Final Independent External Peer Review Report for the Integrated Feasibility Study and Supplemental Environmental Impact Statement for the Medium Diversion at White Ditch Plaquemines Parish, Louisiana

Prepared by
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Prepared for
Department of the Army
U.S. Army Corps of Engineers
Ecosystem Restoration Planning Center of Expertise
Rock Island District

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June 23, 2010
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EXECUTIVE SUMMARY

The U.S. Army Corps of Engineers (USACE) is simultaneously conducting five independent External Peer Reviews (IEPRs) under one project (LCA 6 project) to review six elements of the Louisiana Coastal Area (LCA) Ecosystem Restoration Project. As part of the LCA 6 project, an IEPR was conducted for the Medium Diversion at White Ditch project (hereinafter referred to as White Ditch project).

The White Ditch project study area is located in LCA Subprovince 1 in the Breton Sound hydrologic basin in Plaquemines Parish, Louisiana. The boundary of the project encompasses over 98,000 acres of intermediate to brackish intertidal wetland habitats. The study area boundary follows distinct landscape features, beginning in the north with the confluence of the non-Federal back levee and the Forty-Arpent canal. It then extends along the non-Federal back levee, the Mississippi River levee, the Federal back levee, and along the left descending natural bank of the Mississippi River to the west; past American Bay, California Bay, and through Breton Sound, near Bay Gardene to the south; and into and along River aux Chenes to the east. The area has been significantly impacted by recent tropical storms and hurricanes and is currently isolated from the effects of the Caernarvon freshwater diversion located at the northern end of the Breton Sound basin. There are two discrete project locations that will be considered in the White Ditch study: (1) the area along the Mississippi River where a freshwater diversion structure might be located; and (2) the project area that could be influenced and benefited by the diverted freshwater. The footprint of both of these areas will be dependent upon the overall size and capacity of the diversion structure recommended in the report.

Battelle, as a 501(c)(3) non-profit science and technology organization with experience in establishing and administering peer review panels for USACE, was engaged to coordinate the IEPR of the Integrated Feasibility Study and Supplemental Environmental Impact Statement for the Medium Diversion at White Ditch, Plaquemines Parish, Louisiana, hereinafter referred to as the White Ditch report). Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analyses. The IEPR was external to the agency and conducted following USACE and Office of Management and Budget (OMB) guidance described in USACE (2010), USACE (2007), and OMB (2004). This final report describes the IEPR process, describes the IEPR panel members and their selection, and summarizes the Final Panel Comments of the IEPR Panel (the Panel).

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1 Two of the six elements were reviewed under one independent external peer review.
Five panel members were selected for the IEPR from more than 90 identified candidates for the five LCA 6 project IEPR panels. Based on the technical content of the White Ditch report and the overall scope of the project, the final panel members were selected for their technical expertise in the following key areas: civil design/construction cost engineering, Civil Works planning, wetland ecology, hydrology and hydraulics engineering, and economics.

The Panel received electronic versions of the White Ditch report, along with a charge that solicited comments on specific sections of the documents to be reviewed. The USACE Project Delivery Team briefed the Panel and Battelle during a kick-off meeting held via teleconference prior to the start of the review. Other than this teleconference, there was no direct communication between the Panel and USACE during the peer review process. The Panel produced more than 500 individual comments in response to the 132 charge questions.

IEPR panel members reviewed the White Ditch report documents individually. The panel members then met via teleconference with Battelle to review key technical comments, discuss charge questions for which there were conflicting responses, and reach agreement on the Final Panel Comments to be provided to USACE. Each Final Panel Comment was documented using the following four-part format: (1) a comment statement; (2) the basis for the comment; (3) the significance of the comment (high, medium, or low); and (4) recommendations on how to resolve the comment. Overall, 19 Final Panel Comments were identified and documented. Of these, four were identified as having high significance, seven had medium significance, and eight had low significance.

Table ES-1 summarizes the Final Panel Comments by level of significance. Detailed information on each comment is contained in Appendix A of this report.

Table ES-1. Overview of 19 Final Comments Identified by the White Ditch IEPR Panel

<table>
<thead>
<tr>
<th>Significance – High</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A systems analysis examining the cumulative effects of the existing and proposed diversion projects should be included to determine impacts that site-specific diversion operations will have on the overall system.</td>
</tr>
<tr>
<td>2</td>
<td>Documentation on the Boustany model is needed to determine whether the model is being appropriately applied.</td>
</tr>
<tr>
<td>3</td>
<td>The potential for substantial colonization of exotic and invasive species does exist and the approach to control these species as described in the White Ditch report is not feasible.</td>
</tr>
<tr>
<td>4</td>
<td>The Monitoring and Adaptive Management Plan provides adequate description of the monitoring and reporting systems and their costs, but little information on the potential range of adaptive management options and related costs.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Significance – Medium</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>More information about the sources of the cost and environmental output figures used in the Cost Effectiveness/Incremental Cost Analysis (CE/ICA) (Appendix K) needs to be provided.</td>
</tr>
<tr>
<td></td>
<td>The hydrology discussion is not complete, and the links between the hydrology and vegetative communities need to be explained.</td>
</tr>
<tr>
<td>---</td>
<td>--------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>7</td>
<td>A planning objective of the White Ditch project is to design and operate the diversion in a manner that minimizes deposition and shoaling in the river, but details of how this will be accomplished are not provided.</td>
</tr>
<tr>
<td>8</td>
<td>The processes contributing to relative sea level rise, and the variability in processes other than global sea level rise, require further discussion and consideration.</td>
</tr>
<tr>
<td>9</td>
<td>More quantitative indices for each variable within the Wetland Value Assessment (WVA) model need to be provided.</td>
</tr>
<tr>
<td>10</td>
<td>Lessons learned from related previous and ongoing diversion efforts, and how these data were considered in the assessment and comparison of proposed project alternatives, should be provided.</td>
</tr>
<tr>
<td>11</td>
<td>A more detailed description and justification of the irreversible and irretrievable commitments of resources is required to determine their significance.</td>
</tr>
</tbody>
</table>

**Significance – Low**

|   | The reason for identifying a very specific numeric target for Objective C (1,328,580 cubic yards) is not clear, nor is it clear that this target is met by the Tentatively Selected Plan (TSP). |
|   | The model calibration analysis should be revised when more accurate data are available. |
|   | The Real Estate Plan (Appendix J) requires an explanation of the source of the per acre real estate easement, acquisition costs and cost adjustment factors that were used to generate Total Real Estate Costs. |
|   | The basis of the estimates of incidental recreational benefits associated with the alternatives that are presented in Section 3.5.5.1 of the White Ditch report and referenced back to Annex 1 of Appendix K need to be explained. |
|   | It is not clear whether potential impacts associated with the proposed flow constrictors have been fully considered. |
|   | The overarching problems motivating the White Ditch project, their magnitude, and the need for project implementation should be clearly and specifically stated in an introductory paragraph. |
|   | The discussion of fulfilling project goals and objectives is not complete. |

The Panel generally agreed on its “assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used” (USACE, 2010; p. D-4) in the White Ditch report. In particular it is the Panel's opinion that the document sections and appendices related to economics were very well written, provided useful details about underlying costs and expected environmental outputs, and presented convincing arguments in support of plan selection. The Panel generally agreed that the project is technically sound.
although some important details are missing as noted in the Final Panel Comments (see Appendix A).

**Plan Formulation Rationale:** The primary concern raised by the Panel involved the reliance on acreage estimates calculated by the Boustany model, which along with the Wetland Value Assessment (WVA), are incompletely documented in the White Ditch report. Additional information on these models, including calibration parameters, is required for the Panel to determine if the models are being appropriately applied and to engender confidence in the modeling process and results. In general, the Panel was unable to determine if a systems analysis examining the cumulative effects of the existing and proposed diversion projects was conducted during the White Ditch project planning process to determine site-specific impacts to the overall system. This information, along with a discussion on how lessons learned from related previous diversion efforts were considered in the assessment and a comparison of project alternatives, should be included in the White Ditch report. There is also a concern in that Adaptive Management is recognized as being appropriate for this project yet little information on the potential range of adaptive management options is presented. Additionally the Panel felt that the discussion of the effectiveness of the Tentatively Selected Plan (TSP) in meeting project goals and objectives was incomplete. For example, it is not clear, based on the information presented, whether the project objective for sediment delivery is met by the TSP.

**Engineering:** The engineering discussion of the project included in the White Ditch report is generally thorough, although there appear to be some engineering aspects important to project success that were not completely addressed at this point. One such important aspect that was not included is the influence of operating other planned or ongoing diversions. Since hydrology is obviously an important part of a diversion project, it is imperative to consider the entire study area as a system of diversions, where projects operating upstream may have a significant effect downstream. A significant issue raised by the Panel was that the engineering considerations for the White Ditch project did not include an analysis of the project as component of a system of diversions. Other engineering aspects not clearly presented are the links between hydrology, vegetative communities, and marsh loss/gain, as well as the planned operations of the diversion to minimize deposition in the canals and shoaling in the river. Also, it was not clear to the Panel whether constraints related to access and navigation through the proposed project area were adequately considered. The Panel recommends that the hydrodynamic model calibration be revised once more accurate data are available.

**Economics:** The links between the quantitative analysis of expected benefits presented in the White Ditch report and the final cost and environmental output figures used in the Cost Effectiveness/Incremental Cost Analysis (CE/ICA) to justify the selection of the TSP need to be more fully developed and justified. Some critical numbers used in the ICA cannot be traced back to any of the particular sources that are identified, or analytical results that are provided in the report. This makes it difficult to have confidence in results of the ICA. The document and appendices should be revised so that numbers used in the critical CE/ICA are clearly connected and referenced, preferably to specific tables in the appendices that are stated as being the sources of various numbers. The Panel noted that the cost estimates used in the CE/ICA do not appear to be developed or described in the text or in Appendix K. Other economic concerns are related to the unit value of easements and acquisition costs that are used, but not explained or referenced,
as well as the difficulty of determining what assumptions or analyses were used to estimate the incidental recreation benefits in Annex 1 to Appendix K.

**Environmental:** The potential for substantial colonization by invasive species is a significant environmental challenge, and a realistic approach towards addressing this issue as an element of the proposed plan does not appear to be feasible. Also, the description of the irreversible and irretrievable commitments of resources is vague, and requires further details regarding the types of resources impacted and the magnitude of those impacts. Relative sea level rise (RSLR) is a key issue on a project of this nature. Although relative sea level rise is well considered within the planning framework, a discussion of assumptions regarding fundamental processes (e.g., subsidence, salinity regimes, and organic and inorganic accretion rates) that contribute to RSLR and the potential impacts on vegetation community zonation shifts, marsh loss, and marsh gain is required.
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Appendix A. Final Panel Comments on the Integrated Feasibility Study and Supplemental Environmental Impact Statement for the Medium Diversion at White Ditch, Plaquemines Parish, Louisiana


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LIST OF ACRONYMS

AAHU  Average Annual Habitat Units
ATR   Agency Technical Review
CE/ICA Cost Effectiveness/Incremental Cost Analysis
CEM   Conceptual Ecological Model
CPRA  Coastal Protection and Restoration Authority
CY    Cubic Yards
DrChecks Design Review and Checking System
EFH   Essential Fish Habitat
ERDC  Engineer Research and Development Center
HSI   Habitat Suitability Indices
HU    Habitat Unit
ICA   Incremental Cost Analysis
IEPR  Independent External Peer Review
LCA   Louisiana Coastal Area
OMB   Office of Management and Budget
PED   Preconstruction Engineering and Design
NTP   Notice to Proceed
RSLR  Relative Sea Level Rise
SLR   Sea Level Rise
TSP   Tentatively Selected Plan
USACE United States Army Corps of Engineers
USEPA United States Environmental Protection Agency
USGS  United States Geological Survey
WRDA  Water Resources Development Act
WVA   Wetland Value Assessment
1. INTRODUCTION

The Water Resources Development Act of 2007 (WRDA) authorized the Louisiana Coastal Area (LCA) program. Specifically, WRDA Section 7006(e)(3) requires the Secretary of the Army to submit one feasibility report to Congress on the following six elements of the project (hereinafter referred to as LCA 6 project):

1) Terrebonne Basin Barrier Shoreline Restoration,
2) Small Diversion at Convent/Blind River,
3) Amite River Diversion Canal Modification,
4) Medium Diversion at White Ditch,
5) Convey Atchafalaya River Water to Northern Terrebonne Marshes, and

The Congressional language in WRDA further authorizes construction of these six elements contingent upon submittal of a favorable report from the Chief of Engineers no later than December 31, 2010. The U.S. Army Corps of Engineers (USACE) is the Federal sponsor for the projects and the non-Federal sponsor is Louisiana’s Coastal Protection and Restoration Authority (CPRA).

Five individual IEPRs are being conducted simultaneously under one project (LCA 6 project) to review the six elements of the LCA Ecosystem Restoration Project. As part of the LCA 6 project, an Independent External Peer Review (IEPR) was conducted for the Medium Diversion at White Ditch project (hereinafter referred to as the White Ditch project).

The White Ditch project study area is located in LCA Subprovince 1 in the Breton Sound hydrologic basin in Plaquemines Parish, Louisiana. The boundary of the project encompasses over 98,000 acres of intermediate to brackish intertidal wetland habitats. The study area boundary follows distinct landscape features, beginning in the north with the confluence of the non-Federal back levee and the Forty-Arpent canal. It then extends along the non-Federal back levee, the Mississippi River levee, the Federal back levee and along the left descending natural bank of the Mississippi River to the west; past American Bay, California Bay, and through Breton Sound, near Bay Gardene to the south; and into and along River aux Chenes to the east. The area has been significantly impacted by recent tropical storms and hurricanes and is currently isolated from the effects of the Caernarvon freshwater diversion located at the northern end of the Breton Sound basin.

There are two discrete project locations that will be considered in this study: (1) the area along the Mississippi River where a freshwater diversion structure might be located; and (2) the project area that could be influenced and benefited by the diverted freshwater. The footprint of both of these areas will be dependent upon the overall size and capacity of the diversion structure recommended in the report.

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2 Two of the six elements were reviewed under one independent external peer review.
The area of interest where a diversion structure could be located occurs on the left descending bank of the Mississippi River, between Bertrandville to the north (river mile 69) and the community of Davant to the south (river mile 51). An area of particular interest for this study is the stretch between White Ditch (river mile 64.4) and Phoenix (river mile 59.7). This 4.7-mile stretch is unique in that there is no hurricane protection levee (back levee) on the marsh side that protects existing homes and infrastructure from elevated water levels (tidal or storm surge). The Mississippi River levee is the only flood protection structure that keeps river water from entering the project study area. This situation minimizes the amount of infrastructure that could be affected by construction of a diversion structure and allows for a broader array of measures to be considered in addressing problems in the project area. The project study area is approximately 98,000 acres encompassing an estuarine marsh system that has been heavily influenced by both man-made and natural processes. Channel construction, subsidence, erosion, saltwater intrusion, and storm-related damages have all significantly altered the natural environment, causing extensive losses of wetland habitats.

The objective of this work is to conduct an independent external peer review (IEPR) of the Integrated Feasibility Study and Supplemental Environmental Impact Statement Medium Diversion at White Ditch, Plaquemines Parish, Louisiana (hereinafter referred to as the White Ditch report) in accordance with the Department of the Army, U.S. Army Corps of Engineers, Water Resources Policies and Authorities’ Civil Works Review Policy (EC 1165-2-209) (USACE, 2010), USACE CECW-CP memorandum Peer Review Process (USACE, 2007), and the Office of Management and Budget’s Final Information Quality Bulletin for Peer Review (USACE, 2004). Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analyses.

This final report details the IEPR process, describes the IEPR panel members and their selection, and summarizes the Final Panel Comments of the IEPR Panel on the existing environmental, economic and engineering analyses contained in the White Ditch report. Detailed information on the Final Panel Comments is provided in Appendix A.

2. PURPOSE OF THE IEPR

To ensure that USACE documents are supported by the best scientific and technical information, USACE has implemented a peer review process that uses IEPR to complement the Agency Technical Review (ATR), as described in USACE (2010) and USACE (2007).

In general, the purpose of peer review is to strengthen the quality and credibility of the USACE decision documents in support of its Civil Works program. IEPR provides an independent assessment of the economic, engineering, and environmental analysis of the project study. In particular, the IEPR addresses the technical soundness of the project study’s assumptions, methods, analyses, and calculations and identifies the need for additional data or analyses to make a good decision regarding implementation of alternatives and recommendations. The IEPR is limited to technical review and will not involve policy review.
In this case, the IEPR of the White Ditch report was conducted and managed using contract support from Battelle, which is an Outside Eligible Organization under section 501(c)(3) of the U.S. Internal Revenue Code with experience conducting IEPRs for USACE.

3. METHODS

This section describes the method followed in selecting the members for the IEPR Panel (the Panel) and in planning and conducting the IEPR of the White Ditch report. The IEPR was conducted following procedures described by USACE (2010) and in accordance with USACE (2007) and OMB (2004) guidance. Supplemental guidance on evaluation for conflicts of interest was obtained from the Policy on Committee Composition and Balance and Conflicts of Interest for Committees Used in the Development of Reports (The National Academies, 2003).

3.1 Planning and Schedule

After receiving the notice to proceed (NTP), Battelle held a kick-off meeting on the entire LCA 6 project with USACE to review the preliminary/suggested schedule for each of the five reviews, discuss the IEPR process, and address any questions regarding the scope (e.g., clarify expertise areas needed for panel members). Any revisions to the schedule were submitted as part of the final Work Plan.

Table 1 outlines the tasks conducted under this project and defines the schedule followed in executing the White Ditch IEPR. Tasks 1 through 4 were conducted concurrently for all five IEPRs being conducted under the LCA 6 project. For instance, one work plan applicable to all five LCA 6 reviews was prepared and submitted. Table 1 is based on receipt of approval from the USACE Contracting Officer to begin initial work on the project (i.e., Pre-award funding approval) on March 12, 2010. The actual meeting dates and receipt of the White Ditch report are specific for this review. Note that the work items listed in Task 8 occur after the submission of this IEPR report. Battelle will enter the 19 Final Panel Comments developed by the Panel into USACE’s Design Review and Checking System (DrChecks), a Web-based software system for documenting and sharing comments on reports and design documents, so that USACE can review and respond to them. USACE will provide responses (Evaluator Responses) to the Final Panel Comments, and the Panel will respond (Backcheck Responses) to the Evaluator Responses. All USACE and Panel responses will be documented by Battelle.

Table 1. White Ditch IEPR Schedule

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<thead>
<tr>
<th>TASK</th>
<th>ACTION</th>
<th>DUE DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pre-award funding approval&lt;sup&gt;a&lt;/sup&gt;</td>
<td>March 12, 2010</td>
</tr>
<tr>
<td></td>
<td>NTP/review documents available</td>
<td>March 24, 2010</td>
</tr>
<tr>
<td></td>
<td>Battelle prepares draft Work Plan&lt;sup&gt;b&lt;/sup&gt;</td>
<td>April 9, 2010</td>
</tr>
<tr>
<td></td>
<td>USACE provides comments on draft Work Plan</td>
<td>April 14, 2010</td>
</tr>
<tr>
<td>2</td>
<td>Battelle recruits and screens up to 30 potential panel members; prepares summary information&lt;sup&gt;a&lt;/sup&gt;</td>
<td>April 7, 2010</td>
</tr>
<tr>
<td></td>
<td>Battelle submits draft charge&lt;sup&gt;b&lt;/sup&gt;</td>
<td>April 9, 2010</td>
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<tr>
<td></td>
<td>USACE provides comments on draft charge</td>
<td>April 14, 2010</td>
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</tbody>
</table>
## 3.2 Identification and Selection of IEPR Panel Members

Each of the five LCA IEPRs required experts with identical areas of expertise corresponding to the technical content of the LCA projects: civil design/construction cost engineering, Civil Works planning, wetland ecology, hydrology and hydraulics engineering, and economics. Therefore, efforts to identify and recruit experts were consolidated.

Battelle initially identified 90 candidates for the five LCA 6 project IEPR panels, evaluated their technical expertise, and inquired about potential conflicts of interest. Of these, Battelle chose 29 of the most qualified candidates and confirmed their interest and availability. Of the 29 candidates, 25 were proposed for the final LCA panels (five experts per panel) and four were

<table>
<thead>
<tr>
<th>TASK</th>
<th>ACTION</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Battelle submits final Work Plan, including final charge&lt;sup&gt;b&lt;/sup&gt;</td>
<td>April 19, 2010</td>
</tr>
<tr>
<td></td>
<td>USACE approves final Work Plan, including final charge</td>
<td>April 20, 2010</td>
</tr>
<tr>
<td>4</td>
<td>Battelle selects no more than 25 panel members</td>
<td>April 7, 2010</td>
</tr>
<tr>
<td></td>
<td>Battelle submits list of selected panel members</td>
<td>April 7, 2010</td>
</tr>
<tr>
<td></td>
<td>USACE provides comments on list of panel members</td>
<td>April 9, 2010</td>
</tr>
<tr>
<td></td>
<td>Battelle completes subcontracts for panel members</td>
<td>April 27, 2010</td>
</tr>
<tr>
<td>5</td>
<td>Kick-off meeting convened with USACE and Battelle</td>
<td>March 26, 2010</td>
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<tr>
<td></td>
<td>Kick-off meeting convened with Battelle and IEPR Panel</td>
<td>April 26, 2010</td>
</tr>
<tr>
<td></td>
<td>Kick-off meeting convened with USACE, Battelle, and IEPR Panel</td>
<td>April 27, 2010</td>
</tr>
<tr>
<td>6</td>
<td>Battelle sends review documents and charge to IEPR Panel</td>
<td>April 26, 2010</td>
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<tr>
<td></td>
<td>IEPR Panel completes review and provides comments to Battelle</td>
<td>May 13, 2010</td>
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<tr>
<td></td>
<td>Battelle consolidates comments from IEPR Panel</td>
<td>May 24, 2010</td>
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<tr>
<td></td>
<td>Consensus teleconference convened with IEPR Panel and Battelle</td>
<td>May 24, 2010</td>
</tr>
<tr>
<td>7</td>
<td>IEPR Panel provides draft Final Panel Comments to Battelle</td>
<td>June 2, 2010</td>
</tr>
<tr>
<td></td>
<td>Battelle submits final IEPR Report to USACE&lt;sup&gt;b&lt;/sup&gt;</td>
<td>June 23, 2010</td>
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<tr>
<td></td>
<td>Battelle inputs Final Panel Comments to DrChecks</td>
<td>June 25, 2010</td>
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<tr>
<td></td>
<td>USACE provides draft Evaluator Responses via e-mail (Word document)</td>
<td>June 26, 2010</td>
</tr>
<tr>
<td></td>
<td>Teleconference convened with USACE, Battelle, and IEPR Panel to discuss Final Panel Comments</td>
<td>July 6, 2010</td>
</tr>
<tr>
<td></td>
<td>USACE inputs final Evaluator Responses to Final Panel Comments in DrChecks</td>
<td>July 8, 2010</td>
</tr>
<tr>
<td></td>
<td>IEPR Panel responds to USACE Evaluator Responses (Backcheck Responses)</td>
<td>July 27, 2010</td>
</tr>
<tr>
<td></td>
<td>Battelle submits pdf of DrChecks file and closes out DrChecks&lt;sup&gt;b&lt;/sup&gt;</td>
<td>August 11, 2010</td>
</tr>
<tr>
<td></td>
<td>Project Closeout</td>
<td>October 21, 2010</td>
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</tbody>
</table>

<sup>a</sup> Requested to start on recruitment to meet the aggressive schedule  
<sup>b</sup> Deliverable  
<sup>c</sup> Task occurs after the submission of this report.
proposed as backup panel members for individual areas of expertise (the civil design/construction cost engineering panel member was presented without a backup). The backup panel members were the same for each of the five LCA IEPRs and would be able to serve on any panel that required their participation. The remaining candidates were not proposed for a variety of reasons, including lack of availability, disclosed conflicts of interest, or lack of the precise technical expertise required. The five primary and four backup panel members chosen for the White Ditch report IEPR are described in Section 4.0 of this report.

The candidates were screened for the following potential exclusion criteria or conflicts of interest. Participation in previous USACE technical peer review committees and other technical review panel experience was also considered.

- Involvement by you or your firm in any part of the LCA program, particularly the following six elements:
  - Multipurpose Operation of Houma Navigation Lock
  - Terrebonne Basin Barrier Shoreline Restoration
  - Small Diversion at Convent/Blind River
  - Amite River Diversion Canal Modification
  - Medium Diversion at White Ditch
  - Convey Atchafalaya River Water to Northern Terrebonne Marshes
- Involvement by you or your firm in any work related to the Louisiana Coastal Protection and Restoration Authority (CPRA).
- Involvement by you or your firm in ecosystem restoration, flood risk management, coastal storm damage reduction, or shoreline restoration projects in coastal Louisiana or Mississippi.
- Involvement by you or your firm in the conceptual or actual design, construction, or operations and maintenance of any projects for the LCA program, particularly the six elements listed in #1 above.
- Current employment by the USACE.
- Involvement with paid or unpaid expert testimony related to the LCA program, particularly the six elements listed in the first bullet above (LCA program elements).
- Current or previous employment or affiliation with the non-Federal sponsors or any of the following cooperating Federal, State, County, local and regional agencies, environmental organizations, and interested groups: Louisiana CPRA, Louisiana Office of Coastal Protection and Restoration, National Oceanic and Atmospheric Administration, U.S. Fish and Wildlife Service, Natural Resources Conservation Service, U.S. Environmental Protection Agency (USEPA), Minerals Management Service, and

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3 Battelle evaluated whether scientists in universities and consulting firms that are receiving USACE-funding have sufficient independence from USACE to be appropriate peer reviewers. See OMB (2004, p. 18), “…when a scientist is awarded a government research grant through an investigator-initiated, peer-reviewed competition, there generally should be no question as to that scientist's ability to offer independent scientific advice to the agency on other projects. This contrasts, for example, to a situation in which a scientist has a consulting or contractual arrangement with the agency or office sponsoring a peer review. Likewise, when the agency and a researcher work together (e.g., through a cooperative agreement) to design or implement a study, there is less independence from the agency. Furthermore, if a scientist has repeatedly served as a reviewer for the same agency, some may question whether that scientist is sufficiently independent from the agency to be employed as a peer reviewer on agency-sponsored projects.”

4 Note: Includes any joint ventures in which your firm is involved.
U.S. Geological Survey (USGS) and currently working on LCA-related projects (for pay or pro bono).

- Past, current, pending, or future interests (financial or otherwise) by you, your spouse or children related to the LCA program, particularly the six elements listed in #1 above, including interest in LCA-related contracts or awards from USACE.

- Current personal involvement with other USACE projects, including authoring any manuals or guidance documents for USACE. If yes, provide titles of documents or description of project, dates, and location (USACE district, division, Headquarters, Engineering Research and Development Center [ERDC], etc.), and position/role. Please highlight and discuss in greater detail any projects that are specifically with the New Orleans District.

- Current firm involvement with other USACE projects, specifically those projects/contracts that are with the New Orleans District. If yes, provide title/description, dates, and location (USACE district, division, Headquarters, ERDC, etc.) position/role.

- Any previous employment by the USACE as a direct employee or contractor (either as an individual or through your firm) within the last 10 years, notably if those projects/contracts are with the New Orleans District. If yes, provide title/description, dates employed, and place of employment (district, division, Headquarters, ERDC, etc.), and position/role.

- Previous experience conducting technical peer reviews. If yes, please highlight and discuss any technical reviews concerning:
  - shoreline restoration projects
  - hydrologic diversion projects
  - lock operation projects,
  and include the client/agency and duration of review (approximate dates).

- A significant portion (i.e., greater than 50%) of personal or firm revenues within the last 3 years came from USACE contracts.

- Participation in relevant prior Federal studies/programs relevant to this project, such as:
  - Coast 2050 Plan
  - LCA Ecosystem Restoration Study, 2004
  - Integrated Ecosystem Restoration and Hurricane Protection: Louisiana’s Comprehensive Master Plan for a Sustainable Coast, 2007
  - Louisiana Coastal Protection and Restoration Technical Report, 2009
  - LCA Near-term Restoration Plan, 2004

- Participation in relevant prior non-Federal studies/programs relevant to this project.

- Any publicly documented statement (including, for example, advocating for or discouraging against) related to the LCA program, particularly the six elements listed in LCA projects above.

- Is there any past, present or future activity, relationship or interest (financial or otherwise) that could make it appear that you would be unable to provide unbiased services on this project? If so, please describe.

In selecting the final 29 members for the 5 panels from the list of candidates, Battelle chose experts who best fit the expertise areas and had no conflicts of interest. Then, to assign each selected panel member to a specific IEPR, Battelle evaluated his or her background and expertise.
in more detail for experience that may be most appropriate for the individual LCA projects. For example, if a panel member had experience with coastal restoration, Battelle assigned him or her to the Terrebonne Basin Barrier Shoreline Restoration Project IEPR. In addition, Battelle made every effort to have at least one expert on each panel who had previously served on another IEPR panel managed by Battelle. This ensured that panel members unfamiliar with the process would have someone, in addition to Battelle, who had experience and could provide guidance.

Once the five panel members for the White Ditch report IEPR were chosen from the larger pool of candidates, Battelle established their subcontracts in which they indicated their willingness to participate and confirmed the absence of conflicts of interest through a signed Conflict of Interest form. Section 4.0 of this report provides names and biographical information on the IEPR panel members for the White Ditch report.

Prior to beginning their review and within 2 days of their subcontracts being finalized, all members of the Panel attended a kick-off meeting via teleconference that was planned and facilitated by Battelle in order to review the IEPR process, the schedule, communication, and other pertinent information with the Panel.

### 3.3 Preparation of the Charge and Conduct of the IEPR

Battelle drafted a preliminary charge document for the White Ditch report to assist the USACE with the development of the charge questions to guide the peer review, according to guidance provided in USACE (2010) and OMB (2004). The draft charge was submitted to the USACE for evaluation as part of the draft Work Plan. USACE provided comments and revisions to the draft charge, which was used to produce the final charge. The final charge was submitted to USACE for approval. In addition to a list of 132 charge questions/discussion points developed for the White Ditch IEPR, the final charge included general guidance for the Panel on the conduct of the peer review (provided in Appendix B of this final report). After the charge was reviewed and approved by USACE, it was sent to the Panel to guide the IEPR of the White Ditch report.

To begin the review, Battelle planned and facilitated kick-off meetings via teleconference during which USACE presented project details to the Panel. Two teleconference meetings were conducted for each of the five IEPRs; the first allowed USACE to provide an overview of the LCA Ecosystem Restoration Project as a whole, and the second allowed USACE to brief the individual panels on the specific project that they would be reviewing. Before the meeting, the White Ditch IEPR Panel received an electronic version of the White Ditch report documents and the final charge. A full list of the documents reviewed by the Panel is provided in Appendix B of this report. The Panel was instructed to address the charge questions/discussion points within a comment-response form provided by Battelle.

All IEPR activities conducted – from the review of the documents through the Final Panel Comment Backcheck process (described below) – were conducted solely by the White Ditch IEPR panel members and not in conjunction with the other four panels participating under the LCA 6 project.
3.4 Review of Individual Comments

The White Ditch Panel produced approximately 500 individual comments in response to the charge questions/discussion points. The individual comments were merged into a single table to facilitate the review of the five sets of comments received on the White Ditch report. Battelle reviewed the comments to identify overall recurring themes, areas of potential conflict, and other overall impressions. As a result of the review, Battelle was able to summarize the 500 comments into a preliminary list of 37 overall comments and discussion points. Each panel member’s individual comments were shared with the full Panel in a merged individual comments table.

3.5 IEPR Panel Teleconference

Battelle facilitated a 4-hour teleconference with the Panel so that the panel experts, many of whom are from diverse scientific backgrounds, could exchange technical information. The main goal of the teleconference was to identify which issues should be carried forward as Final Panel Comments in the IEPR Report and decide which panel member would serve as the lead author for the development of each Final Panel Comment. This information exchange ensured that the final IEPR report would accurately represent the Panel’s assessment of the project, including any conflicting opinions. The Panel engaged in a thorough discussion of the overall positive and negative comments, added any missing issues of high-level importance to the findings, and merged any related individual comments. In addition, Battelle confirmed each Final Panel Comment’s level of significance to the Panel.

The Panel also discussed responses to 13 specific charge questions where there appeared to be disagreement among panel members. The conflicting comments were resolved based on the professional judgment of the Panel, and all sets of comments were determined not to be conflicting. Each comment was either incorporated into a Final Panel Comment, determined to be consistent with other Final Panel Comments already developed, or determined to be a non-significant issue.

At the end of these discussions, the Panel identified 19 comments and discussion points that should be brought forward as Final Panel Comments.

3.6 Preparation of Final Panel Comments

Following the teleconference, Battelle prepared a summary memorandum for the Panel documenting each Final Panel Comment (organized by level of significance). The memorandum provided the following detailed guidance on the approach and format to be used to develop the Final Panel Comments for the White Ditch IEPR Report:

- **Lead Responsibility:** For each Final Panel Comment, one Panel member was identified as the lead author responsible for coordinating the development of the Final Panel Comment and submitting it to Battelle. Battelle modified lead assignments at the direction of the Panel. To assist each lead in the development of the Final Panel Comments, Battelle distributed the merged individual comments table, a summary detailing each draft final comment statement, an example Final Panel Comment following the four-part structure described below, and templates for the preparation of each Final Panel Comment.
• Directive to the Lead: Each lead was encouraged to communicate directly with other IEPR Panel members as needed and to contribute to a particular Final Panel Comment. If a significant comment was identified that was not covered by one of the original Final Panel Comments, the appropriate lead was instructed to draft a new Final Panel Comment.

• Format for Final Comments: Each Final Panel Comment was presented as part of a four-part structure:
  1. Comment Statement (succinct summary statement of concern)
  2. Basis for Comment (details regarding the concern)
  3. Significance (high, medium, low; see description below)
  4. Recommendations for Resolution (see description below).

• Criteria for Significance: The following were used as criteria for assigning a significance level to each Final Panel Comment:
  1. High: Describes a fundamental problem with the project that could affect the recommendation or justification of the project
  2. Medium: Affects the completeness or understanding of the reports/project
  3. Low: Affects the technical quality of the reports but will not affect the recommendation of the project.

• Guidance for Developing the Recommendation: The recommendation was to include specific actions that the USACE should consider to resolve the Final Panel Comment (e.g., suggestions on how and where to incorporate data into the analysis, how and where to address insufficiencies, areas where additional documentation is needed).

At the end of this process, 19 Final Panel Comments were prepared and assembled. Battelle reviewed and edited the Final Panel Comments for clarity, consistency with the comment statement, and adherence to guidance on the Panel’s overall charge, which included ensuring that there were no comments regarding either the appropriateness of the selected alternative or USACE policy. There was no direct communication between the Panel and USACE during the preparation of the Final Panel Comments. The Final Panel Comments are presented in Appendix A of this report.

4. PANEL DESCRIPTION

Candidates for the Panel were identified using Battelle’s Peer Reviewer Database, targeted Internet searches using key words (e.g., technical area, geographic region), searches of websites of universities or other compiled expert sites, and referrals. Battelle prepared a draft list of primary and backup candidate panel members (which were screened for availability, technical background, and conflicts of interest), provided it to USACE, and Battelle made the final selection of panel members.

An overview of the credentials of the final five primary members of the White Ditch IEPR panel and their qualifications in relation to the technical evaluation criteria is presented in Table 2. More detailed biographical information regarding each panel member and his or her area of technical expertise is presented in the text that follows the table.
<table>
<thead>
<tr>
<th>Civil Design/Construction Cost Engineering (one expert needed)</th>
<th>Glagola</th>
<th>Pugh</th>
<th>Smith</th>
<th>Orr</th>
<th>King</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum of 10 years demonstrated experience</td>
<td>X</td>
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<tr>
<td>Familiar with large, complex Civil Works projects with high public and interagency interests</td>
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<tr>
<td>Degree(s) in Civil Engineering</td>
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<tr>
<td>Demonstrated experience in performing cost engineering/construction management for all phases of ecosystem restoration, flood risk management, or related projects</td>
<td>X</td>
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<tr>
<td>Familiar with similar projects across US and related cost engineering. Experience in associated contracting procedures, total cost growth analysis and related cost risk analysis is desired</td>
<td>X</td>
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<tr>
<td>Familiar with construction industry and practices used in wetland restoration, flood damage/coastal storm damage reduction in the Gulf of Mexico coast</td>
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<tr>
<td>Civil Works Planning (one expert needed)</td>
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<td>X</td>
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<tr>
<td>At least 10 years of demonstrated experience in Civil Works planning</td>
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<tr>
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<tr>
<td>Degree in planning or related field</td>
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<tr>
<td>Experience with the plan formulation process</td>
<td>X</td>
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<tr>
<td>Familiar with evaluation of alternative plans for ecosystem restoration projects</td>
<td>X</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Familiar with USACE standards and procedures</td>
<td>X</td>
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<td></td>
</tr>
<tr>
<td>Wetland Ecology (one expert needed)</td>
<td>Glagola</td>
<td>Pugh</td>
<td>Smith</td>
<td>Orr</td>
<td>King</td>
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<tr>
<td>At least 10 years of demonstrated experience in wetland ecology</td>
<td>X</td>
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<tr>
<td>Familiar with the ecology of coastal wetlands and estuarine environments and restoration of coastal wetland and estuarine environments in the Gulf of Mexico</td>
<td></td>
<td>X</td>
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<tr>
<td>Masters degree in ecology or biology</td>
<td></td>
<td></td>
<td>X</td>
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<table>
<thead>
<tr>
<th>Hydrology and Hydraulics Engineering (one expert needed)</th>
<th></th>
<th>X</th>
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<tbody>
<tr>
<td>Minimum 10 years experience with engineering analyses related to wetland restoration in coastal areas</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Minimum 10 years experience with engineering analyses related to flood/coastal storm damage reduction</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Familiar with standard USACE hydrologic and hydraulic computer models</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Familiar with large, complex Civil Works projects with high public and interagency interests</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Registered professional engineer</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Minimum of an M.S. degree in civil engineering or hydrology and hydraulics</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Economics (one expert needed)</th>
<th></th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum 10 years experience evaluating the appropriateness of cost effectiveness and incremental cost analysis (CE/ICA), as applied to dollar costs and ecosystem restoration benefits</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Familiar with USACE CE/ICA tool: IWR-Planning Suite (per 3/26 kickoff, this is not required expertise for this IEPR)</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Experience with cost-effectiveness and cost-benefit analysis in general</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Familiar with large, complex Civil Works projects with high public and interagency interests</td>
<td></td>
<td>X</td>
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</tbody>
</table>

As clarified during the March 26, 2010 kickoff teleconference, if a panel member does not have specific experience with IWR Planning Suite, he or she needs to have experience with cost effectiveness and cost-benefit analysis in general.
**Chick Glagola, P.E.**  
**Role:** Civil Design/Construction Cost Engineering Expert  
**Affiliation:** Independent Consultant and University of Florida

**Mr. Steve Pugh** is currently an independent consultant with 17 years of experience in planning and plan formulation. He earned his B.S. in natural resources management from the University of Maryland in 1997. He is a graduate of the USACE Planning Associates Program (2003). His experience has particularly focused on planning and/or evaluating the results of ecosystem restoration projects or watershed studies. These projects have ranged from studies in controlled wetland cells to monitoring tidal and freshwater wetland restoration projects on a watershed scale. Between 1999 and 2007, Mr. Pugh was employed by USACE, Baltimore District, as a Civil Works planner and participated in the various phases of planning, including the evaluation of alternative plans, for approximately 50 ecosystem restoration projects. He participated in all phases of wetland, stream, and fish passage restoration projects from reconnaissance through monitoring and adaptive management. Mr. Pugh also acted as the lead team member responsible for compliance with National Environmental Policy Act (NEPA) and other environmental laws and policies. Mr. Pugh was the lead Civil Works planner and ecologist for the Chesapeake Bay
Marshlands restoration study and demonstration project, which involved evaluating the feasibility of restoring up to 20,000 acres of fresh/brackish water tidal wetlands. Mr. Pugh also acted as the lead Civil Works planner for USACE’s Anacostia River Watershed Restoration Study in Maryland and Washington, DC and the Middle Potomac River Study in Maryland. In 2004, he helped to develop USACE’s PROSPECT course on Planning Ecosystem Restoration Projects and served as a PROSPECT instructor from 2004 to 2007. Mr. Pugh has also served as an instructor for USACE’s “Planning Associates Program.” While employed as a biologist with the National Resource Conservation Service, Mr. Pugh was a team leader on studies related to the development of ecological performance measures for aquatic ecosystem restoration projects and conducted fish, reptile, amphibian, vegetation, aquatic invertebrate, soils, and hydrological studies for a number of wetland restoration projects.

**Elizabeth Smith**

**Role:** Wetland Ecology Expert  
**Affiliation:** Texas A&M University

**Dr. Elizabeth Smith** is currently an Associate Research Scientist at the Center for Coastal Studies, Texas A&M University-Corpus Christi, specializing in the coastal ecology of wetlands, barrier islands, and riparian systems; coastal resource management; and habitat conservation planning, restoration and enhancement. She earned her Ph.D. in Wildlife and Fisheries Sciences from Texas A&M University in 1994. She has over 20 years experience in coastal ecologist research and monitoring, vegetation, tidal hydrology and salinityzonation patterns. Her familiarity with the ecology of coastal wetlands and estuarine environments is demonstrated in her systems analysis of ecological habitat response to natural and human-induced stressor with a primary focus on coastal wetlands, barrier islands, and riparian woodlands. Her courses include Wetland Ecology, Coastal Ecology, and GIS Applications in Ecology. Dr. Smith’s involvement with large Civil Works projects includes identification of restoration sites in Nueces/Corpus Christi bays, Mission-Aransas Watershed, Lower Texas Coast, and NE Tamaulipas, Mexico. Other Civil Works projects include evaluation of creation/restoration projects at Aransas National Wildlife Refuge, Brazoria National Wildlife Refuge, seagrass in Laguna Madre, coastal marsh at Shamrock Island, and evaluation of hydrologic pulses at Francine Cohn Nature Preserve, Indian Point Park, Mustang Island State Park prior to restoration. She has been author/co-author on over 70 technical reports, book chapters and publications on wetland-related assessments and planning, as well as scientific reviews for The Coastal Bend Bays and Estuaries Program, Texas Natural Resource Conservation Service, U.S. Fish and Wildlife Service, Division of Water Resources, National Parks Services, USGS, the Texas Natural Resource Conservation Service, and other entities. Dr. Smith received the 1999 EPA Award for Environmental Excellence in Wetlands (EPA Region 6), and Coastal America Program’s Partnership Award for “Bahia Grande Restoration” from the Executive Office of the White House in 2007. She is a lifetime member of the Society of Wetland Scientists, and a Coastal Region Board Member of the Texas Society of Ecological Restoration.
Michelle Orr, P.E.
Role: Hydrology and Hydraulics Engineering Expert
Affiliation: Philip Williams & Associates

Ms. Michelle Orr, P.E., is currently a principal at Philip Williams and Associates, Ltd. She earned her M.S. in water resources engineering from the University of California, Berkeley, in 1995 and is a registered professional civil engineer in California. Ms. Orr has 15 years of experience in coastal wetland restoration planning and design, integration of flood management and habitat restoration, environmental impact assessment, and project management. Ms. Orr has completed over 100 planning and engineering studies related to the management and restoration of estuaries, wetlands, and lagoons, including large, complex Civil Works projects project with high agency, stakeholder, and public interest. She has led restoration planning and engineering design for over 30,000 acres of coastal wetlands in San Francisco Bay, San Diego Bay, and Puget Sound, and is currently developing plans for restoration of 65,000 acres of tidal habitat restoration in the Sacramento-San Joaquin Delta as part of the Bay Delta Conservation Plan. As the leader of the Environmental and Engineering Services Consultant Team for the South Bay Salt Pond Restoration Project, the largest wetland restoration on the West Coast (15,100 acres; $0.5B), she worked closely with a ten-member Project Management Team comprised of representatives from federal, state and local agencies, major foundations, the science community, and stakeholders. Ms. Orr is responsible for engineering analyses for flood risk reduction along 15 miles of coastal shoreline in San Francisco Bay, including combined coastal and riverine flood modeling. She has experience using standard hydrologic, hydraulic, and sediment transport models (HEC-RAS, HEC-HMS, HEC-6) and has overseen numerous projects that use 1D and 2D hydrodynamic and sediment transport models to address circulation, flooding, and deposition/erosion (e.g., MIKE-11, MIKE-21, MIKE Flood, Delft 3D, UNET).

Dennis King
Role: Economics Expert
Affiliation: King and Associates, Inc.

Dr. Dennis King is currently a research professor and the director of the Natural Capital Research Group at the University of Maryland Center for Environmental Sciences. He is also the managing owner and director of King and Associates, Inc, an economics consulting and research firm. He earned a Ph.D. in natural resource economics from the University of Rhode Island in 1977 and has over 30 years of experience in environmental and natural resource economics, with a strong emphasis on coastal and ocean issues. Dr. King’s experience with cost effectiveness includes working with the USACE Institute for Water Resources to develop incremental cost analysis. He has evaluated costs and cost-effectiveness of wetland creation, restoration, enhancement projects for the U.S. Department of Energy’s Pittsburgh Energy Technology Center. Dr. King has also worked with the EPA to assess the site selection criteria and cost effectiveness of engineered and bio-engineered stream restoration alternatives. He has experience applying incremental cost analysis (ICA) to large-scale environmental restoration projects, such as working with the Maryland Port Administration on an integrated economic and environmental analysis of environmentally beneficial dredge material placement options, including applications to protect and restore wetlands and create island habitats. He has worked with the National Oceanic Atmospheric Administration on guidelines for using economic
analyses to prioritize and manage habitat protection and restoration strategies, and the establishment of mitigation requirements. Additionally, Dr. King has worked with the EPA on frameworks for assessing the benefits and costs of vegetative riparian buffers and wetland mitigation. Dr. King has authored over one hundred reports, papers, and book chapters dealing with economic, business, and trade issues associated with environmental/economic linkages, environmental restoration, and international trade in natural resource products. He has served on scientific committees of the National Research Council and the National Academies of Science, and has been a senior economic consultant to the United Nations, World Bank, U.S. Congressional Committees, and various national industry/government councils.

5. SUMMARY OF FINAL PANEL COMMENTS

The Panel generally agreed on its “assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used” (USACE, 2010; p. D-4) in the White Ditch report. In particular it is the Panel's opinion that the document sections and appendices related to economics were very well written, provided useful details about underlying costs and expected environmental outputs, and presented convincing arguments in support of plan selection. The Panel generally agreed that the project is technically sound although some important details are missing as noted in the Final Panel Comments (see Appendix A).

Plan Formulation Rationale: The primary concern raised by the Panel involved the reliance on acreage estimates calculated by the Boustany model, which along with the Wetland Value Assessment (WVA), are incompletely documented in the White Ditch report. Additional information on these models, including calibration parameters, is required for the Panel to determine if the models are being appropriately applied and to engender confidence in the modeling process and results. In general, the Panel was unable to determine if a systems analysis examining the cumulative effects of the existing and proposed diversion projects was conducted during the MDWD planning process to determine site-specific impacts to the overall system. This information, along with a discussion on how lessons learned from related previous diversion efforts were considered in the assessment and a comparison of project alternatives, should be included in the White Ditch report. There is also a concern in that Adaptive Management is recognized as being appropriate for this project yet little information on the potential range of adaptive management options is presented. Additionally the Panel felt that the discussion of the effectiveness of the Tentatively Selected Plan (TSP) in meeting project goals and objectives was incomplete. For example, it is not clear, based on the information presented, whether the project objective for sediment delivery is met by the TSP.

Engineering: The engineering discussion of the project included in the White Ditch report is generally thorough, although there appear to be some engineering aspects important to project success that were not completely addressed at this point. One such important aspect that was not included is the influence of operating other planned or ongoing diversions. Since hydrology is obviously an important part of a diversion project, it is imperative to consider the entire study area as a system of diversions, where projects operating upstream may have a significant effect downstream. A significant issue raised by the Panel was that the engineering considerations for the White Ditch project did not include an analysis of the project as component of a system of
diversions. Other engineering aspects not clearly presented are the links between hydrology, vegetative communities, and marsh loss/gain, as well as the planned operations of the diversion to minimize deposition in the canals and shoaling in the river. Also, it was not clear to the Panel whether constraints related to access and navigation through the proposed project area were adequately considered. The Panel recommends that the hydrodynamic model calibration be revised once more accurate data are available.

**Economics:** The links between the quantitative analysis of expected benefits presented in the White Ditch report and the final cost and environmental output figures used in the Cost Effectiveness/Incremental Cost Analysis (CE/ICA) to justify the selection of the TSP need to be more fully developed and justified. Some critical numbers used in the ICA cannot be traced back to any of the particular sources that are identified, or analytical results that are provided in the report. This makes it difficult to have confidence in results of the ICA. The document and appendices should be revised so that numbers used in the critical CE/ICA are clearly connected and referenced, preferably to specific tables in the appendices that are stated as being the sources of various numbers. The Panel noted that the cost estimates used in the CE/ICA do not appear to be developed or described in the text or in Appendix K. Other economic concerns are related to the unit value of easements and acquisition costs that are used, but not explained or referenced, as well as the difficulty of determining what assumptions or analyses were used to estimate the incidental recreation benefits in Annex 1 to Appendix K.

**Environmental:** The potential for substantial colonization by invasive species is a significant environmental challenge, and a realistic approach towards addressing this issue as an element of the proposed plan does not appear to be feasible. Also, the description of the irreversible and irretrievable commitments of resources is vague, and requires further details regarding the types of resources impacted and the magnitude of those impacts. Relative sea level rise (RSLR) is a key issue on a project of this nature. Although relative sea level rise is well considered within the planning framework, a discussion of assumptions regarding fundamental processes (e.g., subsidence, salinity regimes, and organic and inorganic accretion rates) that contribute to RSLR and the potential impacts on vegetation community zonation shifts, marsh loss, and marsh gain is required.

Table 3 lists the 19 Final Panel Comment statements by level of significance.

**Table 3. Overview of 19 Final Panel Comments Identified by White Ditch IEPR Panel**

<table>
<thead>
<tr>
<th>Significance – High</th>
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6. REFERENCES


APPENDIX A

Final Panel Comments

on the

Integrated Feasibility Study and Supplemental Environmental Impact Statement for the Medium Diversion at White Ditch Plaquemines Parish, Louisiana
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Final Panel Comment 1:

A systems analysis examining the cumulative effects of the existing and proposed diversion projects should be included to determine impacts that site-specific diversion operations will have on the overall system.

Basis for Comment:

The most basic consideration in hydrologic design is that hydraulic changes upstream will change existing hydraulic systems and conditions downstream. Because this system of “Louisiana Coastal Area (LCA) Restoration, 6 Projects” is composed of interrelated restoration efforts that are physically connected in an upstream to downstream hierarchy, it is necessary to know how changes made upstream will impact areas downstream in terms of freshwater flow and sediment delivery. This is not a simple analysis since these six projects are singularly as well as collectively dynamic and are composed of varying operational modes. Changes in flow within an upstream project will necessarily cause changes to the hydrology downstream. If the upstream project operates in different and varying modes, this will cause a different downstream effect for each of these modes. Without a comprehensive analysis of all of the effects caused by these upstream modal operations, it will be quite difficult to predict how the downstream project will behave. The upstream changes may have a critically negative effect downstream, or they may even have a synergetic effect and improve downstream efficiency. The impact will not be known nor can it be predicted without a thorough analysis of the entire system working as a whole.

This concern is based on the “Hydrology” section in the White Ditch report, (p. 5-9), where it states,

> Other diversions along the Mississippi River would collectively have impacts on river levels and flows that the White Ditch diversion can pull from. While many of the projects along the Mississippi River are considered small diversions (100 to 5,000 cfs), the collective impacts of the whole could have undesired effects on flows and stages from the Mississippi River. System wide coordination would be necessary, particularly if structures are to operate at Mississippi River flows of less than 400,000 cfs, to avoid negative impacts on the navigation of the river. An overall operating plan for all of the diversions would be greatly beneficial.

Another comment that only addresses the convergence effect of two diversions can be seen on (p. 5-11), where it states, “The proposed Myrtle Grove diversion, directly across the river from the proposed White Ditch structure, could have many impacts on the project area as well as the Mississippi River. The combination effect of these two structures working in such close proximity to each other on opposite sides of the river could create changes in flow patterns for the Mississippi River.” The next paragraph states, “System wide coordination would be necessary, particularly if structures are to operate at Mississippi River flows of less than 400,000 cfs, to avoid negative impacts on the navigation of the river. An overall operating plan for all of the diversion would be greatly beneficial.” Information presented in the Value Engineering study suggest that multiple water diversion projects (the system of projects) may interfere with each other.
on the intake (river) side and may have unintended consequences if they overlap in terms of effects on the outflow (project) side (p. 3-51).

<table>
<thead>
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<th><strong>Significance – High:</strong></th>
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<tr>
<td>Incorporating a comprehensive analysis of the system of projects working together at differing levels of operation, and determining what impact this will have on the project success metrics, is critical to the success of this project and to the system of six restoration projects taken as a whole.</td>
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<tr>
<th><strong>Recommendation(s) for Resolution:</strong></th>
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<tr>
<td>To resolve these concerns, the report would need to be expanded to include the following:</td>
</tr>
<tr>
<td>1. A systems analysis requirement that identifies the impact of all projects working in all modal combinations. This analysis would necessarily include currently active projects such as Caernarvon and Myrtle Grove, and would address freshwater and sediment delivery</td>
</tr>
<tr>
<td>2. A discussion of impacts of the systems effect on all of the metrics for success, as defined through the modeling process and described in the report.</td>
</tr>
<tr>
<td>3. A definitive statement that a systems analysis is required for the final design of the LCA 6 project (If such a systems analysis is already a requirement).</td>
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<tr>
<td>4. Detail of how the success measures will be evaluated through all possible operational combinations.</td>
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Final Panel Comment 2:

Documentation on the Boustany model is needed to determine whether the model is being appropriately applied.

**Basis for Comment:**

The Boustany model provides the estimates of restored wetland acreages used for comparing alternatives and selecting the Tentatively Selected Plan (TSP), evaluating the effectiveness of the TSP in meeting project objectives, evaluating risk and uncertainty, and evaluating potential environmental consequences. Wetland acres from the Boustany model are input to the Wetland Value Assessment and used to provide environmental outputs for the Cost Effectiveness/ Incremental Cost Analysis (CE/ICA). While the Boustany model is mentioned by name within the White Ditch report, no other information is provided. Documentation of the model is missing and needs to be added in order to determine whether the model is being appropriately applied.

The Panel assumes that the Boustany model has gone through an external independent peer review and has been certified by the U.S. Army Corps of Engineers (USACE). The Panel, therefore, focused the review comments on whether or not the Boustany model is being applied appropriately for the Medium Diversion at White Ditch (White Ditch) project.

During review of the White Ditch report, a panel member requested information on the Boustany model. USACE subsequently provided two draft documents: (1) “An Ecohydraulic Model for Freshwater Flow Diversion to Coastal Marshes: User’s Guide” and (2) the spreadsheet “DiversionInputGuidance.xls.” The User’s Guide notes that “the model has developed from Boustany (2007) through McKay et al. (2008) to the current incarnation.” The citations refer to draft documents that were not available for this review. The User’s Guide further refers to four associated spreadsheets, only one of which was provided for review.

As represented in the documentation available for review, the model appears to appropriately consider many, though not necessarily all (see below), processes relevant to predicting wetland acreage at the initial planning stage. Based on statements provided in the User’s Guide, the model divides the marsh into 100 uniform bands in the longitudinal direction, considers an extensive range of physical and vegetative processes contributing to net accretion, and has been shown to produce reasonable predictions for four existing freshwater diversions for non-hurricane conditions. The range of physical and vegetative processes parameterized in the model includes organic (vegetative) accretion; inorganic (sediment) accretion; and land loss due to sea level rise, compaction, and subsidence. Accretion considers temporal variability in model parameters; plant productivity by marsh type (fresh, intermediate, brackish and saline); marsh processing of nitrogen; river sediment supply as a function of flow; spatial variability in sediment retention; sediment types/grain sizes; and depth-varying bulk density.
Two known model limitations are noted in the User’s Guide: lack of inclusion of storm-related effects on wetland acreage and lack of application to natural deltaic formation. The limitation related to storm effects is relevant to application of the model to the White Ditch project. Model predictions for storm conditions appear to overstate wetland acreage by up to 60% (Figure 5, p. 12 of the User’s Guide).

Though the User’s Manual describes methods and inputs relevant to predicting wetland acreage for the project, other relevant methods, input, and results are not described. For example, inundation frequency affects plant productivity and excessive inundation can cause marsh loss. Inundation effects on plant productivity are not mentioned. The use of a representative (average) marsh depth across the model domain suggests that different inundation regimes may not have been considered. Because of incomplete information, the Panel cannot evaluate whether the model has been appropriately applied to the project.

**Significance – High:**

Inappropriate application of the Boustany model could affect selection of the TSP, effectiveness of the plan in meeting project objectives, risk and uncertainty, and environmental consequences.

**Recommendation(s) for Resolution:**

To resolve these concerns, the report would need to be expanded to include the following:

1. An overview of the Boustany model, including description of methods, input parameters, and limitations. Model limitations should be discussed as relevant to alternatives evaluation, plan performance, risk and uncertainty, and potential environmental consequences. If errors in Boustany model predictions of marsh development are expected to be the same for all locations and flow alternatives, and therefore not expected to affect the relative ranking of alternatives in the IC/CEA, that should be explained. Storm-related limitations should be evaluated and discussed.

2. Complete documentation of Boustany (2007), McKay et al. (2008a), McKay et al. (2008b), and the User’s Guide provided as references or appendices to the report.

3. Review of the documents noted in recommendation 2 and associated spreadsheets to confirm that the model is being appropriately applied to the White Ditch project.

**Literature Cited:**


Final Panel Comment 3:

The potential for substantial colonization of exotic and invasive species does exist and the approach to control these species as described in the White Ditch report is not feasible.

Basis for Comment:
The White Ditch report states “Hyacinth is a common invasive species in the Breton Sound Basin. Freshwater introduction has the potential to improve conditions for its growth. Hyacinth can out-compete native marsh grasses for resources resulting in conversion to a monoculture. Measures have been considered to control the proliferation of invasive species that could result from sustained freshwater introduction” (Section 3.2.2.5, pp. 3-9 & 3-10). The White Ditch Conceptual Ecological Model (CEM) includes invasive and exotic species as one of the three primary “drivers” defined as “… major external driving forces that have large-scale influence on ecological systems.” (Figure 3 White Ditch Project Ecological Conceptual Model). The White Ditch CEM identifies both hyacinth and nutria as being likely to have a substantial impact on the forecasted project benefits of the proposed White Ditch project particularly in the areas of 1) wetland loss, 2) wetland health, and 3) obstructed navigation. In Section 3.1.2 of the White Ditch CEM documentation it states that other measures taken to introduce freshwater from the Mississippi River into LCA marshes has resulted in the colonization of hyacinth. Hyacinth not only out-competes native marsh grasses for resources but during storms can be blown over onto areas where healthy native marsh exists resulting in the mortality of those plant communities. The proposed project intends to use dredged material in the development of several hundred acres of marsh habitat. The combination of the placement of disturbed soils, the introduction of freshwater, and the likelihood of herbivory from nutria makes these newly established marshes highly susceptible to the colonization of opportunistic invasive plant species. In addition, impacts from excessive nutria herbivory may result in restored marsh areas converting to open water or have other deleterious effects. These factors indicate the necessity of employing a deliberate planned approach to inhibit the large scale colonization of exotic and invasive species in the proposed project area. Although the documentation for the White Ditch CEM encourages the consideration of plant control by multiple measures – including effective diversion, flexible management, prescribed burns, and chemical control – the feasibility report (including the adaptive management plan) seems to limit control of invasive plant species to structural or operational modifications. Also, the feasibility report does not appear to consider measures to address potential impacts from nutria.

Significance – High:
The significant colonization of invasive and exotic species such as hyacinth or nutria, for example, will result in the proposed plan failing to achieve the primary goal of the White Ditch project.

Recommendation(s) for Resolution:
To resolve these concerns, the report would need to be expanded as follows:

1. The full suite of potential measures to reduce or eradicate invasive or exotic species should remain on the table for future consideration. The White Ditch report should not rule out any potential management measures at this point. This
is important because if modifications to structures or operations do not effectively address excessive colonization of undesirable species, other measures may be necessary to protect the federal investment and achieve the stated project goals.

2. The potential impacts of nutria on the proposed project should be recognized and addressed in the White Ditch report.
Final Panel Comment 4:

The Monitoring and Adaptive Management Plan provides adequate description of the monitoring and reporting systems and their costs, but little information on the potential range of adaptive management options and related costs.

Basis for Comment:

The LCA Ecosystem Restoration Study Chief’s Report (2005) states “…feasibility level of detail decision documents will identify specific sites, scales and adaptive management measures, and will optimize features and outputs necessary to achieve the restoration objectives…” The White Ditch Monitoring and Adaptive Management Plan states, “Uncertainties remain concerning the exact project features, monitoring elements, and adaptive management opportunities” (p. 4) and goes on to explain, “uncertainties will be addressed in preconstruction, engineering and design (PED), and a detailed monitoring and adaptive management plan including a detailed cost break down, will be drafted as a component of the design document” (p. 4).

The plan provides an excellent feasibility-level description of monitoring elements, reporting systems and their projected costs but falls short of providing similar detail with respect to potential adaptive management measures and associated costs. Regarding adaptive management measures, the report simply states, “…recommended modifications (i.e., adaptations) of the diversion at White Ditch will be provided as appropriate” (p. 13).

The monitoring and adaptive management plan appears to limit potential adaptive management measures to “modifying the operation of the existing diversion structure or modifying the operation of existing outfall management features” (p. 17). No discussion of specific types of “modifications” has been included and no discussion of how these “modifications” may have an effect on the project outputs is discussed in the plan. In addition, the potential for adaptive management measures other than these “modifications” is not mentioned in the plan. For example, some potential measures to address invasive and exotic species seem to be prematurely ruled out in the feasibility report.

Finally, the cost estimates provided for adaptive management appear to only apply to administrative costs without considering the potential costs of actually implementing potential measures on the ground. It is understood that more details will be provided during the PED phase, but some details regarding the potential range of specific adaptive management measures and their costs should be presented in the report.

Significance – High:

Since the proposed White Ditch project is anticipated to require the implementation of adaptive management measures to achieve project success, specific measures along with their expected affects and potential costs must be explored to determine if the project benefits are feasible.
**Recommendation(s) for Resolution:**

To resolve these concerns, the report would need to be expanded to include the following:

1. A detailed list of the known potential negative outcomes that could cause the project goals and objectives to not be achieved.
2. A range of feasible potential adaptive management measures to address each of these known potential negative outcomes.
3. An explanation of acceptable ways in which identified potential adaptive management measures may be employed, and how and to what degree they may be expected to affect a successful outcome in the project area.
4. Feasibility-level cost estimates and potential funding source(s) to indicate realistic and feasible options to implement identified potential adaptive management measures.
**Final Panel Comment 5:**

More information about the sources of the cost and environmental output figures used in the Cost Effectiveness/Incremental Cost Analysis (CE/ICA) (Appendix K) needs to be provided.

**Basis for Comment:**

Incremental Cost Analysis (ICA) is used to establish that the TSP is the “best buy” alternative. ICA is based on comparing two sets of numbers related to each alternative: dollar costs and environmental benefits. The ICA presented in Section 3.51 through 3.54 of the White Ditch report is based on analysis presented in Appendix K, where Table 1 presents summaries of first costs and operating costs for each of the four flow rate options at Site 2 and Site 3. However, neither that table nor accompanying text mentions where these cost estimates came from or provides any reference for them.

Section 3.5.3 of the report uses the numbers from Table 1 in the ICA and states that, “Further details can be found in the Engineering and Cost Appendices (Appendix L).” However, Appendix L, Section L-12 (Cost Estimates) includes only two tables (Total Project Cost Summary and Total Project Cost Table). These tables refer only to the cost of the TSP, and not to the other alternatives that were considered. The total costs presented for the TSP do not match the costs developed for that alternative in Appendix K.

In addition to the problems with documenting the source of the cost estimates used in the CE/ICA, there are problems finding support for the numerical results of the Average Annual Habitat Units (AAHUs) that were generated by the Wetland Value Assessment (WVA) model and used in the ICA to compare the environmental output (benefits) of the alternatives. The ICA compares the environmental “output” of alternatives based on Habitat Units (HUs) that are numerical combinations of two factors: quantity (acres) and Habitat Suitability Indices (HSIs). Table 3.9 (Section 3.5.2, p. 3-42) presents a Benefits Summary which includes the WVA-generated values of HU for each alternative that are used in the ICA presented in Appendix K. However, these are not the same numbers that are presented in a Wetland Benefit Summary table presented on page 7 of Appendix A. Also, the numbers presented in that unnumbered table in Appendix A are not supported or referenced in the text of Appendix A.

A critical component of the WVA, the acres of various types of marshland expected with each alternative, depends almost exclusively on the results of the Boustany model. The Boustany model is also the source of the marsh loss data in the subsequent Sea Level Rise (SLR) risk assessment used for alternatives selection. However, this model is not described or evaluated anywhere in the White Ditch report.
<table>
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<th>Significance – Medium:</th>
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<tbody>
<tr>
<td>Determining the reliability of the ICA, which directly affects the selection of the TSP, requires a basis for understanding of the data sources and information used in the analysis.</td>
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<tr>
<td>To resolve these concerns, the report would need to be expanded as follows:</td>
</tr>
<tr>
<td>1. The CE/ICA section of the report needs to be revised, and the tables in this section of the report need to be modified to establish clear links between the cost and environmental output numbers used in the CE/ICA and the analysis presented in Appendix A (WVA), Appendix L (Costs), and Appendix K (CE/ICA).</td>
</tr>
<tr>
<td>2. Appendices A, L, and K need to be rewritten to focus more on critical assumptions and sources of information, including results of the Boustany model which is an essential component of both the WVA and Sea Level Rise risk analysis.</td>
</tr>
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**Final Panel Comment 6:**

The hydrology discussion is not complete, and the links between the hydrology and vegetative communities need to be explained.

**Basis for Comment:**

Hydrology is the driving factor in this project, and the success of this project is driven by how water will be diverted, where it will flow, and how it will affect vegetative communities in the project area to sustain marshes. The White Ditch report requires a more complete discussion of hydrology and the linkages between hydrology and vegetative communities. This discussion should consider flow-related sediment, salinity, and nutrient transport effects on vegetative growth.

While some of the mechanisms by which delivery of water, sediments, and nutrients affect marsh gain/loss are self explanatory (e.g., sediment deposition raises ground elevations), others require at least a brief explanation. For example, a simple statement that freshwater emergent vegetation has higher productivity and contributes more to accretion than salt marsh vegetation helps the reader understand how the project is expected to provide benefits. Similar statements explaining the relationship of nutrients and inundation regime to vegetative productivity and accretion would also be helpful. These explanations are needed to understand the management measures included in the alternatives, estimates of project benefits (wetland acres), risk and uncertainty, and environmental effects.

Salinity regimes in a coastal marsh in conjunction with water depth determine the vegetative community. Yet, no information on salinity was provided in Section 4.2.3 Water Quality and Salinity (p.4-6).

Several other projects being planned and implemented in the region are dependent on a similar water source (Mississippi River). The need for system-wide coordination is mentioned several times in the text. The report needs to describe how these projects may impact each other hydrologically and what steps are being taken to increase the likelihood of project(s) success.

The connection between hydrology (pulses, tides, level of inundation), salinity, and vegetation provides the measure of success for the project (e.g., acres converted from open water to vegetation, conversion from a more saline vegetation community to more brackish, intermediate, or fresh vegetation community). These shifts in community types were modeled using the Boustan model and related to wetland benefits through the use of WVA methodology. However, no spatial information is provided (map-based) to indicate where these marsh communities are located for existing conditions and the TSP.

**Significance – Medium:**

A complete discussion of hydrology and the linkages between hydrology and vegetative communities is missing, and affects the completeness and understanding of the report.
**Recommendation(s) for Resolution:**

To resolve these concerns, the report would need to be expanded to include the following:

1. An overview of the linkages between the hydrology and vegetative communities.
2. An expanded discussion in Section 4.2.2 Hydrology to include tidal range, river stage, seasonality, and extent and frequency of storm surges, as well as citations for the river flows presented.
3. A discussion of salinity regimes in Louisiana coastal marshes, the predominant range of salinities in the project area, and descriptions of saltwater intrusion and salt wedge in Section 4.2.3 Water Quality and Salinity.
4. A system-wide management plan that identifies and describes the hydrologic needs of each restoration project in the region, outlines the proposed operation (including timing and amount of water withdrawals), and addresses potential issues arising due to project implementation and recommended solutions.
5. A map of historic vegetation zones in the project area cited in Section 4.2.6.2.1 Wetland Vegetation, Historic Conditions.
6. A map of current vegetation zones in the project area that spatially defines the intermediate, brackish, and saline marsh areas (consult USGS, National Wetlands Research Center) in Section 4.2.6.2.2 Wetland Vegetation, Existing Conditions.
7. Maps of predicted vegetation zone changes in each of the alternatives or in the TSP.
Final Panel Comment 7:

A planning objective of the White Ditch project is to design and operate the diversion in a manner that minimizes deposition and shoaling in the river, but details of how this will be accomplished are not provided.

Basis for Comment:

Shoaling is commonly observed at the mouths of rivers and creeks where flow velocities slow and sediments settle out of suspension. The White Ditch report acknowledges that the “diversion of significant quantities of river sediments and water typically leads to unintended consequences” such as “sedimentation and shoaling in the main river downstream of the diversion” and “in interior distribution channels” within the project area (p. 3-55). The project proposes to dredge the river every ten years and to “carefully design” (p. 3-55) the interior distribution channels to minimize deposition. However, with the qualitative discussion of shoaling provided, it is not clear whether significant channel dredging every ten years will be sufficient, or whether the interior distribution channels can be designed to minimize deposition.

Higher than anticipated shoaling downstream of the diversion has the potential to require more frequent dredging in order to maintain design diversion flows and avoid potential environmental impacts, such as impacts to navigation in the Mississippi River and impacts to flood protection as a result of raising water levels along the back levee.

Additional quantitative and empirical consideration of sedimentation would be helpful. Since a hydrodynamic model of the diversion already exists (Appendix L), modeled bed shear stresses could be compared to critical shear stresses to assess the potential for sediment deposition and scour. Documentation of the extent of shoaling observed downstream of other diversions would increase the level of certainty in predictions of project performance. The assessment should consider the cumulative effects of multiple diversions as well as project-specific effects.

Significance – Medium:

The additional consideration of dredging could affect estimates of project cost and environmental impacts, but would not likely affect the selected plan or success of the project.

Recommendation(s) for Resolution:

To resolve these concerns, the report would need to be expanded to include the following:

1. A quantitative sedimentation assessment.
2. A discussion of observed sedimentation downstream of other diversions.
3. Consideration of cumulative effects of other existing and planned diversions.
4. Revisions to the project description – including the sections on dredging frequency, project costs, environmental affects, and the adaptive management plan – if appropriate based on additional consideration of shoaling.
**Final Panel Comment 8:**

The processes contributing to relative sea level rise, and the variability in processes other than global sea level rise, require further discussion and consideration.

**Basis for Comment:**

Relative Sea Level Rise (RSLR) and its relation to marsh gain/loss are generally well considered in the White Ditch report (pp. 3-6 to 3-7). However, the processes contributing to RSLR (e.g., global sea level rise, subsidence, organic and inorganic accretion) require further discussion. Additionally, the variability in processes other than global sea level rise need to be discussed and should be considered in the project scenarios, were appropriate. Collectively, these processes currently contribute more significantly than global sea level rise to marsh gain/loss. Rates for some of these processes, such as organic accretion, could change significantly if marshes cross thresholds (i.e., inundation or salinity thresholds) that affect vegetative productivity.

The basic accretion and subsidence processes contributing to ongoing marsh loss, and particularly those affected by the project, need to be described and documented with rates and citations. The Affected Environment section contains little or no documentation of organic and inorganic accretion rates and regional subsidence rates. Nor is there documentation of changes in plant productivity with increased inundation frequency, salinity, and nutrients. Subsidence can be caused by soil oxidation, settlement of buried alluvial soils and oil and gas extraction. Subsidence should be discussed more fully, with citations provided. Two references at the end of the report (Section 9.3 Literature Cited) document subsidence rates in coastal Louisiana and relate subsidence to natural and anthropogenic causes (e.g., Lane et al. 2006, Morton et al. 2005), but are not cited in the text. The discussion of salinity in Section 4.2.3 Water Quality and Salinity is missing entirely. Much of the information on accretion and subsidence has clearly been considered in detail (e.g., in the User’s Manual for the Boustany model), but is not described in the report.

**Significance – Medium:**

The discussion of the physical and vegetative processes contributing to marsh gain/loss is missing, and affects the completeness of the report, the understanding of management measures, estimates of project benefits (wetland acres), risk and uncertainty, and environmental effects.

**Recommendation(s) for Resolution:**

To resolve these concerns, the report would need to be expanded to include the following:

1. A brief explanation of the processes affected by the project and how they contribute to marsh gain/loss, such as the relationship of salinity, nutrients and inundation regime to vegetative productivity and accretion.
2. Documentation of sea level rise, organic and inorganic accretion, and subsidence, including rates and citations. For example:
a. Add subsidence information in Section 4.2.1 Soils and Waterbottoms;
b. Add organic/inorganic accretion rates for the project area;
c. Add salinity regimes information.

3. Discussion of variability in relative sea level rise processes other than global sea level rise and consideration of these processes in the scenarios, as appropriate.
**Final Panel Comment 9:**

**More quantitative indices for each variable within the Wetland Value Assessment (WVA) model need to be provided.**

**Basis for Comment:**

The WVA output provides quantitative values of wildlife and habitat benefit for each alternative based on the output of the Boustany model (which provides the acreage amounts for each alternative). The WVA output is then used in the ICA as one of the two critical determinants of the best alternative. Therefore, understanding the WVA concept, development, parameterization, output, sensitivity, and reliability of output is essential to this project. General concept, development, and output are provided in the White Ditch report (3.5.2 Wetland Value Assessment, pp. 3-39 through 3-42). However, the parameterization, sensitivity, and reliability of the output are not given.

It is not the intention of the Panel to question the use of WVA process, but to better understand how it is specifically used in this project. Information on WVA model is given in Appendix B, which includes an “Appendix A,” but is not referenced in the White Ditch main report. Information includes what V1-V6 are (p. 59/85), as well as spreadsheets with model results. Information about only one of the six variable settings (Submerged Aquatic Vegetation) is given in the report (p. 5-42); however, settings are listed in Appendix B (pp. 49-56/85). Information about the sensitivity analyses and reliability of output is needed; however, since this approach is used in many Coastal Wetlands Protection & Restoration Act projects, it is assumed it could be added.

**Significance – Medium:**

Information about what model variables are used, justification of how they are initially set, and how reliable the results are is essential to understand and have confidence in the use of the WVA model to determine the TSP.

**Recommendation(s) for Resolution:**

To resolve these concerns, the report would need to be expanded to include the following:

1. A history of the development and a justification of use of WVA in Section 3.5.2 Wetland Value Assessment.
2. A reference to Appendix B in Section 3.5.2.
3. A list variable types and initial settings in Section 3.5.2.
4. References to other models that were used to parameterize this model in Section 3.5.2.
Lessons learned from related previous and ongoing diversion efforts, and how these data were considered in the assessment and comparison of proposed project alternatives, should be provided.

Basis for Comment:

The White Ditch project will require engineers and scientists involved in the final design to employ the most comprehensive and accurate information available to them at the time. This should include all information on performance data analysis from similar projects and the lessons learned from those projects. This information should include how well the original modeling predicted the measured performance data from these projects. If the modeling method used for the White Ditch project was used on similar projects then these results can be directly compared for predictable accuracy. If the modeling assumptions used on similar projects did not accurately predict measured outcomes, the White Ditch project modeling process should be adjusted to account for the differences in predicted and actual measures of performance.

The White Ditch report indicates that all studies “related to the study area” were examined. Most of the studies are described as having value because they “could serve as a guide for the design of the MDWD.” In some cases, these similar projects are discussed in the White Ditch report, but no performance results were provided to indicate a level of success attained by any of the project metrics. Information could not be found to indicate that data were ever evaluated against what was originally predicted as measures for project success, or how well the modeling process described actual events. One such on-going project that is often mentioned in the report is the Caernarvon Diversion. It would seem from the descriptions that there should be data available from this project, and that the results could easily be compared with the original predictive model used in its development. The relationship between the White Ditch project and another project, Myrtle Grove, is also identified in a number of locations throughout the report. The report indicated that this relationship is significant and perhaps critical.

It would be beneficial to first know what models were used in defining expected performance on on-going and similar projects, and if any of these models are used to predict performance on the White Ditch project. This would therefore inform what level of predictive accuracy could be expected from an evaluation of the collected performance data. In particular, it would be useful to know if the Boustany model used for the White Ditch analysis can be expected to predict accurately over 50 years since this apparently new and little known model generates most of the predicted benefits of the White Ditch project.

In order to be comprehensive and to provide the best basis for drawing conclusions necessary for final design considerations, obtaining all available information is critical to achieving project success.
### Significance – Medium:

Information justifying the models and analysis used to compare the White Ditch project alternatives is missing, and affects the understanding of the project, but does not imply that there are problems with the analysis or the results.

### Recommendation(s) for Resolution:

To resolve these concerns, the report would need to be expanded to include the following:

1. Detailed information related to available data analysis, as well as lessons learned from similar and on-going projects, and how this information will be used in defining final requirements for the White Ditch project.
2. Explanations regarding the models used in defining metrics for similar and on-going projects, and if a similar modeling process was used for the White Ditch project.
Final Panel Comment 11:

A more detailed description and justification of the irreversible and irretrievable commitments of resources is required to determine their significance.

Basis for Comment:

Section 5.19 of the White Ditch report states, “NEPA requires that environmental analysis include identification of any irreversible and irretrievable commitments of resources which would be involved if the proposed action should it be implemented.” The report later states, “A few impacts from the construction of the diversion structure are long-term and permanent. Other impacts that may have a longer effect can be reduced through appropriate measures and best management practices.” (p. 5-134). The report does not specifically identify what the permanent impacts from construction of the proposed White Ditch diversion are expected to be, or the magnitude and spacial extent of those impacts. Also, the report does not specifically indicate the types of measures and best management practices that may be deployed to minimize long-term impacts.

Significance – Medium:

Without specifically identifying the predicted irreversible and irretrievable commitments of resources and the magnitude of those impacts, the White Ditch report is not complete.

Recommendation(s) for Resolution:

To resolve these concerns, the report would need to be expanded to include the following:

1. A paragraph(s) specifically listing the types and magnitudes of irreversible and irretrievable impacts expected to occur as a result of the proposed project should be included in Section 5.19 of the report.

2. A description of the measures and best management practices that will be employed to minimize long-term impacts should be included in the report.
Final Panel Comment 12:

The reason for identifying a very specific numeric target for Objective C (1,328,580 cubic yards) is not clear, nor is it clear that this target is met by the Tentatively Selected Plan (TSP).

Basis for Comment:
Objective C of the White Ditch report is to “[r]estore sediment inputs into the project area equivalent to an average of approximately 1,328,580 cubic yards of sediment per year” (p. 2-8). The reason for identifying a very specific numeric target of 1,328,580 cubic yards (CY) is not clear, and the basis for this number is not provided.

If sedimentation values presented in the White Ditch report are correct, the target of 1,328,580 CY is far greater than the amount required to maintain the current area of marsh habitat (per Objective A). The White Ditch report states that 260,600 CY of sediment is believed to be “a sufficient amount to keep up with the current rate of marsh loss the project areas has historically experienced and have a potential of restoring the marsh back to its historic condition” (p. 5-16). Note that the 260,600 CY estimate is not provided directly in the White Ditch report, but was calculated using the mass value provided in the report, 279,000 tons, and a mass to volume conversion provided elsewhere in the report. [Section 3.9.5 Adaptive Management (p. 3-53) contains a statement that 1.3 MCY is equivalent to 1.4 million tons.]

The White Ditch report does not directly evaluate if the TSP meets Objective C, but it is possible to perform the comparison using values from the report. Assuming the diversion operates at maximum capacity (35,000 cfs) for two months in the spring and 1,000 cfs for the remainder of the year, the TSP diverts 260,600 CY of sediment per year (p. 5-16; 279,000 tons as converted above). If this information is correct, then the project may succeed in maintaining the current areas of marsh habitat, but fall short of meeting the project objective for sediment inputs.

It is not clear why Objective C would specify delivery of far more sediment than is needed to maintain current marsh acreages and why the TSP would be formulated in a way that doesn’t meet Objective C. It is possible that these discrepancies result from an error in the numeric value provided in Objective C, and that the project does perform as intended.

Generally, the level of specificity in the numeric target of 1,328,580 CY appears overly precise (six significant digits) given the level of accuracy possible for this type of prediction.

Significance – Low:
Assuming the project performs as intended to meet the project objectives, including Objective C for sediment delivery, the numeric target of 1,328,580 CY should be clarified to improved the technical quality of the report.
Recommendation(s) for Resolution:

To resolve these concerns, the report would need to be expanded to include the following:

1. A discussion of the reason for setting a numeric target of 1.3 million CY of sediment delivery. The report should describe how this value was estimated and what it is intended to accomplish.

2. A revision of the numeric target if it is in error. If the numeric target is not in error, the plan should be revised to meet the target. If meeting the target is not critical for project success, the objective should be modified accordingly.

3. An expansion of Section 3.9.6 Effectiveness of Tentatively Selected Plan in Meeting Goals and Objectives to directly compare project performance to the numeric target.

4. A revision of the numeric target to be less precise, as appropriate given the level of accuracy.
### Final Panel Comment 13:

**The model calibration analysis should be revised when more accurate data are available.**

**Basis for Comment:**

Hydrodynamic modeling of the project alternatives (Appendix L) notes significant uncertainty in the vertical datum control for tides used in the model (p. L-7). In the final model runs, tidal time series data were shifted vertically by 1.0 foot based on “[l]ocal knowledge of the area, based on discussion with airboat operators” (p. L-26).

This one-foot shift is significant compared to the tide range supporting critical marsh functions within the project area. An error in the assumed tidal boundary conditions has the potential to affect model-predicted diversion flows, hydrodynamics within the project area, and salinity. The US Geological Survey plans to re-survey the tide gauge used in the MDWD modeling in the near future, with “possible publishing of results in April 2010” (p. L-7).

The White Ditch modelers recommend revisiting the calibration once more accurate survey data are available and recommend conducting an assessment of model sensitivity to tide elevations. The Panel supports these recommendations. The White Ditch report should include a statement that the model will be re-calibrated and a sensitivity assessment conducted before or during the PED phase.

Additionally, the modeling appears not to have integrated existing geomorphic information about marsh elevations relative to tide levels, and the modeling appendix is missing a graphic showing modeled base-case salinity for comparison with the project alternatives.

**Significance – Low:**

Vertical control information for tides used in the hydrodynamic modeling is inexact and affects the technical quality of the report.

**Recommendation(s) for Resolution:**

To resolve these concerns, the report would need to be expanded as follows:

1. Add a statement in the report that the model will be re-calibrated and a sensitivity assessment conducted before or during the PED phase.
2. Incorporate additional calibration and sensitivity assessment before or during the PED phase.
3. Consider having a qualified geomorphologist that is familiar with the region review the model setup for consistency with known marsh characteristics relative to inundation and salinity regimes.
4. Add a graphic showing modeled base-case salinity to the modeling appendix.
Final Panel Comment 14:

The Real Estate Plan (Appendix J) requires an explanation of the source of the per acre real estate easement, acquisition costs and cost adjustment factors that were used to generate Total Real Estate Costs.

Basis for Comment:
Appendix J provides clear explanations of the 22 land parcels in the right of way of the project, the amount of land required, and access needs (e.g., temporary or permanent easements, acquisitions, etc.). Section 10, Baseline Cost Estimate, of that appendix refers to Exhibit C as the source of the total real estate cost estimate of $346,000. Exhibit C is a table that lists the acres of various types of land access that are needed and their unit costs. The acreage requirements are explained fully in the text of the Appendix. However, the unit costs are not explained anywhere. There are three numbers that require further explanation: the $350/acre “fee value” used for easements; the “% of Fee Value” that was applied to various types of easements; and the “$15,000 per ownership” figure that was used to estimate acquisition costs.

Significance – Low:
Including an explanation of the unit costs and the percent of unit costs aids in understanding the development of the overall real estate cost estimate.

Recommendation(s) for Resolution:
To resolve these concerns, the report would need to be expanded to include the following:

1. An explanation and further documentation of the basis of the per acre cost estimates for easements and acquisitions in Section 10 of Appendix J, or in Exhibit C of that appendix. This could take the form of a reference to some general source of information about regional undeveloped land costs, or results from a formal or informal survey of land transactions. Data specifying land price quotes, typical market conditions, or reported costs of similar land access at other locations could be utilized as well.
<table>
<thead>
<tr>
<th>Final Panel Comment 15:</th>
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<tr>
<td><strong>The basis of the estimates of incidental recreational benefits associated with the alternatives that are presented in Section 3.5.5.1 of the White Ditch report and referenced back to Annex 1 of Appendix K need to be explained.</strong></td>
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<tr>
<td><strong>Basis for Comment:</strong></td>
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<tr>
<td>Appendix K, Section K1.3.5.1, Recreational Benefits, summarizes the results of an analysis described in Annex 1 to that Appendix, and includes a summary table of recreational benefits, Table 7, that is taken directly from Annex 1.</td>
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</table>

Annex 1 describes recreational fishing in the project area and develops a point system for valuing recreational fishing. It uses USACE guidance to estimate the unit value of a recreational fishing day at $8.99, and, using that daily value and a baseline of 90,109 unit days per year, estimates the value of the recreational fishing that could be affected by the project at $810,256 per year.

Annex 1 then presents an unnumbered table on unnumbered pages with unlabeled estimates of the “Net Increase in Recreational Benefits” of each of the four project alternatives and the no action alternative. This table presents estimates of Net Present Value of Benefits over 50 years and annualized benefits for each of the alternatives. The sources of the 50 year benefit estimates presented in this table are not explained anywhere in the text, although the accompanying text does explain the selection of the discount rate that was used to annualize these benefits.

The differences in benefits estimated for each of the project alternatives must be associated with differences in expected changes in annual user days or unit values or both. More information is needed to explain how the alternatives generate different increases in recreational user days or unit values or both, and also to explain whether the “Recreational Benefits” shown are associated only with fishing, and how they are related to converting open water to marshland.

The text states that “the net increase in average annual habitat units and marsh acres are considered when estimating the improved likelihood of success at fishing and hunting,” and that the estimates used in the analysis are “dependent upon subjective interpretation of the data.” However, there is no mention of what data were subjectively interpreted or how the subjective interpretations were made. Presumably, the value of habitat improvements from the project is resulting in increases in the likelihood of successful fishing, but it is not clear if better fishing is assumed to result in increases in days fished or increases in the value per day fished or both. Some consideration should also be given to project effects on “steaming time” vs. “fishing time” during and after project construction and how that, along with sometimes lower but mostly higher catch rates, affects recreational fishing values.

The text states that “when the beneficial impacts to wildlife become apparent after ten years the likelihood of fishing and hunting success will increase.” Some time line of
presumed positive, negative, and neutral effects on recreational fishing from various aspects of the project and project outcomes (e.g., space use conflicts, relocation of fresh water and salt tolerant species, habitat improvements, etc.) would be helpful in addition to some explanation of the quantitative estimates of cumulative net increase in the dollar value of recreational benefits over 50 years.

<table>
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<th>Significance – Low:</th>
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<tr>
<td>Additional information is required to explain how the project alternatives generate Recreational Benefits.</td>
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<th>Recommendation(s) for Resolution:</th>
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<tr>
<td>To resolve these concerns, the report would need to be expanded to include the following:</td>
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<tr>
<td>1. A revision of the text and tables in the White Ditch report, Appendix K, and Annex 1 of Appendix K to explain and, to the extent possible, justify the increase in recreational fishing, hunting, and other values that are estimated.</td>
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<tr>
<td>2. Clarification of the assumptions, research results, or “subjective interpretations of data” that result in them being different for each of the alternatives presented.</td>
</tr>
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</table>
Final Panel Comment 16:

It is not clear whether potential impacts associated with the proposed flow constrictors have been fully considered.

Basis for Comment:
Canals bisect the marsh throughout the project area and are being used to facilitate sediment and water flow through the restoration site. Five flow constrictor locations are delineated with red circles on maps (Figures 3.10 – 3.13, pp. 3-35 – 3-38) for each alternative along the River aux Chenes, but they are not labeled in the map legends. These locations are generally described as channel constrictions in Sections 5.9 Fisheries (pp. 5-64 – 5-67) and 5.10 Essential Fish Habitat (pp. 5-68 – 5-70); flow constrictors in Section 5.12 Recreation (pp. 5-83 – 5-84); and as notched restrictors in Section 5.15.15 Natural Resources (pp. 5-123 – 5-126) of the White Ditch report. If these structures will limit ecologically important exchange (e.g., exchange of water, nutrients, food sources, and fish) and navigation between River aux Chenes and the project area, these impacts have not been identified in the report. These impacts are not addressed in Sections 2.6 Planning Constraints (p. 2-8), 5.14 Recreation, or 5.15 Socioeconomic and Human Resources (p. 5-85) of the White Ditch report.

Without more information, it is difficult to assess the potential impact/benefit these structures would have on the project outcome. Much research has been conducted on tidal restrictions and their effects on ecosystem function, primarily showing a decrease in migration of shrimp (Herke et al. 1996) and fish (Rogers et al. 1987; Rogers et al. 1992), shifts in benthic communities (Stocks and Grassle 2003), as well as affecting overall coastal marsh function (Kuhn et al. 1999). However, some studies do indicate that tidal restrictions can have a beneficial effect under certain conditions (Raposa and Roman 2001).

By providing more information on the justification of these structures as well as their type, their importance to the project as well as potential impact/benefit to the project can be addressed.

Significance – Low:
Assuming the benefits of the structures outweigh potential adverse impacts, inclusion of this information would increase the technical quality of the report, but is not expected to affect the project recommendation

Recommendation(s) for Resolution:
To resolve these concerns, the report would need to be expanded to include information about the structural restrictions planned for five canals that connect the project area to River aux Chenes in the following locations:
1. Figures 3.20, 3.11, 3.12, and 3.13 – labeled in the legend.
2. Section 2.6 Planning Constraints, Ecosystem Constraints, River aux Chenes – describing potential impacts on fishery movement.
3. Section 5.9 Fisheries – describing potential impacts on fishery movement.
4. Section 5.10 Essential Fish Habitat – describing potential impacts on Essential Fish Habitat (EFH).
5. Section 5.14 Recreation – addressing potential limitations of public access over structure.
6. Section 5.15 Socioeconomic and Human Resources – addressing potential limitations of public access over structure.

**Literature Cited:**


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<th><strong>Final Panel Comment 17:</strong></th>
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<tr>
<td>The overarching problems motivating the White Ditch project, their magnitude, and the need for project implementation should be clearly and specifically stated in an introductory paragraph.</td>
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<tr>
<th><strong>Basis for Comment:</strong></th>
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<tr>
<td>The report does an excellent job describing the problems, needs, and opportunities to address those needs in various sections of the White Ditch report. However, by having this information in disparate locations throughout the White Ditch report the need for this project is not made immediately clear to the reader. It is the opinion of the Panel that it would be very helpful to have a single introductory paragraph that specifically states the problems, the magnitude of the problems, and the value of solving the problems by implementing the White Ditch project.</td>
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<tr>
<th><strong>Significance – Low:</strong></th>
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<tr>
<td>Including this information aids the reader in immediately understanding the landscape-level scope of the problems, the significance and magnitude of the loss of wetland habitat, and the value of restoring the wetlands in the project area.</td>
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<th><strong>Recommendation(s) for Resolution:</strong></th>
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<tr>
<td>To resolve these concerns, the report would need to be expanded to include the following:</td>
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<tr>
<td>1. A paragraph near the beginning of the report that clearly states the problems, specifically identifies the magnitude of the problems, and clearly articulates the value of constructing the project to resolve the problems.</td>
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</table>
**Final Panel Comment 18:**

The discussion of fulfilling project goals and objectives is not complete.

**Basis for Comment:**

In Section 3.9.6 of the White Ditch report, Effectiveness of the Tentatively Selected Plan in Meeting Project Goals, some general statements are made regarding the effectiveness of the TSP at meeting project goals and objectives. However, this section does not include sufficient detail to make an affective argument regarding the extent to which the proposed project will meet the goals and accomplish the objectives. The goal for the project includes multiple sub-elements and the three specific objectives were presented in a quantifiable way. This section does not refer back to all of the elements of the goal or make a statement which quantifies the extent to which all of the objectives will be met.

**Significance – Low:**

Including specific and quantifiable ways in which the objectives and goals are projected to be achieved by the TSP will offer the reader a more compelling case that the TSP is a feasible restoration solution for the project area.

**Recommendation(s) for Resolution:**

To resolve these concerns, the report would need to be expanded to include the following:

1. A specific list of the sub-elements of the project goals and three objectives stated in Section 3.9.6. This list should also state how the project goals and objectives would be met by the TSP, and where possible, describe the magnitude to which these goals and objectives would be expected to be met in a quantifiable way.
**Final Panel Comment 19:**

The report and appendices should receive a technical review that includes linking data presented in the White Ditch report with specific tables in appendices where the data were developed, and a map detailing the locations of all significant projects and features.

**Basis for Comment:**

The vast amount of information provided within the White Ditch report is extraordinary and the organization of all sections and associated appendices is well done. To expedite access to this information, appendices should be referenced in appropriate sections of the report and, where numbers used in the report are from specific tables or analytical results presented in the appendices, the link should be clearly noted.

The integrative nature of this project with other restoration projects in the region is an important component in ecosystem restoration. Since several projects are either in operation, planned, or proposed, and many have a bearing on this project’s success, a map showing their geographic locations would be beneficial.

Several appendices are included in the report, but not referenced in the text. Appendix B is not referenced, but does include important information on the Wetland Value Assessment methodology and results used in the report. Appendix H is not referenced; however “Value Engineering Study” is mentioned on pp. 3-20 and 3-22. Appendix L is referenced in the text, but is also referred to as “Engineering Appendix” on pp. 3-15, 5-8, 5-9, and 5-10.

**Significance – Low:**

Providing referenced links among text and appendices, as well as providing more comprehensive and informative maps, would increase the completeness and understanding of the project.

**Recommendation(s) for Resolution:**

To resolve these concerns, the report would need to be expanded as follows:

1. **Appendices**
   a. Reference Appendix B in Section 3.5.2 Wetland Value Assessment p. 3-39.
   b. Reference Appendix H on pp. 3-20 and 3-22.
   c. Reference Appendix L on pp. 3-15, 5-8, and 5-10.
2. **Maps**
   a. Include all bounding locations used to describe study area in Figure 1.1 (p. 1-3), including northern confluence of non-Federal back levee and Forty-Arpent Canal, Mississippi River levee, Federal back levee, American Bay, California Bay, Bay Gardene, and Caernarvon freshwater diversion.
   b. Provide a map with all other potential/existing projects (such as slide 11, IEPR kickoff 4-26-10.pdf) in Section 1.5.3 Local (pp. 1 – 10-14).
   c. Replace Figure 3.1 with figure that is described in text showing losses over time “areas in light blue” (p. 3-4).
d. Provide a map showing general extent of increased flows that will affect marsh restoration in Section 5.2 Hydrology (p. 5-5).

e. Refer to the correct Figure number in Section 5.6.4 Submerged Aquatic Vegetation, on pp. 5-42 and 5-44; Section 5.6.5 Invasive Species – Vegetation, on pp. 5-45, 5-46, subsequent to including the map in Section 1.5.3 Local (showing all project sites).

f. Include Figure 1 in Appendix D.

g. Provide a map showing extent of habitat change for each project alternative.

h. Provide a map of sampling locations with associated table with parameters to be measured in Appendix I.
APPENDIX B

Final Charge to the Independent External Peer Review Panel

on the

Integrated Feasibility Study and Supplemental Environmental Impact Statement for the Medium Diversion at White Ditch Plaquemines Parish, Louisiana

as

Submitted to USACE on April 23, 2010
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Integrated Feasibility Study and Supplemental Environmental Impact Statement for the Medium Diversion at White Ditch Plaquemines Parish, Louisiana

BACKGROUND

The Water Resources Development Act of 2007 authorized the Louisiana Coastal Area (LCA) program. Specifically, Section 7006(e)(3) requires the Secretary of the Army to submit one feasibility report to Congress on six elements by December 31, 2008. The six elements are

1) Terrebonne Basin Barrier Shoreline Restoration,
2) Small Diversion at Convent/Blind River,
3) Amite River Diversion Canal Modification,
4) Medium Diversion at White Ditch,
5) Convey Atchafalaya River Water to Northern Terrebonne Marshes, and

The Congressional language further authorizes construction of these six elements contingent upon submittal of a favorable report of the Chief of Engineers no later than December 31, 2010. The U.S. Army Corps of Engineers (USACE) is the Federal sponsor for the projects and the non-Federal sponsor is Louisiana’s Coastal Protection and Restoration Authority (CPRA).

This Independent External Peer Review (IEPR) will review the Medium Diversion at White Ditch project.

The Medium Diversion at White Ditch (MDWD) project study area is located in LCA Subprovince 1 in the Breton Sound hydrologic basin in Plaquemines Parish, Louisiana. The boundary of the project encompasses over 98,000 acres of intermediate to brackish intertidal wetland habitats. The study area boundary follows distinct landscape features beginning in the north with the confluence of the non-Federal back levee and the Forty-Arpent canal, extending along the non-Federal back levee, the Mississippi River levee, the Federal back levee and along the left descending natural bank of the Mississippi River to the west; past American Bay, California Bay, and through Breton Sound, near Bay Gardene to the south; into and along River aux Chenes to the east, and back to the point of beginning. The area has been significantly impacted by recent tropical storms and hurricanes and is currently isolated from the effects of the Caernarvon freshwater diversion, located at the northern end of the Breton Sound basin.

There are two discrete project locations that will be considered in this study: The area along the Mississippi River where a freshwater diversion structure might be located; and the project area that could be influenced and benefited by the diverted freshwater. The footprint of both of these areas will be dependent upon the overall size and capacity of the diversion structure recommended in the report.

The area of interest where a diversion structure could be located occurs on the left descending bank of the Mississippi River, between Bertrandville to the north (river mile 69) and the community of Davant to the south (river mile 51). An area of particular interest for this study is
the stretch between White Ditch (river mile 64.4) and Phoenix (river mile 59.7). This 4.7 mile stretch is unique in that there is no hurricane protection levee (back levee) on the marsh side that protects existing homes and infrastructure from elevated water levels (tidal or storm surge). The Mississippi River levee is the only flood protection structure that keeps river water from entering the project study area. This situation minimizes the amount of infrastructure that could be affected by construction of a diversion structure and allows for a broader array of measures to be considered in addressing problems in the project area. The project study area is approximately 98,000 acres encompassing an estuarine marsh system that has been heavily influenced by both man-made and natural processes. Channel construction, subsidence, erosion, saltwater intrusion, and storm-related damages have all significantly altered the natural environment, causing extensive losses of wetland habitats.

OBJECTIVES


Peer review is one of the important procedures used to ensure that the quality of published information meets the standards of the scientific and technical community. Peer review typically evaluates the clarity of hypotheses, validity of the research design, quality of data collection procedures, robustness of the methods employed, appropriateness of the methods for the hypotheses being tested, extent to which the conclusions follow from the analysis, and strengths and limitations of the overall product.

The purpose of the IEPR is to assess the adequacy and acceptability of economic, engineering, and environmental methods, models, and analyses used for the MDWD Integrated FS/SEIS. The IEPR will be limited to technical review and will not involve policy review. The IEPR will be conducted by subject matter experts (i.e., IEPR panel members) with extensive experience in engineering, economics, and environmental issues relevant to the project. They should also have experience applying their subject matter expertise to ecosystem restoration.

The panel members will be “charged” with responding to specific technical questions as well as providing a broad technical evaluation of the overall project. Per EC 1165-2-209, Appendix D, reviews should identify, explain, and comment upon assumptions that underlie all the analyses, as well as evaluate the soundness of models, surveys, investigations, and methods. Review panels should be able to evaluate whether the interpretations of analysis and the conclusions based on analysis are reasonable. Reviews should focus on assumptions, data, methods, and models. The panel may offer their opinions as to whether there are sufficient analyses upon which to base a recommendation.
DOCUMENTS PROVIDED

The following is a list of documents and reference materials that will be provided for the review. **The documents and files presented in bold font are those which are to be reviewed. All other documents are provided for reference.**

- **Integrated Feasibility Study and Supplemental Environmental Impact Statement for the Medium Diversion at White Ditch Plaquemines Parish, Louisiana**
  - Appendix A: Biological Assessment
  - Appendix B: U.S. Fish and Wildlife Service Coordination Letter and Report
  - Appendix C: NOAA Fisheries Service Coordination Letter
  - Appendix D: 404(b)(1) Water Quality Report
  - Appendix E: Louisiana Coastal Resources Program Consistency Determination
  - Appendix F: State Historic Preservation Officer Coordination Letter
  - Appendix G: Responses to Comments
  - Appendix H: Value Engineering Report
  - Appendix I: Adaptive Management/Monitoring Plan
  - Appendix J: Real Estate Plan
  - Appendix K: Benefit/Cost Incremental Cost Analysis
  - Appendix L: Engineering Appendix
  - Appendix M: Hazardous, Toxic, and Radioactive Waste Initial Assessment Documentation
  - Appendix N: Qualitative Induce Shoaling Analysis

- **USACE guidance Civil Works Review Policy (EC 1165-2-209) dated January 31, 2010**
- **CECW-CP Memorandum dated March 31, 2007**
- **Office of Management and Budget’s Final Information Quality Bulletin for Peer Review released December 16, 2004.**
- **Evaluation of Environmental Investments Procedures Manual Interim: Cost Effectiveness and Incremental Cost Analysis**
- **IWR Planning Suite, the cost effectiveness-incremental cost analyses software used by USACE on ecosystem restoration projects and mitigation of ecosystem impacts (accessible from [http://www.pmcl.com/iwrplan/](http://www.pmcl.com/iwrplan/))**

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5 Provided to Economics Panel Member Only

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<tr>
<th>TASK</th>
<th>ACTION</th>
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<tbody>
<tr>
<td>Conduct Peer Review</td>
<td>Review documents sent to panel members</td>
<td>4/26/2010</td>
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<td>Battelle/panel Kick-off Meeting</td>
<td>4/27/2010</td>
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<td>USACE/Battelle/panel Kick-off Meeting with panel members</td>
<td>4/27/2010</td>
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<td>External panel members complete their review</td>
<td>5/13/2010</td>
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<tr>
<td>Prepare Final Panel Comments and Final IEPR Report</td>
<td>Battelle provides panel members merged individual comments and talking points for panel review teleconference</td>
<td>5/20/2010</td>
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<td></td>
<td>Convene panel review teleconference</td>
<td>5/24/2010</td>
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<td>Battelle provides final panel comment directive to panel</td>
<td>5/25/2010</td>
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<td>External panel members provide draft final panel comments to Battelle</td>
<td>6/2/2010</td>
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<td>Battelle provides feedback to panel members on draft final panel comments; panel provides revised draft final panel comments per Battelle feedback</td>
<td>6/3 – 6/8/2010</td>
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<td>Final Panel Comments finalized</td>
<td>6/9/2010</td>
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<td>Battelle provides Final IEPR report to panel for review</td>
<td>6/11/2010</td>
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<td>Panel provides comments on Final IEPR report</td>
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<td>*Submit Final IEPR Report</td>
<td>6/23/2010</td>
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<td>Comment/Response Process</td>
<td>Input final panel comments to DrChecks Battelle provides final panel comment response template to USACE</td>
<td>6/25/2010</td>
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<td>USACE provides draft Evaluator responses and clarifying questions to Battelle</td>
<td>7/6/2010</td>
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<td>Battelle provides panel members the draft Evaluator responses and clarifying questions</td>
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<td>Panel members provide Battelle with draft BackCheck responses</td>
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<td>Teleconference with Battelle and panel members to discuss panel’s draft Backcheck responses</td>
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<td>Final Panel Comment Teleconference between Battelle, IEPR team, and USACE to discuss final panel comments, draft responses and clarifying questions</td>
<td>7/8/2010</td>
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<td>USACE inputs final Evaluator responses in DrChecks</td>
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<td>Battelle provides Evaluator responses to panel members</td>
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<td>Panel members provide Battelle with BackCheck responses</td>
<td>8/10/2010</td>
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<td>Battelle inputs BackCheck responses in DrChecks</td>
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<td>*Battelle submits pdf printout of DrChecks  project file</td>
<td>8/11/2010</td>
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CHARGE FOR PEER REVIEW

Members of this peer review panel are asked to determine whether the technical approach and scientific rationale presented in the MDWD Integrated FS/EIS are credible and whether the conclusions are valid. The reviewers are asked to determine whether the technical work is adequate, competently performed, properly documented, satisfies established quality requirements, and yields scientifically credible conclusions. The panel is being asked to provide feedback on the economic, engineering, environmental resources, and plan formulation. The reviewers are not being asked whether they would have conducted the work in a similar manner.

Specific questions for the panel members (by report section or Appendix) are included in the general charge guidance, which is provided below.

General Charge Guidance

Please answer the scientific and technical questions listed below and conduct a broad overview of the MDWD Integrated FS/EIS. Please focus on your areas of expertise and technical knowledge. Even though there are some sections with no questions associated with them, that does not mean that you cannot comment on them. Please feel free to make any relevant and appropriate comment on any of the sections and appendices you were asked to review. In addition, please note the following guidance. Note that the panel will be asked to provide an overall statement related to 2 and 3 below per USACE guidance (EC 1165-2-209; Appendix D).

1. Your response to the charge questions should not be limited to a “yes” or “no.” Please provide complete answers to fully explain your response.

2. Assess the adequacy and acceptability of the economic and environmental assumptions and projections, project evaluation data, and any biological opinions of the project study.

3. Assess the adequacy and acceptability of the economic analyses, environmental analyses, engineering analyses, formulation of alternative plans, methods for integrating risk and uncertainty, and models used in evaluation of economic or environmental impacts of the proposed project.

4. If appropriate, offer opinions as to whether there are sufficient analyses upon which to base a recommendation.

5. Identify, explain, and comment upon assumptions that underlie all the analyses, as well as evaluate the soundness of models, surveys, investigations, and methods.

6. Evaluate whether the interpretations of analysis and the conclusions based on analysis are reasonable.

7. Please focus the review on assumptions, data, methods, and models.

Please do not make recommendations on whether a particular alternative should be implemented, or whether you would have conducted the work in a similar manner. Also please do not comment on or make recommendations on policy issues and decision making. Comments should be provided based on your professional judgment, not the legality of the document.
1. If desired, panel members can contact one another. However, panel members should not contact anyone who is or was involved in the project, prepared the subject documents, or was part of the USACE Independent Technical Review.

2. Please contact the Battelle deputy project manager (Julian Digialleonardo, digialleonardoj@battelle.org) or project manager (Karen Johnson-Young, johnson-youngk@battelle.org) for requests or additional information.

3. In case of media contact, notify the Battelle project manager immediately.

4. Your name will appear as one of the panelists in the peer review. Your comments will be included in the Final IEPR Report, but will remain anonymous.

Please submit your comments in electronic form to Julian Digialleonardo, digialleonardoj@battelle.org, no later than May 13, 2010, 10 pm EDT.
Independent External Peer Review
Integrated Feasibility Study and Supplemental Environmental Impact Statement for the
Medium Diversion at White Ditch Plaquemines Parish, Louisiana

Final Charge Questions

General Questions

1. To what extent has it been shown that the project is technically sound, environmentally acceptable, and economically justified?

2. Are the assumptions that underlie the economic, engineering, and environmental analyses sound?

3. Are the economic, engineering, and environmental methods, models and analyses used adequate and acceptable?

4. In general terms, are the planning methods sound?

5. Are the interpretations of analysis and conclusions based on the analysis reasonable?

6. Will the proposed restoration (with O&M described in report) produce significant measurable benefits or is additional O&M or are additional restoration activities required for production of significant measurable benefits over the period of analysis? Consider the same question for production of significant measurable benefits beyond the period of analysis.

7. Please address validity of assumptions related to the potential for induced shoaling related to the diversion. Are the proposed operation and maintenance activities and costs associated with shoaling appropriate?

8. Does the report address how the diversions will be operated (pulsing versus consistent flows)? Are the benefits and costs of different operation plans adequately considered?

SECTION 1.0 Study Information

1.1 Study Authority

No questions

1.2 Purpose and Scope

No questions

1.3 Study Area

No questions
1.4 History of Investigation

No questions

1.5 Prior Reports and Existing Projects

9. Have all critically important prior studies performed relative to the study area been described?

1.6 Planning Process and Report Organization

No questions

1.7 USACE Campaign Plan

No questions

SECTION 2.0 – Need for and Objectives of Action

2.1 National Objectives

10. Comment on whether the Medium Diversion at White Ditch (MDWD) Project as proposed will contribute to national ecosystem restoration (NER) output.

2.2 Significance of the MDWD Project Area

No questions

2.3 Public Concerns

11. Have the public concerns been identified?

2.4 Problems, Needs, and Opportunities

12. Is the project need clearly stated?

13. Are the problems facing the White Ditch area accurately described?

14. Are the study area opportunities to improve habitat conditions and address the problems accurately described?

2.5 Planning Objectives

15. Are the planning goal and objectives described clearly?
16. Comment on whether the MDWD Project as proposed will meet the planning objectives.

2.6 Planning Constraints

17. Are the planning constraints described clearly and comprehensively?

18. Comment on whether the MDWD Project as proposed fully considers and accounts for the planning constraints as described.

SECTION 3.0 – Alternatives

3.1 Plan Formulation Rationale

19. Is the rationale for developing the plan clear and complete?

20. Are the criteria for developing the plan comprehensive?

3.2 Management Measures

21. Are the management measures thorough and accurate?

22. Assess the development and grouping of the management measures.

23. Is the methodology to develop the screening criteria appropriate?

24. Is the screening process of the management measures appropriate and adequate?

25. Is the elimination of some of the management measures from further study clearly described?

3.3 Preliminary Alternatives Plans

26. Assess the screening process of the potential alternative plans.

27. Was the elimination of some of the alternative plans from further study clearly described?

28. Is the description of the five potential locations for the diversion structure(s) accurate and sufficiently detailed?

29. Is the screening process used to eliminate some of the potential locations for the diversion structure adequate?

30. Is the incremental cost analysis/cost effectiveness assessment for the MDWD Project accurate and reliable?

3.4 Final Array of Alternatives
31. Is each of the alternative plans clearly described?

32. Assess the screening process used to arrive at the final array of alternatives.

3.5 Comparison of Alternative Plans

33. Are the processes used to compare the Alternative Plans suitable?

34. Evaluate the cost estimates for the various habitat improvement measures.

35. To what extent have significant project design and construction costs been adequately identified and described?

36. Are the WVA ecosystem output models reasonable and appropriate for evaluating project benefits/impacts?

37. Is the way in which the models were applied for evaluating project alternatives appropriate?
   a. If there are any modifications to the models, are they appropriate?
   b. Is weighting of variable or habitat types appropriate?
   c. If not, why?

38. Comment on the model reviewers' assessment of the technical quality, system quality, and usability of the WVA models.

39. Are the models used for the evaluation appropriate regarding:
   a. SI values assigned to variables
   b. The number of target years selected
   c. How AAHUs are calculated (i.e., estimating the sum rather than the arithmetic mean)
   d. How sea level change is incorporated into the models
   e. Whether policy or science is a more important driver for assigning an index value to model variables
   f. Whether calculations in the spreadsheets are correct and easy to use
   g. How risk and uncertainty is handled
   h. Whether the best data sources are used
i. Justification for why the geometric mean or arithmetic mean is used to calculate HSIs.

3.6 NER Plan

40. Is the NER plan sufficiently detailed?

3.7 Locally Preferred Plan

No questions

3.8 Environmentally Preferable Alternative

41. Does the information provided support the selection of the Environmentally Preferable Alternative?

3.9 Plan Selection-Tentatively Selected Plan

42. Is the description of the components of the Tentatively Selected Plan (TSP) sufficient?

43. Are the design, environmental, and construction considerations outlined for the Tentatively Selected Plan appropriate and adequate?

44. Does the preferred alternative give adequate consideration to ongoing or planned projects within the project area?

45. Have the impacts to existing infrastructure, such as state highways and oil and gas infrastructure, been adequately addressed?

46. Have the impacts to ongoing Operations and Maintenance of the Mississippi River Navigation Project been adequately addressed?

47. Has adequate consideration been given to reduce flooding impacts to adjacent communities?

48. Is the level of consideration given to the potential for induced shoaling adequate?

49. Does the plan address all real estate interests (private and public) and requirements resulting from the restoration project?

50. Have the operations and maintenance considerations of the Tentatively Selected Plan been addressed?

51. Was the decision to apply an adaptive management approach to the MDWD Project appropriate?

52. Is the compensatory mitigation measure appropriate?
53. Is the discussion of fulfilling goals and objectives complete?

3.10 Risk and Uncertainty

54. Are the descriptions of the risk and uncertainties associated with the development, selection, and construction of the Tentatively Selected Plan sufficiently comprehensive?

3.11 Implementation Requirements (Also consider information in Appendix I)

55. Have all assumptions, regulations, and stipulations regarding cost sharing, including in-kind work, been clearly described?

56. How complete is the action plan outlined in the financial requirements?

SECTION 4.0 – Affected Environment

4.1 Environmental Setting of the Study Area

57. Is the description of the climate in the study area sufficiently detailed and accurate?

58. Is the description of the geomorphological conditions in the study area sufficiently detailed and accurate?

4.2 Significant Resources

59. Is the description of sea level rise and estimated accretion rates in the study area complete and accurate?

60. Does the description of existing conditions provide for a sufficient understanding of the presence and distribution of soils and waterbottoms in the study area?

61. Is the discussion of factors influencing flow and stage of the Lower Mississippi River in the study area sufficiently comprehensive?

62. Has the historical/recent presence and location of the salt wedge been adequately described and evaluated in relation to the study area?

63. Is the description of the historical and existing flow and water level conditions in the study area adequate?

64. Is the description of the historical and existing sedimentation and erosion conditions in the study area adequate?

65. Is the description of the historical and existing vegetation resources in the study area adequate?
66. Is the description of the historical and existing wetland vegetation resources in the study area adequate?

67. Is the description of the historical and existing upland vegetation resources in the study area adequate?

68. Is the description of the historical and existing submerged aquatic vegetation resources in the study area adequate?

69. Is the description of the historical and existing wildlife and habitat resources in the study area complete and accurate?

70. Is the description of aquatic resources in the project area complete and accurate?

71. Is the description of the historical and existing fishery resources in the study area complete and accurate?

72. Is the description of threatened and endangered species resources in the study area (also consider information in Appendix A) complete and accurate?

73. Is the description of the historical and existing cultural and historic resources in the study area (also consider information in Appendix F) complete and accurate?

74. Is the description of the historical and existing aesthetic resources in the study area complete and accurate?

75. Is the description of the historical and existing recreational resources in the study area complete and accurate?

76. Is the description of the historical and existing socioeconomic resources in the study area complete and accurate?

77. Does this section accurately describe the historic and existing demographic, aesthetic, commercial, recreational, etc., resources of the study area/region? Please comment on each of these items.

78. Is the description of the hazardous, toxic, and radioactive waste in the study area complete and accurate?

SECTION 5.0 – Environmental Consequences

79. Is the scope and detail of the potential adverse effects that may arise as a result of project implementation sufficiently described and comprehensive?

5.1 Soils and Waterbottoms

80. Are environmental effects of changes to soil and waterbottom resources from the alternatives reasonable and factually supported?
81. Are assumptions related to accretion and subsidence rates valid? Will with-project conditions slow degradation, stabilize, or result in marsh building?

5.2 Hydrology

82. Comment on the indirect and cumulative impacts of flow and water level for the alternatives.

83. Are the environmental consequences associated with increased diversion volumes reasonable and factually supported?

84. Are environmental effects of changes to sedimentation and erosion from the alternatives reasonable and factually supported?

85. Are environmental effects of changes to flow and water levels from the alternatives reasonable and factually supported?

86. Are environmental effects of changes to water use and supply from the alternatives reasonable and factually supported?

87. Are environmental effects of changes to groundwater resources from the alternatives reasonable and factually supported?

5.3 Water Quality and Salinity

88. Are environmental effects of changes to water quality and salinity from the alternatives reasonable and factually supported?

5.4 Air Quality

89. Are environmental effects of changes to air quality from the alternatives reasonable and factually supported?

5.5 Noise

90. Are the effects of changes to noise from the alternatives reasonable and factually supported?

5.6 Vegetative Resources

91. Are environmental effects of changes to riparian vegetation resources from the alternatives reasonable and factually supported?

92. Are environmental effects of changes to wetland vegetation resources from the alternatives reasonable and factually supported?

93. Are environmental effects of changes to submerged aquatic vegetation from the alternatives reasonable and factually supported?
94. Are environmental effects of changes to vegetative invasive species conditions from the alternatives reasonable and factually supported?

5.7 Wildlife and Habitat

95. Is the description of projected impacts to wildlife for each of the alternatives complete and accurate?

96. Are environmental effects of changes to wildlife habitat from the alternatives reasonable and factually supported?

5.8 Aquatic Resources

97. Is the description of projected impacts to aquatic resources for each of the alternatives complete and accurate?

98. Are assumptions related to impacts to oysters valid?

5.9 Fisheries

99. Are environmental effects of changes to fishery resources from the alternatives reasonable and factually supported?

100. Are assumptions related to impacts to fisheries valid?

5.10 Essential Fish Habitat (EFH)

101. Are environmental effects of changes to Essential Fish Habitat from the alternatives reasonable and factually supported?

5.11 Threatened and Endangered Species

102. Are environmental effects of changes to threatened and endangered species from the alternatives reasonable and factually supported? (Also consider information in Appendix A)

5.12 Cultural and Historic Resources

103. To what extent have the potential impacts of the alternatives on cultural resources been addressed and supported? (Also consider information in Appendix F)

5.13 Aesthetics

104. Have the potential impacts to aesthetic resources from the alternatives been adequately considered?

5.14 Recreation
105. Have the potential impacts to recreation resources from the alternatives been adequately considered?

5.15 Socioeconomics and Human Resources

106. Have the potential impacts to socioeconomic and human resources from the alternatives been adequately considered?

5.16 Hazardous, Toxic, and Radioactive Wastes

107. Are environmental effects of changes to hazardous, toxic, and radioactive waste from the alternatives reasonable and factually supported?

5.17 Unavoidable Adverse Effects

108. Is the description of unavoidable adverse effects resulting from the implementation of the alternatives adequate?

5.18 Relationship of Short-term Uses and Long-Term Productivity

109. Is the description of the relationship between short-term uses and long-term productivity adequate?

5.19 Irreversible and Irretrievable Commitment of Resources

110. Is the description of the irreversible and irretrievable commitments of resources adequate?

5.20 Mitigation

No questions

5.21 Environmental Consequences Summary

No questions

SECTION 6.0 – Public Involvement

111. Based on your experience with similar projects, has adequate public, stakeholder, and agency involvement occurred to determine all issues of interest and to ensure that the issues have been adequately addressed to the satisfaction of those interested parties? Should any additional public outreach and coordination activities be conducted?

SECTION 7.0 – Coordination and Compliance
No questions

SECTION 8.0 – Conclusions and Determinations

No questions

SECTION 9.0 – Distribution List and Other

No questions

Appendix A: Biological Assessment

No questions

Appendix B: U.S. Fish and Wildlife Service Coordination Letter and Report

No questions

Appendix C: NOAA Fisheries Service Coordination Letter

No questions

Appendix D: 404(b)(1) Water Quality Report

112. Are the general characteristics of the dredged and fill material accurate and adequately described?

113. Is the quantity of the dredged and fill material adequate and factually supported?

114. Is the description of the disposal method sufficiently detailed and comprehensive?

115. Are the suspended particulate/turbidity determinations appropriate?

116. Are the proposed disposal site determinations appropriate?

Appendix E: Louisiana Coastal Resources Program Consistency Determination

No questions

Appendix F: State Historic Preservation Officer Coordination Letter

No questions

Appendix G: Responses to Comments

No questions
Appendix H: Value Engineering Study Report

117. Are the value engineering process and recommendations outlined in the report adequate?

118. Were the three basic value engineering (VE) principles (project function, cost, and ways of constructing the project at the same or a reduced cost) considered during the VE process?

Appendix I: Monitoring and Adaptive Management Plan

119. Are the performance measures, desired outcomes, and monitoring designs for each of the project objectives adequate?

120. Are the proposed monitoring procedures adequate?

121. Is the monitoring program assessment process sufficiently detailed and comprehensive?

122. Are the costs for administering a monitoring and assessment program reasonable?

Appendix J: Real Estate Plan

123. Is the methodology used to estimate the real estate costs presented in this plan appropriate and adequate?

124. Does the plan adequately address all real estate interests (public and private) and requirements allowing for appropriate comparisons across all alternatives?

125. Does the real estate plan address and plan for the potential concerns of landowners in the project area?

Appendix K: Benefit/ Cost – Incremental Cost Analysis

126. To what extent were significant project design and construction costs adequately identified and described?

127. Was the methodology used to conduct the incremental cost analysis adequate and valid?

128. Were the assumptions used to develop the incidental recreation benefits in Annex 1 of this report adequate?

Appendix L: Engineering Appendix

129. Is the 2-D CMS-Flow finite volume model to develop the hydrodynamic project modeling adequate?
130. Are the model’s capabilities and limitations clearly defined?
131. Are the methodologies used to collect data for model input adequate and valid?
132. Are the collected data sufficient to conduct a valid model calibration analysis?

Appendix M: Hazardous, Toxic, and Radioactive Waste Initial Assessment Documentation

No questions

Appendix N: Qualitative Induce Shoaling Analysis

No questions