DEPARTMENT OF THE ARMY
MISSISSIPPI VALLEY DIVISION, CORPS OF ENGINEERS
P.O. BOX 80 VICKSBURG, MISSISSIPPI 39181-0080

REPLY TO
ATTENTION OF:

12 DEC 2012

CEMVD-PD-N

MEMORANDUM FOR Commander, New Orleans District
(ATTN: CEMVN-PM-ORP)

SUBJECT: Grand Isle, Louisiana and Vicinity (Larose to Vicinity of Golden Meadow), Hurricane Protection Project, Lafourche Parish, Louisiana, Post Authorization Change (PAC) Report

1. References:

a. Memorandum, CEMVN-PM-ORP, 8 December 2012, SAB (encl 1).

b. Memorandum, CEPCX-CSDR, 13 June 2012, subject: National Planning Center of Expertise Endorsement - Grand Isle, Louisiana and Vicinity (Larose to Vicinity of Golden Meadow), Hurricane Protection Project, Lafourche Parish, LA, Post Authorization Change Report (encl 2).

c. Engineering Circular (EC) 1165-2-209, Change 1, Civil Works Review Policy, dated 31 January 2012.

2. The subject review plan (RP) was reviewed and endorsed for approval by the National Planning Center of Expertise for Coastal Storm Damage Reduction (CSDR-PCX) and the Risk Management Center (RMC). The RP includes agency technical review and independent external peer review through the Louisiana Water Resources Council and is consistent with the purpose and policy of EC 1165-2-209.

3. I hereby approve this RP, which is subject to change as circumstances require, consistent with study development under the Project Management Business Process. Subsequent revisions to this review plan or its execution will require new written approval from this office.

4. The RP is to be posted to the District website.

5. The POC for this action is Mr. Stephen Stuart, CEMVD-PD-N, at (601) 634-5829.

2 Encl

EDWARD E. BELK, JR., P.E., SES
Director of Programs

CF:
CECW-MVD (J. Redican)
CEPCX-CSDR (L. Cocchieri)

REVIEW PLAN

Grand Isle, Louisiana and Vicinity (Larose to Vicinity of Golden Meadow)
Hurricane Protection Project
Lafourche Parish, LA

Post Authorization Change Report

New Orleans District

MSC Approval Date: *12 December 2012*
Last Revision Date: *12 December 2012*

US Army Corps
of Engineers ®

REVIEW PLAN

Grand Isle, Louisiana and Vicinity (Larose to Vicinity of Golden Meadow)
Hurricane Protection Project
Lafourche Parish, LA
Decision Document Type: Post Authorization Change Report

TABLE OF CONTENTS

1. PURPOSE AND REQUIREMENTS

Purpose. This review plan defines the scope and level of peer review for the Grand Isle, Louisiana and Vicinity (Larose to Vicinity of Golden Meadow) Hurricane Protection Project (LGM project) Post-Authorization Change (PAC) report. The PAC report is the recommended course of action in the CEMVN-PM-OP's memo dated 27 May 2009, an abbreviated letter report, in response to Section 7015. The PAC study analyzes three alternatives along the authorized project alignment to determine the national economic development level of risk reduction for the authorized project. The PAC study alternatives to be studied are: 1) Complete LGM without exceeding the 1965 authorized elevation using the current Hurricane and Storm Damage Reduction System (HSDRRS) excluding the Post-Hurricane Katrina H&H design guidelines, 2) Complete LGM without exceeding the 1965 authorized elevation using the current HSDRRS Design Guideline to include the Post Hurricane Katrina surge models, and 3) Complete LGM based on pre-Hurricane Katrina expressed remaining work.

a. References

(1) ER 1110-2-1150, Engineering and Design for Civil Works Projects, 31 August 1999.
(2) ER 1110-1-12, Quality Management, 21 July 2006.
(3) ER 1105-2-101 Risk Analysis for Flood Damage Storage Reductions Studies
(4) EM 385-1-1 Safety and Health Requirements Manual, ENG Form 5044-R, September 2008.
(5) EM 1110-2-2000 Standard Practice for Concrete for Civil Works Structures Change 2, March 2001.
(6) EM 1110-2-2102 Water stops and Other Joint Materials, September 1995.
(7) EM 1110-2-1913 Design & Construction of Levees, April 2000.
(8) EC 1165-2-209 Water Resources Policies and Authorities – Civil Works Review Policy, 14 Dec 2009.
(9) EC 110-2-6067, Engineering and Design USACE Process for the National Flood Insurance Program (NFIP) Levee System Evaluation, 30 July 2009.
(10) USACE MFR: Subject: Hurricane Protection System Seepage Design Criteria and Retention Slope Stability Criteria, 16 Jan 2009.
(11) CEMVN MFR: Subject: Engineering Division Quality Management Policy Letter #3 – Implementation of "After Action Review" and "Lessons Learned" Action Plan for the Hurricane and Storm Damage Risk Reduction System (HSDRRS) Projects, 20 March 2009
(12) Project Management Plan for LGM (currently being finalized).

b. Requirements. This review plan was developed in accordance with EC 1165-2-209, which establishes an accountable, comprehensive, life-cycle review strategy for Civil Works products by providing a seamless process for review of all Civil Works projects from initial planning through design, construction, and operation, maintenance, repair, replacement, and rehabilitation (OMRR&R). The EC outlines four general levels of review: District Quality Control/Quality Assurance (DQC), Agency Technical Review (ATR), Independent External Peer Review (IEPR), and Policy and Legal Compliance Review. In addition to these levels

of review, decision documents are subject to cost engineering review and certification (per EC 1165-2-209) and planning model certification/approval (per EC 1105-2-412).

(1) District Quality Control/Quality Assurance. All **decision documents** (including supporting data, analyses, environmental compliance documents, etc.) shall undergo DQC. The DQC is an internal review process of basic science and engineering work products focused on fulfilling the project quality requirements defined in the Project Management Plan (PMP). The New Orleans District (CEMVN), including the Regional Planning and Environment Division, South (RPEDS) will manage the DQC for the project. Documentation of the DQC activities is required and will be in accordance with the Quality Manual of CEMVN and the Mississippi Valley Division (CEMVD).

(2) Agency Technical Review. The ATR is mandatory for all decision documents (including supporting data, analyses, environmental compliance documents, etc.). The objective of an ATR is to ensure consistency with established criteria, guidance, procedures and policy. The ATR will assess whether the analyses presented are technically correct and comply with published US Army Corps of Engineers (USACE) guidance, and that the document explains the analyses and results in a reasonably clear manner for the public and decision makers. The ATR is managed within USACE by a designated Review Management Organization (RMO) and is conducted by a qualified team from outside the home district that is not involved in the day-to-day production of the project/product. The ATR team will be comprised of senior USACE personnel and may be supplemented by outside experts as appropriate. To assure independence, the leader of the ATR team shall be from outside CEMVD.

(3) Independent External Peer Review. An IEPR is required for this PAC report. An IEPR is the most independent level of review and is applied in cases that meet certain criteria where the risk and magnitude of the proposed project are such that a critical examination by a qualified team outside of USACE is warranted. A risk-informed decision, as described in EC 1165-2-209, is made as to whether an IEPR is appropriate. An IEPR panel will consist of independent, recognized experts from outside of USACE in the appropriate disciplines, representing a balance of areas of expertise suitable for the review being conducted. There are two types of IEPR: Type I is generally for decision documents and Type II is generally for implementation products.

(a) Type I IEPR. Type I IEPR reviews are managed outside of USACE and are conducted on project studies. Type I IEPR panels assess the adequacy and acceptability of the economic and environmental assumptions and projections, project evaluation data, economic analyses, environmental analyses, engineering analyses, formulation of alternative plans, methods for integrating risk and uncertainty, models used in the evaluation of environmental impacts of proposed projects, and a biological opinion of the project study. Type I IEPR will cover the entire decision document or action and will address all the underlying

engineering, economics, and environmental work, not just one aspect of the study. For decision documents where a Type II IEPR (Safety Assurance Review) is anticipated during project implementation, safety assurance shall also be addressed during the Type I IEPR per EC 1165-2-209.

(b) Type II IEPR. Type II IEPR, or Safety Assurance Review (SAR), are managed outside the USACE and are conducted on design and construction activities for hurricane, storm, and flood risk management projects or other projects where existing and potential hazards pose a significant threat to human life. Type II IEPR panels will conduct reviews of the design and construction activities prior to initiation of physical construction and, until construction activities are completed, periodically thereafter on a regular schedule. The reviews will consider the adequacy, appropriateness, and acceptability of the design and construction activities in assuring public health, safety, and welfare.

(4) Policy and Legal Compliance Review. The LGM PAC report will be reviewed throughout the study process for compliance with law and policy. Guidance for policy and legal compliance reviews is addressed in Appendix H, ER 1105-2-100. These reviews culminate in determinations that the recommendations in the reports, the supporting analyses, and coordination comply with law and policy, and warrant approval or further recommendation to higher authority by the Chief of Engineers. The DQC and ATR augment and complement the policy review processes by addressing compliance with pertinent published Army policies, particularly policies on analytical methods and the presentation of findings in decision documents.

(5) Cost Engineering Review and Certification. The LGM PAC report will be coordinated with the Cost Engineering Directory of Expertise (DX), located in Walla Walla District. The DX, or in some circumstances regional cost personnel that are pre-certified by the DX, will conduct the cost ATR. The DX will provide certification of the final total project cost.

(6) Model Certification/Approval. The EC 1105-2-412 mandates the use of certified or approved models for all planning activities to ensure the models are technically and theoretically sound, compliant with USACE policy, computationally accurate, and based on reasonable assumptions. Planning models are defined as any models and analytical tools that planners use to define water resources management problems and opportunities, to formulate potential alternatives to address the problems and take advantage of the opportunities, to evaluate potential effects of alternatives, and to support decision making. The use of a certified/approved planning model does not constitute technical review of the planning product. The selection and application of the model and the input and output data is still the responsibility of the users and is subject to DQC, ATR, and IEPR. The EC 1105-2-412 does not cover engineering models used in planning. The responsible use of well-known and proven USACE developed and commercial engineering software will continue and the professional practice of documenting the application of the software and modeling results will be followed. Use of engineering models is also subject to DQC, ATR, and IEPR.

2. REVIEW MANAGEMENT ORGANIZATION COORDINATION

The RMO is responsible for managing the overall peer review effort described in this review plan. The RMO for decision documents is the Coastal Storm Damage Risk Reduction Center PCX (Coastal). The Coastal PCX will also coordinate with the Flood Risk Management PCX and the Risk Management Center (RMC).

The RMO will coordinate with the DX to conduct ATR of cost estimates, construction schedules, and contingencies.

3. STUDY INFORMATION

a. Decision Document. A PAC study will be conducted for the LGM project. The PAC report will serve as the decision document and will require the Chief of Engineers and Congress' approval. The National Environmental Protection Act (NEPA) requirements will be met through the development of a Supplemental Environmental Impact Statement (SEIS). The environmental impacts will be determined and discussed with respect to the various environmental laws once pertinent hydraulic and design information is generated during the PAC study. The SEIS is deemed necessary given the potential for the direct, indirect, and cumulative impacts associated with enlarging the footprint of the levee. This will supplement the 1973 EIS and the 1983 SEIS for the LGM project.

b. Project Description. The existing levee system serves as a hurricane storm damage risk reduction system and is approximately 48.3 miles in length of which approximately 11,000 feet consists of floodwalls and floodgates that ring a 17-mile reach of Bayou Lafourche, see figure 1. Navigation on Bayou Lafourche is maintained by two navigable floodgates at Larose and Golden Meadow, which are closed to prevent tidal flooding from an approaching storm or front. Construction of the LGM project was initiated in 1972 and was considered 95 percent complete in 2005 when Hurricane Katrina made landfall in southeast Louisiana. Soils in coastal Louisiana are very wet soils, and when used in construction of levee systems, are characterized by considerable settlement over time. As a result of this settlement, the project's levees required three separate lifts to achieve the authorized elevation. One reach, Section C-North-Hwy 24 remains incomplete; additional lifts[1] are required to complete the initial construction. However, due to subsidence and a datum adjustment, the project's earthen levees were surveyed in 2006 and found to be about 12-36 inches deficient in elevation. Structures surveyed were found to be either at or below the authorized elevation, with some structures measuring up to 3.5 feet deficient in elevation. Thus, the majority of

[1] Soil conditions unique to coastal Louisiana require the construction of levees in lifts – separate construction events that allow for settlement and subsidence of the levee. Post-Katrina surveys of the datums used identified additional sources for error – differences between the authorized and constructed project. These deficiencies are being addressed through a combination of construction efforts and planning actions (this PAC being one) and work by the local sponsor.

the project's elevations are less than authorized. The project features are also not in compliance with the Hurricane and Storm Damage Risk Reduction System (HSDRRS) Design Guidelines established after Hurricanes Katrina.

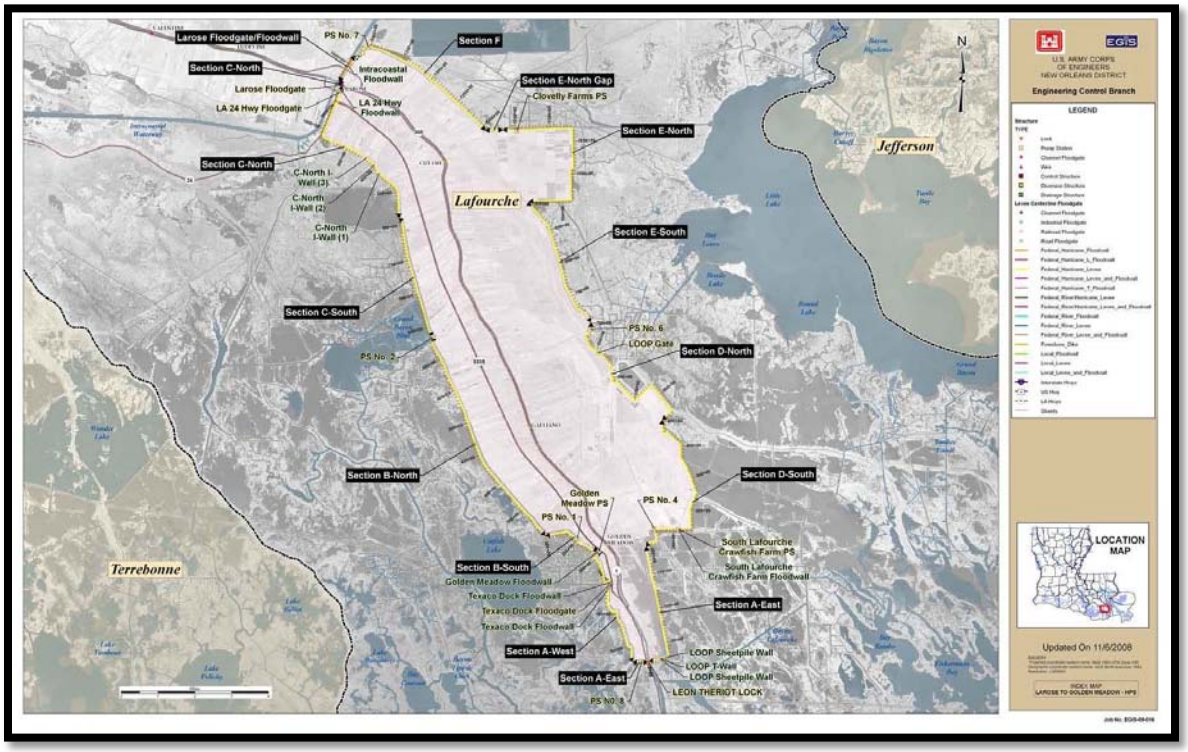

Figure 1: Study Map

The existing hurricane risk reduction ring levee encompasses approximately 63 square miles of Lafourche Parish and extends from Larose to Golden Meadow. The levee runs generally 1.4 miles away from Bayou Lafourche on the west bank and between 0.5 and 3.4 miles away from the bayou on the east bank. Much of the levee system was constructed on land where the natural ground elevations were around 0 feet mean sea level.

Normally, the Larose and Leon Theriot floodgates remain open for navigation and are closed, as necessary, to prevent tidal flooding from Bayou Lafourche. In order to prevent overtopping of the banks of Bayou Lafourche and flooding in the lower area of the project, the Leon Theriot Floodgate was designed to be closed when the outside stage reaches +3.0 feet mean sea level.

c. Factors Affecting the Scope and Level of Review. The timeline for this study is challenging; the study is scheduled to be finalized by 1 December 2012. This study is using both contractors and in-house labor to maintain the tight schedule. The new storm damage risk reduction guidelines will provide a challenge to justify the project. Guidelines have increased the cost to construct levees and could cause a strain on the State of Louisiana to cost share the recommended project.

The importance of reducing risk to the area is significant. The failure of the levee system for this project and the impacts of the new storm surges that are being projected for this area

could cause severe damage to the Nation's oil and gas infrastructure in this area, along with the potential for loss of life and significant damages to improved property. The risk factors that have been identified for the project include overtopping, scour, erosion, settlement, foundation issues, seepage, piping, barge impacts, and relative sea level rise. All of these risk factors are being incorporated into the risk analysis for the project.

This project also has significant interagency interest. Continued development and growth at Port Fourchon would further impact offshore oil and gas industry and the commercial fishing industry. Reduction of flood risk for this area will be a critical element of the project evaluation. In general, there are three major employment sectors in South Lafourche, Louisiana: (1) service; (2) government; and (3) trade industry. The area's major assets are the storage and distribution center for the Louisiana Offshore Oil Port, LLC. (LOOP) facility located near Galliano and Port Fourchon (located south of Golden Meadow). The offshore port facility is located in the Gulf of Mexico, 18 miles south of Port Fourchon, in 110 feet of water. The LOOP is the only port in the U.S. capable of offloading deep draft tankers. The onshore oil storage facility, 25 miles inland, near Galliano, is connected to the offshore port complex by a 48-inch diameter pipeline, providing interim storage for crude oil before it is delivered via connecting pipelines to refineries on the Gulf Coast and in the Midwest. The LOOP handles 13 percent of the nation's foreign oil, about 1.2 million barrels a day, and connects by pipeline to 50 percent of the U.S. refining capability. The facility's pumps, meters to measure the crude oil receipts and deliveries, the above ground tanks, and the control center are vulnerable to hurricane and storm damage. Hurricane Katrina closed the distribution center for four days. Although the control center and generators are elevated to reduce the risk from flooding, major flooding would disrupt access to the industrial centers by the workforce. Port Fourchon, in lower Lafourche Parish, was developed to support the offshore oil and gas industry, and is responsible for servicing 90 percent of deepwater structures in the Gulf of Mexico. It has historically been a land base for offshore oil support services as well as a land base for LOOP. The overwhelming majority (over 95 percent) of tonnage handled at the port is oil and gas related. Every item needed to support the oil and gas industry is handled as cargo. Approximately 30 percent of total tonnage travels to and from the port by inland barge before being transferred to or from an offshore supply vessel. The remainder travels by truck and relies on the only highway in and out of the area, Louisiana Highway 1, which traverses the entire length of the project area.

The structures that will be designed for this project will have resiliency incorporated into the design.

d. In-Kind Contributions. The expected in-kind contributions to be provided by the sponsor, the South Lafourche Levee District, are those attributed to the lands, easements, and rights-of-entry. The in-kind contributions will be reviewed/approved in accordance with the established process developed by the CEMVN.

4. DISTRICT QUALITY CONTROL

a. Documentation of DQC. District Quality Control/Quality Assurance. All decision documents (including supporting data, analyses, environmental compliance documents, etc.)

will undergo DQC. The DQC is an internal review process of basic science and engineering work products focused on fulfilling the project quality requirements defined in the Project Management Plan (PMP). The New Orleans District (CEMVN) will manage the DQC. Documentation of the DQC activities is required and will be in accordance with the Quality Manual of CEMVN and the Mississippi Valley Division (CEMVD).

DrChecks will be used to document all DQC comments, responses, and associated resolutions accomplished throughout the review process. Each element provided by the PDT will undergo standard DQC prior to being submitted to the PDT for inclusion in the report. These individual elements will include the write-ups from analysis for each of the project alternatives from the following sections: real estate, geotechnical, levees, structures, economics, environmental, and planning.

Once compiled, the full report will be reviewed by the team and members of the supervisory chain for completeness, effectiveness, efficiency, and acceptability. The DQC will be completed prior to release of the product for ATR and external review.

5. AGENCY TECHNICAL REVIEW

a. Products to Undergo ATR. The products that will be reviewed through the ATR are the SEIS and the draft and final PAC reports.

b. Required ATR Team Expertise. The expertise represented on the ATR team reflects the significant disciplines involved in the work effort and mirror the expertise on the PDT. The appropriate PCX or RMC, in cooperation of the PDT and vertical team, will determine the final make-up of the ATR team. Based on the disciplines indicated below, the study will require a minimum of 10 reviewers, all of whom will be required to be professionally registered and/or certified (where appropriate).

ATR Team Members/Disciplines	Expertise Required
ATR Lead	The ATR lead is a senior professional with extensive experience in preparing Civil Works decision documents and conducting ATR. The lead has the necessary skills and experience to lead a virtual team through the ATR process. Typically, the ATR lead will also serve as a reviewer for a specific discipline (such as planning, economics, environmental resources, etc).
Plan Formulation	Team member is familiar with watershed level projects, current coastal storm damage reduction planning, and policy guidance and has experience in plan formulation.
Economics	Team member has extensive experience in similar coastal storm damage reduction projects and has a thorough understanding of HEC-FDA.
Risk Analysis	The risk analysis reviewer will be experienced with performing and presenting risk analyses in accordance with

	ER 1105-2-101 and other related guidance, including familiarity with how information from the various disciplines involved in the analysis interact and affect the results.
Environmental Resources	Team member has extensive experience in NEPA requirements, cultural resources, recreational resources, and HTRW.
Hydraulic Engineering	Team member is an expert in the field of urban hydrology and hydraulics, has a thorough understanding of the dynamics of open channel flow systems and enclosed systems, and has an understanding of computer modeling techniques used for this project.
Hydraulic Engineering	Team member is an expert in the field of coastal hydrology and hydraulics and has an understanding of computer modeling techniques used for this project.
Geotechnical Engineering	Team member has a thorough understanding of soils and soils analysis, with a specific knowledge of Louisiana coastal soils and experience with soft saturated ground conditions.
Civil Engineering	Team member has experience in utility relocations, internal drainage construction, projects engineering, and operations and with an understanding of the hurricane storm damage risk reduction systems in use in coastal Louisiana.
Structural Engineering	Team member has expertise in water control structures.
Cost Engineering	Team member is familiar with cost estimating for similar projects using MCACES.
Real Estate	Team member has extensive experience in acquisition and leasing, including right-of-way issues and appraisals.

c. Documentation of ATR. DrChecks review software will be used to document all ATR comments, responses, and associated resolutions accomplished throughout the review process. Comments will be limited to those that are required to ensure adequacy of the product. The four key parts of a quality review comment normally include:

(1) The review concern – identify the product's information deficiency or incorrect application of policy, guidance, or procedures;
(2) The basis for the concern – cite the appropriate law, policy, guidance, or procedure that has not be properly followed;
(3) The significance of the concern – indicate the importance of the concern with regard to its potential impact on the plan selection, recommended plan components, efficiency (cost), effectiveness (function/outputs), implementation responsibilities, safety, Federal interest or public acceptability; and
(4) The probable specific action needed to resolve the concern – identify the action(s) that the reporting officers must take to resolve the concern.

In some situations, especially addressing incomplete or unclear information, comments may seek clarification in order to then assess whether further specific concerns may exist.

The ATR documentation in DrChecks will include the text of each ATR concern, the PDT response, a brief summary of the pertinent points in any discussion, including any vertical team coordination (the vertical team includes the district, RMO, MSC, and HQUSACE), and the agreed upon resolution. If an ATR concern cannot be satisfactorily resolved between the ATR team and the PDT, it will be elevated to the vertical team for further resolution in accordance with the policy issue resolution process described in either ER 1110-1-12 or ER 1105-2-100, Appendix H, as appropriate. Unresolved concerns can be closed in DrChecks with a notation that the concern has been elevated to the vertical team for resolution. If necessary, an ATR comment resolution meeting will be held to resolve any outstanding comments.

At the conclusion of each ATR effort, the ATR team will prepare a Review Report summarizing the review. Review Reports will be considered an integral part of the ATR documentation and shall:

- Identify the document(s) reviewed and the purpose of the review;
- Disclose the names of the reviewers, their organizational affiliations and include a short paragraph on both the credentials and relevant experiences of each reviewer;
- Include the charge to the reviewers;
- Describe the nature of their review and their findings and conclusions;
- Identify and summarize each unresolved issue (if any); and
- Include a verbatim copy of each reviewer's comments (either with or without specific attributions), or represent the views of the group as a whole, including any disparate and dissenting views.

The ATR may be certified when all ATR concerns are either resolved or referred to the vertical team for resolution and the ATR documentation is complete. The ATR lead will prepare a Statement of Technical Review certifying that the issues raised by the ATR team have been resolved (or elevated to the vertical team). A Statement of Technical Review will be completed, based on work reviewed to date, for the AFB, draft report, and final report. A sample Statement of Technical Review is included in attachment 2.

6. INDEPENDENT EXTERNAL PEER REVIEW

a. Decision on IEPR. An IEPR will be conducted for the PAC report. The vertical team decided (with involvement from the district, CEMVD, PCX, and HQUSACE members) that, based on the risk and magnitude of the LGM project and given that the PAC report meets the criteria described in EC 1165-2-209, the LGM project warrants a critical examination by a qualified team outside of USACE. The IEPR will be coordinated by the Coastal Storm Damage Reduction PCX, the Louisiana Water Resources Council (LWRC) and managed by an Outside Eligible Organization (OEO) external to the USACE. The OEO should provide review documents to LWRC panel members. The IEPR panel(s) will evaluate whether the interpretations of analysis and conclusions based on analysis are reasonable. To provide effective review, in terms of both usefulness of results and credibility, the review panels will be given the flexibility to bring important issues to the attention of decision makers; however, review panels will be instructed not to make a recommendation on whether a

particular alternative should be implemented, as the Chief of Engineers is ultimately responsible for the final decision on a planning study. The IEPR panel(s) will accomplish a concurrent review that covers the entire PAC report and will address all the underlying engineering, economics, and environmental work, not just one aspect of the study. The CEMVN will make the draft PAC report available to the public for comment at the same time it is submitted for review (or during the review process) and sponsor a public meeting where oral presentations on scientific issues will be made to the reviewers by interested members of the public. The IEPR review period will extend beyond the public comment period so the IEPR reviewers can observe public reaction to the draft report. An IEPR panel or OEO representative will participate in the CWRB.

b. Products to Undergo Type I IEPR. The products to be reviewed through a Type I IEPR are the SEIS and the draft PAC report.

c. Required Type I IEPR Panel Expertise. The expertise represented on the Type I IEPR panel will be similar to those on the ATR team, but may be more specifically focused and will involve many disciplines/individuals. At minimum, the panel will include the necessary expertise to assess the engineering, environmental, and economic adequacy of the PAC report as required by EC 1165-2-209, Appendix D. The PDT will make the initial assessment of what expertise is needed based on the PMP and the factors affecting the scope and level of review outlined in Section 3 of the review plan and may suggest candidates. The OEO will determine the final participants on the panel.

d. Required level of experience. All levels of reviewers described below shall have experience in design and construction of projects similar in scope to the project being reviewed. In addition, at least one of the reviewers on a given panel shall have recent and relevant experience on multi-million dollar projects verifying the constructability of the proposed designs. For all disciplines described below, the contractor must have a minimum of one individual (either on staff or have the ability to subcontract an individual which meets the minimum requirements) for each of the following experience levels: Level 1 reviewers shall have a minimum of 7 years of general experience in their field; Level 2 reviewers shall have a minimum of 10 years of specialized experience in their field; Level 3 reviewers shall have a minimum of 15 years of specialized experience and are considered to be a recognized expert in their field. Level 2 and Level 3 reviewers shall also have relevant dam and levee experience (except for the Cost Engineers) and experience in failure mode analysis and risk assessment of large complex systems with emphasis on dam and levee safety issues.

IEPR Panel Members/Disciplines	Expertise Required
Economics	The Economics Panel Member will have extensive experience in related to coastal storm damage reduction projects and has a thorough understanding of HEC-FDA.
Environmental	The Environmental Panel Member will have extensive experience in NEPA requirements, cultural resources, recreational resources, and HTRW.
Geotechnical Engineering	The Geotechnical Engineering Panel Member will have an

	extensive experience in geotechnical evaluation of flood risk management structures such as static and dynamic slope stability evaluation, evaluation of the seepage through earthen embankments and under seepage through the foundation of the flood risk management structures, including dam and levee embankments, floodwalls, closure structures and other pertinent features and in settlement evaluation of the structure.
Hydraulic Engineering	The Hydraulic Engineering Panel Member will be an expert in the field of urban hydrology and hydraulics as well as coastal hydrology and hydraulics, have a thorough understanding of the dynamics of open channel flow systems and enclosed systems and has an understanding of computer modeling techniques used for this project.
Civil Engineering / Structural Engineering	The Civil Engineering Panel Member will have expertise in utility relocations, internal drainage for levee construction, projects engineering, application of non-structural flood damage reduction, levee construction, and operations and maintenance. This panel member will also have expertise with designing T-wall, navigable floodgates, locks, and vehicular floodgates.
Plan Formulation	The Planning Panel Member should have expertise in watershed level projects, current coastal storm reduction planning and policy guidance and has experience in plan formulation.

e. Documentation of Type I IEPR. The IEPR panel will be selected and managed by an OEO per EC 1165-2-209, Appendix D. Panel comments will be compiled by the OEO and should address the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used. The IEPR comments should generally include the same four key parts as described for ATR comments in Section 5.c above. The OEO will prepare a final review report that will accompany the publication of the final decision document and shall:

- Disclose the names of the reviewers, their organizational affiliations and include a short paragraph on both the credentials and relevant experiences of each reviewer;
- Include the charge to the reviewers;
- Describe the nature of their review and their findings and conclusions; and
- Include a verbatim copy of each reviewer's comments (either with or without specific attributions), or represent the views of the group as a whole, including any disparate and dissenting views.

The final review report will be submitted by the OEO no later than 60 days following the close of the public comment period for the draft PAC report. The USACE will consider all recommendations contained in the review report and prepare a written response for all recommendations adopted or not adopted. The final PAC report will summarize the review

report and USACE response. The review report and USACE response will be made available to the public, including through electronic means on the internet.

7. POLICY AND LEGAL COMPLIANCE REVIEW

The LGM PAC documents will be reviewed throughout the study process for their compliance with law and policy. Guidance for policy and legal compliance reviews is addressed in Appendix H, ER 1105-2-100. These reviews culminate in determinations that the recommendations in the reports and the supporting analyses and coordination comply with law and policy, and warrant approval or further recommendation to higher authority by the home MSC Commander. DQC and ATR augment and complement the policy review processes by addressing compliance with pertinent published Army policies, particularly policies on analytical methods and the presentation of findings in decision documents.

8. COST ENGINEERING DIRECTORY OF EXPERTISE (DX) REVIEW AND CERTIFICATION

The LGM PAC documents will be coordinated with the Cost Engineering DX, located in the Walla Walla District. The DX will assist in determining the expertise needed on the ATR team and Type I IEPR team (if required) and in the development of the review charge(s). The DX will also provide the Cost Engineering DX certification. The RMO is responsible for coordination with the Cost Engineering DX.

9. MODEL CERTIFICATION AND APPROVAL

a. Planning Models. The following planning models are anticipated to be used in the development of the decision document:

Economic Damage Models: The CEMVN will use Hydrologic Engineering Center Flood Damage Analysis (HEC-FDA) version 1.2.4b to perform the economic analysis. The (HEC-FDA 1.2.5a) computer program will be utilized to evaluate flood damages using risk-based methods. This program is used to quantify the uncertainty in discharge-exceedance probability, stage-discharge and stage-damage functions and assimilates that uncertainty into the economic and engineering performance analyses of alternatives. Monte Carlo simulation is used to compute the expected value of damage while explicitly accounting for the uncertainty in economic and hydraulic parameters used to determine flood inundation damages. The analysis considered a range of possible values, with a maximum and a minimum value for each economic variable used to calculate the elevation- or stage-damage curves and for each hydrologic/hydraulic variable used to calculate the stage-frequency curves. It also considered a probability distribution for the likely occurrence of any given outcome within the specified range. The HEC-FDA program uses Monte Carlo simulation to derive the possible occurrences of each variable. Randomly generated numbers are used to simulate the occurrences of selected variables from within the established ranges and distributions. In order to use this program, the inherent uncertainty associated with each of the key hydrologic/hydraulic and economic variables in the analysis was quantified.

Environmental Models for Habitat Evaluation or Mitigation Planning: Wetland Value Assessment Methodology – Wetland Value Assessment (WVA) methodology of habitat assessment will be used to determine the number of "credits" (expressed in Average Annual Habitat Units (AAHUs)) and acres that will be required to compensate for unavoidable project impacts to various wetland habitats and non-wetland bottomland hardwood habitats. This methodology will also be used to determine the mitigation "credits" that may be generated by various mitigation alternatives evaluated as part of the project.

The WVA methodology is a quantitative habitat-based assessment methodology that quantifies changes in fish and wildlife habitat quality and quantity that are expected to result from a proposed action. The WVA is a modification of the Habitat Evaluation Procedures (HEP) developed by the U.S. Fish and Wildlife Service (USFWS) in 1980. A notable difference exists between the two methodologies, however, in that HEP generally uses a species-oriented approach, whereas the WVA utilizes a community approach. The WVA was also specifically developed for application to several habitat types present in coastal Louisiana. This methodology has been used for numerous CEMVN civil works projects/decision documents, including prior Environmental Assessments (EAs) prepared for components of the LGM project. The WVA methodology also most closely resembles the methodology employed in the 1985 SEIS generated for the LGM project as the means of evaluating the overall levee system's anticipated impacts to wetlands. Furthermore, this methodology is equivalent to the methodology employed to determine the environmental benefits that would be derived from the original mitigation program established for the overall LGM project, as addressed in an EA for the mitigation project approved in 1986.

The WVA models quantify changes in habitat quality and quantity that are projected to occur as a result of proposed actions. Projections of conditions are made without the project and with the project for each of several target years. The net difference in average annual habitat units provides a measure of the effect of the proposed action. The AAHUs represent the total number of Habitat Units gained or lost as a result of a proposed action, divided by the life of the action. A HU is a value derived from multiplying the Habitat Suitability Index for a particular area by the size of the area. The Habitat Suitability Index (HSI or SI) is a unitless number bounded by 0 and 1, where 0 represents no habitat value and 1 represents optimum habitat value HSI.

The WVA models were developed for several habitat communities and have been revised several times since they were first developed in 1991. It is anticipated that this project will utilize WVA models for the following habitat communities: fresh/intermediate marsh, brackish marsh, and/or saline marsh communities; bottomland hardwood communities, and: fresh swamp communities. The methodologies associated with each of these model types will be employed in accordance with the following:

- Environmental Work Group. March 19, 2010. Coastal wetlands planning, protection and restoration act, wetland value assessment methodology, procedural manual. USFWS, Lafayette, LA.

- Environmental Work Group. March 19, 2010. Coastal wetlands planning, protection and restoration act, wetland value assessment methodology, coastal marsh community models. USFWS, Lafayette, LA.
- Environmental Work Group. March 19, 2010. Coastal wetlands planning, protection and restoration act, wetland value assessment methodology, bottomland hardwood community model. USFWS, Lafayette, LA.
- Environmental Work Group. March 19, 2010. Coastal wetlands planning, protection and restoration act, wetland value assessment methodology, swamp community model. USFWS, Lafayette, LA.

The latest versions of the various WVA models were approved for use on this PAC on 28 Feb 2012.

b. Engineering Models. The following engineering models are anticipated to be used in the development of the decision document:

Micro Computer Aided Cost Estimating System (MCACES). The MCACES MII 3.0 will be used to prepare the cost estimate for the project. The MII provides an integrated cost estimating system (software and databases) that meets USACE requirements for preparing cost estimates.

Cost and Schedule Risk Analysis (CSRA). In compliance with Memorandum CECW-CE (1110), dated 3 July 2007, from Major General Don T. Riley, a formal risk analysis study will be conducted for the development of contingency on the total project cost. The purpose of the risk analysis study is to establish project contingencies by identifying and measuring the cost and schedule impact of project uncertainties with respect to the estimated total project cost. The risk analysis process uses Monte Carlo techniques to determine probabilities and contingency. The Monte Carlo techniques are facilitated computationally by a commercially available risk analysis software package (Crystal Ball) that is an add-in to Microsoft Excel. The cost estimates will be developed in an MII 3.0 (MCACES) format, and information will be extracted into Microsoft Excel for cost risk analysis purposes.

ADCIRC/STWAVE. The ADCIRC/STWAVE models will be used for the surge modeling and to generate the nearshore wave heights.

10. REVIEW SCHEDULES AND COSTS

a. Feasibility Scoping Meeting (FSM): Pending – November 2012

b. Alternative Formulation Briefing (AFB): July 2013

c. ATR Schedule and Cost.
Total Cost for ATR: $100,000

d. Type I IEPR Schedule and Cost.

Submit Draft PAC report and SEIS: 1 August 2014
Total Cost for Type I IEPR: $300,000

11. PUBLIC PARTICIPATION

A public meeting will be held to inform the residents of Louisiana of the ongoing progress of the PAC study. Attendees will be provided comment cards at the public meeting. The CEMVN will provide feedback regarding the concerns of the residents of Louisiana. These concerns will be posted to the LGM project website. The SEIS will be made available for public review. In the event the CEMVN receives requests for copies of the SEIS from the general public the requestors will have the options to retrieve the information electronically from the www.nolaenvironmental.gov website or request a hard copy of the documents. Public comments to date will be provided to the IEPR Panel.

12. REVIEW PLAN APPROVAL AND UPDATES

The CEMVN Commander is responsible for approving this review plan. The Commander's approval reflects vertical team input (involving CEMVN, CEMVD, RMO, and HQUSACE members) as to the appropriate scope and level of review for the PAC report. Like the PMP, the review plan is a living document and may change as the study progresses. The CEMVN is responsible for keeping the review plan up to date when minor changes to the review plan since the last MSC Commander approval are documented in attachment 3. Significant changes to the review plan (such as changes to the scope and/or level of review) are required to be re-approved by the CEMVD Commander following the process used for initially approving the plan. The latest version of the review plan, along with the Commanders' approval memorandum(s), will be posted on the CEMVN's webpage. The latest review plan will also be provided to the RMO and the CEMVD.

13. REVIEW PLAN POINTS OF CONTACT

Public questions and/or comments on this review plan should be directed to the following points of contact:

Home District (CEMVN)
Herbert "Joey" Wagner, Senior Project Manager, 504-862-1501
Amanda Landry, Project Manager, 504-862-1052
Maude Johnson, Project Manager, 504-862-1907
Shauniqua Thomas, Project Engineer, 504-862-1335
Crorey Lawton, Plan Formulator, 504-862-1281

CEMVD
Greg Ruff, Deputy Chief, New Orleans District Support Team, 601-634-5928
Stephen Stuart, New Orleans District Support Team, 601-634-5829

RMC POC
Colin Krumdieck, Risk Management Center, 571-232-9189

CSDR-PCX POC
Larry Cocchieri, Deputy Director, PCX-CSDR, 347-370-4571

14. ATTACHMENTS

The Project Delivery Team Roster, Sample Statement of Technical Review for Decision Documents, Review Plan Revisions, and Acronyms and Abbreviations are listed as attachments 1 thru 4.

ATTACHMENT 2: SAMPLE STATEMENT OF TECHNICAL REVIEW FOR DECISION DOCUMENTS

COMPLETION OF AGENCY TECHNICAL REVIEW

The Agency Technical Review (ATR) has been completed for the Post-Authorization Change Report for the Grand Isle, Louisiana and Vicinity (Larose to Vicinity of Golden Meadow) Hurricane Protection Project, in Lafourche Parish, LA. The ATR was conducted as defined in the project's Review Plan to comply with the requirements of EC 1165-2-209. During the ATR, compliance with established policy principles and procedures, utilizing justified and valid assumptions, was verified. This included review of: assumptions, methods, procedures, and material used in analyses, alternatives evaluated, the appropriateness of data used and level obtained, and reasonableness of the results, including whether the product meets the customer's needs consistent with law and existing US Army Corps of Engineers policy. The ATR also assessed the District Quality Control (DQC) documentation and made the determination that the DQC activities employed appear to be appropriate and effective. All comments resulting from the ATR have been resolved and the comments have been closed in DrChecks[sm].

SIGNATURE _____ Date _____

Name
ATR Team Leader
Office Symbol/Company

SIGNATURE _____ Date _____

Amanda Landry
Project Manager, New Orleans District
CEMVN PM-ORP

SIGNATURE _____ Date _____

Name
Architect Engineer Project Manager[1]
Company, location

SIGNATURE _____ Date _____

Nathan Snortland
Risk Management Center, Director
CEIWR-RMC

CERTIFICATION OF AGENCY TECHNICAL REVIEW

Significant concerns and the explanation of the resolution are as follows: *Describe the major technical concerns and their resolution.*

As noted above, all concerns resulting from the ATR of the project have been fully resolved.

SIGNATURE _____ Date _____

Walter Baumy
Chief, Engineering Division (home district)
CEMVN-ED

SIGNATURE _____ Date _____

Troy Constance
Chief, Planning Division, New Orleans District
CEMVN-PD

[1] Only needed if some portion of the ATR was contracted

ATTACHMENT 3: REVIEW PLAN REVISIONS

Revision Date	Description of Change	Page / Paragraph Number

ATTACHMENT 4: ACRONYMS AND ABBREVIATIONS

Term	Definition	Term	Definition
AFB	Alternative Formulation Briefing	NED	National Economic Development
ASA(CW)	Assistant Secretary of the Army for Civil Works	NER	National Ecosystem Restoration
ATR	Agency Technical Review	NEPA	National Environmental Policy Act
CSDR	Coastal Storm Damage Reduction	O&M	Operation and maintenance
DPR	Detailed Project Report	OMB	Office and Management and Budget
DQC	District Quality Control/Quality Assurance	OMRR&R	Operation, Maintenance, Repair, Replacement and Rehabilitation
DX	Directory of Expertise	OEO	Outside Eligible Organization
EA	Environmental Assessment	OSE	Other Social Effects
EC	Engineer Circular	PCX	Planning Center of Expertise
EIS	Environmental Impact Statement	PDT	Project Delivery Team
EO	Executive Order	PAC	Post Authorization Change
ER	Ecosystem Restoration	PMP	Project Management Plan
FDR	Flood Damage Reduction	PL	Public Law
FEMA	Federal Emergency Management Agency	QMP	Quality Management Plan
FRM	Flood Risk Management	QA	Quality Assurance
FSM	Feasibility Scoping Meeting	QC	Quality Control
GRR	General Reevaluation Report	RED	Regional Economic Development
HSDRRS	Hurricane Storm Damage Risk Reduction	RMC	Risk Management Center
HQUSACE	Headquarters, U.S. Army Corps of Engineers	RMO	Review Management Organization
IEPR	Independent External Peer Review	RTS	Regional Technical Specialist
ITR	Independent Technical Review	SAR	Safety Assurance Review
LGM	Larose to Golden Meadow	SEISSAR	Supplemental Environmental Impact StatementSafety Assurance Review
LRR	Limited Reevaluation Report	USACE	U.S. Army Corps of Engineers
MSC	Major Subordinate Command	WRDA USACE	Water Resources Development ActU.S. Army Corps of Engineers
		WRDA	Water Resources Development Act