

**LAKE MANITOBA AND LAKE ST. MARTIN OUTLET CHANNELS PROJECT
RESPONSE TO IAAC TECHNICAL INFORMATION REQUESTS**

Question IAAC-43

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Abbreviations and Acronyms

AEMP	Aquatic Effects Monitoring Plan
cfs	cubic feet per second
EIS	environmental impact statement
EOC	emergency outlet channel
FRWCS	Fairford River Water Control Structure
IAAC	Impact Assessment Agency of Canada
LM	Lake Manitoba
LMOC	Lake Manitoba outlet channel
LSM	Lake St. Martin
LSMOC	Lake St. Martin outlet channel
LSMEOC	Lake St. Martin emergency outlet channel
MI	Manitoba Infrastructure

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EIS Guideline Reference: 7.2.2 Changes to groundwater, surface water, and fluvial morphology;
7.3.1 Fish and Fish Habitat

EIS Reference: 7.2.7 Prediction Confidence; 6.4.7.1 Analytical Assessment Techniques for Surface Water; 6.D2 Hydraulic and Sediment Transport Studies; 3.5.2.11 Water Management

Context and Rationale

Section 7.2.2 of the EIS guidelines requires that the proponent describe changes to water quality and quantity and sediment quality and quantity during all phases of the Project associated with project-related effects to drainage areas, flow paths, and seepage or groundwater into surface water. In addition, Section 7.3.1 requests a description of modifications of hydrological and hydrometric conditions on fish habitat and on the fish species' life cycle activities.

With regards to hydraulic modeling, the EIS states that "hydraulic modelling to predict the potential change in hydraulic conditions in Fairford River, the FRCWS Denil fishway, and the Dauphin River have not been conducted. Hydraulic conditions in the LMOC and LSMOC under different discharges also have not been modeled nor have hydraulic conditions at, and downstream of, the water control structures and drop structures. Therefore, assessment of the potential effects of changes to the hydraulic conditions in the rivers and in the channels on fish habitat, fish passage, and fish and fish egg stranding are qualitative, based on professional judgment using the information available."

The EIS also states that additional studies to further refine the assessment of the residual effects of the Project on surface water are planned as part of detailed design. These studies will include the collection of data to supplement existing hydrologic and hydraulic modelling and enable further examination and quantification of the residual effects on surface water. The information generated by these additional studies planned for the detailed design phase will be provided as it becomes available.

The Agency notes that these studies and modelling are important in predicting residual impacts during the EIS process and validation through follow-up monitoring. Hydraulic models should be developed to evaluate project related effects on groundwater and surface water and to provide a quantitative summary of the potential residual impacts to fish and fish habitat.

The information available in the EIS is insufficient to make a determination of significance of impacts to fish and fish habitat and assess habitat suitability under different flow scenarios.

Information Requests

- a. Provide appropriate models to assess flow hydraulics in the various impacted waterbodies. These models can be used to assess potential residual impacts to fish and fish habitat based on habitat suitability considerations (water depth and velocity, substrate).

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- i. Conduct hydraulic modelling of the LMOC and LSMOC under different conditions;
 - ii. Conduct hydraulic modelling to predict the potential change in hydraulic conditions in Fairford River, the FRWCS Denil fishway, the Dauphin River, Lake St. Martin, and other potentially affected waterbodies.
 - iii. Using the modelling results, complete an assessment of the potential effects of changes to hydraulic on fish and fish habitat. Apply mitigation measures where applicable and assess significance of residual effects. Discuss associated monitoring and follow up.
 - iv. Update the Surface Water Management Plan with results from the hydraulic models.
- b. If the proponent is of the view that hydraulic modelling cannot be conducted or is not required, present a rationale, discuss the validity of conclusions drawn, the related uncertainty with regards to potential effects (assessment predictions) and mitigation, and any monitoring and follow up that will be implemented on a precautionary basis to verify assessment predictions as well as additional mitigation measures required to adaptively manage potential effects of channel hydraulics and sediment transport to fish and fish habitat.

Response IAAC-43

a. Models Used to Assess Flow Hydraulics in the Various Impacted Waterbodies

i. Hydraulic modelling of the LMOC and LSMOC

The following modelling has been carried out on the LMOC and LSMOC and was available in developing the EIS:

- 1D HEC RAS model of the conceptual Lake St. Martin (LSM) and Lake Manitoba (LM) Outlet Channels designs. Note these would now be superseded by the Preliminary Design. Results were documented in the Stage 2 Conceptual Design Report (KGS Group 2016a) and the LSM Reach 2 Preliminary Design Report (KGS Group 2017)
- 1D HEC RAS model of the LSMOC Preliminary Design
 - Analyses initially focused on the 11,500 cfs flood design event. Outputs include water velocities and depths along the entire channel and shear stress predictions for sediment erosion analysis (KGS Group 2017).
- 1D Ice models of LSMOC Preliminary Design
 - A full range of potential ice scenarios in the channel were considered and incorporated into the development of the Project Description (Chapter 3). Outputs include ice thickness, flow velocities and depths (KGS Group 2017).

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- ii. Hydraulic modelling of Fairford River, the FRWCS Denil fishway, the Dauphin River, Lake St. Martin, and other potentially affected waterbodies.

The following modelling was carried out on the Fairford River, the FRWCS Denil fishway, the Dauphin River, Lake St. Martin, and other potentially affected waterbodies during development of the EIS:

- Flood routing models from Lake Manitoba to Lake Winnipeg, including the Fairford and Dauphin Rivers. Results were documented in the Stage 2 Conceptual Design Report (KGS Group 2016a). Note that an updated flood routing model that incorporates the most recent operating guidelines has been developed by Manitoba Infrastructure (MI) and these results now supersede those documented in the Stage 2 Report. (Volume 2, Appendix 6J of the EIS and MI 2019 below).
- 1D HEC RAS models of the Fairford and Dauphin Rivers. Studies and outputs have revolved around the 2011 flood and assessments of the EOC. Results were documented in the Binder 2 - Analysis & Monitoring of Discharges & Ice Processes Report (KGS Group 2014).
- 2D model of the Lower Dauphin River to support assessments of the LSMEOC. Results were documented in the Lake St. Martin Emergency Outlet Channel (LSMEOC) Physical Processes Report (KGS Group 2016b).
- HEC RAS model and sediment transport model of Buffalo Creek. Studies and outputs were focused around the 2011 flood and assessments of the LSMEOC operation. Results were documented in the LSMEOC Physical Processes Report (KGS Group 2016b).
- 1D ice models of the Fairford and Dauphin Rivers to support assessments conducted during the 2011 flood event. Results were documented in the Binder 2 - Analysis & Monitoring of Discharges & Ice Processes Report (KGS Group 2014).

- iii. Assessment of the potential effects of changes to hydraulic on fish and fish habitat.

Results/outputs of these models were used for the assessment of fish and fish habitat in the Environmental Impact Statement (EIS), including the development of mitigation, and follow up and monitoring planning.

- iv. Surface Water Management Plan with Results from Hydraulic Models

The model outputs will be used in development of the Surface Water Management Plan, using inputs gathered during the ongoing engagement process. The plan will cover aspects such as drainage areas, flow paths, and erosion and sedimentation. Further information on this plan and the Environmental Management Program is presented for IAAC-15.

b. Adequacy of Modelling for Assessment

Although there was limited modeling available during EIS preparation, the Project is designed to convey only those flows that the Fairford and Dauphin rivers cannot convey without causing flooding

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around Lake St. Martin. As a result, it is expected that the hydraulic conditions in the Fairford and Dauphin rivers during a flood event would be similar to those that occur in a more typical year, or on a more regular basis than a flood event. Fish using the rivers would be adapted to these conditions for successful migration, spawning and incubation. It has been assumed that the physical parameters of habitats (e.g., velocities and depths) will shift but will still be suitable given that flows will generally not fall below those that are typical for each season under current conditions. Adherence to lake level targets as stated in the operating guidelines will facilitate continued operation of the Denil fishway during Project operation.

It is expected that the additional modeling conducted during the preliminary and detailed design phase will provide information for preparing the Application for *Fisheries Act* Authorization for the Project and in assessing the need for any additional mitigation. The Aquatic Effects Monitoring Plan (AEMP) will include programs to determine whether the EIS predictions are accurate and whether mitigation measures are effective. There will be opportunity for adaptive management of Fairford and Dauphin river flows within the operating guidelines, taking into consideration all stakeholder interests.

References

- KGS Group. 2014. Emergency Reduction of Lake Manitoba and Lake St. Martin Water Levels. Analysis & Monitoring of Discharges & Ice Processes. Prepared for Manitoba Infrastructure and Transportation. File# 11-0300-018. March 2014.
- KGS Group. 2016a. Assiniboine River and Lake Manitoba Basins - Flood Mitigation Study LMB & LSM Outlet Channels Conceptual Design - Stage 2. KGS Group Project 12-0300-011. Final Report. January 2016.
- KGS Group. 2016b. Lake St. Martin Emergency Relief Channel Monitoring and Development of Habitat Compensation: Physical Processes. DRAFT / MIT-009-13_002_REV B. KGS Group 13-0431-001. March 2016.
- KGS Group. 2017. Preliminary Design for Reach 2 of the Lake St. Martin Outlet Channel. KGS Group Project 16-0300-005 Final - Rev 0. June 2017.
- Manitoba Infrastructure. 2019. Development of Operating Rules for Lake Manitoba and Lake St. Martin Outlet Channels with Recommended Revisions.