5.6 Wetlands

5.6.1 Rationale for Selection as Valued Environmental Component

Wetlands were selected as a VEC because of the potential for interactions between Project activities and wetland environments, and because of the relationship between wetlands and wildlife and other biological and physical environments. This is also in response to the Federal Government's goal for No Net Loss of wetland function (Environment Canada 1991).

In the context of the Wetlands VEC:

"Wetland" is defined per the New Brunswick *Clean Environment Act* as land that, either periodically or permanently, has a water table at, near or above the land's surface or that is saturated with water, and sustains aquatic process as indicated by the presence of hydric soils, hydrophytic vegetation and biological activities adapted to wet conditions; and

"Wetland function" is defined per the *Federal Policy on Wetland Conservation* as "…the natural processes and derivation of benefits and values associated with wetland ecosystems, including economic production (*e.g.,* peat, agricultural crops, wild rice, peatland forest production), fish and wildlife habitat, organic carbon storage, water supply and purification (groundwater recharge, flood control, maintenance of flow regimes, shoreline erosion buffering), and soil and water conservation, as well as tourism, heritage, recreational, educational, scientific, and aesthetic opportunities" (Environment Canada 1991).

In this section, the environmental effects of the proposed Project activities on wetlands resulting from construction, operation, and maintenance as well as accidents, malfunctions and unplanned events are assessed.

5.6.2 Environmental Assessment Boundaries

5.6.2.1 Spatial and Temporal

The spatial boundaries (the "Assessment Area") for the assessment of the potential environmental effects of the Project on wetlands include all wetlands within 30 m of the proposed Project footprint, where activities associated with site preparation and construction, operation, and malfunctions and accidents of the proposed Project could potentially result in environmental effects on wetlands. For the purposes of this assessment, wetlands within the Project footprint for the proposed TCH are assumed to be permanently removed. The environmental effects of wetland loss and/or degradation are assessed within the context of the regional biogeoclimatic zone (*i.e.*, the Valley Lowlands Ecoregion) and the alternative wetlands available within the zone.

The temporal boundaries of the proposed Project on the Wetlands VEC include the periods of construction, and subsequent operation and maintenance of the Project in perpetuity.

5.6.2.2 Administrative and Technical

Wetlands are protected through federal and provincial legislation and policy. Although there is no specific federal legislation regarding wetlands, they may be protected federally under the *Species at Risk Act* (*SARA*), if they contain critical habitat for species at risk, the *Migratory Birds Convention Act, 1994* (*MBCA*), if they contain nests of migratory birds, and/or the *Fisheries Act*, if the wetland contributes to an existing or potential fishery. Details on the application of the *SARA* and the *MBCA* for protection of wildlife is provided in the Wildlife VEC, Section 5.7. Details on the application of the *Fisheries Act* for the protection of fish and fish habitat is provided in the Fish and Fish Habitat VEC, Section 5.4.

Wetland conservation is federally promoted by the *Federal Policy on Wetland Conservation* (Environment Canada 1991). The objective of this policy is to "promote the conservation of Canada's wetlands to sustain their ecological and socio-economic function, now and in the future." Coordination of implementation of the policy is the responsibility of Environment Canada, specifically the Canadian Wildlife Service (CWS) and the Environmental Conservation Branch (ECB).

Wetlands are addressed provincially by the *New Brunswick Wetlands Conservation Policy* (NBDNRE and NBDELG 2002). The primary objective of this policy is to prevent the loss of provincially significant wetlands and achieve no net loss of wetland functions for all other wetlands (*i.e.*, wetlands greater than 1 ha in size). Implementation of this policy is the responsibility of NBDNR, through existing legislation (below).

Wetlands are protected provincially by the *Clean Water Act* and the *Clean Environment Act*. Under the *Clean Water Act*, a permit is required for a wetland alteration. Both of these acts are administered by the NBDELG. The *Clean Environment Act* includes provisions to designate a wetland or any portion of it as a protected area. Under the *Clean Water Act*, the *Watercourse and Wetland Alteration Regulation* applies to all wetlands of 1 ha or greater in size, or any wetland contiguous to a watercourse. The application process applies to all activities (construction, clearing and excavation, including construction and maintenance of watercourse crossings) within 30 m of a wetland. Watercourse crossings will be installed according to the Watercourse Alteration Technical Guidelines developed by NBDELG (2002b). In addition, all watercourse crossings of more than 1.2 m in diameter and/or more then 25 m in length, and/or with a slope above 0.5% will follow the *Guidelines for the Protection of Fish and Fish Habitat – The placement and Design of Large Culverts* (DFO 1999a).

Existing information used in support of the assessment of wetlands was obtained from the New Brunswick Wetland Atlas (CWS 1987), the Atlantic Canada Conservation Data Centre (ACCDC),

CWS, Ducks Unlimited (DU), NBDNR and their forest and wetland inventory mapping, orthographic maps and aerial photography (1:6000; 1999). The baseline Assessment Area for wetlands includes the proposed Project footprint and the immediate habitat within 30 m, where activities associated with site preparation and construction, operation, and accidents, malfunctions and unplanned events of the proposed Project could potentially result in environmental effects on wetlands. Knowledge of the wetlands affected by the proposed Project is based on wetland habitat surveys conducted in 2002, supplementary surveys in 2003 and other information provided by the above sources, and the professional judgement of the study team. Wetland habitat surveys were carried out at each of the wetlands to be crossed for the proposed TCH between Perth-Andover and Woodstock in 2002 to provide a current and thorough examination of baseline conditions. The proposed TCH route was divided into three sections and the surveys were conducted by three teams (Dillon 2003; ACER 2003; JWEL 2003a). If there was a realignment affecting a wetland, the need for additional wetland surveys was examined and executed as required in 2003.

Communications with First Nations people are ongoing, and a traditional ecological knowledge (TEK) study will be conducted in support of the Current Use of Lands and Resources for Traditional Purposes by Aboriginal Persons VEC. This TEK study is not yet complete, but may contain information regarding use of wetlands resources (*e.g.*, fish and wildlife) by First Nations people within the Assessment Area.

It is the professional judgement of the study team that the data that are currently available to characterize the existing conditions and the existing knowledge regarding the Project-VEC interactions are sufficient to support the environmental assessment.

5.6.3 Residual Environmental Effects Rating Criteria

A *significant adverse residual environmental effect* occurs when there is a net loss of wetland functions in a wetland of "significant value" as determined following an evaluation of wetland function.

5.6.4 Existing Conditions

A total of 24 wetlands and wetland complexes are found within 30 m of the proposed Project footprint (Figure 5.6.1 A-D, Appendix E). The wetlands range in size from less than 1 ha to 21 ha. Wetland evaluations were conducted on each of the wetlands identified.

5.6.4.1 Methodology

The proposed TCH route was divided into three sections and the surveys were conducted by three teams (Dillon 2003; ACER 2003; JWEL 2003a). Wetland habitat surveys were completed along the proposed

alignment from Woodstock to Perth-Andover. The baseline Assessment Area for wetlands includes the anticipated footprint within the proposed alignment and the immediate habitat within 30 m. Additional wetland habitat surveys were completed by JWEL in 2003 to cover new wetlands that are located within 30 m of the adjusted alignment from Big Presque Isle Stream to Raymond Road (St. Thomas).

Existing information used in support of the assessment of wetlands was obtained from the New Brunswick Wetland Atlas (CWS 1987), the ACCDC, CWS, Ducks Unlimited (DU), NBDNR and their forest and wetland inventory mapping, orthographic maps and aerial photography (1:6000; 1999). During the field surveys, information required to complete a wetland evaluation was compiled. This included information regarding the likely or observed function of the wetland as wildlife habitat, as habitat for rare or endangered species, as a regulator of surface water flow, as a water treatment system, or as a socio-economic resource. This information was supplemental with vascular plant surveys conducted by JWEL in 2003.

As the first step outlined in *The Federal Policy on Wetland Conservation Implementation Guide for Federal Land Managers* (Environment Canada 1996), wetland evaluations were completed on all wetlands identified within 30 m of the proposed Project footprint to determine the "significance" of each wetland. The *New Brunswick Wetlands Conservation Policy* (NBDNRE and NBDELG 2002) applies to all wetlands greater than 1 ha in size. Therefore, wetland evaluations to determine wetland "significance" were evaluated using two processes. Wetlands of 1 ha or smaller in size were evaluated using a version of 10-step evaluation method for wetlands under 2 ha developed for the Nova Scotia Department of Environment Wetlands Directive. Wetlands larger than 1 ha in size were evaluated using a modified Stage Two "Detailed Analysis" detailed in the North American Wetlands Conservation Council (Canada) *Wetland Evaluation Guide* (Bond *et al.* 1992).

Freshwater wetlands in New Brunswick have been evaluated by CWS (1987) using Golet's classification (Golet 1973) and evaluation system to rank wetlands based on an evaluation with respect to wildlife value. The rank is achieved through an evaluation of dominant vegetation, topography, depth of water and proportion and interspersion of cover and water (Golet 1973). The 1987 CWS evaluations were completed based on 1980-1985 aerial photography (CWS 1987). Wetlands with a score greater than 65 are considered productive wetlands (Golet 1973). The Golet score was taken into consideration during the wetland evaluations, however, due to the potential for substantial changes in wetlands since the CWS evaluations, and the identification of wetlands that were not evaluated in 1987, all wetlands were re-evaluated for wildlife value.

The Canada Land Inventory (CLI) provides a national classification system that rates the capability of land to support wildlife (Environment Canada 1970). The CLI for wildlife is restricted to two main groups of wildlife: ungulates and waterfowl. The classification is based on characteristics such as soil, moisture, fertility, landform, climate and vegetation and also assumes good wildlife management

practices are implemented (Environment Canada 1970). The CLI was taken into consideration in some of the wetland evaluations, where they were provided by the baseline studies authors (*i.e.*, Dillon 2003, and ACER 2003).

Species of special conservation concern recorded in the wetlands were ranked according to the criteria provided in Table 5.5.1 in Section 5.5.3.

5.6.4.2 Wetlands 1 Hectare or Smaller in Size

A total of 11 wetlands smaller than 1 ha in size were recorded in the Assessment Area. Each of these wetlands is described below and was evaluated using the 10-step evaluation process of the Nova Scotia Department of Environment Wetlands Directive. Completed wetland evaluations are provided in Appendix E.

Wetland 1 (WL1)

WL1 is a 0.5 ha wetland complex comprising kettle marsh and a coniferous treed basin swamp located north of Demerchant Brook (Figure 5.6.1 A, Appendix E). The wetland was once partially surrounded by agricultural land. Household rubbish was previously discarded in the wetland. A vegetation survey revealed the presence of 58 species of vascular plants, none of which are considered to be rare in New Brunswick. No wildlife species of special conservation concern were observed in the wetland.

The western edge of the proposed Project footprint will cross the eastern edge of WL1. Approximately 0.09 ha will be directly affected by Project-related clearing and construction activities.

Wetland 2 (WL2)

WL2 is a 0.07 ha terminal basin marsh located at the head of an unnamed tributary to Brown Brook (Figure 5.6.1 A, Appendix E). A vegetation survey revealed the presence of 19 species of vascular plants, including small yellow water-crowfoot (*Ranunculus gmelinii* var. *purshii*), which is ranked S2 in New Brunswick (ACCDC 2003), but is considered "Secure" by NBDNRE (2002a). No wildlife species of special conservation concern were observed in the wetland.

The proposed Project footprint will cross through the entire area (0.07 ha) of WL2.

Wetland 4 (WL4)

WL4 is a 0.03 ha stream marsh located at the base of a newly constructed beaver dam on the banks of an unnamed tributary to Graham Brook, south of Bishop Lake (Figure 5.6.1 A, Appendix E). A vegetation survey revealed the presence of 47 species of vascular plants, none of which is considered to be rare in

New Brunswick (Hinds 2000; ACCDC 2003; NBDNRE 2002a). The wetland is not good habitat for amphibian species using ephemeral/vernal pool habitat due to the presence of brook trout. No birds were noted, however, the beaver pond upstream of the wetland could be marginally suitable for waterfowl use during migration. No wildlife species of special conservation concern were observed in the wetland.

WL4 will be crossed by the proposed Project footprint and is expected to be affected by the removal of the beaver dam and installation of culverts at this location.

Wetland 5 (WL5)

WL5 is a 0.4 ha terminal basin marsh located north of Scott Road (Figure 5.6.1 A, Appendix E). A vegetation survey revealed the presence of 41 species of vascular plants, including Canada clearweed (*Pilea pumila*), which is ranked S2 in New Brunswick (ACCDC 2003), and is considered "Sensitive" by NBDNRE (2002a). No wildlife species of special conservation concern were observed in the wetland.

The wetland is located approximately 50 m west of the proposed Project footprint. WL5 will not be directly affected by the proposed Project.

Wetland 6 (WL6)

WL6 is a 0.8 ha stream marsh (beaver meadow) located on Graham Brook (Figure 5.6.1 A, Appendix E). The area was formerly flooded as a result of beaver activity. Beaver activities have ceased and the stream marsh has developed on the bottom of the old beaver pond. A vegetation survey revealed the presence of 83 species of vascular plants, one of which (tufted loosestrife (*Lysimachia thyrsiflora*)) is considered to be uncommon in New Brunswick (ACCDC 2003) but considered "Secure" by NBDNR (NBDNRE 2002a). No rare (S1, S2), "at risk", "May Be At Risk", or "Sensitive" plants were recorded in the wetland. Open water at the western end of the wetland provides relatively good waterfowl habitat. No wildlife species of special conservation concern were observed in the wetland.

The proposed Project footprint will cross WL6. Approximately 0.70 ha of the wetland will be directly affected by the proposed Project.

Wetland 7 (WL7)

WL7 is a 0.09 ha terminal basin marsh located between Scott Road and Dean Road, south of Graham Brook (Figure 5.6.1 A, Appendix E). A vegetation survey revealed the presence of 23 species of vascular plants, including Canada clearweed. No wildlife species of special conservation concern were observed in the wetland.

WL7 is located approximately at the edge of the proposed Project footprint and therefore will be largely outside the proposed Project footprint.

Wetland 8 (WL8)

WL8 is a 0.5 ha terminal basin marsh located at the head of an unnamed tributary to Graham Brook (Figure 5.6.1 A, Appendix E). A vegetation survey revealed the presence of 36 species of vascular plants, including Canada clearweed. No wildlife species of special conservation concern were observed in the wetland. A deer blind indicates hunting in the area.

WL8 will be crossed by the proposed Project footprint on the west side of the wetland. Approximately 0.36 ha of the wetland will be directly affected by the proposed Project.

Wetland 10 (WL10)

WL10 is a 0.47 ha seasonally flooded emergent wetland located south of Route 560 (Figure 5.6.1 B, Appendix E). The wetland consisted of saturated muddy substrate at the time of the survey. Ground vegetation consisted of dead *Equisetum* (horsetail) plants. No rare plants or wildlife species of special conservation concern were observed in the wetland.

Due to modifications of the alignment near this wetland, the wetland is located approximately 50 m from the edge of the Project footprint.

Wetland 21 (WL21)

WL21 is a 0.45 ha seasonally flooded emergent wetland located on Lanes Creek (Figure 5.6.1 D, Appendix E) and is impounded by a beaver dam. Greater than 95% of the wetland is covered in vegetation. The wetland is surrounded by agricultural land and softwood stands. No rare plants or wildlife species of special conservation concern were observed in the wetland.

WL21 will be crossed by the proposed Project footprint through the west side of the wetland. Approximately 0.23 ha of the wetland will be directly affected by the proposed Project.

Wetland 22 (WL22)

WL22 is a 0.15 ha seasonally flooded emergent wetland located in an isolated depression along an unnamed tributary to Harper Brook (Figure 5.6.1 D, Appendix E). Greater than 95% of the wetland is covered in vegetation. The wetland is surrounded by agricultural land and immature and mature

hardwood stands. No rare plants or wildlife species of special conservation concern were observed in the wetland.

All of WL22 will be directly affected by the proposed Project.

Wetland 23 (WL23)

WL23 is a 0.25 ha seasonally flooded shrub wetland located in an isolated depression at the head of an unnamed tributary to Harper Brook (Figure 5.6.1 D, Appendix E). Greater than 95% of the wetland is covered in vegetation. The wetland is surrounded by agricultural land and mixedwood forest stands. A high tension power line RoW runs through the eastern third of the wetland. No rare plants or wildlife species of special conservation concern were observed in the wetland.

All of WL23 will be directly affected by the proposed Project.

5.6.4.2.1 Summary of Wetlands 1 Hectare or Smaller in Size

Some of these small wetlands may be used as thermal refugia by black bear and moose during hot periods in the summer; however, this type of habitat is not limited in the general area. Most of the wetlands also provide breeding habitat for a variety of amphibian species, none of which are considered to be rare in New Brunswick.

None of the wetlands have a Golet score of greater than 65. Generally, the land in the Assessment Area has a CLI classification of 2 for ungulates and 7 for waterfowl. The classification of 2 for ungulates indicates that the land has "very slight limitations to the production of ungulates" (Environment Canada 1970). The classification of 7 for waterfowl indicates that the land has "such severe limitations that almost no waterfowl are produced" (Environment Canada 1970).

Overall the wetlands appear to have low social/cultural value. None of them are part of any protected area such as a national or provincial park, national wildlife area, federal migratory bird sanctuary, ecological reserve, provincial wildlife management area, wildlife refuge, or game sanctuary.

A summary of each of the wetlands smaller than 1 ha is provided in Table 5.6.1.

Table 5.6.1 Summary of Wetlands < 1 ha in Size Located Within 30 m of the Project Footprint

Wetland Number	Wetland Identifier	Wetland Area (ha)	Wetland Type	Relationship to proposed Project Footprint	Area Affected (ha)
WL1	JW6	0.5	Kettle marsh/basin swamp complex	Project footprint through eastern edge of wetland.	0.09
WL2	JW8	0.07	Terminal basin marsh	Project footprint through entire wetland.	0.07
WL4	JW4	0.03	Stream marsh	Project footprint through middle of wetland.	0.03
WL5	JW7	0.4	Terminal basin marsh	Project footprint located to the east of wetland.	0
WL6	JW3	0.8	Stream marsh	Project footprint through middle of wetland.	0.70
WL7	JW2	0.09	Terminal basin marsh	Project footprint skirts east side of wetland.	0.001
WL8	JW1	0.5	Terminal basin marsh	Project footprint through west side of wetland.	0.36
WL10	ACER2	0.47	Seasonally flooded flats	Project footprint located to the west of wetland.	0
WL21	D-F103	0.45	Stream marsh	Project footprint through west side of wetland.	0.23
WL22	D-F102	0.15	Stream marsh	Project footprint through west side of wetland.	0.15
WL23	D-F101	0.25	Shrub swamp	Project footprint through east side of wetland.	0.25

The 10-step evaluation process evaluates the "significance" of a wetland based on the following functions:

- wildlife habitat potential (*e.g.*, Golet score greater than 65);
- rare and endangered species;
- groundwater recharge potential;
- role of the wetland in surface flow regulation;
- agricultural use of the wetland;
- role of the wetland in water treatment; and
- potential for peat development.

Although all of the wetlands may support some wildlife, none had a Golet score greater than 65. Four of the wetlands have rare or uncommon plant species, however, based on discussions with NBDNR regarding these wetlands, none would be considered provincially "significant" (L. Swanson and M. Toner, pers. comm. 2003). The small yellow water-crowfoot is considered to be "Secure" by NBDNR (NBDNRE 2002a). As discussed in Section 5.5, Canada clearweed was recorded in 16 sites within the Assessment Area. Given the small size of the wetlands containing Canada clearweed, and the abundance and distribution of this species in the Assessment Area, these wetlands are not considered to be "significant" for rare and endangered species.

None of the wetlands were considered "significant" for groundwater recharge potential, role of the wetland in surface flow regulation, agricultural use of the wetland, role of the wetland in water treatment, and/or potential for peat development. The conclusion of all of the wetland evaluations (Appendix E) was that none of the wetlands smaller than 1 ha are considered "significant" wetlands.

5.6.4.3 Wetlands Larger Than 1 Hectare in Size

A total of 13 wetlands larger than 1 ha in size were recorded in the Assessment Area. Each of these wetlands is described below and was evaluated using the Stage Two "Detailed Analysis" of the North American Wetlands Conservation Council (Canada) Wetland Evaluation Guide (Bond *et al.* 1992).

Wetland 3 (WL3)

Wetland 3 is a 6.7 ha wetland complex comprising shore marsh, shore bog, coniferous treed shore swamp and open water. Two critical habitat values and one critical ecological value were confirmed in WL3.

Rare animal and plant species are present. Three rare vascular plant species were recorded in the wetland. Lesser bladderwort (*Utricularia minor*), ranked S2 by ACCDC (2003) and considered "Sensitive" by NBDNRE (2002a), was recorded in Wetland 3 and is expected to be found throughout the wetland in suitable habitat. Small yellow water-crowfoot (*Ranunculus gmelinii* var. *purshii*) is ranked S2 in New Brunswick (ACCDC 2003), but is considered "Secure" by NBDNRE (2002a) and may in future be ranked as S3. This species was recorded at five locations within the RoW. Given the apparent status of this species, the loss of this small wetland will not likely have an adverse effect on the local or regional populations. Small-fruited burreed (*Sparganium natans*) is ranked as rare or borderline rare (S2 or S2S3) by ACCDC (2003) and considered "Secure" by NBDNRE (2002a) and was found with lesser bladderwort. Like the lesser bladderwort, this species is expected to be found throughout the wetland in suitable habitat. A breeding bird survey was conducted at Wetland 3 in 2003, and one S4 (ACCDC 2003), "Sensitive" (NBDNRE 2002a) species, purple finch (*Carpodacus purpureus*), was recorded.

The wetland has a Golet score of 67, an accepted wetland evaluation system. Wetlands with a Golet score greater than 65 are considered productive wetlands for wildlife. The Golet score of 67 for WL3 was likely based on the wetland's potential for waterfowl production and as loafing and feeding habitat for migrating waterfowl. Also, the land in the Assessment Area generally has a CLI classification of 2 for ungulates.

The wetland also displays biological diversity that is of interest. Overall the wetland is rich in species flora as well as diversity of local habitats.

Although marginally considered a significant wetland, only a small proportion (<5%) of the wetland, in the most recently flooded portion at the extreme upgradient end, is located within the proposed footprint of the Project. With appropriate drainage controls and maintenance of wetland hydrology, the project is not likely to have a significant environmental effect on the wetland.

Wetland 9 (WL9)

WL9 is a 6.4 ha deep marsh wetland located on an unnamed tributary to Upper Guisiguit Brook (Figure 5.6.1 B, Appendix E). A beaver dam is located at the wetland outlet in the southern end of the wetland, creating open water. The wetland is covered by dead woody and emergent vegetation. The northern end contains dead cedars, grasses and mosses. No rare plant species were recorded in the wetland. Purple finch (S4B, "Sensitive") were observed in the wetland.

The proposed Project footprint will pass through the western side of the wetland. Approximately 4.3 ha of the wetland will be directly affected by the proposed Project.

Wetland 11 (WL11)

WL11 is a 13.3 ha emergent vegetated deep marsh wetland complex located on an unnamed tributary to Lower Guisiguit Brook (Figure 5.6.1 B, Appendix E). A beaver dam is located at the wetland outlet in the southern end of the wetland, creating open water. The wetland is primarily a wet meadow with open water and a swampy beaver pond. Approximately 85% of the wetland complex is covered by vegetation. A vegetation survey revealed the presence of lesser bladderwort (S2, "Sensitive") and two species (hidden-scaled sedge (*Carex cryptolepis*) and lesser tussock sedge (*Carex diandra*)) which are ranked S3 (ACCDC 2003) and "Secure" (NBDNRE 2002a). No wildlife species of special conservation concern were recorded in the wetland.

The proposed Project footprint will pass through the southern end of the wetland. Approximately 0.64 ha of the wetland will be directly affected by the proposed Project.

Wetland 12 (WL12)

WL12 is a 14.1 ha compact shrub swamp located on Lower Guisiguit Brook (Figure 5.6.1 B, Appendix E). An abandoned beaver pond has drained down and the area consists of grasses, alders and cedars. Greater than 95% of the wetland is covered by vegetation. No rare plant species were recorded in the wetland. Purple Finch (S4, "Sensitive") were observed in the wetland.

The proposed Project footprint will pass through the northern end of the wetland. Approximately 0.74 ha of the wetland will be directly affected by the proposed Project.

Wetland 13 (WL13)

WL13 is a 5.54 ha shrub swamp located on an unnamed tributary to Lower Guisiguit Brook (Figure 5.6.1 B, Appendix E). A beaver pond is associated with the wetland, creating open water. Greater than 95% of the wetland is covered by vegetation. No rare plant species or wildlife of special conservation concern were recorded in the wetland.

The proposed Project footprint will pass through the western side of the wetland. Approximately 2.7 ha of the wetland will be directly affected by the proposed Project.

Wetland 14 (WL14)

WL14 is a 4.5 ha shallow marsh located on the headwaters of Lower Guisiguit Brook (Figure 5.6.1 B, Appendix E). A beaver pond is associated with the wetland, creating open water. Approximately 85% of the wetland is covered by vegetation. No rare plant species were recorded in the wetland. Purple Finch (S4, "Sensitive") and Great-crested Flycatcher, ranked as S4 by ACCDC (2003) and considered "Sensitive" by NBDNR (2003a), were observed in the wetland.

The proposed Project footprint will pass through the middle of the wetland. Approximately 3.8 ha of the wetland will be directly affected by the proposed Project.

Wetland 15 (WL15)

WL15 is an 11.3 ha shrub swamp located around Leith Lake (Figure 5.6.1 B, Appendix E). Greater than 95% of the wetland is covered by vegetation. The wetland vegetation consists of mosses, grasses, cedars and black spruce. No rare plant species were recorded in the wetland. Purple Finch (S4, "Sensitive"), Great-crested Flycatcher (S4, "Sensitive") and, Willow Flycatcher, ranked as S1S2 by ACCDC (2003) and considered "Sensitive" by NBDNR (2003a), were observed in the wetland.

The proposed Project footprint will pass through the upland portion of the wetland, which is mostly saturated soils with grass, shrubs and some trees. Approximately 1.2 ha of the wetland will be directly affected by the proposed Project.

Wetland 16 (WL16)

WL16 is a 6 ha wetland complex comprising seasonally flooded shrub swamp located on an unnamed tributary to Hunters Brook (Figure 5.6.1 C, Appendix E). The wetland complex is surrounded by cultivated agricultural land, stands of mixed wood, regenerating clear-cuts, developed land, rural road

and highway. No rare plant species or wildlife of special conservation concern were recorded in the wetland.

WL16 is crossed by the proposed Project footprint on the west side of the wetland. Approximately 1.0 ha of the wetland will be directly affected by the proposed Project.

Wetland 17 (WL17)

WL17 is a 2.3 ha mixed wood treed basin swamp. The wetland is located south of Dryer Road (Figure 5.6.1 C, Appendix E). The wetland is a marginal swamp area interspersed with upland patches. The wetland receives overland surface flow mostly in the spring, and some possible inputs of groundwater. No outflow was obvious. A vegetation survey revealed the presence of 82 species of vascular plants, none of which is considered to be rare in New Brunswick (ACCDC 2003; NBDNRE 2002a). No wildlife species of special conservation concern were observed in the wetland.

The proposed Project footprint will pass through most of the wetland on the eastern side. Approximately 1.6 ha of the wetland will be directly affected by the proposed Project.

Wetland 18 (WL18)

WL18 is a 12.3 ha wetland complex comprising treed basin swamp, raised treed bog, treed bog and open low shrub bog. The wetland is located south of Dryer Road (Figure 5.6.1 C, Appendix E). A vegetation survey revealed the presence of 86 species of vascular plants. Boreal bog sedge (*Carex magellanica* subsp. *magellanica*), which is ranked S2 (ACCDC 2003) and considered to be "Sensitive" (NBDNRE 2002a), was found scattered throughout the swamp near the edge of the bog. No wildlife species of special conservation concern were observed in the wetland. The wetland is an interesting wetland complex containing one of a few true acidic bog habitats identified in the Assessment Area.

The proposed Project footprint will pass along the edge of the western side of the wetland. Approximately 1.5 ha of the shrub swamp wetland will be directly affected by the proposed Project. The swamp area containing boreal bog sedge, and the bog proper will not be directly affected by the proposed Project.

Wetland 19 (WL19)

WL19 is a 3.4 ha, seasonally flooded shrub swamp located on an unnamed tributary to the Little Presque Isle River (Figure 5.6.1 D, Appendix E). The wetland is impounded by a beaver dam. The wetland is surrounded by softwood and mixed wood stands of various ages. Approximately 12% of the wetland perimeter is surrounded by a regenerating clear-cut and agricultural land is located within 60 m to the

north and west. Greater than 95% of the wetland is covered in vegetation. No plant species of special conservation concern were recorded in the wetland. Virginia Rail (S3, "Sensitive") was observed in the wetland.

The proposed Project footprint will pass through the west side of the wetland. Approximately 0.31 ha of the wetland will be directly affected by the proposed Project.

Wetland 20 (WL20)

WL20 is a 21 ha, seasonally flooded shrub swamp located on the Little Presque Isle Stream (Figure 5.6.1 D, Appendix E). The wetland is partially impounded by a beaver dam and the remains of a deteriorated anthropogenic dam. The wetland is surrounded by cultivated agricultural land (76%) and a narrow band of regenerating cutover areas adjacent to cultivated agricultural land (24%). Greater than 95% of the wetland is covered in vegetation. No rare plant species or wildlife of special conservation concern were recorded in the wetland.

The wetland has been assigned a Golet score of 66. The proposed Project footprint will pass through near the middle of the wetland. Approximately 1.4 ha of the wetland will be directly affected by the proposed Project, however, given that Little Presque Isle Stream will be crossed with a bridge structure, the footprint of disturbance should be limited to the bridge pier, depending on the final design and spanning limitations.

Wetland 24 (WL24)

WL24 is 5 ha, a permanently flooded aquatic bed located on an unnamed tributary to the Meduxnekeag River (Figure 5.6.1 D, Appendix E). The wetland is impounded by the existing TCH with a water control structure on the upstream end of the culvert. The wetland consists largely of open water. The wetland is hydrologically connected to a wetland on the west side of the TCH. The wetland is surrounded by cultivated agricultural land (45%), a narrow band of mixed wood adjacent to cultivated agricultural land (45%) and the existing TCH along the western perimeter (10%). Approximately 25% of the wetland is covered in vegetation. No plant or wildlife species of special conservation concern were recorded in the wetland.

The proposed Project footprint crosses WL24 on the west side of the wetland. Approximately 0.54 ha of the wetland will be directly affected by the proposed Project, involving the twinning of the adjacent section of the TCH.

5.6.4.3.1 Summary of Wetlands Larger Than 1 Hectare in Size

Most of the wetlands may be used as thermal refugia by black bear and moose during hot periods in the summer; however, this type of habitat is not limited in the general area. Most of the wetlands also provide breeding habitat for a variety of amphibian species, none of which are considered to be rare in New Brunswick.

Three of the wetlands have a Golet score of greater than 65. Generally, the land in the Assessment Area has a CLI classification of 2 for ungulates and 7 for waterfowl. The classification of 2 for ungulates indicates that the land has "very slight limitations to the production of ungulates" (Environment Canada 1970). The classification of 7 for waterfowl indicates that the land has "such severe limitations that almost no waterfowl are produced" (Environment Canada 1970). Wetland 11 is classified as class 4 for waterfowl, indicating that it has only moderate limitations to the production of waterfowl.

Overall the wetlands appear to have low social/cultural value. None of them are part of any protected area such as a national or provincial park, national wildlife area, federal migratory bird sanctuary, ecological reserve, provincial wildlife management area, wildlife refuge, or game sanctuary.

A summary of each of the wetlands larger than 1 ha is provided in Table 5.6.2.

Table 5.6.2 Summary of Wetlands > 1 ha in Size Located Within 30 m of the Project Footprint

Wetland Number	Wetland Identifier	Wetland Area (ha)	Wetland Type	Relationship to proposed Project Footprint	Area Affected (ha)
WL3	JW5	6.7	Shore marsh/shore bog/shore swamp/open water complex	Project footprint through northeastern end of wetland.	0.32
WL9	ACER1	6.4	Deep marsh	Project footprint through west side of wetland.	4.3
WL11	ACER3	13.3	Deep marsh	Project footprint through southern end of wetland.	0.64
WL12	ACER4	14.1	Shrub swamp	Project footprint through northwest side of wetland.	0.74
WL13	ACER4A	5.5	Shrub swamp	Project footprint through west side of wetland.	2.7
WL14	ACER5	4.5	Shallow marsh	Project footprint through middle of wetland.	3.8
WL15	ACER6	11.3	Shrub swamp	Project footprint through west side of wetland.	1.2
WL16	5222 5219 5217	6	Shrub swamp complex	Project footprint through west side of wetland.	1.0
WL17	JW1-new	2.3	Treed basin swamp	Project footprint through eastern side of wetland.	1.6
WL18	JW2-new	12.3	Treed basin swamp/treed bog/shrub bog complex	Project footprint through western edge of wetland.	1.5
WL19	1992	3.4	Shrub swamp	Project footprint through west end of wetland.	0.31
WL20	1143	21	Shrub swamp	Project footprint through middle of wetland.	1.4
WL24	9441	5	Open water	Project footprint through west end of wetland.	0.54

Through the Stage Two "Detailed Analysis" process of the North American Wetlands Conservation Council (Canada) Wetland Evaluation Guide (Bond *et al.* 1992), wetlands are evaluated for the following values:

- Life Support Values – hydrological values, biogeochemical values, habitat values and ecological values;
- Social/Cultural Values – aesthetic values, recreational values, education and public awareness values, public status values, and cultural attribute values; and
- Wetland Production Values – agricultural values, renewable resource values, non-renewable resource values, tourism and recreational values and urban values.

The Stage Two evaluates the "significance" of a wetland based on "critical values". A critical value is defined as "…a wetland value whose product, service or function is very important to society or where an important threshold or function may be exceeded, resulting in the loss of the function and value" (Bond *et al.* 1992).

A wetland is considered "significant" if three or more critical values are identified for the wetland and/or over 50% of the values identified for the wetland have national/provincial/regional significance (Bond *et al.* 1992).

The conclusion of all of the wetland evaluations (Appendix E) was that only one of the wetlands is considered "significant". WL3 had three critical values identified. None of the wetlands had more than 50% of the values having national, provincial and/or regional significance.

Wetland 3 is a 6.7 ha wetland complex comprising shore marsh, shore bog, coniferous treed shore swamp and open water. Two critical habitat values and one critical ecological value were confirmed in WL3.

Rare animal and plant species are present. Three rare vascular plant species were recorded in the wetland. Lesser bladderwort (*Utricularia minor*), ranked S2 by ACCDC (2003) and considered "Sensitive" by NBDNRE (2002a), was recorded in Wetland 3 and is expected to be found throughout the wetland in suitable habitat. Small yellow water-crowfoot (*Ranunculus gmelinii* var. *purshii*) is ranked S2 in New Brunswick (ACCDC 2003), but is considered "Secure" by NBDNRE (2002a) and may in future be ranked as S3. This species was recorded at five locations within the RoW. Given the apparent status of this species, the loss of this small wetland will not likely have an adverse effect on the local or regional populations. Small-fruited burreed (*Sparganium natans*) is ranked as rare or borderline rare (S2 or S2S3) by ACCDC (2003) and considered "Secure" by NBDNRE (2002a) and was found with lesser bladderwort. Like the lesser bladderwort, this species is expected to be found throughout the wetland in suitable habitat. A breeding bird survey was conducted at Wetland 3 in 2003, and one S4

(ACCDC 2003), "Sensitive" (NBDNRE 2002a) species, purple finch (*Carpodacus purpureus*), was recorded.

The wetland has a Golet score of 67, an accepted wetland evaluation system. Wetlands with a Golet score greater than 65 are considered productive wetlands for wildlife. The Golet score of 67 for WL3 was likely based on the wetland's potential for waterfowl production and as loafing and feeding habitat for migrating waterfowl. Also, the land in the Assessment Area generally has a CLI classification of 2 for ungulates.

The wetland also displays biological diversity that is of interest. Overall the wetland is rich in species flora as well as diversity of local habitats.

Although marginally considered a significant wetland, only a small proportion (<5%) of the wetland, in the most recently flooded portion at the extreme upgradient end, is located within the proposed footprint of the Project. With appropriate drainage controls and maintenance of wetland hydrology, the project is not likely to have a significant environmental effect on the wetland.

As part of the initial constraint analysis and selection of the preferred alignment during the early planning, wetlands are one of the constraints that NBDOT attempts to avoid (Section 3.1.2 of EPP). Given the number of constraints in this area of New Brunswick, some wetlands could not be avoided, without potentially causing significant environmental effects on other VECs, or compromising the design standard of the proposed Project.

5.6.5 Environmental Effects Analysis

5.6.5.1 Project-VEC Interactions

Table 5.6.3 provides a summary of the potential environmental effects resulting from the Project-VEC interactions, including those of past, present and likely future projects. The table is divided according to each of the Project phases assessed (construction, operation and maintenance), as well as malfunctions, accidents and unplanned events. The discussion following the table provides an analysis of key Project-VEC interactions, by Project phase.

Table 5.6.3 Project Activity – Environmental Effects Interaction Matrix for Wetlands

Potential Interactions Between Project Activities and Environmental Effects **Valued Environmental Component: WETLANDS**			
Project Activities and Physical Works (see Table 4.1.1 for list of specific activities and works)	**Potential Environmental Effects**		
	Change in Wetland Quantity	**Change in Wetland Quality**	**Loss of Wetland Function**
Construction			
Site Preparation	✓	✓	✓
Roadbed Preparation	✓	✓	✓
Surfacing and Finishing		✓	
Watercourse Crossing Structures	✓	✓	✓
Ancillary Structures and Facilities Construction	✓	✓	✓
Operation			
Winter Safety		✓	✓
Proposed TCH Presence		✓	
Maintenance			
Proposed TCH Maintenance		✓	✓
Vegetation and Wildlife Management		✓	
Accidents, Malfunctions and Unplanned Events			
Hazardous Materials Spills		✓	✓
Erosion and Sediment Control Failure		✓	✓
Bridge or Culvert Washout		✓	✓
Fires		✓	✓

5.6.5.1.1 Construction

There are several construction activities related to the Project that could affect the Wetlands VEC. The most substantive and likely interactions are a change in habitat quantity or quality as a result of the site preparation and roadbed preparation activities. Other potential environmental effects may occur during all construction phases (including surfacing and finishing, watercourse crossings and bridge construction, and ancillary structures and facilities construction). Potential environmental effects of these activities include a change in habitat quantity or quality and/or the possible loss of wetland function.

As previously indicated in Section 2.2, the route selection process began in 1987. During the route selection process, regulators and stakeholders identified known locations of wetlands within the proposed route corridors. Due to the presence of wetlands and moose habitat identified by landowners, a 10 km section was realigned to the west of the 1999 Alignment (Figure 2.1 C, Appendix B). Although not all of the wetlands were completely avoided, the 2003 realignment minimized disruption to these habitats to the extent possible, considering the other constraints (including design standards).

Although the route selection process avoids many of the wetlands in the landscape, 20 wetlands could not be avoided due to other constraints (*e.g.*, watercourses, rare plants), and two wetlands were only identified in the field following selection of the preferred route. Twenty-two wetlands will be physically disturbed by Project construction activities. One wetland is located within 30 m of the Project footprint, but will not be directly affected by construction activities, and another wetland is now 50 m from the footprint, due to a reduction in the distance between the mainlane centrelines.

Site Preparation

Clearing and grubbing for the proposed TCH will remove vegetation and may change the quality of the habitat along the edge of the Project footprint. Only those wetlands with significant woody stems that may be cut while the ground is frozen would likely be affected during this stage of construction.

Roadbed Preparation

Roadbed preparation will remove wetland soils within the Project footprint. The extent of wetland habitat affected will be the Project footprint.

Blasting can have physical and chemical environmental effects on wetland habitat. Blasting can cause bank failure and/or rock slides and resultant filling of wetland habitat. Nitrogen-based explosives can affect wetland habitat quality by providing nutrients for aquatic plants and promoting algal growth.

The primary potential environmental effect of excavation is exposure of surface water to sulfide bearing bedrock, causing a pH reduction in wetlands to levels that are harmful to fish, and a potential loss of wetland function in wetlands supporting commercially or recreationally fished species. The environmental effects of pH reduction to fish and fish habitat are assessed in the Fish and Fish Habitat VEC, Section 5.4.

Watercourse Crossing Structures

The proposed TCH will require the installation of culverts and bridges. Installation of watercourse crossings can alter wetland habitat through drainage, flooding or extensive erosion. Improperly installed crossings (unplanned event) could also result in the harmful alteration, disruption or destruction of fish habitat and a potential loss of wetland function in wetlands supporting commercially or recreationally fished species. The environmental effects of blockage of fish passage to fish and fish habitat are assessed in the Fish and Fish Habitat VEC, Section 5.4.

Surfacing and Finishing

The handling of asphalt, concrete, hydrocarbon and hazardous materials during the construction phase and surfacing and finishing phase of the new proposed TCH, and storage of these materials at ancillary facilities could potentially affect wetlands. Interactions would most likely be considered the result of accidents, malfunctions and unplanned events.

The introduction of asphalt, hydrocarbons or liquid concrete products to wetlands can have harmful effects on wetland habitat (*e.g.*, plant life) and a potential loss of wetland function in wetlands supporting commercially or recreationally fished species. The environmental effects of surfacing and finishing to fish and fish habitat are assessed in the Fish and Fish Habitat VEC, Section 5.4.

Ancillary Structures and Facilities

Construction of temporary ancillary structures and facilities, such as access roads, borrow areas and disposal sites, has the potential to have interactions with wetlands similar to those of site and road preparation activities.

5.6.5.1.2 Operation

Winter Safety

During winter, salt is used by NBDOT on road surfaces to aid in melting snow, and to provide clear road conditions. Road salt can enter into the environment (surface water, groundwater and soil) through storage and application of these salts. The highest concentrations are usually associated with winter and spring thaws. Road salt application has the potential to result in damage to wetland habitat and/or loss of wetland function if the wetland provides habitat for commercially or recreationally fished species or rare plant species. The environmental effects of winter safety to fish and fish habitat are assessed in the Fish and Fish Habitat VEC, Section 5.4. The environmental effects of winter safety to rare plant species are assessed in the Vegetation VEC, Section 5.5.

Proposed TCH Presence

During the Project-related activities associated with the proposed TCH presence, there is a potential for a change in water quantity or quality, and therefore wetland habitat quantity and quality.

5.6.5.1.3 Maintenance

Proposed TCH Maintenance

Ditching may be required to improve water flow, erosion or excessive vegetative growth. The primary issue of concern is the release of sediment into surface water bodies, including wetlands.

Vegetation and Wildlife Management

Clearing along the proposed TCH is part of NBDOT's regular maintenance to maintain sight lines and may involve both manual and mechanized cutting. Vegetation cutting will occur within the footprint of the Project that has been previously disturbed for site preparation and hydroseeded. Hydroseeding may introduce excess nutrients into wetlands.

5.6.5.1.4 Accidents, Malfunctions and Unplanned Events

Accidents, malfunctions and unplanned events that may occur in association with the Project and could have an adverse environmental effect on wetlands including:

- hazardous material spills;
- erosion and sediment control failure;
- bridge or culvert washout; and
- fire.

Hazardous material spills may degrade wetland habitat quality and result in a loss of wetland function if the wetland provides habitat for commercially or recreationally fished species. Hazardous material spills could be the result of construction activities (*e.g.*, equipment fuelling or faulty vehicle components), operation activities (*e.g.*, hazardous material transport truck accident, or excessive salt application), or maintenance activities (*e.g.*, equipment fuelling).

Erosion and sediment control measures could fail and release sediment into wetlands during precipitation events.

Bridge or culvert washout may result in the loss of wetland function if the wetland provides habitat for commercially or recreationally fished species. This could result from storms greater than accounted for in the structure design.

Fire could alter wetland habitat in the Assessment Area. Fire may be caused as a result of construction activities (*e.g.*, hot equipment), operation activities (*e.g.*, discarded cigarettes or hot exhaust systems in contact with roadside vegetation), and maintenance activities (*e.g.*, hot equipment).

The environmental effects of accidents, malfunctions and unplanned events to fish and fish habitat (in wetlands) are assessed in the Fish and Fish Habitat VEC, Section 5.4.

5.6.5.2 Environmental Effects Analysis and Mitigation

5.6.5.2.1 Construction

The following provides an evaluation of key potential Project-VEC interactions for the construction phase of the Project as summarized in the environmental effects assessment matrix (Table 5.6.4). During construction of the proposed TCH and associated roads and structures, several activities could result in a change in wetland quality and quantity, or loss of wetland function. These include any activities that involve vegetation clearing, soil disturbance or hydrological modifications (site preparation, road preparation, watercourse crossing, and ancillary structures and facilities construction). The sections following this table describe the mitigative strategies aimed at mitigating these potential environmental effects.

Table 5.6.4 Environmental Effects Assessment Matrix for Wetlands (Construction)

Environmental Effects Assessment Matrix
Valued Environmental Component: WETLANDS
Phase: Construction

Project Activity (See Table 4.1.1 for list of specific activities and works)	**Potential Environmental Effects**	**Mitigation**	**Magnitude**	**Geographic Extent**	**Duration/Frequency**	**Reversibility**	**Ecological/Socio-Cultural and Economic Context**
Site Preparation	Change in wetland quantity (A) Change in wetland quality (A) Loss of wetland function (A)	• Avoidance through route selection process • Follow EPP, EFG • Erosion control measures • Limit area of disturbance • Minimize work in and near wetlands	1-2	3	5/1	1	2
Roadbed Preparation	Change in wetland quality (A) Change in wetland quality (A) Loss of wetland function (A)	• Follow EPP, EFG and site specific EPPs • Identify areas of sulfide bearing rock • Obtain approval to blast from DFL and follow DFO's blasting guidelines • Implement drainage controls • Erosion control measures	1-2	1	2/1	R	2
Surfacing and Finishing	Change in wetland quality (A)	• Follow EPP and EFG • Designated fuelling and storage area should be at least 100 m from watercourses and wetlands	1	1	2/1	R	2

Table 5.6.4 Environmental Effects Assessment Matrix for Wetlands (Construction)

Environmental Effects Assessment Matrix
Valued Environmental Component: WETLANDS
Phase: Construction

Project Activity (See Table 4.1.1 for list of specific activities and works)	Potential Environmental Effects	Mitigation	Magnitude	Geographic Extent	Duration/Frequency	Reversibility	Ecological/Socio-Cultural and Economic Context
Watercourse Crossing Structures	Change in wetland quantity (A) Change in wetland quality (A) Loss of wetland function (A)	• Planning for watercourse installation using EPP, and Watercourse Alteration Technical Guidelines • Follow Watercourse and Wetland Alterations permit conditions • Follow EPP • Develop site specific EPPs • Limit area of disturbance • Installations to occur from June 1 to September 30	1-2	1	5/1	1	2
Ancillary Structures and Facilities Construction	Change in wetland quantity (A) Change in wetland quality (A) Loss of wetland function (A)	• Follow EPP, EFG • Erosion control measures • Limit area of disturbance • Designated fuelling and storage area should be at least 100 m from watercourses and wetlands	1	1	5/1	I	2

Key:

Magnitude:
1 = Low: *e.g.,* specific group, habitat, or ecosystem localized one generation or less, within natural variation
2 = Medium: *e.g.,* portion of a population or habitat, or ecosystem 1 or 2 generations, rapid and unpredictable change, temporarily outside range of natural variability
3 = High: *e.g.,* affecting a whole stock, population, habitat or ecosystem, outside the range of natural variation

Geographic Extent:
1 = <1 km²
2 = 1-10 km²
3 = 11-100 km²
4 = 101 - 1,000 km²
5 = 1,001 - 10,000 km²
6 = >10,000 km²

Duration:
1 = <1 month
2 = 1 - 12 months
3 = 13 - 36 months
4 = 37 - 72 months
5 = >72 months

Frequency:
1 = <11 events/year
2 = 11 - 50 events/year
3 = 51 - 100 events/year
4 = 101 - 200 events/year
5 = >200 events/year
6 = continuous

Reversibility:
R = Reversible
I = Irreversible

Ecological/Socio-cultural and Economic Context:
1 = Relatively pristine area or area not adversely affected by human activity.
2 = Evidence of adverse environmental effects.

N/A = Not Applicable
(A) = adverse
(P) = positive

Site Preparation

Where possible, and with considerable success within the limitations of other technical and environmental constraints, wetlands were avoided during the route selection process. The treed portions of the 22 ha of wetland habitat within the footprint will be cleared during site preparation. Eighteen of the 24 wetlands will be only partially disturbed and two will be completely avoided. Many of the wetlands are less than 1 ha in area.

Only one of the wetlands affected (WL3) was evaluated to be "significant" and none are considered to be provincially "significant". Less than 5 % of WL3 will be directly affected by the Project. Rare species affected by the project are likely to be found in the wetland in areas that will not be impacted. The Project is not expected to affect the habitat in WL3 with respect to wildlife productivity or biological diversity. Waterfowl habitat will be maintained in WL3. There will be no net loss of wetland function in WL3.

Wetland areas that will be disturbed during site construction do not provide habitat for S1 or "May Be At Risk" plant species. Few wildlife species of special conservation concern were recorded in any of the wetlands. Many of the wetlands may be used as thermal refugia by black bear and moose during hot periods in the summer; however, this type of habitat is not limited in the general area. Generally, the wetlands are not considered productive habitat for waterfowl.

Overall the wetlands appear to have low social/cultural value. None of them are part of any protected area such as a national or provincial park, national wildlife area, federal migratory bird sanctuary, ecological reserve, provincial wildlife management area, wildlife refuge, or game sanctuary.

As mentioned previously, erosion and sedimentation may occur during all Project phases. Erosion and sedimentation control measures and mitigation are summarized here, but apply to all phases where Project induced erosion or sedimentation is possible.

Erosion control systems will be in place to manage runoff from the construction areas. Erosion control measures are identified in Section 4.3, 4.5 and 4.17 of the EPP and Section 4.2 and 4.3 of the EFG and include erosion control fencing, check dams, use of mulch (possibly from shrubs and trees removed during clearing) and, if necessary, sedimentation control ponds. As these erosion control measures also slow the transport of surface runoff, they will also increase the potential for localized infiltration to groundwater.

For the proposed Project, sedimentation and siltation will be minimized during construction and operation with use of proper mitigative steps outlined in the EPP and EFG and in the *Watercourse Alteration Technical Guidelines* (NBDELG 2002b). Instream work will be conducted between June 1 and September 30 so as not to coincide with periods of increased sensitivity such as spawning and egg incubation times, where possible. If it is necessary to conduct in-stream work after September 30, DFO will be consulted and the work would be carried out only after necessary authorization (*i.e.*, HADD, WAWA) has been obtained. In addition, there will be a 30 m buffer zone adjacent to each wetland and watercourse, where clearing will only occur in areas necessary for the RoW development.

A wetland compensation policy will be developed in consultation with NBDNR and Environment Canada's Canadian Wildlife Service (CWS), in accordance with Federal Wetland Policy and Provincial

Wetland Policy, and will be agreeable to CWS and NBDNR and will be based on the NBDNR Draft Proposed Wetland Mitigation Guidelines for the New Brunswick (December 2003).

Based on the wetland evaluations, consideration of the potential environmental effects of the activities required for site preparation of the proposed TCH, the proposed mitigation (*e.g.*, avoidance through route selection, EPP, EFG, *Watercourse Alteration Technical Guidelines*), and the residual environmental effects significance ratings criteria, the environmental effects on Wetlands by these activities are considered not significant.

Roadbed Preparation

Loss of wetland area during roadbed preparation involves the excavation of wetland (*i.e.* organic) soils. It is possible, however, that excavation of wetland soils that may be within the Project footprint may not be necessary, depending on the final design and the thickness of the organic layer. Environmental effects of the loss of this area were evaluated for site preparation and are considered not significant. Blasting will be avoided where possible but in some instances it may be unavoidable. Should blasting be required during construction in or near a wetland providing fish habitat, authorization will be required from DFO for the use of explosives (Section 32 of the *Fisheries Act)*. Blasting will be conducted in accordance with the EPP and EFG and *Guidelines for use of Explosives in Canadian Fisheries Waters* (Wright and Hopky 1998), and in full compliance with the requirements of DFO's authorization (Section 5.4).

Construction (including blasting) in or near wetlands providing fish habitat will be undertaken between June 1 and September 30, outside of the biologically-sensitive period to avoid the sensitive and critical fish life stages, where possible.

As noted above, erosion and sedimentation may occur during all Project phases, but during roadbed preparation is even more probable. Erosion and sedimentation control measures will remain following site preparation, and will be maintained as necessary.

Based on consideration of the wetland evaluations, potential environmental effects of the individual activities required for roadbed preparation of the proposed TCH and associated roads and facilities, the proposed mitigation (*e.g.*, EPP, EFG, site specific EPPs,), and the residual environmental effects significance ratings criteria, the environmental effects on Wetlands by these activities are considered not significant.

Surfacing and Finishing

Specific mitigative measures in regard to storage of hazardous materials are identified in Section 4.19 of the EPP and Section 5.0 of the EFG. Storage of hazardous materials will not occur within 100 m of a wetland. Permanent storage areas for containers or drums will be clearly marked, have appropriate secondary containment, and be located on an impermeable floor that slopes to a safe collection area. Refuelling of equipment will not be undertaken within 30 m of a wetland. Wastewater from washing equipment will not be released into a wetland. Storage of all hazardous materials will comply with WHMIS requirements, and appropriate material safety data sheets (MSDS) will be located at the storage site.

With proper storage, and refuelling areas, and the use of the mitigative measures outlined within the EPP and EFG, storage, use and handling of hazardous materials during the construction phase should not result in any environmental effects on the aquatic environment. Spills or accidental release of hazardous materials are evaluated within the Accidents, Malfunctions and Unplanned Events phase.

Based on consideration of the wetland evaluations, potential environmental effects of the individual activities and physical works required for surfacing and along the proposed TCH and associated roads and facilities, the proposed mitigation (*e.g.*, EPP, EFG, site specific EPPs), and the residual environmental effects significance ratings criteria, the environmental effects on Wetlands by these activities are considered not significant.

Watercourse Crossing Structures

A planning exercise has been completed for each watercourse crossing along the proposed TCH to evaluate the drainage area upstream of the proposed crossing, terrain in the area, precipitation, and stream bank material. The results will be used to determine the type, and size of the watercourse crossing.

Due to the size of the Little Presque Isle Stream and its flood zone (*i.e.*, the wetland), a freespan structure will be installed. This will minimize the disturbance to wetland habitat and will help to minimize the interaction between the Project and wetland functions.

All watercourse crossing structures will be installed in compliance with the conditions set in the site specific watercourse alteration permit. Bridge design and installation will be done in consultation with DFO and the Canadian Coast Guard (Navigable Waters Protection Program). Sedimentation and siltation will be minimized during construction and operation with the use of proper mitigative steps outlined in various sections of the EPP and EFG and in the *Watercourse Alteration Technical Guidelines* (NBDELG 2002b). During construction, an on-site monitor (environmental inspector) will ensure that

the installations are conducted according to the planning process, meet the Conditions of Approval as described in the Watercourse and Wetland Alteration Permit and do not introduce suspended sediments or contaminants to surface waters. Instream work will be conducted between June 1 and September 30 so as not to coincide with periods of increased sensitive such as spawning and egg incubation times, where possible. In addition, there will a 30 m buffer zone adjacent to each wetland and watercourse, where clearing will only occur in areas necessary for the RoW development.

Based on consideration of the wetland evaluations, potential environmental effects of the activities and physical works required for watercourse crossing structures of the proposed TCH, the proposed mitigation (*e.g.*, EPP, EFG, site specific EPPs, *Watercourse Alteration Technical*), and the residual environmental effects significance ratings criteria, the environmental effects on Wetlands by these activities are considered not significant.

Ancillary Structures and Facilities Construction

Mitigation measures for ancillary structures and facilities will be similar to those described above for other construction activities (*i.e.*, site preparation, roadbed preparation, and surfacing and finishing). Previously disturbed land such as woods roads and other cleared areas will be preferentially chosen for these temporary facilities. Any ancillary structures and facilities will be reviewed for their potential environmental effects on wetlands. In consideration of the Federal Policy on Wetland Conservation and the New Brunswick Wetlands Conservation Policy, wetlands will be avoided to the extent possible. Where applicable, a Watercourse and Wetland Alteration Permit will be obtained.

Based on consideration of the wetland evaluations, potential environmental effects of the activities required for ancillary structures and facilities of the proposed TCH, the proposed mitigation (*e.g.*, EPP, EFG), and the residual environmental effects significance ratings criteria, the environmental effects on Wetlands by these activities are considered not significant.

5.6.5.2.2 Operation

The following provides an evaluation of key potential Project-VEC interactions for the operation phase of the Project as summarized in the environmental effects assessment matrix (Table 5.6.5). Operation of the proposed TCH will continue in perpetuity upon completion of the construction phase of the Project. During operation of the proposed TCH, winter maintenance and the physical presence of the Project could result in a change in wetland quality or loss of wetland function. The sections following this table describe the mitigative strategies aimed at mitigating these potential environmental effects.

Table 5.6.5 Environmental Effects Assessment Matrix for Wetlands (Operation)

Environmental Effects Assessment Matrix
Valued Environmental Component: WETLANDS
Phase: Operation

Project Activity (See Table 4.1.1 for list of specific activities and works)	Potential Environmental Effects	Mitigation	Magnitude	Geographic Extent	Duration/Frequency	Reversibility	Ecological/Socio-Cultural and Economic Context
Winter Safety	Change in wetland quality (A) Loss of wetland function (A)	• Develop long-term salt management plan • Implement EPP and EFG	1	1	1/2	R	2
Proposed TCH Presence	Change in wetland quality (A)	• Proper road design and construction	1	1	1/2	R	2

Key:

Magnitude:
1 = Low: *e.g.,* specific group, habitat, or ecosystem localized one generation or less, within natural variation
2 = Medium: *e.g.,* portion of a population or habitat, or ecosystem 1 or 2 generations, rapid and unpredictable change, temporarily outside range of natural variability
3 = High: *e.g.,* affecting a whole stock, population, habitat or ecosystem, outside the range of natural variation

Geographic Extent:
1 = <1 km²
2 = 1-10 km²
3 = 11-100 km²
4 = 101 - 1,000 km²
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6 = >10,000 km²

Duration:
1 = <1 month
2 = 1 - 12 months
3 = 13 - 36 months
4 = 37 - 72 months
5 = >72 months

Frequency:
1 = <11 events/year
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3 = 51 - 100 events/year
4 = 101 - 200 events/year
5 = >200 events/year
6 = continuous

Reversibility:
R = Reversible
I = Irreversible

Ecological/Socio-cultural and Economic Context:
1 = Relatively pristine area or area not adversely affected by human activity.
2 = Evidence of adverse environmental effects.

N/A = Not Applicable
(A) = adverse
(P) = positive

Winter Safety

Salt application is a winter maintenance activity that has the potential to affect wetlands near the proposed TCH by contamination from salt spray or run-off. The highest concentrations are usually associated with winter and spring thaws. Environment Canada (2001c) indicates that vegetation damage from aerial dispersion can occur up to 200 m from salt-treated multi-lane highways and 35 m from salt-treated two-lane highways. Blomqvist (2001) found that, while salt spray deposition can occur several hundred metres from a treated highway, over 90% of the spray is deposited within 40 m of the highway.

Environment Canada (2001c) recently completed an assessment of road salt under *CEPA*. Recognizing that a total ban of road salt could potentially compromise human safety, the focus of road salt risk management is on implementation measures that optimize winter road maintenance practices so as to not jeopardize road safety while minimizing the potential environmental effects (Environment Canada 2001c). Therefore Environment Canada has categorized road salt as a Track 2 substance, requiring Life-Cycle Management. Management instruments to reduce the potential environmental effects of road salts are being developed through a national multi-stakeholder group (which involves representation from NBDOT) working in conjunction with Environment Canada. Proposed control measures will likely be

presented in July of 2004. In accordance with Environment Canada's policy on road salt, all road agencies (*e.g.*, NBDOT) must develop a Salt Management Plan. NBDOT is committed to developing best salt management practices in a continued effort to reduce the environmental effects of road salt on the environment, in accordance with the proposed federal *Code of Practice for the Environmental Management of Road Salts*. Currently Section 6.2 of the EPP and 5.6 of the EFG identifies salt application protection measures. Application rates identified in the *Highway Maintenance Management System Field Manual* (NBDOT 1992b) will be used to maximize the efficiency of salting and sanding and minimize the potential environmental effects.

Based on consideration of the wetland evaluations, potential environmental effects of the individual activities required for winter safety along the proposed TCH and associated roads and facilities, the proposed mitigation (*e.g.*, long-term salt management plan, EPP, EFG), and the residual environmental effects significance ratings criteria, the environmental effects on Wetlands by these activities are considered not significant.

Proposed TCH Presence

The contribution to runoff from the proposed TCH will be more episodic, compared to the more gradual release of water from forested/vegetated areas. However, due to the relatively small surface area of the highway compared to the area of the watersheds upgradient of most of the watercourses crossings, the potential for a substantive change in the quantity of surface water due to the proposed TCH construction is low. Improper highway design could contribute to a change in the distribution of water, such as a cut and fill resulting in water being redirected to another watershed. However, planned proper design will prevent this potentially adverse environmental effect.

There is a potential for runoff from the road surface to contain contaminants that may affect wetland water quality. The environmental effects of winter safety (*i.e.*, salting and sanding) on surface water (including wetlands) is discussed in Section 5.3.5.2.2.

Based on consideration of the wetland evaluations, potential environmental effects of the individual activities and physical works associated with the presence of the proposed TCH and associated roads and facilities and the residual environmental effects significance ratings criteria, the environmental effects on Wetlands by the proposed TCH presence are considered not significant.

5.6.5.2.3 Maintenance

The following provides an evaluation of key potential Project-VEC interactions for the maintenance phase of the Project as summarized in the environmental effects assessment matrix (Table 5.6.6). During maintenance of the proposed TCH, ditching, vegetation control and watercourse crossing structure

repairs could result in a change in wetland quality or loss of wetland function. The sections following this table describe the mitigative strategies aimed at mitigating these potential environmental effects.

Table 5.6.6 Environmental Effects Assessment Matrix for Wetlands (Maintenance)

Environmental Effects Assessment Matrix
Valued Environmental Component: WETLANDS
Phase: Maintenance

Project Activity (See Table 4.1.1 for list of specific activities and works)	**Potential Environmental Effects**	**Mitigation**	**Magnitude**	**Geographic Extent**	**Duration/Frequency**	**Reversibility**	**Ecological/Socio-Cultural and Economic Context**
Proposed TCH Maintenance	Change in wetland quality (A) Loss of wetland function (A)	• Implement EPP and EFG • Apply for Watercourse and Wetland Alteration Permits, follow requirements • Maintain buffer zone within 30 m of wetland	1	1	1/1	R	2
Vegetation and Wildlife Management	Change in wetland quality (A)	• Implement EPP and EFG • Follow Watercourse and Wetland Alteration Permits conditions for work within 30 m of wetland	1	1	1/2	R	2

Key:

Magnitude:
1 = Low: *e.g.,* specific group, habitat, or ecosystem localized one generation or less, within natural variation
2 = Medium: *e.g.,* portion of a population or habitat, or ecosystem 1 or 2 generations, rapid and unpredictable change, temporarily outside range of natural variability
3 = High: *e.g.,* affecting a whole stock, population, habitat or ecosystem, outside the range of natural variation

Geographic Extent:
1 = <1 km²
2 = 1-10 km²
3 = 11-100 km²
4 = 101 - 1,000 km²
5 = 1,001 - 10,000 km²
6 = >10,000 km²

Duration:
1 = <1 month
2 = 1 - 12 months
3 = 13 - 36 months
4 = 37 - 72 months
5 = >72 months

Frequency:
1 = <11 events/year
2 = 11 - 50 events/year
3 = 51 - 100 events/year
4 = 101 - 200 events/year
5 = >200 events/year
6 = continuous

Reversibility:
R = Reversible
I = Irreversible

Ecological/Socio-cultural and Economic Context:
1 = Relatively pristine area or area not adversely affected by human activity.
2 = Evidence of adverse environmental effects.

N/A = Not Applicable
(A) = adverse
(P) = positive

Proposed TCH Maintenance

Ditching may be required to improve water flow, erosion or excessive vegetative growth. The primary issue of concern is the release of sediment into surface water bodies. NBDOT has identified this issue in Section 6.1.4 of the EPP, which includes detailed protection measures to protect surface waters. A Watercourse and Wetland Alteration Permit will be obtained for any activities within 30 m of a wetland.

Based on consideration of the wetland evaluations, potential environmental effects of the individual activities associated with the maintenance of the proposed TCH and associated roads and facilities, the proposed mitigation (*e.g.*, EPP, EFG, site specific EPPs), and the residual environmental effects

significance ratings criteria, the environmental effects on Wetlands by these activities are considered not significant.

Vegetation and Wildlife Management

Vegetation control will be conducted by mechanical clearing during operation on the RoW *(e.g.,* road shoulders and interchanges). As stated in Section 6.1.6 of the EPP, there will be no herbicides used for vegetation control. For vegetation control activities within 30 m of a wetland, when required, a Watercourse and Wetland Alteration Permit will be obtained before initiation of activities.

Any increase in wetland nutrient levels from hydroseeding would be temporary as the applications are infrequent and these nutrient forms are readily absorbed by sediments or taken up by plants.

Based on consideration of the wetland evaluations, potential environmental effects of the individual activities associated with the vegetation and wildlife management along the proposed TCH and associated roads and facilities, the proposed mitigation (*e.g.,* EPP, EFG, Watercourse and Wetland Alteration Permit conditions), and the residual environmental effects significance ratings criteria, the environmental effects on Wetlands by these activities are considered not significant.

5.6.5.2.4 Accidents, Malfunctions and Unplanned Events

The following provides an evaluation of key potential Project-VEC interactions for accidents, malfunctions and unplanned events as summarized in the environmental effects assessment matrix (Table 5.6.7). The issues related to wetlands are hazardous materials spills, erosion and sedimentation control failure, bridge or culvert washout and fires. These accidents are possible during all Project phases. Further discussion of each accident type follows the table.

Table 5.6.7 Environmental Effects Assessment Matrix for Wetlands (Accidents, Malfunctions and Unplanned Events)

Environmental Effects Assessment Matrix
Valued Environmental Component: WETLANDS
Phase: Accidents, Malfunctions and Unplanned Events

Project Activity (See Table 4.1.1 for list of specific activities and works)	Potential Environmental Effects	Mitigation	Magnitude	Geographic Extent	Duration/Frequency	Reversibility	Ecological/Socio-Cultural and Economic Context
Hazardous Materials Spills	Change in wetland quantity (A) Loss of wetland function (A)	• Implement EPP and EFG procedures, and provincial and federal regulations should be followed for storage and handling of materials • Contingency Plan • Employee training	1-2	1	2/1	R	2
Erosion and Sedimentation Control Failure	Change in wetland quantity (A) Loss of wetland function (A)	• Implement EPP and EFG preventative measures	1-2	1-2	1/1	R	2
Bridge or Culvert Washout	Change in wetland quantity (A) Loss of wetland function (A)	• Design of watercourse crossings to handle the 1 in 100 year peak discharge event	1-2	1	2/1	R	2
Fires	Change in wetland quantity (A) Loss of wetland function (A)	• Implement EPP and EFG procedures, and provincial and federal regulations should be followed for storage and handling of materials • Contingency Plan • Employee training	1-2	1	3/2	R	2

Key:

Magnitude:
1 = Low: *e.g.,* specific group, habitat, or ecosystem localized one generation or less, within natural variation
2 = Medium: *e.g.,* portion of a population or habitat, or ecosystem 1 or 2 generations, rapid and unpredictable change, temporarily outside range of natural variability
3 = High: *e.g.,* affecting a whole stock, population, habitat or ecosystem, outside the range of natural variation

Geographic Extent:
1 = <1 km²
2 = 1-10 km²
3 = 11-100 km²
4 = 101 - 1,000 km²
5 = 1,001 - 10,000 km²
6 = >10,000 km²

Duration:
1 = <1 month
2 = 1 - 12 months
3 = 13 - 36 months
4 = 37 - 72 months
5 = >72 months

Frequency:
1 = <11 events/year
2 = 11 - 50 events/year
3 = 51 - 100 events/year
4 = 101 - 200 events/year
5 = >200 events/year
6 = continuous

Reversibility:
R = Reversible
I = Irreversible

Ecological/Socio-cultural and Economic Context:
1 = Relatively pristine area or area not adversely affected by human activity.
2 = Evidence of adverse environmental effects.

N/A = Not Applicable
(A) = adverse
(P) = positive

Hazardous Materials Spills

Known hazardous materials that will be used during the construction and operation of the proposed TCH include fuels, lubricants, solvents and antifreeze. There is also a high probability that a large quantity of other various unidentified hazardous materials will be transported along this route. There is a possibility that these materials could be accidentally introduced into wetlands through a spill of these materials.

These materials could temporarily degrade wetland quality and have an effect on wetland function in wetlands that provide habitat for fish and wildlife. In addition, contaminants can accumulate in soils and be mobilized slowly over time.

Employee environmental awareness training will include the handling of hazardous materials. The likelihood of a hazardous material spill during construction will be minimized by following Section 4.19 of the EPP and Section 5 of the EFG. The design of the highway to RAD120 standards will reduce the likelihood of spills of hazardous materials due to accidents during operation of the highway. NBDOT has spill response contingency procedures identified in Section 8.1 of the EPP and Section 5.7 of the EFG. The transportation of dangerous goods is strictly regulated in New Brunswick and Canada, and the regulatory spill response system is highly co-ordinated and effective. In the unlikely event of a hazardous materials spill, the spilled material will be contained and NBDOT will assist with the clean up. Materials to facilitate a rapid containment and clean up of hazardous material spills will be available during construction in or near Watercourses and Wetlands. Site-specific EPPs will be developed for work near environmentally sensitive areas and these will address preparedness measures that are necessary to ensure effective emergency response in the event of spills is reflective of the level of sensitivity.

The magnitude of the environmental effect of a spill would be dependent on a number of factors that are difficult to predict. However, given the mitigation in place, the magnitude of environmental effects attributable to these infrequent and unlikely accidents, malfunctions and unplanned events are likely to be low, and worst case medium. Reversibility of environmental effects on wetland functions will depend on the functions involved, and the proportion of wetland area affected. Resident fish and wildlife would re-establish within the affected area.

Based on consideration of the wetland evaluations, potential environmental effects of an accidental release of a hazardous material into wetlands along the proposed TCH and associated roads and facilities, the proposed mitigation (*e.g.*, EPP, EFG), contingency plans, and the residual environmental effects significance ratings criteria, the environmental effects on Wetlands by these accidents are considered not significant.

Erosion and Sediment Control Failure

There is a potential during heavy precipitation events or flash floods for erosion control structures (*i.e.*, check dams) to fail. To reduce the possibility of this occurring, protection measures will be followed as described in Section 4.5 of the EPP. Specifically, erosion control structures will be monitored regularly and maintained in a functional condition until the grass on seeded slopes is sufficiently established to be an effective erosion deterrent. All check dams will be inspected before and after each rainfall and at least daily during periods of prolonged rainfall. All check dams found to be damaged will be repaired

immediately. Sediment deposits retained by structures will be removed when the level of sedimentation is within 100 mm of the top of the structure.

Based on consideration of the wetland evaluations, potential environmental effects of an accident, malfunction, or unplanned event, involving erosion and sediment control failure along the proposed TCH and associated roads and facilities, the proposed mitigation (*e.g.*, EPP, EFG), contingency plans, and the residual environmental effects significance ratings criteria, the environmental effects on Wetlands by these accidents are considered not significant.

Bridge or Culvert Washout

There is a potential during high flood events for portions of the proposed TCH, or bridge or culvert installations, to be washed out, which would potentially affect Wetlands. This could temporarily degrade wetland quality due to increased sedimentation, or affect wetland function by deposition of debris material into the stream (concrete debris, bridge/culvert materials) in wetlands that provide fish habitat. Factors influencing the magnitude, duration and geographic extent of the environmental effect include amount and duration of flooding, type and size of washout, natural terrain surrounding the watercourse and location within the watershed. The extent of the environmental effects of such a road failure or washout on wetlands is predicted to be low, as most wetlands generally are in low-lying areas, such that the extent of effects will be limited.

Roads are most susceptible to washouts during the high flow period during and immediately following spring snow melt. Road design will focus on protection of the wetland environment by incorporating buffer zones, drainage and erosion control features and conservative culvert and bridge design criteria. Watercourse crossings (bridges and culverts) will be designed with a hydraulic capacity to handle at least the 1 in 100 year peak discharge event, and will follow the *Watercourse Alteration Technical Guidelines* (NBDELG 2002b).

Based on consideration of the wetland evaluations, potential environmental effects of bridge or culvert washout along the proposed TCH and associated roads and facilities, the proposed mitigation (*e.g., Watercourse Alteration Technical Guidelines*), contingency plans, and the residual environmental effects significance ratings criteria, the environmental effects on Wetlands by these accidents are considered not significant.

Fires

The potential environmental effects of a fire in the Project area could be severe. A forest fire could alter wetland quality or result in a loss of wetland function (*e.g.*, wildlife habitat, fish habitat). Fire within the Assessment Area of the proposed TCH could occur during any phase of the Project due to lightning or

human activities. Factors influencing the severity and duration of environmental effects include time of year, extent of fire damage and type of fire (chemical, forest). Risk of forest fire along the road route is possibly higher than in non-road areas due to the presence of human activity along the road route, which may be recreational or commercial in nature.

If the forest fire affects a large proportion of the wetlands, the magnitude of the environmental effect of such a fire could be medium. Reversibility of physical environmental effects of fire is high, but would occur over a number of years. Restoration of wetland quality or function would rely on the re-establishment of vegetation communities through succession, and repopulation of fish and wildlife species.

The potential for Project-related fires during Construction and Maintenance will be mitigated through equipment maintenance (*e.g.*, power saw mufflers and vehicle exhaust systems) and proper vigilance working with power equipment in forested areas, as per Section 8.4 of the EPP. Also, any burning of vegetative debris will require permits from NBDNR and NBDELG as per Section 4.8.3 of the EFG. All construction activities will be done in compliance with regulations contained within the *Forest Fires Act.*

During all construction activities, NBDOT inspectors will monitor clearing and other relevant operations to ensure equipment is functional and personnel are trained in its use.

Fire fighting services for the Perth-Andover to Woodstock region are located in Perth-Andover, Centreville, Lakeville, Florenceville, Bath, Glassville, Bristol, Hartland, Plaster Rock, Debec, Maliseet and Woodstock. The locations of these fire stations are close enough to provide adequate response to fires during operation of the proposed TCH. The potential for Project-related fires during Operation will be mitigated through vegetation management (*e.g.*, mowing and brush cutting) as per Section 6.1.6 of the EPP.

In the event of a fire occurring as a result of Construction or Maintenance activities, NBDOT personnel shall be prepared (*i.e.*, will have access to round point shovel or fire extinguisher) to control and fight any fires in and about the work area, as per Section 7.4 and 8.4 of the EPP, and the *Forest Fires Act*. All fires will be reported to NBDNR. Forest fires not related to the Project will be managed by NBDNR.

Based on consideration of the wetland evaluations, potential environmental effects of an uncontrolled fire along the proposed TCH and associated roads and facilities, the proposed mitigation (*e.g.*, EPP, EFG), contingency plans, and the residual environmental effects significance ratings criteria, the environmental effects on Wetlands by these accidents are considered not significant.

Summary

In summary, accidents, malfunctions and unplanned events may affect wetlands. Fires, spills of hazardous materials, and bridge or culvert washouts could result in a loss of wetland function (*e.g.*, fish or wildlife habitat). These environmental effects are considered to be well mitigated, of low to medium magnitude, of short duration and reversible. Any potential environmental effects will be mitigated by the effective implementation of the EPP, contingency plans, and training/education of employees at the site. The proposed TCH will be designed for improved safety, and therefore should reduce the likelihood or frequency of vehicular accidents as compared to the existing two-lane highway. In that regard, the Project has a positive environmental effect.

5.6.5.3 Determination of Significance

Table 5.6.8 evaluates the significance of potential residual environmental effects resulting from the interaction between Project activities and wetlands, after taking into account any proposed mitigation. The table also considers the level of confidence of the study team in their determination and the likelihood of potential environmental effects.

Table 5.6.8 Residual Environmental Effects Summary Matrix for Wetlands

Residual Environmental Effects Summary Matrix
Valued Environmental Component: WETLANDS

Phase	Residual Environmental Effects Rating	Level of Confidence	Likelihood	
			Probability of Occurrence	Scientific Certainty
Construction	NS	3	3	3
Operation	NS	3	2	3
Maintenance	NS	3	1	3
Accidents, Malfunctions and Unplanned Events	NS	3	1	2
Project Overall	NS	3	2	3

Key
Residual Environmental Effect Rating:
S = Significant Adverse Environmental Effect
NS = Not-significant Adverse Environmental Effect
P = Positive Environmental Effect

Level of Confidence
1 = Low Level of Confidence
2 = Medium Level of Confidence
3 = High Level of Confidence

Probability of Occurrence: based on professional judgement
1 = Low Probability of Occurrence
2 = Medium Probability of Occurrence
3 = High Probability of Occurrence

Scientific Certainty: based on scientific information and statistical analysis or professional judgement
1 = Low Level of Confidence
2 = Medium Level of Confidence
3 = High Level of Confidence
N/A = Not Applicable
*As determined in consideration of established residual environmental effects rating criteria.

The residual environmental effects of the Project on wetlands, following mitigation, are the direct loss of approximately 22 ha of wetlands to construction. The wetland evaluations found that only one wetland may be considered "significant". The direct environmental effects of the Project on the residual unaffected parts of the "significant" wetland are small and mitigation will be in place during

Construction and Operation to mitigate potential environmental effects on wetland function, resulting in no net loss of wetland function. Wetland evaluations of the remaining wetlands also determined that there would be no net loss of wetland function on adjacent remnants. Compensation measures planned for the Project are expected to adequately compensate for the direct losses and ensures that the Project will result in no net loss of wetland.

The residual environmental effects are considered not significant for all project phases.

5.6.6 Compensation

A similar highway project in New Brunswick that required wetland compensation was carried out at Grand Lake Meadows (GLM). Compensation was required because the GLM is a "significant" wetland on local, regional, provincial, national or international scales. Compensation required by NBDNR for the loss of wetland function at the GLM wetlands includes:

- development of an approved compensation plan;
- document actual loss of habitat;
- a combination of habitat acquisition and restoration;
- if land acquisition cannot be fully attained, funding for wetland acquisition and restoration will be provided for the balance of wetland area not compensated for;
- compensation for direct loss of habitat values and life-support functions within the Project footprint;
- partnership and funding opportunities for loss of social/economic functions (*e.g.*, development of public access, educational interpretive facilities, and research and management projects);
- 3:1 compensation ratio for acquisition, restoration and protection of wetland habitat outside the GLM;
- 10:1 compensation ratio for acquisition and dedication of wetland habitat within GLM; and
- a monitoring plan will be developed and implemented.

As none of the wetlands within 30 m of the Project footprint are within an ESA, or are "significant" wetlands on regional, provincial, national or international scales, the compensation ratio that has been agreed to by EC, TC, and NBDNR for the Project is 3:1.

5.6.7 Monitoring and Follow-up

Only one "significant" wetland was identified within the Assessment Area. Additional monitoring is recommended beyond that which is stipulated in the EPP to ensure protection measures are used and are working.

Wetlands within the Assessment Area will be monitored, within a short period after construction is completed, to visually assess wetland hydrology, introduction of invasive plant species, and use by recreational vehicles. The wetlands will be reassessed visually for the same parameters after a three year period following completion of construction. NBDOT will negotiate a wetlands compensation plan that will be implemented as compensation for the project. Those negotiations will include the required follow-up that arises from that negotiation. Any follow-up identified in that process will become a part of the follow-up program as required under *CEAA*.

5.7 Wildlife

5.7.1 Rationale for Selection as Valued Environmental Component

Wildlife was selected as a VEC because of the potential for interactions between Project activities and wildlife, and because of the relationship between wildlife and other biological and physical environments. In particular, this VEC addresses ungulates (specifically moose and white-tailed deer), migratory birds, and species of special conservation concern, as indicators of wildlife in the Assessment Area.

5.7.2 Environmental Assessment Boundaries

5.7.2.1 Spatial and Temporal

The spatial boundaries for the Project include the footprint and adjacent habitat where activities associated with construction, operation, and malfunctions and accidents of the Project could result in environmental effects on wildlife. For the purposes of this assessment, terrestrial habitat within the limits of clearing for the asphalt surfaces and structures is assumed to be permanently removed. Other areas in the Project footprint to be cleared and landscaped will generally result in a change in habitat type from forest to open habitat. The potential environmental effects of habitat loss and/or degradation are assessed within the context of the regional biogeoclimatic zone (*i.e.*, the Valley Lowlands Ecoregion) and the alternative terrestrial habitat available within the zone.

The temporal boundaries of the Project include the construction periods, and operation in perpetuity. Clearing activities will be conducted outside of the breeding season of most wildlife species (*i.e.*, no clearing from May 1 to August 31).

5.7.2.2 Administrative and Technical

Wildlife species of special conservation concern are protected federally under the *Species at Risk Act* (*SARA*). As defined in the *SARA*, "wildlife species" means a species, subspecies, variety or geographically or genetically distinct population of animal, plant or other organism, other than a bacterium or virus, that is wild by nature and (a) is native to Canada; or (b) has extended its range into Canada without human intervention and has been present in Canada for at least 50 years. The purpose of this act is to protect wildlife species at risk, and their critical habitat. The *SARA* is administered by Environment Canada, Parks Canada Agency and Fisheries and Oceans Canada. Wildlife (animal) species potentially found within the assessment area and protected under *SARA* include Least Bittern and Yellow Rail.

Endangered wildlife species are protected provincially under the New Brunswick *Endangered Species Act*. The purpose of this act is to provide protection to endangered species and their habitats. The New Brunswick *Endangered Species Act* is administered by NBDNR. Bald Eagle (*Haliaeetus leucocephalus*) and Canada lynx (*Lynx canadensis*) are listed as regionally endangered.

Migratory birds are protected federally under the *Migratory Birds Convention Act*. The purpose of this act is to protect migratory birds and active nests. The *Migratory Birds Convention Act* is administered by Environment Canada.

Spatial habitat information used for the assessment includes the proposed TCH footprint (1,054 ha including access roads), and is defined by twenty two digital map tiles (78,894 ha) which give a larger view of the area traversed by the Project (Figure 5.8.1 in Section 5.8.2.2). This Agriculture and Forestry Assessment Area ("Assessment Area") was used for the assessment of agriculture and forestry in the Land Use, and Labour and Economy VECs. The data were obtained from the NBDNR Forest Inventory Mapping (1996/2000).

Information used in support of the assessment of wildlife, including the potential of the area for harbouring rare and endangered species, was obtained from forest inventory mapping (1996/2000), NBDNR aerial photography (1996/2000 at 1:12,500), NBDOT aerial photography (1999 at 1:6,000), Hinds (2000), Atlantic Canada Conservation Data Centre (ACCDC 2003), NBDNR (2003a), COSEWIC (2003) and other information from stakeholders and government departments with applicable expertise. Knowledge of the habitats affected by the Project is based on terrestrial surveys conducted in 2002 and 2003 and other information provided by the above sources, and the professional judgement of the study team.

The ungulate aerial survey boundaries are within 500 m of the alignment, with flight lines occurring 250 m on either side of the alignment. The extents of bird habitat surveyed depend on the species types surveyed. Owls were surveyed as much as 1 km from the alignment, where access was available using ground survey methods. Ground survey boundaries for most birds were within 100 m of the alignment, however more vocal species and those with large territories (*e.g.* hawks) may be detected at greater distance from the alignment.

5.7.3 Residual Environmental Effects Rating Criteria

A *significant adverse residual environmental effect* is one that affects wildlife (direct mortality, change in migratory patterns, habitat avoidance) or wildlife habitat (loss or change) in such a way as to cause a decline in abundance or change in distribution of population(s) of indicator/representative wildlife species over one or more generations within the assessment boundaries, defined as the Valley Lowlands Ecoregion, and natural recruitment may not re-establish the population(s) to its original level.

5.7.4 Existing Conditions

5.7.4.1 Migratory Birds

Migratory birds were studied following a protocol provided by Environment Canada (2003a). Owl and woodpecker surveys were conducted in April, followed by two site visits to each survey area in June.

Breeding bird surveys were completed in April and June 2003 along the RoW. The breeding bird surveys were conducted in 22 areas along the RoW, representing three habitat types including mature forest, wetland and grassland/agricultural habitats. Wherever possible, the largest and most contiguous examples of each habitat type crossed by the proposed TCH were selected for the study. A total of 24 areas were selected by Environment Canada and NBDNR as suitable study sites. The sites included 9 forest habitats, 9 wetland habitats and 4 grassland/agricultural habitats. Figures 5.7.1 A-D (Appendix F) indicate the survey area locations. After the selection process, one wetland site (B16) was eliminated since it is avoided due to an alignment change following initial site selection and a second site (B1) was not surveyed in June because it had been recently clear cut, and no longer was a suitable representative of the selected habitat type (*i.e.* mature forest). No suitable replacement sites were located in the field.

April surveys included owl surveys in the evenings, and surveys in the mornings targeting woodpeckers, although all species encountered were recorded. Owl surveys were conducted between April 21 and 27, 2003 in the Project area between one half hour after sunset (9:20 PM) and 12:40 AM. The survey method was modified from the New Brunswick Owl Survey (Takats *et al*. 2001). Playbacks including Northern Saw-whet Owl, Boreal Owl, Eastern Screech-Owl, Long-eared Owl, Barred Owl and Great Horned Owl were played in sequence, starting with 2 minutes of silent listening, and separated by two minutes of silent listening. A total of 14 survey locations at or near the alignment near (within 1 km of) selected mature forest and wetlands bird sites were visited using accessible roads. Survey locations included near B2 at the existing Route 2, Scott Road, Dean Road, Route 560 at River de Chute, Stairs Road near Reid Lake, A. Brown Road near Site B10, B. Smith Road, J. Clark Road, Back Greenfield Road near Site B12, Backland Road, Dryer Road, St. Thomas Road near Site B18, Estey Road, and Palmer Road (Figure 5.7.1 A-D in Appendix F). Survey conditions were affected by traffic noise where they were located immediately adjacent the existing TCH (Site B2). These noise influences were unavoidable. Species recorded in the vicinity of the alignment during the survey included Great Horned Owl, Barred Owl, and Northern Saw-whet Owl. The majority of the owls were recorded more than 300 m from the alignment. A total of 18 owls were recorded in the vicinity of six of the survey sites, however only 6 owls at three sites have at least a portion of their territory near the RoW. A Great Horned Owl was reported at the end of a survey in the vicinity of Site B10 (A. Brown Road). Northern Saw-whet Owls were recorded at Site B5 (Dean Road), and just south of Scott Road at the alignment. Two Barred Owls were recorded on either side of Dean Road. Additional surveys along the

Beaconsfield Road, well west of the alignment using sections of an existing New Brunswick Owl Survey route (Route #87) resulted in 7 Barred Owls and a pair of Saw-whet Owls.

For the morning surveys, all species of bird observed or heard near the RoW were recorded and evidence of breeding activity was gathered using techniques used in the Maritime Breeding Bird Atlas project (Erskine 1992). For the purposes of this study, species heard or observed within 100 m of the Project footprint were recorded. The breeding status of each species was determined from evidence of breeding observations. As suggested by the CWS guidelines, playbacks were used periodically during surveys, especially where there may have been a drop in bird activity. Playbacks were used more frequently during the late morning surveys when bird vocalizations were reduced. Playbacks for wetlands included Yellow Rail, Virginia Rail, Sora, Common Moorhen, and American Coot. Playbacks for forest habitats included Coopers Hawk and Red-shouldered Hawk, as recommended by CWS and NBDNR (D. Busby and S. Makepeace, pers. comm.). Woodpeckers and other raptor calls were used occasionally where expected species were not heard during the regular listening periods, and suitable habitat was present.

Particular attention was paid to the presence of target species identified by Environment Canada and NBDNR (Environment Canada 2003a). Each bird heard or observed during the survey was documented individually along with the habitat it was found in and any evidence of breeding activity exhibited. This provides information on the relative abundance of species present, as well as habitat preferences. Information on specific habitat types in which individuals were recorded is not available for the April surveys. For the June surveys, each site was visited twice, with at least one visit at each site conducted during the early morning hours, with the second survey generally conducted later in the morning, such that each surveyor generally conducted an early morning survey and a later morning survey at a different site. There were three survey teams in April and four teams conducting surveys in June. Each team consisted of an experienced bird surveyor and a navigator.

A list of the species expected to be found in the area was prepared. It was derived from the list of encountered species in the breeding bird atlas squares through which the proposed TCH passes (Erskine 1992). The list was reviewed and species characteristic of the three targeted habitat areas were identified. In total 80% of the expected species for the mature forest habitat were recorded during the surveys of the mature forest survey areas. In agricultural survey areas, 56% of the expected species of agricultural land were detected and 75 % of expected species in the wetland habitat were detected in the wetland survey areas. In all cases, additional species not on the list of expected species were recorded, due to the diversity of the habitats in each of the habitats targeted, such as forest of varying maturities adjacent wetland habitat. Of all expected species across these three habitat types, only 23 species (16%) were not detected during the various surveys. Most of these are the rarer species, or waterfowl or marsh birds that were not found in the wetlands along the route. Blackpoll Warbler was the warbler for which there was available habitat along the route that was not detected during the surveys.

Table 5.7.1 indicates the number of individuals and the highest breeding status for each species observed in the survey sites during the April surveys.

Table 5.7.1 Number of Species and Highest Breeding Status Observed in the April 2003 Morning Surveys.

Common	Binomial	Mature Forest		Wetland		Total
		Total Reported	Highest Breeding Status* Recorded	Total Reported	Highest Breeding Status* Recorded	
Canada Goose	*Branta canadensis*			7	OB	7
Wood Duck	*Aix sponsa*	2	PR	2	PR	4
Green-winged Teal	*Anas crecca*			2	PR	2
American Black Duck	*Anas rubripes*			11	OB	11
Mallard	*Anas platyrhynchos*			4	OB	4
Osprey	*Pandion haliaetus*	1	OB			1
Northern Harrier	*Circus cyaneus*			1	OB	1
Northern Goshawk	*Accipiter gentilis*	1	OB			1
Broad-winged Hawk	*Buteo platypterus*	1	OB	3	OB	4
American Kestrel	*Falco sparvarius*	1	OB			1
Merlin	*Falco columbarius*			1	PO	1
Ruffed Grouse	*Bonasa umbellus*	4	PO	8	PR	12
Common Snipe	*Gallinago gallinago*	1	PO	1	PO	2
Mourning Dove	*Zenaida macroura*			1	PO	1
Belted Kingfisher	*Ceryle alcyon*			1	OB	1
Yellow-bellied Sapsucker	*Sphyrapicus varius*	70	PR	13	PR	83
Downy Woodpecker	*Picoides pubescens*	15	PR	12	PR	27
Hairy Woodpecker	*Picoides villosus*	12	PR	1	OB	13
Black-backed Woodpecker	*Picoides arcticus*	1	OB			1
Northern Flicker	*Colaptes auratus*	31	PR	22	PR	53
Pileated Woodpecker	*Dryocopus pileatus*	10	PO	2	OB	12
Blue Jay	*Cyanocitta cristata*	5	OB	7	PO	12
American Crow	*Corvus brachyrhynchos*	2	OB	6	PO	8
Black-capped Chickadee	*Poecile atricapillus*	4	PO	20	PR	24
Red-breasted Nuthatch	*Sitta canadensis*	5	OB	1	PR	6
White-breasted Nuthatch	*Sitta carolinensis*	4	PO	1	OB	5
Brown Creeper	*Certhia americana*	2	PO	3	PO	5
Winter Wren	*Troglodytes troglodytes*	5	PO	9	PO	14
Golden-crowned Kinglet	*Regulus satrapa*	2	PO			2
Ruby-crowned Kinglet	*Regulus calendula*	3	PO	5	PO	8
Veery	*Catharus fuscescens*	1	OB			1
Hermit Thrush	*Catharus guttatus*	7	PR	2	PO	9
American Robin	*Turdus migratorius*	19	PR	22	PR	41
Savannah Sparrow	*Passerculus sandwichensis*			1	PO	1
Song Sparrow	*Melospiza melodia*	4	PO	8	PO	12
Swamp Sparrow	*Melospiza georgiana*	1	OB	9	PO	10
White-throated Sparrow	*Zonotrichia albicollis*	8	PO	14	PO	22
Red-winged Blackbird	*Agelaius phoeniceus*			38	PO	38
Common Grackle	*Quiscalus quiscula*	4	OB	5	OB	9
Purple Finch	*Carpodacus purpureus*	5	PO	3	PO	8

Table 5.7.1 Number of Species and Highest Breeding Status Observed in the April 2003 Morning Surveys.

Common	Binomial	Mature Forest		Wetland		Total
		Total Reported	Highest Breeding Status* Recorded	Total Reported	Highest Breeding Status* Recorded	
American Goldfinch	*Carduelis tristis*	9	OB	11	PO	20
Evening Grosbeak	*Coccothraustes vespertinus*	3	OB	7	OB	10
	Totals	243		264		507
*Breeding Status: OB =Observed only; PO = Possible breeder; PR = Probable breeder; CO = Confirmed breeder						

A total of 42 bird species (507 records) were recorded within the survey areas during the April morning surveys. Most of the expected woodpecker species that were specifically targeted during these surveys were recorded. Three-toed Woodpecker was recorded at one location, however it was noted well outside the Project footprint. In decreasing order of abundance, woodpecker species recorded include Yellow-bellied Sapsucker (83), Northern Flicker (53), Downy Woodpecker (27), Hairy Woodpecker (13), Pileated Woodpecker (12), and Black-backed Woodpecker (1).

Table 5.7.2 indicates the number of individuals and the highest breeding status for each species observed in the survey sites during the June surveys.

A total of 111 bird species (4,411 records) were recorded within the survey areas during the June bird surveys. The most numerous species recorded for agricultural land were Song Sparrow (81) and Savannah Sparrow (72). Forested habitat was most abundant in Ovenbird (129) and Red-eyed Vireo (120). Alder Flycatcher (84) and Red-winged Blackbird (83) were determined to be the most reported species in the wetland areas surveyed.

Other species not recorded in the survey sites, but recorded away from the alignment include: Baltimore Oriole, and migrating Horned Lark and Uplands Sandpiper.

Table 5.7.2 Number of Species and Highest Breeding Status Observed in the June 2003 Survey

Common	Binomial	Forested Land		Agricultural Land		Wetland		Total
		Total Reported	Highest Breeding Status* Recorded	Total Reported	Highest Breeding Status* Recorded	Total Reported	Highest Breeding Status* Recorded	
Common Loon	*Gavia immer*	1	OB			1	OB	2
Pied-billed Grebe	*Podilymbus podiceps*					2	PO	2
Double-crested Cormorant	*Phalacrocorax auritus*					1	PO	1
Great Blue Heron	*Ardea herodias*					1	PO	1
Canada Goose	*Branta canadensis*	4	PO	11	OB	28	PR	43
Green-winged Teal	*Anas crecca*			5	PR	5	PR	10
American Black Duck	*Anas rubripes*	2	PO	1	OB	22	CO	25
Mallard	*Anas platyrhynchos*	14	PR	21	PR	26	PR	61
Ring-necked Duck	*Aythya collaris*			2	PR	1	PO	3
Hooded Merganser	*Lophodytes cucullatus*	2	PO	1	PO	12	CO	15
Osprey	*Pandion haliaetus*	1	CO	6	CO	1	OB	8
Northern Harrier	*Circus cyaneus*					1	OB	1
Sharp-shinned Hawk	*Accipiter striatus*					1	CO	1
Northern Goshawk	*Accipiter gentilis*	1	CO					1
Broad-winged Hawk	*Buteo platypterus*	3	PO	2	CO	2	PO	7
Red-tailed Hawk	*Buteo jamaicensis*					1	PO	1
American Kestrel	*Falco sparverius*	2	PR	3	PO	1	OB	6
Merlin	*Falco columbarius*			2	PR			2
Ruffed Grouse	*Bonasa umbellus*	8	PO			10	PO	18
Virginia Rail	*Rallus limicola*					3	PO	3
Sora	*Porzana carolina*					4	PR	4
Killdeer	*Charadrius vociferus*	1	PO	2	PO			3
Spotted Sandpiper	*Actitus macularia*					2	PO	2
Common Snipe	*Capella gallinago*	2	PO			3	PR	5
American Woodcock	*Philohela minor*	1	OB					1
Rock Dove	*Columba livia*			1	OB			1
Mourning Dove	*Zenaida macroura*	10	PR	4	PO	6	PO	20
Barred Owl	*Strix varia*	2	CO			1	PR	3
Ruby-throated Hummingbird	*Archilochus colubris*	9	PO			1	OB	10
Belted Kingfisher	*Megaceryle alcyon*	1	PO			5	CO	6

Table 5.7.2 Number of Species and Highest Breeding Status Observed in the June 2003 Survey

Common	Binomial	Forested Land		Agricultural Land		Wetland		Total
		Total Reported	Highest Breeding Status* Recorded	Total Reported	Highest Breeding Status* Recorded	Total Reported	Highest Breeding Status* Recorded	
Yellow-bellied Sapsucker	*Sphyrapicus varius*	35	CO	3	PO	11	PR	49
Downy Woodpecker	*Picoides pubescens*	10	PO	4	PO	5	PO	19
Hairy Woodpecker	*Picoides villosus*	8	CO	5	PO	6	CO	19
Black-backed Woodpecker	*Picoides arcticus*	1	OB					1
Northern Flicker	*Colaptes auratus*	12	PR	7	PO	10	PO	29
Pileated Woodpecker	*Dryocopus pileatus*	7	PO	1	PO	7	PO	15
Olive-sided Flycatcher	*Nuttallornis borealis*	9	PR	3	PO	24	PO	36
Eastern Wood Pewee	*Contopus virens*	36	PO	3	PO	8	PO	47
Yellow-bellied Flycatcher	*Empidonax flaviventris*	12	PR	1	PO	6	PO	19
Alder Flycatcher	*Emphidonax alnorum*	14	PO	40	PR	84	PR	138
Willow Flycatcher	*Empidonax traillii*					6	PO	6
Least Flycatcher	*Empidonax minimus*	38	PR	16	PR	16	PR	70
Eastern Phoebe	*Sayornis phoebe*	1	PO					1
Great Crested Flycatcher	*Myiarchus crinitus*	14	PR	4	PO	22	PR	40
Eastern Kingbird	*Tyrannus tyrannus*	1	PO	2	PR	25	CO	28
Tree Swallow	*Iridoprocne bicolor*			1	PO	18	PR	19
Bank Swallow	*Riparia riparia*					20	PR	20
Barn Swallow	*Hirundo rustica*	2	CO	4	OB			6
Gray Jay	*Perisoreus canadensis*	3	CO					3
Blue Jay	*Cyanocitta cristata*	29	PR	13	PR	20	PO	62
American Crow	*Corvus brachyrhyncos*	12	PR	51	PR	10	PO	73
Common Raven	*Corvus corax*	2	PO	13	CO	8	CO	23
Black-capped Chickadee	*Poecile atricapilla*	32	PR	18	CO	52	CO	102
Boreal Chickadee	*Poecile hudsonica*	1	OB			1	OB	2
Red-breasted Nuthatch	*Sitta pusilla*	6	PO			3	PO	9
White-breasted Nuthatch	*Sitta carolinensis*	2	PO			1	PR	3
Brown Creeper	*Certhia familiaris*	11	PO	1	PO	3	PO	15

Table 5.7.2 Number of Species and Highest Breeding Status Observed in the June 2003 Survey

Common	Binomial	Forested Land		Agricultural Land		Wetland		Total
		Total Reported	Highest Breeding Status* Recorded	Total Reported	Highest Breeding Status* Recorded	Total Reported	Highest Breeding Status* Recorded	
Winter Wren	*Troglodytes troglodytes*	30	PR			14	PO	44
Golden-crowned Kinglet	*Regulus satrapa*	2	PO	2	PO	4	PO	8
Ruby-crowned Kinglet	*Regulus calendula*					5	PO	5
Veery	*Catharus fuscescens*	70	PR	33	PR	63	PR	166
Swainson's Thrush	*Catharus ustulatus*	22	PR	1	PO	9	PO	32
Hermit Thrush	*Catharus guttatus*	32	CO	3	PO	16	PO	51
Wood Thrush	*Hylocichla mustelina*	12	PR			5	PO	17
American Robin	*Turdus migratorius*	88	CO	40	CO	74	CO	202
Gray Catbird	*Dumetella carolinensis*	3	PO	3	PO			6
European Starling	*Sturnus vulgaris*			7	CO	1	PO	8
Cedar Waxwing	*Bombycilla cedrorum*	18	PR	42	PO	39	PO	99
Blue-headed Vireo	*Vireo solitarius*	25	PR	4	PO	25	PR	54
Warbling Vireo	*Vireo gilvus*					1	PO	1
Red-eyed Vireo	*Vireo olivaceus*	120	PR	48	PR	38	PR	206
Tennessee Warbler	*Vermivora peregrina*	3	PO	1	PO	1	PO	5
Nashville Warbler	*Vermivora ruficapilla*	28	PR	6	PO	21	PR	55
Northern Parula	*Parula americana*	48	PR	15	PO	34	PO	97
Yellow Warbler	*Dendroica petechia*			25	PR	37	PR	62
Chestnut-sided Warbler	*Dendroica pensylvanica*	51	PR	36	PR	26	PO	113
Magnolia Warbler	*Dendroica magnolia*	76	PR	15	PR	40	PR	131
Cape May Warbler	*Dendroica tigrina*			1	PO	2	PO	3
Black-throated Blue Warbler	*Dendroica caerulescens*	69	PR			9	PO	78
Yellow-rumped Warbler	*Dendroica coronata*	4	PR			12	PO	16
Black-throated Green Warbler	*Dendroica virens*	84	PR	20	PR	18	PO	122
Blackburnian Warbler	*Dendroica fusca*	38	PR	16	PR	15	PO	69
Palm Warbler	*Dendroica palmarum*	3	PR					3
Bay-breasted Warbler	*Dendroica castanea*	8	PR	5	PO	5	PO	18
Black-and-white Warbler	*Mniotilta varia*	42	PR	8	PR	23	PO	73

Table 5.7.2 Number of Species and Highest Breeding Status Observed in the June 2003 Survey

Common	Binomial	Forested Land		Agricultural Land		Wetland		Total
		Total Reported	Highest Breeding Status* Recorded	Total Reported	Highest Breeding Status* Recorded	Total Reported	Highest Breeding Status* Recorded	
American Redstart	*Setophaga ruticilla*	52	PR	65	PR	34	PR	151
Ovenbird	*Seiurus aurocapillus*	129	CO	10	PR	29	PO	168
Northern Waterthrush	*Seiurus noveboracensis*	13	PR	5	PO	36	PO	54
Mourning Warbler	*Oporornis philadelphia*	30	PR	26	PR	7	PO	63
Common Yellowthroat	*Geothlypis trichas*	62	CO	48	PR	72	PR	182
Wilson's Warbler	*Wilsonia pusilla*					2	PO	2
Canada Warbler	*Wilsonia canadensis*	34	PR	8	PO	23	PR	65
Scarlet Tanager	*Pirangea olivacea*	23	PR			7	PR	30
Northern Cardinal	*Cardinalis cardinalis*	1	PO					1
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	18	PR	7	PO	22	PO	47
Indigo Bunting	*Passerina cyanea*					1	PO	1
Chipping Sparrow	*Spizella passerina*	1	PO	8	CO	1	PO	10
Savannah Sparrow	*Passerchulus sandwhichensis*	2	PR	72	PR	6	PR	80
Song Sparrow	*Melospiza melodia*	15	PO	81	CO	32	CO	128
Lincoln's Sparrow	*Melospiza lincolnii*	7	PO			3	PO	10
Swamp Sparrow	*Melospiza georgiana*	3	PO	1	PR	24	PR	28
White-throated Sparrow	*Zonotrichia albicollis*	65	CO	32	PR	48	PR	145
Dark-eyed Junco	*Junco hyemalis*	2	PO			1	PO	3
Bobolink	*Dolichonyx oryzivorus*			24	PR	5	PR	29
Red-winged Blackbird	*Agelaius phoeniceus*			4	PR	83	CO	87
Rusty Blackbird	*Euphagus carolinus*					2	OB	2
Common Grackle	*Quiscalus quiscula*	13	PR	31	PR	70	CO	114
Brown-headed Cowbird	*Molothrus ater*			1	PO	1	PO	2
Purple Finch	*Carpodacus purpureus*	21	PR	9	PO	17	PO	47
American Goldfinch	*Carduelis tristis*	22	PO	43	CO	23	PO	88
Evening Grosbeak	*Hesperiphona vespertina*	3	PO			7	PO	10
	Totals:	1754		1057		1600		4411

*Breeding Status:

OB	Observed only	PR	Probable breeder
PO	Possible breeder	CO	Confirmed breeder

5.7.4.1.1 Bird Species of Special Conservation Concern

Table 5.7.3 lists bird species of special concern that were recorded during the various bird surveys. No species listed in Schedule 1 of the *SARA* or in the *New Brunswick Endangered Species Regulation* were recorded in the bird survey areas. There are no known Bald Eagle nests within 500 m of the Project footprint.

Table 5.7.3 Bird Species of Special Conservation Concern Recorded in the Survey Area.

Scientific Name	Common Name	ACCDC Rank *	NBDNR Status**
Red-tailed Hawk	*Buteo jamaicensis*	S4B	Sensitive (B)
Great Crested Flycatcher	*Myarchus crinitus*	S4B	Sensitive (B)
Purple Finch	*Carpodacus purpureus*	S4B	Sensitive (B)
Virginia Rail	*Rallus limicola*	S3B	Sensitive (B)
Willow Flycatcher	*Emphidonax trailii*	S1S2B	Sensitive (B)
Wood Thrush	*Hylocichla mustelina*	S3B	May Be At Risk (B)
Northern Cardinal	*Cardinalis cardinalis*	S2B	Sensitive (B)
Indigo Bunting	*Passerina cyanea*	S3B	Secure (B)

*ACCDC Ranks	
S1	Extremely rare throughout its range in the province (typically 5 or fewer occurrences or very few remaining individuals). May be especially vulnerable to extirpation.
S2	Rare throughout its range in the province (6 to 20 occurrences or few remaining individuals). May be vulnerable to extirpation due to rarity or other factors.
S3	Uncommon throughout its range in the province, or found only in a restricted range, even if abundant at some locations. (21 to 100 occurrences).
S4	Usually widespread, fairly common throughout its range in the province, and apparently secure with many occurrences, but the Element is of long-term concern (e.g. watch list). (100+ occurrences).
S#S#	Numeric range rank: A range between two consecutive numeric ranks. Denotes range of uncertainty about the exact rarity of the Element (e.g., S1S2).
S#B	Breeding: The rank refers to the breeding population of the element in the province.
**NBDNR Status:	
At Risk:	Species for which a formal assessment has been completed, and determined to be at risk of extirpation or extinction. To be described by this category, a species must be either listed as Endangered or Threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), or as Endangered or Regionally Endangered under the *New Brunswick Endangered Species Act* and accompanying regulations.
May Be At Risk:	Species or populations that may be at risk of extirpation or extinction, and are therefore candidates for a detailed risk assessment. It includes species that are of concern because of low numbers, population declines, or habitat pressures – often in combination with a lack of information concerning these factors.
Sensitive:	Species which are not believed to be at risk of extirpation or extinction, but which may require special attention or protection to prevent them from becoming at risk. This rank does not necessarily imply that all of the factors influencing a population are of concern, or that management or recreational use of those species is likely to cause them to become at risk.
Secure:	Species that are not believed to be At Risk, May Be At Risk, or Sensitive. These were generally species that were widespread and/or abundant. Although some Secure species may be declining, their level of decline was not felt to be a threat to their status in the province.

The presence of six species of special concern that also appeared on the list of CWS target species, was reported within the survey sites. These included: Red-tailed Hawk, Great Crested Flycatcher, Purple

Finch, Virginia Rail, Willow Flycatcher and Wood Thrush. As noted above, the locations of bird survey areas are shown in Figures 5.7.1 A-D (Appendix F).

Red-tailed Hawks primarily nest in woodlands and often forage in open areas including cutovers (Erskine 1992). One Red-tailed Hawk was recorded in a coniferous treed swamp in the survey area (B12) and was listed as possibly breeding due to its occurrence in suitable nesting habitat. The breeding population of Red-tailed Hawk is considered "Sensitive" in the province of New Brunswick, according to NBDNR (2003a), although it is ranked S4 by ACCDC.

Great Crested Flycatchers commonly nest in woodlands (Erskine 1992). There were forty records of this species in 11 of the 22 survey sites, primarily in forested and wetlands habitats during the June 2003 survey. The survey areas where Great Crested Flycatchers were observed include B2, B8, B9, B10, B12, B13, B14, B17, B20, B23 and B24. Of the forty records, fourteen individuals were recorded as probably breeding due to the observation of pairs and agitated behaviour. Twenty-four individuals were recorded as possibly breeding due to their presence in areas of suitable nesting habitat. The remaining two individuals exhibited no indication of breeding. During a site visit to Site B2 separate from the bird surveys, a pair of Great Crested Flycatchers was observed copulating, and entering a nest cavity. The breeding population of Great Crested Flycatchers is considered "Sensitive" in the province of New Brunswick, according to NBDNR (2003a), although it is ranked S4 by ACCDC.

Purple Finch are known to build their nests in conifers, however they frequent open mixed woodland and well-treed gardens, as well as spruce/fir forests (Erskine 1992). A total of forty-seven Purple Finch were recorded in the survey area during the June surveys. They were primarily located in forested and wetland areas, however several were observed on agricultural land. The survey areas where they were observed include B2, B3, B4, B5, B6, B7, B9, B10, B12, B13, B21, B23 and B24. Twelve individuals were recorded as probable breeders since pairs and territorial behaviour were observed. Thirty-one individuals were recorded as possibly breeding due to their presence in areas of suitable nesting habitat. Four individuals exhibited no indication of breeding. The breeding population of Purple Finch is considered "Sensitive" in the province of New Brunswick, according to NBDNR (2003a), although it is ranked S4 by ACCDC.

Virginia Rail generally breed in marsh habitat (Erskine 1992). Three individuals were recorded in the survey area, all in a wetland (B19). All three were listed as possible breeders due to their presence in suitable nesting habitat. The breeding population of Virginia Rail is considered "Sensitive" in the province of New Brunswick, according to NBDNR (2003a). ACCDC (2003) ranks the breeding population of Virginia Rail in New Brunswick as S3.

Willow Flycatchers generally frequent shrubby habitats (Erskine 1992). Six Willow Flycatchers were observed in a mixedwood treed swamp in the survey area (B13). All six were listed as possible breeders

due to their presence in suitable nesting habitat. The breeding population of Willow Flycatcher is considered "Sensitive" in the province of New Brunswick, according to NBDNR (2003a). ACCDC (2003) ranks the breeding population of Willow Flycatcher in New Brunswick as S1S2. Although documented records of Willow Flycatcher are relatively few, it is believed that this species is increasing in numbers in the province (D. Busby, pers. comm.). It is almost identical in appearance to the Alder Flycatcher, and is generally distinguished by its call notes and song. Alder Flycatcher was also recorded in site B13, in the wetter portions of the habitat.

Wood Thrushes occur in hardwood forest (Erskine 1992), and are most often associated with seepage areas within these forests. They are at the northeast limit of their range in the Maritimes. A total of seventeen Wood Thrushes were observed in the survey area (B2, B6, B7, B12, B19, and B23). Twelve individuals were recorded in forested areas, and five in or adjacent wetland habitat. Seven were listed as probable breeders due to their displays of agitated and territorial behaviour. Ten individuals were listed as possible breeders due to their presence in suitable nesting habitat. The breeding population of Wood Thrush is classed as a "May Be At Risk" species in New Brunswick, according to NBDNR (2003a). ACCDC (2003) ranks the breeding population of Wood Thrush in New Brunswick as S3.

One occurrence of Northern Cardinal was recorded amid immature hardwoods bordering an agricultural area (B23). This is a species that was not listed on the target list but is a species considered by NBDNR (2003a) to be "Sensitive". ACCDC (2003) ranks the breeding population of Northern Cardinal in New Brunswick as S2. Northern Cardinals frequent shrubbery, thickets and wood edges, close to garden feeding stations (Erskine 1992).

Indigo Bunting was observed one time during the June 2003 survey (B12). The species in known to prefer forest edges, thickets and shrubbery (Erskine 1992). This species was not included on the target list and is considered "Secure" by NBDNR (2003a), but is a species with a breeding population ranked as an S3 species in New Brunswick by ACCDC (2003). It was recorded as possibly breeding, due to its presence in suitable breeding habitat. However, the habitat in close proximity to the Project footprint is not considered critical habitat for this species, and there is no lack of apparently suitable habitat in the region.

CWS Target Species

Additional bird species recorded during the June 2003 study that have no official species of concern ranking but which did appear on the CWS target list of species include: Olive-sided Flycatcher, Canada Warbler, Boreal Chickadee and Rusty Blackbird.

Olive-sided Flycatchers are characteristically found in open woodlands and other places where scattered trees remain (Erskine 1992). A total of thirty-six Olive-sided Flycatchers were recorded in the survey

area: twenty-four in wetland habitat; nine in forested habitat; and three in agricultural areas. The survey areas where they occurred included B6, B7, B8, B9, B10, B12, B13, B14, B17, B18 and B20. Three were considered probable breeders, while most (29) were considered possible breeders due to their observed presence in suitable nesting habitat. Four individuals exhibited no indication of breeding. Most were associated to some degree with nearby wetland habitats. Their relative abundance and distribution along the alignment suggests that they are likely relatively common in the landscape, as long as there are wetlands present.

Canada Warblers are usually found in dense understory vegetation of mature to mid-age mixed forests, most closely associated with broad-leafed trees and shrubs, but with conifers usually present too (Erskine 1992). In total, sixty-five individual Canada Warblers were recorded in 13 of the 22 survey areas during the June 2003 survey. The survey areas where they occurred included B2, B4, B9, B10, B12, B13, B14, B15, B17, B18, B20, B23 and B24. They were primarily observed in forested and wetland habitat areas, with several recorded adjacent agricultural areas. Of the sixty-five individuals, fifty-one were recorded as possible breeders due to their observed presence in suitable nesting habitat. Twelve individuals were considered probable breeders due to displays of agitated and territorial behaviour. Two Canada Warblers were observed within the survey sites but exhibited no indications of breeding. The distribution and numbers of Canada Warbler recorded during the surveys would suggest they are relatively abundant in the landscape. Canada Warbler was also noted as relatively abundant further south near the Saint John River during surveys in support of another highway project.

Boreal Chickadees are found in forests, particularly spruce forests (Erskine 1992). A total of two boreal chickadees were recorded in the survey area: one in wetland habitat and one in forested habitat (B6 and B18, respectively). No evidence of breeding was observed. The scarcity of this species was unexpected, however would suggest there may be relatively little suitable habitat for this species in the Project footprint.

Rusty Blackbirds frequent cool habitats in spruce bogs, swamps and alder swales (Erskine 1992). A total of two individuals were recorded in wetland habitats (B6 and B14). No evidence of breeding was observed. The habitat in the study would be considered marginal for this species, and the lack of historic record for this species in the area would tend to support this.

5.7.4.2 Ungulates

5.7.4.2.1 Historic Data and Public Consultation Summary

Moose habitat was incorporated into the original selection of the alignment, using mapping provided by NBDNR based on an aerial survey conducted March 24, 1998. The results of the survey support the public comments that the area between Dryer Road and Raymond Road between Strong Corner to the

west and Route 103 to the east had a high incidence of moose and deer. This area is low lying with mature cedar stands. As a result of public comments and geotechnical concerns, the alignment was moved out of the low-lying mature cedar forest, to as far as possible to the west, however not so far as to impede on agricultural land.

The Project is entirely within Wildlife Management Area (WMA) 10, within NBDNR Region 4. The WMA includes the area between Grand Falls and Woodstock west of the Saint John River, and on the east side of the Saint John River bordered by Grand Falls, Plaster Rock, Juniper Station, and Bristol. Most of the Crown land in this WMA is located east of the Saint John River, and is where much of the hunting pressure in this zone occurs (N. Prentice, pers. comm.).

The 2002 registered resident moose kill for WMA 10 was 65 moose, compared with 2,020 for the province, or 3.2% of the provincial registered kill (NBDNR 2003b). The 2003 quota, however was reduced from 111 in 2002 to only 10 in 2003 due to other mortality factors (NBDNR 2003b; N. Prentice, pers. comm.).

The 2002 registered resident deer kill for WMA 10 was 566 deer, compared to 6,443 for the province, or 8.8% of the provincial registered kill (NBDNR 2003b). The kill per km² for WMA 10 for 2002 was 0.20, nearly double the provincial rate of 0.11 per km². The antlerless deer hunt is currently limited in the province, in order to increase the population.

Land within the Assessment Area has the highest density of agricultural land, and has very little Crown land, compared to other areas of WMA 10. However, there are many small woodlot owners and some freehold land (H.J. Crabbe and Sons Limited) in the vicinity of the Project. Forestry activities in this area result in a changing landscape, and the creation of foraging habitat for moose and deer.

5.7.4.2.2 Winter Aerial Survey

An aerial survey was conducted on March 1, 2003, targeting moose and deer along the alignment. NBDNR Region 4 forest ranger Allen Goodine from the Perth-Andover District Office participated in the survey, conducted in a helicopter, with a pilot experienced at conducting aerial moose and deer surveys. Two JWEL biologists were the other two observers. Conditions were good, with a clear sky and no wind, and temperatures were between –10 and –1ºC. Although it had been three days since there was at least a trace of snow, NBDNR recommended that the survey not wait for a significant snowfall before conducting the survey (N. Prentice, pers. comm.). Snow depths in the region were around 1.5 m, which was restricting deer movement in most areas.

The pilot used a series of coordinates on either side of the RoW, located approximately 250 m from the line. The pilot flew up the eastern side of the alignment from Woodstock to Perth-Andover, and down

the western side from Perth-Andover to Woodstock. An 8 km section from Beaconsfield Road to Dean Road west of the alignment was flown as well, resulting in a total flight path near the proposed alignment of approximately 160 km.

Results of the aerial survey are presented in Figures 5.7.1 A-D (Appendix F), distinguishing between areas with old and fresh moose tracks, and identifying areas with evidence of potential deer wintering habitat, based on the habitat type and the presence of deer and/or tracks. Old tracks were those visible, however were altered due to snow fall and/or melting snow. New tracks were those that were likely made within a few days of the survey. Moose and deer sightings are also displayed on this figure.

Other mammal species recorded during the aerial survey included porcupine, coyote, and otter. Fisher was noted during the flight more than 10 km north outside the Project boundaries.

The density of moose encountered during the survey was relatively low, at 0.05 moose per km flown, or 0.11 moose per km of new highway. Density of deer was 0.125 per km flown (0.29 per km of new highway). The present TCH south of Perth-Andover on the east side of the Saint John River is not an area of exceptionally high moose collision rates (N. Prentice, pers. comm.)

The Assessment Area is not a major deer wintering area in the region (N. Prentice, pers. comm.). Some potential deer wintering habitat was identified along the route (Scott Road, Dean Road, River de Chute, Strong Corner, Raymond Road, and the proposed Hartland Interchange), generally in areas of mature conifer-dominated forest. Most of the management of mature coniferous forest habitat occurs on Crown land, and in major tracts of freehold land, neither of which were present in the vicinity of the alignment. Due to the size of the potential deer wintering habitat areas and the number of deer recorded during the aerial survey, these areas are not likely used by a substantive number of deer. Larger tracts of mature forest (*e.g.*, east of Strong Corner, Clarke Bog to the west of Strong Corner, Payson Lake west of Jacksontown) likely support a much larger proportion of the wintering deer in the vicinity, compared to the habitat in the survey area. The area where the most deer were recorded (Strong Corner) is located in an area with suitable wintering habitat on either side of the alignment. In most areas where there were smaller concentrations of deer, potential habitat exists on either side of the alignment.

As evidenced by the observed tracks and moose activity observed during the aerial survey, moose are generally not restricted to wintering areas in the Project area, even with the observed snow depths in the winter, and therefore their movement is not impeded. The necessary wintering habitat that can be limiting for moose is early successional habitats containing browse. As a result, moose wintering distribution shifts with the changing landscape. As mature hardwood stands are cut, moose are attracted to these areas as the browse species regenerate.

5.7.4.2.3 Other Observations

During bird surveys and both 2002 and 2003 wetland and plant surveys, incidental observations were made of wildlife. Moose sightings and sign were observed throughout the Assessment Area, in particular north of Little Presque Isle River. Moose sign were observed in nearly all of the wetlands, in mature cedar stands, and in and adjacent to clear-cut areas. Moose often made use of the NBDOT cutlines as travel corridors. The area between Dryer road and Raymond Road had a relatively high rate of encounters with moose during June bird surveys. This was the section of the proposed TCH where the route was changed, partially due to the public identifying the area to the east as having a high density of moose relative to the rest of the alignment. Although much of the land use immediately west of the alignment in this area is agricultural, there is some wetland and forest habitat remaining.

5.7.4.2.4 Consultation with NBDNR

The results of the aerial survey were provided to NBDNR for discussion purposes. NBDOT has reviewed the information and provided a preliminary plan for incorporating corridors and wildlife fencing based upon design constraints and the aerial surveys. This preliminary plan was reviewed with Norman Prentice, NBDNR Region 4 Regional Manager.

The experience from road construction north of the Project is that routing highways through areas of older uncut forests may result in cutting of adjacent habitats by the woodlot owners, due to the opportunistic access. The result is the attraction of moose to the edge of the RoW, where their presence was not previously reported. Given the changes in the landscape that are occurring and are likely to occur in the near and distant future due to forestry practices and the highway construction activities themselves, NBDNR has recommended that the details of where to locate corridors and fencing be developed over the course of project development. Corridors, however, will have to be selected relatively early in the design process.

5.7.4.3 Other Wildlife Species of Special Conservation Concern

5.7.4.3.1 Mammals

Under the New Brunswick *Endangered Species Act*, two mammals are protected as endangered and regionally endangered (respectively) in the Province:

- Eastern cougar (*Felis concolor couguar*); and
- Canada lynx (*Lynx canadensis*).

The occurrence of these species has not been confirmed in the Project area. Cougars have not been confirmed in New Brunswick until 1992 (Cumberland and Dempsey 1994) in Juniper, although the cougar was not confirmed as an eastern cougar. Biologists are now wondering if there was ever a subspecies of cougar, and now refer to eastern cougar as cougar (*Felis concolor*) (Libby 2000).

In New Brunswick, Canada lynx tend to inhabit forested wilderness areas favouring mature forests with a dense undercover of thickets and windfalls. They will inhabit other types of habitat as long as they contain minimal forest cover and adequate numbers of prey (*i.e.,* snowshoe hare). There are no records of lynx sightings within the Project area (C. Libby, pers comm.), and the likelihood of encountering lynx in this area is low given the landscape in this area (*e.g.,* agricultural land). The proximity of the alignment to human habitation and road network also decreases the likelihood of Canada lynx in the Assessment Area.

There are no known records of species listed in Schedule 1 of *SARA*, within the Assessment Area. COSEWIC lists Gaspé shrew (*Sorex gaspensis*) as the one mammal listed as a species of special concern in New Brunswick. This species has a very restricted known range in New Brunswick. One of only two recorded sites for this species is Moose Mountain, located approximately 5 km from River de Chute, on the east side of the Saint John River.

The Gaspé shrew is a small and slender insectivore with a long tail; it is light grey in colour. It is considered closely related to the long-tailed shrew (*Sorex dispar*) of the Appalachian Mountains area. The known habitat preference of the Gaspé shrew is rock outcrops and talus slopes in highlands where there are steep slopes. Although steep slopes are located between Perth-Andover and River de Chute, immediately to the west of the alignment, aerial photos (1:6,000 scale taken during November 1999) did not reveal any talus slopes, and field crews did not encounter this habitat type during the various surveys along the route. Given the specific habitat requirements of this species, it is very unlikely to be present in close proximity of the Project footprint.

Long-tailed shrew is ranked a questionable S1 (due to the uncertainty of the rank) by ACCDC (2003) and "May Be At Risk" by NBDNR (2003a). This species has only been recorded at two locations in Albert County in southern New Brunswick and Colchester County in northern Nova Scotia. The range of long-tailed shrew in nearby Maine extends only to the central part of the state. Long-tailed shrews inhabit humid, moss-covered talus slopes within softwood or sometimes deciduous forests. The ecologically similar rock vole (*Microtus chrotorrhinus*) is ranked S1 by ACCDC (2003) and sensitive by NBDNR (2003a). Rock voles inhabit a restricted ecological niche, occurring in humid, moss covered rocks formed on talus slopes at high elevations; the species is rarely found below 915 m (3000 ft) elevation, but has been located down to 451 m (1500 ft). Rock voles are frequently associated with rocky areas near streams running through coniferous forest stands. At mountain peaks, fog and dew can

provide the moisture and humidity needed by this species. Given the specific habitat requirements of this species, it is very unlikely to be present in close proximity of the Project footprint.

Bat species of special conservation concern ranked S1, S2, or S3 by ACCDC and ranked "At Risk", "May Be At Risk", or "Sensitive" by NBDNR, include eastern pipistrelle (*Pipistrellus subflavus*; ranked S2?; "Sensitive"). Other bats ranked S4 by ACCDC but "Sensitive" by NBDNR include northern long-eared bat (*Myotis septentrionalis*) and little brown bat (*Myotis lucifugus*). Eastern pipistrelle, northern long-eared bat and little brown bat are most sensitive during the winter months when regional populations have congregated into a few locations. Disturbance at these sites can potentially result in the deaths of large numbers of bats. There are no known hibernation sites such as caves or mines in the Assessment Area so these species are unlikely to be present during the period from November to May when they are hibernating. There was no karst (an irregular limestone region with sinks, underground streams, and caverns) topography found within the Project boundaries. The sink holes associated with karst topography often form over solution caves, which can provide hibernation sites for a number of bat species including eastern pipistrelle which prefer solution caves. No critical habitat for these species is known to occur in the Project area.

Given the lack of likely interaction between the Project and the mammal species discussed above, mammals species of special conservation concern are not brought forward in the environmental effects analysis.

5.7.4.3.2 Herpetiles

Wood Turtle

Background

Wood turtle (*Glyptemys insculpta*), a species of both provincial and national concern, are classed as S3 by the ACCDC, in New Brunswick, and considered "Sensitive" by NBDNR (2003a). Their range in Canada is restricted to Ontario, Quebec, New Brunswick and Nova Scotia, and is listed as a species of special concern in these four provinces by COSEWIC (2003). The general status in Canada is "Sensitive", although in Quebec, wood turtle is a "May Be At Risk" species.

Wood turtles typically occur in relatively small populations of up to a hundred or so in any given area. These populations are found along stretches of riparian habitat with cobble and gravel areas of river bottom on meandering watercourses through rich intervale habitats. A core wood turtle habitat feature of such sites is the presence of high depositional sandy banks that are scoured by winter and spring floods, reducing the establishment of shading vegetation cover. These banks must be high enough to

generally be dry by the mid June onset of nesting and the, mid June to mid September, incubation period.

Distinctly amphibious in nature, wood turtles hibernate in larger rivers and brooks, within their habitat, most frequently in areas with greater than a meter of water depth and generally out of the main current. In early spring wood turtles emerge from hibernation/brumation and stick close to their main watercourse habitats, alternately basking on the banks and seeking shelter from cooler temperatures in the water. At this time the males frequently journey up and down the main streams seeking breeding opportunities, though breeding attempts may occur throughout the active period from late April to early October (varies with local or yearly climate fluctuations), relatively far from core habitat, whenever males encounter females. As spring's often cold night temperatures grow milder, wood turtles make more frequent excursions onto land to feed and often spend days out of the water though they seldom remain far from a watercourse. They also make excursions high up on local tributaries far from their hibernaculae. In mid June, mature gravid females congregate at suitable natural sandy or gravelly riparian beaches to lay eggs, and then disperse after the eggs are laid. They may also choose other nesting sites proximal to the river or occasionally further afield that have suitable open, well drained, and friable substrates for nesting. Often these are anthropogenic in nature such as railway and roadbeds, gravel or sandpits, and farm fields near rivers. While some such sites may offer excellent nesting opportunities; others, such as tilled fields and roadbeds, may offer special hazards to eggs, hatchlings and most importantly to the breeding females. Wood turtles slow to mature, long-lived, and have only modest reproductive potential. As such, any disturbance situation that reduces hatching success, recruitment of juveniles into the adult population, or increases mortality of the adult breeding population above a normal level, can result in precipitous population declines.

Wood turtle populations are able to persist in the face of human alterations to their habitat. Indeed, much of their riparian intervale habitat is influenced by human activities, and in many sites with turtle populations, altered in part to pastures, hayfields, cropland, road and railways, in addition to forestry and other activities. Human activities harmful to wood turtle populations include:

- aggregate removal from riparian beaches or sources of sediment inflow to the river system;
- excessive erosion induced deposition into waterways;
- allowing cattle to congregate on riparian beaches inhibiting nesting or later trampling nests (this could also apply to people);
- introduction of pollutants that reduce the survival or the reproductive success of the turtles;
- indirectly creating conditions that increase egg predator (such as raccoons, red fox and striped skunk) populations, increasing the normally heavy predator induced mortality of eggs and hatchlings beyond a sustainable level;
- accidental kills of turtles on roadways or with machinery in farm fields; and
- sporadic casual removal of adults or juveniles as pets.

Directed intensive removal of adults and juveniles for the commercial pet trade can even more quickly induce a rapid decline in, or local loss of, a wood turtle population.

Results of Investigations

Areas initially identified as having the greatest potential to support, and possibly provide core habitat for wood turtles included the larger waterways. Aerial photography showing these watercourses did not suggest classic riparian nesting beaches within the proposed Project footprint, including the access road crossings. These sites included River de Chute, the Big Presque Isle Stream, Little Presque Isle Stream, and near the Lower Guisiguit Brook adjacent to the Project footprint. These larger waterway crossings were visited during spring breeding bird surveys and plant surveys by a field technician experienced in assessing habitat for wood turtle. These major riparian crossing areas could, however, be described as potential wood turtle habitat well suited for foraging and as general movement corridors. No wood turtles or unequivocal evidence of such were noted during site visits to any of these larger watercourses throughout the routing. Not encountering wood turtles is not an unusual situation during spot checks of any one site, as they are a reasonably cryptic species of low population density, even about core habitat and during prime observational season. No prime nesting beaches were noted at or immediate to any of the crossing imprints. Any other potential nesting sites in these areas were absent or of an extremely marginal nature unlikely to provide significant nesting opportunities. No evidence of nesting (*e.g.,* egg shells and egg predator dug holes) was noted. Similarly the relatively shallow depths and swift currents of all the major stream crossings with the exception of the Little Presque Isle Stream crossings, offered little suitable hibernaculae. In the instance of the Little Presque Isle Stream crossings, the relatively still waters were deep enough for hibernating but appeared to be of a mostly soft silt or organic bottom. Additionally the only potential nesting sites, at this broad marshy, slow flowing, reach of the river, were in nearby tilled fields and on soil exposures in pastures excessively trampled by cattle, and thus extremely marginal.

Almost all of the small streams and brooks crossed by the alignment could be said to provide potential summer foraging habitat for wood turtles. This would be particularly true if such small streams were relatively near and connected to larger streams and rivers having core wood turtle habitat features that indeed supported wood turtle populations. Again no wood turtles were encountered during surveys of the area but this alone in no way excludes potential wood turtle presence and seasonal use. Such streams may provide summer foraging and mating opportunities and even serve as movement corridors between populations essentially inhabiting larger streams in different watershed areas.

Dusky Salamander

Background

Northern dusky salamander (*Desmognanthus fuscus*) is classed as S3 by the ACCDC, in New Brunswick, and considered "Sensitive" by NBDNR (2003a). Their known range in Canada is restricted to Ontario, Quebec, and New Brunswick and is listed as not at risk in these three provinces by COSEWIC (2003). The general status in Canada is "Sensitive", although in Ontario and Quebec, it is a "May Be At Risk" species.

Characterized as one of the most common species of salamander in North America due to its extensive range, this species occurs from parts of Louisiana, and Alabama and Mississippi, up to southeastern Canada. In Canada the dusky salamander is known only from the more southern and western areas of New Brunswick and from South Eastern Quebec mostly east of the Saint Lawrence River and not extending up into the Gaspé. In Ontario the only known historical record was from the Niagara River Gorge, and while long thought to be extirpated, the species was relocated from this region (Kamstra 1991). In the Maritime Provinces, the prehistoric development of the Tantramar Marshes and the Northumberland Strait has evidently kept an ecologically similar stream associated species, the Northern two-lined salamander (*Eurycea bislineata*), from colonizing either Nova Scotia or Prince Edward Island. The same may be suggested for the northern dusky salamander. Apparently suitable habitat for both these stream associated salamander species is present in these other Maritime Provinces, though in the case of the Dusky salamander it is not clear if populations extend up to the Northumberland Strait shore or towards the Nova Scotia border.

In New Brunswick the extent of the range of this elusive, and perhaps overlooked, salamander is not well known. Most records are in the southern and southwestern areas of the Province. The largest populations of this species are in Browns Flats in southwestern NB and the northern range was only previously known to extend to Woodstock. Over the entirety of their extensive range south of New Brunswick, northern dusky salamanders are known from a variety of aquatic and semi-aquatic forested habitats. Seeps and small streams with plenty of mosses, rocks, logs and other cover along the edges and into the water are favoured habitat. The southern coastal plain form (*D. f. conanti*) is even said to occur along the margins of swamps and sluggish, muddy lowland streams (Petranka 1998). In northern locations in the United States that the surveyor has visited, and in locations the surveyor has discovered dusky salamanders, or examined a known location (Fundy National Park) in New Brunswick, the habitat may be described as, cool, clear water, fishless seepage and spring head streams (M. MacDonald, pers. comm.). These streams are situated in and shaded by a mature cover of trees which also shelters at least the nearby terrestrial habitat. Forest cover can vary from deciduous to mixed to coniferous species.

In most locations along the routing, forest cover was mature deciduous, dominated by sugar maple, but in one instance white cedar was dominant. At one site in Fundy National Park, spruce appeared to dominate. Old growth and mature forest cover provide significant layers of leaf litter and humus that retains moisture, more large limb and trunk debris for cover and moist hideaways and a shaded, multilayered canopy that minimizes drying of leaf litter during dry periods. These conditions benefit exclusively terrestrial species such as red-back salamanders, as well as more amphibious species like northern two-lined and dusky salamanders, by allowing them basic habitat needs and maximizing the time salamanders can spend foraging on the forest floor where food availability is greatest. The benefits to stream salamanders of mature forest cover are even more pronounced. Retention of mature forest cover keeps streams cool, mostly clear of silt and permanently flowing. Even if a stream was naturally of an ephemeral or intermittent nature, mature forest cover in the area will retain areas of extensive water flow and pools as long as possible. Clear cutting over or near such streams leads conditions hostile to stream salamander survival. These include increase in water temperature, scouring flood flows followed by seasonal drying of waterways, and dryer, hotter terrestrial environment that restricts if not precludes foraging above ground or cover. These conditions generally lead to declines in stream salamander populations, if not local extirpation. For example, without perennial stream flows, northern two-lined salamanders cannot breed successfully, as their larvae generally require 2-3 years to transform from their gilled stage.

While northern two-lined salamanders generally lay eggs beneath rocks in the stream, northern dusky salamanders generally lay their eggs terrestrially, with the female also in attendance as with two-lined salamanders, in or beneath stream side moss mats and clumps, under logs, leaf piles or other debris in mid to late summer. The young enter the streams post hatching and in some cases fall water levels may reach their nests and stimulate hatching or make entry to the water easier. Northern dusky larvae studied in Kentucky and Ohio enter the water in the fall, and grow little during the fall and winter and had a larval stage lasting 9 months (Jutterblock 1990). Wilder (1913) estimated transforming dusky salamander larvae, found in June, in Massachusetts were 8-10 months old. Obviously any seep or streamlet harbouring a breeding population of dusky salamanders must have water in it from at least fall to early summer, though a brief dry period in late summer would not necessarily preclude dusky salamanders breeding there. Northern dusky salamanders, like many stream associated species are sensitive to altered water flow patterns, and high temperatures in their streams as well as pollution and siltation. Stream siltation and high metal concentrations appear to be the two main factors in eliminating this species from many of the streams draining coal strip mines in parts of Kentucky and Tennessee (Gore 1983). Forest clearing in and around habitat leads to scouring, siltation, and loss of cover generally lowering stream salamander populations. Increased acidification of aquatic habitat can decrease or eliminate populations. While acid precipitation is a concern, especially in poorly buffered areas, acidic drainage from mines, or exposures of acid bearing rock during road construction would be deleterious to stream salamander populations, as they are to fish, despite many salamanders having somewhat more acid tolerance than many fish.

Results of Investigations

Surveys for amphibian species along the alignment, interchanges and associated access roads were conducted in 2002 and 2003 concurrently with breeding bird, plant, and wetland surveys. Transformed and adult northern dusky salamanders are readily distinguishable from the other six species of salamander known from New Brunswick. The robust hind legs compared to the more slender forelimbs of dusky salamanders alone is sufficient to differentiate them from the northern two-line salamander. The surveyor has had past experience with the species in several U.S. locations.

Northern dusky salamanders were encountered only occasionally. Locations discovered in 2002 included three seep streams from the Bairdsville area near the rich forest site hosting the rare Canada violet (12 found), and a spring head pool feeding into Wark Brook near Perth-Andover, in Victoria County (one found). An additional northern dusky salamander site was located in 2003 in a forest-situated seep spring head, immediately below a potato field, just south of the Backland Road, in Carlton County (three males, one female and one juvenile found). In all cases the particular small watercourse in question appeared to be fishless, as several streamlets were obviously intermittent in nature and would be inhospitable to fish. Also most streamlets where dusky salamanders were found were located in mature deciduous dominated forest or forest patches that had not been subject to any recent (*i.e.*, in the last 20 years or more) cutting pressure. The Wark Brook site near Perth-Andover was in a sloping stream valley in which the immediate forest cover about the brook was dominated by mature white cedar. In all the dusky salamander sites northern two-lined salamanders were also found to be present in the same general habitat. In one instance a small male northern dusky salamander was found under the same large rock less than 10 cm from an adult male northern two-lined salamander. Only adult and sub-adult dusky salamanders were noted. Dusky salamanders were characteristically located in cool, clear water seeps and streamlets, generally under rocks near the waters edge, approximately 70 cm^2 or greater in area, that had shallow water under them. In instances where a salamander was located in a dry section of stream it was found within the stream channel, under a rock where substrate moisture was greatest.

Additional searches were performed in early August 2003 specifically for dusky salamander in potential habitat located both along, and off the Project footprint. This was done in an effort to see if indeed northern dusky salamanders were present more generally along the route and to show their presence in the area off route as well. Four sites not encountered enroute to another survey subject were chosen from aerial photos. The known dusky salamander site south of the Backland Road was re-examined as a control. Salamanders were not discovered at any of the survey sites, however two dusky salamanders were found at the control site, near Backland Road.

In summary, northern dusky salamanders were located from five sites along or proximal to the Project footprint between Perth-Andover and Florenceville. These salamanders were present from shallow

seepage streams and springhead seeps within mature forest cover. While northern two-lined salamanders also invariably seemed to be present in the same habitat with the Dusky salamanders, this more widespread (in New Brunswick) species was generally noted in a far greater number of streams along the routing, and from less specific stream habitat types. It may be that northern dusky salamanders may be less able to cope with fish presence than northern two-lined salamanders or otherwise have more specific habitat requirements, or are less able to persist or re-colonize areas post disturbance event like clear cutting. The species may however simply be generally less abundant and more cryptic at any given site than are northern two-lined salamanders, and thus not as easily detected. With their long larval period and overlap of larval year classes in a given permanent stream, northern two-line salamanders would be more detectable than dusky salamanders for that reason alone.

The current state of Wildlife populations in the vicinity of the Proposed TCH and habitat as available within the Assessment Area (22 map tiles – 78,894 ha) provide a benchmark for the evaluation of cumulative environmental effects on wildlife, as they reflect the sum of the environmental effects that are acting upon them.

5.7.5 Environmental Effects Analysis

5.7.5.1 Project-VEC Interactions

Table 5.7.4 provides a summary of the potential environmental effects resulting from the Project-VEC interactions, including those of past, present and likely future projects. The table is divided according to each of the Project phases assessed (construction, operation and maintenance), as well as for accidents, malfunctions and unplanned events. The discussion following the table provides an analysis of key Project-VEC interactions, by Project phase.

Table 5.7.4 Project Activity – Environmental Effects Interaction Matrix for Wildlife

Potential Interactions Between Project Activities and Environmental Effects **Valued Environmental Component: WILDLIFE**					
Project Activities and Physical Works	**Potential Environmental Effects**				
	Change in Habitat Quantity	**Change in Habitat Quality**	**Habitat Fragmentation**	**Direct Mortality**	**Loss of Species of Special Conservation Concern**
Construction					
Site Preparation	✓	✓	✓	✓	✓
Roadbed Preparation		✓	✓	✓	✓
Watercourse Crossing Structures	✓	✓	✓	✓	✓

Table 5.7.4 Project Activity – Environmental Effects Interaction Matrix for Wildlife

Potential Interactions Between Project Activities and Environmental Effects **Valued Environmental Component: WILDLIFE**					
Project Activities and Physical Works	**Potential Environmental Effects**				
	Change in Habitat Quantity	**Change in Habitat Quality**	**Habitat Fragmentation**	**Direct Mortality**	**Loss of Species of Special Conservation Concern**
Ancillary Structures and Facilities Construction	✓	✓	✓	✓	✓
Operation					
Winter Safety		✓			
Proposed TCH Presence		✓	✓	✓	✓
Maintenance					
Proposed TCH Maintenance		✓			
Vegetation and Wildlife Management		✓		✓	
Accidents, Malfunctions and Unplanned Events					
Hazardous Materials Spills		✓		✓	✓
Erosion and Sediment Control Failure		✓			
Bridge or Culvert Washout		✓			
Fires	✓	✓	✓	✓	✓
Vehicular Collisions				✓	✓
Wildlife Encounters				✓	✓

5.7.5.1.1 Construction

There are several construction activities related to the Project that could affect the Wildlife VEC, however the main environmental effect is the loss and resultant fragmentation of habitat due to site preparation activities. There is also the potential for direct mortality of wildlife or loss of species of concern unable to escape disturbances, such as some herpetiles, active migratory birds nests, and small mammals. The breeding season for birds is generally the most critical, since eggs and nestlings cannot move from sources of disturbance. Construction activities may result in the destruction or permanent abandonment of nests or increased predation of eggs and young during temporary abandonment. Birds and other wildlife in general can also be affected by habitat loss and sensory disturbance, as well as the creation of edge habitat. Construction of the proposed TCH will result in the creation of edge habitat. Edge habitat has both positive and negative implications for birds. Edge habitats often support a large number and variety of bird species. Edges also tend to attract generalist predators such as raccoons, red fox, coyote, dogs, cats, crows and jays. They may also attract Brown-headed Cowbirds a nest parasite of passerine birds (*i.e.,* perching songbirds of the order Passeriformes). The presence of high concentrations of predators and Brown-headed Cowbirds along habitat edges can result in these areas becoming reproductive sinks in which large numbers of birds attempt to breed but have poor breeding success.

Linear developments such as highways also have the potential to fragment habitats. Some species may be reluctant to cross roadways causing populations to be isolated in habitat fragments. These fragments may be too small to support a population of a particular species particularly if it requires forest interior habitats for survival. Physical isolation of a population combined with the deleterious environmental effects of edge may eliminate species in habitat fragments.

Clearing and grubbing will result in the removal of trees, shrubs and other ground cover such as herbaceous plants, brush piles and deadfalls that provide cover and foraging habitat for various birds and other wildlife. This will result in the displacement of wildlife that have historically used the habitat within the Project footprint and in adjacent habitats. Noise from construction activities including blasting can disturb wildlife in the habitat adjacent the Project footprint.

The proposed TCH will require the installation of culverts and bridges. Wildlife species susceptible to activities affecting watercourses include riparian nesting birds and stream-associated salamanders (*e.g.,* dusky salamander).

5.7.5.1.2 Operation

Operational activities that could potentially affect wildlife include the presence of the highway, and winter maintenance activities. Traffic on the proposed TCH could disturb birds nesting or foraging in habitats adjacent to the roads. The presence of wildlife fencing is meant to keep wildlife, especially moose and deer, off the highway, and direct them to wildlife corridors. This fencing could keep ungulates from critical habitat if corridors are not suitable, and if such habitat is not available on either side of the highway. Improperly designed fencing can result in the trapping of ungulates within the RoW. Salt contamination of watercourses could affect stream-associated salamanders, and residual salt concentrations on the side of the proposed TCH could attract wildlife such as moose and deer during the spring.

5.7.5.1.3 Maintenance

The potential environmental effects of the maintenance of infrastructure such as pavement, lines, signage and guiderails would be similar to or less intrusive than the environmental effects of the original construction of these structures. These activities would likely be of smaller scale and extent than during construction, and of low frequency. Vegetation maintenance (*i.e.,* mowing) can result in the destruction of nests should birds choose to nest within the grassy medians, slopes and ditches, and if the activity occurs during the breeding season.

5.7.5.1.4 Accidents, Malfunctions and Unplanned Events

Hazardous materials spills on land would generally be localized and unlikely to interact substantially with wildlife, as these would most likely occur in disturbed or other anthropogenic areas. However, spills in watercourses could affect stream-associated salamanders, and potentially affect other wildlife use of watercourses (*e.g.*, as a drinking water source), as contamination could be carried a considerable distance downstream and a spill in a watercourse or area frequented by migratory birds is prohibited under the *MBCA Migratory Bird Regulations*. Similarly, erosion and sediment control failure, as well as a bridge or culvert washout could affect stream-dwelling wildlife.

Fire events during any phase of the Project could affect the remaining habitat area or quality for wildlife, and result in the displacement of wildlife. Similar to clearing activities, direct mortality of eggs or nestlings, as well as wildlife such as salamanders and some small mammals could result from an uncontrolled fire.

Vehicular collisions includes collisions with wildlife. Without the use of extraordinary measures, the risk of collisions with moose or deer cannot be eliminated, however they can be reduced with the appropriate use of wildlife barriers and corridors. Moose are most active at dawn and dusk. They are very hard to see at night, (their eyes do not reflect light like those of deer) and their dark coat makes them nearly invisible after dark. Collisions with other wildlife such as birds, small mammals and herpetiles are also likely to occur on the new proposed TCH, as on other highways in the province.

Wildlife encounters are possible, especially during manual clearing activities, and locations where food debris may be present and attract animals such as raccoons and bears. The removal of problem or nuisance animals may be required for safety reasons. NBDNR would be contacted in these instances.

5.7.5.2 Environmental Effects Analysis and Mitigation

5.7.5.2.1 Construction

During construction of the proposed TCH and associated roads and structures, several activities could have environmental effects on wildlife. These include any activities (site preparation, road preparation, watercourse crossings) that involve vegetation clearing resulting in a loss of suitable breeding or foraging habitat, and resulting in fragmentation and potential direct mortality and loss of species of special conservation concern. The sections following this table describe the mitigative strategies aimed at mitigating these potential environmental effects. The discussion is grouped in the major components of the Wildlife VEC, including Migratory Birds, Ungulates, and Wildlife Species of Special Conservation Concern.

Table 5.7.5 Environmental Effects Assessment Matrix for Wildlife (Construction)

Environmental Effects Assessment Matrix
Valued Environmental Component: WILDLIFE
Phase: Construction

Project Activity (See Table 4.1.1 for list of specific activities and works)	**Potential Environmental Effects**	**Mitigation**	**Magnitude**	**Geographic Extent**	**Duration/Frequency**	**Reversibility**	**Ecological/Socio-Cultural and Economic Context**
Site Preparation	• Change in habitat quantity (A) • Change in habitat quality (A) • Habitat fragmentation (A) • Direct mortality (A) • Potential loss of species of special conservation concern (A)	• Route selection • Follow EPP and EFG • Limit area of environmental effect • Use designated roadways and access; limit offroad activity • Clear outside of breeding season, and grub as early as possible. • Avoid clearing during periods when deer are yarding.	1-2	3-4	3/6	1	2
Roadbed Preparation	• Change in habitat quality (A) • Habitat fragmentation (A) • Direct mortality (A) • Potential loss of species of special conservation concern (A)	• Follow EPP (Section 4) • Use designated roadways and access; limit offroad activity	1-2	3-4	3/6	R	2
Watercourse Crossing Structures	• Change in habitat quantity (A) • Change in habitat quality (A) • Habitat fragmentation (A) • Direct mortality (A) • Potential loss of species of special conservation concern (A)	• Follow EPP (site specific for major watercourse crossings) • Wood Turtle Relocation Plan • Limit area of environmental effect	1-2	1	3/1	1	2
Ancillary Structures and Facilities Construction	• Change in habitat quantity (A) • Change in habitat quality (A) • Habitat fragmentation (A) • Direct mortality (A) • Potential loss of species of special conservation concern (A)	• Follow EPP • Limit area of impact • Use designated roadways and access; limit offroad activity • Clear outside of breeding season, and grub as early as possible. • Avoid clearing during periods when deer are yarding.	1	2	3/6	1	2

Table 5.7.5 Environmental Effects Assessment Matrix for Wildlife (Construction)

Environmental Effects Assessment Matrix
Valued Environmental Component: WILDLIFE
Phase: Construction

Project Activity (See Table 4.1.1 for list of specific activities and works)	**Potential Environmental Effects**	**Mitigation**	**Magnitude**	**Geographic Extent**	**Duration/Frequency**	**Reversibility**	**Ecological/Socio-Cultural and Economic Context**

Key:

Magnitude:
1 = Low: *e.g.,* specific group, habitat, or ecosystem localized one generation or less, within natural variation
2 = Medium: *e.g.,* portion of a population or habitat, or ecosystem 1 or 2 generations, rapid and unpredictable change, temporarily outside range of natural variability
3 = High: *e.g.,* affecting a whole stock, population, habitat or ecosystem, outside the range of natural variation

Geographic Extent:
1 = <1 km^2
2 = 1-10 km^2
3 = 11-100 km^2
4 = 101 - 1,000 km^2
5 = 1,001 - 10,000 km^2
6 = >10,000 km^2

Duration:
1 = <1 month
2 = 1 - 12 months
3 = 13 - 36 months
4 = 37 - 72 months
5 = >72 months

Frequency:
1 = <11 events/year
2 = 11 - 50 events/year
3 = 51 - 100 events/year
4 = 101 - 200 events/year
5 = >200 events/year
6 = continuous

Reversibility:
R = Reversible
I = Irreversible

Ecological/Socio-cultural and Economic Context:
1= Relatively pristine area or area not adversely affected by human activity.
2 = Evidence of adverse environmental effects.

N/A = Not Applicable
(A) = adverse
(P) = positive

Migratory Birds

The breeding season is generally the most critical period for migratory bird species, since eggs and nestlings cannot escape the source of disturbance. Birds in general can also be affected by habitat loss and sensory disturbance as well as the creation of edge habitat, as a result of construction of the proposed TCH. The environmental effects of clearing and grubbing are most likely to occur when these activities are conducted during the period when most migratory bird species are breeding (predominantly from May to the end of August). Clearing and grubbing at this time may result in the direct mortality of eggs and unfledged nestlings. The killing of migratory birds or the destruction of their nests, eggs, or young is an offence under the *Migratory Birds Convention Act (MBCA)*. NBDOT will conduct most clearing of the planned RoW during the fall/winter, which should avoid potential direct adverse environmental effects on nesting birds. However, there is a small known amount of clearing (approximately 5% of the total) that may take place during the May to August timeframe. Specifically, clearing of watercourse buffer zones (typically 30 m either side of the watercourse). In addition, some clearing activities such as surveying and clearing for RoW adjustments may be required during this period. RoW adjustments may be required as mitigation for other VECs (*e.g.,* avoidance of an unforeseen important archaeological site, or a sulfide-bearing rock vein) or due to engineering and design limitations (*e.g.*, slope stability). Due to construction timing restrictions as a result of other legislation (*i.e.*, Fisheries Act), site preparation activities (*e.g.*, grubbing and grading) will take place during the May to August period. This may result in the disturbance of some groundnesting birds for a

period of up to 30 days, which is the time in which grading activities must be completed (within a given work area) as specified by the Work Progression Clause (Section 3.4.1.2.5).

Where possible, draw-down and removal of beaver dams, on ponds or wetlands where waterfowl are known to be actively nesting or raising young, will be conducted outside the May to August breeding season.

Construction within the Project footprint will result in the permanent loss of habitat for various bird species, and the creation of more open habitat for edge-nesting species. Clearing and grubbing outside of the breeding season will remove habitat for nesting birds. If adjacent suitable habitat is not available, those birds will not likely nest until nearby habitat becomes available, as most birds return to the same general area from year to year. The result is likely a higher non-breeding population. In the short term, clearing of mature forest for highway construction resembles clear-cutting of forest habitat; mature forest becomes unavailable or reduced in the immediate area. The footprint area to be cleared will be as narrow as practical to reduce the amount of lost habitat.

The Carleton-Victoria Forest Products Marketing Board (CVFPMB) is a not-for-profit organization created in 1978 by a regulation under the *Natural Products Act*. The purpose and intent of the CVFPMB is to promote the development and use of the private woodlots within Carleton and Victoria counties as a dependable source of supply of primary forest products for wood using industries. The CVFPMB negotiates prices, contracts, and market access on behalf of Wood Producers who are marketing primary forest products from within the regulated area of the Board. The CVFPMB supports an Annual Allowable Cut (AAC) of 4,000 ha per year, or 2% of the forested land base (185,000 ha) in the two counties. This AAC represents the productive capacity of the forest in private hands. This excludes industrial freehold land, which is managed for sustainability, likely more than private woodlots. Although the CVFPMB has no formal management control over how much wood private woodlot owners cut in a year, the annual cut usually fluctuates +/- 5 or 10% around the AAC (*i.e.* from 3,600 to 4,400 ha are actually cut each year). Assuming all of the 735 ha of forest habitat within the Project footprint (based on 1996/1999 forest inventory mapping) contained marketable timber, clearing of the Project footprint would represent 20% of the CVFPMB AAC. As the RoW has undergone cutting for at least the past 1 ½ years, and the remaining clearing will be spread out over the next two years, the cutting will be spread over several years, and would likely represent an average of 250 ha per year, which is within the year to year variability in the AAC (T. Fox, CVFPMB pers. comm.). The permanent loss of the forest habitat within the Project footprint represents 0.4% of the forest base in Carlton and Victoria counties, or 1.8% of the forest base within the Assessment Area. Also, the total area of forest that will be lost as a direct result of clearing for the proposed TCH is relatively small compared to the total area of forest cleared in the region to support local and regional sawmills and pulpmills. The mature or overmature portion of this habitat loss within the Project footprint is approximately 206 ha, or 28% of the forest base within the Project footprint, compared to 30% in the Assessment Area.

Up to 20 of the 115 ha (19%) of wetlands located within 30 m of the Project footprint will be directly lost due to the Project, which represents 1.2% of the 1,863 ha of the delineated wetland habitat in the Assessment Area. None of the wetlands were particularly high quality waterfowl or marsh bird habitat. The wetland with the highest number of waterfowl and marsh birds recorded was Wetland 3, where the Project footprint crosses the upstream edge of the wetland. There is far more significant wetland habitat to the west of the alignment including the Williamstown Lake Wetlands, a 820 ha ESA with a great diversity of wetland habitat types that is considered one of the most important waterfowl habitats in the region. Two Ducks Unlimited sites (Carlisle Lake and Tweedie Lake Flowage) are also located well outside of the Project boundaries.

A total of 223 ha of agriculture/grassland habitat representing 21% of the total Project footprint will be directly affected within the Project footprint. The bird surveys indicate that although many birds were recorded in association or close proximity of agricultural habitat, relatively few birds were likely nesting in this habitat. As most of this land is intensively managed, most grassland species recorded were associated with uncultivated edges and the few fallow fields in the bird survey areas.

Habitat fragmentation by the Project may adversely affect local populations of birds living adjacent to the proposed alignment but will not affect regional populations in a substantive way. The Assessment Area has already been subjected to habitat fragmentation as a result of forest harvesting activity, agricultural activity, residential and linear developments including roads. Approximately 33% of the proposed Project footprint passes through disturbed early successional habitats such as clear-cuts, shrub thickets and regenerating forest. Another 30% of the Project footprint runs through areas adjacent to existing roads, and other non-forest land use. The adverse environmental effects of habitat fragmentation can be reduced by routing the RoW through heavily disturbed areas such as agricultural land or recent clear-cuts. However given the importance of agriculture in the region, agricultural land was avoided where possible. Also, because of the distribution of properties, disturbances such as forestry or agricultural operations tend to be long and narrow and are crossed by the proposed TCH along their shortest axis rather than their longest axis making it difficult to minimize the amount of new disturbance and edge created by constructing in previously disturbed areas.

The potential residual adverse environmental effects associated with construction on migratory birds are considered not significant because the population of migratory birds within the regional biogeoclimatic zone (*i.e.*, the Valley Lowlands Ecoregion) is not expected to be affected in a substantive way. Past environmental effects on migratory birds over the past twenty years are most likely associated with changes in habitat from forestry operations and the conversion of forest land to agriculture. These activities change the habitat such that nesting habitat is reduced for some species while habitat is created for other species. However, the CVFPMB and Industrial Freehold try to manage forest lands so that the forest resource is sustainable and result in a mixture of forest development stages.

Ungulates

Moose are present throughout most of the Assessment Area (between Perth-Andover and the Hartland Interchange), as evidenced by the aerial survey and incidental observations. The selection of the routing took into account the historic moose habitat identified during the 1998 flyover by NBDNR, and modifications to the alignment were made in 2003 based on public consultations that recommended a shift in the alignment towards Strong Corner. Most of the area to the west of Strong Corner has Environmentally Significant Areas that cover much of the area and were therefore avoided. Only movement of the corridor through the agricultural land would potentially reduce the potential environmental effects on moose habitat, however, it is very likely that this could result in a substantive loss of agricultural productivity in the region. Consultations with stakeholder have suggested that such a loss would simply be offset by the clearing of adjacent forest land and conversion to agriculture (D. Prosser, pers. comm.). Clearing activities within the Project footprint and in some cases in adjacent land by private landowners during the earlier planning stages up to the first few years of construction is creating wintering habitat (browse) for moose. Roadbed preparation will affect some wetland habitat (open water for cooling and foraging of aquatic plants in summer), however alternate habitat is available in the region, and few of the wetlands within 30 m of the Project footprint are of suitable size or have open water depths to be considered critical habitat for moose. As moose are poor thermal regulators, they are attracted to large, cleared, wind-swept areas such as highways to gain relief from summer temperatures and insect attack.

The loss of a few small areas of potential deer wintering habitat located within the Project footprint is not expected to substantively affect the regional deer population. Other potential environmental effects of site preparation and the permanent conversion of the forest habitat within the Project footprint on adjacent potential deer wintering habitat include a change in habitat quality of the immediately adjacent habitat, and habitat fragmentation. The proposed Project footprint is in close proximity to several other areas of potential deer wintering habitat. Potential deer wintering habitat is however available on either side of the proposed alignment. Despite the harvesting of past deer wintering habitat and the potential environmental effects of the existing highway, larger tracts of potential deer wintering habitat remain in the region.

Although clearing in the winter is beneficial for breeding birds, clearing should not occur during periods of heavy snow conditions, when deer movement is hindered, or when deer may be yarded up in areas of deer wintering habitat within or near the Project footprint. Clearing in these areas should be conducted early in winter when snow depths are still thin.

Construction activities will be spaced out along the alignment such that they will generally not impede the movement of moose or deer across the alignment, although ungulates may avoid areas of high

construction activity. The installation of wildlife fencing will likely occur near the end of the construction schedule.

The selection of areas for inclusion of wildlife corridors and/or fencing is being determined in consultation with NBDNR. Areas proposed by NBDOT as locations for wildlife corridors, based on the winter survey and the feasibility based on topography and design constraints are typically associated with planned structures for watercourses, as well as access road crossings or other overpasses. These areas include, Big Presque Isle Stream (bridge structures), Strong Corner (overpass planned for property access road), Guisiguit Brook (watercourse crossing), River de Chute (watercourse and road crossing) and possibly Brown Brook (Figures 5.7.1 A-D, Appendix F). Wildlife fencing is proposed to correspond to the above corridor sites.

NBDNR has requested a flyover with NBDOT to have a first hand look at habitat and topography of four selected locations where deer and/or moose were recorded near the alignment, in order to relate topography to the location and expected design of the proposed TCH (*i.e.* areas of cut and fills). The flyover is planned for fall 2003. The feasibility and need for wildlife corridors in these areas will be evaluated at that time. NBDNR has also recommended a follow-up aerial survey during the next winter, to fine tune and confirm the high use areas that may warrant wildlife fencing, among other mitigation.

Based on consideration of the potential environmental effects of the individual activities and physical works required for construction along the proposed TCH and associated roads and facilities, the proposed mitigation, and the residual environmental effects significance ratings criteria, the environmental effects on ungulates from these activities are considered not significant.

Wildlife Species of Special Conservation Concern

The one Red-tailed Hawk recorded in a coniferous treed swamp in the survey area B12 was hunting near a wetland (coniferous treed swamp) at the time of the survey. It was observed flying towards suitable nesting habitat nearby in an adjacent mature hardwood hill, at a considerable distance from the Project footprint. The construction of the proposed TCH is not likely to result in the loss of the nesting area of this individual.

Great Crested Flycatchers are relatively abundant in many of the forested and near wetland habitats along the route. The relatively high abundance suggests that this species is relatively common in the region, where suitable habitat exists. The critical habitat feature of Great Crested Flycatcher is the need for natural or woodpecker-excavated cavities for nesting, preferably in hardwood and cedar trees. The presence of this species is likely closely associated with the relatively high numbers and wide distribution of woodpeckers along the proposed alignment. They were even found in the relatively fragmented habitat of site B24 at the southernmost end of the alignment. Most of the birds were, in fact,

recorded outside of the Project footprint, although many were likely nesting in habitat in close proximity to (within 100 m of) the footprint.

Purple Finch was also relatively abundant along the alignment, located in a variety of habitats along the route, including selectively cut forest and immature forest stands. Purple Finches were mostly found north of Florenceville, although they were also recorded in the fragmented landscape around site B24. Although still common in New Brunswick, Breeding Bird Survey trends indicate there has been a decrease in the population of Purple Finches over the past 40 years. The reason for this decline is not known. No critical habitat for this species has been identified within the survey sites, and there is no evidence that there is no suitable habitat outside of the alignment and within the greater Assessment Area.

Virginia Rail was reported during both site visits to site B19 (Wetland 19) in June, with one reported during the first visit, and 2 during the second. Overall, the wetlands along the route had relatively little habitat that would be considered suitable for nesting of marsh birds such as Virginia Rail. The secretive marsh bird appeared during the first site visit after playing tapes several times. As the footprint will affect a relatively small proportion of the wetland, and there are portions of the wetland that are more than 500 m from the Project footprint, this species may breed in this marsh following construction. Regardless, there is much more habitat suitable for marsh birds such as the Virginia Rail several km to the west of the proposed TCH (*i.e.,* Williamstown Lake Wetlands).

Willow Flycatchers are apparently increasing in numbers in the province (Dan Busby, pers. comm.) and its preferred habitat is not particularly limited in the landscape. They are typically more aggressive than the more common Alder Flycatcher, and may displace Alder Flycatchers from the drier sections of wetland habitats (F. Lavender, pers. comm.). It is likely that, although the habitat near Site B13 in which the Willow Flycatchers were recorded will be lost to construction, suitable nesting habitat should be available in the landscape.

Wood Thrush were recorded in a number of survey sites along the route. A close look at where they were recorded reveals that many were observed outside of the Project footprint. Site B2 was surveyed prior to the realignment in this area, so birds recorded upslope from the footprint are now at a considerable distance from the area of disturbance. Many of the records of this species during the June survey were relatively close to open habitats such as wetlands and agricultural land. Also, Wood Thrush have been known to nest close to human habitation. Therefore, Wood Thrush should still be able to persist in habitats adjacent the highway, following construction of the proposed TCH. In addition, a portion of site B2 which contains the largest recorded population of Wood Thrush encountered during bird surveys will be purchased for conservation purposes and no longer at risk of future forest harvesting.

Bird species of concern with few individuals reported included an individual Northern Cardinal recorded in immature hardwoods bordering an agricultural area, and one Indigo Bunting recorded in suitable nesting habitat (forest edges, thickets and shrubbery) adjacent an agricultural field. The habitats in which these species were reported was suitable, but there was no evidence of breeding. Even if these individuals are unable to nest in adjacent habitat, the loss of these possible breeders would not likely be significant.

No grassland/agriculture-associated bird species of special conservation concern or listed as target species by CWS were reported along the alignment, although two were recorded migrating through the area (Upland Sandpiper and Horned Lark).

Despite the presence of some bird species that have shown some historic evidence of population declines, these species are still relatively abundant in the region. The loss of some habitat for these species is not considered significant when put into the context of the regional population. Beyond the avoidance of clearing from May 1 to August 31, no other mitigation is recommended with respect to migratory birds of concern.

Wood turtles have been recorded in many of the watersheds crossed by the proposed TCH, however no critical habitat has been identified. Most of the larger watercourses will be spanned by bridges, which, following construction, should permit the passage of wood turtles as long as there is some terrestrial habitat along the stream edge, under the bridge. The many small stream crossings had no, or extremely marginal at best, potential as to nesting or hibernaculae sites within the Project footprint, and so would not be expected to provide any core habitat for wood turtles. The only likely interaction between construction activities and wood turtle is the discovery of individuals. Wood turtles encountered in the field during construction that are at risk of harm should be relocated beyond the construction boundaries, in their direction of travel.

Dusky salamanders discovered within the Project footprint are likely to be killed during construction activities including site preparation and roadbed preparation. Dusky salamanders were found in shallow seepage streams and springhead seeps within mature forest cover. Based on the searches for this species inside and outside the Project footprint, a viable population of this species will be left undisturbed in three of the five sites following construction activities. The discovery of this species in Victoria County has resulted in a range extension for this species, and has been reported to the New Brunswick Museum. As no voucher specimens have been collected for the Museum, voucher specimens could be removed from areas where Dusky Salamanders have been reported that will be lost during construction.

Like all stream salamanders any large scale removal of forest cover from about their stream habitat and adjacent terrestrial foraging areas is detrimental. Loss of forest generally diminishes or eliminates the moist microhabitats needed by forest dwelling salamanders. Additionally for stream species, the resulting alterations to water flow regime, with potential for both increased scouring events and siltation,

as well as drying of the watercourse is detrimental. With regards to highway construction, direct loss of stream habitat and seep genesis sites to construction can have adverse environmental effects on local populations, but these impacts need not be significant in many cases if basic mitigation is applied. As long as stream flows and intact mature forest cover around them remain on either side following highway construction, then thriving populations of stream salamanders can be maintained. Care must be taken to minimize any construction derived or post construction siltation. It must also be ensured that no sulfide-bearing rock is exposed proximal to the stream or used as roadbed fill.

Possible mitigation of potential adverse environmental effects to stream salamander habitat downstream from the construction activities can include erosion control measures to prevent siltation to the mostly fishless, small streams and seeps, and avoidance of exposure of sulfide-bearing rock during construction. Leachate from such rock leads to declines in stream pH and can increase metal concentrations to toxic levels.

Based on consideration of the potential environmental effects of the individual activities and physical works required for construction along the proposed TCH and associated roads and facilities, the proposed mitigation, and the residual environmental effects significance ratings criteria, the environmental effects on wildlife species of special conservation concern by these activities are considered not significant.

5.7.5.2.2 Operation

The following section provides an evaluation of key potential Project-VEC interactions for operations as summarized in the environmental effects assessment matrix (Table 5.7.6). Operations with a potential environmental effect on wildlife include highway operation (presence of highway; vehicular traffic), and winter maintenance (salt application), which could cause a change in habitat quality, maintain habitat fragmentation, or cause direct mortality or loss of species of special conservation concern.

Table 5.7.6 Environmental Effects Assessment Matrix for Wildlife (Operation)

Environmental Effects Assessment Matrix **Valued Environmental Component: WILDLIFE** **Phase: Operation**							
Project Activity (See Table 4.1.1 for list of specific activities and works)	**Potential Environmental Effects**	**Mitigation**	**Magnitude**	**Geographic Extent**	**Duration/Frequency**	**Reversibility**	**Ecological/Socio-Cultural and Economic Context**
Winter Safety	• Change in habitat quality (A)	• Implement EPP and EFG • Develop long term salt management plan	1	3	5/3	R	2

Table 5.7.6 Environmental Effects Assessment Matrix for Wildlife (Operation)

Environmental Effects Assessment Matrix
Valued Environmental Component: WILDLIFE
Phase: Operation

Project Activity (See Table 4.1.1 for list of specific activities and works)	Potential Environmental Effects	Mitigation	Magnitude	Geographic Extent	Duration/Frequency	Reversibility	Ecological/Socio-Cultural and Economic Context
Proposed TCH Presence	• Change in habitat quality (A) • Habitat fragmentation (A) • Direct mortality (A) • Loss of species of special conservation concern (A)	• Monitoring of moose/deer activity	1	3-4	5/6	R	2

Key:

Magnitude:
1 = Low: *e.g.,* specific group, habitat, or ecosystem localized one generation or less, within natural variation
2 = Medium: *e.g.,* portion of a population or habitat, or ecosystem 1 or 2 generations, rapid and unpredictable change, temporarily outside range of natural variability
3 = High: *e.g.,* affecting a whole stock, population, habitat or ecosystem, outside the range of natural variation

Geographic Extent:
1 = <1 km^2
2 = 1-10 km^2
3 = 11-100 km^2
4 = 101 - 1,000 km^2
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6 = >10,000 km^2

Duration:
1 = <1 month
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3 = 13 - 36 months
4 = 37 - 72 months
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Frequency:
1 = <11 events/year
2 = 11 - 50 events/year
3 = 51 - 100 events/year
4 = 101 - 200 events/year
5 = >200 events/year
6 = continuous

Reversibility:
R = Reversible
I = Irreversible

Ecological/Socio-cultural and Economic Context:
1 = Relatively pristine area or area not adversely affected by human activity.
2 = Evidence of adverse environmental effects.

N/A = Not Applicable
(A) = adverse
(P) = positive

Migratory Birds

During the operational phase of the Project, traffic on the proposed TCH could disturb birds nesting or foraging in habitats near the new road. Several studies have shown that disturbance associated with automobile traffic can have an adverse environmental effect on bird abundance and breeding success. A study of terrestrial bird abundance, species composition and breeding success in forested habitats adjacent to a busy highway in New Brunswick (JWEL 1998) revealed a reduction in bird abundance of 18% to 25% in plots located 100 and 200 m away from the road relative to control plots 500 m from the road. Evidence of breeding activity was reduced by 34% to 39% relative to control plots. These reductions were not statistically significant. A similar study conducted in the Netherlands revealed a reduction in the number of singing males from 3.3/ha in control plots to 2.1/ha in areas within 200 m of a highway (Reijnen and Foppen 1994). These data indicate that disturbance associated with operation of the road will have a measurable adverse environmental effect on local populations but is not expected to result in a significant environmental effect on regional populations. Reijnen and Foppen (1994) noted that the degree of disturbance to birds by highway traffic was best correlated with noise levels. As such, the best means of mitigating the adverse environmental effects of traffic on birds is to reduce noise levels. There is no practical or effective way in which to do this over a stretch of highway this long. Noise barriers would be prohibitively expensive and a reduction in speed limits within practical limits

would have only a minor effect on noise levels. By way of example, reduction of the speed limit from 80 kph to 70 kph would only reduce noise levels by an average of 2 dB_A at a distance of 100 m from the highway.

Based on consideration of the potential environmental effects of the operation of the proposed TCH and associated roads and facilities and the residual environmental effects significance ratings criteria, the environmental effects on migratory birds by these activities are considered not significant.

Ungulates

The presence of the proposed TCH along with the vehicular traffic will fragment forested habitats remaining on either side of the highway. Deer and moose may choose not to cross the proposed TCH, or those that do, run the risk of direct mortality due to vehicle collisions. In areas where wildlife fencing is present, deer and moose will be less likely to cross. Artificial corridors are planned, and their preliminary locations, based in part on the aerial survey results, are under review and in the early stages of planning. The ever changing landscape with regards to moose wintering habitat makes it difficult to choose locations for Wildlife structures and wildlife fencing, as has been demonstrated in a previous highway project north of Grand Falls (Section 5.7.4.2.4). The east/west movement of deer and moose in the area may be affected by the proposed alignment, due to the lack of cover, and the risk from vehicle collisions.

Approximately 47 ha of potential deer wintering habitat, based on deer or track aggregations noted during the aerial survey, are located within 300 m of the RoW.

There are, however, potential deer wintering habitat, and moose habitats available on either side of the proposed TCH. The location of wildlife fencing and corridors will be fine-tuned over the next year during the design phase of the Project, in consultation with NBDNR.

The mechanism of degradation of habitats for wildlife during operation is noise. Vehicle noise could lead to displacement of wildlife and/or habitat avoidance. Deer are particularly susceptible when using deer wintering habitat, and increased energy expenditures because of disturbances could lead to lower survival. Ungulates are expected to become habituated to the noise produced by vehicular traffic, given the high frequency of traffic along the TCH.

Based on consideration of the potential environmental effects of the operation of the proposed TCH and associated roads and facilities, the proposed mitigation (*e.g.*, wildlife corridors and fencing) and the residual environmental effects significance ratings criteria, the environmental effects on ungulates by these activities are considered not significant.

Wildlife Species of Special Conservation Concern

Potential environmental effects on bird species of special conservation concern are the same as those for migratory birds, discussed above.

As the known population of dusky salamander in the vicinity of the Project and outside the Project footprint is located upslope of the alignment, the potential environmental effects of salt contamination of watercourses are low, however there could be as yet undiscovered populations in downgradient locations. As discussed in Section 5.4.5.2.2, NBDOT is committed to developing best salt management practices in a continued effort to reduce the environmental effects of road salt on the environment. Currently Section 6.2.1 of the EPP identifies salt application protection measures. Application rates identified in the *Highway Maintenance Management System Field Manual* (NBDOT 1992b) will be used to maximize the efficiency of salting and sanding and minimize the potential environmental effects. This should reduce the potential environmental effects of road salt on stream-associated salamanders.

Following construction activities, the presence of the proposed TCH could have an adverse environmental effect on wood turtle. More roads in wood turtle habitat mean more general habitat fragmentation, more potential for accidental roadway mortality of turtles, and more access to humans who might remove wood turtles from their habitat. In a highway project such as this the only possible mitigation, other than avoiding or minimizing any damage to any identified core habitat features (such as prime nesting sites or hibernaculae), is to utilize bridges to span the larger watercourses. For smaller stream crossings, where bridges are not necessary or feasible, implementation of the largest possible culvert design is advisable. With regards to wood turtles, such a culvert design would allow as much light as possible to enter the tunnel (anecdotal observations suggest wood turtles appear to leave the water to travel terrestrially down or up a stream, when confronted by a long dark culvert.). Additionally, at least at low water levels, the culvert would have some sort of terrestrial movement corridor. Given the lack of core wood turtle habitat, the added cost of over-sizing culverts specifically for wood turtle is not warranted in this instance.

Based on consideration of the potential environmental effects of the operation of the proposed TCH and associated roads and facilities, the proposed mitigation, and the residual environmental effects significance ratings criteria, the environmental effects on wildlife species of special conservation concern by these activities are considered not significant.

5.7.5.2.3 Maintenance

The following provides an evaluation of key potential Project-VEC interactions for maintenance activities as summarized in the environmental effects assessment matrix (Table 5.7.7). Maintenance activities with a potential environmental effect on the wildlife include proposed TCH maintenance and vegetation and wildlife maintenance (mowing and maintenance of wildlife fencing and crossings),

which could cause a change in habitat quality, maintain habitat fragmentation, or cause direct mortality or loss of species of special conservation concern.

Table 5.7.7 Environmental Effects Assessment Matrix for Wildlife (Maintenance)

Environmental Effects Assessment Matrix
Valued Environmental Component: WILDLIFE
Phase: Maintenance

Project Activity (See Table 4.1.1 for list of specific activities and works)	Potential Environmental Effects	Mitigation	Magnitude	Geographic Extent	Duration/Frequency	Reversibility	Ecological/Socio-Cultural and Economic Context
Proposed TCH Maintenance	• Change in habitat quality (A)	• Follow EPP Sections 6.1 and 6.3	1	2	2/1	R	2
Vegetation and Wildlife Management	• Change in habitat quality (A) • Direct mortality (A)	• Proper design and maintenance of wildlife corridors and fencing • Management of clear-cut areas in and near RoW to reduce browse	1	3	2/1	R	2

Key:

Magnitude:
1 = Low: *e.g.,* specific group, habitat, or ecosystem localized one generation or less, within natural variation
2 = Medium: *e.g.,* portion of a population or habitat, or ecosystem 1 or 2 generations, rapid and unpredictable change, temporarily outside range of natural variability
3 = High: *e.g.,* affecting a whole stock, population, habitat or ecosystem, outside the range of natural variation

Geographic Extent:
1 = <1 km^2
2 = 1-10 km^2
3 = 11-100 km^2
4 = 101 - 1,000 km^2
5 = 1,001 - 10,000 km^2
6 = >10,000 km^2

Duration:
1 = <1 month
2 = 1 - 12 months
3 = 13 - 36 months
4 = 37 - 72 months
5 = >72 months

Frequency:
1 = <11 events/year
2 = 11 - 50 events/year
3 = 51 - 100 events/year
4 = 101 - 200 events/year
5 = >200 events/year
6 = continuous

Reversibility:
R = Reversible
I = Irreversible

Ecological/Socio-cultural and Economic Context:
1 = Relatively pristine area or area not adversely affected by human activity.
2 = Evidence of adverse environmental effects.

N/A = Not Applicable
(A) = adverse
(P) = positive

Migratory Birds

Maintenance activities could disturb birds located adjacent to the proposed TCH. Maintenance activities, which will occur in conjunction with the operation of the proposed TCH, are unlikely to cause any unique disturbance to birds, beyond those environmental effects related to operational traffic. Maintenance activities such as resurfacing the TCH are not expected to have significant environmental effects on local bird populations. Disturbance associated with repairs to the road surface are not expected to be any more intense than that encountered during the construction or operational phases of the Project, and would generally be of smaller scale, and would therefore have less an effect than construction activities. In fact, habitat avoidance due to noise would be the main potential effect, which would be of limited duration and frequency. Sections 6.1 and 6.3 of the EPP provide various environmental protection measures that will help reduce potential environmental effects on wildlife, including migratory birds. Where possible, bridge maintenance activities, such as cleaning or resurfacing, will be conducted outside the breeding season (May to August) where migratory birds are known to nest on bridge structures

Mowing and brush cutting of the vegetated slopes and drainage ditches could destroy the nests of ground nesting birds such as the Savannah Sparrow, Bobolink or Ring-necked Pheasant if birds choose to nest immediately adjacent the busy highway. None of these species are of special conservation status. In fact, no bird species of special conservation concern requiring grassland habitat was recorded during the migratory bird surveys. Currently, the maintenance branch of NBDOT mows the grassy edges and medians of the provinces highways as required, usually once per year, for safety, and partially for aesthetic reasons (*i.e.*, tourism).

Based on consideration of the potential environmental effects of the maintenance of the proposed TCH and associated roads and facilities and the residual environmental effects significance ratings criteria, the environmental effects on migratory birds by these activities are considered not significant.

Ungulates

Proposed TCH Maintenance is not expected to have an adverse environmental effect on ungulates, as it would simply be similar to highway construction activities, but on a smaller scale. Vegetation control on the edges of the proposed TCH is not expected to have an adverse environmental effect. If the vegetation control removes suitable browse species, then control of this material will serve to reduce the potential interaction with traffic.

Maintenance of wildlife structures will be required to ensure their effectiveness. This work will be of short duration and will be conducted during summer months, and therefore should have limited effects on ungulates. Further, such maintenance will ensure the continual effectiveness of the fencing, and will on balance be beneficial to local populations.

Based on consideration of the potential environmental effects of the maintenance of the proposed TCH and associated roads and facilities, the proposed mitigation, and the residual environmental effects significance ratings criteria, the environmental effects on ungulates by these activities are considered not significant.

Wildlife Species of Special Conservation Concern

Issues associated with highway and vegetation maintenance with regards to bird species of concern are the same as described above for migratory birds and incorporate the same mitigation. No such species that require grassland/agricultural land as critical habitat were reported in the surveyed areas.

Based on consideration of the potential environmental effects of the maintenance of the proposed TCH and associated roads and facilities, the proposed mitigation, and the residual environmental effects significance ratings criteria, the environmental effects on wildlife species of special conservation concern by these activities are considered not significant.

5.7.5.2.4 Accidents, Malfunctions and Unplanned Events

The following provides an evaluation of key potential Project-VEC interactions between accidents, malfunctions and unplanned events, and the Wildlife VEC, as summarized in the environmental effects assessment matrix (Table 5.7.8). The main issues related to Wildlife are fires and vehicular collisions, although hazardous materials spills, erosion and sediment control failure and bridge/culvert washout could have adverse environmental effects on stream-associated species of special conservation concern. These accidents are possible during all Project phases. Further discussion of each accident type follows the table.

Table 5.7.8 Environmental Effects Assessment Matrix for Wildlife (Accidents, Malfunctions and Unplanned Events)

Environmental Effects Assessment Matrix
Valued Environmental Component: WILDLIFE
Phase: Accidents, Malfunctions and Unplanned Events

Project Activity (See Table 4.1.1 for list of specific activities and works)	**Potential Environmental Effects**	**Mitigation**	**Magnitude**	**Geographic Extent**	**Duration/Frequency**	**Reversibility**	**Ecological/Socio-Cultural and Economic Context**
Hazardous Materials Spills	• Change in habitat quality (A) • Direct mortality (A) • Potential loss of species of special conservation concern (A)	• Implement EPP and EFG procedures, and provincial and federal regulations should be followed for storage and handling of materials • Contingency Plan • Employee training	1	1	1/1	R	2
Erosion and Sediment Control Failure	• Change in habitat quality (A)	• Implement EPP and EFG preventative measures • Contingency Plan	1-2	1 or 2	1/1	R	2
Bridge or Culvert Washout	• Change in habitat quality (A)	• Design of watercourse crossings to handle the 1 in 100 year peak discharge event	1-2	1 or 2	1/1	R	2
Fires	• Change in habitat quantity (A) • Change in habitat quality (A) • Habitat fragmentation (A) • Direct mortality (A) • Potential loss of species of special conservation concern (A)	• Implement EPP and EFG preventative measures (Section 7.4) • Contingency Plan • Follow NBDNR *Forest Fire Act* • Design of highway to include emergency access or median roads	1-3	1 or 2	1/1	R	2
Vehicular Collisions	• Direct mortality (A) • Potential loss of species of special conservation concern (A)	• Wildlife fencing and corridors • Moose habitat signage • Monitoring of moose activity	1	3	5/2-5	R	2

Table 5.7.8 Environmental Effects Assessment Matrix for Wildlife (Accidents, Malfunctions and Unplanned Events)

Environmental Effects Assessment Matrix
Valued Environmental Component: WILDLIFE
Phase: Accidents, Malfunctions and Unplanned Events

Project Activity (See Table 4.1.1 for list of specific activities and works)	**Potential Environmental Effects**	**Mitigation**	**Magnitude**	**Geographic Extent**	**Duration/Frequency**	**Reversibility**	**Ecological/Socio-Cultural and Economic Context**
Wildlife Encounters	• Direct mortality (A) • Potential loss of species of special conservation concern (A)	• Keep work areas free from food debris. • Avoid off road travel. • Wood Turtle Encounter Relocation Plan • Notify local NBDNR	1	2	2	R	2

Key:

Magnitude:
1 = Low: *e.g.,* specific group, habitat, or ecosystem localized one generation or less, within natural variation
2 = Medium: *e.g.,* portion of a population or habitat, or ecosystem 1 or 2 generations, rapid and unpredictable change, temporarily outside range of natural variability
3 = High: *e.g.,* affecting a whole stock, population, habitat or ecosystem, outside the range of natural variation

Geographic Extent:
1 = <1 km^2
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3 = 11-100 km^2
4 = 101 - 1,000 km^2
5 = 1,001 - 10,000 km^2
6 = >10,000 km^2

Duration:
1 = <1 month
2 = 1 - 12 months
3 = 13 - 36 months
4 = 37 - 72 months
5 = >72 months

Frequency:
1 = <11 events/year
2 = 11 - 50 events/year
3 = 51 - 100 events/year
4 = 101 - 200 events/year
5 = >200 events/year
6 = continuous

Reversibility:
R = Reversible
I = Irreversible

Ecological/Socio-cultural and Economic Context:
1= Relatively pristine area or area not adversely affected by human activity.
2 = Evidence of adverse environmental effects.

N/A = Not Applicable
(A) = adverse
(P) = positive

Hazardous Materials Spills

Known hazardous materials that will be used during the construction and operation of the proposed TCH include fuels, lubricants, solvents and antifreeze. There is also a possibility that a large quantity of other various unidentified hazardous materials will be transported along this route. There is a possibility that these materials could be accidentally introduced into watercourses through a spill of these materials. These materials could temporarily degrade water quality and have subsequent environmental effects on freshwater biota including stream-associated herpetiles. In addition, contaminants can accumulate in sediments and be mobilized slowly over time. The effects of a hazardous material spills on terrestrial wildlife would generally be limited to the spill area, and would not have a significant effect in wildlife in the region. Prompt cleanup of these spills will reduce further interactions.

The magnitude of the environmental effect of a spill would be dependent on a number of factors that are difficult to predict. However, given the mitigation in place, the magnitude of environmental effects attributable to these infrequent and unlikely accidents, malfunctions and unplanned events are likely to be low, and worst case medium. Reversibility of physical environmental effects is high, due to the dynamic nature of lotic (actively flowing) water systems. The high spring flows and high bedload

transport will effectively flush the system during the spring following the event. Employee environmental awareness training will include the handling of hazardous materials. Section 4.19 of the EPP addresses hazardous materials issues. NBDOT has spill response contingency procedures identified in Section 8.1 of the EPP and Section 5.7 of the EFG. In the unlikely event of a hazardous material spill, the spilled material will be controlled and contained, and NBDOT will assist with the clean up. Materials to facilitate a rapid containment and clean up of hazardous material spills will be available on-site during construction in or near Watercourses and Wetlands. The transportation of dangerous goods is strictly regulated in New Brunswick and Canada, and the regulatory spill response system is highly co-ordinated and effective.

Based on consideration of the potential environmental effects of an accident, malfunction, or unplanned event, involving the release of a hazardous material into aquatic or terrestrial habitat along the proposed TCH and associated roads and facilities, the proposed mitigation, and contingency plans, the environmental effects of hazardous material spills are considered unlikely. Given the habitat preferences and distribution of stream-associated herpetiles in the Assessment Area, the environmental effects on wildlife would not likely result in the decline of a wildlife community that would not recover in one generation and are therefore considered not significant.

Erosion and Sediment Control Failure

There is a potential during heavy precipitation events or flash floods for erosion control structures (*i.e.*, check dams) to fail, and affect any potential habitat of wood turtle or dusky salamander. However, no critical wood turtle habitat is located in the vicinity of the Project footprint, or for a considerable distance downstream based on a desktop analysis and field visits, and dusky salamander habitat not affected by the Project footprint will typically be found in more upstream sections of watercourse crossings. Nonetheless, to reduce the possibility of this occurring, protection measures will be followed as described in Section 4.5 of the EPP. Specifically, erosion control structures will be monitored regularly and maintained in a functional condition until the grass on seeded slopes is sufficiently established to be an effective erosion deterrent. All check dams will be inspected before and after each rainfall and at least daily during periods of prolonged rainfall. All check dams found to be damaged will be repaired immediately. Sediment deposits retained by structures will be removed when the level of sedimentation is within 100 mm of the top of the structure.

Based on consideration of the potential environmental effects an accident, malfunction, or unplanned event, involving erosion and sediment control failure along the proposed TCH and associated roads and facilities, and the proposed mitigation the environmental effects on Wildlife habitat would not likely result in the decline of a Wildlife community that would not recover in one generation and are therefore considered not significant.

Bridge or Culvert Washout

A bridge or culvert washout would have a similar but more severe interaction with stream-associated herpetiles such as wood turtle and dusky salamander, as described above. There is a potential during high flood events for portions of the proposed TCH, or bridge or culvert installations to be washed out. This could temporarily degrade water quality due to increased sedimentation, or affect habitat quantity by the loss of suitable nesting habitat or hibernaculae. Factors influencing the magnitude, duration and geographic extent of the environmental effect include amount and duration of flooding, type and size of washout, natural terrain surrounding watercourse and location within the watershed. The extent of the environmental effects of such a road failure or washout on herpetiles is predicted to be low due to the small area of a watershed which is covered by the watercourse crossings, and the paucity of critical habitat downstream of the water crossings. Reversibility potential is high due to the dynamic nature of stream high spring discharges and high spring bedload transportation.

Roads are most susceptible to washouts during the high flow period during and immediately following spring snow melt. Road design will focus on protection of the aquatic environment by incorporating buffer zones, drainage and erosion control features and very conservative culvert and bridge design criteria. Watercourse crossings (bridges and culverts) will be designed with a hydraulic capacity to handle at least the 1 in 100 year peak discharge event, and will follow the *Watercourse Alteration Technical Guidelines* (NBDELG 2002b).

Based on consideration of the potential environmental effects an accident, malfunction, or unplanned event involving a bridge or culvert washout along the proposed TCH and associated roads and facilities, the proposed mitigation, and contingency plans, the environmental effects on wildlife would not likely result in the decline of a wildlife community that would not recover in one generation and are therefore considered not significant.

Vehicle Collisions

Direct mortality of wildlife could result from collisions with vehicles. During the operational phase of the Project, there will be bird mortality associated with collisions with automobiles. Based on general studies of avian collisions with vehicles on roads in Europe and North America (Erickson *et at.* 2001), estimates of avian mortality rates range from as low as 0.001 birds/km/yr to as high as 201 birds/km/yr. Avian mortality rates due to vehicle collision would be expected to vary with a number of factors, including, but not, limited to, volume of traffic (Noss undated), traffic speed, habitat through which the road traverses, extent of RoW clearing, bird species present and bird abundance. Roadkill data collected for a 100 Series Highway (four-lane), secondary highway and city streets in Nova Scotia over a two year period yielded an average rate of roadkill of 0.9 birds/km/yr for the 100 Series Highway, 1.2 birds/km/yr for the secondary highway and 0.7 birds/km/yr for city streets (M. Crowell unpublished data). The

proposed TCH will be a 70 km long highway, therefore, the estimated number of birds killed in collisions with automobiles would be 63 per year. This is probably an underestimate of the actual number of birds likely to be killed since small birds are easily missed during the surveys and their bodies are quickly destroyed by traffic or removed by scavengers. If it is assumed that only one in ten birds killed by traffic is recorded, the estimated number of birds killed per year would be approximately 630 birds. This number represents only a small proportion of the regional bird population.

Vehicular traffic in the general area is not expected to increase substantively, however there will be a shift in a high proportion of the traffic from the existing Route 2, which is located mostly along the Saint John River, to a more inland location. Annual average daily traffic is expected to increase by 3.73%. This increase is expected regardless of whether or not the new TCH is built. Some researchers suggest that bird fatalities are correlated with traffic volumes, however, a lack of detailed studies makes this difficult to assess. A recent review of bird fatalities on European roads presents conflicting results from separate studies (Erritzoe *et al.* 2003). A Danish study showed a greater number of birds killed on a higher traffic volume road, with 96 birds/km/yr on a main road with 2,823 vehicles/24 hr compared to 43 birds/km/yr on a secondary road with 332 vehicles/24 hr (Bruun-Schmidt 1994, cited in Erritzoe *et al*. 2003). A German study found fewer birds killed on a higher traffic volume road, with 154 birds/km/yr on a main road with 2,650 vehicles/24 hr compared to a 320 birds/km/yr on a secondary road with 780 vehicles/24 hr (Fuellhaas *et al.* 1989 cited in Erritzoe *et al.* 2003). Based on these studies, it is apparent that the relationship between bird fatalities and traffic volume is complicated and is not likely linear. Many researchers suggest that there is a learning effect, by which birds may be better able to learn to avoid traffic on roads with higher traffic volumes (Erritzoe *et al.* 2003). In the Danish study, an 853% increase in traffic volume resulted in a doubling of bird fatalities. It is likely that a 3.73% increase in traffic volume would result in an immeasurably small increase in bird fatalities. This increase in bird fatalities would be expected even if the proposed TCH is not built.

Fencing with escape mechanisms and underpasses are the most effective countermeasure to reduce deer and moose mortalities from vehicle collisions (Smiley 2002). These will be designed with input from wildlife biologists (*i.e.,* NBDNR). The most critical time for moose is during the winter, and is dependent on the availability of browse. At these times moose and deer are more likely to concentrate in smaller areas than at other times of the year. Although moose collisions will occur year round, moose are more likely to be encountered between May and October, with June, July and August being the most critical months on New Brunswick highways. As most moose collisions are expected to be reported to NBDNR, the department has an opportunity to consider these mortality rates when setting quotas for hunters in a WMA.

Where wood turtle may occur near watercourses or forested habitats along the proposed TCH, and adequate crossing structures are not available, wood turtles may be susceptible to mortalities due to vehicle collisions. As described in Section 5.7.5.2.2, suitable corridors are the only possible mitigation

for a highway. However, given that no critical wood turtle habitat is found near the proposed TCH, the likelihood for encounters is low. Also, bridge structures planned for the major watercourses are likely to provide suitable travel corridors for wood turtle.

Based on consideration of the potential environmental effects of an accident, malfunction, or unplanned event, involving a bridge or culvert washout along the proposed TCH and associated roads and facilities, the proposed mitigation (*e.g.*, well planned placement and well design corridors and fencing), and contingency plans, the environmental effects on wildlife would not likely result in the decline of a wildlife community that would not recover in one generation and are therefore considered not significant.

Fires

Fire within the Assessment Area of the proposed TCH could occur during any phase of the Project due to lightning or human activities. Fires can never be completely eliminated from the landscape, however regulations and appropriate mitigation can reduce their probability and extent. Factors influencing the severity and duration of environmental effects include time of year, extent of fire damage and type of fire (chemical, forest). Risk of forest fire along the road route is possibly higher than in non road areas due to the presence of human activity along the road route, which may be recreational or commercial in nature.

Forest birds have diverse habitat requirements and will react differently according to the species, and the severity of the fire. Forest fires in mature forest could reduce the amount of potential deer wintering habitat, and would result in only a temporary reduction of browse in regenerating forest; vegetation regeneration after a fire would provide excellent browse for deer and moose. Shelter is not an absolute requirement for the winter survival of moose in areas of moderate winter severity.

The potential for Project-related fires during Construction and Maintenance will be mitigated through equipment maintenance (*e.g.*, power saw mufflers and vehicle exhaust systems) and proper vigilance working with power equipment in forested areas, as per Section 8.4 of the EPP. Also, any burning of vegetative debris will require permits from NBDNR and NBDELG as per Section 4.8.3 of the EFG. All Construction activities will be done in compliance with regulations contained within the *Forest Fires Act*.

During all construction activities, NBDOT inspectors will monitor clearing and other relevant operations to ensure equipment is functional and personnel are trained in its use.

In the event of a fire occurring as a result of Construction and Maintenance activities, NBDOT personnel shall be prepared (*i.e.*, will have access to round point shovel or fire extinguisher) to control

and fight any fires in and about the work area, as per Section 7.4 and 8.4 of the EPP, and the *Forest Fires Act*. All fires will be reported to NBDNR. Forest fires not related to the Project will be managed by NBDNR.

Firefighting services for the Perth-Andover to Woodstock region are located in Perth-Andover, Centreville, Lakeville, Florenceville, Bath, Glassville, Bristol, Hartland, Plaster Rock, Debec, Maliseet and Woodstock. The locations of these fire stations are close enough to provide adequate response to fires during operation of the proposed TCH. Mitigation measures are prevention oriented through vegetation management (rregular mowing and brushing) as per Section 6.1.6 of the EPP to reduce the risk of fires from vehicles parked on the vegetation along the proposed TCH.

Based on consideration of the potential environmental effects of an accident, malfunction, or unplanned event involving a forest fire affecting wildlife habitat along the proposed TCH and associated roads and facilities, the proposed mitigation, and contingency plans, the environmental effects on Wildlife would not likely result in the decline of a wildlife community that would not recover in one generation and are therefore considered not significant.

5.7.5.3 Determination of Significance

Table 5.7.9 evaluates the significance of potential residual environmental effects resulting from the interaction between Project activities and wildlife and wildlife habitat, after taking into account any proposed mitigation. The table also considered the level of confidence of the study team in this determination and the likelihood of potential environmental effects.

Table 5.7.9 Residual Environmental Effects Summary Matrix for Wildlife

Residual Environmental Effects Summary Matrix **Valued Environmental Component: Wildlife**				
Phase	**Residual Environmental Effects Rating**	**Level of Confidence**	**Likelihood**	
			Probability of Occurrence	**Scientific Certainty**
Construction	NS	3	1	3
Operation	NS	3	1	3
Maintenance	NS	3	1	3
Accidents, Malfunctions and Unplanned Events	NS	3	1	3
Project Overall	NS	3	1	3

Table 5.7.9 Residual Environmental Effects Summary Matrix for Wildlife

Residual Environmental Effects Summary Matrix **Valued Environmental Component: Wildlife**				
Phase	**Residual Environmental Effects Rating**	**Level of Confidence**	**Likelihood**	
			Probability of Occurrence	**Scientific Certainty**
Key Residual Environmental Effect Rating: S = Significant Adverse Environmental Effect NS = Not-significant Adverse Environmental Effect P = Positive Environmental Effect Level of Confidence 1 = Low Level of Confidence 2 = Medium Level of Confidence 3 = High Level of Confidence			Probability of Occurrence: based on professional judgement 1 = Low Probability of Occurrence 2 = Medium Probability of Occurrence 3 = High Probability of Occurrence Scientific Certainty: based on scientific information and statistical analysis or professional judgement 1 = Low Level of Confidence 2 = Medium Level of Confidence 3 = High Level of Confidence N/A = Not Applicable *As determined in consideration of established residual environmental effects rating criteria.	

The residual environmental effects of the Project on Wildlife, taking into account mitigation, are the are the loss of an estimated 735 ha of forest and 74 ha of undeveloped land (including 22 ha of wetland), the fragmentation of habitat, and some residual mortality to wildlife (including migratory birds and moose) due to vehicle collisions and (for moose) increased hunter access. No migratory birds of special conservation concern were directly associated with the estimated 223 ha of agricultural land/grassland that will be lost to the Project. Key mitigation for migratory birds include limiting the area of critical habitat of species of special conservation concern required for the Project to the extent possible, and conducting most clearing outside the breeding season of migratory birds. Mature forest in the most important critical habitat encountered along the alignment, in terms of the type and number of migratory birds of special conservation concern recorded, including CWS "target" species. The loss of a small percentage of the available mature forest in the region from the Project is not likely to have a significant effect on migratory bird populations requiring this habitat. Forests are typically managed in such a way as to maintain a mixture of forest development stages. The purchase and future protection of an AHF stand which also contains the largest recorded population of Wood Thrush (the only "May Be At Risk" bird species) encountered during bird surveys should in part compensate for some losses of mature forest from the Project.

With respect to moose, mitigation includes route selection and refinement of the highway, and the use of wildlife fencing and crossings. The highway was realigned in the vicinity of Dryer road to Raymond Road in response to public concern that this was an area of high use by moose. NBDOT is also working closely with NBDNR biologists to select appropriate locations for fencing and wildlife crossings based on the results of aerial surveys, and to design the crossings to increase the likelihood that they will be used successfully, taking into account recent guidelines developed by NBDNR.

The residual environmental effects of the Project on Wildlife are therefore considered not significant for all phases and for the Project overall.

Based on consideration of the Project related and cumulative environmental effects, it is concluded that the wildlife and wildlife habitat resources in the vicinity of the Project have the capacity to meet the needs of the present and those of the future.

5.7.6 Monitoring and Follow-up

Monitoring of moose and deer in the vicinity of the proposed TCH is recommended in the short term to help fine tune the design of mitigation strategies (wildlife corridors and fencing). To aid in the design of wildlife corridors and fencing NBDNR and NBDOT will fly the alignment (Fall 2003) to understand the relationship between the topography and the proposed TCH to determine the need for structures and fencing. A follow-up aerial survey involving NBDNR personnel is recommended over the next winter to fine tune and confirm the high use areas that may warrant wildlife fencing, among other mitigation. NBDOT will continue to evaluate available technologies to keep moose off of highways and to provide information to motorists that will decrease the likelihood of collisions.

Other related follow-up is a recommendation for NBDOT to work with the CVFPMB to encourage the management of regenerating forest habitat near the Project footprint, so it is less attractive to moose and deer as browse. Existing management programs and money are already available to private woodlot owners, and managed by the CVFPMB. In addition, land that has already been cut, but will be within the RoW purchased by NBDOT should be managed using standard silvicultural techniques.

5.8 Land Use

5.8.1 Rationale for Selection as Valued Environmental Component

Project-interactions with current land use in the immediate vicinity of the Project will occur, and Land Use was therefore selected as a VEC. Project-related interactions with Land Use may include those residential and commercial land uses, recreational land use/access, forest resource use and agricultural uses. Environmental effects resulting from the Project on this VEC are defined by interruptions or disruptions to current land use by Project activities such that present land use activities are restricted and/or degraded and/or cannot continue at present levels.

In this section, the environmental effects of the Project activities on Land Use resulting from construction and operation, as well as accidents, malfunctions, and unplanned events are assessed.

5.8.2 Environmental Assessment Boundaries

5.8.2.1 Spatial and Temporal

The spatial boundaries for the assessment of commercial, residential and recreational land uses include the proposed TCH, and nearby (*i.e.*, <200 m) residential and recreational areas adjacent to its alignment, where activities associated with construction, operation, and accidents, malfunctions and unplanned events of the Project could potentially intersect with land use.

The spatial boundaries for the assessment of agriculture and forestry related land uses are defined by the upper Saint John River Valley, including Carleton and Victoria counties, and parts of Madawaska and York counties.

The temporal boundaries of the Land Use VEC include the four year construction period of the Project, as described in Section 3.0, and operations and maintenance in perpetuity.

5.8.2.2 Administrative and Technical

The proposed TCH is located within the counties of Carleton and Victoria. Planning within incorporated municipalities is regulated by municipal zoning regulations. Perth-Andover and Woodstock are the only municipalities through which the proposed TCH partially crosses. Most of the proposed TCH passes through rural unincorporated areas, which are regulated under the *Rural Planning District Regulation – Community Planning Act*, administered by NBDELG.

Information used in support of assessing residential, commercial and recreational land use issues was obtained from public and stakeholder consultations, mapping and property identification data, and a windshield reconnaissance survey along the existing TCH. Knowledge of the area affected by the Project is based on this information base, as well as the professional judgement of the study team.

Agriculture and forestry land-use data are based on forest cover information from NBDNR (1996 and 2000 aerial photography), NB Department of Agriculture, Department of Fisheries and Aquaculture (DAFA) and Statistics Canada information. Forestry activities at both the property and regional levels span rotations in excess of fifty years. Agricultural activities are based on shorter crop rotation schedules, three to five years covers most productions.

The spatial information used for the detailed assessment of Project-related environmental effects on both agriculture and forestry includes the Project footprint (1,054 ha including access roads), in the context of twenty-two digital map sheets (78,894 ha) that provides a larger contextual view of the area traversed by the Project. Figure 5.8.1 describes the location of the agriculture and forestry Assessment Area ("Assessment Area"). Assumptions used reflect current sectoral soil and water conservation Best Management Practices (BMPs).

Analyses of the market value of residential, commercial and other resource land uses would require very extensive and exhaustive study and research of each property. This is beyond the administrative boundary limitations of the environmental assessment as the environmental effects of the Project can be assessed, given planned mitigation, without that level of detail. Even with the support of extensive market analyses the results may not be conclusive in aggregate or at the individual property level due to externalities, lack of control, and scientific basis. Further, any analyses would be subject to criticism by property owners due to the unpredictability and fluctuations of the marketplace, subjectivity of property owners, individual business plans and decisions and financial capabilities of the individuals involved. NBDOT has and continues to negotiate fair market value settlements with property owners and land acquisitions of all properties affected by the Project.

It should be noted that changes to future land management practices as a result of better information on wood supply and the voluntary implementation of agriculture soil and water conservation BMPs, are difficult to quantify and are unlikely to represent projects or activities that will be carried out in the future that may overlap with the Project. As such, they are not considered in this assessment.

It is the professional judgement of the study team that the data available to characterize the existing land use conditions and the existing knowledge regarding the Project-VEC interactions are sufficient to support the environmental assessment.

5.8.3 Residual Environmental Effects Rating Criteria

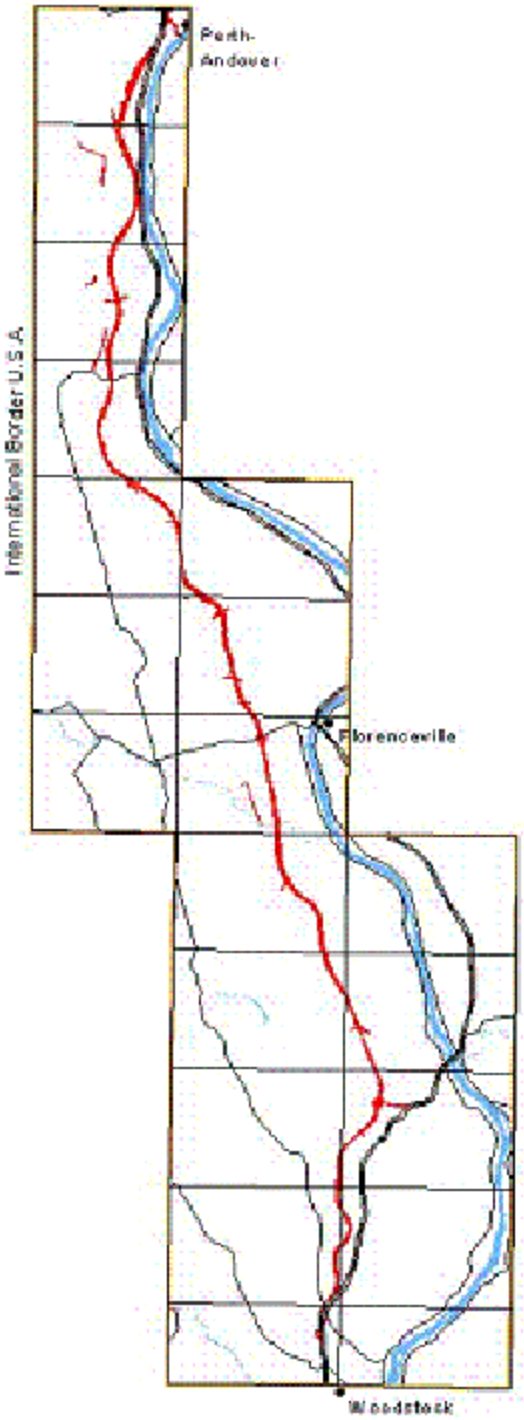
A *significant residual environmental effect* on land use (excluding agriculture and forestry) is one where the proposed use of land for the Project and related facilities is not compatible with adjacent land use activities and plans, and the proposed use of the land will create a change or disruption that restricts or degrades present land uses such that the activities cannot continue to be undertaken at current levels for extended periods of time and cannot be compensated. Public and Stakeholder feedback comments made during open houses and various channels of communication with NBDOT and/or its agents form the basis for determining incompatible land uses.

Both agriculture and forestry dominate the landscape and the local economy and consequently the local and regional scales are used. A *significant residual environmental effect* on land use for forestry and agricultural land use is one that affects the regional sector's ability and viability such that processing facilities would close or curtail operation with a substantial loss of employment, or modify commodity prices and or the producer's ability to access market.

5.8.4 Existing Conditions

The proposed Project is located within Carleton and Victoria Counties, and will pass through and/or serve a number of incorporated municipalities (Woodstock, Hartland, Florenceville, Centreville, Bath, Bristol and Perth-Andover) and 6 local service districts. Two of these local service districts, Lakeville and Simonds have advisory committees. The Project is subject to the land use plans and regulations of the incorporated municipalities it passes through, Perth-Andover and Woodstock. Currently, there are no rural land use development plans applicable to the local service districts along the proposed alignment. Land use planning for the rural areas is a responsibility of the New Brunswick Department of Environment and Local Government, as provided for by the *Rural Planning District Regulations of the Community Planning Act*.

FILE: 14677\WORKING\LOCATOR-MAP



LEGEND

- DEFINED AGRICULTURE AND FORESTRY ASSESSMENT AREA
- ROADS
- CURRENT TRANS-CANADA HIGHWAY
- PROPOSED NEW ROUTE 2 TRANS-CANADA HIGHWAY
- SAINT JOHN RIVER
- NBDNR MAP SHEET LINES

AGRICULTURE AND FORESTRY ASSESSMENT AREA LOCATOR MAP
NEW ROUTE 2 TRANS-CANADA HIGHWAY
PROJECT PERTH-ANDOVER TO WOODSTOCK

Date:	Scale:
2003 10 06	N.T.S.
Job No.:	Fig. No.:
14677	5.B.1

Jacques Whitford
Consulting Engineers
Environmental Scientists

The proposed Project is a by-pass route and will primarily be located on woodland and to a lesser extent on farmland. The selection of the proposed alignment by NBDOT was made to avoid existing residential, commercial and agricultural land uses as much as was reasonably possible (Section 2.0). However, the proposed alignment will pass through and run adjacent to some existing residential and commercial development, generally at locations where the proposed TCH will cross the existing TCH and other secondary roads. The proposed RoW is comprised of approximately 70% forested land, 21% agricultural land, over 7% other undeveloped land, and less than 2% developed residential, commercial or industrial property. The Project will also cross some areas used for recreational purposes including hunting and trail riding (*e.g.*, ATV and snowmobile).

The existing TCH generally follows the Saint John River and serves as both a major interprovincial highway and a local/regional road. Most of the adjacent lands along the existing TCH are developed and used for agriculture, with commercial and residential development in and around the many communities. Much of the existing TCH is accessed at-grade by local roads and highways, and driveways for farms, commercial establishments and residents. The existing TCH also serves as a major tourism route. It provides access to various attractions and facilities, and is a scenic route with numerous vistas to the river and its pristine valley, terrain and fall colours.

The current land uses have been identified from recent aerial photos, geographic information mapping and regulatory authorities, as well as baseline field studies and observation conducted for this CSR. Land use issues and concerns were received from property owners and stakeholders through a series of public meetings organized by NBDOT (Sections 2.0 and 4.0), as well as interviews conducted for this study with provincial and municipal government officials, recreation organizations, economic and business organizations and planning agencies.

The existing TCH extends north-south from Perth-Andover to Woodstock and traffic volumes range from 4,200 to 8,800 vehicles per day. The highest traffic volumes are in the vicinity of Woodstock where a large component of the traffic is local traffic. Approximately 3,000 to 3,500 vehicles per day originate and are destined outside the region. This traffic is pass-by or through traffic. After completion of the Project, through traffic will be diverted to the proposed TCH. The remaining traffic on the existing TCH will be comprised of locally oriented traveling within, or to and from the Project limits. This traffic will be split between the new TCH and the existing TCH. Traffic remaining on the existing TCH will be reduced to about 500 to 2,800 vehicles per day, depending on the extent of local usage (NBDOT 2002).

Trucks currently make up 27% to 34% of the total traffic along the existing TCH. Most trucks will be diverted to the proposed TCH, except those serving local industry and delivery.

5.8.4.1 Commercial Land Use

The Project proposes a new alignment for the TCH that extends over most of the distance between Perth-Andover and Woodstock. The existing commercial establishments within the spatial boundaries of the Project fall into three general categories.

- there are three commercial establishments located within the proposed Project RoW that will need to be removed or relocated.

- there are commercial establishments on the existing TCH that are focused on providing goods and services to the pass-by highway traffic exposure for some or all their business; and

- there are commercial establishments on the existing TCH that are not reliant on the highway traffic exposure for their business, but instead are either focused on the local markets or external markets outside the region.

Commercial establishments have been categorized according to interviews with municipal and private agency officials, as well as a windshield survey to identify commercial development along the existing TCH.

5.8.4.1.1 Proposed Project RoW

Three commercial operations in the Jacksonville area fall within the proposed Project RoW. Construction of the proposed TCH will require their removal. These include a recreational vehicle dealership, a home based business and a butcher shop.

5.8.4.1.2 Existing TCH Route

Woodstock/ Jacksonville Area

There are three commercial establishments located adjacent to the existing TCH at the Jacksonville interchange. They include a motel and restaurant operation, a recreational vehicle dealer and a trucking company. The motel and restaurant serves both the existing TCH traffic and the Woodstock area communities. The recreation vehicle dealer primarily serves the local area market, as well as some highway traffic. The trucking company is not reliant on pass-by existing TCH traffic. All three companies require highway access. The Project in this area is a twinned highway section that will entail the addition of two new lanes, but no change in the alignment or access for these businesses.

Jacksonville to Hartland

The proposed alignment will begin north of Jacksonville. The commercial establishments on the existing TCH between Jacksonville and Hartland include two service stations, two trucking companies and a golf course. Both service stations serve the existing TCH traffic, as well as the local area market. The golf course at Hartland is highly visible from the existing TCH. It serves the area residents and pre-planned visitors, and generates a small part of its business from passing travelers. The trucking companies provide regional and national services and are not reliant on exposure to highway traffic, but will require access to the proposed TCH.

Hartland

The Day and Ross trucking company terminal and a truck stop service station are located along the existing TCH at Hartland. Hartland has a number of commercial establishments on or adjacent to the existing TCH that cater to the highway traffic market. On the east side of the river, at the intersection of the existing TCH and Route 105 there are fast food outlets and a grocery store that were established to serve both the community and the highway traffic.

Hartland also has a number of other commercial establishments located within the community. These businesses include Day and Ross headquarters, accommodations, restaurants and retail outlets and serve both the Hartland visitors and highway traffic. The Hartland Covered Bridge, visible from the existing TCH, is a major attraction that draws traffic from the highway.

Hartland to Florenceville

Just north of Hartland, a motel is located on the existing TCH that is focused on serving highway traffic and visitors to the Hartland area. A hotel and restaurant facility is located in Florenceville on the existing TCH just south of the Saint John River bridge. This business serves both the Florenceville visitors and highway travelers.

Florenceville is a major agriculture centre and international headquarters to McCain Foods. There are a number of commercial establishments located along or adjacent to the existing TCH, including the McCain Foods plant, a trucking company and agriculture equipment companies. The trucking and the agriculture equipment companies serve local markets, and are not reliant on the highway traffic. McCain Foods ships frozen food products by truck to points throughout North America. It is not reliant on the existing TCH traffic market, but will require access to the proposed TCH to serve external markets.

Florenceville to Perth-Andover

This section of the existing TCH contains a number of commercial businesses. These include motels (2), campgrounds (2), service stations (2), restaurants (3) and stores (4). These businesses are primarily or partially focused on serving the highway traffic. There are a number of other businesses along the existing TCH that are mainly focused on providing service to local residents and businesses. These include vehicle repairs, auto parts store, wood working shop, Agriculture Centre and the NBDOT District Garage.

Perth-Andover

The proposed TCH will use the existing alignment and interchange at Perth-Andover. Two commercial establishments are located at the interchange. A motor inn is partially focused on serving the highway traffic market, in addition to pre-planned visitors to the area.

5.8.4.2 Residential Land Use

The selection of the proposed Project alignment by NBDOT attempted to minimize the environmental effects on residential properties. However, 34 properties containing houses or multiple unit residences fall within the RoW of the proposed TCH.

The highest number of affected houses is in the Jacksonville area (12). Other residential areas affected by the proposed Project include River De Chute (5), Bowmaster Flats (5), Sipperel Road (2), Backland Road (2), Raymond Road (1), Florenceville - Route 110 (2), B. Smith Road (1), Beaconsfield Road (1), Scott Road (1), and Perth-Andover (2). Agreements to purchase 27 of these residential properties have been successfully negotiated. The Provincial Government is continuing negotiations for the five Bowmaster Flats properties, and one each in the Jacksonville and the Beaconsfield Road areas.

The proposed Project alignment largely passes through forested lands, and avoids most residential areas. There are residences located along most of the local roads and highways that cross the proposed TCH, such as those noted above that have or are being removed and compensated.

Some other residences along these local roads and highways are located outside, but adjacent to, the proposed RoW. About 32 residences are located adjacent (within 200 m) to the proposed RoW.

5.8.4.3 Recreational Land Use

The land between the US border and the Saint John River from Woodstock to Perth-Andover is used for a range of recreational activities. The major activities include the use of an extensive off-road trail system used for bike riding, walking, snowmobiling and all-terrain vehicle (ATV) riding.

5.8.4.3.1 Trails

The trails include the following.

Sentier NB Trail/Trans-Canada Trail

Sentier NB Trail is part of a national trail system (Trans-Canada Trail) connecting all provinces and territories and a global trail organization. The Sentier NB Trail runs from Woodstock up the Saint John River Valley to Grand Falls. It is a multi-use trail, built on an abandoned Canadian Pacific Railway line. It is used for short walks and bicycle rides by residents and visitors, as well as multi-day trips on foot or bicycle.

This trail runs on the east side of the River, and does not cross or approach the proposed new TCH RoW.

International Appalachian Trail

The International Appalachian Trail is a hiking trail that runs from Southern US (Alabama) on up to Maine, New Brunswick, Quebec and will eventually be extended to Newfoundland. It enters New Brunswick at the Fort Fairfield border crossing (Route 190). It extends north to Four Falls, south along the Saint John River (NB Trail), and then heads up the Tobique River to Plaster Rock, Mt. Carleton, and back to St. Quentin. From there it follows the Restigouche River up to the Gaspé, Quebec.

The Appalachian Trail will cross the Aroostook to Grand Falls portion of the TCH at Four Falls, north of the Project limits from Perth-Andover to Woodstock. Access to the trail will be available at a number of points including Highway 190, the Four Falls interchange, Aroostook and Perth-Andover.

Snowmobile Trails

The New Brunswick Federation of Snowmobile Clubs (NBFSC) maintains a system of trails throughout the province. DNR has recently undertaken to map the known trails that are maintained by the Federation. According to the most recent data, there are six snowmobile trails which cross the proposed new four-lane highway rout (Figure 3.2 A-D, Appendix C).

ATV Trails

Several ATV clubs also maintain trails, many of which are part of the snowmobile trail network. Most of the trails are on the east side of the Saint John River. These trails have not been documented by the province. The use on snowmobile trails in spring, summer and fall and various woods roads by ATV's seem a logical assumption.

Level of Use

There is limited information available on the level of use of these trails. There have not been any surveys or traffic counts done for these trails. However, the 2001 Tourist and Parks survey (New Brunswick Department of Tourism and Parks 2001) of Saint John River Valley tourists indicated that 28 percent rated hiking and biking as a major interest. Wildlife viewing, a related activity, was also a popular activity of interest (23 percent).

Snowmobiling is clearly a major recreational activity in the Saint John River Valley. Between Woodstock and Grand Falls, there are six snowmobile clubs with 1,249 members who have paid for trail permits (NBFSC, pers. comm.). This would include trail users from other parts of the Province and out-of-Province visitors.

5.8.4.3.2 Hunting, Fishing and Trapping

Hunting and fishing are popular activities for Carleton County and Victoria residents and visitors. The Project is located within Wildlife Management Zone 10. Zone 10 runs from Grand Falls to Woodstock from the US border east to Plaster Rock and Juniper Station. Zone 10 is an active hunting area (NBDNRE 2003b) for deer (566 registered deer kills out of a provincial total of 6,443), black bear (125 kills out of provincial total of 1,905) and moose (65 kills out of a provincial total of 2,020). This hunting takes place on the wooded lands, both private and Crown land. This includes the private woodlots located along the proposed TCH and adjacent lands.

The recreational fishing activity occurs mainly in the two large watercourses crossed by the proposed TCH (K. Dickenson, DFO Woodstock, pers. comm.). These are the Big Presque Isle Stream (rainbow trout, brown trout and small mouth bass) and the Little Presque Isle Stream (small mouth bass and gaspereau). The other smaller streams and lakes also support other limited recreational fishing activity.

There are two recreational hunting and fishing outfitters located near the proposed TCH. These primarily provide outfitting and guiding services to non-local and out of province hunters (mostly for deer and bear hunting). These outfitters are located in the Centreville area. Their camps are not located on the proposed RoW, but some of the RoW is used for hunting activities.

There is some trapping activity within the proposed RoW and surrounding area for a range of furbearer species, such as fox, marten, fisher, beaver and bobcat. This is for recreation, commercial and animal control purposes.

5.8.4.4 Agriculture

Agriculture dominates the landscape through most of the Project area. Most of the agriculture production in Carleton and Victoria Counties is on the west side of the Saint John River and is potato or potato-related through crop rotation. The importance of this crop continues to grow and more and more land is being recovered, rejuvenated and placed into potato production.

There are 116 farm operations in the Statistics Canada 2001 Census Consolidated Subdivisions (CCS) in the area accounting for 5 percent of the provincial farm population representing:

- 12 percent of the Provincial field crop producers (potatoes, grain and oilseed, wheat, hay); and
- 5 percent of the Provincial beef cattle producers.

Potato land is being treated with careful rotational planning and is being regarded as the resource to covet above all others. The loss of land is considered important for the viability of a farming operation.

Based on individual stakeholder consultations, the consolidation of farms (combining several farms through acquisition or lease) has decreased the numbers of farmers but increased the size of farms substantially. With consolidation, cultivation can be oriented across several parcels of land creating large uninterrupted fields suited to large scale farming resulting in important industrial economies of scale, increased levels of sophistication in all aspects of production. New Brunswick's Average Yield is ranked second nationally in 2001 and in 2002 (NB Potato Statistics Update, B. Ouellette, DAFA, pers. comm.).

It is not uncommon for several traditional farms to be combined into one larger parcel and for a farm operation to have several separate large parcels often many kilometres apart and to see equipment on the move around the counties attending to fields on several parcels. The land ownership as depicted on property maps can therefore be misleading when it comes to appreciating the scale of agriculture.

Farms in the Assessment Area are larger operations, according to Statistics Canada (2001 Census, with 11 percent of the farms greater than 453 ha, as compared to 9 percent in Carleton County and 3 percent in the Province.

Larger parcels with larger fields with less fencing and associated windbreak vegetation create the potential for wind erosion.

The presence of agriculture and lack of forest cover is most evident in the area between Woodstock and Hartland. The same area between Woodstock and Hartland experiences drought conditions comparable to southern Manitoba. McCain Foods and other producers have explored and tried irrigation, which is needed but not yet economical for a number of reasons. Other smaller specialty producers have undertaken similar trials (J. Daigle, Eastern Canada Soil and Water Conservation Centre, pers. comm.).

The Canada Land Inventory (CLI) (Department of Forestry and Rural Development 1969) is a classification system developed to categorize soil capabilities by economic sector. Table 5.8.1 below summarized the CLI classification for agricultural production. According to the CLI the Project is located on lands of generally similar capability as those throughout the Assessment Area.

Table 5.8.1 CLI Soil Capability for Agriculture

CLI Soil Capability for Agriculture		Proposed Project Footprint		Assessment Area	
Class	**Description**	**ha**	**%**	**ha**	**%**
0	Organic Soils – Not placed in capability classes	0	0	1,019	1
1	Soils in this class have no significant limitations in use for crops	0	0	0	0
2	Soils in this class have moderate limitations that restrict the range of crops or require moderate conservation practices – moderately high to high in productivity for a fairly wide range of crops	180	17	13,518	17
3	Soils in this class have moderately severe limitations that restrict the range of crops or require special conservation practices - fair to moderately high in productivity for a fair range of crops	292	28	20,199	26
4	Soils in this class have severe limitations that restrict the range of crops or require special conservation practices, or both – low to fair in productivity for a fair range of crops but may have higher productivity for a specially adapted crop	552	52	35,565	46
5	Soils in this class have very severe limitations that restrict their capability to producing perennial forage crops, and improvement practices are feasible – improvement practices may include clearing of bush, cultivation, seeding, fertilizing, or water	26	3	5,852	7
7	Soils in this class have no capability for arable culture or permanent pasture - this class also includes rockland, other non-soil areas, and bodies of water too small to be calculated on map	0	0	109	0
Water	Water	3	0	2,632	3
	Totals	**1,053**	**100**	**78,894**	**100**

According to the CLI, the Project footprint has 97 percent Class 4 and better. In the Assessment Area, it is 90 percent, as compared to 48 percent in New Brunswick. Clearly the vicinity of the Project has very productive agricultural land, which is reflected in the intensive management and the associated land values.

CLI capability classes are national and consider sub-soil, soil profiles and depth, moisture, climate, slope, vegetation and do not consider modern cultivation practices. The land capability, which is well above the provincial average, could be even better than suggested by the CLI.

The Project footprint is 21 percent (223 ha) agriculture while the immediate surrounding area (20 map tiles) is 37 percent, which reflects how well agricultural lands were avoided through route selection. The Project footprint represents 0.8 percent of the Assessment Area.

Based on individual stakeholder consultations, a major portion of both potato and beef productions are shipped to the US or central Canada and are highly dependent on timely and efficient transportation. Potatoes are low priced commodity and are sensitive to time to market for product freshness. (P. MacDonald, Potatoes NB, pers. comm. 2003).

Conservation

Agriculture is experiencing a heightened environmental awareness aimed at water quality and soil conservation. The following represent some important initiatives in this regard.

The *Livestock Operations Act* requires a site development plan outlining (among other things) the proximity of a facility and related activities to other facilities and to dwellings, watercourses and wetlands and other environmentally sensitive areas with mitigating measures.

The Agriculture Environment Management Initiative 2003 produced by the New Brunswick Department of Agriculture, Fisheries and Aquaculture (NBDAFA 2003) is intended to facilitate the conservation and enhancement of the natural resource used by the NB agriculture sector and to minimize its environmental effects on the environment. There are seven programs in the initiative:

- nutrient management;
- on-farm stewardship;
- soil conservation;
- integrated pest management;
- livestock odour reduction;
- agro-environmental club; and
- strategic initiatives.

Producer organizations have also embraced the furthering of BMPs respecting the environment and soil productivity. The mission of the Soil and Crop Improvement Association is to Pioneer and advance leading soil and crop practices in New Brunswick. The Agriculture Producers Association of New

Brunswick coordinates the Environmental Farm Plan (31 percent of producers in Carleton County and 60 percent in Victoria County) have begun the process.

The Prince Edward Island *Agricultural Crop Rotation Act* deals with crop rotation and with land cultivation practices on slopes greater than 9 percent. Similar legislation is anticipated in New Brunswick that will require crop rotation (1-year potato, 2 years other) and soil conservation measures on slopes greater than 9 percent (for example terracing removes approximately 5 percent of the land from production). These initiatives would, if implemented as anticipated, in the short term, effectively reduce potato production area, hence increasing the demand to create more land suited for potato production in the future. Land for potato production is often created through converting forest land to agriculture.

5.8.4.5 Forest Resources

The Project footprint is almost 70% forestland. Table 5.8.2 shows the forest within the Project footprint is predominately hardwood and mixed wood and generally representative of the forest cover in the Assessment Area.

Table 5.8.2 Forested Area, Project Footprint Assessment Area

Forest Cover Type	Project Footprint		Assessment Area	
	%	ha	%	ha
Hardwood	25	263	16	12,623
Mixed Wood	33	348	23	18,145
Softwood	11	116	11	8,678
Total Forested	**69**	**727**	**50**	**39,446**

(1996 and 2000 Digital Forest Data (NBDNR))

The age class distribution of the forest based on NBDNR digital data is presented in Table 5.8.3. This table reveals that more than half of the forest in both the Project area and the Assessment Area are in the regenerating to immature stages of development. It was commented during stakeholder consultations that the digital data for their area typically under estimates the development stage (*i.e.*, Forest stands are typically older than the digital data present). This has not been confirmed in this study.

Table 5.8.3 Forested Area, Project Footprint Assessment Area

Forest Stand Development Stage	Project Footprint		Assessment Area	
	%	ha	%	ha
Regeneration	8	61	6.5	2,487
Sapling/Young	38	282	33	13,127
Immature	25	186	30	11,772
Mature	27	200	30	11,497
Overmature	1	6	1.5	564
Total Forested	**99**	**735**	**99**	**39,447**

(1996 and 2000 Digital Forest Data (NBDNRE))

The forestland in the Project footprint is entirely private woodlots and industrial freehold. Private woodlots are forest lands owned by individuals and/or timber harvest contractors while industrial freehold land are owned by businesses that own forest product processing facilities such as sawmills or pulp and paper mills. Of the forestlands within the Project footprint, 11 percent are industrial freehold. Table 5.8.4 below summarized the CLI classification for forest tree growth.

Table 5.8.4 CLI Soil Capability for Forestry

CLI Soil Capability for Agriculture		Proposed Project Footprint		Assessment Area	
Class	**Description**	**ha**	**%**	**ha**	**%**
3	Lands having moderate limitations to the growth of commercial forests (5.6 m^3/ha/yr in productivity	849	81	37,988	48
4	Lands having moderately severe limitations to the growth of commercial forests (4.2 m^3/ha/yr in productivity)	137	13	33,109	42
5	Lands having severe limitations to the growth of commercial forests (2.9 m^3/ha/yr in productivity)	65	6	4,083	5
6	Lands having severe limitations to the growth of commercial forests (1.4 m^3/ha/yr in productivity)	0	0	1,098	1
Water	Water	33	0	2,616	3
	Totals	**1,084**	**100**	**78,894**	**99**

(Department of Forestry and Rural Development 1967)

According to the CLI a larger percentage of the Project footprint is located on Class 3 forest lands that are the most productive in the Assessment Area.

Based on the NBDNR digital forest mapping data, the most common commercial tree species within the Project footprint are two hardwoods, poplar (*Populus* spp.) and sugar maple (*Acer Saccharum*), followed by eastern white cedar (*Thuja occidentalis L.*) and balsam fir (*Abies balsamea (L.) Mill*).

Silviculturally treated areas in the Project footprint include 12.6 ha of softwood plantations and 1.6 ha of commercial thinning. It is likely that there are areas of Pre-commercial thinning within the Project footprint that do not show up in the digital data because of the difficulty in identifying its presence by photo-interpretation.

5.8.5 Environmental Effects Analysis

NBDOT presented an initial routing and layout for a new TCH in 1998 through a series of public meetings. It then revised its plans to address a number of concerns related to the environmental effects on agricultural land, land access and traffic. In 1999 NBDOT presented a revised plan that addressed many of the concerns about the initial plan. In June 2003, NBDOT again presented the proposed revised plan at public meetings (June 24, 25, and 26), and have subsequently prepared the final proposed alignment, as described in Section 3.0 of this report.

Land use issues were considerably mitigated by the decision to construct the Project along a new by-pass alignment rather than twinning the existing route. This avoided most residential and commercial areas, and farmland disruption. In addition, the successive improvements to the by-pass alignment plans by NBDOT in consultation with the public led to the proposed alignment that is the basis of this environmental assessment. Section 2.2 provides details of how public concerns and issues were addressed in the route selection process.

5.8.5.1 Project-VEC Interactions

The potential interactions between Project activities and the Land Use VEC are indicated in Table 5.8.5 for each Project phase, and accidents, malfunctions and unplanned events. The nature of these interactions is summarized in the following sections that address the potential environmental effects of each Project activity.

Table 5.8.5 Project Activity - Environmental Effects Interaction Matrix - Land Use

Potential Interactions Between Project Activities and Environmental Effects **Valued Environmental Component: LAND USE**					
Project Activities and Physical Works (see Table 4.1.1 for list of specific activities and works)	**Potential Environmental Effects**				
	Change in Residential Land Use	**Change in Commercial Land Use**	**Change in Recreational Land Use**	**Change in Forest Resource Land Use**	**Change in Agricultural Land Use**
Construction					
Site Preparation	✓	✓	✓	✓	✓
Roadbed Preparation	✓		✓		
Surfacing and Finishing	✓		✓		
Watercourse Crossing Structures	✓		✓		
Ancillary Structures and Facilities	✓		✓	✓	✓
Operation					

Table 5.8.5 Project Activity - Environmental Effects Interaction Matrix - Land Use

Potential Interactions Between Project Activities and Environmental Effects **Valued Environmental Component: LAND USE**					
Project Activities and Physical Works (see Table 4.1.1 for list of specific activities and works)	**Potential Environmental Effects**				
	Change in Residential Land Use	**Change in Commercial Land Use**	**Change in Recreational Land Use**	**Change in Forest Resource Land Use**	**Change in Agricultural Land Use**
Winter Safety				✓	✓
Proposed TCH Presence	✓	✓	✓		
Maintenance					
Proposed TCH Maintenance	✓	✓			
Vegetation and Wildlife Management					
Accidents, Malfunctions and Unplanned Events					
Construction	✓	✓	✓	✓	✓
Operation	✓	✓	✓	✓	✓
Maintenance	✓	✓		✓	

5.8.5.1.1 Construction

The interaction of the environmental effects of the construction activities and physical works of the Project with the Land Use VEC is summarized in Table 5.8.5 and described below.

Commercial Land Use

There were three commercial businesses in the Jacksonville area that were located within the proposed RoW. These businesses have already re-located. These business operations include a recreational vehicle dealership, a home based business and a butcher shop.

Residential Land Use

The Project construction will require the purchase and/or relocation of 34 residential buildings, as identified previously in Section 5.8.4.

About 32 residences are located adjacent (within 200 m) to the proposed RoW. The residents of these houses are likely to experience a perceptible change in noise levels from the construction equipment during all phases of construction of the proposed TCH. Residents may also be affected by air emissions and other disturbances generated by the Project. These issues and environmental effects are addressed in detail in Section 5.1 Atmospheric Environment.

Recreational Land Use

The recreational land uses in the vicinity of the Project include hiking, bicycling, snowmobiling, all-terrain vehicle (ATV) use, hunting and fishing. Hiking, bicycling, snowmobiling and ATV use takes place on established trails, as identified in the existing conditions Section 5.8.4. The Project will intercept six NBFSC trails that cross the proposed RoW (figure 3.2, Appendix C).

The Project is within Wildlife Management Zone 10, which is an active area for hunting and fishing. The forested lands are used for hunting as are the major watercourses for fishing. There are two hunting and fishing outfitting operations located on adjacent lands. The two outfitters in the area, Deerville Camps (Deerville) and Knoxford Lodge (Upper Knoxford) raised their concern that the Project will reduce the land available for hunting. Knoxford Lodge was concerned that the Project would reduce the already limited woodlands in its area. Both outfitters supported the Project but regretted the potential environmental effect it would have on the recreational hunting in the area. These camps will not be affected by the Project but the construction phase will result in a loss of land available for hunting by resident and non-resident hunters.

Construction activities at watercourse crossing will result in restriction (for safety) to recreational fishing at the construction site only.

Construction activities will temporarily affect recreation trail land use in the immediate vicinity of the Project due to noise, dust and other minor disturbances during all Project activity phases and physical works.

Forest Resource Land Use

Landowners whose property will be affected by the project in regards to access to the forest resources will be compensated for the loss of that land/resource.
Most of the environmental effects to the forest resource will occur or be initiated during site preparation. The potential environmental effects centre around the removal of forest land base resulting in a loss of production to the landowner and forest cover in general. During the site preparation stage of construction the following adverse changes to the forest resources will occur:

- landowners will lose ownership of a portion of their land holdings;
- based on the Project footprint, 735 ha of forest land will be cleared;
- approximately 33,000 m^3 of softwood and 42,500 m^3 of hardwood will be harvested and enter the commercial forest products market;
- approximately 340 ha of young/regeneration and 186 ha of immature forest stands will be cleared resulting in a loss of unmerchantable future wood resources;

- woodlots will be severed, resulting in the potential for economically in-operable remnant parcels; and
- silviculturally treated areas (plantations and thinnings) will be cleared resulting in a loss of investment made by woodlot owners.

Although some of these environmental effects will continue in perpetuity, these environmental effects are mitigated in the Construction Phase of the Project and are therefore considered only in the Construction phase of the EA.

Other adverse environmental effects may be caused by altered transportation routes during construction to parts of woodlots being interfered with during construction of the proposed TCH.

Agricultural Land Use

Landowners whose property will be affected by the project in regards to agricultural resources will be compensated for the loss of that land/resource.

Most of the environmental effects to the agriculture resource will occur or be initiated during the site preparation phase of construction. The environmental effects centre on the removal of and/or access to agricultural land resulting in a loss of production to the landowner. Potential adverse changes to the agriculture resources during site preparation are described below.

Based on the proposed alignment, 223 ha of agricultural land, recently developed agricultural land or infrastructure will be removed from production. Portions of farm operation will be severed, resulting in the potential for economically in-operable remnant parcels; landowners will lose ownership of those portions of their land holdings so affected resulting in a loss of productive capacity of the farm.

Although some of these environmental effects will continue in perpetuity, these environmental effects are mitigated in the Construction Phase of the Project and are therefore considered only in the Construction phase of the EA.

Portions of farm operations will be severed, resulting in environmental effects caused by transportation and access routes to agricultural land being disrupted or interfered with during construction. This could potentially reduce the economic operability of severed parcels.

Ancillary structures and facilities required for construction (*e.g.,* borrow pits, disposal areas) may interfere with various land uses due to loss of use, or temporary interference with use.

5.8.5.1.2 Operation

The Project-Land Use VEC interactions of the operation phase of the Project are summarized in Table 5.8.5 and described below.

Commercial Land Use

When the Project commences operation, the presence of the proposed TCH will create a shift in traffic from the existing TCH. Approximately 3,000 vehicles per day, including most trucks, of through traffic will be diverted from the existing TCH to the proposed TCH. This is expected to affect some businesses located along the existing TCH in terms of reduced traffic exposure and business activity.

Residential Land Use

A number of residents located outside the RoW, but adjacent to the proposed Project have expressed concern that they will be adversely affected by the presence and operation of the proposed TCH due to traffic noise, air emissions and other disturbances. There are 32 households within 200 m of the proposed RoW that are likely to be affected by the traffic noise generated by the proposed TCH. These potential environmental effects are addressed in more detail in Section 5.1 Atmospheric Environment.

Residences along the existing TCH are expected to experience a reduction of traffic once the Project is constructed. This will likely improve the level of service and safety along the existing TCH and will reduce traffic noise to residents along the existing TCH.

Recreational Land Use

The presence of the proposed TCH traffic will affect recreational land use benefits due to noise and other minor disturbances in the immediate vicinity of the Project. However this will only occur while crossing the proposed RoW, as the trails and most recreation activities are located away from the Project.

Forest Resources Land Use

During the winter, NBDOT will use salt. This has the potential to damage tree foliage along the edge of adjacent forest. The damage can occur during thaws when salt spray or during drier periods when salt dust can be blown onto trees close to the proposed TCH.

Loss of productive forest land initiated during clearing will continue for the duration (in perpetuity) of the Project, however, mitigation and compensation are addressed in the Construction Phase of the Project.

Operating costs may increase for some landowners because of the proposed TCH, either because of having to transport forest products longer distances or having to float (move) equipment to separate work locations. These costs may be somewhat offset by the benefits of having a four-lane highway for access to markets at higher speeds, better grades and 100% weight limits.

Agricultural Land Use

During the winter, NBDOT will use salt that can contaminate soil along the edge of adjacent agricultural land through salt spray during thaws or through salt dust during drier periods.

Most of the environmental effects to the agriculture resource will be initiated during site preparation and continue for the life of the Project, however, mitigation for this loss is addressed in the Construction Phase of the Project.

The Project may cause cold air pooling which may in turn affect the ability to grow certain crops. This potential environmental effect is discussed in Section 5.1.5.1.

Operating costs may increase for some landowners, either because of having to transport products longer distances or having to move equipment and material (*e.g.,* fertilizer) to separate work locations during the production season.

During Operation the following positive/beneficial changes to the agriculture resources will occur:

- traffic along the old TCH will be greatly reduced making it much more agriculture-friendly especially during the growing and harvesting season that requires regular movement of machinery from site to site; and
- two of the principal agriculture productions (potato and beef) are highly dependent on efficient transportation for both cost and time to market (freshness), both of which will be realized as a result of the project.

5.8.5.1.3 Maintenance

The Project-environmental interactions during Maintenance are summarized in Table 5.8.5 and described below.

Proposed TCH maintenance, such as road repairs and resurfacing may adversely effect residents adjacent to the proposed Project due to noise and other atmospheric disturbances. This would only be a concern during major maintenance, such as resurfacing or bridge reconstruction.

5.8.5.1.4 Accidents, Malfunctions and Unplanned Events

The Project-VEC interactions that may result from accidents, malfunctions and unplanned events are summarized in Table 5.8.5 and described below.

Residential and Commercial Land Use

Accidents, malfunctions and unplanned events have the potential to adversely affect residential and commercial land use. These could occur during construction, operation and maintenance phases of the Project. Potential incidents include major vehicle accidents, fire, and contaminant spills that could affect air or water quality, and could result in a requirement to evacuate properties, property damage, injury or loss of life.

Recreational Land Use

Accidents, fires, other malfunctions and unplanned events could affect recreational land use due to noise, restricted access, odour and other factors. These could occur during construction, operation and maintenance phases of the Project. However, recreation activities, such as the use of recreation trails do not occur within the proposed RoW, except to cross it. This will reduce the likelihood of such incidents.

Forest Resources

During all of the Project activities there is a risk of forest fires being started from either the highway construction workers or highway users. The greatest risk of fire is during site preparation and subsequent construction activities. During the operation of the proposed TCH, the risk of fire is related to weather, roadside vegetation management and human error (cars parking in the grass or smokers carelessly discarding burning embers).

Based on stakeholder consultations with the CVFPMB and field staff observations, an unplanned event that has already occurred and continues to occur is timber harvesting incremental to the Proposed TCH. Either the landowners are having their forest lands harvested by a contractor or doing the harvesting themselves, in anticipation of the proposed TCH development. When retaining a harvesting contractor, a small portion of landowners are having the RoW and adjacent forest stands cut at the same time, to minimize costs and to avoid perceived issues of access in the future.

Agricultural Resources

During all of the Project activities there is a risk of accidents, malfunctions and unplanned events. They are for the most part temporary and reversible. The principle events during Construction activities are construction related traffic congestion on the old TCH, particularly during the growing and harvesting season or are livestock related. There is the potential to disrupt the water supply for livestock operations or for livestock to otherwise experience stress and loss of production during construction.

Livestock feed lots contain concentrations of animal manure that can contaminate water during removal and storage. This is addressed in relation to Surface Water (Section 5.3)

During all Project activities there is a risk of spring grass fires being started from either the highway construction workers or highway users. The greatest risk of fire is during site preparation and subsequent construction activities. During the operation of the proposed TCH the risk of fire is related to weather, roadside vegetation management and human error (cars parking in the grass or smokers carelessly discarding burning embers).

5.8.5.2 Environmental Effects Analysis and Mitigation

5.8.5.2.1 Construction

The activities associated with the construction of this Project may have an effect on Land Use in the Project area. The sections following Table 5.8.6 describes the strategies aimed at mitigating these potential environmental effects.

Table 5.8.6 Environmental Effects Assessment Matrix for Land Use (Construction)

Environmental Effects Assessment Matrix **Valued Environmental Component: LAND USE** **Phase: Construction**							
Project Activity (See Table 4.1.1 for list of specific activities and works)	**Potential Environmental Effects**	**Mitigation**	**Magnitude**	**Geographic Extent**	**Duration/Frequency**	**Reversibility**	**Ecological/Socio-Cultural and Economic Context**
Site Preparation	Change in Residential Land Use (within RoW) (A)	• Purchase properties within RoW	2	1	5/1	1	2
	Change in Residential Land Use (Adjacent to RoW) (A)	• Dust Control • Work Progression	1	1	1/6	R	2

Table 5.8.6 Environmental Effects Assessment Matrix for Land Use (Construction)

Environmental Effects Assessment Matrix
Valued Environmental Component: LAND USE
Phase: Construction

Project Activity (See Table 4.1.1 for list of specific activities and works)	Potential Environmental Effects	Mitigation	Magnitude	Geographic Extent	Duration/Frequency	Reversibility	Ecological/Socio-Cultural and Economic Context
	Change in Commercial Land Use (A)	• Purchase properties with RoW	2	1	5/1	1	2
	Change in Recreational Land Use (A)	• Ensure trail continuity • Dust control • Erosion and sedimentation control • Work Progression	1	1	1/6	R	2
	Change in Forest Resources Land Use (Land taken out of production) (A)	• Land Acquisition: Open and early communication with landowners • Time (as construction schedule permits) for landowner to exercise clearing options • Compensation for market value of land • Provision of access to severed properties negotiated, where necessary	1	2	2/1	I	2
	Change in Agricultural Land Use (Land taken out of production) (A)	• Land Acquisition: Open and early communication with landowners • Compensation for market value of land • Provision of access to severed properties negotiated, where necessary	2	2	5/6	I	2
Roadbed Preparation	Change in Residential Land Use (Adjacent to RoW) (A)	• Dust Control • Work Progression	1	1	1/6	R	2
	Change in Residential Land Use (Within RoW) (A)	• Compensation at fair market value	1	1	5/6	R	2
	Change in Recreational Land Use (for hunting) (A)	• Wildlife collision measures (fencing crossings etc.) • See Wildlife VEC Section 5.7	1	2	1/6	R	2
	Change in Recreational Land Use (for trails) (A)	• Dust Control • Erosion and sedimentation control • Work Progression	1	1	1/6	R	2
	Change in Forest Land Use (Operations) (A)	• Reasonable accommodations made to allow forestry operations access to adjoining lands during construction	2	2	4/2	R	2

Table 5.8.6 Environmental Effects Assessment Matrix for Land Use (Construction)

Environmental Effects Assessment Matrix
Valued Environmental Component: LAND USE
Phase: Construction

Project Activity (See Table 4.1.1 for list of specific activities and works)	Potential Environmental Effects	Mitigation	Magnitude	Geographic Extent	Duration/Frequency	Reversibility	Ecological/Socio-Cultural and Economic Context
Surfacing and Finishing	Change in Residential Land Use (Adjacent to RoW) (A)	• Dust Control • Work Progression	1	1	1/6	R	2
	Change in Recreational Land Use (for hunting and for trails) (A)	• Dust Control • Erosion and sedimentation control • Work Progression	1	2	1/6	R	2
Watercourse Crossing Structures	Change in Residential Land Use (Adjacent to RoW) (A)	• Dust Control • Work Progression	1	1	1/6	R	2
	Change in Recreational Land Use (for hunting and for trails) (A)	• Dust Control • Erosion and sedimentation control • Work Progression	1	2	1	R	2
Ancillary Structures and Facilities Construction	Change in Residential Land Use (Adjacent to RoW) (A)	• Dust Control • Work Progression	1	1	1	R	2
	Change in Recreational Land Use (for hunting and for trails) (A)	• Provide trail continuity • Dust Control • Work Progression Erosion and sedimentation control	1	2	1	R	2
	Change in Forest Resource Land Use (Land taken out of production) (A)	• Land Acquisition: Open and early communication with landowners • Time (as construction schedule permits) for landowner to exercise clearing options • Compensation for market value of land • Provision of access to severed properties negotiated, where necessary	1	2	2/1	I	2
	Change in Forest Land Use (Operations) (A)	• Provision of access to severed properties negotiated, where necessary	2	2	4/2	R	2
	Change in Agricultural Land Use (Land taken out of production) (A)	• Land Acquisition: Open and early communication with landowners • Compensation for market value of land • Provision of access to severed land	2	2	5/6	I	2
	Change in Agricultural Land Use (Operation) (A)	• Provision of access to severed properties negotiated, where necessary	1	2	5/6	R	2

Table 5.8.6 Environmental Effects Assessment Matrix for Land Use (Construction)

Environmental Effects Assessment Matrix
Valued Environmental Component: LAND USE
Phase: Construction

Project Activity (See Table 4.1.1 for list of specific activities and works)	Potential Environmental Effects	Mitigation	Magnitude	Geographic Extent	Duration/Frequency	Reversibility	Ecological/Socio-Cultural and Economic Context

Key:

Magnitude:
1 = Low: *e.g.,* specific group, residence or neighbourhood affected such that adjacent land use activities will not be disrupted such that current activities cannot continue even after short periods of time.
2 = Medium: *e.g.,* part of a community affected such that adjacent land use activities will be disrupted such that current activities cannot continue for extended period of time longer than two years.
3 = High: *e.g.,* community affected such that adjacent land use activities will be disrupted such that current activities cannot continue for extended periods of time longer than two years and are not compensated for.

Geographic Extent:
1 = <1 km^2
2 = 1-10 km^2
3 = 11-100 km^2
4 = 101 - 1,000 km^2
5 = 1,001 - 10,000 km^2
6 = >10,000 km^2

Duration:
1 = <1 month
2 = 1 - 12 months
3 = 13 - 36 months
4 = 37 - 72 months
5 = >72 months

Frequency:
1 = <11 events/year
2 = 11 - 50 events/year
3 = 51 - 100 events/year
4 = 101 - 200 events/year
5 = >200 events/year
6 = continuous

Reversibility:
R = Reversible
I = Irreversible

Ecological/Socio-cultural and Economic Context:
1 = Relatively pristine area or area not adversely affected by human activity.
2 = Evidence of adverse environmental effects.

N/A = Not Applicable
(A) = adverse
(P) = positive

Commercial Land Use

The removal of the three businesses from the proposed RoW is required to allow the Project to proceed along the proposed route. The planned mitigation measure is the purchase of the commercial properties at fair market prices agreeable to the existing owners and removal of all buildings and other improvements. Commercial activity is not a major land use within the proposed RoW in terms of the number of businesses and area of land. The existing commercial businesses have relocated already under agreement with NBDOT.

Residential Land Use

The Project will result in the elimination of any residential land use within the proposed RoW. The mitigation program for elimination of residential land use entails purchasing the properties, to allow the owners to relocate to another residence elsewhere. The purchase agreements are negotiated on a case by case basis to address the specific interests, concerns and circumstances of the residents affected.

The Project will require the removal of 34 residential buildings from the proposed RoW. The Provincial Government is negotiating agreements to purchase these properties. The purchase price and other provisions of compensation agreements reflect market values for the properties and any improvements,

as well as the cost and availability of alternative accommodation and relocation expenses. Suitable alternative residential properties are available in the area to address the needs of those affected.

Negotiations are ongoing for the remaining properties, as part of the RoW preparation phase of the construction. The provisions of the *Expropriation Act* will be used to acquire the properties. This Act provides for compensation based on the market value of the land, damages attributable to disturbance, and any special economic advantages or disadvantages arising from the occupation of the land. Where the payment of market value would create hardship for the owner, the Act provides for additional payments to allow the owner to obtain equivalent accommodation.

Although clearly a considerable inconvenience for property owners, mitigation is designed and should be effective in compensating home owners for that inconvenience.

Residential land use along local roads and highways adjacent to the proposed RoW will be affected during the construction of the Project due to noise, air emissions and dust generated by truck traffic and construction equipment. About 32 residences are located adjacent (within 200 m) to the proposed RoW. Mitigation measures include application of dust control methods and work progression specifications to ensure construction activity scheduling is met and duration minimized. These environmental effects are addressed in Section 5.1 Atmospheric Environment.

Recreational Land Use

The main potential environmental effect of the Project on recreational land use during construction is the intersection of recreational trails that are used for hiking, biking, snowmobiling and other activities. Trail users would be exposed to noise, dust and other disruptions during construction temporarily affecting the quality of experience of trail users. Consultation with recreation organizations identified one established hiking/biking trail and six snowmobile (ATV) trails that intersect the proposed RoW. There may be other recreation trails in the area that could be affected. However, no other trails have been identified as established and maintained trails by the various recreational organizations.

Potential mitigation measures during construction are to identify established recreational trails and develop approaches to ensure the continuation of trail access for recreational users. In addition dust and erosion controls and work progression scheduling can be specified in construction contracts to minimize potential environmental effects on trail use during construction activities.

The design of the proposed TCH will provide for the construction of trail access through the use of signage, tunnel underpasses or other means.

There may be temporary interruption to recreational fishing at the immediate location of some of the watercourse crossings (*e.g.,* Big Presque Isle River), as for safety reasons public access to the river will be restricted. This interruption will only affect a very small portion of these watercourses and will be temporary.

Forest Resource Land Use

During site preparation most of the environmental effects to the forest resource will occur or be initiated. The environmental effects centre on the removal of and/or access to forest land base during construction resulting in a loss of production to the landowner and forest cover in general.

Market Value

The primary mitigation for productive forestland loss is through compensation of landowners for both the lands acquired, used or otherwise affected by the proposed TCH, and the forest resource on those lands. The compensation process will take into account a broad range of issues such as land use, forest resources, remnants and severances. Landowners will be clearly and consistently informed as to their rights, options and the methods of valuation as they pertain to the New Brunswick Expropriation Act and NBDOT's methods of valuation and negotiation.

There are situations whereby landowners may elect to harvest or arrange to have that portion of the property harvested rather than receive compensation for standing timber to be cleared and NBDOT will attempt to ensure that there is adequate time for the landowner to organize and implement clearing options in a timely manner consistent with existing operations.

Additional cost associated with accessing severed land parcels will be off-set by the benefit of having better access to markets at better grades, higher speeds and 100% weight limits. 735 ha of formerly forested lands will be removed from future production. Based on CLI data, this represents an annual withdrawal from the productive forest land base representing approximately 3,900 m^3/year or 1.2% of the Carleton-Victoria Forest Products Marketing Board (CVFPMB) annual volume from private lands.

Access to Forest Lands

Recognizing that the construction of the proposed TCH and access roads will take two to three years to complete, NBDOT will also attempt to provide on-going forestry operations with access across the RoW throughout the construction period as safety and operational considerations permit.

Agricultural Land Use

During site preparation most of the environmental effects to the agriculture resource will occur or be initiated. The potential environmental effects centre around the removal of and/or access to agricultural land resulting in a loss of productive capacity and production by the landowner.

Land Acquisition and Agriculture Resource Values

As mentioned previously, the potential environmental effects occurring or originating during Construction centre around the access to and/or removal of agricultural land from production. Because some of the potential environmental effects will continue beyond the construction phase, the mitigation while initiated during construction, should reflect other phases of the Project. The primary mitigation is through landowner compensation for the lands acquired, used or otherwise affected by the proposed TCH. Two hundred and twenty-three hectares of formerly agricultural land will be removed from production as a result of the Project, however, this only represents 0.3% of the agricultural land in the Assessment Area.

Landowners will be clearly and consistently informed as to their rights, options and the methods of valuation and negotiation as they pertain to the *New Brunswick Expropriation Act* and NBDOT's compensation methods. Properties that are severed in such a manner that a remnant parcel precludes current land use will be mitigated through provision of compensation and or alternate access.

Farms are business/economic interests with land being the source of productive capacity. Those farm operations affected by the Project are also facing a business decision that is imposed on them by the proposed TCH. There are commonly situations whereby farm operators may wish to make adjustments to their operations. NBDOT will work with landowners to plan and accommodate those adjustments.

Not all land will be acquired by NBDOT. There will be properties that will be severed that are not acquired by NBDOT (called a severance) and recognizing that the construction of the proposed TCH and access roads may take several years to complete, on-going agricultural operations may need regular access across the RoW at certain periods of the year. Reasonable provisions will be considered to allow these operations to be conducted during construction as operational requirements permit.

Severed land may also represent an additional cost to the farm through the regular movement of equipment, material and crops. For properties that are severed in such a manner that a severance results in additional operational costs, NBDOT will negotiate fair compensation.

Additional cost associated with accessing severed land parcels will be off-set by the benefit of having better access to markets at better grades, higher speeds and 100% weight limits.

For larger operations (often several consolidated properties), alternatives such as land exchanges to create land consolidations to maintain the farm unit's productive capacity and efficiency should be explored.

Summary - Construction

The potential environment effects of Project related construction activities on Land Use in consideration of the characteristics of those potential environmental effects and planned mitigation are considered not significant.

5.8.5.2.2 Operation

The potential environmental effects of the Project operation on Land Use are characterized in Table 5.8.7. The following provides a detailed discussion of these potential environmental effects during the Operation phase of the Project, including mitigation.

Table 5.8.7 Environmental Effects Assessment Matrix for Land Use (Operation)

Environmental Effects Assessment Matrix **Valued Environmental Component: LAND USE** **Phase: Operation**							
Project Activity (See Table 4.1.1 for list of specific activities and works)	**Potential Environmental Effects**	**Mitigation**	**Magnitude**	**Geographic Extent**	**Duration/Frequency**	**Reversibility**	**Ecological/Socio-Cultural and Economic Context**
Winter Safety	Change in Forest Resource Land Use (Salt damage to forest trees adjacent to highway) (A)	• Fair compensation for damaged trees • Adherence to EPP	1	1	5/3	R	2
	Change in Agricultural Land Use (Salt damage to agricultural land adjacent to highway) (A)	• Fair compensation for damaged farm land • Adherence to EPP • Suitable buffer/distance from salt source	1	1	3/3	R	2
Proposed TCH Presence	Change in Residential Land use (Adjacent to RoW) (A)	• Monitor noise	1	1	5/6	R	2
	Change in Residential Land use (Along existing TCH) (P)	• None required	2	3	5/6	R	2
	Change in Commercial Land Use (P)	• None recommended	1	1	5/6	R	2
	Change in Recreational Land Use (for trails) (A)	• Ensure trail continuity	1	1	5/6	R	2

Table 5.8.7 Environmental Effects Assessment Matrix for Land Use (Operation)

Environmental Effects Assessment Matrix
Valued Environmental Component: LAND USE
Phase: Operation

Project Activity (See Table 4.1.1 for list of specific activities and works)	Potential Environmental Effects	Mitigation	Magnitude	Geographic Extent	Duration/Frequency	Reversibility	Ecological/Socio-Cultural and Economic Context
	Change in Recreational Land Use (for hunting) (A)	• Wildlife collision measures (fencing and crossing)	1	2	5-6	R	2

Key:

Magnitude:
1 = Low: *e.g.,* specific group, residence or neighbourhood affected such that adjacent land use activities will not be disrupted such that current activities cannot continue even after short periods of time.
2 = Medium: *e.g.,* part of a community affected such that adjacent land use activities will be disrupted such that current activities cannot continue for extended period of time longer than two years.
3 = High: *e.g.,* community affected such that adjacent land use activities will be disrupted such that current activities cannot continue for extended periods of time longer than two years and are not compensated for.

Geographic Extent:
1 = <1 km^2
2 = 1-10 km^2
3 = 11-100 km^2
4 = 101 - 1,000 km^2
5 = 1,001 - 10,000 km^2
6 = >10,000 km^2

Duration:
1 = <1 month
2 = 1 - 12 months
3 = 13 - 36 months
4 = 37 - 72 months
5 = >72 months

Frequency:
1 = <11 events/year
2 = 11 - 50 events/year
3 = 51 - 100 events/year
4 = 101 - 200 events/year
5 = >200 events/year
6 = continuous

Reversibility:
R = Reversible
I = Irreversible

Ecological/Socio-cultural and Economic Context:
1 = Relatively pristine area or area not adversely affected by human activity.
2 = Evidence of adverse environmental effects.

N/A = Not Applicable
(A) = adverse
(P) = positive

Commercial Land Use

Once constructed, the presence of the proposed new TCH is expected to attract new commercial development adjacent to the proposed RoW (primarily at interchanges) to provide goods and services to the highway users. Identified developments include major highway service centres at Perth-Andover and Grand Falls. These developments are taking place outside the proposed RoW near the interchanges and are subject to existing municipal and provincial land use regulations and plans. It is expected that other developments will take place, but have not been identified to date. This commercial development is considered a positive effect on the economy and no mitigation or enhancement measures are proposed.

The loss of business to businesses along the existing TCH due to traffic diversions is considered an economic rather than a land use environmental effect, and is addressed in the Labour and Economy VEC (Section 5.11).

Residential Land Use

Residential land use adjacent to the proposed RoW may be adversely affected during the operational phase of the Project due to noise, air emissions and other disturbances from the passing traffic on the

proposed TCH, as well as local roads and highways used for access. According to the survey of existing sound levels, and the forecasts of traffic noise with the proposed TCH, conducted for the Atmospheric Environment VEC assessment, there are about 32 houses located within 200 m of the proposed RoW that are likely to experience a perceptible change in sound level. A detailed assessment of these environmental effects and possible mitigation measures are addressed in Section 5.1 Atmospheric Environment.

Many residences are located along the existing TCH. Upon completion of the proposed TCH, most through vehicular and truck traffic along the existing TCH will be diverted to the proposed TCH. This is expected to reduce the traffic noise, air emissions and other disturbances to residents, as well as improve traffic safety along the existing TCH.

Residents along the existing TCH will be positively affected by the diversion of heavy trucks and through traffic to the proposed TCH, which will improve safety and level of service. No mitigation or enhancement measures are necessary.

Recreational Land Use

The potential environmental effect of the Project on recreation during the operation phase is the same as was described for the construction phase, but will continue in perpetuity. There are other recreational trails in the area that may possibly be affected.

Mitigation measures for trails during operation of the Project will include measures that ensure the continuity of trail access through the use of signage, tunnel underpasses or other means. As can be seen in Figure 3.2 (A-D) Appendix C, two of the snowmobile trails cross the new highway at overpasses. The continuity of the Provincial snowmobile trail system will be ensured via the provision of a crossing. Crossings will not be provided for local trail systems. However, riders may legally cross highways at their own risk.

Hunting activity will be eliminated within the RoW and on immediately adjacent lands due to displacement of wildlife (avoidance) and loss of habitat, and the restricted hunting area requirements for firearm operations. Mitigation measures for recreational hunting include provision of wildlife fencing and/or crossings to prevent wildlife losses by avoiding highway collisions with wildlife. Environmental effects of the Project operations on wildlife are addressed in Section 5.7 Wildlife.

Forestry Resources Land Use

During the winter, salt will be used and has the potential to damage tree foliage along the proposed RoW in small and isolated area. Damage is generally reversible however product value may be affected (*e.g.,* Christmas trees).

The Primary mitigation for salt damage is in the design of the Project whereby the width of the RoW will likely provide a suitable buffer between the source of the salt and vegetation and the adherence to the EPP Section 6, which specifies application rates as per the Highway Maintenance Management System Manual, which seeks maximum effectiveness and minimizing salt requirements.

In instances where salt damage has caused trees to die or to be rendered non-merchantable (*e.g.,* Christmas trees), fair and reasonable compensation for damaged trees will be negotiated.

Agricultural Land Use

During the winter months salt used on the TCH can contaminate agricultural land through salt spray during thaws or through salt dust during drier periods. Exposure to these conditions is likely to be in small and isolated areas. Damage is generally temporary, however product value may be affected.

The Primary mitigation for salt damage is in the design of the Project whereby the width of the RoW provides a suitable buffer between the source of salt and agricultural land. Also, the adherence to the EPP, Section 6, which specifies application rates as per the Highway Maintenance Management System Manual, will ensure maximum effectiveness and minimize salt requirements.

In instances where salt damage has caused crops to fail, fair and reasonable compensation for damaged crops will be negotiated.

Summary - Operation

Based on the consideration of the environmental effects of the individual activities required to operate the proposed TCH and the proposed mitigation, and in consideration of the residual environmental effects rating criteria, the residual environmental effects on Land Use are considered not significant.

5.8.5.2.3 Maintenance

Table 5.8.8 provides the environmental effects analysis matrix for Maintenance activities of the Project including mitigation.

Table 5.8.8 Environmental Effects Assessment Matrix for Land Use (Maintenance)

Environmental Effects Assessment Matrix
Valued Environmental Component: LAND USE
Phase: Maintenance

Project Activity (See Table 4.1.1 for list of specific activities and works)	**Potential Environmental Effects**	**Mitigation**	**Magnitude**	**Geographic Extent**	**Duration/Frequency**	**Reversibility**	**Ecological/Socio-Cultural and Economic Context**
Proposed TCH Maintenance	Change in Residential and Commercial Land Use (A)	• None recommended	1	1	1	R	2

Key:

Magnitude:
1 = Low: *e.g.,* specific group, residence or neighbourhood affected such that adjacent land use activities will not be disrupted such that current activities cannot continue even after short periods of time.
2 = Medium: *e.g.,* part of a community affected such that adjacent land use activities will be disrupted such that current activities cannot continue for extended period of time longer than two years.
3 = High: *e.g.,* community affected such that adjacent land use activities will be disrupted such that current activities cannot continue for extended periods of time longer than two years and are not compensated for.

Geographic Extent:
1 = <1 km^2
2 = 1-10 km^2
3 = 11-100 km^2
4 = 101 - 1,000 km^2
5 = 1,001 - 10,000 km^2
6 = >10,000 km^2

Duration:
1 = <1 month
2 = 1 - 12 months
3 = 13 - 36 months
4 = 37 - 72 months
5 = >72 months

Frequency:
1 = <11 events/year
2 = 11 - 50 events/year
3 = 51 - 100 events/year
4 = 101 - 200 events/year
5 = >200 events/year
6 = continuous

Reversibility:
R = Reversible
I = Irreversible

Ecological/Socio-cultural and Economic Context:
1 = Relatively pristine area or area not adversely affected by human activity.
2 = Evidence of adverse environmental effects.

N/A = Not Applicable
(A) = adverse
(P) = positive

Periodic maintenance will be required for the Project, such as resurfacing and reconstruction of roadbeds and structures. Typically, major resurfacing of roadways takes place about every fifteen years. Bridges and major structures have longer structural refurbishment periods. These maintenance activities would create additional noise and dust which could affect adjacent residential and commercial land use. This issue is addressed in Section 5.1 Atmospheric Environment.

Major maintenance could affect recreational land use due to noise, dust and other disturbances. The infrequency and short duration of these disturbances do not warrant additional mitigation measures. Maintenance is not likely to affect forestry and agricultural operations in any substantive way.

The potential environmental effects of Project maintenance on Land Use are, in consideration of planned mitigation, considered not significant.

5.8.5.2.4 Accidents, Malfunctions and Unplanned Events

The potential environmental effects on Land Use that could occur as a result of accidents, malfunctions and unplanned events are characterized in Table 5.8.9. Potential mitigation measures during Project

operation are also provided. The following provides a detailed discussion of these potential environmental effects.

Table 5.8.9 Environmental Effects Assessment Matrix for Land Use (Accidents, Malfunctions and Unplanned Events)

Environmental Effects Assessment Matrix
Valued Environmental Component: LAND USE
Phase: Accidents, Malfunctions and Unplanned Events

Project Activity (See Table 4.1.1 for list of specific activities and works)	**Potential Environmental Effects**	**Mitigation**	**Magnitude**	**Geographic Extent**	**Duration/Frequency**	**Reversibility**	**Ecological/Socio-Cultural and Economic Context**
Construction	Change in Residential and Commercial Land use (A)	• Adherence to applicable health and safety legislation • Emergency response plans	1	1	1/1	R	2
	Change in Recreational Land Use (A)	• Adherence to applicable health and safety legislation • Emergency response plans	1	1	1/1	R	2
	Change in Forest Resource Land Use Forest Fires (A)	• EPP • *NB Forest Fires Act: Regulation General* • In progress monitoring by NBDOT inspectors	1 or 2	2	2/1	R	2
	Change in Forest Resource Land Use (A) Incremental Timber Harvesting	• Communication with landowners well in advance • Clarify to landowners that survey lines may change	2	2	3/3	R	2
	Change in Agricultural Land Use Fire (A)	• EPP • *NB Forest Fires Act: Regulation General* • In progress monitoring by NBDOT inspectors • Communication with landowners • Scheduling around peak agriculture movements	1 or 2	1 or 2	3/3	R	2
Operation	Change in Residential and Commercial Land use (A)	• Adherence to applicable health and safety legislation • Emergency response plans	1	1	1/1	R	2
	Change in Recreational Land Use (A)	• Adherence to applicable health and safety legislation • Emergency response plans	1	1	1/1	R	2
	Change in Forest Resource Land Use Forest Fires (A)	• Roadside vegetation management as per EPP	1 or 2	3	3/3	R	2

Table 5.8.9 Environmental Effects Assessment Matrix for Land Use (Accidents, Malfunctions and Unplanned Events)

Environmental Effects Assessment Matrix
Valued Environmental Component: LAND USE
Phase: Accidents, Malfunctions and Unplanned Events

Project Activity (See Table 4.1.1 for list of specific activities and works)	Potential Environmental Effects	Mitigation	Magnitude	Geographic Extent	Duration/Frequency	Reversibility	Ecological/Socio-Cultural and Economic Context
	Change in Agricultural Land Use Fire (A)	• EPP • *NB Forest Fires Act: Regulation General* • Communication with landowners	1 or 2	1 or 2	3/3	R	2
Maintenance	Change in Residential and Commercial Land Use (A)	• Adherence to applicable health and safety legislation • Emergency response plans	1	1	1/1	R	2

Key:

Magnitude:
1 = Low: *e.g.,* specific group, residence or neighbourhood affected such that adjacent land use activities will not be disrupted such that current activities cannot continue even after short periods of time.
2 = Medium: *e.g.,* part of a community affected such that adjacent land use activities will be disrupted such that current activities cannot continue for extended period of time longer than two years.
3 = High: *e.g.,* community affected such that adjacent land use activities will be disrupted such that current activities cannot continue for extended periods of time longer than two years and are not compensated for.

Geographic Extent:
1 = <1 km^2
2 = 1-10 km^2
3 = 11-100 km^2
4 = 101 - 1,000 km^2
5 = 1,001 - 10,000 km^2
6 = >10,000 km^2

Duration:
1 = <1 month
2 = 1 - 12 months
3 = 13 - 36 months
4 = 37 - 72 months
5 = >72 months

Frequency:
1 = <11 events/year
2 = 11 - 50 events/year
3 = 51 - 100 events/year
4 = 101 - 200 events/year
5 = >200 events/year
6 = continuous

Reversibility:
R = Reversible
I = Irreversible

Ecological/Socio-cultural and Economic Context:
1 = Relatively pristine area or area not adversely affected by human activity.
2 = Evidence of adverse environmental effects.

N/A = Not Applicable
(A) = adverse
(P) = positive

Residential and Commercial Land Uses

Accidents, malfunctions and unplanned events could have a range of environmental effects, including hazardous material spills to major vehicle accidents. One of the main purposes of the Project is to improve the safety of highway travel. However, traffic accidents are likely to occur on the proposed TCH, albeit at a lesser rate of incidence and severity than along the existing TCH (NBDOT 2002).

The mitigation measures include the enforcement of all applicable environmental, and health and safety laws during construction, operation and maintenance. Emergency response measures (*e.g.*, fire, rescue, ambulance, spill response) will be developed to address a range of potential events. Additional discussion of hazardous material spills can be found in the Groundwater VEC (Section 5.2), the Surface Water VEC (Section 5.3), and the Fish and Fish Habitat VEC (Section 5.4).

Recreational Land Use

Accidents, malfunctions and unplanned events that could occur during construction, operation or maintenance of the Project may diminish the enjoyment/benefits of the recreational land use due to noise, dust, air emissions and other undesirable conditions. Given that the recreational activities within the proposed RoW are only for the purposes of accessing recreational lands on the other side, the environmental effects would be limited in magnitude and duration. Normal mitigation measures to minimize the environmental effects of the range of accident and unplanned events would be appropriate. These would include emergency response measures including fire, rescue, ambulance, and spill response.

Forest Resources Land Use

During all phases of the Project there is a risk of forest fires being started from either the highway construction workers or highway users. The greatest risk of fire is during the Site Preparation Stage and subsequent construction activities. The primary mitigation is through prevention and the EPP Section 4 that deals with environmental protection measures during construction that suggests a preference for conducting forest clearing during the winter months during which time forest fire hazards are reduced and includes obtaining a burning permit from NBDNR. Where winter harvests are not possible, fire protection equipment requirements must be consistent with those required on all forest operations in New Brunswick as specified within the *Forest Fires Act* and Section 7.4 of the EPP.

In all construction activities, NBDOT inspectors will monitor clearing and other relevant operations to ensure equipment is functional and personnel are trained in its safe use with respect to the prevention of fires.

During the operation of the proposed TCH the risk of fire is related to weather, roadside vegetation management and human error (cars parking in the grass or smokers carelessly discarding burning embers). The mitigation measures are prevention oriented through vegetation management (regular mowing and brushing) as per Section 6.1.6 of the EPP to reduce the risk of fires from vehicles parked on the vegetation along the proposed RoW.

Based on stakeholder consultation with the CVFPMB, study team observations, it is apparent that incremental timber harvesting is occurring as a result of perceived economic benefit by property owners in anticipation of the RoW. Incremental harvesting is difficult to quantify at this time, as it is in-progress.

There is anecdotal evidence of landowners reacting to finding survey lines across their property and assuming the location is established and reacting to it by harvesting immediately, only to have the alignment moved in the evaluation process.

In consultation with the CVFPMB, a review of available information was conducted in an attempt to confirm the occurrence. Using NB Transportation Certificate data between April 2002 and August 7th, 2003, delivery records for properties intersecting the proposed RoW were extracted and a field sample conducted.

Of 478 properties that intersect the proposed RoW, 36 (7.5%) reported wood volumes delivered to processing plants during the sample period. Twelve were field visited and 10 had harvesting beyond the RoW. The volumes reported ranged from 38.5 m^3 to 3,080 m^3, with an average volume harvested per property of 609 m^3.

NBDOT will inform landowners well in advance of the expropriation process to avoid triggering incremental harvesting arising from uninformed speculation.

Agricultural Land Use

During all of the Project activities there is a risk of accidents, malfunctions and unplanned events.

During all Project activities there is a risk of spring grass fires being started from either the highway construction workers or highway users. The greatest risk of fire is during site preparation and subsequent construction activities during the early spring. The primary mitigation of accidental fires is through prevention as per Section 4.0 of the EPP. The EPP suggests a preference for conducting forest clearing during the winter months during which time fire hazards are reduced and includes obtaining a burning permit from NBDNR.

During all operations, fire protection equipment requirements must be consistent with those required on all forest operations in New Brunswick as specified within the *Forest Fires Act* and the EPP (Section 7.4 Forest Resources). In all construction activities, NBDOT inspectors should monitor clearing and other relevant operations to ensure equipment is functional and personnel are trained in its usage with respect to forest fire prevention.

During the operation of the proposed TCH the risk of fire is related to weather, roadside vegetation management and human error (cars parking in the grass or smokers carelessly discarding burning embers). The mitigation measures are prevention oriented through vegetation management (regular mowing and brushing) as per Section 6.1.6 of the EPP to reduce the risk of fires from vehicles parked on the vegetation along the proposed RoW.

Summary - Accidents, Malfunctions and Unplanned Events

The potential environmental effects of accidents, malfunctions and unplanned events based on planned mitigation, considered not significant.

5.8.5.3 Determination of Significance

Table 5.8.10 presents a summary of the residual environmental effects of the Project on land uses.

Table 5.8.10 Residual Environmental Effects Summary Matrix for Land Use

Residual Environmental Effects Summary Matrix
Valued Environmental Component: LABOUR AND ECONOMY

Phase	Residual Environmental Effects Rating	Level of Confidence	Likelihood	
			Probability of Occurrence	Scientific Certainty
Construction	NS	3	3	3
Operation	NS	3	3	3
Maintenance	NS	3	1	1
Accidents, Malfunctions and Unplanned Events	NS	3	1	1
Project Overall	NS	3	2	3

Key
Residual Environmental Effect Rating:
S = Significant Adverse Environmental Effect
NS = Not-significant Adverse Environmental Effect
P = Positive Environmental Effect

Level of Confidence
1 = Low Level of Confidence
2 = Medium Level of Confidence
3 = High Level of Confidence

Probability of Occurrence: based on professional judgement
1 = Low Probability of Occurrence
2 = Medium Probability of Occurrence
3 = High Probability of Occurrence

Scientific Certainty: based on scientific information and statistical analysis or professional judgement
1 = Low Level of Confidence
2 = Medium Level of Confidence
3 = High Level of Confidence
N/A = Not Applicable
*As determined in consideration of established residual environmental effects rating criteria.

The residual environmental effects of the Project on Land Use are in consideration of planned mitigation and the residual environmental effects rating criteria, are considered not significant.

5.8.6 Monitoring and Follow-up

No significant environmental effects were identified. However, monitoring may be required if potential environmental effects are identified (*e.g.*, noise-related complaints). This would likely entail traffic counting and noise monitoring as discussed further in Section 5.1.6 (Atmospheric Environment VEC).

A further consideration for monitoring and follow-up would be to confirm that the established recreational trails maintain continuity across the RoW.

5.9 Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons

5.9.1 Rationale for Selection as Valued Environmental Component

For the purposes of this assessment, Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons is defined as the use of lands, and resources within those lands, that are within the footprint of the Project or on adjacent lands where those uses and resources are potentially affected by the Project. This "use" refers to contemporary hunting, fishing, and gathering activities for subsistence purposes as well as the use of lands and resources for social and ceremonial activities.

The proposed Project will result in the loss of terrestrial habitat as a result of Construction. During Operation, land or surface water adjacent to the Project facilities may be affected (*e.g.*, by the use of road salt). Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons was selected as a VEC to assess the potential interactions between Project activities and any current uses of the lands and resources that may potentially be affected by Project activities.

5.9.2 Environmental Assessment Boundaries

5.9.2.1 Spatial and Temporal

The spatial boundaries for the Project include the RoW boundaries where activities associated with construction, operation, and malfunctions and accidents of the Project could result in environmental effects on the terrestrial or aquatic environments. For the purposes of this assessment, any current use of land and resources within the limits of clearing for the highway is assumed to be permanently removed.

The temporal boundaries of the Project include the construction period, and operation and maintenance in perpetuity.

5.9.2.2 Administrative and Technical Boundaries

The Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons can best be determined by the Aboriginal Community. To that end, NBDOT has funded a Traditional Ecological Knowledge (TEK) study that was undertaken by the Tobique Economic Development Corporation (TEDCO) on behalf of the Chiefs of the six Maliseet First Nations communities in New Brunswick (Oromocto, St, Mary's, Kingsclear, Woodstock, Tobique, and Madawaska). The report resulting from this study, while completed, has not been made available to NBDOT to date. Representatives of TEDCO have provided a brief summary of issues raised (C. Cameron, pers. comm.). In addition, staff from NBDOT and their environmental consultants attended and participated in a series of six open

houses conducted by TEDCO, where information was gathered from those attending the sessions held in each of the communities. Finally, there has been correspondence and communication between NBDOT and some of the elected Chiefs of the six Maliseet communities. This environmental assessment relies upon the information gathered from those sources. It should be noted that no specific hunting, fishing or gathering areas have been identified within the Project boundary, from these sources. Similarly, no specific ceremonial or spiritual sites have been noted in the Project area in the information provided, and nothing specific has been mentioned to NBDOT staff or their consultants during the open house sessions or at any other time during this process. Information gathered during the TEK Study (TEDCO 2003) for the Pokiok to Longs Creek four-lane highway section was, where appropriate, also included in this assessment. The Pokiok to Longs Creek highway is part of the same Route 2 highway and is located approximately 40 kilometres from this Project.

The proposed study methodology was the same as that used by TEDCO in the previous TEK study (TEDCO 2003) for the construction of the Pokiok to Longs Creek four-lane section of the Trans-Canada Highway. The process began with the hiring of Maliseet members of each of the six communities. These individuals were referred to as the community coordinators. Their primary role was to gather information, conduct research and interviews of various community members, community elders, traditionalists, and resources users (*e.g.*, hunters, fishers, and gatherers). Site visits were also conducted in areas where the study identified a need for additional data. It widely accepted that a trusting relationship between the interviewer and the interviewee is essential to ensure that the information is provided in an open and honest manner. Frequently, individuals within a First Nation community will provide more information to someone they know, which increases the quality of the TEK study. These coordinators were also responsible for organizing and attending the open houses in each of the communities. These Open houses provided a forum to launch the consultation and TEK study processes. Members of NBDOT staff and their consultants, as well as the community coordinator and staff from Aboriginal Resource Consultants (the consulting firm hired by TEDCO to oversee the TEK and community consultation) were all present at each of the six open houses. This presence allowed for those attending the open house to ask questions on the design and proposed location of the highway, the information resulting from the field studies, and raise any questions about the TEK and consultation process with those directly responsible. In addition, any comments provided during these forums were noted by the participants for incorporation in the overall assessment of the environmental effects from the Project.

In addition, previous relevant environmental assessments (from other highway projects), drafts of the Project CSR and Screening Report, and Project field study reports were presented to the coordinators. These documents were left within the community and were housed at a location where anyone within the community could review them and provide further comment. Mapping of all the Project areas was provided showing the information that had been gathered as a result of the field studies. These maps

were also left with the coordinators with the same community access provision as the other documentation.

The community coordinators were provided instruction on the draft versions of the various environmental assessments regarding where to find relevant information that community members might seek and how the assessment of potential environmental effects on other VECs was undertaken. The coordinators were also instructed as to the use of the numerous maps that were provided to each community. Contact information for NBDOT as well as their environmental consultants was also provided, should any member of the community wish to speak directly to those individuals or if the community coordinators had questions.

The role of the community coordinators was to function as conduits for information and questions about the Project to and from their respective communities, and to generate the information for the TEK study.

The methodology for the TEK study followed an eight-step process.

- Engage local community coordinators (discussed above).

- Define the objective of the study –to gather relevant data from knowledgeable community sources and attempt to determine whether the proposed construction activities could potentially have a negative effect on any areas of significance.

- Develop a list of informants – identify a list (which could be amended at any time to add more people) of elders, hunter/fishers, ceremonial/traditional users who are recognized as possessing the information.

- Develop a questionnaire – to ensure that a structured and consistent approach was followed during the discussion process, a questionnaire was developed and used as a guide by the coordinators.

- Mapping – provided by NBDOT and their consultants to assist the interview process.

- Contact Interviewees – various members of each community were contacted to participate in the TEK study. The purpose and objectives of the study were explained to each person interviewed and a convenient meeting time arranged. Notes were either taken during the interview or written afterwards, depending upon the preference of the interviewee.

- Report – the information gathered for the TEK study was consolidated into a detailed report.

- Site visit – when requested or warranted, a site visit was undertaken in order to assist in the understanding of the project and presentation of information.

Finally, it must be noted that information is sometimes provided with the condition that it not be made public due to the potential for exploitation.

5.9.3 Criteria for Establishing Threshold of Significance

A *significant residual environmental effect* is an unmitigated long-term Project-induced change in the current use of land and resources for traditional purposes by Aboriginal people or First Nation communities. If it was determined that adverse changes to the access to, or the availability of, such land and resources to members of the local First Nation communities was the result of the Project, this was considered an adverse environmental effect.

5.9.4 Existing Conditions

The proposed four-lane highway route primarily travels through rural settings that are either forested or currently being used, or has in the relatively recent past been used, for agriculture. There is virtually no Crown Land being traversed by the highway routing. Almost all of the forested areas within the RoW have been previously harvested at some point in the past, ranging in time from recently to 100 years or more.

The summary information of the TEK study indicated that a large percentage of those interviewed expressed a concern that the construction of the Project could adversely affect the availability of various game animals located along the proposed highway route, in areas considered traditional Maliseet territory. The summary suggested that the depletion of these resources would eliminate Traditional Aboriginal use of the area.

The summary also indicated that some interviewees indicated that there were locations within the Meductic and Flat Top Mountain areas that have been used by the Maliseet People in the past for ceremonial and spiritual purposes.

The summary also indicated that there were concerns regarding how the Maliseet community would be assured they had an opportunity to review potential environmental effects to such things as burial grounds or gathering locations and/or lands of spiritual significance, if there is no direct Maliseet involvement in the ongoing monitoring of the Project.

Although not explicitly cited in the summary information provided to NBDOT, it is assumed, due to the proximity of this Project with other highway projects for which a similar TEK study was undertaken, a

general concern over other issues will be expressed for this Project. These could include such issues as: the availability of black and white ash trees in the area (TEDCO 2003), the collection of cedar, sweet grass, white birch fungus, and other traditional medicinal plants, the Maliseet trail, the condition of rivers, lakes and brooks and their use as guiding tools for travelling, and the potential for finding previously unknown burial grounds.

5.9.5 Environmental Effects Analysis

5.9.5.1 Project-VEC Interactions

This section evaluates the significance of potential residual environmental effects resulting from Project interactions with the Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons VEC. The assessment of environmental effects includes mitigation. Although no specific locations within the zone of influence of the Project or along the proposed highway route have been identified, the information available indicates a number of current issues regarding land and resources used for traditional purposes by Aboriginal purposes that may be affected by the Project. A summary of the potential environmental effects resulting from Project-VEC interactions is provided in Table 5.9.1. This table includes accidents, malfunctions, and unplanned events.

Table 5.9.1 Project Activity – Environmental Effects Interaction Matrix for Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons

Potential Interactions Between Project Activities, Including Other Projects, and Environmental Effects **Valued Environmental Component: CURRENT USE OF LAND AND RESOURCES FOR TRADITIONAL PURPOSES BY ABORIGINAL PERSONS**	
Project Activities and Physical Works	**Potential Environmental Effect** **Project Related Change in Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons**
Construction	
Site Preparation	✓
Roadbed Preparation	
Surfacing and Finishing	
Watercourse Crossing Structures	✓
Ancillary Structures and Facilities Construction	✓
Operation	
Winter Safety	✓
Proposed TCH Presence	✓
Maintenance	
Proposed TCH Maintenance	
Vegetation and Wildlife Management	
Accidents, Malfunctions and Unplanned Events	
Construction	✓
Operation	✓
Maintenance	✓

Table 5.9.1 illustrates that the initial phases of construction activities as well as the presence of the highway itself have the potential for interaction with the Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons VEC.

5.9.5.1.1 Construction

The construction process associated with the highway project involves various groundbreaking activities that will result in the loss of terrestrial habitat. However, as noted in Section 2 of this document, the routing of this highway has been selected to avoid to the extent possible, areas identified as critical habitat, such as wetlands. Construction activities will include permanent crossings of all watercourses along the route. This activity has the potential to result in adverse environmental effects on fish and fish habitat as well as water quality in these watercourses. Although a concern was expressed in the Pokiok to Longs Creek TEK Study (TEDCO 2003) over potential Project environmental effects to lakes and ponds, no such waterbodies will be crossed by the proposed highway route. There is the potential for construction to affect ceremonial sites located along the proposed highway. All tree species within the RoW area defined for clearing will be cut down including all black and white ash, cedar, and birch trees. The construction of ancillary facilities such as borrow areas / gravel pits may result in adverse environmental effects on land and resources relevant to this VEC in those areas. The activities associated with the later phases of Construction of the Project, such as the surfacing and finishing of the highway, are not anticipated to interact with the Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons VEC

5.9.5.1.2 Operation

Winter safety activities, such as the application of salt may interact with the Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons, in such areas as water quality on adjacent watercourses in regards to overall fish health and availability. The presence of the highway itself will of remove various plant species from the immediate highway RoW and displace from the immediate highway RoW a variety animal species that may affect the Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons VEC.

5.9.5.1.3 Maintenance

Within the normal activities associated with highway maintenance, there will be no substantive interaction between this phase of the Project and the VEC.

5.9.5.1.4 Accidents, Malfunctions and Unplanned Events

During Construction, Operation and Maintenance, there is the potential for interaction between the Project and the Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons in the case of Accidents, Malfunctions or Unplanned Events. The accidental release of a contaminant (*i.e.,* a spill) has the potential to have an adverse environmental effect on the VEC.

5.9.5.2 Environmental Effects Analysis and Mitigation

The following tables in this section provide the residual environmental effects assessment matrices for Project activities that could potentially interact with the Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons. The section has been divided into Project phases (*i.e.*, Construction, Operation, Accidents, Malfunctions and Unplanned Events). The text following each table provides a discussion of the environmental effects and mitigation outlined in the matrix.

5.9.5.2.1 Construction

Table 5.9.2 Environmental Effects Assessment Matrix for Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons

Environmental Effects Assessment Matrix **Valued Environmental Component: CURRENT USE OF LAND AND RESOURCES FOR TRADITIONAL PURPOSES BY ABORIGINAL PERSONS** **Phase: Construction**							
Project Activity	**Potential Adverse Environmental Effect,**	**Mitigation**	**Evaluation Criteria for Assessing Environmental Effects**				
			Magnitude	**Geographic Extent**	**Duration/Frequency**	**Reversibility**	**Ecological/Socio-Cultural and Economic Context**
Site Preparation	Change in Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons (A)	• Implement Black and White Ash Harvesting plan • Fish and Fish Habitat, Vegetation, Wetlands, and Wildlife, and Archaeological Resources Mitigation as described in Sections 5.4, 5.5, 5.6, 5.7, and 5.10	1	3	3/6	R	2
Watercourse Crossing Structures	Change in Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons (A)	• Fish and Fish Habitat, Vegetation, Wetlands, and Wildlife, and Archaeological Resources Mitigation as described in Sections 5.4, 5.5, 5.6, 5.7, and 5.10	1	1	3/2	R	2

Table 5.9.2 Environmental Effects Assessment Matrix for Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons

Environmental Effects Assessment Matrix
Valued Environmental Component: CURRENT USE OF LAND AND RESOURCES FOR TRADITIONAL PURPOSES BY ABORIGINAL PERSONS
Phase: Construction

Project Activity	Potential Adverse Environmental Effect,	Mitigation	Evaluation Criteria for Assessing Environmental Effects				
			Magnitude	Geographic Extent	Duration/Frequency	Reversibility	Ecological/Socio-Cultural and Economic Context
Ancillary Structures and Facilities Construction	Change in Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons (A)	• Conduct rare plant and archaeological survey prior to groundbreaking in these areas if they are a new development	1	1	3/1	R	2

KEY

Magnitude:
1 = Low: *e.g.*, short-term change in Aboriginal land use and access to resources, localized
2 = Medium: *e.g.,* short to medium-term change in Aboriginal land use and access to resources and may extend to the areas adjacent to the Project footprint.
3 = High: *e.g.,* long-term change in Aboriginal land use and access to resources and may extend well outside the Project Footprint

Geographic Extent:
1 = <10 ha (0.1 km²)
2 = 0.1-1 km²
3 = 1-10 km²
4 = 11-100 km²
5 = 101-1000 km²
6 = >1000 km²

Duration:
1 = < 1 month
2 = 1-12 months
3 = 13-36 months
4 = 37-72 months
5 = > 72 months

Frequency:
1 = < 11 events/year
2 = 11-50 events/year
3 = 51-100 events/year
4 = 101-200 events/year
5 = >200 events/year
6 = continuous

Reversibility:
R = Reversible
I = Irreversible

Ecological/Socio-cultural and Economic Context:
1 = Relatively pristine area or area not adversely affected by human activity.
2 = Evidence of adverse environmental effects.

N/A = Not Applicable
(A) = adverse
(P) = positive

Construction activities associated with the Project will result in the loss of terrestrial habitat due to the footprint required. However, as described in Section 2, the alignment of the RoW has been selected to avoid critical vegetation and wildlife habitat, including wetlands. Adverse environmental effects resulting from the Project related to the hunting and gathering of various wildlife species (*e.g.,* moose, deer, and partridge) are discussed in detail in Section 5.7 of this EA and are considered not significant. Although some habitat for moose, deer and partridge will be lost, these species will not be significantly affected. A range of mitigation measures have been proposed in Section 5.7 to minimize the potential environmental effects on wildlife. Therefore, since the population of these species is not anticipated to be significantly affected, it is unlikely that the ability to hunt these species will be significantly affected by the Project. In addition to this, although the Aboriginal community has indicated that they do hunt some of these species, in particular moose, in the area of the proposed RoW, no specific locations of concern have been identified to NBDOT.

Adverse environmental effects resulting from the Project on the plant species within and along the RoW are discussed in detail in Section 5.5 of this EA and are considered not significant. Species such as sweet grass, mentioned in the previous TEK study, was not identified along the RoW during the plant surveys. For the rare plants identified along the RoW, numerous adjustments to the RoW have been implemented to avoid these resources. While it is possible that some traditionally gathered plants do exist within the RoW and thus may be lost during construction activities, mitigation for any known rare species has already been implemented. Other species must therefore be relatively common, and therefore can still be gathered in adjacent or nearby areas.

Construction activities in and around watercourses will result in the alteration, destruction or disruption of fish and fish habitat. However this effect will be temporary and minimal in extent, and will be fully compensated. Only the portion of the watercourse required to be crossed by the highway will be directly affected. The remaining portion of each watercourse will be unaffected by the Project. Adverse environmental effects on fish and fish habitat resulting from the Project are discussed in detail in Section 5.4 of this document and are not considered significant. A range of mitigation options for the effects on fish and fish habitat is also discussed in detail in Section 5.4. Similarly, all navigable watercourses include mitigation to ensure navigability is maintained. As such, it is expected that current use of these waterways as guiding tools will not be adversely affected by the Project.

As previously stated in this document, the location of ancillary facilities (*e.g.,* borrow pits), which could have adverse environmental effects on VECs identified in this report, cannot be determined at this time. For this Project, such facilities are not permitted to be located in environmentally sensitive areas such as wetlands, thereby protecting those resources. In addition, NBDOT has committed to subjecting these locations (once identified) to an environmental survey that will include a rare plant survey and an archaeological resources survey.

To mitigate potential concerns about black and white ash, NBDOT has stated that it will develop and implement, if desired, a similar Black and White Ash Harvesting Plan as it did for the Pokiok to Longs Creek highway section, in consultation with the Maliseet First Nations. This plan included the marking of specific tree species (in this case Ash) prior to clearing by professional foresters and members of the Maliseet community. During clearing these species were set aside and piled separately for pick-up and trucking to the Maliseet communities to be used in various cultural activities, such as basket making.

Cedar and white birch are widely available in the region and no specific mitigation is recommended for these species. Species mentioned in the previous TEK study (TEDCO 2003) such as fiddleheads and sweet grass were not specifically mentioned in the summary information provided for this Project. Fiddleheads (*Matteuccia struthiopteris* or ostrich fern) were reported during the vascular plant surveys for this Project, however specific locations where this species was found are unavailable. Sweet grass (*Hierochloë odorata*), however, was not recorded. While it is possible that sweet grass exists within the

proposed RoW, field personnel would likely have recorded this species if it had occurred in the study area in large patches. Adverse environmental effects on wetlands resulting from the Project are discussed in detail in Section 5.6 of this document and are not considered significant. A range of mitigation options for the environmental effects to wetlands are also discussed in detail in Section 5.6. Since the populations of these species are not anticipated to be significantly affected by the Project, it is unlikely that the ability to gather these species will be significantly affected by the Project. In addition to this, no specific gathering locations were identified within the RoW.

During the TEK study and the open houses, it was indicated that there are locations within the Meductic (Maliseet Trail) and Flat Top Mountain areas that have been used by the Maliseet People in the past for ceremonial and spiritual purposes. Davidson Lake, in the Pokiok to Longs Creek area, was also mentioned in this context. As can be seen in Figure 5.9.1, these locations are a considerable distance from the proposed highway route for this Project. Therefore, due to the distance from the Project to these locations (ranging from 15 to 40 or more kilometres) and the fact that there has been no identified interaction between these areas and the Project, any potential environmental effects to these areas as a result of the Project are considered not significant.

As noted in Section 5.10, a professional archaeologist has reviewed the potential for the loss of archaeological and heritage resources in the Project area. Although two individual artifacts were recovered on the banks of two separate watercourses (Section 5.10), there were no habitation features associated with these artifacts and the Project will not result in the loss of any of these resources. Section 5.10 outlines mitigation that ensures that any resources found during construction will be protected through implementation of contingency measures that will include contact and involvement of the Maliseet First Nations.

To address the concerns presented in the TEK summary information regarding how the Maliseet community will have an opportunity to review potential environmental effects of the project, a number of initiatives have and will take place. First, as mentioned above, each of the six communities have access to the environmental assessment reports for the sections of the highway near their communities. In addition, the First Nations consulting company, Aboriginal Resources Consultants (ARC), hired to oversee the community consultation process, was provided with copies of the original background study reports upon which the assessments were based. As also mentioned, NBDOT paid, through ARC, for the hiring of the community coordinators who were to be a conduit for information between their respective communities and NBDOT and its consultants. At all of the open houses Project and contact information was made available and all who attended these sessions were encouraged to take this information with them at the end of the session. These handouts contained contact names, addresses and telephone numbers in case any additional information was sought, questions were forthcoming or if anyone wanted to provide further relevant information. Copies of these handouts were left with the community coordinators as well. A questionnaire was also provided at the open house sessions.

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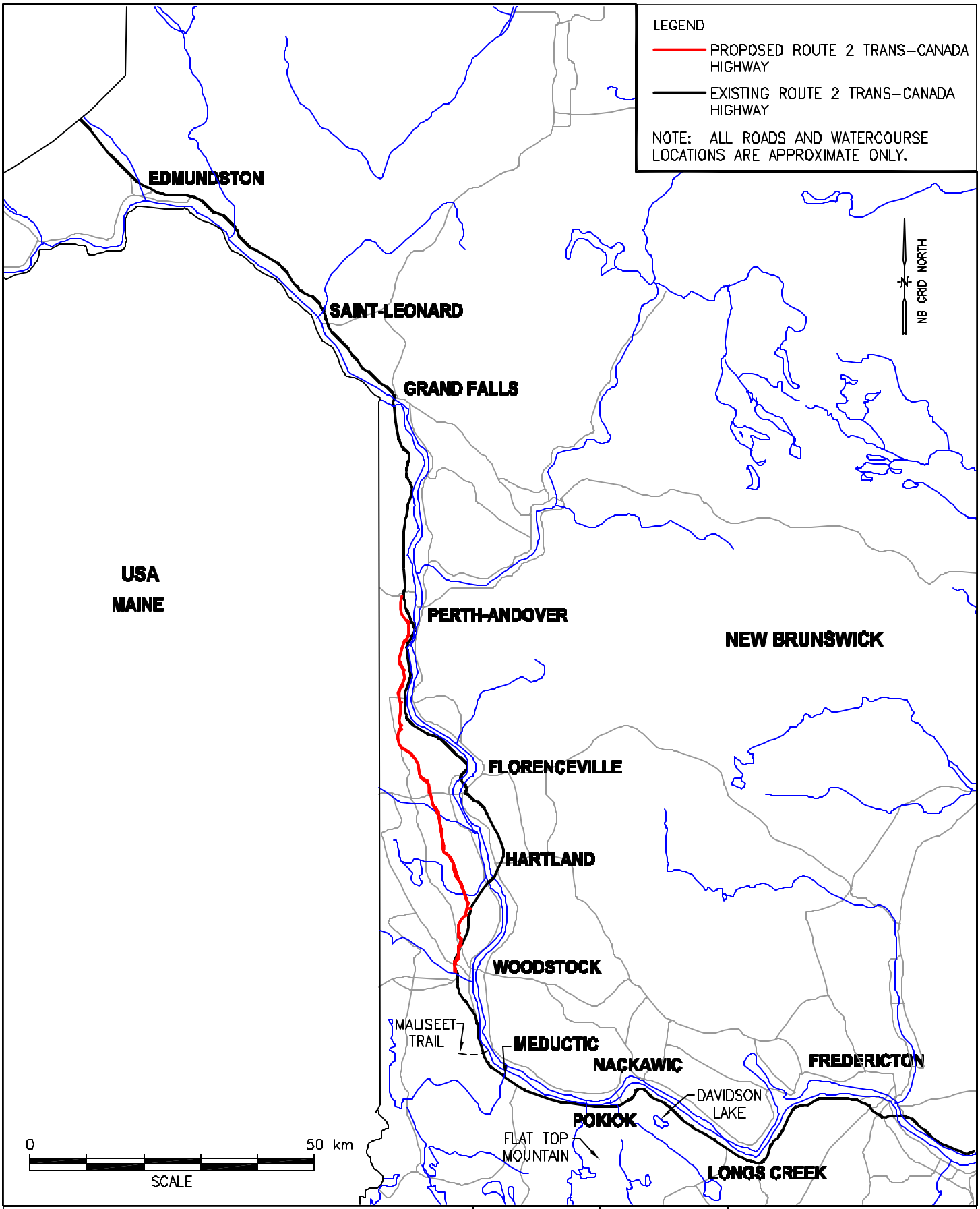

APPROXIMATE LOCATION OF FEATURES MENTIONED DURING TEK STUDY

Date:	Scale:
2004 05 17	AS SHOWN
Job No.:	Fig. No.:
14677	5.9.1

Jacques Whitford
Consulting Engineers
Environmental Scientists

It asked such questions as "Did you feel that the information presented to you today was helpful?", "Do you know of any current use of the area of the proposed four-lane highway?", and "What are your main areas of interest or concern on which we should focus our project design…?". Space was also provided for any other comments and the person's name, which was optional. Copies of this questionnaire were also left with the community coordinator.

NBDOT intends to continue in its open communication with the six communities. NBDOT has offered to establish a Maliseet Nation Liaison Committee composed of an individual from each community and one full time Aboriginal Coordinator, who will be part of the highway project team. The proposal is that the six community representatives will meet with the Aboriginal Coordinator a minimum of four times per year, perhaps monthly initially, during the construction of the Project in order to discuss issues related to the construction of the highway. Visits to the RoW could be arranged during construction (for safety reasons, members of the public are not encouraged to visit the RoW unaccompanied by Project personnel). NBDOT has offered to pay for the participant's time and cover any expenses related to this Liaison Committee.

5.9.5.3 Operation

Table 5.9.3 Environmental Effects Assessment Matrix for Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons

Environmental Effects Assessment Matrix **Valued Environmental Component: CURRENT USE OF LAND AND RESOURCES FOR TRADITIONAL PURPOSES BY ABORIGINAL PERSONS** **Phase : Operation**							
Project Activity	**Potential Adverse Environmental Effects**	**Mitigation**	**Evaluation Criteria for Assessing Environmental Effects**				
			Magnitude	**Geographic Extent**	**Duration/Frequency**	**Reversibility**	**Ecological/Socio-Cultural and Economic Context**
Winter Safety	Change in Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons (A)	• Surface water mitigation described in section 5.3	1	2	2/2	R	2
Proposed TCH Presence	Change in Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons (A)	• Fish and Fish Habitat, Vegetation, Wetlands, and Wildlife, and Archaeological Resources Mitigation as described in Sections 5.4, 5.5, 5.6, 5.7, and 5.10	2	3	5/6	I	2

Table 5.9.3 Environmental Effects Assessment Matrix for Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons

Environmental Effects Assessment Matrix
Valued Environmental Component: CURRENT USE OF LAND AND RESOURCES FOR TRADITIONAL PURPOSES BY ABORIGINAL PERSONS
Phase : Operation

Project Activity	Potential Adverse Environmental Effects	Mitigation	Evaluation Criteria for Assessing Environmental Effects				
			Magnitude	Geographic Extent	Duration/Frequency	Reversibility	Ecological/Socio-Cultural and Economic Context

KEY

Magnitude:
1 = Low: *e.g.*, short-term change in Aboriginal land use and access to resources, localized
2 = Medium: *e.g.,* short to medium-term change in Aboriginal land use and access to resources and may extend to the areas adjacent to the Project footprint.
3 = High: *e.g.,* long-term change in Aboriginal land use and access to resources and may extend well outside the Project Footprint

Geographic Extent:
1 = <10 ha (0.1 km²)
2 = 0.1-1 km²
3 = 1-10 km²
4 = 11-100 km²
5 = 101-1000 km²
6 = >1000 km²

Duration:
1 = < 1 month
2 = 1-12 months
3 = 13-36 months
4 = 37-72 months
5 = > 72 months

Frequency:
1 = < 11 events/year
2 = 11-50 events/year
3 = 51-100 events/year
4 = 101-200 events/year
5 = >200 events/year
6 = continuous

Reversibility:
R = Reversible
I = Irreversible

Ecological/Socio-cultural and Economic Context:
1 = Relatively pristine area or area not adversely affected by human activity.
2 = Evidence of adverse environmental effects.

N/A = Not Applicable
(A) = adverse
(P) = positive

Winter weather requires that, in the interests of safety, all public roads be salted in order that the driving surface is kept free of snow and ice. Adverse environmental effects resulting from the Project relating to the quality of surface water as a result of road salt are discussed in detail in Section 5.3 and are considered not significant. A range of mitigation measures has been proposed in Section 5.3 to minimize the potential environmental effects on Surface Water.

The presence of the highway will obviously prevent any Current Land and Resource Use for Traditional Purposes by Aboriginal Persons within the RoW. However, it is anticipated that activities, such as hunting, fishing and gathering, will simply be displaced to areas immediately adjacent to the proposed RoW. In the case of fishing, for example, this activity can easily be accommodated either up or down stream of the RoW and in the case of large bridge structures, accommodated under the bridge following the completion of construction activities. No adverse environmental effects to any animal, bird or plant populations are anticipated as a result of this Project with the implementation of the mitigation measures discussed in Section 5.4, 5.5, 5.6, and 5.7. The only potential environmental effect on Wildlife as a result of the presence of the highway will be on their movement across the area, which in some locations will be blocked by the highway. This issue will be addressed by the installation of wildlife fencing and

the provision of wildlife crossing structures at various locations along the highway (these locations will be determined in conjunction with NBDNR). No traditional habitation sites were identified within the RoW during the archaeological resources survey of the RoW. Mitigation measures to address any concerns should an unknown pre-contact archaeological site be encountered during construction are discussed in Section 5.10. Adverse environmental effects from the Project relating to the presence of the highway are considered not significant.

5.9.6 Accidents, Malfunctions and Unplanned Events

Table 5.9.4 Environmental Effects Assessment Matrix for Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons

Environmental Effects Assessment Matrix **Valued Environmental Component: CURRENT USE OF LAND AND RESOURCES FOR TRADITIONAL PURPOSES BY ABORIGINAL PERSONS** **Phase: Accidents, Malfunctions and Unplanned Events**							
Project Activity	**Potential Adverse Environmental Effects**	**Mitigation**	**Evaluation Criteria for Assessing Environmental Effects**				
			Magnitude	**Geographic Extent**	**Duration/Frequency**	**Reversibility**	**Ecological/Socio-Cultural and Economic Context**
Construction	Change in Current use of Land and Resources for Traditional Purposes by Aboriginal Persons (A)	• Fish and Fish Habitat, Wetland, and Archaeological and Heritage Resources Mitigation as described in Sections 5.4, 5.6 and 5.10 • Surface Water mitigation described in section 5.3	1	1	1/1	R	2
Operation	Change in Current use of Land and Resources for Traditional Purposes by Aboriginal Persons (A)	• Fish and Fish Habitat, Wetland, and Archaeological and Heritage Resources Mitigation as described in Sections 5.4, 5.6 and 5.10 • Surface Water mitigation described in section 5.3	1	1	1/1	R	2

Table 5.9.4 Environmental Effects Assessment Matrix for Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons

Environmental Effects Assessment Matrix
Valued Environmental Component: CURRENT USE OF LAND AND RESOURCES FOR TRADITIONAL PURPOSES BY ABORIGINAL PERSONS
Phase: Accidents, Malfunctions and Unplanned Events

Project Activity	Potential Adverse Environmental Effects	Mitigation	Evaluation Criteria for Assessing Environmental Effects				
			Magnitude	Geographic Extent	Duration/Frequency	Reversibility	Ecological/Socio-Cultural and Economic Context

KEY

Magnitude:
1 = Low: *e.g.*, short-term change in Aboriginal land use and access to resources, localized
2 = Medium: *e.g.,* short to medium-term change in Aboriginal land use and access to resources and may extend to the areas adjacent to the Project footprint.
3 = High: *e.g.,* long-term change in Aboriginal land use and access to resources and may extend well outside the Project Footprint

Geographic Extent:
1 = <10 ha (0.1 km²)
2 = 0.1-1 km²
3 = 1-10 km²
4 = 11-100 km²
5 = 101-1000 km²
6 = >1000 km²

Duration:
1 = < 1 month
2 = 1-12 months
3 = 13-36 months
4 = 37-72 months
5 = > 72 months

Frequency:
1 = < 11 events/year
2 = 11-50 events/year
3 = 51-100 events/year
4 = 101-200 events/year
5 = >200 events/year
6 = continuous

Reversibility:
R = Reversible
I = Irreversible

Ecological/Socio-cultural and Economic Context:
1 = Relatively pristine area or area not adversely affected by human activity.
2 = Evidence of adverse environmental effects.

N/A = Not Applicable
(A) = adverse
(P) = positive

The type of accident envisioned that could have an adverse environmental effect on this VEC is the spill of a contaminant or a toxic substance into a wetland or watercourse. While a major spill in one of these areas could have significant adverse environmental effects, an accident of this nature is considered unlikely. Adverse environmental effects on Surface Water, Fish and Fish Habitat, Wetlands, and Archaeological and Heritage Resources resulting from an accident, malfunction or unplanned event during the Project are discussed in detail in Sections 5.3, 5.4, 5.6, and 5.10 of this document and are not considered significant. A range of mitigation options for the environmental effects to Surface Water, Fish and Fish Habitat, Wetlands, and Archaeological and Heritage Resources are discussed in detail in Section 5.3, 5.4, 5.6 and 5.10.

5.9.6.1 Determination of Significance

Table 5.9.5 evaluates the significance of potential residual environmental effects resulting from the interaction between Project activities and Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons, after taking into account any proposed mitigation. The table also considers the level of confidence of the study team in this determination and the likelihood of potential environmental

effects. The residual environmental effects are considered not significant for all Project phases. A potentially major hazardous material spill for the Project would be considered a significant accident however, is viewed as unlikely to occur. It is anticipated that NBDOT's willingness to continued communication with the Aboriginal communities would provide an opportunity to manage and mitigate potential adverse environmental effects that are identified in respect of the Project.

Based on this analysis, the residual environmental effects of the Project on the Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons VEC are rated as not significant, with the exception of Accidents, Malfunctions, and Unplanned Events that are related to fish and fish habitat. Although it is possible for an accident to occur that could damage fish habitat, or result in fish mortality, the likelihood of an event with a magnitude great enough to result in a significant residual adverse environmental effect is considered very low.

Table 5.9.5 Residual Environmental Effects Summary Matrix for Current use of Land and Resources for Traditional Purposes by Aboriginal Persons

Residual Environmental Effects Summary Matrix
Valued Environmental Component: CURRENT USE OF LAND AND RESOURCES FOR TRADITIONAL PURPOSES BY ABORIGINAL PERSONS

Phase	Residual Environmental Effects Rating*	Level of Confidence	Likelihood	
			Probability of Occurrence	Scientific Certainty
Construction	NS	3	1	2
Operation	NS	3	1	2
Maintenance	N/A	N/A	N/A	N/A
Accidents, Malfunctions and Unplanned Events	S	3	1	3
Project Overall	NS	3	1	2

Key:

Residual environmental Effect Rating:
S = Significant Adverse Environmental Effect
NS = Not-significant Adverse Environmental Effect
P = Positive Environmental Effect

Level of Confidence
1 = Low Level of Confidence
2 = Medium Level of Confidence
3 = High Level of Confidence

Probability of Occurrence: based on professional judgement

1 = Low Probability of Occurrence
2 = Medium Probability of Occurrence
3 = High Probability of Occurrence

Scientific Certainty: based on scientific information and statistical analysis or professional judgement
1 = Low Level of Confidence
2 = Medium Level of Confidence
3 = High Level of Confidence
N/A = Not Applicable
*As determined in consideration of established residual environmental effects rating criteria.

5.9.7 Monitoring and Follow-up

In order to keep the lines of communication open between NBDOT and the Maliseet First Nation communities it is recommended that, in consultation with the six Maliseet Chiefs, the Maliseet Nation Liaison Committee be established and that NBDOT create and fill the position of the Aboriginal Coordinator. This effort can only accomplished if there is the desire and cooperation of the six Maliseet

communities. While NBDOT will be the catalyst for this effort, the ability for it to function properly and provide meaningful information to the communities must come from within the communities and their Chiefs.

NBDOT is committed to ongoing monitoring and, where practical, mitigation of issues raised and potential adverse environmental effects as a result of the Project on the current use of land and resources for traditional purposes that are identified by the Aboriginal Community throughout the construction of the Project.