DEPARTMENT OF THE ARMY
US ARMY ENGINEER DIVISION, SOUTHWESTERN
1100 COMMERCE STREET, SUITE 831
DALLAS TX 75242-1317

REPLY TO
ATTENTION OF

CESWD-PDP

12 JUL 2012

MEMORANDUM FOR Commander, Galveston District

SUBJECT: Clear Creek, Texas, Flood Risk Management, General Reevaluation Report - Review Plan Approval (PWI # 074810)

1. References:

a. EC 1165-2-209, Civil Works Review Policy, 31 January 2010.

b. Memorandum, CESWD-PDS-P, 12 September 2007, subject: Review Plan Approval for the Clear Creek, Texas Feasibility Report.

c. Memorandum, CESWD-PDS-P, 30 January 2012, subject: Clear Creek, Texas Draft Flood Risk Management Project General Reevaluation Report & Environmental Impact Statement Dec 2011, Southwestern Division (SWD) Comments (comment #6, page 32).

d. Email, CESWG-PE-PL, Mr. Robert W. Heinly, 20 June 2012, subject: Clear Creek GRR Review Plan Approval Request

2. The previously approved Review Plan (RP) included Independent External Peer Review for the subject project and additional reviews conducted during the feasibility study that have been completed. In accordance with reference 1.c., the district has provided an update to the review plan for inclusion with the Final Report.

3. The Flood Risk Management Planning Center of Expertise has reviewed the RP and has endorsed the updated RP for SWD approval.

4. In accordance with the referenced guidance for review of civil works products, I hereby approve the enclosed Review Plan (RP) for the subject study.

5. Please post the final approved RP and a copy of this memorandum to the District's public internet website and provide the internet address to the Flood Risk Management Planning Center of Expertise and SWD. Before posting to the District website, the names of USACE employees should be removed.

6. The SWD point of contact for this action is Mr. Saji Varghese, CESWD-PDP, and he can be reached at 469-487-7069.

Encl

THOMAS W. KULA
Brigadier General, USA
Commanding

CF:
CESWG-PE-PL/ Mr. Robert Heinly (w/encls)

REVIEW PLAN

CLEAR CREEK, TEXAS
FLOOD RISK MANAGEMENT
GENERAL REEVALUATION REPORT

U.S. Army Corps of Engineers
Galveston District

MSC Approval Date: July 2012
Last Revision Date: June 2012

US Army Corps
of Engineers ®

REVIEW PLAN

CLEAR CREEK, TEXAS
FLOOD RISK MANAGEMENT
General Reevaluation Study

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1. PURPOSE AND REQUIREMENTS

a. Purpose. This Review Plan defines the scope and level of peer review for the Clear Creek, Texas, General Reevaluation Report (GRR) and Supplemental Environmental Impact Statement (SEIS).

b. References

(1) Engineering Circular (EC) 1165-2-209, Civil Works Review Policy, 31 Jan 2010
(2) Change #1 EC 1165-2-209, 31 Jan 2012
(3) EC 1105-2-412, Assuring Quality of Planning Models, 31 Mar 2011
(4) Engineering Regulation (ER) 1110-1-12, Quality Management, 30 Sep 2006
(5) ER 1105-2-100, Planning Guidance Notebook, Appendix H, Policy Compliance Review and Approval of Decision Documents, Amendment #1, 20 Nov 2007
(6) PMP for Clear Creek, Texas study
(7) MSC and/or District Quality Management Plan(s)

c. 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).

2. REVIEW MANAGEMENT ORGANIZATION (RMO) COORDINATION

The RMO is responsible for managing the overall peer review effort described in this Review Plan. The RMO for decision documents is typically either a Planning Center of Expertise (PCX) or the Risk Management Center (RMC), depending on the primary purpose of the decision document. The RMO for the peer review effort described in this Review Plan is Flood Risk Management PCX.

The RMO will coordinate with the Cost Engineering Directory of Expertise (DX) to ensure the appropriate expertise is included on the review teams to assess the adequacy of cost estimates, construction schedules and contingencies.

3. STUDY INFORMATION

a. Decision Document. For the Clear Creek, Texas study, a GRR Report and Supplemental Environmental Impact Statement are being prepared to develop and evaluate alternatives for flood risk management and ecosystem restoration in the Clear Creek watershed. The approval authority for this document was been delegated to the MSC by HQUSACE in a memo dated 8 June 2011 in accordance with ER 1165-2-502. This document will not require Congressional Authorization.

b. Study/Project Description. The Clear Creek, Texas Flood Risk Management study has a single-purpose to manage the flood risk in the Clear Creek watershed. The study is being performed with

non-Federal sponsors: Harris County Flood Control District, Galveston County, and Brazoria Drainage District #4.

Clear Creek drains an area south of and partially within the City of Houston. The Clear Creek watershed is located in four counties, includes 16 cities and covers approximately 260 square miles of land. The watershed is composed of relatively flat coastal plain with elevations varying from near sea level at Clear Lake on the eastern edge of the watershed to about 75 feet mean sea level (MSL) on the western watershed boundary. Clear Creek receives flow from 17 principal tributaries. The Clear Creek watershed 1 percent (100-year) annual exceedance probability (AEP) floodplain contains an area of approximately 19,000 acres. Many communities and subdivisions along the creek are subject to flooding and recent floods (1973, 1976, twice in 1979, 1989, October 1994, and June 2001) have caused extensive property damage. A flood in July 1979 caused more than $90 million (1979 price level) in damages in the Clear Creek watershed.

As a result of numerous storms and flooding events, the Flood Control Act of 1962 authorized the initial investigation of flood problems on Clear Creek. In 1968, a survey report recommending construction of flood control measures along the main channel of Clear Creek was submitted to Congress. The recommendation was for an improved grass-lined channel 31 miles long, which would replace about 41 miles of existing winding channel. The grass-lined channel was designed to contain flood flows up to and including the 1 percent AEP flood event. In submitting the report, the Secretary of the Army directed that the recommended plan be reviewed during the preconstruction planning stage and modified to achieve the most reasonable balance between structural modification of the creek, floodplain regulations, and a broad program of floodplain management. Congress authorized the Clear Creek Flood Control project in the Flood Control Act of 1968, as described in House Document No. 351, 90th Congress, 2nd Session, including the condition of authorization stipulated by the Secretary of the Army. This stipulation, together with subsequent Congressional actions, administrative changes to water resources planning policies, changes in the project area, and changes in the attitude of the affected public, required a comprehensive restudy of the Clear Creek project.

The watershed is approximately 45 miles long and is relatively flat, typical of the Gulf Coast Plains. Elevations vary from less than 5 feet above MSL near Clear Lake to approximately 75 feet above MSL at the western end. The floodplain is much wider and shallower in the upstream extents, specifically in the cities of Pearland and Friendswood where the annual flood damages are highest. It narrows and deepens as it moves downstream into Clear Lake where annual damages are lowest as it relates to riverine flooding. The only significant irregularities in the slope are the valleys cut by the creek and its tributaries. Because of the relatively flat terrain, the watershed divides are not well defined. Risk of flooding within the floodplain is substantial allowing development of a project which could have significant economic affects to the nation but single flood events are fairly shallow, somewhat reducing the risk to life safety.

In addition, some portions of the study area are relatively natural and some have remain untouched long enough to return to a somewhat natural state. Because of these factors, some stakeholders are interested in identifying measures that take into consideration environmental sensitivity. Considerable coordination is required to insure that all stakeholders' interests are taken into consideration. Due to these aspects, it is especially challenging to develop flood risk management measures that reduce damages in the upstream reaches while assuring no significant environmental impacts in areas that remain natural.

The team has completed substantial analysis and identified an NED Plan for coordination with stakeholders and the vertical team.

This NED plan includes both conveyance and inline detention flood risk management measures on the main stem of Clear Creek as well as several tributaries. Conveyance measures on Clear Creek include high-flow benches adjacent to the low-flow creek (which will be allowed to return to a natural state). Inline detention is also proposed for the main stem of Clear Creek. Conveyance on Marys Creek, Turkey Creek and Mud Gully include trapezoidal channel rectification ranging from 15 to 45 feet in width. The largest feature of the project is the conveyance components proposed for the main stem of Clear Creek. These features are designed to maintain a natural low-flow channel that will minimize impacts of the project while facilitating the reduction of flood damages through the construction of high-flow benches. The only detention feature included in the plan is made up of linear detention located in the footprint of the high-flow bench cut conveyance feature, but only when the high-flow bench leaves the footprint of the natural low-flow channel. In the footprint of the low-flow channels, habitat already existing will remain while any areas not currently forested will be planted in an attempt to create a shaded stream habitat. All of the channels consist of grass-lined earthen channels, with the exception of Mod Gully, which is a concrete-lined channel to match with existing concrete improvements. The cost estimate for this plan is approximately $181,000,000.

c. **Factors Affecting the Scope and Level of Review.** The Clear Creek GRR is a flood risk management study used to identify measures that will reduce flood damages in a fairly flat topography with variable floodplains. There were challenges throughout the study because of the scope and technical complexity of this project.

This project does involve public safety (life safety) concerns and does not involve significant threat to human life/safety assurance. The Clear Creek study area is characterized as a relatively flat floodplain with shallow flooding associated with all events. The problem along the creek is flood damages to residential, commercial, and public investment caused by frequent low-level flood events associated with localized rainfall events and larger less frequent events with significant levels of flooding usually associated with tropical events. Velocities do not pose a significant threat to life in any studied reach, with velocities typically ranging from 1 to 5 cubic feet per second for all flood events. These frequent events impact the structures with an average depth of flooding ranging from 0.5 to 1.5 feet. These low velocities and shallow depths of flooding, along with viable evacuation routes during flooding events are why there is not expected to be a significant threat to human life. The District Chief of Engineering concurs with the assessment that this project does not involve life safety risk.

Continued risks are expected as any plan that might be recommended will not remove all risk of flooding. Also, there will be a continued risk of flooding that will require involvement of local drainage managers. There is some risk of the transference of damages when you build flood risk components on portions of a stream. In the past environmental and public safety aspects of the project have been controversial, however due to the significant public coordination and involvement done by the team, this controversy has been significantly reduced.

There is no request by the Governor of an affected state for a peer review by independent experts. No information in the decision document or anticipated project design is likely to be based on novel

methods, involve the use of innovative materials or techniques, present complex challenges for interpretation, contain precedent-setting methods or models, or present conclusions that are likely to change prevailing practices. There is not a project design anticipated to require redundancy, resiliency, and/or robustness, unique construction sequencing, or a reduced or overlapping design construction schedule. The proposed project consists of mostly of grass-lined earthen channels, with the exception of one tributary which is concrete-lined to match existing conditions.

Because of this coordination factors such as cultural, environmental, fish and wildlife and endangered species are not triggers for the requirement of IEPR. A SEIS is being completed for this study. Additionally, the construction costs for the current plan are greater than $45 million. For these reasons, IEPR will be conducted.

d. **In-Kind Contributions.** Products and analyses provided by non-Federal sponsors as in-kind services are subject to DQC, ATR, and IEPR. The in-kind products and analyses to be provided by the non-Federal sponsor include:
    - services for project management;
    - public involvement, coordination and outreach;
    - environmental studies;
    - hydraulics and hydrology studies;
    - data collection;
    - geotechnical studies;
    - engineering; and
    - participate in reviews.

Specifically, the non-Federal sponsor has prepared a general sediment evaluation and is overseeing a channel boring contract as part of their work-in-kind efforts. No final in-kind products were prepared by the sponsors.

4. DISTRICT QUALITY CONTROL (DQC)

All decision documents (including supporting data, analyses, environmental compliance documents, etc.) shall undergo DQC. 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 home district shall manage DQC. Documentation of DQC activities is required and should be in accordance with the Quality Manual of the District and the home MSC.

a. Documentation of DQC. It is managed by the Galveston District and may be conducted by staff in the home district as long as they are not doing the work involved in the study, including contracted work that is being reviewed. Basic quality control tools include a Quality Management Plan (QMP) providing for seamless review, quality checks and reviews, supervisory reviews, PDT reviews, etc. Additionally, the PDT is responsible for a complete reading of the report to assure the overall integrity of the report, technical appendices and the recommendations before approval by the District Commander. The Planning Chief will assure that DQC has been provided by all offices and will provide certification of DQC to the review teams.

b. Products to Undergo DQC. For the Clear Creek GRR, non-PDT members and/or supervisory staff will conduct this review for major draft and final products, including products provided by the non-Federal sponsors as in-kind services following review of those products by the PDT.

c. Required DQC Expertise. For the Clear Creek GRR, non-PDT members and/or supervisory staff will conduct this review. It is expected that the Major Subordinate Command (MSC)/District QMP address the conduct and documentation of this fundamental level of review.

5. AGENCY TECHNICAL REVIEW (ATR)

ATR is mandatory for all decision documents (including supporting data, analyses, environmental compliance documents, etc.). The objective of 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 USACE guidance, and that the document explains the analyses and results in a reasonably clear manner for the public and decision makers. ATR is managed within USACE by the designated 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. ATR teams will be comprised of senior USACE personnel and may be supplemented by outside experts as appropriate. The ATR team lead will be from outside the home MSC.

a. **Products to Undergo ATR.** The ATR process is being conducted throughout the study process. ATR involvement was conducted prior to major project milestones (FSM, IPR, and AFB), as well as completion of an ATR of the draft report prior to the 2010 Feasibility Review Conference (FRC). The FRC resulted in the requirement for an additional ATR review to address specific sedimentation and Hydrology and Hydraulics (H&H) modeling concerns before HQUSACE would allow the draft report to be released for public review. An ATR review is scheduled for the final report. The ATR team was formed to perform periodic reviews of the feasibility study efforts, including the project assumptions, analyses, and calculations, as needed throughout the planning study process. The ATR focused on the following:

- Review of the planning study process,
- Review of the methods of analysis and design of the alternatives and recommended plan,
- Compliance with program and NEPA requirements, and
- Completeness of study and support documentation

b. **Required ATR Team Expertise.** The ATR is being conducted by experienced peers within the same discipline who are not directly involved with the development of the study or project being reviewed. Management of ATR reviews is conducted by professionals outside of the home district. For planning feasibility-level studies, the ATR is managed by the appropriate Planning Center of Expertise (PCX) with appropriate consultation with the allied Communities of Practice, such as engineering and real estate. The ATR team was formed prior to stand-up of the FRM PCX and did not include a member from that PCX. In view of the older procedures followed in forming the ATR team, for additional ATR necessary after the AFB, revisions will be made to the team makeup, including its leadership, to ensure that review of future study products is compliant. The ATR team has completed reviews of the draft documents in preparation of an IPR and the AFB. Currently, the team received ATR Certification on the AFB read ahead (17 April 2009) and on the draft report for the FRC (18 August 2010) with an additional certification (17 February 2011) on the HEC (Hydrologic

Engineering Center) Risk and Uncertainty Work Product and Sedimentation White Paper in response to HQUSACE policy review of the GRR.

The review team consisted of six reviewers, at least one from each of the following disciplines: engineering design, hydraulics and hydrology, economics, environmental, real estate, plan formulation, operations and cost engineering. A brief description of the disciplines on the ATR team is included below:

ATR Team Members/Disciplines	Expertise Required
ATR Lead	The ATR lead should be a senior professional with extensive experience in preparing Civil Works decision documents and conducting ATR. The lead should also have the necessary skills and experience to lead a virtual team through the ATR process. The ATR lead may also serve as a reviewer for a specific discipline (such as planning, economics, environmental resources, etc).
Planning	The Planning reviewer should be a senior water resources planner with experience in current planning policies and guidance related to reevaluation studies
Economics	The Economics reviewer should have a strong understanding of economic models or studies relative to flood risk management.
Environmental Resources	The Environmental Resources reviewer should have strong background in coastal ecosystems (e.g. tidal marsh, floodplain forest and coastal prairie) and Texas environmental laws and regulations, including Cultural Resources
Hydrology and Hydraulics (H&H)	The H&H reviewer has extensive knowledge of hydraulic and hydrologic principles associated with flood risk management studies
Design Engineering	The engineering design reviewer has extensive knowledge of design parameters for flood risk management studies
Cost Engineering	The Cost Engineering reviewer should have a strong knowledge of the cost estimating practices for flood risk management projects. The Cost Engineering team member will be from the Cost Estimating PCX in the Walla Walla District.
Real Estate	The Real Estate reviewer should have knowledge in reviewing RE Plans for feasibility studies.
Risk Analysis	The risk analysis reviewer will be experienced with performing and presenting risk analysis 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

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 should be limited to those that are required to ensure adequacy of the product. The four key parts of a quality review comment will 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.

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.

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 should 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 (IEPR)

IEPR may be required for decision documents under certain circumstances. 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 IEPR is appropriate. IEPR panels will consist of independent, recognized experts from outside of the 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 IEPR. Type I IEPR reviews are managed outside the 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 analysis, 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 biological opinions of the project study. Type I IEPR will cover the entire decision document or action and will address all 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.

- 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 shall consider the adequacy, appropriateness, and acceptability of the design and construction activities in assuring public health safety and welfare.

a. **Decision on IEPR.** The Clear Creek GRR is a flood risk management study used to identify measures that will reduce flood damages in a fairly flat topography with variable floodplains. The decision document meets some of the mandatory triggers for Type I IEPR described in Paragraph 11.d.(1) and Appendix D of EC 1165-2-209. Although the scope and technical complexity of this project is not expected to warrant IEPR, the project does involve public safety concerns. Continued risks are expected as any plan that might be recommended will not remove all risk of flooding. There will be a continued risk of flooding that will require involvement of local drainage managers. Also, there is some risk of the transference of damages when you build flood risk components on portions of a stream. The IEPR team attempted to evaluate these risks to insure no significant impacts. Additionally in the past environmental and public safety aspects of the project have been controversial. However, due to the significant public coordination and involvement done by the team, this controversy has been significantly reduced. Because of this coordination, factors such as cultural, environmental, fish and wildlife and endangered species are not triggers for the requirement of IEPR. A SEIS is being completed for this study. Additionally, the construction costs for the current plan are greater than $45 million. For these reasons, IEPR was conducted. In the Preconstruction Engineering and Design phase, a Type II IEPR (SAR) shall be conducted on design and construction activities for this project because this Type II IEPR is required for all flood risk management projects. The requirement for Type II IEPR is based upon Section 2035 of WRDA 2007, the OMB Peer Review Bulletin and other USACE policy considerations.

b. **Products to Undergo Type I IEPR.** Interim products for hydrology and hydraulics, economics, and environmental were provided before the draft report is released for public review. The full IEPR

panel also received the entire draft feasibility report, environmental impact statement and all technical appendices.

c. **Required Type I IEPR Panel Expertise.** IEPR panels were made up of recognized independent experts from outside of USACE, with disciplines appropriate for the type of review being conducted. The PCX contracted with Battelle to manage the review. Six IEPR panel members were selected by Battelle using the National Academy of Science's policy for selecting reviewers. No candidates were nominated by USACE, public, or scientific or professional societies. However, a pool of potential reviewers was evaluated by USACE to ensure no conflict of interest. Since this feasibility study is a flood risk management, anticipated disciplines of IEPR reviewers are engineering (hydrology and hydraulics), economics, and environmental. The IEPR panel review was federally funded, including the costs associated with obtaining the IEPR panel contract. Responding to IEPR comments was cost shared with the local sponsor.

IEPR Panel Members/Disciplines	Expertise Required
Economics	The Economics Panel Member should have experience in water resource economic evaluation or review, working directly for or with USACE, and have experience with the HEC-FDA model. The reviewer should also have experience reviewing federal water resource economic documents justifying construction efforts, an understanding of social well-being and regional economic development, and an understanding of traditional natural economic development benefits
Environmental (Ecology)	The Ecology Panel Member should have experience in describing and evaluating the complex relationships and dynamics of coastal prairie and/or riparian ecosystems and experience assessing the consequences of altering environmental conditions
Environmental (NEPA Impact Assessment)	The NEPA Impact Assessment Panel Member should have experience in evaluating and conducting NEPA impact assessments, conducting cumulative effects analyses, as well as experience with complex multi-objective public. The reviewer should work projects with competing trade-offs and have experience in determining the scope and appropriate methodologies for impact assessment and analyses for a variety of projects with high public and interagency interest. The reviewer should also have experience determining the scope and appropriate methodologies for impact assessment and analyses for projects having impacts to nearby sensitive habitats.
Hydraulic Engineering	The hydraulic engineering reviewer should have an extensive experience in hydraulic theory and practice. The reviewer should be familiar with USACE application of risk and uncertainty analyses in flood damage reduction studies and standard USACE hydrologic and hydraulic computer models.
Geotechnical (fluvial)	The geotechnical (fluvial) engineering reviewer should have geotechnical studies and design of flood control works including channel modifications, an understanding of traditional natural economic development benefits, and be familiar with

	geotechnical practices used in Texas site investigation planning and implementation including modification of stream channels for flood risk management purposes, minimizing environmental impacts, fluvial processes, and geomorphology.
Geotechnical (risk analysis)	The geotechnical (risk analysis) engineering reviewer should have geotechnical studies and design of flood control works, including channel modifications and geotechnical risk analysis with application of probabilistic methods to geotechnical aspects of flood damage reduction planning studies.

d. Documentation of Type I IEPR. The IEPR panel was selected and managed by an Outside Eligible Organization (OEO) per EC 1165-2-209, Appendix D. Panel comments were compiled by the OEO and addressed the adequacy and acceptability of the economic, engineering and environmental methods, models, and analyses used. IEPR comments generally include the same four key parts as described for ATR comments in Section 4.d above. The OEO prepared a final Review Report that will accompany the publication of the final decision document and did:

- 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 was submitted by the OEO no later than 60 days following the close of the public comment period for the draft decision document. USACE considered all recommendations contained in the Review Report and will prepare a written response for all recommendations adopted or not adopted. The final decision document 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

All decision 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

All decision documents shall 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

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, for the purposes of the EC, 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 (if required).

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. As part of the USACE Scientific and Engineering Technology (SET) Initiative, many engineering models have been identified as preferred or acceptable for use on Corps studies and these models should be used whenever appropriate. 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 (if required).

a. Planning Models. The following planning models were used in the development of the decision document:

Model Name and Version	Brief Description of the Model and How It Will Be Applied in the Study	Certification / Approval Status
HEC-FDA 1.2.5 (Flood Damage Analysis)	HEC-FDA program provides the capability for integrated hydrologic engineering and economic analysis for formulating and evaluating flood risk management plans using risk-based analysis methods. The program will be used to evaluate and compare the future without- and with-project plans along Clear Creek to aid in the selection of a recommended plan to manage flood risk.	Certified
Community based HEP Mitigation model	The HEP model benefitted from input from numerous resource agencies that were part of the Interagency Coordination Team (ICT) developed for the project.	Approved – April 2011

b. Engineering Models. The following engineering models were used in the development of the decision document:

Model Name and Version	Brief Description of the Model and How It Will Be Applied in the Study	Approval Status
HEC-1 (Hydrology)	The Hydrologic Engineering Center's rainfall runoff model	Legacy

	(HEC-1) for the watershed computes the rainfall runoff to be used in other models.	software available at the time of this modeling
HEC-2 (Hydraulics)	The HEC-2 program computes water surface profiles for one-dimensional steady, gradually varied flow in rivers of any cross section.	Legacy software available at the time of this modeling
HEC-RAS (H&H) Modeling	The Hydrologic Engineering Center's River Analysis System (HEC-RAS) program provides the capability to perform one-dimensional steady and unsteady flow river hydraulics calculations. The program will be used for steady flow analysis to evaluate the future without- and with-project conditions along Clear Creek and its tributaries.	HH&C CoP Preferred Model
Mii - cost estimating model	Mii is the cost estimating model used to develop cost estimates for projects.	
Crystal Ball Risk Based Analysis	Crystal Ball software shall be used to conduct Cost Risk Analysis.	

10. REVIEW SCHEDULES AND COSTS

a. ATR Schedule and Cost.

- **Review Schedule**

TASK	Date
Feasibility Scoping Meeting	July 26, 2002 (actual)
ATR for AFB Initiation	September 26, 2008 (actual)
ATR for AFB Completion	April 17, 2009 (actual)
Update of Project Review Plan	June 24, 2009 (actual)
AFB Read Ahead Submittal	July 9, 2009 (actual)
AFB	September 16, 2009 (actual)
ATR for FRC Initiation	May 18, 2010 (actual)
ATR for FRC Certification	August 18, 2010 (actual)
Submittal of Draft Documents to HQ/SWD	August 19, 2010 (actual)
ATR for sedimentation/H&H issues (HEC) completed	February 17, 2011 (actual)
Draft Update of Project Review Plan	August 2011 (actual)
Policy and Public Review of Draft Report Initiation	December 16, 2011 (actual)
Policy and Public Review of Draft Report Completion	February 14, 2012 (actual)
Receipt and Respond to comments on Review Plan	February 2012 (actual)
ATR Backcheck for Final Report Initiation	March 22, 2012
ATR Backcheck for Final Report Certification	May 10, 2012

Public Review of Final Report Initiation	August 10, 2012
Public Review of Final Report Completion	September 8, 2012

- The cost for ATR are as follows:

ATR for AFB read ahead	$ 42,292 (actual)
ATR for FRC read ahead	$ 30,149 (actual)
ATR for sedimentation issue	$ 7,000 (actual)
ATR for HEC review	$ 16,500 (actual)
ATR for Cost Estimates (Walla Walla)	$ 9,910 (actual)
ATR for Final Report	$ 25,000 estimate
Total ATR Costs	$130,851

b. Type I IEPR Schedule and Cost.

- **IEPR Review Schedule**

TASK	Date
IEPR Initiation	May 18, 2009 (actual)
IEPR Certification	August 27, 2009 (actual)
IEPR backcheck/followup Initiation	May 27, 2010 (actual)
IEPR backcheck/followup Certification	August 20, 2010 (actual)
Chief of Engineer's IEPR Summary Report	June 2012 estimate

- The cost for IEPR, which has been completed, was a total of $426,600.

c. Model Certification/Approval Schedule and Cost.

- **Model Certification/Approval Schedule**

TASK	Date
Model Approval Initiation	May 21, 2009 (actual)
Final Model Approval	April 26, 2011 (actual)

- Cost for any necessary approval of the mitigation models is not available. All other models used are already certified or approved for use.

11. PUBLIC PARTICIPATION

Three USACE-sponsored public scoping meetings were conducted in 2001 for this project. These meetings occurred on March 15, 2001, in Friendswood, Texas; May 3, 2001, in League City, Texas; and May 9, 2001, in Pearland, Texas. An ICT made of representatives from the District, non-Federal sponsor, state and Federal resource agencies, and interested groups was formed as part of the study. The ICT participated in identifying potential sensitive resources and environ-mental issues and developing ways to address those issues. A Public Involvement Plan was formulated to ensure public involvement throughout the feasibility study process. The public, including scientific or professional societies, were not asked to nominate potential peer reviewers. Public review was held after the AFB and those comments will be summarized in the SEIS with responses provided. ATR review of the AFB package

included discussion of the Public Scoping Meeting and included public comments. An additional public meeting on the draft SEIS and report was conducted on January 11, 2012, in Friendswood, Texas.

TASK	START DATE	FINISH DATE
Public Meetings	July 22, 1997	November 11, 1997
Public Scoping Meeting	March 15, 2001	May 9, 2001
ICT Meetings	May 2002	TBD
Public Review of Draft GRR & SEIS	December 16, 2011	February 14, 2012
Public Meeting for Draft SEIS	January 11 ,2012	January 11 ,2012
Public Review of Final GRR & SEIS	August 10, 2012	September 8, 2012

Proceedings from all public meetings, minutes from ICT meetings or any other public involvement meetings were posted on the Galveston District website for the Clear Creek Project and are available to the public and reviewers. The comments received during the public review of the draft report and their responses will be included in the final SEIS. A public review will also be held on the final report.

12. REVIEW PLAN APPROVAL AND UPDATES

The Galveston District Commander is responsible for approving this Review Plan. The Commander's approval reflects vertical team input (involving district, MSC, RMO, and HQUSACE members) as to the appropriate scope and level of review for the decision document. Like the PMP, the Review Plan is a living document and may change as the study progresses. The home district is responsible for keeping the Review Plan up to date. 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) should be re-approved by the MSC Commander following the process used for initially approving the plan. The latest version of the Review Plan, along with the Commanders' approval memorandum, should be posted on the Home District's webpage. The latest Review Plan should also be provided to the RMO and home MSC.

13. REVIEW PLAN POINTS OF CONTACT

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

- Ms. Sheri Willey, Galveston District PDT Planning contact at (409) 766-3917 or sheridan.s.willey@usace.army.mil
- Mr. Sam Arrowood, Southwestern Division contact at (409) 766-3970 or sam.a.arrowood@usace.army.mil
- Mr. Eric Thaut, PCX Manager at (415)503-6852 or eric.w.thaut@usace.army.mil

ATTACHMENT 1: TEAM ROSTERS (Removed Prior to Posting on Webpage)

ATTACHMENT 2: SAMPLE STATEMENT OF TECHNICAL REVIEW FOR DECSION DOCUMENTS

COMPLETION OF AGENCY TECHNICAL REVIEW

The Agency Technical Review (ATR) has been completed for the General Reevaluation Report for Clear Creek, Texas. 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 _____
Sharon Tirpak
Project Manager
CESWG-PM-J

SIGNATURE _____ Date _____
Name
Architect Engineer Project Manager[1]
Company, location

SIGNATURE _____ Date _____
Eric Thaut
Review Management Office Representative
CESPD-PDP (FRM-OCX)

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 _____
Robert Howell
Acting Chief, Engineering Division
CESWG-EC

SIGNATURE _____ Date _____
Dolan Dunn
Chief, Planning Division
CESWG-PE

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

ATTACHMENT 3: REVIEW PLAN REVISIONS

Revision Date	Description of Change	Page / Paragraph Number
August 2011	Update to follow EC 1165-2-209	Throughout
August 2011	Updated schedule and costs to reflect actual reviews	Throughout
February 2012	Incorporate Review Plan into FRM review plan template	Throughout

ATTACHMENT 4: ACRONYMS AND ABBREVIATIONS

Term	Definition	Term	Definition
AFB	Alternative Formulation Briefing	MSC	Major Subordinate Command
ASA(CW)	Assistant Secretary of the Army for Civil Works	MSL	Mean Sea Level
ATR	Agency Technical Review	NED	National Economic Development
CSDR	Coastal Storm Damage Reduction	NER	National Ecosystem Restoration
DPR	Detailed Project Report	NEPA	National Environmental Policy Act
DQC	District Quality Control/Quality Assurance	O&M	Operation and maintenance
DX	Directory of Expertise	OMB	Office and Management and Budget
EA	Environmental Assessment	OMRR&R	Operation, Maintenance, Repair, Replacement and Rehabilitation
EC	Engineer Circular	OEO	Outside Eligible Organization
EIS	Environmental Impact Statement	OSE	Other Social Effects
EO	Executive Order	PCX	Planning Center of Expertise
ER	Ecosystem Restoration	PDT	Project Delivery Team
FDR	Flood Damage Reduction	PAC	Post Authorization Change
FEMA	Federal Emergency Management Agency	PMP	Project Management Plan
FRM	Flood Risk Management	PL	Public Law
FSM	Feasibility Scoping Meeting	QMP	Quality Management Plan
GRR	General Reevaluation Report	QA	Quality Assurance
HEC	Hydrologic Engineering Center	QC	Quality Control
HEC-FDA	HEC's Flood Damage Analysis	RED	Regional Economic Development
Home District/MSC	The District or MSC responsible for the preparation of the decision document	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
ICT	Interagency Coordination Team	SAR	Safety Assurance Review
IPR	In Progress Review	SEIS	Supplemental Environmental Impact Statement
ITR	Independent Technical Review	USACE	U.S. Army Corps of Engineers
LRR	Limited Reevaluation Report	WRDA	Water Resources Development Act