



US Army Corps
of Engineers®

REVIEW PLAN

CHICAGO SANITARY & SHIP CANAL AQUATIC NUISANCE SPECIES DISPERSAL BARRIERS EFFICACY STUDY, Cook, DuPage and Will Counties, Illinois

Interim Feasibility Report and Environmental Assessment



Chicago District

30 September 2009

REVIEW PLAN

*CHICAGO SANITARY & SHIP CANAL
AQUATIC NUISANCE SPECIES DISPERSAL BARRIERS EFFICACY STUDY,
Cook, DuPage and Will Counties, Illinois*

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1. PURPOSE AND REQUIREMENTS

Purpose. This Review Plan defines the scope and level of peer review for the CHICAGO SANITARY & SHIP CANAL AQUATIC NUISANCE SPECIES DISPERSAL BARRIERS EFFICACY STUDY, Cook, DuPage and Will Counties, Illinois Interim Feasibility Report and Environmental Assessment.

a. References

- (1) Engineering Circular (EC) 1105-2-410, Review of Decision Documents, 22 Aug 2008
- (2) EC 1105-2-407, Planning Models Improvement Program: Model Certification, 31 May 2005
- (3) Engineering Regulation (ER) 1110-2-12, Quality Management, 30 Sep 2006
- (4) Section 3061 WRDA 2007 Implementing Guidance, March 2009
- (5) Dispersal Barrier Efficacy Study Project Management Plan, September 2009
- (6) Dispersal Barrier Efficacy Quality Control Plan September 2009

b. Requirements. This review plan was developed in accordance with EC 1105-2-410, which establishes the procedures for ensuring the quality and credibility of U.S. Army Corps of Engineers (USACE) decision documents through independent review. The EC outlines three levels of review: District Quality Control, Agency Technical Review, and Independent External Peer Review. In addition to these three levels of review, decision documents are subject to policy and legal compliance review and, if applicable, safety assurance review and model certification/approval.

- (1) District Quality Control (DQC). DQC is the review of basic science and engineering work products focused on fulfilling the project quality requirements defined in the Project Management Plan (PMP). It is managed in the home 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 providing for seamless review, quality checks and reviews, supervisory reviews, Project Delivery Team (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 Major Subordinate Command (MSC)/District quality management plans address the conduct and documentation of this fundamental level of review; DQC is not addressed further in this review plan.
- (2) Agency Technical Review (ATR). ATR is an in-depth review, managed within USACE, and conducted by a qualified team outside of the home district that is not involved in the day-to-day production of the project/product. The purpose of this review is to ensure the proper application of clearly established criteria, regulations, laws, codes, principles and professional practices. The ATR team reviews the various work products and assure that all the parts fit together in a coherent whole. ATR teams will be comprised of senior USACE personnel (Regional Technical Specialists (RTS), etc.), and may be supplemented by outside experts as appropriate. To assure independence, the leader of the ATR team shall be from outside the home MSC.
- (3) Independent External Peer Review (IEPR). 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. IEPR is generally for feasibility and reevaluation studies and modification reports with Environmental Impact Statements (EISs). IEPR is managed by an outside eligible organization (OEO) that is described in Internal Revenue Code Section 501(c) (3), is exempt

from Federal tax under section 501(a), of the Internal Revenue Code of 1986; is independent; is free from conflicts of interest; does not carry out or advocate for or against Federal water resources projects; and has experience in establishing and administering IEPR panels. The scope of review will address all the underlying planning, engineering, including safety assurance, economics, and environmental analyses performed, not just one aspect of the project.

- (4) Policy and Legal Compliance Review. Decision documents will be reviewed throughout the study process for their compliance with law and policy. These reviews culminate in Washington-level 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 Chief of Engineers. Guidance for policy and legal compliance reviews is addressed further in Appendix H, ER 1105-2-100, Planning Guidance Notebook. When policy and/or legal concerns arise during DQC or ATR that are not readily and mutually resolved by the PDT and the reviewers, the District will seek issue resolution support from the MSC and HQUSACE in accordance with the procedures outlined in Appendix H, ER 1105-2-100. IEPR teams are not expected to be knowledgeable of Army and administration policies, nor are they expected to address such concerns. The home district Office of Counsel is responsible for the legal review of each decision document and signing a certification of legal sufficiency.
- (5) Safety Assurance Review. In accordance with Section 2035 of Water Resources Development Act (WRDA) of 2007, EC 1105-2-410 requires that all projects addressing flooding or storm damage reduction undergo a safety assurance review of the design and construction activities prior to initiation of physical construction and periodically thereafter until construction activities are completed on a regular schedule sufficient to inform the Chief of Engineers on the adequacy, appropriateness, and acceptability of the design and construction activities for the purpose of assuring public health, safety, and welfare. A future circular will provide a more comprehensive Civil Works Review Policy that will address the review process for the entire life cycle of a Civil Works project. That document will address the requirements for a safety assurance review for the Pre-Construction Engineering Phase, the Construction Phase, and the Operations Phase. The decision document phase is the initial design phase; therefore, ER 1105-2-410 requires that safety assurance factors be considered in all reviews for decision document phase studies.
- (6) Model Certification/Approval. EC 1105-2-407 requires certification (for Corps models) or approval (for non-Corps models) of planning models used for all planning activities. The EC defines planning models 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 EC does not cover engineering models used in planning. Engineering software is being addressed under the Engineering and Construction (E&C) Science and Engineering Technology (SET) initiative. Until an appropriate process that documents the quality of commonly used engineering software is developed through the SET initiative, engineering activities in support of planning studies shall proceed as in the past. 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.

2. STUDY INFORMATION

a. Study Authority:

SEC. 3061 CHICAGO SANITARY AND SHIP CANAL DISPERSAL BARRIERS PROJECT, ILLINOIS

(a) TREATMENT AS SINGLE PROJECT.-The Chicago Sanitary and Ship Canal Dispersal Barrier Project (in this section referred to as "Barrier I"), as in existence on the date of enactment of this Act and constructed as a demonstration project under section 1202(i)(3) of the Non-indigenous Aquatic Nuisance Prevention and Control Act of 1990 (16 U.S.C. 4722(i)(3)), and the project relating to the Chicago Sanitary and Ship Canal Dispersal Barrier, authorized by section 345 of the District of Columbia Appropriations Act, 2005 (Public Law 108-335; 118 Stat. 1352) (in this section referred to as "Barrier II") shall be considered to constitute a single project.

(b) AUTHORIZATION.

(1) IN GENERAL.-The Secretary, at Federal expense, shall:

(A) upgrade and make permanent Barrier I;

(B) construct Barrier II, notwithstanding the project cooperation agreement with the State of Illinois dated June 14, 2005;

(C) operate and maintain Barrier I and Barrier II as a system to optimize effectiveness;

(D) conduct, in consultation with appropriate Federal, State, local, and nongovernmental entities, a study of a range of options and technologies for reducing impacts of hazards that may reduce the efficacy of the Barriers; and,

(E) provide to each State a credit in an amount equal to the amount of funds contributed by the State toward Barrier II.

Decision Document. Chicago Sanitary & Ship Canal Aquatic Nuisance Species Dispersal Barriers Efficacy Study, Cook, Du Page and Will Counties, Illinois, Interim Feasibility Report(s) and Environmental Assessment. The study may need additional Congressional Authorization. The Efficacy Study will evaluate hazards associated with the Barriers Project in four areas of study. The areas of study are: *Optimal Operating Parameters*; *ANS Barrier Bypasses*; *ANS Human Intervention*; and, *ANS Abundance Reduction*. *Optimal Operating Parameters* will address the threat of Aquatic Nuisance Species (ANS-aka Asian Carp) moving through the Barriers. Evaluations being performed by ERDC and CERL are evaluating operating voltage and frequency through field, flume and tank tests. ERDC will provide a report based on their findings that will be utilized by the District in the Operations of the Barrier. *ANS Barrier Bypasses* will address the potential routes for bypass of the Barriers Project by ANS through alternative flow paths, including the adjacent waters of the Lower Des Plaines River and the Illinois and Michigan Canal. *ANS Human Intervention* will address those practices where ANS are purposely or inadvertently transferred through human intervention. These practices could include the release of ballast or bilge water, ANS transmitted via bait buckets, or ANS transmitted through buy and release situations. *ANS Abundance Reduction* will address potential means to reduce the population of ANS species. Methods that could be evaluated include over-harvesting, application of piscicides or other biological means to reduce the population of ANS. The NEPA documentation will address the elements of the study as required by laws and regulation.

b. Study Area Description. The Barriers Project is located on the Chicago Sanitary and Ship Canal at River mile 296.5 between the Lockport L&D and the Junction with the Cal-Sag Channel. The Barriers Projects consist of an array of electrical dispersal barriers, two are currently constructed and in operation, Barrier I, which was activated in 2002, and Barrier IIA that was activated in 2009. A third Barrier, Barrier IIB is scheduled for completion by 2011. Although the dispersal barriers were

designed to prevent the movement of any ANS fish species through the canal, the current species of concern are the Asian carp (Cypriniformes: Cyprinidae). Asian carp have the potential to damage the Great Lakes' and confluent large riverine ecosystems by disrupting the complex food web of the system and causing damage to the \$8 billion/year sport fishing industry. Two species of Asian carp, bighead carp (*Hypophthalmichthys nobilis*) and silver carp (*H. molitrix*), have become well established in the Mississippi and Illinois River systems exhibiting exponential population growth in recent years. Both of these species are voracious feeders, consuming up to 40% of their body weight daily. Bighead and silver carp primarily feed on plankton, the major food source of larval fish which they can easily out-compete. They are opportunistic feeders that possess life history traits common to any successful invasive species, which include: rapid growth rates, short generation times, exceptional dispersal capabilities, high reproductive output early in life, high abundance in their original range, and broad environmental tolerance. These traits have enabled bighead and silver carp to achieve massive population numbers soon after establishing. Currently, the LaGrange pool of the Illinois River is estimated to have the largest population of bighead and silver carp in the world. The prevention of an inter-basin transfer of bighead and silver carp from the Illinois River to Lake Michigan is paramount in avoiding ecologic and economic disaster.

- c. **Study Processes:** The PDT has recommended that the Efficacy Study be completed in three or more interim reports. Recently obtained genetic information has indicated the presence of Asian Carp much closer to the Barriers in the Chicago Sanitary and Ship Canal. Genetic testing has also demonstrated the presence of Asian Carp in two parallel water bodies, the lower Des Plaines River and the Illinois and Michigan Canal above the Barriers Project. The presence of the Asian Carp in these water bodies has accelerated the schedule of the Physical Bypass portion of the Efficacy Study due to the imminent and significant threat the Asian Carp pose to the Great Lakes Basin. The PDT has determined that it will produce an Interim I Study that will address a temporary solution to the physical bypass issue, with a subsequent report, Interim III, to address the full study outline for the Efficacy Study. Due to the emergency nature of the current situation, Interim I will be completed by the PDT on 29 October 2009. An Environmental Assessment (EA) will be completed as part of the Interim I study. Study costs for Interim I are estimated at approximately \$100,000, with implementation costs estimated at \$5M. An ATR will be completed on Interim I on 30 October 2009 by an interdisciplinary team from the Corps and other agencies. Interim II, which will be completed in early 2010 will address Dispersal Barrier Optimal Operating Parameters. Estimated study costs for Interim II are \$1M, with implementation of recommendation via Barriers Project Operation and Maintenance. ATR will be performed on the Interim II report by a team composed of experts in the field of electrical barriers and selected staff from the Corps. Interim III, which will fully address all the remaining areas of study and a permanent solution to the Des Plaines Bypass, is scheduled for completion in September 2010. Interim III study cost is currently estimated at \$1M, and current estimated implementation costs estimated between \$35M-\$50M. An EA will be completed in conjunction with Interim III, unless there are indications that an Environmental Impact Statement will be required. The team will evaluate the need for an EIS after the completion of Interim I. An ATR will be completed on the draft and Final Interim III reports by a team composed of representatives from the Corps, other agencies and other subject matter experts. It is anticipated that emergency authorization will be needed to immediately implement the recommendations for Interim I and that Interim III will likely go through a normal review and approval process.

d. Factors Affecting the Scope and Level of Review.

- The Efficacy Study is likely to include significant challenges to the PDT because of the high level of concern regarding the potential bypasses of the Barriers Project, as well as the high level of interest the project has elicited from other federal, state, local agencies and the public.

- The Barriers Efficacy Project can provide protection to the significant environmental and economic resources of the Great Lakes. The passage of the Asian Carp (or other ANS) into the Great Lakes could result in an ‘environmental meltdown’ of one of the most significant environmental resources in the United States.
- While the use of electric dispersal barriers is not wide spread, the current installations in the CSSC are not the only examples of this technology world-wide. Further, the analysis methods and tools employed by the PDT in the development of the Efficacy Study will likely not be novel, complex or precedent setting. The most significant and costly aspects of the Barriers Efficacy Study will likely involve the construction of berms or raising the existing roadway/trail embankment and/or installing other impediments to physical bypass of ANS.
- A Type I IEPR may be required for the Interim III Efficacy Report based on the cost of the recommended plan and potential concerns about life-safety issues related to levee overtopping. A decision regarding Type I IEPR will be made during the AFB process based on the draft design and costs. The district will coordinate the decision on the Type I IEPR with LRD, the ECO-PCX and HQUSACE. A Type II Safety Assurance Review may be considered for the Efficacy Study on the entire Barriers project. The determination regarding the Type II IEPR will be coordinated with LRD and the ECO-PCX after a review of the ongoing safety analyses for the barriers projects. If it occurs, the TYPE II review would be performed during PED phase.

e. **In-Kind Contributions.** The Efficacy Study is 100% Federal.

3. AGENCY TECHNICAL REVIEW (ATR)

a. **General.** ATR for decision documents covered by EC 1105-2-410 are 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 shall ensure that the product is consistent 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 the results in a reasonably clear manner for the public and decision makers. Members of the ATR team will be from outside the home district. The ATR lead will be from outside the home MSC. The leader of the ATR team will participate in milestone conferences and the Civil Works Review Board (CWRB) to address review concerns.

b. Products for Review:

- (1) **Interim I** – Preliminary Optimal Operating Parameters; Emergency Solutions for ANS Barrier Bypass (Des Plaines and I&M Canal); Preliminary ANS Abundance Reduction; Preliminary Human Intervention (Bilge/Ballast Water); and, Environmental Assessment.
- (2) **Interim II** – Optimal Operating Parameters. This Interim will be produced by ERDC/CERL.
- (3) **Interim III** – Complete Efficacy Study – Contents would include: Optimal Operating Parameter (from Interim II)s; ANS Barrier Bypasses; ANS Human Intervention; ANS Abundance Reduction; and NEPA document.

c. Required ATR Team Expertise.

The ATR team will be comprised of Corps staff, other agencies and academics or other subject matter experts in the following disciplines. The Review Team lead will be from outside LRD.

- Planning/Environmental Assessment: Review team lead will be a Subject Matter Expert (SME) or Regional Technical Specialist (RTS) in the field of ecosystem restoration in the Illinois River or Great Lakes Basins

- NEPA Compliance: Team member will be an expert in the field of NEPA compliance and all appropriate laws and regulations, with extensive experience on a variety of Corps of Engineers projects. The team member should be a RTS or equivalent.
- Fisheries: Team member will have expertise ichthyology/fisheries biology for Midwestern fisheries, including ANS, fish characteristics, T&E species, etc including both riverine and Great Lakes fisheries. The team member should be a RTS or equivalent.
- Economic Analysis/Risk and Uncertainty: Team member will be an expert in the field of Risk and Uncertainty and the use of HEC-FDA to look at exceedance probabilities. The team member should be a RTS or equivalent. Since HEC-FDA will not be utilized in Interim I, this member will participate in the Interim III review, only.
- Hydrology & Hydraulics: Team member will be an expert in the field of hydrology & hydraulics and have a thorough understanding of hydrologic and hydraulic modeling including: HEC-1, HEC-2, HEC-HMS, HEC-RAS, and Risk and Uncertainty Evaluations. The team member should be a RTS or equivalent.
- Cost Engineering: Cost_DX will provide a team member for the review of the Cost Estimates.
- Civil Design Analysis: Team member will have experience in levee design and safety issues and civil design. The team member should be a RTS or equivalent.
- Geotechnical Engineering: Team member will be an expert in the areas of geotechnical engineering as relates to levee design and safety issues, or engineering and analysis of groundwater and surface water in limestone-bedrock environments. The team member should be a RTS or equivalent.
- Electrical Engineering: Team member will be an expert in the field of electrical engineering and will review the methods and conclusions of the Preliminary and Final Optimal Operating Parameters portion of the Efficacy Study. The team member should be an RTS or equivalent.

d. 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 been 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 or 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 coordination, and lastly the agreed upon resolution. The ATR team will prepare a Review Report which includes a summary of each unresolved issue; each unresolved issue will be raised to the vertical team for resolution. Review Reports will be considered an integral part of the ATR documentation 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.

ATR may be certified when all ATR concerns are either resolved or referred to HQUSACE for resolution and the ATR documentation is complete. Certification of ATR should be completed, based on work reviewed to date, for the AFB, draft report, and final report. A sample certification is included in ER 1110-2-12.

4. INDEPENDENT EXTERNAL PEER REVIEW (IEPR)

- a. **General.** IEPR is conducted for decision documents if there is a vertical team decision (involving the district, MSC, PCX, and HQUSACE members) that the covered subject matter meets certain criteria (described in EC 1105-2-410) where the risk and magnitude of the proposed project are such that a critical examination by a qualified team outside the USACE is warranted. IEPR is coordinated by the appropriate PCX and managed by an Eligible Outside Organization (OEO) external to the USACE. IEPR panels shall 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 should be given the flexibility to bring important issues to the attention of decision makers; however, review panels should be instructed to not 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 or reoperations study. IEPR panels will accomplish a concurrent review that covers the entire decision document and will address all the underlying engineering, economics, and environmental work, not just one aspect of the study. Whenever feasible and appropriate, the office producing the document shall make the draft decision document 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 can be made to the reviewers by interested members of the public. An IEPR panel or OEO representative will participate in the CWRB.
- b. **Decision on IEPR.** IEPR will be deferred to the Interim III Efficacy Report and will consist of a Safety Assurance Review (Type II IEPR).
- c. **Products for Review.** Efficacy Study, Interim III (based on the current estimated costs). The issues to be reviewed will focus on the design of the solution to address physical bypass of the barriers, including issues related to the Risk and Uncertainty evaluations, safety issues related to the bypass of the barriers by aggressive ANS species. The IEPR team will also review the Optimal Operating Parameters portion of the Efficacy Study in regards to the testing methods and recommendations.
- d. **Required IEPR Panel Expertise.**
 - Fisheries: The Panel member should be an ichthyologist/fisheries biologist with extensive expertise related to Midwestern fisheries (both riverine and Great Lakes), ANS, and Asian Carp.
 - Hydrology & Hydraulics: Team member will be an expert in the field of hydrology & hydraulics and have a thorough understanding of hydrologic and hydraulic modeling including: HEC-1, HEC-2, HEC-HMS, HEC-RAS, and Risk and Uncertainty Evaluations. The Panel member should have experience in levee design and safety issues.
 - Geotechnical Engineering: The panel member should have extensive experience in engineering and analysis of groundwater and surface water in limestone-bedrock environments. The

limestone bedrock of the Lower Des Plaines embankment is highly fissured with both groundwater and surface water connections.

- **Electrical Engineering:** Team member should have extensive experience field of electrical engineering as relates to electrical fields and fish shocking, and will review the methods and conclusions of the Preliminary and Final Optimal Operating Parameters portion of the Efficacy Study.

- e. **Documentation of IEPR.** DrChecks review software will be used to document IEPR comments and aid in the preparation of the Review Report. Comments should address the adequacy and acceptability of the economic, engineering and environmental methods, models, and analyses used. IEPR comments should generally include the same four key parts as described for ATR comments in Section 3. The OEO will be responsible for compiling and entering comments into DrChecks. The IEPR team will prepare a Review Report that will accompany the publication of the final report for the project 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 IEPR panel no later than 60 days following the close of the public comment period for the draft decision document. The report will be considered and documentation prepared on how issues were resolved or will be resolved by the District Commander before the district report is signed. The recommendations and responses will be presented to the CWRB by the District Commander with an IEPR panel or OEO representative participating, preferable in person.

5. MODEL CERTIFICATION AND APPROVAL

- a. **General.** The use of certified or approved models for all planning activities is required by EC 1105-2-407. This policy is applicable to all planning models currently in use, models under development and new models. The appropriate PCX will be responsible for model certification/approval. The goal of certification/approval is to establish that planning products are theoretically sound, compliant with USACE policy, computationally accurate, and based on reasonable assumptions. The use of a certified or approved model does not constitute technical review of the planning product. Independent review of the selection and application of the model and the input data and results is still required through conduct of DQC, ATR, and, if appropriate, IEPR. Independent review is applicable to all models, not just planning models. Both the planning models (including the certification/approval status of each model) and engineering models used in the development of the decision document are described below:

- b. **Planning Models.** The following planning models are anticipated to be used:

- HEC-FDA 1.2.4 (Certified). The Hydrologic Engineering Center's Flood Damage Reduction 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. HEC-FDA will be used to determine the likelihood of overtopping associated with varying levels of "protection" that would be achieved by constructing a berm, raising the

existing road, or installing some other physical means to keep the ANS from bypassing the Barriers Project via the Des Plaines River. Risk factors will be utilized in combination with best professional judgment from SME on Asian Carp to determine acceptable levels of risk. HEC-FDA will utilize factors from the hydrologic and hydraulic models, as well as input based on the risk related to overtopping from fisheries in a Monte Carlo simulation. As for levee analysis, the HEC-FDA runs will assist the PDT in setting the final elevation of the protection based on an acceptable level of uncertainty.

c. Engineering Models. The following engineering models are anticipated to be used:

- **HEC-RAS 4.0.** 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 the lower Des Plaines Rivers. The modeling will be used to develop water surface profiles for with- and without project conditions for the purposes of overtopping associated risk analysis, and to address floodway permitting requirements. The PDT will also utilize existing HEC-2 models (FIS) for portions of the analysis.
- **HEC-HMS 3.4.** The Hydrologic Engineering Center's Hydrologic Modeling System (HEC-HMS) The Hydrologic Modeling System (HEC-HMS) is designed to simulate the precipitation-runoff processes of dendritic watershed systems. HEC-HMS will be used to generate flow hydrographs for the Lower Des Plaines River for input into the HEC-RAS modeling. The PDT will also utilize existing HEC-1 models (based on the FIS) for portions of the analysis.
- **HEC-SSP:** The Hydrologic Engineering Center's Statistical Software Package (HEC-SSP) allows the user to perform statistical analyses of hydrologic data. The current version of HEC-SSP can perform flood flow frequency analysis based on Bulletin 17B, "Guidelines for Determining Flood Flow Frequency" (1982), a generalized frequency analysis on not only flow data but other hydrologic data as well, and a volume-duration frequency analysis on high and low flows. SSP will be used to develop flood frequency information for the Lower Des Plaines River.

6. REVIEW SCHEDULES AND COSTS

a. ATR Schedule and Cost.

Milestone	Estimated Date	Review Cost
Draft Interim I Report	19October 2009	\$15,000
IPR with LRD/HQUSACE	23 October 2009	n/a
Draft Final Interim I Report/Design Complete	29 October 2009	\$10,000
Draft Interim II	TBD	\$10,000
Draft Interim III Report/AFB	June 2010	\$15,000
Final Draft Interim III Report	September 2010	\$15,000

b. IEPR Schedule and Cost. IEPR schedule and cost will be developed after the completion of Interim I. An update to the RP will be completed at that time.

c. Model Certification/Approval Schedule and Cost. The HEC-FDA model is an approved model. It is not anticipated that any other models will be utilized for the study.

7. PUBLIC PARTICIPATION

The Chicago District intends that communication about the study will be an open and transparent process. The district regularly provides updates to the Barrier Advisory Panel, which includes local and regional agencies, subject matter experts and is open to the general public. The Barrier Project Communication Plan provides for regular opportunities for information sharing with the public as well as opportunities for soliciting community input. The Review Plan will be posted on the District's web site, and the Barrier Advisory Panel as well as the public will be notified of opportunities to provide input. Information available on the district's web site as relates to the Barriers Project will also be used to convey information on the Efficacy Study.

8. PCX COORDINATION

Review plans for decision documents and supporting analyses outlined in EC 1105-2-410 are coordinated with the appropriate Planning Center(s) of Expertise (PCXs) based on the primary purpose of the basic decision document to be reviewed. The lead PCX for this study is the ECO-PCX. The ECO-PCX will coordinate with the Cost Engineering Directory of Expertise (DX) to conduct ATR of cost estimates, construction schedules and contingencies

9. MSC APPROVAL

The MSC that oversees the home district is responsible for approving the review plan. Approval is provided the MSC Commander. The commander's approval should reflect vertical team input (involving district, MSC, PCX, and HQUSACE members) as to the appropriate scope and level of review for the decision document. Like the PMP, the RP is a living document and may change as the study progresses. Changes to the RP should be approved by following the process used for initially approving the RP. In all cases the MSCs will review the decision on the level of review and any changes made in updates to the project.

10. REVIEW PLAN POINTS OF CONTACT

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

Susanne Davis, Chief, Planning Branch Chicago District - 312-846-5580
Charles Shea, Project Manager, Chicago District - 312-846-
Scott Kozak, Project Manager, Chicago District - 312-846-
Hank Jarboe, Lakes and River Division, Planning and Policy - 513-684-6050
Michael Scuderi, LRD Account Manager, ECO PCX - 206-764-7205

ATTACHMENT 1: TEAM ROSTERS

Project Development Team

Discipline	Office/Agency
Project Manager	CELRC-PM-PM
Project Manager	CELRC-PM-PM
Quality Manager	CELRC-PM-PL
Planning	CELRC-PM-PL
Environmental Analysis	CELRC-PM-PL-E
Environmental Analysis	CELRC-PM-PL-E
Environmental Analysis	CELRC-PM-PL-E
NEPA Compliance/Environmental &- Social	CELRC-PM-PL-E
Economic Analysis	CELRC-PM-PL-F
Economic & Risk Analysis	CELRC-PM-PL-F
GIS	CELRC-PM-PL
Survey	
Real Estate	CELRE-RE
Design	CELRC-TS-D
Civil Design Analysis	CERLC-TS-D-C
Civil Design Analysis	CERLC-TS-D-C
Geotechnical Analysis	CERLC-TS-D-G
Hydrology and Hydraulic Engineering	CELRC-TS-D-HH
Hydrology and Hydraulic Engineering	CELRC-TS-D-HH
Environmental Engineering	CELRC-TS-D-HE
Cost Engineering	CELRC-TS-D-C
Construction	CELRC-TS-CO

Agency Technical Review Team

Discipline	Office/Agency
Planning-ATR Lead	MVR
Environmental Analysis	MVR
Environmental Analysis ¹	USEPA
NEPA Compliance/Environmental &- Social	Corps
Fisheries ¹	TBD
Fisheries	MVP
Economic & Risk Analysis ¹	Corps
Real Estate	LRB
Civil Design Analysis	Corps
Geotechnical Engineering	LRN
Hydrology and Hydraulic Engineering ¹	Corps
Hydrology and Hydraulic Engineering	IDNR-OWR
Cost Engineering	Walla Walla DX
Electrical Engineering ¹	Corps

¹ This discipline/reviewer not required for the ATR of the Interim I Report

Independent External Peer Review Team (Safety Assurance Review)

Discipline	Name	Office/Agency
Fisheries	TBD	
Geotech Analysis	TBD	
Hydrology and Hydraulic Engineering	TBD	
Electrical Engineering	TBD	

ATTACHMENT 2: ATR CERTIFICATION TEMPLATE

CHICAGO DISTRICT ENGINEER'S STATEMENT OF AGENCY TECHNICAL REVIEW (ATR) AND LEGAL REVIEW OF THE CHICAGO SANITARY AND SHIP CANAL AQUATIC NUISANCE SPECIES DISPERSAL BARRIERS, EFFICACY STUDY, INTERIM FEASIBILITY REPORT AND ENVIRONMENTAL ASSESSMENT

I. AGENCY TECHNICAL REVIEW (ATR) COMPLETION

We, the ATR Team (ATRT), have completed the review of the subject document as reflected in the Quality Control Plan and the ATR documentation.

_____ ATR Member	_____ Date	_____ ATR Member	_____ Date	_____ ATR Member	_____ Date
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_____ ATR Member	_____ Date	_____ ATR Member	_____ Date	_____ ATR Member	_____ Date
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_____ ATR Member	_____ Date	_____ ATR Member	_____ Date	_____ ATR Member	_____ Date
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The ATR is complete. Issues that were unresolved between the ATR Team and Design Team are attached along with the determination of the appropriate Functional Chief. All comments are documented at _____.

Quality Manager Date

II. CHIEFS' AUTHENTICATION

We, as the senior chiefs with responsibility for respective portions of the subject document, authenticate by our signature below that 1) quality control procedures have been followed, 2) the ATR is complete, and 3) there are no outstanding issues. Further, we concur in the recommendation of the document found on page ____, para. ____.

_____ Chief, Design Branch	_____ Date	_____ Chief, Planning Branch	_____ Date
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_____ Chief, Real Estate Branch	_____ Date	_____ Chief, Project Management Branch	_____ Date
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_____ Chief, Construction & Operations Branch	_____ Date	_____ Chief, Plan, Prgms & Proj Mgmt Div.	_____ Date
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_____ Chief, Technical Services Div.	_____ Date
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III. LEGAL REVIEW CERTIFICATION. The subject document, including all associated documents required by the National Environmental Policy Act, has been fully reviewed by Office of Counsel, CELRC, and is found to be legally sufficient.

District Counsel

Date

IV. DISTRICT ENGINEER'S CERTIFICATION

I certify that the Agency Technical Review for the subject document is complete and that there are no outstanding issues. I reiterate the recommendation found in the subject document on page____, para_____.

Commander

Date

U.S. Army Engineer District, Chicago