Final Independent External Peer Review Report

Integrated Feasibility Study and Supplemental Environmental Impact Statement for the Louisiana Coastal Area – Amite River Diversion Canal Modification Element of the Section 7003 (E)(3) Ecosystem Restoration Projects Study

Prepared by
Battelle Memorial Institute

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

Contract No. W911NF-07-D-0001
Task Control Number: 10096
Delivery Order: 0896

June 23, 2010

SHORT-TERM ANALYSIS SERVICE (STAS)

on

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Scientific Services Program

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EXECUTIVE SUMMARY

The Amite River Diversion Canal (ARDC) Modification study area is located in the Louisiana Coastal Area (LCA) Subprovince 1 and is situated along the ARDC in Ascension and Livingston Parishes. The study area is bounded on the north by the old channel of the Amite River, Old River, Chinquapin Canal, and Bayou Chene Blanc; on the east by the Blind River; on the south by the Petite Amite River and the New River Canal; and on the west by the Sevario Canal, Ascension Parish flood protection levees, and the Laurel Ridge Canal.

In the 1950s, the U.S. Army Corps of Engineers (USACE) constructed the ARDC in an effort to relieve flooding along the upper Amite River and to enhance the flow of water from the meandering Amite River to Lake Maurepas. The 10-mile-long canal is 350 feet wide and was dug to a depth of 25 feet. Construction was completed in October 1964. The ARDC is connected to the Amite River by a control weir at French Settlement that was designed to retain low flows in the Amite River.

USACE is simultaneously conducting five[1] individual Independent External Peer Reviews (IEPRs) under one project (LCA 6 project) to review six elements of the LCA Ecosystem Restoration Project. As part of the LCA 6 project, an IEPR was conducted for the Integrated Feasibility Study and Supplemental Environmental Impact Statement for the Louisiana Coastal Area – Amite River Diversion Canal Modification Element of the Section 7003 (E)(3) Ecosystem Restoration Projects Study, hereinafter referred to as the Amite 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 Amite 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).

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 Amite report and the

[1] Two of the six elements were reviewed under one independent external peer review.

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 Amite documents, 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 550 individual comments in response to the 125 charge questions.

IEPR panel members reviewed the Amite 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 a four-part format consisting of: (1) a comment statement; (2) the basis for the comment; (3) the significance of the comment (high, medium, or low); and (4) recommendation(s) on how to resolve the comment. Overall, 11 Final Panel Comments were identified and documented. Of these, 8 were identified as having high significance, 3 had medium significance, and 0 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 11 Final Comments Identified by the Amite Report IEPR Panel

Significance – High	
1	The Hydrologic Engineering Center-River Analysis System (HEC-RAS) model does not accurately represent the hydrologic conditions necessary for project success and is not well documented.
2	The effects of relative sea level rise (RSLR) on alternative plans need to be explained in detail.
3	Adaptive management is appropriate and should be developed and implemented.
4	The monitoring plan lacks relevance, justification, and methodology to properly evaluate the success of the project.
5	The inclusion of vegetation plantings in all project alternatives warrants further justification as partial exclusion could have a substantial influence on selection of the Recommended Plan.
6	The cost effectiveness and incremental cost analyses (CE/ICA) are not clearly explained and are not reported in a manner consistent with U.S. Army Corps of Engineers (USACE) standard procedures in the Planning Guidance Notebook.
7	The project costs have substantial uncertainty and inconsistencies that could affect the selection of the Recommended Plan.
8	The Wetland Value Assessment (WVA) of project benefits and its supporting documentation are incomplete.

Significance – Medium	
9	The plan formulation – specifically, system-wide and project-specific problems, opportunities and objectives; management measures; the final array of alternatives; and selection of the Recommended Plan – needs additional explanation.
10	Geotechnical stability of the proposed dredged material piles along channel cuts in native swamp should be discussed in terms of both design and constructability issues.
11	The overall geomorphic setting and basis of the designs proposed for channel conveyance networks need to be explained.

The IEPR panel members agreed on their "assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used" (USACE, 2010; p. D-4) in the Amite report. The ARDC Modification project will substantively contribute to the National Ecosystem Restoration (NER) plan and will be enhanced by the coordination of other restoration projects in the LCA. Overall, the public involvement process and coordination with local authorities appeared to be comprehensive and extensive for this stage of the study. In general, the project will meet all of the objectives put forward to some extent; however, the degree to which it will meet the objectives is highly uncertain, and the IEPR Panel recognizes the restorative action is limited by budget and schedule constraints. The majority of the Panel's comments focused on providing more detail and discussion to clarify issues in several areas. The following statements summarize the Panel's findings, which are described in more detail in the Final Panel Comments (see Appendix A).

Plan Formulation: The general approach used to develop and select the Recommended Plan was rational and appropriate; however, the Panel expressed a need for a clearer logic trail between the system-wide problems and opportunities identified in the 2004 LCA Plan and the geographically specific problems and opportunities in the ARDC Modification area. There also needs to be a clearer explanation of the final array selection and connection of the seven alternatives to the project objectives.

Economics: The Amite report is comprehensive in the general information that is provided; however, the cost effectiveness and incremental cost analyses (CE/ICA) are not clearly explained and require closer adherence with USACE standard procedures. The assumptions and details of the CE/ICA are not presented in the narrative. The final array is not composed in a way that allows an analysis to identify the incremental benefits and incremental costs of different alternatives.

Engineering: The engineering of the project included in this report is generally done well, but some engineering aspects that are important to project success have not been completely addressed. The civil design and construction costs appeared generally reasonable; however, there were some inconsistencies in the construction cost contingency that appeared to increase the total project cost (TPC) for the Recommended Plan beyond the $8.1 million Water Resources Development Act (WRDA) authorization and Section 902 limit. It also appears that potential costs associated with relative sea level rise (RSLR) have not been considered and could therefore be a major categorical omission in the cost analysis.

Environmental: The Panel agreed that USACE is generally utilizing the best available tools it has to accomplish the analysis; however, the Panel raised several concerns related to hydraulic modeling, Wetland Value Assessment (WVA) modeling, adaptive management, and the monitoring plan. The models seem to have a track record of previous application, evaluation, and improvement that make them suitable for use on this project. This is not to say that they make accurate predictions. More detail on the sources of input and the mechanisms for producing output are needed to make a fully informed evaluation of the models. The use of these models for predicting average annual habitat units (AAHUs) is particularly important to document thoroughly, as AAHUs are the sole basis for determining project benefits. The methodology and scientific underpinnings of the WVA are incomplete and not sufficiently documented. Significant uncertainties occur in the hydraulic modeling that are associated with the actual footprint of the area that will be affected. There is also a lack of description and validation of the HEC-RAS model. Specifically, an apparent bias exists in the HEC-RAS calibration in that seasonal variation is not accurately captured, and therefore the model is unable to predict the water level dynamics that are most relevant to seedling establishment and achieving the target level of wetland function. If refinements to the HEC-RAS model show longer durations of summer drying, confidence in project sustainability would be bolstered. The extent to which accretion keeps pace with RSLR is also a key uncertainty that needs to be addressed more rigorously. The project risk and uncertainty associated with RSLR should be further considered from an adaptive management standpoint. The Panel strongly believes that there are adaptive management strategies that could be employed. The largest issues identified by the Panel are the need for a well-developed adaptive management plan and the lack of a comprehensive monitoring plan. The performance measures presented in the proposed monitoring plan do not match the fundamentally important variables used to calculate AAHUs in the WVA model.

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LIST OF ACRONYMS

AAHU	Average Annual Habitat Unit
ARDC	Amite River Diversion Canal
CE/ICA	Cost Effectiveness and Incremental Cost Analysis
CEM	Conceptual Ecological Model
CPRA	Coastal Protection and Restoration Authority
CRA	Cost-Risk Analysis
DrChecks	Design Review and Checking System
ERDC	Engineer Research and Development Center
HEC-RAS	Hydrologic Engineering Center-River Analysis System
HU	Habitat Units
IEPR	Independent External Peer Review
IWR	Institute for Water Resources
LCA	Louisiana Coastal Area
MCACES	Micro-Computer Aided Cost Estimating System
NER	National Ecosystem Restoration
NOAA	National Oceanic and Atmospheric Administration
NTP	Notice to Proceed
O&M	Operations and Maintenance
OCPR	Office of Coastal Protection and Restoration
OMB	Office of Management and Budget
RSLR	Relative Sea Level Rise
TPC	Total Project Cost
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 (WRDA) of 2007 authorized the Louisiana Coastal Area (LCA) program to restore wetland ecosystems along the coast of Louisiana. Specifically, 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
6) Multipurpose Operation of Houma Navigation Lock.

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).

Five[2] individual Independent External Peer Reviews (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 IEPR was conducted for the Integrated Feasibility Study and Supplemental Environmental Impact Statement for the Louisiana Coastal Area – Amite River Diversion Canal Modification Element of the Section 7003 (E)(3) Ecosystem Restoration Projects Study (hereinafter referred to as the Amite report).

The Amite River Diversion Canal (ARDC) Modification study area is located in the LCA Subprovince 1 and is situated along the ARDC in Ascension and Livingston Parish. The study area is bounded on the north by the old channel of the Amite River, Old River, Chinquapin Canal, and Bayou Chene Blanc; on the east by the Blind River; on the south by the Petite Amite River and the New River Canal; and on the west by the Sevario Canal, Ascension Parish flood protection levees, and the Laurel Ridge Canal.

In the 1950s, the USACE constructed the ARDC in an effort to relieve flooding along the upper Amite River and to enhance the flow of water from the meandering Amite River to Lake Maurepas. The 10-mile-long canal is 350 feet wide and was dug to a depth of 25 feet. Construction was completed in October 1964. The ARDC is connected to the Amite River by a control weir at French Settlement that was designed to retain low flows in the Amite River.

The report under review focuses on the ARDC Modification project. Prior studies and reports have documented degradation in the swamp adjacent to the ARDC and have demonstrated a need for ecosystem restoration that simulates historical hydrologic conditions. This project would

[2] Two of the six elements were reviewed under one independent external peer review.

establish hydrologic connectivity between the ARDC and the western Maurepas Swamp, allowing the swamp to drain during seasonal low-flow conditions in the Amite River and promoting the germination and survival of the seedlings of the bald cypress and other trees. It would also allow nutrients and sediments to be introduced from the ARDC into the swamp.

The objective of the work described here was to conduct an IEPR of the Amite report in accordance with procedures described in the Department of the Army, USACE Engineer Circular *Civil Works Review Policy* (EC No. 1165-2-209) (USACE, 2010), USACE CECW-CP memorandum *Peer Review Process* (USACE, 2007), and Office of Management and Budget (OMB) bulletin *Final Information Quality Bulletin for Peer Review* (OMB, 2004). Battelle, as a 501(c)(3) non-profit science and technology organization with experience in establishing and administering peer review panels, was engaged to coordinate the IEPR of the Amite report. 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 Amite 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, 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.

In this case, the IEPR of the Amite 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. 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 Amite report 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 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 Amite report are specific for this review. Note that the work items listed in Task 8 occur after the submission of this report. Battelle will enter the 11 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. Amite Report IEPR Schedule

TASK	ACTION	DUE DATE
1	Pre-award funding approval[a]	March 12, 2010
	NTP/review documents available	March 24, 2010
	Battelle prepares draft Work Plan[b]	April 9, 2010
	USACE provides comments on draft Work Plan	April 14, 2010
2	Battelle recruits and screens up to 30 potential panel members; prepares summary information[a]	April 7, 2010
3	Battelle submits draft charge[b]	April 9, 2010
	USACE provides comments on draft charge	April 14, 2010
	Battelle submits final Work Plan, including final charge[b]	April 19, 2010
	USACE approves final Work Plan, including final charge	April 20, 2010
4	Battelle selects no more than 25 panel members	April 7, 2010
	Battelle submits list of selected panel members	April 7, 2010
	USACE provides comments on list of panel members	April 9, 2010
	Battelle completes subcontracts for panel members	April 27, 2010
5	Kick-off meeting convened with USACE and Battelle	March 26, 2010
	Kick-off meeting convened with Battelle and IEPR Panel	April 26, 2010
	Kick-off meeting convened with USACE, Battelle, and IEPR Panel	April 27, 2010
6	Battelle sends review documents and charge to IEPR Panel	April 26, 2010
	IEPR Panel completes review and provides comments to Battelle	May 13, 2010

TASK	ACTION	DUE DATE
	Battelle consolidates comments from IEPR Panel	May 24, 2010
	Consensus teleconference convened with IEPR Panel and Battelle	May 25, 2010
7	IEPR Panel provides draft Final Panel Comments to Battelle	June 2, 2010
	Battelle submits final IEPR Report to USACE[b]	June 23, 2010
8[c]	Battelle inputs Final Panel Comments to DrChecks	June 25, 2010
	USACE provides draft Evaluator Responses via e-mail (Word document)	July 6, 2010
	Teleconference convened with USACE, Battelle, and IEPR Panel to discuss Final Panel Comments	July 19, 2010
	USACE inputs final Evaluator Responses to Final Panel Comments in DrChecks	July 27, 2010
	IEPR Panel responds to USACE Evaluator Responses (Backcheck Responses)	August 10, 2010
	Battelle submits pdf of DrChecks file and closes out DrChecks[b]	August 11, 2010
9	Project Closeout	October 21, 2010

[a] Requested to start on recruitment to meet the aggressive schedule

[b] Deliverable

[c] Task occurs after the submission of this report.

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 were consolidated to identify and recruit experts.

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 proposed as backup panel members for individual areas of expertise (the civil design/ construction cost engineering panel 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 Amite 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.[3] Participation in previous USACE technical peer review committees and other technical review panel experience was also considered.

- Involvement by you or your firm[4] in **<u>any</u>** 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[4] in any work related to the Louisiana CPRA.
- Involvement by you or your firm[4] 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[4] in the conceptual or actual design, construction, or operations and maintenance (O&M) of any projects for the LCA program, particularly the six elements listed in #1 above.
- Current employment by USACE.
- Involvement with paid or unpaid expert testimony related to the LCA program, particularly the six elements listed in the LCA projects above.
- 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 (OCPR), National Oceanic and Atmospheric Administration (NOAA), U.S. Fish and Wildlife Service, Natural Resources Conservation Service, U.S. Environmental Protection Agency (USEPA), Minerals Management Service, and 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.

[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.

- 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, Engineer 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[4] 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.), and position/role.
- Any previous employment by the USACE as a direct employee or contractor (either as an individual or through your firm[4]) 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[4] 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 five 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 Amite 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 of the Amite IEPR panel members.

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 Amite IEPR review to assist 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 were used to produce the final charge. The final charge was submitted to USACE for approval. In addition to a list of 125 charge questions/discussion points developed for the Amite 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 review of the Amite 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 Amite IEPR Panel received an electronic version of the Amite 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 Amite 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 Amite Panel produced approximately 550 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 Amite 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 550 comments into a preliminary list of 22 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 five 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 12 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 Amite Final 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. Recommendation(s) 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).

During the process of preparing the Final Panel Comments, the Panel recommended that 2 Final Panel Comments be combined, reducing the total number of Final Panel Comments to 11. 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 Amite 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 2. Amite Report IEPR Panel: Technical Criteria and Areas of Expertise

	Vita	Ulrich	Montague	Bledsoe	Hoehn
Civil Design/Construction Cost Engineering (one expert needed)	**X**				
Minimum of 10 years demonstrated experience	X				
Familiar with large, complex Civil Works projects with high public and interagency interests	X				
Degree(s) in civil engineering	X				
Demonstrated experience in performing cost engineering/construction management for all phases of ecosystem restoration, flood risk management, or related projects	X				
Familiar with similar projects across the United States and related cost engineering. Experience in associated contracting procedures, total cost growth analysis, and related cost-risk analysis (CRA) desired	X				
Familiar with construction industry and practices used in wetland restoration, flood damage/coastal storm damage reduction in the Gulf of Mexico coast	X				
Civil Works Planning (one expert needed)		**X**			
At least 10 years of demonstrated experience in Civil Works planning		X			
Familiar with large, complex Civil Works projects with high public and interagency interests		X			
Degree in planning or related field		X			
Experience with the plan formulation process		X			
Familiar with evaluation of alternative plans for ecosystem restoration projects		X			
Familiar with USACE standards and procedures		X			

	Vita	Ulrich	Montague	Bledsoe	Hoehn
Wetland Ecology (one expert needed)			**X**		
At least 10 years of demonstrated experience in wetland ecology			X		
Familiar with the ecology of coastal wetlands and estuarine environments and restoration of coastal wetland and estuarine environments in the Gulf of Mexico			X		
Masters degree in ecology or biology			X		
Hydrology and Hydraulics Engineering (one expert needed)				**X**	
Minimum 10 years experience with engineering analyses related to wetland restoration in coastal areas				X	
Minimum 10 years experience with engineering analyses related to flood/coastal storm damage reduction				X	
Familiar with standard USACE hydrologic and hydraulic computer models				X	
Familiar with large, complex Civil Works projects with high public and interagency interests				X	
Registered professional engineer				X	
Minimum of an M.S. degree in civil engineering or hydrology and hydraulics				X	
Economics (one expert needed)					**X**
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					X
Familiar with USACE CE/ICA tool: Institute for Water Resources (IWR)-Planning Suite (per 3/26 kickoff, this is not required expertise for this IEPR)					
Experience with cost effectiveness and cost-benefit analysis in general[a]					X
Familiar with large, complex Civil Works projects with high public and interagency interests					X

[a.] 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.

Chuck Vita, P.E.
Role: Civil Design/Construction Cost
Affiliation: URS Corporation

Dr. Chuck Vita, P.E., is currently a senior principal engineer with the URS Corporation. He has 37 years of professional experience, which includes cost engineering and management associated with civil engineering and environmental cleanup projects. He earned a Ph.D. in civil engineering from the University of Washington in 1985 and is a licensed Professional Engineer in Alaska, California, and Washington. He has provided construction support for many Civil Works projects. As feasibility study manager, Dr. Vita was responsible for cost engineering associated with the ecosystem restoration as part of the 1,500-square-mile Coeur d'Alene Basin environmental cleanup (USEPA Region 10). As part of a project for the National Oceanic and Atmospheric Administration, he served as the construction management quality assurance engineer for the Sha Dadx Habitat Restoration Project, Puyallup River, Washington, which involved the construction of a 3,500-foot-long ring levee. He is familiar with the various contracting procedures for environmental and civil engineering projects utilized by Federal, State, and local agencies. Dr. Vita is experienced in performing cost-risk analyses as part of cost estimating and evaluations associated with environmental cleanups, including developing analysis tools for probabilistic cost estimating.. He also has experience with total cost growth analysis associated with environmental and civil engineering projects. Dr. Vita is familiar with construction industry practices used in flood control/coastal storm damage reduction along the Gulf of Mexico coast, including knowledge of the New Orleans Hurricane and Storm Damage Risk Reduction System. He has served as a committee member for the National Academy Transportation Research Board's Alaska Risk Assessment of Oil and Gas Infrastructure Peer Review. Dr. Vita has authored numerous comprehensive reports, professional papers, and presentations on engineering performance analyses and is noted for rigorous conceptual and statistical data analysis and interpretation, including design and evaluation of exploration, testing, and monitoring programs.

Cheryl Ulrich, P.E.
Role: Civil Works Planner
Affiliation: Weston Solutions, Inc.

Ms. Cheryl Ulrich, P.E., is currently a planner and engineer with Weston Solutions, Inc., in Atlantic Beach, Florida. She earned her M.S. in civil engineering (with an emphasis on coastal and hydraulic engineering) from the University of California at Berkeley in 1987. She is a registered professional engineer in Florida. Ms. Ulrich has over two decades of USACE Civil Works experience, including 8 years as a plan formulator, 8 years as a project manager, and 5 years as a program manager. She is familiar with USACE plan formulation standards and procedures and has direct project experience in every Civil Works mission area, including flood damage reduction, coastal erosion and beach nourishment, shoreline and stream bank protection, navigation, hydropower, ecosystem restoration, and dredged material management (all of which required directly dealing with the USACE planning process). While working for the USACE Jacksonville District (1997-2007), Ms. Ulrich executed many comprehensive watershed evaluations and large-scale multi-purpose ecosystem restoration projects, including the entire South Florida Ecosystem Restoration Program of which the $10.5 billion Comprehensive

Everglades Restoration Plan was a part. Ms. Ulrich was involved with the plan formulation from a project level, as well as the programmatic system level. She facilitated the development of an economic justification methodology that was applied to all the plan's projects. She is familiar with IWR-Plan, as many of the Everglades studies used the tool to determine the "best buy" plan using cost effectiveness and incremental cost analysis. Ms. Ulrich represented the Jacksonville District with Congressional interests, White House Council on Environmental Quality, OMB, Assistant Secretary of the Army (Civil Works), and other high-level Federal, State, and local government officials. For USACE Headquarters, she served as the project manager in preparing a plan to implement a National Center for Ecosystem Restoration.

Clay Montague

Role: Wetland Ecologist
Affiliation: Independent Consultant and University of Florida

Dr. Clay Montague is currently an Associate Professor of Systems Ecology in the Department of Environmental Engineering Sciences at the University of Florida, Gainesville, specializing in coastal and estuarine ecology, systems ecology, ecological modeling, and environmental science. He received his Ph.D. in zoology from the University of Georgia in 1980. He has over 30 years of experience on ecological management of intertidal wetlands and estuaries of the Gulf and Southeastern Atlantic coasts, including research, teaching, publications, and speeches. He was co-developer of a 3D estuarine modeling addition to Arc GIS called ACES (Analytical Framework for Coastal and Estuarine Study) and coauthored a major review of estuaries of the southeastern United States for the journal *Estuaries*. He wrote the first chapter of the book *Ecology and Management of Tidal Marshes: A Model from the Gulf of Mexico*. He is currently supervising doctoral research on hurricane flooding in Louisiana coastal wetlands.
Dr. Montague's involvement with large Civil Works projects includes researching and consulting on the ecological effects on wetlands and estuaries for projects such as inlet management in North Carolina and Florida for USACE and Jupiter Florida Inlet Management District; beach nourishment in Florida for USACE and U.S. Navy; and water diversions on estuaries of Florida Bay for the National Parks Service, South Florida Water Management District, and St. Johns River Water Management District. He has authored/coauthored over 80 papers and publications related to wetland restoration, ecology, estuarine systems, and coastal ecosystems. He has written several articles on the ecology and management of impounded coastal wetlands in the southeastern United States. Dr. Montague has served as the President of the Southeastern Estuarine Research Society and has served on the board of the Estuarine Research Federation. He is a past member of the Coastal Engineering Technical Advisory Committee, State of Florida Office of Beaches and Coastal Systems, and served on the Ecosystems Panel for the National Science Foundation.

Brian Bledsoe, P.E.

Role: Hydrology and Hydraulics Engineer
Affiliation: Independent Consultant and Colorado State University

Dr. Brian Bledsoe, P.E., is currently an associate professor in the Civil and Environmental Engineering department at Colorado State University. He earned his Ph.D. in civil engineering and river mechanics from Colorado State University in 1999 and is a registered professional engineer in Colorado and North Carolina with 22 years of experience. Dr. Bledsoe has been conducting engineering analyses and wetland restoration-related research in coastal areas since 1991. His research and teaching interests are focused on the interface between hydraulic engineering and ecology, with an emphasis on the development of effective and ecologically based river, wetland, and watershed restoration practices. He served as a wetland restoration specialist for the North Carolina Department of Environment and Natural Resources (NCDENR) Divisions of Coastal Management and Water Quality, during which he conducted research on the hydrology, hydraulics, water quality, and ecology of wetlands to determine design criteria for wetland/riparian restoration projects. He later served as the State's lead engineer in the development, implementation, and retrofitting of best management practices and ecosystem rehabilitation measures designed to restore water quality to impaired water bodies. While with North Carolina Department of Environment and Natural Resources, Dr. Bledsoe conducted engineering analyses related to flood and coastal storm damage reduction. Dr. Bledsoe is very familiar with USACE hydrologic and hydraulic models, including HEC-RAS, HEC-2, HEC-1, HEC-6T, HEC-HMS, and RMA-2. He has taught HEC-RAS short courses at Colorado State University and introduces several of these models in the engineering courses he teaches, including Environmental River Mechanics, Stream Rehabilitation Design, and Nonpoint Source Pollution. He has experience with large complex Civil Works projects including the U.S. 17 Neuse River Bridge and New Bern Bypass projects (North Carolina Department of Transportation). In addition, he was selected to participate in the IEPR for the Biscayne Bay Coastal Wetlands Project Implementation Report. Dr. Bledsoe's M.S. research at North Carolina State University focused on coastal wetland ecology and hydrology and he has authored over 50 publications related to wetlands, stream and watershed processes, restoration, and water quality.

John Hoehn

Role: Economics
Affiliation: Independent Consultant and Michigan State University

Dr. John Hoehn is currently a professor of agricultural and resource economics at Michigan State University. He earned his Ph.D. in agricultural economics from the University of Kentucky in 1984 and has 31 years of experience in researching and applying benefit-cost analyses, non-market valuation methods (including cost effectiveness and incremental cost analysis [CE/ICA]), risk assessment, ecosystem services, ecological economics, and natural hazards. Dr. Hoehn's M.S. thesis evaluated the incremental costs and benefits of setting up marketing co-ops for farmers; his Ph.D. dissertation developed theoretical ICA principles and applied these principles to regional and national air quality programs. He has been researching and teaching applications of CE/ICA for over 30 years. His experience with ecosystem restoration includes a grant from Michigan Sea Grant: Ecological and Economic Consequences of Hydropower-Related Watershed Restoration in Great Lakes Tributaries. He also coauthored a

book chapter on species restoration in the Great Lakes area. Dr. Hoehn has worked with a number of Federal and international agencies doing research and advising on large Civil Works projects, including serving as an economist for the Federal Trustees (multi-agency and tribal) in evaluating the economic damages from the Exxon Valdez oil spill; conducting an economic evaluation for the U.S. Agency for International Development and the Egyptian government of the agency's investments in Cairo's water supply and wastewater treatment; serving as an economic advisor to the International Joint Commission multiagency, 5+year, $20+ million study of Lake Ontario-Saint Lawrence Seaway water releases, water structures, and water levels; and the ongoing International Joint Commission study of USACE water regulation in the Great Lakes. In addition to these larger projects, he has been involved in numerous smaller water and natural resource projects with Federal agencies, including USACE, Department of Justice, Department of Interior, USEPA, U.S. Department of Agriculture, and the National Research Council.

5. SUMMARY OF FINAL PANEL COMMENTS

The IEPR panel members agreed on their "assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used" (USACE, 2010; p. D-4) in the Amite report. The ARDC Modification project will substantively contribute to the National Ecosystem Restoration (NER) plan and will be enhanced by the coordination of other restoration projects in the LCA. Overall, the public involvement process and coordination with local authorities appeared to be comprehensive and extensive for this stage of the study. In general, the project will meet all of the objectives put forward to some extent; however, the degree to which it will meet the objectives is highly uncertain, and the IEPR Panel recognizes the restorative action is limited by budget and schedule constraints. The majority of the Panel's comments focused on providing more detail and discussion to clarify issues in several areas. The following statements summarize the Panel's findings, which are described in more detail in the Final Panel Comments (see Appendix A).

Plan Formulation: The general approach used to develop and select the Recommended Plan was rational and appropriate; however, the Panel expressed a need for a clearer logic trail between the system-wide problems and opportunities identified in the 2004 LCA Plan and the geographically specific problems and opportunities in the ARDC Modification area. There also needs to be a clearer explanation of the final array selection and connection of the seven alternatives to the project objectives.

Economics: The Amite report is comprehensive in the general information that is provided; however, the cost effectiveness and incremental cost analyses (CE/ICA) are not clearly explained and require closer adherence with USACE standard procedures. The assumptions and details of the CE/ICA are not presented in the narrative. The final array is not composed in a way that allows an analysis to identify the incremental benefits and incremental costs of different alternatives.

Engineering: The engineering of the project included in this report is generally done well, but some engineering aspects that are important to project success have not been completely addressed. The civil design and construction costs appeared generally reasonable; however,

there were some inconsistencies in the construction cost contingency that appeared to increase the total project cost (TPC) for the Recommended Plan beyond the $8.1 million Water Resources Development Act (WRDA) authorization and Section 902 limit. It also appears that potential costs associated with relative sea level rise (RSLR) have not been considered and could therefore be a major categorical omission in the cost analysis.

Environmental: The Panel agreed that USACE is generally utilizing the best available tools it has to accomplish the analysis; however, the Panel raised several concerns related to hydraulic modeling, Wetland Value Assessment (WVA) modeling, adaptive management, and the monitoring plan. The models seem to have a track record of previous application, evaluation, and improvement that make them suitable for use on this project. This is not to say that they make accurate predictions. More detail on the sources of input and the mechanisms for producing output are needed to make a fully informed evaluation of the models. The use of these models for predicting average annual habitat units (AAHUs) is particularly important to document thoroughly, as AAHUs are the sole basis for determining project benefits. The methodology and scientific underpinnings of the WVA are incomplete and not sufficiently documented. Significant uncertainties occur in the hydraulic modeling that are associated with the actual footprint of the area that will be affected. There is also a lack of description and validation of the Hydrologic Engineering Center-River Analysis System (HEC-RAS) model. Specifically, an apparent bias exists in the HEC-RAS calibration in that seasonal variation is not accurately captured, and therefore the model is unable to predict the water level dynamics that are most relevant to seedling establishment and achieving the target level of wetland function. If refinements to the HEC-RAS model show longer durations of summer drying, confidence in project sustainability would be bolstered. The extent to which accretion keeps pace with RSLR is also a key uncertainty that needs to be addressed more rigorously. The project risk and uncertainty associated with RSLR should be further considered from an adaptive management standpoint. The Panel strongly believes that there are adaptive management strategies that could be employed. The largest issues identified by the Panel are the need for a well-developed adaptive management plan and the lack of a comprehensive monitoring plan. The performance measures presented in the proposed monitoring plan do not match the fundamentally important variables used to calculate AAHUs in the WVA model.

Table 3 lists the 11 Final Panel Comment statements by level of significance.

Table 3. Overview of 11 Final Comments Identified by the Amite Report IEPR Panel

Significance – High	
1	The Hydrologic Engineering Center-River Analysis System (HEC-RAS) model does not accurately represent the hydrologic conditions necessary for project success and is not well documented.
2	The effects of relative sea level rise (RSLR) on alternative plans need to be explained in detail.
3	Adaptive management is appropriate and should be developed and implemented.
4	The monitoring plan lacks relevance, justification, and methodology to properly evaluate the success of the project.
5	The inclusion of vegetation plantings in all project alternatives warrants further justification as partial exclusion could have a substantial influence on selection of the Recommended Plan.
6	The cost effectiveness and incremental cost analyses (CE/ICA) are not clearly explained and are not reported in a manner consistent with U.S. Army Corps of Engineers (USACE) standard procedures in the Planning Guidance Notebook.
7	The project costs have substantial uncertainty and inconsistencies that could affect the selection of the Recommended Plan.
8	The Wetland Value Assessment (WVA) of project benefits and its supporting documentation are incomplete.
Significance – Medium	
9	The plan formulation – specifically, system-wide and project-specific problems, opportunities and objectives; management measures; the final array of alternatives; and selection of the Recommended Plan – needs additional explanation.
10	Geotechnical stability of the proposed dredged material piles along channel cuts in native swamp should be discussed in terms of both design and constructability issues.
11	The overall geomorphic setting and basis of the designs proposed for channel conveyance networks need to be explained.

6. REFERENCES

OMB (2004). Final Information Quality Bulletin for Peer Review. Executive Office of the President, Office of Management and Budget, Washington, DC. Memorandum M-05-03. December 16.

The National Academies (2003). Policy on Committee Composition and Balance and Conflicts of Interest for Committees Used in the Development of Reports. The National Academies (National Academy of Science, National Academy of Engineering, Institute of Medicine, National Research Council). May 12.

USACE (2000). Planning Guidance Notebook. Department of the Army, US Army Corps of Engineers, Washington, DC. Regulation No. ER 1105-2-100. April 22.

USACE (2004). Louisiana Coastal Area (LCA) Ecosystem Restoration Study. Volume II: Final Programmatic Environmental Impact Statement. US Army Corps of Engineers, New Orleans District, New Orleans, LA. 918 pp.

USACE (2007). Peer Review Process. Department of the Army, US Army Corps of Engineers, Washington, DC. CECW-CP Memorandum. March 30.

USACE (2010). Water Resources Policies and Authorities: Civil Works Review Policy. Department of the Army, US Army Corps of Engineers, Washington, DC. Engineer Circular (EC) No. 1165-2-209. January 31.

APPENDIX A

Final Panel Comments

on the

Integrated Feasibility Study and Supplemental Environmental Impact Statement for the Louisiana Coastal Area – Amite River Diversion Canal Modification Element of the Section 7003 (E)(3) Ecosystem Restoration Projects Study

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Comment 1:

The Hydrologic Engineering Center-River Analysis System (HEC-RAS) model does not accurately represent the hydrologic conditions necessary for project success and is not well documented.

Basis for Comment:

The HEC-RAS model correctly indicates that hydrologic connectivity will be restored to some degree and that water will be exchanged between the Amite River Diversion Canal (ARDC) and the swamps. However, significant uncertainty remains with respect to the level of drying that will be attained and the actual footprint of the area with sufficient dry spells for seedling establishment.

The model is not validated, and the calibration appears to be influenced by a systematic bias that overestimates growing season stages and underestimates stages during the remainder of the year (Appendix L, Figures 2.4 and 2.5). Inaccuracies in the HEC-RAS model and its lack of fidelity to hydrological processes preclude a rigorous assessment of project performance. In addition, the hydrologic analysis lacks a clear linkage with seedling establishment processes controlled by extended summer dry spells. The Wetland Value Assessment (WVA) model depends on the output of the HEC-RAS model to predict project benefits – namely, swampland average annual habitat units (AAHUs). Therefore, it is necessary that the linkages be established clearly.

The details of model specification and parameterization are not provided. Several critical assumptions/decisions made in the HEC-RAS modeling are not sufficiently explained or justified. For example, the methods and justification for using culverts/road embankments, weirs, etc. (that do not exist) to emulate the storage area exchange and drawdown are not provided. The choice of the Modified Puls routing method in the HEC-RAS model is not justified and explained. The Panel is concerned with the model specification because no physical justification is provided for how the cuts/channels were represented with hypothetical structures, and because it remains unclear how faithful these modeling tactics are to the actual hydrologic behavior of the system under the conditions most relevant to seedling establishment.

There is no validation of the model, and the calibration results are not clearly communicated with respect to measures of error and model performance. Visual inspection of Figures 2.4 and 2.5 in Appendix L (pp. 13-14) suggests that root mean square errors in the HEC-RAS calibration are substantially larger than the “average” values reported in Appendix L (p. 11), and there is no accompanying explanation. The model appears to be poorly calibrated for the growing season, and average values seem to mask systematic biases in growing season vs. dormant season errors that cancel in the annual calibration.

The model is not representative of the most ecologically relevant aspects of the hydrologic regime with respect to seedling establishment. The performance of the HEC-RAS calibration is assessed using measures of performance that differ from the key

measures that will determine project benefits. For example, the monitoring plan (Appendix I, p. 9) states that a specific objective is to "maintain dry periods (moist soils) in the swamp for a minimum 7-35 days during summer and early fall for seed germination and maintain water levels below seedling height to promote seedling survival." However, the model as currently implemented does not accurately represent dry periods. As such, there is a disconnect between the hydrologic modeling exercise and the requirements for cypress-tupelo establishment. This disconnect would seem to seriously impact predictions from the WVA model that were used to establish project benefits.

Insufficient emphasis on linking the hydrologic modeling to specific seasonal hydrologic targets for seedling establishment is an overarching concern. The HEC-RAS model has not been applied in a manner that addresses some of the most critical concerns including:

- the effects of the Recommended Plan on the frequency, duration, and timing of seed-germinating drying spells,
- the linkage between Recommended Plan hydrologic effects and germination / regeneration requirements of cypress and tupelo, and
- model performance during growing season drying cycles when predictive accuracy is arguably most important.

Without a model that can estimate these ecologically relevant characteristics, there is no semblance of a weight of evidence that the project will provide sufficient summer drainage to reverse the current trajectory of degradation.

The HEC-RAS modeling of flood risk seems reasonable; however, the report is not sufficiently clear on two points: (1) the locations of human dwellings and adjacent land uses, and (2) the implications of no flow conveyance through swamp storage areas in the HEC-RAS model during extreme events.

Significance – High:

The HEC-RAS modeling uncertainties substantively affect the project justification and sustainability, as well as the entire WVA analysis.

Recommendation(s) for Resolution:

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

1. Provide additional details and clarification on the HEC-RAS model specification and parameterization (geometry file), as well as calibration accuracy.
2. Different parameterizations/calibrations of the model for the growing season vs. dormancy and for different hydrologic variables (dry spells vs. overall exchange/connectivity). A geometry file that better represents drawdown during growing season dry spells as affected by evapotranspiration and soil storage would provide a much sounder basis for assessing project performance. Given the apparent direction of bias in the HEC-RAS calibration, refinements to HEC-RAS model and its calibration (improved representation of the growing season) could potentially show longer durations of summer drying and bolster confidence in project sustainability.

3. Predictions from HEC-RAS that are put into an ecological context with respect to how the proposed action will alter the aspects of the hydrologic regime that are most relevant to seedling establishment (duration of summer/early fall dry spells). Further clarification is needed on the hydrologic regimes necessary to allow seedling establishment and achieve the target level of wetland function. This requires defining the range of natural variability of growing season hydrologic regimes in systems not exhibiting a trend of degradation, and modeling whether the proposed actions will likely create conditions that fall within this range of variability.
4. A clearer description of the locations of proximate human dwellings and land uses, and an explanation of why the assumption of no flow conveyance through swamp storage areas during extreme events in the HEC-RAS model does not affect the conclusions of the flood risk analysis.

Comment 2:

The effects of relative sea level rise (RSLR) on alternative plans need to be explained in detail.

Basis for Comment:

RSLR is critical in the rate of conversion of cypress-tupelo swamp to marsh. However, the Amite report does not provide adequate explanation regarding the effects of RSLR on (1) the performance of alternative plans at different locations and (2) how project outcomes change over time in terms of habitat units and cumulative habitat units (CHUs). This lack of clarity about the impact of RSLR on the alternatives and Recommended Plan leaves the long-term sustainability of the project as an unanswered question.

Table 3.19 on p. 3-97 (also Table 5.27 on p. 5-28) indicates that the Recommended Plan delays inundation under the low scenario from year 14 to year 40 of the planning horizon. The reference to "inundation" implies that the project area becomes a marsh after 40 years. The text does not discuss the latter's implication and therefore leaves the sustainability question unanswered.

RSLR is the net effect of at least three phenomena: absolute sea level rise, subsurface geological subsidence, and surface subsidence due to erosion and decay of organic matter. The project presumably will slow or reverse surface subsidence due to erosion and decay. The analysis does not specify how much the Recommended Plan and other alternative plans reduce or reverse surface subsidence. It is not clear whether the analysis considered changing the location of management measures in the development of alternative plans to increase their output. Different locations may vary in their susceptibility to surface subsidence and the effects of inundation. It seems possible that the biological output of alternatives may be increased by being affected by RSLR later, rather than earlier, in the project time horizon.

The RSLR rates used in the analysis also require further explanation and justification from scientific literature. The rates of RSLR used in project evaluation (p. 2-10, lines 325-6) appear high relative to rates in one article cited in the Amite report. The report used 1.5 feet (ft), 1.9 ft, and 3.2 ft over the 50-year planning horizon in the analysis. However, the citation of Snedden et al. (2007) on p. 2-9 suggests that RSLR is no more than 10 millimeters/year, implying a RSLR of no more than 1.64 ft over the 50-year planning horizon, or about half of the high rate used in the analysis.

Additionally, the report would benefit from further discussion of how RSLR affects the AAHU productivity of plan alternatives. The report also needs to explicitly address the consequences of RSLR in view of its contribution to sustainable National Ecosystem Restoration (NER) and Louisiana Coastal Area (LCA) ecosystem restoration.

Significance – High:
The lack of clarity about RSLR effects on the performance and formulation of alternatives leaves the long-term sustainability of the project in doubt.
Recommendation(s) for Resolution:
To resolve these concerns, the report would need to be expanded as follows: 1. An explanation and discussion in Chapter 3 of how RSLR affects the formulation and performance of plan alternatives. 2. A discussion of how RSLR and inundation affects the shape of the graphs in Figures 3.17 to 3.24, pp. 3-65 to 3-67. The report should explain why there is a plateau of benefits after year 30 in each figure. Also, the report should clarify whether the vertical axes of Figures 3.17 to 3.24 are actually "Habitat Units" (as the labels indicate) or cumulative habitat units, or AAHUs. 3. Additional citations and explanation for the low, intermediate, and high RSLR rates used in the analysis 4. A discussion of how RSLR and transitory restoration provided by the Recommended Plan contribute and limit the project's contribution to NER and LCA ecosystem restoration absent potential future adaptive management to mitigate actual and evolving RSLR.

Comment 3:

Adaptive management is appropriate and should be developed and implemented.

Basis for Comment:

As acknowledged in Appendix I, pp. 6 and 7, and in the main report, p. 3-85 and elsewhere, much uncertainty accompanies wetland restoration projects, especially those that involve relative sea level rise (RSLR). Significant uncertainty exists in both future RSLR and the performance of the ARDC Modification. RSLR implies that project benefits will be short-lived without adaptive management to compensate. Table 3.19 indicates "Years to Permanent Inundation" as 17 to 40 years "With Project" and 8 to 14 years under the "No Action Alternative." Even the low rate of RSLR indicates the project area, with project, will be open water before the end of the 50-year project planning period.

When uncertain outcomes exist, the likelihood of project success can be greatly enhanced through adaptive management. A large portion of the ARDC Modification budget is identified for monitoring. Monitoring results are more valuable when used to take corrective action to react to undesirable outcomes. Appendix I further states that "there are no clear actions that could be taken in response to monitoring results" (Appendix I, p. 7, and p. 3-85 of the main report). The Panel disagrees with this statement and believes adaptive management is appropriate for the ARDC Modification. The Panel believes that an adaptive management plan could reduce the adverse consequences of RSLR and extend the effective life of the project.

If the project produces a hydrological regime that allows swampland development and self-perpetuation, then swampland habitat can be restored as intended, or at least its conversion to marsh and open water can be slowed in the face of RSLR. However, if the frequency and duration of drawdowns are not suitable for wetland tree seed germination, for example, and if this is correctable, then modifications should be undertaken to adjust the hydrological regime.

Feasible adaptive management actions include modifying the shape and branching of conveyances, adding more conveyances, and adding cuts in the railroad bed or adjusting the size and shape of their openings.

To accomplish adaptive management, the ARDC Modification monitoring program must include protocols specifically designed to reveal hydrological inadequacy and take the necessary measures to corrective action. Plans can then be made to modify the conveyances and cuts accordingly.

RSLR and adaptive management are probably best considered in an integrated approach for the LCA program and the affected ecosystem as a whole.

Significance – High:
Because both the rate of RSLR and the success of wetland restoration are uncertain and depend on producing a hydrological regime suitable for swampland development and perpetuation, adaptive management and targeted hydrological monitoring must be included to be able to react to uncertainties of the project and rectify undesirable trends.
Recommendation(s) for Resolution:
To resolve these concerns, the report would need to be expanded as follows: 1. A statement of intention to adopt adaptive management. 2. An adaptive management plan that identifies feasible hydraulic adjustments such as conveyance and cut modifications. 3. A monitoring plan that can direct appropriate adaptive modifications of hydraulics toward producing more effective swampland habitat improvement. 4. An explicit discussion about how RSLR affects project benefits and about how rigorous adaptive management, including monitoring, can extend and sustain the benefits. 5. Consider adaptive management to deal with RSLR for the LCA program as a whole, so that an integrated approach can be taken.

Comment 4:

The monitoring plan lacks relevance, justification, and methodology to properly evaluate the success of the project.

Basis for Comment:

AAHUs are the primary performance measure and the sole criterion used for determining benefits of the ARDC Modification, yet AAHUs are not an output of the proposed monitoring program. The purpose of the project is intimately connected to achieving an increase in AAHUs; therefore, the monitoring program should focus on a determination of AAHUs as a performance measure. The change analysis of aerial imagery described in the monitoring plan is not linked to the computation of AAHUs. Also, other evidence of project performance evaluation is not included to adequately convert monitoring results to an estimate of AAHUs.

Monitoring should allow at least a rough verification of the AAHUs expected from the Recommended Plan. Presently, 679 AAHUs are expected. Monitoring should be able to measure whether or not the predicted increase of habitat units (HUs) occurred by year 10 (the last monitoring year). This is presently 290 HUs, as indicated in Table 3.11. The monitoring program must provide the data necessary to evaluate project success in terms of AAHUs and HUs.

Because the WVA model was used to determine AAHUs, monitoring should focus on the parameters used as input for the WVA model. Those parameters are not stated in the report, but apparently include output from the HEC-RAS model. Hence, monitoring should also focus on the parameters used as input or produced as output from the HEC-RAS model.

Although the Conceptual Ecological Model (CEM) and the monitoring plan mention basic biological and hydrological information that could be used by trained ecologists, botanists, and zoologists (and perhaps the WVA model) to estimate AAHUs, the methods used to estimate AAHUs are not mentioned. One stated purpose of the CEM is to identify performance measures, yet the monitoring plan does not incorporate some of the measures identified by the CEM that would seem essential for AAHU determination. In particular, sediment accretion rate is not proposed for monitoring, yet would seem essential to the success of the project during the present condition of sea level rise and regional subsidence. In addition, some indicator of fish and wildlife use of the affected area is essential and also not included in the monitoring plan.

The monitoring plan contains a serious disconnect between objective 2 (reducing impoundment of water) and the chosen performance measure 2a (production and extent of swampland habitat). The appropriate measure would be whether impounded water still occurs. Performance measure 2b (number of saplings) is also disconnected from its monitoring design for 2b (diameter at breast height and overstory cover). The performance measure should be the number of saplings. The monitoring design for measure 2c (depth, duration, and frequency of flooding) calls for 3 years of pre-project

monitoring in six key areas, but the areas are not specified and the years do not appear in the project schedule.

Significance – High:

The cost of monitoring is a huge portion of the estimated budget ($3 million of the $7.7 million budget, or 39%), yet the monitoring plan is focused on evaluating neither project benefits (AAHUs), nor project hydrological objectives, measures are poorly justified, and methods are incomplete and in some cases inappropriate.

Recommendation(s) for Resolution:

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

1. Focus the monitoring program on estimating AAHUs. Include methodology for converting the basic measures of project objectives to an estimate of AAHUs. Explain the linkage between hydrological and ecological monitoring results. Connect measures together so that an assessment of swampland habitat improvement will be possible.
2. Carefully define the seasonal water level fluctuations that are most important to cypress and tupelo development. Use these definitions consistently both as drivers of the WVA model and as monitoring performance measures:
    a. Support all proposed performance measures by reference to evidence in data, literature, or expert opinion. For example, performance measure 2c states: "Maintain dry periods (moist soils) in the swamp for a minimum 7-35 days during summer and early fall for seed germination and maintain water levels below seedling height to promote seedling survival." In this case, quantify the meaning of "dry" and justify the quantity. Justify the 7- to 35-day period.
    b. Monitor the specific hydrologic attributes predicted by the HEC-RAS model that were used as input for the WVA model. Measuring these attributes would in part provide input for the assessment of AAHUs and in part validate the HEC-RAS model and its appropriate use as input to the WVA model.
3. Use direct measures to assess project objectives (measure saplings to assess saplings; impounded water to assess impounded water; habitat use or habitat suitability to assess habitat; sediment accretion rate to assess sedimentation, etc.).
4. Monitor fish and wildlife use of the area. This could be done relatively inexpensively by focusing on a few easily detected but meaningful species (as opposed to more complete assessments of animal communities).
5. Measure sediment accretion rate, which can be monitored inexpensively using marked sediment horizons or Surface Elevation Table devices (see http://www.pwrc.usgs.gov/set/ for a description of these devices).
6. Explain the uses of monitoring results to:
    a. assess whether conveyances and cuts were sufficient and placed effectively
    b. modify sampling frequencies

c. determine the adequacy of drawdown for seedling germination, and the adequacy of hydrological regime for seedling survival, growth, and maturation, etc.
d. compare with background data to determine changes caused by the project.

7. Identify and justify all of the following as if writing a scientific paper: methods for all measurements, sample collections, sample processing, and analysis procedures with types of technology and expert assistance used, all proposed spatial and temporal sampling frequencies and site visits, and all statistical analyses to be used. Include an explanation of how monitoring effort will be divided between cypress-tupelo swamp and the bottomland hardwood areas. .
8. Exclude measures that do not assist in the estimation AAHUs and do not directly assess the specific project objectives. Avoid expensive tangential measures such as continuous recording of dissolved oxygen and turbidity. Sensors for dissolved oxygen and turbidity must be maintained weekly. These variables are cheap to measure by hand at a number of locations on periodic site visits. Periodic site visits will be needed to assess sediment accretion, nutrient accumulation, and habitat use. Turbidity and dissolved oxygen can be measured during these visits (perhaps continuously for a period of a few days at a time if desired).
9. Salinity and water level are essential measurements. Sensors for continuously recording salinity and water level are cheaper to maintain than those for dissolved oxygen and turbidity. Include pre-project monitoring of salinity and water level in the project schedule (in Table 3.16 and everywhere else in the report that the schedule is identified).
10. Specify the six key areas mentioned in the monitoring design for measure 2c (depth, duration, and frequency of flooding).
11. Include a monitoring program to assess the efficacy of tree planting and of nutria control.
12. Consider having the monitoring plan independently reviewed.

Comment 5:

The inclusion of vegetation plantings in all project alternatives warrants further justification as partial exclusion could have a substantial influence on selection of the Recommended Plan.

Basis for Comment:

The tradeoff between planting wetland trees and constructing more embankment cuts and water conveyances was not fully analyzed and discussed. Planting trees is the single most expensive activity of the Recommended Plan, accounting for more than half of the construction costs, but the justification for plantings is lacking. The primary justification was a paragraph beginning with the following statement: "Based on feedback from the PDT and additional site investigations, it was determined that the most highly degraded areas within NE-2 and SE-2 would need to incorporate vegetative plantings as a component of all alternatives proposed within these subunits" (Section 3.3.1, p. 3-31). Why no alternative methods of vegetative planting were considered is not explained. However, the closing statement of the paragraph states: "These plantings were eliminated as a standalone option, because it was determined that plantings would not provide benefits without restored hydrologic connectivity." Such a justification for eliminating plantings as a standalone option is baffling. The Panel feels that cost effectiveness of tree planting as an alternative should be evaluated and included in plan selection.

If various types and amounts of vegetative plantings had been included as management measures during the alternative formulation process, the outcome of plan selection might be substantially different, and greater benefits could result. Management measures could include, for example: no planting; broadcast seeding; seedling planting at different densities; use of bare root (rather than container-grown) seedlings; and use of no nutria control, some nutria control, and complete nutria control. No planting is a viable option because a major project goal is to restore a hydrological regime sufficient for wetland trees to complete their life cycles on their own. Therefore, a successful hydrological modification project would seem to make planting unnecessary.

Furthermore, the benefits per unit cost of planting trees appear to fail the cost effectiveness test. Evidence is given in the report that a 50% die-off of planted trees will require 50% of the area to be replanted within a few years (p. 3-84 of the main report and p. 8-1 of the Engineering Appendix (Section 8 of Appendix L). No evidence is given that planting will increase the rate of swampland recovery to a degree that justifies the costs. The cost estimate for the Recommended Plan (Alternative 33) is given in detail in Appendix L: Table 1, p. 8-3 of the Cost Annex to Section 10, Cost Estimates. In that table, the cost of vegetative planting is given as $0.82 million, or 52% of the construction costs (shown as $1.58 million). Ninety-nine percent of the planting costs are for wetland trees. Neither the method of planting nor planting densities were explained and justified. Nutria control to protect the young planted trees is a substantial 84% of the total vegetative planting costs ($0.69 million of $0.82 million). The rationale for determining the necessary amount of nutria control and its efficacy was not discussed.

Cost has limited the Recommended Plan to the least expensive viable plan (Alternative 33), even though Alternative 39 was identified as the NER plan. Tree planting with the proposed methods is equivalent in cost to building several more water conveyances and railroad bed cuts in the vicinity of the ARDC. The relative benefits of doing less planting and more construction were not discussed. With less or no planting, different planting techniques (such as seed broadcasting or use of bare root seedlings), and less or no nutria control, more of the already limited budget could be directed toward building more water conveyances and opening more of the railroad bed.

Significance – High:

The high cost of wetland tree planting calls for additional justification, because more water conveyances, openings, and cuts could be constructed which could influence the selection of the Recommended Plan.

Recommendation(s) for Resolution:

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

1. Justification of the choice of wetland tree planting method, the planting density, and the efficacy of nutria control is needed. A justification would include comparison of natural reseeding, broadcast seeding, seedling planting in different densities, and use of bare root (rather than container-grown) seedlings, with and without various levels of nutria control.
2. Sufficient evidence to justify the type and amount of planting, if available. If it is not available, the monitoring plan should include tests of alternative planting methods, densities, and tests of nutria-control efficacy that would be valuable in all wetlands restoration projects in the southeastern United States.

Comment 6:

The cost effectiveness and incremental cost analyses (CE/ICA) are not clearly explained and are not reported in a manner consistent with U.S. Army Corps of Engineers (USACE) standard procedures in the Planning Guidance Notebook.

Basis for Comment:

CE/ICA is central to the report and the rationale for the Recommended Plan. The current description of the CE/ICA is neither clear nor complete. The narrative requires revision to detail the assumptions and calculations used to obtain the results. Parts of the CE/ICA analysis as described by ER 1105-2-100 are missing from the narrative (see below). The Amite report should fully explain the details of the CE/ICA analysis.

There are three weaknesses in the CE/ICA sections (Chapter 3, Section 3.5, and Appendix K, Section 2). First, the final array is not composed in a way that allows the analysis to identify the incremental benefits and incremental costs of different management measures. Additional plans need to be incorporated into the final array to identify the incremental contribution of individual measures such as bank openings, railroad cuts, conveyance channels, large area plantings, and spatial focus on either the north or south side of the ARDC.

The shortcomings of the reported CE/ICA are illustrated by comparing Plans 34 and 35. Plan 34 includes railroad cuts, conveyance, and plantings and Plan 35 does not. Additional alternatives to be formulated and analyzed so that the CE/ICA does a more detailed comparative analysis of the railroad cuts, conveyance and plantings. The goal of CE/ICA is to develop a plan composed of the most cost effective alternative, but the current analysis does not fulfill that goal. The analysis needs to include additional plans to identify the cost effectiveness.

A revised final array should also recognize the core role of ARDC bank openings in providing water to other management measures. Bank openings provide the water flows that make other management measures productive. The number and location of bank openings need to be a first consideration in the development of alternative plans. Other measures such as cuts and plantings are doomed to be cost-ineffective without sufficient water. Inadequate water may be the reason why Plan 34 is cost-ineffective. Plan 34 includes two railroad cuts but only one bank opening. The southern railroad cut in Plan 34 is quite distant from the bank opening, and there is a more northern railroad cut between the southern cut and the bank opening. The northern railroad cut probably diverts most of the water from the bank opening so that little water arrives to the southern cut. Without sufficient water, the southern is unproductive. Plan formulation needs to account for such interactions and other measures in setting up the final array.

In addition, it may be possible to eliminate some plans from the current final array. For instance, Plan 39 appears to be unnecessary since Plan 39 appears to combine Plans 34 and 38 into a single plan. Since Plans 34 and 38 are on separate sides of the ARDC, there is no ecological interaction between them, so they have the same ecological impact

whether implemented separately or together. It also seems that Plan 39 should cost the same as the total cost of Plans 34 and 38.

The second weakness is that the CE/ICA procedures are not fully explained. Critical analytical details such as the interest rate and time period used to annualize cost are not stated. Key figures, such as those on pp. 3-65 to 3-67, are not labeled accurately (e.g., the vertical axis in the figure must be in AAHUs but is labeled as HUs) and are not explained in terms of how project benefits change and plateau over time.

The third weakness is that the explanation of the ICA does not appear to be consistent with the USACE procedures described in ER 1105-2-100. USACE indicates that the ICA analysis should compute "incremental cost, incremental output, and incremental cost per unit of incremental output" (USACE, 2000; see Appendix E, p. E-155). Table 3.13 lists incremental output, but incremental cost and incremental cost per unit of output are not given. An ICA cannot be accurately completed without the missing information. Providing the additional incremental cost and incremental cost per unit of output information may help explain to readers why Plan 38 is identified as a Best Buy and Plan 37 is not.

Significance – High:

Fully documented and carefully explained CE/ICA are essential to plan screening and selection.

Recommendation(s) for Resolution:

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

1. A sensitivity analysis to identify the incremental benefits and incremental costs. The current final array suggests that the ARDC and railroad grade openings are the most productive of AAHUs, so a sensitivity analysis should begin with plans that focus only on the number and location of such openings. The sensitivity analysis should examine how the number and spatial location of openings affect output in terms of AAHUs. Plantings appear to be the least productive of the management measures with respect to cost, and should only be added to the plans in the sensitivity analysis after the incremental benefits and incremental costs of other key management measures have been fully investigated.
2. Separation of the analysis into two divisions: one for alternatives on the north of the ARDC and the other for alternatives on the south side of the ARDC. The current analyses suggest that alternatives on the north and south sides of the ARDC are hydrologically, ecologically, and economically independent.
3. A check of the costs of plans 34, 38, and 39 to determine whether the total cost of Plans 34 and 38 should be equal to the cost of Plan 39.
4. A detailed explanation of the CE/ICA assumptions and details. Key assumptions include the interest rate used in computing annualized cost. Details include an explanation of the steps and procedures used to compute annualized cost, incremental benefit, incremental costs, and incremental cost per unit of output. Annualized cost might be best explained by describing its algebraic relationship to total cost.

5. Review, implementation, and explanation of the CE/ICA in a manner that is consistent with USACE ER 1105-2-100, especially Appendix E (USACE, 2000; Appendix E).
6. Augmentation or deletion of Appendix K. The current Appendix K contains no information that is not already presented in Chapter 3.

Literature Cited

USACE (2000). Planning Guidance Notebook. Department of the Army, US Army Corps of Engineers, Washington, DC. Regulation No. ER 1105-2-100. April 22.

Comment 7:

The project costs have substantial uncertainty and inconsistencies that could affect the selection of the Recommended Plan.

Basis for Comment:

The Recommended Plan (Alternative 33) estimated total project cost (TPC) appears reasonable with a relatively high degree of "bottom line" contingency, as represented by the cost-risk analysis (CRA) (Appendix L, Cost Annex 10-2) Tables 1 and 2 (CRA, pp. 9, 11). With the CRA 80% confidence level (P80) for cost contingency, it appears unlikely that actual project costs (for the given Recommended Plan) would overrun the Micro-Computer Aided Cost Estimating System (MCACES) estimate. Substantial uncertainties associated with the cost estimate that could affect the Recommended Plan still remain. First, there are significant inaccuracies in the cost estimates, including contingencies that could cause the Recommended Plan Alternative 33 to exceed the $8.1 million 2007 WRDA funding authorization and 902 limit. The CRA P80 contingency calculated by the Monte Carlo simulation is actually $1.520 million (CRA, Table 2, p. 11), or 59% (relative to a most likely cost of $2.591 million), and *not* $0.959 million, or 37%, as stated in Appendix L, Section 10, Figure 4 (p. 10-8). The net effect of the difference, $0.561 million, would be an estimated TPC of $8.334 million, not $7.773 million, for Recommended Plan Alternative 33 (lower right-hand corner of the same Figure 4). The corrected TPC of $8.334 million would therefore exceed the $8.1 million WRDA authorization and 902 limit.

The inconsistencies in the cost sections of the Amite main report (Table 3.8, p. 3-56) and the Appendix L Section 10, including the three cost annexes, are noted as follows. The costs in Table 3.8 of the main report are consistent with the Appendix L, Section 10, Tables 1 and 2 (pp. 10-3,4) and the Cost Annex, Tables 1-7, but these costs are not consistent with the Section 10 Cost Estimates "MCACES Costs" (pp. 10-7 and 10-8) including Figure 4 "MCACES TPCS" (p. 10-8, and incorrectly referred to in text at p. 10-7 as "Table 4"). Figure 4 (p. 10-8) is the same as the Annex 10-1 "Total Projected Cost Summary" (no page number), which is based on the Annex 10-2 CRA Table 1 "Summary Risk Register" (CRA, p. 9) and Table 2 "Crystal Ball Data and Results" (CRA, p. 11).

Only the CRA quantifies the range of potential TPCs (Cost Annex 10-2, pp. 11-14). The CRA shows a Monte Carlo simulation-calculated P80 contingency of 59% ($4.111 million) – not 34% (Section 10, p. 10-7; Annex 10-2, p. ES-1); not 37% (Annex 10-2, p. 15; Annex 10-1; Figure 4, Section 10, p. 10-8); and not 25% (Cost Annex 8-3 to 8-8; main text, p. 3-56). The cost estimates with their contingencies need to be made consistent, with particular attention to a "correct" MCACES TPC estimate.

Also, the risk events and their cost estimates in the CRA Table 1 "Summary Risk Register" (p. 9), while unavoidably subjective and non-unique, are not supported in the report with a detailed rationale. The CRA does not provide a good supporting qualitative discussion and rationale of project-specific risks (pp. 7-16, including Table 1) as represented in the quantitative cost risk estimates, Table 2 "Crystal Ball Data and Results" (p. 11).

Further, the uncertainty in the cost estimates causes some overlapping of the alternative cost frequency curves (cost risk), which are not identified, discussed, or quantified in the cost estimates. This cost-overlapping effect is likely mitigated to some extent by implicit positive correlations between the cost estimates of the various alternatives (i.e., relatively high or low cost estimates would correlate between alternatives because of similar cost analysis methods and assumptions). Still, the Recommended Plan could be significantly affected by this uncertainty, potentially changing the actions included in the current Recommended Plan (Alternative 33). Cost effectiveness could also be significantly affected, potentially changing the Recommended Plan from the current Alternative 33.

Finally, potential long-term costs associated with RSLR could be a major categorical omission in the cost analysis. Because RSLR could render the Recommended Plan unsound for its purpose without effective future action to counter RSLR effects, those potential costs should be made explicit in the cost estimate.

Significance – High:

The corrected MCACES TPC for the Recommended Plan could exceed the $8.1 million WRDA authorization and 902 limit. This also affects relative costs and cost effectiveness, which could result in modifications to the TPC.

Recommendation(s) for Resolution:

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

1. Revised project cost estimates with contingencies to be consistent throughout the Amite report, with particular attention to a "correct" MCACES TPC estimate that accurately reflects the CRA for the Recommended Plan.
2. Resolution of the apparent conflict that the corrected MCACES TPC of $8.334 million for the Recommended Plan exceeds the $8.1 million WRDA authorization and 902 limit. (Implementation of Recommendation 1 could resolve Recommendation 2.)
3. The CRA with the full risk register (not just the summary, CRA Table 1) and adequate explanation and rationale of the project-specific risks that are quantified in the Monte Carlo simulation (CRA, Table 2).
4. Consideration of the effect on the Recommended Plan of overlapping cost frequency curves for the alternatives, which could result in modifications to the Recommended Plan.
5. Potential costs associated with RSLR in the project cost estimates.

Comment 8:

The Wetland Value Assessment (WVA) of project benefits and its supporting documentation are incomplete.

Basis for Comment:

The WVA model, the scientific basis of the scenarios in Appendix K (pp. 3-44), and the algorithms by which the scenarios are ultimately scored are not clearly described. Furthermore, the Panel is concerned that the WVA spreadsheet calculations are not provided and therefore cannot be understood and checked.

A key issue in the discussion of temporal impacts is whether certain portions of the impact areas convert from swamp to marsh, both with and without the project. The long-term outcome for conversion from swamp to marsh is not clear. Table 5.7 on p. 5-28 indicates that inundation by marsh occurs with and without the project, which appears to contradict the HU analysis of Chapter 3. Page 3-59, line 1018, indicates that the marsh model was not used to evaluate the project. This seems likely to bias the net benefit analysis in favor of the project. The rationale for excluding the marsh model is not entirely clear. The time dimension of HUs is not specified. It appears to be an annual measure.

The listing of variables with and without the project does not address the spatial distribution of impacts within the primary and secondary impact areas even though Figure 1, p. 48, indicates that results vary within the areas. In particular, it is not clear whether parts of the primary and secondary impact areas convert from swamp to marsh within the 50 year planning horizon (as indicated by Table 5.7 on p. 5-8). The text does not explain or discuss the listing of data in pp. 45 and 46 or the table on p. 53. Both the listing and table appear to offer important information regarding the spatial and temporal project impacts. More justification is also needed to support the assumption that sediment accretion will offset subsidence (pp. 3-59, 61 based on grey literature from Shaffer et al. 2006—unclear which reference), particularly in secondary impact areas that are not proximate to the excavated channels.

The low sea level rise scenario produces very little drying over the 10 years of the hydrologic model (Appendix L, p. 37). The prediction of semi-permanent flooding of the secondary impact areas may not allow much germination of cypress and tupelo seeds, yet that is one reason given for doing the project. As such, the WVA scenarios used to assign the scores do not seem to reflect the predictions of the hydrologic model in some instances.

The “years to marsh” estimates that first appear in Figure 2.2 and Table 2.2 (pp. 2-12, 13) and again in Table 5.11 (p. 5-46) seems to play an important role in the WVA analysis. The source cited (as in the 8 mm/year accretion rate estimates) is Bernard Wood personal communication. The scientific basis and reliability of this information is not discussed.

Uncertainty from the hydraulic modeling propagates through this analysis in multiple variables, and concerns about the HEC-RAS calibration bring the WVA outputs into question. It is not clear how the various hydrological descriptors estimated by the HEC-RAS model were used to drive the WVA. The only information provided is that (p. 3-61): "the H&H Model was used to assist in assigning values to V1-V4, based on the expected days of drying associated with each alternative" and "the cubic feet of water is translated to the categories of V3." Additionally, the apparent absence of a variable focusing on the hydrologic performance in terms of the duration of continuous dry spells in summer/early fall underscores a lack of congruence between the performance measures in Appendix I (see measure 2c) and the way the hydrology predictions are used to drive the WVA model.

The statement was made that sea level rise was the most uncertain variable in the WVA, but a basic sensitivity analysis was not performed. Multiplying a measure of sensitivity times a measure of uncertainty is an appropriate way to quantify and evaluate risk in the application of model results.

Significance – High

The methodology and scientific underpinnings of the WVA analysis are unclear and not sufficiently documented. Project benefits and sustainability cannot be evaluated without this information.

Recommendation(s) for Resolution:

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

1. Specify all hydrological and biological inputs to the WVA model. Include references to the sources of data used for each input.
2. The scoring algorithms should be clarified and the scoring spreadsheets should be provided in Appendix K. The judgments that went into the scoring (and the assumptions upon which the judgments were made) should be discussed further and made more transparent. A record of how Habitat Suitability Index values were assigned to different conditions of each variable is needed.
3. The hydrological and ecological basis of the footprints of the primary and secondary impact areas should be explained. These sub-areas need to be discussed with reference to the spatial and temporal distribution of impacts and benefits. In particular, identify those areas of primary and secondary impacts that convert to marsh in the target years. Explain and discuss the listing on Appendix K pp. 45 and 46 and the table on p. 53. In the latter discussion, give particular attention to the time of impacts and benefits over the 50 year planning horizon. Identify the impacts that are sustained in the long-term (e.g., at the end of the 50 year planning horizon).
4. Directly address the risk and uncertainty around rates of accretion versus subsidence and RSLR, and examine implications for the benefits analysis. The relationships between different times to marsh, site topography, stage-duration predictions from HEC-RAS, and the WVA scenarios used for scoring need to be better explained.

5. Section 3.5 should provide a more complete description of how the WVA model components and elements were selected and applied. Provide rationales for the exclusion of components and elements that may have a significant impact on the estimation of HUs.
6. The summary table of AAHUs and CHUs on p. 3-63 should be documented to better explain whether these are the increases in AAHUs and CHUs to be expected over the no-action alternative, or something else.
7. Reference and present the figures that show the definitions of the primary and secondary impact areas (Figure 1 especially) before the list of assumptions is given.
8. Clearly define the different classes of wetlands (Class 1-6) in the WVA analysis.
9. The WVA Information Sheet describes model assumptions for a low sea level rise run of the model. It should be specified what, if any, assumptions are different for the medium and high sea level rise scenarios.
10. The basis and reliability of the "years to marsh" information should be discussed. Please explain how the categories of the landscape were assigned (10 years to marsh, 20 to 30 years, etc). Categories might be based on elevation data, percent cover, or something else.
11. Include a table of model input parameters with sensitivity of model output and uncertainty in model input listed by variable.
12. State the time dimension of HUs and label Figures 3.17 to 3.24 (pp. 3-65 to 3-67) accordingly (e.g., "Net Annual Benefits" instead of "Net Benefits").
13. A check of the WVA is apparently under way by the Habitat Evaluation Team of the U.S. Fish and Wildlife Service, according to the report. Results of this check should clearly state whether the ranking of alternatives, their cost effectiveness, or their AAHU output are significantly affected.

Comment 9:

The plan formulation – specifically, system-wide and project-specific problems, opportunities and objectives; management measures; the final array of alternatives; and selection of the Recommended Plan – needs additional explanation.

Basis for Comment:

The basis for the plan formulation process stems from the LCA Louisiana Ecosystem Restoration Study (USACE, 2004). The Panel's specific plan formulation concerns are listed below:

- System-wide to Project-specific issues
  - A clear logic trail is lacking between the 2004 LCA Plan system-wide problems and opportunities and the geographically specific problems and opportunities in the ARDC study area.
  - The 2004 LCA Plan problems, needs, and opportunities are clearly presented; however, there is no mention of the system-wide objectives and the connection with the four ARDC project-specific objectives. The focusing of the plan formulation into subunits with "minimal, moderate, severe" degradation problems seems to be the result from "Hydrologic Restoration in the Swamps West of Lake Maurepas;" however, the problem definition does not address the specifics of each subunit. There are inconsistencies between the Amite main report and the appendices in the listing of the ARDC planning objectives and report title.
- Management Measure Consistency issue
  - The description of the management measures is very confusing in comparison with Table 3.2. There are management measures (e.g., bank degradation, wastewater introduction, maximization of Lake Maurepas to act as a saltwater buffer, habitat creation via placement of dredged material) that are not included on Table 3.2. If they were screened out prior to the table creation, this was not explained in the report. In addition, there are management measures that were added in Table 3.2 (Measures from Project Delivery Team (MPDT), RG Railroad Grade, RS Removal of dredge material berm, and VE value engineering) that are not described in Section 3.2.2.
- Final Array of Alternatives issues
  - The explanation of how the 12 management measures were developed into the initial array of the 39 alternatives (Table 3.4) is not clearly presented.
  - The discussion on how each of the seven alternatives meet the four project-specific objectives is insufficient. The basis to retain the seven alternatives is only illustrated as the following: "These alternatives were retained since they would provide the connectivity for freshwater, nutrients and sediments. Additionally, the alternative would meet all project objectives."
- Selection of the Recommended Plan
  - There is not enough documentation with regard to the WVA model and CEM's relationship to project benefits, the CE/ICA, and cost estimates used to define the Recommended Plan.

Significance – Medium:

Clearly defining the relationship of the system-wide effort to the project-specific effort and the plan formulation process is essential to justification of the Recommended Plan.

Recommendation(s) for Resolution:

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

1. System-wide to Project-specific
    a. A clearer logic trail between the 2004 LCA Plan system-wide problems and opportunities and the geographically specific problems and opportunities in the ARDC study area
    b. Definition of the 2004 LCA Plan's specific objectives and the logic trail to the four ARDC objectives
    c. Additional information from "Hydrologic Restoration in the Swamps West of Lake Maurepas"
    d. Consistency between the main report and the appendices in the listing of the ARDC planning objectives and report title
2. Management Measure Consistency
    a. Consistency between the description of management measures and Table 3.2.
3. Final Array of Alternatives
    a. A better explanation of how the 12 management measures were developed into the initial array of the 39 alternatives. In Section 3.3.1, the logic behind Table 3.4 should be defined, and that table should be included there. Table 3.3 should then be moved to Section 3.3.3, which includes the logic behind the screening/evaluation of the alternative plans. This reorganization should eliminate the confusion of reading about the screening results prior to understanding how the alternatives were developed from the management measures. (pp. 3-24 through 3-33).
    b. A specific discussion on how each of the seven alternatives retained meets the four project-specific objectives.
4. Selection of the Recommended Plan
    a. Additional documentation with regard to the WVA model and CEM's relationship to project benefits, the CE/ICA, and cost estimates used to define the Recommended Plan.

Literature Cited

USACE (2004). Louisiana Coastal Area (LCA) Ecosystem Restoration Study. Volume II: Final Programmatic Environmental Impact Statement. US Army Corps of Engineers, New Orleans District, New Orleans, LA. 918 pp.

Comment 10:

Geotechnical stability of the proposed dredged material piles along channel cuts in native swamp should be discussed in terms of both design and constructability issues.

Basis for Comment:

While the earthwork designs appear generally reasonable, the dredged material from channel cuts in native swamp may prove to be too saturated and structurally weak to maintain acceptable side slopes and stability without some sort of special processing, treatment, or containment. Dredged material stability and placement could be a significant constructability issue, even for qualified earthwork contractors having local experience.

The Panel assumes that these issues will be addressed during the design phase. The current Amite report lacks (1) technical assumptions regarding dredged material placement, and (2) design details related to dredged material side slopes or placement other than the conceptual relationships to cut channels as shown in the cross sections, Section 6, Figures 2-5. It is also noted that the sections on Geology (Appendix L, Section 2) and Geotechnical Engineering (Appendix L, Section 5), which could appropriately include relevant discussion about dredged material stability, placement, or constructability, do not currently do so.

A lack of stability in the placed dredge piles could also directly affect revegetation in terms of both the practical ability to plant and the provision of a structurally stable substrate for plantings.

Significance – Medium:

Because instability of the dredged material piles could adversely affect earthwork construction and revegetation, it should be discussed.

Recommendation(s) for Resolution:

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

1. A discussion of dredged material stability issues (including potential slope instability limitations) and needs for mitigation (including any special construction techniques).

Comment 11:

The overall geomorphic setting and basis of the designs proposed for channel conveyance networks need to be explained.

Basis for Comment:

The physical basis for the selected number of conveyance channels and their lengths, as well as the longitudinal profile of the proposed channels, is not clear. The Amite report should better explain how the conveyance channel locations were selected to "maximize" connectivity (e.g., rationale for three cuts as opposed to two or more than three) and how the lengths of the conveyance channels affect the spatial extent of the primary and secondary impact areas.

The report lacks a clear description of how the channel designs compare to the analogs (relict cuts) that were surveyed in terms of hydraulic geometry, longitudinal profile, cross-section, network structure, and the way they tie into the larger ARDC. Furthermore, there is no discussion of why the hydraulic geometry of these channels/networks differs from the surveyed analog channels.

The assumed 3:1 side slope for conveyance channels is reasonable until the geotechnical investigation is completed during the Preliminary Engineering and Design phase of this project. At that time, it will be appropriate to reassess whether the design geometry of the channels should more closely emulate the scaling of the surveyed analog channels. Some drawings for the side slopes indicate 4:1, but the text states 3:1.

Subtle differences in conveyance channel alignment and spoil placement could have a significant effect on the hydrologic effectiveness of the excavated channels. The channel alignment would ideally follow the lowest topography as the excavation proceeds away from the berm as opposed to an alignment defined without an on-the-ground field survey (not LiDAR). The Panel understands that the breach locations were targeted at low areas, but it remains unclear whether the alignment of upstream conveyance channel segments will be chosen to maximize water exchange given site-specific microtopographic attributes surveyed in the field.

The Panel had difficulty finding important information on the strategic placement of the railroad cuts that should be incorporated into the Amite report (see Appendix H, p. 4-6).

The description of the geomorphological conditions in the study area is not sufficiently detailed and accurate. A brief discussion of the morphologic style of relict channels as it relates to what was designed is missing. A discussion of existing data on rates of floodplain accretion is missing. The geomorphological description in Section 4.1.2 jumps from the scale of the St. Bernard deltaic complex to details about the berm associated with the ARDC.

The depth of excavation for new conveyance channels will reach to levels of soil that may have less organic content than the surface soils onto which they are placed. It would

be helpful to know how thick the Holocene layer is above the Pleistocene layer, and how different the surface soils are from the material underlying them at the excavation depth.

Significance – Medium:

A lack of information on the geomorphic context and basis of the designs proposed for channel conveyance networks affects the completeness/understanding of the Amite report.

Recommendation(s) for Resolution:

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

1. A better explanation of how the surveys of existing tributary channels or "cuts" informed the design of the trapezoidal conveyance channels (or not), as well as a discussion of why they differ in cross-section, planform, and profile.
2. Consistency between conveyance channel sideslopes (3:1 vs. 4:1) and text and drawings.
3. A discussion of how the actual conveyance channel alignment/planform will be adjusted in the field to reflect site microtopography and maximize water exchange.
4. Important information on the strategic placement of the railroad cuts (Appendix H, p. 4.6).
5. A description of the geomorphological setting at an intermediate scale in Section 4.1.2. The description should include the drainage area, tidal flow, and interconnections of the Amite River, ARDC, and Blind River and their relationship to Lake Maurepas. The Engineering Appendix (Appendix L) does a thorough job of describing the intermediate scale and perhaps should be referenced in Section 4.1.2. More information on measured rates of floodplain accretion is also needed.
6. Any assumptions made concerning the similarity of the material taken from the full depth of excavation to the material on the swamp surface, especially with respect to differences in organic matter content.
7. An examination of the incremental AAHU contribution of conveyances relative to their cost in the CE/ICA.

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APPENDIX B

Final Charge to the Independent External Peer Review Panel

on the

Integrated Feasibility Study and Supplemental Environmental Impact Statement for the Louisiana Coastal Area – Amite River Diversion Canal Modification Element of the Section 7003 (E)(3) Ecosystem Restoration Projects Study

as

Submitted to USACE on April 23, 2010

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Final Charge Guidance and Questions to the Peer Reviewers
for the
Louisiana Coastal Area – Amite River Diversion Canal Modification Study Integrated Feasibility Study and Supplemental Environmental Impact Statement

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, 2010. 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 Whites Ditch,
5) Convey Atchafalaya River Water to Northern Terrebonne Marshes, and
6) Multipurpose Operation of Houma Navigation Lock.

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 Amite River Diversion Canal Modification project.

The Amite River Diversion Canal (ARDC) Modification study area is located in the Louisiana Coastal Area (LCA) Subprovince 1 and is situated along the ARDC in Ascension and Livingston Parish. The study area is bound to the north by the old channel of the Amite River, Old River, Chinquapin Canal, and Bayou Chene Blanc; to the east by the Blind River; to the south by the Petite Amite River and the New River Canal; and to the west by the Sevario Canal, Ascension Parish flood protection levees, and the Laurel Ridge Canal.

In the 1950s, the USACE constructed the ARDC in an effort to relieve flooding along the upper Amite River and to enhance the flow of water from the meandering Amite River to Lake Maurepas. The 10 mile long canal is 350 feet wide and was dug to a depth of 25 feet. Construction was completed in October 1964. The ARDC is connected to the Amite River by a control weir at French Settlement that was designed to retain low flows in the Amite River.

The report under review focuses on the LCA-ARDC Modification project. Prior studies and reports have documented degradation in the swamp adjacent to the ARDC and have demonstrated a need for ecosystem restoration that simulates historical hydrologic conditions. This project would establish hydrologic connectivity between the ARDC and the western Maurepas Swamp, allowing the swamp to drain during seasonal low-flow conditions in the Amite River and promoting the germination and survival of the seedlings of the bald cypress and

other trees. It would also allow nutrients and sediments to be introduced from the ARDC into the swamp.

OBJECTIVES

The objective of this work is to conduct an independent external peer review (IEPR) of the ARDC Modification Study Integrated Feasibility Study and Supplemental Environmental Impact Statement (Amite River Integrated FS/EIS) 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) dated January 31, 2010 and the Office of Management and Budget's *Final Information Quality Bulletin for Peer Review* released December 16, 2004.

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.

This purpose of the IEPR is to assess the adequacy and acceptability of economic, engineering, and environmental methods, models, and analyses used for the Amite River Integrated FS/EIS. 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 Louisiana Coastal Area – Amite River Diversion Canal Modification Element of the Section 7003 (E)(3) Ecosystem Restoration Projects Study

- **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: Economics and Benefits**
- **Appendix L: Engineering Appendix**

- 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[5]
- 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/)[1]

[5] Provided to Economics Panel Member Only

SCHEDULE

TASK	ACTION	DUE DATE
Conduct Peer Review	Review documents sent to panel members	4/26/2010
	Battelle/panel Kick-off Meeting	4/27/2010
	USACE/Battelle/panel Kick-off Meeting with panel members	4/27/2010
	External panel members complete their review	5/13/2010
Prepare Final Panel Comments and Final IEPR Report	Battelle provides panel members merged individual comments and talking points for panel review teleconference	5/20/2010
	Convene panel review teleconference	5/24/2010
	Battelle provides final panel comment directive to panel	5/25/2010
	External panel members provide draft final panel comments to Battelle	6/2/2010
	Battelle provides feedback to panel members on draft final panel comments; panel provides revised draft final panel comments per Battelle feedback	Not Applicable
	Final Panel Comments finalized	6/9/2010
	Battelle provides Final IEPR report to panel for review	6/11/2010
	Panel provides comments on Final IEPR report	6/14/2010
	*Submit Final IEPR Report	6/23/2010
Comment/ Response Process	Input final panel comments to DrChecks Battelle provides final panel comment response template to USACE	6/25/2010
	USACE provides draft Evaluator responses and clarifying questions to Battelle	7/6/2010
	Battelle provides panel members the draft Evaluator responses and clarifying questions	7/8/2010
	Panel members provide Battelle with draft BackCheck responses	7/13/2010
	Teleconference with Battelle and panel members to discuss panel's draft Backcheck responses	7/15/2010
	Final Panel Comment Teleconference between Battelle, IEPR team, and USACE to discuss final panel comments, draft responses and clarifying questions	7/15/2010
	USACE inputs final Evaluator responses in DrChecks	7/27/2010
	Battelle provides Evaluator responses to panel members	7/30/2010
	Panel members provide Battelle with BackCheck responses	8/10/2010
	Battelle inputs BackCheck responses in DrChecks	8/10/2010
	*Battelle submits pdf printout of DrChecks project file	8/11/2010

CHARGE FOR PEER REVIEW

Members of this peer review panel are asked to determine whether the technical approach and scientific rationale presented in the Amite River 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 Amite River 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.

- 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.
- Please contact the Battelle deputy project manager (Anne Gregg, GreggA@battelle.org) or project manager (Karen Johnson-Young, johnson-youngk@battelle.org) for requests or additional information.
- In case of media contact, notify the Battelle project manager immediately.
- 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 Anne Gregg, GreggA@battelle.org no later than May 13, 2010, 10 pm EDT.

Independent External Peer Review
Louisiana Coastal Area – Amite River Diversion Canal Modification Study Integrated Feasibility Study and Supplemental Environmental Impact Statement

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.

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

7. 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

8. Comment on whether the LCA-ARDC Modification Project as proposed will contribute to national ecosystem restoration (NER) output.

2.2 Public Concerns

9. Have the public concerns been identified?

2.3 Problems, Needs, and Opportunities

10. Is the project need clearly stated?

11. Is the Conceptual Ecological Model (CEM) sufficiently comprehensive?

    a. Does it include all of the information relevant to ecosystem monitoring goals presented?

12. Are the qualifiers used to explain the problems identified in Table 2.1 for each study area subunit clearly explained?

13. Are the problems facing coastal Louisiana accurately described?

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

2.4 Planning Objectives

15. Are the planning goal and objectives clearly described?

16. Comment on whether the LCA-ARDC Modification Project as proposed will meet the planning objectives.

2.5 Planning Constraints

17. Are the planning constraints clearly and comprehensively described?

18. Comment on whether the LCA-ARDC Modification Project as proposed will fully consider and account for the planning constraints.

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. Assess the development and grouping of the management measures.

22. Are the management measures thorough and accurate?

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.

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

27. Is the screening process of the potential alternative plans appropriate and adequate?

    a. Is the elimination of some of the alternative plans from further study clearly described?

28. Is the decision to incorporate vegetative plantings as a component of all alternatives proposed in the NE-2 and SE-2 hydrologic units appropriate?

3.4 Final Array of Alternatives (Alternatives Studied in Detail)

29. Is each of the alternative plans clearly described?

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

3.5 Comparison of Alternative Plans

31. Are the processes used to compare the Alternative Plans clear and reasonable?

32. Is the use of the IWR-Plan to evaluate the cost effectiveness of each alternative appropriate and adequate?

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

34. Please comment on the cost estimates for the various habitat improvement measures.

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

36. 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?

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

38. 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

39. How accurate and complete are the computed exchange channel flows with relative sea level rise (RSLR)?

3.6 National Ecosystem Restoration Plan

40. Is the NER Plan sufficiently detailed?

3.7 Plan Selection - Tentatively Selected Plan

41. Is the description of the components of the Tentatively Selected Plan sufficient?

42. Is the discussion of fulfilling goals and objectives complete?

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

44. Is the decision to not apply an adaptive management approach to the LCA-ARDC Modification Project appropriate?

45. Is the compensatory mitigation measure appropriate?

46. Is the Tentatively Selected Plan's proposed construction schedule feasible?

47. Comment on the finding that the "Preferred Alternative Construction activities would directly affect vegetation in the areas of the new conveyance channels and cuts in the existing LCA- ARDC spoil bank both permanently and temporarily."

48. In your expert opinion, has the document adequately outlined methods to reduce and/or mitigate the temporary and permanent impacts?

49. Are the planned mobilization/demobilization, construction, and maintenance and operation activities listed in this section comprehensive?

3.8 Risk and Uncertainty

50. Are the descriptions of the risk and uncertainties associated with the development, selection, and construction of the Tentatively Selected Plan sufficiently detailed and factually supported?

3.9 Implementation Requirements/Adaptive Management (Also consider information in Appendix I)

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

SECTION 4.0 – Affected Environment

4.1 Environmental Setting of the Study Area

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

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

4.2 Significant Resources

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

55. Is the description of the historical and existing water quality conditions in the study area complete and accurate?

56. Is the description of the historical and existing salinity regime conditions in the study area complete and accurate?

57. Is the description of the historical and existing wetland vegetation resources in the study area complete and accurate?

58. Is the description of the historical and existing upland vegetation resources in the study area complete and accurate?

59. Is the description of the historical and existing vegetative invasive species in the study area complete and accurate?

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

61. Is the description of the historical and existing aquatic resources in the study area complete and accurate?

62. Is the description of the historical and existing submerged aquatic vegetation in the study area complete and accurate?

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

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

65. 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?

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

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

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

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

SECTION 5.0 – Environmental Consequences

70. 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

71. Are environmental effects of changes to soil and waterbottom resources from the alternatives reasonable and factually supported?

72. Are the assumptions regarding soils impacts justified?

73. Are assumptions related to accretion and subsidence rates valid? Will with-project conditions slow degradation, stabilize, or result in marsh building?

5.2 Hydrology

74. Is the assessment of project performance based on the low, intermediate, and high projections of sea level rise rates appropriate?

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

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

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

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

79. Is the assessment accurate that no direct or indirect impacts to water quality or groundwater would occur for any of the alternatives?

5.3 Water Quality & Salinity

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

5.4 Air Quality

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

5.5 Noise

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

5.6 Vegetation Resources

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

84. Are environmental effects of changes to submerged aquatic vegetation from the alternatives reasonable and factually supported?

85. How might nutria affect the success of restoration actions?

5.7 Wildlife Habitat

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

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

5.8 Fishery Resources

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

89. Are assumptions related to impacts to fisheries valid?

5.9 Aquatic Resources

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

5.10 Essential Fish Habitat

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

5.11 Threatened and Endangered Species

92. 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

93. 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

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

5.14 Recreation

95. Have the potential impacts to recreation resources from the alternatives been adequately considered?

5.15 Socioeconomic and Human Resources

96. Are the potential impacts to socioeconomic and human resources from the alternatives reasonable and factually supported?

5.16 Hazardous, Toxic, and Radioactive Waste

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

5.17 Unavoidable Adverse Impacts

98. 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

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

5.19 Irreversible and Irretrievable Commitment of Resources

100. 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

101. 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 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

102. Are the general characteristics of the dredged and fill material accurately and adequately described?

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

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

105. Are the suspended particulate/turbidity determinations appropriate?

106. 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 Report

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

108. 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: Adaptive Management/Monitoring Plan

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

110. Are the proposed monitoring procedures appropriate?

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

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

Appendix J: Real Estate Plan

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

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

Appendix K: Economics and Benefits

115. How complete and accurate are the models assumptions, variables included, and expected future scenarios?

116. How thorough, robust, and accurate is the cost effectiveness and incremental cost analysis presented?

117. Are the criteria used to evaluate, screen, and eliminate alternatives appropriate, if not, please discuss.

Appendix L: Engineering Appendix

118. Are the hydraulic model boundary conditions and input parameters realistic and representative of actual conditions?

    a. Should other input variables have been considered?

119. Do the calibration results suggest the model is capable of predicting flows and stages within an acceptable range of error?

120. Comment on the inability of the model to simulate flow circulation within the swamp. Would this phenomenon significantly affect model results.

121. Are the conclusions drawn from application of the model supported by the modeling results?

122. Given the presented geology (Section 2) and the geotechnical (Section 5), are the technical assumptions used to recommend dredged material placement valid?

123. What other assumptions should be included in the development of the Cross Sections and/or Preliminary Design Alternatives?

124. Are the basic investigative techniques and interpretive methodologies presented for the planned geotechnical investigation appropriate and adequate?

a. Are there alternative methods and/or borings that should be performed?

125. Are the assumptions used to determine the cost of operations and maintenance for the proposed project adequate?

a. Are the assumptions used to develop the cost estimate and contingencies for the proposed project adequate?

b. Is anything missing?