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February 18, 2008

Your file
2AM-MEA
Our file:
NU-03-0109

Ms. Phyllis Beaulieu
Manager of Licensing
Nunavut Water Board Via electronic mail to:
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Dear Ms. Beaulieu:

Subject: Fisheries and Oceans Canada Technical Review of the Meadowbank Gold Project Type A Water License Application and Supporting Documents

Fisheries and Oceans Canada (DFO) would like to thank the Nunavut Water Board (NWB) for providing an opportunity to participate in the technical and pre-hearing meetings in support of a Type A Water License Application for the Meadowbank Gold Project by Agnico-Eagle Mines Limited (AEM).

In preparation for the Public Hearing scheduled for April 15, 2008, Fisheries and Oceans Canada (DFO) offers technical comments with respect to the water license application and the supporting documents as it relates to our mandate. The areas of concern for DFO are as follows:

- Sedimentation;
- Fish Salvage Program;
- Aquatic Effects Management Program;
- Blasting Plan;
- Closure and Reclamation; and
- Fish Habitat Compensation

DFO looks forward to participating in the Nunavut Water Board technical meeting and pre-hearing conference for AEM's Type A water licence application for the Meadowbank Gold Project. Should you have any questions, please contact me by telephone at (867) 979-8007 or by fax at (867) 979-8039.

Yours sincerely,

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**Technical Comments for the
Nunavut Water Board
Technical Meeting and Pre-Hearing Conference**

**Type A Water License Application
Meadowbank Gold Mine Project**

February 18, 2008

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1. REGULATORY REVIEW AND TECHNICAL QUESTIONS/COMMENTS

Fisheries and Oceans Canada (DFO) has completed a review of the Type A Water Licence application NWB File NO: 2AM-MEA and the supporting documents submitted by Agnico-Eagle Mines Limited (AEM) for the Meadowbank Gold Mine Project. DFO has conducted our review in regard to our mandate under the Fisheries Act which is explained briefly below. Our review identifies the impacts to fish and fish habitat as a result of the Project. We submit the following to identify the technical issues that need further clarification during the technical and pre-hearing conference to determine whether these can be resolved.

2. INTRODUCTION

The Constitution Act (1982) provides the federal government with exclusive authority for sea coastal and inland fisheries within Canada's territorial boundaries. Fisheries and Oceans Canada exercises this authority under the *Fisheries Act*. Specifically, DFO is responsible for the management and protection of fish and marine mammals and their habitats. There are two fundamental provisions in the *Fisheries Act* that pertain to the conservation and protection of fish habitat. One is section 35 of the Act that prohibits the harmful alteration, disruption or destruction of fish habitat without an authorization from the Minister of Fisheries and Oceans or through a regulation under the *Fisheries Act*. The other is section 36 that prohibits the deposit of deleterious substance into fish bearing waters unless authorized by a regulation under the Act or by another law of Parliament.

Environment Canada, on behalf of the Minister of Fisheries and Oceans, administers section 36 of the *Fisheries Act*. DFO relies upon advice provided by Environment Canada regarding issues pertaining to water quality. There are other sections of the *Fisheries Act* that pertain to the conservation and protection of fish and fish habitat and these include sections 20 (fish ways), 30 (fish guards) and 32 (destruction of fish) among others.

DFO's Policy for the Management of Fish Habitat ("the Habitat Policy"), introduced in 1986, provides general guidance on the application of the habitat protection provisions of the *Fisheries Act* and applies to all projects that have the potential to harm fish habitat. The long-term objective of DFO is to achieve a net gain in the productive capacity of fish habitat for Canadian fisheries resources. A fundamental strategy for achieving this is to prevent the further loss of productive capacity of existing habitats. Productive capacity is defined in the Habitat Policy to mean the maximum natural capacity of habitats to produce healthy fish, safe for human consumption, or to support or produce aquatic organisms upon which fish depend. DFO will strive to achieve No Net Loss by avoiding impacts, by the application of mitigation and, failing that, to balance unavoidable habitat losses through habitat compensation on a project-by-project basis to maintain the productive capacity of habitats supporting fisheries resources. The Habitat Policy also places emphasis on integrated resource planning and review of project proposals on an ecosystem basis taking into account Fish Habitat Management plans and/or Fisheries Management Plans where they exist.

Under the Nunavut Land Claims Agreement, DFO participates in the regulatory review process led by the Nunavut Water Board (NWB). In this context, DFO has reviewed the Type A Water License application and supporting documents as submitted for impacts to fish and fish habitat. DFO respectfully submits the following comments as expert advice to the NWB to assist in their review of this project. The information requests and recommendations presented in this submission may be subject to change as new information is brought forward during the technical

review meeting and/or public hearing. Should new information be obtained, any changes in DFO's recommendations will be brought to the attention of NWB.

3. Impacts to Fish and Fish Habitat

3.1. Sediment and Water Quality Issues

Under agreement with DFO, Environment Canada (EC) administers section 36(3) of the *Fisheries Act* which prohibits the deposit of deleterious substances into fish frequented waters, unless authorized by regulation made under the *Fisheries Act*. While many aspects of water quality are administered by EC, DFO does maintain an interest in potential increases in suspended sediment due to the possibility for sediments to smother habitats once out of suspension.

There are a number of project activities or works where sediment could potentially cause impacts to fish and fish habitat. Some of the project activities that will cause impacts occur during the construction of building and road infrastructure. The major source of impacts from sediment however will likely be due to the construction of the dikes from the materials used in construction and from the placement of dike materials into the water bodies which will displace the sediment at the bottom of the lake.

3.1.1. General Conditions – Construction

Road Construction, Diversion Ditches

During the construction, operation, modification, maintenance and decommissioning of the various components of the Meadowbank Project infrastructure, several works will occur in or near water bodies and have the potential to harmfully impact fish and fish habitat. Activities associated with this project will involve the use of machinery in or near fish habitat, the withdrawal of water from lakes, and disturbing the bed and banks of water bodies with the potential to cause erosion and sedimentation. In most cases, there are common mitigation measures that can substantially reduce impacts to fish and fish habitat.

It is DFO's position that all materials used for works or undertakings, including fish habitat compensation measures such as dikes, shoals and fish compensation works in or near water, is clean competent rock, non-acid generating (NAG) and non-metal leaching (NML).

It is likely that many of these impacts from sediment due to construction activities can be mitigated through best management practices, however specific details are lacking. These need to be addressed specifically in the various management plans.

DFO recommends that all construction, operation, modification, decommissioning, abandonment and restoration plans for all infrastructure works or undertakings in or near water include best management practices for sediment and erosion control that will mitigate potential harmful impacts to fish and fish habitat. Management plans should include specific detail of mitigation measures during and after construction as it relates to ice-rich soils, steep slopes, sedimentation control and bank remediation.

3.2. Dike Construction Activities

Construction of the dikes is proposed to occur by sequentially adding materials into the lake (p 59-60 of Application) which will cause substrate disturbance and fine sediment disruption which

will increase turbidity and TSS levels in the lake. This activity will cause sediment to be suspended in the water column and settle out in other areas of the lake. This could potentially disrupt and limit the ability of fish to locate food sources and feed. Additionally the sediment when it settles out could also smother benthic invertebrates and fish eggs or other biota. It is not certain how far this HADD could potentially reach out into the lakes. Sediment that accumulates at a depth greater than 1 mm will smother and kill biota therefore this impact must be minimized and mitigated to the greatest extent possible.

Details should be provided in regards to the projected sediment plumes and details need to be provided on the extent of this disturbance. Details on mitigative techniques to contain the disturbance and impacts should be provided. The Application document (p.59-60) and the Aquatic Effects Management Plan indicates that a silt curtain will be utilized to contain some of the sediment but specific details on the location have not been presented.

This detailed information needs to be presented in the Plan in relation to background data on lake currents, projected sediment plumes and what measures will be taken to monitor turbidity and sediment accumulation.

3.3. Dewatering Activities

In order to access the ore bodies, Meadowbank will be constructing a number of dikes to isolate areas of the lakes and then subsequently dewater these areas so that they can be mined by open pit practices. It is proposed that some of the water to be decanted will be pumped to the natural environment and that some may also be pumped to a number of attenuation ponds or to other lakes. As water levels in the dewatered areas lower, there is potential for sediment to slump and potentially greatly increase TSS and turbidity. The increased levels could potentially harm fish and also result in excess sediment being discharged to some of the lakes. Details are lacking as to threshold values of turbidity and suspended sediment. It is not clear what criteria are to be used to establish threshold limits when alternative areas such as attenuation ponds to allow excess sediment to settle out are to be used. It is also not clear what areas will potentially be used and what the capacity of attenuation ponds will be.

DFO would like clarification and a detailed explanation of the dewatering process and water management during this process to ensure impacts to fish and fish habitat from sediment are fully mitigated. Threshold levels for TSS need to be established for management purposes.

It also proposed that a fish salvage operation will occur in conjunction with dike construction and dewatering activities. Since there is potential that fish could become entrained in pumps, proper screening on intakes will be required. DFO recommends that the company adhere to DFO's Freshwater End-of-Pipe Fish Screen Guidelines (DFO 1995) for proper screening and submit engineering designs for approval.

4. Fish Salvage

The dewatering of Second Portage, Third Portage and Vault Lakes will require that fish be salvaged prior to completely dewatering the various areas.

4.1. Fish Salvage Program

The Fish-Out Program is to be developed in consultation with DFO, the local community and other interested stakeholders. A primary purpose of the program is to gain information on fish

production in the lakes as well as on fish-environment interactions in Arctic ecosystems to better understand and assess no net loss of fish habitat. As well, the primary purpose is to ensure the fish resource is not wasted; therefore, fish will be salvaged for use by the local communities.

The Fish-Out program should follow the general methods listed in DFO's Fish-Out Protocol and should include the following:

- a) Daily electronic reports of the CPUE phase and numbers on total removal phase
- b) Results of community consultations
- c) Method of dealing with excess fish
- d) Phasing of fish out within Second Portage, Third Portage and Vault Lakes.

Meadowbank has been working on developing a specific fish-out program for the project lakes to submit for approval.

5. Aquatic Effects Management Program

A number of proposed monitoring plans are mentioned in the Aquatic Effects Management Program. The plan is to monitor effects from a number of project components such as potential seepage from the tailings containment, and to monitor potential effects from effluents and various materials used in construction. As a result it is stated that there is a tailings monitoring plan, a Mine Site Water Quality Monitoring Plan, a Receiving Water Quality and Fish Habitat Monitoring Plan and an Aquatic Effects Monitoring Plan which includes Core Monitoring and Targeted Monitoring. As well, there is to be a No Net Loss Monitoring Program, involving a Sampling and Analysis Plan, to monitor pre implementation, during and post enhancement conditions.

It appears that Meadowbank has identified a number of comprehensive monitoring programs; however, many of the Plans are very conceptual. For example in the "Type A Water License Application on page 117 in reference to the AEMP, it is stated that; "This program will be developed in detail". This detail needs to be provided for the completion of an adequate technical review and before a Type A Water Licence is issued. The review is necessary to determine whether the Monitoring Plans will have the scientific rigour necessary to distinguish project impacts from natural variation.

In addition, monitoring should verify impact predictions.

As well, the adequacy of baseline data has not been determined. Meadowbank had also committed during the Environmental Assessment to collect further baseline data during pre operating phases and this information has not been presented. This information needs to be presented and discussed at the technical sessions in relation to the proposed monitoring plans.

The Aquatic Effects Management Plan needs a detailed table along with mapping or illustrations that identify the specific locations of sample sites, the numbers of samples and each parameter that is proposed for sampling. The monitoring schedule for the life of the mine and post closure needs to be developed and presented. Of particular importance to DFO is the monitoring of the biological community and the integrity of the aquatic ecosystem. Monitoring needs to be rigorous enough to document that the project does not impact various trophic level organisms such as zooplankton that fish such as lake trout or char depend on. As is mentioned the monitoring program also needs to avoid impacts to fish populations; therefore, sentinel species should also be considered when selecting organisms to ascertain metal levels in fish or other biota.

A number of targeted monitoring studies are also identified to deal with particular issues. For instance, all dike faces will be constructed from low metal leaching iron formation rock. There is to be a sampling plan to determine metal levels that leach into the water from the dike material but the plan is very conceptual. Details need to be provided as to methodology, schedule, sampling apparatus and protocols.

An additional study mentioned in the AEMP is one to monitor the utilization of spawning habitat by lake trout after dike construction since it is proposed that lake trout will use the dike face. Details need to be provided as to how this will be carried out and how success or effectiveness is measured.

It is mentioned that the principles of adaptive management will be utilized in monitoring activities. However, details need to be provided in how this will be carried out. Threshold levels for action need to be an integral part of any adaptive Management Plan and since they have not been provided, the Plans are incomplete.

Finally, the requirements for reporting and approving the various monitoring Plans and subsequent monitoring reports needs to be determined and included as conditions of a Type A Water License.

6. Blasting Plan

A number of outstanding concerns need to be addressed with the blasting Plan to ensure that fish and fish habitat are not impacted during mine blasting operations. Calculations need to be redone since an Overpressure of 100 kPa was used for calculations when the proponent was advised to use 50 kPa during the EA phase.

It is also stated that for portions of dike or shoreline where the 13mm/s guideline is exceeded, modified blast designs can be used or additional fill materials could be placed along the shoreline or dike upstream (lake side) face to increase distance from blast area. This is a concern to DFO since additional fill placed along the shoreline or dike upstream face could result in a HADD if the material is placed in the lake.

Therefore details need to be provided on what will be done for portions that exceed 13 mm/s guideline. In addition a detailed vibration monitoring program needs to be described.

7. Closure and Reclamation

The Closure and Reclamation Plan is conceptual in nature but some detail should be provided in regard to processes on refilling the pits and possible effects on the natural lakes. Management Plans need to include provisions so that excess water withdrawal of natural water bodies will not occur.

Since dike breaching will not occur until water quality is acceptable within the pits, contingencies need to be developed in the event that dikes will not be breached. A requirement for contingency planning should be part of the closure plan.

8. Fish Habitat Loss, Compensation and the No-Net-Loss (NNLP) Plan for Fish Habitat

There are a number of project works that will result in direct losses of fish habitat. The works range from the placement of materials in the lakes to construct the dikes, the dewatering of significant portions of the lakes and from road construction and water diversion activities.

The Harmful Alteration, Disruption or Destruction (HADD) of fish habitat is prohibited under sub-section 35(1) of the *Fisheries Act* unless authorized by DFO under sub-section 35(2). Where the HADD is unavoidable Authorizations are not issued unless acceptable measures to compensate for the habitat losses are implemented by the proponent.

The NNLP submitted by Meadowbank has been accepted in principle as a result of discussions during the Environmental Assessment phase where it was determined that the habitat losses could likely be compensated. However it was expected that there would be changes to the design of some of the compensation works and that there may be other suitable areas or projects for compensation.

A chart and schedule should be developed to identify when certain habitat compensation measures are being implemented.

DFO's concern is that much of the compensation is delayed until mine closure which will result in an extended loss of productive capacity during the time the compensation is deferred. Much of the compensation is also contingent on acceptable water quality within the pit areas. Other opportunities should therefore be actively pursued before and during the mine operation period so that the effectiveness of compensation can be determined. There may be many opportunities within the watershed as a whole and these have not been explored to the extent that they should be.

It will also be very important that effectiveness is determined where compensation has been proposed during operations such as along the face of the dike. This area is supposed to be suitable habitat for spawning and this should be determined during mine operations. Monitoring activities should begin immediately after construction of the dikes to determine if there is a concern due to metal leaching from the rock materials used in dike construction. Details on monitoring and sampling protocols of the interstitial waters and methods for determining fish use of these areas have not been provided.

In addition threshold levels should be determined so that an adaptive management plan can be utilized in the event that predictions are not realized.

DFO recommends that other fish habitat compensation measures be explored in the watershed. In addition a contingency plan for compensation in the event water quality within the pits is not acceptable must be presented.

8.1. Habitat Loss from the Construction of Tailings Impoundment Area

The use of the northwest arm of Second Portage Lake as a Tailings Impoundment Area (TIA) requires an amendment to the Metal Mining Effluent Regulations (MMER). These regulations were made under Sub-Section 36(5) of the *Fisheries Act* and provide conditions under which the deposit of deleterious substances into fish frequented waters will be allowed for metal mines. Under the MMER, if a proposed tailings impoundment area is fish frequented, then the water body in question must be added to Schedule II of the regulations prior to tailings deposition.

The regulatory amendments for MMER, which require Governor-in-Council (GiC) approval, can only be initiated following the completion of the environmental assessment and once Fisheries and Oceans Canada has determined that impacts to fish habitat are acceptable and can be mitigated and/or compensated. Once these steps are completed, Environment Canada can develop the Regulatory Impact Assessment Statement (RIAS) at which time the amendment can be forwarded to GiC for consideration.

DFO forwarded a letter to Environment Canada on March 1, 2007 indicating that initiation of the *Fisheries Act* Metal Mining Effluent Regulation (MMER) amendment process may begin. With respect to the water license application for Meadowbank, DFO defaults to EC's recommendations for the tailings impoundment area (TIA) in Second Portage Lake and water quality requirements.

DFO supports Meadowbank's progress towards meeting all of the obligations under the MMER as directed by Environment Canada, on behalf of DFO.

8.2. Habitat Loss and Compensation from Minor Project Activities

8.2.1. Drawdown Activities and Water Diversions

There is potential loss and impact to fish habitat from many proposed water drawdown and diversion activities that are proposed as a result of infrastructure development. Controls need to be put in place to ensure that there is no excessive drawdown of the water bodies which could result in fish kills. The water license also needs to contain measures to ensure that drawdowns and diversions do not result in fish habitat losses and impacts from sediment.

8.2.2. Diversion of Phaser Lake Outflow

Phaser Lake discharge will be redirected to Turn Lake since the natural drainage has been altered. However, no details have been provided to demonstrate that the connecting channel is passable to fish. Section 4.2.5 of the NNLP just states that there is no net difference in water balances and therefore that there is no impact to fish habitat, but this is not necessarily true if connecting channels are eliminated or impassable. The text (at least in section 4.2.5) does not indicate that discharge will be pumped, but figures in other reports indicate a dewatering barge will be employed. The details therefore need to be specified. In addition, erosive conditions that will potentially increase sediment transport and deposition need to be monitored in this location as well as in others.

8.2.3. Portage Lakes Connecting Channel

Construction of the dikes will eliminate the westernmost of three channels connecting Second and Third Portage lakes and it is proposed that the easternmost channel may need to be widened to facilitate flow. It is possible that this enhancement could serve as compensation for fish habitat loss but the detailed engineering survey as suggested in the NNLP (4.2.1) has not been provided. Detailed drawings of the proposed modification should be provided as well as hydraulic assessment of the proposed modified channel and the impact on water levels between the two lakes.

8.2.4. Intake and Effluent Pipes

Three pipelines are to be constructed in the project lakes one of which will be for the intake and two for effluent discharge to a diffuser located in the lakes.

Detailed drawings including the plan, profile and cross-section of the freshwater intake pipe need to be provided as well as the site and design of the fish intake screen. The intake end of the pipe will be screened in accordance with the DFO “Freshwater End-of-Pipe Fish Screen Guidelines (DFO 1995).

Detailed drawings including the plan, profile and cross-section of the effluent pipes also need to be provided.

8.2.5. Turn Lake Road Crossing

The access road between the plant site and the Vault development will require two 75 m long, 2.5 m diameter round culverts with a sideslope ratio of 3H:1V. Under freshet conditions discharge velocity will not exceed 0.6 m/s so that fish passage should not be impeded. Detailed estimates of water velocities and depth of flow during low, medium and high flow events should be provided.

DFO does not agree with the statement in section 4.2.3 that migratory habitat will not be adversely affected. The NNLP states that fish migration is uncommon and that large boulders are likely preventing the movement of fish between the two lakes. As the culvert installation will result in a HADD of fish habitat, the removal of the fish barrier will provide access between lakes thus providing greater access. This could be considered compensation for the HADD associated with the culvert installation. The details of the HADD and compensation associated with the crossing should be provided.

Adequate mitigation to facilitate passage should include embedding the culvert at least 20% with the backfill material in the culvert matching the upstream and downstream gradients. Monitoring will need to confirm that the installation of the culverts do not block fish migration.

It is also stated that standard construction practices are to be employed during culvert installation and details should therefore be provided. Detailed drawings of the plan, profile, and cross-section of the culvert crossing will need to be prepared. The construction sequence should be described.

9. SUMMARY

In summary, DFO appreciates the on-going efforts of Agnico-Eagle Mines Limited for the Meadowbank Project and supports the approach, in principle, to mitigate and compensate impacts to fish and fish habitat. DFO looks forward to participating in the Nunavut Water Board Technical Sessions for Agnico-Eagle Mines Limited water license application for the Meadowbank Project.

10. Summary List of Recommendations

1. DFO recommends that all construction, operation, modification, decommissioning, abandonment and restoration plans for all infrastructure works or undertakings in or near water include best management practices for sediment and erosion control that will mitigate potential harmful impacts to fish and fish habitat. Management plans should include specific detail of mitigation measures during and after construction as it relates to ice-rich soils, steep slopes, sedimentation control and bank remediation.
2. DFO recommends that the details of dike construction in regards to the projected sediment plumes and the extent of the disturbance be provided.

- a. DFO recommends that details on the mitigative techniques (i.e. silt curtains) to contain the disturbance and impacts be provided.
 - b. DFO recommends that the detailed information noted above be presented in the Plan in relation to background data on lake currents, projected sediment plumes and what measures will be taken to monitor turbidity and sediment accumulation.
3. DFO recommends that AEM provide clarification and a detailed explanation of the dewatering process and the associated water management to ensure impacts to fish and fish habitat from sediment are fully mitigated.
 - a. DFO recommends that AEM adhere to DFO's Freshwater End-of-Pipe Fish Screen Guidelines (DFO 1995) for proper screening for dewatering activities and submit engineering designs for approval.
4. The Fish-Out program should follow the general methods listed in DFO's Fish-Out Protocol and should include the following:
 - a. Daily electronic reports of the CPUE phase and numbers on total removal phase
 - b. Results of community consultations
 - c. Method of dealing with excess fish
 - d. Phasing of fish out within Second Portage, Third Portage and Vault Lakes.
5. DFO recommends that the Aquatic Effects Management Plan (AEMP) provide greater details as listed in section 5 above.
6. DFO recommends that AEM provide details on methodology, schedule, sampling apparatus and protocols for the targeted studies listed in the AEMP.
 - a. DFO recommends that details on how the monitoring of the utilization of dike faces as spawning habitat by lake trout after dike construction will be carried out and how success or effectiveness is measured.
7. DFO recommends that details of how the principles of adaptive management utilized in monitoring activities will be carried out.
8. DFO recommends that the calculations in the blasting plan be redone since an overpressure of 100 kPa was used for calculations when the proponent was advised to use 50 kPa during the EA phase.
 - a. DFO recommends that details be provided on what will be done for portions that exceed the 13 mm/s guideline.
 - b. DFO recommends that AEM provide a detailed vibration monitoring program for the blasting activities.
9. DFO recommends that contingency plans be developed in the closure and reclamation plan in the event that dikes will not be breached.
10. DFO recommends that a chart and schedule be developed to identify when certain habitat compensation measures are being implemented.
11. DFO recommends that details on monitoring and sampling protocols of the interstitial waters and methods for determining fish use of these areas be provided.
12. DFO recommends that other fish habitat compensation measures be explored in the watershed. In addition a contingency plan for compensation in the event water quality within the pits is not acceptable must be presented.

13. DFO recommends that details of the diversion channel of Phaser Lake outflow be provided to demonstrate that the connecting channel is passable to fish.
14. DFO recommends that the NNLP Monitoring include monitoring of the runoff or sedimentation from the diversion channel of Phaser Lake outflow.
15. DFO recommends that the detailed drawings of the proposed modification of the westernmost channel connecting Second and Third Portage Lakes be provided as well as a hydraulic assessment of the proposed channel modification and the impact on water levels between the two lakes.
16. DFO recommends that detailed drawings including the plan, profile and cross-section of the freshwater intake pipe be provided as well as the site and design of the fish intake screen.
 - a. DFO recommends that the detailed drawings including the plan, profile and cross-section of the effluent pipes also be provided.
17. DFO recommends that detailed estimates of water velocities and depth of flow during low, medium and high flow events be provided for the Turn Lake Road crossing.
 - a. DFO recommends that the details of the HADD and fish habitat compensation associated with the Turn Lake Road culvert installation be provided.
 - b. DFO recommends that the construction sequence and detailed drawings of the plan, profile, and cross-section of the Turn Lake Road culvert crossing be provided.