# Fish Habitat & Electrofishing results for Sheldrake Lake Tributary

This document contains pages extracted from

Class I Environmental Impact Assessment Highway 113 Project
November 13, 2009
Submitted to: Nova Scotia Department of Transportation and Infrastructure
Renewal 08-9611-1000
Submitted by: Dillon Consulting Limited

The pages were extracted from this public NSE document for use by the Woodens River Watershed Environmental Organization (WRWEO – wrweo.ca)

The extracted pages are:

- **Pages 1-19 from the main report** (NSE file: Hwy113.2009.EA.Report.pdf)
- **Section 9-11 on Fish and Fish Habitat**; Pages 186 – 196 from the main report, (NSE file: Hwy113.2009.EA.Report.pdf)
- **Figure 9-4, showing location of tributary and sampling area** (NSE file: Hwy113.2009.EA.Report.Fig_9-4_Aquatic_Env_.pdf)
- **NS Stream Data Sheet for Sheldrake Lake Tributary** from Appendix B5 (NSE file Hwy113.2009.EA.Report.Appendix_B5.pdf)
- **Surface Water Assessment for Sheldrake Lake Tributary** Page 1&2 from Appendix F (NSE file: Hwy113.2009.EA.Report.Appendix_F.pdf

The original documents are posted at http://www.gov.ns.ca/nse/ea/
(Search for documents listed under Highway 113 or the specific files listed above.)

In referencing any of these materials, please cite the original reports.

- DP for WRWEO, Jan. 1, 2011

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November 2009

# Environmental Impact Assessment Report

# HIGHWAY 113

Submitted by:

NOVA SCOTIA

Transportion and Infrastructure Renewal

DILLON CONSULTING

# Class I Environmental Impact Assessment
# Highway 113 Project

*November 13, 2009*

*Submitted to:*
**Nova Scotia Department of Transportation and Infrastructure Renewal**

**08-9611-1000**

*Submitted by:*
**Dillon Consulting Limited**

November 13, 2009

NOVA SCOTIA TRANSPORTATION
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ATTENTION: Mr. Phil Corkum, P.Eng.

***Highway 113–Environmental Assessment Report***

Please find enclosed an Environmental Assessment Report for the proposed Highway 113. The report addresses the Terms of Reference issued by Nova Scotia Environment and Labour (now Nova Scotia Environment) on October 16, 2006 as well as issues raised by regulatory agencies, environmental non-governmental organizations, and the public with respect to the project.

If you have any questions on the report, do not hesitate to contact me.

Yours truly,

DILLON CONSULTING LIMITED

Robert Young, M.Sc., P.Geo.
Project Manager

RBY:jep
Our File: 08-9611

# EXECUTIVE SUMMARY

Nova Scotia Transportation and Infrastructure Renewal (TIR) is proposing to construct a new twinned (four lane, wide median) highway (Highway 113) between Highway 103 near Exit 4 and Highway 102 near Exit 3 to improve the efficiency of travel between Highways 103 and 102 as well as to relieve increasing congestion on Hammonds Plains Road. Highway 113 will be a 9.9 km highway with interchanges located on Highway 103 west of Exit 4; at the Sheldrake Heights connector road (a half-diamond interchange); at Kearney Lake Road; and at Highway 102 west of Exit 3. The overall goal of the proposed highway is to allow through traffic from Highway 103 to Highway 102 (and vice versa) to bypass the Halifax urban core, thereby reducing travel time and reducing traffic volumes on the inner reaches of Highway 102 and Highway 103 and the Hammonds Plains Road. Nova Scotia Transportation and Infrastructure Renewal commenced needs assessment and initial planning activities for Highway 113 in 1998.

## *Need for the Project*

The traffic which presently passes between Highway 103 along the South Shore and Highway 102 north of Bedford will experience the most benefit from the shorter route length, faster operating speeds, and higher levels of service along Highway 113. Commercial traffic traveling between Highways 102, Highway 103, and the proposed Highway 107 extension (east of Highway 102 and west of Highway 118) will similarly benefit from the traffic improvements resulting from Highway 113. While construction is not anticipated to happen for many years, early planning for the highway is important as the area has been developing quickly and possible routes for a future highway were becoming increasingly limited. Without TIR proactively preserving the corridor the majority of land required for the highway would have likely been privately developed making future highway construction very disruptive and expensive. The majority of the property necessary for the highway has now been acquired by TIR.

Highway 113 is consistent with the Halifax Regional Municipality's Municipal Planning Strategy, which indicates that the need for such a facility would be necessary to accommodate future growth areas such as Upper Tantallon, Hubley, Bedford West and the lands adjacent to Hammonds Plains Road in the vicinity of the Halifax peninsula. The plan identifies Highway 113 as a "Future Potential Project" that may be required beyond the Plan's 25 year horizon.

***Alternatives***

Alternatives to the construction of a new highway in this location include: implementing other modes of transportation; upgrading Hammonds Plains Road to 100 series highway standards; or do nothing. The alternatives were not deemed as sufficient or viable to address growing traffic volumes and to improve the efficiency in commercial traffic movement.

The chosen alignment takes into consideration a number of objectives: minimizing intrusion into crown lands; maintaining a balance of separation distances between Ragged Lake and Blue Mountain Hill; minimizing wetland impacts; and on-going cooperation with NSE, NSDNR, and HRM on highway planning and design.

***Previous Environmental Assessment Activities***

TIR had previously completed a Registration Document in 2000 in accordance with the Environmental Assessment Regulations in force at that time (Washburn and Gillis, 2000). The Registration Document was supplemented with 3 addenda issued between 2001 and 2004 to address specific questions regarding project funding; landowner discussions; wildlife movement and corridors; distribution of Mainland moose in the study area; encroachment on Blue Mountain Hill; and the deletion of a proposed connector road at the west end of the proposed highway (it was subsequently constructed). In addition, TIR completed a Focus Report in 2006 that examined how the proposed highway fit with Halifax Regional Municipality's Regional Planning Strategy (now Municipal Planning Strategy). On July 10, 2006 the Minister of Environment and Labour determined that an Environmental Assessment Report was required in accordance with Part IV of the Environment Act based on a review of the Focus Report and input received from provincial and federal agencies and the public. Subsequently, Nova Scotia Environment and Labour (now Nova Scotia Environment [NSE]) issued the Terms of Reference for this Environmental Assessment Report. The environmental assessment incorporates the findings and conclusions of this previously completed work and specifically addresses the requirements of the Terms of Reference.

***Environmental Assessment Results***

The overall approach taken for this environmental assessment was to focus on project-specific issues or concerns in a manner that is consistent with the NSE Terms of Reference. As a result this environmental assessment has been prepared following an 'issues based' framework that

focuses the assessment of impacts on relevant project-specific issues and environmental concerns raised by the public, regulatory agencies and the environmental assessment team.

The issues-based methodology takes into account issues of concern raised by the public and regulatory agencies. The issues to be addressed are identified at the early stages of the assessment and it is those issues that were emphasized in the completion of the EA. This allows the EA to focus on not only VECs as identified in the Terms of Reference but also on important project and site specific issue. Prominent issues raised and their resolutions are summarized below.

*Impacts on mainland moose and deer and fragmentation/impacts on existing ecological integrity of the area (includes Blue Mountain/Birch Cove Lakes)*

Studies by NSDNR on the spatial distribution and abundance of Mainland Moose have shown that there is a small population that exists on Chebucto Peninsula but several winter aerial and radio-tracking studies have shown that this small population limits its range to the Chebucto Peninsula and the range would not be fragmented by the proposed highway as the population does not usually venture close to the proposed alignment or the Blue Mountain/Birch Cove Lakes Wilderness Area. TIR will provide a structure between Maple and Fraser Lake with an opening large enough for large mammals to pass. Therefore, impacts on mainland moose and deer are not significant. In addition, the use of open span culverts will allow for movement of small mammals and herpetiles. Hydraulic connectivity of wetlands crossed by the highway will be maintained.

*Surface Water Quality and Quantity*

It is predicted that there would be a low level of significance for this issue as erosion and sediment control measures will be implemented during construction and maintained throughout the construction period. These will be identified in Environmental Control Plans and Culvert Mitigation Plans and will consistent with the Generic EPP. Measures will be maintained through all seasons. Ongoing monitoring of upcoming weather conditions will occur to prepare for specific events.

*Wetlands*

There are no significant residual effects that are identified for wetlands that cannot be avoided or mitigated based on TIR working with NSE, DFO, NSDNR and EC staff to finalize appropriate compensation measures for wetlands within the footprint of the highway. TIR has minimized impacts by alterations made to the alignment requested by NSDNR. Where impacts to wetlands are unavoidable TIR will prepare detailed designs for the proposed work and submit wetland alteration approval applications to NSE.

*Priority and At Risk Species and Migratory Birds*

It is predicted that effects on these species are not significant and no significant residual effects have been identified for priority and at risk species that cannot be avoided or mitigated. TIR will work with NSDNR staff to finalize appropriate management planning for the Southern Twayblade on completion of detailed designs for the proposed highway. Construction work will be scheduled to be seasonally sensitive to nesting and migratory birds

*Groundwater*

Water wells within 300 m of the alignment are drilled wells and cased to bedrock. As a result run-off from highway construction and maintenance is not expected to impact well water. Should wells be impacting by blasting, TIR will replace the well. The effects of the project on groundwater are not significant.

*Fish Habitat Assessment of Proposed Crossings*

TIR will implement mitigation measures consistent with the protection of surface water quality noted above including site specific Erosion and Sediment Control measures. In addition, habitat loss associated with watercrossings will be addressed through DFO's HADD process or equivalent at the time of design. As a result, habitat loss is not considered significant.

*Traffic/Transportation*

The Highway 113 project will improve the traffic conditions of the area, primarily on Highway 102, Highway 103, and Route 213 (Hammonds Plains Road). The project will provide a safer and more efficient transportation corridor for commuters as well as for trucking goods and services. Therefore, the volume of traffic projected to be diverted to the new Highway 113 will reduce traffic demands on Hammonds Plains Road and other surrounding facilities in the future.

This is beneficial as the projected transportation demands along existing facilities are expected to exceed capacity in the near future. The project will reduce or delay the need for widening and upgrading of other roadways.

*Land Use and Socio-Economic Considerations*

The proposed alignment will likely have both positive and negative effects to property values along the alignment, depending on the existing and potential land use for property. For example, a negative effect to property values may occur as a result of the presence of the highway in the vicinity of residential dwellings. TIR will conduct further investigation of noise effects of the highway during the design phase of the project and will implement appropriate mitigation measures to minimize impacts on property value, if required. Conversely, there are expected to be positive effects associated with the shorter travel time or increased access resulting from the new alignment where interchanges are close by. For example, commercial property values in the Atlantic Acres Business Park could potentially increase in value due to improved access to the provincial highway network. In addition, there will be no access from the highway to adjacent private landholdings or crown lands and therefore the highway will not act as a catalyst for future development in these areas.

*Air Quality*

The construction phase of the project will have limited negative effects on local air quality through the potential for dust generation. Implementation of dust control practices will minimize these effects on air quality. There is expected to be an improvement in air quality with the reduction of congestion on existing routes. Therefore the effects of the project on air quality are considered not significant.

*Public Consultation*

As part of the planning process for the proposed Highway 113 and throughout the environmental assessment process, including during the preparation of this environmental assessment report, the public and regulators have had opportunities to voice their concerns regarding the Project and the potential impacts. All of the concerns and items brought forward during these consultations were noted and reviewed during this study. TIR is committed to the development of a Community Liaison Committee (CLC) when a decision is made to proceed with the project. The CLC will be composed of representatives from the community; HRM regional planning, traffic and

transportation, parks; environmental interest groups; and watershed advisory committees. This will include third party facilitation to coordinate communication to and from the CLC with the broader community. TIR expects that representatives of NSE and NSDNR will also be involved in the CLC by providing information on provincial programs and activities relevant to the highway.

***Conclusion***

Through careful design and planning, engagement with the public, stakeholders and regulatory authorities and the use of TIR's Generic EPP, combined with application of appropriate site specific mitigation measures. TIR will address potential adverse environmental effects and reduce the predicted adverse impacts to a low level of significance through project planning and implementation. In summary therefore, the proposed Highway 113 Project has important overall social and safety benefits, both locally and regionally. This environmental assessment demonstrates that any adverse effects or significant environmental effects of the project can be adequately mitigated through compliance with the proactive planning and mitigation measures described in this environmental assessment.

## List of Acronyms

| | |
|---|---|
| AADT | Annual Average Daily Traffic |
| AB | Aggregate Base |
| AC | Asphalt Concrete |
| ACCDC | Atlantic Canada Conservation Data Centre |
| ADR | Alternate Dispute Resolution |
| AMD | Acid mine drainage |
| ARD | Acid Rock Drainage |
| ASB | Aggregate Subbase |
| BMPs | Best Management Practices |
| CDWQ | Canadian Drinking Water Quality |
| CEAA | *Canadian Environmental Assessment Act* |
| CEPA | Canadian Environmental Protection Act |
| $CH_4$ | Methane |
| CLC | Community Liaison Committee |
| CMP | Culvert Mitigation Plan |
| $CO_2$ | Carbon dioxide |
| COR | Conditions of Release |
| CWS | Canadian Wildlife Service |
| DFO | Department of Fisheries and Oceans (Federal) |
| EA | Environmental Assessment |
| EC | Environment Canada |
| ECP | Environmental Construction Plan |
| ECM | Environmental Compliance Monitoring |
| EEM | Environmental Effects Monitoring |
| EMP | Environmental Management Plan |
| EPP | Environmental Protection Plan |
| ESC | Erosion and Sediment Control |
| FA | *Canadian Fisheries Act* |
| GHG | Greenhouse Gas |
| GPS | Global Positioning System |
| HMVK | Million vehicle-kilometres |
| HRM | Halifax Regional Municipality |
| HRWC | Halifax Regional Water Commission |
| IRM | Integrated Resource Management |
| MBCA | *Migratory Birds Convention Act* |
| NDSI | Noise Depreciation Sensitivity Index |
| NMHC | Non-methane hydrocarbons |
| NOx | Nitrogen oxides |
| $N_2O$ | Nitrous oxide |
| NSE | Nova Scotia Department of the Environment |

| | |
|---|---|
| NSESA | *Nova Scotia Endangered Species Act* |
| NSNR | Nova Scotia Department of Natural Resources |
| NSPI | Nova Scotia Power Inc. |
| TIR | Nova Scotia Department of Transportation and Infrastructure Renewal |
| NWPA | *Canadian Navigable Waters Protection Act* |
| PCC | Portland Cement Concrete |
| PID | Property Identifier |
| PM | Particulate matter |
| ROW | Right-of-Way |
| SARA | *Canadian Species at Risk Act* |
| SMP | Salt Management Plan |
| SOx | Sulphur oxides |
| SPP-HD | Special Places Program – Heritage Division |
| TAC | Transportation Association of Canada |
| TC | Transport Canada |
| TOR | Terms of Reference |
| TSS | Total Suspended Solids |
| VEC | Valued Ecosystem or Environmental Component |
| VOCs | Volatile organic compounds |

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No significant residual effects are identified for wetland VECs that cannot, or will not, be avoided/mitigated based on TIR working with NSE, DFO, NSDNR and EC staff to finalize appropriate environmental management planning. This management planning will be done on completion of detailed designs for the proposed work and submission of wetland alteration approval applications. For example, the compensation associated with wetland alteration approval applications would be considered as "*other acceptable means*" under the definition in the TOR which states that "…*those adverse effects or significant environmental effects which cannot or will not be avoided or mitigated through the application of environmental control technologies or* ***other acceptable means****".*

#### *9.10.3.1 Follow-up and Monitoring*

Follow-up monitoring is limited to the compensation project(s) to confirm meeting of "no net loss" policy and long-term stability. Additional follow-up with respect to invasive species will be implemented as per TIR's management plan.

## 9.11 Fish and Fish Habitat

### *9.11.1 Existing Environment*

**Fish Habitat Assessment Methodology**

Fish habitat was examined within the ROW and downstream within a potential zone of influence of the study ROW. The criteria for determining the zone of influence of the project on fish habitat depends on the watercourse characteristics. For small to moderate streams typical of the study area, potential upstream effects are expected to be limited to 50 m upstream of the footprint and downstream effects to be generally attenuated within 100 m of the ROW.

Streams were initially identified from mapping, aerial photographs and DFO data. Fish habitat assessments were conducted following DFO protocols to identify stream size, habitat character, cover and bottom composition at proposed watercourse crossings. Habitat data evaluated potential for spawning, rearing, nursery, available food supply and migration areas. Water chemistry data was collected as noted in the Surface Water Section.

Electrofishing was conducted on selected watercourses in the fall of 2008 using spot survey techniques to identify presence/absence of fish species and confirm previous EA findings. The

relative distribution, abundance and composition of valued fish species were assessed. Individual's life stage and general health was noted.

**Results**

Fish and their habitat are protected under the federal *Fisheries Act*. Aquatic habitat, as defined by DFO's Fish Habitat Policy (1996), includes environmental components "on which fish depend, directly or indirectly, in order to carry out their life processes".

Watercourses along the ROW (listed in the Surface Water section along with known fish species), flow to the Atlantic Ocean via St. Margarets Bay, Shad Bay and the Bedford Basin (NSEL watershed IEJ – see Figure 9-4).

The study area primarily supports recreational fishing. The downstream marine environment in Bedford Basin also primarily supports recreational fishing, although limited commercial lobster fishing has occurred. The Shad Bay and St. Margaret's Bay marine environment supports commercial lobster as well as groundfish and bait fisheries. The river mouth at Shad Bay, Woodens River and Bedford Basin are closed to shellfish harvest due to bacterial contamination. The remainder of Shad Bay and St. Margaret's Bay are open to shellfish harvest.

No aquatic federal SARA or NSESA species are known for the study area. One federally COSEWIC listed species is present:

- American eel (COSEWIC, 2008; Special Concern) – expected in most permanent watercourses.

Provincially sensitive priority species identified for the study area include:

- Brook trout (NSDNR sensitive) – expected in most permanent watercourses; and
- Gaspereau (NSDNR sensitive) – although not observed during 2008, were captured in 2000 field surveys in the Fraser Lake/Maple Lake connector area. Gaspereau run up the Nine Mile River system.

The NSDNR Significant Habitat Database identifies Fraser Lake and Maple Lake system as habitat for species of concern (brook trout, gaspereau) and the Woodens River system as at risk species habitat (Atlantic salmon). Salmon were not captured in 2000 or 2008 field investigations. Anadromous smelt were historically known for the Paper Mill Lake Run. The dam at the mouth of Papermill Lake may prevent upstream movement of smelt.

Table 9-43 summarizes key features of the major crossings and implications for fish habitat and passage requirements. Appendix F provides physical and flow information for each proposed crossing and information on habitat and fish data specific to each of the watercourses is provided in Appendix B5.

**Table 9-43 Summary of Major Watercourse Crossings**

| WC No. | Watercourse (RFP ID)/ Wetland | Habitat Character | Key Habitat within 150 m corridor | Electrofishing Results | HADD | Passage Required |
|---|---|---|---|---|---|---|
| 1 | Tributary to Sheldrake Lake | Existing Culvert | Poor adult brook trout habitat; fair eel habitat | 1999 – 3 American eel<br>2008 – 1 American eel upstream | NA | NA |
| 2 | Tributary between Maple and Fraser Lakes | Depends on actual location; Stillwater to Riffle/Run | Poor to fair adult brook trout; poor to fair salmonid rearing; fair eel habitat | 1999 – 4 brook trout, 14 American eel, 1 white sucker, 1 Gaspereau, 9 banded killifish<br>2008 – 10 American eel | YES | YES |
| 3A | Fishers Brook | Riffle/ Stillwater | Fair to poor adult brook trout, eel (limited low flow access) | 1999- 2 brook trout<br>2008 – not fished (no flow or too deep) | YES | YES |
| 3B | Fishers Brook | Stillwater | Fair adult brook trout, eel | 1999-0<br>2008 – not fished (too deep) | YES | YES |
| 3C | Fishers Brook | Stillwater | Fair adult brook trout, eel | 1999-0<br>2008 – not fished (too deep) | YES | YES |
| 4 | Stillwater Run | Stillwater (and small Riffle/Run section) | Fair adult brook trout, eel | 1999-14 brook trout, 3 American eel<br>2008 – downstream brook trout, sucker and American eel; upstream killifish and eel; to deep to fish at crossing | YES | YES |
| 5 | Outlet of Ragged Lake | Stillwater | Fair adult brook trout, eel in Stillwater. | 1999 – 3 brook trout, 5 American eel, 15 9-spine stickleback<br>2008 - not fished (too deep) | YES | YES |

**Table 9-43 Summary of Major Watercourse Crossings (cont'd)**

| WC No. | Watercourse (RFP ID)/ Wetland | Habitat Character | Key Habitat within 150 m corridor | Electrofishing Results | HADD | Passage Required |
|---|---|---|---|---|---|---|
| 6 | Black Duck Brook | Riffle/Flat (Dry in summer) | Limited habitat (habitat present upstream and downstream) | 1999 – 0<br>2008 – 0 (brook trout captured upstream) | NO (if limited to dry section) | YES |
| 7 | Tributary to Kearney Run | Riffle/Flat | Limited habitat (seasonal potential for eels, minnows); intermittent upstream | 1999 – 0<br>2008 - 0 | YES (limited ) | NO |
| 8 | Tributary to Papermill Lake | Stillwater | Poor adult brook trout, eel | 1999 – 2 brook trout<br>2008 - 0 | YES | YES |

*brook trout -DNR yellow species, **American eel - COSEWIC Special Concern Species

Ten watercourse crossings were identified as having fish habitat, although Black Duck Brook and the tributary to Kearney Lake likely provide seasonal habitat at best. Generally, habitat was fair and reflects underlying low nutrient bedrock. Low populations of brook trout were present in most streams with habitat. Spawning habitat was generally limited at the crossing areas. Minnows, suckers and perch were identified in addition and may occur in other watercourses.

### *9.11.2 Impact Evaluation/Effects Assessment*

DFO's guiding principle when considering impacts to fish habitat is "No Net Loss" to preserve habitat and productivity. In order to satisfy the "No Net Loss" guiding principle, the habitat manager's first priority is to avoid or reduce the project's potential for Harmful Alteration, Disruption or Destruction (HADD) of habitat through routing and appropriate mitigation measures. If a HADD is still expected to occur and is justified, authorization is typically granted if appropriate compensation is available.

Potential effects to fish and fish habitat include both direct loss of habitat at the crossing location and indirect effects related to potential disturbances downstream of the crossing, particularly related to surface water quality. TIR has developed standard Environmental Protection procedures which target minimizing effects of potential surface water contaminants such as suspended sediments and winter maintenance runoff as well as following DFO guidelines for fish passage requirements in crossing structures. These procedures form the basis for mitigation

of downstream impacts. TIR follows DFO's hierarchical approach in attempting to avoid in-stream work where practical through structure design and construction options. Where fish habitat loss is unavoidable, TIR will work through the HADD process to appropriately compensate for habitat loss. Effects of accidents and malfunctions have been previously described in Section 7.10

#### *9.11.2.1 Construction*

The principal interactions between Project activities and fish habitat are associated with the construction phase of the Project and include:

- the habitat loss at the watercourse crossing locations as a result of culvert installations in the streambed;
- fish mortality associated with infrastructure installation at the watercourse crossings;
- earthworks, such as grubbing and stripping topsoil/overburden resulting in modified habitat due to shade loss, decreased slope stability and increased sedimentation and erosion into surface waters; and,
- the placement of excess material in stockpiles leading to increased erosion and sedimentation of waterbodies.

Erosion and siltation of fish habitat can adversely affect fish directly, or cause a degradation of habitat. These effects can be caused directly during crossing and disturbance of stream banks and substrate, or indirectly during adjacent work where soils or vegetation may be disturbed. Blasting, if required near stream crossings, can also harm fish and habitat. Blasting near stream crossings, if required, will be conducted according to Guidelines for use of Explosives in or Near Canadian Fisheries Waters (Wright and Hopky, 1998). Stream-crossings required by the Project will be subject to follow-up habitat assessments. A provincial Watercourse Alteration Approval (under the Environment Act) will be required as well as an Authorization under Section 35(2) of the Fisheries Act for the harmful alteration, disruption, destruction (HADD) of fish habitat pursuant to DFO's No Net Loss Policy. Stream crossings will be conducted according to all other applicable guidelines (e.g., maintaining water flow, fish passage, and implementing erosion control).Potential construction related interactions with fish habitat and proposed mitigation are outlined in Table 9-44.

**Table 9-44 Potential Project Interactions with Fish Habitat (Project TOR Section 9.10) - Construction**

| Project Interaction | Potential Effect | Mitigative Factor and Measure |
|---|---|---|
| Structure installation immediately adjacent to watercourses | Direct loss of fish habitat | Compensation to meet "no net loss" and monitoring of compensation effectiveness |
| | Potential for fish stranding or mortality during construction | Fish rescue during culvert construction |
| Clearing and grubbing, sub-grade placement, construction of access and service roads in alignment footprint up gradient of watercourses | Sediment effects such as abrasion of eyes and gill surfaces, inability to find food organisms, feed or find cover, exposure to predation | Timing of works in and adjacent to watercourses within designated the designated low flow construction windows to avoid sensitive periods for fish migration or spawning |
| | Degradation of habitat (water quality) due to sediment, acid rock drainage, or other contaminants both at the crossing and downgradient | Blasting is anticipated. If blasting is required near watercourses (not anticipated as watercourse crossings will primarily be in areas of fill.) DFO Blasting Guideline will be followed<br><br>Acid bedrock is not anticipated - If exposed bedrock shows iron staining (indicating possible dispersed iron pyrites) the rock will be tested for net acid generation and appropriate measures will be taken for removal and disposal of the bedrock removed. |
| | Sediment deposition may alter fish habitat by affecting spawning beds (fill the interstitial spaces in spawning gravel, reducing subsurface oxygen flow and negatively affecting egg development), rearing habitat, winter or summer refuge (infilling of deep pools used during summer for refuge from warmer water or in winter from ice) or by affecting food species (reducing the amount of invertebrate species in substrate) | Soils present are not highly erodible however on the steep slopes associated with the ravines the use of common material covered with rock will be used to minimize erosion potential |

**Table 9-44 Potential Project Interactions with Fish Habitat (Project TOR Section 9.10) – Construction (cont.)**

| Project Interaction | Potential Effect | Mitigative Factor and Measure |
|---|---|---|
| | | **Sediment and Erosion Control** implementation and monitoring as outlined in the Surface Water section including:<br>• Measures in-place prior to construction activity<br>• Minimize time soils exposed<br>Clearing to be restricted to construction area and minimal work space<br>• Daily work area stabilization<br>• Use of clean rock for riprap/armour stone/backfill<br>Contingency for predicted and unpredicted storm events:<br>• No equipment in watercourse unless "in the dry"<br>• Stabilized inlets and outlets<br>• No fording<br>Construction monitoring |
| Crossing structure design | Potential for barriers to fish passage | Use of clear span structures over fish habitat where practical. Meeting requirements for fish passage (DFO guidelines) |
| | Potential for loss of riparian habitat within the footprint | Restoration of riparian habitat and provision of culvert pools as required |
| Storm water control during clearing and grubbing, sub-grade placement, construction of access and service roads | Sediment effects and degradation of habitat (water quality) due to sediment or other contaminants | Timing of works in and adjacent to watercourses within designated t low flow construction windows to avoid sensitive periods for fish migration or spawning |

Indirect impacts are mitigated through the project EPP. General mitigation for watercourse crossing is identified in EPP Section 2.1. Erosion and sediment control measures are outlined in Section 3.2 of the EPP. The EPP details proper design and implementation, including monitoring of erosion and sediment control measures required to mitigate potential sediment impacts.

Table 9-45 identifies the watercourses where fish habitat loss is predicted based on current TIR design (footprint width x average stream width). This assessment is based on TIR s preliminary design and ultimate fish habitat protection will be based on TIR s final design and commitment

to compensation appropriate to the rules in place when the highway is constructed. Avoidance is not possible at these locations. Where possible TIR has redesigned its planned crossing methods to minimize habitat loss**.** Because of these unavoidable habitat losses, on confirmation from DFO that applications under the Section 35 (2) of the *Fisheries Act* will be required as the work will likely result in harmful alteration, disruption or destruction (HADD) of fish habitat, compensation proposals will be developed in consultation with DFO.

**Table 9-45 Project Footprints on Watercourses and Required Compensation**

| No | Watercourse | Project Activity | Estimated Maximum Footprint ($m^2$) | Estimated Required Compensation ($m^2$) {Assuming 3 to 1} |
|---|---|---|---|---|
| 1 | Tributary to Sheldrake Lake | culvert already constructed | NA | NA |
| 2 | Tributary between Maple and Fraser Lakes | bridge construction – expected to be clear span | NA | NA |
| 3A | Fishers Brook | culvert construction | 80 m by 7 m - 560 | 1680 |
| 3B | Fishers Brook | culvert construction | 60 m by 6 m - 360 | 1080 |
| 3C | Fishers Brook | culvert construction | 65 m by 10 m - 650 | 1950 |
| 4 | Stillwater Run | culvert construction | 90 m by 6 m - 540 | 1620 |
| 5 | Outlet of Ragged Lake | culvert construction | 100 m by 9 m - 900 | 2700 |
| 6 | Black Duck Brook | bridge construction - expected to be clear span | NA | NA |
| 7 | Tributary to Kearney Run | culvert construction | 70 m by 5 m - 350 | 1050 |
| 8 | Tributary to Paper Mill Lake | culvert construction | 500 m by 30 m - 15000 | 45000 |
| **TOTAL** | | | 18360 | 55080 |

### *9.11.2.2 Operation and Maintenance*

The principal interaction between the Project and fish habitat quality, beyond the construction phase and commissioning, is stormwater disposal throughout the operation of the drainage ditches. Ditching and culverts will be designed to manage surface drainage, based on the

drainage within the watershed. These will be designed to carry flows to the natural drainage network. A Stormwater Management Plan will be developed to prevent sediment-laden runoff from the Highway from entering streams. This plan will be designed to meet provincial requirements for surface runoff quality. Standard mitigation measures will be applied to minimize operation-related environmental effects on freshwater habitat in the Project area. Potential operational related interactions with fish habitat and proposed mitigation are outlined in Table 9-46.

**Table 9-46 Potential Project Interactions with Fish Habitat (Project TOR Section 9.10) - Operation/Maintenance**

| Project Interaction | Potential Effect | Mitigative Factor and Measure |
|---|---|---|
| Vegetation clearance and management immediately adjacent to watercourses | Potential impacts to downgradient habitat | Use of mechanical clearance only adjacent to fish habitat |
| Ditch or culvert maintenance immediately adjacent to watercourses | Contribution of sediment to downgradient habitat | TIR ditch maintenance mitigation program (EPP Section 2.1.2 and 3.0) |

The Project EPP provides general mitigation for potential indirect impacts to fish habitat (EPP Section 2.1.2) associated with operation/maintenance.

### *9.11.3 Significance*

A significant adverse effect for fish habitat is one that affects this VEC such that the CCME Guidelines for the Protection of Freshwater Aquatic Life are exceeded, or impacts of the project contravene section 36(3) of the Federal *Fisheries Act* or provisions of the Environment Act. A significant adverse effect is one that affects freshwater fish and fish habitat physically, chemically, or biologically, in quality or extent, to such a degree that there is a decline in the species diversity of the habitat. Such an effect would be reflected by a decline in abundance and/or change in distribution of one or more populations of species dependent upon that habitat. Natural recruitment would not return the population(s), or any populations or species dependent upon the habitat, to their former level within several generations. Table 9-47 identifies the likelihood of proposed project activities to cause significant adverse environmental effects to fish habitat after mitigation. Watercourses with direct impact will meet the policy of "no net loss" through provision of compensation in consultation with DFO. With mitigation, the effect of

**Table 9-47 Significance of Potential Effects on Fish Habitat (Project TOR Section 9.10)**

| | Magnitude | Geographic Extent | Duration and Frequency | Reversibility | Ecological Context | Significant Effect |
|---|---|---|---|---|---|---|
| **Construction Effects** | | | | | | |
| Direct loss of fish habitat | Moderate | Low | One time (or twice if lanes expanded in future) | Yes (with compensation plan) | Watercourse fish habitat not unique in area | No (with compensation plan) |
| Potential for fish stranding or mortality during construction | Low | Low | One time (or twice if lanes expanded in future) | Yes | Watercourse fish habitat not unique in area | No |
| Barriers to fish habitat | Low | Low | One time (or twice if lanes expanded in future) | Yes | Structure to maintain habitat and/or passage | No |
| Storm water control during clearing and grubbing, sub-grade placement, construction of access and service roads | Low | Low | One time (or twice if lanes expanded in future) | Yes | Water quality to meet provincial/ federal guidelines | No |
| Degradation of habitat (water quality) due to sediment. No acid rock drainage, or other contaminants. | Low | Low | One time (or twice if lanes expanded in future) | Yes | Water quality to meet provincial/ federal guidelines | No |
| **Operation/Maintenance Effects** | | | | | | |
| Impacts to downstream habitat from vegetation clearance and management immediately adjacent to watercourses (sedimentation, destabilization of riparian habitat) | Negligible | Negligible | Seasonally | Yes | Adjacent riparian habitat to be maintained | No |
| Sedimentation of downstream habitat from ditch or culvert maintenance immediately adjacent to watercourses | Low | Negligible | Less than once a year | Yes | Water quality to meet provincial/ federal guidelines | No |

Magnitude High-population affected; moderate – community affected; Low – individuals affected
Extent –High-at ecosystem level; Moderate – critical habitat level; Low-local

erosion and sedimentation on fish and fish habitat is considered not significant. Other indirect impacts are mitigated through measures outlined in Sections 2.1.2, 2.7 and 3.2 of the Project EPP. No significant residual effects are identified for fish VECs that cannot or will not be avoided/ mitigated based on TIR meeting DFOs requirement for "no net loss" of fish habitat through the HADD approval process. For example, the compensation associated with fish habitat compensation would be considered as "*other acceptable means*" under the definition in the TOR which states that "*…those adverse effects or significant environmental effects which cannot or will not be avoided or mitigated through the application of environmental control technologies or* ***other acceptable means****".*

#### *9.11.3.1 Follow-up and Monitoring*

Follow-up monitoring of water quality will include construction inspection and monitoring during construction as noted in Section 7.0 and in the EPP In addition, monitoring will be conducted in relation to compensation projects to confirm meeting of "no net loss" (to be detailed in the HADD application).

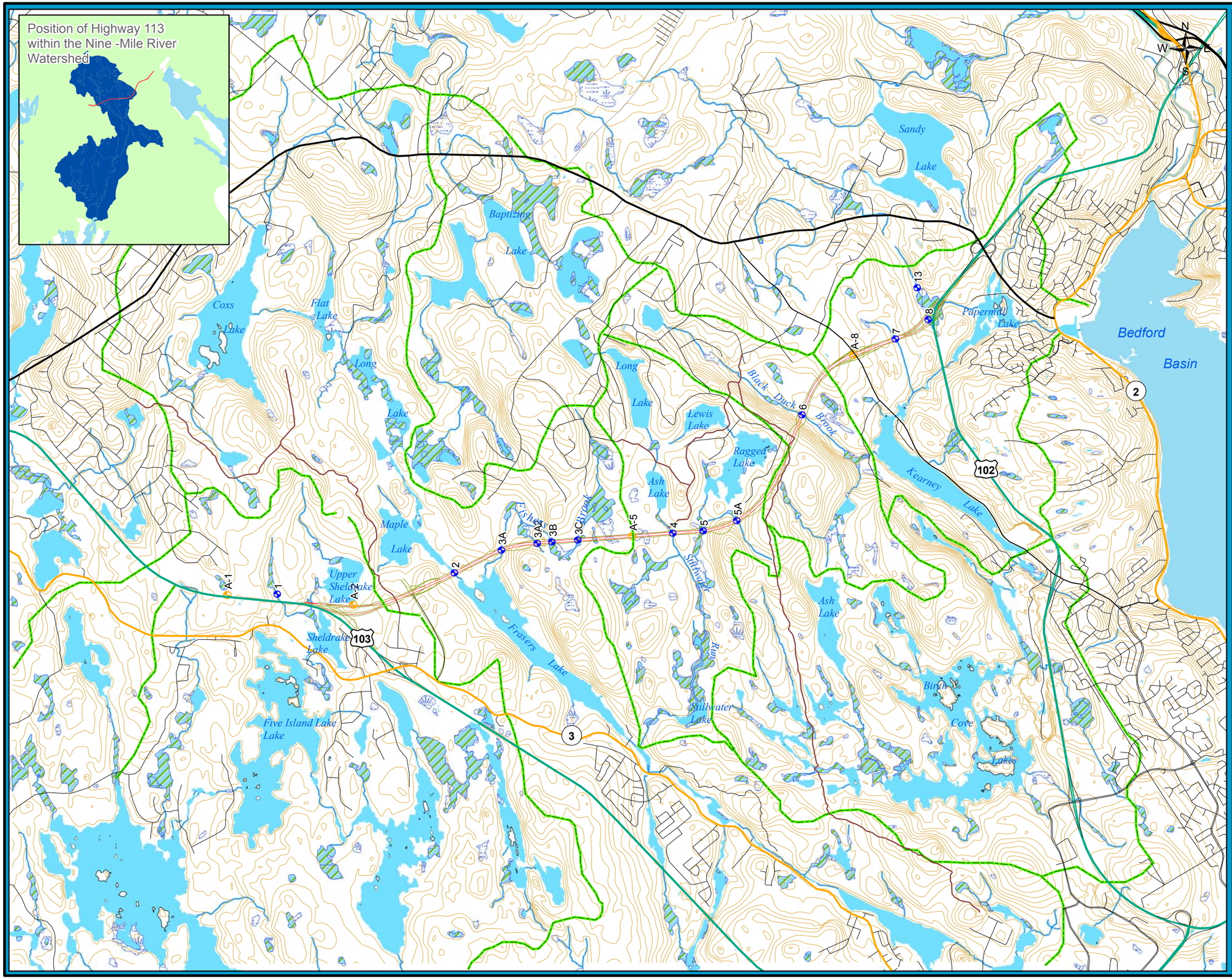
## 9.12 Bedrock and Surficial Geology

### *9.12.1 Existing Environment*

#### *9.12.1.1 Bedrock Geology*

The majority of the proposed Highway 113 study area is underlain by granites of the South Mountain Batholith, while the easternmost section is underlain by Goldenville Formation bedrock. The following is a more detailed discussion regarding these rock types in order of age (oldest to youngest) and the method of emplacement, as well as comments on land use and potential for acid rock drainage.

*Meguma Group – Goldenville Formation* - The Cambro-Ordovician Goldenville Formation is part of the Meguma Group and is comprised of greenish-grey metagreywacke bedrock (quartzite) with minor interbedded slates. It is present in the eastern portion of the study area (Highway 102 to the west side of Kearney Lake Road).



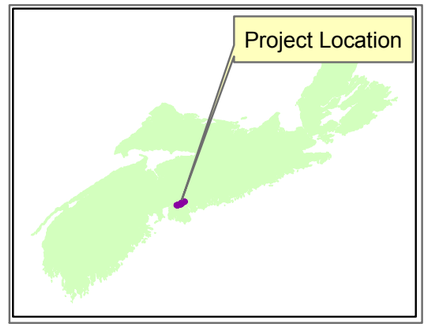

NOVA SCOTIA
Transportation and Infrastructure Renewal

# Highway 113
# Environmental Assesment Report

## Figure 9-4:
## Aquatic Environment

Watercourse crossing
- Derived from Flow Accumulation Model
- Derived from 10k Topo data

- Proposed Alignment
- Approximate Highway Footprint
- Watercourse
- Approximate Sub-watershed Boundaries
- Wetland from NSDNR database
- Wetland from 10K topo data
- Waterbody
- 100-Series Highway
- Trunk Highway
- Major Road/Street
- Local Road/Street
- Track or Trail




Meters

970 485 0 970 1,940

DILLON CONSULTING

Project Name: Highway 113 EA
Map Created By: SCM
Map Checked By: RBY
Date Created: June 2009
Date Modified:
File Path: G/GIS/089611 - Highway 113

Source:NSDNR, SNS&MR, NSTIR

## Nova Scotia Stream Data Sheet

from: Hwy 113 EA, Appendix B5

**Stream Name: Trib. To Sheldrake Lake**
**Personnel: KM,TN**
**Start Point: downstream of HWY 103**
**End Point: upstream of HWY 103**

**Stream No.: 1**
**Date: September 26, 2008**
**Stream Order: 1**
**NTS Coordinates: 20T 436679 494757 to 20T 436760 4948025**

| | | | | | | | | Substrate % | | | | | | | Site % | | | | | | | | | | Stream Banks | | | | | | | | | | Pool Criteria | | | Pool Tail Criteria | | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | | | | | | | | | Vegetation | | | | | | Erosion | | | | | | | | | | | | |
| Unit # | Unit Type | Stream Type | Chainage at Unit End (m) | Unit Length (m) | Average Width (m) | Avg. Depth Wet Width (m) | Bedrock | Boulders | Rock | Cobbles | Gravel | Sand | Fines | Embeddedness | Riffle | Run | Flat | Pool | Undercut Bank (%) | Overhanging Vegetation (%) | Large Woody Debris (m) | Shade (%) | Bare Ground | Moss | Grass | Shrubs | Coniferous Trees | Deciduous Trees | Stable | Bare Stable | Eroded | Depth (m) | Cover (%) | Stream (%) | Embeddedness | Median Substrate Size | Fines (%) | Length (m) | Turbulance (%) | |
| 1 | us | | | + | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | Upper Sheldrake Lake |
| 2 | us | Fl | +150 | 150 | 4 | 0.3 | | 25 | 15 | 10 | | 15 | 35 | h | | | 100 | | 5 | 5 | >10 | 75 | 35 | 15 | 5 | | 35 | 10 | 95 | | 5 | | | | | | | | | Fair adult habitat |
| 3 | us | Rf/Fl | 100 | 100 | 2 | 0.2 | 5 | 15 | 20 | 15 | 15 | 15 | 15 | m | 60 | | 40 | | 10 | 10 | >10 | 60 | 30 | 10 | 25 | 5 | 20 | 10 | 95 | | 5 | | | | | | | | | Poor habitat, Efish- 1 eel (30 cm forklength) |
| 4 | x | | -90 | 90 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | existing culvert |
| 5 | ds | Still | -390 | 300 | 4+ | 0.8 | | 20 | 10 | 10 | | 10 | 50 | m | | 100 | | | | 5 | | 20 | | | 15 | 65 | 5 | 15 | 100 | | | | | | | | | | | Backfrooded from lake; fair adult habitat |
| 6 | ds | | | + | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | Sheldrake Lake |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Unit 2

Unit 3

Unit 4

**Water Crossing 1 – Tributary to Sheldrake Lake**

The watercourse at the proposed crossing is a tributary between Upper Sheldrake Lake and Sheldrake Lake. The system collects surface flows from an area north of the existing Highway 103. The watershed for this water crossing is undeveloped as observed from aerial photography and property mapping.

At Highway 103 there is an existing 1800 mm diameter concrete culvert. This culvert will require an extension to accommodate the construction of a ramp from the proposed Highway 113. The existing culvert is in excellent shape and the ordinary high water mark appears to be only a little over half way up the culvert. The stream in the vicinity of the extension is approximately 10 m wide immediately upstream of the culvert. Large boulders are present at the inlet of the culvert, preceded by a pool and a defined channel. The predominant particle size upstream is boulder and the depth ranges from 25 mm in the riffles to greater than half a metre in the pool. The water shed is well vegetated with mixed forest.

| **Water Crossing 1<br>Tributary to Sheldrake Lake<br>Basin Characteristics Upstream of Proposed Crossing** | |
|---|---|
| **Parameter** | **Value** |
| Drainage Area | 1.65 $km^2$ |
| Drainage Length<br>[Channel Length] | 3.0 km<br>[2.6 km (including lake)] |
| Average Basin Slope | 2.0 % |
| Approximate Slope at Crossing Location | < 0.5 % |
| % Lakes | 15.2 % |
| Estimated 1:2 Year Flow | 1.01 $m^3/s$ |
| Estimated 1:100 Year Flow | 1.93 $m^3/s$ |

**Water Crossing 2 - Tributary between Maple Lake and Fraser Lake**

This water course is within the water shed of a large lake system that includes Cox' Lake, Flat Lake, Long Lake and Maple Lake. The tributary then discharges into Fraser Lake. A portion of this watershed includes residential development. It also includes small pockets of commercial establishments. The watercourse flows from the northwest of the proposed Highway 113 from Maple Lake into Fraser Lake.

*Channel at the proposed highway*

The watercourse is greater than 20 m wide at the approximate location of the highway crossing. The water had over topped the banks and was flooding the adjacent forested area. The water depth could not be estimated due to the width, darkness and depth of water in the stream. The visible stream bed was made up of predominantly boulder sized particles. There were no apparent pool/riffles along the watercourse.

The watershed in the area of the watercourse was mostly treed and moderately sloped. The large lakes directly up and downstream of the crossing directly affect the character of the stream.