Wood River Levee System
Limited Reevaluation Report for Design Deficiency Corrections
Independent External Peer Review (IEPR)

Final IEPR Panel Comments, USACE Responses, and IEPR Panel Backcheck Comments

24 August 2011

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For the best of reasons

Wood River IEPR Comments

Each comment is formatted into four parts that include the following: (1) a clear statement of the concern, (2) the basis for the concern, (3) the significance of the concern (the importance of the concern with regard to project implementability), and (4) the recommended actions necessary to resolve the concern to include a description of any additional research that would appreciably influence the conclusions. Comments are rated as “high,” “medium,” or “low” to indicate the general significance the comment has to the sufficiency of the Limited Reevaluation Report (LRR). The significance ratings are applied using the following criteria:

- High = Comment describes a fundamental problem with the project that could affect the recommendation or justification of the project
- Medium = Comment affects the completeness or understanding of the recommendation or justification of the project
- Low = Comment affects the technical quality of the reports but will not affect the recommendation or justification of the project

NOTE: During the preparation of the IEPR Panel Backcheck comments, some minor formatting changes were made to the Final IEPR Panel Comments for consistency, but the text of the Final Comments has not been altered in any way.

Comment #1:
There are several issues identified concerning the engineering analysis of the underseepage design.
Basis for Comment:
The LRR appears to use conservative assumptions in the underseepage analysis, which seems to result in the recommendation of significant seepage control measures, and does not clearly provide justification or references in the use of such specific design details. Some of the conservative assumptions include: • A factor of safety of 1.6, even though it is common professional practice to use a lower factor of safety for temporary conditions, such as flood stage. • A maximum allowable hydraulic gradient of 0.5 between adjacent relief wells, even though TM-3-424 calls for design gradients of 0.5–0.6 (from p. 23 of the LRR). • The design water level of 54-foot (ft) elevation at the St. Louis Gage, rather than 52 ft as noted on p. 21 of the LRR. • None of the existing relief wells are operational, including those installed in 1985. Page 15 of the LRR does not even note whether or not the 1985 wells are functioning. • The new wells will operate at 80% efficiency, as noted on p. 27 of the LRR. Without providing specific justification or basis for using such design parameters, the use of these assumptions is not fully understood and is in question. These conservative assumptions may be adding multiple "layers" of conservatism to the design and may be resulting in the need for extensive remedial measures. For example, it seems conservative to install a 140-ft-deep slurry wall to bedrock to control underseepage due to a short-term (less than 9 months) flood event. A full cutoff wall, i.e., cutoff wall to bedrock, has not been installed for some dams that impound a permanent reservoir, so a full cutoff for a levee should be explained. It is not clear what the precedence is for a levee with a full cutoff. In the LRR, a full cutoff is recommended for Decision Segment 151+50 to 185+50 over a length of 2,910 ft to a depth of 140 ft. In this same Decision Segment, 3,970 lineal ft of 100-ft-deep cutoff wall is recommended. In addition, a relief well spacing of as little as 83 ft is recommended.
Significance: HIGH
The LRR appears to use conservative assumptions in the underseepage analysis, and the justification for using such significant seepage control measures is not fully understood.
Recommendation(s) for Resolution:
The underseepage analysis should be revised to understand the effect of these assumptions on the design and should include the following: A. Parametric study to understand the sensitivity of the recommended control measures to the design criterion of a safety factor of 1.6, as well as a lower factor of safety for the temporary condition of a flood stage. B. Parametric study to understand the sensitivity of the recommended control measures to the design criterion of a maximum hydraulic gradient of 0.5 between relief wells.

C. Parametric study to understand the sensitivity of the recommended control measures to the design criterion of assuming no effect of existing relief wells during the flood event due to reduced efficiency, as well as the 80% efficiency assumption for the new wells.

D. Alternatively, specific reference to USACE policy should be cited in the LRR as justification for these key parameters.

USACE Evaluator Response (#1): CONCUR

The LRR may appear to use conservative assumptions that are not clearly justified or referenced. Specific references are listed in Apppendix D but the section will be reviewed and revised to better clarify accordingly.

Corps criteria as stated in EM 1110-2-1913 *Design and Construction of Levees* is very clear that factors of safety with respect to underseepage gradients shall be at least 1.60. This factor of safety in turn affects the calculation of the allowable gradient of 0.5 between adjacent relief wells using an assumed clay blanket unit weight of 115 pcf. When the unit weight of the blanket is varied then the allowable gradient will vary between 0.5-0.6.

The design water level of 54-foot at the St. Louis Gage used in the underseepage analysis is the authorized level of protection for Wood River Levee System. It is stated on page 21 of the LRR "The design water surface for the underseepage analysis corresponds to the authorized net levee grade of 52 ft at the St Louis gage plus 2 feet of freeboard."

The existing relief wells are of the wood stave screen type and are beyond their design life and therefore are not considered to be effective for underseepage controls. The wells installed in 1985 are not wood stave wells, but none of them are present in the segments considered in this LRR. This is explained in detail on page D-14.

The 80% efficiency used in this analysis was determined by previous studies in the Alton to Gail system pertaining to well efficiency over time that included pump testing and cleaning of existing wells. This is explained in detail on page D-14.

The decision segment 151+50 to 185+50 is discussed and the use of a full cut-off wall is explained in the Geotechnical appendix on page D-12. The discussion and explanation will be reviewed and revised accordingly to give the reader a better understanding.

A. NOT ADOPT. It is Corps criteria to use the safety factor of 1.6

B. NOT ADOPT. It is Corps criteria to use the allowable hydraulic gradient of 0.5 between relief wells when using a clay blanket unit weight of 115 pcf.

C. NOT ADOPT.

D. ADOPT IN PART. Some specific references are cited in appendix D and others that need clarification will be addressed and revised accordingly.

IEPR Panel Backcheck Comment (#1): CONCUR

It is apprporiate to include additional information and references to provide a better understanding of the why certain parameters are used as indicated in the response.

Comment #2:
There are several issues concerning the construction of the slurry trench cutoff walls that should be considered before proceeding with the design.
Basis for Comment:
The LRR does not thoroughly discuss some of the potential problems with constructing deep cutoff walls via slurry trenches. These problems can impact the cost and performance of the completed cutoff wall. Some examples of the potential problems are listed below and the problems can lead to cost increases. • Wall verticality varies with depth of wall with a well-constructed wall, showing a vertical deviation of at least 1%. Therefore, a well-constructed 140-ft-deep wall would have a deviation of at least 1.4 ft. Adjacent panels of the wall could also deviate 1%, so a gap could exist in the wall with depth due to verticality. • Gaps or windows in the cutoff wall could also occur due to failure to remove some in-situ soil. • Anchoring or sealing a cutoff wall into bedrock can be problematic because of difficulties excavating the rock or the rock being jointed, and a depth of embedment of about 5 ft—not 1 ft—is required. • Developing a suitable self-hardening slurry mix can be problematic in achieving the desired long-term cutoff wall properties such as ductility so cracking does not occur during seismic events. • Slope stability issues may occur while excavating at the levee toe to construct the cutoff wall.
Significance: HIGH
The LRR does not thoroughly discuss the potential problems and cost overruns usually associated with deep cutoff wall construction. These considerations may change the design in some reaches.
Recommendation(s) for Resolution:
The underseepage analysis should provide a more thorough discussion of the consideration of these construction issues and investigate possibly more cost effective alternatives to deep (≥100 ft) cutoff walls such as: A. Flood side blanket or buried geomembrane B. Protected side relief wells and/or seepage berms
USACE Evaluator Response (#2): CONCUR
The potential problems discussed are valid to the final design and construction of the deep slurry trench cutoff walls, although the consideration of them for this report is premature. These types of issues will be handled later in the final design process and during plans and specs by QA/QC monitoring and testing requirements. **A. ADOPT IN PART.** Flood side blankets or buried geomenbranes in this area are ineffective

alone because of the river's close proximity to the levee; the entrance condition would remain unchanged. The provided discussion will be revised accordingly for clarity. **B. ADOPT IN PART.** Both protected side relief wells and seepage berms were considered for this area. Relief wells are ineffective because of the thin to nonexistent landside blanket causing uneconomically close well spacing. The required berms in this area are extremely wide and cause environmental impacts to wetlands that make them cost prohibitive. The provided discussion will be revised accordingly for clarity.
IEPR Panel Backcheck Comment (#2): CONCUR
The panel understands that this is not the final design but notes that these considerations are still important to evaluate in the study phase, as it typically establishes the road map for future plans.

Comment #3:
There are several issues concerning the overall design, particularly the slurry trench cutoff walls and relief wells.
Basis for Comment:
Some examples of the potential design issues not thoroughly presented in the LRR are listed below: • The slurry mix for the cutoff walls must provide enough ductility so that the cutoff wall does not crack and allow greater seepage. • Generally, the top of slurry cutoff walls settle with time due to slurry bleed and/or consolidation. This settlement can result in a gap forming at the top of the wall that can act as a seepage path, which can reduce the effectiveness of the wall. • Recent data on the long-term performance of cutoff walls suggests decreased effectiveness with time due to high gradients developing at wall joints, cracks, transitions, windows/gaps, and soil and bedrock connections. Thus, the effectiveness of the walls may decrease with time. This is true with relief wells, too, but relief wells are less expensive and can be augmented more easily than cutoff walls. • Special attention should be given during design to interfaces between deficiency correction alternatives, as well as the levee section. On p. 29 of the LRR, overlap areas are noted in the design of the slurry cutoff walls that are adjacent to other correction measures. This is a good approach. • Pages D-10 and D-11 note observations of seepage occurring through the embankments on the Upper Wood River (e.g., 22+50 to 30+50) observed in the prior 1993 flood. It is not clear how the design deficiency correction measures proposed would affect seepage through the embankments. Discussion of whether the levees need to be retrofitted is not apparent.
Significance: HIGH
The LRR does not thoroughly discuss these design issues, which are critical considerations in implementing the project.
Recommendation(s) for Resolution:
A. The underseepage and cost-benefit analyses should consider the design issues discussed above for cutoff walls and relief wells. B. In the design phase, procedures should be implemented to ensure that levee/deficiency correction alternative interfaces are appropriately detailed. C. The LRR should clearly indicate why seepage through the levee is acceptable, or provide alternative correction measures that would be effective for this case.
USACE Evaluator Response (#3): CONCUR
The LRR does not discuss these design issues for the cutoff wall because consideration of them for this report is premature and these type of issues will be handled later in the final design

process and during plans and specs by QA/QC monitoring and testing requirements. The through seepage observed during the 1993 flood in Upper Wood River stations 22+50 to 30+50 is addressed by the LRR and discussed on page D-11 of the Geotechnical Appendix. This is the segment near the Alton Marina where it is believed that the presence of a shallow sand layer under the riverside blanket that extends under the clay capped hydraulically filled levee is the cause. This sand layer allows seepage to enter the core of the levee creating the appearance of through seepage. By implementing the shallow cut-off trench the seepage through this layer would be eliminated. **A. NOT ADOPT.** Relief wells in this area have already been analyzed and deemed infeasible. **B. ADOPT.** **C. ADOPT IN PART.** This is discussed in the Geotechnical Appendix and will be clarified as necessary.
IEPR Panel Backcheck Comment (#3): CONCUR
The panel understands that this is not the final design but notes that these considerations are still important to evaluate in the study phase, as it typically establishes the road map for future plans.

Comment #4:
There is no discussion of the seismic design/performance of the levees or proposed correction measures.
Basis for Comment:
The LRR subject area is located in a region that will likely be affected by local faults and/or the New Madrid Fault system, yet there is no mention of this seismic risk in the LRR. After construction, the cutoff walls and relief wells will be subjected to seismic forces. The resulting seismic deformations can cause cracks in the completed walls and/or bending of the relief well casing, which can impact the performance of these seepage control measures. It is anticipated that the seepage berms will be less impacted by seismic forces. Seismic deformation analyses should be performed to assess the performance of the seepage control structures during the design seismic event.
Significance: HIGH
The LRR does not discuss seismic design/performance of the levees essential to understanding the key design details.
Recommendation for Resolution:
The anticipated seismic performance of the levee and mitigation measures should be included in the LRR. If deficiencies are noted in the analysis resulting from strong shaking or liquefaction, then they should be addressed.
USACE Evaluator Response (#4): CONCUR
There is no discussion of the seismic design/performance of the levees or proposed correction measures in the LRR. The following will be added to the LRR. As stated in EM 1110-2-1913 on page 6-3 "d. Case IV - Earthquake. Earthquake loadings are not normally considered in analyzing the stability of levees because of the low probability of an earthquake coinciding with periods of high water." If and when and earthquake does occur, the levee system will be inspected for damage with remedial measures taken to restore the system back to an acceptable level before the next flood season. **NOT ADOPT.**
IEPR Panel Backcheck Comment (#4): CONCUR
It is appropriate for the seismic discussion be added to the LRR as indicated in the response. The panel also emphasizes that seismic deformation analysis of seepage control structures should be considered in the design stage, and it is important that the structures account for potential seismic problems. Noting these design conditions early in the process may save costs in the future.

Comment #5:
It is unclear whether the without-project condition should include the improvements planned for the levee system to meet Federal Emergency Management Agency (FEMA)-required 100-year (yr) flood protection levels, as planned for and described by the Southwest Illinois Flood Prevention District Council (SWILFPDC) in their Implementation Plan.
Basis for Comment:
The SWILFPDC has commissioned engineering studies and has recently (July 2011) released a Project Implementation Plan that outlines the basic components of the design, cost estimate, schedule, and financial plan for the project to improve the region's flood protection system. http://www.floodpreventiondistrict.org/wp-content/uploads/2011/07/Project-Implementation-Plan-report-ver.-1.7.pdf The stated goal of the project design *"is to achieve improvements to the flood protection system that, once constructed, will fully address the requirements of 44 CFR 65.10, the criteria that determine the eligibility for FEMA to accredit the system and designate the American Bottom as protected from flooding"* (p. 9). Appendix L to the LRR contains a letter from SWILFPDC regarding the design deficiency correction in which the SWILFPDC states that they anticipate that *"some of the features of the design deficiency correction project may help achieve FEMA accreditation and that some or all of the features of the FPDC and WRLD project to achieve FEMA accreditation will contribute to addressing the design deficiency."* However, the interaction and degree of overlap of these projects does not seem to be clarified in any of the LRR documents or elsewhere.
Significance: HIGH
Proper specification of the alternatives is critical to the cost-benefit analysis and other project impacts analysis.
Recommendation for Resolution:
Clarify the relationship of the Wood River Levee System portions of the SWILFPDC Plan to the Plan evaluated in the LRR. If the design deficiency correction measures are in addition to those planned by the SWILFPDC, then the without-project condition appears to over-estimate the Probability of Unsatisfactory Performance (PUP) of the without-project condition and the associated flood damage reduction benefits. If the improvements evaluated in the LRR include the measures planned by the SWILFPDC, then the without-project conditions applied in the LRR (i.e., no levee improvements) and estimated flood reduction benefits are appropriate. If this is the case, then the LRR Cost-Benefit Analysis should evaluate three alternatives: the No Action, the SWILFPDC plan, and the USACE design deficiency correction plan, because in this case the operative federal decision is whether to undertake a project to provide the incremental protection from 100-yr to >500-yr flooding, and a cost-benefit analysis should be available to support this decision. Besides clarifying and possibly revising the alternatives in the main body of the LRR and the Economic Appendix, statements in the Environmental Assessment (EA) (specifically in Section 1.4, p. A-A-9 and Section 4.1, p. A-A-33) should be verified or revised to be consistent with the clarified determination of what constitutes the various alternatives.

USACE Evaluator Response (#5): NON-CONCUR
A comparison of work between the Southwest Illinois Flood Protection District Council (the "non-Federal sponsor [NFS]") and the Corps has taken place during working meetings and will be ongoing. The results from recent working meetings are consistent and complimentary design solutions (the recommended plan per design reach) between both agencies. The actual work performed by the Corps will be finalized during the Plans and Specs phase of the project and work that has been permitted and/or under construction by the NFS will be taken into consideration during Plans and Specs. Ideally the improvements planned for the levee system to meet FEMA-required flood protection levels, as planned for by a non-Federal sponsor, such as those described by the Southwest Illinois Flood Protection District Council should be considered in a Corps study FWOP. In this study, however, 100-year protection improvements planned by the NFS are not considered in the FWOP for the following reasons: NFS Funding Capabilities Uncertain: Although the non-Federal sponsor "intends" to perform work per their stated goal, the NFS revenue stream may not be strong enough to "actually" support completing 100% of the work needed to meet 100-year protection. The Corps' current financial analysis of the NFS capabilities does not support their "strong preference to build the project solely with revenues provided through the FPD sales tax". The NFS has publicly stated that they cannot attain the 100-year protection improvements without the Corps project because they currently do not have enough funds, and once their bond funds are exhausted they have no other means to obtain funds. Therefore it is highly unlikely that NFS improvements will begin, much less be complete prior to the Corps project. The NFS statement that "some or all of the features of the FPDC and WRLD project to achieve FEMA accreditation will contribute to addressing the design deficiency" is highly speculative considering future cost escalations and the financial capabilities of the NFS. Permitting Process Requirements: The NFS may likely not have the funding stream to bring their designs up to Corps standards under 33 United States Code, Section 408. In addition, the NFS has not overcome the Clean Water Act, Section 404 requirements. Alternative Plans are based on viable implementable options. At this juncture in the Corps study process NFS designs are only near 35% complete and NFS funding capabilities to start and complete improvements are highly uncertain. It is difficult, nearly impossible to predict which features might be constructed and which will not be constructed. Therefore, the Corps study does not consider 100-year protection improvements planned by the NFS in the Future Without Project conditions evaluation and does not believe it would be responsible to include those improvements as a possible Alternative for evaluation. **DO NOT ADOPT.**
IEPR Panel Backcheck Comment (#5): CONCUR
The response provided clearly discusses why USACE does not consider the 100-year protection improvements planned by the SWILFPDC a possible alternative for evaluating the without-project conditions. Providing this information in the final LRR package clarifies the uncertainty.

Comment #6:
As presently written, the LRR does not effectively integrate the findings of the EA or Plan Formulation to provide a cogent explanation of how the tentatively selected plan was selected on the basis of effectiveness (safety, viability, reliability), costs, or environmental impacts.
Basis for Comment:
As a standalone public document, the LRR should clearly show why the tentatively selected plan best addresses the issues of effectiveness, cost, and environmental impacts to produce a project that best meets the public interest. The majority of the discussion of environmental consequences of the plan is in relation to the No-Action alternative, but there is little written discussion of how the tentatively selected plan (preferred alternative) was selected to begin with. Such discussion is critical to evaluating the extent to which the proposed alternative impacts the environment relative to other potential alternatives that were not carried forward. Table 5.6.1 provides a summary matrix of the plan formulation process and the justification of the selected alternative by reach, but there is no discussion of environmental impacts, and the table is more of a summary of the tentative plan than alternatives.
Significance: HIGH
The LRR does not adequately discuss the process and evidence for how the tentatively selected plan was selected providing justification for the selection over the other potential alternatives.
Recommendation for Resolution:
A. Information provided in Appendix B, Plan Formulation should be described and distilled to explain how the tentative proposed plan was developed. B. The EA in Appendix A should be revised to reflect this discussion as well, from the perspective of environmental impacts. C. Section 5.5.4 should be greatly expanded to include a discussion of the various alternatives considered and their environmental effects. Each alternative considered does not need a full environmental analysis, but rather an initial discussion of how the alternatives were winnowed down on the basis of cost and effectiveness, followed by a discussion of environmental impacts of the major alternatives considered. D. Then the section on Environmental Consequences in the LRR should be revised to summarize the results of both, to allow the reader a transparent understanding of the process.
USACE Evaluator Response (#6): CONCUR
Recommendations A-D for Comment #6: ADOPT – these recommendations will be addressed and implemented should the same or similar kind of public comment be submitted.
IEPR Panel Backcheck Comment (#6): CONCUR
Concur that such public comments received should be incorproated to enhance the quality of future drafts and ensure compliance with NEPA as indicated in the response.

Comment #7:
The EA lacks sufficient detail and analysis of the environmental impacts of the tentatively selected plan, *relative to other potential project alternatives*, to allow clear and sufficient evaluation of project impacts.
Basis for Comment:
The discussion of impacts in the EA is generic and does not allow the reader to come away with a clear understanding of impacts within each reach as a result of the proposed alternative, or impacts relative to the other potential design alternatives that could be employed to minimize them. Specific examples are listed below. A. Project Purpose and Need statement does not seem totally accurate and lacks sufficient detail to document the need for the project. While the need for the project is described adequately, albeit indirectly, elsewhere in the EA and LRR, it should be pulled forward into the EA into the Project Purpose and Need statement concisely to allow evaluation of the preferred alternative against others considered, including the No-Action alternative. The project purpose given in the EA is "*The purpose of this study is to evaluate design deficiency correction alternatives and choose a tentatively selected plan that will allow the Wood River Levee System to function as initially intended by the designer in a safe, viable and reliable manner*." That purpose statement seems to address the purpose of the study and not the project itself. The purpose of the project itself would be "To correct deficiencies in the design of underseepage and through seepage controls necessary to return the Wood River Levee System to its original design condition." Also, the project need is dictated by the need to ensure that not only does the system operate safely and effectively, but to prevent residents and communities from experiencing the fiscal impacts from increased insurance rates associated with being in the 100-yr floodplain. This is important, since it provides the basis for which alternatives need to be considered versus others that do not, and establishes the point that the No-Action alternative is not viable. B. The character and scope of the study area have not been adequately described sufficient to undertake a systems/watershed/ecosystem-based investigation, or to allow sufficient evaluation of impacts. In general, there are insufficient graphics in the EA to allow the reader to evaluate the text discussion on existing conditions or project impacts. Examples are: wetlands impacts relative to different design alternatives, location of potential hazardous, toxic, and radioactive waste (HTRW) impacts, location of cultural resources, bald eagles nests, etc. within the project area. As a result, while the text discussion regarding the extent of environmental impacts sounds reasonable, there is no way to confirm the impacts of the proposed alternative relative to No-Action conditions or other potential alternatives. Specifically: i. Section 3.2 would benefit from having a graphic that shows geologic cross-sections of the area as a basis for understanding the need for the proposed plan (e.g., cutoff walls not feasible in some areas). ii. Section 3.5 states that "*in the vicinity of the East Alton community water supply, there is a plume of groundwater contamination coming from two sites that consist of leaking underground storage tanks, and the contaminants include various*

volatile organic compounds (IEPA, 2010b)." A graphic would be helpful showing the location of this plume relative to any project activities. If it will not be impacted, then the impacts section should state so clearly.

iii. Section 3.9 discusses prime farmland; a graphic of Natural Resources Conservation Service soil types would be helpful in interpreting the text.

iv. Section 3.14 states "*Within the proposed project construction footprint, six archaeological sites have been previously recorded: 11MS67 (further testing required), 11MS108 (ineligible), 11MS178 (further testing required), 11MS1584 (ineligible), 11MS1600 (further testing required), and 11MS2025 (eligible). As noted for each site, two have been determined to be ineligible for nomination to the National Register of Historic Places (NRHP), therefore the project will have no adverse impact on these sites. Of the remaining four, additional research will be required for three sites in order to assess the potential effects of this undertaking upon the sites, while one site has been determined to be eligible.*" Again, a graphic would be helpful to show where these sites are in relation to the proposed alternative and to evaluate whether there are any alternatives that could avoid these sites.

v. Section 4.7 would benefit from a simple graphic showing how the proposed relief wells, cutoff wall, and seepage walls will act to intercept groundwater flow and lower water levels while relieving hydrostatic pressure on the levees. Perhaps the graphics in Appendix D and E could be brought forward into the EA or LRR to explain. A cross-sectional view, similar to a site conceptual model used in remedial investigation reports, would be helpful in understanding the proposed project.

C. A description of the screening process used to develop the tentatively selected plan should be provided along with those alternatives considered. Table A-A-1 summarizes the alternative selected, but there is no discussion of the environmental consequences of other alternatives considered and rejected. The text of the EA should also describe the reaches that do not have more than one feasible alternative.

D. Section 3.3 Air Quality mentions a Conformity Determination that was conducted; this should be appended to the EA.

E. Section 4.1 compares project impacts from a 500-yr flood event. The EA should be revised to be consistent with the Project Purpose of restoring the levees to be protective of the 100-yr flood, unless it will be designed to withstand the 500-yr flood. In the latter case, the Project Purpose statement should be revised as well. This same comment applies to other sections of the EA where impacts from the 500-yr flood are discussed.

F. Section 4.1 also mentions but does not attempt to quantify job creation. At a minimum, some discussion should be added to the EA to indicate whether the jobs created would be temporary construction jobs or permanent ones, along with an estimate of the number created, with justification for the estimate.

G. Section 4.7 Hydrologic Conditions begins by stating "*No significant climatological changes are expected to occur over the next 50 years.*" This statement is unsubstantiated.

H. Section 4.8 should indicate how temporary noise impacts to residents would be mitigated (e.g., by limiting construction activity to daytime hours).

I. Section 4.10 discusses impacts to biological resources, and describes Habitat Suitability Indices (HSIs) for various wildlife species potentially affected by the project. It is difficult to ascertain whether the species chosen are appropriate indicators without a better description of the natural communities present and their extent within the study area. For example, Section 3.10 states "*Groundcover is related to site wetness, and may not be present at all, may be discontinuous and consists of various sedges, forbs, and grasses, or may be dense and support a diversity of herbaceous plant species.*" The description does not provide dominant species, or the specific vegetation community present. Wildlife habitats affected by the proposed action are described as "*2.6 acres of emergent wetlands, 0.3 acres of forested wetlands, and 2.1 acres of bottomland hardwood forest (nonwetland floodplain forest).*" Without sufficiently detailed description, it is difficult to confirm or corroborate the conclusion of the EA that habitats impacted would be of low quality. For example, if the emergent wetland is dominated by common reed (*Phragmites australis*), a common invasive species, the conclusion can be easily corroborated. This is important, not simply as a basis of documenting potential impacts to existing conditions, but in determining and evaluating mitigation requirements for the project.

J. Related to the sub-comment #9 above, the individuals who conducted the HSI analyses should be identified. Appendix A-B and A-D refer to representatives of an interagency team, but this is not mentioned in the EA.

K. The following discussion presented in the EA should be expanded to summarize alternatives and impacts evaluated at each individual reach, and used as a basis for the Section 404(b)(1) analysis: "*Mitigation for unavoidable adverse impacts to wetlands and bottomland hardwoods is part of the tentatively selected plan. Avoidance of impacts to wetlands and bottomland hardwoods was considered during the development of the proposed action. For example, at design reach 5 (151+50 – 185+50), the seepage berm option considered there would directly impact about 70 acres of various wetland habitats. Instead the proposed cutoff wall would avoid these direct impacts. Avoidance or minimization of impacts is possible at design reaches 4, 5, and 12 (see Table A-A-12). Where relief wells are proposed within small areas of bottomland hardwoods, individual wells can be sited in the future during the plans and specifications stage to minimize any required tree clearing. Similarly, the construction easement for the cutoff wall proposed at design reach 5 (151+50 – 185+50) can be narrowed in width to avoid the loss of about 0.2 acre of forested wetland. Table A-A-12 reflects future efforts at design reaches 4, 5, and 12 to avoid and minimize habitat losses. At design reach 14, habitat losses are unavoidable because the proposed seepage berm (or fill) was the only feasible solution to solve the underseepage problem at this location. At design reaches 13 and 15, relief wells would avoid about 1.5 acres of impacts to low-quality bottomland hardwoods (Table A-A-12), but this option was not the least cost alternative at these locations.*"

L. Currently the Draft EA proposes no mitigation for reduced hydrology within the extensive wetland within Design Reach 5, associated with implementation of measures to reduce or eliminate underseepage from the levees. The EA states: "*As a result of less wet conditions in the ponding area, shifts in the abundance and spatial extent of several*

wetland plant communities are expected. The currently extensive mud flats are expected to diminish in area and be replaced shallow marshes and wet meadows."

M. The project planning period encompassed by the EA should be established early in the document as the basis for Future No-Action conditions. The mitigation calculations are based on a 50-yr project life, and the cumulative impacts section states that the project is based on a 50-yr planning horizon.

Significance: HIGH

The EA lacks sufficient information to adequately assess environmental impacts.

Recommendation for Resolution:

A. Revise Project Purpose and Need statement to address the purpose of the project itself and also the need to ensure that not only does the system operate safely and effectively, but to prevent residents and communities from experiencing the fiscal impacts.

B. Include graphics to provide a better visual understanding of existing conditions or project impacts.

C. Provide a description of the screening process used to develop the tentatively selected plan and that describes the reaches that do not have more than one feasible alternative.

D. Append the Conformity Determination to the EA.

E. Revise the EA to be consistent with the Project Purpose of the design life (i.e., 100-yr flood vs. 500-yr flood).

F. Include discussion to indicate whether the jobs created would be temporary construction jobs or permanent ones along with an estimate of the number created.

G. Provide justification for the claim that no climatological changes are expected or eliminate the statement from the EA.

H. Indicate how temporary noise impacts to residents would be mitigated.

I. Provide sufficient description to ascertain whether the species chosen are appropriate indicators of the dominant species or the specific vegetation community present.

J. Identify the individuals who conducted the HSI analyses.

K. Summarize alternatives and impacts evaluated at each individual reach and used as a basis for the Section 404(b)(1) analysis.

L. Consider whether the anticipated habitat conversion would result in significant biological impacts to species such as migratory shorebirds. Given the importance of this habitat within the region, consider mitigation measures including reestablishment of some of the mudflats eliminated.

M. Establish the project planning period encompassed by the EA early in the document as the basis for Future No-Action conditions.

USACE Evaluator Response (#7): CONCUR

Recommendations A-M for Comment #7: ADOPT – these recommendations will be addressed and implemented should the same or similar kind of public comment be submitted.

IEPR Panel Backcheck Comment (#7): CONCUR
Concur that such public comments received should be incorproated to enhance the quality of future drafts and ensure compliance with NEPA as indicated in the response.

Comment #8:
It is unclear what value was used in the analyses for the horizontal permeability of the pervious foundation.
Basis for Comment:
On p. D-15, the procedure for analyzing the underseepage is presented, but the reference to indicate how the "k-value" was determined (e.g., assumed or via lab testing) is not clear. Under the soil laboratory testing carried out, no indication of hydraulic conductivity testing was mentioned. Page D-16 indicates that commercially available sands will be used, but it appears that the properties are assumed.
Significance: MEDIUM
Understanding the use of any appopriate k-value is critical for performing adequate underseepage analysis.
Recommendation for Resolution:
Add the procedure for determining k in the report. Once a borrow source is identified, confirmation should be made that it meets the design requirements.
USACE Evaluator Response (#8): CONCUR
The value used in the analysis for the horizontal permeability of the pervious foundation will be clarified in the report. The value used was determined using the correlation for D10 size using figure 3-5 in EM 1110-2-1913 **ADOPT.**
IEPR Panel Backcheck Comment (#8): CONCUR
Concur, but the panel also notes the importance that the final design should incorporate a k-value based on actual test results.

Comment #9:
The threat to future levee performance based on prior observations should be better explained.
Basis for Comment:
Page 24 of the LRR describes some of the observations during prior flood events that resulted in this design deficiency report. The LRR does not elaborate on what specific deficiencies were noted that led to the particular recommended correction measures. Some examples of the prior observations and suggestions for clarifying the observations are listed below: • *"In some reaches along the Alton to Gale system, when the gathered piezometric data is extrapolated to design flood levels, a level of system performance is predicted to be well below acceptable limits."* What was "well below acceptable limits"? Gradient? Seepage quantity? Did any levee fail? How much will the design event exceed this event? • *"Observations made during the 1973, 1993 and 2008 flood fights show development of high uplift gradients, sand boils, and heavy seepage along reaches with no in-place seepage control measures as well as reaches that do contain seepage control measures."* From a geotechnical point of view, high uplift gradients are not in themselves problematic unless the factor of safety against uplift is below the design criterion and a critical structure will become unstable. If this is the case, the LRR should give specifics of this deficiency. • From a geotechnical point of view, the presence of sand boils may not be problematic, but they can be if there is sufficient flow to erode a significant amount of foundation material from under the levee. If this is the case, the LRR should state sand boils and high flow were observed. If the sand boil occurs with low flow, a substantial amount of soil will not be eroded in the short duration of the flood and the sand boil can be remediated during and after the flood. • From a geotechnical point of view, the "heavy seepage" is not problematic unless the seepage contains soil particles that are being eroded from the levee or underlying foundation. If this is the case, the LRR should state heavy seepage and accompanying erosion was observed. • *"It has been concluded that this unsatisfactory performance stems from the unconservative assumptions made in TM 3-430 and limited observations of levee underseepage performance made at that time."* A number of USACE Districts are using a lower maximum hydraulic gradient between adjacent relief wells than the St. Louis District. As a result, the St. Louis District should clarify why it is using a higher maximum hydraulic gradient and the initial design assumptions are unconservative. Have there been any levee failures with the TM 3-430 criteria?
Significance: MEDIUM
The LRR should better explain why prior observations do not meet design criteria to provide a better understanding of the project.

Recommendation(s) for Resolution:
Revise the LRR and/or analyses to properly utilize prior observation during flood events.
USACE Evaluator Response (#9): CONCUR
The threat to future levee performance based on prior observations will be reviewed and revised accordingly for better explanation. Corps criteria for underseepage is based on a Factor of Safety of 1.6 applied to the critical vertical seepage gradient to arrive at an allowable gradient. For instance, a clay blanket with a saturated unit weight of 112 pcf will have a calculated critical gradient of 0.79 and an allowable gradient of 0.496. Field calculations of gradients use the measured piezometric elevations to determine the excess head acting on the clay blanket. The measured excess head divided by the thickness of the clay blanket yields the existing field graidient. This is compared to the allowable gradient. Field piezometric measurements can be plotted against the existing river elevation and the ensuing trends extrapolated to higher river elevations. The extrapolated head would be used to determine field gradients at higher flood elevations. Also, observations of excess seepage and material transport (sand boils) is a clear indicator that the seepage regime is exceeding allowable Corps criteria. The St. Louis District experienced two catastrophic levee failures during the 1993 flood (the Bois Brule levee and the Kaskaskia levee) both of which were directly attributable to excess underseepage and seepage gradients. The St. Louis flood protection project also experienced an underseepage related foundation failure but catastrophic failure was averted by a heroic flood fight intervention. Although no such catastrophic failure occurred at the Wood River Levee, there were areas of excess underseepage that compelled the flood fight teams to action. Subsequent studies including geotechnical exploration and testing and detailed seepage calculations (in this LRR report and the previous GRR report) yielded levee reaches that do not meet Corps criteria for underseepage. Corps criteria as stated in EM 1110-2-1913 *Design and Construction of Levees* is very clear that factors of safety with respect to underseepage gradients shall be at least 1.60. These studies in this LRR are based on this guidance. CEMVS's point of view is that sand boils must be avoided and controlled wherever they occur. The sand boil represents the initiation of the internal erosion failure mechanism, and to date, there is no clear methods to predict neither the continuation of the internal erosion nor the status of that erosion. Although there are some historic sand boils within CEMVS levees (boils that have occurred in the same place during numerous floods) and the levees have not yet failed, the 1993 Bois Brule and Kaskaskia Island levee failures progressed from the observation of small boils to uncontrollable sand boils and levee failure within one to four days. Transport of foundation materials at a sand boil represents a critical juncture. If not entirely clear from the body of the LRR, the report will be revised to make this clear. CEMVS cannot comment on other District practices, but CEMVS designs its levee strictly according to the guidance found in EM 1110-2-1913 *Design and Construction of Levees*. CEMVS also uses additional guidance and clarifications found in DIVR 1110-2-400 *Design of Landside Seepage Berms*. CEMVS's philosophy is also informed by TM 3-430 *Investigation of Underseepage Alton to Gale Levee Systems* and the subsequent publication TM 3-424 *Investications of Underseepage Lower Mississippi Levees*. **ADOPT IN PART.**

IEPR Panel Backcheck Comment (#9): CONCUR
The additional information provided in the response is appropriate to include in the LRR.

Comment #10:
It is unclear from the report what constitutes "failure" of the levee.
Basis for Comment:
On p. 17 of the LRR, the discussion includes terms such as "failure as a result of underseepage," "catastrophe failure," and "actual levee failure." It appears that these terms are used loosely and it is unclear the specific concerns of USACE. Later in the report, the first paragraph under Section 5.3.1 is useful, but in the second sentence it is unclear whether both types of seepage are considered "underseepage" and whether both are problems. It should be clarified if underseepage alone can be a failure or if the slopes of the levee need to fail.
Significance: MEDIUM
Use of the term "failure" is unclear and is necessary to understand proper design conditions.
Recommendation for Resolution:
A short paragraph should be included in the LRR that defines the range of failures USACE is concerned about, and then consistently use those definitions through the report.
USACE Evaluator Response (#10): CONCUR
Corps criteria as stated in EM 1110-2-1913 *Design and Construction of Levees* is very clear that factors of safety with respect to underseepage gradients shall be at least 1.60. As such, CEMVS designs its levee strictly according to the guidance found in EM 1110-2-1913 *Design and Construction of Levees*. CEMVS also uses additional guidance and clarifications found in DIVR 1110-2-400 *Design of Landside Seepage Berms*. CEMVS's philosophy is also informed by TM 4-430 *Investigation of Underseepage Alton to Gale Levee Systems* and the subsequent publication TM 3-424 *Investications of Underseepage Lower Mississippi Levees*. These studies in this LRR are the results of this guidance. Concur that terms used interchangeably should be 'tightened up'. But CEMVS considers excess underseepage and sand boils a failure that must be dealt with decisively.
IEPR Panel Backcheck Comment (#10): CONCUR
The additional information provided in the response is appropriate to include in the LRR.

Comment #11:
The net benefits are to a great degree dependent on the values used for the PUP, which are point estimates provided by District Engineers using professional judgment.
Basis for Comment:
The Hydrologic Engineering Center Flood Damage Reduction Analysis (HEC-FDA) model is a risk-analysis-based approach to estimating the expected annual flood reduction benefits of alternatives, recognizing flood risk as well as uncertainty in the measurement and specification of various values. However, the current version of the model treats the PUP's deterministically; there is no uncertainty band (e.g., standard deviation) provided for these probabilities. The concern is that differences in the values for the PUP, which are estimated using engineering judgment, can possibly result in substantial differences in the expected annual flood reduction benefits. The uncertainty behind these PUP values is a general concern. Some specific aspects to this concern with the selection of PUP values include: (1) have seismic risks and their implications for levee performance been considered? (2) are the without-project PUP's based on the design basis assumption of zero performance from the existing relief wells?
Significance: MEDIUM
The expected annual net benefit is dependent on the selected values for the PUP.
Recommendation for Resolution:
Conduct an analysis of the sensitivity of the expected annual flood reduction benefits to variations in the PUP's within a reasonable range. Clarify the assumptions that were made regarding seismic risk and regarding the performance of existing relief wells in developing the PUPs for the without-project condition.
USACE Evaluator Response (#11): CONCUR
The economist will work with the geotechnical engineers to provide a description of the uncertainty of the PUPs and the possible impact of this uncertainty.
IEPR Panel Backcheck Comment (#11): CONCUR
It is appropriate to discuss the uncertainty of the PUP values in the LRR as indicated in the response.

Comment #12:
Section 7.0 Environmental Consequences provides a summary of impacts from the tentatively selected plan, as taken from the EA. Again, the summary of impacts does not demonstrate the preferred alternative's impacts relative to the other alternatives, or how the effects will be mitigated.
Basis for Comment:
As a standalone document the LRR should integrate the results of the studies and analyses upon which the plan is based, rather than incorporating them largely by reference to Appendices A (including A-D), H, and K, so that the reviewing agencies and public can ascertain compliance with NEPA and USACE requirements, and follow the decision-making logic behind the selected plan.
Significance: MEDIUM
The LRR does not effectively integrate and organize information that supports the assessment of impacts.
Recommendation for Resolution:
Section 7 should be revised to reflect the issues identified above and in Comment #6 so that the reader can ascertain the project impacts relative to other alternatives considered.
USACE Evaluator Response (#12): CONCUR
ADOPT - Section 7 of the main report will be revised to reflect the issues identified in this comment; this will be done regardless of any public comments.
IEPR Panel Backcheck Comment (#12): CONCUR
It is appropriate that the LRR incorporate a sufficient discussion as indicated in the response.

Comment #13:
The Draft EA concludes with an unsigned Finding of No Significant Impact (FONSI), which is not fully justified given missing information on potential Cultural Resources and HTRW impacts.
Basis for Comment:
The EA discussion in Appendix A notes that a Phase II EA is required to further evaluate HTRW concerns and that further Cultural Resources investigation is required before a final design of the project can be developed. The EA recommends this additional study and is followed by an unsigned FONSI. However, usually an EA has one of two outcomes: either the review indicates there is little likelihood of significant impacts, in which case a FONSI may be issued, or there is a potential for a significant impact to be addressed by further information collection as part of an EIS. Another alternative is to collect more information before the EA is released. At any rate, the cultural resources impacts remain inconclusive.
Significance: MEDIUM
A FONSI is not supported given that the LRR presents potential environmental concerns.
Recommendation for Resolution:
Delete the FONSI until such time as the necessary studies have been completed.
USACE Evaluator Response (#13): CONCUR
ADOPT IN PART – The District already released for public review the project report including EA and draft FONSI, but the concern expressed about the uncertainty of potential HTRW impacts does not reflect recent HTRW coordination. The report including EA and draft FONSI now state that based on best available information, existing HTRW contamination is expected to be avoided; a Phase II assessment to be completed prior to any signing of a FONSI will provide additional information confirming or denying this. Regarding the concern expressed about the uncertainty of cultural resource impacts, the District acknowledges that potential impacts are currently unknown, but believes that there is no potential for such impacts to become significant. The Memorandum of Agreement on the assessment of cultural resource impacts and the mitigation of adverse effects will be signed prior to the signing of a FONSI, and it will specify that potential cultural resource effects are either avoided or mitigated if avoidance is not possible.
IEPR Panel Backcheck Comment (#13): CONCUR
This additional information and the approach described in the response addresses the concern.

Comment #14:
It is not clear from the report that all elevations cited in the report and used for design reference the same vertical datum (e.g., NAVD 88).
Basis for Comment:
On p. D-5, the LRR indicates that the boring locations were surveyed using the NAD 83 horizontal datum, and on p. D-6, the LRR notes that NGS survey control was used. However, the vertical datum is not mentioned. The datum for the hydrosurveys was also not indicated. With data from a variety of sources and spanning several decades, it is critical that all elevations use the same vertical datum.
Significance: MEDIUM
Ensuring all elevations use the same datum is critical for the design.
Recommendation for Resolution:
All elevations noted in the LRR should have the datum used noted. If different data are used, then the elevations must be corrected.
USACE Evaluator Response (#14): CONCUR
It is not clear from the report that all elevations cited in the report and used for design reference the same vertical datum. **ADOPT:** The vertical datum used was NAVD 88 and this will be made clear in the report.
IEPR Panel Backcheck Comment (#14): CONCUR
This information provided in the response is appropriate to include in the LRR.

Comment #15:
It is unclear how the 52-ft stage at the St. Louis Gage corresponds to the stages along the project site that have river elevations in the 400s.
Basis for Comment:
Pages 18 and 19 discuss the PUP at various stages, as noted on Charts 2 and 3.
Significance: MEDIUM
An explanation of how the 52-ft stage correlates to stages at various project locations is important to adequately understand the project design.
Recommendation for Resolution:
Clearly indicate in the LRR the correlation between the St. Louis Gage and the stages at the project locations.
USACE Evaluator Response (#15): CONCUR
ADOPT. The exceedance probability for each project stage is indicated on Chart 2. The project stages corresponding to 52+2 ft at the St Louis Gage are 443.4 for River Mile 201 and 441.8 for River Mile 197 as indicated in table C-1. For clarification in the main report the following foot note will be added: "The project stages corresponding to 52+2 ft at the St Louis Gage are 443.4 for River Mile 201 and 441.8 for River Mile 197"
IEPR Panel Backcheck Comment (#15): CONCUR
This information provided in the response is appropriate to include in the LRR.

Comment #16:
The wetland mitigation plan presented in Appendix A-B requires additional detail in order to fully evaluate its effectiveness against the potential for future failure.
Basis for Comment:
The plan provides solid documentation for the derivation of mitigation credits, as well as a credible process for monitoring and contingency planning. However, the mitigation credits derived provide no allowance for future failure. In short, 5.6 acres of wetlands are proposed for mitigation to offset approximately 5 acres of impacts. The appropriateness of this recommendation cannot be verified without better information on the plant species composition of existing vegetation communities. Table A-B-3 gives detailed information on the representative herbaceous species at the mitigation site, but there is little information on the wetlands impacted. From review of the EA (Appendix A-D, p. AD-5) it appears that the wetlands themselves were not delineated, but that impacts were ascertained from reviewing remote sensing data. If that is the case, there is additional uncertainty regarding the existing resource to be mitigated. Based on the panel's experience, other USACE districts require 2:1 acreage for mitigation to ensure against the likelihood of failure and as acknowledgement that human engineered systems do not completely match the functions provided by natural ones. Tables A-B-4 and A-B-5 appear generic and numbers provided do not provide for any cost escalation over the 10-yr monitoring period. The $1000 annual planting costs appears assumed and not estimated based on number of plants or a given percent mortality. The same is true for invasive species management and related costs.
Significance: MEDIUM
The wetland mitigation plan does not provide a clear understanding of whether potential impacts are effectively addressed.
Recommendation for Resolution:
The District should revisit the likelihood of success of the proposed mitigation site and allow for a margin of error in the calculations to address uncertainties inherent in offsetting impacts. The mitigation plan should be revised to address the comments raised.
USACE Evaluator Response (#16): CONCUR
ADOPT - The District will revise the mitigation plan to allow for a margin of error to address uncertainties inherent in achieving success; this will be done regardless of any public comments.
IEPR Panel Backcheck Comment (#16): CONCUR
It is appropriate that the LRR incorporate the possibility of future failure as indicated in the response.

Comment #17:
The Section 404(b)(1) analysis reads more like a description of the proposed project impacts to wetlands rather than a process by which wetlands impacts were avoided and minimized through careful consideration of alternatives.
Basis for Comment:
Section 404(b)(1) guidelines, under § 230.5 General procedures to be followed, part C, state: *"Examine practicable alternatives to the proposed discharge, that is, not discharging into the waters of the U.S. or discharging into an alternative aquatic site with potentially less damaging consequences (§230.10(a)).*" This should be done for any reach for which wetland impacts are proposed, and should encompass alternative methods for addressing underseepage, alternative locations where possible (e.g., relief wells), and alternative construction methods, including any necessary access roads or other improvements required for implementing the project.
Significance: MEDIUM
Section 404(b)(1) does not appropriately discuss wetlands impacts minimization through the consideration of alternatives.
Recommendation for Resolution:
The Section 404(b)(1) analysis should be revised to incorporate appropriate discussion that examines wetlands impacts minimization through consideration of alternatives as prescribed by the Section 404(b)(1) guidelines.
USACE Evaluator Response (#17): CONCUR
ADOPT - The Section 404(b)(1) analysis will be revised accordingly should the same or similar kind of public comment be submitted.
IEPR Panel Backcheck Comment (#17): CONCUR
Concur that such public comments received should be incorproated to enhance the quality of future drafts as indicated in the response.

Comment #18:
With regard to the estimated berm quantities, it is not clear whether an allowance was made for site preparation (e.g., clearing and grubbing) beneath the scanned Light Detection And Ranging (LIDAR) surface.
Basis for Comment:
On the second page of Appendix E, the text indicates that the berm surface was superimposed on the LIDAR surface to calculate quantities. Depending on the condition of the existing ground surface (e.g., vegetation), it seems that this would result in a lower bound sand quantity estimate.
Significance: MEDIUM
Berm quantities and associated costs are not clearly understood.
Recommendation for Resolution:
Modify LRR to either explain why this procedure is appropriate, or increase estimated sand quantities to account for site preparation.
USACE Evaluator Response (#18): CONCUR
The PDT agrees there is an ambiguity whether an allowance was made to account for material which is cleared and grubbed below the existing ground surface to calculate berm embankment quantities. **ADOPT.** Although there is six inches of cleared and grubbed material below the existing ground surface, there is also eight inches of topsoil on the exterior surface of the berms to bring it to ultimate design grade. For simplicity, the berm quantity was modeled from existing groundline to the finished top surface, knowing that the final top eight inch layer of berm is topsoil, not embankment material. An additional topsoil quantity eight inches thick was modeled on top of the finished berm surface to calculate the topsoil quantity. The way the berm embankment is currently modeled, the topsoil quantity you would have to remove from the the embankment quantity for the finish design surface of the berm essentially offsets (within 2 inches) the additional quantity you would add to berm embankment for material you remove for clearing and grubbing.
IEPR Panel Backcheck Comment (#18): CONCUR
This information provided in the response is appropriate to include in the LRR.

Comment #19:
There is some concern that the pump stations are designed for lower bound condition.
Basis for Comment:
On the third page of Appendix E, the LRR indicates that the pump stations were sized to match the anticipated flows from the wells. If additional flows are observed (e.g., surface run-off, more efficient relief well performance), there is some concern that the pumps could not handle the total flow at peak periods.
Significance: MEDIUM
The discussion of the pump station design poses some concern with the current interpretation.
Recommendation for Resolution:
Further discuss the size selection of the pumps to ensure that they are sized properly, or briefly explain why excess flow to the pumps would not have an adverse effect on levee performance.
USACE Evaluator Response (#19): CONCUR
ADOPT: The following will be added to Appendix C - Hydraulics The pumps were sized to match the calculated design well flow at the maximum possible flood event for the system before overtopping. The scope of this report is design deficiency correction and therefore only those impacts caused by the underseepage solutions proposed in the LRR are authorized to be accounted for. An interior flood event causing surface runoff is not in the scope. However, since the wells are sized at the maximum flood event there would be excess pump capacity on the rising side of the hydrograph that could be used for other purposes. The pump capacity does not adversely affect levee performance. If excess flow were to occur, water ponding on the interior of the levee will reduce the gradient for underseepage.
IEPR Panel Backcheck Comment (#19): CONCUR
This information provided in the response is appropriate to include in the LRR.

Comment #20:
A number of benefit categories are omitted and not mentioned, while other benefit categories are mentioned and various speculative damage estimates are stated, but they are not included in the HEC-FDA model or the expected annual damage reduction benefits.
Basis for Comment:
The LRR and its appendices do not include estimates of flood damages to agriculture and to infrastructure (except the Mel Price Locks and Dam) and do not note the absence of these estimates. Their omission lowers the expected annual net benefits and benefit-cost ratio from what it would be if they were included. For other damage categories, there are some catastrophic scenarios that are described in the LRR (in the EA and the Economics Appendix), sometimes with attempts made to quantify the damages that might result in the event of such a scenario. These damages are not in any way comparable to the expected annual damages output from the HEC-FDA model, as they are not subject to the entire uncertainty and flood and failure probability risk analysis. For example, Appendix J contains a discussion of the environmental cleanup benefits of the design deficiency correction. The discussion includes highly speculative cleanup cost estimates from other oil spill events that may or may not be applicable to the situation under study. These quoted damage values are never used in the analysis and a definitive statement regarding their applicability is not given. The Appendix also discusses the possibility of refineries being forced to close and hints at a serious military impairment from this closure, but does not estimate the actual lost fuel production nationwide (the potential extent of shifting production to other refineries is not explored) nor states its significance in the context of total military grade jet fuel production.
Significance: LOW
The omitted benefits that are not named in the LRR (agriculture and infrastructure damage reduction) would not be expected to have a large value in comparison to the benefits that are estimated. Also, the benefit-cost ratio is already over 1.1 (a threshold established in P&G, over which estimation of omitted benefits is not required). As for the damages that are described but not included, their omission from the cost-benefit analysis is not significant in the sense that including these damages would only have increased the benefit-cost ratio. Although the statements regarding possible catastrophic scenarios may possibly be overly alarming, the conclusion of a positive net annual benefit would not be altered, and this result is the critical one in the decision-making calculus.
Recommendation for Resolution:
The various types of damages that would be reduced but could not be estimated in the net benefits analysis should be enumerated, but the report should avoid vague and unsupported but alarming statements about possible damages and should avoid highly speculative estimates of possible damage. To avoid possible misinterpretation, any damage estimates that are given should come with the caveat that the damages are not expressed in comparable terms to the expected annual damages, and therefore cannot be simply added to the expected annual damages.

USACE Evaluator Response (#20): CONCUR
The vague language will be corrected to accurately address the scenario discussed. Also, the uncounted benefit categories will be discussed qualitatively.
IEPR Panel Backcheck Comment (#20): CONCUR
It is appropriate for the LRR to include the additional discussion indicated in the response.