Mary River Iron Mine
Nunavut Water Board Water License
Application Section 9
Representative Crossing Summary Sheet

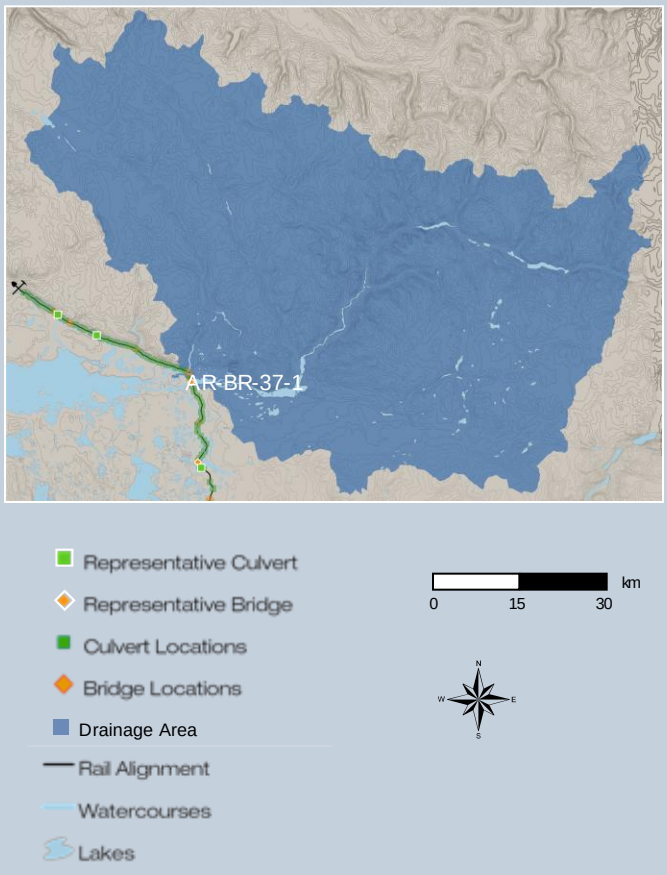
BR-37-1

Zone: 17W
Easting: 595447
Northing: 7894053
Station: 37+572

Fish Habitat	Important fish habitat
Structure Design	No. Spans: 7 Span Lengths: 30m Bridge Type: Deck Plate Girder (DPG) Slope: 3.1 %
Drainage Area	5601.0 km^2
Design Flow	10 yr 3 day delay = 423.48 m^3/s 200-yr = 2124.71 m^3/s
Downstream Velocity	10 yr 3 day delay = 1.04 m/s 200 yr = 1.95 m/s

Description of Crossing Structure

The representative bridge crossing, BR-37-1 consists of 7 individual 30 meter spans utilizing steel girders crossing the Ravn River. Due to the height of the railway above the river, steel towers are required to support the superstructure at the appropriate elevation. Precast concrete abutments and pier caps in turn support the superstructure and the towers. The Ravn River is a significant waterway in the area and is believed to maintain water flow year round. The river is considered navigable and is classified as a high importance fish habitat.



Crossing Construction

Due to the size and complexity of BR-37-1, construction will occur in two distinct stages. Accordingly, construction will occur in both frozen and thawed conditions. Each stage will require a construction berm to gain access to three adjacent piers. Each berm will project from a bank out into the river and surround the pier locations, thus allowing equipment to gain access for construction. River flows will be diverted away from the berm, but always maintain no less than one third of the river channel open for flow. It is anticipated that during the spring freshette, the berms will be removed, allowing full natural channel banks to be utilized for the short duration of expected high waters. The preferred berm material is ice and snow, but granular material may be required to prevent erosion around the projecting edge and allow construction activities before winter freeze-up. The watercourse channel will be restored to the original stream characteristics. Construction of the foundation for the structure will involve the drilling or driving of piles into the permafrost for each of the abutments and piers. Drilling spoils if required, will be collected and either removed from the site or used for the railway embankment construction. No excavation of native material is anticipated for the abutments. Minimal excavation to allow the pre-cast concrete pile caps to be placed and secured over piles and below the streambed is anticipated. Class 3 large riprap will be placed to create an erosion protection apron around the concrete pile cap. Precast concrete pedestals will be installed above the pile caps to above the anticipated high water level. Steel towers will then be installed on the pedestals to support steel girders. Silt fencing will be placed on the banks to prevent sediment from entering the watercourse throughout construction. Construction materials, equipment and debris will be removed from the berms prior to each spring freshette.

Anticipated machinery required for the construction includes trucks, crane, backhoe (for spoils removal), pile rig and cementitous mixers. Materials and machinery will be transported to and from the site on an access road or on the rail alignment. All construction activity will be restricted to the area within the identified construction right-of-way zone.

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Site Photos

1

2

3

Photo 1 is an aerial image of the Ravn River of the crossing area. Photos 2 and 3 are taken at the approximate crossing location, looking downstream and across from the northern shore.

Existing Conditions at Crossing Site

The lands surrounding the Ravn River Crossing are relatively flat and are characterized by numerous ponds and small lakes. Approximately 9 km downstream of the crossing, the river enters Angajurjualuk Lake. This site is an important fish habitat and provides abundant, suitable habitat for both Arctic Char and the Ninespine stickleback. The river at this location has high potential as rearing habitat and as a migration corridor for both species. However it does not provide overwintering habitat for either species and only provides low spawning habitat potential for ninespine stickleback.

Navigability:	Navigable	
Width and Depth:	Bankflow width =146 m Wetted width = 114 m Maximum Depth = >1m	
Substrate and Vegetation:	Channel Morphology: 50% Riffle, 20% Pool, 30% Rapid Substrate Composition: 5%Fines, 15% Gravel, 50% Small Cobble, 20% Large Cobble, 10% Boulder Stream Cover: N/A	
Channel Meander Pattern:	Floodplain Width (m): not measured Channel Pattern: Meandering Channel Confinement: partially confined Channel Gradient: <0.5º	Bank Height (L/R; m): 0.0-3.0 Bank Shape (L/R):20% undercut, 80% sloped Bank Stability :Not determined
Fish Habitat :	The Ravn River provides abundant suitable habitat for both Arctic char and the Ninespine stickleback species.	

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Predicted Environmental Impact	Proposed Mitigation
Direct loss of fish habitat from structure installation.	• If construction of the bridge crossings is determined to result in a Harmful Alteration, Disruption or Destruction (HADD) of fish habitat, DFO will determine appropriate measures to ensure "no net loss" • Watercourse channel will be restored to the original stream flow characteristics.
Potential for fish stranding or mortality during construction	• Temporary crossings required to work from an opposite bank will employ ice bridges or snow fills as conditions allow. • No in–water work will be carried out during the timing window for fall spawning fish (September 1 to June 30). • The withdrawal of any water will not exceed 10 % of the instantaneous flow, in order to maintain existing fish habitat. • The watercourse will be checked regularly for eggs, juveniles, and adult fish through the section intersected by the crossing. Any stranded fish will be rescued. Banks should be monitored during the draw down period especially.
Potential for barriers to fish passage	• Meet DFO requirements for fish passage. • Following construction of the crossing and where it is safe to do so, a v-notch in the centre of the ice bridge will be created to allow it to melt from the centre and also to prevent blocking fish passage, channel erosion and flooding. Compacted snow will be removed from snow fills prior to the spring freshet
Potential for loss of riparian habitat within the footprint	• Restoration of riparian habitat
Sediment effects and degradation of water quality due to sediment or other contaminants both at the crossing and downstream	• Construction will follow practices outlined in the Section 9.6 and Project EMS • Timing of works in and adjacent to watercourses during winter window to avoid sensitive periods for fish migration or spawning.
Damage to stream banks from construction equipment increases the potential for erosion	• Operate machinery on land (above the HWM) and in a manner that minimizes disturbance to the banks of the watercourse. • Install effective sediment and erosion control measures before starting work to prevent the entry of sediment into the watercourse. Inspect them regularly during the course of construction and make all necessary repairs if any damage occurs. • Banks and substrate will be restored to pre-construction condition.
Removal of vegetation at crossing locations.	• This removal should be kept to a minimum and within the right-of-way. • Approaches will be designed and constructed so that they are perpendicular to the watercourse to minimize loss or disturbance to riparian vegetation. • Existing trails, roads, or cut lines will be used wherever possible to avoid disturbance to the riparian vegetation. • Any disturbed areas will be vegetated by planting and seeding native species and areas with be covered by mulch to prevent erosion and to help seeds germinate. The site will be maintained until site is stabilized by vegetation.
Direct or indirect impact from blasting.	• If blasting is required near watercourse, DFO Blasting Guidelines (Wright and Hopky) will be met where possible.
Potential for spills of fuel or other fluid from construction vehicles	• Adhere to contingency plans identified in the project EMS (DEIS, Volume 10). • Machinery is to arrive on site in a clean condition and is to be maintained free of fluid leaks. Wash, refuel and service machinery and store fuel and other materials for the machinery away from the water to prevent any deleterious substance from entering the water. • Keep an emergency spill kit on site in case of fluid leaks or spills from machinery. • Use snow berms (if possible) to prevent deleterious substances from entering the watercourse.
Solid waste could foul the local environment and attract scavengers	• Solid waste generated at the crossing site will be removed from the site and disposed of in accordance with applicable Nunavut regulations