Missouri River Recovery Program

Independent Social Economic Technical Review

Final

Evaluation of Human Considerations Objectives, Metrics, Methods, and Models for the Missouri River Recovery Management Plan

September 12, 2014

Performed for:
U.S. Institute for Environmental Conflict Resolution
and Missouri River Recovery Implementation Committee

Performed by:
Missouri River Independent Social Economic Technical Review Panel
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Preface

This report presents the findings and recommendations of the Missouri River Recovery Implementation Committee (MRRIC) Independent Social Economic Technical Review (ISETR) panel, a team of two economists and a social scientist selected for their expertise in diverse aspects of agricultural and resource economics, water resources issues, and use of science and social science in decision making. The independent expert panel was selected by the Third Party Science Neutral with input from MRRIC, and was instructed to conduct its business, in accord with procedures outlined in the "MRRIC ISAP Approach Structure Ground Rules."

At the request of MRRIC, the panel evaluated human considerations objectives, metrics, methods, and models that the U.S. Army Corps of Engineers plans to use in assessing effects of alternative management actions designed to protect three threatened or endangered species that inhabit the Missouri River. The panel learned about the plans and issues, and developed its report in a three month period from May to August, 2014, a small window of time in the Corps' three year, fast paced development of its Missouri River Recovery Management Plan and Environmental Impact Statement.

The charge to the panel was developed around plans for use of the Corps' Principles and Guidelines including its "four-accounts" assessment and planning approach. This approach is to be embedded in a collaborative, structured decision process called PrOACT; and coincident with onset of the panel's engagement, a PrOACT coach was contracted by the Corps.

This report represents the understanding and recommendations of three independent experts as a snapshot in time of a dynamic and constantly evolving process as all parties (Corps, PrOACT coach, U.S. Fish and Wildlife Service, and MRRIC) worked to blend two quite different evaluation and planning processes. Many of the panel's draft findings and recommendations, first shared in mid-August, have already been incorporated into the blending of the two processes.

Discussions among the panelists, agency planners, and MRRIC members have guided the process of integrating some recommendations. This "final" report reflects some of those discussions, and responds to some of the questions for clarification asked by agency staff and MRRIC members. Some of the discussions and questions submitted to ISETR, however, relate to

ongoing issues and challenges that extend beyond the scope of this panel's engagement and should be addressed by continuing dialogue among the parties. Thus, this panel's final report is just a step in the ongoing process and parts of it may seem now, or will soon, to be superseded as the process moves rapidly on.

Findings and recommendations presented here generally are agreed to by all panelists. They may disagree on some of the details, as MRRIC members have heard in plenary meeting and work group calls. Nonetheless, panelists have not identified major areas of disagreement among themselves regarding how the Corps and MRRIC are or should be progressing in the planning process, based on this limited view into it.

The panel hopes it has served useful advisory and review roles in the process.

Robb Turner, Third Party Science Neutral
September 12, 2014

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Executive Summary

The Missouri River Recovery Program Independent Social Economic Technical Review panel (ISETR) received its charge from the Missouri River Recovery Implementation Committee (MRRIC), including its lead agencies, the U.S. Army Corps of Engineers (Corps) and U.S. Fish and Wildlife Service (FWS). The charge was to review, in the context of the PrOACT[1] structured decision-making process guiding development of the Missouri River Recovery Program Management Plan and Environmental Impact Statement (MRRMP-EIS), the human considerations objectives and metrics as they have been organized by the Corps and answer:

> A. How well does the set of human considerations objectives address the range of socioeconomic interests in the basin?
>
> B. How well will the selected performance metrics measure impacts to resources that are important to MRRIC as identified in the human considerations objectives?

And for the socio-economic analyses planned for use in developing the Management Plan:

> C. How well will the methodologies and models proposed by the Corps measure or describe potential impacts of alternative management actions to the human considerations objectives?

A draft report was prepared after the panel reviewed the documents provided (see Appendix B), observed the MRRIC May 2014 meeting in Rapid City, South Dakota, participated in three webinars designed for the panel (May 15, May 30, June 16), two conference calls in which ISTER consulted with the PrOACT coach (June 6, July 9), and multiple phone and email conversations among panelists and the Third Party Science Neutral (TPSN). Comments on the August 4 draft report received during a webinar presentation with the HC Ad Hoc Committee (August 15), during ISETR's presentation of preliminary results at the MRRIC August 2014

[1]The PrOACT name derives from the key steps in the structured decision-making process – determining the Problem, Objectives, Alternatives, Consequences, and Tradeoffs – described in Hammond JS, Keeney RL, Raiffa H (1999) Smart Choices. Harvard Business School Press, Boston, MA.

meeting in Casper, Wyoming, and via email after the presentation were considered by the panel in producing this final report.

There is inherent uncertainty in managing river water flows. In order to provide some bounds for developing human objectives and metrics, the Corps indicated in January 2014 that river flows satisfying existing Master Manual criteria should be assumed. If the ongoing Effects Analysis indicates that the listed species require management actions including river operations alternatives outside the Master Manuel criteria (that have been termed "sideboards"), the Corps and FWS have agreed to revisit the three year timeline for completing the MRRMP-EIS and re-engage with MRRIC regarding methods and metrics appropriate to flows outside the sideboards. In light of this, ISETR has focused discussion in this report on options within the sideboards. The report notes some matters to be considered if alternatives outside the sideboards are to be evaluated.

Preparing this report coincided with the initial work of a new PrOACT coach. As a consequence, ISETR was working in rapidly evolving circumstances directly salient to the charge questions posed to it. The ISETR charge had been developed to consider the Corps' aggregation of stakeholders' objectives and metrics and the appropriateness of the methods and metrics the Corps proposed to use in its four-account analysis, with only a placeholder for the PrOACT process ("in the context of…"). The initial process described to ISETR evolved rapidly from the four accounts being front and center to the PrOACT process being front and center. The ISETR noted in its draft report that it seemed that there were two parallel planning processes concurrently underway; the PrOACT process and the traditional Corps "four-accounts" approach. At the August MRRIC meeting the Corps indicated its intention to merge the two processes. As of the time of writing this final report, how the four-accounts process is to be incorporated or "blended" into the PrOACT process is still being defined. The time allotted for ISETR to complete the work it agreed to do was sufficient. That said this report represents a snapshot in time of an evolving process that seeks to satisfy the needs of many interests.

In the report that follows, ISETR provides responses to the twelve sub-questions listed in the charge document (see appendix A). Here organized by the high-level charge questions are ISETR's recommendations. See the full report for associated background text and findings.

A. How well does the set of human considerations objectives address the range of socioeconomic interests in the basin?

Q 1 Recommendation 1:

MRRIC members should review the list of concerns identified by ISETR as not specifically included in the HC framework document (see appendix C of this report), and seek to get them included in the process if they are not adequately covered elsewhere.

Q 1 Recommendation 2:

The HC AHG should be proactive in ensuring a properly executed PrOACT process takes place to facilitate stakeholder values and interests being retrieved and considered in decision making.

Q 2 Recommendation 1:

An on-going task of the HC AHG and MRRIC as a whole should be continuing to encourage stakeholder understanding of and engagement in the PrOACT process. Stakeholders need to be provided with a clear understanding of how the Corps' planning process and the PrOACT process will interact. ISTER finds the HC AHG and MRRIC have accomplished an initial, critical step in the Corps' planning process and the PrOACT process, identifying relevant stakeholders. Essential to the success of the PrOACT process is gaining the commitment of the identified stakeholders to participate in it.

Q 2 Recommendation 2:

The Corps should acknowledge its role as the representative of the federal interest (a term from the P&G) and, in that role, make explicit early and throughout the process what its own planning and budgeting requirements may require for metrics, what it can consider as the range of alternatives it can implement, decision criteria, and most importantly how the PrOACT process will be used to assist in selection of a preferred alternative. Therefore, the Corps either needs to directly participate in the PrOACT process or provide clear guidance for those who are participating about the requirements that must be met to attain federal funding. Direct participation by the Corps in the PrOACT process is highly desirable as PrOACT is a shared learning process.

Q 3 Recommendation 1:

The Corps should clarify for participants in the PrOACT process how the analyses being conducted in the four accounts will assist in selection of a preferred alternative and its budgetary justification.

B. How well will the selected performance metrics measure impacts to resources that are important to MRRIC as identified in the human considerations objectives?

Q 4/5/6 Recommendation 1:

The HC AHG should encourage the Corps to specify a metric for measuring the "learning benefits" from including financial and HC costs in plan formulation for taking actions to reduce or adapt to uncertainty. The HC AHG also should encourage the PrOACT coach and Corps to include a learning objective in the design and execution of the PrOACT process.

C. How well will the methodologies and models proposed by the Corps measure or describe potential impacts of alternative management actions to the human considerations objectives?

Q 7 Recommendation 1:

Impacts from patterns and flows that are beyond the sideboards may require different analyses and perhaps different models and methods.

Q 7 Recommendation 2:

To enable stakeholders to come to terms with the credibility of the Corps certified models, the HC consequences analysis, and the evaluation of tradeoffs, the Corps should be as transparent as possible regarding assumptions, data sources, data gaps, and uncertainties. Stakeholders need to take time to develop knowledge of and confidence in the Corps' application of its certified models.

Q 7 Recommendation 3:

Where possible modelers should provide uncertainty bars, describe the limitations of the models, if known, and provide a sensitivity analysis with respect to key assumptions.

Q 8/9/11 Recommendation 1:

If MRRIC wishes to have additional oversight of the Corps' evaluation approach as it is taking place, or review of its results, one approach would be to create a technical team to provide oversight on behalf of MRRIC of the ongoing process, or of the post hoc review comments,

perhaps to evaluate the responsiveness of the Corps to those comments in the context of a learning objective or the adaptive management process.

Q 10 Recommendation 1:

The Corps should continue to engage with MRRIC through PrOACT in a shared effort to adapt the Corps traditional planning and decision making approaches to meet the ESA imperative of "avoiding jeopardy."

Q 12 Recommendation 1:

The immediate objective should be to gain understanding of and confidence in the PrOACT process. The HC AHG and the Corps should advance MRRIC understanding of the differences, and the implications of the differences, between the Corps' traditional planning approach and the PrOACT process. That said ISTER understands that the Corps is committed to the activities of PrOACT and wishes to use PrOACT to assist in choosing a preferred alternative.

Final ISETR
Evaluation of Human Considerations Objectives, Metrics, Methods, and Models for the Missouri River Recovery Management Plan

Introduction

The Missouri River Recovery Program Independent Social Economic Technical Review panel (ISETR) received its charge from the Missouri River Recovery Implementation Committee (MRRIC), including its lead agencies, the U.S. Army Corps of Engineers (Corps) and U.S. Fish and Wildlife Service (FWS). The charge was to review, in the context of the PrOACT[2] structured decision-making process guiding development of the Missouri River Recovery Program Management Plan and Environmental Impact Statement (MRRMP-EIS), the human considerations objectives and metrics organized by the Corps and answer:

> A. How well does the set of human considerations objectives address the range of socioeconomic interests in the basin?
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> B. How well will the selected performance metrics measure impacts to resources that are important to MRRIC as identified in the human considerations objectives?

And for the socio-economic analyses planned for use in developing the Management Plan:

> C. How well will the methodologies and models proposed by the Corps measure or describe potential impacts of alternative management actions to the human considerations objectives?

In this report, ISETR provides responses to the twelve sub-questions listed in the charge document (see below and Appendix A). These responses include comments in the form of findings as well as recommendations to MRRIC, the Corps, and FWS.

The draft report was prepared after the panel reviewed the documents provided (see Appendix B), observed the MRRIC May 2014 meeting in Rapid City, South Dakota, and participated in three webinars designed for the panel (May 15, May 30, June 16), two conference calls in which

[2]The PrOACT name derives from the key steps in the structured decision-making process – determining the Problem, Objectives, Alternatives, Consequences, and Tradeoffs – described in Hammond JS, Keeney RL, Raiffa H (1999) Smart Choices. Harvard Business School Press, Boston, MA.

ISTER consulted with the PrOACT coach (June 6, July 9), and multiple phone and email conversations among panelists and the TPSN. This final report was prepared after consideration by the panel of comments on the August 4 draft report that were received during a webinar presentation with the HC Ad Hoc Committee (August 15), during ISETR's presentation of preliminary results at the MRRIC August 2014 meeting in Casper, Wyoming, and via email after the presentation.

MRRIC requested human considerations be included in the Corps' analyses leading to the selection of a preferred alternative to respond to the "avoid jeopardy" requirements of the BiOp for the three listed species. The "avoid jeopardy" requirement is a constraint that must be met by any proposed alternative. It will be an agency (Fish and Wildlife Service and Corps) determination of which alternatives meet this requirement. In concept (as described in ISTER webinar # 3) a set of alternatives, all of which are deemed to "avoid jeopardy," will be formulated by the Corps based on results of the ongoing Effects Analysis of past, current, and potential new river operations management actions. The Corps and MRRIC are proceeding under the assumption there will be more than one "avoid jeopardy" alternative for one or more species. In anticipation of that possibility, a report "Draft Framework for Human Considerations Objectives and Performance Metrics and Associated Modeling/Methodology" (June 2014) was prepared by the Corps. Concurrently, the Corps engaged a PrOACT coach to guide the lead agencies and MRRIC with the structured decision process that has been identified to assist with evaluation of human considerations consequences and tradeoffs of alternatives to be identified.

There is inherent uncertainty in managing river water flows. In order to provide some bounds for developing human objectives and metrics, the Corps indicated in January 2014 that river flows satisfying existing Master Manual criteria should be assumed. If the ongoing Effects Analysis indicates that the listed species require management actions including river operations alternatives outside the Master Manuel criteria (that have been termed "sideboards"), the Corps and FWS have agreed to revisit the three year timeline for completing the MRRMP-EIS and re-engage with MRRIC regarding methods and metrics appropriate to flows outside the sideboards. In light of this, ISETR has focused discussion in this report on options within the sideboards. The report notes some matters to be considered if alternatives outside the sideboards are to be

evaluated. Even working within the sideboards, there are pressures on the process of engaging MRRIC stakeholders stemming from the tight timeline for developing the MRRMP.

ISETR was working in rapidly evolving circumstances directly salient to the charge questions posed to it. Most notably ISETR's preparing of this report coincided with the initial work of a new PrOACT coach. The ISETR charge had been developed to consider the Corps' aggregation of stakeholders' objectives and metrics and the appropriateness of the methods and metrics the Corps proposed to use in its four-account analysis, with only a placeholder for the PrOACT process ("in the context of…"). The initial process described to ISETR evolved rapidly from the four accounts being front and center to the PrOACT process being front and center. The ISETR noted in its draft report that it seemed that there were two parallel planning processes concurrently underway; the PrOACT process and the traditional Corps "four-accounts" approach. At the August MRRIC meeting the Corps clarified that there is one process, PrOACT, which will incorporate the four-accounts analyses as appropriate. As of the time of writing this final report, how the four-accounts process is to be incorporated or "blended" into the PrOACT process is still being defined. As a result, this report treats the processes as separate, although ISTER recognizes that the Corps has stated its commitment to blending the two as it proceeds. Thus, this report represents a snapshot in time of an evolving process that seeks to satisfy the needs of many interests.

The charge questions have been used to organize the content of this report. To reduce redundancy, the background discussion in some cases serves as the support for findings and recommendations in response to more than one question. To improve flow, the questions are addressed in a slightly different order than they were presented in the charge statement. Specifically, the questions (Q) are re-ordered and then answered as follows: Q 12; Q 1; Q 2; Q 3; Q 4,5,6; Q 7; Q 8,9,11; Q 10. Answering charge Q 12 first provides context for the answers to charge questions 1-11.

ISTER Response to Questions Posed

Q12. Is the proposed Alternative Development Methodology and Decision Analysis Approach constructed in an objective manner that includes a process for review by interested parties of the effects of each alternative management action?)

ISTER treated the charge language, "In the context of PrOACT…" to be an important directive to the review. This required ISTER to come to an understanding of the PrOACT process as it is being implemented by the PrOACT coach to identify its possible differences and linkages with Corps planning practice. ISETR understands PrOACT is the particular collaborative decision process MRRIC has adopted to help structure the MRRMP-EIS planning effort. PrOACT is one of a family of collaborative decision making processes having different names.

Whatever the name, collaborative decision making processes attempt to minimize disagreements among stakeholders (defined to include agencies of governments), ideally finding consensus, where at the start there have been conflicts/disputes. The desired outcome of any such process is a plan for moving forward, preferably including on-going mechanisms to learn and adapt.[3]

PrOACT is presented as a framework in the Alternative Development Methodology and Decision Analysis Approach (ADM/DAA) document, yet it is not fully evident how PrOACT and the more traditional Corps "four-accounts" evaluations will interact. The PrOACT process has its own specific data and analytical requirements, some of which can be supported by Corps' analyses and the work of the Human Considerations Ad Hoc Work Group (HC AHG) and some not. Table 1 is a generalized view of the differences.

[3] See: Lisa Bourget, ed. Converging Waters, 2011, http://www.iwr.usace.army.mil/Portals/70/docs/maasswhite/Converging_Waters.pdf. Ch. 2, 3, 10, 11, and 12 are conceptual – rest are cases – among which Ch. 5 may be most relevant. Also see: Robin Gregory, Lee Failing, Michael Harstone, Graham Long, Tim McDaniels, Dan Ohlson, Structured Decision Making: A Practical Guide to Environmental Management Choices, John Wiley, 2012; and Richard N. Palmer, Hal E. Cardwell, Mark A. Lorie and William Werick, "Disciplined Planning, Structured Participation, and Collaborative Modeling — Applying Shared Vision Planning to Water Resources", Journal of the American Water Resources Association, Volume 49, Issue 3, pages 614–628, June 2013.

Table 1. ISTER understanding of the planning model differences

	Corps planning approach, as being adapted to the decision problem[4]	**PrOACT process**
Identify relevant stakeholders, values, and interests to be considered	Comprehensive list as provided by the Human Considerations Compilation Report, Sept, 2013 and subsequent documents.	List as derived by the PrOACT coach from the Human Considerations Compilation Report, Sept, 2013 and subsequent documents.
HC metrics used in the analysis	Interpreted from HC raw data report, organized into 4 account structure and then further translated into metrics used in traditional Corps evaluation models and methods. Depending on project authorization, emphasis typically is on monetary measures of effects in the NED account or on National Ecosystem Restoration (NER) account. For this application the best analogy is to the NER account.	There are no "technically correct" or required metrics in the PrOACT process. There are only metrics that are meaningful to the stakeholders. Such metrics are elicited during the PrOACT process.
Response models for relating actions to effect on metrics	Certified Corps models link alternatives to changes in physical and biological watershed processes and to the metrics selected for use in the Corps' evaluations.	Credible models ranging from simplified and built with the stakeholders to acceptance of complex (including Corps certified) models; models link alternatives to changes in physical and biological watershed processes and to metrics that are deemed relevant and informative by the stakeholders.
Screening and evaluating plans	The Corps CE-IC screening software evaluates different combinations of actions called alternatives, all of which will avoid jeopardy. Dominated alternatives are discarded as not being cost effective. The remaining alternatives are ranked by incremental cost. [5]	Different combinations of "avoid jeopardy" actions are presented to the PrOACT participants. Led by the PrOACT coach, consequences of these alternatives and tradeoffs among them are evaluated through an iterative process that is an integrated discussion of actions, effects analysis, values, and

[4] ISTER was told (memo ahead of webinar 3) that the Corps will not be applying their standard analysis and choice process to choosing a preferred alternative, although some of the analytical tools will be used. From ISTER's perspective it is not clear how the PrOACT process and the tools of the Corps planning process will be deployed in developing the necessary decision documents.

[5] The decision problem is that at low levels of cost (with costs being financial outlays and opportunity costs – often subjective assessments – borne by current stakeholders) the avoidance of jeopardy may not be realized. So the analysis is essentially moving along an incremental cost curve. Graphically imagine the horizontal axis being

		interests. [6]
Decision criteria/ Preferred alternative	Choose the Corps "federal interest" plan, That choice is a requirement of the Corps hierarchical decision process.[7]	Formulate a plan that can secure agreement among all those participating in the PrOACT process.

Q 12 Finding 1:

In their broad conceptual logic, PrOACT processes replicate elements of Corps planning, yet the ways in which metrics are created, alternatives are formulated, and impacts evaluated may differ. Also, the resulting choices made may differ. The PrOACT process is a new concept to MRRIC, as well as to the Corps. As a result, there will need to be adequate time for MRRIC to understand the process and for the Corps to establish how the results of a PrOACT process would be used in decision making. The present deadlines as described to ISTER in early July will challenge the PrOACT coach, MRRIC, and the agencies in applying the state of the practice in collaborative decision making.

Q 12 Recommendation 1:

The immediate objective should be to gain understanding of and confidence in the PrOACT process. The HC AHG and the Corps should advance MRRIC understanding of the differences, and the implications of the differences, between the Corps' traditional planning approach and the PrOACT process. That said ISTER understands that the Corps is committed to the activities of PrOACT and wishes to use PrOACT to assist in choosing a preferred alternative.

increased likelihood of avoiding jeopardy. As the likelihood increases the incremental costs increase at maybe an increasing rate. The cost dimension has both measured financial outlays and judgments made by stakeholders on what constitutes a cost to them. The stakeholders' costs get revealed though a collaborative process in PrOACT. In the Corps model they are computed by experts.

[6] The PrOACT process is initially focusing on hydrologic metrics. It is expected that the stakeholders will be asked to describe when changes are "significant: and defend why they are in terms of adverse effects on their values and interests.

[7] Evaluation criteria listed in Table 1 of the ADM/DAA (v11) include completeness, effectiveness, efficiency, and acceptability, though it is not clear how these are to be evaluated. ISTER was told in webinar 3 that "acceptability" to stakeholders will be a consideration in choosing the preferred plan. It was not clear in the webinar if the PrOACT process was the means to discover the acceptable plan.

Q 1. Has the Corps synthesized the raw input to accurately represent the interests expressed by MRRIC members?

In the HC framework document of June 2014, the Corps ***qualitatively recognized*** the vast majority of the interests expressed by stakeholders. The Corps employed a format that follows from the analytical requirements of its internal (federal) planning guidelines and fits within the format of the Corps' planning process. The result is a synthesis where stakeholder interests may appear in the primary text, the causal chains, and/or supplementary paragraphs. This can make it difficult for those not familiar with the Corps' format to readily identify the raw input in the Corps' synthesis.

Appendix C of this report, a crosswalk created by ISTER, lists each of the stakeholder's inputs and then identifies the location in the HC framework document where this concern is addressed. All stakeholder comments were addressed in the straw man documents. Approximately 55 stakeholder concerns were not directly addressed in the HC framework document (designated as "no" in Appendix C). These concerns either 1) did not suggest a specific metric that could be measured for a modeling process (including concerns about the impact of management changes on global warming and world food production, or 2) were concerns closely related to other concerns that were addressed in the framework document. For example, flood risk due to increased flows from Gavins Point is listed as a concern; whereas, the framework document explores flood risk in general.

Q 1 Finding 1:

If one eliminates concerns where the impact of management changes is unlikely to be of major consequence and also eliminates specific concerns that overlap with more general impacts, the list of concerns listed in the HC framework document appears to adequately reflect the stakeholders' concerns.

Q 1 Recommendation 1:

MRRIC members should review the list of concerns identified by ISETR as not specifically included in the HC framework document (see appendix C of this report), and seek to get them included in the process if they are not adequately covered elsewhere.

Q 1 Finding 2:

In practice some of the details in the raw data set were lost because of the necessity for aggregation and by the perceived need to conform to Corps planning guidelines. Therefore, within the HC framework text some of the detail provided in the raw data form submitted was not included, perhaps making it difficult for some stakeholders to be certain that their contributions were included. For example, a stakeholder had raised concerns about the impact of water quality on eco-tourism. This is not directly addressed in the document. There is however some overlap between this concern and the proposed work on habitat distributions that is described in the EQ portion of the document.

Q 1 Recommendation 2:

The HC AHG should be proactive in ensuring a properly executed PrOACT process takes place to facilitate stakeholder values and interests being retrieved and considered in decision making.

Q 2. Based on your experience, are there any significant stakeholder's interests or objectives clearly missing?

The broad membership that is the hallmark of MRRIC and the HC AHG process resulted in an inclusive and comprehensive definition of stakeholders. A challenge for any stakeholder process is how to acknowledge the views of those who do not feel sufficiently strongly to engage actively in the process. To uncover if there are "missing" stakeholders would require a review of the processes by which membership in MRRIC is decided, and the ISTER did not undertake such an evaluation. During the presentation of our report on August 20, 2014, a member pointed out that the raw input data did not include concerns from the commercial fishing industry. Other members thought this perspective was adequately covered by other overlapping interests.

ISTER notes any preferred alternative will need to justify federal expenditures as it competes with other projects that have achieved standing in the budget process. The Corps represents the federal interest, including a suite of considerations from tax costs to legal and procedural authorities and requirements affecting the Corps' ability to act. The Corps needs to secure approval for the preferred plan from its review hierarchy and for its budgeting process.

Q 2 Finding 1:

MRRIC constitutes a large and comprehensive group of stakeholder perspectives that appears adequate to represent all known interests. Adding additional stakeholders would further complicate participation in the PrOACT process, increasing the difficulty of exploring the consequences of alternatives and making tradeoffs among them. Already there is a need to consider ways to organize efficient and effective participation in PrOACT. One option is to consider a "Circles-of-influence" design.[8] Whatever means are chosen, it is important that the choice is made by MRRIC collectively.

Q 2 Recommendation 1:

An on-going task of the HC AHG and MRRIC as a whole should be continuing to encourage stakeholder understanding of and engagement in the PrOACT process. Stakeholders need to be provided with a clear understanding of how the Corps' planning process and the PrOACT process will interact. ISTER finds the HC AHG and MRRIC have accomplished an initial, critical step in the Corps' planning process and the PrOACT process, identifying relevant stakeholders. Essential to the success of the PrOACT process is gaining the commitment of the identified stakeholders to participate in it.

Q 2 Recommendation 2:

The Corps should acknowledge its role as the representative of the federal interest (a term from the P&G) and, in that role, make explicit early and throughout the process what its own planning and budgeting requirements may require for metrics, what it can consider as the range of alternatives it can implement, decision criteria, and most importantly how the PrOACT process will be used to assist in selection of a preferred alternative. Therefore, the Corps either needs to directly participate in the PrOACT process or provide clear guidance for those who are participating about the requirements that must be met to attain federal funding. Direct participation by the Corps in the PrOACT process is highly desirable as PrOACT is a shared learning process.

[8] See 6.12 at http://www.iwr.usace.army.mil/Portals/70/docs/iwrreports/10-R-6.pdf.)

Q 3. Does the organization of objectives allow for a comprehensive examination of potential impacts to socioeconomic resources in the basin from the Missouri River Plan? Was the way the human considerations objectives were grouped (into interest areas and the four accounts) done in a way that will allow thorough consideration of all objectives?

The Corps organized the raw data from the stakeholders into the four accounts in accordance with and to facilitate its internal planning requirements. The Corps has provided two rationales for this. First, the Corps argues this organizational structure would be helpful in facilitating preparation of the required EIS. Second, the Corps argues that federal planning requirements (the P&G) demand the organization into the four accounts as was done in the HC document. ISTER agrees that the P&G does allow for display of effects of alternatives using the four accounts structure. However, given the still-limited descriptions of how impacts to the human objectives will be evaluated, it is difficult for ISETR to assess whether the four-accounts organizational structure will result in "comprehensive examination" and "thorough consideration" of all objectives.

The logic behind these four accounts in Corps' planning is well established. However, only one account (NED, or maximize net benefits subject to compliance with environmental law and regulation) is typically used for federal budget decision making. In the case of the ESA, or environmental restoration generally, the Corps has reconfigured the NED decision rule into a cost effectiveness-incremental justification framework. In this framework NED benefits may be subtracted from implementation costs in finding the cost effective alternatives and then the "incrementally justified" alternative is chosen as the recommended plan from among the cost effective options.

Other Social Effects are relevant to stakeholders who may be asked to support or make financial contributions to a plan. In fact the Corps may recommend a "locally preferred plan" under certain conditions. It is unclear to ISTER how RED, EQ, or OSE effects will be used by the Corps in justifying the plan for consideration by the Corps' decision hierarchy.

Looking to PrOACT, it is not evident to ISTER how the four account organization of objectives may serve the "thorough consideration of objectives" within the PrOACT process; however, the grouping is not likely to be detrimental to the PrOACT process. Neither the metrics nor the

grouping into the four accounts is being used initially in the PrOACT process. At a later time the Corps' metrics from one or more of the accounts may be used in the PrOACT process.

Q 3 Finding 1:

The Corps has argued that the current organization of objectives is a writing convenience for the preparation of the EIS and is a requirement for the Corps' planning process. ISTER understands that this may be a Corps requirement and may facilitate its preparation of reports and analyses required by law and regulation. ISETR cannot say at this stage whether the organization is likely to support a "comprehensive evaluation" or "thorough consideration" of objectives.

Q 3 Recommendation 1:

The Corps should clarify for participants in the PrOACT process how the analyses being conducted in the four accounts will assist in selection of a preferred alternative and its budgetary justification.

Q 4. Do the performance metrics establish qualitative and quantitative measures and do they accurately represent the human consideration objectives?

Q 5. Are the performance metrics appropriate to, or a good fit with, the proposed methods of analysis of impacts to them?

Q 6. Are there better metrics to use in place of the existing performance metrics to evaluate potential impacts to those objectives?

The Corps has both agency-required and recommended plan formulation and evaluation procedures for empirically executing the conceptual frameworks described in the June 2014 HC framework document. These procedures in turn lead to the selection of both monetary and non-monetary metrics and models for predicting the effect of alternative actions on those metrics. The plan formulation and evaluation procedures have been developed to support the hierarchical choice decision process for federal budgeting; that form of analysis is the traditional approach for Corps planning. ISTER understands that these metrics and models have been developed over decades and have evolved as the result of critical academic review, and are state of the evaluation practice. Some methods and models are more widely and routinely used than others.[9]

[9] Recent Obama administration efforts to issue new planning guidelines were to alter the plan formulation process and selection criteria, but would not alter the underlying methods for assessing benefits, costs and non-monetary effects under the four accounts of the P&G.

For execution of PrOACT the PrOACT coach has organized, at least initially, the concerns expressed in the raw data sheets in terms of physical and hydrologic effects on the water and related land resources. The PrOACT process is eliciting hydrologic and physical metrics for each stakeholder's interest, and if there are monetary or other non-monetary metrics of interest they can emerge from that elicitation process. Based on the professional literature it is unlikely that strict adherence to metrics that might emerge from a process that satisfies the Corps' decision hierarchy would yield the same metrics and models that would emerge from a PrOACT collaborative decision process.

Q 4/5/6 Finding 1:

ISTER found that the metrics proposed for use in the four-account structure were shaped to conform to metrics in line with Corps planning guidelines, whether or not stakeholders identified a metric as relevant from their perspective. This being said, the June 2014 HC framework document, when carefully read includes references to most of the concerns expressed by stakeholders (see Question 1 above) at some point in the different logic chains.

Q 4/5/6 Finding 2:

A key step in the PrOACT process is to elicit performance metrics from the participating stakeholders. The metrics generated through the PrOACT process are meaningful as judged by the stakeholders and may or may not be regarded as "technically correct" by subject matter experts. Through that elicitation, the participants may or may not affirm the use of the Corps' defined metrics. Through their choices the stakeholders themselves will conclude whether or not Corps metrics "…accurately represent the human consideration objectives."

Q 4/5/6 Finding 3:

A critically important and missing metric necessary for an adaptive management process is the value of knowledge gained for increasing the likelihood of reducing analytical uncertainty. Learning can be an objective in the plan formulation process when there is significant uncertainty, but a) may add cost to the plan, and b) change the nature, timing and/or location of some of the management actions. Therefore, among the benefits of any plan is learning and the "value of information" is a benefit that can warrant a) or b) above. Based on a high level review

of the EA-AM concept paper, these conceptual principles seem to be recognized (see EA-AM, Section 3.5, especially).

Q 4/5/6 Recommendation 1:

The HC AHG should encourage the Corps to specify a metric for measuring the "learning benefits" from including financial and HC costs in plan formulation for taking actions to reduce or adapt to uncertainty. The HC AHG also should encourage the PrOACT coach and Corps to include a learning objective in the design and execution of the PrOACT process.[10]

Q 7. Are the methods and models that USACE plans to use for each objective appropriate for evaluating the impact of alternatives on the statement of stakeholder objectives? Are there more appropriate means that you can suggest?

NOTE: The answers to question 7 focus on the Corps' evaluation process. Part 1 of the answer is about the sideboards concept. Part 2 of the answer is directly about the Corps' modeling processes for relating alternatives to effects on metrics, recognizing that at the time ISTER did its review it was not clear what procedures would be used by the Corps or used in PrOACT. Therefore, part 2 offers illustrative examples and is not a comprehensive review. Part 3 of the answer expands to a comment on models and the PrOACT process. Part 4 of the answer applies to both the PrOACT and Corps' modeling processes.

Q 7 Part 1: Sideboards

The HC framework document, as well as the forthcoming Effects Analysis and PrOACT process, could be used to evaluate a full range of river patterns and flows, including patterns and flows that would result from reservoir operation control rules different from those in the current master manual. At the same time, a January 10, 2014 memo from the Corps states that:

> "The current efforts to develop human objectives/metrics should assume evaluation of current types of mechanical habitat management actions. In regards to flows, the following existing Master Manual criteria should be assumed:
>
> - 2006 Master Manual spring pulse (bi-modal pulse). Generally, a March pulse of 5 kcfs minus the contributions from the James River and held at its peak for 2 days and a May pulse that can range from 9 kcfs to 20 kcfs minus the James River contribution and be held at its peak for 2 days. Both pulses are constrained dependent on sufficient water in storage and downstream flow limits. The specific detailed technical criteria

[10] See, for example, McDaniels, T. L., and R. Gregory. 2004. Learning as an objective within a structured risk management decision process. *Environ. Sci. Technol. 38* (No. 7), 1921-1926.

on how and when the pulses are achieved are described in the Master Manual pages I-6 to I-10 and are attached.

- Drought Conservation Measures as per the Master Manual
- Unbalanced Reservoir Regulation (upper three reservoirs) as per the Master Manual."

MRRIC in turn reminded the lead agencies that should they decide to pursue river operations alternatives that are outside these constraints, termed "sideboards", the three year timeline for completion of the MRRMP-EIS would need to be revisited.

> "MRRIC members understand that, should the scope of alternatives formulated differ from the assumptions as outlined in the January 10 memo, USACE will revisit the three-year timeline for completion of the MRRMP-EIS, allowing time for MRRIC to re-engage on human considerations objectives and metrics at a minimum level of medium collaboration and reconsider their recommendations."

This discrepancy between the possible range of river flows and the range currently constrained by the sideboards was noted by the ISTER in making its review. However, the raw data document and the June 2014 HC framework document do not make this distinction as clear as it might be and may lead to stakeholder debates over HC impacts on the effects of changes in river flows that are not relevant if the sideboards are adhered to in the next phase of plan formulation. For example, ISTER was told by the Corps that the low range of river flows observed during historic drought years were prescribed narrowly by the Master Manual. In addition the Corps told ISTER that reservoir operations could not prevent flooding under widespread rainfall and runoff events across the whole basin.

Q 7 Finding 1:

The sideboards are expected to limit the range of "avoid jeopardy" alternatives affecting hydrology that may be proposed. Our understanding is that as long as the January 10, 2014 sideboards criteria are in place, then no change in river flows in drought years according to Corps' modeling is being considered. This sideboards document should alleviate stakeholders' concerns about intake pipes, irrigation and navigation in drought years. However, removing the hydrology sideboards would warrant ISETR revisiting the answers to the charge questions.[11]

[11] The sideboards are only about hydrology at this point, but there are implicit sideboards as well. As one example there are limits on the amount of land acquisition and processes for land acquisition (budgetary, willing seller).

Q 7 Recommendation 1:

Impacts from patterns and flows that are beyond the sideboards may require different analyses and perhaps different models and methods.[12]

Q 7 Part 2. Corps Models and Methods

For elements in each of the four accounts ISTER was provided only with descriptions of ***the conceptual logic*** for execution of Corps required analyses. ISTER believes that the logic structure in each section is clearly written and provides a sound conceptual foundation for the application of "state of the practice" analyses in applied water resources planning.

The models the Corps proposes for executing its work are mostly "certified" as required by Corps regulation for any Corps study.[13] Prior to certification, certified models have been through an extensive and lengthy review process. For proposed applications where there is no reference to a certified model, the HC framework document offers limited descriptions of the models that might be used so it is difficult to assess the technical logic for those proposed approaches.

Q 7 Recommendation 2:

To enable stakeholders to come to terms with the credibility of the Corps certified models, the HC consequences analysis, and the evaluation of tradeoffs, the Corps should be as transparent as possible regarding assumptions, data sources, data gaps, and uncertainties. Stakeholders need to take time to develop knowledge of and confidence in the Corps' application of its certified models.

[12] In technical terms most Corps analyses are partial equilibrium modeling that may not apply at some point where the changes to the system get "large" (non-trivial;" not marginal"). If the changes become significant then a different system of models may be required to look at regional and national adjustments. For example a small change in farmland acres may not have noticeable effect on market prices for commodities in regions. A larger change may have price effects at the regional or national level. As another example the costs of adapting thermal power production to modest changes in river pattern and flow (as well as depth of channel at point of intake) can be evaluated as the Corps proposes. More significant changes that result in the need to abandon a thermal plant that would otherwise continue to be operated require analysis of electricity market adjustments.

[13] Models shown here must be used, unless an exception is granted.
http://planning.usace.army.mil/toolbox/library/ERs/entire.pdf
The models at this URL are advisory. http://library.water-resources.us/pubsearchS.cfm?series=NED.
http://planning.usace.army.mil/toolbox/current.cfm?Title=Model%20Certification&ThisPage=ModelCert&Side=No

Q 7 Finding 2:

The methods and models proposed for RED and NED sections in the June version of the HC framework document, as well as in a subsequent ISTER webinar are appropriate and state of the practice.

Past experience suggests that ideal application of the models will often be limited by data availability. Also, assumptions made in applying the models may affect the results reported, but ISETR recognizes that model application requires professional judgments that may differ among practitioners. Different applications can yield different, and often widely different, final results. These conditions simply reflect the inherent problems associated with modelling highly complex systems, especially when time and budget available for such analysis is by necessity limited.

Q 7 Recommendation 3:

Where possible modelers should provide uncertainty bars, describe the limitations of the models, if known, and provide a sensitivity analysis with respect to key assumptions.[14]

Challenges in Model Application: Some Illustrations

Recognizing that the model certification process is in place, ISTER chose to offer some illustrative technical comments on challenges in model application. The illustrations below include findings and recommendations for these illustrative topics: IMPLAN modeling for RED, NED and RED agricultural damage effects, data for flood damage assessment, OSE effects, and recreational experience valuation.

IMPLAN

First, consider the certified model IMPLAN®. Section 4.9.1 of the June HC framework document proposes to use the Corps' certified model IMPLAN for Regional Economic Development impact estimation. This software is easy to use and provides a detailed estimate of the impact of changes in expenditures due to different alternatives on regional economies. This model is widely used in applied work of this type. The model represents the economic linkages between different sectors, and recognizes that the inputs used in one sector typically come from another sector. For example, the model could be used to estimate the effect of reduced

[14] Adoption of the principles of risk management now being advanced in the Corps should be applied to the maximum extent possible. See: http://www.corpsriskanalysisgateway.us/

agricultural sales at the farm gate on sales of businesses that support farm production. In this way the secondary (or indirect) impacts of changes can be measured.

The IMPLAN model has been subject to two important criticisms. First, it uses fixed input-output coefficients among the sectors. If the output of one sector doubles, then it is assumed that the inputs for this sector also double. The use of this fixed factor ignores important economies of scale. For example if a car dealership or restaurant doubles their sales revenue there is no guarantee that the number of hourly and managerial employees will also double.

A second criticism of the IMPLAN model is that unless the assumptions made are critically vetted, the results may miss-estimate the effect of a change. For example, a 2008 report by the Minnesota Department of Agriculture used IMPLAN to estimate the statewide impact of the ethanol industry and concluded that ethanol production had a $4.95 billion economic impact on Minnesota and generated 18,000 jobs[15]. In this case the users of the IMPLAN model assumed (or perhaps did not recognize that they assumed) that all of the labor inputs used to grow corn and all of the labor used to produce fertilizer and other corn production inputs were due to the existence of the ethanol industry. It ignored the fact that these industries existed in Minnesota before the ethanol industry developed and that the ethanol industry specifically located in Minnesota to take advantage of corn availability. The ethanol industry did not cause corn sector jobs and if anything ethanol jobs should correctly be attributed to corn. A researcher at the Federal Reserve Bank of Minneapolis said the following about this application of IMPLAN. "If you took every company in Minnesota and looked at its spillover effects and went through all these multipliers, the estimate of goods and services produced would be 10 times what we actually produce.[16]"

Q 7 Finding regarding IMPLAN:

Impact calculations based on IMPLAN are extremely sensitive to assumptions made by the person running the program.

[15] See http://implan.com/index.php?option=com_multicategories&view=article&id=105:the-number-factory&Itemid=71

[16] Again see http://implan.com/index.php?option=com_multicategories&view=article&id=105:the-number-factory&Itemid=71

Flood Damage to Agriculture

As a next illustration consider the Corps' approved models and methods used to estimate NED and RED effects of both flooding and lack of interior drainage on agriculture. The proposed metrics are the change in net income to farmers and damages to non-crop resources such as farm roads and fences. It is essential to realize that the net income calculation is a proxy for the willingness to pay of landowners to avoid the effects of flooding and high water tables.

The willingness to pay to avoid flooding and high water is measured using a farm budget net income analysis where prices are held constant (or change as a result of exogenous factors) and flooding or compromised drainage result in one or more of the following over the planning time horizon, relative to a without-action condition: reduced yields, changes in crop planted and/or increased production costs. The logic is that farm operators would be willing to pay as much as, but no more than, the change in net income for actions that will avoid flooding or high water tables. The change in net income is calculated on a per acre basis with vs without the flooding/drainage effect and then per acre effects are multiplied by the number of acres affected. Here, as with IMPLAN, it will be essential to know the assumptions made by analysts about effects on yield, crop choice and cost as projected over time, with vs without the alternative. The assumptions made are often controversial.

The analysis is complicated by the reality that many farmers might purchase multi-peril crop insurance that pays compensation for crops lost to high water, or for prevented planting. Indemnities will therefore compensate for some share of the lost gross income with the result that net income is stabilized. If farmers do purchase crop insurance the indemnities will come from insurance companies or taxpayers, and are transfer payments. The lost revenue effect of the flood loss is not eliminated, but rather is transferred to others. Another effect of the availability of the insurance is that it may affect cropping patterns if the premiums are not full risk priced, in effect subsiding planting certain crops in flood prone areas. The Corps guidance speaks directly to how these subsidies are to be considered when NED is increased. It is not clear how any subsidies would be addressed if the NED decreases.

While the NED loss is limited to net income as a measure of willingness to pay, the RED effects must consider gross revenue loss effects. The IMPLAN model might require all spending

(agricultural input purchases) and all receipts (gross crop sales) that might be lost to flooding. Also, the RED analysis has to account for the transfer payments and not assume that the income from agriculture is lost to the regional economy. As a result, spending of the transfer payments (insurance indemnities) would be included in the RED analysis, even if crops were lost to flooding.

Q 7 Finding regarding Crop Damages:

The level of detail in the description for how NED agricultural income effects and RED consequences is too general to be evaluated for its validity, and there are no applications available for review.

Non-Agriculture Crop Flood Damage[17]

The proposed methods for RED and NED measures of non-agricultural income flood damage rely on estimates of the value of homes, businesses, and infrastructure in the flood plain adjusted for the probability of flooding. Here, one might criticize the data employed. It appears that the economic data on the value of these non-agricultural assets will come from the HAZUS model and US census data. This will result in a synthetic estimate of the likely economic damages caused by flooding. Surprisingly, the proposed metric ignores available data on the economic impact of the 2011 flood. It is better to use actual data in place of model simulations when it is available.

Q 7 Finding regarding Flood Data:

The HAZUS and census data based models could be calibrated so that the predicted outcome of a 2011 type flood approximately equals available estimates for this flood.

Passive Uses and Other Social Effects

The section of the HC framework document relating to Other Social Effects is extremely vague and repeats the following phrase a total of thirteen times.

> Performance Metric: This metric may be described qualitatively or use a constructed scale to facilitate comparison with other types of other social effects (OSE).

[17] NED objective 3 Flood Risk Management proposes to include flood damage to agricultural crops. These calculations will overlap with the agricultural flood damage mentioned earlier. The authors of these two sections should coordinate to avoid this outcome.

The section on Passive Uses concludes as follows.

> "As a result of the issues described above, non-monetary metrics or qualitative descriptions are often used to describe the relative societal and passive value of ecosystems. The Corps will consider passive use values and benefits as part of the Human Considerations evaluation. Any relevant literature or research on these values will be presented and described qualitatively."

Many of the concerns that are to be addressed in this section (Sustainability of Century Farms, Environmental Justice, Community Well Being, and Traditional Ways of Life) are not amenable to measurements used for the concerns noted above. Therefore, we anticipate that after a lengthy exercise, the authors of this section will report that it was not possible to generate suitable measures of impacts to these concerns. The PrOACT process is an ideal place to voice and respond to these concerns.

Q 7 Finding regarding OSE:

MRRIC, the HC ad hoc group and the agencies recognize that the PrOACT process is a means for defining metrics and evaluating how alternative actions may affect those metrics for subjective or uncertain concerns. Comparison of impacts to and tradeoffs among concerns in the OSE account involving values can be made in the PrOACT process.

Recreation Valuation

During one ISETR webinar, a Corps consultant suggested that the Corps may use willingness to pay (WTP) to measure recreation values. ISETR also was told that the Corps would use unit day values that do not depend on WTP measures. The agency has published unit day values that are used to place a monetary value on a recreation day.[18] Willingness to pay surveys are popular in the environmental literature and are considered the best way to measure the value of goods where there is no functioning market. However, there are many criticisms of such surveys. As one example, respondents to these studies may overestimate their true willingness to pay because they feel they can influence policy at no cost to themselves. This phenomenon is well known in the literature and is called hypothetical bias. It can be measured by eliciting values using a survey method and later repeating this same process where the same participants use real money. In one extreme case, Norwegian consumers responded to a survey question indicating that they

[18] http://planning.usace.army.mil/toolbox/library/EGMs/EGM14-03.pdf

were willing to pay a premium of 386 Norwegian crowns/Kg for Norwegian beef over US beef[19]. When asked to pay this amount of money the premium fell to 37 Norwegian crowns: a ten-fold reduction.

Q 7 Finding regarding Recreation Valuation:

If the Corps uses surveys to calculate willingness to pay, the results should be reported along with uncertainty bars. Alternatively, the Corps could instead rely on unit day values for estimating the NED value of recreation, or the two analyses could be used together to help bound the results.

Q 7 Part 3: Assessing stakeholder claims in the PrOACT process

The HC working group process for soliciting input from stakeholders allowed the respondents to express their interests and to make explicit and implicit claims of effects of alternatives on those interests. For example, alternatives will (or may) undercut water compelled rates, increase thermal power costs by $X, enhance ground water recharge, etc.

Affirming the possibility of these effects begins by recognizing that effects occur in a complex socio-economic system of direct influences and feedbacks. As one example, assessing the effect of limiting navigation days on the rail and truck freight rates charged shippers (water compelled rates) first requires a careful conceptual understanding of freight traffic commodity volumes, origins and destinations, possible multi-modal combinations for making movements, commodity market conditions, and perhaps more. Such assessments can be reflected in a response model.

Q7 Part 3 Finding

The HC raw data collection process did not make clear that the hypothesized (again explicit and implicit) effects would be subject to model assessment in the PrOACT process or that the likelihood of the effects occurring would be open to expert review (as is occurring with ISAP review of the Effects Analysis work by the EA teams).

[19] Alfnes, Frode, and Kyrre Rickertsen. "SC-X: Calibrating Stated Choice Surveys with Experimental Auction Markets." *Annual Meeting of American Agricultural Economics Association, Montreal*. 2003.

Q 7 Part 4: Effects Modeling for HC

At this time there is no information on the results of the predictive models and there is limited information on which of the asserted (explicit or implicit) claims of effects will be modeled. ISTER suggests that both the Corps and the PrOACT coach should help MRRIC understand that these claims might be best understood as hypothesized effects of alternatives on the human considerations metrics. As MRRIC has come to appreciate during the effects analysis work on the listed species, hypotheses need to be tested or evaluated, and not rejected before they are included in a response model. This basic appreciation needs to be extended to human considerations.

Q 8. Are these methods and models consistent with / in keeping with best practices for implementing the 1983 Principles and Guidelines?

Q 9. Based on your expertise, are the data inputs planned to be used in the models the best available (e.g., best available census data)?

Q 11. Are the planned analyses comprehensive and have the plans been adequately documented?

ISTER has been provided with only a high level conceptual discussion of proposed modeling processes (e.g. "we will use IMPLAN and here is what it is"). ISTER was not provided with results of any actual or example applications, either as quantification of the metrics (data used) or how Corps models were applied to predict the effect on the metric with vs. without an alternative. Nor was ISTER provided with sufficiently detailed descriptions of key assumptions and data sources that would be employed to make such calculations.

Evaluation of the professional quality of any analysis must go beyond the conceptual descriptions of intentions, to include the application and such matters as assumptions about no-action conditions, ceteris paribus assumptions, data accuracy and reliability, etc. ISTER recognizes that such applications are still in development. The Corps has often had the credibility of its analyses challenged in the past by a wide array of stakeholders. In fact, some of the results from the most basic hydrologic, geomorphic, and economic models used by the Corps have been subject to external criticism. Those challenges most often are about the application of the tools and rarely are about the conceptual logic underlying the tools.

As mentioned above, Corps certified models have undergone extensive review and certification as best practice for various applications. Specifics of their use in evaluating alternatives for the

MRRMP-EIS, including data to be used and plans or documentation for their use, were not available for ISETR to assess the likelihood of effectively quantifying or describing effects on stakeholders' objectives and metrics. The Corps has an extensive formal external and internal review process for its reports. If a technical team was to be asked by MRRIC to review such reports, this team could add value by providing quality control to the review process, summarizing the reviews and describing the results of these reviews in a less technical way, and evaluating the Corps' response to the review comments received.

Q 8/9/11 Recommendation 1:

If MRRIC wishes to have additional oversight of the Corps' evaluation approach as it is taking place, or review of its results, one approach would be to create a technical team to provide oversight on behalf of MRRIC of the ongoing process, or of the post hoc review comments, perhaps to evaluate the responsiveness of the Corps to those comments in the context of a learning objective or the adaptive management process.

Q 10. Will the qualitative and quantitative methodologies and models to be used provide the inputs that will be needed in the Consequences and Tradeoffs steps of PrOACT?

A key question facing the Corps and MRRIC is to what extent the Corps "four-accounts" approach to analysis can be merged with the more organic, stakeholder-engaged PrOACT process. While several previous answers suggest it is still too early to resolve this question, ISETR believes resolution will be important in maximizing stakeholder understanding and acceptance of the agencies' decision process. The Corps asserts there is a single process underway currently. It is essential that the Corps and FWS leadership and staff come to understand and communicate how the different modeling approaches and data requirements will be blended to meet the agencies' planning and fiduciary needs for a complete, effective, efficient, and acceptable preferred alternative.

If in order to meet its fiduciary obligations, the Corps will have to produce a separate synthesis document under its own guidelines and requirements, the Corps and FWS leadership should clarify for MRRIC the differences and mutual support possibilities of the necessary Agency planning process and PrOACT process. This includes articulating the different decisions to be served, and whether and how the Agency planning process differs from the PrOACT process yet might be supported by it.

Q 10 Recommendation 1:

The Corps should continue to engage with MRRIC through PrOACT in a shared effort to adapt the Corps traditional planning and decision making approaches to meet the ESA imperative of "avoiding jeopardy."

Appendix A: ISETR Charge Categories and Review Questions

What has been done that we would like ISETR to review

In the context of the PrOACT structured decision process that is guiding development of the Missouri River Recovery Management Plan, please review the human considerations objectives as they have been put together by USACE. Also review the "raw" input from MRRIC members and consider:

A. How well does the set of human considerations objectives address the range of socioeconomic interests in the basin?

1. Has the Corps synthesized the raw input to accurately represent the interests expressed by MRRIC members?
2. Based on your experience, are there any significant stakeholder interests or objectives clearly missing?
3. Does the organization of objectives allow for a comprehensive examination of potential impacts to socioeconomic resources in the basin from the Missouri River Plan? Was the way the human considerations objectives were grouped (into interest areas and the four accounts) done in a way that will allow thorough consideration of all objectives?

B. How well will the selected performance metrics measure impacts to resources that are important to MRRIC as identified in the human considerations objectives?

4. Do the performance metrics establish qualitative and quantitative measures that accurately represent the human consideration objectives?
5. Are the performance metrics appropriate to, or a good fit with, the proposed methods of analysis of impacts to them?
6. Are there better metrics to use in place of the existing performance metrics to evaluate potential impacts to those objectives?

What's planned that we'd like ISETR to review

In the context of the PrOACT structured decision process that is guiding development of the Missouri River Recovery Management Plan, please review the methodologies planned to be used by the Corps and consider:

C. How well will the methodologies and models proposed by the Corps measure or describe potential impacts of alternative management actions to the human considerations objectives?

7. Are the methods and models that USACE plans to use for each objective appropriate for evaluating those respective objectives? Are there more appropriate means that you can suggest?
8. Are these methods and models consistent with / in keeping with best practices for implementing the 1983 Principles and Guidelines?
9. Based on your expertise, are the data inputs planned to be used in the models the best available (e.g., best available census data)?
10. Will the qualitative and quantitative methodologies and models to be used provide the inputs that will be needed in the Consequences and Tradeoffs steps of PrOACT?

11. Are the planned analyses comprehensive and have the plans been adequately documented?
12. Is the proposed Alternative Development Methodology and Decision Analysis Approach constructed in an objective manner that includes a process for review by interested parties of the effects of each alternative management action?

Appendix B: Working List of Documents provided for ISETR to Review

Procedural:

1. USACE MRRIC ISAP Approach Structure Ground Rules doc: "USACE MRRIC ISAP Approach Structure Ground Rules - FINAL MODIFIED"
2. MRRIC Human Considerations charge : "HC Ad Hoc Group Charge - February 13 2014 – APPROVED"
3. Structured Decision Making 101 Webinar Information (June 28, 2013)
    a. Presentation: "Components of Structured Decision Making MRRIC Final"
    b. Summary: "SDM101 Webinar Summary 6-28-13 FINAL"
    c. Webinar recording: http://resolv.adobeconnect.com/p6qi96rluc0/
4. PrOACT Overview Webinar (July 16, 2013)
    a. Presentation: "MRRP SDM PrOACT MRRIC Overview"
    b. Summary: "SDM Debrief Webinar Summary 07-16-13 v2"
    c. Webinar recording: http://resolv.adobeconnect.com/p9sqwsfgwh6/
5. Compilation of PrOACT Questions from Webinars (August 2013): "SDM-PrOACT Questions from Webinars"

Background and Contextual Documents:

6. P&G 1983: "P&G_1983"
7. Planning Guidance Notebook – ER-1105-2-100: "Planning Guidance Notebook - ER_1105-2-100--Apr00"
8. Draft Management Plan Overview and Schedule: "2014-01-23 Draft Management Plan Overview and Schedule"
9. Critical Engagement Points document: "2014-01-23_MRRIC and ISAP CEP v11 (redline)"
10. Problem Statement Working Document: "Problem Statement as of February 11 v1".
11. Sideboards Document: "2014-01-10_USACE Action Item 4 HC Sideboards v5"
12. Effects Analysis Approach Document: "Effects Analysis guidance document 09 13 13_V5"
13. Prologue to the HC recommendations: "MRRIC HC Recs Prologue v65"

For Substantive Review:

14. Current set of MRRIC HC Objectives and Performance Metrics, with MRRIC edits/comments: "MRRIC HC Obj Metrics Recommendations v3"
15. Compilation of human considerations, submitted by members between January and August 2013: "Human Considerations Compilation Sept. 4, 2013"
16. HC Objectives by Accounts: "HC Objs by Account Diagram Handout_10-31-13_v3"
17. Human Considerations Comment and Response Summary – "Summary Comments and Responses_Human Considerations_01.31.14"
18. Human Considerations - Draft Objectives and Performance Metrics Crosswalk: "HC Objectives Crosswalk_10.30.13"
19. HC Objectives and Metrics Outline Version (also referred to as the "salmon sheet'): "HC Objectives and Metrics Outline Version 10-31-13_v2")
20. 14 Strawmen Documents (organized by interest):
    a. Agriculture
    b. Recreation
    c. Dredging
    d. Navigation
    e. Flood Risk
    f. Environmental
    g. Irrigation
    h. Hydropower
    i. Thermal, Water Supply, and Wastewater
    j. Water Quality
    k. Local Government
    l. Tribal
    m. Cultural Resources
    n. Wastewater
21. Alternatives Development Methodology and Decision Analysis Approach: "ADM/DAA April 2014 (MRRIC)"

22. Draft Framework for Human Considerations Objectives and Performance Metrics and Associated Modeling/Methodology: June 2014
23. MRRP Adaptive Management Concept, Version 1, July 11, 2014

Appendix C: Comparison of Stakeholder Concerns (expressed in the raw data) with the HC Framework Document

Commenter's Name	Interest Area	Issue	Was issue Addressed?	Document Location
Don Borgman	Agriculture	Local Economic Impact	Yes	RED Objective 1
Don Borgman	Agriculture	Crop delay due to high-water tables	Yes	RED Objective 1
Don Borgman	Agriculture	Effect on food output worldwide	No	
Don Borgman	Agriculture	Flooding due to high river stages	Yes	RED Objective 3
Don Borgman	Agriculture	River navigation efficiency	Yes	RED Objective 6
Don Borgman	Agriculture	Tax revenue loss	Yes	RED Objective 1
Don Borgman	Agriculture	Environmental Benefits	Yes	EQ Objective 1
Kari Herrick	Agriculture	Irrigation Water	Yes	RED Objective 5
Kari Herrick	Agriculture	Overland Flooding	Yes	NED Objective 13
Kari Herrick	Agriculture	Noxious Weeds	Yes	OSE Objective 8
Randy Asbury	Agriculture	Bank Erosion on Private Property	No	
Randy Asbury	Agriculture	Interior Drainage	Yes	RED Objective 1
Randy Asbury	Agriculture	Levee Integrity	Yes	RED Objective 3
Randy Asbury	Agriculture	Flood Risk Below Platte River	No	
Randy Asbury	Agriculture	Flood Risk due to Manmade Releases	Yes	RED Objective 3
Randy Asbury	Agriculture	Flood Risks due to Coincidence	Yes	RED Objective 3
Randy Asbury	Agriculture	Irrigation Intake	Yes	RED Objective 5
Randy Asbury	Agriculture	River Nutrient amount	Yes	OSE Objective 5
Shawn Shouse	Agriculture	Trespassing Concerns	No	
Shawn Shouse	Agriculture	Flood Flow Diversions	Yes	RED Objective 3
Shawn Shouse	Agriculture	Flood Storage	Yes	RED Objective 3
Shawn Shouse	Agriculture	Agriculture and Wildlife Cohabitation	Yes	EQ Objective 1
John Lott	Agriculture	Livestock Grazing near reservoirs	Yes	NED Objective 1
David Shorr	Dredging	Sediment Load	Yes	NED Objective 5

Commenter's Name	Interest Area	Issue	Was issue Addressed?	Document Location
David Shorr	Dredging	Bed Load	Yes	RED Objective 3
David Shorr	Dredging	Commercial Sand Production	Yes	RED Objective 2
David Shorr	Dredging	BSNP Integrity	Yes	EQ Objective 1
Bill Lay	Dredging	Streambed Degradation	Yes	EQ Objective 1
John Lott	Environmental Conservation	Fish and Wildlife production	Yes	EQ Objective 1
Paul Lepisto	Environmental Conservation	Native Fish Reproduction	Yes	EQ Objective 1
Paul Lepisto	Environmental Conservation	Terrestrial Habits	Yes	EQ Objective 1
Brad Walker	Environmental Conservation	Floodplain and River Ecosystems	Yes	EQ Objective 1
Thomas Ball	Environmental Conservation	Global Warming Effects	No	
Thomas Ball	Environmental Conservation	Greenhouse Gas	Yes	OSE Objective 4
Paul Lepisto	Environmental Conservation	Wetland Preservation	Yes	OSE Objective 4
Thomas Ball	Environmental Conservation	Restoration of Natural Hydrography	Yes	EQ Objective 1
Thomas Ball	Environmental Conservation	Shallow water performance metric	Yes	EQ Objective 1
Thomas Ball	Environmental Conservation	Public Health	Yes	OSE Objective 13
Marian Maas	Environmental Conservation	Impact on Wildlife	Yes	EQ Objective 1
Marian Maas	Environmental Conservation	Impact on Wildlife	Yes	EQ Objective 1
Thomas Ball	Environmental Conservation	Greenhouse Gas	Yes	OSE Objective 4
Brad Walker	Environmental Conservation	Missouri River and Floodplain Function	Yes	NED Objective 13
Paul Lepisto	Environmental Conservation	Native Fish Reproduction	Yes	EQ Objective 1
Paul Lepisto	Environmental Conservation	Wetlands Effects	Yes	OSE Objective 1
Paul Lepisto	Environmental Conservation	Terrestrial Habits	Yes	EQ Objective 1
Thomas Ball	Environmental Conservation	Global Warming Effects	No	

Commenter's Name	Interest Area	Issue	Was issue Addressed?	Document Location
Bill Lay	Environmental Conservation	Invasive Species Control	Yes	OSE Objective 8
Robert Vincze	Flood Risk	Protection of Human Life	Yes	OSE Objective 6
Robert Vincze	Flood Risk	Effects on daily life from Flooding	Yes	OSE Objective 6
Robert Vincze	Flood Risk	Flood Emergency Response	Yes	OSE Objective 6
Robert Vincze	Flood Risk	Winter Release of Garrison	No	
Robert Vincze	Flood Risk	Release from Gavin's Point	No	
Robert Vincze	Flood Risk	Damage to Private Property	Yes	NED Objective 7
Robert Vincze	Flood Risk	Farmland Drainage	Yes	NED Objective 1
Robert Vincze	Flood Risk	Loss of Prime Farmland	Yes	NED Objective 1
Robert Vincze	Flood Risk	Water Retention	Yes	NED Objective 3
Robert Vincze	Flood Risk	Levee Maintenance	Yes	NED Objective 3
Robert Vincze	Flood Risk	Crop Insurance	Yes	NED Objective 13
Robert Vincze	Flood Risk	Navigation Channel Erosion	No	
Robert Vincze	Flood Risk	Encroachment Effects on Dams	No	
Robert Vincze	Flood Risk	Channel Width	Yes	NED Objective 2
Robert Vincze	Flood Risk	Self-Scouring Channels	No	
Robert Vincze	Flood Risk	Reduced Sediment effect on Erosion	No	
Robert Vincze	Flood Risk	U.S. Army Corps of Engineers Ability to Communicate	No	
Robert Vincze	Flood Risk	Effects of Tax Reduction on Public Schools	No	
Robert Vincze	Flood Risk	National and Regional Economic Development	Yes	NED Objective 1, RED Objective 1
Bill Lay	Flood Risk	River Flow effects on Flooding	Yes	RED Objective 3
Bill Lay	Flood Risk	Proper Reservoir Levels	No	
Brian Barels	Hydropower	Hydropower Rate Changes due to River Elevation	Yes	RED Objective 4
Thomas Graves	Hydropower	Timing of Hydropower Releases	Yes	RED Objective 4
Thomas Graves	Hydropower	Water Spillage Effects during Drought	No	

Commenter's Name	Interest Area	Issue	Was issue Addressed?	Document Location
Buzz Mattelin	Irrigation	Operation of Irrigation during Growing Season	Yes	RED Objective 5
Buzz Mattelin	Irrigation	Costs of Irrigation	Yes	RED Objective 5
Buzz Mattelin	Irrigation	Changes in Irrigation	Yes	RED Objective 5
Buzz Mattelin	Irrigation	Quality of Water	Yes	RED Objective 5
John Lott	Irrigation	Cost Effectiveness of Irrigation from Storage Reserves	Yes	NED Objective 5
Bill Lay	Irrigation	Range of Reservoir Levels where Irrigation is Feasible	Yes	OSE Objective 8
Bill Lay	Irrigation	Range of Stream Flows where irrigation is Feasible	Yes	OSE Objective 8
Bill Lay	Irrigation	Effects on Irrigation from Sediment Load	Yes	OSE Objective 8
Don Meisner	Local Government	Changes in Flood Control	Yes	OSE Objective 6
Don Meisner	Local Government	Flood Control	Yes	OSE Objective 6
Don Meisner	Local Government	Water Supply	Yes	OSE Objective 13
Don Meisner	Local Government	Recreation	Yes	OSE Objective 10
Don Meisner	Local Government	Water Supply	Yes	OSE Objective 13
Don Meisner	Local Government	Riverbed Degradation	No	
Franklyn Pogge	Local Government	Effects on Regional Economic Development	Yes	RED Objectives 1 through 11
Franklyn Pogge	Local Government	Effects on Dredging	Yes	RED Objective 2
Franklyn Pogge	Local Government	Effects on Local Economy	Yes	RED Objective 1 through 11
Franklyn Pogge	Local Government	Utilizing River to Full Potential	No	
Franklyn Pogge	Local Government	Effect on Local Cultural Resource	Yes	EQ Objective 2
Franklyn Pogge	Local Government	Flooding Effects on Community	Yes	OSE Objective 6
Franklyn Pogge	Local Government	Channel Effects on Navigation	Yes	RED Objective 6
Franklyn Pogge	Local Government	Effect on Recreation	Yes	OSE Objective 10

Commenter's Name	Interest Area	Issue	Was issue Addressed?	Document Location
Franklyn Pogge	Local Government	Effects on Environment	Yes	EQ Objective 1
Bill Lay	Local Government	Flood Risk Management Facilities	Yes	NED Objective 3
Marian Maas	Local Government	Increased Recreation Development	Yes	RED Objective 7
Marian Maas	Local Government	Revenue Growth from River Changes	Yes	RED Objective 7
Marian Maas	Local Government	Local Business Effect from Increased Recreation	Yes	RED Objective 7
Marian Maas	Local Government	Effect on Community from Changes	Yes	OSE Objective 10
John Lott	Local Government	Ability of Local Government to Meet Obligations	No	
Karen Rouse	Local Government	Repercussions on Land and Water Structures	No	
David Shorr	Navigation	Volume of Water Made Available for Navigation	Yes	OSE Objective 9
David Shorr	Navigation	Consistent Drafts needed for Barges	No	
David Shorr	Navigation	Preservation of BSNP	No	
David Shorr	Navigation	Increasing Tonnage on the River	Yes	NED Objective 6
Randy Asbury	Navigation	Shoaling	No	
Randy Asbury	Navigation	Channel Dimensions	Yes	OSE Objective 6
Randy Asbury	Navigation	Summer Navigation Flow	No	
Randy Asbury	Navigation	Channel Maintenance	Yes	NED Objective 12
Randy Asbury	Navigation	Tow and Draft Reductions	No	
Randy Asbury	Navigation	Channel Reliability	Yes	OSE Objective 9
Randy Asbury	Navigation	Effects on Mississippi River Commerce	Yes	NED Objective 6
Randy Asbury	Navigation	Changes to Reservoir Storage Levels	No	
Randy Asbury	Navigation	Effects on Flood Control	Yes	OSE Objective 6
Kenneth Reeder	Recreation	Economic Impact	Yes	RED Objective 7
Marian Maas	Recreation	Increased Recreation Effects	Yes	RED Objective 7
Paul Lepisto	Recreation	Recreation Industry Changes	Yes	RED Objective 7

Commenter's Name	Interest Area	Issue	Was issue Addressed?	Document Location
Paul Lepisto	Recreation	Recreation Access	Yes	OSE Objective 10
Paul Lepisto	Recreation	Fish Spawning	Yes	EQ Objective 1
Paul Lepisto	Recreation	Invasive Species	Yes	OSE Objective 8
John Lott	Recreation	Recreation use of Public Areas along River	Yes	OSE Objective 10
Karen Rouse	Recreation	Effects on State Parks and Historical Property	No	
Bill Lay	Recreation	Stable Summer Flow below Gavin's Point	No	
Bill Lay	Recreation	Determine Optimum Levels for Fish Reproduction	Yes	EQ Objective 1
Bill Lay	Recreation	Determine Unstable Level for Reservoir	No	
Bill Lay	Recreation	Determine Optimal Level for Recreation	No	
Bill Lay	Recreation	Determine Unstable River Level	No	
Brian Barels	Thermal Power	Impact of Thermal Intakes on Power Output	Yes	RED Objective 8
Brian Barels	Thermal Power	Monthly Maximum River Temperature	Yes	NED Objective 8
Brian Barels	Thermal Power	Flow Rate at Thermal Intake	No	
Brian Barels	Thermal Power	Likelihood of Ice Dam Formation	No	
Brian Barels	Thermal Power	Change in Thermal Price due to Management Decisions	Yes	RED Objective 8
Chris VandeVenter	Thermal Power	Impact on Thermal Power from Drought	No	
John Pozzo	Thermal Power	Impacts on Thermal Plants from change	Yes	RED Objective 8
John Pozzo	Thermal Power	Impact on Thermal Power from Cooling	Yes	RED Objective 8
John Pozzo	Thermal Power	Navigation of Thermal Power Plant Parts	Yes	OSE Objective 9
John Pozzo	Thermal Power	Effect on Southern Power Plants	Yes	NED Objective 4
John Pozzo	Thermal Power	Wastewater Treatment Effects	Yes	NED Objective 9

Commenter's Name	Interest Area	Issue	Was issue Addressed?	Document Location
John Pozzo	Thermal Power	Minimize Creation of Ice Dams	No	
John Pozzo	Thermal Power	Impact of Increased Power Costs	Yes	RED Objective 4
John Pozzo	Thermal Power	Timing of Implementation of Change	No	
Bill Lay	Thermal Power	River Level Discharge Limits	Yes	OSE Objective 11
Thomas Graves	Tribal Interests	Tribal Water Intakes	Yes	OSE Objective 12
Thomas Graves	Tribal Interests	Tribal Flooding Risks	Yes	OSE Objective 12
Karen Rouse	Wastewater	Ability of Dischargers to have Reliable Flow	Yes	RED Objective 9
Karen Rouse	Wastewater	Water Quality Downstream	Yes	NED Objective 10
Karen Rouse	Wastewater	Water Quality Upstream	Yes	NED Objective 10
Karen Rouse	Wastewater	Cumulative Effect of Waste loads	Yes	NED Objective 10
Karen Rouse	Wastewater	Changes in Water Quality due to Wastewater	Yes	NED Objective 10
Karen Rouse	Water Quality	Water Supply	Yes	OSE Objective 11
Karen Rouse	Water Quality	Changes in Water Quality	Yes	OSE Objective 11
Karen Rouse	Water Quality	Effect on Water Processing Costs	Yes	RED Objective 10
Karen Rouse	Water Quality	Wastewater Effects	Yes	NED Objective 10
Karen Rouse	Water Quality	Treatment Changes	Yes	NED Objective 10, OSE Objective 13
Karen Rouse	Water Quality	Effects due to Pollutants	Yes	OSE Objective 10
Karen Rouse	Water Quality	Effects on Community Well-being	Yes	OSE Objective 10
Karen Rouse	Water Quality	Effects on Fish	Yes	EQ Objective 1
Karen Rouse	Water Quality	Effects on Visitors	Yes	OSE Objective 10
Karen Rouse	Water Quality	Value of High Quality Water to Residents	Yes	OSE Objective 13

Commenter's Name	Interest Area	Issue	Was issue Addressed?	Document Location
Karen Rouse	Water Quality	Pesticide and Fertilizer Effect on Water Quality	Yes	NED Objective 13
Karen Rouse	Water Quality	Cost of Removing Pollutants	Yes	NED Objective 11
Karen Rouse	Water Quality	Effect of Water Quality on Recreation	Yes	OSE Objective 10
Karen Rouse	Water Quality	Effects of Water Quality on Wildlife	Yes	EQ Objective 1
Marian Maas	Water Quality	Demand for High Quality Water Reducing Available Amount	No	
Marian Maas	Water Quality	Improved Water Quality through increase in Wetlands	No	
Marian Maas	Water Quality	Enrollment of Floodplains in NRCS Programs	No	
Marian Maas	Water Quality	Recognition of Natural Flow Regime	No	
Marian Maas	Water Quality	Improve Water Quality by Slowing River	No	
Marian Maas	Water Quality	Improve Macro invertebrate Diversity and Abundance by Slowing River	No	
Marian Maas	Water Quality	Human Values	No	
Marian Maas	Water Quality	Reduction of Wetlands causing Water Quality to decline	Yes	OSE Objective 4
Marian Maas	Water Quality	Importance of High Quality Water	Yes	OSE Objective 13
Marian Maas	Water Quality	Health Risks of Water	Yes	OSE Objective 13
Marian Maas	Water Quality	Contaminants affecting young Pallid Sturgeon	No	
Marian Maas	Water Quality	Recreational Benefit of Diverse Wildlife	Yes	OSE Objective 10
Karen Rouse	Water Quality	Impacts of Missouri Water Laws	No	
Mike Armstrong	Water Supply	Need of Clean Water	Yes	OSE Objective 13
Mike Armstrong	Water Supply	Need for Continuous Water Availability	Yes	NED Objective 11

Commenter's Name	Interest Area	Issue	Was issue Addressed?	Document Location
Mike Armstrong	Water Supply	Fixed Intake Valves Require Consistent Water Levels	Yes	NED Objective 11
Mike Armstrong	Water Supply	Protection of Water Supply Facilities	No	
Mike Armstrong	Water Supply	Number of Intake Valves	Yes	NED Objective 11
Mike Armstrong	Water Supply	Cost of Replacing Intake Valves	Yes	NED Objective 11
Mike Armstrong	Water Supply	Reconstruction of Valves may not be Feasible	No	
Mike Armstrong	Water Supply	Intake Valve Replacement Costs Absorbed by Taxpayers and Ratepayers	Yes	RED Objective 11
Mike Armstrong	Water Supply	Changes Required by Smaller Water Supply Facilities	Yes	RED Objective 11
Mike Armstrong	Water Supply	Effects on Larger Municipal Water Supply Facilities	Yes	NED Objective 11
Mike Armstrong	Water Supply	Expected Increase in Demand for Water	Yes	RED Objective 10
Mike Armstrong	Water Supply	Degradation of River Bed effecting Intake Valves and Wells	No	
Mike Armstrong	Water Supply	Intake Valves Jeopardized by Siltation and Aggradation	No	
Mike Armstrong	Water Supply	Power Plant Cooling Intakes	Yes	NED Objective 8
Mike Armstrong	Water Supply	Impact of Interrupting Power Plant Operations	Yes	RED Objective 11
Mike Armstrong	Water Supply	Water Quality affected by Low Water Levels	Yes	NED Objective 11
Mike Armstrong	Water Supply	Fixed Intake Replacement Costs	Yes	NED Objective 11
Mike Armstrong	Water Supply	Water Supply to Missouri River could be affected	Yes	NED Objective 11
Mike Armstrong	Water Supply	Fixed Intake Replacement Costs	Yes	NED Objective 11
Mike Armstrong	Water Supply	Accessibility of Water	Yes	NED Objective 11

Commenter's Name	Interest Area	Issue	Was issue Addressed?	Document Location
Mike Armstrong	Water Supply	Facilities affected by changes in River	Yes	NED Objective 11
Mike Armstrong	Water Supply	Cost of Replacing Intake Valves	Yes	NED Objective 11
Mike Armstrong	Water Supply	Reconstruction of Valves may not be Feasible	No	
Mike Armstrong	Water Supply	Intake Valve Replacement Costs Absorbed by Taxpayers and Ratepayers	Yes	RED Objective 11
Mike Armstrong	Water Supply	Effects on Municipal and Rural Water Systems and Irrigation	Yes	RED Objective 11
Mike Armstrong	Water Supply	Impact of Interrupting Power Plant Operations	Yes	RED Objective 11
Mike Armstrong	Water Supply	Fixed Intake Replacement Costs	Yes	NED Objective 11
Mike Armstrong	Water Supply	Cost of Replacing Intake Valves	Yes	NED Objective 11
Mike Armstrong	Water Supply	Reconstruction of Valves may not be Feasible	No	
Mike Armstrong	Water Supply	Intake Valve Replacement Costs Absorbed by Taxpayers and Ratepayers	Yes	RED Objective 11
Mike Armstrong	Water Supply	Protection of Water Supply Facilities by U.S. Army Corps of Engineers	No	
Mike Armstrong	Water Supply	Protection of Water Supply Quality by U.S. Army Corps of Engineers	No	
Mike Armstrong	Water Supply	Low Summer Flow Problems	No	
Mike Armstrong	Water Supply	Water Quality affected by Algae	Yes	OSE Objective 13
Mike Armstrong	Water Supply	Drought Conservation Measures affect Intake Valves	No	
Mike Armstrong	Water Supply	Sustainability of Current Water Suppliers	Yes	RED Objective 10
Mike Armstrong	Water Supply	River Bed Degradation affecting Pump Bays	No	
Mike Armstrong	Water Supply	Weather Conditions can affect Pump bays	No	

Commenter's Name	Interest Area	Issue	Was issue Addressed?	Document Location
Mike Armstrong	Water Supply	Corp Should Develop Minimum Elevation Levels	No	
Mike Armstrong	Water Supply	Effects on Power Cooling Intakes	Yes	NED Objective 8
Mike Armstrong	Water Supply	Low Summer Flow Effects on Power Plant Intake	No	
Mike Armstrong	Water Supply	Impact of Interrupting Power Plant Operations	Yes	RED Objective 11
Mike Armstrong	Water Supply	Accessibility of Water	Yes	NED Objective 11
Joel Christensen	Water Supply	Acceptable Level of Missouri River	No	
John Lott	Water Supply	Water Supply to Municipalities	Yes	NED Objective 11

(A "no" indicates that ISETR did not find this issue addressed in the HC Framework Document. See report text on pages 17 and 18 for further discussion.)