

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

Question IAAC-40

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Abbreviations and Acronyms

EIS	environmental impact statement
IAAC	Impact Assessment Agency of Canada
LMOC	Lake Manitoba outlet channel
OG	operating guideline
VC	valued component

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EIS Guideline Reference: 3.2 Project Activities; 7.3.1 Fish and fish habitat

EIS Reference: Appendix 6J Development Of Operating Rules For Lake Manitoba and Lake St. Martin Outlet Channels With Recommended Revisions (Manitoba Infrastructure 2019a)

Context and Rationale

Section 3.2 of the EIS guidelines requires a description of the activities during the operations phase of the project, with emphasis on activities that have the greatest potential to have environmental effects and Section 7.3.1 requires information to support the assessment of the potential effects of the Project on fish and fish habitat.

Appendix 6J of the EIS has identified a number of Operating Rules for the LMOC and LMBOC operating channels. Rule 2 states that:

“The Lake Manitoba Outlet Channel may be opened pro-actively (when the water level is below 812.5 ft.) if the water level on Lake Manitoba is forecasted to be above 813 ft. in the same season (REV 1). - Modelling of the 103 years with data indicated that Operating Guideline #2 has minimal impact on reducing the peak water level when compared to no pro-active operation (i.e., outlet only open when water level is above 812.5 ft.). However, it will likely be widely supported over a reactive approach based on perceived effectiveness.”

The EIS identifies variants of standard guidelines for the conditions under which the Project would be operational, including times when the outlet channels would be opened pro-actively. The EIS does not address potential environmental effects associated with the full suite of operational scenarios.

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- a) Provide an assessment of effects under all possible operating scenarios. Alternatively, provide a justification for why the conclusions in the EIS are valid for all operating scenarios.

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- a) The following response provides justification as to why additional assessment representative of other operating scenarios is not required. It is organized first by an explanation of the basis of the Operating Guidelines (OGs) and then by an explanation of the assessment basis in the Environmental Impact Statement (EIS).

The conclusions in the EIS are valid and adequately reflect a range of potential operating conditions, as both the OGs and the EIS are based on a historical record of regional water conditions that encapsulate all possible scenarios described in the OGs. Large and regional flood events are highly complex, stochastic, irregular (in time) and episodic in nature and represent conditions to which both

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Project design by its physical works and Project operation by the OGs are intended to mitigate across the wide spectrum of those conditions.

To assist clarity:

- EIS Volume 2, Appendix 6J Development Of Operating Rules For Lake Manitoba And Lake St. Martin Outlet Channels With Recommended Revisions, as referenced in the request, refers to “Operating Rules” in its title. The term “Operating Guidelines” is later used in that Appendix to refer to a specific numbered sequence of steps guiding Project operation. Operating Guidelines are also referred to in the request. The term “Operating Guidelines” will henceforth be used in this response.
- EIS Volume 2, Appendix 6K Lake Manitoba And Lake St. Martin Outlet Channels Impacts On Lake Manitoba And Lake St. Martin replicates some of the information in Appendix 6J, represents an update of some details, and provides further hydrological details in its sub-appendices. As such, Appendix 6K is also referenced below.

Explanation of the Basis of the Operating Guidelines

The OGs for the permanent outlet channels were developed through an iterative process based on hydrologic modelling of over 100 years of past flood events. This approach allowed for a wide array of unique hydrologic conditions to be assessed, including multiple decadal wet and dry cycles. Fundamental to the understanding of project operation is that its purpose of flood reduction is directly accomplished by maintaining desired lake levels under any operating condition.

The process for developing the guidelines was as follows:

1. A first draft of the OGs was incorporated into a hydrologic model to simulate the response of Lake Manitoba and Lake St. Martin lake levels using over 100 years (1915-present) of historic inflow data.
2. The results were analyzed to identify outlier events that caused unintended consequences, such as rapid fluctuations in lake levels or a higher peak water level than would occur in a given year without the outlets.
3. The OGs were then revised with the inclusion of conditional statements to eliminate these unintended consequences.
4. The above steps were then repeated, and updated, with the results reflected in the OGs.

The conditional statements in the OGs were explicitly included in the model data produced for the surface water assessment with the exception of the discretionary conditional statements related to pro-active operation of the outlet channels based on flood forecasts. The following further discusses those discretionary conditions given their implication to “all possible operating scenarios” as posed in the request.

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Although these discretionary conditional statements were not explicitly included in the modelled data provided in the EIS, they can be considered to be implicitly represented in the modelled data as they were found to have minimal impact on reducing flows and water levels when applied. They are considered implicitly included because those discretionary conditions directly affect lake water levels within a full historical range of those levels, including those that may arise from operating the Project with those conditions as represented in the historical data. The OGs can therefore be considered to be fully represented in the surface water assessment and should not be considered to contain multiple exclusive scenarios which would each require their own assessment.

Simulations of the discretionary conditional statements were run to assess the efficacy of pro-active operation assuming that a two-month lake level forecast would be sufficiently reliable for operating decisions. It was found that all of the major floods were preceded by minor floods in the previous year and that the outlet channels were already in operation and the pro-active OGs did not apply. An exception to this was in the flood of 1974; during this flood, pro-active operation resulted in an 18 mm reduction in the peak water level.

Theoretical floods were simulated to further evaluate discretionary aspects of the OGs. It was found that the OGs could result in a 30–60 mm reduction in peak water levels under rare hydrologic conditions. For the purpose of the surface water assessment this was deemed to be insignificant to the flow regime given the historical range of variability; as such, the hydrologic modelling results in the assessment are considered to be representative of the changes in lake conditions with the Project.

Explanation of Assessment Basis in EIS

The OGs will directly affect the hydrological regime in the mitigated watersheds. As surface water is part of the Groundwater and Surface Water valued component (VC), this is the first affected VC relevant to the OGs. EIS Volume 2 Section 6.4.7.1 Analytical Assessment Techniques for Surface Water describes the basis of the assessment of potential Project effects on surface water. Further to that explanation, the data used for that assessment is that generated in the Lake Manitoba Water Balance model, as discussed in Appendix 6K, which includes detailed data from that model in its Appendix A: Lake Level Hydrographs and Appendix B: Table of Statistics. That data represents empirically obtained information and modelling of the Project's influence on that hydrology if it were in operation at the time.

Any other assessed VCs in the EIS for which surface water may have an influence are assessed in recognition of the surface water assessment data, analysis and conclusions. As such, and given what was stated above under "Explanation of the Basis of the Operating Guidelines", the EIS adequately reflects potential operational scenarios of the Project.