Final Independent External Peer Review Report
Lower Cache Creek, Yolo County, Woodland Area, California, Feasibility Study

Prepared by
Battelle Memorial Institute

Prepared for
Department of the Army
U.S. Army Corps of Engineers
Flood Risk Management Planning Center of Expertise
Baltimore District

Contract No. W912HQ-15-D-0001
Task Order: W912HQ19F0074

March 9, 2020

Photo by USACE

BATTELLE
It can be done

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Executive Summary

Project Background and Purpose

The Cache Creek is a west-side tributary of the Sacramento River near Sacramento, California. The primary study area encompasses the City of Woodland, the town of Yolo, and surrounding agricultural areas. The main stem of Cache Creek originates with the outflows of Clear Lake in the Coast Range Mountains of Northern California. The north fork of Cache Creek is impounded by Indian Valley Dam and joins the main stem above Capay Valley before flowing out of the foothills into California's Central Valley. Water in the creek only reaches the Woodland area at certain times of year due to upstream retention and diversions for water supply. The channel then passes north of the City of Woodland through levees constructed by the U.S. Army Corps of Engineers (USACE) in 1958 as part of the Federally authorized Sacramento River Flood Control Project. The leveed portion of Cache Creek discharges into the Cache Creek Settling Basin (CCSB), which was also constructed by USACE as a separately authorized component of the Sacramento River Flood Control Project. Cache Creek has historically carried a large sediment load. The settling basin was constructed to prevent sediment carried by Cache Creek from adversely affecting the hydraulic capacity of the Yolo Bypass through excessive sediment deposition and thereby increasing the flood risk of the City of Sacramento. Water from the CCSB flows over a concrete weir and discharges into the Yolo Bypass.

There is a risk to human life and safety in the City of Woodland, town of Yolo, and surrounding areas from flooding of Lower Cache Creek. Floodwaters from Lower Cache Creek create a significant life safety risk by inundating roadways from city streets to Interstate 5, which creates hazards for motorists and isolates citizens from critical facilities such as hospitals. Additionally, flooding from Lower Cache Creek poses a risk of economic damage to property and critical infrastructure within the City of Woodland, town of Yolo, and surrounding areas. The anticipated damageable property (structures and contents) is $1.3 billion (October 2018 price levels) and the average annual damages are expected to range from $20.7 million to $27.5 million over the 50-year period of analysis. Damages are concentrated in an industrial area in northeastern Woodland, southwest of the CCSB.

The threat of flooding to the City of Woodland includes potential impacts on both residential and commercial property, disruption of two major transportation routes (Interstate 5 and the Union Pacific Railroad), and impacts on agricultural production. Federal Interest was identified in a 2003 USACE Draft Feasibility Report and Environmental Impact Statement/Environmental Impact Report (DFR/DEIS-EIR), and potential damages in the project area have grown in the intervening 17 years owing to an increase in population and value of damageable property in the study area.

Independent External Peer Review Process

Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analysis. USACE is conducting an Independent External Peer Review (IEPR) of the Lower Cache Creek, Yolo County, Woodland Area, California, Feasibility Study (hereinafter: Lower Cache Creek FS IEPR). As a 501(c)(3) non-profit science and technology organization, Battelle is independent, is free from conflicts of interest (COIs), and meets the requirements for an Outside Eligible Organization (OEO) per guidance described in USACE (2018). Battelle has experience in establishing and administering peer review panels for USACE and was engaged to coordinate this IEPR. The IEPR was external to the agency and conducted following USACE and Office of Management and Budget (OMB) guidance described in USACE (2018) and OMB (2004). This final report presents the Final Panel Comments of the IEPR Panel (the Panel). Details regarding the IEPR (including the process for selecting panel members, the panel members' biographical information and expertise, and the charge submitted to the Panel to guide its review) are presented in appendices.

Based on the technical content of the decision documents and the overall scope of the project, Battelle identified potential candidates for the Panel in the following key technical areas: planning formulation/economics, environmental compliance, hydrologic and hydraulic (H&H) engineering, and geotechnical engineering. Battelle screened the candidates to identify those most closely meeting the selection criteria and evaluated them for COIs and availability. USACE was given the list of all the final candidates to independently confirm that they had no COIs, and Battelle made the final selection of the four-person Panel from this list.

The Panel received electronic versions of the decision documents (1,248 pages in total), along with a charge that solicited comments on specific sections of the documents to be reviewed. Following guidance provided in USACE (2018) and OMB (2004), USACE prepared the charge questions, which were included in the draft and final Work Plans.

The USACE Project Delivery Team (PDT) briefed the Panel and Battelle during a kick-off meeting held via teleconference at the start of the review to provide the Panel an opportunity to ask questions of USACE and clarify uncertainties. Other than Battelle-facilitated teleconferences, there was no direct communication between the Panel and USACE during the peer review process.

IEPR panel members reviewed the decision documents individually and produced individual comments in response to the charge questions. The panel members then met via teleconference with Battelle to review key technical comments and reach agreement on the Final Panel Comments to be provided to USACE. Each Final Panel Comment was documented using a four-part format consisting of (1) a comment statement; (2) the basis for the comment; (3) the significance of the comment (high, medium/high, medium, medium/low, or low); and (4) recommendations on how to resolve the comment. Overall, eight Final Panel Comments were identified and documented. Of these, one was identified as having medium/high significance, one had medium significance, five had medium/low significance, and one had low significance.

Battelle received public comments from USACE on the 2019 Lower Cache Creek Draft Feasibility Report (Draft FR) and Draft Supplemental Environmental Impact Statement (Draft SEIS), public scoping comments from 2015, and public comments on the 2003 DFR/DEIS-EIR (three files containing 747 pages of comments and one Excel spreadsheet summarizing comments from 696 pages of those comments) and provided them to the IEPR panel members. The panel members were charged with determining if

any information or concerns presented in the public comments raised any additional discipline-specific technical concerns that should be addressed in the Draft FR or Draft SEIS. After completing its review, the Panel identified one new issue and subsequently generated one Final Panel Comment that summarized the concern.

Results of the Independent External Peer Review

The panel members agreed on their "assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used" (USACE, 2018) in the Lower Cache Creek FS review documents. Table ES-1 lists the Final Panel Comment statements by level of significance. The full text of the Final Panel Comments is presented in Section 4.2 of this report. The following summarizes the Panel's findings.

Based on the Panel's review, the Draft FR and Draft SEIS are well-written, concise, and provide excellent supporting documentation on engineering, environmental, economic, and plan formulation issues. The documents provided a balanced assessment of the economic, engineering, and environmental issues of the overall project. The Panel identified some elements of the report that should be clarified.

Engineering: The Draft FR and the Draft SEIS state that the outlet weir will not be raised. However, it also states that the California Department of Water Resources (DWR) will continue to operate and maintain the CCSB as outlined in the CCSB Operations and Maintenance (O&M) Manual. These two assumptions conflict because the O&M Manual reportedly calls for the outlet weir to be raised once the retained sediment reaches a prescribed level. The Panel believes this inconsistency needs to be resolved, and, if the intention is to raise the weir in the future, the Draft FR and Draft SEIS need to account for the hydraulic impacts and resulting costs.

The Panel also noted that several thousand feet of cutoff wall is being included in the project when no seepage in the area was noted during the March 2019 highwater event. It is unclear to the Panel why this structure is being included when USACE design guidelines indicate that seepage remediation is not required.

Environmental: The Panel believes the Draft FR and Draft SEIS clearly document the overall need for the project, the steps followed in formulating the alternatives, and the decisions made in the selection of the Tentatively Selected Plan (TSP). However, there are a few items that need to be clarified. In several instances, the Panel found that the methods used for data collection were not described to allow for an understanding of the accuracy of the data being used. Without information on how data were collected, the validity of the conclusions drawn is hard to assess. The Panel also believes that without quantification of the unavoidable impacts that would occur under the TSP, the adequacy of the proposed mitigation cannot be assessed.

The Panel noted that between the 2003 DFR/DEIS-EIR and the current Draft FR and Draft SEIS reviewed here, USACE changed from proposing on-site, in-kind mitigation to proposing mainly the use of off-site, in-kind mitigation banks. The justification for the use of mitigation banks in general to address mitigation, and the proposed mitigation banks in particular, is not clear.

Economics/Plan Formulation: The Panel believes the total project costs may be underestimated because no costs were included for pump station improvements or for sediment removal upstream of the new inlet weir to the CCSB. The Panel noted that gates and pump station improvements, if needed, have

the potential to increase costs significantly, and the planned ponding upstream of the proposed new inlet weir to the CCSB would cause sedimentation in this area that would likely need to be removed at some point during the life of the project. The Draft FR and Draft SEIS do not clearly state whether the cost of purchasing flood easements for land with increased flooding under the future with-project condition is included in the cost estimates and benefit-cost ratio (BCR) assessment.

Table ES-1. Overview of Eight Final Panel Comments Identified by the Lower Cache Creek FS IEPR Panel

No.	Final Panel Comment
Significance – Medium/High	
1	The Draft FR and Draft SEIS do not account for the hydraulic impacts (and resulting costs) of a potential increase in the design height of the CCSB outlet weir.
Significance – Medium	
2	Total project costs may be underestimated because no costs were included for pump station improvements or for sediment removal upstream of the new inlet weir to the CCSB.
Significance – Medium/Low	
3	The methods used for data collection, as described in the environmental analysis, are not always clear.
4	The methods used in the environmental analysis to analyze impacts do not fully address unavoidable impacts under the TSP or fully describe the proposed mitigation of such impacts.
5	The justification for the use of mitigation banks in general to address mitigation, and the proposed mitigation banks in particular, is not clear.
6	It is unclear why several thousand feet of cutoff wall is being included in the project when no seepage in the area was noted during the March 2019 highwater event and USACE design guidelines indicate that seepage remediation is not required.
7	The Draft FR and Draft SEIS do not clearly state whether the cost of purchasing flood easements for land with increased flooding under the future with-project condition is included in the cost estimates and BCR assessment.
Significance – Low	
8	The Draft FR and Draft SEIS does not explain why information on Interstate 5 (I-5) traffic and on surrounding agricultural resources to support the analysis of alternatives has been deferred to the next project phase.

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LIST OF ACRONYMS

ADM	Agency Decision Milestone
BCR	Benefit-Cost Ratio
CCSB	Cache Creek Settling Basin
COI	Conflict of Interest
CWA	Clean Water Act
DEIS/EIR	Draft Environmental Impact Statement/Environmental Impact Report
DFR	Draft Feasibility Report
DrChecks	Design Review and Checking System
DWR	Department of Water Resources
EAP	Emergency Action Plan
EC	Engineer Circular
EIR	Environmental Impact Report
EM	Engineer Manual
ER	Engineer Regulation
ERDC	Engineer Research and Development Center
ESA	Environmental Site Assessment
ETL	Engineer Technical Letter
FEMA	Federal Emergency Management Agency
FR	Feasibility Report
FS	Feasibility Study
GIS	Geographic Information System
H&H	Hydrologic and Hydraulic
HEC-FDA	Hydrologic Engineering Center-Flood Damage Reduction Analysis
HEC-FIA	Hydrologic Engineering Center-Flood Impact Analysis
HEC-HMS	Hydrologic Engineering Center-Hydrologic Modeling System
HEC-LifeSim	Hydrologic Engineering Center-Life Loss/Direct Damage Estimate
HEC-SSP	Hydrologic Engineering Center-Statistical Software Package
HGM	Hydrogeomorphic Approach to Functional Assessment
HMR	Hydrometeorological Report
IEPR	Independent External Peer Review

IWR	Institute for Water Resources
LOMR	Letter of Map Revision
LULC	Land Use-Land Cover
NED	National Economic Development
NEPA	National Environmental Policy Act
O&M	Operations and Maintenance
OEO	Outside Eligible Organization
OMB	Office of Management and Budget
OMRR&R	Operations, Maintenance, Repair, Rehabilitation, and Replacement
PDT	Project Delivery Team
PMF	Probable Maximum Flood
SEIS	Supplemental Environmental Impact Statement
SRH-2D	Sedimentation and River Hydraulics 2D
SSA	South Suburban Airport
TSP	Tentatively Selected Plan
ULE	Underwriters Laboratories Environment
USACE	United States Army Corps of Engineers
WOUS	Waters of the United States

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1. INTRODUCTION

The Cache Creek is a west-side tributary of the Sacramento River near Sacramento, California. The primary study area encompasses the City of Woodland, the town of Yolo, and surrounding agricultural areas. The main stem of Cache Creek originates with the outflows of Clear Lake in the Coast Range Mountains of Northern California. The north fork of Cache Creek is impounded by Indian Valley Dam and joins the main stem above Capay Valley before flowing out of the foothills into California's Central Valley. Water in the creek only reaches the Woodland area at certain times of year due to upstream retention and diversions for water supply. The channel then passes north of the City of Woodland through levees constructed by the U.S. Army Corps of Engineers (USACE) in 1958 as part of the Federally authorized Sacramento River Flood Control Project. The leveed portion of Cache Creek discharges into the Cache Creek Settling Basin (CCSB), which was also constructed by USACE as a separately authorized component of the Sacramento River Flood Control Project. Cache Creek has historically carried a large sediment load. The settling basin was constructed to prevent sediment carried by Cache Creek from adversely affecting the hydraulic capacity of the Yolo Bypass through excessive sediment deposition and thereby increasing the flood risk of the City of Sacramento. Water from the CCSB flows over a concrete weir and discharges into the Yolo Bypass.

There is a risk to human life and safety in the City of Woodland, town of Yolo, and surrounding areas from flooding of Lower Cache Creek. Floodwaters from Lower Cache Creek create a significant life safety risk by inundating roadways from city streets to Interstate 5, which creates hazards for motorists and isolates citizens from critical facilities such as hospitals. Additionally, flooding from Lower Cache Creek poses a risk of economic damage to property and critical infrastructure within the City of Woodland, town of Yolo, and surrounding areas. The anticipated damageable property (structures and contents) is $1.3 billion (October 2018 price levels) and the average annual damages are expected to range from $20.7 million to $27.5 million over the 50-year period of analysis. Damages are concentrated in an industrial area in northeastern Woodland, southwest of the CCSB.

The threat of flooding to the City of Woodland includes potential impacts on both residential and commercial property, disruption of two major transportation routes (Interstate 5 and the Union Pacific Railroad), and impacts on agricultural production. Federal Interest was identified in a 2003 USACE Draft Feasibility Report and Environmental Impact Statement/Environmental Impact Report (DFR/DEIS-EIR), and potential damages in the project area have grown in the intervening 17 years owing to an increase in population and value of damageable property in the study area.

Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analysis. The objective of the work described here was to conduct an Independent External Peer Review (IEPR) of the Lower Cache Creek, Yolo County, Woodland Area, California, Feasibility Study (hereinafter: Lower Cache Creek FS IEPR) in accordance with procedures described in the Department of the Army, USACE, Engineer Circular (EC) *Review Policy for Civil Works* (EC 1165-2-217) (USACE, 2018) and the Office of Management and Budget (OMB), *Final Information Quality Bulletin for Peer Review* (OMB, 2004). Supplemental guidance on evaluation for conflicts of interest (COIs) was obtained from the *Policy on Committee Composition and Balance and Conflicts of Interest for Committees Used in the Development of Reports* (The National Academies, 2003).

This final report presents the Final Panel Comments of the IEPR Panel (the Panel) on the existing engineering, economic, environmental, and plan formulation analyses contained in the Lower Cache

Creek FS IEPR documents (Section 4). Appendix A describes in detail how the IEPR was planned and conducted, including the schedule followed in executing the IEPR. Appendix B provides biographical information on the IEPR panel members and describes the method Battelle followed to select them. Appendix C presents the final charge to the IEPR panel members for their use during the review; the final charge was submitted to USACE in the final Work Plan according to the schedule listed in Table A-1. Appendix D presents the organizational COI form that Battelle completed and submitted to the Institute for Water Resources (IWR) prior to the award of the Lower Cache Creek FS IEPR.

2. PURPOSE OF THE IEPR

To ensure that USACE documents are supported by the best scientific and technical information, USACE has implemented a peer review process that uses IEPR to complement the Agency Technical Review, as described in USACE (2018).

In general, the purpose of peer review is to strengthen the quality and credibility of the USACE decision documents in support of its Civil Works program. IEPR provides an independent assessment of the engineering, economic, environmental, and plan formulation analyses of the project study. In particular, the IEPR addresses the technical soundness of the project study's assumptions, methods, analyses, and calculations and identifies the need for additional data or analyses to make a good decision regarding implementation of alternatives and recommendations.

In this case, the IEPR of the Lower Cache Creek FS was conducted and managed using contract support from Battelle, which is an Outside Eligible Organization (OEO) (as defined by EC 1165-2-217). Battelle, a 501(c)(3) organization under the U.S. Internal Revenue Code, has experience conducting IEPRs for USACE.

3. METHODS FOR CONDUCTING THE IEPR

The methods used to conduct the IEPR are briefly described in this section; a detailed description can be found in Appendix A. The IEPR was completed in accordance with established due dates for milestones and deliverables as part of the final Work Plan; the due dates are based on the award/effective date and the receipt of review documents.

Battelle identified, screened, and selected four panel members to participate in the IEPR based on their expertise in the following disciplines: planning formulation/economics, environmental compliance, hydrologic and hydraulic (H&H) engineering, and geotechnical engineering. The Panel reviewed the Lower Cache Creek FS documents and produced eight Final Panel Comments in response to 16 charge questions provided by USACE for the review. This charge also included two overview questions and one public comment question added by Battelle, for a total of 19 questions. Battelle instructed the Panel to develop the Final Panel Comments using a standardized four-part structure:

1. Comment Statement (succinct summary statement of concern)
2. Basis for Comment (details regarding the concern)
3. Significance (high, medium/high, medium, medium/low, or low; in accordance with specific criteria for determining level of significance)
4. Recommendation(s) for Resolution (at least one implementable action that could be taken to address the Final Panel Comment).

Battelle reviewed all Final Panel Comments for accuracy, adherence to USACE guidance (EC 1165-2-217), and completeness prior to determining that they were final and suitable for inclusion in the Final IEPR Report. There was no direct communication between the Panel and USACE during the preparation of the Final Panel Comments. The Panel's findings are summarized in Section 4.1; the Final Panel Comments are presented in full in Section 4.2.

4. RESULTS OF THE IEPR

This section presents the results of the IEPR. A summary of the Panel's findings and the full text of the Final Panel Comments are provided.

4.1 Summary of Final Panel Comments

The panel members agreed on their "assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used" (USACE, 2018) in the Lower Cache Creek FS IEPR review documents. The following summarizes the Panel's findings.

Based on the Panel's review, the Draft FR and Draft SEIS are well-written, concise, and provide excellent supporting documentation on engineering, environmental, economic, and plan formulation issues. The documents provided a balanced assessment of the economic, engineering, and environmental issues of the overall project. The Panel identified some elements of the report that should be clarified.

Engineering: The Draft FR and the Draft SEIS state that the outlet weir will not be raised. However, it also states that the California Department of Water Resources (DWR) will continue to operate and maintain the CCSB as outlined in the CCSB Operations and Maintenance (O&M) Manual. These two assumptions conflict because the O&M Manual reportedly calls for the outlet weir to be raised once the retained sediment reaches a prescribed level. The Panel believes this inconsistency needs to be resolved, and, if the intention is to raise the weir in the future, the Draft FR and Draft SEIS need to account for the hydraulic impacts and resulting costs.

The Panel also noted that several thousand feet of cutoff wall is being included in the project when no seepage in the area was noted during the March 2019 highwater event. It is unclear to the Panel why this structure is being included when USACE design guidelines indicate that seepage remediation is not required.

Environmental: The Panel believes the Draft FR and Draft SEIS clearly document the overall need for the project, the steps followed in formulating the alternatives, and the decisions made in the selection of the Tentatively Selected Plan (TSP). However, there are a few items that need to be clarified. In several instances, the Panel found that the methods used for data collection were not described to allow for an understanding of the accuracy of the data being used. Without information on how data were collected, the validity of the conclusions drawn is hard to assess. The Panel also believes that without quantification of the unavoidable impacts that would occur under the TSP, the adequacy of the proposed mitigation cannot be assessed.

The Panel noted that between the 2003 DFR/DEIS-EIR and the current Draft FR and Draft SEIS reviewed here, USACE changed from proposing on-site, in-kind mitigation to proposing mainly the use of off-site, in-kind mitigation banks. The justification for the use of mitigation banks in general to address mitigation, and the proposed mitigation banks in particular, is not clear.

Economics/Plan Formulation: The Panel believes the total project costs may be underestimated because no costs were included for pump station improvements or for sediment removal upstream of the new inlet weir to the CCSB. The Panel noted that gates and pump station improvements, if needed, have the potential to increase costs significantly, and the planned ponding upstream of the proposed new inlet weir to the CCSB would cause sedimentation in this area that would likely need to be removed at some point during the life of the project. The Draft FR and Draft SEIS do not clearly state whether the cost of purchasing flood easements for land with increased flooding under the future with-project condition is included in the cost estimates and benefit-cost ratio (BCR) assessment.

4.2 Final Panel Comments

This section presents the full text of the Final Panel Comments prepared by the IEPR panel members.

Final Panel Comment 1

The Draft FR and Draft SEIS do not account for the hydraulic impacts (and resulting costs) of a potential increase in the design height of the CCSB outlet weir.

Basis for Comment

Section 5.1.8 of Appendix B includes the assumption that the CCSB outlet weir will not be raised. This section also includes the assumption that the California DWR will continue to operate and maintain the CCSB as outlined in the CCSB O&M Manual. Since the O&M Manual reportedly calls for the outlet weir to be raised once the retained sediment reaches a prescribed level, the basis for the assumption in the Draft FR and Draft SEIS that the outlet weir would not be raised is unclear.

If the CCSB outlet weir were raised, the design water surface for the Cache Creek Levee would likely increase over a portion of the project, at least upstream to approximately Station 180+00 per Civil Design Plate 62. Any increase in the design water surface would require an increase in the top of levee elevation to maintain the same level of protection. An increase in the top of levee would result in higher costs for the same benefits.

Significance – Medium/High

An increase in the design height of the levee would lead to higher costs for the same benefits, resulting in a lower BCR for the TSP.

Recommendations for Resolution

1. Coordinate with the DWR to determine whether the intention is to raise the weir in the future, and, if so, to what extent.
2. If the weir is to be raised, account for the maximum potential weir raise in the hydraulic model of the TSP.
3. Use the model results to determine the updated design elevation of the levees.
4. Revise costs based on the new design height.

Final Panel Comment 2

Total project costs may be underestimated because no costs were included for pump station improvements or for sediment removal upstream of the new inlet weir to the CCSB.

Basis for Comment

In Section 4.2 of the Draft FR, the Internal Drainage subsection indicates that the design of culverts, sluice gates, and associated systems has not been fully developed and will be optimized during later phases of the project.

Draft FR Appendix D, Cost Engineering Report, does not provide sufficient detail to determine how much cost was included in the project estimate for internal drainage-related items. Gates and pump station improvements, if needed, have the potential to increase costs significantly.

Section 3.7 of Appendix D indicates that operations, maintenance, repair, rehabilitation, and replacement (OMRR&R) costs for the project were based on average annual routine costs per mile of levee and channel. The planned ponding upstream of the proposed new inlet weir to the CCSB would cause sedimentation in this area that would likely need to be removed at some point during the life of the project. Given the unusual nature of the project (i.e., the significant ponding area and depth), the Panel does not believe that these average annual routine costs per mile include the cost of sediment removal.

Significance – Medium

Project costs could be greater than estimated, potentially resulting in a different preferred alternative.

Recommendations for Resolution

1. Determine the excess pumping capacity of the existing pump station and compare that to the planned storage volume to determine if additional pumping capacity would be needed. Include additional costs as necessary.
2. Review the included costs for the gates and culverts to verify that appropriate costs are included, and review as necessary.
3. Include OMRR&R costs related to periodic sediment removal from the planned ponding area upstream of the proposed inlet weir to the CCSB.

Final Panel Comment 3

The methods used for data collection, as described in the environmental analysis, are not always clear.

Basis for Comment

All environmental analyses must first identify existing (pre-project) resources. In the Lower Cache Creek decision documents, the pre-project resources are described clearly, but the methods by which these data were acquired are not always described equally clearly.

Some methods are briefly described, but not adequately. For example, the methods used for mapping Waters of the United States (WOUS) and Land Use-Land Cover (LULC) are incomplete. The decision documents state that data for WOUS were collected using a walking survey, while the data for LULC were collected using a vehicular survey. In both cases, the data were superimposed onto aerial photographs. However, there is too little information about the methods used and accuracy of the data (and related data products) to allow a full and complete review and subsequent assessment of the adequacy of both datasets.

Other data collection methods are not described at all. For example, the results of the Phase I Environmental Site Assessment (ESA) are reported, but the methods of data collection and analysis are said to be available in Section 3.2.5 of the 2003 DFR/DEIS-EIR, which was neither provided nor readily available.

Significance – Medium/Low

The lack of completeness and clarity regarding the methods of data collection makes it difficult to assess both the adequacy of the methods and the validity of the conclusions drawn based upon the subsequent analyses.

Recommendations for Resolution

1. Provide a complete description of the methods used to map the WOUS, including how data were collected in the field and how these data were used to create maps that were superimposed onto the aerial photographs, then estimate the accuracy of the final data products.

2. Provide a complete description of the methods used to map the LULC, including how data were collected in the field and how these data were used to create maps that were superimposed onto the aerial photographs, then estimate the accuracy of the final data products.

3. Either provide a complete description of the methods used in the Phase I ESA, or include the full Phase I ESA in an appendix.

Final Panel Comment 4

The methods used in the environmental analysis to analyze impacts do not fully address unavoidable impacts under the TSP or fully describe the proposed mitigation of such impacts.

Basis for Comment

Impact analyses are required to (1) determine how impacts can be avoided or minimized, and (2) identify which (if any) impacts are unavoidable. Assuming the data collection was adequate, then the Lower Cache Creek decision documents adequately describe how impacts are avoided and minimized. However, the documents do not clearly quantify unavoidable impacts.

Few models were used to evaluate the environmental impacts for the existing conditions, the future without-project conditions, and the alternatives conditions. The H&H models could have been used, especially in assessing the potential impacts to resources in the CCSB under the TSP. There are expected increases in the depths of standing water, durations of inundation, and/or velocities of flowing water. These increases might have environmental impacts on resources in the CCSB, including WOUS. There also are conditional or functional assessment models available that can be used to quantify change in condition or function, many written into guidance such as USACE's Final 2015 Regional Compensatory Mitigation and Monitoring Guidelines (USACE, 2015). However, instead of using a model, a simple rule-based quality assessment approach was employed, without explaining the reason for its use or describing how it was used (e.g., in setting mitigation ratios).

Significance – Medium/Low

Mitigation approaches, including mitigation ratios, typically follow from a clear quantification of the unavoidable impacts under the TSP. Without this information, it is difficult to assess the adequacy of the proposed mitigation.

Recommendations for Resolution

1. Clearly quantify the direct and indirect unavoidable impacts under the TSP.
2. Clearly explain how the quantification of the direct and indirect unavoidable impacts due to the TSP are used to justify the mitigation strategy, including the mitigation ratios.

Literature Cited

USACE (2015). Final 2015 Regional Compensatory Mitigation and Monitoring Guidelines. U.S. Army Corps of Engineers South Pacific Division. January 12.

Final Panel Comment 5

The justification for the use of mitigation banks in general to address mitigation, and the proposed mitigation banks in particular, is not clear.

Basis for Comment

The Draft FR and Draft SEIS make recommendations regarding the use of mitigation banks, but the documents are not clear on how those recommendations were reached.

The assumption that mitigation banks in general are sufficient for most mitigation needs is not adequately supported. According to the Draft SEIS, Appendix H, the 2003 DFR/DEIS-EIR proposed on-site, in-kind mitigation. In the Draft FR and Draft SEIS, almost all mitigation is off-site, in-kind in mitigation banks. This approach represents a major shift in mitigation strategy that requires a clear explanation. If this is just a matter of policy (e.g., USACE and EPA, 2008), then this simply needs to be stated clearly.

The assumption that the selected mitigation banks in particular are adequate for the identified mitigation needs is not adequately justified. The mitigation banks selected are all approximately 50 miles from the unavoidable impacts of the TSP. A service area is never defined, so it is not clear whether the unavoidable impacts of the TSP and the selected mitigation banks are in the same service area. Even if they are, the reasons for bypassing nearby mitigation banks are not explicitly stated.

In any case, the broader context of the entire system is not clearly discussed. The unavoidable impacts of the TSP are in the Cache Creek watershed, which is a subset of the Sacramento River watershed, which is a subset of the Bay-Delta watershed. The decision documents do not explain how unavoidable impacts in the Cache Creek watershed would fit into the broader context of similar resources in the Bay-Delta watershed, and how mitigation approximately 50 miles away in both the Sacramento River and San Joaquin watersheds adequately mitigates for unavoidable impacts at Lower Cache Creek.

Significance – Medium/Low

The lack of completeness and clarity regarding the selection of the mitigation approach, including the specific mitigation banks selected, makes it difficult to assess whether the proposed mitigation strategy for unavoidable impacts under the TSP would be effective.

Recommendations for Resolution

1. Justify the use of mitigation banks as opposed to on-site, in-kind mitigation. If this is just a matter of policy (e.g., USACE and EPA, 2008), then this simply needs to be stated clearly.
2. Justify the selection of the specific mitigation banks, including the defined service area and the reasons for bypassing nearby mitigation banks and selecting more remote mitigation banks.
3. Explain the mitigation strategy in a broader systems context, including why unavoidable impacts in the Cache Creek watershed are being mitigated for by mitigation occurring approximately 50 miles away in the Sacramento River and San Joaquin watersheds.

Literature Cited

USACE and EPA (2008). Compensatory Mitigation for Losses of Aquatic Resources, Final Rule. Department of Defense, Department of the Army Corps of Engineers, 33 CFR Parts 325 and 332 and Environmental Protection Agency, 40 CFR Part 230. Federal Register Vol. 73, No. 70. Accessed February 4, 2020 at: https://www.epa.gov/sites/production/files/2015-03/documents/2008_04_10_wetlands_wetlands_mitigation_final_rule_4_10_08.pdf

Final Panel Comment 6

It is unclear why several thousand feet of cutoff wall is being included in the project when no seepage in the area was noted during the March 2019 highwater event and USACE design guidelines indicate that seepage remediation is not required.

Basis for Comment

Section 7 of Appendix C states that the area of the proposed cutoff wall has no history of past seepage. Supplemental information consisting of a memorandum by MBK Engineers does not indicate any seepage in this area during the March 2019 highwater event (MBK Engineers, 2019).

Section 7.2 of Appendix C indicates that the seepage exit gradients are less than 0.5 for all water surface elevations when the landside ditch was modeled full of water. Section 7.2 of Appendix C also indicates that the cutoff wall is being included as required by Underwriters Laboratories Environment (ULE) protocols. The use of more stringent ULE protocols may have resulted in an overly ambitious design.

The Panel is aware of no USACE design guidance, such as Engineer Manual (EM) 1110-2-1913 (USACE, 2000) or Engineer Technical Letter (ETL) 1110-2-569 (USACE, 2005), that requires landside ditches to be empty during seepage analysis. In actuality, it is the Panel's experience that ditches are typically analyzed full since that is the most common condition for the ditches during highwater events. The use of more stringent ULE protocols may have resulted in an overly ambitious design.

Significance – Medium/Low

Analyses have been completed using criteria other than USACE criteria, resulting in higher project costs.

Recommendations for Resolution

1. Revise the required project features to include only those required by USACE design guidelines.

Literature Cited

MBK Engineers (2019). Memorandum Documentation of Huff's Corner Flood Fight, submitted to Elisa Sabatini, Yolo County, March 13, 2019.

USACE (2005). Design Guidance for Levee Underseepage. Engineer Technical Letter (ETL) 1110-2-569, Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. May 1.

USACE (2000). Design and Construction of Levees. Engineer Manual (EM) 1110-2-1913. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. April 30.

Final Panel Comment 7

The Draft FR and Draft SEIS do not clearly state whether the cost of purchasing flood easements for land with increased flooding under the future with-project condition is included in the cost estimates and BCR assessment.

Basis for Comment

Hydraulics and Civil Design Plates 79 to 86 indicate that properties north of the proposed levee would be subject to increased flood potential as a result of the project. The Draft FR and Draft SEIS specifies that flowage easements were included for alternatives that alter the flow path of flood flows. However, it is unclear if costs associated with easements for mitigating increased flood potential on neighboring property owners within existing flow paths have been included in the cost estimate of the TSP.

A number of public comments were submitted with concerns regarding increased floodwater on their farmland.

Significance – Medium/Low

This comment includes costs potentially not considered, which could result in a lower BCR under the TSP and other alternatives.

Recommendations for Resolution

1. Determine if flood easements of the impacted properties were considered for the TSP.
2. If flood easements have not been included, estimate costs for the flood easements and revise costs in the Draft FR and Draft SEIS.
3. Clarify in the Draft FR and Draft SEIS how flood impacts to neighboring properties would be mitigated.

Final Panel Comment 8

The Draft FR and Draft SEIS does not explain why information on Interstate 5 (I-5) traffic and on surrounding agricultural resources to support the analysis of alternatives has been deferred to the next project phase.

Basis for Comment

The Draft FR and Draft SEIS states that a description of the I-5 traffic, as well as a report on the agricultural analysis, will be provided in later phases of the study. However, the analysis of alternatives in Sections 2.1 and 2.2 would be strengthened by providing at least preliminary information at this time.

Significance – Low

Providing preliminary information on I-5 traffic and on surrounding agricultural resources would better set the stage for a more complete evaluation in the next phase of the project.

Recommendations for Resolution

1. Explain why information on I-5 traffic and agricultural resources will be added in the next phase.
2. Determine the approach to each topic study.
3. Provide, at minimum, a brief discussion on the rationale and scope of these studies in the Draft FR and Draft SEIS.

5. REFERENCES

MBK Engineers (2019). Memorandum Documentation of Huff's Corner Flood Fight, submitted to Elisa Sabatini, Yolo County, March 13, 2019.

OMB (2004). Final Information Quality Bulletin for Peer Review. Executive Office of the President, Office of Management and Budget, Washington, D.C. Memorandum M-05-03. December 16.

The National Academies (2003). Policy on Committee Composition and Balance and Conflicts of Interest for Committees Used in the Development of Reports. The National Academies (National Academy of Science, National Academy of Engineering, Institute of Medicine, National Research Council). May 12.

USACE (2018). Water Resources Policies and Authorities: Review Policy for Civil Works. Engineer Circular (EC) 1165-2-217. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. February 20.

USACE (2015). Final 2015 Regional Compensatory Mitigation and Monitoring Guidelines. U.S. Army Corps of Engineers South Pacific Division. January 12.

USACE (2005). Design Guidance for Levee Underseepage. Engineer Technical Letter (ETL) 1110-2-569, Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. May 1.

USACE (2000). Design and Construction of Levees. Engineer Manual (EM) 1110-2-1913. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. April 30.

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APPENDIX A

IEPR Process for the Lower Cache Creek FS Project

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A.1 Planning and Conduct of the Independent External Peer Review (IEPR)

Table A-1 presents the major milestones and deliverables for the IEPR of the Lower Cache Creek, Yolo County, Woodland Area, California, Feasibility Study (hereinafter: Lower Cache Creek FS IEPR). Due dates for milestones and deliverables are based on the award/effective date listed in Table A-1. The review documents were provided by U.S. Army Corps of Engineers (USACE) on December 18, 2019. Note that the actions listed under Task 6 occur after the submission of this report. Battelle anticipates submitting the pdf printout of the USACE's Design Review and Checking System (DrChecks) project file (the final deliverable) on May 12, 2020. The actual date for contract end will depend on the date that all activities for this IEPR are conducted and subsequently completed.

Table A-1. Major Milestones and Deliverables of the Lower Cache Creek FS IEPR

Task	Action	Due Date
1	Award/Effective Date	5/21/2019
	Review documents available	12/18/2019
	Public comments available	2/18/2020
	Battelle submits draft Work Plan[a]	6/4/2019
	USACE provides comments on draft Work Plan	6/24/2019
	Battelle submits final Work Plan[a]	12/12/2019
2	Battelle submits list of selected panel members[a]	6/10/2019
	USACE confirms the panel members have no COI	6/26/2019
3	Battelle convenes kick-off meeting with USACE	6/17/2019
	Battelle convenes kick-off meeting with panel members	12/18/2019
	Battelle convenes kick-off meeting with USACE and panel members	12/18/2019
4	Panel members complete their individual reviews	1/21/2020
	Panel members provide draft Final Panel Comments to Battelle	1/31/2020
	Battelle sends public comments to panel members for review	2/19/2020
	Panel confirms one additional Final Panel Comment is necessary with regard to the public comments	2/26/2020
	Panel finalizes Final Panel Comments	2/27/2020
5	Battelle submits Final IEPR Report to USACE[a]	3/9/2020
6[b]	Battelle convenes Comment Response Teleconference with panel members and USACE	4/27/2020
	Battelle submits pdf printout of DrChecks project file[a]	5/12/2020
	Agency Decision Milestone (ADM) meeting[c]	6/30/2020
	Contract End/Delivery Date	8/31/2020

[a] *Deliverable.*
[b] *Task 6 occurs after the submission of this report.*
[c] *The ADM meeting was listed in the Performance Work Statement under Task 3 but was relocated in this schedule to reflect the chronological order of activities.*

At the beginning of the Period of Performance for the Lower Cache Creek FS IEPR, Battelle held a kick-off meeting with USACE to review the preliminary/suggested schedule, discuss the IEPR process, and address any questions regarding the scope (e.g., terminology to use, access to DrChecks, etc.). Any revisions to the schedule were submitted as part of the final Work Plan. The final charge consisted of 16 charge questions provided by USACE, two overview questions and one public comment question added by Battelle (all questions were included in the draft and final Work Plans), and general guidance for the Panel on the conduct of the peer review (provided in Appendix C of this final report).

Prior to beginning their review and after their subcontracts were finalized, all the members of the Panel attended a kick-off meeting via teleconference planned and facilitated by Battelle in order to review the IEPR process, the schedule, communication procedures, and other pertinent information for the Panel. Battelle planned and facilitated a second kick-off meeting via teleconference during which USACE presented project details to the Panel. Before the meetings, the IEPR Panel received an electronic version of the final charge, as well as the review documents and reference/supplemental materials listed in Table A-2.

Table A-2. Documents to Be Reviewed and Provided as Reference/Supplemental Information

Review Documents	No. of Review Pages
Lower Cache Creek Draft Feasibility Report	117
Supplemental Environmental Impact Statement (include appendices and matrix of public comments)	262 + 450
Engineering Appendix (includes civil, geotechnical, cost)	353
Real Estate Appendix	36
Economics Appendix	30
Total Number of Review Pages	**1,248**
Public Comments [a]	**747**

[a] *Supporting documentation only. These documents are not for Panel review and should be used as information sources only. They are not included in the total page count.*

In addition to the materials provided in Table A-2, the panel members were provided the following USACE guidance documents.

- Review Policy for Civil Works (EC 1165-2-217, February 20, 2018)
- Office of Management and Budget's Final Information Quality Bulletin for Peer Review (December 16, 2004)
- Foundations of SMART Planning

- Feasibility Study Milestones (PB 2018-01, September 30, 2018 and PB 2018-01(S), June 20, 2019)
- SMART – Planning Overview
- Planning Modernization Fact Sheet
- USACE Climate Change Adaptation Plan (2015)

About halfway through the review, Battelle submitted 14 panel member questions to USACE. USACE was able to provide written responses to all the questions prior to the end of the review.

A.2 Review of Individual Comments

The Panel was instructed to address the charge questions/discussion points within a charge question response form provided by Battelle. At the end of the review period, the Panel produced individual comments in response to the charge questions/discussion points. Battelle reviewed the comments to identify overall recurring themes, areas of potential conflict, and other overall impressions. At the end of the review, Battelle summarized the individual comments into a preliminary list of overall comments and discussion points. Each panel member's individual comments were shared with the full Panel.

A.3 IEPR Panel Teleconference

Battelle facilitated a teleconference with the Panel so that the panel members could exchange technical information. The main goal of the teleconference was to identify which issues should be carried forward as Final Panel Comments in the Final IEPR Report and decide which panel member should serve as the lead author for the development of each Final Panel Comment. This information exchange ensured that the Final IEPR Report would accurately represent the Panel's assessment of the project, including any conflicting opinions. The Panel engaged in a thorough discussion of the overall positive and negative comments, added any missing issues of significant importance to the findings, and merged any related individual comments. At the conclusion of the teleconference, Battelle reviewed each Final Panel Comment with the Panel, including the associated level of significance, and confirmed the lead author for each comment.

A.4 Preparation of Final Panel Comments

Following the teleconference, Battelle distributed a summary memorandum for the Panel documenting each Final Panel Comment (organized by level of significance). The memorandum provided the following detailed guidance on the approach and format to be used to develop the Final Panel Comments for the Lower Cache Creek FS IEPR:

- Lead Responsibility: For each Final Panel Comment, one panel member was identified as the lead author responsible for coordinating the development of the Final Panel Comment and submitting it to Battelle. Battelle modified lead assignments at the direction of the Panel. To assist each lead in the development of the Final Panel Comments, Battelle distributed a summary email detailing each draft final comment statement, an example Final Panel Comment following the four-part structure described below, and templates for the preparation of each Final Panel Comment.

- Directive to the Lead: Each lead was encouraged to communicate directly with the other panel members as needed and to contribute to a particular Final Panel Comment. If a significant

comment was identified that was not covered by one of the original Final Panel Comments, the appropriate lead was instructed to draft a new Final Panel Comment.

- Format for Final Panel Comments: Each Final Panel Comment was presented as part of a four-part structure:
  1. Comment Statement (succinct summary statement of concern)
  2. Basis for Comment (details regarding the concern)
  3. Significance (high, medium/high, medium, medium/low, and low; see description below)
  4. Recommendation(s) for Resolution (see description below).
- Criteria for Significance: The following were used as criteria for assigning a significance level to each Final Panel Comment:
  1. **High:** There is a fundamental issue within study documents or data that will influence the technical or scientific basis for selection of, justification of, or ability to implement the recommended plan.
  2. **Medium/High:** There is a fundamental issue within study documents or data that has a strong probability of influencing the technical or scientific basis for selection of, justification of, or ability to implement the recommended plan.
  3. **Medium:** There is a fundamental issue within study documents or data that has a low probability of influencing the technical or scientific basis for selection of, justification of, or ability to implement the recommended plan.
  4. **Medium/Low:** There is missing, incomplete, or inconsistent technical or scientific information that affects the clarity, understanding, or completeness of the study documents, and there is uncertainty whether the missing information will affect the selection of, justification of, or ability to implement the recommended plan.
  5. **Low:** There is a minor technical or scientific discrepancy or inconsistency that affects the clarity, understanding, or completeness of the study documents but does not influence the selection of, justification of, or ability to implement the recommended plan.
- Guidelines for Developing Recommendations: The recommendation section was to include specific actions that USACE should consider to resolve the Final Panel Comment (e.g., suggestions on how and where to incorporate data into the analysis, how and where to address insufficiencies, areas where additional documentation is needed).

Battelle reviewed and edited the Final Panel Comments for clarity, consistency with the comment statement, and adherence to guidance on the Panel's overall charge, which included ensuring that there were no comments regarding either the appropriateness of the selected alternative or USACE policy. At the end of this process, eight Final Panel Comments were prepared and assembled. There was no direct communication between the Panel and USACE during the preparation of the Final Panel Comments. The full text of the Final Panel Comments is presented in Section 4.2 of the main report.

A.5 Conduct of the Public Comment Review

Following the schedule in Table A-1, Battelle received one Excel spreadsheet and three pdf files containing 747 pages of public comments on the Lower Cache Creek FS project from USACE. The files include public comments on the 2019 Lower Cache Creek Draft FR and Draft SEIS, public scoping comments from 2015, and public comments on the 2003 Draft Feasibility Report and Environmental Impact Statement/Environmental Impact Report (DFR/DEIS-EIR). Battelle then sent the public comments to the panel members in addition to the following charge question:

1. **Do the public comments raise any additional discipline-specific technical concerns with regard to the overall report?**

The Panel produced individual comments in response to the charge question. Each panel member's individual comments for the public comment review were shared with the full Panel. Battelle reviewed the comments to identify any new technical concerns that had not been previously identified during the initial IEPR. The panel members confirmed that one new Final Panel Comment would be developed to summarize the additional issue raised by the IEPR Panel. One panel member was identified by Battelle as the lead author responsible for coordinating the development of the Final Panel Comment and submitting it to the other panel members and Battelle. The Final Panel Comment was developed as part of the four-part structure following guidance previously described in Section A.4.

Battelle reviewed and edited the Final Panel Comment for clarity, consistency with the comment statement, and adherence to guidance on the Panel's overall charge, which included ensuring that the comment did not make any observations regarding either the appropriateness of the selected alternative or USACE policy. There was no direct communication between the Panel and USACE during the preparation of the Final Panel Comment.

A.6 Final IEPR Report

After concluding the review and preparation of the Final Panel Comments, Battelle prepared a final IEPR report (this document) on the overall IEPR process and the IEPR panel members' findings. Each panel member and Battelle technical and editorial reviewers reviewed the IEPR report prior to submission to USACE for acceptance.

A.7 Comment Response Process

As part of Task 6, Battelle will enter the eight Final Panel Comments developed by the Panel into USACE's DrChecks, a Web-based software system for documenting and sharing comments on reports and design documents, so that USACE can review and respond to them. USACE will provide responses (Evaluator Responses) to the Final Panel Comments, and the Panel will respond (BackCheck Responses) to the Evaluator Responses. All USACE and Panel responses will be documented by Battelle. Battelle will provide USACE and the Panel a pdf printout of all DrChecks entries, through comment closeout, as a final deliverable and record of the IEPR results.

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APPENDIX B

Identification and Selection of IEPR Panel Members for the Lower Cache Creek FS Project

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B.1 Panel Identification

The candidates for the Independent External Peer Review (IEPR) of the Lower Cache Creek, Yolo County, Woodland Area, California, Feasibility Study (hereinafter: Lower Cache Creek FS IEPR) Panel were evaluated based on their technical expertise in the following key areas: planning formulation/economics, environmental compliance, hydrologic and hydraulic (H&H) engineering, and geotechnical engineering. These areas correspond to the technical content of the review documents and overall scope of the Lower Cache Creek FS project.

To identify candidate panel members, Battelle reviewed the credentials of the experts in Battelle's Peer Reviewer Database, sought recommendations from colleagues, contacted former panel members, and conducted targeted Internet searches. Battelle evaluated these candidate panel members in terms of their technical expertise and potential conflicts of interest (COIs). Of these candidates, Battelle chose the most qualified individuals, confirmed their interest and availability, and ultimately selected four experts for the final Panel. The remaining candidates were not proposed for a variety of reasons, including lack of availability, disclosed COIs, or lack of the precise technical expertise required.

Candidates were screened for the following potential exclusion criteria or COIs. These COI questions were intended to serve as a means of disclosure in order to better characterize a candidate's employment history and background. Battelle evaluated whether scientists in universities and consulting firms that are receiving USACE-funding have sufficient independence from USACE to be appropriate peer reviewers. Guidance in OMB (2004, p. 18) states,

> "…when a scientist is awarded a government research grant through an investigator-initiated, peer-reviewed competition, there generally should be no question as to that scientist's ability to offer independent scientific advice to the agency on other projects. This contrasts, for example, to a situation in which a scientist has a consulting or contractual arrangement with the agency or office sponsoring a peer review. Likewise, when the agency and a researcher work together (e.g., through a cooperative agreement) to design or implement a study, there is less independence from the agency. Furthermore, if a scientist has repeatedly served as a reviewer for the same agency, some may question whether that scientist is sufficiently independent from the agency to be employed as a peer reviewer on agency-sponsored projects."

The term "firm" in a screening question referred to any joint venture in which a firm was involved. It applied to any firm that serves in a joint venture, either as a prime or as a subcontractor to a prime. Candidates were asked to clarify the relationship in the screening questions.

Panel Conflict of Interest (COI) Screening Questionnaire for the IEPR of the Lower Cache Creek, Yolo, County, Woodland Area, California, Feasibility Study
1. Previous and/or current involvement by you or your firm in the Lower Cache Creek, Yolo, County, Woodland Area, California, Feasibility Study (hereinafter: Lower Cache Creek FS) and related projects.
2. Previous and/or current involvement by you or your firm in flood control in the Lower Cache Creek area.

Panel Conflict of Interest (COI) Screening Questionnaire for the IEPR of the Lower Cache Creek, Yolo, County, Woodland Area, California, Feasibility Study
3. Previous and/or current involvement by you or your firm in the conceptual or actual design, construction, or operation and maintenance (O&M) of any projects in the Lower Cache Creek area.
4. Current employment by the U.S. Army Corps of Engineers (USACE).
5. Previous and/or current involvement with paid or unpaid expert testimony related to Lower Cache Creek.
6. Previous and/or current employment or affiliation with the non-Federal sponsors or any of the following cooperating Federal, State, County, local and regional agencies, environmental organizations, and interested groups *(for pay or pro bono):* • State of California Central Valley Flood Protection Board • Yolo County Flood Control Water Conservation District • City of Woodland • California Department of Water Resources (DWR).
7. Past, current, or future interests or involvement (financial or otherwise) by you, your spouse, or your children related to Yolo County, California.
8. Current personal involvement with other USACE projects, including whether involvement was to author any manuals or guidance documents for USACE. If yes, provide titles of documents or description of project, dates, and location (USACE district, division, Headquarters, Engineer Research and Development Center [ERDC], etc.), and position/role. Please highlight and discuss in greater detail any projects that are specifically with the Sacramento District.
9. Previous or current involvement with the development or testing of models that will be used for, or in support of, the Lower Cache Creek FS project.
10. Current firm involvement with other USACE projects, specifically those projects/contracts that are with the Sacramento District. If yes, provide title/description, dates, and location (USACE district, division, Headquarters, ERDC, etc.), and position/role. Please also clearly delineate the percentage of work you personally are currently conducting for the Sacramento District. Please explain.
11. Any previous employment by USACE as a direct employee, notably if employment was with the Sacramento District. If yes, provide title/description, dates employed, and place of employment (district, division, Headquarters, ERDC, etc.), and position/role.
12. Any previous employment by USACE as a contractor (either as an individual or through your firm) within the last 10 years, notably if those projects/contracts are with the Sacramento District. If yes, provide title/description, dates employed, and place of employment (district, division, Headquarters, ERDC, etc.), and position/role.

Panel Conflict of Interest (COI) Screening Questionnaire for the IEPR of the Lower Cache Creek, Yolo, County, Woodland Area, California, Feasibility Study
13. Previous experience conducting technical peer reviews. If yes, please highlight and discuss any technical reviews concerning flood risk management, and include the client/agency and duration of review (approximate dates).
14. Pending, current, or future financial interests in contracts/awards from USACE related to the Lower Cache Creek FS project.
15. Significant portion of your personal or office's revenues within the last three years came from USACE contracts.
16. Significant portion of your personal or office's revenues within the last three years came from State of California Central Valley Flood Protection Board and Yolo County Flood Control and Water Conservation District contracts.
17. Any publicly documented statement (including, for example, advocating for or discouraging against) related to the Lower Cache Creek FS project.
18. Participation in relevant prior and/or current Federal studies related to the Lower Cache Creek FS project.
19. Previous and/or current participation in prior non-Federal studies related to the Lower Cache Creek FS project.
20. Has your research or analysis been evaluated as part of the Lower Cache Creek FS project?
21. Is there any past, present, or future activity, relationship, or interest (financial or otherwise) that could make it appear that you would be unable to provide unbiased services on this project? If so, please describe.

Providing a positive response to a COI screening question did not automatically preclude a candidate from serving on the Panel. For example, participation in previous USACE technical peer review committees and other technical review panel experience was included as a COI screening question. A positive response to this question could be considered a benefit.

B.2 Panel Selection

In selecting the final members of the Panel, Battelle chose experts who best fit the expertise areas and had no COIs. Table B-1 provides information on each panel member's affiliation, location, education, and overall years of experience. Battelle established subcontracts with the panel members when they indicated their willingness to participate and confirmed the absence of COIs through a signed COI form. USACE was given the list of candidate panel members, but Battelle selected the final Panel.

Table B-1. Lower Cache Creek FS IEPR Panel: Summary of Panel Members

Name	Affiliation	Location	Education	P.E.	Exp. (yrs)
Plan Formulation / Economics					
Ken Casavant	Independent consultant	Pullman, WA	Ph.D. Agricultural Economics	N/A	~50
Environmental Compliance Specialist					
Mark Rains	University of South Florida	Temple Terrace, FL	Ph.D., Hydrologic Sciences	N/A	27
Hydrology and Hydraulic Engineering					
Steven Brown	Hanson Professional Services, Inc	Springfield, IL	B.S., Civil/Environmental Engineering	Yes	12
Geology / Geotechnical Engineering					
Michael Lambert	Independent consultant	Pulaski, TN	M.E., Geotechnical Engineering	Yes	30

Table B-2 presents an overview of the credentials of the final four members of the Panel and their qualifications in relation to the technical evaluation criteria. More detailed biographical information on the panel members and their areas of technical expertise is given in Section B.3.

Table B-2. Lower Cache Creek FS IEPR Panel: Technical Criteria and Areas of Expertise

Technical Criterion	Casavant	Rains	Brown	Lambert
Plan Formulation / Economics				
Minimum 15 years of demonstrated experience in economics and planning	X			
M.S. degree or higher	X			
Very familiar with USACE plan formulation process, procedures, and standards	X			
Familiarity with evaluation of alternative plans for Flood Risk Management Feasibility Studies	X			
Familiarity with USACE standards and procedures	X			
Experience related to evaluating traditional Civil Works plan benefits associated with Feasibility Studies, to include experience in USACE methodologies for determining the economic benefit-cost and cost effectiveness of alternatives	X			

Table B-2. Lower Cache Creek FS IEPR Panel: Technical Criteria and Areas of Expertise (continued)

Technical Criterion	Casavant	Rains	Brown	Lambert
Environmental Compliance Specialist				
B.S. degree or higher in a related field (biologist or ecologist)		X		
Experience directly related to environmental compliance and should have extensive knowledge of the following: agriculture, wetlands, and riparian habitats		X		
Demonstrated experience working with National Environmental Policy Act (NEPA) impact assessments		X		
Hydrologic and Hydraulic (H&H) Engineer				
Registered professional engineer			X	
Extensive experience in hydrologic and hydraulic engineering			X	
Experienced with all aspects of hydrology and hydraulic engineering including: hydrology; urban hydrology and hydraulics; open-channel systems; effects of management practices and low-impact development on hydrology; design of earthen dams, levees, and detention ponds; floodplain mapping; use of non-structural systems as they apply to flood-proofing, warning systems, and evacuation			X	
Must be experienced with 1D and 2D hydraulic modeling software			X	
Specialized experience in river engineering, erosion and sedimentation, levee channels, and floodplains			X	
Familiarity with rivers with water control structures and dredging projects			X	
Geotechnical Engineer				
Senior-level geotechnical engineer with extensive experience				X
Minimum of 15 years in the field of geotechnical engineering related to the analysis, design, and construction of levees and/or dams, including rehabilitations of these structures				X
Knowledge and experience in failure mode analysis, risk assessment of embankments, evaluation of risk reduction measures, and construction experience in remediation measures (seepage berms, relief wells, cutoff walls, etc…) for dam and/or levee projects				X
Working knowledge of all applicable USACE design criteria				X
Registered professional engineer (P.E.) and, also preferably, a registered Geotechnical Engineer (G.E.)				X

B.3 Panel Member Qualifications

Detailed biographical information on each panel member's credentials, qualifications, and areas of technical expertise is summarized in the following paragraphs.

Name	**Ken Casavant, Ph.D.**
Role	**Planning Formulator / Economist**
Affiliation	**Independent Consultant**

Dr. Casavant is a professor and economist at the School of Economic Sciences at Washington State University, Director of the Freight Policy Transportation Institute, and adjunct professor at North Dakota State's Upper Great Plains Transportation Institute. He earned his Ph.D. in agricultural economics from Washington State University in 1971. Dr. Casavant has nearly 50 years of experience as an economist, with expertise in flood risk management plan formulation assignments—particularly, the evaluation and comparison of alternative plans for numerous flood risk management projects, including Cap Section 205 projects. He has served as an economic consultant detailing the tradeoffs necessary on several multi-objective public works projects, most recently on studies of the deep-draft national and international maritime industry and flood risk management.

Dr. Casavant is very familiar with USACE plan formulation processes, procedures, and standards. He has more than 15 years of experience in plan formulation, evaluation, and comparison of alternative plans for numerous flood risk projects, navigation studies (lock replacement), ecosystem restoration projects, and feasibility studies, including his technical reviews of the Lower Columbia River Channel Deepening Project, the Upper Mississippi and Illinois Navigation Study, the Barataria Basin Barrier Shoreline Restoration Study, and the Mississippi River Gulf Outlet Ecosystem Restoration Plan, many of which included flood risk management requirements. The Mississippi-Illinois system project was a navigation lock system replacement project that included coastal inland waterway system needs. For the Lower Columbia River project, Dr. Casavant analyzed the costs of deep-draft shipping and the impacts of those costs on the project. The supply chains and alternative movements of maritime steam ships were a focal point of the analyses. For the Delaware River Main Channel Deepening Project, he assessed and documented the benefits of the project. For the Upper Mississippi and Illinois Navigation Study, he examined alternative shipping flows, including shallow and deep draft, and performed benefits calculations as part of the economic evaluation.

Dr. Casavant has worked with USACE methodologies for cost effectiveness/incremental cost analysis and has a detailed knowledge of USACE standards and procedures, including the Institute for Water Resource (IWR) Planning Suite. As an economist or a combined Civil Works planner/economist for USACE IEPRs, he has studied and evaluated alternative plans for navigation lock replacement projects as well as navigation/dredging projects, such as the Savannah Harbor Expansion Project General Re-evaluation Report. Over the last 10 years, he has worked on 13 USACE projects for which he has applied USACE standards and procedures, including the IWR Planning Suite methodologies, with a focus on effective and efficient ecological and natural sustained output per dollar of relevant expenditure for alternative project formulations. He has applied the USACE six-step planning process, which is governed by Engineer Regulation (ER) 1105-2-100, Planning Guidance Notebook, during his work as a technical reviewer and peer reviewer on more than 20 projects, such as the Port of Iberia Channel Deepening Project in 2006 for USACE; the External Independent Economic Opinion on Identifying and Measuring

NED Benefits: Navigation Shipping; and the Morganza to the Gulf IEPR study, a hurricane protection and storm damage risk project.

Dr. Casavant has experience identifying, reviewing, and evaluating impacts on environmental resources from structural flood risk and impacts related to hurricane and coastal storm damage risk reduction projects. As part of other IEPRs, he has reviewed assessments prepared using Hydrologic Engineering Center-Flood Damage Reduction Analysis (HEC-FDA) software, HEC Life Loss/Direct Damage Estimate (HEC-LifeSim) simulation software, and/or HEC Flood Impact Analysis (HEC-FIA) software. Whether reviewing risk assessments developed using Monte Carlo evaluations or traditional risk models in the IWR Planning Suite, he has broad and applied experience working with risk-informed approaches to decision making. The six most recent projects he has contributed to had critical components concerning the impacts of environmental resources from flood risk and coastal storm damage. He has also been a plan formulator expert on Louisiana Water Resources Council IEPRs; several of the projects under review had a specific objective to evaluate the damage reduction and the risk associated with achieving benefits from flood risk management, and one project focused specifically on the impact on shorelines.

Dr. Casavant has published more than 70 journal articles and has contributed to hundreds of written documents, including chapters in books, books, abstracts, proceedings, professional materials, conference papers, and research bulletins, circulars, and reports. He is a member of numerous professional associations, such as the Transportation Research Board–National Research Council, the International Agricultural Economics Association, and the Logistics and Physical Distribution Association.

Name	**Mark Rains, Ph.D.**
Role	**Environment Compliance Specialist**
Affiliation	**University of South Florida**

Dr. Rains is a Professor of Geology and the Director of the School of Geosciences at the University of South Florida, the President of Coshow Environmental, Inc., and the Associate Editor of Wetland and Watershed Hydrology for the Journal of the American Water Resources Association. He earned his B.A. in Ecology, Behavior, and Evolution from the University of California at San Diego in 1990, his M.S. in Forestry (Wetland Ecology) from the University of Washington in 1994, and his Ph.D. in Hydrologic Sciences (River and Wetland Ecohydrology) from the University of California at Davis in 2002. He also is a licensed Professional Wetland Scientist. He has more than 27 years of experience in the public and private sectors in the science, policy, and management of wetlands and rivers, including extensive experience in the functional assessment, restoration, and management of degraded wetlands and rivers in agricultural settings.

Dr. Rains has worked full time in academia continuously since 2003, conducting research focused on hydrological connectivity, the role that hydrological connectivity plays in governing ecosystem structure and function, and the role that science plays in informing water-related law, policy, and decision-making. He has published nearly 50 peer-reviewed articles that have been cited nearly 1,500 times. He has worked throughout North, Central, and South America and in the Caribbean Basin and is particularly well known for his work on vernal pools, geographically isolated wetlands that are particularly prevalent in the agricultural landscapes in the Great Central Valley of California. He is a nationally acknowledged and award-winning expert on the role of science in the Clean Water Act (CWA), especially in regard to the definition of "Waters of the United States," having served on the U.S. Environmental Protection Agency's

Science Advisory Board charged with reviewing the scientific underpinnings of the definition of "Waters of the United States" outlined in the 2015 Clean Water Rule proposed by the Obama Administration.

Dr. Rains has also worked as a consultant in the private sector since 1993—full-time from 1993-1997 and part-time since 1997. He specializes in issues related to National Environmental Policy Act (NEPA), the Endangered Species Act (ESA), and the CWA and related programs, with his work resulting in both peer-reviewed papers and technical reports. He worked closely with the national team developing and implementing the Hydrogeomorphic Approach to Functional Assessment (HGM) nationwide, being lead or co-author on HGM guidebooks throughout the nation, including the Northern Prairie, California, and Alaska. He is recognized as an expert on matters related to wetlands in agricultural landscapes, including serving as an expert witness for the U.S. Department of Justice on multiple cases related to vernal pools in the agricultural landscapes in the Great Central Valley of California. One such case, heard by the Supreme Court of the United States, helped define the scope of normal farming practices in wetlands (*Borden Ranch Partnership and Angelo K. Tsakopoulos, Petitioners, v. United States Army Corps of Engineers and Environmental Protection Agency*, 537 U.S. 99 [2002]).

Dr. Rains' familiarity with Midwestern U.S. river ecology is reflected in both his consulting and research as well as his involvement as the Environmental expert on the Programmatic Environmental Impact Statement for the Mechanical Creation and Maintenance of Emergent Sandbar Habitat on the Upper Missouri River USACE IEPR. He is familiar with changes in river function and processes resulting from the implementation of flood risk management measures and has authored numerous peer-reviewed papers and technical papers on river hydrology, geomorphology, and ecohydrology.

Name	**Steven Brown, P.E., CFM**
Role	**Hydrology and Hydraulic Engineer**
Affiliation	**Hanson Professional Services, Inc**

Mr. Brown has 12 years of experience as a civil engineer responsible for hydraulics studies/analyses, site hydrology, storm sewer systems design, roadway drainage design, and hydraulic modeling for bridges and flow control structures. He has a B.S.in civil/environmental engineering and is a professional engineer (P.E.) in Indiana and Illinois. He is also a Certified Floodplain Manager in Illinois.

Mr. Brown is experienced with the Sedimentation and River Hydraulics 2D (SRH-2D) modeling software and has used his knowledge to train Illinois Department of Transportation staff in its use for bridge projects. The class covered topics ranging from basic 2D modeling concepts from mesh generation and optimization to modeling bridge piers and pressure flow conditions. Mr. Brown developed the 2D modeling for the proposed configuration, developed all course materials, and delivered the presentations related to the proposed configuration. Class participants were provided class materials, model solutions, and references as a guide to future projects using SRH-2D.

For the Lake Decatur Dam Spillway Structure Repairs and Emergency Action Plan, Decatur, Illinois, Mr. Brown developed a HEC-Hydrologic Modeling System (HEC-HMS) model of the reservoir and watershed using Hydrometeorological Report-51 (HMR-51) and HMR-52 to develop Probable Maximum Flood (PMF) hydrographs. He also developed HEC-RAS 1D and 2D models used for semi-quantitative risk assessment of dam failure over a range of flood events up to the PMF and development of inundation mapping. He helped produce flood risk maps of the downstream infrastructure to aid the city in warning

and evacuating residents in the event of a dam failure. He also helped the city and emergency responders coordinate emergency action plans.

In support of Lake Bloomington and Evergreen Lake Dam Breach Modeling, Emergency Action Plans and Federal Emergency Management Agency (FEMA) Letter of Map Revision (LOMR), Bloomington, Illinois, he conducted hydraulic modeling of the flow over the dam spillways and downstream inundation areas. The project included topographic survey of the dams and hydraulic survey of channels and bridge structures to develop HEC-RAS modeling of Money Creek to define the floodway and floodplain boundaries in preparation of the LOMR submittal to FEMA. Other hydraulic components include development of an unsteady flow model of the Mackinaw River to route dam breach flows from both lakes and produce breach inundation mapping and structure identification in support of an emergency action plan (EAP) and operation and maintenance (O&M) manuals. Hydrology components of the project include calculations in HEC-HMS for the 700-square-mile Mackinaw River basin. The HEC-Statistical Software Package (HEC-SSP) was used to analyze gage data via Bulletin 17B and calibrate the model to the gages. Nexrad data were also utilized in the calibration effort. The project included preparation of design plans for a bridge deck replacement, structural repairs at each dam, and underwater investigations of both dam faces. In addition to updating the FEMA map, he performed dam breach analyses of both dams and generated flood risk maps to aid the City in flood warning and evacuation efforts.

Mr. Brown was the hydraulic engineer responsible for models and the permit package for the Komatsu Manufacturing Facility Illinois River Levee Raise, Design and Permitting, Peoria, Illinois. The project designed and permitted a levee system improvement that included a 1- to 6-foot earthen levee raise and construction of two floodgates at Komatsu's Peoria Manufacturing Operations facility along the Illinois River in Peoria. Modeling efforts included river modeling as well as interior drainage design to develop FEMA floodplain map elements. He also helped develop an EAP for the levee district.

Mr. Brown conducted water balance modeling that analyzed different alternatives to develop a supplemental water supply for a new flue gas desulphurization system (scrubber) at a Central Illinois Reservoir. The investigation included the feasibility of using existing water supplies from nearby cities, ground water sources (including the abandoned coal mine underlying the plant area), the Mississippi River, surface water possibilities (including new lakes and dams), perched impoundments, raising the existing lake, pumping from a nearby creek, and possible combinations of different alternatives.

For the Vistra East Fork Shoal Creek Pump Station and Gate Structure, Coffeen, Illinois, Mr. Brown worked as a civil engineer responsible for laying out erosion control measures and creating various exhibits, as well as conducting a water supply study of Coffeen Lake that accounted for additional water from the gate pumping and various other potential options to increase available water supply in the lake.

Mr. Brown worked on the Cedar Rapids Flood Protection System–West Side Phase I, Cedar Rapids, Iowa, as a Geographic Information System (GIS) designer responsible for conceptual design of the alignment of the flood protection system for the west side of the Cedar River in Cedar Rapids. The flood risk reduction system consisted of earthen levees, floodwalls, demountable floodwalls, combination floodwalls, road and railroad closure structures, pump station analysis, and critical infrastructure penetrations of the net levee section. He was part of a team responsible for the geotechnical, structural, and hydraulic design of the system using USACE design criteria.

For the South Suburban Airport (SSA) Tier 2 Master Plan and Environmental Impact Statement Floodplain Study, Will County, Illinois, Mr. Brown was the hydraulics engineer in charge of establishing

detailed flood profile information regarding the water features that existed within the limits of the proposed SSA for the waterway study limits as approved by the Federal Aviation Administration (FAA) for Rock Creek. Specifically, 100-year floodplain limits were developed for all water features that were currently indicated as unnumbered Zone A floodplain within the approved FAA study limits. In addition, existing land use and stream system conditions (channel alignment, cross section shape, channel roughness, and hydraulic structure characteristics) were evaluated.

Mr. Brown was the H&H engineer for the BNSF Railroad Embankment Washouts, near Chillicothe, Illinois (various locations). This project focused on emergency repair and analysis of a Crow Creek flooding event which severely eroded the existing channel banks and formed a new cut-off channel immediately adjacent to an existing rail embankment. The creek was modeled in HEC-RAS with available hydrology information and at various locations where the rail embankment was damaged. Project analysis included an evaluation of the flood event to determine the cause of the damage and design of erosion control measures to prevent future damage to existing rail infrastructure. The project included the design of a rock ramp to isolate normal creek flows from the new cut-off channel.

Mr. Brown is a member of the Association of State Dam Safety Officials, Illinois Society of Professional Engineers, American Society of Civil Engineers, and Illinois Association of Floodplain and Stormwater Management.

Name	**Michael Lambert, P.E.**
Role	**Geotechnical Engineer**
Affiliation	**Independent Consultant**

Mr. Lambert is an independent consultant with more than 30 years of direct geotechnical and soil engineering experience. As a former geotechnical engineer with Shannon and Wilson, Inc., he oversaw site investigations, developed geotechnical-related design and construction recommendations, developed and reviewed project plans and specifications, and monitored compliance with project plans and specifications. He earned his M.E. in civil engineering from the University of Louisville in 1988, and is a registered P.E. in Missouri, Arkansas, Oregon, Tennessee, and California.

Mr. Lambert has been involved with pre-construction flood risk management projects such as Howard Bend Levee, Missouri; Yakima River Levee, Washington; and the Missouri Bottom Levee System, Missouri. Post-construction flood risk management projects include St. Louis City Flood Wall Evaluation; Stockton, California, Levee Evaluation/Design for the Department of Water Resources (DWR); Lewiston, Idaho, Levee; Chesterfield Levee, Missouri; East St. Louis Flood Protection Project, Illinois; Marine Corps Base Camp Pendleton Air Station Levee, California; City of Reedsport Levee, Oregon; and Coweeman Levee, Washington. For each of these projects, design activities were conducted in accordance with USACE methods and criteria. In addition, risk and fragility analysis concepts were considered as part of each project.

Mr. Lambert is experienced with the geotechnical aspects of urban levees, floodwalls, earthen levees, and channel structures along large river systems, including the Mississippi River, Ohio River, Missouri River, and Illinois River. Relevant urban levee projects have included support for the Howard Bend Levee System in Maryland Heights, Missouri, and the City of St. Louis Floodwall along the Mississippi River. He has also performed inspections for more than 484 miles of USACE levees and over 56 miles of U.S. Bureau of Reclamation irrigation canals. His experience with floodwall design and construction is

demonstrated by the Howard Bend Levee System in Maryland Heights. As senior geotechnical engineer and project manager, he was responsible for reconstruction and upgrading to provide protection from a 500-year flood event. The flood protection system included earthen levee floodwalls, closure structures, and a pump station. Engineering and design evaluations of channel structures conducted by Mr. Lambert include several locks and dams (L&D) along the Mississippi River (L&D 25 and Mel Price), and Ohio River (Olmsted, L&D 52, L&D 53, Canelton Lock, and Markland Lock).

All of these projects, including the non-USACE projects, were completed in accordance with USACE guidance, including USACE's safety assurance review policy and guidance and applicable risk assessment methodology. Mr. Lambert has served on the Type I IEPR for the Phase II Post-Authorization Decision Documents for the Sacramento River Bank Protection Project, California; the Delaware River Basin Comprehensive Flood Risk Management Interim Feasibility Study and Integrated Environmental Assessment for New Jersey, New Jersey; and multiple Type II IEPR teams for levee projects, including two projects for the Chesterfield-Monarch Levee, six projects for the Wood River Levee System, and one project for the mainline Mississippi River Levee in Tunica, Mississippi.

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APPENDIX C

Final Charge for the Lower Cache Creek FS IEPR

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Charge Questions and Guidance to the Panel Members for the Independent External Peer Review (IEPR) of the Lower Cache Creek, Yolo County, Woodland Area, California, Feasibility Study

This is the final Charge to the Panel for the Lower Cache Creek FS IEPR. This final Charge was submitted to USACE as part of the final Work Plan, originally submitted on December 12, 2019. The dates and page counts in this document have not been updated to match actual changes made throughout the project.

BACKGROUND

The Cache Creek is a west side tributary of the Sacramento River near Sacramento, California. The primary study area encompasses the City of Woodland, the town of Yolo, and surrounding agricultural areas. The main stem of Cache Creek originates with the outflows of Clear Lake in the Coast Range Mountains of Northern California. The north fork of Cache Creek is impounded by Indian Valley Dam and joins the main stem above Capay Valley before flowing out of the foothills into California's Central Valley. Water in the creek only reaches the Woodland area at certain times of year due to upstream retention and diversions for water supply. The channel then passes north of the City of Woodland through levees constructed by United States Army Corps of Engineers (USACE) in 1958 as part of the Federally authorized Sacramento River Flood Control Project. The leveed portion of Cache Creek discharges into the Cache Creek Settling Basin (CCSB), which was also constructed by USACE as a separately authorized component of the Sacramento River Flood Control Project. Cache Creek has historically carried a large sediment load. The settling basin was constructed to prevent sediment carried by Cache Creek from adversely affecting the hydraulic capacity of the Yolo Bypass through excessive sediment deposition and thereby increasing the flood risk of the City of Sacramento. Water from the CCSB flows over a concrete weir and discharges into the Yolo Bypass.

There is a risk to human life and safety in the City of Woodland, town of Yolo, and surrounding areas from flooding of Lower Cache Creek. Floodwaters from Lower Cache Creek create a significant life safety risk by inundating roadways from city streets to Interstate 5, which creates hazards for motorists and isolates citizens from critical facilities such as hospitals. Additionally, flooding from Lower Cache Creek poses a risk of economic damage to property and critical infrastructure within the City of Woodland, town of Yolo, and surrounding areas. The anticipated damageable property (structures and contents) is $1.3 billion (October 2018 price levels) and the average annual damages are expected to range from $20.7 million to $27.5 million over the 50-year period of analysis. Damages are concentrated in an industrial area in northeastern Woodland, southwest of the CCSB.

The threat of flooding to the City of Woodland includes potential impacts on both residential and commercial property, disruption of two major transportation routes (Interstate 5 and the Union Pacific Railroad), and impacts on agricultural production. Federal Interest was identified in a 2003 USACE draft feasibility study, and potential damages in the project area have grown in the intervening 15 years owing to an increase in population and value of damageable property in the study area.

OBJECTIVES

The objective of this work is to conduct an independent external peer review (IEPR) of the Lower Cache Creek, Yolo County, Woodland Area, California, Feasibility Study (hereinafter: Lower Cache Creek IEPR) in accordance with the Department of the Army, USACE, Water Resources Policies and Authorities' *Review Policy for Civil Works* (Engineer Circular [EC] 1165-2-217, dated February 20, 2018), and the

Office of Management and Budget's (OMB's) *Final Information Quality Bulletin for Peer Review* (December 16, 2004). Peer review is one of the important procedures used to ensure that the quality of published information meets the standards of the scientific and technical community. Peer review typically evaluates the clarity of hypotheses, validity of the research design, quality of data collection procedures, robustness of the methods employed, appropriateness of the methods for the hypotheses being tested, extent to which the conclusions follow from the analysis, and strengths and limitations of the overall product.

The purpose of the IEPR is to "assess the adequacy and acceptability of the economic and environmental assumptions and projections, project evaluation data, economic analyses, environmental analyses, engineering analyses, formulation of alternative plans, methods for integrating risk and uncertainty, models used in evaluation of economic or environmental impacts, and any biological opinions" (EC 1165-2-217; p. 39) for the decision documents. The IEPR will be limited to technical review and will not involve policy review. The IEPR will be conducted by subject matter experts (i.e., IEPR panel members) who meet the technical criteria and areas of expertise required for and relevant to the project.

The Panel will be "charged" with responding to specific technical questions as well as providing a broad technical evaluation of the overall project. Per EC 1165-2-217 (p. 41), review panels should identify, explain, and comment upon assumptions that underlie all the analyses, as well as evaluate the soundness of models, surveys, investigations, and methods. Review panels should be able to evaluate whether the interpretations of analysis and the conclusions based on analysis are reasonable. Reviews should focus on assumptions, data, methods, and models. The panel members may offer their opinions as to whether there are sufficient analyses upon which to base a recommendation.

DOCUMENTS PROVIDED

The following is a list of documents, supporting information, and reference materials that will be provided for the review. The review assignments for the panel members may vary slightly according to discipline.

Review Documents	No. of Review Pages	Subject Matter Experts			
		Planning Formulator/ Economist	Environmental Compliance Specialist	H&H Engineer	Geotechnical Engineer
Lower Cache Creek Draft Feasibility Report	100	100	100	100	100
Supplemental Environmental Impact Statement (include appendices and matrix of public comments)	250	250	250	250	250
Engineering Appendix (include civil, geotechnical, cost)	300	0	0	300	300
Real Estate Appendix	15	15	15	0	0
Economics Appendix	50	50	0	0	0
Public Comments [a]	100	100	100	100	100
Total Number of Review Pages	**815**	**515**	**465**	**750**	**750**

[a] Page count for public comments is approximate. USACE will submit public comments to Battelle, which will in turn submit the comments to the IEPR Panel.

Documents for Reference

- Review Policy for Civil Works (EC 1165-2-217, February 20, 2018)
- Office of Management and Budget's Final Information Quality Bulletin for Peer Review (December 16, 2004)
- Foundations of SMART Planning
- Feasibility Study Milestones (PB 2017-01, January 10, 2017)
- SMART – Planning Overview
- Planning Modernization Fact Sheet
- USACE Climate Change Adaptation Plan (June 2015)

SCHEDULE & DELIVERABLES

This schedule is based on the receipt date of the final review documents and may be revised if review document availability changes. This schedule may also change due to circumstances out of Battelle's control such as changes to USACE's project schedule and unforeseen changes to panel member and USACE availability. As part of each task, the panel member will prepare deliverables by the dates indicated in the table (or as directed by Battelle). All deliverables will be submitted in an electronic format compatible with MS Word (Office 2003).

Task	Action	Due Date
Attend Meetings and Begin Peer Review	Subcontractors complete mandatory Operations Security (OPSEC) training	1/17/2020
	Battelle sends review documents to panel members	12/19/2019
	Battelle convenes kick-off meeting with panel members	12/18/2019
	Battelle convenes kick-off meeting with USACE and panel members	12/18/2019
	Battelle convenes mid-review teleconference for panel members to ask clarifying questions of USACE	1/14/2020
Prepare Final Panel Comments and Review Publics Comments	Panel members complete their individual reviews	1/21/2020
	Battelle provides talking points for Panel Review Teleconference to panel members	1/23/2020
	Battelle convenes Panel Review Teleconference	1/24/2020
	Battelle provides Final Panel Comment templates and instructions to panel members	1/27/2020
	Panel members provide draft Final Panel Comments to Battelle	1/31/2020
	Battelle provides feedback to panel members on draft Final Panel Comments; panel members revise Final Panel Comments	2/01/2020 - 2/09/2020
	Panel finalizes Final Panel Comments	2/10/2020

Task	Action	Due Date
Prepare Final Panel Comments and Review Publics Comments	Battelle receives public comments from USACE	2/17/2020
	Battelle sends public comments to Panel	2/19/2020
	Panel completes its review of public comments	2/24/2020
	Battelle and Panel review the Panel's responses to the charge question regarding the public comments	2/25/2020
	Panel drafts Final Panel Comment for public comments, if necessary	2/27/2020
	Panel finalizes Final Panel Comment regarding public comments, if necessary	3/2/2020
Review Final IEPR Report	Battelle provides Final IEPR Report to panel members for review	3/4/2020
	Panel members provide comments on Final IEPR Report	3/6/2020
	*Battelle submits Final IEPR Report to USACE	3/10/2020
	USACE Planning Center of Expertise (PCX) provides decision on Final IEPR Report acceptance	3/17/2020
Comment/ Response Process	Battelle inputs Final Panel Comments to Design Review and Checking System (DrChecks) and provides Final Panel	3/19/2020
	Battelle convenes teleconference with USACE to review the Comment Response process	3/19/2020
	Battelle convenes teleconference with Panel to review the Comment Response process	3/19/2020
	USACE Project Delivery Team (PDT) provides draft Evaluator Responses to USACE PCX for review	4/9/2020
	USACE PCX reviews draft Evaluator Responses and works with USACE PDT regarding clarifications to responses, if needed	4/15/2020
	USACE PCX provides draft PDT Evaluator Responses to Battelle	4/16/2020
	Battelle provides draft PDT Evaluator Responses to panel members	4/20/2020
	Panel members provide draft BackCheck Responses to Battelle	4/23/2020
	Battelle convenes teleconference with panel members to discuss draft BackCheck Responses	4/24/2020
	Battelle convenes Comment Response Teleconference with panel members and USACE	4/27/2020
	USACE inputs final PDT Evaluator Responses to DrChecks	5/4/2020
	Battelle provides final PDT Evaluator Responses to panel members	5/5/2020

Task	Action	Due Date
	Panel members provide final BackCheck Responses to Battelle	5/8/2020
	Battelle inputs panel members' final BackCheck Responses to DrChecks	5/11/2020
	*Battelle submits pdf printout of DrChecks project file	5/12/2020
ADM	Agency Decision Milestone (ADM) Meeting	6/30/2020
	Contract End/Delivery Date (extension needed from USACE for ADM)	5/31/2020

***** Deliverables

****** Battelle will provide public comments to panel members after they have completed their individual reviews of the project documents to ensure that the public comment review does not bias the Panel's review of the project documents.

CHARGE FOR PEER REVIEW

Members of this IEPR Panel are asked to determine whether the technical approach and scientific rationale presented in the decision documents are credible and whether the conclusions are valid. The Panel is asked to determine whether the technical work is adequate, competently performed, and properly documented; satisfies established quality requirements; and yields scientifically credible conclusions. The Panel is being asked to provide feedback on the economic, engineering, environmental resources, and plan formulation. The panel members are not being asked whether they would have conducted the work in a similar manner.

Specific questions for the Panel (by report section or appendix) are included in the general charge guidance, which is provided below.

General Charge Guidance

Please answer the scientific and technical questions listed below and conduct a broad overview of the decision documents. Please focus your review on the review materials assigned to your discipline/area of expertise and technical knowledge. Some sections have no questions associated with them; however, you may still comment on them. Please feel free to make any relevant and appropriate comment on any of the sections and appendices you were asked to review. In addition, please note that the Panel will be asked to provide an overall statement related to 2 and 3 below per USACE guidance (EC 1165-2-217).

1. Your response to the charge questions should not be limited to a "yes" or "no." Please provide complete answers to fully explain your response.

2. Assess the adequacy and acceptability of the economic and environmental assumptions and projections, project evaluation data, and any biological opinions of the project study.

3. Assess the adequacy and acceptability of the economic analyses, environmental analyses, engineering analyses, formulation of alternative plans, methods for integrating risk and uncertainty, and models used in evaluating economic or environmental impacts of the proposed project.

4. If appropriate, offer opinions as to whether there are sufficient analyses upon which to base a recommendation.

5. Identify, explain, and comment upon assumptions that underlie all the analyses, as well as evaluate the soundness of models, surveys, investigations, and methods.

6. Evaluate whether the interpretations of analysis and the conclusions based on analysis are reasonable.

7. Please focus the review on assumptions, data, methods, and models.

Please **do not** make recommendations on whether a particular alternative should be implemented, or whether you would have conducted the work in a similar manner. Also, please **do not** comment on or make recommendations on policy issues and decision making. Comments should be provided based on your professional judgment, **not** the legality of the document.

1. If desired, panel members can contact one another. However, panel members **should not** contact anyone who is or was involved in the project, prepared the subject documents, or was part of the USACE Agency Technical Review (ATR).

2. Please contact the Battelle Project Manager/Program Manager (Lynn McLeod; mcleod@battelle.org) for requests or additional information.

3. In case of media contact, notify the Battelle Program Manager, Lynn McLeod (mcleod@battelle.org) immediately.

4. Your name will appear as one of the panel members in the peer review. Your comments will be included in the Final IEPR Report, but will remain anonymous.

Please submit your comments in electronic form to the Project Manager, no later than 10 pm ET by the date listed in the schedule above.

Independent External Peer Review of the Lower Cache Creek, Yolo County, Woodland Area, California Feasibility Study

Charge Questions and Relevant Sections as Supplied by USACE

The following Review Charge to Reviewers outlines the objectives of the Independent External Peer Review (IEPR) for the subject study and identifies specific items for consideration for the IEPR Review Panel.

The objective of the IEPR is to obtain an independent evaluation of whether the interpretations of analysis and conclusions based on analysis are reasonable for the subject study. The IEPR Review Panel is requested to offer a broad evaluation of the overall study decision document in addition to addressing the specific technical and scientific questions included in the Review Charge. The Review Panel has the flexibility to bring important issues to the attention of decision makers, including positive feedback or issues outside those specific areas outlined in the Review Charge. The Review Panel can use all available information to determine what scientific and technical issues related to the decision document may be important to raise to decision makers. This includes comments received from agencies and the public as part of the public review process.

The Panel review is to focus on scientific and technical matters, leaving policy determinations for USACE and the Army. The Panel should not make recommendations on whether a particular alternative should be implemented or present findings that become “directives” in that they call for modifications or additional studies or suggest new conclusions and recommendations. In such circumstances the Review Panel would have assumed the role of advisors as well as reviewers, thus introducing bias and potential conflict in their ability to provide objective review.

Panel review comments are to be structured to fully communicate the Panel’s intent by including the comment, why it is important, any potential consequences of failure to address, and suggestions on how to address the comment.

The Review Panel is asked to consider the following items as part of its review of the decision document and supporting materials.

Broad Evaluation Charge Questions

1. Is the need for and intent of the decision document clearly stated?

2. Does the decision document adequately address the stated need and intent relative to scientific and technical information?

Given the need for and intent of the decision document, assess the adequacy and acceptability of the following:

3. Project evaluation data used in the study analyses

4. Economic, environmental, and engineering assumptions that underlie the study analyses

5. Economic, environmental, and engineering methodologies, analyses, and projections

6. Models used in the evaluation of existing and future without-project conditions and of economic or environmental impacts of alternatives

7. Methods for integrating risk and uncertainty

8. Formulation of alternative plans and the range of alternative plans considered

9. Quality and quantity of the surveys, investigations, and engineering sufficient for conceptual design of alternative plans

10. Overall assessment of significant environmental impacts and any biological analyses.

Further,

11. Evaluate whether the interpretations of analysis and the conclusions based on analysis are reasonable.

12. Assess the considered and tentatively selected alternatives from the perspective of systems, including systemic aspects being considered from a temporal perspective, including the potential effects of climate change.

For the tentatively selected plan, assess whether:

13. The models used to assess life safety hazards are appropriate

14. The assumptions made for the life safety hazards are appropriate

15. The quality and quantity of the surveys, investigations, and engineering are sufficient for a concept design considering the life safety hazards and to support the models and assumptions made for determining the hazards

16. The analysis adequately addresses the uncertainty and residual risk given the consequences associated with the potential for loss of life for this type of project.

Battelle Summary Charge Questions to the Panel Members[1]

Summary Questions

17. Please identify the most critical concerns (up to five) you have with the project and/or review documents. These concerns can be (but do not need to be) new ideas or issues that have not been raised previously.

18. Please provide positive feedback on the project and/or review documents.

[1] Questions 17 through 19 are Battelle-supplied questions and should not be construed or considered part of the list of USACE-supplied questions. These questions were delineated in a separate appendix in the final Work Plan submitted to USACE.

Public Comment Questions

19. Do the public comments raise any additional discipline-specific technical concerns with regard to the overall report?

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APPENDIX D

Conflict of Interest Form

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David Kaplan
USACE, Institute for Water Resources
May 15, 2019
C-2

Conflicts of Interest Questionnaire

Independent External Peer Review
Lower Cache Creek, Yolo County,
Woodland Area, California, Feasibility Study

The purpose of this document is to help the U.S. Army Corps of Engineers identify potential organizational conflicts of interest on a task order basis as early in the acquisition process as possible. Complete the questionnaire with background information and fully disclose relevant potential conflicts of interest. Substantial details are not necessary; USACE will examine additional information if appropriate. Affirmative answers will not disqualify your firm from this or future procurements.

NAME OF FIRM: **Battelle Memorial Institute Corporate Operations**
REPRESENTATIVE'S NAME: **Courtney Brooks**
TELEPHONE: **614-424-5623**
ADDRESS: **505 King Avenue, Columbus, Ohio 43201**
EMAIL ADDRESS: **brooksc1@battelle.org**

I. INDEPENDENCE FROM WORK PRODUCT. Has your firm been involved in any aspect of the preparation of the subject study report and associated analyses (field studies, report writing, supporting research etc.) **No** Yes (if yes, briefly describe):

II. INTEREST IN STUDY AREA OR OUTCOME. Does your firm have any interests or holdings in the study area, or any stake in the outcome or recommendations of the study, or any affiliation with the local sponsor? **No** Yes (if yes, briefly describe):

III. REVIEWERS. Do you anticipate that all expert reviewers on this task order will be selected from outside your firm? No **Yes** (if no, briefly describe the difficulty in identifying outside reviewers):

IV. AFFILIATION WITH PARTIES THAT MAY BE INVOLVED WITH PROJECT IMPLEMENTATION. Do you anticipate that your firm will have any association with parties that may be involved with or benefit from future activities associated with this study, such as project construction? **No** Yes (if yes, briefly describe):

V. ADDITIONAL INFORMATION. Report relevant aspects of your firm's background or present circumstances not addressed above that might reasonably be construed by others as affecting your firm's judgment. Please include any information that may reasonably: impair your firm's objectivity; skew the competition in favor of your firm; or allow your firm unequal access to nonpublic information.

No additional information to report.

Courtney M. Brooks

Courtney Brooks

May 15, 2019

Date

Use or disclosure of data contained on this sheet is subject to the restriction on the title page of this proposal

BATTELLE

It can be done