MEMORANDUM FOR Assistant Secretary of the Army (Civil Works), 108 Army Pentagon, Washington, D.C. 20310-0108

SUBJECT: Village of Hatch, New Mexico, Flood Risk Management Project Continuing Authorities Program, Section 205


2. Logistic Management Institute (LMI), a not-for-profit government consulting company with experience in establishing and administering peer review panels for the U.S. Army Corps of Engineers (Corps), was engaged to conduct the IEPR for the Village of Hatch, New Mexico, Flood Risk Management Feasibility Report and its supporting documentation. The IEPR panel consisted of four members with expertise in civil engineering, economics and planning, environmental/National Environmental Policy Act, hydrology and hydraulics, and geotechnical engineering.

3. The enclosed document contains the approved final written responses of the Chief of Engineers to the issues raised and the recommendations contained in the IEPR Report. The IEPR Report and the Corps responses have been coordinated with the vertical team and will be posted on the internet, as required by EC 1165-2-217.

4. Questions or concerns should be directed to Bradd Schwichtenberg, Deputy Chief, South Pacific Division Regional Integration Team, at (202) 761-1367.

Encl

JAMES C. DALTON, P.E.
Director of Civil Works
Independent External Peer Review (IEPR) was conducted for the Detailed Project Report and integrated Environmental Assessment for the Section 205 Small Flood Risk Management Project Hatch, New Mexico in accordance with Section 2034 of the Water Resources Development Act of 2007, the USACE peer review policy (currently, EC 1165-2-217) and the Office of Management and Budget’s Final Information Quality Bulletin for Peer Review (2004). The goal of the U.S. Army Corps of Engineers (USACE) Civil Works program is to always provide scientifically sound, sustainable water resources solutions for the nation. The USACE review processes are essential to ensuring project safety and quality of the products USACE provides to the American people.

APMI, a non-profit science and technology organization with experience in establishing and administering peer review panels for the USACE, was engaged to conduct the IEPR for the Hatch, NM, Flood Risk Management Project, and its supporting documentation. APMI identified potential candidates for the panel in the following key technical areas: Civil Works planning/economics, biological resources and environmental compliance, hydrology and hydraulic engineering, geotechnical engineering, and Flood Risk Analyst. APMI made the final selection of the Four-person Panel.

APMI issued its Final Independent External Peer Review Report on April 28, 2017. Overall, eighteen final panel comments were identified and documented. Of these, two were identified as having medium-high significance, six were identified as having medium significance, five had medium/low significance, and five had low significance.

The USACE concurred with all comments. As a result of the Panel Backcheck and subsequent USACE responses, there were suggested 23 recommendations. Of these 23 recommendations, 22 were adopted and 1 was not adopted.

The following discussions present the Final Response to the eighteen comments.
1. IEPR Comment – *Significance – Medium High.* The seepage evaluation described in the Geotechnical Engineering Appendix does not analyze the potential for uplift on the downstream side of the embankment that could result in harmful boils and piping.

This comment includes three recommendations. The first and third recommendation was adopted. The second recommendation was not adopted.

**Recommendation 1.** Compile available subsurface information to develop a typical embankment and foundation cross-section. The methodology described in Appendix B of EM 1110-2-1913 should be utilized to evaluate the potential for harmful uplift.

**USACE Response: Adopted**

**Actions Taken:** Available sub-surface information has been incorporated into the finite element analysis model used for the analysis of Hatch Dam. Although EM 1110-2-1913 is only applicable to levees; the seepage analysis for Hatch Dam follows the general process laid out in Appendix B of the EM. Additional seepage discussion is presented in Exhibit C of Appendix F paragraphs 3.2.4 – 3.3.3, and Appendix F 4.1.4 Embankment Seepage. Detailed analysis and design using detailed subsurface investigations will be addressed as part of the design and implementation phase of the project.

**Recommendation 2.** Revise the cost estimate to incorporate any measures needed to address potential uplift conditions.

**USACE Response: Not Adopted**

**Actions Taken:** Since alternatives consisted of different sizes of dams at the same location, the feasibility study focused on those aspects that would differentiate the alternatives from each other. The current cost estimate includes provisions for a toe drain, drainage blanket, and cutoff trench to mitigate seepage through the embankment and lower the exit gradients along the downstream toe. The estimate includes up to 35% contingency to account for uncertainty due unknown conditions and level of detail in the designs. Additional features and detail will be developed during Design and Implementation. These features would be needed in any of the alternatives and would not affect the alternative selection presented within the Detailed Project Report.

**Recommendation 3.** Formulate future subsurface exploration programs needed for the final design of the embankment to provide more definitive information to evaluate the characteristics of the downstream confining layer and the overall subsurface profile. This would include obtaining a deep boring to establish the bottom of the aquifer beneath the embankment.

**USACE Response: Adopted**

**Actions Taken:** Additional subsurface investigations will be performed to inform detailed design during the Design and Implementation phase of the project. Language has been included in the Detailed Project Report section 3.8.14 Additional Investigation and Analysis.
2. **IEPR Comment - Significance – Medium-High.** The number and distribution of the borings used to design the embankment and related structure do not meet USACE practice for the design of dams.

This comment includes two recommendations both of which were adopted.

**Recommendation 1.** Obtain additional subsurface data to more accurately determine the character of the foundation beneath the higher sections of the dam and the extent of the material that will be required to be removed. In order to expedite the required exploration, the USACE could consider using test bits by means of a backhoe for the current program in lieu of additional borings.

**USACE Response: Adopted**

**Actions Taken:** Additional subsurface investigations will be performed during design and implementation in order to further understand and characterize in-situ materials at the site. This recommendation is adopted in paragraph 3.8.14 *Additional Investigation and Analysis* of the Detailed Project Report to describe specific parameters and tests that will be performed.

**Recommendation 2.** Conduct a comprehensive exploration program prior to final design to obtain representative samples of the foundation material and to assess the density and shear strength of the underlying granular foundation deposits.

**USACE Response: Adopted**

**Actions Taken:** Additional subsurface investigations will be performed during design and implementation in order to further understand and characterize in-situ materials at the site. This recommendation is adopted in paragraph 3.8.14 *Additional Investigation and Analysis* of the Detailed Project Report to state that foundation materials will be assessed for in-situ shear strength and density to determine their suitability beneath the embankment structure and to determine what seepage control measures. Triaxial testing will be performed to establish strength parameters for the embankment utilizing unconsolidated-undrained and consolidated-undrained triaxial testing for the semi-pervious material and undrained triaxial testing for the pervious random fill material.

3. **IEPR Comment - Significance – Medium.** The Environmental Site Assessment does not address the effect of the loss of water to downstream users and instream flows as a result of evaporation within the detention basin.

Recommendation. Provide analysis and discussion of evaporative losses anticipated from the detention basin and the potential effect of the loss on downstream flows and water users.

**USACE Response: Adopted**

**Actions Taken:** Evaporative losses in arid regions can be significant and the potential impacts to surface water should be evaluated between the proposed project alternatives and no action alternative. Section 4.4.1.1.1 of the Detailed Project Report has been revised to
include a qualitative discussion stating that the proposed project will reduce potential evaporative and infiltration losses. This is accomplished by limiting detention time to 96 hours or less per the New Mexico State Engineer and Interstate Compact requirements. Floodwaters would be exposed to evaporation for two to three times longer in the no action alternative since floodwaters are ponded within and around the Village of Hatch for days or weeks. The discussion of pan evaporation rates presented in Section 2.1 *Climate and Climate Change* will be reiterated here.

4. **IEPR Comment - Significance – Medium.** No explanation is provided for why the costs for Dam B are less than the costs for Dam A.

**Recommendation.** Include an explanation in the report as to why the cost of both RE (Model) and reservoir fill are less for the larger Dam B than for the smaller Dam A and why the total average annual cost are higher for Dam B than Dam A.

**USACE Response: Adopted**

**Actions Taken:** The higher cost of the smallest dam alternative is counterintuitive and should be explained in the evaluation. A brief statement explaining the higher cost of Alternative A has been added to Section 3.7.3 to read: “Dam A is slightly more expensive than Dam B because it will require import of borrow from a commercial source outside the project area.”

5. **IEPR Comment - Significance – Medium.** The analysis is inadequate to determine to what extent flooding occurs as a result of the sediment deposition in the confined channel.

**Recommendation.** Describe the extent to which existing and future conditions will alter flood control operations in the Village of Hatch with respect to perching within channels, drains, and streams. Identify how those future conditions may impact the proposed conditions and what level of effort is required to maintain the effectiveness of the proposed conditions dealing with perching and long-term sediment deposition. The report should consider to what extent the channels are designed to be self-scouring, what maintenance is needed to maintain channel capacity, and how much sediment scoured below the dams from clear releases will be deposited in the canal system over the long-term.

**USACE Response: Adopted**

**Actions Taken:** The proposed alternative is designed to manage sediment, as well as, flood flows so that conveyance in existing channels and irrigation drains is maintained. While monitoring and maintenance of existing and proposed channels will be required, the proposed project will reduce these efforts over the existing (no action alternative) condition. A summary description has been added in Section 3.8.9.1 of the Detailed Project Report and Section 4.10 of Appendix A, *Hydrology and Hydraulics* to discuss sediment trapping efficiency of the proposed dam and its beneficial effect on the irrigation drain. The proposed project will reduce the amount of sediment entering the Colorado Drain from Spring Canyon and subsequently reduce active maintenance of the drain by the Elephant Butte Irrigation District.
6. **IEPR Comment - Significance – High.** The report does not adequately document the extent to which sediment yield and transport has been considered in the analysis.

**Recommendation.** Describe in more detail the extent to which sediment yield and transport have been considered in the alternatives analysis considering, at a minimum, the issues mentioned in the Basis for Comment.

**USACE Response: Adopted**

**Actions Taken:** Additional narrative is needed to describe development of the estimated volume of sediment storage needed in the proposed project. A summary description has been added in Section 3.8.9.1 of the Detailed Project Report and Section 4.10 of Appendix A, *Hydrology and Hydraulics* to discuss sediment yield and transport in the Spring Canyon system. The Hatch Dam is proposed to have a storage capacity of 283 acre-ft. The amount of sediment passing the existing Spring Canyon Dam and delivered from the intervening 1.8 sq. mi. downstream of Spring Canyon Dam may be conservatively expected to approximately 0.61 ac-ft/yr of deposition in the proposed dam.

7. **IEPR Comment - Significance – Medium.** The stability analyses portrayed in the documents utilize only assumed drained strength parameters for the strength of the semi-pervious core and thereby do not conform to USACE criteria, which require the use of consolidated undrained shear strength parameters in conjunction with drained shear strength parameters.

**Recommendation.** Include, in the final design investigation, a testing program based on remolded samples of soil obtained from the proposed borrow area. The testing program should include sufficient triaxial testing for the semi-pervious material to establish a range of likely drained and consolidated undrained shear strength parameters that can be used to determine appropriate design values for both the core and the random fill material.

**USACE Response: Adopted**

**Actions Taken:** The current geotechnical analysis of the embankment is incomplete and requires refinement during detailed design and implementation. Undrained shear strength parameters will be incorporated within the material parameters for the semi-pervious core material in the geotechnical model for slope stability during rapid drawdown. Slope stability and seepage analyses for static loading conditions including the use of both drained and undrained soil conditions will be performed for detailed geotechnical design of the dam.

This recommendation is adopted in paragraph 3.8.14 Additional Investigation and Analysis of the Detailed Project Report. The narrative details additional subsurface investigations and analysis that will be performed during design and implementation in order to further understand and characterize materials at the site.
8. **IEPR Comment - Significance – Medium.** The stability analyses for the embankment were not based upon the results of a laboratory testing program but utilized assumed shear strength values for both the random fill and semi-pervious core material.

**Recommendation.** The final design of the embankment should be based upon a comprehensive exploration program to conform to USACE standards for dam embankments, including sampling and laboratory testing of remolded samples as described above. The program should have sufficient triaxial testing results to provide a range of values from which conservative design shear strengths can be determined. For the semi-pervious core material, the testing should include unconsolidated-undrained, consolidated-undrained, and drained triaxial testing. If the random fill material is pervious, only drained testing would be required.

**USACE Response: Adopted**

**Actions Taken:** Laboratory data indicating shear strength parameters for the project is limited due to the narrow scope of the existing sub-surface investigations performed for the feasibility level analysis. Additional sub-surface investigations and geotechnical analysis will be performed during the design and implementation phase. Section 3.8.14 *Additional Investigation and Analysis* of the Detailed Project Report has been revised to describe additional subsurface investigations that will be performed during design and implementation in order to further understand and characterize materials at the site and within the borrow area.

9. **IEPR Comment - Significance – Medium Low.** The Environmental Assessment (EA) does not discuss whether the existing levee constructed from dredge spoils may contain contaminated soils requiring special handling at possibly increased costs.

**Recommendation.** Revise the text discussion in Section 2.7 and the EA to address whether the levee material likely contains contaminants and state whether or not sampling and testing is needed to ensure that contamination is not an issue.

**USACE Response: Adopted**

**Actions Taken:** The presence of a spoil berm or pile warrants special consideration in the potential presence of contaminated soils. The berm is believed to be composed of soils pushed up from the immediately adjacent area rather than dumped at that location. The Executive Summary and Section 4.6.2 *Facility/Utility Relocation* has been revised to make clear that suitable material from the existing spoil berm will included in borrow for earthen dam construction. Section 4.5 *Hazardous, Toxic and Radioactive Waste* has been revised to state that an environmental site assessment will be repeated at the site 6 months prior to construction. At that time, all sources of borrow and disposal, staging and access areas will be inspected for indications of possible contamination. Testing of that material will be conducted if warranted.

10. **IEPR Comment - Significance – Medium Low.** Price levels and interest rates used to evaluate cost of the three alternative dam sizes are inconsistent in Appendix B, *Economics.*
**Recommendation.** Use the same price levels and interest rate to evaluate all three alternatives to select the TSP. The evaluation of the TSP using the current price levels and interest rate should be presented separately.

**USACE Response: Adopted**  
**Actions Taken:** Text has been added in Section 11 of Appendix B, *Economics* to more accurately describe what each cost table is trying to convey. The comparison of alternatives and selection of the NED plan uses the common price level for cost and benefits. These price levels are not updated once the NED plan is identified however, price levels of the NED plan are updated to the current interest rate. Table B-7 shows that the 3 alternatives were analyzed at the same interest rate (3.5%). That same table also references the NED plan at the current interest rate. Tables B-8 A, B, and C state the interest rate used to calculate benefits at the most recent point in which they were analyzed.

11. **IEPR Comment - Significance – Medium-Low.** Constructing the embankment over the cast-in-place outlet works will create loads on the foundation soils that could create harmful settlements beneath the outlet works.

**Recommendation.** Conduct further analysis to determine the magnitude and distribution of settlement beneath the foundation of the outlet works after the embankment load is applied. Include provisions in the structural design of the outlet works to accommodate the loads induced by foundation settlement. These measures could include increased reinforcement of the concrete or consideration of flexible joints at the junction of the gatewell and conduit section.

**USACE Response: Adopted**  
**Actions Taken:** Some uncertainty exists with respect to the properties of existing soils at the project site due to limited geotechnical survey and testing performed at this stage of the study. The density and distribution of borings especially along longitudinal axis of the proposed embankment. An analysis of magnitude of settlement as this stage would have limited value; however, future detailed and targeted geotechnical survey, testing and analysis will be used to complete these analysis during detailed design. This recommendation is adopted in Section 3.8.13 Outlet Works in the Detailed Project Report. To include the potential for provisions such as watertops between conduit joints, drainage material placed around the conduit, flexible joints between the gatewell and conduit and thickened or reinforced concrete.

12. **IEPR Comment - Significance – Medium-Low.** The proposed roller compacted concrete (RCC) thickness of 12 inches may not be thick enough to avoid cracking that could be induced by minor settlement in the underlying embankment and foundation.

This comment includes two recommendations, both of which have been adopted.

**Recommendation 1.** Develop estimates of the potential for settlement beneath the spillway slab.
USACE Response: Adopted

**Actions Taken:** Some uncertainty exists with respect to the properties of existing soils at the project site due to limited geotechnical survey and testing performed at this stage of the study. Estimates of potential settlement would be the same for all alternatives and would not impact plan selection. Detailed design prior to project construction will be performed based on future detailed and targeted geotechnical survey, testing and analysis to include estimates of potential settlement. This recommendation is adopted in paragraph 3.8.13 Outlet Works in the Detailed Project Report.

**Recommendation 2.** Thicken the RCC slab to minimize the potential for harmful cracking. The minimum thickness should be 24 inches, as provided in the PCA guidance. As an alternative to a thicker RCC slab, provide a reinforced concrete slab over the top of the spillway section

USACE Response: Adopted

**Actions Taken:** This recommendation is adopted in paragraph 3.8.13 Outlet Works in the Detailed Project Report to state “some uncertainty exists with respect to the properties of existing soils at the project site due to limited geotechnical survey and testing performed at this stage of the study. Detailed design prior to project construction will be performed based on future detailed and targeted geotechnical survey, testing and analysis. Results of these analysis could include thicker concrete or using reinforced concrete instead of roller compacted concrete.”

13. IEPR Comment - **Significance – Medium-Low.** The present design of the spillway does not include any provisions for energy dissipation downstream of the spillway section. Turbulent flows discharging over the spillway under high-flow conditions could undermine the soil-cement facing on the downstream side of the spillway leading to a failure of the spillway section.

**Recommendation.** Develop numerical or physical hydraulic models to evaluate the potential for harmful scour downstream of the spillway. Based on the results of the analyses, develop protection plans to ensure that harmful scour does not occur under high-flow conditions.

USACE Response: Adopted

**Actions Taken:** Since alternatives consisted of different sizes of dams at the same location, the feasibility study focused on those aspects that would differentiate the alternatives from each other. Features and analysis common to all alternatives were captured in cost estimates using parametric or non-parametric methods and detailed analysis is deferred to the design and implementation phase. This detailed analysis will include evaluations of slope protection with a stilling basin and end sill with cut off wall and other protection plans to dissipate energy and mitigate erosion and head cutting of the spillway. Section 3.8.13 Outlet Works has been revised to include this discussion. The analysis is not be expected to change plan selection or significantly change feasibility level cost estimates since adequate contingency has been built into the estimate.
14. IEPR Comment - *Significance – Low.* The Main Report and the *Cost Engineering Report Appendix* contain contradictory information on the length of construction and expected start date for the project.

**Recommendation.** Determine if the project is expected to be constructed in less or more than 12 months. If the period of construction is expected to be more than 12 months, include interest during construction in the cost analysis.

**USACE Response:** Adopted  
**Actions Taken:** The text in the feasibility report and the cost appendix is inconsistent with respect to the construction period. The text in Section 10 and Table B-7 of Section 16 in the cost appendix and the recommendations section of the feasibility report have been revised to reflect an approximately 12 month construction period.

15. IEPR Comment - *Significance – Low.* In Section 5.3, *Cost Sharing Requirements* of the Main Report (page 105), indicates that the total non-Federal share of the total project cost is both 35 percent and 50 percent.

**Recommendation.** Revise Section 5.3 *Cost Sharing Requirements* to indicate that the Cost Apportionment Percentage of Total Cost-Shared Amount is 65 percent federal and 35 percent non-federal.

**USACE Response:** Adopted  
**Actions Taken:** The language in section 5.3 *Cost Sharing Requirements* is confusing. The cost sharing requirements are in–fact 65 Federal and 35 percent non-federal. The text in Section 5.3 has been revised to remove mention of a 50% criteria and only present the 35% cost share obligation with a 5% portion as cash.


**Recommendation.** Include in Appendix B, *Economics,* the calculations that produced the Average Annual Benefits to agriculture.

**USACE Response:** Adopted  
**Actions Taken:** Appendix B, *Economics,* Section 3.1 3.1 *Valuation of Roads, Railroads, Utilities, Agricultural and Emergency Service* has been revised to include calculations that produced the Average Annual Benefits to agriculture.

17. IEPR Comment - *Significance – Low.* The benefits presented in Appendix B, *Economics* in Table B-9 are incorrectly presented.

**Recommendation.** Revise the benefits produced by Dam C presented in Table B-9 to read $2,440.00.
USACE Response: Adopted
Actions Taken: Table B-9—Expected Value of EAD and EAD Reduced for Proposed Projects did include an error. This error does not impact plan selection or change the recommended plan. Table B-9 has been revised to correct the without project condition for Dam C. The revision will state that expected annual damages are $3,091 for no action minus $660 (with project damages) so that the benefits equal $2,431.

18. IEPR Comment - Significance – Low. The two location maps shown in Exhibit A of Appendix F, Geotechnical Engineering, showing the location of the borings obtained by RTI in 2000, are very poor quality and make it extremely difficult to relate the boring locations to the proposed structures.

Recommendation. The location of the borings obtained by RTI in 2000 should be shown on a drawing similar to that developed for the borings obtained in 2011. Revise the drawing of the project features to include the location of the borings obtained by RTI in 2000, which will allow a clear understanding of the relevance of the 2000 subsurface information.

USACE Response: Adopted
Actions Taken: The sub-surface investigation map provided for the 2000 RTI work is difficult to read and interpret. A new map is needed to provide approximate locations of the bore holes and their relevance to the proposed dam footprint. An overall plan sheet has been included showing all boreholes from the 2000 RTI and 2011 USACE sub-surface investigations. This map will be located in both Exhibit A and Exhibit B of Appendix F and in Figure 19 of Section 3.8.5 Subsurface Investigation of the Detailed Project Report.