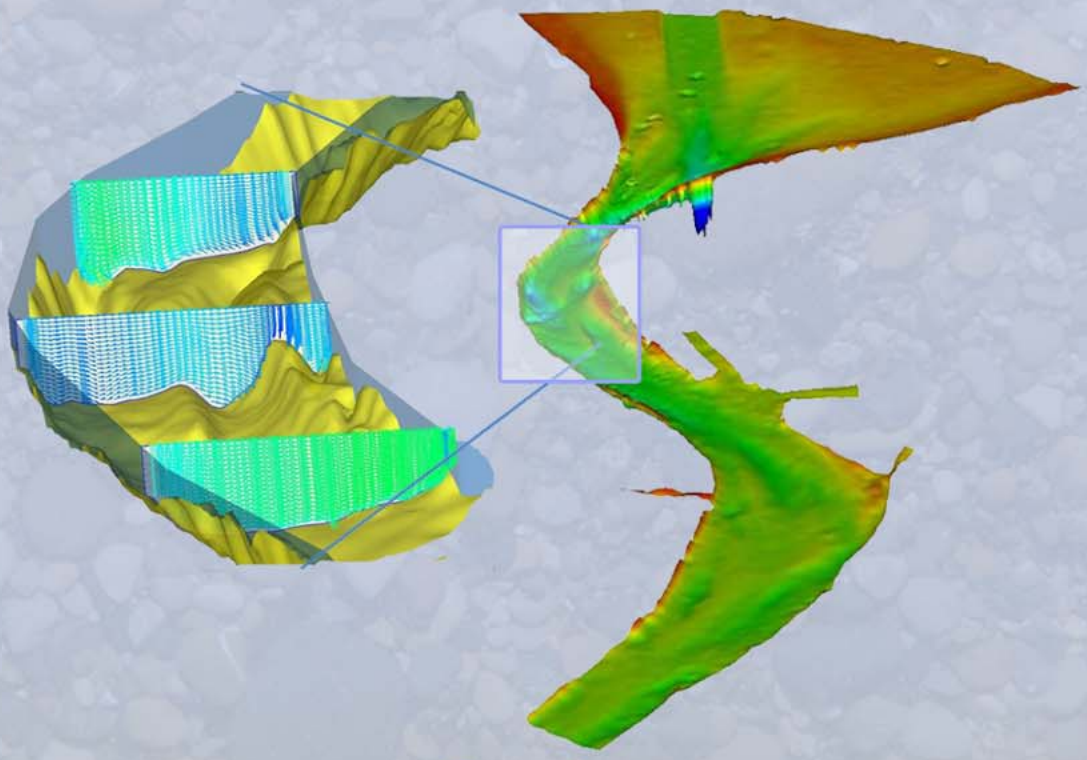
INTERNATIONAL Upper Great Lakes STUDY

6th PROGRESS REPORT
to the
INTERNATIONAL JOINT COMMISSION



by the
INTERNATIONAL UPPER GREAT LAKES STUDY BOARD

Semi-Annual Appearance
Ottawa, Ontario
October 28, 2009

INTERNATIONAL UPPER GREAT LAKES STUDY BOARD

Commissioners:

The International Upper Great Lakes Study Board submits herein its sixth Semi-annual Progress Report, covering activities from March 15 to October 15, 2009.

1. SUMMARY

During this period, the draft report on determining whether the St. Clair River conveyance has changed was completed. The report is the culmination of three years of studies by close to a hundred scientists and investigators from government, non-government agencies and academia and concludes that the conveyance of the St. Clair had increased since 1962. Based upon a number of considerations, the Study Board concluded that remediation is not warranted. During the next phase of work, when climate change is considered in the development of outflow management alternatives, mitigation measures and potential regulation of the St. Clair River may be considered as part of mitigation planning for climate change adaptation. During the period, progress was made by the technical work groups of the Lake Superior Regulation Task Team toward establishing a framework for plan formulation and evaluation.

The following are highlights, with more details provided under Section 2:

- St. Clair River:

    - The ***draft*** report entitled, "***Impacts on Upper Great Lakes Water Levels: St. Clair River*** was distributed on May 1, 2009. A Summary Report in both English and French was distributed on May 15, 2009. Finally a compendium of project summaries was distributed at the end May, 2009.

    - All investigations to determine the causes of declining differences between the levels of Lakes Michigan-Huron and Erie are essentially complete. A number of investigations were initiated on the basis of reactions to public inputs to supplement information that was uncertain and to substantiate findings or clarify attribution: modelling of the 1984 ice jam, assessment of the role of navigation on bed features and sediment transport and further analysis on hydraulic model sensitivity and uncertainty. These reports are currently being finalized or are being internally reviewed, and their findings are being incorporated into the final report.

    - Eight scientific/technical reviews were conducted and seven of these have been completed by the IPR pertaining to St. Clair River conveyance investigations. Synthesis reviews on the three key chapters within the St Clair River report were also made. Also a review of the full draft report was completed.
    - Seventeen public meetings were held throughout the upper Great Lakes region along with numerous face-to-face meetings, interviews and

communication through newspapers and other media. A separate document is being produced by PIAG that synthesizes the public input from the 90 day review period (May 1- August 1).

- Lake Superior Regulation:

  - Sites have been investigated where assessments are being conducted in terms of recreational boating activities, ecosystem sensitivities and coastal processes. Due to funding and time constraints, efforts will concentrate on sites with existing data and therefore limited new data collection.

  - The Ecosystem TWG has begun its development of an integrated ecological response model (IERM2), coordinating its development with the plan formulation and evaluation group.

  - A joint meeting of the Ecosystems, Commercial Navigation and Hydropower TWGs has led to a proposal to investigate St. Marys River control structure operations toward providing cross-interest benefits.

  - Three methodological reviews were conducted regarding plan formulation and evaluation and the economic and ecosystem strategies.

  - The organizational structure of the Study has been modified to facilitate the shift in activities for the Superior regulation portion of the Study and is shown below (Figure 1).

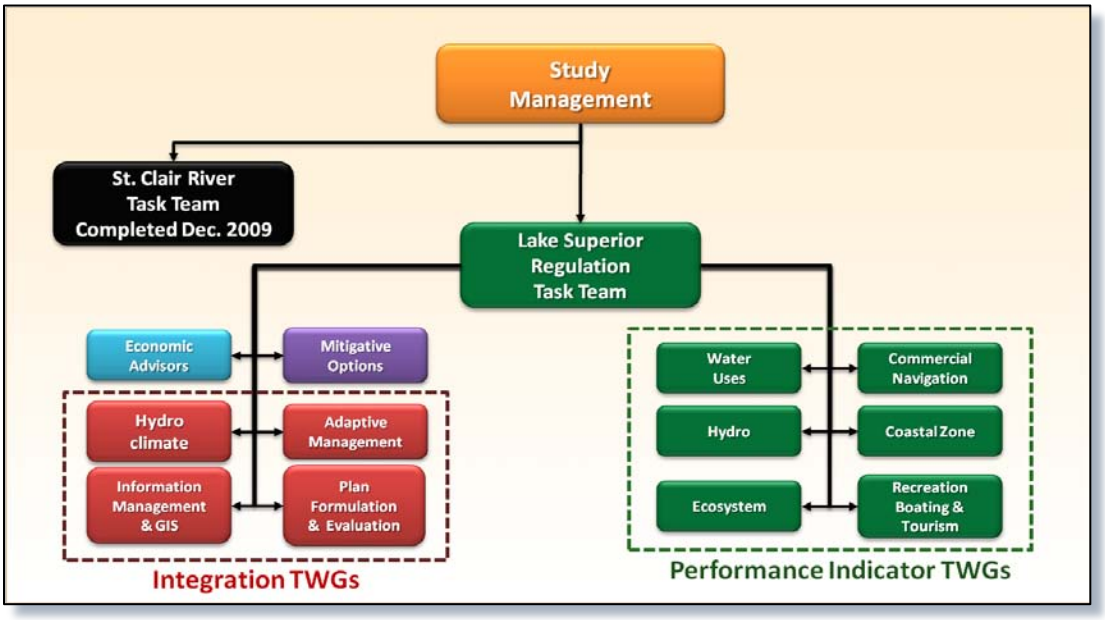


Figure 1. Modified Organizational Structure to Better Address Study Requirements

  - The Plan Formulation and Evaluation Group has continued to conduct 'Circles of Influence' meetings to gather stakeholder input to revised alternatives. Plan development has continued around eight baseline alternatives. The emphasis

of alternatives in extreme cases will center around adaptive management to climate change and possible structural considerations in Great Lake connecting channels.

2. STUDY TEAM AND BOARD ACTIVITIES

2.1 ST. CLAIR RIVER TASK TEAM

The Task Team met several times during the reporting period, through Team and TWG meetings and teleconferences with the principal Investigators. Each TWG was asked to develop a summary of findings report, consolidating all research conducted and establishing an overall assessment of findings. All this information formed the basis of the draft St. Clair Report that was released for comments on May 1, 2009, a full year ahead of what was planned in the Plan of Study. Public comments were sought for a 90-day period (ending on August 1, 2009) on the scientific findings. The Task Team assisted the Study Board with 17 public meetings by responding to the technical questions from public, NGOs and the media.

During the reporting period a total of eight reports, three synthesis Chapters and a draft report were submitted for the Independent Peer Review. The reviews were slower than expected and impacted the final delivery of the report. The Task Team has requested the PIs/TWGs to respond to the comments received in the following order:

1. Provide responses to the peer reviews on the scientific/technical reports;
2. Rewrite report chapters in light of peer & public reviews and respond to peer review comments;
3. Provide responses to the public & NGO scientific/technical comments.

The Task Team will focus on providing comments in order of priority: those that came in during the 90-day period and next to those that came in during the 30 day grace period.

The Task Team has now established a schedule to ensure the delivery of the final report on December 1, 2009. In the following two sections, the strategy developed by the Task Team and the results are summarized.

2.1.1 STUDY STRATEGY

The International Joint Commission's Directive to the Study Board required an examination of the physical processes and possible ongoing changes in the St. Clair River and the effects of such changes on levels of Lake Michigan-Huron. Addressing these two closely linked issues required a comprehensive understanding of hydraulic, hydrological and geomorphological processes. The water levels in Lake Michigan-Huron depend not only on the connecting channel flows and net basin supplies (NBS), but also to varying degrees on the respective conveyance changes in the St. Clair, Detroit and Niagara Rivers and on the water level in Lake Erie.

Beyond the question of the St. Clair River's conveyance, other natural and human factors can affect the upper Great Lakes water levels. These include changes in the

components of the upper Great Lakes NBS (precipitation, evaporation and runoff), decadal variations in ice cover, which affects evaporation rates, Lake Superior outflow regulation, water diversions and consumptive uses, and glacial isostatic adjustment (GIA).

The central challenge of the St. Clair River part of the Study was to determine whether the conveyance of the river has changed and, if so, what factors may have caused the change. In addition, it was recognized early on that uncertainty associated with all the data collected, instrumentation used and the various models employed to calculate conveyance and NBS would be a key component of the Study in that it would affect the basic decision of whether remediation would be required for whatever changes were determined through the various modelling and analytical exercises. Hence, an important role of this report would be to clearly convey scientific uncertainty in light of the findings and conclusions.

What is implicit in the state of Lake Michigan-Huron water levels is not only the steep decline in levels since 1997, but also the narrowing of the water level difference between Lake Michigan-Huron and Lake Erie (also known as the head difference). Since 1962, the average decline in the head difference has been 23 cm (9 in). To make a meaningful interpretation of the change in the head difference since the dredging in 1962, the Study used the entire water level data series from 1860 to 2006.

The Study strategy was predicated on the above factors and captured in the following graphic (Figure 2). It identifies the fundamental question that the Study was designed to answer: *What factors are responsible for the change in lake-to-lake fall (the head difference)?*

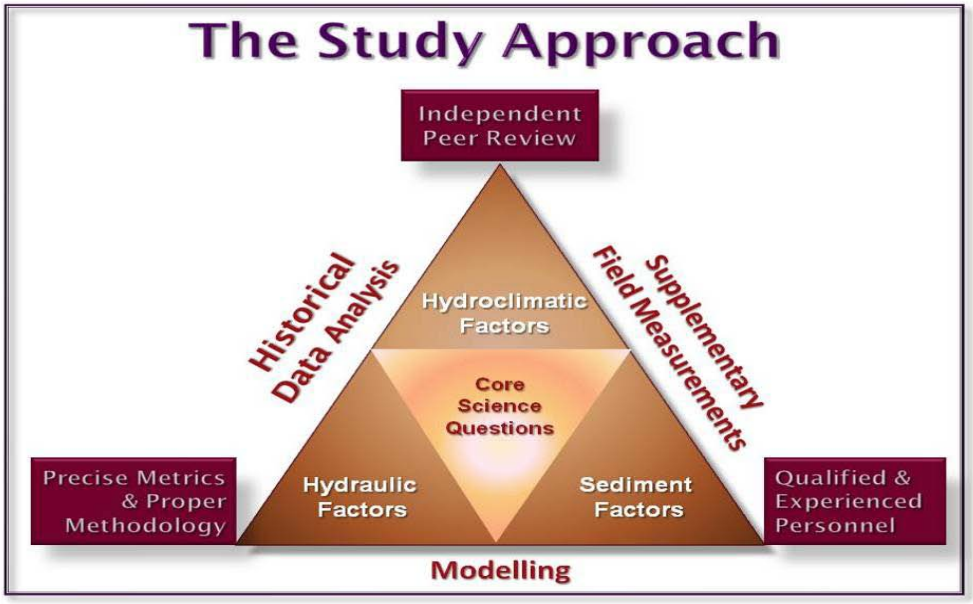


Figure 2. Analytical and Modelling Strategy for the International Upper Great Lakes Study

The change in lake-to-lake fall is likely a result of a combination of factors:

- Changes in the conveyance or hydraulic properties of the St. Clair River;
- Changes in the lake-wide surplus or deficit from net total supplies (NTS);
- Differences in the net total supplies (NTS) between the Lake Michigan-Huron and Lake Erie basins;
- Glacial Isostatic Adjustments, both apparent and real;
- Changes in the conveyance of the Detroit and Niagara Rivers; and,
- Rounding errors and unknowns.

For each of the perspectives, the Study Board formulated a series of science questions and the Task Team designed applied research projects to generate information needed to answer these questions. Some of the more than 40 applied research projects were designed to address more than one science question, so that the Study could address a particular question from a number of perspectives. The applied research projects, in turn, were the basis for the preparation of the 34 major scientific/technical reports that formed the scientific foundation of the Study's final report. In addition, the Task Team commissioned two supplemental reports to address specific engineering and institutional questions relevant to the Study's basic policy issue, i.e., what type of remediation options could be considered and how those options would be implemented by the respective agencies and authorities.

Another aspect of the strategy was to deal with each component through multiple methods. These methods included mathematical models, analytical tools, data mining and analysis, measurements, visual inspection and laboratory analysis. Again, the Study adopted an approach of useful redundancy. Several hydraulic models were used to determine if the solutions converged. This, in turn, would provide bounds to the uncertainty related to results from individual models.

2.1.2 SYNTHESIS AND RESULTS INTEGRATION

The results captured from all the research the Study had carried out is summarized in the graphic produced below (Figure 3):

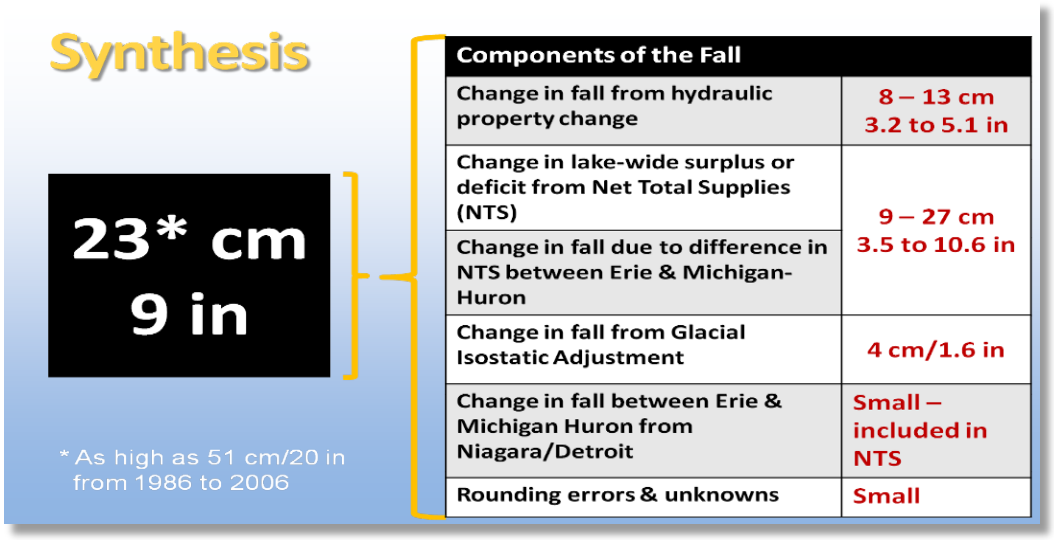


Figure 3. Synthesis of Results

The integration involves a type of scientific forensic analysis of past events and phenomena, coupled with an imperfect understanding of how the present physical system works. The Task Team assisted the Study Board in addressing all these issues related to the inherent scientific uncertainties as part of its work in developing its conclusions and recommendations.

The Study recognized the need to translate the scientific uncertainties embodied in the sources of information – the various physical factors, model outputs and statistical ambiguities – into a coherent set of decisions that displayed degrees of confidence in the various contributing pieces of information. This step was important not only for the Study's own internal decision processes and transparency, but also for reporting its findings and recommendations to the public and the International Joint Commission.

For this Study, the Task Team recommended using the IPCC model. Confidence levels were expressed in terms such as: "highly confident"; "somewhat confident"; and "less confident". The Study constructed a similar confidence scale to reflect its view of the relative quality of the information used on which to base the findings.

The following graphic (Figure 4) illustrates the Study's understanding of the data and the relative influence that they had on the range of findings. Each contributing piece of information was associated with varying degrees of confidence in the results. Each decision was based on various contributing models and lines of evidence to answer the basic science questions.

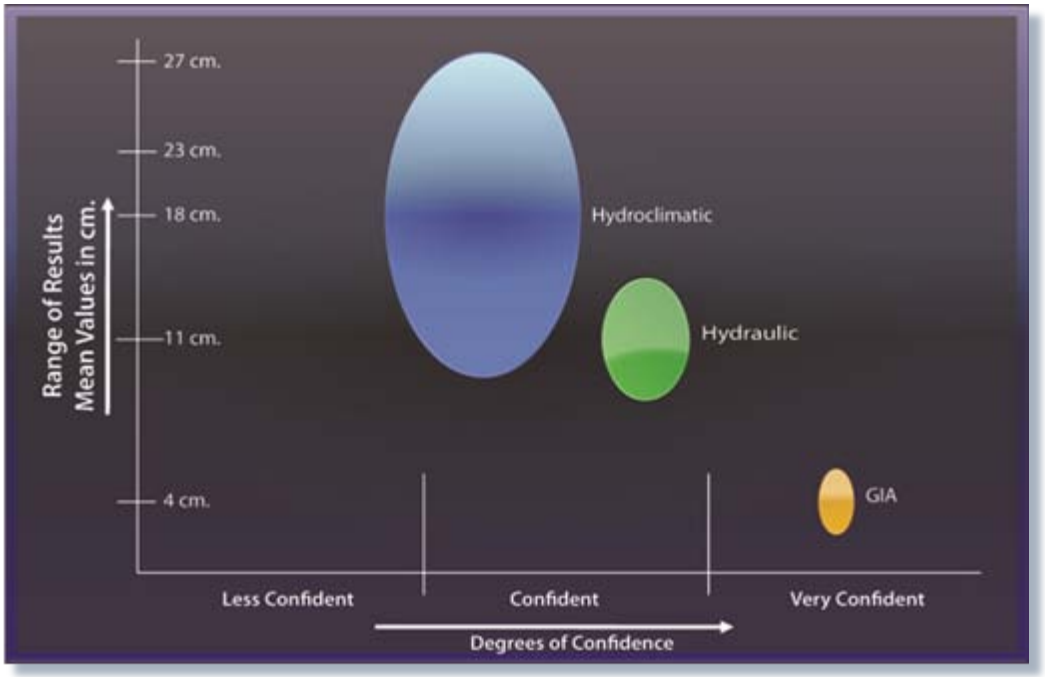


Figure 4. Range of Results versus "Degrees of Confidence"

After much deliberation the Study Board determined that remediation was not warranted at this time. Factors that were considered in the decision were: the magnitude of change in conveyance, the uncertainty around the change, what data the Study Board had more

confidence in and finally the factors – natural or man-made - that could have prompted the change. The Study Board recommended that the issue of mitigation for future lake level changes would be examined in light of climate change impacts in the next Phase of the Study.

2.2 LAKE SUPERIOR REGULATION TASK TEAM

The Team held two meetings during the reporting period to guide TWG progress toward the development of performance indicators and to strengthen TWG involvement in the process of plan formulation. As part of the transition, the organizational structure of the Study has been modified as shown in Section 1 (P.3). TWGs will be grouped into three categories: Performance Indicator, Advisory and Integration. The Groups representing interests, namely the Water Uses, Commercial Navigation, Hydropower, Coastal Processes, Ecosystems and Recreational Boating and Tourism, fall under the Performance Indicator category. The Plan Formulation and Plan Evaluation Groups were combined into the Plan Formulation and Evaluation Group (PFEG) and are under the Integration category. The Study Board, Task Team and PIAG will be identifying a broad range of regulation plans for development and testing. PFEG will translate these concepts/ideas into plans and then evaluate them based on the proposed performance indicators/criteria that will be endorsed or determined by the Study Board. This will be an iterative process in order to find a robust and, if possible, a more equitable plan. Also under this category are the Adaptive Management and Mitigation Options TWGs. The Advisory category consists of an Economic Advisory Group, the Hydroclimatic TWG and Data Verification and GIS TWG.

2.2.1 Performance Indicator TWGs

Coastal Processes TWG

A review of available Geographic Information System (GIS) data was completed for the Coastal Zone TWG (in partnership with the Ecosystem TWG) in August 2009. The information is critical for determining the geographic scope for any further analysis by the Coastal Zone TWG. Numerous agencies were contacted and their available data summarized. In addition to the data inventory, a contract was initiated to support the site selection process for the TWG. The large study area and finite budget require the use of existing study sites that are pertinent to the Study objectives. The site selection work is ongoing and will be finalized in October 2009. The Coastal Zone TWG has also contracted the preparation of theme reports to summarize the existing knowledge on the themes of flooding, shore protection, erosion, and low water impacts. These reports will be critical in helping the Study Board understand the nature and extent of water level impacts to the riparian community of the upper Great Lakes. The contractor is scheduled to deliver the theme reports in October, 2009.

The Coastal Zone TWG also spent considerable time developing a broad strategy for undertaking the analysis required to evaluate impacts of fluctuating water levels on shore processes and associated interests. The strategy utilized the results of the previous contract deliverables including those on erosion modelling and low water. The strategy document was prepared both as an overall guide for the TWG and as the basis

for the peer review meeting held in July, 2009. The TWG has been developing detailed scopes of work based on the strategy document and is incorporating specific suggestions from the peer reviewers in that work. The contracting process for these scopes is expected to be initiated in October, 2009.

Commercial Navigation TWG

Transportation costs have been selected by the Commercial Navigation TWG as the primary performance indicator to be used for evaluating alternative/modified regulation plans. A model has been developed by the USACE-Buffalo District to generate a series of transportation cost by depth curves to estimate the impacts of alternative lake level scenarios on navigation activities. The curves can be segregated by water route, month and commodity to allow for various sensitivity analyses to be run. Initial curves have been generated for all U.S. to U.S. and U.S to Canada vessel movements in the vessel movement dataset being utilized.

The preparation of the contextual narrative has been completed under contract and the report has been sent to the Study's coordinator of contextual narratives.

In co-operation with the Plan Evaluation Group, the TWG held a "Circles of Influence" meeting with ten commercial navigation stakeholders. Information on the Study and on the stakeholders' concerns was exchanged.

The TWG participated in a meeting to discuss hydropower, environmental and commercial navigation issues specific to the St. Marys River. The development of terms of reference is underway for a study to address peaking and ponding issues and alternatives from hydro and navigation perspectives.

Ecosystems TWG

Through a series of workshops and meetings, the ETWG has adopted an approach that is focused on assessing ecosystem vulnerabilities to changing Upper Great Lakes water level regimes. The objective of this approach is to identify water level ranges and thresholds that minimize adverse impacts to biotic communities and ecosystem function. For the purpose of this Study, water level regimes are defined as the magnitude, frequency, timing (seasonality), duration, and rate of change of water levels through time. The fundamental approach used can be summarized as follows:

- Understand the vulnerability of various ecosystem components to water level regime changes in the Upper Great Lakes;
- Quantify the relationship between changing water level regimes (magnitude, frequency, timing, duration and rate of change) and key ecosystem functions and components by evaluating ecological performance indicators at multiple representative sites throughout the Upper Great Lakes basin;
- Develop and apply an integrated modelling framework tool (IERM2) to Identify and establish site-specific and regional water-level criteria or thresholds above which, or

below which, harm will be done to various ecosystem components and, by extension, to the Upper Great Lakes ecosystem;
- Use the 'heuristic' (a model used to explore sensitivities and responses, rather than a predictive tool) IERM2 tool to identify criteria or threshold exceedance that might occur in response to proposed water level regulation plans; and
- Identify vulnerabilities and potential opportunities for ecological improvement as a function of changing water level regimes (adaptive management).

Individual field sites have been selected based on a set of criteria that include: geographic and eco-regional representation across a broad range of ecosystem types and components; sensitivity and responsiveness to changes in water level regime; available historical data and imagery; ongoing research and field activity; and socio-economic interest (Table 1 and Figure 4). These sites will be evaluated and modelled individually to determine critical water level regime thresholds that may result in significant changes to biological communities and/or ecosystem functions.

A standardized description of biological conditions will be used to qualitatively assess the ecological response and vulnerabilities to water level change. Using the IERM2 tool (currently under development by the modelling contractor) ecological response curves will be developed at each site for each of the hydrologic characteristics used to describe water level variability (magnitude, frequency, timing, duration, and rate of change). These curves will link descriptors of biological condition (based on performance indicators) with descriptors of water level variability to identify possible thresholds.

Site List by Great Lake and Ecosystem Component

Lake	Location	Type	Country
Lake Huron	**Eastern Georgian Bay Wetlands**	Wetland	Canada
	North Channel Georgian Bay Wetlands	Wetland	Canada
	Les Cheneaux Islands	Wetland	United States
	Saginaw Bay	Shallow Embayment	United States
Lake Michigan	**Bays de Noc**	Embayment	United States
	Eastern Shore Drowned River Mouths	Drowned River Mouths	United States
	Beaver Island Archipelago	Bedrock Island	United States
Lake Superior	**St. Louis River Estuary**	Drowned River Mouth	United States
	Chequamegon Bay – Kakagon Sloughs	Wetland, Shallow Embayment	United States
	Black Bay	Wetland, Shallow Embayment	Canada
	Bedrock North Shore Stream Mouths (Duluth to Thunder Bay)	Bedrock River Mouths	Canada/ United States
	Apostle Islands	Bedrock Islands	United States
	Batchewana and Goulais Bays (SE Superior)	Wetland	Canada
Lake Erie	**Long Point**	Wetland/Shallow Embayment	Canada
Connecting Channels	**St. Marys River**	Connecting Channel, Rapids, Hydropower	Canada/ United States

Table 1. Great Lake Ecosystem Component Sites

Figure 4. Ecosystem TWG Study Sites

Thresholds Linked to Ecological Degradation

At the St. Marys River workshop held on June 16-17 at Sault Ste. Marie, ON, the ETWG presented a way to relate relative ecological degradation to thresholds that could be applied uniformly across the Upper Great Lakes and various ecosystem components (Figure 5). This descriptive framework of biological conditions is based on approaches developed and applied to riverine environments by U.S. EPA and numerous State regulatory agencies. Moreover, this concept has been incorporated into the Adaptive Management paradigm currently being recommended by the Plan Evaluation Group.

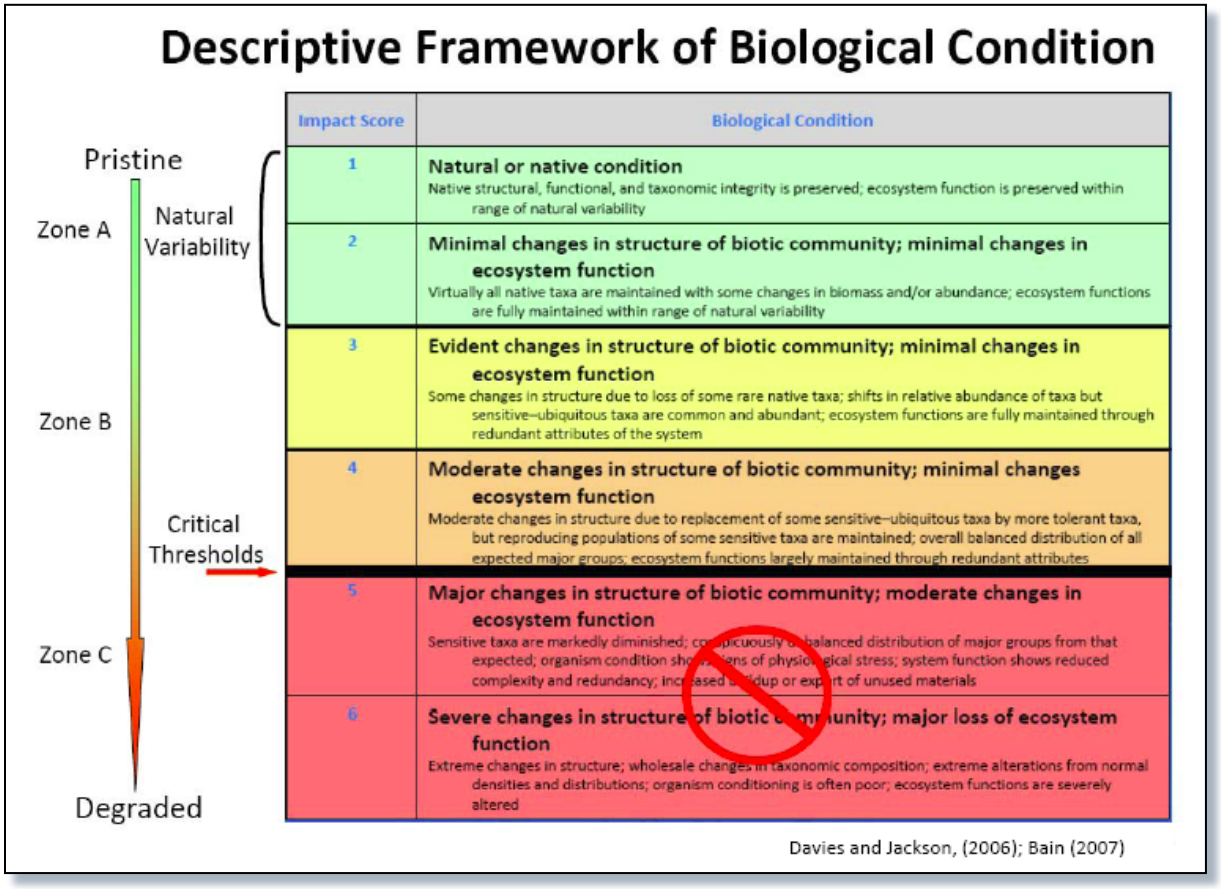


Figure 5. Descriptive Framework of Biological Condition

St. Marys River

The ETWG presented a request to evaluate the possibility of changing how flows and water levels are manipulated at the St. Marys River control works and hydropower facilities to enhance the effectiveness of the GLFC sea lamprey control program and assess the potential ecological benefits of modifying flows through the St. Marys Rapids. This would entail a study of not less than one year to provide guidance to plan developers and the Lake Superior Board of Control as to possible ecological benefits that might accrue. This work would be done in collaboration with Hydropower Technical Work Group and the Great Lakes Fishery Commission.

ETWG Other

The ETWG has filled several subcontract positions on both the U.S. and Canadian side to assist with project management, GIS data collection and development, IERM2 tool development and implementation, and is using the Cooperative Ecosystem Study Unit (CESU) process to subcontract site coordinators for all of the U.S. ETWG selected study sites. The Study has subcontracted with several site coordinators to evaluate study sites on the Canadian side of the basin.

Recreational Boating, Cruise Ship and Tourism TWG

The Recreational Boating, Cruise Ship and Tourism TWG initiated a comprehensive field research project designed to measure, evaluate and assess the impact that fluctuating water levels were having or could have on the marina industry in ten Canadian and seven U.S. zones around the Great Lakes. The research undertaken on the Canadian side documented water-depth measurement and GPS locations of almost 14,000 slips in 88 marinas. The measurements taken were then downloaded into a computer program to be evaluated using a number of different water level scenarios. Those evaluations are now underway.

A questionnaire was prepared and over 130 marina operators were interviewed to gain information on past, current and future operating procedures and how the operators had adapted to the changing water levels experienced in the past. Many operators have been in business for more than twenty years and have experienced the high levels of the 1980s as well as the low water levels of the 2000s.

A contract was signed in September 2009 with Dr. Ed Mahoney of Michigan State University to write the TWG contextual narrative.

Research is under way to assess the impact that changing water levels are having or could have on the cruise ship industry. Potential ports that could, or are currently facilitating cruise ships, have been identified and a list of ships that may or are currently offering excursions around the Great Lakes has been prepared.

A Request For Proposals (RFP) was developed to contract a firm to assess water level impacts on the tourism business in four key areas of the Great Lakes. However, due to delays getting the RFP out, only one response was received. That firm could not begin the study when initially requested due to current work commitments. It has now been agreed that the firm will commence the project in October and have it completed by late July, 2010. As part of their research, they plan on interviewing almost 1600 businesses in Canada and the U.S.

Municipal, Industrial and Domestic Water Uses TWG

The contract to inventory municipal and industrial water intakes and wastewater outfalls was completed in October, 2008. However, although the contract was completed, the inventory is incomplete due to lack of or inconsistent information provided by different states and the Province of Ontario. The primary deficiency was the lack of information on intake elevations. For example, where intakes did have an elevation or depth, it was uncertain as to the datum that was used for reference. The next phase of the study will be to initiate a contract to obtain detailed information on municipal and industrial water intakes, i.e., intake elevation, critical water intake system elevation, and other information needed for the performance indicators. Not all intakes will be surveyed. The contract is to focus on the more vulnerable areas, i.e., shallower areas of the Great Lakes, and larger water systems. The contract is also to address impacts from higher water levels. Work is underway to let a contract this Fall.

To gain additional data on several intakes, the TWG has proposed a contract with a Chicago firm which designed intakes for 14 water treatment plants on the Great Lakes. The intent is to obtain the elevation of the intakes and other critical information from the as-built drawings. The contract will be let in the fall of 2009.

A contract regarding future water demand was conducted by Dr. Ben Dziegielewski and a draft final report has been received. A no-cost extension of the contract to December, 2009 has been granted so that 2005 water use data can be obtained for all the states and also to give Dr. Dziegielewski an opportunity to present his findings to the Study Board.

A revised draft of the TWG contextual narrative was reviewed and has been submitted to the Study's contextual narrative consultant. The contextual narrative was revised to address comments concerning irrigation from the peer review. The next revisions will occur when additional results are received from the projects noted above.

Hydropower TWG

A contextual narrative on hydropower has been drafted by Drs. Robert Sinclair and David Patton of Potomac Economics for the Hydropower TWG. The TWG is continuing to refine this narrative, including providing additional contextual data and information on all hydropower operations situated around the upper Great Lakes. The draft has been provided to the contextual narrative co-ordinator for review.

One of the Study's priorities is to review hydropower peaking and ponding operations at the St. Marys River stations and its impact on vessel transits, with a view to improving upon this process. Commercial navigation concerns about ponding typically become more pronounced during low water level and flow conditions, as these operations can contribute to vessel delays. The Lake Superior Regulation Task Team and PEG co-leads met with the Hydropower; Commercial Navigation; Ecosystems; and Recreational Boating, Cruise Ship and Tourism TWGs and their PIAG liaisons in June 2009 to discuss issues and opportunities related to flow and level regulation at the St. Marys River, at which time several priorities for further study were identified.

Among these priorities, the Hydropower TWG is now procuring an independent analysis of hydropower prices, and preparing a study to examine the potential effects of more extreme hydrologic conditions on hydropower generating capacity. As well, it is working with the Commercial Navigation TWG to study the potential benefits and costs to commercial navigation and hydropower of alternative ways for scheduling of peaking and ponding operations, and will work with Ecosystems TWG and others on studies to examine potential ecosystem benefits associated with alternative flow regimes, including what effects these would have on hydropower operations. The Hydropower TWG has reviewed and commented on work by PEG to refine the flow-head-power algorithms for each of the St. Marys River stations.

2.2.2 Integration TWGs

Plan Formulation Group

The Plan Formulation Group (PFG) is working to develop alternative Lake Superior outflow regulation plans, as possible replacements for Plan 1977A. The group (composed of scientists and engineers from Environment Canada, the U.S. Army Corps of Engineers and universities all with experience in designing, testing and implementing outflow regulation plans) met twice during the reporting period.

PFG worked with the Plan Evaluation Group (PEG) to develop the Plan Formulation and Evaluation Strategy for the Study that underwent a formal peer review process in April.

The guideline document "The Physical and Operational Limits/Capacities of Control Structures at Sault Ste. Marie" was completed and is now in use by the plan formulators. Another summary report was drafted that reviews the relevant parts of the Boundary Waters Treaty and the existing Orders of Approval for Lake Superior outflow regulation for use by the plan formulators. A former IJC legal advisor is being engaged to expand on this review and provide more interpretation/context for the PFEG and the Board. A third document is in preparation that documents the various hydraulic and hydrologic conditions and technical assumptions that make up the base case being used to develop and test the plans.

The PFG is assisting the PEG with the development of a Shared Vision Model (SVM), which is being used to evaluate the regulation plans. The SVM continues to evolve as more information becomes available. Preliminary performance indicators in the SVM are now being used by the plan formulators to understand the system response to adjustments they make in their regulation plans.

Both the PFG and PEG are in liaison with the Study's Hydroclimatic TWG to develop the hydrologic scenarios that will be used to develop, test and evaluate the plans. The hydrologic datasets for the upper lakes that were developed in the Lake Ontario – St. Lawrence River Study have been used to date and will continue to be used until updated and revised scenarios from the Hydroclimate TWG are available. The sensitivity of the water level simulation results to the initial water levels was tested and it was found that the effect of different starting levels dissipated after about 15 years. This will be taken into account in future plan evaluation..

In addition to the simulation of earlier proposed plans (e.g., Plan 1.21, developed in the Levels Reference Study), preliminary versions of two plans were prepared, one set based on the natural flow relationship and another based on method to balance the levels of Lake Superior and Lakes Michigan-Huron. Other regulation plans, using different approaches including multi-objective optimization and simple rule curves with limits, are also in development.

The PFG participated in the joint meeting in Sault Ste. Marie in June to discuss with the ecosystem, commercial navigation, recreational boating/tourism and hydropower TWGs how the flows in the St Marys Rapids are affected by the current operations of the gates in the Compensating Works and how hydropower peaking and ponding affects flows and levels in the St Marys River. A joint work plan was developed to investigate if and

how gate movements could be modified to have more gradual flow changes in the rapids including the feasibility of changes within the month to moderate the rate of flow change while meeting total flow requirements. Information was obtained at this meeting on the flow preferences and issues for the St Marys River ecosystem, commercial navigation and hydropower interests. This information has provided the PFG with some additional St Marys River objectives for plan formulation.

Plan Evaluation Group

The Plan Evaluation Group concentrated its efforts in a number of areas over this time period. In April, the Plan Evaluation Group presented their Plan Formulation and Evaluation Strategy to the external peer review group. This document presented the overall strategy and methods that will be used by the Study to formulate, evaluate and recommend a new set of rules for regulating the release of water from Lake Superior. Generally, the peer reviewers were supportive of the approach, but noted that while the Shared Vision Planning process as presented looked promising, without more information they were not prepared to comment further. They asked for improved clarification of the legal framework. They had specific comments related to site selection, adaptive management and the economic analysis all of which were formally responded to in a written response. Following this review, PEG worked with the Superior Task Team TWGs in the development of both a Socio-Economic Evaluation strategy and an Ecological Evaluation strategy which were presented for external peer review in July, 2009. Responses to the peer review comments generated from this process are currently being generated by the TWGs.

PEG continued to work with the Plan Formulators in the development of the preliminary evaluation model known as the mock Shared Vision Model (SVM). (refer to Plan Formulation Group section).

In June, PEG participated in a joint meeting with the Hydro TWG, Commercial Navigation TWG, Ecosystem TWG and Recreational Boating and Tourism TWG in Sault Ste. Marie to discuss regulation issues specific to the St. Marys River. Based on the outcome from this meeting, PEG worked with the other TWGs to develop scopes of work for three possible investigations for the St. Marys River including: Hydropower re-scheduling; 2010 Sea Lamprey Experiments; and Smoother Gate Changes. These were presented and tentatively approved by the Study Board (depending on funding requirements) at the Sept 9-10, 2009 Board meeting in Chicago.

PEG held three circles of influence workshops over this time period. The first was held at Walpole Island on May 20, 2009. The Walpole Island area is not affected by changes in Lake Superior regulation so discussions focused on the St. Clair River component of the Study and on climate change and adaptive management. While in Sault Ste. Marie in June, PEG conducted another circles of influence meeting on the evening of June 16, with interests in that area. Participants were particularly interested in flow allocation between hydro power and the rapids and well as specific issues related to the timing and duration of releases. Another workshop was held with commercial navigation interests in Cleveland, Ohio on August 12. Participants made it clear at this meeting that

their greatest interest was to maintain at least a 27 ft. depth throughout the system and to minimize variations in water levels.

PEG also spent considerable time working on an Adaptive Management work plan for dealing with future uncertainty regarding Great Lakes levels and flows. Following-up on a Board request, PEG hosted an Adaptive Management workshop in Windsor on June 2-3, 2009. The purpose of this workshop was to gather feedback from climate experts and resource managers on the merits of pursuing an Adaptive Management strategy within the Study. The workshop was effective in generating ideas and a path forward. A workshop report was produced which formed the basis for the revised Adaptive Management Work Plan which was presented to the Study Board on September 10, 2009. The work plan identified nine tasks:

Task 1: Define system vulnerabilities (hydrologic zones of increasing vulnerability)
Task 2: Develop risk scenarios
Task 3: Define plausibility of risks
Task 4: Develop existing regulation strategies to address future risks
Task 5: Evaluate the ability to influence levels and flows through new structures
Task 6: Develop non-regulation strategies to address future risks
Task 7: Identify long-term monitoring and modelling requirements for adaptive management
Task 8: Conduct an institutional analysis
Task 9: Develop adaptive management plans for regulation and non-regulation response

At that meeting, the Study Board approved Tasks 1-5 plus Task 7 of the proposed work plan and provided $340K from uncommitted funds over the remainder of the Study towards Adaptive Management. Tasks 6, 8, and 9 were not approved at the Sept. 10 meeting. The Board asked that more detail be provided on these tasks and presented at their next Board meeting in December, 2009. Adjustments to the budget will be required to reflect the approved amounts and additional scoping of Tasks 6, 8, and 9 will be necessary. The Board appointed Wendy Leger as the Canadian co-lead for a new Adaptive Management Group (AMG) to lead this effort. A U.S. lead is pending. The Plan Evaluation Group will continue to be led by Bill Werick, but will join with the Plan Formulation Group led by David Fay to form the Plan Formulation and Evaluation Group (PFEG) as mentioned previously.

2.2.3 Advisory TWGs

Economic Advisory Group

The Economic Advisory Group consists of Dr. Stephen Renzetti of Brock University and Dr. John Hoehn of Michigan State University. The Group provided input to the Team in preparation for the Independent Peer Review of economic and ecosystem methodological strategies. Although not a formal member of the Group, Study Board member Dr. John Boland provided a presentation to the Board on a strategy for economic analysis regarding the suitability of hedonic pricing. Drs. Boland, Renzetti and Hoehn will assist in preparing the Team's response to the IPR Group.

In a related activity, Dr. Mark Dunning has been hired by the Study to review all TWG contextual narratives for consistency and also to prepare a synthesis document addressing all interests.

Hydroclimatic TWG

Efforts over this reporting period focused on integrating the results of the comparative hydrologic data analysis, statistical and hydroclimatic modelling and the studies undertaken to quantify the impact of climate on lake levels. Key findings were:

- Climate variability is the main driver of the lake level relationships between lakes and over time;
- The change in conveyance is only responsible for 25-33 percent of the change in fall between Lake Michigan-Huron and Lakes Erie from 1986 to 2005;
- The climate was by far the major contributing factor for the 1996-2005 period;
- New monitoring and observation methods are required to better estimate the water supplies to the lakes; and,
- New hydroclimatic models are required to better predict climate effects on lake levels.

During the reporting period, the investigation of new observation and monitoring technologies of over-lake precipitation, watershed runoff and lake evaporation continued. Work also progressed with the regional climate models for both comparative analyses and the development of climate change scenarios.

Planning and permits for placing the second eddy covariance instrumentation on Spectacle Reef, Lake Huron in September was also conducted. The system has now been installed. Repairs, maintenance and power upgrades were made to the Stannard Rock site in Lake Superior. Evaluation of the evaporation data and model comparisons will be done this fall.

With the completion of the St. Clair River Study, the Group will now focus on support to the Lake Superior Regulation Task Team providing scenarios for evaluation including those based on stochastic and climate change water supplies.

2.4 Independent Peer Review

The Independent Peer Review (IPR) Group was engaged throughout the reporting period through reviewing eight scientific reports, three key Chapters of the main report, and the main report, as well as number of face-to-face meetings on three methodological reviews.

The following eight scientific reports were submitted for review:

1. Net Basin Supply Comparison Analysis;
2. Change Detection in the Great Lakes – Hydroclimatic Variables;

3. Rationalizing the Decline in Lake Michigan-Huron Water Levels Using the Coordinated Great Lakes Routing Model;
4. Detection of Conveyance Changes in St. Clair River using Historical Water-Level and Flow Data with Inverse One-Dimensional Hydrodynamic Modeling;
5. Statistical and Spatial Analysis of Bathymetric Data for the St. Clair River, 1971-2007;
6. St. Clair RMA2 Modelling;
7. Review of Discharge Measurements and Rating Equations on the St. Clair and Detroit Rivers Since 1962; and
8. Modelling of Hydrodynamics and Sediment Transport in St. Clair River.

Overall, all the reviews were supportive of the work that had been done, but did identify areas for improvement. Study responses to peer review are currently being completed. The draft report received favorable reviews, but the review also noted that more effort was required to clarify and present the hydroclimatological findings.

For the Lake Superior Regulation, three methodological reviews were made:

1. Plan Formulation and Evaluation Strategy on April 20th;
2. Socio-Economic Sector Evaluation Strategy on July 21st; and
3. Ecological Evaluation Strategy on July 22nd.

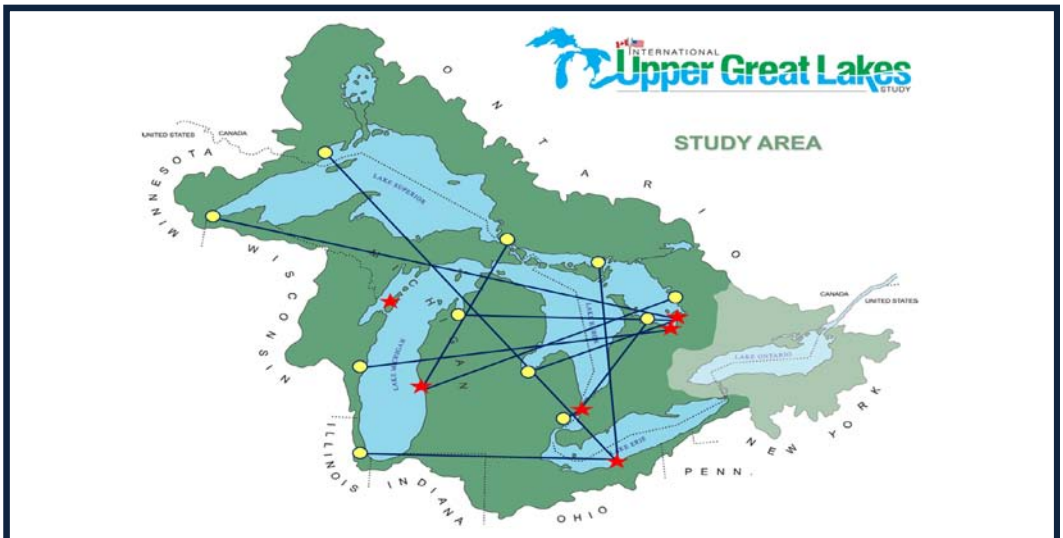
A Study response to the peer review has been prepared and submitted to the IPR Group for the Plan Formulation and Evaluation Strategy.. Study responses to the Socio-Economic Sector Evaluation Strategy and Ecological Evaluation Strategy peer review comments are being prepared.

2.5 PUBLIC INTEREST ADVISORY GROUP (PIAG)

Public Interest Advisory Group

During the period, the Public Interest Advisory Group met in person twice and also via conference call. On April 9th, PIAG met in Ypsilanti, Michigan and was briefed on the findings and recommendations in the draft report. PIAG also provided extensive comments and revisions to the summary report for the public that was distributed on May 1st in order to supplement public understanding of the technical draft report. Members provided extensive input to a plan to use video-conferencing technology to connect several “hub” public meetings to numerous “satellite” locations, allowing upstream and downstream interests to learn about each other’s concerns. PIAG members also served as hosts at all of the public meetings and moderated the question and answer periods (Figure 6).

PIAG met August 19-20 in Sault Ste. Marie where they were briefed on the operations of the compensating works and power dams and learned more details about the development of potential Lake Superior regulation plans. In addition, they provided input to the Study regarding comments from their respective interest groups and geographical areas regarding the St. Clair report.



Using videoconferencing technology, five "hub" locations [Muskegon, MI; Sarnia, ON; Midland, ON; Town of the Blue Mountains (Collingwood), ON; and Cleveland, OH] were connected to eleven "satellite" locations [Bay City, MI; Traverse City, MI; Grosse Pointe Farms, MI; Owen Sound, ON; Little Current, ON; Thunder Bay, ON; Parry Sound, ON; Sault Ste. Marie, ON; Superior, WI; Mequon, WI; and Evanston, IL]. There was one stand alone meeting in Fish Creek, Wisconsin.

Figure 6. Locations of Public Meetings

Communications and Outreach

In advance of the release of the draft St. Clair River report on May 1st, briefings were held for Parliamentary and Congressional members and staff, the Ontario provincial government, the U.S. Great Lakes Interagency Task Force, the Great Lakes and St. Lawrence Cities Initiative, the Council of Great Lakes Governors, various U.S. and Canadian consitutent groups and the media. Following the release, the relevant legislative committees in Michigan were briefed as were many city, township and county officials from along the St. Clair River.

With the assistance of PIAG, the Communications Team developed a very aggressive strategy to promote public attendance at 17 public meetings regarding the draft report that were held throughout the upper Great Lakes on both sides of the border. In addition to the *On the Level* newsletter, five fact sheets about the Study were developed, and meeting evaluation and response form were circulated at the meetings. A large majority of respondents were generally satisfied with the format and presentations at the public meetings though some concerns were expressed by those who disagreed with the recommendations in the draft report. A separarte report has been prepared by the Communications Team regarding the outcome of its activities related to St. Clair report public meetings.

2.6 STUDY MANAGEMENT

2.6.1 Meetings

The various groups associated with the Study have met throughout the last reporting period. Appendix 1 shows the groups, activities, dates and locations of these meetings. Meetings planned for November, December and January are shown in Appendix 2.

2.6.2 Budget/ Expenditures

Tables 2 & 3 below show approved, committed and spent amounts in the U.S. and Canada through September 30, 2009.

Table 2 - U.S. Funding (in $1000US)

Activity	Budget[1]	Committed[2]	Spent[3]	Difference[4]
Study Board and Management	300	101	199	0
St. Clair Task Team & Hydroclimatology TWG	70	13	57	0
Lake Superior Regulation Task Team	1347	613	733	0
Public Interest Advisory Group	90	53	37	0
Information Technology	0	0	0	0
Plan Evaluation Group	486	324	138	24
Peer Review Group	0	0	6	0
Grand Total Budget	**2293**	**1104**	**1164**	**24**

Notes:
1. Study Board budget.
2. Funds allocated for Principal Investigator or Agency.
3. Funds spent to date.
4. Difference between the budget and committed/ spent to date.

Table 3 - Canadian Funding (in $1000Cdn)

Activity	Budget[1]	Committed[2]	Spent[3]	Difference[4]
Study Board and Management	295	73	49	173
St. Clair Task Team & Hydroclimatology TWG	384	220	125	39
Lake Superior Regulation Task Team	1377	256	102	1019
Public Interest Advisory Group (PIAG)	50	0	24	26
Information Technology (IT)	99	10	11	78
Plan Evaluation Group (PEG)	110	63	18	29
Peer Review Group (IPR)	30	0	7	23
Grand Total Budget	**2345**	**622**	**336**	**1387**

Notes:
1. Study Board budget
2. Funds allocated for Principal Investigator or Agency
3. Funds spent to date
4. Difference between the budget and committed/ spent to date

3. IJC ADVICE, CONSULTATION AND INFORMATION

The Study Board requests decisions or direction from the Commission on the following issues:

1. **Remediation for 1962 Dredging** - During its public meetings, the Board repeatedly encountered public questions and numerous press stories as to why the acknowledged impacts of the 1962 dredging had not been addressed in our Study as part of our remediation analysis. We referred them to the 'Alerting Letter' of October 2007 that the Commission sent to the Governments, at the Board's request. This letter raised these issues and offered their interpretation that the Board was only to deal with the changes in the St. Clair River ***post 1962 dredging***, and that remediation would only to be considered if the Study could show a link to that dredging for any 'ongoing erosion'. The Board also interpreted that phrasing to mean that only human-made changes should be considered for remediation and not natural causes (e.g., ice jams, historical high water levels, etc.). Is the Board's interpretation valid? The Board needs to understand the Commission's position on this particular issue before revising of the Final Report. These issues are still at the heart of many public responses to the Draft Study Report, and are relevant in the next phase of the Study, and will impact on the Commission when it undertakes its Formal Hearings.

Decision Required: *Does the Commission support the Board's interpretation that a) its mandate does not include the 1962 dredging impacts and b) remediation should be linked to a human intervention? If not, what does the Commission see as being the correct interpretation?*

2. **Mitigation of Climate Change Impacts** - During our public meetings, the Board repeatedly assured the public that mitigative options (including regulation structures in St. Clair River) would be considered in addition to Lake Superior regulation plans, if they were found to be necessary to deal with significant climate change impacts. These mitigative measures are not intended to compensate for lake level changes due to dredging and other man-made changes, but only for climate change related impacts (according to the Board's interpretation of the Plan of Study and IJC Directive). How does the Commission interpret the Board's mandate for the second phase of the Study? Again, this is important as the Board reviews its recommendations.

   Decision Required: *Does the Commission agree that the Study Board has the mandate to make the recommendation that it will review mitigative options based only on potential significant climate change impacts?*

3. **Funding of 'Legacy projects' and Monitoring System for Adaptive Management** - The Board laid out the need for sustained funding of some of the 'Legacy projects' that have been initiated as part of the Study (i.e., three international discharge gauges and two evaporation measurement systems). These monitoring systems are essential to understanding the hydroclimatology of the Upper Great Lakes basin. Some Board members have discussed the importance of these systems and the need for funding support with Congressional staff and Members of Congress, during their initial briefings in late April and early May. Subsequently, there were discussions with members of the Great Lakes Observing System (GLOS) and the newly appointed Mr. Cameron Davis (referred to as 'Great Lakes Czar') for funding support. The response was that such requests should come through the Commission and the State Department. There is a real opportunity, and a narrow window for making the funding requests through the appropriate channels by the Commission, especially since there is a $475,000,000 Great Lakes Fund set aside to support such projects. The Board would like to know if the Commission is actively pursuing these avenues to secure such funding, and making the case for future funding for an active 'Adaptive Management Plan' tied to climate change monitoring in support of any new Lake Superior regulation plan implementation.

   Decision Required: *Does the Commission agree that this is an appropriate initiative for the Commission to pursue funding support for these essential monitoring systems?*

4. **Independent Peer Review** - Both the Study and the Independent Peer Review had challenges (e.g., long delays in obtaining reviews and providing responses, not fully adhering to the peer review guidelines, etc.) with meeting the expectations and conditions of the peer review process. The Study Board fully

supports the peer review but feels that it is important that the Commission, IPR Co-leads and Study Team evaluate the process and determine what changes can be made to improve on the timeliness of the process for the second phase of the Study. The Study Board would like to know if the Commission concurs and would initiate a meeting/teleconference for the purposes of improving the peer review process. The Board suggests it take place in the December or January time fame, which marks the end the St. Clair River phase of the Study.

Decision Required: *Does the Commission agree that these discussions need to take place and will orchestrate these discussions?*

5. **Adaptive Management** - The Study Board has concluded that adaptive management needs to be an integral and functioning component of the Study. Based on the Lake Ontario-St Lawrence Study, trying to implement an adaptive management strategy after the Study has been completed is very challenging. Given that adaptive management was not specifically identified in the Plan of Study, the Study Board is asking the Commission for direction on this issue. The Study Board has identified an initial $350,000 towards developing and applying the strategy, but the full proposal calls for $650,000. The strategy would focus on engaging those groups and institutions that should be involved with responding to a targeted changing condition. The Study Board recognizes that the Commission must be engaged in this effort, as the Commission will be responsible for guiding this process after the Study has been completed.

   Decision Required: *Does the Commission support the expenditure of funds for adaptive management and the need to pursue this as part of the current Study?*

Respectfully submitted,

GENE STAKHIV
U.S. Co-Director

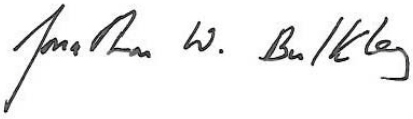
TED YUZYK
Canadian Co-Director

KAY FELT

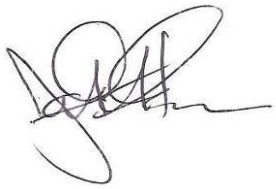
JIM BRUCE

JAMES BREDIN

DON BURN



JONATHAN BULKLEY



JON GEE

JOHN BOLAND

ALLAN CHOW

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Appendix 1 – Meetings Held Related to the Study

	Apr 09	May 09	Jun 09	Jul 09	Aug 09	Sep 09	Oct 09
Study Board						Chicago (9-10)	
Task Teams		LSRTT Detroit (12-13)				SCTT Meeting Burlington (2-4)	LSRTT Burlington (14-15)
TWGs	Ecosystems Modelling Workshop Detroit (3) Plan Form. Group Burlington (21-22)		Adaptive Management Workshop Detroit (2-3) Joint Ecosystems/ Com. Nav./ Hydropower Meeting Sault Ste Marie, Ont. (16-17)	Coastal TWG Detroit (27-29)	Plan Form. Group Burlington (31-Sept 1)	Rec. Boating TWG Windsor (9-10)	
PIAG	Detroit (7)				Sault Ste Marie, MI (19-20)		
Public Mtgs.	See Separate Document						
Other	IJC Appearance Wash, DC (1) IPR Group Burlington (20)			IPR Group Detroit (21-22)			IJC Appearance Ottawa (28)

Appendix 2 – Planned Meetings Related to the Study

	Nov 09	Dec 09	Jan 10
Study Board		Windsor (9-10)	
Task Teams			
TWGs			Adaptive Management Experts Workshop Toronto (19-20)
PIAG		Windsor (11)	
Public Mtgs.			
Other			