SUMMARY REPORT ON THE PEER REVIEW OF THE GREAT LAKES – ST. LAWRENCE RIVER ADAPTIVE MANAGEMENT COMMITTEE'S APPROACH TO THE EXPEDITED REVIEW OF PLAN 2014- PHASE 1

PROVIDED BY THE INDEPENDENT REVIEW GROUP (IRG)

November 23, 2021

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Great Lakes – St. Lawrence River Adaptive Management Committee
on behalf of the International Lake Ontario – St. Lawrence River Board
of the International Joint Commission

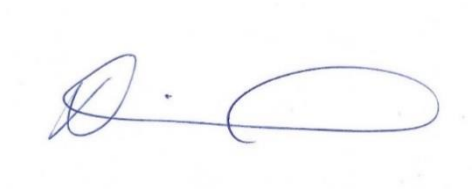
Re: Peer Review of Phase 1 of the Expedited Review of Plan 2014

The Independent Peer Review Group (IRG) is pleased to deliver its Summary Report required under the Statement of Work for the Peer Review of Projects associated with Phase 1 of the Expedited Review of Plan 2014.

We look forward to a post-peer review meeting if that is required.

Thank you for the opportunity to work on this review.

Yours truly,



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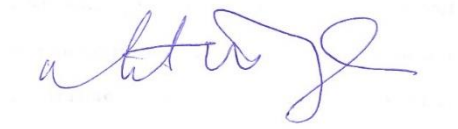

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EXECUTIVE SUMMARY

The Great Lakes – St. Lawrence River Adaptive Management Committee (GLAM Committee) of the International Joint Commission (IJC) began Phase 1 of the expedited review of Plan 2014 in February 2020. The objective of Phase 1 was to assess flow releases under the International Lake Ontario – St. Lawrence River Board (Board) deviation authority recognizing current conditions and high lake levels and high inflows during the review period. This was primarily to support the Board in deciding how best to deviate from Plan 2014 to moderate high levels while under the authority to do so.

A component of Phase 1 was an independent peer review conducted at "arms-length of the International Joint Commission (IJC)" by the Independent Review Group (IRG), consisting of one US and one Canadian member. The overarching role of the IRG was to review and comment on the appropriateness and sufficiency of key documents, such as the work plans, studies, models and monitoring efforts, used by the GLAM Committee to inform Board decision-making while under deviation authority due to extreme high-water conditions.

The IRG was formed in February 2021, and worked collaboratively to provide evaluation and consensus-based feedback and comment on seven GLAM Committee documents. The timing of the IRG review of these documents was structured to provide coordinated feedback to the GLAM Committee at critical points in the process over the last several months to permit mid-course adjustments and, in particular, inform the planning process of future work under Phase 2 of the expedited review.

This report is a summary and synthesis of the reviews and feedback that the IRG provided to the GLAM Committee over the course of the ongoing reviews. Here, the IRG is summarizing the findings and recommendations that have come from the four main review activities, as follows:

Short and Long Term Strategy Document and 2021 Annual Workplan

- The GLAM Committee's short- and long-term strategy serves the IJC's overall goal of an adaptive management strategy that is flexible for the ongoing evaluation and improvement of the regulation plans for the outflows of Lake Ontario (and Lake Superior).
- The 2021 workplan is very robust in terms of the tasks and activities aimed at providing the data and information to achieve the objectives of Phase 1.
- The majority of workplan items were both appropriate and needed.
- The GLAM Committee should better ensure that, and/or communicate how, the short-term and long-term strategy is shaping the annual workplan, and how that workplan is changing from one year to the next based on completed (or ongoing) activities of the previous year.
- The GLAM Committee should ensure that it consistently improves broad stakeholder understanding (across all areas of interest) through better documentation and communication of how the plan and the Board has (or could) respond to extreme flows and levels, the limits under the regulation plan, and the trade-offs inherent in any modification in the plan.

Decision Support Tool

- The DST provides a synthesis of data and information in an initially digestible format. The approach allows the user to very quickly and somewhat intuitively know how the different

deviation strategies would affect the water levels in different locations, and to do so through the view of particular water years.

- The DST should develop and adopt an approach that allows consistency for evaluating tradeoffs across all interests, recognizing that it is impossible and inappropriate for the value of some interests to be represented by singular quantitative metrics, particularly economic metrics.
- The DST, based in Microsoft Excel, will become increasingly complex and 'clunky' as more aspects are added to it; further, it will be increasingly difficult to ensure accuracy of data and calculations as the DST grows in size and complexity through time.

Economic Impact Assessment of Halting Commercial Navigation

- The report, analysis, and underlying methods are based on credible and defensible economic principles and methods; the findings of the report are sound.
- The methods used and assumptions made in the analysis are reasonable, but underestimate the total economic impact of halting commercial navigation traffic.
- The underestimates are likely most impactful on economic impacts of early closure.
- The public data available is most likely adequate for the current and an expanded economic impact analysis, but greater direct engagement between the IWR analysis team and industry representatives would enable some cross-checking of key assumptions and interpretations.

Phase 1 Report

- The report's primary need was to convey the realities of the system, and to convey what was achieved during Phase 1. In this regard, the report is successful.
- The Phase 1 report provides an appropriate and effective roadmap for Phase 2 work.
- The GLAM Committee should move more quickly and decisively toward an alternative, more appropriate software platform for the Decision Support Tool (DST).
- The GLAM Committee should de-emphasize advanced technical approaches (e.g., machine learning) until the DST technology is appropriate.
- The development of a highly usable DST should be a priority of Phase 2 given its centrality to public engagement and decision-making of the Board and IJC.
- Economic valuation for comparing various/competing interests should be de-emphasized, when possible, because of the inability to develop such metrics across all interests/issues.
- The 2021 Work Plan should be released at or near the same time as the Phase 1 Report, giving the various interests some confidence that the GLAM Committee and the Board are following through with the steps developed in Phase 1.

1. BACKGROUND AND SUMMARY OF THE INDEPENDENT REVIEW GROUP (IRG) REVIEW

The Great Lakes – St. Lawrence River Adaptive Management Committee (GLAM Committee) began Phase 1 of the expedited review of Plan 2014 in February 2020. The objective of Phase 1 was to assess flow releases under the International Lake Ontario – St. Lawrence River Board (Board) deviation authority recognizing current conditions and high lake levels and high inflows during the review period. This was primarily to support the Board in deciding how best to deviate from Plan 2014 to moderate high levels while under the authority to do so.

A component of Phase 1 was an independent peer review conducted at "arms-length of the International Joint Commission (IJC)" by the Independent Review Group (IRG), consisting of one US and one Canadian member. The overarching role of the IRG was to review and comment on the appropriateness and sufficiency of key documents, such as the work plans, studies, models and monitoring efforts, used by the GLAM Committee to inform Board decision-making while under deviation authority due to extreme high-water conditions.

The IRG was formed in February 2021, and worked collaboratively to provide evaluation and consensus-based feedback and comment on the following GLAM Committee documents:

1. Short-term and Long-term Strategy for Evaluating and Improving Rules for Managing Releases from Lakes Ontario and Superior, and the GLAM Committee 2021 Workplan (Plan 2014 related sections only);
2. Annotated table of contents of the draft Phase 1 report;
3. Documentation of the Decision Support Tool (DST);
4. Deviation DST Manual;
5. Draft Phase 1 report;
6. Second draft Phase 1 report; and,
7. The Report on the Economic Impact Assessment of Halting Commercial Navigation on the Montreal-to-Lake Ontario Section of the St. Lawrence Seaway (review of methodology only).

The timing of the IRG review of the above documents was structured in such a way as to provide coordinated feedback to the GLAM Committee at critical points in the process over the last several months to permit mid-course adjustments and, in particular, inform the planning process of future work under Phase 2 of the expedited review.

The eighth obligation of the IRG is to provide a summary of its peer review of the GLAM Committee's approach to Phase 1 of the Expedited Review of Plan 2104, which is the subject of this report.

The GLAM Committee outlined to the IRG that the documents provided for independent review "shall be assessed by the IRG in terms of the degree to which:

1. The models and reports are sufficient and appropriate to evaluate the impacts of Board decisions on deviations from the regulation plan (Plan 2014);
2. The studies reflect reasonable scientific methods, assumptions and supported findings;
3. The Models sufficiently and appropriately integrate and display the key information needed for a comprehensive evaluation and understanding of the sector (interest) being evaluated; and,
4. Information is sufficiently provided within time and resources available."

It is with these parameters that the IRG conducted its review and provided the consensus-based feedback to the GLAM Committee. Following is a summary of the feedback and comments on each of the documents, and combined where it made sense under the following headings:

- Short- and Long-Term Strategy Document and 2021 Annual Workplan;
- Documentation of the Decision Support Tool (DST) Framework and Manual;
- Economic Impact Assessment of Halting Commercial Navigation; and,
- Phase 1 Report.

2. SHORT- AND LONG-TERM STRATEGY DOCUMENT AND 2021 ANNUAL WORKPLAN

2.1. Context

In order to carry out their expedited review, in their 2020 Work Plan (covering the period October 1, 2019 to September 30, 2020), dated January 28, 2020, the GLAM Committee included a new table (Table 4) of proposed "Phase 1 Expedited Review Activities", in addition to their regular annual workplan activities. In their 2021 Work Plan (covering the period October 1, 2020 to September 30, 2021), dated October 9, 2020, the GLAM Committee incorporated the expedited review activities into the annual workplan in "Table 2: Summary of GLAM FY21 Section A – Core Components - Plan review and evaluation work plan activities."

On September 1, 2020, The GLAM Committee prepared a paper "Short-Term and Long-Term Strategy for Evaluating and Improving Rules for Managing Releases from Lakes Ontario and Superior". This document "describes a flexible strategy developed by the GLAM Committee for the on-going evaluation and improvement of the regulation plans through the use of adaptive management". The strategy also describes how the expedited review, with its two phases, fits into the overall review of the results of the regulation within 15 years of inception.

As a starting point, there were some structural differences between the strategy and the work plans developed by GLAM Committee that made it quite difficult to 'cross-walk' from the strategy to the work plan, and vice versa. For example, the strategy is conceptually and financially organized around six 'components' and three 'approaches'. In contrast, the work plan is organized based around three 'working groups'. This may be necessary due to organizational realities, but there is still a need to ensure that the strategy document is guiding the formulation of the annual work plan. Over time, as monitoring programs become increasingly complex, and as particular monitoring programs become ensconced over time, this type of cross-walking and consistency between strategy and work plans is necessary to ensure that work lines are being directed toward specific strategies, and adapted accordingly through time. The IRG suspects that such cross-walking is occurring, but it is not explicitly articulated in the supporting documents.

2.2. Review of Strategy

The GLAM Committee's short- and long-term strategy serves the IJC's overall goal of an adaptive management strategy that is flexible for the on-going evaluation and improvement of the regulation plans for the outflows of Lake Ontario (and Lake Superior).

One of the more difficult aspects of the system to manage, and thus one of the areas in greatest need of attention in the strategy, is the uncertain, unpredictable nature of climate/hydrologic inflows into the Lake Ontario-St. Lawrence River system, and the impacts of lake level fluctuations on the ecology of the system. In addition, there is very limited ability to forecast high flows based on climate conditions several months in advance. As such, Phase 1 is focused on assessing flow releases under Board deviation authority; that is, given the uncertainty in hydrology and how flows affect water levels, it is prudent for the GLAM Committee to primarily support the Board with the information needed to make decisions on how best to deviate from Plan 2014 to moderate high water levels (and flooding both upstream and downstream of the project), especially when operating under criterion H14 of the 2016 Orders. Under the current strategy, more than half the funding in Phase 1 is directed to Component 3 (Impact Assessment and Predictive Models), which is focused on using predictive models to assess outcomes. This is an appropriate allocation of resources given the types of problems being confronted (i.e., the overall strategy is appropriate).

In addition, and as recognized by the strategy document, a secondary objective of the expedited review should be to improve broad stakeholder understanding (across all areas of interest) through better documentation and communication of how the plan and the Board has (or could) respond to extreme flows and levels, the limits under the regulation plan, and the trade-offs inherent in any modification in the plan. The Strategy includes the establishment of a Public Advisory Group; however, the IRG suggests that additional efforts at communication be considered, particularly those that 'translate' for a broader, less technical audience. Moreover, there should be concerted effort to make the outcomes of ongoing work, and the decisions being made, as clearly communicated as possible to the broader public. As an example, while there are an incredible number of documents on the IJC website providing excellent information, it is unreasonable for the general public, or even a non-specialist stakeholder, to be able to digest the breadth and technical depth of the information presented. Some alternative efforts are needed for communicating the work.

2.3. Review of Annual Workplan

The 2021 GLAM Committee work plan builds on activities undertaken since the committee was formed in 2015 (to meet its adaptive management strategy objectives) and addresses new requirements to meet the IJC request to undertake an expedited review of Plan 2014. The IRG found that the 2021 work plan is very robust in terms of the tasks and activities aimed at providing the data and information to achieve the objectives of Phase 1.

However, even after reviewing all the documents available to the IRG, it is difficult to determine if the 2020 and 2021 work plans are filling the gaps in data needed to achieve the objectives of Phase 1 of the expedited review. It appears that most tasks in Table 4 of the 2020 work plan (proposed tasks for the expedited review) were carried over as "regular" tasks in the 2021 work plan. Further, there is no confirmation what, if any, Plan 2014 expedited review tasks were completed within the reporting period

for the 2020 work plan. In the future, the GLAM Committee should provide a summary of past work plans, what was unknown/uncertain, what activities were undertaken, and what (if any) activities were completed in the previous work plan. A simple first step in this direction could be to provide (as part of the annual work plan) a table of what tasks were completed and removed from future work plans. If there are very few tasks that are being added to the 'completed' table each year, then this may indicate that the program is slipping into becoming a long-term monitoring program rather than a targeted adaptive management program.

2.4. Findings and Recommendations

- The GLAM Committee's short- and long-term strategy serves the IJC's overall goal of an adaptive management strategy that is flexible for the ongoing evaluation and improvement of the regulation plans for the outflows of Lake Ontario (and Lake Superior).
- The 2021 workplan is very robust in terms of the tasks and activities aimed at providing the data and information to achieve the objectives of Phase 1.
- The majority of workplan items were both appropriate and needed.
- The GLAM Committee should better ensure that, and/or communicate how, the short-term and long-term strategy is shaping the annual workplan, and how that workplan is changing from one year to the next based on completed (or ongoing) activities of the previous year.
- The GLAM Committee should ensure that it consistently improves broad stakeholder understanding (across all areas of interest) through better documentation and communication of how the plan and the Board has (or could) respond to extreme flows and levels, the limits under the regulation plan, and the trade-offs inherent in any modification in the plan.

3. DOCUMENTATION OF THE DECISION SUPPORT TOOL (DST) FRAMEWORK AND MANUAL

3.1. Context

One of the central efforts of the GLAM Committee has been developing a Decision Support Tool (DST). The DST has been developed to synthesize a tremendous amount of data, information, and assumptions into a single package, thus allowing decision-makers to have a coherent place for relevant information. The tool was designed and constructed based on the DST Framework, and is not intended to identify a single, optimal decision, but rather to provide information in a way that supports decisions.

Overall, the DST does provide a synthesis of information, particularly hydrologic information, in an initially digestible format. The approach allows the user to very quickly and somewhat intuitively know how the different deviation strategies would affect the water levels in different locations, and to do so through the view of particular water years. As it has been developed, this is an incredibly good starting point for any user, as it communicates the importance of the water management plan particularly compared to the pre-project condition.

3.2. Importance of Metrics of Impacts

The DST strategy is to provide some broad-based metrics across the entire system, and then to provide some more qualitative/descriptive perspective using Local Impact Zones. This approach is appropriate, but its usefulness to the Board will depend on how well the broad metrics reflect the system and ensuring that the Local Impact Zones (and associated metrics) sufficiently represent the variety of interests and the breadth of the system.

What metrics are used, and how they are quantified and communicated, is incredibly important for the use of DSTs and for informing decisions. It is typical for these kinds of tools (particularly when used by engineers or economists) to be pushed such that they have the appearance of objectivity; e.g., a single metric is used, which allows for both an appearance of objectivity as well as an allure that decisions can be optimized to maximize or minimize around that particular metric. One of the most commonly used metrics is, of course, economic tradeoffs: collapsing a range of impacts or benefits into economic value, and then using that as an objective metric. However, when converting to such singular metrics, the subjectivity (and most all of the uncertainty) is subsumed as part of the development and calibration stages. All of the assumptions and uncertainty occurs in the early stages of converting to the metric, and then the final metric is presented (or interpreted) as being both objective and authoritative.

The DST, at this point in its development, is avoiding these common pitfalls. The DST is using a broad-based metric (number of structures inundated) that does not translate between interests (e.g., with hydropower impacts or commercial navigation). Further, the DST is assessing these based on categories of impacts (e.g., Extreme, Major, Low), and also acknowledging that the performance indicator(s) may not be "fungible." This approach embraces that the purpose of a DST is to inform decisions that involve tradeoffs rather than to be an algorithm that identifies the optimal decision. However, we caution against what will likely be a push for some interests to quantify impacts via economics, while others remain reliant on qualitative metrics; this creates an uneven playing field for assessments.

3.3. Limitations of the Current DST for Usability and Communication

The software package on which the DST is based (Microsoft Excel) is neither designed nor intended to be used in the way that it is being used for the DST. While it is likely that with some time and practice, that the Board and GLAM Committee can develop some command of the tool and how to navigate and use it, the current software approach should not be considered a long-term, viable solution.

Over time, there will inevitably be more data and more analysis/functions as well as scenarios that will need to be included in the DST. That is, the data and information will increase over time rather than decrease. The DST will thus become increasingly slow, and unstable, as these additions are made. As importantly, Excel is also not designed for visualizations, and so if the DST is to be used as a communication or decision-making tool, the limitations for such basic visualizations and simplified simulations will become a barrier. Given the critical aspect of the Board and GLAM Committee being able to understand and communicate their decisions to stakeholders and broader community, it is important (if not imperative) that a more appropriate communication tool/platform be developed in the near future.

Most problematically, this approach of relying on Excel has a very high likelihood for transcription/calculation errors that are difficult, if not impossible, to identify. Of all the aspects of using

Excel as the basis for this DST, it is this problem of transcription/calculation errors (which are potentially compounded through subsequent analysis) that merits greatest attention/justification for investing in alternative software platforms.

3.4. Findings and Recommendations

- The DST provides a synthesis of data and information in an initially digestible format. The approach allows the user to very quickly and somewhat intuitively know how the different deviation strategies would affect the water levels in different locations, and to do so through the view of particular water years.
- The DST should develop and adopt an approach that allows consistency for evaluating tradeoffs across all interests, recognizing that it is impossible and inappropriate for the value of some interests to be represented in singular quantitative metrics, particularly economic metrics.
- The DST, based in Microsoft Excel, will become increasingly complex and 'clunky' as more aspects are added to it; further, it will be increasingly difficult to ensure accuracy of data and calculations as the DST grows in size and complexity through time.

4. ECONOMIC IMPACT ASSESSMENT OF HALTING COMMERCIAL NAVIGATION

4.1. Context

The GLAM Committee commissioned the US Army Corps of Engineers (USACE) Institute for Water Resources (IWR) to undertake an independent assessment of the economic impacts related to the hypothetical scenario of a necessary temporary closure by the Seaway Corporations of the St. Lawrence Seaway between St. Lambert (Montreal) and Cape Vincent (Lake Ontario) because of unsafe velocities and cross-currents in the river due to Lake Ontario outflows. The information gathered from this effort will be used by the Board and GLAM Committee to support trade-off evaluations and further scenario testing regarding outflow management strategies.

In May 2020, the IWR published an economic impact assessment of halting commercial navigation traffic on the St Lawrence Seaway. The IWR report estimates the economic impact of potential disruptions of commercial navigation, with specific analysis of three hypothetical scenarios: delayed opening, mid-season navigation stoppage, and early closing.

Results of their analysis indicate that while all closure scenarios have negative economic impact, the delayed opening scenario would have less impact than the mid-season and early closure scenarios. The analysis makes use of industry-standard methods, although the analysis was limited in the time available and in the data available. The analysis relied on estimates derived from relatively coarse publicly available data (monthly), rather than higher resolution, proprietary data (daily).

4.2. External Reviews

Two external economists (one representing the US, and the other representing Canada) provided independent peer reviews of the IWR Report (ComNav reviewers). The ComNav reviewers were tasked

with providing advice as to the sufficiency and appropriateness of the methodology employed in, and information provided by the IWR Report, for consideration in making decisions, given the available data.

Each ComNav reviewer provided a written report and the two independent reviews were quite consistent with similar perspectives and consensus. A meeting was held between the IRG and the two ComNav reviewers to ensure accurate understanding and interpretation of their respective reviews.

The reviewers found that the underlying methods are based on credible and defensible economic principles and methods, despite the constraint of lack of proprietary data faced by the IWR report researchers. That is, the findings of the report are sound. Further, the reviewers found that, while the report addresses the impact of temporary closures of the Seaway upon the navigation industry itself and those industries that provide support to the navigation industry, the analysis does not include the economic impact of Seaway closures on the broader community of users and producers. Although the latter was acknowledged by IWR, this is a critical exclusion to a full assessment of economic impacts of Seaway closure. That is, the methods used and assumptions made in the analysis are reasonable, but assuredly underestimate the total economic impact of halting commercial navigation traffic. Based on the understanding of the overall system, the external reviewers suggested that the underestimates are likely most impactful on economic impacts of early closure (as opposed to delayed opening or mid-season closure); this is due to sensitivity of grain traffic to navigation, which is dependent on late season navigation availability.

Finally, a critical question about the entire analysis was whether the data available for the analysis was sufficient to develop robust, defensible conclusions. The external reviewers both agreed that the public data available is most likely adequate for the current and an expanded economic impact analysis; however, they also suggested that some engagement between the IWR analysis team and industry representatives would enable some cross-checking of key assumptions and interpretations, and thus better ensure the overall understanding and accurate representation of the system in the analysis.

4.3. Findings and Recommendations

- The report, analysis, and underlying methods are based on credible and defensible economic principles and methods; the findings of the report are sound.
- The methods used and assumptions made in the analysis are reasonable, but underestimate the total economic impact of halting commercial navigation traffic.
- The underestimates are likely most impactful on economic impacts of early closure.
- The public data available is most likely adequate for the current and an expanded economic impact analysis, but greater direct engagement between the IWR analysis team and industry representatives would enable some cross-checking of key assumptions and interpretations.

5. PHASE 1 REPORT

5.1. Context

The Phase 1 Report summarizes the work performed by the GLAM Committee across a range of topics for informing the decisions related to deviations from Plan 2014. This report reflects the fact that there

was a tremendous amount of information compiled and summarized to describe the work done across a range of geographies and sectors as part of the ongoing work related to the GLAM Committee. This Phase 1 Report reviews both the history of the governing/informing bodies, but also the history of the recent hydrologic events (e.g., floods in 2017 and 2019-2020) as well as the many programs ongoing to inform decision-making.

The report's primary need was to convey the realities of the system, and to convey what was achieved during Phase 1. In this regard, the report is successful. In particular, the final section (Section 7) is particularly helpful in its conveying the gaps in data and/or understanding, along with its setting a very clear path for what the next steps in this effort will likely need to entail. That is, the IRG finds that the GLAM Committee (as reflected in this Phase 1 report) is heading in the right direction, and thus, Phase 1 was successful in its overarching objective. Further, the closing section of this Draft Phase 1 report provides an appropriate roadmap for Phase 2 work.

In addition, the DST is an incredibly informative approach, and reflects a significant step forward in providing information for broader groups related to tradeoffs between decisions (with caveats, as described above). The DST developers have been careful and thoughtful to convey that this is a source of information and support rather than an optimization tool that could or should drive decisions. That is, the proposed use of the DST is appropriate and carefully communicated.

5.2. Remaining and Overarching Concerns

While the overall direction and work plan to date has been appropriate and in many ways impressive, there are a set of concerns that remain for the GLAM Committee as they set priorities and plans for Phase 2. We raise several in particular that should receive attention early in Phase 2 rather than later, as they have the high potential (if unaddressed) to create substantial long-term challenges or consequences for the Board/IJC:

1. Invest in the technology of DST: The GLAM Committee should move more quickly and decisively toward an alternative, more appropriate software platform for the DST. The current reliance on a rather elaborate spreadsheet remains cumbersome and clumsy for its purpose. But more importantly, there is a much higher potential for errors in the construction and use of spreadsheets than in other software platforms and packages available. This risk could be reduced by an investment in modernizing the technology of the DST. To be clear, the reliance on an overly sophisticated spreadsheet creates a high potential for unknowable, high impact errors in analysis and communication, a risk that will grow over time. This risk can be, and should be, mitigated by changing software platforms.

2. De-emphasize advanced technical approaches until DST technology is appropriate: The development of a highly usable DST should be a priority of Phase 2 given its centrality to public engagement and decision-making of the Board and IJC. However, there remains some advocacy for machine learning (ML) approaches to add some sophistication to the analysis; this is largely unsupported by the report/theme otherwise (which emphasizes the need and importance of broad engagement with public groups, plugging clear holes in data, and increasing the understandability of data and results). The push to ML would be counter to all of these, and would come at a potentially high cost. While the data overall exist and a research group could pursue such an approach, it is unclear why

this is re-emerging as a priority at the opening of the next phase of work (and why it even appears in this document given the complete lack of context for it otherwise).

3. De-emphasize the use of economic values for comparing various/competing interests: The IRG has recommended at various points against using economic valuation as a common metric with which to compare impacts between interests/issues. Such approaches, when inappropriately used, can give the illusion of quantitative precision when often such precision is created through assumptions very early in the process. We are here reiterating our previous concerns on this point and recommending that the GLAM Committee not convert impacts to economic values across issues and concerns. In some cases, the metric/interest is appropriately quantified in economic terms (e.g., navigation industry impacts; loss of hydropower revenue; shoreline damages; loss of tourism revenue), but in other cases, it is wholly inappropriate (e.g. ecosystem impacts). The GLAM Committee should be cautious regarding which metrics and measures are used within and across interests and geographies.

4. Clarify or coordinate the release of 2021 Work Plan: The 2021 Work Plan should be released at or near the same time as the Phase 1 Report. This will give the various interests some confidence that the GLAM Committee and the Board are following through with the steps developed in Phase 1. In Section 2.0 above, we recommended that the GLAM Committee better communicate how their strategies (short and long-term) are shaping the annual work plan. Our recommendation here is a continuation of this broader theme: the GLAM Committee should take every opportunity to show how analysis and work being done in the past is specifically translating to allocation of resources in the future. This builds long-term trust about how decisions are being made, and that the process – including the scientific and adaptive management process – is important to the overall decision-making process of the Board and the IJC.

5.3. Findings and Recommendations

- The report's primary need was to convey the realities of the system, and to convey what was achieved during Phase 1. In this regard, the report is successful.
- The Phase 1 report provides an appropriate and effective roadmap for Phase 2 work.
- The GLAM Committee should move more quickly and decisively toward an alternative, more appropriate software platform for the Decision Support Tool (DST).
- The GLAM Committee should de-emphasize advanced technical approaches (e.g. machine learning) until the DST technology is appropriate.
- The development of a highly usable DST should be a priority of Phase 2 given its centrality to public engagement and decision-making of the Board and IJC.
- Economic valuation for comparing various/competing interests should be de-emphasized, when possible, because of the inability to develop such metrics across all interests/issues.
- The 2021 Work Plan should be released at or near the same time as the Phase 1 Report, giving the various interests some confidence that the GLAM Committee and the Board are following through with the steps developed in Phase 1.