Final Independent External Peer Review Report Chatfield Storage Reallocation Study and Environmental Impact Statement

Prepared by
Battelle Memorial Institute

Prepared for
Department of the Army
U.S. Army Corps of Engineers
Water Management and Reallocation Planning Center of Expertise
Southwestern Division

Contract No. W912HQ-10-D-0002
Task Order: 0006
October 25, 2011

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505 King Avenue
Columbus, OH 43201

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FINAL
INDEPENDENT EXTERNAL PEER REVIEW REPORT
for the

Chatfield Storage Reallocation Study and Environmental Impact Statement
EXECUTIVE SUMMARY

Project Background and Purpose

The Chatfield Dam and Lake Project was originally authorized in 1950 for flood control, silt control, recreation, fish and wildlife, and water supply storage. The primary purpose of the project, in conjunction with the Cherry Creek and Bear Creek reservoirs (also known as the Tri-Lakes), is to protect the Denver Metro area from catastrophic floods that have devastated the area periodically. Congress authorized the U.S. Army Corps of Engineers (USACE) to conduct a reallocation study of Chatfield Lake for joint flood control and conservation purposes, including storage for municipal and industrial water supply, agriculture, and recreation and fishery habitat protection and enhancement. This study was authorized under Section 808 of the Water Resources Development Act of 1986 and the River and Harbor Act of 1958 (Title III, Water Supply Act of 1958, as amended).

The purpose of and need to reallocate a portion of the flood control pool to water supply is to increase availability of water, sustainable over the 50-year period of analysis, in the greater Denver area so that a larger proportion of existing and future (increasing) water needs can be met. From a sustainability standpoint, the sponsor is specifically interested in opportunities to increase surface water supply without the development of significant amounts of new infrastructure in order to reduce their reliance on non-renewable non-tributary groundwater (NTGW). Chatfield Dam has been identified as an important potential source of water storage due to its ideal location on the mainstem of the South Platte River.

While many alternatives were considered and screened from further analysis, the alternatives considered in detail in the Chatfield Reallocation Study are:

1. Construction of Penley Reservoir combined with gravel pit storage
2. Continued reliance on NTGW combined with gravel pit storage
3. Chatfield Lake reallocation from flood control pool to allow an additional 20,600 acre-feet of water supply storage (12 ft increase in top of conservation pool, additional 587 acres inundated)
4. Chatfield Lake reallocation from flood control pool to allow an additional 7,700 acre-feet of water supply storage (5 ft increase in top of conservation pool, additional 215 acres inundated).

As there are significant social, economic, and environmental resources that will be affected by these alternatives (specifically recreational and ecological resources, including the endangered Preble's meadow jumping mouse), an Environmental Impact Statement (EIS) is being completed. While it is not anticipated that a reallocation at Chatfield Lake will create public

safety concerns or major controversy, the total implementation cost will be greater than $45 million (although 100% non-Federal cost) and the study has impacts of a significant enough nature to require an EIS, thus triggering an Independent External Peer Review (IEPR).

Independent External Peer Review Process

USACE is conducting an IEPR of the Chatfield Reservoir Storage Reallocation Feasibility Report and Environmental Impact Statement (FR/EIS) (hereinafter: Chatfield FR/EIS).

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 (2010). Battelle has experience in establishing and administering peer review panels for USACE and was engaged to coordinate the IEPR of the Chatfield FR/EIS. Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analyses. The IEPR was external to the agency and conducted following USACE and Office of Management and Budget (OMB) guidance described in USACE (2010), USACE (2007), and OMB (2004). This final report describes the IEPR process, describes the panel members and their selection, and summarizes the Final Panel Comments of the IEPR Panel (the Panel).

Four panel members were selected for the IEPR from more than 16 identified candidates. Based on the technical content of the Chatfield FR/EIS and the overall scope of the project, the final panel members were selected for their technical expertise in the following key areas: water supply planning, environmental science, hydrology and hydraulics engineering, and economics. USACE was given the list of candidate panel members, but Battelle made the final selection of the Panel.

The Panel received electronic versions of the Chatfield FR/EIS documents, totaling more than 2,250 pages, along with a charge that solicited comments on specific sections of the documents to be reviewed. The charge was prepared by USACE according to guidance provided in USACE (2010) and OMB (2004). Charge questions were provided by USACE and included in the draft and final Work Plans.

The USACE Project Delivery Team briefed the Panel and Battelle during a kick-off meeting held via teleconference prior to the start of the review. In addition to this teleconference, a teleconference with USACE, the Panel, and Battelle was held halfway through the review period to provide the Panel an opportunity to ask questions of USACE and clarify uncertainties. The Panel produced more than 130 individual comments in response to the 34 charge questions.

IEPR panel members reviewed the Chatfield FR/EIS documents individually. The panel members then met via teleconference with Battelle to review key technical comments, discuss charge questions for which there were conflicting responses, 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, or low); and (4) recommendations on how to resolve the comment. Overall, 27 Final Panel Comments were identified and documented. Of

these, 8 were identified as having high significance, 18 had medium significance, and 1 had low significance.

Results of the Independent External Peer Review

The panel members generally agreed among one another on their "assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used" (USACE, 2010; p. D-4) in the Chatfield FR/EIS; however, initially there was some disagreement among two panel members regarding how specific the purpose and need statement for the project should be. One panel member said that the purpose and need was sufficiently stated, while the second panel member said that it needed to be more specific because the purpose and need statement drives the development and screening of alternative concepts and the evaluation of alternatives for the selection of the preferred alternative. The second panel member also indicated that the development of the alternatives was based on a purpose and need that was too broad and did not capture the need for storage reallocation specifically at Chatfield Reservoir. In the end, the Panel defaulted to the expert opinion of the panel member who believes the purpose and need statement needs to be more specific.

The majority of issues identified are related to the planning process approach used for the screening of alternative concepts, the evaluation of alternatives, and the selection of the preferred alternative. Issues are presented regarding inconsistencies in screening and evaluation of alternatives, lack of consideration given to other viable alternatives, and impacts that could have been evaluated more thoroughly. Each issue has been presented separately in several Final Panel Comments. There may seem to be some redundancy in the Final Panel Comments since they are all related to the same general issues regarding application of sceening criteria and how alternatives are evaluated. However, the Panel has concluded that due to their individual significance, they should be reported as individual issues identified during the IEPR. Table ES-1 lists the Final Panel Comment statements by level of significance. The full text of the Final Panel Comments is presented in Appendix A of this report. The following statements summarize the Panel's findings.

Water Supply Planning: Generally, the Feasibility Report (FR)/Environmental Impact Statement (EIS) presents a viable way to reallocate flood pool storage for meeting water demands in the Denver area. The FR/EIS could provide more detail concerning the ability of the proposed project to meet the demands of the proponents. Information is lacking on how the proposed storage reallocation would help confirm the proponents' water supplies during sustained drought conditions such as those experienced in the 1950s, 1970s, and early 2000s. Also, more detail could have been presented in the FR/EIS to allow comparisons of water supply yields and reliability among the various alternatives.

Economics: The economic analysis overlooks less costly water supply alternatives and has some inconsistencies with U.S. Water Resources Council (WRC) Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (U.S. WRC, 1983). It is not clear why less costly water rights transfer alternatives were not brought forward as distinct alternatives considered in detail when such water rights transfers were included in three of the four alternatives considered in detail. This seems to undermine the

selection of Alternative 3 as the National Economic Development (NED) plan when there are more reliable water sources available for what appears to be half the per acre-foot (AF) costs of Alternative 3. Furthermore, the recreation economic analysis is not consistent with U.S. Water Resources Council Principles and Guidelines (U.S. WRC, 1983) for projects with this magnitude of recreation, nor is the use of least cost alternative for valuing agricultural water supply.

Engineering: The report clearly identifies the importance of maintaining the current level of flood protection for the Denver urban area. However, the potential for sediment deposition to impact the water supply and flood management benefits of the project requires specific information on the expected levels of sediment deposition; this information is not provided or discussed in the analysis. Also, reservoir routings of extreme flood events (1 in 100, 1 in 200, etc.) are not presented, and this information or an explanation of why this information is not used to project future conditions is important for reducing the uncertainty associated with conclusions regarding impacts on flood management.

Environmental: There was a high level of collaboration with various agency and non-agency stakeholders on the project-specific environmental issues. However, it seems that many environmental impacts that should have been considered were overlooked or not fully addressed. The selection of the preferred alternative also does not seem to consider minimization and avoidance of environmental impacts in keeping with the National Environmental Policy Act (NEPA).

Table ES-1. Overview of 27 Final Panel Comments Identified by the Chatfield IEPR Panel

No.	Final Panel Comment
Significance – High	
1	Statements regarding the purpose and need of the project appear to conflict and are not comprehensive in details on the reliability of suitable yield and time to achieve the project objectives.
2	The planning constraint to "avoid the acquisition of water rights owned by others" and the associated screening criteria LT1 may be too restrictive and may have resulted in prematurely eliminating viable alternatives from consideration.
3	The screening criteria related to water rights are not applied consistently to evaluate alternative concepts.
4	The purpose and need (PN1) and logistics and technology (LT1 and LT5) criteria are not consistently applied for the Penley Reservoir and Highland Ranch Reservoir in the screening analysis.
5	The evaluation of alternatives does not meet the study objective to avoid and minimize environmental impacts under NEPA.
6	The No Action Alternative for the alternatives analysis includes action alternatives at other sites rather than a future without project condition that only represents no reallocation at Chatfield Reservoir.
7	The benefit-cost analysis does not evaluate benefits of agricultural and municipal and industrial water supply uses separately.
8	Recreational value loss from Alternative 3 may be underestimated if nearby recreation sites do not have the capacity to accommodate displaced visitors.
9	Reliance on Unit Day Values instead of more appropriate regional or site-specific models and a very small sampling of recreation users may have resulted in substantial underestimation of the recreational losses from the Chatfield project.
Significance – Medium	
10	The geographic boundaries of the study area are not clearly defined and do not include the features of all of the alternatives presented.
11	Some terminology and conditions for the screening analysis are not clearly defined, and some screening criteria that should have been considered are not.
12	The FR/EIS does not include screening criteria that would eliminate reservoir deepening by sediment removal as an alternative to raising the elevation of the conservation pool.
13	No information is provided on storage capacity for several of the alternative concepts presented for screening analysis.
14	The environmental constraints do not appear to have been applied consistently across alternatives for the alternatives analysis.
15	The environmental constraints considered during the evaluation of alternatives do not take geological, ecological, socio-economic, and environmental justice impacts into account.
16	Some of the assumptions regarding aesthetic and recreational value are not fully explained, and it is not clear whether the same set of assumptions has been applied across the range of alternatives in the analysis.

No.	Final Panel Comment
17	It is not clear how much of the projected future water demand is to accommodate the existing service area demand and future growth and how much is to accommodate future expansion of the service area and new growth.
18	How water yield and reliability of the water supplies were determined for each of the alternatives is not explained in the FR/EIS.
19	The analysis of flood frequencies and flood control impacts may not accurately characterize larger floods or account for the potential impact due to the loss of flood control space.
20	The adaptive management considerations do not fully explore the potential impact of climate change on future conditions for the various alternatives.
21	Sediment accumulation over the life of the project and how it may affect pool levels are not evaluated.
22	It is not clear whether compensatory mitigation activities would create a wildlife hazard for aircraft.
23	The effects determinations outlined in Appendix V for the preferred alternative are not correctly stated or evaluated for certain Federally listed species.
24	The cumulative impacts analysis provided in the Biological Assessment is not consistent with statutory requirements outlined in Section 7 of the ESA.
25	The Ecological Functional Value (EFV) system and Habitat Suitability Indices (HSIs) seem to be subjective, do not have a clear link to ecological impacts, and may not accurately reflect changes in habitat quality.
26	EUTROMOD is not an appropriate model to use for assessing water quality issues for the project.
Significance – Low	
27	The difference between the operation elevation and elevation of the conservation pool for the preferred alternative as stated in Appendix S of the EIS is different from that in the main document.

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LIST OF ACRONYMS

AEP	Annual exceedence probability
AF	Acre- feet
ARO	Army Research Office
ASCE	American Society of Civil Engineers
ATR	Agency Technical Review
AWRA	American Water Resources Association
CDNR	Colorado Department of Natural Resources
CDOW	Colorado Division of Wildlife
CE	Categorical Exclusions
CE/ICA	Cost-Effectiveness/Incremental Cost Analysis
COI	Conflict of Interest
CVM	Contingent Valuation Method
CWA	Clean Water Act
CWCB	Colorado Water Conservation Board
DrChecks	Design Review and Checking System
DOT	Department of Transportation
EC	Engineering Circular
EFV	Ecological Functional Value
EIA	Environmental Impact Analysis
EIS	Environmental Impact Statement
ERDC	Engineering Research and Development Center
ESA	Endangered Species Act
FAA	Federal Aviation Authority
FR	Feasibility Report
HSI	Habitat Suitability Index
IEPR	Independent External Peer Review
IWR	Institute for Waters Resources
M&I	Municipal and industrial
MWSI	Metropolitan Water Supply Investigation
NED	National Economic Development
NEPA	National Environmental Policy Act
NREL	Natural Resource Ecology Laboratory
NTGW	Non-tributary groundwater
NTP	Notice to Proceed
NWI	National Wetland Inventory
NWR	National Wildlife Refuge
OEO	Outside Eligible Organization
OMB	Office of Management and Budget
OSE	Other Society Effects
PMJM	Preble's meadow jumping mouse
RED	Regional Economic Development
SFU	State Fish Unit
SMWSA	South Metro Water Supply Authority
SMWSS	South Metro Water Supply Study

SWSI	Statewide Water Supply Initiative
TCM	Travel Cost Method
UDV	Unit Day Values
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USFS	United States Forest Service
WCD	Water Conservancy District
WRC	Water Resources Council
WRDA	Water Resources Development Act
WSD	Water and Sanitation District

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1. INTRODUCTION

The Chatfield Dam and Lake Project was originally authorized in 1950 for flood control, silt control, recreation, fish and wildlife, and water supply storage. The primary purpose of the project, in conjunction with the Cherry Creek and Bear Creek reservoirs (also known as the Tri-Lakes), is to protect the Denver Metro area from catastrophic floods that have devastated the area periodically. Congress authorized the U.S. Army Corps of Engineers (USACE) to conduct a reallocation study of Chatfield Lake for joint flood control and conservation purposes, including storage for municipal and industrial water supply, agriculture, and recreation and fishery habitat protection and enhancement. This study was authorized under Section 808 of the Water Resources Development Act of 1986 and the River and Harbor Act of 1958 (Title III, Water Supply Act of 1958, as amended).

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The objective of the work described here was to conduct an IEPR of the Chatfield Reservoir Storage Reallocation Feasibility Report (FR) and Environmental Impact Statement (EIS) in accordance with procedures described in the Department of the Army, USACE Engineer

Circular *Civil Works Review Policy* (EC No. 1165-2-209) (USACE, 2010), USACE CECW-CP memorandum *Peer Review Process* (USACE, 2007), and Office of Management and Budget (OMB) bulletin *Final Information Quality Bulletin for Peer Review* (OMB, 2004). Battelle, as a 501(c)(3) non-profit science and technology organization with experience in establishing and administering peer review panels, was engaged to coordinate the IEPR of the Chatfield IEPR. Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analyses.

This final report details the IEPR process, describes the IEPR panel members and their selection, and summarizes the Final Panel Comments of the IEPR Panel on the existing environmental, economic, and engineering analyses contained in the Chatfield FR/EIS. The full text of the Final Panel Comments is presented in Appendix A.

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 (ATR), as described in USACE (2010) and USACE (2007).

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 economic, engineering, and environmental analysis 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 Chatfield FR/EIS was conducted and managed using contract support from Battelle, which is an Outside Eligible Organization (OEO) (as defined by EC No. 1165-2-209) under Section 501(c)(3) of the U.S. Internal Revenue Code with experience conducting IEPRs for USACE.

3. METHODS

This section describes the method followed in selecting members for the IEPR Panel (the Panel) and in planning and conducting the IEPR. The IEPR was conducted following procedures described by USACE (2010) and in accordance with USACE (2007) and OMB (2004) guidance. 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).

3.1 Planning and Schedule

The original contract for this IEPR was awarded May 14, 2010 through the Army Research Office (ARO) Scientific Services Program Contract, and Battelle immediately began planning activities, including recruiting experts for the review panel. However, these planning activities were discontinued immediately when Battelle was notified in July 2010 that there would be a

significant delay in the receipt of the review documents. As a result of this delay, USACE decided to terminate the ARO contract. The IEPR was restarted under the USACE, Institute for Waters Resources (IWR) contract on September 27, 2010 and has continued to be conducted under that contract. A kickoff teleconference meeting was held with USACE on October 8, 2010 to discuss the review process and schedule, and preparation to recruit experts for the review panel resumed, assuming that the review documents would become available June 1, 2010. Finalization of the review documents was delayed, and review documents were not available until August 15, 2011.

Because the original kick-off meeting was held more than 9 months prior to the actual start of the review due to the significant delay in receipt of the review documents, Battelle conducted a second kick-off meeting with USACE to review the preliminary/suggested schedule, discuss the IEPR process, and address any questions regarding the scope (e.g., clarify expertise areas needed for panel members). Any revisions to the schedule were submitted as part of the final Work Plan.

Table 1 defines the schedule followed in executing the IEPR. Due dates for milestones and deliverables are based on discussions with USACE regarding document availability (Table 1). The asterisks (*) indicate deliverables. Note that the work items listed in Task 7 occur after the submission of this report. Battelle will not enter the 27 Final Panel Comments developed by the Panel into USACE's Design Review and Checking System (DrChecks), a Web-based software system for documenting and sharing comments on reports and design documents, as is typically done for IEPRs and is specified in the USACE Statement of Work. Rather, USACE will review the Final Panel Comments in the Final IEPR Report and will provide written responses (Evaluator Responses) to the Final Panel Comments directly in the Final Panel Comment forms developed. The Panel will also respond (BackCheck Responses) to the Evaluator Responses directly in the Final Panel Comment forms. Battelle will maintain a record of all USACE and Panel responses.

Table 1. Chatfield IEPR Schedule

Task	Action	Due Date
1	**Award/Effective Date**	9/27/2010
	Review documents available	8/15/2011
	*Battelle submits draft Work Plan	7/29/2011
	USACE provides comments on draft Work Plan	8/5/2011
	Battelle convenes teleconference (if necessary)	8/5/2011
	*Battelle submits final Work Plan	8/10/2011
2	Battelle requests input from USACE on the COI questionnaire	7/18/2011
	USACE provides comments on COI questionnaire	7/20/2011
	*Battelle submits list of selected panel members	8/3/2011
	USACE confirms the panel members have no COI	8/4/2011
	Battelle completes subcontracts for panel members	8/16/2011
3	USACE provides charge to be included in Work Plan	7/26/2011
4	Battelle convenes second kick-off meeting with USACE[1]	7/19/2011
	Battelle sends review documents to Panel	8/16/2011
	USACE/Battelle convenes kickoff meeting with Panel	8/19/2011
5	Battelle convenes mid-review teleconference for Panel to ask clarifying questions of USACE	9/2/2011
	Panel members complete their individual reviews	9/19/2011
	Battelle provides Panel merged individual comments and talking points for Panel Review Teleconference	9/23/2011
	Panel members provide draft Final Panel Comments to Battelle	10/4/2011
6	***Battelle submits Final IEPR Report to USACE**	**10/25/2011**
7	Battelle convenes teleconference with USACE to review the Comment Response Process	10/27/2011
	USACE provides draft Evaluator Responses to Battelle	11/8/2011
	Battelle convenes teleconference with Panel and USACE to discuss Final Panel Comments and draft responses	11/21/2011
	USACE provides final Evaluator Responses in Final Panel Comment Forms	12/7/2011
	Panel provides BackCheck Responses in Final Panel Comment Forms	12/21/2011
	*Battelle submits pdf of Final Panel Comment Forms	12/22/2011
	Contract End/Delivery Date	2/29/2012

Deliverables are noted with an asterisk (*)

[1]The initial kickoff meeting with Battelle and USACE was on October 8, 2010 after the contract award on September 27, 2010.

3.2 Identification and Selection of IEPR Panel Members

The candidates for the Panel were evaluated based on their technical expertise in the following key areas: water supply planning, environmental science, hydrology and hydraulics engineering, and economics. These areas correspond to the technical content of the Chatfield FR/EIS and overall scope of the Chatfield Reservoir Storage Reallocation Study.

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 initially identified more than 16 candidates for the Panel, evaluated their technical expertise, and inquired about potential COIs. Of these, Battelle chose 6 of the most qualified candidates and confirmed their interest and availability. Of the 6 candidates, 4 were proposed for the final Panel and 2 were proposed as backup reviewers. Information about the candidate panel members, including brief biographical information, highest level of education attained, and years of experience, was provided to USACE for feedback. Battelle made the final selection of panel members according to the selection criteria described in the Work Plan.

The four proposed primary reviewers constituted 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.

The candidates were screened for the following potential exclusion criteria or COIs.[a] These COI questions were intended to serve as a means of disclosure and to better characterize a candidate's employment history and background. 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.

- Involvement by you or your firm[b] in the Chatfield Storage Reallocation Study and EIS.
- Involvement by you or your firm[2] in flood control, water storage, water supply, and ecosystem restoration studies in the Chatfield, Cherry Creek, and Bear Creek Reservoirs (i.e. Tri-Lakes); Denver Metro area; the South Platte River and Plum Creek; South Platte River Basin; Douglas, Jefferson, Arapahoe, and Park counties.
- Involvement by you or your firm[2] in projects related to the Chatfield Storage Reallocation Study and EIS.

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[a] Battelle evaluated whether scientists in universities and consulting firms that are receiving USACE-funding have sufficient independence from USACE to be appropriate peer reviewers. See OMB (2004, p. 18), "….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."

[b] Includes any joint ventures in which your firm is involved and if your firm serves as a prime or as a subcontractor to a prime. Please clarify which relationship exists.

- Current employment by USACE.
- Involvement with paid or unpaid expert testimony related to Chatfield Storage Reallocation Study and EIS.
- Current or previous employment or affiliation with members of the cooperating agencies or local sponsors, including City of Aurora, Central Colorado Water Conservancy District (WCD), Colorado State Parks, Denver Botanic Gardens at Chatfield, Western Mutual Ditch Company, Castle Pines Metropolitan District, Castle Pines North Metropolitan District, Centennial Water and Sanitation District (WSD), Center of Colorado WCD, Mount Carbon Metropolitan District, Perry Park Country Club, Roxborough WSD, Other South Metro Water Supply Authority (SMWSA), Town of Castle Rock, U.S. Forest Service (USFS), Colorado Department of Natural Resources (CDNR), Colorado Division of Wildlife (CDOW), Chatfield State Fish Unit (SFU), Chatfield Work Group, Denver Water, Colorado Water Conservation Board (CWCB) (for pay or *pro bono*).
- Past, current, or future interests or involvements (financial or otherwise) by you, your spouse, or your children related to the Chatfield, Cherry Creek, and Bear Creek Reservoirs (i.e. Tri-Lakes); Penley Reservoir; Denver Metro area; the South Platte River and Plum Creek; South Platte River Basin; Douglas, Jefferson, Arapahoe, and Park counties.
- 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, Engineering Research and Development Center [ERDC], etc.), and position/role. Please highlight and discuss in greater detail any projects that are *specifically* with the Omaha District.
- Current firm[2] involvement with other USACE projects, *specifically* those projects/contracts that are with the Omaha District. If yes, provide title/description, dates, and location (USACE district, division, Headquarters, ERDC, etc.), and position/role.
- Any previous employment by USACE as a direct employee or contractor (either as an individual or through your firm[2]) within the last 10 years, *notably* if those projects/contracts are with the Omaha District. If yes, provide title/description, dates employed, and place of employment (district, division, Headquarters, ERDC, etc.), and position/role.
- Previous experience conducting technical peer reviews. If yes, please highlight and discuss any technical reviews concerning ecosystem restoration, flood control and water storage, and water supply planning and include the client/agency and duration of review (approximate dates).
- Pending, current, or future financial interests in Chatfield Storage Reallocation Study and EIS related to contracts/awards from USACE.
- A significant portion (i.e., greater than 50%) of personal or firm[2] revenues within the last three years from USACE contracts.
- Any publicly documented statement (including, for example, advocating for or discouraging against) related to Chatfield Storage Reallocation Study and EIS.

- Participation in prior Federal studies related to the flood control/water reallocation project for the greater Denver area and/or the Chatfield Storage Reallocation Study and EIS.
- Participation in prior non-Federal studies related to the flood control/water reallocation project for the greater Denver area and/or the Chatfield Storage Reallocation Study and EIS including:
  - Metropolitan Water Supply Investigation (MWSI), 1999
  - Colorado Department of Public Health and Environment Water Quality Control Commission: Regulation Number 73 Chatfield Reservoir Control Regulation, 1999 and 2006
  - Chatfield Watershed and Reservoir: 1986–1995 Historical Data Analysis andMonitoring Program Review, 1997
  - Chatfield Watershed Authority Annual Reports: 1989–2006
  - Report on Surveys for Preble's Meadow Jumping Mouse and Ute Ladies'-Tresses Orchid, 1998 and Preble's Meadow Jumping Mouse, 2001
  - Biological Assessment Routine Operation of Chatfield Dam and Reservoir Effects on Preble's Meadow Jumping Mouse, 1999
  - Draft Existing Conditions Report for Biological Resources, 2000
  - Draft Existing Conditions Report for Cultural Resources, 2000
  - Chatfield Lake Project, Colorado: Master Plan Update, Final Environmental Assessment and Finding of No Significant Impact, 2002
  - Chatfield Reallocation Study Storage Use Patterns, 2003
  - Chatfield Reservoir Recreation Study, 2006 and 2007
  - Chatfield Storage Reallocation Project Rare Plant Survey for the Ute Ladies'-Tresses Orchid and the Colorado Butterfly Plant, 2005 and 2006
  - Class III Cultural Resources Survey of Chatfield State Park, Arapahoe, Douglas and Jefferson Counties, Colorado, 2007
  - Tri-Lakes Sedimentation Studies Area-Capacity Report, 2001; Chatfield Portion Updated 2007
  - South Metro Water Supply Study (SMWSS), 2003
  - Statewide Water Supply Initiative (SWSI), 2004 and Colorado's Water Supply Future, SWSI Phase 2, 2007
  - Facing Our Future: A Balanced Water Solution for Colorado, 2005
- 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.

In selecting the final members of the Panel from the list of candidates, Battelle chose experts who best fit the expertise areas and had no COIs. The four final reviewers were either affiliated with academic institutions, consulting companies, or were independent consultants. 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 made the final selection of the Panel. Section 4 of this report provides names and biographical information on the panel members.

Prior to beginning their review and within 3 days of their subcontracts being finalized, all members of the Panel attended a kick-off meeting via a teleconference planned and facilitated by Battelle in order to review the IEPR process, the schedule, communication procedures, and other pertinent information for the Panel.

3.3 Preparation of the Charge and Conduct of the IEPR

Charge questions were provided by USACE and included in the draft and final Work Plans. In addition to a list of 34 charge questions/discussion points, the final charge included general guidance for the Panel on the conduct of the peer review (provided in Appendix B of this final report).

Battelle planned and facilitated a final kick-off meeting via teleconference during which USACE presented project details to the Panel. Before the meeting, the IEPR Panel received an electronic version of the final charge as well as the Chatfield FR/EIS documents and reference materials. The documents and files listed in Table 2 were provided for review; the other documents were provided for reference or supplemental information only. Based on USACE's assessment of which documents each expert needed to review, reviewers were assigned specific documents and sections of documents based on their expertise/discipline. These assignments were made to make the mose effective use of the the reviewers' time and ensure that their primary focus was on the review material relative to their area of expertise. However, reviewers were not restricted from reviewing other portions of the report as long as they were able to do so within the schedule and the contractual level of effort for the review.

Table 2. Documents Reviewed by the Panel, by Discipline

Title	Approximate Number of Pages	Required Disciplines
Chatfield Reallocation FR/EIS	475	All Disciplines[1]
Appendix A – Dam Safety Evaluation	231	No Disciplines
Appendix B – Water Control Plan	18	H&H Engineer
Appendix C – Water Supply Demand Analysis	53	Water Supply Planner and Economist
Appendix D – Ecosystem Restorations Evaluation Report	61	Environmental Scientist
Appendix E – Wetlands	14	Environmental Scientist
Appendix F – Species of Mammals, Birds, Reptiles, and Amphibians Known to Occur in the Project Area	8	Environmental Scientist
Appendix G – Butterfly Species Identified at Denver Botanic Gardens at Chatfield, 1992-2001	3	Environmental Scientist
Appendix H – USACE Hydrology Report: Chatfield Dam and Reservoir	63	H&H Engineer
Appendix I – USACE Hydraulic Analysis	11	H&H Engineer
Appendix J – Impacts of Increased Water Supply Storage on Water Quality	65	Water Supply Planner, Environmental Scientist and H&H Engineer
Appendix K – Compensatory Mitigation Plan	315	Environmental Scientist and Economist
Appendix L – Real Estate Plan	20	No Disciplines
Appendix M – Recreation Facilities Modification Plan[2]	272	Economist
Appendix N – Chatfield Marina Reallocation Impact Assessment Report[2]	46	Economist
Appendix O – Cost of Reallocation	32	Water Supply Planner and Economist
Appendix P – Public and Agency Scoping Comments	33	All Disciplines
Appendix Q – Avian Point Count Data	5	Environmental Scientist
Appendix R – Antecedent Flood Study	30	H&H Engineer
Appendix S – Compliance with Environmental Statutes	51	Environmental Scientist
Appendix T – National Economic Development (NED) Recreation Benefit Analysis	40	Economist

Title	Approximate Number of Pages	Required Disciplines
Appendix U – Regional Economic Development (RED) and Other Society Effects (OSE) Analyses[3]	70	Economist
Appendix V – Draft Biological Assessment	75	Environmental Scientist
Appendix W – CWA 404(b)(1) Report	31	Environmental Scientist
Appendix X – Fish and Wildlife Coordination Act documentation	4	Environmental Scientist
Appendix Y – MCACES Documentation[2]	123	Economist
Appendix Z – Tree Management Plan	25	Environmental Scientist
Appendix AA – Summaries of Water Provider's Water Conservation Programs	21	Water Supply Planner
Appendix BB – Policy Waivers	66	No Disciplines
Total Page Count (Approximate)	2257	

[1]It was not necessary for all reviewers to read all sections of the main document; rather they could focus on the sections pertinent to their discipline.
[2]Only a high level review for consistency was necessary.
[3]RED and OSE accounts were not used directly in the economic or feasibility justifications for the project.

Documents provided for reference included:

- USACE guidance *Civil Works Review Policy* (EC 1165-2-209) dated January 31, 2010
- CECW-CP Memorandum dated March 31, 2007
- Office of Management and Budget's *Final Information Quality Bulletin for Peer Review* released December 16, 2004

About halfway through the review of the Chatfield FR/EIS documents, a teleconference was held with USACE, the Panel, and Battelle so that USACE could answer any questions the Panel had concerning either the review documents or the project. In addition, throughout the review period, USACE provided additional documents at the request of panel members. These additional documents were provided to Battelle and then distributed to the Panel as supplemental information only and were not part of the official review. During the review process, the Panel requested the following supplemental information from USACE:

- Exhibit I, Standing Instructions to Dam Tender for Reservoir Regulation, Chatfield Dam and Reservoir
- Exhibit II, Operating Agreement Between the State of Colorado and the U.S. Army Corps of Engineers, Omaha District
- Chatfield Plate 57 – Reservoir Regulation Coordination Chart, September 2000
- Chatfield Plate 58 – Monthly Operation Report MDR 0168, October 2001
- Chatfield Dam and Lake Antecedent Flood Study, December 2005 Supplement, May 2011

- Best, Allen. 2002 Drought Found to be Worst in 300 Years. *Summit Daily News*, January 3, 2004
- Chatfield Reservoir reallocation spreadsheet for the City of Brighton, including costs for environmental mitigation
- Chatfield Reallocation Study Storage Use Patterns. Colorado Water Conservation Board. February 2003
- Email response regarding the cost of agricultural water rights.

3.4 Review of Individual Comments

The Panel was instructed to address the charge questions/discussion points within a comment-response form provided by Battelle. At the end of the review period, the Panel produced approximately 130 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. As a result of the review, Battelle summarized the 130 comments into a preliminary list of 27 overall comments and discussion points. Each panel member's individual comments were shared with the full Panel in a merged individual comments table.

3.5 IEPR Panel Teleconference

Battelle facilitated a 4-hour teleconference with the Panel so that the panel members, many of whom are from diverse scientific backgrounds, 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 would 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 high-level importance to the findings, and merged any related individual comments. In addition, Battelle confirmed each Final Panel Comment's level of significance to the Panel.

The Panel also discussed responses to one specific charge question where there appeared to be disagreement among panel members. The conflicting comments were resolved based on the professional judgment of the Panel, and all sets of comments were determined not to be conflicting. Each comment was either incorporated into a Final Panel Comment, determined to be consistent with other Final Panel Comments already developed, or determined to be a non-significant issue.

At the end of these discussions, the Panel identified 27 comments and discussion points that should be brought forward as Final Panel Comments.

3.6 Preparation of Final Panel Comments

Following the teleconference, Battelle prepared 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 Chatfield FR/EIS:

- 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 the merged individual comments table, a summary 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 other IEPR 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, 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: Describes a fundamental problem with the project that could affect the recommendation, success, or justification of the project. Comments rated as high indicate that the Panel analyzed or assessed the methods, models, and/or analyses and determined that there is a "showstopper" issue.
  2. Medium: Affects the completeness of the report in describing the project, but will not affect the recommendation or justification of the project. Comments rated as medium indicate that the Panel does not have sufficient information to analyze or assess the methods, models, or analyses.
  3. Low: Affects the understanding or accuracy of the project as described in the report, but will not affect the recommendation or justification of the project. Comments rated as low indicate that the Panel identified information (tables, figures, equations, discussions) that was mislabeled or incorrect or data or report sections that were not clearly described or presented.
- Guidance 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).

At the end of this process, 27 Final Panel Comments were prepared and assembled. 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. There was no direct communication between the Panel and USACE during the

preparation of the Final Panel Comments. The Final Panel Comments are presented in Appendix A of this report.

4. PANEL DESCRIPTION

Candidates for the Panel were identified using Battelle's Peer Reviewer Database, targeted Internet searches using key words (e.g., technical area, geographic region), searches of websites of universities or other compiled expert sites, and referrals. Battelle prepared a draft list of primary and backup candidate panel members (who were screened for availability, technical background, and COIs), and provided it to USACE for feedback. Battelle made the final selection of panel members.

An overview of the credentials of the final four primary members of the Panel and their qualifications in relation to the technical evaluation criteria is presented in Table 2. More detailed biographical information regarding each panel member and his area of technical expertise is presented in the text that follows the table.

Table 3. Chatfield IEPR Panel: Technical Criteria and Areas of Expertise

Technical Criteria	Frick	Young	Countryman	Loomis
Water Supply Planning (one expert needed)				
Minimum 10 years experience with the plan formulation process	X			
Familiar with large, complex Civil Works projects with high public and interagency interests	X			
Familiar with the development and evaluation of alternative plans for water supply for municipal industrial, and agricultural uses, to include surface and groundwater sources	X			
Experience in water supply planning in regions with significant seasonal variations in runoff and that experience severe droughts	X			
Familiar with Western water law and appropriate systems of water rights as well as knowledge of current Colorado water law	X			
Experience directly working with or for USACE and dealing directly with the USACE planning process as outlined in ER-1105-2-100, Planning Guidance Notebook, especially with regard to water storage reallocation studies	***waiver requested**			
Degree in planning, engineering or a related field	X			
Environmental Science (one expert needed)				
Minimum 10 years experience in environmental sciences		X		
Familiar with large, complex Civil Works projects with high public and interagency interests		X		
Particular knowledge of ecosystem restoration and habitat mitigation practices and also be familiar with National Environmental Pollution Act (NEPA) and Endangered Species Act (ESA) requirements		X		
Experience in studies of and mitigation planning for riparian, wetland and aquatic ecologic systems, to include considerations of cold-water fish species. Preferably this experience will include studies related to rivers and lakes along the Front Range of the Rocky Mountains		X		
M.S. degree in ecology or biology		****waiver requested**		

Technical Criteria	Frick	Young	Countryman	Loomis
Hydrology and Hydraulics Engineering (one expert needed)				
Professional Engineer with 10 years experience with the hydrologic and hydraulic analyses related to large flood control structures, reverine flooding, flood damage estimation, and probabilistic estimates of water supply reservoir yields			X	
Familiar with large, complex Civil Works projects with high public and interagency interests			X	
Familiar with standard USACE hydrologic and hydraulic computer models and data analysis tools preferably including:HEC-2, HEC-5, HEC-DSS, HEC-FFA, HEC-MLRP and STATS			X	
M.S. degree or higher in civil or water resources engineering			****waiver requested**	
Economics (one expert needed)				
Minimum 10 years demonstrated experience in the field of economics				X
Familiar with large, complex Civil Works projects with high public and interagency interests				X
Able to evaluate the appropriateness of Cost-Effectiveness/Incremental Cost Analysis (CE/ICA), as applied to capital costs and ecosystem restoration benefits				X
Experience with NED analysis procedures, particularly as they relate to recreation, ecosystem, flood control and water supply projects				X
Familiar with the USACE tool for CE/ICA called IWR-Planning Suite, and experience directly working for or with USACE and directly dealing with the USACE process for testing the financial feasibility of water storage reallocation as outlined in ER-1105-2-100, Planning Guidance Notebook				X
Degree in economics or a related field				X

* Confirmed by USACE via email on August 1, 2011 that being familiar with ER 1105-2-100 is "preferable", but not at the expense of someone who understands water supply planning.

** Mr. David Young holds a B.S. in marine biology, has 10 years experience working directly or indirectly with USACE projects and has 17 years experience performing NEPA impact assessments. Mr. Joseph Countryman holds a B.S. in civil engineering and has more than 40 years of experience in hydraulic engineering and hydrology in the western U.S. Battelle is confident that the expertise of both men qualifies them to serve on this IEPR.

Dave Frick

Role: This panel member was chosen primarily for his water supply planning experience and expertise.
Affiliation: Ayres Associates, Inc.

Dave Frick, Ph.D. is Executive Vice President for Ayres Associates in Fort Collins, Colorado, where he serves as project manager for a wide range of projects. He received his Ph.D. in civil engineering from Colorado State University in 1990 and is a registered professional engineer in Colorado, Wyoming, and Michigan. Dr. Frick has 39 years of experience in the development of water supply plans, drainage and flood control planning, and floodplain studies, and has conducted studies for municipalities, counties, and state and Federal agencies, including the Colorado Water Conservation Board and Federal Emergency Management Agency.

Dr. Frick's work on large, complex Civil Works projects has involved water supply planning for reservoir projects and evaluation of yields within complex water rights systems. Specific studies include the Colorado River, Fraser River, Poudre River, South Platte River, and Big Thompson River basins. These studies included the development of drafts for water supply planning analysis and complex computer models for analysis of water rights yields. Dr. Frick also performed research in the remote sensing of snowpack and soil moisture and has conducted computer simulations of water distributions systems, groundwater aquifers, and surface water hydrology. These studies all included alternative analysis that considered various water uses and water supplies including both surface and groundwater sources.

In addition to the development of modeling tools for planning analysis, Dr. Frick has also used many existing models, including Riverware, Modsim, SAMS, and the Colorado River Decision Support System. Because of his familiarity with Western water law and appropriate systems of water rights, Dr. Frick has testified as an expert witness in water court in both Colorado and Nebraska. He has conducted numerous studies of water supplies based on Colorado water law and the complexities of changes in use and augmentation for groundwater. Dr. Frick has been a consultant on USACE projects such as the EIS for the Haligan enlargement, and hydrologic modeling for Two Forks Reservoir, Wolford Mountain Reservoir, Elkhead Creek Reservoir and Green mountain reoperations. Dr. Frick was a member of the San Juan River Recover Plan, and as such, has reviewed water supply planning studies for the San Juan River Basin, including simulation of water rights yields, and reservoir reoperation studies. He is a member of the American Council of Engineering Companies and the American Water Resources Association.

Dave Young

Role: This panel member was chosen primarily for his environmental science experience and expertise.
Affiliation: Independent consultant

Dave Young is an independent environmental consultant. He earned his B.S. in marine biology from Texas A&M University at Galveston in 1993. He has more than 17 years of experience in wetland delineation, environmental assessments, water quality, and NEPA, and has been directly involved with water resource evaluation and NEPA assessments for more than 10 years. Mr. Young has advanced USACE Wetland Delineation/Management training and has attended

training courses on various aspects of NEPA, including Section 106 coordination, and state Department of Transportation (DOT) processes related to NEPA compliance (Florida DOT, Arizona DOT, and Texas DOT). He has led NEPA studies (Categorical Exclusions [CEs], Environmental Assessments/Findings of No Significant Impacts, and other state-related NEPA documents) and supported EISs for various types of projects, performed USACE regulatory compliance and permitting, performed habitat assessments and surveys for wildlife, including listed species pursuant to the ESA, and participated in public and agency involvement.

His experience with cumulative impacts analysis for complex multi-purpose public works projects includes working directly or indirectly for USACE managing and providing support for the Houston Ship Channel - Placement Areas 14 and 15 project and serving as technical lead for the Section 227 Demonstration Project (both with USACE Galveston District).

Mr. Young's experience with ecosystem restoration and habitat mitigation is primarily focused on various sizes of compensatory mitigation plans and development in Arizona, Texas, and Florida. This includes ecosystem restoration and habitat mitigation for large rivers, proposed reservoirs, as well as small and moderately sized compensatory mitigation projects. He has conducted studies of small- and moderate-size riparian, wetland, and ecological mitigation areas in central Florida, Texas, and Arizona for both public and private clients, and compliance inspections and restoration plan development for hundreds of these mitigation sites in Florida. Mr. Young has extensive experience with developing alternative analyses, coordination with concerned landowners and stakeholders, and coordination with various regulatory and resource agencies. Mr. Young's experience with western U.S. coldwater or trout fisheries includes evaluating potential impacts to the Apache trout (listed) and to other cold water fishes such as cutthroat trout, rainbow trout, and brown trout. He has performed qualitative assessments of the evaluation of environmental benefits as part of the NEPA evaluation process for USACE transportation, linear, and land development projects. His experience includes lakes and rivers in the Basin and Range systems west of the Front Range of the Rocky Mountains. Mr. Young has served in previous USACE independent external peer reviews as an expert panelist.

Joe Countryman

Role: This panel member was chosen primarily for his hydrology and hydraulics engineering experience and expertise.
Affiliation: MBK Engineers, Inc.

Joe Countryman is a principal with MBK Engineers in Sacramento, California. He earned his B.S. in civil engineering in 1966 from California State University, San Jose. He is a registered civil engineer in California and Nevada, in addition to being a Diplomate, Water Resources Engineer in the American Academy of Water Resource Engineers. He has 45 years of experience in West Coast hydraulic engineering and hydrology. For the past 23 years, he has worked on a variety of hydrology, hydraulics, flood control, water supply, and water resources development projects for MBK Engineers. These have included the development of improved flood operations plans for Folsom Dam, involving forecast-based operations and the development of modification plans to provide improved flood protection for Sacramento and recent improvements for operation efficiency and flood control capability including designing new spillway gates. He has been involved in developing improved flood control and water

supply operations of New Don Pedro and Friant Dams, and has worked on the development of the Forecast Coordinated Operations plan for Oroville and New Bullards Bar reservoirs. For the Natomas Basin, he participated in the preparation of feasibility studies, environmental impact analysis (EIA) and design support and hydraulic impact analysis using one- and two-dimensional hydraulic modeling. He was also involved in reviewing the 1997 flood in the Sacramento, Feather, American, and San Joaquin River basins and developing a model of the San Joaquin River systems to reproduce the flood event. This work included hydraulic model calibration of the flood and reservoir operation analysis.

Between 1966 and 1987, Mr. Countryman served as USACE Chief of Water Control Management, Sacramento District, working on flood control planning, design, and operation. While in this position, he gained significant experience in real-time daily operations and modifying Federal flood control regulations to incorporate best available technology, environmental requirements, and improving water supply capability. He was responsible for the engineering analysis of flood problems and the operation of flood control projects throughout the western U.S., including 17 USACE reservoirs in California and the monitoring of 25 partnership reservoirs in California, Nevada, and Colorado. In addition, he was in charge of the development of operational criteria for the multiple-purpose Warm Springs and Coyote Valley Dams in the Russian River Basin, California, and the four Truckee River Basin Reservoirs.

He is familiar with standard USACE hydrologic and hydraulic computer models and data analysis tools including both the older HEC-2 and HEC-5 models, as well as current software such as HEC-RAS, RES-SIM, HEC-DSS, HEC-FFA, and STATS. He is a member of the American Society of Civil Engineers and received an Award of Distinction from San Jose State University, College of Engineering.

John Loomis

Role: This panel member was chosen primarily for his economics experience and expertise.
Affiliation: Colorado State University and independent consultant

John Loomis, Ph.D. is a professor of economics in the Department of Agricultural and Resource Economics at Colorado State University in Fort Collins, Colorado. He received his B.A. and M.A. degrees in economics from California State University and a Ph.D. in economics from Colorado State University in 1983. Dr. Loomis has more than 30 years of experience in academia, consulting, and government. He has taught economics at two universities, published three books on economics, and has published more than 100 articles in economics journals.

Dr. Loomis has worked as an economist on large, complex Civil Works projects, including serving as a Science Review Panel member on a large water transfer project to move "conserved" water from the Lower Colorado River below Austin, Texas, to San Antonio to provide a sustainable drinking water supply, and reduce San Antonio's reliance on groundwater pumping that was adversely affecting an endangered species. He also worked on the Elwha Dam removal in Washington, which was led by the U.S. Bureau of Reclamation but involved the National Park Service, since the dams were adjacent to Olympic National Park and had to reflect the tribal values of a Native American reservation below the dams. Dr. Loomis was also an economics consultant on the USACE's Lower Snake River Salmon Migration Feasibility Report and EIS

that evaluated the removal of the four Lower Snake River Dams. Both dam removal projects had high public visibility due to the controversial nature of dam removal in the Pacific Northwest.

Dr. Loomis is familiar with economic techniques of CE/ICA and has taught these techniques to graduate students and has applied them routinely for performing project analysis for scale decisions. He has written chapters in all three of his books on cost-benefit analysis, and taught cost-benefit analysis to graduate and undergraduate students, including the issue of how to properly account for capital costs along with discounting of capital and operation and maintenance costs over the life of a project. Dr. Loomis has published several papers that address cost-benefit analysis of natural resource management issues. He has addressed cost-benefit analysis of ecosystem restoration benefits on the South Platte River in Colorado, evaluating the benefits of riparian restoration and instream flows, along with the costs of instream flows. Dr. Loomis has also worked on the economic benefits of restoring ecosystem services provided by wetlands using meta analysis.

Dr. Loomis is very familiar with NED procedures and has co-taught a course on this with the USACE Waterways Experiment Station during the early to mid-1980s for USACE and Bureau of Reclamation economists. Dr. Loomis has more than 80 publications using the NED recommended recreation valuation techniques of Travel Cost Method, Contingent Valuation and Unit Day values; has dedicated a chapter to each of these methods in one of his textbooks; and teaches these methods in his courses. Dr. Loomis' 2000 Ecological Economics article on "Ecosystem Services of an Impaired River" has been the model for several other ecosystem valuation studies from Georgia to China. He is familiar with estimating the benefits of flood control to avoid damages to property and human life and is familiar with water supply economics, including municipal water supply. Finally, Dr. Loomis serves on the Scientific Advisory Board, Environmental and Resource Economics, and is co-editor for the Association of Environmental and Resource Economists Newsletter. He has served as an expert panelist in previous USACE independent external peer reviews.

5. SUMMARY OF FINAL PANEL COMMENTS

The panel members generally agreed among one another on their "assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used" (USACE, 2010; p. D-4) in the Chatfield FR/EIS document; however, initially there was some disagreement among two panel members regarding how specific the purpose and need statement for the project should be. One panel member said that the purpose and need was sufficiently stated, while the second panel member said that it needed to be more specific because the purpose and need statement drives the development and screening of alternative concepts and the evaluation of alternatives for the selection of the preferred alternative. The second panel member also indicated that the development of the alternatives was based on a purpose and need that was too broad and did not capture the need for storage reallocation specifically at Chatfield Reservoir. In the end, the Panel defaulted to the expert opinion of the panel member who believes the purpose and need statement needs to be more specific.

The majority of issues identified are related to the planning process approach used for the screening of alternative concepts, the evaluation of alternatives, and the selection of the preferred

alternative. Issues are presented regarding inconsistencies in screening and evaluation of alternatives, lack of consideration given to other viable alternatives, and impacts that should have been evaluated more thoroughly. Each issue has been presented separately in several Final Panel Comments. There may seem to be some redundancy in the Final Panel Comments since they are all related to the same general issues regarding application of sceening criteria and how alternatives are evaluated. Table 4 lists the Final Panel Comment statements by level of significance. The full text of the Final Panel Comments is presented in Appendix A of this report. The following statements summarize the Panel's findings.

Water Supply Planning: Generally, the FR/EIS presents a viable way to reallocate flood pool storage for meeting water demands in the Denver area. The FR/EIS could provide more detail concerning the ability of the proposed project to meet the demands of the proponents. Information is lacking on how the proposed storage reallocation would help firm up the proponents' water supplies during sustained drought conditions such as those experienced in the 1950s, 1970s, and early 2000s. Also, more detail could have been presented to allow comparisons of water supply yields and reliability among the various alternatives.

Economics: The economic analysis overlooks less costly water supply alternatives and has some inconsistencies with U.S. Water Resources Council (WRC) Principles and Guidelines (U.S. WRC, 1983). It was not clear why less costly water rights transfer alternatives were not brought forward as distinct alternatives considered in detail since such water right transfers were included in three of the four alternatives considered in detail. This seems to undermine the selection of Alternative 3 as the NED plan when there are more reliable water sources available for what appears to be half the per acre-foot costs of Alternative 3. Furthermore, the recreation econonomic analysis is not consistent with U.S. WRC Principles and Guidelines (U.S. WRC, 1983) for projects with this magnitude of recreation, nor is the use of least cost alternative for valuing agricultural water supply.

Engineering: The report clearly identifies the importance of maintaining the current level of flood protection for the Denver urban area. However, the potential for sediment deposition to impact the water supply and flood management benefits of the project requires specific information on the expected levels of sediment deposition; this information is not provided or discussed in the analysis. Also, reservoir routings of extreme flood events (1 in 100, 1 in 200, etc.) are not presented, and this information or an explanation of why this information is not used to project future conditions is important for reducing the uncertainty associated with conclusions regarding impacts on flood management.

Environmental: The Panel is impressed with the level of collaboration with various agency and non-agency stakeholders on the project-specific environmental issues. However, it seems that many environmental impacts that should have been considered were overlooked or not fully addressed. The selection of the preferred alternative also does not seem to consider minimization and avoidance of environmental impacts in keeping with the NEPA.

Table 4. Overview of 27 Final Panel Comments Identified by the Chatfield IEPR Panel

No.	Final Panel Comment
Significance – High	
1	Statements regarding the purpose and need of the project appear to conflict and are not comprehensive in details on the reliability of suitable yield and time to achieve the project objectives.
2	The planning constraint to "avoid the acquisition of water rights owned by others" and the associated screening criteria LT1 may be too restrictive and may have resulted in prematurely eliminating viable alternatives from consideration.
3	The screening criteria related to water rights are not applied consistently to evaluate alternative concepts.
4	The purpose and need (PN1) and logistics and technology (LT1 and LT5) criteria are not consistently applied for the Penley Reservoir and Highland Ranch Reservoir in the screening analysis.
5	The evaluation of alternatives does not meet the study objective to avoid and minimize environmental impacts under NEPA.
6	The No Action Alternative for the alternatives analysis includes action alternatives at other sites rather than a future without project condition that only represents no reallocation at Chatfield Reservoir.
7	The benefit-cost analysis does not evaluate benefits of agricultural and municipal and industrial water supply uses separately.
8	Recreational value loss from Alternative 3 may be underestimated if nearby recreation sites do not have the capacity to accommodate displaced visitors.
9	Reliance on Unit Day Values instead of more appropriate regional or site-specific models and a very small sampling of recreation users may have resulted in substantial underestimation of the recreational losses from the Chatfield project.
Significance – Medium	
10	The geographic boundaries of the study area are not clearly defined and do not include the features of all of the alternatives presented.
11	Some terminology and conditions for the screening analysis are not clearly defined, and some screening criteria that should have been considered are not.
12	The FR/EIS does not include screening criteria that would eliminate reservoir deepening by sediment removal as an alternative to raising the elevation of the conservation pool.
13	No information is provided on storage capacity for several of the alternative concepts presented for screening analysis.
14	The environmental constraints do not appear to have been applied consistently across alternatives for the alternatives analysis.
15	The environmental constraints considered during the evaluation of alternatives do not take geological, ecological, socio-economic, and environmental justice impacts into account.
16	Some of the assumptions regarding aesthetic and recreational value are not fully explained, and it is not clear whether the same set of assumptions has been applied across the range of alternatives in the analysis.

No.	Final Panel Comment
17	It is not clear how much of the projected future water demand is to accommodate the existing service area demand and future growth and how much is to accommodate future expansion of the service area and new growth.
18	How water yield and reliability of the water supplies were determined for each of the alternatives is not explained in the FR/EIS.
19	The analysis of flood frequencies and flood control impacts may not accurately characterize larger floods or account for the potential impact due to the loss of flood control space.
20	The adaptive management considerations do not fully explore the potential impact of climate change on future conditions for the various alternatives.
21	Sediment accumulation over the life of the project and how it may affect pool levels are not evaluated.
22	It is not clear whether compensatory mitigation activities would create a wildlife hazard for aircraft.
23	The effects determinations outlined in Appendix V for the preferred alternative are not correctly stated or evaluated for certain Federally listed species.
24	The cumulative impacts analysis provided in the Biological Assessment is not consistent with statutory requirements outlined in Section 7 of the ESA.
25	The Ecological Functional Value (EFV) system and Habitat Suitability Indices (HSIs) seem to be subjective, do not have a clear link to ecological impacts, and may not accurately reflect changes in habitat quality.
26	EUTROMOD is not an appropriate model to use for assessing water quality issues for the project.
Significance – Low	
27	The difference between the operation elevation and elevation of the conservation pool for the preferred alternative as stated in Appendix S of the EIS is different from that in the main document.

6. REFERENCES

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APPENDIX A

Final Panel Comments

on the

Chatfield IEPR

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Comment 1:
Statements regarding the purpose and need of the project appear to conflict and are not comprehensive in details on the reliability of suitable yield and time to achieve the project objectives.
Basis for Comment:
The purpose and need statement for the project is to "Increase availability of water, sustainable over the 50-year period of analysis, in the greater Denver area, so that a larger proportion of existing and future (increasing) water needs can be met." This statement does not clearly define the population directly affected, the geographic region benefiting from the project, the types of water uses that the project will be benefiting, or the timeframe within which the project objectives need to be achieved. The vagueness of the purpose and need statement allows consideration of alternatives that may not be the most cost-effective and may not minimize environmental impacts, which is not in keeping with National Environmental Policy Act (NEPA). Section 2.2.1 of the FR/EIS (p. 2-4) states, "The purpose and need is to increase availability and reliability of providing an additional average year yield of up to approximately 8,539 acre-feet (AF) of M&I water, sustainable over a 50-year period." This altered purpose and need statement is more specific and more aligned with the purpose and need specific to this project, which is to provide 20,600 AF of additional water storage that can be used to supplement the water supply of the Denver region. USACE has acknowledged that this only meets a portion of the regional water supply needs in the 50-year analysis period; therefore, it is reasonable to narrow the alternatives to include only those alternatives that provide 20,600 AF of water storage.
Significance – High:
Because the purpose and need statement for the project does not provide specific objectives regarding yield, the geographic region that will be benefiting the water supply partners, timing, and water uses, the selection of the preferred alternative as the NED Plan is not clearly justified.
Recommendation(s) for Resolution:
1. Revise the purpose and need statement in the FR/EIS to be more specific about the geographic region that would be beneficial to the water supplier partners, the sustainable yield estimated to support current and future demands, and the timeframe within which the water is needed. 2. Consider revising the screening criteria, concepts, alternatives analysis, and potentially preferred alternative in the FR/EIS based on the more specific purpose and need statement, as appropriate.

Comment 2:
The planning constraint to "avoid the acquisition of water rights owned by others" and the associated screening criteria LT1 may be too restrictive and may have resulted in prematurely eliminating viable alternatives from consideration.
Basis for Comment:
The FR/EIS indicates that one of the planning constraints chosen for this study is to "avoid the acquisition of water rights owned by others" (pp. 2-5 and 2-6). However, the rationale provided does not clearly explain the reason this constraint was chosen. Water rights transfers are one of the most commonly used major sources of water for cities along the Colorado Front Range and in the project area. It is not clear from the screening criteria LT1 in Table 2-1 why any alternative involving water right transfers should be dismissed, since such transfers meet project Purpose and Need criteria PN1, Cost criteria C1, overall logistics, and Environmental Impacts criteria EC1. It appears that this constraint has largely been interpreted in the screening process to be a prohibition on any alternative predominantly relying on agricultural transfer of water rights. Table 2-4 eliminates all five agricultural water transfers based on "cost, logistics and timing." Supplemental information, however, indicates that agricultural water transfers do meet the following criteria: • *Cost Criteria C1*: The supplemental cost spreadsheet from Brighton indicates that senior water rights are available for $10,500/AF (half the cost of the selected plan, Alternative 3). In response to questions raised by the Panel during a USACE conference call, a representative from the Centennial Water District indicated that these senior water rights would have a priority date of 1880 to 1900. As such they are very firm, hence better than the selected plan in which "Chatfield storage rights in Alternatives 3 and 4, which we are describing as junior water rights, have 1984 to 2005 priority dates thus clearly much more junior water rights." • *Timing:* During a teleconference meeting on 9-8-2011, a representative from the Centennial Water District indicated that agricultural water rights transfers can be completed in 1 to 3 years in water court. Thus water rights transfers appear to provide water more rapidly than any of the other alternatives considered in detail. • *Environmental Impacts (EC1):* Agricultural water transfers would avoid many of the environmental impacts associated with the selected plan, thereby minimizing the need to mitigate many of the impacts associated with Alternative 3. The assumption that the project should avoid the acquisition of water rights owned by others, which would be less expensive, faster, more reliable, and result in lower environmental impact than other alternatives for increasing storage, is too restrictive and hinders the ability to meet the project purpose and needs in a cost-effective manner.
Significance – High:
Application of the restrictive planning constraint and screening criteria LT1 ruling out water transfers may prevent identification of a "least costly" and lowest environmental impact alternative that meets the purpose and need of the project.

Recommendation(s) for Resolution:
1. Explain how the planning constraint to avoid acquisition of water rights by others and screening criteria LT1 on water rights availability are necessary to meet the purpose and needs of the project in a cost-effective and timely manner while minimizing impacts to the environment. 2. Otherwise, include agricultural water rights transfer alternatives in the Alternatives Considered in Detail.

Comment 3:
The screening criteria related to water rights are not applied consistently to evaluate alternative concepts.
Basis for Comment:
LT1 in Table 2-1, Criteria for Preliminary Screening of Alternatives indicates that, in order to advance, an alternative does not require the acquisition of water rights or transfer of existing water rights. Table 2-4 eliminates all agricultural water transfer alternatives based on "cost, logistics and timing." However, Alternatives 1 (p. 4-116), 2 (p. 4-118), and 4 (p. 4-121) all have agricultural water transfers as features of their plans. At the request of the Panel, USACE provided the City of Brighton cost spreadsheet showing cost per acre-foot for water rights and other additional information indicating that the No Action Alternative and 7,700 AF of Reallocation Alternatives involve acquisition of senior water rights from agricultural water right transfers. These acquisitions are at a cost of $10,500/AF, which is one-half the cost of the Preferred Alternative (i.e., Alternative 3) and one-third the cost per acre-foot of the No Action Alternative (i.e., Alternative 1). Since agricultural water transfer alternatives are more cost-effective than the Preferred Alternative as the NED plan, the acceptability of agricultural water transfers would seem to merit consideration as the NED plan.
Significance – High
Inconsistent application of criteria for the selection of alternatives to be considered in detail makes it difficult to justify the selection of Alternative 3 as the NED plan.
Recommendation(s) for Resolution:
1. Clearly explain and document the rationale for the inconsistency between inclusion of agricultural water transfers in three of the four Alternatives Considered in Detail and the Screening Criteria in Table 2-1 (LT1) and elimination of all agricultural water transfer alternatives in Table 2-4. 2. Otherwise, carry alternatives that include agricultural water transfers forward as Alternatives Considered in Detail.

Comment 4:
The purpose and need (PN1) and logistics and technology (LT1 and LT5) criteria are not consistently applied for the Penley Reservoir and Highland Ranch Reservoir in the screening analysis.
Basis for Comment:
It is not clear how the purpose and need and logistics and technology criteria were applied during the screening process, resulting in advancing Penley Reservoir but not Highland Ranch Reservoir. • The Penley Reservoir provides 11,300 AF of storage, transferring the storage through various tunnels and pipelines, along with associated pump stations. Water from Plum Creek Reservoir (not included in the study) also diverts water to Penley Reservoir through pipelines and associated pump stations. In essence, Plum Creek and Penley are dependent on each other for operation and would be considered operation of "multiple storage facilities." This alternative would be eliminated by itself because (1) it does not meet the purpose and need [PN1] of 20,600 AF or average yield of 8,539 AF of storage as stated in Table 2-1 (however, the documented purpose and need does not include a specific AF storage requirement), and (2) it involves multiple storage facilities [LT5]. Although this alternative concept does not meet the purpose and need by itself, it is carried forward with combined storage components from gravel pits, which are evaluated differently. • The Highland Ranch Reservoir Series was eliminated because it does not meet the purpose and need [PN1]. It is not clear why it was eliminated, based on current storage commitments [LT1, LT5], since it provides 33,000 AF of storage. For this screening criterion, the FR/EIS does not state what the time frame for transferring or purchasing existing rights from the current water holders. LT1 states that the acquisition of water rights was eliminated if it did not occur "in a reasonably foreseeable time frame," but "a reasonably foreseeable time frame" is not defined. LT5 was also used as a screening criterion to eliminate this alternative. This criterion concludes that operation of multiple storage facilities, along with pipelines or treatment facilities, would not be applicable to meet the yield. It is not clear why this alternative was eliminated when it provides the storage capacity, although, like Penley Reservoir, it does not meet the purpose and need by itself.
Significance –High:
The inconsistent application of screening criteria to alternatives may affect the decision to advance the four alternatives identified for detailed analysis.
Recommendation(s) for Resolution:
1. Apply screening criteria consistently across all 37 project concepts. 2. Explain the screening process and application of selection criteria in detail to justify why some concepts were carried forward and others were not.

Comment 5:
The evaluation of alternatives does not meet the study objective to avoid and minimize environmental impacts under NEPA.
Basis for Comment:
The only screening concepts given consideration of environmental impacts are the four alternatives carried forward in the analysis. Screening of the other 33 concepts in Tables 2-2 and 2-4 do not include considerations for environmental criteria in the analysis. As such, it is not clear whether there was an evaluation for the least environmentally damaging alternative. This concern is echoed by the multiple comments from the EPA attached as appendices to the FR/EIS. Reasonable assumptions can be made whether the 33 screening concepts would avoid, minimize, and/or reduce impacts on aquatic ecosystems and whether mitigation could be provided to compensate for potential impacts. The screening concepts could potentially impact land use, wetlands, water quality, socio-economics, aesthetics, hazardous materials, wildlife, threatened and endangered species, etc.
Significance – High:
The outcome of the concept screening analysis may have been different, or additional screening alternatives may have been considered for further analysis, if avoidance and minimization of environmental impacts had been applied consistently across all project concepts.
Recommendation(s) for Resolution:
1. Qualitatively re-evaluate all 37 screening concepts for potential environmental impacts. 2. If needed, carry forward additional or revised alternatives in the FR/EIS based on this revised analysis.

Comment 6:
The No Action Alternative for the alternatives analysis includes action alternatives at other sites rather than a future without project condition that only represents no reallocation at Chatfield Reservoir.
Basis for Comment:
A true "no action" alternative describes without-project conditions. However, the without project condition for the Chatfield Reallocation alternatives analysis assumes that additional projects will be developed to enhance the local water supply. The alternatives analysis does not describe the potential impacts that could occur without the implementation of the project. The No Action Alternative for the Chatfield project includes the development of the Penley Reservoir, an affiliated pipeline, and gravel pits offsite. While this project could potentially occur within a No Action scenario at Chatfield, there is no justification for considering these actions to be part of the without-project conditions in the economic evaluation. The No Action Alternative would be higher in cost than some of the action alternatives and overlooks lower cost alternatives such as purchasing water rights from the agriculture interests (thus artificially making it look advantageous to use an action alternative). The No Action Alternative should not include projects that are reasonably foreseeable; those projects should be evaluated as part of the cumulative effects/impact analysis. Since this project is primarily a reservoir reoperation (non-structural plan) specifically at Chatfield Reservoir, the without project plan should be to not change the operation of Chatfield Reservoir.
Significance – High:
Performing an alternatives analysis using a without project condition that includes alternative actions could potentially result in overlooking low-cost alternatives, such as the purchasing of water rights from the agriculture interests.
Recommendations for Resolution:
1. Revise the future without project condition to represent a true No Action Alternative (i.e., no reoperation of Chatfield Reservoir or alternative projects). 2. Re-evaluate the alternatives using the revised without project condition. 3. Provide documentation that the current without project condition has not prevented low-cost alternatives (such as purchasing water rights from agricultural interests) from being considered.

Comment 7:

The benefit-cost analysis does not evaluate benefits of agricultural and municipal and industrial water supply uses separately.

Basis for Comment:

A principle of NED benefit-cost analysis is that distinct features are to be analyzed separately. In the FR/EIS, the benefit-cost analysis does not calculate separately the benefits and costs of the different types of water uses, nor does it show that each use of water has a benefit-cost ratio greater than 1. The FR/EIS and appendices indicate 15% of the project water is going to agricultural purposes for well augmentation to grow relatively low value crops such as alfalfa and corn, and 85% is going to municipal and industrial (M&I) use.

- *Agricultural Water Supply.* The documented average cost of water in the Preferred Alternative 3 is $21,597/AF (ES-34), whereas, according to data in the City of Brighton cost spreadsheet showing the capital and operating cost of each alternative, senior water rights for agriculture can be purchased for $10,500/AF, producing a benefit-cost ratio of less than 1. Since a slightly smaller project could be designed that does not supply this 15% of water to agriculture, the incremental cost of supplying that irrigation water needs to be compared to the incremental benefits of water in agriculture.

  It has not be demonstrated that agricultural water users are willing to pay the $21,597/AF costs under Alternative 3 when they can purchase senior water rights from other farmers for $10,500/AF. Furthermore, the U.S. Water Resources Council (WRC) Principles and Guidelines (U.S. WRC, 1983) do not allow the cost of the least expensive alternative to be used to quantify the benefits to agricultural. This approach is only permissible for M&I uses.
- *M&I Water Supply.* Cities up and down the Front Range of Colorado are increasingly relying on agricultural water right as the least costly alternative to meeting their municipal water supply needs. Appendix O indicates that M&I water supply benefits are defined as the most likely least cost No Action Alternative to be implemented. While this general approach is consistent with the U.S. WRC Principles and Guidelines (U.S. WRC, 1983), there is no evidence that the water providers would be willing to pay $24,024/AF cost under Alternative 2 or that they currently pay this much. Alternative 2 is not the least cost alternative water supply available to cities since agricultural water rights are available for $10,500/AF.

By combining agriculture and M&I costs in the benefit-cost analysis, it is not possible to see whether either water use had positive NED benefits.

Significance –High:

If the agricultural and M&I costs are not evaluated separately, it is not possible to determine whether the Preferred Alternative (i.e., Alternative 3) is the least cost alternative.

Recommendation(s) for Resolution:

1. Following U.S. WRC Principles and Guidelines (U.S. WRC, 1983), use farm budgets to calculate and display the separable or incremental benefits associated with the 15% of project water going to agricultural water supply as compared to the incremental cost of supplying this agricultural water.

2. Document water providers' current costs of water for M&I uses.
3. Document what percentage of water providers' current water supply comes from agricultural water transfers and at what cost.
4. Document why water providers would not, in the absence of the project, choose to purchase water from agriculture.
5. Document that project water providers would pay nearly $24,000/AF for raw water in order to justify that they would, in the absence of this project, choose to incur that cost for M&I water.

Literature Cited

U.S. WRC (1983). Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies. U.S. Government Printing Office, March 10.

Comment 8:
Recreational value loss from Alternative 3 may be underestimated if nearby recreation sites do not have the capacity to accommodate displaced visitors.
Basis for Comment:
There is insufficient documentation of methods used to estimate visitor displacement from Chatfield Reservoir and support for the implicit assumption made that nearby recreation sites have the capacity to accommodate the displaced users. There is also little uncertainty analysis regarding estimated changes in recreation use by alternative. • Methods for estimating visitor displacement and recreation capacity at other sites to absorb visitor use displaced from Chatfield Reservoir are not documented. Appendix T (Table 4 and accompanying text) discusses an estimated visitor displacement of 180,000 visitors during construction and 100,000 visitors during post-construction years 1 - 5. The BBC consulting report is referenced as the basis for these estimates, but the report is not cited or provided. Without the BBC report, it is difficult for the Panel to understand how these visitor displacement figures were determined. • The nearby recreation sites and their capacity to accommodate the displaced visitors are not discussed. The visitor comments in Exhibit D of Appendix T indicate that, during some weekends and holidays, Chatfield Reservoir is used to capacity. This suggests there may not be unused capacity at other sites. If nearby sites do not have the capacity to accommodate the displaced visitors, then all of the recreation benefits to these displaced visitors will be lost. • If nearby sites cannot accommodate displaced visitors, recreation loss associated with Alternative 3 will be substantially greater than estimated in the FR/EIS. With the typical $8 Unit Day Values (UDV) calculated in Table 6 of Appendix T, there would be a loss of $1.4 million a year in recreation benefits for two years during construction and a loss of about $800,000 a year for 5 years post-construction (a total of $4 million). This is nearly $7 million in recreation losses occurring in the first 7 years of project implementation, a substantial impact on the Present Value of recreation. Including these lost recreation values would greatly increase the overall lost recreation benefits calculated in the NED costs of Alternative 3. • No uncertainty analysis is conducted for recreation losses, besides noting that there is uncertainty regarding the hydrology. Given the reliance on professional judgment to assess the reduction in visitor benefits associated with drawdown, there is probably some uncertainty in those estimates that needs to be addressed. The analysis currently assumes a reduction of one-half a standard deviation from the UDV; however, this assumption is not supported or explained. There is also uncertainty regarding the reduction in visitor use with drawdown. Without the BBC report, it cannot be determined whether a formal uncertainty analysis has been or can be conducted. If a model of visitor use in response to reservoir drawdown over the years has been developed, then a formal uncertainty analysis using the standard error of the estimated visitation could be performed.

Significance – High:
The selection of Alternative 3 as the NED plan may not be supported if the recreational users displaced from Chatfield Reservoir cannot be accommodated at the other nearby recreation sites, resulting in a substantially large loss of recreational benefits.
Recommendation(s) for Resolution:
1. Provide a reference for the BBC report, which discusses visitor displacement, and provide a brief discussion in Appendix T of the methods used to estimate displaced recreational users. 2. Provide information on which nearby recreation sites have the capacity to accommodate the visitors estimated to be displaced from Chatfield State Park under Alternatives 3 and 4 during the two-year construction period and post-construction years 1 - 5 of operation. 3. Provide the basis for choosing one-half a standard deviation of the UDV as the reduction in visitor benefits associated with visitors displaced to other recreation sites. 4. Perform a quantitative uncertainty analysis for the recreation loss analysis under Alternatives 3 and 4 using either the information in the BBC report on visitor displacement or a model relating visitation to Chatfield Reservoir levels over the past years (e.g., months with full reservoir pools, months with lower reservoir pools due to drought or drawdown).

Comment 9:

Reliance on Unit Day Values instead of more appropriate regional or site-specific models and a very small sampling of recreation users may have resulted in substantial underestimation of the recreational losses from the Chatfield project.

Basis for Comment:

The approaches used to calculate recreation benefits and changes in recreation use with Alternatives 3 and 4 are not based on information that is specific enough to characterize a large, heavily used recreation area.

- U.S. WRC Principles and Guidelines (U.S. WRC, 1983) (Figure 2.8.2), which the FR/EIS confirms USACE is required to follow, indicate that if annual visits are greater than 750,000, a regional model or site-specific study, such as Travel Cost Method (TCM) or Contingent Valuation Method (CVM), should be developed. The FR/EIS and Appendix T indicate that Chatfield State Park has received 1.4 to 1.6 million annual visits for the last five years. Appendix T states that annual recreational use was split by activity, such that each activity had fewer than 750,000 visits, rather than looking at total recreational use (p. 2), and that the USACE "vertical team" and the District and the Division concurred in the use of the UDV method rather than a regional model or site-specific study (p. 3). There is no rationale provided for splitting use by activity. Chatfield State Park receives twice the cut-off visitation that is defined in the U.S. WRC Principles and Guidelines (U.S. WRC, 1983). If the Principle and Guidelines criteria for determining what valuation method to use had been applied, either a site-specific or regional model would have been used. Figure 2.8.2 defines regional and site-specific studies as TCM or CVM, not UDV.
- It is not clear how the standard deviation of UDVs was developed in Table 6 of Appendix T. It is important to know this since the decreased benefits for the displaced users is based on the standard deviation of the UDV.
- A very small (n=88) and non-random sample is used to estimate the effects of 12-foot reservoir drawdown associated with Alternative 3 on 1.5 million visitors. This sample size (less than one tenth of 1% of the 1.5 million visitors) is being used to describe the impact on several recreation activities participated in by 1.5 million visitors. In Appendix T, the consultant (BBC) states that budget and timing constraints prevented a multi-seasonal intercept survey, which would be the most appropriate sampling method. However, such a survey could have been conducted on a limited budget by partnering with Chatfield State Park personnel, providing a larger and more representative sample of the population using Chatfield Reservoir.
- A very small reduction in recreation use value has been estimated for the 12-foot drawdown associated with Alternative 3, which results in mudflats, greater distance of the new parking/picnic facilities from shore, etc. This low estimate seems inconsistent with some of the workshop comments received about the impact of Alternative 3 on water-based recreation (Exhibit D in Appendix T). For example, there is only a 5% drop in value, even in water-based recreation activities like swimming, jet skiing, and motorized and non-motorized boating. There is no justification for the small estimated

reduction in recreation use value when these activities collectively represent a substantial portion of visitor use.

- The small sample of recreation representatives was not asked how recreational use would change with Alternative 4. Rather, change in recreational use was estimated based on an adjustment to information for Alternative 3. The rationale for not asking effects of Alternative 4 is not presented.

Significance –High:

The recreational losses may have been underestimated and may affect the selection of the NED plan.

Recommendations for Resolution:

1. Do not split recreation use by activity and apply the appropriate valuation models required by the U.S WRC Principles and Guidelines (U.S. WRC, 1983).
2. Explain how the standard deviations of the UDVs were calculated in Table 6 of Appendix T.
3. Explain how a one-day workshop with a very small, non-random sample of visitors is expected to compare with the results of a multi-seasonal analysis of recreation use at Chatfield State Park.
4. Explain how a small sample (n=88) of recreation representatives could provide accurate estimates of the effect of Alternative 3 on 1.5 million visitors.
5. Explain why the group of recreation representatives at the workshop was not asked about changes in recreational use under Alternative 4.

Comment 10:
The geographic boundaries of the study area are not clearly defined and do not include the features of all of the alternatives presented.
Basis for Comment:
The project study area is defined as extending from the Chatfield Reservoir downstream along the South Platte River to the Adams/Weld County line. Figure 1-1 shows a large aspect of Central Colorado, focusing on the various tributaries of the South Platte River. Figure 1-2 shows an area upstream of Chatfield Reservoir, but does not define where the study area ends. • It is not clear if the project study area needs to be redefined because (1) the benefits from the reallocation project would extend to various users who may be within or outside the stated project study area, or (2) the purpose and need are to provide water for a 50-year period to the Denver metropolitan area, which may include areas outside the county boundaries shown. • Many of the gravel pits shown in Figures 2-6 through 2-9 are outside the defined project study area, being located north of the Adams/Weld county line. The various features and considerations of the project alternatives are supposed to be consistent with the project study area. Any exceptions should be related to cumulative impacts and threatened and endangered species analysis, as these resources and the project effects on these resources could extend outside the project study area. • The geology and soils analysis (Section 3.2.2) includes Weld and Morgan Counties, which are outside the stated project study area. • The aquatic life and fisheries analysis (Section 3.5) ends at Strontia Springs reservoir at the upstream end of the South Platte River. However, the removal of critical habitat for the Preble's meadow jumping mouse (PMJM) would affect its populations upstream past that reservoir as well as the overall population of this species, which ranges well outside the study area (other states). Compensatory mitigation is proposed for the PMJM well upstream of the reservoir at Spring Creek. Wetlands are only evaluated to the Adams/Weld County line (Section 3.7). • Weld and Morgan Counties are used to address socio-economic impacts on downstream agriculture (Section 3.15), yet they are outside the defined project study area. • For environmental justice considerations, it is unclear whether Morgan County should be included in the analysis, as agricultural uses would be affected.
Significance –Medium:
Because the project study area is not clearly defined, it is difficult to determine whether all project impacts have been identified and addressed.

Recommendation(s) for Resolution:
1. Clearly define the project study area and use this area consistently in the analysis of all alternatives. *2.* Clearly show the extent of the project study area in the figures and exhibits that accompany the FR/EIS.

Comment 11:
Some terminology and conditions for the screening analysis are not clearly defined, and some screening criteria that should have been considered are not.
Basis for Comment:
The FR/EIS does not clearly define several key phrases and terms that frame the basis of several of the screening criteria, including "unreasonably costly relative to other concepts," "reasonably foreseeable timeframe," and "acceptable" (within the context of mitigation and permitting requirements). There should be a specific measure or unit that defines these terms, which results in decisions during the screening process. Environmental Criteria (EC) 1 for the screening of alternatives appears to only focus on aquatic ecosystems. EC1 should include all environmental considerations under NEPA instead of just aquatic ecosystems. EC2 seems to allow alternatives to advance through the screening analysis only if there are impacts to perennial streams and wetlands and an acceptable mitigation plan. Impacts to ephemeral and intermittent streams are not considered, although they provide similar functions and values to aquatic and terrestrial resources within the project study area. These functions and values could also be evaluated and considered in the development of an acceptable mitigation plan.
Significance –Medium:
It is difficult to understand how the alternatives for detailed analysis were selected unless screening terms and criteria are clearly defined and the screening process includes consideration of all potential impacts.
Recommendations for Resolution:
1. Clearly define all of the terms and established screening criteria for all 37 concepts. 2. Provide a complete description of the screening process and how each alternative concept was screened or advanced.

Comment 12:
The FR/EIS does not include screening criteria that would eliminate reservoir deepening by sediment removal as an alternative to raising the elevation of the conservation pool.
Basis for Comment:
It does not appear that any alternative concepts were considered that would result in keeping the same footprint of the existing reservoir at elevation 5,232 ft while providing for the additional storage desired. Such alternatives could include reservoir deepening. These alternatives concepts may not have been considered because of substantial costs for implementation; however, without presenting any information or analysis, it is unclear whether these alternatives would even be feasible. It is reasonable and conceivable that alternatives that do not alter the footprint of the reservoir at 5,232 ft and provide additional storage could be achieved while still meeting the purpose and need.
Significance –Medium:
The justification for the alternative screening process and the selection of the preferred alternative is not completely supported without presenting all of the alternatives that could be considered that meet the purpose and need of the project, specifically alternatives that include deepening the reservoir by sediment removal and/or keeping the reservoir footprint the same.
Recommendation(s) for Resolution:
1. Revise the FR/EIS to include alternatives that could result in keeping the same footprint of the existing reservoir at elevation 5,232 ft and provide a thorough analysis of potential benefits, detriments, and impacts associated with these concepts. 2. Develop compensatory mitigation plans, as needed, for unavoidable impacts.

Comment 13:
No information is provided on storage capacity for several of the alternative concepts presented for screening analysis.
Basis for Comment:
The amount of storage capacity available for Bear Creek and Cherry Creek Reservoirs, as well as the Alluvial Aquifer Conjunctive Use and Chatfield Reuse Program and Regional Reuse Water Infrastructure and Supply Efficiency (WISE) partnership concepts, is not provided in the FR/EIS. Because of this omission, it is not clear whether any of these alternative concepts might have been able to provide sufficient storage capacity to meet the purpose and need for the project and been advanced for further analysis.
Significance –Medium:
Without information on storage capacity for all of the alternative concepts, it is not possible to determine whether those concepts might meet the purpose and need for the project.
Recommendation(s) for Resolution:
1. Include storage capacity in the description of all the alternative concepts in the FR/EIS. 2. Re-evaluate the alternatives using the storage information to determine whether they should be advanced for further analysis.

Comment 14:
The environmental constraints do not appear to have been applied consistently across alternatives for the alternatives analysis.
Basis for Comment:
Environmental constraints regarding land use, wetlands, and hazardous, toxic, and radioactive waste do not appear to have been evaluated consistently across alternatives during the alternatives analysis. • *Land Use:* Land use impacts are not quantified for Alternatives 3 and 4 in the analysis. This information is only provided for Alternatives 1 and 2. • *Wetlands/Waters of the U.S.*: National Wetland Inventory (NWI) data and maps are used to characterize wetlands for the parts of the FR/EIS related to wetlands and waters of the U.S.; however, wetlands data from the Natural Resource Ecology Laboratory (NREL) Colorado State are used for the parts of the FR/EIS that relate to wildlife, vegetation, and listed species. The data used across the alternatives in the analysis of impacts to wetlands, which translate to impacts on vegetation and wildlife, are inconsistent and may not be comparable across alternatives. • *Hazardous, Toxic, and Radioactive Wastes*: There is no discussion indicating that site inspections for hazardous, toxic, and radioactive wastes have been performed for Alternative 1 areas, although such inspections were performed for the other alternatives in the analysis. Based on aerial photography, existing land uses for Alternative 1 areas include farming activities, and there is the potential for hazardous waste contamination associated with these facilities. Further study, documentation, and coordination are needed to determine whether recognized environmental conditions exist at this location that would indicate "the presence or likely presence of any hazardous substances or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, ground water, or surface water of the property." (ASTM E1527-05).
Significance –Medium
The inconsistent evaluation of potential environmental impact across the various alternatives affects the understanding of potential impacts to all human populations and natural resources as a result of the project.
Recommendation(s) for Resolution:
1. Assess potential impacts to land use and wetlands from the presence of hazardous, toxic, and radioactive wastes consistently across all of the alternatives in the alternatives analysis. 2. Explain the outcome of each analysis for all of the alternatives to support the selection of the preferred alternative.

Literature cited:

ASTM Standard E1527-05 (2003). Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process. ASTM International, West Conshohocken, PA. DOI: 10.1520/C0033-03, **www.astm.org**.

Comment 15:
The environmental constraints considered during the evaluation of alternatives do not take geological, ecological socio-economic, and environmental justice impacts into account.
Basis for Comment:
Some of the environmental constraints considered for the evaluation of alternatives, such as geological, ecological, socio-economic, and environmental justice impacts, do not include all of the information necessary for the analysis. • *Geology/Soils*: There is little or no discussion of the conversion of soils from nonhydric to hydric soils in saturated and/or inundated conditions, impacts on farmlands of state importance, and subsurface mineral rights and resources in the alternatives analysis. • *Mineral Rights*: It is reasonable to assume that private lease holders may have the ability to obtain subsurface mineral rights on Federal lands, in particular, in Pike National Forest, which is identified as part of the compensatory mitigation plan for Alternative 3. Even if the existing compensatory mitigation plan work is within an existing right-of-way easement, mineral resources could be obtained within this area and/or geophysical exploration could occur. It is not clear from the alternatives analysis whether obtaining mineral rights (oil, gas, or other minerals) could: 1. Potentially affect the ultimate success of the project in protecting the PMJM. 2. Have a cumulative effect on additional subsurface mineral mining/exploration. 3. Alter surficial and deeper groundwater aquifers that could be used for storage and recovery, in an effort to supply water needs for the Denver region. 4. Result in mineral exploration at Chatfield Reservoir that would result in damage and/or fluctuations of the pool elevation anticipated under Alternative 3. • *Wetlands/Waters of the U.S.*: Riffle/pool complexes, mudflats, and vegetated shallows are not described and/or delineated in the FR/EIS. These resources are defined as "special aquatic sites" protected and regulated pursuant to Section 404 of the Clean Water Act (CWA). • *Floodplains/Floodways:* These resources are not evaluated or described in the EIS as required by Executive Order 11988. Potential adverse effects on floodplains and floodways may cause adverse effects on public health, safety, and welfare upstream or downstream of the impact area. • *Threatened & Endangered Species*: Impacts on listed species other than the PMJM are not considered, and there are other listed species that may be affected. For example, it is not clear whether there is suitable habitat for the migrating whooping crane under each of the alternatives, or whether the Townsend's big-eared bat would be adversely affected by any of the alternatives. This species can inhabit crevices and masonry structures (bridges, culverts, and the like), yet no description of potential crevices and masonry structures are provided in the FR/EIS. Furthermore, the study area for listed species is generally too limited, as there could be adverse and/or detrimental effects on listed species outside the stated study area.

- *Environmental Justice and Socio-economics*: Table 3-13 has not been updated to include 2010 census data. This section of the FR/EIS also lacks specific data on census tracts and/or block groups/blocks required to evaluate aspects of the alternatives that will directly affect certain populations. County-level data, which were used for the analysis, could skew decisions regarding alternative selection and/or location. For instance, an alternative might be located in an area with a minority and/or low-income population and result in a disproportionate effect on these populations (discussed in Chapter 4). However, there is no information on communities, community cohesion, and/or individual residences in the defined study area to determine whether a disproportionate effect will occur. For example, Alternative 1 includes the creation of a new reservoir that may affect specific populations. However, without information on communities, community cohesion, and/or individual residences, it is unclear whether the effects on these areas would be significant enough to raise environmental justice issues and require avoidance and/or minimization of impacts.

Significance –Medium

The omission of some environmental constraints limits the understanding of how impacts are considered during the alternatives analysis.

Recommendation(s) for Resolution:

1. Include in the alternatives analysis information on the conversion of soils from nonhydric to hydric soils in saturated and/or inundated conditions, impacts on farmlands of state importance, and subsurface mineral rights and resources.
2. Describe riffle/pool complexes, mudflats, and vegetated shallows for each of the alternative scenarios in the alternatives analysis.
3. Evaluate floodplains and floodways in the alternatives analysis, as outlined in Executive Order 11988.
4. Consider the impacts on all Federally and state-listed species in the alternatives analysis.
5. For the evaluation of socio-economic impacts:
    - Provide updated Census Data for the project study area.
    - Revise the analysis of socio-economic and environmental justice considerations based on 2010 Census data and include consideration of block and block group data to be consistent with Executive Order 12898.
    - Revise the environmental documentation to include information on communities, community cohesion, and individual residences within the study area so potential impacts on these resources can be evaluated for the project.
    - Revise the analysis of impacts based on any potential impacts on communities, community cohesion, and individual residences within the study area.

Comment 16:
Some of the assumptions regarding aesthetic and recreational value are not fully explained, and it is not clear whether the same set of assumptions has been applied across the range of alternatives in the analysis.
Basis for Comment:
The Panel is unable to evaluate potential effects on recreational and aesthetic values in the alternatives analysis because the assumptions are not clearly defined and explained, and the same set of assumptions is not applied across all of the alternatives in the alternatives analysis. Specifically: • Existing land uses evaluated in the project study area include pasturelands, rangelands, and grasslands that provide various recreational and aesthetic values. They may include biologically diverse landscapes that provide passive recreation (hiking, photography), rangelands that allow observation of various livestock and non-livestock animals that use these habitats, and the like. It is not clear how the aesthetic values of pasture, rangelands, and grasslands stay intact if the land use changes to a reservoir in Alternatives 1 and/or 2. • The aesthetic impacts discussion for Alternative 3 only focuses on the "ring," the area that is exposed during low storage. It does not discuss how the viewshed of the mountains, foothills, and other geographic features would change and whether this would affect how visitors perceive Chatfield Reservoir and Chatfield State Park. This could be especially noticeable at the relocated marina and restaurant facilities. • It is not clear how Penley Reservoir (Alternative 1) would not provide recreation. Recreation includes active and passive activities. It is reasonable to assume that recreational activities such as fishing and non-motorized boats/kayaks could be used on the Reservoir. Costs and benefits for these activities at Penley Reservoir are not included in the FR/EIS and supplemental documentation.
Significance –Medium:
The potential effects on recreation and aesthetics for all the alternatives cannot be fully evaluated based on the information provided in the FR/EIS.
Recommendation(s) for Resolution:
1. Describe the potential effects on aesthetic values for all alternatives considered in detail in the FR/EIS. 2. Explain why it is assumed that no recreational uses would be provided at Penley Reservoir. *3.* Revise the FR/EIS to describe potential effects to the viewshed as a result of Alternatives 3 and 4.

Comment 17:
It is not clear how much of the projected future water demand is to accommodate the existing service area demand and future growth and how much is to accommodate future expansion of the service area and new growth.
Basis for Comment:
Table 1-2 does not separate current demand and projected future water demand into (1) demand based on the existing service area, and (2) demand based on new growth due to expansion of the service area. There also are no data on how much of the water needed by the project proponents will supply existing growth within the service area versus future growth related to expansion of the service area to accommodate new growth. The basis for any such future growth outside the service area needs to be presented (e.g., the cities have a master land use plan that zones the areas to be serviced by this future water for urban or suburban or commercial development). In addition, although Table 1-2 shows project proponents' supplies, 2010 demands, and future demands, there is no clear explanation or documentation on how those numbers were used in the No Action and alternatives analysis.
Significance –Medium:
It is difficult to understand the role the project plays in meeting current and future water demands of the project proponents without explaining how current and future demands and population growth are used in the alternatives analysis.
Recommendation for Resolution:
1. Explain how each of the individual project proponents' separate demands for current and future water supply is used in the No Action and alternatives analysis.

Comment 18:

How water yield and reliability of the water supplies were determined for each of the alternatives is not explained in the FR/EIS.

Basis for Comment:

Because of inconsistency in the terminology on water yield and because the water yield analysis is not presented or summarized in the FR/EIS, it is difficult to determine the differences in water yield characteristics among each of the alternatives.

- There is inconsistency in terminology and information presented on project water yield. For example, Chapter 4 refers to average annual yield, whereas Chapters 2, 5, and 7 refer to average year yield. Those terms could be interpreted either as two different situations, where one is the yield of water to the proponents during an average year and the other is the average annual yield over the period of study, or both terms could be referring to the same yield.
- Section 4.4, Environmental Consequences–Hydrology states that the non-tributary ground water (NTGW) would pump the full 8,529 AF (p. 4-28). This yield is inconsistent with the explanation of yields for Alternative 2 in Chapter 2,which states that the yield for NTGW would be 4,270 AF (p. 2-61).
- The FR/EIS does not provide details of an analysis of water yield for each alternative to support the claim that there is the same yield across alternatives. Section 2.4 discusses the alternatives and states that the alternatives were developed to have the same yield. However, there is no reference cited or presentation of the analysis completed to explain how the yields for each alternative were calculated.
- The tables in Appendix B of Appendix H list storable flows and releases for Alternatives 3 and 4, but no information is provided on how those tables were developed. Mid-review teleconference discussions indicated that the tables were developed from the 2003 Colorado Water Conservation Board (CWCB) Reallocation Study (referenced in Chapter 1, Section 1.3.4.9, and Chapter 2, Section 2.3.6). However, the 2003 CWCB study was not referenced in Appendix H, the Hydrology Report to the FR/EIS. Appendix H only says the storable flows and releases were provided by the State. Chapter 5 discusses the drought year storable flow of 2,379 AF by reuse of NTGW. However, the 2003 CWCB Reallocation Study states (p. 5) that in drought years there is no water available for storage. There is no explanation for the analysis that was completed to justify the differences between the dry year yields.
- The FR/EIS claims that, under Alternative 4, any shortfall in average year yields with the smaller pool would be made up by NTGW and gravel pit storage; but there is no reference to the study that supports the conclusion.
- For Alternative 2, the yield of NTGW in dry years is potentially much greater than the yield of direct flow or storage rights because pumping is not limited by prior appropriation to senior water rights. Therefore the firm yield, defined as the yield during prolonged droughts, should be greater for Alternative 2 than for Alternative 3. This is not discussed, nor is an analysis referenced to substantiate the yield estimates. There is

little discussion in the FR/EIS of the project yield other than average annual yields, making it difficult to gauge the reliability of the water supply of each alternative.
Significance –Medium:
The alternatives selection cannot be fully justified without a reference to and summary of the water yields and water reliability analysis.
Recommendation(s) for Resolution:
1. Make terminology and information on water yield consistent throughout the documentation (e.g., reconcile the inconsistencies between Chapters 2 and 5 of the NTGW pumping on Alternative 2.) 2. Provide the analyses of the annual water yields that were completed for each alternative either by referencing documents in the FR/EIS or providing this information in the appendices. 3. Include a summary of the water demands being met by each of the alternatives over the period of analysis. 4. Provide an analysis of the reliability of the water supply under each alternative; this could be accomplished by providing a summary of average, wet year, and dry year yields for each alternative.

Comment 19:
The analysis of flood frequencies and flood control impacts may not accurately characterize larger floods or account for the potential impact due to the loss of flood control space.
Basis for Comment:
The comparison of with and without-project conditions at Chatfield Reservoir is based on routing the historic record (1942-2000) through the reservoir. This method is effective in defining the flood flow conditions up to the 1 in 60 annual exceedence probability (AEP) flood event. Since the Denver urban area is provided flood protection by Chatfield Reservoir, the 1 in 100 up to 1 in 500 AEP flood event needs to be evaluated and defined. However, the analysis only provides an extrapolation of the historic floods to the 1 in 500 AEP level. This is not the traditional analysis USACE uses for determining reservoir operation impacts and may significantly underestimate the impact of reducing flood space at Chatfield Reservoir. If flood routings of the 1 in 100, 1 in 200, and 1 in 500 AEP flood events show no impact on downstream flood protection, then the project could proceed as formulated.
Significance – Medium:
Because the flood routings used for the analysis of flood frequencies only covers a 60-year period, there is a high degree of uncertainty associated with impacts from larger flood events.
Recommendation(s) for Resolution:
1. Provide flood routings of the 1 in 100, 1 in 200, and 1 in 500 AEP floods. 2. If a flood impact is determined, include adequate flood management mitigation in the project to keep it “flood neutral.”

Comment 20:
The adaptive management considerations do not fully explore the potential impact of climate change on future conditions for the various alternatives.
Basis for Comment:
Climate change, while not thoroughly studied in the region, is a necessary factor to consider for determining whether many aspects of the project will be effective and successful. It is unclear whether any of the alternatives would effectively meet the regional water needs given potential climatologic changes, and the potential impacts of climate change on the project are not fully explored by the adaptive management considerations. Climate change could result in extended periods of mixing at Chatfield Reservoir, producing effects that are greater than those estimated as a result of a high frequency of water quality criteria exceedances. One such event occurred in September 2010 when water quality parameters at Chatfield were exceeded, affecting the local supply of water available for municipal use. Climate changes hypothesized for the region could also produce changes in growing seasons, so that warmer acclimated plant species transgress to historically colder areas and colder species transgress to areas acclimated to warmer temperatures. These species could also be affected (beneficially or detrimentally) by changes in rainfall patterns and snow melt (or lack thereof). It is unclear whether the mitigation concepts have considered these potential effects in the selection of sites, plants species, hydrological modifications, etc. It is also unclear why mitigation concepts include only one year of baseline groundwater hydrology data to ascertain design specifications. Given the dynamic nature of seasonal climate variations in the area, along with fluctuations due to El Niño and La Niña, more than one year of data should be collected. Insufficient groundwater data collection may result in an inappropriate design for mitigation concepts, especially when changes to groundwater and surface water availability for mitigation are uncertain. Adaptive management considerations must be fully addressed to account for how climate change would affect hydrology in these mitigation areas, as well as water quality in Chatfield Reservoir.
Significance –Medium:
The adaptive management strategies are incomplete without a full evaluation of the potential impacts of climate change on future conditions for each of the alternatives.
Recommendation(s) for Resolution:
1. Provide a full qualitative evaluation of how climate change may affect future conditions for each of the alternatives, that is, whether adequate hydrology will be available to support project goals and objectives. 2. Revise adaptive management goals and objectives with respect to climate change to address the long-term nature of the project.

Comment 21:
Sediment accumulation over the life of the project and how it may affect pool levels are not evaluated.
Basis for Comment:
The report does not present estimates for future sediment accumulation in Chatfield Reservoir. Both water supply functionality and flood protection capability are dependent upon adequate storage space in the reservoir, which may be impacted by sediment deposition. Neither the draft Water Control Plan nor the information provided in Appendix H of the FR/EIS address how sediment deposition in Chatfield Reservoir would affect the future operation plan.
Significance –Medium:
Information regarding sediment accumulation is important for understanding future reservoir storage capacity.
Recommendation(s) for Resolution:
1. Provide information documenting that sediment deposition in Chatfield Reservoir is not a potential problem. 2. Otherwise, explain how sediment deposition will be handled in the future.

Comment 22:
It is not clear whether compensatory mitigation activities would create a wildlife hazard for aircraft.
Basis for Comment:
The Federal Aviation Administration (FAA) requires that consideration be given to potential impacts on aircraft from wildlife attractants. The project study area is large, encompassing a minimum of five counties along the Front Range of the Rocky Mountains. It is unclear whether there was any coordination with the FAA during the development of project alternatives. The location of compensatory mitigation proposed for the preferred alternative, as well as other mitigation plans considered for non-preferred alternatives, could result in wildlife attractants that may be within the vicinity of, or within the flight paths of, various aviation aircraft.
Significance –Medium:
Without a clear understanding of the potential impacts on aviation equipment as a result of wildlife attractants, it is not clear whether there may be public safety, health, and welfare concerns and risk to avian species.
Recommendation(s) for Resolution:
1. Coordinate with the FAA to determine if all the alternatives carried forward in analysis could potentially affect aviation equipment. 2. If there is a concern, evaluate and analyze potential effects on wildlife from potential collisions with aircraft in those parts of the study area that could be within the flight paths of aircraft. 3. Modify the effects determinations for Federal and state-listed species if they would be affected by aircraft collisions.

Comment 23:

The effects determinations outlined in Appendix V for the preferred alternative are not correctly stated or evaluated for certain Federally listed species.

Basis for Comment:

The Endangered Species Act (ESA) requires that all potential effects on threatened and endangered species be described and documented, whether they are adverse or beneficial. A "no effect" determination means that an action would have absolutely no effect on that species. Throughout Appendix J, the effect determination nomenclature is not in conformance with Section 7 of the ESA. Effects determinations under the ESA must be stated as "no effect," "may affect, not likely to adversely affect," and "may affect, likely to adversely affect." One example of incorrect nomenclature in the text is the use of the determination "may affect, but will not likely to adversely affect."

The following text provides examples of places in Section 5.2, Appendix V, where nomenclature is inconsistent with ESA and clarity is needed:

- Interior least tern and piping plover habitat occurs within the study area (gravelly or sandy shorelines). The Preferred Alternative is expected to provide a benefit to migrating species and have "no adverse impact." The effect terminology is incorrect and the effect determination is not a "no effect" because the Preferred Alternative would have a beneficial effect on the species. The correct terminology should be "may affect, not likely to adversely affect."
- Whooping cranes migrate within the project study area, but have not been reported in Colorado since 2002. It was documented that any occurrence would be an "accidental migration pattern." It was also documented that there would be "no adverse impact" to the whooping crane. The migration pattern of the whooping crane is documented by USGS (Status Survey and Conservation Action Plan, Whooping Crane [Meine and Archibald, 1996]) as occurring within Colorado from the Grays Lake National Wildlife Refuge near the border of Idaho and Wyoming southeast to Monte Vista National Wildlife Refuge (NWR) near the south-central portion of Colorado where they have a migration stopover. Although not probable, it is possible that this species could migrate over the project area. The creation of herbaceous marsh habitats to offset unavoidable impacts proposed by the Preferred Alternative would provide suitable habitat for whooping cranes during migration. Therefore, the effect determination is not stated correctly and the effect determination should be a "may affect, not likely to adversely affect" because the project may have a beneficial effect on the species.
- It is unclear whether the effects analysis and determination considered how the proposed compensatory mitigation activities for the PMJM in Pike National Forest, upstream of Chatfield Reservoir, would affect the Mexican spotted owl.

Section 6.0 of Appendix V also provides effect determinations for those species potentially affected by the Preferred Alternative. The effect determinations for the interior least tern and the piping plover are not consistent with those stated in Section 5.2.

It is unclear whether the effect determination of "may affect, not likely to adversely affect" for the PMJM at Spring Creek considered the long-term effects of culverts and stilling basins on

this species. Routine maintenance and upkeep of these structures, including diverting stormwater to adjacent created habitats for PMJM, may have an adverse effect on this species.
Significance –Medium:
The information presented in the effects determination does not provide a complete description of potential impacts on Federally listed species.
Recommendation(s) for Resolution:
1. Revise Appendix V, as well as applicable sections of the FR/EIS, to have standard nomenclature for the effects determinations for listed species pursuant to Section 7, ESA. 2. Revise Appendix V, as well as applicable sections of the FR/EIS, to correctly describe the effects determinations for the least tern, piping plover, and whooping crane. 3. Provide additional documentation in the Biological Assessment and FR/EIS that supports the effects determinations made for the Mexican spotted owl and PMJM in Pike National Forest (Spring Creek).

Literature Cited:

Meine, Curt D. and George W. Archibald (Eds) (1996). The cranes: - Status survey and conservation action plan. IUCN, Gland, Switzerland, and Cambridge, U.K. 294pp. Northern Prairie Wildlife Research Center Online.
http://www.npwrc.usgs.gov/resource/birds/cranes/index.htm (Version 02MAR98).

Comment 24:
The cumulative impacts analysis provided for the Biological Assessment is not consistent with statutory requirements outlined in Section 7 of the ESA.
Basis for Comment:
The cumulative impacts analysis provided in the FR/EIS does not conform to the requirement of the ESA, Section 7, which states: "…the impact on the environment which results from incremental impact of the action when added to other past, present, and reasonably foreseeable future actions and regardless of what agency (federal or non-federal) or persons undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." Under Section 402.02 of 50 CFR Part IV, cumulative effects is defined as "those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation." Cumulative impacts analysis under NEPA evaluates what might foreseeably occur, while cumulative impacts analysis under ESA evaluates what would be reasonably certain to occur. The severity and type of effects under the two analyses could vary considerably, which is why it is mandated to perform the analysis pursuant to both acts; however, cumulative impacts are only evaluated in conformance with NEPA.
Significance –Medium:
The Biological Assessment does not fully address potential cumulative effects of future State or private activities within the action area within the 50-year analysis period.
Recommendation(s) for Resolution:
1. Revise the Biological Assessment to adequately analyze cumulative impacts pursuant to Section 7 of the ESA. 2. Revise the FR/EIS based on these changes and potential changes to the effects determinations for listed species.

Comment 25:
The Ecological Functional Value (EFV) system and Habitat Suitability Indices (HSIs) seem to be subjective, do not have a clear link to ecological impacts, and may not accurately reflect changes in habitat quality.
Basis for Comment:
Neither the link between habitat quality and the EFVs and HSIs nor the development of the EFVs and HSIs are explained and supported. In the FR/EIS, HSIs also are not provided for all birds and other wildlife that may be present within the area of analysis. The development of additional HSI models for other species is necessary to help develop a comprehensive mitigation plan that accounts for the functions and values the impacted areas provide to these species. It is not clear why the scoring/ranking indices used 0.25 increments in the EFV scoring system when any values between 0 and 1.0 could have been used. No basis for this incremental scoring is provided, and resulting scores may not be sensitive enough to detect changes or differences. The scores for upland areas and the low value riparian system seem to be too low, and are not explained or justified. These areas are generally in designated critical habitat for the PMJM and should be afforded extra protection. Various man-made and induced alterations would result in scores being slightly below 1.0, if they were scored on a continuous scale of 0 to 1.0. The incremental buffer width is set at 100-foot intervals, but there is no support for this number or what the most beneficial buffer width should be for target wildlife species and/or the PMJM. It is also not clear from the information provided how the 1.25, 2, and 3 multipliers were developed for HSI models, as there are no scientific references to support these increments. The size, type, and conceptual design of the compensatory mitigation plan could change based on the re-evaluation of these indices, scores, and multipliers.
Significance –Medium:
Lack of explanation for EFV scoring and the use of seemingly subjective scoring and ranking analyses could produce results that are unrepeatable and do not have any clear ecological meaning, ultimately affecting the justification for the mitigation proposed.
Recommendation(s) for Resolution:
1. Develop and evaluate HSIs for all species or groups of species potentially using impacted habitat within the project study area, including terrestrial species that use aquatic/wetland habitats. 2. Further describe and quantify the methods used to develop the incremental analysis used in the EFV, including weighted multipliers and buffer widths. 3. Re-evaluate mitigation needs to include information for additional species. 4. Re-evaluate mitigation needs for the size, type, and conceptual design based on re-evaluated indices, scores, and multipliers.

Comment 26:
EUTROMOD is not an appropriate model for assessing water quality issues for the project.
Basis for Comment:
The EUTROMOD model used for the Chatfield Project is a regional nutrient loading and lake response model that was originally developed using reference information from the southeast United States. Additional models have also been developed for the Midwest. However, the Midwest and Southeast regions of the country do not have the same factors as semi-arid environments, including rainfall regimes, soils, and other limnological factors. It is unclear if the methodology used would be appropriate for Colorado, even though it has been used in Nebraska and Oklahoma, because of the unique characteristics of lake and reservoir systems in the foothills of the Front Range of the Rockies. There are numerous other water quality models available that may be more appropriate for evaluating water quality issues associated with the proposed project. These may include, but are not limited to, CORMIX, WASP7, or QUAL2K. Site-specific water quality models are often developed for specific watercourses, lakes, and the like. EUTROMOD is a relatively easy model to use, as it is spreadsheet-based and the input data requirements are minimal. However, its simplicity results in limitations. In Section 3.1.4, the limitations of the model and analysis discussed include the inability to effectively characterize variability and uncertainty. The dynamic effects and processes taking place across the Chatfield Reservoir, which is stated as having "a wide range of results spatially and temporally across the depth of the reservoir, which are much higher than even the range of model error bounds." It is not clear, in light of the limitations outlined in Appendix J, whether these spatial and temporal variations at depth would adversely affect water quality long term. It is also unclear whether an existing regionally specific water quality model or a water quality model developed specifically for the South Platte/Chatfield Reservoir would provide more certainty in the results of the water quality analysis performed.
Significance –Medium
The EUTROMOD model outputs may not reflect future water quality conditions resulting from the project with a reasonable level of certainty.
Recommendation(s) for Resolution:
1. Re-run the water quality analysis using a more accurate regional model that addresses the limitations identified by EUTROMOD. 2. Document the revised results in the FR/EIS based on the new modeling.

Comment 27:
The difference between the operation elevation and the elevation of the conservation pool for the preferred alternative as stated in Appendix S of the EIS is different from that in the main document.
Basis for Comment:
In Attachment 3 of Appendix S, a letter from the National Park Service (NPS)/ Department of the Interior (DOI), dated October 2010, indicates that the proposed project would raise the Chatfield pool elevation from 5426.94 ft to 5444 ft (~17 ft). That is greater than the increase in the pool elevation proposed in Alternative 3 (17 ft versus 12 ft) and the bottom elevation is lower than 5432 ft (highest limits of the "conservation pool"). Based on this discrepancy between Appendix S and the main report, it is unclear whether the reallocation is from 5432 ft to 5444 ft or from 5426.94 ft to 5444 ft.
Significance – Low:
The unexplained discrepancy in the elevation of the conservation pool in different places in the FR/EIS affects the technical quality and understanding of the report.
Recommendations for Resolution:
1. Provide an explanation in the FR/EIS regarding the difference between the NPS stated pool elevation and the elevations stated by USACE in the EIS.

APPENDIX B

Final Charge to the Independent External Peer Review Panel
as
Submitted to USACE on August 10, 2011

on the

Chatfield IEPR

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Charge Questions and Guidance to the Peer Reviewers
for the
Independent External Peer Review of the Chatfield Storage Reallocation Study and Environmental Impact Statement

BACKGROUND

The Chatfield Dam and Lake Project was originally authorized in 1950 for flood control, silt control, recreation, fish and wildlife, and water supply storage. The primary purpose of the project, in conjunction with the Cherry Creek and Bear Creek reservoirs (also known as the Tri-Lakes), is to protect the Denver Metro area from catastrophic floods that have devastated the area periodically. Congress authorized USACE to conduct a reallocation study of Chatfield Lake for joint flood control and conservation purposes, including storage for municipal and industrial water supply, agriculture, and recreation and fishery habitat protection and enhancement. This study was authorized under Section 808 of the Water Resources Development Act of 1986 and the River and Harbor Act of 1958 (Title III, Water Supply Act of 1958, as amended).

The purpose of and need to reallocate a portion of the flood control pool to water supply is to increase availability of water, sustainable over the 50-year period of analysis, in the greater Denver area so that a larger proportion of existing and future (increasing) water needs can be met. From a sustainability standpoint, the sponsor is specifically interested in opportunities to increase surface water supply without the development of significant amounts of new infrastructure in order to reduce their reliance on non-renewable non-tributary groundwater (NTGW). Chatfield Dam has been identified as an important potential source of water storage due to its ideal location on the mainstem of the South Platte River.

While many alternatives were considered and screened from further analysis, the alternatives considered in detail in the Chatfield Reallocation Study are:

1. Construction of Penley Reservoir combined with gravel pit storage
2. Continued reliance on non-tributary groundwater combined with gravel pit storage
3. Chatfield Lake reallocation from flood control pool to allow an additional 20,600 acre-feet of water supply storage (12 ft increase in top of conservation pool, additional 587 acres inundated)
4. Chatfield Lake reallocation from flood control pool to allow an additional 7,700 acre-feet of water supply storage (5 ft increase in top of conservation pool, additional 215 acres inundated).

As there are significant social, economic, and environmental resources that will be affected by these alternatives (specifically recreational and ecological resources, including the endangered Preble's meadow jumping mouse), an Environmental Impact Statement (EIS) is being completed. While it is not anticipated that a reallocation at Chatfield Lake will create public safety concerns or major controversy, the total implementation cost will be greater than $45 million (although 100% non-Federal cost) and the study has impacts of a significant enough nature to require an EIS, thus triggering an independent external peer review (IEPR).

OBJECTIVES

The objective of this work is to conduct an IEPR of the Chatfield Storage Reallocation Study and Environmental Impact Statement (hereinafter: Chatfield IEPR) in accordance with the Department of the Army, USACE, Water Resources Policies and Authorities' *Civil Works Review Policy* (EC 1165-2-209) dated January 31, 2010, and the Office of Management and Budget's *Final Information Quality Bulletin for Peer Review* released 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, engineering, and environmental methods, models, and analyses used" (EC 1165-2-209; p. D-4) for the Chatfield 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) with extensive experience in water supply planning, environmental science, hydrology and hydraulics engineering, and economic issues relevant to the project. They will also have experience applying their subject matter expertise to flood risk management.

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 1165-2-209, Appendix D, 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.

Documents for Review

The following documents are to be reviewed by designated discipline:

Title	Approximate Number of Pages	Required Disciplines
Chatfield Reallocation Feasibility Study and Environmental Impact Statement	475	All Disciplines[1]
Appendix A – Dam Safety Evaluation	231	No Disciplines
Appendix B – Water Control Plan	18	H&H Engineer
Appendix C – Water Supply Demand Analysis	53	Water Supply Planner and Economist
Appendix D – Ecosystem Restorations Evaluation Report	61	Environmental Scientist
Appendix E – Wetlands	14	Environmental Scientist
Appendix F – Species of Mammals, Birds, Reptiles, and Amphibians Known to Occur in the Project Area	8	Environmental Scientist
Appendix G – Butterfly Species Identified at Denver Botanic Gardens at Chatfield, 1992-2001	3	Environmental Scientist
Appendix H – USACE Hydrology Report: Chatfield Dam and Reservoir	63	H&H Engineer
Appendix I – USACE Hydraulic Analysis	11	H&H Engineer
Appendix J – Impacts of Increased Water Supply Storage on Water Quality	65	Water Supply Planner, Environmental Scientist and H&H Engineer
Appendix K – Compensatory Mitigation Plan	315	Environmental Scientist and Economist
Appendix L – Real Estate Plan	20	No Disciplines
Appendix M – Recreation Facilities Modification Plan[2]	272	Economist
Appendix N – Chatfield Marina Reallocation Impact Assessment Report[2]	46	Economist
Appendix O – Cost of Reallocation	32	Water Supply Planner and Economist
Appendix P – Public and Agency Scoping Comments	33	All Disciplines
Appendix Q – Avian Point Count Data	5	Environmental Scientist
Appendix R – Antecedent Flood Study	30	H&H Engineer
Appendix S – Compliance with Environmental Statutes	51	Environmental Scientist
Appendix T – National Economic Development (NED) Recreation Benefit Analysis	40	Economist

Title	Approximate Number of Pages	Required Disciplines
Appendix U – Regional Economic Development (RED) and Other Society Effects (OSE) Analyses[3]	70	Economist
Appendix V – Draft Biological Assessment	75	Environmental Scientist
Appendix W – CWA 404(b)(1) Report	31	Environmental Scientist
Appendix X – Fish and Wildlife Coordination Act documentation	4	Environmental Scientist
Appendix Y – MCACES Documentation[2]	123	Economist
Appendix Z – Tree Management Plan	25	Environmental Scientist
Appendix AA – Summaries of Water Provider's Water Conservation Programs	21	Water Supply Planner
Appendix BB – Policy Waivers	66	No Disciplines
Total Page Count (Approximate)	2257	

[1]It will not be necessary for all reviewers to read all sections of the main document, but rather to focus on the section that are pertinent to that reviewers discipline.
[2]Only a high level review for consistency is expected to be necessary.
[3]RED and OSE accounts are not used directly in the economic or feasibility justifications for the project.

Documents for Reference

- USACE guidance Civil Works Review Policy (EC 1165-2-209) dated January 31, 2010
- CECW-CP Memorandum dated March 31, 2007
- Office of Management and Budget's Final Information Quality Bulletin for Peer Review, released December 16, 2004.

SCHEDULE

This draft schedule is based on the August 15, 2011 receipt of the final review documents. The schedule will be revised upon receipt of final review documents.

Task	Action	Due Date
Conduct Peer Review	Battelle sends review documents to Panel	8/18/2011
	Battelle convenes kickoff meeting with Panel	8/19/2011
	USACE/Battelle convenes kickoff meeting with Panel	8/19/2011
	Battelle convenes mid-review teleconference for Panel to ask clarifying questions of USACE	9/2/2011
	Panel members complete their individual reviews	9/19/2011
Prepare Final Panel Comments and Final IEPR Report	Battelle provides Panel merged individual comments and talking points for Panel Review Teleconference	9/23/2011
	Battelle convenes Panel Review Teleconference	9/26/2011
	Final Panel Comments finalized	10/14/2011
	Battelle provides Final IEPR Report to Panel for review	10/18/2011
	Panel provides comments on Final IEPR Report	10/20/2011
	*Battelle submits Final IEPR Report to USACE	10/25/2011
Comment/ Response Process	Battelle convenes teleconference with Panel to review the Comment Response Process (if necessary)	10/27/2011
	USACE provides draft Evaluator Responses to Battelle	11/8/2011
	Battelle provides the Panel the draft Evaluator Responses	11/14/2011
	Panel members provide Battelle with draft comments on draft Evaluator Responses (i.e., draft BackCheck Responses)	11/17/2011
	Battelle convenes teleconference with Panel to discuss draft BackCheck Responses	11/18/2011
	Battelle convenes teleconference with Panel and USACE to discuss Final Panel Comments and draft responses	11/21/2011
	USACE provides final Evaluator Responses in Final Panel Comment Forms	12/7/2011
	Battelle provides Evaluator Responses to Panel	12/12/2011
	Panel members provide Battelle with final BackCheck Responses in Final Panel Comment Forms	12/15/2011
	Battelle reviews Panel's BackCheck Responses	12/21/2011
	*Battelle submits pdf of Final Panel Comment Forms	12/22/2011

CHARGE FOR PEER REVIEW

Members of this IEPR Panel are asked to determine whether the technical approach and scientific rationale presented in the Chatfield documents are credible and whether the conclusions are valid. The Panel is asked to determine whether the technical work is adequate, competently performed, 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 Chatfield IEPR documents. Please focus your review on the review materials assigned to your discipline/area of expertise and technical knowledge. Even though there are some sections with no questions associated with them, that does not mean that you cannot 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 the following guidance. Note that the Panel will be asked to provide an overall statement related to 2 and 3 below per USACE guidance (EC 1165-2-209; Appendix D).

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 Independent Technical Review.
2. Please contact the Battelle Project Manager (Amanda Maxemchuk, MaxemchukA@battelle.org) or Program Manager (Karen Johnson-Young (johnsonyoungk@battelle.org) for requests or additional information.
3. In case of media contact, notify the Battelle Program Manager, Karen Johnson-Young (johnsonyoungk@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 Amanda Maxemchuk, MaxemchukA@battelle.org, no later than September 19, 2011, 10 pm ET.

EIS Sections to Be Reviewed by Discipline

Approx. Pages	EIS Section	Water Supply Planner	Environ. Scientist	H&H Engineer	Economist
Executive Summary					
3	1.1 Introduction	√	√	√	√
3	1.2 NEPA Process, Agency Coordination and Public Involvement	√	√	√	√
4	1.3. Study Objectives	√	√	√	√
28	1.4 Alternatives	√	√	√	√
1. Purpose of and Need for Action					
1	1.1 Introduction	√	√	√	√
2	1.2 Purpose and Need Statement	√	√	√	√
29	1.3 Background	√	√	√	√
2. Alternatives					
3	2.1 Problems and Opportunities	√	√	√	√
3	2.2 Planning Objective and Constraints	√	√	√	√
25	2.3 Development of Alternatives	√	√		
32	2.4 Alternatives Considered in Detail	√	√	√	√
1	2.5 Comparison of Alternatives	√	√	√	√
1	2.6 Evaluation of Critieria	√	√	√	√
2	2.7 Evaluation of Methodology	√	√	√	√
20	2.8 Evaluation of Altenatives	√	√	√	√
3. Affected Environment					
3	3.1 Introduction		√		

Approx. Pages	EIS Section	Water Supply Planner	Environ. Scientist	H&H Engineer	Economist
5	3.2 Geology and Soils		√		
4	3.3 Hydrology	√	√	√	
8	3.4 Water Quality		√		
2	3.5 Aquatic Life and Fisheries		√		
6	3.6 Vegetation		√		
18	3.7 Wetlands		√		
8	3.8 Wildlife		√		
30	3.9 Endangered, Threatened, and Candidate Speicies, Species of Special Concern and Sensitive Communities		√		
9	3.10 Land Use		√		
4	3.11 Hazardous, Toxic, Radiological Wastes		√		
2	3.12 Air Quality		√		
1	3.13 Noise		√		
1	3.14 Aesthetics		√		
6	3.15 Socioeconomic Resources		√		√
1	3.16 Transportation		√		
5	3.17 Recreation		√		√
3	3.18 Cultural Resources		√		
4. Environmental Consequences					
6	4.1 Environmental Consequences Introduction	√	√	√	√
15	4.2 Geology and Soils		√		
13	4.3 Hydrology	√	√	√	
10	4.4 Water Quality		√		
10	4.5 Aquatic Life and Fisheries		√		
15	4.6 Vegetation		√		
7	4.7 Wetlands		√		
7	4.8 Wildlife		√		
19	4.9 Endangered, Threatened, and Candidate Speicies, Species of Special Concern and Sensitive Communities		√		
2	4.10 Land Use		√		
1	4.11 Hazardous, Toxic, Radiological Wastes		√		
3	4.12 Air Quality		√		
3	4.13 Noise		√		
4	4.14 Aesthetics		√		
7	4.15 Socioeconomic Resources		√		√

Approx. Pages	EIS Section	Water Supply Planner	Environ. Scientist	H&H Engineer	Economist
2	4.16 Transportation		√		
11	4.17 Recreation		√		√
1	4.18 Cultural Resources		√		
22	4.19 Cumulative Impacts	√	√	√	√
2	4.20 Collective Operational Scenario That Could Reduce Environmental Impacts	√	√	√	√
5. Economic Analysis, Comparison of Alternatives, and Selected Plan					
1	5.1 Introduction	√	√	√	√
2	5.2 Alternatives Considered in Detail	√	√	√	√
7	5.3 Comparison of Alternatives	√	√	√	√
2	5.4 Evaluation of Alternatives	√	√	√	√
16	5.5 Selected Plan	√	√	√	√
6. Public Involvement, Review, and Consultation					
1	6.1 Introduction		√		
1	6.2 Public and Agnecy Scoping Involvement		√		
4	6.3 Public and Agency Scoping Comments	√	√	√	√
2	6.4 Public and Agency Involvement Regarding the Draft FR/EIS		√		
TBD	6.5 Draft FR/EIS Public Comments				
7.1 Conclusions and Recommendations					
1	7.1 Summary	√	√	√	√
4	7.2 Major Conclusions	√	√	√	√
1	7.3 Recommendations	√	√	√	√
8. References					
Appendices					
231	Appendix A- Dam Safety Evaluation				
18	Appendix B- Water Control Plan			√	
?	Appendix C- Water Supply Demand Analysis	√			√
61	Appendix D- Ecosystem Restorations Evaluation Report		√		
14	Appendix E- Wetlands		√		
8	Appendix F- Species of Mammals, Birds, Reptiles, and Amphibians Known to Occur in the Project Area		√		
3	Appendix G- Butterfly Species Identified at Denver Botanic Gardens at Chatfield, 1992-2001		√		

Approx. Pages	EIS Section	Water Supply Planner	Environ. Scientist	H&H Engineer	Economist
63	Appendix H- USACE Hydrology Report: Chatfield Dam and Reservoir			√	
11	Appendix I- USACE Hydraulic Analysis[1]			√	
?	Appendix J- Impacts of Increased Water Supply Storage on Water Quality	√	√	√	
315	Appendix K- Compensatory Mitigation Plan		√		√
20	Appendix L- Real Estate Plan				
272	Appendix M- Recreation Facilities Modification Plan[3]				√
46	Appendix N- Chatfield Marina Reallocation Impact Assessment Report[2]				√
32	Appendix O- Cost of Reallocation	√			√
33	Appendix P- Public and Agnecy Scoping Comments	√	√	√	√
5	Appendix Q- Avian Point Count Data		√		
30	Appendix R- Antecedent Flood Study			√	
51	Appendix S- Compliance with Environmental Statutes		√		
40	Appendix T- National Economic Development (NED) Recreation Benefit Analysis				√
70	Appendix U- Regional Economic Development (RED) and Other Society Effects Analyses				√
75	Appendix V- Draft Biological Assessment		√		
31	Appendix W- CWA 404(b)(1) Report		√		
4	Appendix X - Fish and Wildlife Coordination Act documentation		√		
123	Appendix Y- MCACES Documentation[3]				√
25	Appendix Z- Tree Management Plan		√		
21	Appendix AA- Summaries of Water Provider's Water Conservation Programs	√			
66	Appendix AB- Policy Waivers				
2257	**Total Approx. Pages**	**446**	**1265**	**515**	**823**

Notes:

[1]Page count does not include figures

[2]Estimate total review needed approx. 50 pages to verify consistency with economic evaluation

[3]May need cursory review to verify consistency with economic evaluation

Independent External Peer Review
of the
Chatfield Storage Reallocation Study and Environmental Impact Statement

Charge Questions and Relevant Sections As Supplied By USACE

Project Background; Purpose, Need and Scope of the Study.

1. Are the underlying purposes and needs for the study adequately documented as a basis for the development of alternatives and selection of the recommended plan?

2. Are the stated problems and opportunities relevant to the purpose and need for the study, reasonably complete and justifiable based on the description of existing and future conditions?

3. Are the stated planning objectives sufficient to achieve the purposes and needs of the study? Are the planning objectives directly related to all relevant problems and opportunities?

4. Are the stated planning constraints reasonably complete and justifiable? Do the stated constraints unduly restrict the consideration of alternative courses of action?

5. Is the geographic and environmental area of interest relevant to the study of the proposed storage reallocation adequately defined? Are there additional considerations that would indicate the need to expand or contract the study area?

6. Is the relationship of the current study to previous studies, other Federal and State agencies, non-Federal sponsors and stakeholders adequately stated?

7. Are applicable regulations and policy that affect the study scope, development of alternatives, selection of the recommended plan and project implementation clearly presented?

8. Were the public, stakeholders, agencies and Native American tribes adequately engaged in the scoping of issues, concerns and potential remedies?

Formulation and Screening of Alternatives.

9. Are the future conditions expected to exist in the absence of reallocating storage at the project for water supply logical and adequately described and documented?

10. Are the assumptions used in developing the most probable future without-project conditions reasonable?

11. Are there other future without-project conditions / no-action alternatives that you would consider equally or more likely?

12. Was a reasonably complete array of possible measures considered in the development of alternatives?

13. Does the formulation of alternatives meet the study objectives and avoid violating the study constraints?

14. Please evaluate the screening of the proposed alternatives. Are the screening criteria appropriate? In your opinion, are the results of the screening acceptable?

Existing Conditions and Affected Environment

15. Is the analysis of existing resources within the study area comprehensive and sufficiently complete to support the study analyses?

16. Does the study adequately describe those resources identified during the scoping process as important in making decisions about the project?

17. Is the discussion and analysis of hydrology and hydraulics sufficient to characterize baseline conditions and adequately evaluate forecasted conditions?

18. Are there additional data and analyses that would provide significant information to better characterize the study area and potentially affect the plan formulation and evaluation of impacts in the study?

19. Are there other significant resources or conditions that may be impacted that have not been considered?

Evaluation and Comparison of Alternatives

20. Were the assumptions made for use in developing the future with-project conditions for each alternative reasonable? Were adequate scenarios considered? Were the assumptions consistent across the range of alternatives?

21. Are the changes between the without and with-project conditions adequately described for each alternative?

22. Are the engineering, economic and environmental analyses used in evaluating and comparing the alternatives consistent with generally accepted methodologies?

23. Were computer models used appropriately and adequate to support the conclusions drawn from them? Were the model analyses sufficiently discriminatory to identify meaningful differences between alternatives?

24. Are risks and uncertainties associated with the benefits, costs, and impacts of each alternative adequately addressed and described?

25. Has hydrologic uncertainty related to the yield of conservation storage at the project been adequately considered and communicated?

Selection and Implementation of Recommended Plan

26. Are the data, methods, assumptions and analyses used in this study sufficient to support the study recommendation?

27. Does the report adequately support findings of feasibility and economic justification for the recommended plan?

28. Will any additional effort, measures or projects be required to realize the expected benefits of the recommended plan?

29. Have the cumulative impacts of the recommended plan been comprehensively and accurately described?

30. Are implementation responsibilities and requirements, to include environmental commitments, of USACE and the non-Federal sponsors sufficiently described?

31. Are implementation costs comprehensive and adequately presented?

32. Are the commitments, as described, enough to avoid, minimize, or mitigate adverse environmental effects?

33. Are there other actions or methods that could be used to avoid, minimize or mitigate environmental harm?

Public Involvement and Coordination

34. Based on your experience with similar projects, have adequate public, stakeholder, and agency involvement occurred to determine all issues of interest and to ensure that they are adequately addressed?