

Response to Peer Review Comments by IUGLS Board and by Recreational Boating, Cruise Ship and Tourism Technical Working Group (TWG)

1. References

- a) IUGLS “Strategy Document for Independent Peer Review”(April, 2009), entitled **Socio-Economic Sector Evaluations of Lake Superior Regulation Plans for the International Upper Great Lakes Levels Study**
- b) Independent Technical Review Report, Prepared by Derek Bjonback, PhD
- c) Independent technical Review Report, Prepared by Stuart G. Walesh, PhD, PE
- a) TWG Draft Response, prepared by Bill Boik and Glenn Warren, Co-Chairs; Rec. Boating, Tourism and Cruise Ship TWG

2. Response Overview.

- a) Overall, the independent peer reviews, by Drs. Bjonback and Walesh, were favorable, both recognizing the difficulties of developing meaningful evaluation metrics for recreational boating, and the understandable gap between the original goals of the evaluation and the practical outcomes.
- b) Ultimately, both reviewers understood and accepted the reality that the principal metric for evaluation – i.e. the ‘performance indicator’ that directly linked recreational boating economic viability with desirable lake levels was the most useful under the circumstances. It provided a direct measure of the relative hydrologic vulnerability of marinas to lake level fluctuations at the 17 representative sites selected for the study.
- c) The Study Board and the TWG initially attempted to pursue a more robust economic performance measure for recreational boating, developing a number of indirect measures such as lost slip revenue and mitigation damages and costs to adjust to high and low lake levels (dredging, floating dock adaptations, storm damages, etc.). These figures, however, were *estimates* based on derived information, which then had to be further extrapolated, so it became apparent that these were not sufficient to support the intended broad economic analysis that was outlined in the study strategy document.
- d) Nevertheless, it was understood from the outset, that a complete, traditional economic analysis would be difficult, especially since it would not be comprehensive. Rather it would be based on a subset of 17 ‘representative’ sites around the Great Lakes that would be surveyed and would serve as an indicator of how the recreational boating sector would be affected by various lake level changes.
- e) The IUGLS response to review comments, therefore, are presented within the context of the original “Strategy Document” (Ref 1), presented to the Independent Review Group for comment, and revised accordingly by the IUGLS in April, 2009.

- f) The strategy document was independently peer-reviewed and accepted as the basis for the overall analytical strategy for each of the sectors, include recreational boating.
- g) While the overall **goal** was to directly relate water level fluctuations to economic productivity, it was recognized that for some of the sectors, particularly recreational boating, that it would be very difficult because of the paucity of information and the large study area (see discussion under **Caveats**).
- h) Hence a sampling methodology based on ‘representative site analysis’, of key areas around the Great lakes that most closely reflected the range of economic activities associated with recreational boating.

3. EVALUATION GOALS (Ref 1). The key goal of the International Upper Great Lakes Study is to formulate and evaluate options to improve the rules for regulating levels on Lake Superior. The constant interplay of highly variable and largely unpredictable lake level fluctuations with the various and variable uses of the Great Lakes system has created a complex decision process that necessarily must consider balancing the equitable distribution of benefits and costs amongst the various users and the needs of the natural system. Creating an evaluation and decision making framework that will enhance and explicate Board decisions in an open and transparent manner, and which readily encompasses public inputs is a challenging endeavor. To achieve that goal, the Study Board has developed a systematic framework for evaluation which was outlined in an earlier document – The Formulation and Evaluation of Lake Superior Regulation Plans for the International Upper Great Lakes Levels Study A Strategy Document for IPR Review, April 2009. The evaluation framework, of necessity, focuses on an accounting of the social, economic and ecological benefits and costs of each of the regulation options, and their distribution across the four lakes of the upper Great lakes system. This report focuses on the economic evaluations. A separate report does the same for ecosystem impacts. Furthermore, there are qualitative factors to consider in any evaluation, dealing with the equitable distribution of benefits and costs, across all sectors and geographic areas and considering the preservation of established benefits, the need to address environmental concerns that have not been considered before but are important to society, and the embedded policy goal of the current plan, to adjust Lake Superior levels so that it is about as far from its average level for a particular month as are Lakes Michigan-Huron.

The crux of the evaluation framework is to directly relate lake level fluctuations and critical threshold levels to economic productivity *at the selected representative sites*. This is accomplished through the use of ‘performance indicators’ (PI’s), conventional economic information and metrics routinely used for traditional benefit-cost analysis. These PIs are then used to compare and evaluate the *relative performance* of each economic sector (hydropower, commercial navigation, recreational boating, etc.) under the range of historical and anticipated lake level fluctuations – across all sectors and lakes – *for each of the selected representative sites*. The selection of sites was undertaken very carefully, with substantial inputs from the TWGs and the PIAG (Public Interest Advisory Group) in order to capture the salient economic

activity areas for a specific sector, as well as reflecting the unique characteristics of each sector within each lake. So, while a comprehensive assessment of the recreational boating sector was not possible, mainly because of data limitations and study budget, the comparison of various regulation alternatives could be assessed consistently and uniformly, based on the data for the 17 representative sites.

4. CAVEATS (Ref 1). Based on preliminary analyses of prospective regulation plans, it is likely that the physical water level changes under the new regulation plan(s) recommended by the Study Board will not be much different from the current regulation plan, which in itself is not much different from ‘no regulation’, which is nearly equivalent to a natural system (accounting for connecting channel modifications over the past 100 years). There is always uncertainty in predicting the consequences of one plan or another over an extended time horizon of 30-50 years. One of the realities that the Board will face, for both economic and environmental evaluation is that, given the relatively small differences in average lake level elevations between plans (measured in centimeters), it may be that the errors in the most sophisticated and exhaustive estimation of impacts are likely to be greater than the differences between the actual consequences of any two plans. *An exhaustive assessment would require a data collection and modeling effort that would cost far more and take far longer than the budget and schedule for this study allow its average level for a particular month as are Lakes Michigan-Huron.*

- a) The estimates of hydropower and commercial navigation benefits should be particularly robust, with plenty of data and straightforward analytic techniques (the value of energy and the costs of shipping). *There simply is not enough time or money to collect data at all sites where there could be impacts in three other categories - coastal, recreational boating and municipal and industrial water supply; instead, the Study Board has undertaken a ‘representative site analysis’ approach, which selects key areas around the lakes that most clearly reflect the range of economic activities and can serve as proxies for those water-using sectors.* The analytic methods in these three categories are also more open to discussion. The estimates of boating and tourism benefits are not as simply estimated as power, where there is a market value for what is produced, or navigation, where the benefit estimate can be based on ample cost data.
- b) In each of the three categories, the straightforward analysis of water level frequency curves will greatly fortify the comparison of plan based on impacts. For example, while it may be difficult to measure the economic benefit of an additional inch of water to boaters on Lake Michigan, boaters are confident that they prefer near average levels during the boating season. *In sum, the evaluation framework the Study Board designed should be sufficient for a comparative evaluation and ranking of plans, even if the absolute magnitude of the impacts is in doubt.*
- c) IUGLS will use traditional methods for estimating boating benefits, but those methods are not as direct as hydropower (estimated market value of energy) or navigation (estimated change in shipping costs). In addition, time and money constraints will make it

impossible to inventory the draft available for all Great Lakes boating areas, so some uncertainty will be introduced because of the selection of particular sites where information is acquired. *But several factors suggest that even with this uncertainty, the ability of the Board to rank plans – to say this plan is better for boaters than that plan – is still fairly robust, because simple water level statistics by themselves are useful in ranking plans for boaters – boaters prefer near normal levels during the boating season.* The dollar impacts at site are most likely to be needed to rank plans like 1.21, which shift benefits from lake to lake. In that case, the performance indicator could be used in an incremental analysis, to determine if significant gains on Michigan-Huron could be realized with very little negative impact on Lake Superior.

- b) The primary **performance indicator** for boating will be the change in the value of recreational boating because of changes in water levels. On the LOSL study, this was done based on extensive field surveying of the water depths available at marina slips and entrances throughout Lake Ontario and the St Lawrence Seaway; every marina was visited and many slips measured directly, while the bottom elevations of the remaining slips were interpolated from measured elevations. Boating surveys and a review of the literature established credible estimates of the number of hours spent boating in each calendar month and the willingness to pay for that recreational opportunity. **Based on reasonable assignments of boats to slips (extrapolated where necessary from US data on the distribution of boat size and type, which was more complete), an estimate could be made of the number of boats that could not go from slip to open water at various water surface elevations. This could translate to the value of the lost recreational opportunity.**
- d) **Consequently, a partial estimate of recreational boating impacts will be done, using sites selected by recreational boating experts. The sites are not meant to be a random sample but rather a representative one of the various marina conditions within the Upper Great Lakes.**
- e) **Major boating areas such as Chicago will not be surveyed because the TWG feels that changing water levels would not inhibit boating there. This sampling approach is considered the best use of limited funds, given that the Study Board will not rank plans based on the algebraic sum of net benefits in each sector (hydro-power, commercial navigation, recreational boating, etc.).**
- f) **The study areas (Survey Zones) for the recreational boating analysis were selected on the basis of the type of tourism infrastructure, nature of tourism product (i.e., urban, small community, parks), the density of marinas and the geology (limestone or granite bottom) of the area which has a major influence on sensitivity to water level fluctuations and major technical adaptation options like dredging. Each survey zone is 80 kms (50 miles) across and all marinas that fall within the zones will be surveyed if time permits. On the Canadian side of the Great Lakes, there is very little data available on marina operations. The United States, through its**

universities and the Army Corps of Engineers, have been studying recreational boating on the Great Lakes for many years and have much more data readily available than does Ontario. Hence 10 Canadian zones were selected compared to only seven U.S. sites.

- g) Also taken into consideration were areas where low water levels in recent years were reported by the public to be significantly affecting boating (eg. Georgian Bay and Holland MI). Due to significant resource limitations and time constraints for primary research, a census of marinas and a large-scale boater survey is not possible, nor is a totally random sample deemed defensible. Instead, the study areas were selected to provide insight into the nature of impacts from fluctuating water levels and build a portfolio of adaptation strategies and constraints to adaptation.

RESPONSES TO PEER REVIEWER COMMENTS

COMMENT A (Dr. Bjonback): These comments apply to both reports. The primary comment relates to the objective of the studies, and how the studies met stated objectives. The terms of reference are referred to on page 3 but are not included in the reports. However, both reports do state objectives as follows:

- (1) Two performance indicators are (page 4):
 - (a) Number of unusable marina slips resulting from water level fluctuations based on surveys of boat slips in 17 zones around the Great Lakes excluding Lake Ontario.
 - (b) Economic impact of fluctuating water levels on marina operators within the Great Lakes Basin excluding Lake Ontario.
- (2) Assess the vulnerability of the Upper Great Lakes marina industry to fluctuations in water levels one meter up and down from the long term average during the boating season.

Objective (1)(a) has been achieved, but objectives (1)(b) and (2) have not. The surveys provide data for a subset of marinas in the basin, but the methodology and data for the industry does not exist to extrapolate or estimate aggregate economic impacts for all marinas in the basin as a whole.

RESPONSE to Comment A: Yes, the Study has achieved objective (1)(a) – i.e. in terms of a dense sampling and survey of the 17 representative sites around the basin. That information – i.e. the direct relationships of the number of available boat slips under various lake levels - comprises **the core performance indicator (PI) that is used to evaluate the relative**

performance of various candidate plans compared to the current plan 77A and the ‘pre-project’ condition for each of the 17 representative sites.

We agree that objective (1) (b) was not fully achieved, although an attempt was made to quantify the economic benefits and losses associated with various lake levels. The Study Board understood that this was a possibility (see discussion under Caveats) and the economic advisors discussed the dearth of good economic information needed to develop a working methodology for a basin-wide economic impact assessment for the boating sector, and decided not to pursue that aspect of the evaluation based on interim information that was developed, and not to use the economic data for evaluation. While some information for (1)(b) was collected to address the broader economic changes of the recreational boating sector, it focused only on **direct losses** to the representative marinas caused by water level fluctuations – and did not pursue the indirect losses of associated businesses and services. The overall economic impact on that sector, and all associated services was simply not achievable with the information that was available.

Seventeen thousand (17,000) boat slips were surveyed out of an estimated 150,000 slips around the study area which related to approximately 12% of the total slips. (50% were surveyed in Canada and 6 % were surveyed in the U.S.) From our surveys it is calculated that in some areas, up to 30 % of the slips would be rendered unusable if water-levels were to drop or rise by approximately one meter from the 2009 water-levels. From a business standpoint, if a company loses 30 % of its revenue derived from slip rentals, that in turn will related to a decline in spending for other services and amenities at that facility. This conceivably could force a business to close if that condition were too last one or more operating seasons or at least have a significant impact on that operator’s bottom line. The TWG believes that their field research demonstrated that a significant impact on operators would occur. The estimates of the financial impacts (not complete economic impacts) were based on surveys and interviews with marina owners and operators and, hence, comprise an attempt to quantify the financial losses under different lake level regimes.

The reviewer (Dr. Bjonback) acknowledged that there were many caveats scattered in the report to suggest that this task might not be achievable:

“The surveys provide data for a subset of marinas in the basin, but the methodology and data for the industry does not exist to extrapolate or estimate aggregate economic impacts for all marinas in the basin as a whole. Statements within both reports confirm this limitation. (Bjonback) “

This information would be useful to gather for other purposes, in the future, as part of localized adaptive management efforts, and studies for various alternative regulatory and coastal zone management policies specific to certain regions, but that detailed information would have little influence on the principal purpose of evaluating the relative performance of various alternative plans under a variety of lake level regimes.

These data difficulties were anticipated by the Study Board and the TWG, to a large extent, as discussed in the overall strategy for analyzing recreational boating impacts. The Board, however, was interested initially in pursuing this aspect to the extent feasible. Unfortunately, it did not work out, and the effort was dropped by assent of the Board.

As to Dr. Bjonback’s comment of not achieving Objective (2), the Board does not agree with this assessment. Objective (2) – i.e. “assess the **vulnerability** of the marina industry...” is based on the fundamental hydrologic relationships developed as part of Objective (1)(b), and the number of usable/unusable boat slips at the 17 representative areas for the various lake level scenarios. ‘Vulnerability’ can be assessed using various non-economic metrics, as was done in this case. The 17 sites were carefully selected to be ‘representative’ of the various recreational boating circumstances and opportunities. The sampling and surveys demonstrated that while there are localized unique physical limitations and aspects that hamper adaptation under extreme lake level conditions, there was a remarkable similarity in the outcomes – i.e. the lake level ranges that created economic difficulties. Hence the Study Board is confident that the vulnerability assessment, in the form of developing ‘coping zones’ as the mechanism for quantifying ‘vulnerability’, is robust enough to be extrapolated to all the areas of the Great lakes and for a variety of future climate scenarios.

COMMENT B (Dr. Bjonback): For the results of these studies to have utility **for policy making purposes**, an estimate of basin wide damages for the marina industry would be necessary. It is not possible to evaluate how the sample could be used to extrapolate results to the industry as a whole. The sample sites, 17 areas of study (AOS) “...were chosen to represent significant regions of the upper Great Lakes recreational boating and tourism industries”. (page 4).

RESPONSE to Comment B: Yes, we agree that since a basin-wide estimate of the damages (and benefits) could not be developed for the industry, much less extrapolated from the 17 representative sites, the Study Board did not propose using this information for ‘basin-wide policy –making purposes’. The term ‘policy-making purposes’ has different connotations. The only change in policy that the Study Board is examining is the development of a new regulation plan. For that purpose, the relative comparison of the physical, economic and environmental performance of alternative plans for a common set of 17 selected representative sites was determined to be suitable by the Study Board and the peer reviewers of the Study Strategy (Ref 1). If one were using the information for setting basin-wide economic policies to regulate or enhance the recreational boating ‘industry’ itself (via tax incentives or other economic measures) then the information collected would not be an adequate basis for such policy development.

COMMENT C (Dr. Bjonback): To achieve a basin-wide perspective, a comprehensive inventory of marinas and facilities would be necessary. The studies recommend this as well. (page 16). Perhaps this was beyond the terms of reference and budget for the study.

RESPONSE to Comment C. The Study Board agrees that this would have been a worthwhile effort. It would have been easier to undertake on the U.S. side, because regional Input/Output models exist that can provide the secondary and tertiary regional economic impacts of the recreational boating and tourism industry. However, no equivalent data base and comparable models exist for the Canadian side. This effort would be essential if a structural multi-lake regulation plan was ever considered to deal with climate change, or some other major alteration to the Great lakes hydraulics were contemplated (e.g. expanding the St. Lawrence Seaway). However, since we are dealing with a relatively small incremental adjustment to the regulation plan of one lake, the Board felt that this level of analysis was not warranted – particularly with the limitations of data, budget or time, even though an effort was made to quantify the economic impacts in a different manner. The direct physical information on the effect of lake levels on the suitability and availability of boat slips was sufficient for the evaluation and comparison of relatively comparable plans for regulation lake levels.

COMMENT D (Dr. Bjonback) – Detailed Comments

D-1 The first report should be more specific in outlining important study parameters that are specified in the second report. The most important parameters that need more detailed treatment in the first report are the reference to water levels, which are 2009 levels, and the aggregate basin-wide expression of damages in dollars which are specified as Canadian dollars (with specific reference to exchange rates prevailing in 2009).

RESPONSE D-1. Agreed, except we decided not to aggregate the damages on basin-wide basis for reasons discussed previously – primarily the inability to extrapolate basin-wide damages based on incomplete data for the representative sites.

D-2 Page 6. “...not all marinas were surveyed due to time constraints.” Were the marinas actually surveyed representative in some explicit ways of those that were not? This is important to judge the validity of the sample to express total impacts over all marinas in the region.

RESPONSE D-2: Yes, the TWG undertook a very thorough approach to selecting the initial 17 ‘representative’ sites. Many factors went into that selection process, and the Study Board feels that this subset is adequate for extrapolating the relative vulnerability of the recreational boating sector to lake level fluctuations. This is borne out in the datasets collected, which showed that there were similarities of marinas on all lakes and in both countries in terms of their response to high and low lake levels. This was demonstrated not only by response of the physical attributes but also the responses to the surveys that we received. So the Board has a relatively high degree of confidence in extrapolating the impacts across the Great Lakes basin, using the representative

areas for a *comparative vulnerability assessment* and evaluation of alternative regulation plans with respect to the current regulation plan.

COMMENT D-3: Page 10, and other pages in the second report. Dredging and dock modifications are capital improvements which have a project life greater than one year. As such, any capital investments should be amortized over their anticipated project life with an appropriate cost of capital. Adding the entire capital cost (rather than amortized cost) to increased operational costs would overestimate the extent of damages. Also increased operational costs may also be reduced in future low water events since structural adjustments may reduce increased operational costs.

RESPONSE to D-3: Agreed- this methodology was incorrectly applied. Since we did not use these figures as part of alternative plan evaluation, this is a moot point. On the other hand a more realistic benefit-cost analysis of lake level fluctuations and economic impacts would have to develop an ‘expected annual benefits (damages)’ approach for the various lake levels, and the frequency of time the marinas resided in each coping zone. The reality is that the sampling data collected by the TWG at the 17 representative areas shows that the marinas are in the ‘damage’ zones (high and low water) approximately 10% of the time – meaning that for 90% of the time, the industry is accruing benefits from lake level regulation.

COMMENT D-4: Page 118 and pages following. Tables 50 and 51 indicate that the response rates for interviews with operators were very low in reporting damages and adaptations in actual cost terms to hypothetical reductions in water levels. Given the low response rate, the resulting damage estimates for each region may be subject to a large potential sampling error. This error may be offset with the use of historical adaptations cost data provided by the operators. In future follow-up studies, a better approach would be to retain contractors familiar with marine construction in each area to provide estimates of potential damage.

RESPONSE to D-4: Agreed. The suggestion to use marine contractors as a better approach would yield a more detailed and complete picture of damages. As is the case for many private businesses, marina staffing is hired based on skills to be used to support the business. This results in less contracting and more in-house labor used in adaptive changes to the facility. The TWG chose to survey the marina owners as the best point of information expecting the in-house and contracted costs would be included.

COMMENT E (Dr. Walesh):

E-1 Page 10, paragraph 4: In the economic analysis, nothing is said about the length of the marina operation season which affects annual slip-loss revenue. This is discussed in Appendix A beginning on page 28. Page 11, paragraph 6: This “slip-loss revenue estimates” section could be the place to discuss the length of the marina operating season.

Response E-1. Yes, true – but these revenue estimates were an attempt to quantify the economic damages. Since the methodology was flawed, the Study Board did not use this information for evaluating the relative performance of alternative regulation plans, and based their evaluation entirely on the relative availability of boat slips at the 17 representative sites.

However, there is a significant section in the final report that deals with the length of operating seasons in various areas of the study area.(see table 15,16, 17,18 of the Final Report) The Economic Overview Report is meant to be a detailed addendum to the Economic Section of the Overall Final Report beginning on Page 91.

Most private marinas offer seasonal slip rates and this generally makes up the bulk of businesses revenues despite the length of the operating season. Most publically owned marinas cater more to transient boaters and industry seasonality may be more important to them.

E-2: Pages 15 and 16: I suggest reducing the precision of the costs. The precision used, in spite of all the caveats, may still imply, to some, an accuracy that is simply not there. Perhaps the decimal points and zeros after them could be dropped and the costs rounded to the nearest \$1000.

Response E-2: Agreed, and it has been adjusted in the report. Though this adjustment is moot, since the Study Board chose not to use the economic information in their evaluation of the relative performance of alternative plans with respect to the recreational boating sector, and relied only on the relative availability of boat slips

E-3: Page 4, paragraph 6: I suggest explaining why AOSs needed to be representative of eco-regions and bedrock geology. For example, do eco-regions and/or bedrock geology influence spatial water level fluctuations with the four upper lakes? Or perhaps bedrock geology is relevant to marina mitigation/adaption measures.

Response E-3: Agreed. This explanation is in the main report, but not in the Summary.

E-4: Page 8, paragraph 1: Reference is made to “each slip’s elevation.” Based on the formula, this means the elevation of the marina “bottom,” that is, at the bottom of the water column at the slip. The expression “slip’s elevation” could be initially confusing. For example, is it the water surface elevation at the slip, the finger pier elevation, etc.? Possibly use “slip’s bottom elevation.”

Response E-4: Agreed. In part D, the reference to slip’s elevation should have been “slips bottom elevation” as suggested by Dr. Welsh. This has been changed in the Peer Review document and the Main Report. We now refer to this as Slip Bottom Elevations.

E-5: Page 8, paragraph 4: This is a discussion of marina access channels. Perhaps this should be qualified given that channel depths deduced from nautical charts will not be as accurate as water depths measured within the connected marina.

Response E-5: This difference in accuracy was discussed in the main report.

E-6: Page 10, paragraph 2: The reference to “four performance indicators” here may be confused with the “four (4) performance indicators” mentioned in the last paragraph on page 3. They are apparently not the same four indicators. Perhaps some other term, other than “performance indicators,” could be used on page 10.

Response E-6: We agree that another term should have been used in place of “four (4) performance indicators”, which caused some confusion. These should be referred to as Study Assessment Objectives, and have been changed in the reports.