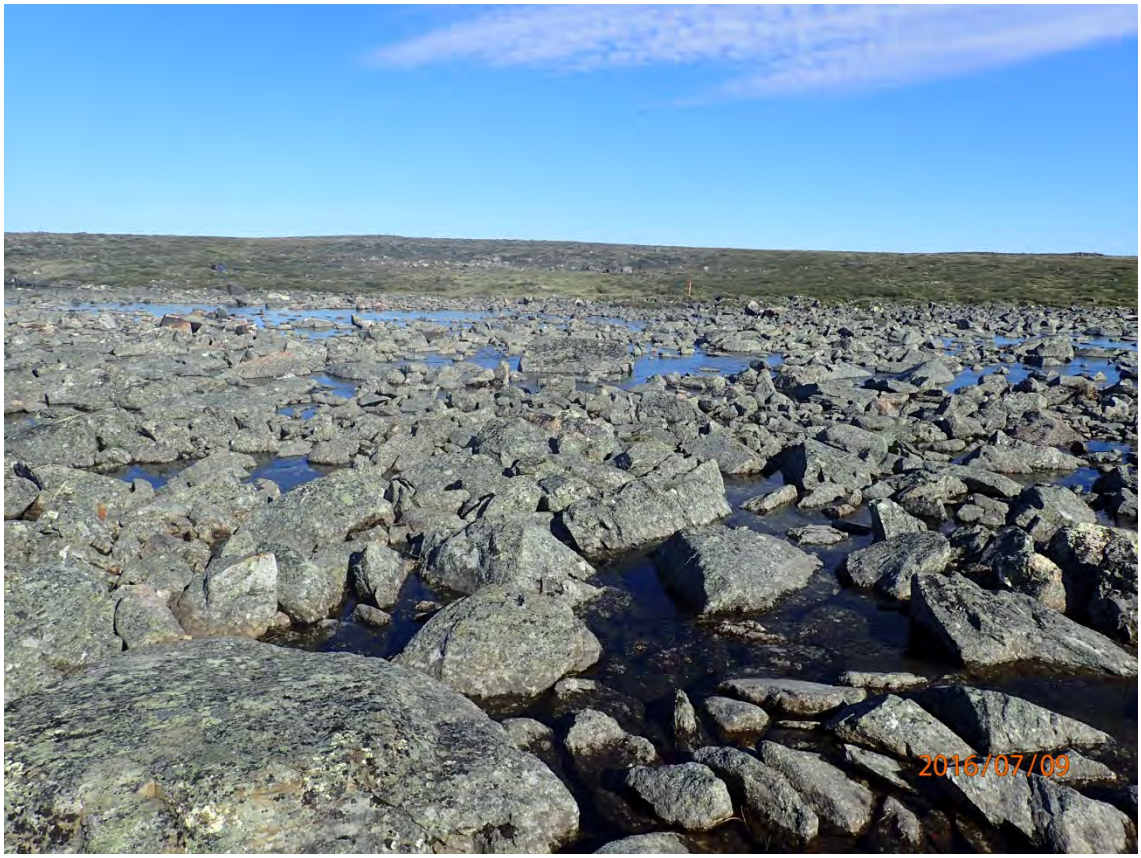
# APPENDIX H

## Fisheries Assessment of the Proposed Mammoth Channel Crossing

# AGNICO EAGLE MINES LTD. - MEADOWBANK DIVISION – WHALE TAIL PIT PROJECT

# FISHERIES ASSESSMENT OF A PROPOSED TEMPORARY BRIDGE ACROSS THE WATERCOURSE BETWEEN WHALE TAIL AND MAMMOTH LAKES: EXISTING CONDITIONS AND PREDICTED EFFECTS




Submitted to:

Agnico Eagle Mines Limited: Meadowbank Division
Regional Office - 93, Rue Arseneault, suite 202,
Val-d'Or, Québec, J9P 0E9
January 11, 2017

C. PORTT and ASSOCIATES
56 Waterloo Avenue
Guelph, Ontario, N1H 3H5
cportt@sentex.net

# Table of Contents



# List of Tables

# List of Figures

# 1.0 INTRODUCTION

Agnico Eagle Mines Limited: Meadowbank Division (Agnico Eagle) is proposing to develop Whale Tail Pit, a satellite deposit on the Amaruq property, in continuation of mine operations and milling of the Meadowbank Mine. The Amaruq Exploration property is a 408 square kilometre ($km^2$) site located on Inuit Owned Land approximately 150 kilometres (km) north of the hamlet of Baker Lake and approximately 50 km northwest of the Meadowbank Mine in the Kivalliq region of Nunavut (Figure **1**.**1**).

The Meadowbank Mine is an approved mining operation and Agnico Eagle is looking to extend the life of the mine by constructing and operating Whale Tail Pit (referred to in this document as the Project). Baseline data have been collected in support of the Environmental Review to document existing conditions and to provide the foundation for a qualitative and quantitative assessment of project operations.

Agnico Eagle wishes to construct a temporary, all-season crossing of the watercourse connecting Whale Tail Lake and Mammoth Lake (Figure 2) to facilitate ongoing exploration activities and connect the predevelopment quarry and associated activities to the future Whale Tail Pit waste rock facility during the construction phase. C. Portt and Associates was retained to assess the existing conditions with respect to fish and fish habitat in the watercourse in order to:

- identify a preferred location for the crossing in order to minimize impacts to fish and fish habitat,
- characterize the existing conditions in the vicinity of the proposed crossing with respect to fish habitat and the fish community, and
- make recommendations with respect to the crossing design in order to prevent or minimize harm to fish or fish habitat, and
- conduct a pathways-of-effect analysis of the proposed crossing at the proposed location.

This report documents the methods and results of these investigations and analyses.

## 1.1 Scope

This report describes fish community and fish habitat at the immediate vicinity of the proposed crossing, based on field work conducted in 2014, 2015 and 2016. A pathways of effect analysis is provided based on the fish habitat and fish community information and the bridge design, provided by Agnico Eagle.

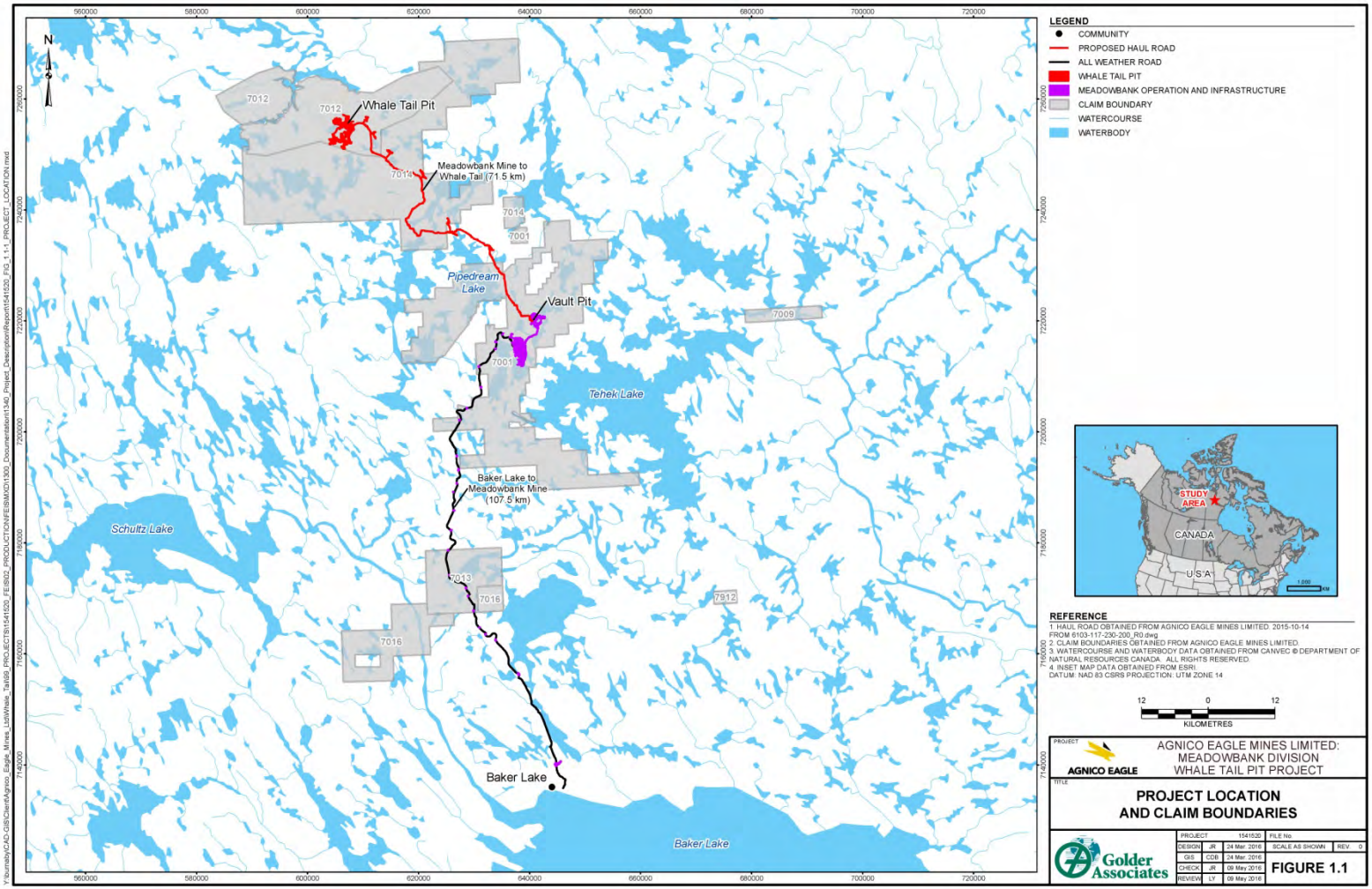



Figure 1.1. Location of the proposed Whale Tail Pit Study Area.

### 1.2 Objectives

- Identify a preferred location for the proposed crossing.
- Characterize the existing fish habitat and fish community in the vicinity of the proposed crossing.
- Conduct a pathways-of-effect (PoE) analysis to identify mitigation measures and residual effects.

### 1.3 Physical Setting

The study area is located on the Canadian Shield within a Low Arctic ecoclimate of continuous permafrost, which is one of the coldest and driest regions of Canada (Azimuth, 2010). The lakes within the Whale Tail pit study area are ultra-oligotrophic/oligotrophic (nutrient poor, unproductive) headwater lakes that are typical of the Arctic. The ice-free season on the lakes is very short. Ice break-up usually occurs during mid- to late-June, and ice begins to form again on the lakes in late September or early October. Complete ice cover is attained by late October, with maximum ice thickness of about 2 m occurring in March/April (Azimuth, 2013). Many small watercourses become dry once the land begins to freeze in the fall and, where water is present, most freeze to the bottom during the winter (BAER, 2005; Jones *et al*, 2010). Flows during the spring melt and the summer vary with drainage area.

## 2.0 METHODS AND RESULTS

### 2.1 Selection of the Crossing Location

C. Portt examined the connecting channel on the ground on July 9, 2016, to identify a preferred crossing location from the standpoint of preventing or minimizing negative impacts to fish and/or fish habitat. The substrate in the connecting channel is a mixture of cobble and boulder. No areas with unique habitat characteristics were observed. Therefore, the location where there was the least exposed water surface (i.e. the driest crossing) was identified as the preferred crossing location. The coordinates of this location were determined by hand-held GPS and provided to AEM. This is the location where AEM proposes to construct the crossing; it is shown, with fish sampling locations and waypoints referred to in this report, in Figure 2.

### 2.2 Existing Conditions

#### 2.2.1 Fish Habitat

Photographs are presented in Appendix A that show the crossing location under a variety of water level and flow conditions. The substrate at the proposed crossing location is a mixture of boulders and cobbles. The proposed crossing location is shown from the air on June 19, 2016, when the water level

and flow was high (**Error! Reference source not found.**), on July 3, 2016, at an intermediate water level and flow (**Error! Reference source not found.**, and on August 31, 2016, and September 2, 2014, when the water level was low (**Error! Reference source not found.** and 4). The crossing location was photographed from the ground at Waypoint 147 on July 4, 2015, when the water level was relatively high (Photographs 5 and 6), from Waypoint 802 (Photographs 7 and 8) and waypoint 803 (Photograph 9) on July 9, 2016, at an intermediate water level, and from Waypoint 438 on August 25, 2015 when the water level was low (Photographs 10, 11, and 12).

The photographs show that, with the exception of a few protruding boulders, there was surface water present across the entire connecting channel on June 19, 2016, during the spring freshet. As water levels fall, boulder and cobble are exposed across more of the channel. On July 9, 2016, there was very little water visible at the surface between waypoint 802 and the north side of the channel and it was estimated that there was water above the boulders and cobbles over approximately 40% of the area between waypoint 802 and the south side of the channel. At low water levels there is no water above the boulders and cobbles. The channel is completely frozen during the winter.

### 2.2.2 Fish Community

Six fish species have been captured in Whale Tail and/or Mammoth Lakes and/or tributary watercourses during field investigations in 2014, 2015 (C. Portt and Associates, 2016) and 2016 (C. Portt and Associates, unpublished data). These are lake trout (*Salvelinus namaycush*), Arctic char (*Salvelinus alpinus*), round whitefish (*Prosopium cylindraceum*), burbot (*Lota lota*), slimy sculpin (*Cottus cognatus*) and ninespine stickleback (*Pungitius pungitius*). Arctic Grayling (*Thymallus arcticus*) have not been captured and are not thought to be present in the study area.

Hoop nets were set to assess fish movement between Whale Tail Lake and Mammoth Lake during the period June 19 – July 13, 2015 (C. Portt and Associates, 2016). The net locations are shown in Figure 2.1 and the deployment information is provided in Table **1**. No fish were captured by a total of 64 net-days of effort.

Table 1. Hoop nets locations (refer to Figure 2.1), deployment and removal dates, net orientation and total soak time.

| Location | Net # | Opening facing | Date set | Date removed | Total soak time (days) |
|---|---|---|---|---|---|
| LHN2a | 2 | downstream | June 19, 2015 | June 27, 2015 | 8 |
| | | upstream | June 27, 2015 | June 28, 2015 | 1 |
| | 4 | downstream | June 21, 2015 | June 28, 2015 | 7 |
| LHN2b | 2 | upstream | June 28, 2015 | July 13, 2015 | 15 |
| | 4 | downstream | June 28, 2015 | July 13, 2015 | 15 |
| LHN3 | 1 | upstream | July 4, 2015 | July 13, 2015 | 9 |
| | 3 | downstream | July 4, 2015 | July 13, 2015 | 9 |

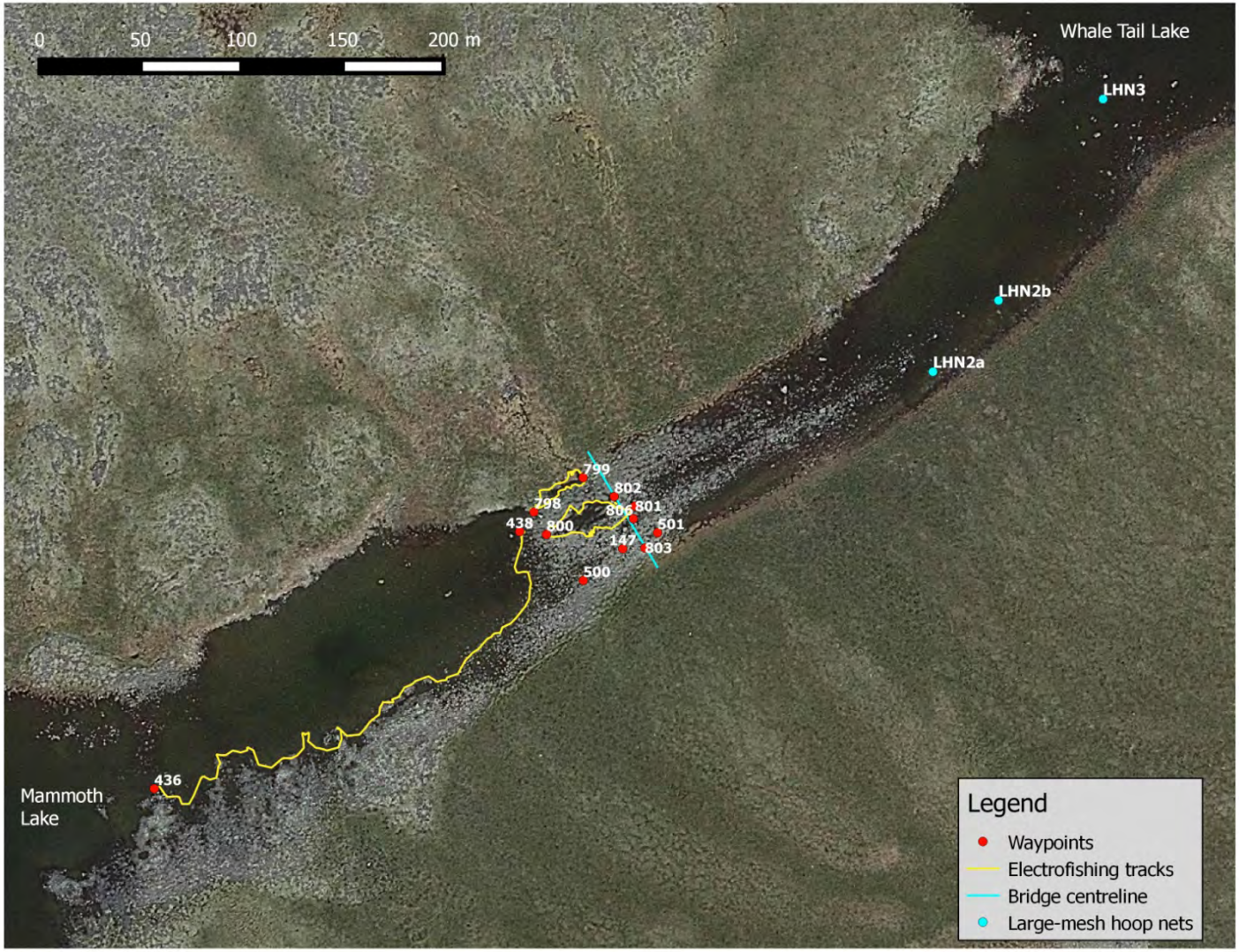



**Figure 2.1. Fish sampling locations, waypoints referred to in the text, and approximate centreline of the proposed bridge.**

Electrofishing was conducted in the vicinity of the proposed crossing on August 25, 2015, and July 9, 2016, by two-person crews using a Halltec backpack electrofisher set at 950 volts and 250 hertz (Figure 2, Table 2; Photographs 13 and 14). In total, three juvenile lake trout, one juvenile round whitefish, five slimy sculpin and one ninespine stickleback were captured.

**Table 2. Electrofishing dates, locations (refer to Figure 2.1), effort and catches.**

| Date (yy/mm/dd) | Waypoints (Figure 2.1) | Track Length (m) | Electroseconds | Slimy Sculpin | Juvenile Lake Trout | Juvenile Round Whitefish | Ninespine Stickleback |
|---|---|---|---|---|---|---|---|
| 2015/08/25 | 436-438 | 324 | 950 | 4 | 1 | | |
| 2016/07/09 | 798-799 | 77 | 578 | 1 | | 1 | 1 |
| 2016/07/09 | 800-801 | 112 | 1111 | | 2 | | |

### 2.2.3 Hydrology

Golder Associates Ltd. monitored the water elevation in Whale Tail Lake from June 12 to September 16, 2015, and measured discharge through the channel between Whale Tail and Mammoth Lake on three occasions during that period (Golder, 2016). The level logger in Whale Tail Lake was installed on June 12 when the channel between Whale Tail and Mammoth lakes was still frozen and discharge was zero. Measured discharge was 4.23 $m^3$/sec on June 14, 2015, when the water level in Whale Tail Lake was approximately 1 cm below its highest point that spring. The maximum velocity measured on that date, when velocity was measured at 28 equidistant locations across the channel at a location approximately 150 m upstream from the proposed crossing, was 0.45 m/sec and the mean velocity was 0.26 m/sec. Maximum depth along the transect across the watercourse at that location was 0.75 m and the mean depth was 0.52 m. Measured discharge was 0.190 $m^3$/sec on August 7, 2015, and 0.012 $m^3$/sec on September 16, 2015.

# 3.0 PATHWAYS OF EFFECTS ANALYSIS

A Pathways of Effects (PoE) analysis was undertaken for the proposed temporary bridge using the PoEs identified by Fisheries and Oceans Canada (DFO; http://www.dfo-mpo.gc.ca/pnw-ppe/pathways-sequences/index-eng.html) to identify residual effects on fish and fish habitat. The table of standard mitigation measures provided during DFO Fisheries Act information sessions in the spring of 2015 was modified/annotated to reflect the specifics of the temporary bridge. The relevant PoEs were identified for both land-based and water-based activities based on the undertaking. The individual PoEs were examined to determine which branches applied to the project. The mitigation measures were then applied to the applicable pathways and a determination was made as to which pathways were broken and where residual effects remained. The results of the analyses are discussed and are illustrated using the DFO PoE diagrams. The pathways where relevant mitigation measures apply are indicated on the

diagrams using the DFO alpha-numeric codes. A red X indicates that a particular path is not relevant, or that it has been effectively broken by the mitigation measures that were applied. Residual effects are outlined in red.

## 3.1 Overview of Construction Plans and Schedule

The following description of the proposed bridge is based on drawings prepared by WSG and provided by Agnico Eagle, dated November 22, 2016 . The bridge will consist of two spans of 28 m, supported by abutments on each bank and a centre pier. The centre pier will be constructed of gabions filled with 100 mm – 200 mm rip rap which enclose an area filled with 300 mm – 500 mm crushed stone. The central pier will occupy an area of approximately 71 $m^2$.

The temporary bridge is planned to be constructed in April 2018 prior to freshet and is expected to be used for predevelopment during the open water season from June to October 2018. Its' use may depend on the receipt of permits and the completion of the proposed dewatering and fishout of the North Basin of Whale Tail Lake and may extend for use by exploration. A winter ice road crossing is proposed to be used in the winter of 2018 and 2019.

## 3.2 Determination of Relevant Pathways

The PoEs for land-based activities are shown in Figure 3.1 and those for water-based activities are shown in Figure 3.2. The land-based PoEs that are applicable to the project are vegetation clearing (1), grading (2), explosives (4) and industrial equipment (5). The water-based PoEs that are applicable to the project are explosives (4), industrial equipment (5), placement of material (10), and fish passage (17). The PoEs for explosives (4) and industrial equipment (5) are common to both land-based and water-based activities, so a total of six unique PoEs were evaluated.

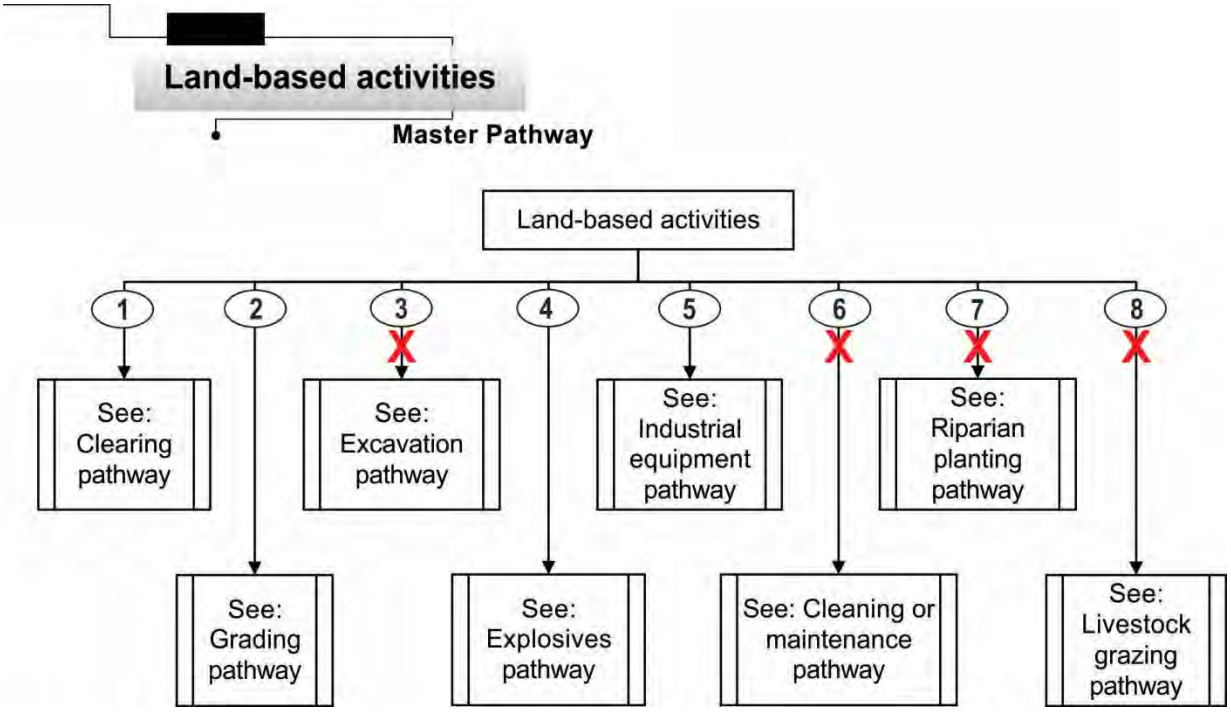



Figure 3.1. Pathways of effects for land-based activities. Pathways 1, 2, 4 and 5 are relevant to this project.

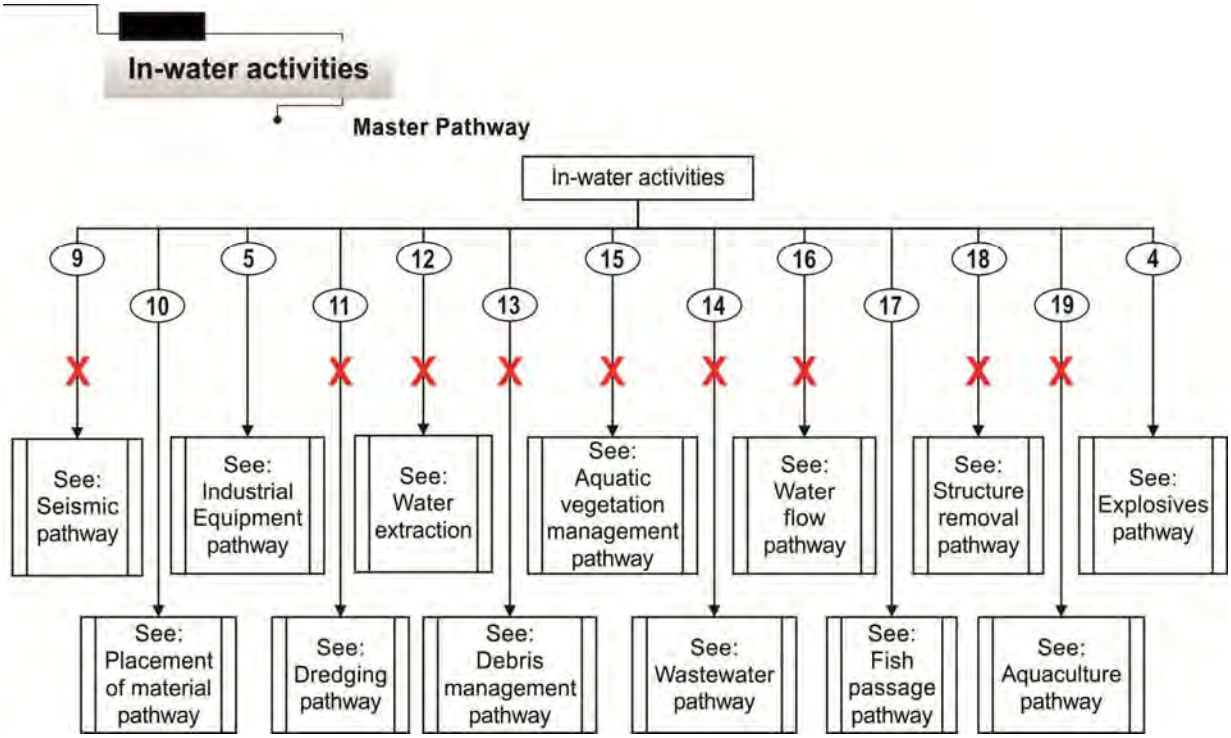



Figure 3.2. Pathways of effects for water-based activities. Pathways 10, 5, 17 and 4 are relevant to this project.

## 3.3 Pathway Analysis

### 3.3.1 Vegetation Clearing (Pathway 1)

The low tundra vegetation in the project area does not interfere with construction activities. Therefore it is not necessary to clear vegetation *per se*, except where excavation is required within the access road footprint. Except for the crossing, the road approach to the bridge will be located a minimum of 31 m from any watercourse or waterbody as per Nunavut Water Board license requirements. Therefore effects on riparian vegetation are limited to the area of disturbance at the approaches of the proposed bridge, and the area of disturbance will be minimized to the distance necessary to install the bridge. Areas of exposed soil will be stabilized with clean rip rap. No herbicides will be used.

The tundra vegetation contributes almost no woody debris or leaf litter and there is no in-stream organic material evident at the crossing. The short tundra vegetation also provides no shade and consequently has to no effect on water temperature.

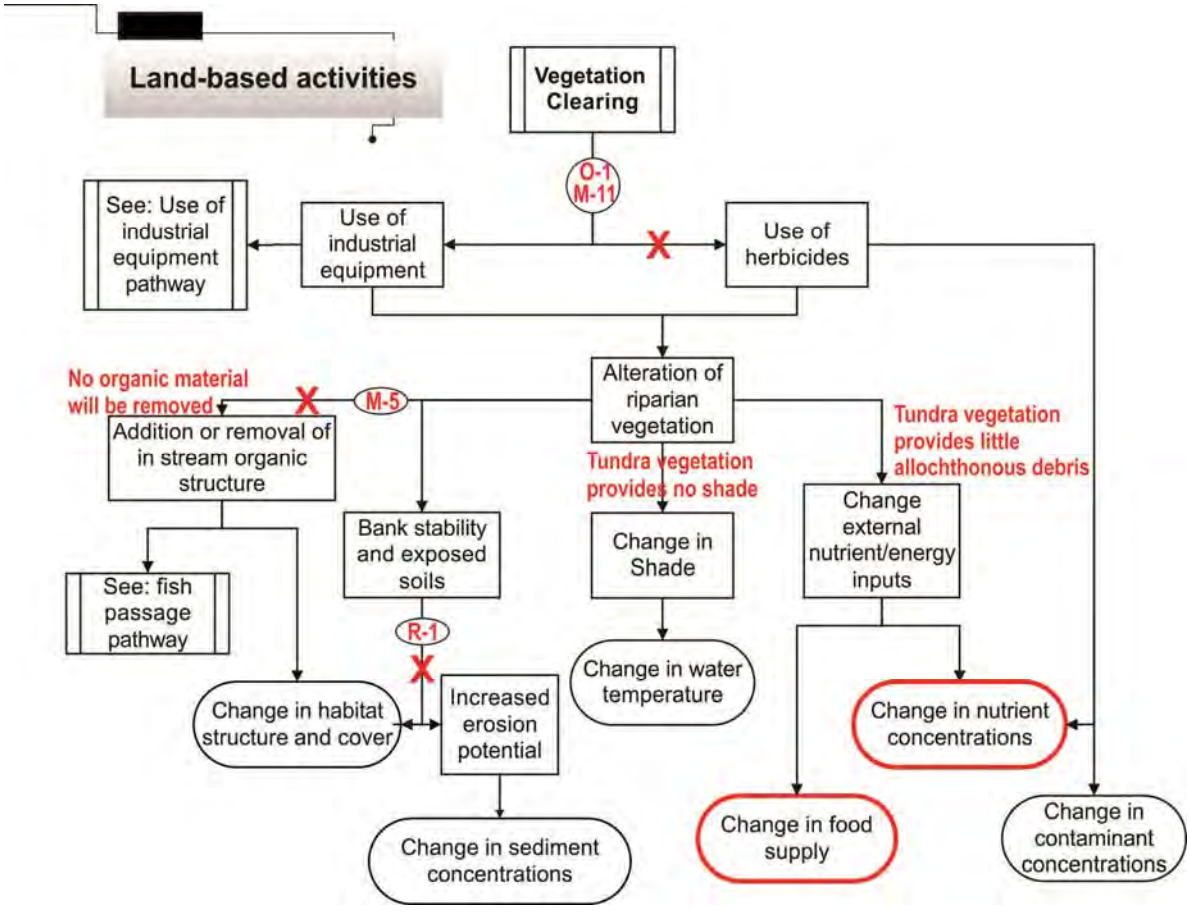



Figure 3.3. PoE diagram for vegetation clearing.

### 3.3.2 Grading (Pathway 2)

Except at the proposed bridge crossing, a minimum buffer of 31 m is maintained between watercourses/waterbodies and the road approaches. No significant changes in land drainage patterns will occur. There will be no grading of streambanks or addition or removal of instream organic structure as a result of grading. Where there is potential for exposed soils to be conveyed to the watercourse the soils will be stabilized with clean rip rap. No residual impacts will occur as a result of grading.

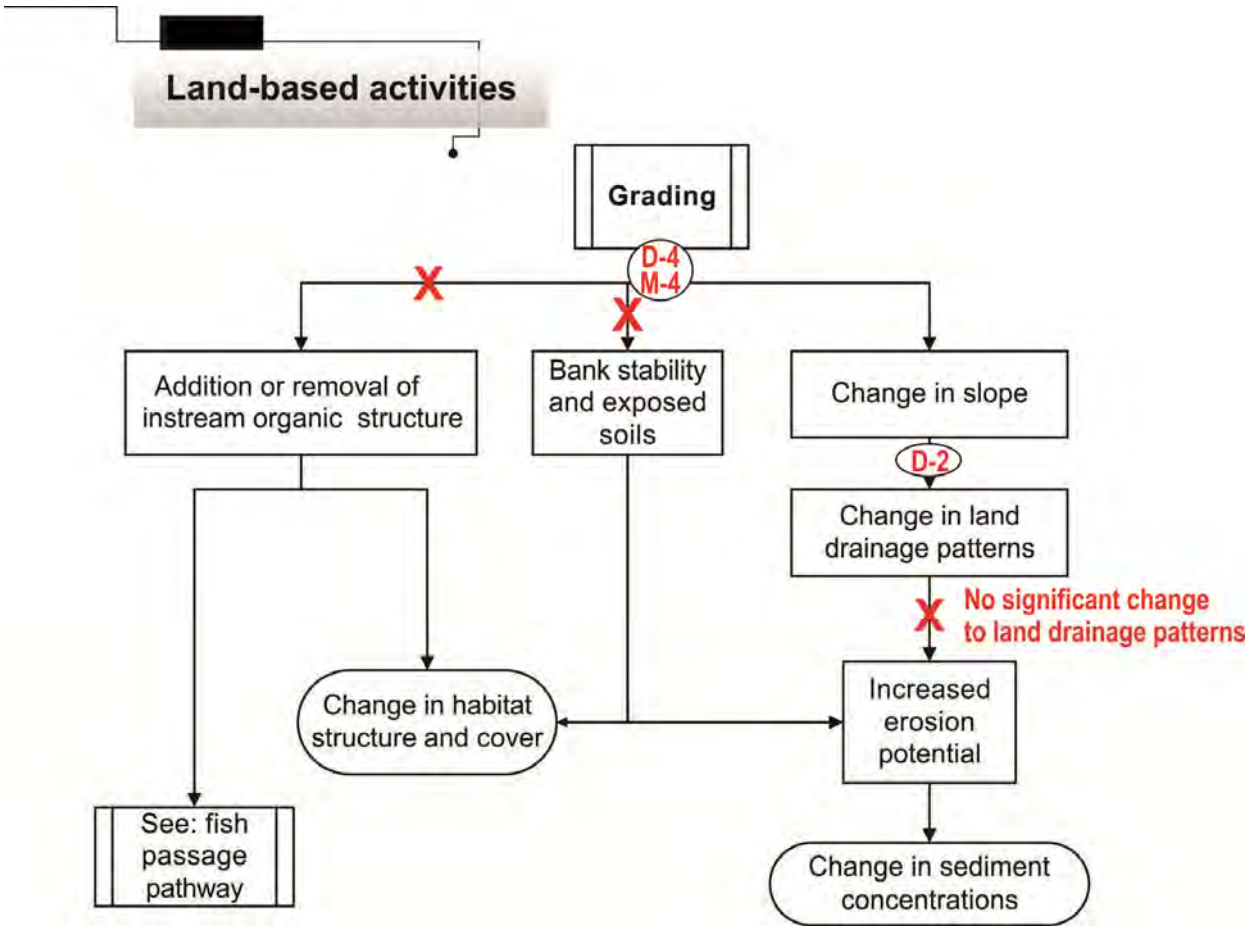



Figure 3.4. PoE diagram for grading.

### 3.3.3 Use of Explosives (Pathway 4)

Construction during the winter when the channel between Whale Tail and mammoth Lakes is frozen solid and does not contain fish greatly reduces the potential exposure of fish to blasting effects and eliminates the potential for blasting to increase sediment concentrations (M-4). The DFO fish protection measures for use of explosives (O-2) will be adhered to in order to prevent lethal or sublethal effects to

fish and to prevent nutrients or contaminants from entering fish-bearing waters. If blasting creates erodible banks, these will be stabilized with clean rip rap (R-1). No residual impacts will result from blasting.

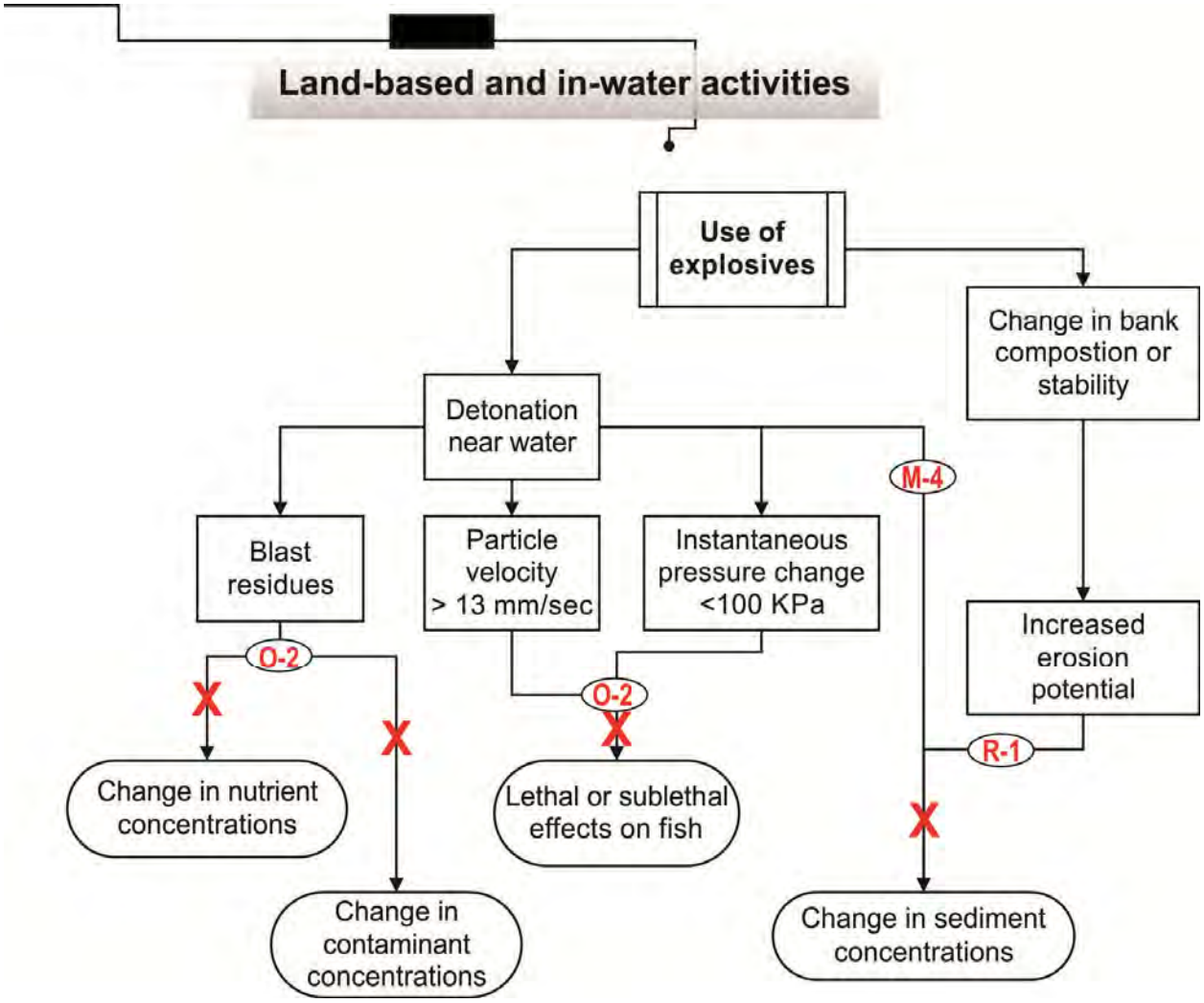



Figure 3.5. PoE diagram for use of explosives.

### 3.3.4 Use of Industrial Equipment (Pathway 5)

All of the industrial equipment used during bridge construction will be mobile. Except at the bridge crossing, a minimum buffer of at least 31 m will be maintained between waterbodies/watercourses and the approach road footprint (O-1). At the watercourse crossing, the work area will be limited to the minimum bank length required to install the bridge (O-1). Construction activity and crossing of the channel will occur when the soil and water are frozen (O-1), which eliminates the need for dewatering, as well as the potential for sediment re-suspension and potential mortality of fish/eggs/ova from equipment. In-water work during the unfrozen period is not anticipated, but if it were to become

unavoidable it will be minimized and will adhere to the DFO timing windows (http://www.dfo-mpo.gc.ca/pnw-ppe/timing-periodes/nu-eng.html).

Equipment will be stored and maintained in a manner that prevents the entry of any deleterious material from entering the water (M-3). A spill management strategy will be implemented to address possible oil, grease and fuel leaks from equipment (M-9).

It is not expected that any stripping will occur but, if it does, stripped material will be stored at least 31 m from any watercourse or water body and if there is potential for erosion of the material to a watercourse or waterbody it will be isolated with erosion control measures (M-5). Following construction, any potential sediment generating materials will be stabilized with clean rip rap (R-3).

No residual impacts will result from the operation of equipment.

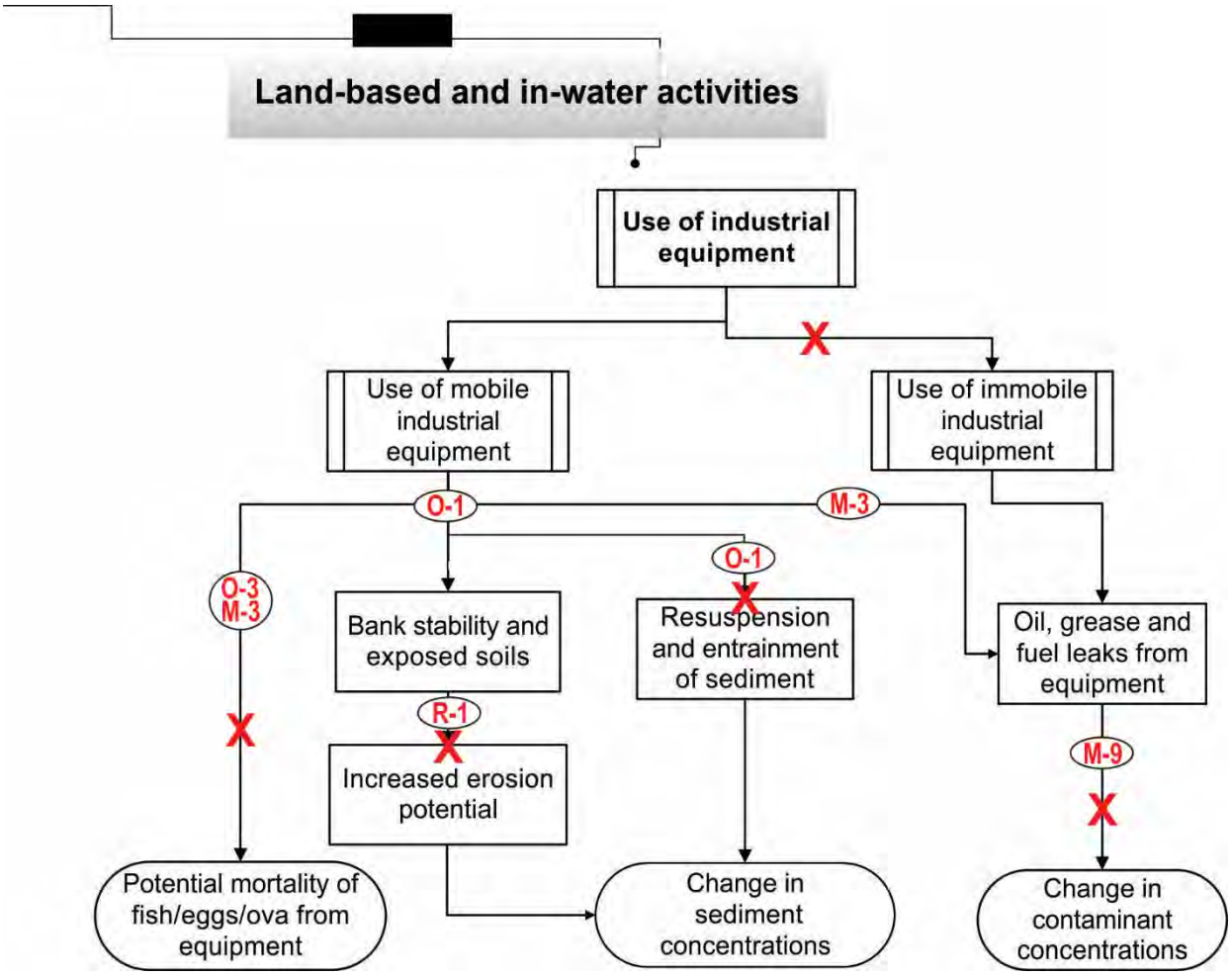



Figure 3.6. PoE diagram for use of industrial equipment.

### 3.3.5 Placement of Materials or Structures in Water (Pathway 10)

The bridge location has been selected to occupy an area of the channel with the shortest period of surface flow, thus avoiding more productive continuously open water habitats (D-4). The crossing technique was selected based on the need to maintain fish passage and to minimize, to the extent feasible, the alteration of fish habitat (D-1). The bridge abutments will be placed outside of the bankfull channel, but a single pier will be located mid-channel. The pier will have a footprint of approximately 71 $m^2$, and will be constructed with an outer wall of rock-filled gabion baskets and an inner core of large rock material, to coincide with the surrounding boulder substrate of the channel and provide similar interstitial habitat for invertebrates and fish.

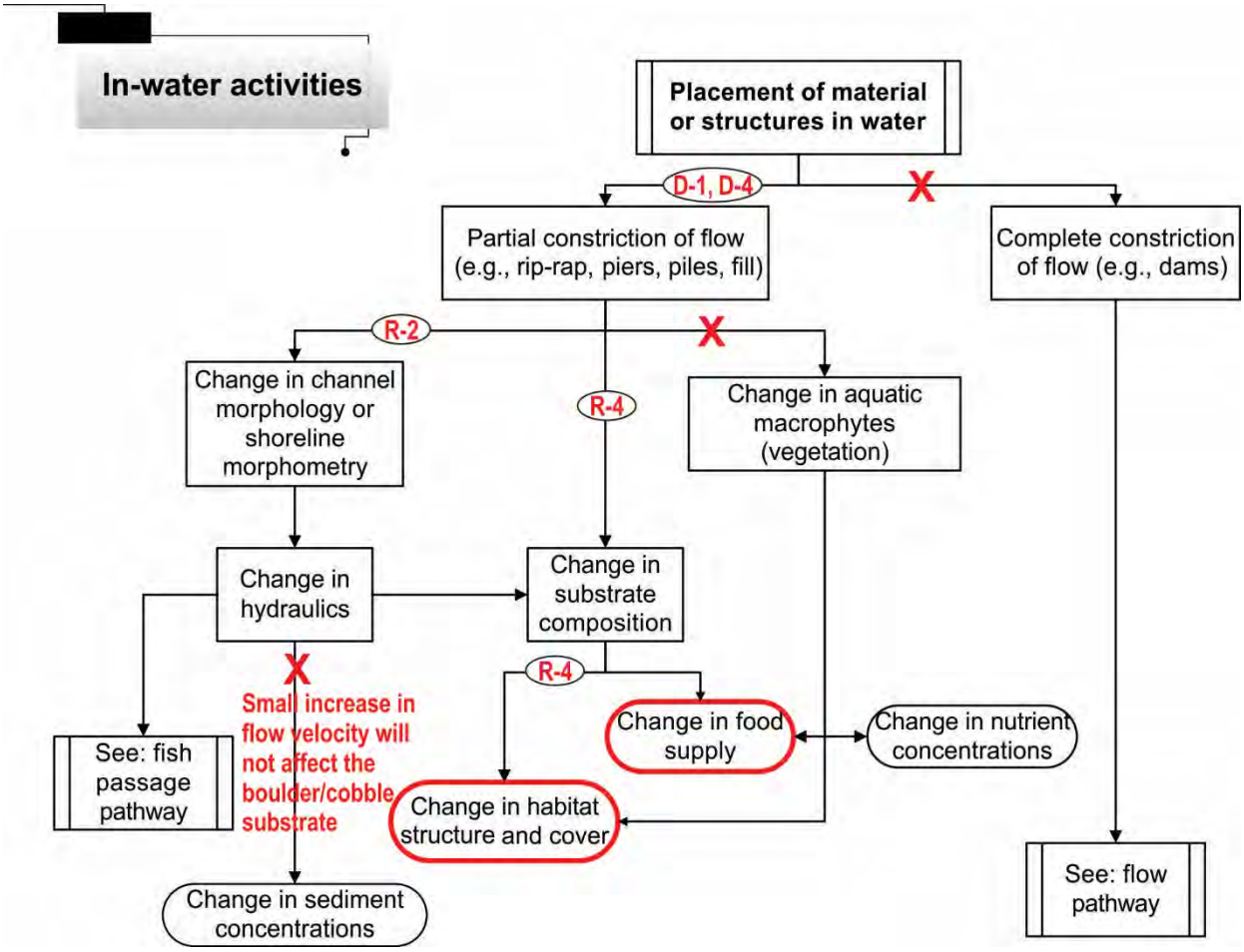



Figure 3.7. PoE diagram for placement of material or structures in water.

It is expected that the residual effects from this bridge will only be related to the central pier that will be placed within the bankfull channel. While the central pier represents a temporary change in habitat structure and cover, it is thought that the change will be minor because during most of the year the pier materials will provide similar habitat to the existing boulder and cobble substrate of the surrounding

channel. The only difference will occur during the part of the open-water period when there would be surface water present at the pier location. Therefore, although a change in food supply has been identified as a residual effect, it is thought that this change will be very minor because no surface water is present during most of the year, interstitial spaces will continue to be present in the area occupied by the pier, and benthic invertebrate production is extremely limited in these shallow areas which freeze to the bottom each winter. A change in hydraulics caused by the central bridge pier, resulting in a minor increase in already low velocities, will not affect the substrate composition or cause a change in sediment conditions, due to the boulder/cobble substrate.

### 3.3.6 Fish Passage Issues (Pathway 17)

No changes in water chemistry or water temperature will result from the bridge construction, nor will any diversions occur. The crossing structure will allow both upstream and downstream fish passage to be maintained to the extent that it currently occurs. The central pier will reduce the capacity of the channel and therefore will increase flow velocity but flow velocities are low and the boulder substrate creates eddies and quiescent areas. No change to fish passage is predicted to occur.

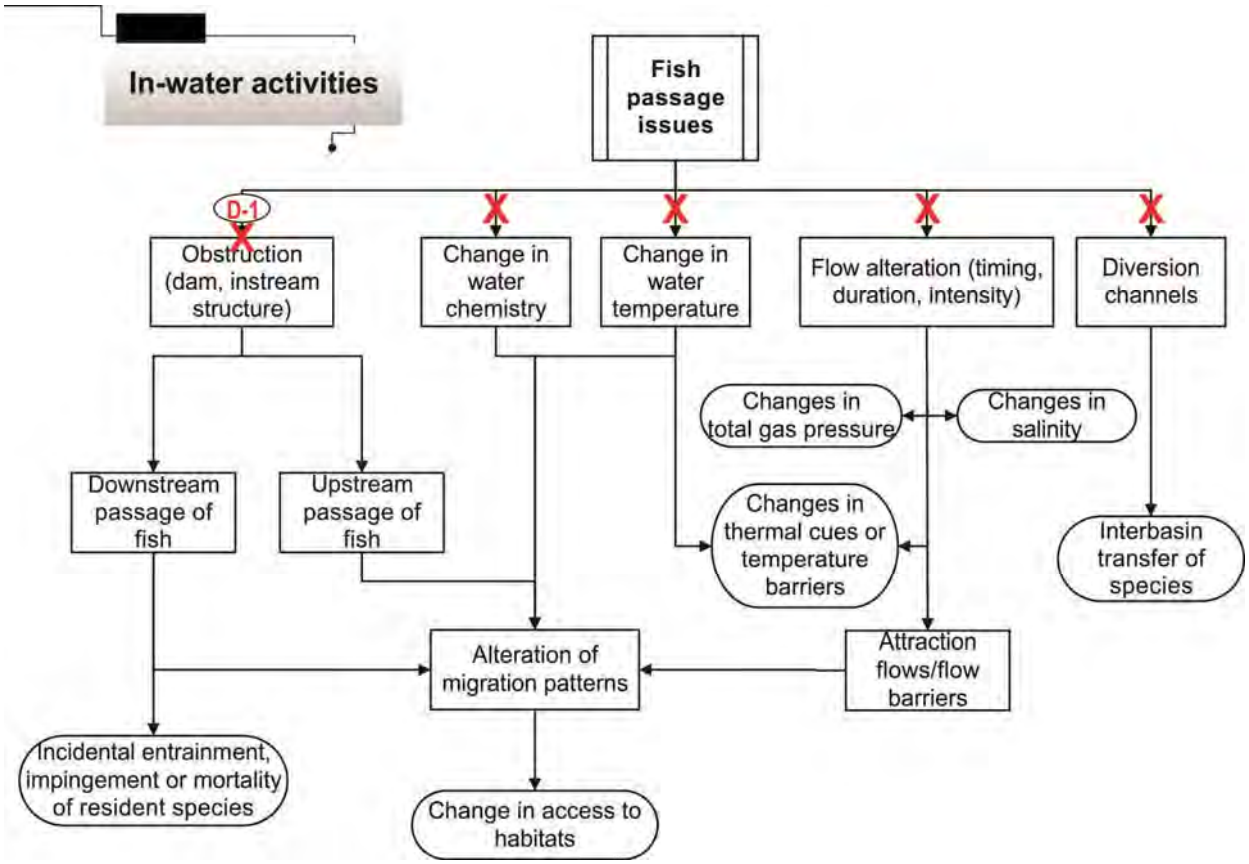



Figure 3.8. PoE diagram for fish passage.

### 3.4 Summary of Residual Effects

The results of the residual effects analysis indicate that only minor effects will occur as a result of this temporary bridge, which will be constructed under frozen conditions. These effects will be due to the short sections of boulder/tundra shoreline that will be occupied by the bridge abutments and the approach road, and the bridge pier that will be placed mid-channel. Riparian tundra vegetation provides little in the way of allochthonous inputs and virtually no shade and the short section of riparian vegetation removed by the bridge abutments is expected to have little or no effect on aquatic productivity. The central bridge pier will occupy approximately 71 $m^2$ of channel bottom, but the material used in its construction will be similar to the existing substrate and will provide similar interstitial aquatic habitat. No effect on fish passage will occur. The bridge pier will also reduce channel capacity, but the fact that the channel is essentially a narrows between two lakes with slow velocities means that the minor velocity increase in the boulder channel will have no effect upon fish passage. This bridge is temporary, to be used for exploration access and, if permits are received, during predevelopment and the construction phase of the Whale Tail Pit project. It will be constructed in the winter, and is located within the proposed dewatered area for the Whale Tail Pit. In the event that this area is not dewatered, the bridge will be removed when either an alternative crossing becomes available or the crossing is no longer required for exploration purposes.

## 4.0 REFERENCES

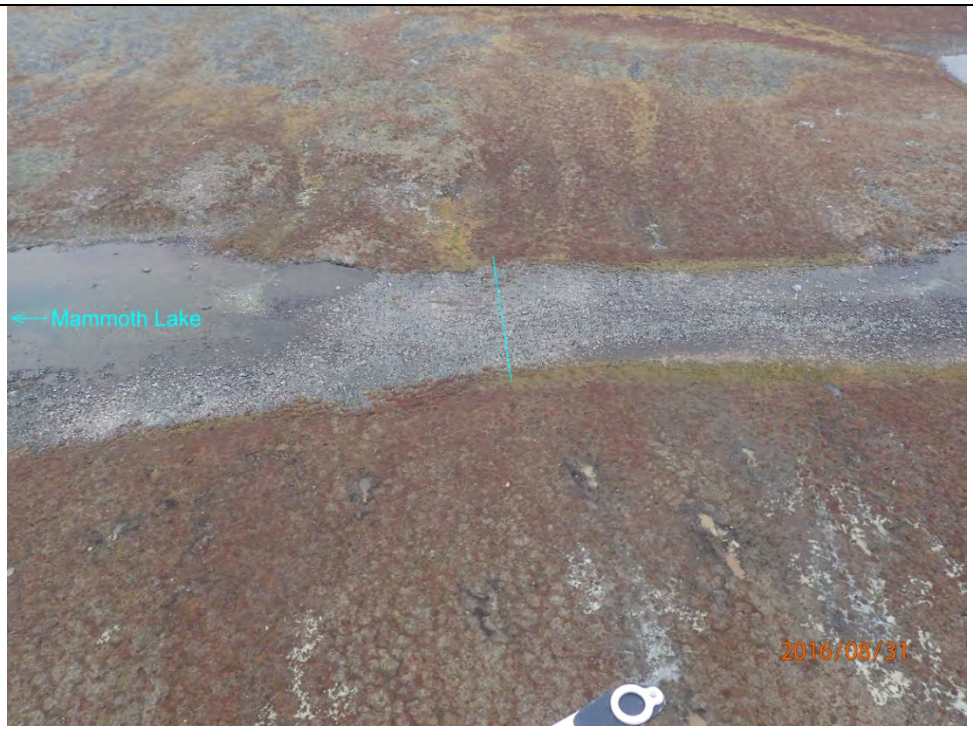
Golder Associates Ltd., 2016. Agnico Eagle Mines: Meadowbank Division - Whale Tail Pit Project 2015 Hydrology Baseline Report. 77 p + appendices.

# APPENDIX A

Photo Appendix


**Photograph 1. Aerial view of the connecting channel between Whale Tail Lake (Lake A17) and Mammoth Lake (Lake A16). June 19, 2016. The blue line represents the approximate centre line of the proposed bridge.**


**Photograph 2. Aerial view of the connecting channel between Whale Tail Lake (Lake A17 on the right) and Mammoth Lake (Lake A16 on the left). July 3, 2016. The blue line represents the approximate centre line of the proposed bridge.**




**Photograph 3. Aerial view of the connecting channel between Whale Tail Lake (Lake A17 to the right) and Mammoth Lake (to the left). August 31, 2016. The blue line represents the approximate centre line of the proposed bridge.**


**Photograph 4. Aerial view of the connecting channel between Whale Tail Lake (Lake A17, on the left) and Mammoth Lake. September 2, 2014. The blue line represents the approximate centre line of the proposed bridge.**

**Photograph 5. View looking across and upstream from Waypoint 147 (refer to Figure 2) on July 4, 2015. The proposed bridge tie-in location on the bank is to the right of centre in this photograph.**

**Photograph 6. View looking upstream across the proposed crossing location from Waypoint 147 (refer to Figure 2). July 4, 2015.**

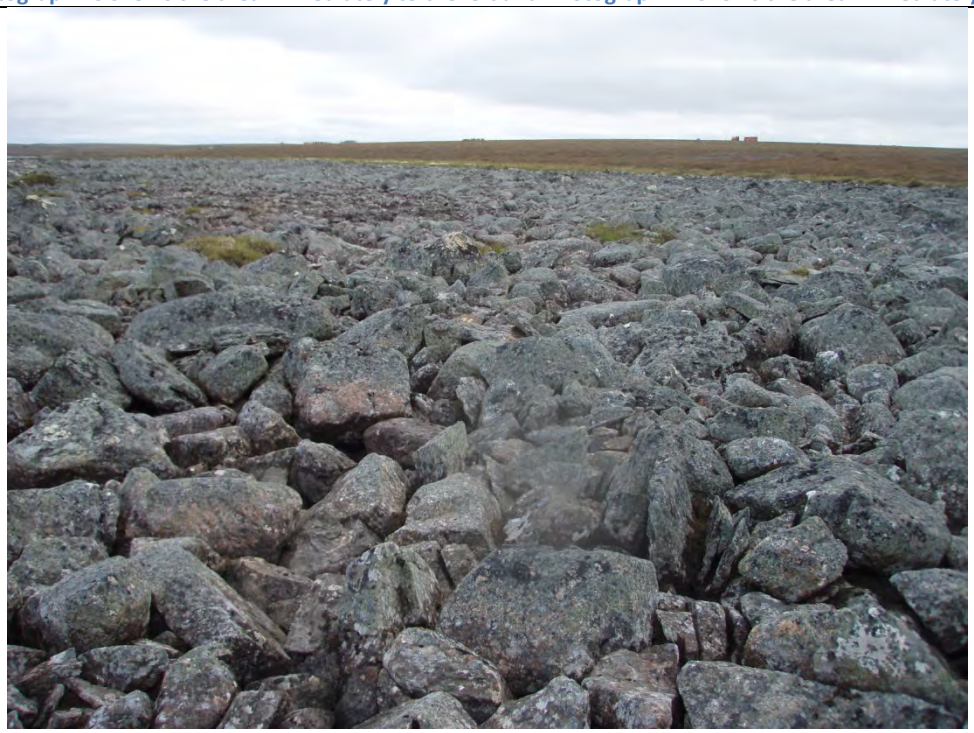

**Photograph 7. View looking north-west across the proposed bridge location from Waypoint 802 (refer to Figure 2) on July 9, 2016.**


**Photograph 8. View looking south-east across the proposed bridge location from Waypoint 802 (refer to Figure 2) on July 9, 2016.**

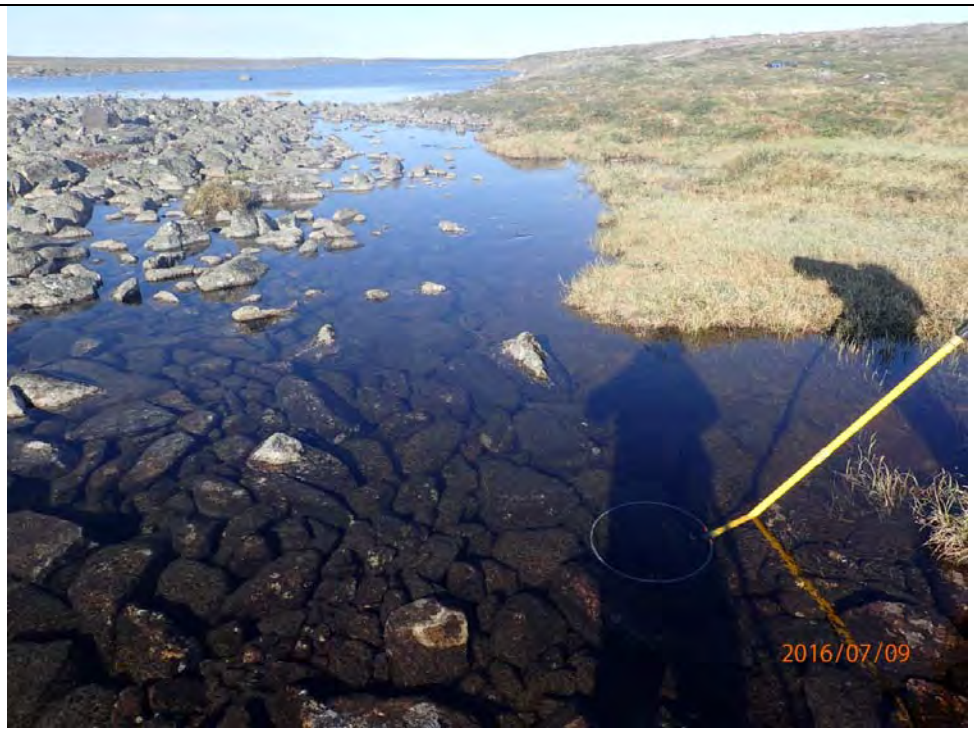

**Photograph 9. View looking north-west across the proposed bridge location from Waypoint 803 (refer to Figure 2) on July 9, 2016.**

**Photograph 10. View looking upstream across the proposed crossing location from Waypoint 438 (refer to Figure 2) along the left side of the connection between Whale Tail and Mammoth Lakes. August 25, 2015. Photograph 11 shows the area immediately to the right.**

**Photograph 11. View looking upstream across the proposed crossing location from Waypoint 438 (refer to Figure 2). August 25, 2015. Photograph 10 shows the area immediately to the left and Photograph 12 shows the area immediately to the right.**



**Photograph 12. View looking upstream across the proposed crossing location from Waypoint 438 (refer to Figure 2) along the right side of the connection between Whale Tail and Mammoth Lakes. August 25, 2015. Photograph 11 shows the area immediately to the left.**




**Photograph 13. View of electrofishing site 2016-A looking downstream toward Mammoth Lake from Waypoint 799. July 9, 2016.**


**Photograph 14. View of electrofishing site 2016-B looking downstream toward Mammoth Lake from Waypoint 801. July 9, 2016.**

# APPENDIX B

DFO Standard Mitigation Measures Modified/Annotated to Reflect the Specifics of the Whale Tail Pit Temporary Bridge Crossing between Whale Tail and Mammoth Lake

| Design Considerations | | |
|---|---|---|
| **CODE** | **MITIGATION MEASURE** | **DESCRIPTION** |
| D-1 | Design - Bridge, Culvert or Other In-water Structures | The temporary bridge will be installed with abutments on each bank and a central pier. Bridge abutments will be located outside of the bankfull channel. Pier material will be similar to existing substrate, maintaining interstitial flow and habitat. |
| D-2 | Design – Drainage System | No drainage diversions will occur as a result of the proposed construction. |
| D-4 | Design - Site Selection | The crossing location was selected to minimize the wetted width and duration of surface flow. The approaches are at right angles to the watercourse. |

| Operational Constraints | | |
|---|---|---|
| **CODE** | **MITIGATION MEASURE** | **DESCRIPTION** |
| 0-1 | Operational Constraint - Access | Except at crossings, a minimum buffer of at least 31 m is maintained between waterbodies/watercourses and the road footprint and borrow areas.<br><br>At the watercourse crossing, the work area will be limited to the minimum bank length required to install structures.<br><br>Most construction will occur when the watercourse and its banks are frozen. If in-water work is required during the open-water period, it will be restricted to the period when in-water work is permitted according to the timing DFO windows (refer to O-3) |
| 0-2 | Operational Constraint - Blasting | Adhere to DFO fish protection measures for use of explosives: http://www.dfo-mpo.gc.ca/pnw-ppe/measures-mesures/index-eng.html |
| 0-3 | Operational Constraint - Timing of In-Water Works | Most construction activity will occur when the ground and watercourse is frozen. If in-water work occurs when the watercourse is not frozen it will adhere to the DFO timing windows (http://www.dfo-mpo.gc.ca/pnw-ppe/timing-periodes/nu-eng.html). Because the watercourse freezes completely it cannot support fall spawning, In-water work under open-water conditions will be avoided from May 1 to July 15. |

| Management Practices/Controls | | |
|---|---|---|
| **CODE** | **MITIGATION MEASURE** | **DESCRIPTION** |
| M-1 | Management - Chemicals | No herbicides or pesticides will be used during road construction or maintenance.<br><br>The abutments and central pier will be constructed using quarry material which has been found to have no potential to generate acid drainage.<br><br>In areas or times identified by the Agnico Eagle road supervisor as being prone to high dust levels, where safe road visibility is impaired, or in areas where dust deposition is impacting fish habitat and/or water quality, the road supervisor will arrange mitigation measures as appropriate. This could involve actions such as grading of the road surface, placement of new coarser topping, and/or watering of the road surface. Based on the experience of the Meadowbank AWAR from Baker Lake to the mine site, use of chemical dust suppressants is not expected for the exploration access road. However, if there are safety concerns, chemical dust suppressants will be only used as a last resort and only in accordance with the Environmental Guidance for Dust Suppression published by the Government of Nunavut Department of Environment (GN 2014). |
| M-2 | Management – Dewatering Discharge | Dewatering will not be necessary during bridge construction. |
| M-3 | Management - Equipment | Most construction activity will occur when the ground and watercourse are frozen.<br><br>Equipment will be stored and maintained in a manner that prevents the entry of any deleterious substance from entering the water or being deposited on ice.<br><br>It is not expected that equipment will enter the water because the crossing will be conducted under frozen conditions. If equipment does unexpectedly have to enter the water any part of equipment entering the water or operating on the bank shall be free of fluid leaks, and externally cleaned/degreased to prevent any deleterious substance from entering the water. |

| Management Practices/Controls (continued) | | |
|---|---|---|
| **CODE** | **MITIGATION MEASURE** | **DESCRIPTION** |
| M-4 | Management - Erosion and Sediment Controls | Construction when the ground is frozen reduces erosion potential. Areas with potential to generate erosion will be stabilized with rip rap. Any evidence of erosion will be repaired by placing rip rap over the affected area, and measures will be taken to reduce the velocity of the water with, for example, silt curtains and/or small dikes. Any problematic water will be directed away from water bodies, or held if possible. If necessary, silt curtains will be used to control suspended sediments in water seeping from the borrow pits. |
| M-5 | Management – Excess Materials | It is expected that the crossing will be constructed without stripping of the native soils .If soil is stripped or other material is generated it will be stored at least 31 m from any watercourse or waterbody. If there is potential for erosion of the material to a watercourse or waterbody it will be isolated with erosion control measures (i.e. silt fencing). |
| M-6 | Management – Fish Screens | No pumping is anticipated as part of this project. |
| M-7 | Management – Fish Transfer | It is expected that the crossing will be construced when the watercourse is completely frozen and no fish are present. No isolation of fish habitat during the open-water period is anticipated. In the event that isolation is required, fish within the isolated area will be captured and relocated to outside of the enclosed area. Relocations will be conducted by a qualified environmental professional, with the necessary permits in place and using appropriate capture, handling and release techniques to prevent harm and minimize stress. |
| M-9 | Management – Spills | The Spill Contingency Plan will be activated in the event of a spill. Spill kits will be on-site at all times and all employees and contract personnel will be trained and be responsible to report, mitigate and clean up small spills. In the case of a larger spill, spill response will be implemented by the Emergency Response Team based at Meadowbank and the environmental staff, who will advise, document, and report on initial response and clean-up actions. |
| M·10 | Management – Temporary Flow | The crossing will be constructed when the watercourse is frozen, effectively isolating the work zone. |
| M-11 | Management - Vegetation | The tundra vegetation in the project area does not interfere with construction activities. Road fill material will be placed directly of the existing soil without cutting, stripping, or grubbing. |

| Rehabilitation Measures | | |
|---|---|---|
| **CODE** | **MITIGATION MEASURE** | **DESCRIPTION** |
| R-1 | Rehabilitation - Bank | Bank disturbance will be minimized. Where banks are disturbed and potential for erosion exists, they will be stabilized with clean riprap. |
| R-2 | Rehabilitation - Bed and Substrate | Bed disturbance is not anticipated to be necessary. |
| R·3 | Rehabilitation - Exposed Soils/Surfaces | Areas of disturbed soil that drain to a watercourse/waterbody will be stabilized with clean rip rap. |
| R-4 | Rehabilitation - In-stream Cover | No removal of material from below the ordinary high water mark is anticipated. |
| R-5 | Rehabilitation – Riparian Vegetation Plantings | Tundra vegetation will not be re-planted. Bank areas with erosion potential will be stabilized with clean rip rap. |