

## 5.0 POTENTIAL EFFECTS ASSESSMENT

Potential effects to the Aquatic Environment include changes in surface water quality, habitat quantity, habitat quality or direct mortality to fish.

Changes to surface water quality include increased temperature and sedimentation. Water temperature can increase through the clearing of vegetation within the Project Area which results in increased exposure to sunlight. Impacts from sedimentation, as outlined in the EMM (NBDTI 2010), include:

- Suspended solids can abrade or clog fish gills causing stress to fish and even result in death;
- Deposition of sediment particles can settle in spawning beds smothering/killing incubating eggs and cause the area to be unsuitable for spawning in the future;
- Turbidity decreases the amount of sunlight that can reach the algae and aquatic plants which reduces the food supply for aquatic life;
- Sediment deposited in the watercourse channel can decrease the water depth which increases the water temperature and may result in unacceptable water temperature for fish habitat;
- Fish feeding may be affected by smothering of food sources (i.e., benthic invertebrates), or by reduced visibility in some species due to the turbidity level;
- Surface water quality can be impaired through runoff of sand and salt applied during winter maintenance;
- Erosion and sediment control structure failures resulting in deposits of sediment into watercourses during heavy runoff events; and
- Fires caused by hot exhaust systems coming into contact with fine fuels or sun reflecting off discarded glass bottles; can affect riparian vegetation and increase susceptibility to erosion.

Habitat quantity can be reduced through the construction of bridges or culverts including the footprint associated with the following:

- Construction of bridge abutments;
- Construction of bridge piers;
- Placement of riprap; and
- Placement of culverts.

Habitat quality can be reduced through vegetation clearing which can cause the following:

- A reduction in shaded areas;
- Removal of instream cover;
- Water temperature changes which can result in temperature tolerances of fish being exceeded causing stress, or habitat avoidance; and
- Increased bank erosion.

Direct mortality can occur from:

- Blasting activities, by the production of an underwater shock wave that bursts the fish's swim bladder;
- Construction and OMR activities associated with bridges and culverts (i.e., electrofishing);
- Hazardous spills caused by fuel leaks;
- Accidents involving vehicles containing dangerous goods; and
- Vehicle collisions, resulting in hazardous material spills entering a watercourse.

### **5.1 Construction Phase**

Construction activities could affect surface water quality, habitat quantity, habitat quality and/or cause direct mortality to fish. Clearing and grubbing, site preparation, road bed construction, surfacing and finishing and temporary ancillary facilities could reduce habitat quality and change surface water quality. Watercourse crossing construction could affect surface water quality, habitat quantity, habitat quality and/or cause direct mortality to fish.

### **5.2 Operation, Maintenance and Rehabilitation**

Operation, Maintenance and Rehabilitation activities could affect fish and fish habitat through summer and winter maintenance activities. Summer maintenance, consisting of activities such as patching, grading, ditch maintenance, vegetation control, and culvert and bridge maintenance, could impact habitat quantity, quality, surface water quality and/or cause direct mortality. Winter maintenance, consisting of activities such as snow removal and disposal, sanding and salting could also impact habitat quality and/or surface water quality.

### **5.3 Accidents, Malfunctions and Unplanned Events**

Accidents, malfunctions and unplanned events could change surface water quality, habitat quantity, habitat quality and/or cause direct mortality to fish during construction and OMR through spills, erosion and sediment control failures, fires and/or collisions.

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## **6.0 MITIGATION**

Mitigation measures to be implemented during Construction and OMR phases of the Project are outlined in Table 5, including measures outlined in NBDTI EMM (NBDTI 2010) as well as additional measures. In addition during the design phase, NB DTI will explore measures to maintain shallow open water habitat in the impacted areas around Black Brook as well as the Borrow Pit.

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**Table 4. Summary of mitigation measures to be implemented during construction, and operation, maintenance and rehabilitation of Glenwood Area to Miramichi Bypass.**

Project Phase	Summary of Potential Impacts	Applicable Section of NBDTI EMM		Additional Mitigation Measures
<p>Construction, including:</p> <ul style="list-style-type: none"> <li>• Clearing, grubbing;</li> <li>• Site preparation;</li> <li>• Road bed construction;</li> <li>• Watercourse crossings;</li> <li>• Surfacing and finishing; and</li> <li>• Temporary Ancillary facilities.</li> </ul>	<p>Changes in:</p> <ul style="list-style-type: none"> <li>• Surface water quality;</li> <li>• Habitat quantity; and</li> <li>• Habitat quality;</li> </ul> <p>In addition, direct mortality to fish may also occur.</p>	<p>5.1 Asphalt Concrete 5.2 Beaver and Beaver Dam Removal 5.3 Clearing 5.4 Culverts 5.5 Detouring 5.6 Dust Control 5.7 Erosion and Sediment Management 5.8.2 Blasting 5.8.3 Crushing, Screening and Washing 5.10 Fire Prevention and Contingency 5.11 Grubbing 5.12 Spill Management 5.13 Storage and Handling of Petroleum Products</p>	<p>5.14 Storage and Handling of other Hazardous Materials 5.15.1 Structures Construction 5.17 Temporary Ancillary Facility Management 5.18 Topsoil 5.19 Vehicle and Equipment Management 5.20 Waste Management 5.22 Work Progression 5.23.3 Forest Resources 5.23.7 Rare Plants 5.23.8 Watercourses, Fish and Fish Habitat 5.23.10 Wetlands 5.23.11 Wildlife and Wildlife Habitat 5.24 Working Near Pipelines and Other Underground Services 5.25 Sulphide Bearing Rock &amp; Acid Rock Drainage Management</p>	<ul style="list-style-type: none"> <li>• Fish passage determinations will be carried out in consultation with DFO.</li> <li>• Offsetting will also be carried out in consultation with DFO, as required.</li> <li>• Culverts will be designed as per DFO Guidelines for Fish Passage (2002).</li> </ul>
<p>Operation, Maintenance and Rehabilitation including:</p> <ul style="list-style-type: none"> <li>• Summer maintenance ; and</li> <li>• Winter maintenance.</li> </ul>	<p>Changes in:</p> <ul style="list-style-type: none"> <li>• Surface water quality;</li> <li>• Habitat quantity; and</li> <li>• Habitat quality;</li> </ul> <p>In addition, direct mortality to fish may also occur.</p>	<p>5.1 Asphalt Concrete 5.2 Beaver and Beaver Dam Removal 5.3 Clearing 5.4 Culverts 5.5 Detouring 5.6 Dust Control 5.7 Erosion and Sediment Management 5.8.3 Crushing, Screening and Washing 5.10 Fire Prevention and Contingency 5.11 Grubbing 5.12 Spill Management 5.13 Storage and Handling of Petroleum Products 5.14 Storage and Handling of other Hazardous Materials</p>	<p>5.15.1 Structures Construction 5.16 Summer Highway Maintenance 5.17 Temporary Ancillary Facility Management 5.18 Topsoil 5.19 Vehicle and Equipment Management 5.20 Waste Management 5.21 Winter Highway Maintenance 5.22 Work Progression 5.23.3 Forest Resources 5.23.7 Rare Plants 5.23.8 Watercourses, Fish and Fish Habitat 5.23.10 Wetlands 5.23.11 Wildlife and Wildlife Habitat 5.24 Working Near Pipelines and Other Underground Services 5.25 Sulphide Bearing Rock &amp; Acid Rock Drainage Management</p>	<p>Should Fish Habitat compensation be required, it will be carried out in consultation with DFO.</p>
<p>Accidents, Malfunctions and Unplanned Events</p> <ul style="list-style-type: none"> <li>• Erosion;</li> <li>• Fires;</li> <li>• Erosion and Sedimentation control failures; and</li> <li>• Accidents.</li> </ul>	<p>Changes in:</p> <ul style="list-style-type: none"> <li>• Surface water quality;</li> <li>• Habitat quantity; and</li> <li>• Habitat quality;</li> </ul> <p>In addition, direct mortality to fish may also occur.</p>	<p>5.7 Erosion and Sediment Management 5.10 Fire Prevention and Contingency 5.12 Spill Management 5.13 Storage and Handling of Petroleum Products 5.14 Storage and Handling of other Hazardous Materials 5.23.3 Forest Resources</p>		

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## 7.0 IMPACT ASSESSMENT

Regulatory framework exists for the Aquatic Environment through the Provincial *Clean Water Act*, and Federal *Fisheries Act* and *Navigable Waters Protection Act*. There is potential for impacts to occur with surface water quality, habitat quantity and habitat quality in addition to direct mortality to fish during Construction and Operation, and Maintenance and Rehabilitation phases.

All watercourses were deemed to be minor in nature, therefore not requiring approval under the *NPA*.

The project will be carried out in consultation with DFO. All required permits and approvals will be obtained from applicable provincial and federal agencies, and any impacts to fish and fish habitat will be compensated if required as per the revised *Fisheries Act*.

The assessment of the impacts of the proposed Glenwood area to Miramichi Bypass Project for Construction, and Operation, Maintenance and Rehabilitation are presented in Table 6. With the mitigation measures as outlined in the NBDTI EMM (2010) and compensation if required, as per the revised *Fisheries Act*; the impacts of the Glenwood Area to Miramichi Bypass Project on the Aquatic Environment are determined to not likely be significant.

**Table 5. Assessment of impacts for construction, and operation, maintenance and rehabilitation of Glenwood Area to Miramichi Bypass.**

Activity	Is Impact Likely to be Significant?	Rationale
Construction, including: <ul style="list-style-type: none"> <li>• Clearing, grubbing;</li> <li>• Site preparation;</li> <li>• Road bed construction;</li> <li>• Watercourse crossings;</li> <li>• Surfacing and finishing; and</li> <li>• Temporary ancillary facilities.</li> </ul>	No No No No No	All work will be conducted following the standard mitigation measures outlined in the NBDTI EMM as well as additional mitigation measures stated in Table 5. In addition, impacts to fish and fish habitat will be compensated, if required, as per the <i>Fisheries Act</i> .  All required permits and approvals will be obtained from applicable regulatory agencies.
Operation, Maintenance and Rehabilitation including: <ul style="list-style-type: none"> <li>• Summer maintenance;</li> <li>• Winter maintenance; and</li> <li>• Culverts.</li> </ul>	No No	
Accidents, Malfunctions and Unplanned Events <ul style="list-style-type: none"> <li>• Erosion;</li> <li>• Fires;</li> <li>• Erosion and Sedimentation control failures; and</li> <li>• Accidents.</li> </ul>	No No No No	

### 7.1 Monitoring and Follow Up

Compliance monitoring of mitigation measures, as required, will be conducted during Construction and OMR activities. Monitoring of surface water quality during Construction and OMR will include TSS sampling as required.



## 8.0 REFERENCES

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