

Annual Work Plan

Fiscal Year

2021

Annual Work Plan in support of a long-term adaptive management strategy for the on-going review and evaluation of the regulation plans and the expedited review of Plan 2014.

Covering
October 1, 2020 to September
30, 2021

October 9, 2020

WORK PLAN

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|-------------------------|--|-----------------|-----------------------|
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Note: This document is only valid on the day it was printed

GLAM Committee Membership

Blue text identifies other International Joint Commission Board and Committee affiliations

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|--|--|
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NOTE: The Great Lakes-St. Lawrence River Adaptive Management (GLAM) Committee was established by the International Joint Commission (IJC) and is comprised of an equal number of members from the United States and Canada. Members of the Committee serve at the pleasure of the IJC and are expected to be full participants in all activities of the Committee. As with all IJC Boards and Committees, the GLAM Committee members serve in their personal and professional capacity, not as a representative of their agencies or employers.

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Purpose

This work plan identifies the priority activities to be carried out or initiated by the GLAM Committee in the period covering October 1, 2020 through September 30, 2021. These activities support the long-term adaptive management strategy (on-going review and evaluation) of regulation plans for the outflows of Lake Superior and Lake Ontario, and also address an IJC priority request to initiate an expedited review of Plan 2014.

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Introduction

On January 16, 2015 the International Joint Commission (IJC) issued a Directive establishing the Great Lakes-St. Lawrence River Adaptive Management (GLAM) Committee which reports to the three Great Lakes-St. Lawrence River Boards (Superior, Niagara and Lake-Ontario-St. Lawrence (Boards)). The GLAM Committee is to carry out the required monitoring, modelling and assessment related to on-going evaluation of the regulation plans and address other questions that may arise due to changing conditions, in consultation with the Boards. In the summer of 2019, the IJC requested the GLAM Committee begin planning for an expedited review of Plan 2014 with the goal of further moderating flooding that occurred because of record water supplies to the Lake Ontario-St. Lawrence River system in 2017 and 2019. Phase 1 of this expedited review is an 18-24 month effort officially launched by the IJC in February 2020 that focuses on assessing flow releases under Board deviation authority. This document presents the sixth annual work plan of the GLAM Committee covering Fiscal Year 2021 (FY21) from October 1, 2020 through September 30, 2021 and coinciding with the United States fiscal year for federal agencies. It incorporates the longer term GLAM requirements while prioritizing the Phase 1 expedited review activities.

Purpose and Objectives

As outlined in the [January 2015 GLAM Directive](#), the objective of the GLAM Committee is to provide information to the Boards and advise them and the IJC regarding the effects control structures (approved in the Commission's Orders of Approval and Directives) have on levels and flows in boundary waters and the impacts the regulation plans have on the affected interests. This includes the on-going review and evaluation of regulation plans related to:

- a) the effectiveness of the existing regulation plans in managing water levels and flows in the Lake Ontario-St. Lawrence River system and Lake Superior.
- b) examining how the system may be changing over time and whether any modifications to the regulation plan(s) may be warranted; and
- c) any other questions requested by the Boards and/or IJC that may affect the Boards' water management decisions over the long-term.

The 2015 Directive tasks the GLAM Committee to design a work plan for review and approval by the Great Lakes Control Boards and the IJC that supports long-term efforts to address the following questions:

1. How well are the impacts of levels and flows represented by current data and models used in the evaluation?
2. How will future water supplies differ from those used to test the current management of levels and flows?
3. How are other physical, chemical, biological, and/or socio-economic conditions of the system changing over time?

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4. How can the management of levels and flows benefit other physical, chemical, biological and/or socio-economic conditions?

The 2021 GLAM Committee work plan builds on activities undertaken since the committee was formed in 2015 and addresses new requirements resulting from the request in February 2020 by the IJC for an expedited review of Plan 2014. The committee has developed its short-term and long-term strategy (covering 1 to 15 years, consistent with the requirements of the updated Orders), to deliver on the requirements in the directive and the expedited review. Figure 1 illustrates the various components of the broader adaptive management framework outlined in the strategy. The core components relate to (1) hydroclimate conditions, (2) calculating water levels and flows, (3) developing and using predictive models to assess outcomes, (4) evaluating plan performance, and (5) supporting the IJC and boards in making decisions based on the available information. The feedback components include monitoring and testing changes, validating and improving impact models, and re-considering assessments of plan performance if key objectives change. Overarching components that apply to all aspects of the framework include (6) broader engagement and outreach, peer review, information management, institutional arrangements, and project management.

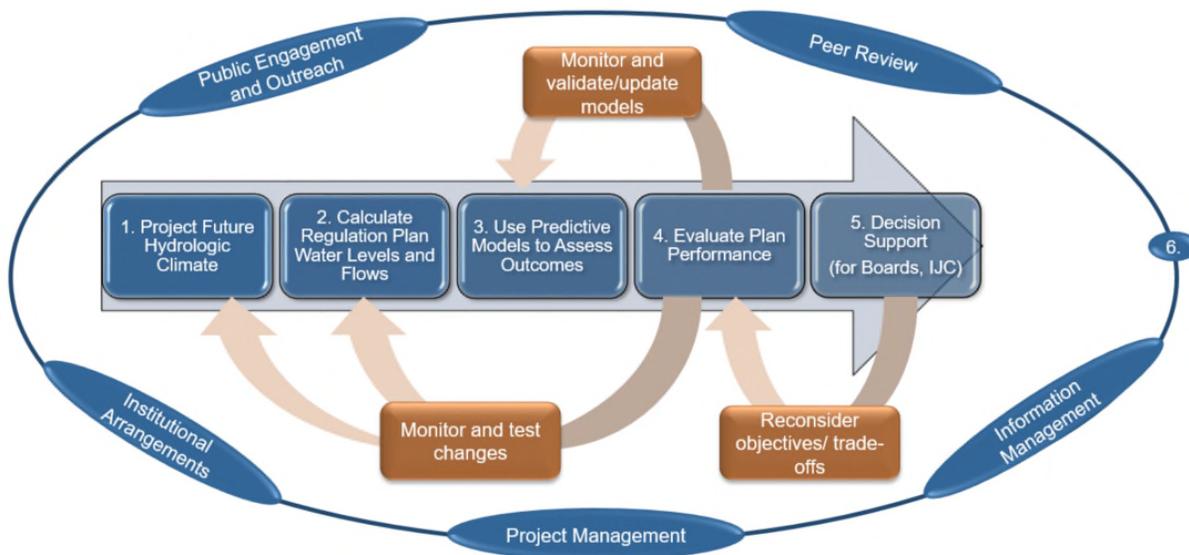


Figure 1: Illustration of the GLAM Committee's adaptive management framework

Scope and Timeline

While the adaptive management process undertaken by the GLAM Committee is an on-going effort that recognizes the dynamics of the large and complex Great Lakes – St. Lawrence River system, the GLAM must also address the immediate requirements of the expedited review of Plan 2014 requested by the IJC. This work plan, therefore, is based both in the context of a long-term initiative and the 15 year

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reporting period within the IJC Orders for Lake Superior and Lake Ontario, which run through years 2030 for Plan 2012 (Superior) and 2032 for Plan 2014 (Ontario), and also in the context of the immediate requirements of the expedited review. This is the sixth work plan prepared by the GLAM Committee and it builds on work initiated and information gained through implementation of the [2016](#) through [2020](#) work plans, while also addressing the new requirements of the expedited review. Individual work plan tasks contribute to a particular aspect of the GLAM Committee's overall Directive and long-term requirements and the short-term requirements of the expedited review. Work plan tasks referred to as 'Ongoing' are done in support of long-term adaptive management requirements. In the FY21 work plan, all upper Great Lakes tasks as well as a few longer-term Lake Ontario and St. Lawrence River tasks fall into the Ongoing category.

In response to the 2017 and 2019 flood events on Lake Ontario and the St. Lawrence River, the IJC has asked the GLAM Committee to work with the Board to undertake an expedited review of Plan 2014 with the goal of further reducing future high water impacts. As part of the committee's short and long-term strategy, a phased expedited review process was outlined with two phases.

Expedited Review Phase 1 - An 18-24-month effort specific to Lake Ontario – St. Lawrence River-, starting October 2019, focused on flow releases under **board deviation authority** recognizing current conditions and high inflows in the foreseeable future. *Phase 1 has been funded.*

Expedited Review Phase 2 - A 3-5 year assessment of the regulation plan(s) under **many possible extremes**, both high and low, and combinations of extremes, to assess the risk and implications of changes to limits, triggers and Board deviations decisions over the longer term (beyond the current/near term conditions). *Phase 2 activities are dependent on future funding.*

The FY21 work plan primarily focuses on tasks in support of Phase 1 of the expedited review for Plan 2014, carry over items from the FY20 work plan, as well as new activities to be initiated based on Phase 1 priorities. In addition, adaptive management tasks supporting long-term Lake Ontario – St. Lawrence River objectives, as well as upper Great Lakes needs, have been included. ***The tasks in the work plan are based on the resources that are expected to be available over the October 1, 2020 to September 30, 2021 period based on approved IJC Phase 1 expedited review funds as well as in-kind agency support and approved IWI funds. Actual resources can vary throughout the year based on operational requirements in support of IJC regulation boards and may impact overall delivery. Should Phase 2 expedited review funding become available, updates will be made to this FY21 work plan.***

GLAM Organization, Roles, and Responsibilities

The GLAM Committee is organized based on the structure outlined in the [3-5 year mid-term strategy](#) in the committee's first triennial progress report.

There are three integrated, ad hoc working groups that lead specific activities (**Error! Reference source not found.** 2). They include the following:

1. **Hydroclimate Working Group** – Focuses on understanding and reducing uncertainty in the primary “driver” of water level changes in the Great Lakes – St. Lawrence system, that being the dynamics of the hydroclimate system
2. **Impact Assessment Working Group** – Structured to ensure outcomes of water level and flow scenarios on the various interests can be sufficiently characterized (i.e. through models or qualitatively). These interest categories include commercial navigation, hydropower, municipal and industrial water uses, coastal, recreational boating and tourism, and environmental.
3. **Plan Review/Decision Support Working Group**: An integrating group, pulling together updated hydroclimate science and improved performance indicators along with outflow simulations to review and evaluate regulation plan performance. Collectively, this working group supports the decision support activities necessary to understand whether the management of levels and flows can benefit other physical, chemical, biological, and/or socio-economic conditions. This includes providing decision criteria for recommendations on when and how a decision should be made when proposing changes to the regulation plans to the IJC



Figure 2: GLAM organizational and reporting structure

The GLAM Committee as a whole provides oversight to the working groups as well as guidance and support related to cross-cutting issues including:

- Reporting and communication between the Boards and GLAM, and the IJC and GLAM;
- Correspondence related to Great Lakes Water Quality Agreement (GLWQA) activities;
- Supporting external communications with key stakeholders through outreach and engagement, managing information, and ensuring quality control and in particular working with the Public Advisory Group (PAG) established by the IJC to advise the GLAM on the expedited review;
- Working with the IJC to develop and information management system and supporting IJC led peer review

Fiscal Year 2021 Work Plan - Product Descriptions, Timelines and Resources

This work plan is divided into two sections as illustrated in **Error! Reference source not found.**:

Section A identifies work projects within the core components previously outline in Figure 1 of the overall adaptive management framework. These tasks are primarily assigned to one of the three working groups described above to support plan review and evaluation. The individual tasks are organized based the five core components in Figure 1. There is also a basic annual review component for each of the working groups related to hydroclimate, impact assessment, and plan review information of importance based on conditions in the 2020 calendar year. The majority of work plan tasks contribute to delivery of the core components of the adaptive management framework outlined in Figure 1. In many cases, these targeted projects are identified based on knowledge gained from the review of conditions within the previous calendar year as part of the annual report development.

Section B outlines GLAM oversight and administrative activities needed to manage the GLAM Committee and support all work projects and long-term efficiencies. The tasks support the overarching activities of the adaptive management framework outlined in Figure 1 and collectively make up component 6.

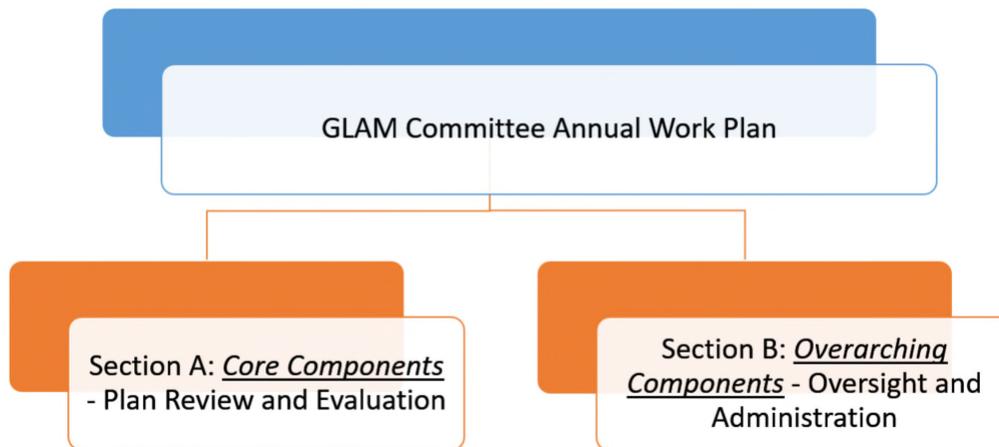


Figure 3: Organization of GLAM annual work plan

Specific tasks identified in the work plan represent activities the GLAM Committee has identified as priorities and which the GLAM Committee believes can be resourced with one of the following options:

- 1) Available committee membership, IJC staff and/or assigned agency resources given current expectations for the coming year, or
- 2) Are already receiving financial support through Phase 1 expedited review funding, or
- 3) Are approved through the International Watershed Initiative (IWI)

In addition to the tasks falling within the previous three categories, there are a few specific projects being undertaken and resourced directly through partner agencies that are identified in the work plan. These projects are included in the work plan because their products directly support GLAM Committee

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objectives. However, the projects are primarily being managed, resourced and undertaken outside of the GLAM Committee and in support of other agency priorities. GLAM Committee members felt it was important to highlight these additional items in the work plan because of the relevance of the work to longer-term efforts, yet they are flagged because the committee has limited control on their overall delivery.

Error! Reference source not found. shows expected resources available to the GLAM Committee in FY21. The resource levels include a number of IWI projects continuing from FY20 that were previously reported in the FY20 work plan. The table also includes the total funding for Phase 1 of the expedited review. Note that Phase 1 funding was initiated in FY20 and some of the expedited review funds were also allocated in the FY20 work plan. Table 1 does not include agencies in-kind staff contributions, nor does it include additional resources that may yet be acquired through the IWI program. Typically, in-kind ECCC and USACE contributions average around 3 FTE, but are expected to be higher in the coming year due to the expedited review requirements.

Table 1: Summary of currently identified resources (\$) for GLAM activities in FY21 (includes full support for tasks that may have been partially completed in FY20. Therefore these totals include support that was previously in FY20 work plan and not just the incremental FY20 component)**

| Agency | \$US | \$CAN |
|--|----------|----------|
| IJC support (includes proposals already submitted and endorsed under the International Watersheds Initiative (IWI) ***) | \$122K | \$104K |
| Federal government funding to support Phase 1 of the expedited review (covering the period January 2020 to September 2021) Note that the total in the work plan table may not add exactly to \$1.5 million due to funds previously allocated in part of the FY20 work plan. | \$1,500K | \$1,500K |

Section A – Core Components - Plan Review and Evaluation

The GLAM Committee’s priority Core Component Plan Review and Evaluation work plan tasks are identified in Table 2. The highest priority activities are the ones that contribute directly to Phase 1 of the expedited review and have been funded. In addition, there are a few ongoing activities to support the long-term adaptive management requirements for both Lake Ontario and the upper Great Lakes that are being maintained with in-kind contributions and/or IWI funding. These include undertaking targeted projects to validate or improve existing impact assessment tools such as a detailed review of existing performance indicators based on what was learned from the record high water levels in 2017 and 2019.

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Section B – GLAM Overarching Components - Oversight and Administration

The GLAM Committee's overarching oversight and administration activities focus on overall management of committee and its activities. This includes guidance and implementation of overarching GLAM functions including information management as well as communications, outreach, and engagement activities and reporting. Specific oversight and administration tasks, including those contributing to the expedited review of Plan 2014, are identified in Table 3. It is important to note that a key requirement in the GLAM Directive for a Triennial Report, which should be due in this fiscal year, has been postponed by the IJC in light of the expedited review. The IJC will advise GLAM on when that Triennial Report will be due, but it is not included in this work plan.

Possible Additional Tasks

Should Phase 2 expedited review funding become available at some point during the execution of the FY21 work plan, further updates and modifications may be required with the addition of Phase 2 tasks. As well, there are a few long-term tasks that have been put on hold to concentrate on the expedited review. These will be completed as time permits.

Table 2: Summary of GLAM FY20 Section A – Core Components - Plan review and evaluation work plan activities

| SECTION A: Core Components - Plan Review and Evaluation | | | | | | | |
|--|---------------------------------|--|--|---|---------------------------|------------|---------------------------|
| Summary of annual conditions | | | | | | | |
| Task | AM Contribution | Task Title | Proposed Products | Description | Expected Resources | | Estimated Delivery |
| | | | | | U.S. | CDN | |
| Hydroclimate Working Group | | | | | | | |
| FY21-1.1 | Phase 1 Expedited Review | Prepare routine report material required for hydroclimate assessments | 1) Draft 2018-2020 hydroclimate summary for Board review. | The summary will discuss relevant hydroclimate information that supports long-term GLAM plan review activities. The summary will cover the 2018-2020 calendar years as well as relevant surveillance information reported on during the year. (to be coordinated with expedited review reporting) | In-kind | In-kind | May-21 |
| Impact Assessment Working Group | | | | | | | |
| FY21-1.2 | Ongoing | Prepare routine report material required for understanding baseline conditions and benefits of observed water levels and flows | 1) Draft 2018-2020 impact assessment summary for Board review. | The summary will discuss relevant impact assessment information that supports long-term GLAM plan review activities. The summary will cover the 2018-2020 calendar years as well as relevant surveillance information reported on during the year. (to be completed for the upper Great Lakes. Lake Ontario and the St. Lawrence River will be coordinated and integrated with expedited review reporting) | In-kind | In-kind | Sept-21 |
| Plan Review Working Group | | | | | | | |
| FY21-1.3 | Ongoing | Prepare routine report material required for ongoing evaluations of existing regulation plan performance | 1) Draft year-end 2018-2020 plan review and evaluation summary for Board review. | The summary will discuss relevant plan review information that supports long-term GLAM activities to assess regulation plan performance. The summary will cover the 2018-2020 calendar years and include simulations of alternative outflow management strategies based on 2020 conditions and identified plan review activities in the work plan. (to be completed for the upper Great Lakes. Lake Ontario and the St. Lawrence River will be coordinated and integrated with expedited review reporting) | In-kind | In-kind | Sept-21 |

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| SECTION A: Core Components - Plan Review and Evaluation | | | | | | | | |
|--|---------------------------------|--|---|--|---------------------------|------------|---------------------------|--|
| Priority Projects – FY21 | | | | | | | | |
| Task | AM Phase | Task Title | Proposed Products | Description | Expected Resources | | Estimated Delivery | |
| | | | | | U.S. | CDN | | |
| Hydroclimate Working Group | | | | | | | | |
| FY21-2.1 | Phase 1 Expedited Review | Short-term (1-2 year) water supply scenarios based on current conditions | 1) Extreme water supply sequences for the next few years | Develop a range of plausible (including extreme) combinations of climate factors for the next 1-3 years to produce extreme water supply sequences for deviation simulations. | In-kind | In-kind | Jan-21 | |
| FY21-2.2 | Ongoing | Application of Machine Learning (ML) and Artificial Intelligence (AI) to Lake Ontario Regulation Decisions | 1) Summary report on the utility of ML and AI application to regulation decisions and recommendations for further research. | The project explores machine learning and artificial intelligence as applied to making regulation decisions for the Lake Ontario-St. Lawrence River system water levels and outflows. The researcher will work with an existing training set of 50,000 years (quarter-monthly timestep) to develop algorithms to assist human decision-makers. | In-kind | In-kind | Aug-21 | |
| FY21-2.3 | Ongoing | Identification of research priorities linking hydroclimate and plan review requirements | 1) List of key hydroclimate questions specific to GLAM Committee needs | There is a wide range of hydroclimate research undertaken in the Great Lakes basin by federal and state agencies as well as academic institutions. As part of efforts to review IJC regulation plans in the basin, there are some targeted projects that need attention. This task would involve developing that priority list in consultation with the hydroclimate and plan review groups to identify critical tasks and knowledge gaps to improve outflow regulation. | In-kind | In-kind | Dec-20 | |

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| **FY21-2.4 ¹ | Ongoing | Updating Future Lake Level Projections | 1) Projections of Great Lakes Water Levels under a Range of Climate Change Scenarios available for the Great Lakes Region | This is part of an ECCC funded 5 year project (2017-2022) titled "Assessing and Enhancing the Resilience of Great Lakes Coastal Wetlands to Climate Change". This portion of the project includes the development of historical (base line) and multiple climate change water supply and water level scenarios for testing wetland vulnerability and to drive the impact assessment models. The project will use regional climate change scenarios to determine a range of plausible future lake levels. | N/A | In-kind through ECCC funded project | Dec-20 |
| Impact Assessment Working Group – Lake Ontario and St. Lawrence River (Ecosystem) | | | | | | | |
| FY21-2.5 | Ongoing for product 1 and Phase 1 Expedited Review for product 2 | Ecosystem Performance Indicator review and prioritization assessment | 1) Initiation of a review of existing Lake Ontario and St. Lawrence River ecosystem Performance Indicators, and prioritization for mid to long-term Performance Indicator and model improvements 2) Identification of existing ecosystem indicators for Lake St. Lawrence and the upper St. Lawrence River and their applicability to high water deviation decisions | Since its inception in 2015, the GLAM Committee has been looking at how to use existing performance indicators in the long-term assessment of the Lake Superior and Lake Ontario regulation plans. In preparing the annual report for 2017, it became evident that a broader status assessment of the existing ecosystem indicators was required to determine which ones were priority for monitoring, validating, updating , and integration into a long-term adaptive management process. Given limited resources, the GLAM Committee cannot monitor all indicators and it is important to assess how the existing indicators can best be tracked, what external efforts are ongoing related to individual indicators, and how the GLAM Committee can best fill priority gaps. <i>NOTE: previous GLAM Committee work plans included a task for a broader review of existing socio-economic indicators. Some of that is being done through the expedited review process for individual indicators.</i> | In-kind | \$40K IWI and additional in-kind support | May-21 |
| FY21-2.6 | Ongoing | Continued Evaluation of Meadow Marsh Algorithm | 1) An updated report integrating 2017 through 2020 field data into the comparison of the wetlands algorithm along with a response to 2017 peer review | This is a carry-over item from previous work plans and is critical to support updating and validating the meadow marsh Performance Indicator. Unfortunately, in-kind agency resources have been re-directed to support other expedited GLAM Committee priorities and this item has been delayed. It is still | In-kind (possibly IWI request) | In-kind (possibly IWI request) | Sept-21 |

¹ The project is being undertaken and directed through partner agencies but outcomes will contribute to long-term GLAM Committee objectives

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| | | | 2) Preliminary development of a longer-term coastal wetland monitoring strategy to support GLAM efforts along with implementation requirements. | considered a priority for the GLAM Committee and will be critical for Phase 2 of the expedited review. Consideration will be given to developing an IWI proposal to support the project. | | | |
| FY21-2.7 | Ongoing | Monitoring of Lake Ontario Coastal Wetlands on the Canadian Shoreline | 1) Summary report and monitoring data for use in long-term model validation efforts | This is a continuation of wetland monitoring consistent with past field sampling tasks. It covers field monitoring of 16 Canadian wetland sites in late summer of 2020 by the Canadian Wildlife Service to support model validation of the meadow marsh Performance Indicator . | in-kind | \$64K IWI and additional in-kind support | Mar-21 |
| FY21-2.8 | Phase 1 Expedited Review | Lower River IERM2D status | 1) Short report on IERM2D current status and priority future modifications | The lower St. Lawrence River IERM2D model was used in the final evaluations of Plan 2014. As with all computer models, further updates are required to keep the model code current and efficient. This task will include documentation on the current IERM2D status and priority modifications to support Phase 2 of the expedited review. | N/A | \$50K expedited review funds | Sept-21 |
| FY21-2.9 | Phase 1 Expedited Review | Lake St. Lawrence Ecosystem Indicator | 1) Overview assessment of possible ecosystem implications of low upper St. Lawrence water levels due to high Lake Ontario outflows | In both 2018 and 2020, outflows from Lake Ontario were very high through the fall in an effort to draw Lake Ontario levels down and reduce the risk of high water levels the following spring. These high outflows lead to reduced water levels on Lake St. Lawrence and parts of the upper St. Lawrence River, with potential ecological implications. This task will build on previous work looking and ecosystem impacts of low water in the winter months to qualitatively assess potential ecosystem impacts of low fall levels. | In-kind | \$50K expedited review funds | Aug-21 |
| **FY21-2.10 ² | | <i>Wetlands modelling to assess wetlands vulnerability to climate change</i> | 1) <i>Integrated Ecological Response Model (IERM) Development for 25 Great Lakes wetlands</i> | <i>Ecohydraulic modelling known as the Integrated Ecosystem Response Model (IERM) are being developed by ECCC as part of project titled "Assessing and Enhancing the Resilience of Great Lakes Coastal Wetlands to Climate Change" to assess wetland vegetation and wetland habitat vulnerability to climate change. This model will use data gathered by the Canadian Wildlife</i> | | <i>In-kind through ECCC funded project</i> | <i>Mar-22</i> |

² The project is being undertaken and directed through partner agencies but outcomes will contribute to long-term GLAM Committee objectives

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|--|--|--|--|--|--|--|--|
| | | | | <i>Service of ECCC and other sources to generate algorithms relating water levels and other climate drivers to wetlands response and produce geospatial datasets of results over a number of years (~30 yrs), covering the historical sequence and numerous future climate change projections developed.</i> | | | |
|--|--|--|--|--|--|--|--|

| Impact Assessment Working Group – Lake Ontario and St. Lawrence River (Socio-Economic) | | | | | | | |
|---|--|---|--|---|------------------------|--|---------|
| FY21-2.11 | Phase 1 Expedited Review | Municipal meetings within NY State, Ontario, and Quebec | 1) Host meetings with shoreline municipalities to gather further information on 2017 and 2019 high water impacts to support reporting and model comparison | Shoreline municipalities and their residents were directly impacted by high water levels on Lake Ontario and the St. Lawrence River in 2017 and 2019. These meetings will seek to provide a forum for municipal staff representatives to report on local high water impacts so that information can be summarized and reported back to the Board and the IJC. The US work started in FY20 and should be finished by December 2020. The Canadian meetings are being contracted, with the meetings expected in the fall of 2020 and final reports due March 2021 | \$75K IWI for NY State | \$80K for ON, and \$80K for QC - expedited review funds | Apr-21 |
| FY21-2.12 | Phase 1 Expedited Review | Impact information for Indigenous communities and Native American Tribes | 1) Gather information on the impacts of high water levels in 2017 and 2019 from representatives of Indigenous communities and Native American Tribes along the Lake Ontario and St. Lawrence River shoreline | Indigenous communities and Native American tribes along the Lake Ontario and St. Lawrence River were directly impacted by fluctuating water levels over the past few years including extremely high levels in 2017 and 2019. The GLAM Committee would like to ensure the perspectives of Indigenous communities is captured in its assessment of past impacts and identification of future risk. Through the support of a contractor, the GLAM Committee will work with local community representatives to share knowledge and perspective. | Included in CDN effort | \$40K - expedited review funds | Apr-21 |
| FY21-2.13 | Phase 1 Expedited Review (Lake Ontario) | Implementation of self-reporting damage questionnaire for Great Lakes-St. | 1) Make 2020 questionnaire available online 2) Promote questionnaire to maximize responses | An online, self-reporting questionnaire is available for shoreline property owners along the Great Lakes- St. Lawrence River to report high water impacts. The questionnaire will be promoted through the fall of 2020 and material summarized for reporting to the IJC in 2021. The information will also be used for | In-kind | In-kind | Sept-21 |

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| | and Ongoing (Upper Lakes) | Lawrence River shoreline (2020) | <ol style="list-style-type: none"> 3) Summarize the questionnaire responses for the Boards and IJC purposes 4) Undertake a test validation process to determine if questionnaire modifications are needed in future years | comparison to previous impact models. The work support surveillance that ties back in to PI validation and potential future updating . | | | |
| FY21-2.14 | Phase 1 Expedited Review | Lake Ontario and upper St. Lawrence River shoreline characterization | <ol style="list-style-type: none"> 1) Review of background/support information regarding shoreline impacts (including resiliency) 2) Updated statistics on offshore and nearshore wave and storm surge 3) Updated geospatial database characterizing shoreline vulnerability (shoreline development, community infrastructure, public spaces etc.) 4) Shoreline characterization information integrated into Phase 1 decisions process | The GLAM Committee is prioritizing data consolidation regarding shoreline development and attributes on Lake Ontario and the upper St. Lawrence River shoreline. This includes information about the type and extent of development and its vulnerability relative to different water levels. The information will be aggregated to support the Boards decision processes. | \$135K - expedited review funds and in-kind | \$65K - expedited review funds and in-kind | Feb-21 |
| FY21-2.15 | Phase 1 Expedited Review | Lake Ontario and upper St. Lawrence River test site modelling | <ol style="list-style-type: none"> 1) Site prioritization for test modelling 2) Insights on metrics for economic impacts and societal disruptions 3) Updates to overtopping and runoff for test site modelling 4) Application of detailed shoreline dynamic models for test sites along the Lake Ontario and upper St. Lawrence River shoreline and integration into Phase 1 decisions process | Based on observations and information from 2017 and 2019, further site scale modelling of shoreline impacts is required to understand how impacts change with different water level and storm conditions and how to represent those results in relevant impact metrics. In the immediate term, the goal is to undertake detailed modelling at test sites to support Board decisions and guide the application of impact modelling in the future. | \$135K - expedited review funds and in-kind | \$175K - expedited review funds and in-kind | Feb-21 |

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| FY21-2.16 | Phase 1 Expedited Review | Lower St. Lawrence flood model validation | <ol style="list-style-type: none"> 1) Validation of existing lower St. Lawrence River flood impact model based on 2017 and 2019 2) Improvements to model output for extreme deviation scenarios | During the LOSLRS, a flood impact model was developed for the lower St. Lawrence River. Based on observations in 2017 and 2019, the flood damage estimates from the model are being reviewed as part of a validation process. Work has focused on the Lac St. Pierre area and will extend to Lac St. Louis. Based on the validation, further updates to the input data will be made to improve the estimates of flood extent under different Board deviation decisions. This work directly supports F limit decisions. | N/A | \$110K - expedited review funds and in-kind | Mar-21 |
| FY21-2.17 | Phase 1 Expedited Review | Long-term coastal strategy | <ol style="list-style-type: none"> 1) Strategy for expanding detailed coastal impact modelling and undertaking ongoing data collection | Moving forward into Phase 2 of the expedited review, the GLAM Committee will look to expand on the detailed test site modelling undertaken in Phase 1 of the expedited review. As well, a strategy will need to be developed to collect critical coastal data on an ongoing basis. This task will outline a general strategy for moving that work forward, including lesson's learned from Phase 1 coastal activities including the shoreline characterization and test site modelling. | \$20K - expedited review funds and in-kind | \$10K - expedited review funds and in-kind | Sept-21 |
| FY21-2.18 | Phase 1 Expedited Review | Revisit shore protection that was surveyed by either NYDEC (2011) or USACE (2015) to assess response to high water conditions | <ol style="list-style-type: none"> 1) An assessment of a subset of shore protection structures previously surveyed by NYDEC and/or USACE to determine condition following 2017 high water levels. | This is a carry-over item from previous work plans in support of Performance Indicator validation and potential future updating . It involves an assessment of a subset of shore protection structures previously surveyed by NYDEC and/or USACE to determine their conditions following 2017 and 2019 high water conditions. Expedited Review funds will be used to support the effort | \$70K - expedited review funds | \$5K - expedited review funds | Sept-21 |
| FY21-2.19 | Phase 1 Expedited Review | Recreational Boating and Tourism PI review | <ol style="list-style-type: none"> 1) A priority assessment of existing recreational boating and tourism indicators and options for expanding suite of PIs | Damages to tourism and recreational boating based on 2017 and 2019 data and information will be assessed to gain an understanding of possible additional indicators that should be used by the ILOSLRB to assess impacts. | \$50K - expedited review funds | N/A | Oct-20 |
| FY21-2.20 | Phase 1 Expedited Review | Recreational boating and tourism data collection | <ol style="list-style-type: none"> 1) Acquisition of additional recreational boating and tourism impacts for the Lake Ontario and St. Lawrence River shoreline and | Building on the recreational boating and tourism performance indicator review, acquire additional direct information on impacts for integration into the decision support process. Observed data will be used to help inform the Board on critical thresholds and understand relative difference in impacts | \$100K - expedited review funds | \$130K - expedited review funds | Mar-21 |

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| | | | integration into Phase 1 decisions process | throughout the system (e.g. Lake Ontario vs. Lake St. Lawrence and downstream). The work will also support Phase 2 efforts to update and/or develop new rec boating and tourism PI for Lake Ontario and the St. Lawrence River. | | | | |
| FY21-2.21 | Phase 1 Expedited Review | Seaway Navigation Economic Analysis | 1) Finalize IWR report based on peer review comments | In FY20, the US Army Corps of Engineers Institute for Water Resources (IWR) completed an analysis of the economic impacts of high flows exceeding seaway maximum limits (under deviation authority of the ILOSLRB). The analysis looked at the economic impacts of early shutdown, delayed opening, or mid-year temporary shutdowns. While the report is finished, the IJC will be peer reviewing the report and IWR will respond to the feedback in FY21. Note \$108K was spent on this effort in FY20 using IWI funds. | \$17K IWI funds | In-kind | Dec-20 | |
| FY21-2.22 | Phase 1 Expedited Review | Hydropower critical thresholds | 1) Consolidated information on critical hydropower thresholds | The GLAM Committee has reached out to representatives of the three main hydropower entities (Ontario Power Generation, New York Power Authority, and Hydro-Quebec) to identify critical water level and flow thresholds related to their St. Lawrence River facilities. The GLAM Committee will be consolidating the information for the decision support process. | \$30K expedited review funds | \$30K expedited review funds | Dec-20 | |
| FY21-2.23 | Phase 1 Expedited Review | SVM documentation | 1) Review and document current state of all SVM models and components including the modelling platforms | GLAM Committee members will be reviewing the state of current SVM in the context of supporting Board deviation decisions. This is a starting point for further decision support efforts discussed further down in the work plan. | \$25K - expedited review funds | In-kind | Jan-21 | |
| Impact Assessment Working Group – Upper Great Lakes | | | | | | | | |
| FY21-2.24 | Ongoing | St. Marys River IERM Rapids Data | 1) Review of new data in the context of potential IERM2D enhancements | This builds off an FY20 work plan item and supports Performance Indicator and model development within the St. Marys River IERM. The project involved the collection of substrate data in the St. Marys Rapids area by USACE to support IERM validation. The next step will be to for USACE and ECCC staff to collectively review the substrate and plant data and define the next steps for the modelling effort in terms of validating and improving the model and possibly expanding the model domain. | In-kind | In-kind | Sept-21 | |

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| FY21-2.25 | Ongoing | Development of initial flooding performance indicator for the St. Marys River | 1) Preliminary development of flooding performance indicator for the St. Marys River. | This is a carry-over item from previous work plans. During high flows through the St. Marys River, local flooding can occur at various locations in the river. No performance indicator was developed during the IUGLS for this area and one is now required. This effort will initiate the Performance Indicator and model development for application in future plan review activities. | In-kind | In-kind | Sept-21 |
| FY21-2.26 | Ongoing | Development of flow change smoothness performance indicator for St. Marys Rapids | 1) Develop plan and schedule for developing PI | Eventually it may be possible for the IERM to be used to quantify benefits of smooth month to month flow changes in the rapids. However, it may still be years before the IERM is fully calibrated to be used for this purpose, and it may not ever be able to be used for this purpose. In the meantime, the development of a more qualitative PI should be discussed. | In-kind | In-kind | Sept-21 |
| Plan Review/Decision Support Working Group | | | | | | | |
| FY21-2.27 | Phase 1 Expedited Review | Ice stability analysis in the upper St. Lawrence River | 1) Finalize ice stability analysis report | In collaboration with the US Army Corps of Engineers IWR, researchers at Clarkson University have undertaken a Lake St. Lawrence ice stability analysis with regards to dam operations. The draft report has been reviewed by the regulation representatives and is being finalized by the researchers with the final report and presentation expected by October 2020. | \$30K IWI funds | In-kind | Oct-20 |
| FY21-2.28 | Phase 1 Expedited Review (Lake Ontario) and Ongoing (Superior) | Development of regulation plan simulations into new regulation and routing model | 1) Development of the new coordinated simulation model for Plan 2014, 1958DD, Plan 2012, 77A, and preproject 2) Updated input datasets that includes Lake Ontario net basin supplies, St. Lawrence River water levels, ice conditions, roughness factors, downstream tributary flows, etc. | This is a Board requirement, but needed for GLAM too. The regulation representative offices in Cornwall, Buffalo, and Detroit are working on a new regulation and routing model for the Great Lakes, in collaboration with the Coordinating Committee on Great Lakes Basic Hydrologic and Hydraulic Data. The new simulation model will incorporate updated regulation rules (and deviation assumptions) for Plan 2014, 1958DD, Plan 2012, 77A, and preproject conditions. In addition, the input datasets will be developed to run the simulation model. | In-kind | In-kind | Dec-20 |
| FY21-2.29 | Phase 1 Expedited Review (Lake | Review and documentation of Lake Ontario and Lake Superior | 1) Narrative of differences between 58DD and Plan 2014 from 2017 through 2020 | This is a Board requirement, but needed for GLAM too. As part of ongoing board operations requirements, the regulation representative offices are already initiating efforts to look at the operation of the current regulation plans (Plan 2014 and Plan | In-kind | In-kind | Jan-21 |

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| | Ontario) and Ongoing (Superior) | outflow operations in 2018 through 2020 | 2) Narrative of differences between 77A and Plan 2012 from 2017 through 2020 3) Run week to week simulations of models for Plan 2014 with 1958DD from 2017 through 2020. Compare to actual conditions | 2012), the previous regulation plans (1958DD and 77A), and preproject conditions from 2018 through 2020. This is also a requirement for the GLAM Committee. On Lake Ontario, the regulation representative offices are starting with a narrative description of the differences between Plan 2014 and 1958DD and that will support further documentation by the GLAM Committee, possibly as part of the triennial report. | | | |
| FY21-2.30 | Phase 1 Expedited Review | Documentation of possible changes to deviation assumptions required for updates to simulation models | 1) Report(s) that thoroughly describes maximum limits of Plan 2014, how deviations have been implemented in the past, and how deviations might be considered in the future | To simulate regulation plan water levels over a wide range of extreme conditions, deviation decisions that might be made by the Board need to be explicitly defined in the model code. How the Board deviates may change over time based on a variety of factors. This task is to define a standard set of deviation assumptions for integration into the simulation models for long-term regulation plan comparison | In-kind | In-kind | Jan-21 |
| FY21-2.31 | Phase 1 Expedited Review | Run updated models to simulate, test and evaluate the effects of different strategies | 1) The regulation representative offices will be running a range of simulations based on Board deviation strategy options and documenting outcomes. | The regulation representative offices produce simulations based on a range of possible Board deviation strategies to inform Board decision making processes. The regulation representatives will also be using those tools to help look at additional deviation strategies to inform the decision support process. | \$100K - expedited review funds | \$23K - expedited review funds (note \$77K was previously allocated) | Sept-21 |
| FY21-2.32 | Ongoing | Review upper Great Lakes decision framework from IUGLS in context of recent deviation decisions | 1) Summary of IUGLS decision framework and application to Plan 2012 deviation decisions | Within the IUGLS, a model and decision framework was developed for comparing regulation plan outcomes using a suite of performance indicators. With the operation of Plan 2012, deviation decisions for winter operations have been common and the ILSBC is now looking at formalizing those strategies. As part of that process, the GLAM Committee will need to look at the IUGLS decision framework and tools to see that they are appropriate for the current ILSBC decision processes. | In-kind | In-kind | starting in FY21 |

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| FY21-2.33 | Phase 1 Expedited Review | Work with the Board to clearly articulate key objectives and concerns in their deviation strategies. | 1) Interview Board members to document their individual and collective decision criteria in spreadsheet form. | GLAM Committee members and associates have interviewed ILOSLRB members to document their individual and collective decision criteria when under deviation authority. The results have been collated and sent to the Board for their review. The GLAM Committee will finalize the feedback early in FY21 as part of the decision support process. | In-kind | In-kind | Oct-20 |
| FY21-2.34 | Phase 1 Expedited Review | Present information on economic and environmental trade-offs between deviation decisions and how they are consistent with plan objectives | 1) Review and summarize the design requirements for a deviation decision support process 2) Recommend and implement risk-based approach to support deviation decisions 3) Diagram the architecture for a new SVM 4) Report outlining possible multi-criteria decision support tools | This is an overarching decision support task to integrate impact information and simulation scenarios to support Board decision processes. The bulk of the funds will be to engage shared vision planner/modeler experts on how to integrate and visual existing data to support Board decisions given the high degree of uncertainty. The critical objective is to have a functional product for use by the ILOSLRB in March of 2021, with final documentation and updates for future application by September 2021. This work starts with a vision of what GLAM would like the approach to provide to the Board, and leads into (1) a recommended risk based approach to fit that vision, (2) an assessment of where our current capabilities fit and fail those needs, (3) a brainstorming process to develop decision support alternatives, and (4) a conceptual model that would be developed in the future. | \$230K - expedited review funds and in-kind | \$135K - expedited review funds and in-kind | Sept-21 |
| FY21-2.35 | Phase 1 Expedited Review | Practice decisions with the ILOSLRB | 1) Practice decision support workshop facilitation | Practice decision workshops will be held to inform the development of the decision support process. | \$30 K - expedited review funds | \$25 K - expedited review funds | Sept-21 |
| FY21-2.36 | Ongoing | Analyze performance of deviation strategy used during sidechannel reductions | 1) Re-coded Plan2012 that includes deviation strategy. 2) SVM results of re-coded 2012 code using existing SVM used during IUGLS 3) Summary report to IJC | The Superior Board has operated for several years under a deviation strategy, approved by the IJC, to minimize impacts through the St. Marys Rapids that would have been specified by Plan 2012 due to hydro-power outages. GLAM will assist Board staff with evaluating the impacts of this strategy using existing upper lakes SVM to assist the IJC with determining if the regulation plan code should be officially modified, or if the existing deviation directive should be modified. | In-kind | In-kind | Sept-21 |

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Table 3: Summary of GLAM FY19 Section B – oversight and administration work plan activities

| Section B: GLAM Oversight and Administration | | | | | | | |
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| Task | AM Phase | Task Title | Proposed Products | Description | Expected Resources | | Estimated Delivery |
| | | | | | U.S. | CDN | |
| FY21-3.1 | Ongoing | GLAM Committee Coordination, Management, and Reporting | <ol style="list-style-type: none"> 1) Annual work plan for FY21 for submission to the Boards. 2) Semi-annual progress reports for submission to the Boards in March 2021 and September 2021. | <p>This is an on-going task that includes the coordination, management operation and oversight of GLAM Committee activities and working groups. It includes primarily the work of the co-chairs, secretaries and their staff who help support the operation of the GLAM Committee. This activity is supported primarily through USACE and ECCC with some operation and maintenance funds provided by IJC-Ottawa.</p> <p>There are three specific products for this task including the development of an annual work plan for submission to the boards, semi-annual progress reports in March and September of 2021, and coordination and oversight of the annual reporting to support the development of a Triennial Report (note the IJC has postponed the requirement of the next Triennial Report, which was due this fiscal year, until after the expedited review is complete). These items are requirements of the IJC Directive to the GLAM Committee.</p> | In-kind | In-kind | Sept-21 |
| FY21-3.2 | Phase 1 Expedited Review and ongoing | Monitoring of Work Plan Delivery | <ol style="list-style-type: none"> 1) Task descriptions and periodic updates on progress that contribute to semi-annual reporting. | <p>The GLAM Committee secretaries in conjunction with the GLAM Co-chairs will track work plan progress. This is an ongoing committee requirement and contributes to semi-annual progress reporting.</p> <p>With the implementation of the expedited review, an additional project manager has been engaged to further support delivery of the work plan.</p> | \$135K - expedited review funds and in-kind | \$20K - expedited review funds and in-kind | Sept-21 |

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| FY21-3.3 | Phase 1 Expedited Review and ongoing | GLAM Information Management Needs to support expedited review and ongoing Adaptive Management | <ol style="list-style-type: none"> 1) Implementation of new IJC Sharepoint and MS Teams platform to support GLAM work 2) File organization and archiving of final reports and documents online, including metadata 3) Implementation of a data and document storage system to capture expedited review products for public access and reporting purposes | The GLAM Committee will be moving forward with improved tools for document management and collaboration to support committee activities. This includes a new IJC rollout of MS Teams and Sharepoint. In addition, the committee will concentrate of ensuring existing datasets and reports are properly archived and made available online through an integrated reporting process. The document management and storage solution implemented will capture expedited review and ongoing GLAM Committee products. The Committee will work with IJC staff to identify the appropriate repository for critical datasets and reports. | \$50K - expedited review funds and in-kind | \$50K - expedited review funds and in-kind | Sept-21 |
| FY21-3.4 | Phase 1 Expedited Review and ongoing | Communication products on the GLAM Committee and the Expedited Review | <ol style="list-style-type: none"> 1) Communications products to promote the work of the GLAM Committee, particularly in the context of the expedited review | Together with IJC staff and the ILOSLRB Communications Committee, the GLAM Committee will work with external contractors to improve public communications regarding the work of the GLAM Committee, the ILOSLRB outflow management, and particularly the implementation of the expedited review process. | \$100K - expedited review funds | \$100K - expedited review funds and in-kind | Sept-21 |
| FY21-3.5 | Phase 1 Expedited Review | Public Advisory Group to support the Expedited Review | <ol style="list-style-type: none"> 1) Support the implementation of a Public Advisory Group to support the Expedited Review | The IJC has established a Public Advisory Group (PAG) as part of the expedited review process. The IJC has engaged a contractor to lead the PAG effort (the budget funds are supporting that component, as well as PAG operations and travel as necessary). The GLAM Committee works closely with the contractor and the PAG to share information on the expedited review process and seek PAG input. Supporting the PAG is an important and ongoing requirement for the GLAM Committee in FY21. | \$100K - expedited review funds | \$100K - expedited review funds and in-kind | Sept-21 |
| FY21-3.6 | Phase 1 Expedited Review | Peer Review | <ol style="list-style-type: none"> 1) Peer review of GLAM Committee strategy and products 2) Improved connections with research community and linking with related research | In conjunction with IJC staff, the GLAM Committee will implement a peer review process for Phase 1 of the expedited review. The IJC will lead the effort. | \$80K - expedited review funds | \$80K - expedited review funds | Sept-21 |
| FY21-3.7 | Ongoing | Maintain engagement with GLWQA activities | <ol style="list-style-type: none"> 1) Ongoing GLAM co-chair participation in meetings of the IJC’s WQB and SAB. | The IJC Directive to the GLAM Committee specifically highlights the importance of ensuring coordination and liaison between the Great Lakes Control Boards and the Boards created by the Great Lakes Water Quality Agreement (GLWQA) – the Great | In-kind | In-kind | Sept-21 |

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| | | | 2) Interaction with GLWQA annexes to further potential common objectives. | Lakes Water Quality Board (WQB) and Science Advisory Board (SAB). To better link water levels and flows regulation with water quality considerations, the GLAM Committee is requested to engage in outreach activities with the WQB and SAB. The GLAM Committee co-chairs are participating in joint meetings of the WQB and SAB. | | | |
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Work Plan Prerequisites and External Dependencies

Prerequisites required to ensure the success of this work plan include the on-going annual support of the agencies represented on the GLAM Committee along with additional staff support as identified by those agencies. It also requires that funds identified by the IJC for Phase 1 are made available to the GLAM Committee in a timely manner. It also assumes that necessary implementation and contract arrangements can be made for individual projects.

As this is an on-going effort, the priorities set and commitments made are estimates based on what the committee understands to be the resources available. The expertise available through the partner agencies continues to be evaluated relative to the priorities identified. There may in fact be a need to readjust proposed products depending on the expertise required and available to complete the task. These assessments will occur throughout the year as the work plan progresses. The GLAM Committee will keep the Boards aware of progress through semi-annual reporting.

Revision History

Date of next revision:

| Revision Date | Previous Revision Date | Summary of Changes | Changes Marked |
|----------------------|-------------------------------|---------------------------|-----------------------|
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