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# **FISHERIES AND OCEANS CANADA**

## **Technical Review Comments to the Nunavut Impact Review Board (NIRB) and Nunavut Water Board (NWB)**

### **Doris North Gold Mine Project**

**Water Licence 2AM-DOH1323 Amendment No.1  
Project Certificate No. 003 Reconsideration**

**December 2015  
DFO File No.: 02-HCAA-CA7-00117**

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## EXECUTIVE SUMMARY

Fisheries and Oceans Canada (DFO) has reviewed TMAC Resources Inc.'s (TMAC) Doris North Gold Mine Project, Water Licence No. 2AM-DOH1323 Amendment No. 1 Application, and Project Certificate No. 003 Amendment Proposal, pursuant to the *Fisheries Act*. DFO's Fisheries Protection Program will determine what aspects of the proposal could impact fish and fish habitat, and work with the Proponent to avoid, mitigate and offset impacts.

DFO's comments are based on our departmental mandate under the *Fisheries Act*, specifically the management and protection of fish, marine mammals and their habitat. DFO's primary focus in reviewing proposed developments in and around fisheries waters is to ensure that works, undertakings and activities are conducted in such a way that the proponents are in compliance with the applicable provisions of the *Fisheries Act*.

The fisheries protection provisions of the *Fisheries Act (2013)*, specifically subsection 35(1), state that "*No person shall carry on any work, undertaking or activity that results in serious harm to fish that are part of a commercial, recreational or Aboriginal fishery or to fish that support such a fishery.*" However, under paragraph 35(2)(b) of the *Fisheries Act*, the Minister of Fisheries and Oceans may issue an Authorization with terms and conditions in relation to a proposed work, undertaking or activity that may result in *serious harm to fish*. *Serious harm to fish* is defined in section 2 of this Act as the death of fish, or permanent alteration to or destruction of fish habitat.

DFO is providing the following technical review comments in response to the Nunavut Impact Review Board (NIRB) correspondence dated November 5, 2015, and the Nunavut Water Board (NWB) correspondence, also dated November 5, 2015.

The Technical Review Comments from DFO outlined below cover areas for which DFO seeks clarification and further detail. In summary the major issues identified include:

### Changes to the Life-of-Mine and *Fisheries Act* Authorization Conditions

The proposed Amendments to the Doris North Gold Mine Project will result in an increased life-of-mine from two to six years. DFO will require clarification as to how the increase in life-of-mine will affect monitoring requirements for existing Authorization NU-02-0117.2.

### Impacts to Aquatic Environments

Proposed infrastructure and Project works, undertakings and activities, including a discharge pipeline into Roberts Bay, water loss from Doris Lake as a result of underground mining operations and the installation of water course crossings are associated with the development of the proposed Doris North Mine and have the potential for *serious harm to fish* as defined by the *Fisheries Act*. DFO has determined that additional information is needed before the extent of residual *serious harm to fish* can be evaluated and any required offsetting determined.



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## 1.0 INTRODUCTION

This technical review submission summarizes Fisheries and Oceans Canada's (DFO) assessment and recommendations concerning the proposed Type A Water Licence 2AM-DOH1323 Amendment Application and Project Certificate No. 003 Amendment Proposal for the Doris North Gold Mine project. The purpose of this submission is to provide expert advice to the Nunavut Impact Review Board (NIRB) and the Nunavut Water Board (NWB) to assist in their assessment of potential environmental impacts associated with the Proposal.

As directed by the NIRB and the NWB in their letters dated November 5, 2015, this submission focuses on detailed analysis of the Amendment Proposal for the Doris North Project Certificate No. 003 and the Amendment Application for the Water Licence 2AM-DOH-1323 to provide a thorough technical assessment as well as an analysis of the adequacy and quality of the information presented by the Proponent TMAC Resources Inc. The intent of technical review comments is to outline whether Parties agree with the Proponent's conclusions, the adequacy of the proposed mitigation and monitoring measures and whether Parties support the approval of the amendment as currently proposed.

## 2.0 MANDATE, RELEVANT LEGISLATION AND POLICY

The *Constitution Act* (1982) provides the federal government with exclusive authority for coastal and inland fisheries within Canada's territorial boundaries. DFO exercises this power through, the administration of the *Fisheries Act* and some aspects of the *Species at Risk Act*. Under the *Fisheries Act*, DFO is responsible for the management, protection and conservation of fish (which include marine mammals as defined by the *Fisheries Act*) and their habitats. The Minister of Fisheries and Oceans is one of the competent ministers under the *Species at Risk Act* (SARA).

In general, the Fisheries Protection Program of DFO undertakes the review of proposed developments in and around fisheries waters to ensure that works, undertakings and activities are conducted in such a way that the proponents are in compliance with the applicable provisions of the *Fisheries Act*.

The mandate of the Fisheries Protection Program is to maintain the sustainability and ongoing productivity of commercial, recreational and Aboriginal fisheries. Subsection 35 (1) of the fisheries protection provisions of the *Fisheries Act* states that "No person shall carry on any work, undertaking or activity that results in *serious harm to fish* that are part of a commercial, recreational, or Aboriginal fishery or to fish that support such a fishery.

Fisheries and Oceans Canada interprets *serious harm to fish* as:

- the **death of fish**;
- a **permanent alteration** to fish habitat of a spatial scale, duration or intensity that limits or diminishes the ability of fish to use such habitats as spawning grounds, or as nursery, rearing, or food supply areas, or as a migration corridor, or any other area in order to carry out one or more of their life processes;
- the **destruction of fish habitat** of a spatial scale, duration, or intensity that fish can no longer rely upon such habitats for use as spawning grounds, or as nursery, rearing, or food supply areas, or as a migration corridor, or any other area in order to carry out one or more of these life processes.

However, under paragraph 35(2)(b) of the *Fisheries Act*, the Minister of Fisheries and Oceans may issue an authorization with terms and conditions in relation to a proposed work, undertaking or activity that may result in *serious harm to fish*, subject to the consideration of the four factors in Section 6 of the *Fisheries Act*:

1. The contribution of the relevant fish to the ongoing productivity of commercial, recreational or Aboriginal fisheries;
2. Fisheries management objectives;
3. Whether there are measures and standards to avoid, mitigate or offset *serious harm to fish* that are part of a commercial, recreational or Aboriginal fishery, or that support such a fishery; and
4. The public interest.

The Fisheries Protection Program is guided by the “Fisheries Protection Policy Statement” (October 2013), the intent of which is to provide guidance to Canadians to ensure that they are complying with the *Fisheries Act*. It strengthens the Government’s ability to address key threats to the productivity and sustainability of our fisheries, through standards and guidelines to avoid, mitigate and offset impacts to fisheries and to ensure compliance with these requirements.

The “Fisheries Productivity Investment Policy: A Proponent’s Guide to Offsetting” (November 2013) provides guidance on undertaking effective measures to offset *serious harm to fish* that are part of or that support a commercial, recreational or Aboriginal fishery, consistent with the fisheries protection provisions of the *Fisheries Act*. The objective of offsetting is to counterbalance unavoidable residual *serious harm to fish* and the loss of fisheries productivity resulting from a project.

The *Species at Risk Act* is intended to prevent Canadian indigenous species, subspecies and distinct populations of wildlife from being extirpated or becoming extinct; to provide for the recovery of wildlife species that are extirpated, endangered or threatened as a result of human activity; and to manage species of special concern to prevent them from becoming endangered or threatened. The Minister of Fisheries and Oceans is the competent minister for listed aquatic species that are fish (as defined in section 2 of the *Fisheries Act*) or marine plants (as defined in section 47 of the *Fisheries Act*).

Environment Canada (EC) is responsible for the administration and enforcement of the pollution prevention provisions of the *Fisheries Act* on behalf of DFO (section 34 and sections (36-42)).

For more information, see: <http://www.dfo-mpo.gc.ca/pnw-ppe/pol/index-eng.html>

### 3.0 TECHNICAL REVIEW COMMENTS

<b>Review Comment No.</b>	<b>3.1 Life-of-Mine and Fisheries Act Authorization Conditions</b>
<b>Subject/Topic</b>	<b>Life-of-Mine and Fisheries Act Authorization Conditions</b>
<b>References</b>	<p>Package 2: Project Description (June 2015): p. iv</p> <p>Package 4: Identification of Potential Environmental Effects and Proposed Mitigation (June 2015): 4-38</p> <p>Package 5: P5-2, Interim Closure and Reclamation Plan (June 2015): p. 19</p> <p>Fisheries Act Authorization NU-02-0117.2: Condition 5</p>
<b>Summary</b>	<p>TMAC notes that the proposed changes will “add approximately 4 years of mine life to the approximately 2 years originally reported in the Final Environmental Impact Statement... bringing the total life of mine to about 6 years.” (Package 2, p. iv)</p> <p>“The fish habitat monitoring program was developed to monitor the stability and successful use of fish habitat compensation structures, specifically the jetty and shoals in Roberts Bay.” (Package 4, 4-38)</p> <p>At closure, the existing jetty and marine outfall berm associated with the proposed discharge pipeline “will be partially removed, to an elevation 0.3 m below the low water level. The rock fill will be placed into the surrounding water. The mooring points and buoys will be removed from site.” (Package 5, P5-2, p. 19)</p>
<b>Importance of issue to impact assessment</b>	This issue relates to TMAC’s obligations under <i>Fisheries Act</i> Authorization NU-02-0117.2.
<b>Detailed Review Comment</b>	<p><b>Gap/Issue:</b> <i>Fisheries Act</i> Authorization NU-02-0117.2 refers to a schedule of monitoring that includes, among other details, setting the timing of monitoring activities relative to years of construction, years of mine operation, and years post-closure, at which point the existing jetty constructed in Roberts Bay will be lowered below the high water level.</p> <p><b>Disagreement with Amendment Proposal conclusion, and reasons:</b> The proposed amendments, including an extension of Life-of-Mine by approximately 4 years, are not reflected in Roberts Bay Habitat Compensation Monitoring Plans, as well as closure plans to lower the existing jetty in Roberts Bay.</p>



<b>Recommendation/Request</b>	<p><b>3.1.1</b> DFO requests that TMAC reflect the implications of the adjusted Life-of-Mine will be in revised Monitoring Plans and closure activities associated with <i>Fisheries Act</i> Authorization NU-02-0117.2. These updates may require modifications to the current <i>Fisheries Act</i> authorization and will be addressed during the regulatory phase of the proposed Project amendments.</p>

<b>Review Comment No.</b>	<b>3.2 Reduction in Doris Lake Water Levels</b>
<b>Subject/Topic</b>	<b>Reduction in Doris Lake Water Levels</b>
<b>References</b>	<p>Package 2: Project Description (June 2015): p. v, 16</p> <p>Package 4: Identification of Potential Environmental Effects and Proposed Mitigation (June 2015): various pages as indicated below</p> <p>DFO (June 21, 2010) DFO Protocol for Winter Water Withdrawal from Ice-Covered Waterbodies in the Northwest Territories and Nunavut.</p> <p><i>Fisheries Act</i> Authorization NU-02-0117.3</p>
<b>Summary</b>	<p>The proposed Project will result in additional water losses from Doris Lake. TMAC notes that “the maximum groundwater inflow encountered at full mine development under Doris Lake is expected to be 3,000 m<sup>3</sup>/day. The modelling indicates a risk that some of the water entering the mine will originate in Doris Lake, and could infiltrate at a rate that could cause reductions in Doris Lake water levels. Based on modelling and review of baseline data, the changes to Doris Lake are considered to be mostly within the natural variation of flows in the system. Should changes occur outside of natural variation, TMAC will offset for any negative effects to fisheries.” (Package 2, p. v)</p> <p>TMAC does not, however, request that this water be incorporated into allowable withdrawals allocated in its Water Licence. “Additional water beyond the current permitted withdrawal volume will not be required to be withdrawn from Doris Lake. As such, no additional water allowance is being requested in this Amendment Application.” (Package 2, p. 16)</p>
<b>Importance of issue to impact assessment</b>	It is not yet clear whether any residual <i>serious harm to fish</i> as a result of the Project will be incurred from these additional water losses in Doris

	<p>Lake, which would require Authorization under the fisheries protection provisions of the <i>Fisheries Act</i>, as well as development of an Offsetting Plan to offset for impacts to fisheries productivity in Doris Lake. Residual <i>serious harm to fish</i> is that which cannot be avoided or mitigated.</p>
<p><b>Detailed Review Comment</b></p>	<p><b>Gap/Issue:</b> TMAC indicates that modelling predicts volumes lost from Doris Lake into the underground mine may be more than double the volumes allocated for its withdrawal from Doris Lake under the Water Licence: “Annual withdrawal of 480,000 m<sup>3</sup> from Doris Lake is currently permitted (Type A Water Licence 2AM-DOH1323). ... [it is] estimated that in addition, loss of water from Doris Lake into the underground workings could be up to 610,000 m<sup>3</sup>/year at its peak.” (Package 4, p 2-20)</p> <p>TMAC suggests that this additional loss is likely to result in <i>serious harm to fish</i>: “The maximum potential water level decrease due to the extraction of the currently permitted 480,000 cm/year from Doris Lake is within the range of natural variability, and no adverse effects are predicted in the Doris North FEIS. ... The cumulative water losses from Doris lake, included the permitted withdrawal volume combined with the loss to the underground mine, <b>are predicted to result in serious harm to fisheries</b> and an Offset Plan and DFO Authorization will be obtained.” (Package 4, p. i) [emphasis added]</p> <p>DFO concurs with TMAC that water levels in Doris Lake fluctuate annually. Between 2004 and 2014, the mean water level fluctuation for Doris Lake was 0.54 m, with a minimum of 0.29 m and a maximum of 0.74 m over various time periods (Package 4, Table 2.3-2).</p> <p>DFO also notes that total annual withdrawals, assuming maximum withdrawal under the Water Licence and including the additional losses from Doris Lake, come to approximately 4% of the total lake volume. “Doris Lake...has a surface area of 337.8 ha, a volume of 27, 275,094 m<sup>3</sup>, an average depth of 8.1 m.” (Package 4, p. 2-11).</p> <p>TMAC calculates that water loss will decrease outflow from Doris Lake by on average 13.7 %, resulting in a draw-down of lake levels by 23 cm during the winter (less than 4 % of the lake volume under 2 m ice). This is within the general 10% maximum winter withdrawal guideline recommended by DFO for lakes in the Northwest Territories and Nunavut (DFO, 2010); however, this does not preclude consideration of potential impacts to fish and fish habitat in the nearshore littoral zone in a site-specific manner. (Package 4, p. 2-24 to 2-26)</p> <p>DFO notes that much of the shoreline is bedrock, but that habitats that may be suitable as spawning substrates for fish in Doris Lake are also located primarily near shore, which suggests that spawning habitat may</p>

be both limited, and vulnerable to lower lake water levels. (Package 4, p. 2-11).

TMAC has also discussed the effects of water reduction in Doris Lake on subsequent outflows and areas downstream. “As a result of the winter water withdrawal, onset of Doris Lake outflow will be delayed by 10 days compared to baseline conditions.” (Package 4, p. 2-21 and Table 2.5-1). Furthermore, “the total number of flow days in Doris Lake Outflow and Creek will decrease by 15 days (baseline flow days = 131, project = 116.” (p. 2-26) This represents a reduction in available rearing habitat used by Arctic Char, Lake Trout and Ninespine Stickleback by an 11% on average) and up to a maximum of 18% (for dry years) for the six years during which the water loss during mining may persist.” (p. 2-27)

Further on, “Effects of water loss from Doris Lake are diminished downstream of Little Roberts Lake (Table 2.5-2).” “This represents a potential reduction in fish passage... and access to habitats... by Arctic Char, Lake Trout by less than 1% (on average) and up to a maximum of 5% (for dry years) for the six years during which the water loss during mining may persist.” (Package 4, p. 2-28).

TMAC notes that more information is needed and is to be obtained. “To quantify the amount of serious harm required to be offset (i.e., up to 18% reduction in flow days and the 27.9% reduction in discharge), additional modeling and characterization of Doris Lake Outflow and Doris Creek are required.” (Package 4, p. 2-27).

Mitigation has been proposed by TMAC: “Use of intercepted groundwater for drilling purposes [to] reduce the demand from freshwater and lake drawdown.” (Package 4, p. 2-28)

**Disagreement with Amendment Proposal conclusion, and reasons:** DFO agrees with TMAC that additional studies are needed to verify the location, and suitability, of spawning habitats for Lake Trout in Doris Lake, but also recommends that TMAC establish the location and suitability of spawning shoals for Lake Whitefish and Lake Cisco, also known to be present in Doris Lake. Lake Whitefish and Lake Cisco are fish species known to be part of, or support, commercial, recreational or Aboriginal fisheries.

It is not yet clear whether all of the avoidance and mitigation measures, which may be used by the proponent to address the impacts of potential water loss in Doris Lake and downstream environments, will be insufficient to address potential *serious harm to fish* as a result of the Project. DFO has not yet been determined whether Authorization and offsetting would be required. Furthermore, it is not clear what proportion of the intercepted groundwater may be used in place of freshwater withdrawals, nor is it clear how much of the Water Licence-

	<p>allotted 480,000 m<sup>3</sup> per year TMAC is actually planning to draw from Doris Lake during the time which Doris Lake will also be losing water to underground mining operations. Thus, the extent to which use of intercepted groundwater will avoid or mitigate impacts to fish and fish habitat has not been clearly established.</p> <p>DFO notes that monitoring for offsetting associated with <i>Fisheries Act</i> Authorization NU-02-0117.3 is ongoing in Roberts Lake Outflow. It is not clear how potential negative impacts to Roberts Lake Outflow offsetting as a result of reductions in flow will be incorporated into future monitoring.</p> <p>DFO also notes that a revised Aquatic Effects Monitoring Program does not appear to be included in the application documents. It is not clear whether water levels in Doris Lake and/or its outflows will be monitored, so that the actual amount of lake drawdown may be determined and additional mitigation measures put into place if thresholds are reached (including the possibility of cessation of water withdrawal from Doris Lake, such that total water losses from the Lake either do not exceed what is permitted in the Water Licence, or do not cause unauthorized <i>serious harm to fish</i>).</p> <p>One further mitigation measure that could be considered would be the withdrawal of freshwater from an alternate source.</p>
<p><b>Recommendation/Request</b></p>	<p><b>3.2.1</b> DFO recommends that TMAC conduct the described baseline studies, including those to determine the location and suitability of fish habitat spawning shoals for all fish species in Doris Lake that are part of or support a commercial, recreational or Aboriginal fishery, including Lake Trout, Lake Whitefish and Lake Cisco. This should include the quantity of spawning habitat that will be exposed to ice scour or desiccation following additional loss of water from Doris Lake to underground mining activity. This information will be needed to determine the amount of residual <i>serious harm to fish</i> as a result of the proposed Project that cannot be avoided or mitigated, and must be Authorized and offset according to the applicable provisions of the <i>Fisheries Act</i>.</p> <p><b>3.2.2</b> DFO recommends that TMAC explore all possible mitigation measures to avoid and mitigate <i>serious harm to fish</i> in Doris Lake as a result of the proposed Project. This includes consideration of alternate water sources, and providing more detailed assessments of the extent to which intercepted groundwater may be used in place of freshwater withdrawals in Doris Lake. Precise estimates of actual water withdrawal rates during the phase of the proposed Project when underground mining operations will occur will also be required to determine the effectiveness of their proposed mitigation regarding impacts to fish and</p>

	<p>fish habitat.</p> <p><b>3.2.3</b> DFO recommends that TMAC revise their Aquatic Effects Monitoring Program to include monitoring of water levels in Doris Lake and outflows, as well as threshold water levels beyond which additional mitigation measures must be taken to avoid <i>serious harm to fish</i>.</p> <p><b>3.2.4</b> DFO recommends that TMAC address how potential impacts to Roberts Lake Outflow will affect the effectiveness and monitoring of offsetting constructed for <i>Fisheries Act</i> Authorization NU-02-0117.3, and how any such impacts can be avoided or mitigated.</p>
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<b>Review Comment No.</b>	<b>3.3 Roberts Bay Discharge Pipeline</b>
<b>Subject/Topic</b>	<b>Roberts Bay Discharge Pipeline</b>
<b>References</b>	<p>Package 2: Project Description (June 2015): p. v, 21</p> <p>Package 4: Identification of Potential Environmental Effects and Proposed Mitigation (June 2015): various pages as indicated below</p> <p>DFO letter to NIRB, January 17, 2014: "TMAC Resources Inc.'s Proposed Modifications to the Doris North Gold Mine Project and Reconsideration of the NIRB Project Certificate No 003 Terms and Conditions."</p>
<b>Summary</b>	<p>TMAC is proposing to construct a large discharge pipeline in Roberts Bay. "The pipe will enter the marine environment, armoured by riprap. The pipeline will run approximately 2 km from shore to the bathymetric contour." (Package 2, p. v)</p> <p>"The discharge pipeline will enter the Roberts Bay marine environment through a Marine Outfall Berm, which extends from the shoreline to approximately the 4 m bathymetric contour. ... The pipeline will thus consist of both armoured and exposed sections. Construction of the Marine Outfall Berm to the 4 m bathymetric contour protects the pipeline from ice scouring and displacement." (Package 2, p. 21)</p> <p>"Berm installation will involve the placement of two layers of geogrid covering an area of 2490 m<sup>2</sup> on the seabed prior to the placement of rock fill. Placed rock will cover approximately 1,550 m<sup>2</sup> of the seabed, leaving 940 m<sup>2</sup> of geogrid to exposed below the MHHWL, extended outwards ~5m from the toe of the marine outfall berm. It is expected that this exposed geogrid will rapidly be covered by sediments through tidal deposition. ... The berm structure will be comprised of clean Run of</p>

	<p>Quarry (ROQ) and Rip Rap (i.e., armor rock), with smaller substrate sizes ranging from 250-500 mm in diameter, and upwards of 1 to 1.5 m for the larger Rip Rap that will be required at the toe of marine outfall berm.” (Package 4, p. 4-60).</p> <p>“After emerging ... at the toe of the marine outfall berm, the pipeline, still protected within the 24” diameter (610 mm) steel pipe for approximately 5 m, will continue along the bottom for approximately 2191 m to the 40 m isobaths, ending at the diffuser... the current design of the proposed pipeline is expected to have a footprint of up to approximately 628 m<sup>2</sup> if 50% settlement occurs (i.e., no suspension). ... The pipeline will be ballasted with concrete weights that will stabilize (and possibly suspend) the pipeline along the bottom of the seafloor. Each ballast is expected to have a footprint of ... 0.32 m<sup>2</sup> [and there will be]....438 exposed ballast weight units. Thus the total footprint of the ballast weights will be approximately 140 m<sup>2</sup>.” (Package 4, p. 4-61).</p> <p>“With current information, the total area permanently altered/lost by the construction of the subsea pipeline and associated infrastructure... will be upwards of 2,318 m<sup>2</sup>... consisting primarily of fine/mud substrates, which are abundant in Roberts Bay.” (p. 4-62)</p>
<b>Importance of issue to impact assessment</b>	<p>Although DFO considers it unlikely that the proposed Roberts Bay Discharge Pipeline, as currently planned, will result in a localized impact to fish populations, DFO notes that survey methodology to assess the presence of marine mammal species in the region is non-standard and may result in underestimates of abundance.</p>
<b>Detailed Review Comment</b>	<p><b>Gap/Issue:</b> TMAC has suggested that the proposed discharge pipeline, including the outfall berm, may result in <i>serious harm to fish</i> in Roberts Bay. “It is recognized that construction of the Marine Outfall Berm in the marine environment may constitute Serious Harm and that a Fisheries Authorization will be required from DFO.” (Package 2, p. 22)</p> <p>Roberts Bay contains a number of species that are part of, or support, commercial, recreational and Aboriginal fisheries. “A total of 17 confirmed [fish] species have been captured in Roberts Bay... in addition to 3 unconfirmed species... for a total of 20 species” (Package 4, 4-49). Additionally, “three species of marine mammals, the beluga whale..., ringed seal..., and bearded seal..., have been observed in marine environments surrounding the Doris North Project.” Narwhals have also been recently noted nearby in Cambridge Bay (Package 4, 4-45). Marine mammal abundance was determined via “two survey methods..., an [aerial] survey was flown in early spring of 2010 to document the presence and distribution of seals ... [and] a ship-based survey was also conducted in late summer of 2010 between Cambridge Bay and Roberts</p>

Bay to document the presence of larger marine mammals, such as belugas” (Package 4, 4-45). During the barge survey, “one observer scanned for seabirds and marine mammals from either the port or starboard side of the vessel; the observer selected the side that had the least wind and glare to minimize error” (Package 4, 4-47).

In the proposed area of infrastructure development, shoreline was assessed to be 51% cobble, 15% boulder, 15% gravel, 14% fines and 5% bedrock; “the substrate in the littoral zone is also dominated by cobble (48%) and boulder (31%). ... whereas offshore areas consisted primarily of mud” (p. 4-30).

“It is proposed that the permanent alteration/loss of habitat ... will be offset through a combination of infrastructure design and offsetting replacement habitats including: the use of coarse rocky substrates (dominated by ~1 m<sup>2</sup> diameter rip rap at toe of berm, remaining substrates between 250 to 300 mm in diameter) for construction of the marine outfall berm (surface area below MHHWL of approximately 650 m<sup>2</sup>); new surface area created by the concrete ballast contributing up to 2.12 m<sup>2</sup>)... and the creation of two rock shoals.” (p. 4-63)

“Importantly, the pipeline and its construction is not expected to obstruct the migration of marine fish such as capelin, which undergo seasonal movements to spawning grounds east of Roberts Bay as installation will be timed to occur during the most appropriate window to ensure minimal interference with sensitive life stages of most fish species known to exist in Roberts Bay.” (p. 4-63)

**Disagreement with Amendment Proposal conclusion and reasons:** DFO notes that the survey method used by TMAC to assess the presence of marine mammals apart from seals (Barge Survey) is non-standard methodology, representing a single transect and that observers were only present on one side of the ship. Thus, the abundance of marine mammals in Roberts Bay and the surrounding area may be underestimated. DFO notes that appropriate selection of mitigation methods and timing windows to avoid impacts to fish and marine mammals in Roberts Bay requires suitable baseline knowledge of the species present in the region.

However, DFO notes that the proposed discharge pipeline has not currently been assessed as likely to result in residual *serious harm to fish* requiring a *Fisheries Act* Authorization. As DFO noted previously to TMAC and NIRB, “There are new works and undertakings proposed in the marine environment, specifically the installation of the diffuser array and the associated pipeline and ballast. DFO has determined that this will not result in *serious harm to fish* and a *Fisheries Act* Authorization will not be required to carry out these works.” (DFO Letter to NIRB, January 17, 2014, p. 1—2). Furthermore, DFO has determined that, as



	currently designed and presented in the Application, the marine outfall berm is unlikely to result in a localized effect to fish populations.
<b>Recommendation/Request</b>	<b>3.3.1</b> DFO recommends that TMAC use a precautionary approach, in determining the extent to which mitigation measures are employed, during the construction and operation of the proposed Roberts Bay Discharge Pipeline, as it is possible that marine mammal abundance in the region has been underestimated.

<b>Review Comment No.</b>	<b>3.4 Roads – Water Crossings</b>
<b>Subject/Topic</b>	<b>Roads – Water Crossings</b>
<b>References</b>	<p>Package 2: Project Description (June 2015): p. v</p> <p>Package 4: Identification of Potential Environmental Effects and Proposed Mitigation (June 2015): p. 2-24</p>
<b>Summary</b>	<p>“An additional 550 m of road and pipe length will extend to the northwest of the existing jetty and laydown area.” (Package 2, p. v)</p> <p>Two new water crossings will be required in the proposed Project. “A combined wastewater pipeline and road crossing is required over a small, unnamed stream that flows into Roberts Bay West.... Only Ninespine Stickleback have previously been captured [in this stream]. Additional sampling will be completed prior to crossing installation to confirm species composition and distribution. ... Doris Connector Vent Raise Access Road crosses a small unnamed tributary to Doris Lake.... Since this stream has not previously been sampled, it will be assessed in advance of crossing installation to determine whether it bears fish or not.” (Package 4, p. 2-24).</p>
<b>Importance of issue to impact assessment</b>	If appropriate avoidance and mitigation practices are not employed in water crossing design, construction and maintenance, <i>serious harm to fish</i> may result.
<b>Detailed Review Comment</b>	<b>Gap/Issue:</b> TMAC indicates that “Several DFO operational statements ... will be used as best management practices, along with DFO’s Measures to Avoid Causing Harm to Fish and Fish Habitat. ... As a result of mitigation and best management practices, no residual effects are anticipated on freshwater fish and fish habitat due to the construction of



	<p>stream crossings.” (Package 4, p. 2-24 and 2-25)</p> <p><b>Disagreement with Amendment Proposal conclusion and reasons:</b> TMAC has highlighted the use of mitigation practices, such as those presented in DFO’s former Operational Statements, in water crossing construction. However, it is unclear at this time, in the absence of detailed engineering designs, what the full suite of measures is that TMAC intends to implement to avoid, mitigate or offset <i>serious harm to fish</i> as defined in the <i>Fisheries Act</i> as a result of water crossings proposed for the Doris North Project. Furthermore, the fish-bearing status (and fish community present) in both streams that will be crossed as a result of the Project has yet to be determined.</p>
<p><b>Recommendation/Request</b></p>	<p><b>3.4.1:</b> DFO recommends that TMAC implement all available best management practices to avoid and mitigate <i>serious harm to fish</i> as a result of water crossing construction, operation and decommissioning when it comes to fish-bearing streams. This includes, but is not limited to, appropriate design of water crossings to facilitate fish passage at both high and low flows, timing windows that incorporate spawning, incubation and hatch times for all species using water courses, sediment and erosion control, protection and replanting of riparian vegetation, and other forms of bank stabilization.</p> <p><b>3.4.2:</b> DFO recommends that the TMAC provide DFO with detailed plans of all water crossings for review prior to construction, including the type of crossing, mitigation measures to be employed, timing of construction and measures taken to ensure water flow and fish passage is maintained at both high and low flows.</p>

## 4.0 SUMMARY OF RECOMMENDATIONS

Life-of-Mine and <i>Fisheries Act</i> Authorization Conditions	
1	<b>3.1.1</b> DFO requests that TMAC reflect the implications of the adjusted Life-of-Mine will be in revised Monitoring Plans and closure activities associated with <i>Fisheries Act</i> Authorization NU-02-0117.2. These updates may require modifications to the current <i>Fisheries Act</i> authorization and will be addressed during the regulatory phase of the proposed Project amendments.
Reduction in Doris Lake Water Levels	
2	<b>3.2.1</b> DFO recommends that TMAC conduct the described baseline studies, including those to determine the location and suitability of fish habitat spawning shoals for all fish species in Doris Lake that are part of or support a commercial, recreational or Aboriginal fishery, including Lake Trout, Lake Whitefish and Lake Cisco. This should include the quantity of spawning habitat that will be exposed to ice scour or desiccation following additional loss of water from Doris Lake to underground mining activity. This information will be needed to determine the amount of residual <i>serious harm to fish</i> as a result of the proposed Project that cannot be avoided or mitigated, and must be Authorized and offset according to the applicable provisions of the <i>Fisheries Act</i> .
3	<b>3.2.2</b> DFO recommends that TMAC explore all possible mitigation measures to avoid and mitigate <i>serious harm to fish</i> in Doris Lake as a result of the proposed Project. This includes consideration of alternate water sources, and providing more detailed assessments of the extent to which intercepted groundwater may be used in place of freshwater withdrawals in Doris Lake. Precise estimates of actual water withdrawal rates during the phase of the proposed Project when underground mining operations will occur will also be required to determine the effectiveness of their proposed mitigation regarding impacts to fish and fish habitat.
4	<b>3.2.3</b> DFO recommends that TMAC revise their Aquatic Effects Monitoring Program to include monitoring of water levels in Doris Lake and outflows, as well as threshold water levels beyond which additional mitigation measures must be taken to avoid <i>serious harm to fish</i> .
5	<b>3.2.4</b> DFO recommends that TMAC address how potential impacts to Roberts Lake Outflow will affect the effectiveness and monitoring of offsetting constructed for <i>Fisheries Act</i> Authorization NU-02-0117.3, and how any such impacts can be avoided or mitigated.
Roberts Bay Discharge Pipeline	
6	<b>3.3.1</b> DFO recommends that TMAC use a precautionary approach, in determining the extent

	to which mitigation measures are employed, during the construction and operation of the proposed Roberts Bay Discharge Pipeline, as it is possible that marine mammal abundance in the region has been underestimated.
<b>Roads – Water Crossings</b>	
7	<b>3.4.1</b> DFO recommends that TMAC implement all available best management practices to avoid and mitigate <i>serious harm to fish</i> as a result of water crossing construction, operation and decommissioning when it comes to fish-bearing streams. This includes, but is not limited to, appropriate design of water crossings to facilitate fish passage at both high and low flows, timing windows that incorporate spawning, incubation and hatch times for all species using water courses, sediment and erosion control, protection and replanting of riparian vegetation, and other forms of bank stabilization.
8	<b>3.4.2</b> DFO recommends that the TMAC provide DFO with detailed plans of all water crossings for review prior to construction, including the type of crossing, mitigation measures to be employed, timing of construction and measures taken to ensure water flow and fish passage is maintained at both high and low flows.

## 5.0 REFERENCES

Fisheries and Oceans Canada (DFO) (June 21, 2010) DFO Protocol for Winter Water Withdrawal from Ice-Covered Waterbodies in the Northwest Territories and Nunavut. 3 p.

Fisheries and Oceans Canada (DFO) (October 2013) Fisheries Protection Policy Statement. 22 p.

Fisheries and Oceans Canada (DFO) (November 2013) Fisheries Productivity Investment Policy: A Proponents Guide to Offsetting. 19 p.