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5. ECONOMIC ANALYSIS, COMPARISON OF ALTERNATIVES, AND PLAN SELECTION

5.1 Introduction

This chapter describes the process that was used to evaluate the alternatives and ultimately recommend the 20,600 Acre-Foot Reallocation Alternative as the Selected Plan for implementation at Chatfield Reservoir. Corps guidance requires an economic analysis as part of the evaluation of alternatives. The Planning Guidance Notebook (ER 1105-2-100, USACE, 2000), the USACE Water Supply Handbook (Revised Institute for Water Resources Report 96-PS-4, USACE, 1998), and the *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies* (P&Gs) (U.S. Water Resources Council, 1983) provided guidance for identifying and assessing the proposed alternatives. The chapter summarizes information from previous chapters; Appendix Y, Project Implementation Costs; and Appendix O, Cost of Reallocation; compares the four alternatives; and identifies the Selected Plan. Appendix Y describes and summarizes the project first costs (construction costs and construction contingency costs) of the alternatives. The project first costs from Appendix Y are the basis of the National Economic Development (NED) costs developed in Appendix O. The NED costs include the project first costs, operation, maintenance, repair, rehabilitation, and replacement (OMRR&R), and other NED costs described below and in Appendix O. The timeline in Tables 13 and 14 in Appendix K is used to present value the NED costs at the beginning of analysis. Because of the present valuing process, the project first costs in Appendix Y will not be duplicated in Appendix O and the report. Each project participant reviewed the cost estimate information described for their entity. Participants agreed to the use of the various local sources and agreed to the reasonableness and applicability of the estimates. The sponsor and participants are aware that the costs reflected are estimates and they shall be responsible for any costs over and above those estimated in the report necessary to meet the requirements of the Recreation Facilities Modification Plan and the Compensatory Mitigation Plan. The Corps of Engineers does not endorse nor certify the estimated costs reflected in Appendix Y. The sponsor is responsible for funding any cost increases. Costs in Appendix Y were escalated to Fiscal Year 2013 dollars and, as stated, included contingencies. A summary description of the features of the Selected Plan is presented in Chapter 6.

FY 2013 (October 2012) interest rates and price levels were used to perform the NED and financial analyses of the four proposed alternatives and the local repayment amount for project costs, using the Economic Guidance Memorandum (EGM) 13-01, Federal Interest Rate for Corps of Engineers Projects for Fiscal Year 2013 (USACE, October 26, 2012). Costs of the Selected Plan and calculations for the updated cost of storage are presented at FY 2013 price levels, using FY 2013 federal interest rates found in EGM 13-01 (USACE, October 26, 2012. .

5.2 Alternatives Considered in Detail

This study focuses on four alternatives as described in Chapter 2:

- Alternative 1—No Action, Penley Reservoir combined with Gravel Pit Storage

- Alternative 2—NTGW combined with Gravel Pit Storage (Least Cost Alternative to Chatfield Reservoir Storage Reallocation)
- Alternative 3—Reallocation of 20,600 acre-feet of Storage (20,600 Acre-Foot Reallocation)
- Alternative 4—Reallocation of 7,700 acre-feet of Storage (7,700 Acre-Foot Reallocation) and use of NTGW and Gravel Pit Storage

A detailed description of each of the alternatives and their various components for addressing the purpose and need of the project is presented in Section 2.4. These alternatives met the federal objective as well as the objectives and sub-objectives presented in the Purpose and Need Statement that responds to the water supply/demand analysis described in Chapter 1. The federal objective is to reasonably maximize NED consistent with protecting the Nation's environment, and consistent with the Corps' Environmental Operating Principles (EOP) (described in Section 1.6). The objectives and sub-objectives are to develop alternatives that:

- Increase availability and reliability of water supply by providing an additional average year yield of 8,539 acre-feet (maximum average yield from 20,600 acre-foot Chatfield) of M&I water, sustainable over a 50-year period, to contribute towards meeting a water supply shortfall projected to be 90,000 acre-feet per year by 2050 for the service area of the 12 water providers.
- Provide, over the 50-year planning period, water supply of equivalent quality as currently supplied to the Denver Metro region.
- Maintain adequate levels of downstream flood control over the 50-year period of analysis.
- Ensure provision in-kind of recreation facilities and experiences during the 50-year period of analysis.
- Ensure maintenance of environmental benefits by minimizing environmental impacts, fully mitigating unavoidable significant impacts, monitoring to evaluate the level of success, and implementing an adaptive management strategy involving input from several agencies.
- Become less reliant on non-renewable groundwater by utilizing renewable water supplies, thus extending the availability and life of these critical aquifers for use by future generations.
- Are consistent with USACE EOP and USACE Campaign Plan goals, including robust design, risk management and communication, reliability and adaptability to future change.
- Find collaborative solutions to future Denver Metro area water supply needs.

The major components of the proposed alternatives shown in Table 5-1 are combined to provide equal amounts and quality of water for an additional average year yield of 8,539 acre-feet over the planning period. The NED procedure and the financial analysis require assessment of all of the costs involved in implementing each alternative. The evaluation therefore considers the specific components that comprise each alternative and date when each component would be available to supply water. Because the Chatfield Reservoir storage reallocation project is assumed to be

implemented in 2017, that year is defined as the base year and the start of the 50-year planning period for the purpose of this analysis. Alternatives would provide water in the base year and continue that supply until 2067. Penley Reservoir is a key component of the No Action Alternative (Alternative 1); however, this proposed reservoir could not yield water supply in the base year. NTGW would be required to provide water until Penley Reservoir was available. The reallocation of 7,700 acre-feet of Chatfield Reservoir storage (Alternative 4) would not provide a water supply equivalent to Alternatives 1, 2, and 3. Gravel pits and NTGW components were added to 7,700 acre-feet of Chatfield Reservoir storage reallocation to make the Alternative 4 yield comparable to the other alternatives.

Table 5-1
Water Supply Sources

| | Alternative 1 No Action* | Alternative 2 NTGW/ Downstream Gravel Pits | Alternative 3 20,600 Acre-Foot Reallocation | Alternative 4 7,700 Acre-Foot Reallocation/NTGW/ Downstream Gravel Pits |
|---|-------------------------------------|---|--|--|
| Penley Reservoir User Group ¹ | NTGW, Penley Reservoir | NTGW | Chatfield Reservoir | Chatfield Reservoir, NTGW |
| Lower South Platte Gravel Pit User Group ² | Gravel Pits | Gravel Pits | Chatfield Reservoir | Chatfield Reservoir, Gravel Pits |
| Other User (Denver Botanic Gardens) ³ | NTGW, other storage ³ | NTGW, other storage ³ | Chatfield Reservoir | Chatfield Reservoir, NTGW, other storage ³ |

* Surface water from Penley Reservoir would replace NTGW in 2032, assuming a 15-year construction period starting in 2017.

¹As defined in Section 2.4.1.1.

²As defined in Section 2.4.1.2.

³As described in Section 2.4.1.3, other storage would include storage on Deer Creek or near Chatfield Reservoir.

5.2.1 Water Supply Yields (Benefits) by Source for Each Alternative

Each alternative provides 8,539 acre-feet average year yield of additional water supply when fully online. The Penley Reservoir User Group's share of this average year yield is 5,275 acre-feet and the Lower South Platte Gravel Pit User Group would acquire 3,248 acre-feet average year yield based on its level of participation in the 20,600 acre-foot storage reallocation and the ability to capture some NTGW in Chatfield Reservoir for reuse. Denver Botanic Gardens' share of the average year yield is 16 acre-feet. These average year yields are based on volumes that could be stored from inflows during the 1942–2000 period of record (POR), including some years of severe drought when the only water stored were flows that were captured for reuse, for a minimum drought-year yield of 2,379 acre-feet. Table 5-2 presents the average year yield associated with the components identified for each alternative. It is assumed that the demand for water is independent of the alternative source of water. Therefore the alternatives would not change the rate at which water is demanded.

The Compensatory Mitigation Plan (CMP) presents a phased project implementation process which establishes milestones for implementing mitigation activities and meeting success criteria as a precondition to use of proportionate amounts of reallocated storage. For the purposes of the economic and financial analysis it was conservatively assumed that the Chatfield water providers would not be able to fully meet the mitigation milestones and that they would not be able to fully use the reallocated storage immediately. If yield is related to the use of storage, the average year yield would be reduced from the 8,539 acre-feet. All alternatives would develop water sources at the same rate as Chatfield (Alternative 3).

Table 5-2
Water Supply Quantities, Average Year Yield (Acre-Feet)

| | Alternative 1 No Action | Alternative 2 NTGW/Downstream Gravel Pits | Alternative 3 20,600 Acre-Foot Reallocation | Alternative 4 7,700 Acre-Foot Reallocation/NTGW/ Downstream Gravel Pits |
|---|------------------------------------|--|--|--|
| Penley Reservoir User Group¹ | | | | |
| NTGW | 5,275 | 5,275 | 0 | 3,323 |
| Penley Reservoir* | 5,275* | 0 | 0 | 0 |
| Chatfield Reservoir | 0 | 0 | 5,275 | 1,952 |
| Total | 5,275 | 5,275 | 5,275 | 5,275 |
| Lower South Platte Gravel Pit User Group² | | | | |
| Gravel Pits | 3,248 | 3,248 | 0 | 2,046 |
| Chatfield Reservoir | 0 | 0 | 3,248 | 1,202 |
| Total | 3,248 | 3,248 | 3,248 | 3,248 |
| Other User (Denver Botanic Gardens)³ | | | | |
| NTGW and other storage ³ | 16 | 16 | 0 | 10 |
| Chatfield Reservoir | 0 | 0 | 16 | 6 |
| Total | 16 | 16 | 16 | 16 |

* Surface water from Penley Reservoir would replace NTGW in 2032, assuming a 15-year construction period starting in 2017.

¹As defined in Section 2.4.1.1.

²As defined in Section 2.4.1.2.

³As described in Section 2.4.1.3, other storage would include storage on Deer Creek or near Chatfield Reservoir.

The No Action Alternative (Alternative 1) combines Penley Reservoir with NTGW for the upstream water providers and gravel pit storage for the downstream providers. The wells and gravel pits would be developed as needed over 11 years to match the same phased implementation of the use of storage that is described for Alternative 3. NTGW would be used until construction of Penley Reservoir was completed in 2032 (assuming a 15-year construction period starting in 2017). Penley Reservoir storage would reduce the use of NTGW. When this reduction would be realized is not known and would vary by participant because of the nature of its water rights. Despite this, the average year yield of 8,539 acre-feet was used in this analysis.

With Alternative 2, the upstream providers would develop NTGW to meet their needs. The downstream providers would develop gravel pits for their needs. The wells and gravel pits would be developed over 11 years.

Alternative 3 would reallocate 20,600 acre-feet of Chatfield flood control storage to water supply storage. NTGW use would be reduced with this alternative. When this reduction would be realized is not known and would vary by participant because of the nature of its water rights. To alleviate this uncertainty, the average year yield of 8,539 acre-feet was assumed.

Alternative 4 would combine NTGW and gravel pits with reallocation of 7,700 acre-feet of Chatfield Reservoir flood control storage to water supply storage. The reallocation of 7,700 acre-feet at Chatfield Reservoir is about 3,160 acre-feet average year yield. NTGW and gravel pits would provide 5,379 acre-feet average year yield to bring the total average year yield for this alternative to 8,539 acre-feet. These components would be implemented simultaneously over the 11-year period of storage usage.

5.3 Comparison of Alternatives

The plans were compared by their financial and NED costs and impacts in four accounts: NED, Regional Economic Development (RED), Environmental Quality (EQ), and Other Social Effects (OSE).

5.3.1 Financial Costs

The financial costs represent the participant's cost to implement, operate, and maintain an alternative. The costs include the cost of storage, environmental mitigation, and recreation modifications, OMRR&R, and specific cost for infrastructure needed to deliver the water. Water supply projects are 100 percent non-federal costs. The financial cost analysis estimates the costs providers would have to pay for each alternative and determines the feasibility of the alternatives. For Alternatives 1 and 2 the financial analysis both estimates the cost and feasibility. For Alternatives 3 and 4 this is not the case. Two different analyses are performed – one to determine the provider's cost and another for feasibility. The provider's cost of storage is presented for Fiscal Year (FY) 2013 in Table 5-3. The federal discount rate and the water supply discount rate from the Economic Guidance Memorandum 13-01 are 3.75 percent and 2.875 percent for FY 2013. The costs were updated from FY 2011 to FY 2013 using EM 1110-2-1304 Civil Works Construction Cost Index System (CWCCIS). Financial feasibility of the alternatives compared to the no-action alternative (Alternative 2) can best be demonstrated when alternative costs are less than Alternative 2. The cost of storage, infrastructure, environmental mitigation, recreation modifications, and OMRR&R costs are financial costs. Appendix O presents these costs in greater detail.

Table 5-3
Cost of Storage Analysis for Alternative 3

| | Cost In Millions (FY 2013\$) |
|-------------------------|--|
| Benefits Foregone | \$15.6 |
| Revenue Foregone | 0 |
| Replacement Cost | 0 |
| Updated Cost of Storage | \$39.1 (\$16.0 with ASA(CW) exemption) |

5.3.1.1 Method for Determining Cost of Storage

Paragraph (a) on Page 3-34 of ER 1105-2-100 specifies that the cost of reallocated storage will be the highest amount resulting from four calculation methods: revenue foregone, benefits foregone, replacement flood control benefit costs, or the updated cost of storage; see Appendix O for detailed definitions of these four costs. The cost of storage is applicable to Alternatives 3 and 4. The information that follows shows the comparison to determine which of the four categories would be used for the cost of storage at FY 2013 price levels for Alternative 3, the Selected Plan. The benefits foregone are due to lower recreation benefits over the 50-year planning period. There is no revenue foregone, because there is no existing income to the U.S. Treasury from the Chatfield project. There are no replacement costs because the hydrology analysis showed there was no significant loss of downstream flood control benefits. The amount calculated for updated cost of storage is greater than the amounts for the other categories, and thus will be the basis for the cost of storage to be repaid by the non-federal providers.

Section 5.3.1.2 explains the calculation of the updated cost of storage as \$39.1 million, which is far higher than the \$15.6 million for NED recreation benefits foregone. Therefore, the user cost of storage is based on the updated cost of storage calculated. Because the dependable yield is so low and the updated cost of storage is so much higher than the Corps' national average cost, the ASA(CW) approved a special exemption which reduces the user cost of storage to 41 percent of the amount calculated, or approximately \$16.0 million. While the \$16.0 million user cost of storage is only slightly higher than the NED benefits foregone, even if it were lower than the NED benefits foregone the user cost of storage would remain \$16.0 million because the user cost methods are based on comparing the NED benefits foregone with the updated cost of storage without the exemption approved by ASA(CW).

5.3.1.2 Calculation of Updated Cost of Storage

The updated cost of storage for Alternatives 3 and 4 was calculated using the Use of Facilities cost allocation procedure described in ER 1105-2-100, Appendix E, paragraph E-57.d.(2)(d). When Alternative 3 became the Selected Plan, its updated cost of storage was recalculated at FY 2013 price levels, as described in detail below. The joint-use costs for the construction of the Chatfield Dam and Lake Project were derived from as-built construction costs between 1967 and 1979. These were updated from 1973, which is the midpoint of the construction period, to FY 2013 price levels using CWCCIS factors. These are in Table 5-4.

Table 5-4
Updated Joint-Use Costs

| Code | Construction Component/Activity | Joint-use Cost | Joint-use Cost 2013 FY13/Q |
|------|--|----------------|-------------------------------|
| 01 | Lands and damages (acquisition started May 1967) | \$15,595,200 | \$80,627,184 |
| 02 | Relocations | \$15,161,300 | \$77,690,699 |
| 03 | Reservoir | \$1,121,300 | \$5,701,934 |
| 04 | Dams | \$31,398,900 | \$162,466,874 |
| 08 | Roads, rail roads, and bridges | \$112,000 | \$573,919 |
| 09 | Channels and canals | \$6,803,600 | \$37,575,918 |
| 11 | Levees and floodwalls | \$4,300 | \$23,026 |
| 14 | Recreation facilities | \$11,148,500 | \$57,689,905 |
| 15 | Structures | \$10,500 | \$52,782 |
| 19 | Buildings, grounds, and utilities | \$1,715,300 | \$8,876,126 |
| 20 | Permanent operating equipment | \$70,700 | \$365,850 |
| | Subtotal | \$83,141,600 | \$431,644,217 |
| 30 | Engineering and design | \$7,864,100 | \$40,927,659 |
| 31 | Supervision and administration | \$3,974,900 | \$20,686,837 |
| | Total Construction | \$94,980,600 | \$493,258,713 |
| | Less Specific Recreation Facilities | \$11,148,500 | \$57,689,905 |
| | Total Joint-use Storage Construction Cost | \$83,832,100 | \$435,568,808 |

The joint-use costs are obtained by removing the specific recreation costs from the construction costs and they are associated with the total usable storage. The cost of storage for an alternative is derived from the joint-use cost and the reallocated storage. For Alternative 3, 20,600 acre-feet is the reallocated storage. The updated cost of storage is derived from the updated joint-use cost and the

ratio of reallocated storage to usable storage. The usable storage at Chatfield Reservoir is the total storage (234,932 acre-feet) less the volume accumulated with sediment after 100 years (5,670 acre-feet based on USACE 2011c), or 229,262 acre-feet. The reallocated storage for Alternative 3 is 20,600 acre-feet. The storage numbers and ratio are in Table 5-5.

Table 5-5
Storage Analysis
Alternative 3

| | |
|--|---------|
| Total storage AF | 234,932 |
| Sediment depletion volume (100 years) AF | 5,670 |
| Usable Storage | 229,262 |
| Reallocated storage AF | 20,600 |
| Cost of storage ratio | 0.0899 |
| Percent of usable storage | 8.99 |

The cost of storage ratio is calculated from the formula $\text{reallocated storage} / \text{usable storage}$ or $0.0899 = 20,600 / (234,932 - 5,670)$ where $234,932 - 5,670$ is the usable storage. In terms of percent the ratio is 8.99 percent. The ratio is multiplied by the joint-use costs to obtain the cost of storage. The FY 2013 updated cost of storage is currently estimated to be \$39.1 million ($\$435,568,800 \times 8.99$ percent/100) and an estimated \$3.8 million (capitalized value; $\$1,897,200 \times 0.0899 \times 22.43449$) for OMRR&R related to the proposed water supply purpose.

Assistant Secretary of the Army for Civil Works [ASA(CW)] granted an exemption of the policy for the determination of the updated cost of storage. Based on the high costs for riparian habitat impacts, recreation modifications, low dependable water yield, and the updated cost of storage, the cost per acre-foot was shown to be about four times greater than the next highest cost for a Corps reallocation project. The ASA(CW) exempted Chatfield Reservoir reallocation from the existing policy and established a one-time reduction of the estimated updated cost of storage. The cost of storage to be paid by the water providers is 41 percent of the estimated cost of storage. The cost of storage is an amount that is repaid to the United States Treasury for that portion of Chatfield costs for the reallocated water storage. That set the FY 2013 cost of storage at \$16.0 million shown in Table 5-6. The exception reduced the cost per acre-foot of storage nearer to the national average cost per acre-foot. For FY 2013 using the federal water supply discount rate of 2.875 percent (EGM 13-01) amortized over 30 years, the longest period for which repayment is allowed, the annual cost would be \$805,500.

Table 5-6
Updated Cost of Storage
FY 2013 Price Levels

| | |
|--|--------------|
| Updated Cost of Storage Alternative 3 | \$39,137,400 |
| Cost of Storage with Exemption Alternative 3 | \$16,046,300 |

The annual OMRR&R related to the proposed water supply purpose was estimated from actual costs incurred at Chatfield Reservoir between 1997 and 2006. The average annual amount for joint use OMRR&R at September 2006 prices was updated to \$1,897,200 at FY 2013 prices using CWCCIS factors. An estimate for Alternative 3 was calculated by multiplying \$1,897,200 by the storage factor of 8.99 percent (0.0899). Additional specific water supply operation costs related to

the proposed project would be incurred at the reservoir for Alternatives 3 and 4. The additional operation is for dam safety monitoring at the new conservation pool levels, increased number of water releases and pre-release calculations, and additional operations. OMRR&R estimates are shown in Table 5-7 for Alternative 3.

Table 5-7
Annual Chatfield-Related OMRR&R, Alternative 3

| | Proportion of Chatfield Joint Use | Additional Specific Water Supply | Total |
|-------------------|--------------------------------------|-------------------------------------|-----------|
| 2013 Price Levels | \$170,500 | \$47,200 | \$217,700 |

The water providers must repay the cost of storage over 30 years, starting when the WSA is signed, at the water supply interest rate in effect at the signing or could choose to pay upfront. In FY 2013 the rate is 2.875 percent. The actual OMRR&R costs are indeterminate at this time, but would be estimated and paid at the beginning of each year. At the end of the year, the actual amount would be reconciled with the payment made at the beginning of the year to the Corps of Engineers Northwestern Division Omaha District (CENWO) from the water providers' escrow account. The OMRR&R would be paid in perpetuity beyond the 30 years for cost of storage repayment. Estimates of the annual costs are shown in Table 5-8. Additional Chatfield costs including dam safety instrumentation including piezometers, Master Plan development, review of real estate requests, and area capacity table update costs are included in Table 5-8 as Modifications to Corps Project and Corps Oversight of Implementation. Funds for Corps work on the Modifications to Corps Project and Operations implementation items will be paid from the water providers' escrow account directly to CENWO as part of the project construction phase. The OMRR&R includes the part of Chatfield's OMRR&R costs associated with the 20,600 acre-feet of storage and additional operation and monitoring costs. The planning horizon of 50 years is broken into the first 30 years when payments are made for cost of storage and OMRR&R and the remaining 20 years when only OMRR&R payments are made.

Table 5-8
Annual Cost Related to Chatfield Storage
FY 2013 Price Levels

| | Annual Cost Years 1–30 | Annual Cost Years 31–50 |
|---|---------------------------|----------------------------|
| Annual Cost of Storage (using ASA(CW) Exemption) | \$805,500 | \$0 |
| Modifications to Corps Project and Corps Oversight of Implementation | \$31,600 | \$31,600 |
| Annual OMRR&R | \$217,700 | \$217,700 |
| Total | \$1,054,800 | \$249,300 |

Additionally, the providers would be responsible for infrastructure, environmental mitigation, and recreation modifications. These are itemized in Table 5-9 at FY 2013 price levels. The total annual cost for Alternative 3 is shown in Table 5-9. The costs are presented for the period when cost of storage is being repaid (years 1–30) and for the period after cost of storage has been repaid. These are estimates since costs would be determined when the WSA is signed and the years following.

Table 5-9
Financial Costs, FY 2013 Price Levels

| | Years 1–30 | Years 31–50 |
|---|-------------|-------------|
| Annual Cost of Storage | \$805,500 | 0 |
| Annualized First Cost without Cost of Storage | \$4,753,100 | \$4,753,100 |
| Total Annual OMRR&R | \$2,497,300 | \$2,497,300 |
| Total Annual Costs | \$8,055,900 | \$7,250,400 |

Table 5-10 presents the implementation costs and the present value of 50 years of annual OMRR&R costs for the alternatives at first quarter fiscal year 2013 (FY 2013) price levels. These costs were discounted and annualized at the FY 2013 rate of 3.75 percent. Water provided by Alternative 3 is the least expensive of the alternatives. Appendix O presents these costs in detail.

Table 5-10
Present Value, Financial Cost of the Alternatives, FY 2013 Price Levels

| | Alternative 1 | Alternative 2 | Alternative 3 | Alternative 4 |
|---|---------------|---------------|---------------|---------------|
| Initial/Implementation Costs | | | | |
| Cost of Storage | \$0 | \$0 | \$16,046,300 | \$5,997,900 |
| Specific (Infrastructure) | \$244,915,266 | \$146,109,028 | \$784,765 | \$85,030,164 |
| Recreation Modifications | \$0 | \$0 | \$47,303,435 | \$23,535,167 |
| Environmental Mitigation | \$0 | \$0 | \$58,545,585 | \$21,883,544 |
| Total Implementation Costs | \$244,915,266 | \$146,109,028 | \$122,680,117 | \$136,446,776 |
| Present Value, 50 Years of OMRR&R Costs | \$38,476,380 | \$39,987,271 | \$56,025,050 | \$43,695,180 |
| Present Value of Total Costs | \$283,391,647 | \$186,096,300 | \$178,705,167 | \$180,141,956 |

5.3.1.3 Financial Feasibility

The test for financial feasibility compares the financial implementation costs and OMRR&R of the Selected Plan to the most likely, least costly no action alternative, which is Alternative 2. Table 5-11 shows this comparison using annual implementation and OMRR&R costs, which would differ from annual NED costs. The financial costs include the cost of storage and exclude both interest during construction and recreation benefits foregone. Alternative 3 is less costly than Alternative 2 by about \$0.33 million per year. It is also less costly than Alternative 1 and 4 by about \$4.7 million per year and \$0.06 million per year, respectively.

Table 5-11
Financial Test (FY 2013 Price Levels)

| | Alternative 1 | Alternative 2 | Alternative 3 | Alternative 4 |
|--|---------------|---------------|---------------|---------------|
| Annualized Initial/ Implementation Costs | \$10,916,907 | \$6,512,696 | \$5,468,370 | \$6,082,008 |
| Annual OMRR&R Costs | \$1,715,055 | \$1,782,401 | \$2,497,273 | \$1,947,679 |
| Total Annual Costs | \$12,631,961 | \$8,295,097 | \$7,965,643 | \$8,029,687 |

5.3.2 National Economic Development Account

The NED cost includes the costs to implement, maintain, and operate each alternative. Alternatives 3 and 4 include an additional cost associated with the lost recreation benefits associated with the change in lake levels and recreation modifications at Chatfield Reservoir.

The NED account compares the alternatives based on NED cost at FY 2013 price levels and interest rates. NED costs include first costs and OMRR&R costs; however, unlike financial costs, NED costs include interest during construction (IDC) and lost recreation benefits but do not include the cost of storage. Annual NED cost, annual NED benefit, and net annual NED benefit are used to determine the NED Plan. Net annual NED benefit is the difference between the annual NED benefit and annual NED cost. Flood control benefits are not included in the NED account because the hydrologic analysis of the alternatives indicated that no significant differences occur between the alternatives' water surfaces downstream from Chatfield Reservoir. Recreation benefits are not included in the annual NED benefit according to Paragraph (1) on Page 3-35 of ER 1105-2-100, which states the NED water supply benefits are measured by the cost of the alternative most likely to be implemented in the absence of the proposed plan, which in this case is Alternative 2. The NED recreation benefits lost are considered as part of the cost of reallocated storage (Appendix E of ER 1105-2-100). For this project the NED recreation benefits lost are included in the NED costs along with the environmental mitigation and recreation modification costs. All alternatives therefore have the same annual NED benefits because Alternatives 1, 3, and 4 provide the same water supply benefits as Alternative 2. Table 5-12 summarizes the NED account for each of the proposed alternatives. Appendix O presents the NED costs in detail. The difference in costs between Alternatives 2 and 3 would need to decrease by \$0.49 million annually (a capitalized value of \$11.1 million) before Alternatives 2 and 3 would be equal in cost. However, based on the costs presented in Table 5-12, the Selected Plan would be feasible for the water providers to implement because of its lower cost.

Table 5-12
National Economic Development Account in Millions, FY 2013 Price Levels

| | Alternative 1 Penley Reservoir/NTGW/ Downstream Gravel Pits (Most Likely No Action) | Alternative 2 NTGW/Downstream Gravel Pits (Least Costly No Action) | Alternative 3 20,600 Acre-Foot Reallocation | Alternative 4 7,700 Acre-Foot Reallocation/NTGW/ Downstream Gravel Pits |
|-------------------------|--|---|---|--|
| Annual NED Cost* | \$12.76 | \$8.42 | \$7.92 | \$8.40 |
| Annual NED Benefit* | 8.42 | 8.42 | 8.42 | 8.42 |
| Net Annual NED Benefit* | -\$4.34 | \$0.00 | \$.49 | \$0.013 |

* Annual entries were calculated using an interest rate of 3.75 percent over the 50-year planning period.

The recreation benefits under Alternatives 1 and 2 are the current benefit level since no recreation change would occur at Chatfield Reservoir. Construction and operation of Alternative 3 would affect recreational activity at Chatfield State Park if recreational facilities were closed to accommodate construction activities. Alternative 3 would decrease recreation benefits by \$0.7 million per year. Under Alternative 3, visitor use at Chatfield is expected to decrease by 17.6 percent (from 1.66 million to 1.37 million visitors) during construction, by 9.4 percent (to 1.51 million visitors) 1 to 5 years after construction, and by 4.1 percent (to 1.60 million visitors) 6+ years after construction (BBC 2010). Under Alternative 4, visitor benefits would decrease by \$0.57 million per year. Under Alternative 4, visitor use at Chatfield is expected to decrease by 14.1 percent (from 1.66

million to 1.43 million visitors) during construction, by 8.0 percent (to 1.53 million visitors) 1 to 5 years after construction, and by 3.3 percent (to 1.61 million visitors) 6+ years after construction.

The NED cost includes costs required to implement the alternatives including construction and operation and maintenance cost. Interest during construction is also included. Alternative 1 includes costs for two components, NTGW and Penley Reservoir for the upstream water providers. These components provide the same amount of water to the upstream water providers, totaling 4,270 acre-feet. Penley Reservoir would replace the use of NTGW. To make the cost of implementing Alternative 1 comparable to the other alternatives' costs, the discounted cost (discounted from 2032 to 2017 at 3.75 percent) of the NTGW component was removed from the account. Alternative 1 has negative net annual NED benefits compared to Alternative 2.

5.3.3 Regional Economic Development Account

The RED account addresses economic characteristics important to the state, counties, and communities in the study area. Items in this account relate to economic activities such as employment and income.

Expenditures in conjunction with the reallocation of water supply at Chatfield Reservoir are of two types. The first is the payment to the Federal Treasury for the cost of the reallocated storage. The second regards the expenditures for the cost of construction and related costs for water supply infrastructure related to the project and mitigation. The cost of storage for Alternative 3 is a payment in lump sum or over a 30-year period of \$16.1 million in FY 2013 dollars. Although an outflow from the regional economy to the national economy, this figure is small compared to the size of the Denver Metropolitan area economy and would not have a significant effect. For example according to the U.S. Census Bureau, State Metropolitan Area Data Book: 2006, Metropolitan and Micropolitan Area Data Tables, the personal income for the Denver Metropolitan Statistical Area was \$86,526,000,000 in 2002. The outflow of about \$0.8 million per year would be 0.0009 percent of the personal income. The employment impact would be of similar magnitude.

The second component, consisting primarily of construction, does not result in a major outflow or inflow of funds to the regional economy and would not appreciably affect RED any more than a similar expenditure would if the funds are not used for the reallocation activity. In both instances the funds are the responsibility of local sponsors and would be derived from sinking funds, bond sales, and/or income. No federal funds would be allocated to this effort. In the event the local sponsors choose to take advantage of federal financing, they pay for reallocated storage over time along with appropriate level of interest (repayment period not to exceed 30 years). In any event, no significant RED impact is considered likely and the cost of an input output study to better identify the impacts is not believed to be warranted for this analysis.

The recreation impacts would affect concessionaires by reducing their income during and after construction. Assuming the concessionaires are local, these impacts would be local. The state of Colorado would experience reduced income from concession sales and visitation during both construction activities and the recovery period following completion of construction. Local businesses that cater to Chatfield State Park visitors and/or sell recreation equipment would also experience reduced income. The farm impacts would occur in counties where water rights were transferred to municipalities.

Table 5-13 summarizes the RED impacts for each of the proposed alternatives. The RED analysis, prepared by BBC (2010) and included as Appendix U, was based upon FY 2010 cost estimates that have since been updated. The proposed alternatives would adversely affect recreation at the reservoir during relocation of recreation facilities. After construction, visitation would recover but is expected to continue below normal levels after a period. As described earlier, visitor use at Chatfield under Alternative 3 is expected to decrease by 17.6 percent (from 1.66 million to 1.37 million visitors) during construction, by 9.4 percent (to 1.51 million visitors) 1 to 5 years after construction, and by 4.1 percent (to 1.60 million visitors) 6+ years after construction (BBC, 2010). This would adversely affect income of the concessionaires and the state of Colorado. Alternative 3 is expected to generate a total of \$318.0 million in economic output in the region, which includes the direct impact of the project (\$178.8 million) and the resulting economic activity generated in response to project demands for goods and services (indirect impacts) and spending attributed to direct and indirect labor earnings (induced impacts), which total an additional \$131.6 million. Each alternative would also generate direct, indirect, and induced jobs. In addition to the approximate 324 construction jobs per year directly supported by Alternative 3 over the first two years of construction, an additional 292 annual jobs would be generated in the study area, for a total of about 615 annual jobs in the study area per year during the first two years of project construction. Payment associated with water storage leaving the region represents a loss of about 154 total jobs (i.e., direct, indirect and induced jobs) during the first year of construction under the proposed alternative. Ongoing operational spending is estimated to support about 22 total jobs per year. In total, the employment benefits of project construction and operations are estimated to be approximately 2,257 person-years of employment over the 50-year analysis period in the study area under Alternative 3. About half of that total is attributable to ongoing operations expenditure. ▲

▲ Table 5-13
Regional Economic Development Impacts

| | Construction (Year 1-2) | Year 3 | Storage Payment | Operations (Year 4-50) | 50-Year Total |
|---|----------------------------|--------|-----------------|---------------------------|---------------|
| No Action | | | | | |
| Income (millions) | \$251.6 | \$2.5 | Not applicable | \$2.5 | \$623.1 |
| Employment (jobs) | 1,748.5 | 18.3 | Not applicable | 18.3 | 4,375.4 |
| NTGW/Downstream Gravel Pits | | | | | |
| Income (millions) | \$167.2 | \$1.2 | Not applicable | \$1.2 | \$391.5 |
| Employment (jobs) | 1,162.3 | 8.7 | Not applicable | 8.7 | 2,742.2 |
| 20,600-Acre-Foot Reallocation | | | | | |
| Income (millions) | \$88.5 | \$19.7 | (\$21.1) | \$3.0 | \$318.0 |
| Employment (jobs) | 615.4 | 136.8 | (154.0) | 22.2 | 2,257.0 |
| 7,700 Acre-Foot Reallocation/NTGW/Downstream Gravel Pits | | | | | |
| Income (millions) | \$148.2 | \$32.9 | (\$7.8) | \$2.1 | \$419.4 |
| Employment (jobs) | 1,029.8 | 228.8 | (57.2) | 15.2 | 2,945.6 |

Source: BBC, 2010

▲ Alternatives 1 and 2 have no impact on recreation at the reservoir.

Based upon the size of the regional economy and the financial costs in Table 5-10, none of the alternatives would have a significant impact on employment, income, or output of the Denver region. Alternative 1 would have the greatest impact on the Denver Metropolitan Statistical Area personal income at 0.013 percent.

5.3.4 Environmental Quality Account

The potential environmental issues, impacts, mitigation, and related information associated with each alternative are summarized in Table 2-9 and discussed in more detail in Chapter 4. The major potential adverse impacts that have been identified include:

- The loss of grassland and upland habitat during Penley Reservoir construction and impacts on species, onsite wetlands, and wetland disturbance at diversion pipe under Alternative 1.
- The loss of production in NTGW wells under Alternative 2. The determination of significant impacts to NTGW hydrology under Alternative 2 is based on the SMWSS study, which includes peer-reviewed hydrologic and economic models. These models considered a much greater yield than Alternative 2 or the reallocation alternatives would provide, but the same conclusions from the SMWSS study apply to Alternative 2.▲
- ▲▪ The increase in total phosphorus in Chatfield Reservoir under Alternatives 3 and 4.
- The killing of cottonwoods and conversion of vegetative and wetland types under Alternatives 3 and 4.
- The loss of wetland functions under Alternatives 3 and 4.
- The conversion of terrestrial wildlife and migratory bird habitats to aquatic or semi-aquatic habitats, and the periodic inundation of habitat, disturbing resident species, under Alternatives 3 and 4.
- The potential inundation of Preble's meadow jumping mouse habitat, including Critical Habitat in Plum Creek and the South Platte River, under Alternatives 3 and 4.
- The adverse impacts on northern leopard frog under Alternatives 3 and 4.
- Depletion of winter base flows below Chatfield Reservoir under Alternatives 3 and 4.
- The loss of recreation fees and revenues for the marina operator and Chatfield State Park during construction under Alternatives 3 and 4. (This was included in the RED Account.)
- The loss and relocation of recreation facilities from inundation under Alternatives 3 and 4. (This was included in the NED Account.)
- The potential impacts on National Register of Historic Places (NRHP)-eligible sites under each alternative.

These adverse impacts would be mitigated to the maximum extent possible, as discussed in Chapter 4 and Appendices K and M.

5.3.5 Other Social Effects Account

The OSE account compares the alternatives in areas of life, health, and safety and community cohesion. Downstream life, safety, and health would not be affected because no alternative would

significantly increase existing flood risks. The Chatfield embankment is considered adequate to prevent flooding. The Corps conducted a study to assess the risk of embankment failure during seismic events that may occur in the Chatfield area. As described in Section 3.2.1, the studies found that the raised pool would not increase the risk of failure during a seismic event (Appendix A). Table 5-14 summarizes the OSE impacts for each of the proposed alternatives.

Table 5-14
Other Social Effects Impacts

| | Alternative 1 No Action | Alternative 2 NTGW/Downstream Gravel Pits | Alternative 3 20,600 Acre-Foot Reallocation | Alternative 4 7,700 Acre-Foot Reallocation/NTGW/Do wnstream Gravel Pits |
|---------------------------------|--|--|---|--|
| Life, Safety, and Health | | | | |
| Flood Plain Buildings | No change | No change | No change | No change |
| Community Cohesion | | Many personal and community sacrifices due to very strict water conservation measures as NTGW declines | | |
| Flood Potential | No change in downstream flood damages | No change in downstream flood damages | No change in downstream flood damages | No change in downstream flood damages |
| Water Supply | Adds 8,539 acre-feet | Adds 8,539 acre-feet | Adds 8,539 acre-feet | Adds 8,539 acre-feet |
| Public Safety | No added stress on project structures | No added stress on project structures | The raised pool would not increase the risk of failure during a seismic event | The raised pool would not increase the risk of failure during a seismic event |

5.3.6 Impacts on Other Project Purposes (Benefits Foregone)

The authorized and operating purposes of the Chatfield Dam and Reservoir project are presented below, along with impacts of the alternatives at FY 2011 prices in carrying out these purposes.

- Flood Control (NED)—No effect (Alternatives 1, 2, 3, and 4).
- Recreation (NED)—Alternatives 1 and 2 have no effect on recreation facilities at Chatfield. Alternatives 3 and 4 would result in \$2.1 and \$1.0 Million, respectively, in annualized costs over 50 years for relocating roads and recreational facilities; these are included in modification costs to be paid 100 percent by non-federal interests and are in the total NED costs (with interest during construction) of the proposed action.
- Recreation (NED)—Alternatives 1 and 2 have no effect on recreation benefits at Chatfield. Alternatives 3 and 4 would result in an estimated \$697,000 and \$587,400, respectively, in annual average loss/year in recreation benefits based on Unit Day Values (UDVs) over 50 years. This is due to losses in Chatfield State Park visitation and to reduced UDVs for: 1) those using substitute recreation sites; 2) most Chatfield State Park visitors during construction; and 3) some Chatfield State Park visitors for at least the next 10 years, while newly planted trees mature.
- Recreation (RED)—Alternatives 1 and 2 would not affect visitor expenditures at Chatfield. Alternatives 3 and 4 are projected to result in reduced visitor spending at Chatfield and elsewhere in Colorado that would impact the regional economy by \$0.75 and \$0.56 Million, respectively, in annualized decreases over 50 years in recreation-related business income,

including lost income for concessionaires and Colorado State Parks. As an additional measure proposed beyond the Federally Recommended Plan, yearly reimbursements to Colorado State Parks and Chatfield concessionaires for documented losses in income will be paid 100 percent by non-federal interests.▲

- ▲ ■ Fish and Wildlife (EQ)—Alternatives 1 and 2 would not affect wetlands or riparian habitat at Chatfield. Alternatives 3 and 4, respectively, are estimated to result in loss of ecological functions due to potential inundation of, or relocation of recreation facility modifications on, the following acreage of habitat at Chatfield: up to 157.2 and 119.8 acres of wetland/riparian habitat, up to 456.54 and 272.54 acres of Preble's meadow jumping mouse habitat (including approximately 155.68 and 88.08 acres of Designated Critical Habitat), and up to 618.54 and 360.54 acres of habitat for birds and other wildlife. The cost to mitigate these impacts is \$3.5 Million annually for Alternative 3 and \$1.3 Million annually for Alternative 4. The costs of offsetting these impacts are included in mitigation costs to be paid 100 percent by non-federal interests and in total costs of the proposed action.

The most noticeable adverse effects to existing Chatfield Lake project purposes will occur to recreation. Construction and operation of Alternative 3 would decrease recreational benefits at Chatfield State Park by \$0.7 million per year due to reductions in UDV's and in the numbers of Chatfield State Park visitors. Some Chatfield visitors would use a substitute site in Colorado instead, but at a reduced UDV. Most Chatfield visitors during construction would also have reduced UDV's due to the views, noise, and access problems from construction activities. After recreation modifications are constructed, many activities will return to pre-reallocation visitor levels, but with reduced UDV's, mainly due to views of the unvegetated shoreline resulting from pool fluctuations and to the lack of mature trees. For some activities for which mature trees are important, such as nature interpretation, bird watching, outdoor photography, horseback riding, and picnicking, Chatfield visitation losses and reduced UDV's would be moderate during the first 5 to 10 years after construction and would be of lesser extent during years 11–50 after construction, when most of the newly planted trees will have matured.

5.4 Evaluation of Alternatives

The proposed alternatives were compared by their contributions to the planning objectives, response to planning constraints and their acceptability, completeness, effectiveness, and efficiency with respect to the planning objectives. An additional planning objective is consistency with the Corps' seven Environmental Operating Principles (EOP), guidelines with a multi-generational timeframe, in accordance with ER 200-1-5. The EOP were listed in Chapter 1, and consistency of each alternative with each EOP was summarized in Table 2-11. This evaluation is summarized in Table 5-15.

**Table 5-15
Plan Evaluation**

| | Alternative 1 No Action | Alternative 2 NTGW/Downstream Gravel Pits | Alternative 3 20,600 Acre-Foot Reallocation | Alternative 4 7,700 Acre-Foot Reallocation/NTGW/ Downstream Gravel Pits |
|---|---|---|---|--|
| 1. Contribution to Planning Objectives | | | | |
| Minimize Environmental Impacts | Meets objective with mitigation. | Meets objective with mitigation. | Meets objective with mitigation of impacts at Chatfield Reservoir. | Meets objective with mitigation of impacts at Chatfield Reservoir and other mitigation. |
| Minimize Recreation Impacts | No Impact. | No Impact. | Meets objective with mitigation of impacts at Chatfield State Park. | Meets objective with mitigation of impacts at Chatfield State Park. |
| Reliable Water Supply | Penley Reservoir replaces NTGW. Downstream providers depend on junior water rights. | NTGW available for droughts. Needs long-term replacement of NTGW beyond 50-year planning horizon. | Depends on junior water rights. | Needs long-term replacement of NTGW. Depends on junior water rights. |
| 2. Response to Planning Constraints | | | | |
| Financial Capability of Water providers | Within user capability. | Within user capability. | Within user capability. Least costly. | Within user capability. |
| Institutional Acceptability | Water court action needed. | Water court action needed. | No water court action needed. | Water Court action needed. |
| Public Acceptability | Implementable. Reduces NTGW use. | Implementable. Uses NTGW. Least acceptable. | Implementable. Reduces NTGW use. Most acceptable. | Implementable. Reduces NTGW use somewhat. |
| 3. Consideration of Four P&G Criteria | | | | |
| Completeness | Meets objectives. | Meets objectives. | Most complete. | Meets objectives. |
| Effectiveness | Meets objectives. | Meets objectives. | Most effective. | Meets objectives. |
| Efficiency | Least Efficient. | Most efficient no action plan. | Most efficient. | Meets objectives. |
| Acceptability | Meets objectives. | Least acceptable. | Most acceptable. | Meets objectives. |
| 4. EOP Consistency | | | | |
| Extent of consistency with the 7 Environmental Operating Principles | Fully consistent with 3 EOP; partially consistent with 4 EOP. | Fully consistent with 2 EOP; partially consistent with 2 EOP; inconsistent with 3 EOP. | Fully consistent with all 7 EOP. | Fully consistent with 4 EOP; partially consistent with 3 EOP. |

5.4.1 Contribution to Planning Objectives

None of the alternatives would change the downstream flood damage potential. Alternatives 3 and 4 would affect environmentally-sensitive sites at or near Chatfield Reservoir. Mitigation would minimize these impacts. Alternatives 3 and 4 would adversely affect recreation. Buildings and facilities relocated because of pool elevation changes would reduce visitation and income to concessionaires and State Parks. Recreation modifications and sponsor reimbursements to concessionaires and State Parks would minimize these impacts.

The final planning goal is to provide a reliable water supply to the providers requesting storage space in Chatfield Reservoir. All alternatives would meet this goal during the 50-year planning period. NTGW is not renewable so water supply storage would need to be developed eventually under

Alternatives 2 and 4. Because gravel pit or reservoir storage relies on junior surface water rights, the water supply for all alternatives, to some degree, would be unreliable during dry periods. NTGW is reliable during droughts.▲

▲ 5.4.2 Response to Planning Constraints

Planning constraints include the financial capabilities of the providers, institutional acceptability, and public acceptability. All alternatives are within the financial capabilities of the water providers requesting storage space in Chatfield Reservoir. However, only Alternatives 2, 3 and 4 have non-negative net benefits. Alternative 3 is the least costly of the four alternatives, so it would rank above the others.▲

All alternative plans are implementable or publicly acceptable (i.e., acceptable to the participating entities). Because NTGW is non-renewable, alternatives using this source are less publicly acceptable. Alternatives 1, 3, and 4 reduce NTGW use because they incorporate storage components. Alternative 3 is most acceptable to the water providers because it is the least costly, reduces NTGW usage upon implementation, and provides renewable water supply. Alternatives 3 and 4 would change the existing recreation and environmental resources at Chatfield Reservoir. This may result in these alternatives being less acceptable to the general public. The appearance of the lake and adjacent areas would be different after mitigation and during the new operations of the dam. Sites familiar to current park users may be inundated or socially changed. These changes could be considered negatively by some of the general public. Public concerns regarding the Project included mitigation, alternatives, economics, recreation, water rights, NEPA, downstream flow, planning process, and water quality. A detailed discussion of the public involvement, review, and consultation process is included in Chapter 8 of the FR/EIS.

5.4.3 Consideration of Four P&G Criteria

The four proposed alternatives were identified for further consideration because they met the planning objectives. Table 5-15 summarizes the response of these alternatives to the four P&G criteria: acceptance, completeness, effectiveness, and efficiency. Other alternatives not chosen for further study failed to meet these objectives in one or more of these areas.

Completeness reflects the degree to which an alternative plan contains the necessary measures to ensure the planned effects. All alternatives are essentially complete. As described in Section 5.4.2, Alternatives 1, 2, and 4 would require additional steps to transfer or develop water rights. Costs for these steps have been included for these alternatives. Alternative 3 is the most complete alternative because it would not require the transfer of water rights.

Effectiveness is the extent to which an alternative plan alleviates the identified problems. All alternatives are effective because they meet the planning objectives. Alternative 3 is the most effective because it maximizes net NED benefits and minimizes adverse RED impacts.

Efficiency is the extent to which an alternative is the most cost-effective means of addressing problems while protecting the nation's environment. Alternatives 2 and 3 have non-negative net NED benefits and are therefore efficient. Alternatives 1 and 4 are not efficient because they have negative net benefits. Alternative 2 is the most efficient No Action alternative. Alternative 1 is the ▲ most costly alternative. When Penley Reservoir is available in 2027, use of this source would reduce

the use of NTGW and associated pumping costs. Alternative 3 is the most efficient of the four alternatives because it provides 8,539 acre-feet of water supply at the least cost. With mitigation measures, it preserves the nation's environment.

Acceptability is addressed in Section 5.4.2. All of the alternative plans are acceptable to the public in that all are implementable; however, Alternative 3 is the most acceptable to the water providers because it is the least costly, reduces NTGW usage upon implementation, and provides renewable water supply. Alternatives 3 and 4 may be less acceptable to the general public because of the impacts to existing recreation and environmental resources.

5.4.4 Risk Analysis and Uncertainties

The Chatfield Reservoir storage reallocation study includes analyses of resource impacts and project costs. There are varying degrees of uncertainty associated with the assumptions used in these analyses. This section discusses the main sources of uncertainty. Standard models and conservative assumptions were used in the study in order to reduce the uncertainties.

Uncertainty would affect the costs and performance of the alternatives. Weather would affect the yield of all alternatives because all use storage to some extent. NTGW usage would also be affected if used to replace surface water during extended dry periods. Population growth location and rates would affect the use of NTGW and would change the surface water runoff characteristics. Mitigation performance would affect the costs of Alternatives 3 and 4. Additional measures may be required to ensure adequate mitigation. The cost of storage may change due to Federal Government decisions.

5.4.4.1 Hydrologic and Hydraulic Modeling

The hydrologic and hydraulic modeling of Chatfield and downstream flows in the South Platte River play a key role in the study, as the output from these modeling efforts are used in the impacts analysis for a variety of resources including fish, wildlife, wetlands, and recreation. The potential hydrologic impacts of the alternatives were evaluated using historical (1942 to 2000) data from South Platte River stream gages and Chatfield Reservoir operations (beginning after the reservoir was constructed), and the Corps' reservoir simulation computer model (HEC-5). Detailed descriptions of the hydrologic and hydraulic modeling efforts, including the model assumptions, are included in Appendices H and I, respectively. The historical flow data reflect any impacts to the river flows over time, including changes in available water rights, water supply needs, timing of runoff, or additional reservoirs constructed upstream. Because the historical flow data were used with no corrections for present day conditions, there is a tendency for the hydrologic model to overestimate the water available for the potential new water providers at Chatfield. Because of this tendency, the average pool levels reflected in the reallocation alternatives would likely be lower than what is shown in the tables and on the graphs in this chapter. Thus the results of the impact analysis based on the modeled reservoir pools under the reallocation alternatives tends to show somewhat greater impacts than would likely be experienced in an actual reallocation scenario, but provides a good basis for relative comparison between alternatives.

There is uncertainty about the potential effects of climate change on future conditions in the Chatfield study area. Climate change would likely result in greater variability in climate. There may be more floods and more/longer periods of drought, which cannot be accurately predicted at this time.

The Corps' model uses inflows during the 1942–2000 POR, which tend to be greater on average than expected for future conditions for all alternatives. This results in a greater probability of adequate mitigation for all types of inundation-related environmental impacts.

5.4.4.2 Reliability of Water Supplies

It is important to recognize that 20,600 acre-feet of new storage capacity in Chatfield Reservoir does not equate to 20,600 acre-feet of new water yield. For this study it is assumed that the average year yield for 20,600 acre-feet of storage is 8,539 acre-feet. Several factors, including precipitation, runoff, and the seniority of water rights, play a key role in the availability of water and storage opportunities in any given year. The actual yield of water supplies that would be realized from use of the storage space would vary every year. The water rights of the 12 water providers that would allow them to store water in Chatfield Reservoir are, in general, very junior in their relative priority and therefore they are expected to be in priority relatively infrequently. One estimate of water supply yield is the “average year yield,” which is the average annual amount of water expected to result from the storage of available water rights.

One of the limitations related to water supplies is that Chatfield State Park must remain in outdoor recreation uses pursuant to Section 6(f) of the LWCF Act (Public Law 88-578, as amended) because LWCF assistance was used by the Colorado Division of Parks and Outdoor Recreation to construct the recreation facilities at Chatfield Reservoir. The National Park Service, with assistance from Colorado State Parks, oversees compliance with the LWCF Act. If facilities funded with LWCF grants were inundated under the Selected Plan, they would have to be replaced elsewhere in the park, and Colorado State Park staff would have to submit a formal letter to the National Park Service recognizing the changes and stating that the park was not in default. If the facilities were removed and not relocated, then the state would be in default (per Section 8(f)(3) of the LWCF Act). However, because all recreation facilities are planned to be relocated in-kind under the Selected Plan, the Selected Plan would comply with the LWCF Act. The National Park Service has issued a letter concurring with Colorado State Parks that the Chatfield Reservoir Storage Reallocation project will not result in a Section 6(f)(3) conversion (see Attachment 3 in Appendix S).

Another limitation related to water supplies is that the existing conservation pool in Chatfield Reservoir contains water storage space between elevation 5,423 msl and 5,432 msl held between the state of Colorado and Denver Water. Denver Water considers its use of this pool to be a vital and permanent component of its water supply system. Because the 1979 Agreement granting Denver Water the exclusive right to store water in Chatfield Reservoir is only modifiable by mutual agreement, Denver Water considers any alternatives that would decrease the amount of its storage capacity in Chatfield Reservoir to be unacceptable. As a result, water below 5,432 feet msl is not available for reallocation and cannot be redefined as an integrated pool with other water providers. Because senior water rights were considered in the hydrology analysis, Denver Water's water right would not limit the reliability of water supplies under the Selected Plan.

An uncertainty regarding the reliability of water supplies as it relates to the development of alternatives is that for a few upstream providers near the edge of the aquifer, it may not be physically possible to utilize NTGW through the 50-year period of analysis. They may need to pursue alternative sources of water. Due to uncertainties regarding the courses of action of the affected entities, it is assumed their water needs are satisfied with NTGW for purposes of this study. To the

extent that other alternative water sources are more costly than NTGW, the NTGW/Downstream Gravel Pits Alternative is a conservative least-cost alternative to the Chatfield Reservoir storage reallocation project. ▲

Chatfield Reservoir storage depletion rate was originally anticipated at be a loss of storage within the reservoir of 189.5 AF per year. Based on updated information in 2010, the sedimentation is projected to be considerably less with a long term depletion rate of 30AF per year. The difference in depletion rates is probably due to current knowledge of limited sediment load measurements from the upper South Platte River basin during project design. However, with this deposition rate of 30 AF per year, it should be noted that sediment deposition is variable and may respond to extreme weather events such as drought and thunder storms and physical events such as forest fires and changes in land use. Applying the current long-term depletion rate of 30 AF per year, it is estimated that in the year 2060, a storage capacity of 90.8 % would exist and in 2110, storage capacity in the multi-purpose pool is projected to have 85.4 % capacity remaining.

5.4.4.3 ▲ Downstream Damages

Future storm events would affect downstream damages. Storms downstream from Chatfield would have similar damages for all alternatives. Storms upstream from Chatfield would be affected by Chatfield Dam. For upstream storms, downstream damages would reflect the risk and uncertainty associated with the alternative's hydrology and hydraulics. The results of hydrologic and hydraulic modeling, detailed in Appendices H and I respectively, showed that flood flows in the South Platte downstream of Chatfield Dam would not differ significantly among the four alternatives. Future development in the downstream floodplain would occur outside of the Federal Emergency Management Agency-designated floodway. Uncertainty to damages under future conditions would be dependent on alternative risk and uncertainty defined by the hydrology and hydraulics.

Reallocation would not impact the primary flood risk management purpose of Chatfield reservoir. During Tri-Lakes system flood control storage evacuation for Level I (small flood events), as defined in Appendix B – Tri-Lakes Water Control Plans, the reallocation of flood control storage at Chatfield slightly increases releases and affects the timing and duration of releases made from Cherry Creek and Bear Creek though the primary flood risk management purpose for Cherry Creek and Bear Creek is not affected. Reference Appendix B – Tri-Lakes Water Control Plans for an example of how the release magnitudes are affected. There is no change to system flood control storage evacuation releases during Level II (large flood events), as defined in Appendix B – Tri-Lakes Water Control Plans.

5.4.4.4 Antecedent Flood Study

The antecedent flood study used conservative modeling assumptions to determine whether the five feet of freeboard requirement would be met if the pool is raised to 5,444 feet msl. Corps regulations require consideration of an antecedent flood of 50 percent of the Inflow Design Flood. This assumption was reviewed based on local and regional historical storm data. Based on this review, it was concluded that the 50 percent value was overly conservative and that a maximum value of 40 percent would represent the actual data and also be sufficiently conservative. There is some uncertainty with this assumption, but the analysis is considered sufficiently conservative and protective. An Independent Technical Review by the U.S. Bureau of Reclamation was performed on

the study, and a waiver was granted to the 50 percent antecedent flood criteria by USACE headquarters.

5.4.4.5 Water Quality

The water quality analysis used a number of assumptions to model the concentrations of nutrients, metals, and bacteria. The load quantification process and concentration predictions do not consider the complex interactions among evaluated parameters and those not explicitly considered, and the analysis should be considered a gross quantification of impacts. There were uncertainties associated with a number of the parameters, such as the hydraulic residence time, the hypolimnetic volume, flux rates, background loads of bacteria, and the use of the swim beach by birds and humans. In order to address the key sources of uncertainty, concentrations were modeled using a range of values for the most important parameters and outputs were provided for minimum, average, and maximum cases. Thus, the uncertainty is effectively addressed by capturing the range of possible outcomes.

5.4.4.6 Vegetation and Wildlife

The analysis of impacts to vegetation and wildlife are dependent on the hydrologic and hydraulic modeling, and thus are affected by the uncertainties associated with those modeling activities. Several other sources of uncertainty are discussed below.

Habitat Mapping. The mapping of Preble's mouse, bird, and wetlands habitat was conducted in the field using a recent aerial photograph of the Chatfield Lake study area. Due to the uncertainty associated with this method, the estimated number of acres may be up to 5 percent more or less than the actual number of acres. This level of uncertainty is not considered significant in selecting the plan. ▲

▲ **Analysis of Future Vegetation Conditions.** The estimates of acres of vegetation at future water levels assume that water would be available at a sufficient amount to encourage long-term successional changes in vegetation. This was based on current proportions of vegetation types at existing water levels and spatial analysis of slope and elevation of land at the future water levels. The analysis looks at vegetation in a band 0 to 6 feet above the proposed future levels. The estimates likely over-estimate the amount of vegetation that is predicted to change. This is because the hydrologic model of the reservoir may overestimate the degree to which water levels fluctuate under Alternatives 3 and 4. The over-estimation of the change in vegetation types is not considered significant.

Fisheries and Downstream Flows in the South Platte River. The hydrologic modeling was developed to predict flood levels at relatively large timeframes (e.g., months and years versus days and hours). Therefore, the predictions that mean monthly discharges from the Chatfield Dam would be minimal may mask the more detailed data that would indicate that substantial decreases in flow may be reached for specific days or hours of a day. This more detailed data may show that there are times when daily discharge rates may be impacting flows immediately downstream from Chatfield Reservoir. However, the abundance of tributaries that provide water to the river would quickly offset any decreases in flows further downstream and thus minimize the potential for flow-related impacts to fisheries.

5.4.4.7 Recreation

The analysis of impacts to recreation at Chatfield State Park is dependent on the hydrologic modeling and thus is affected by the uncertainties associated with the model.

5.4.4.8 Cost Uncertainty

In general, future economic conditions in the Denver region, the nation, and the world would affect alternative costs. Depressed conditions would tend to reduce the costs of material and labor, whereas expanding conditions would have the opposite effect. Alternatives with more immediate implementation costs may be less subject to cost uncertainty than other alternatives. Alternative 1 costs would be more uncertain than Alternatives 2, 3, and 4 because Penley Dam construction would not be immediate. The uncertainty of operation and maintenance costs would be similar for all alternatives because these costs would be expended over time. Future climatic conditions would affect alternative operation costs if different from the POR. Yields of storage measures could differ from the averages used in the study, which are based on the POR. NTGW usage patterns would affect the operation and maintenance cost.

5.4.5 Trade-off Analysis

The analysis shows that the alternatives are very comparable in their performance. Each alternative plan provides additional water in the same quantity and quality (8,539 acre-feet), is implementable, and mitigates adverse impacts. From an NED and financial perspective, Alternative 3 is the least expensive and provides storage for renewable surface water in an existing reservoir. Alternative 1 requires the construction of a new reservoir and Alternative 2 depends in part on the use of nonrenewable NTGW. However, Alternatives 1 and 2 would not have impacts at Chatfield Reservoir. Alternative 4 also provides storage for renewable surface water, but the storage capacity would be less than that provided by Alternative 3, and part of this difference would be provided by nonrenewable NTGW. The impacts at Chatfield from implementing Alternative 4 would be less than the impacts from Alternative 3. However, the impacts at Chatfield from Alternatives 3 and 4 can all be mitigated.

Although Alternative 3 would be the least expensive in total costs, there are cost trade-offs. Table 5-16 shows this with implementation cost and annual OMRR&R costs valued using FY 2013 price levels and 3.75 percent federal interest rate. The Chatfield alternatives have greater environmental mitigation and recreation modification costs (see Table 5-10) than the No Action Alternatives. This represents disruption to the environment and recreation at Chatfield that would not be present with Alternatives 1 or 2. Alternatives 1, 2, and 4 would mitigate their impacts for dried farmland. Alternative 3 would not impact this resource. The impacts for all alternatives can be mitigated. Alternative 4 would require additional NTGW and storage to provide the same amount of water as Alternative 3 (see Table 5-2). Alternative 3 would minimize infrastructure investment represented by the cost of storage and specific costs (costs required to develop, access, treat, and deliver the Participant's water) compared to the other alternatives. Alternatives 1 and 2 would require the greatest infrastructure investment. The cost of storage would be paid to the U.S. Treasury and would not result in regional investment. Regional investment would be the greatest with Alternative 1. The net effect of this investment would be minimal on a regional basis since the source for the funds is from the region. Alternative 3 would require the greatest OMRR&R outlays from the water providers. Table 5-16 also shows the costs per acre-foot of average year yield for annualized implementation costs, for annual OMRR&R costs and total annual costs. Alternative 3

has the least cost per acre-foot for annualized implementation and total annual cost. Alternative 1 has the least cost per acre-foot for annual OMRR&R cost.

Table 5-16
Annual Financial Costs of the Alternatives per Acre-Foot of Average Year Yield, FY 2013 Price Levels

| | User Costs | | | |
|--|---------------|---------------|---------------|---------------|
| | Alternative 1 | Alternative 2 | Alternative 3 | Alternative 4 |
| Initial/ Implementation Cost Including Capitalized OMRR&R Cost | \$10,916,907 | \$6,512,696 | \$5,468,370 | \$6,082,008 |
| Annual OMRR&R Costs | \$1,715,055 | \$1,782,401 | \$2,497,273 | \$1,947,679 |
| Total Annual Costs | \$12,631,961 | \$8,295,097 | \$7,965,643 | \$8,029,687 |
| Annualized Implementation Cost/acre-foot | \$1,278 | \$763 | \$640 | \$712 |
| Annual OMRR&R Cost/acre-foot | \$201 | \$209 | \$292 | \$228 |
| Total Annual Cost/acre-foot | \$1,479 | \$971 | \$933 | \$940 |

Alternatives 1, 2, and 4 use NTGW to some extent (see Table 5-2). This is a nonrenewable source and it is not sustainable over a long period (beyond the 50-year planning period). The upstream water providers would be affected. NTGW would be available during long dry periods possibly at high costs. The downstream water providers would also be affected during extended dry periods because their surface water rights may not yield water. With Alternative 3 surface water rights may not yield water during extended dry periods.

Alternatives 3 and 4 would be able to more effectively capture water during high flows because Chatfield is located on the South Platte River. Storage components (Penley and gravel pits) with the other alternatives would be located on tributaries or adjacent to the South Platte River and therefore they would not be as effective at capturing water during high flows due to the pumping capacity used to collect the flows.

5.4.6 Plan Designations

Alternative 3 maximizes NED benefits and therefore is the designated NED plan. Alternative 3 also is the alternative that best meets the water supply needs of the water providers for the local communities and therefore is designated the Locally Preferred Plan. Alternative 3 is also the Least Environmentally Damaging alternative because: 1) the environmental impacts of Alternative 3 at Chatfield can all be fully mitigated; 2) Alternative 3 does not result in the drying up of any farmland or include the use of non-renewable NTGW; and 3) Alternative 3 is the plan most consistent with the Corps' seven EOP.

5.5 The Selected Plan

5.5.1 Identification of the Selected Plan

The 20,600 Acre-Foot Reallocation Alternative (Alternative 3) is designated as the Selected Plan. It is the NED Plan and the Locally Preferred Plan of the water providers. It is also fully consistent with the Corps' EOP. Alternative 3 is the Selected Plan because it is the alternative that minimizes the cost of supplying water and therefore maximizes net NED benefits. It offers \$4.8 million more in net annual benefits than Alternative 1, \$0.5 million more net annual benefits than Alternative 2, and \$0.5 million more than Alternative 4. Mitigation measures ensure that important environmental resources are preserved and recreation modifications would maintain the recreation experience at

Chatfield Reservoir. A description of the features of the Selected Plan (Alternative 3) is located in Chapter 6.

5.5.2 Determinations Required by Authorizing Legislation

The requirements of several legislative authorizations specific to the reallocation, or the existing Chatfield Lake project, must be met in order to implement the Chatfield Water Supply Reallocation Project. The sections that follow evaluate how the Selected Plan (Alternative 3) meets these requirements. Letters from CDNR, CWCB and the National Park Service regarding the requirements of Section 808, Section 116 and the LWCF Act are included at the end of this section.

5.5.2.1 Section 808 Findings

Section 808 of WRDA 1986, as amended, authorizes the Secretary of the Army to implement a reallocation of existing storage at Chatfield Reservoir, “...upon request of and in coordination with the Colorado Department of Natural Resources (CDNR) and upon the Chief of Engineers’ finding of feasibility and economic justification...”.

The requirement for CDNR involvement has and continues to be met. The CDNR, in a letter dated January 31, 2012, requested that the Corps consider reallocating space within Chatfield Reservoir for water supply purposes, on behalf of a group of water providers in the Denver metropolitan area. CDNR has participated with the Corps under a Feasibility Cost Share Agreement to cost-share the reallocation study. CDNR continues to support the reallocation project, has coordinated with the Water Providers and the Corps in developing the plan, and will serve as the overall non-federal sponsor signing the WSA with the Corps. The Corps continues to have discussions with the state and the water providers to further refine the legal relationship between the entities.

In regards to the requirement for the Chief of Engineers’ finding, the analyses presented in the FR/EIS show that Alternative 3, the Selected Plan, is economically justified and feasible.

The Selected Plan is economically justified. It meets all federal NED goals providing \$8.42 million in annual NED benefits to total annual NED project costs of \$7.92 million, for a benefit to cost ratio of 1.06. It is the least costly alternative providing an average year yield of 8,539 acre-feet meeting a portion of the demand that is expected to continue to increase. The cost of the Selected Plan is within the financial capabilities of the water providers.

The Selected Plan is feasible, as shown in the FR/EIS evaluations of engineering, environmental and institutional and social considerations. The proposed raise in lake level will meet dam safety requirements and does not impact the primary flood risk management purpose at Chatfield Reservoir. Flood control capabilities at Chatfield Reservoir would not be reduced by the proposed reallocation of flood storage to water supply storage. Reallocation would not impact the primary flood risk management purpose of Chatfield reservoir. During Tri-Lakes system flood control storage evacuation for Level I (small flood events), as defined in Appendix B – Tri-Lakes Water Control Plans, the reallocation of flood control storage at Chatfield slightly increases releases and affects the timing and duration of releases made from Cherry Creek and Bear Creek though the primary flood risk management purpose for Cherry Creek and Bear Creek is not affected. Reference Appendix B – Tri-Lakes Water Control Plans for an example of how the release magnitudes are affected. There is no change to system flood control storage evacuation releases during Level II

(large flood events), as defined in Appendix B – Tri-Lakes Water Control Plans. Adverse effects to recreation facilities and environmental resources will be avoided or off-set by relocations and modifications to recreation facilities, construction of ecosystem restoration features, and preservation and enhancement of off-site habitat. All recreation modifications and environmental mitigation features utilize well-established concepts and practices, and design and construction will follow Corps standards and regulations.

The Selected Plan is environmentally and socially acceptable because environmental mitigation and recreation modifications are included in the plan to avoid or compensate for adverse effects to those resources. Environmental mitigation will be required to offset impacts to terrestrial-based effects (wetland and riparian habitats, including Preble's mouse critical habitat). Positive environmental effects to the fisheries supported by the reservoir include the inundation of terrestrial habitats which will result in increased habitat structure for use by fish and other aquatic life. Additionally, increased primary productivity as a result of increased shoreline inundation will enhance productivity at virtually every trophic level in the aquatic food web. Impacted recreation facilities will be replaced with new facilities. Although the recreation experience may be diminished for current park users due to changed facilities and lake fluctuations from the new operations of the dam, the recreation modifications and maturation of replaced trees and vegetation will provide equivalent recreation opportunities that are expected to be acceptable to the general public.

The Selected Plan will fulfill a portion of the state and regional plans for addressing future water supply sources for the Denver metropolitan area. Population growth within the Denver, Colorado, metropolitan area continues to create a demand on water providers. Colorado's population is projected to be between 8.6 and 10.3 million in 2050. The Statewide Water Supply Initiative (SWSI), commissioned by the State Legislature, estimates that by 2050, Colorado will need between 600,000 and 1 million acre-feet/year of additional municipal and industrial water. This proposed reallocation project will help enable water providers to utilize a surface water supply source to provide water to local users, mainly for municipal, industrial, and agricultural needs, in response to rapidly increasing demand and lessen dependence on non-tributary ground water. Chatfield Reservoir is well placed to help meet this objective for the following reasons: the reservoir provides a relatively immediate opportunity to increase water supply storage without the development of significant amounts of new infrastructure; it lies directly on the South Platte River (efficient capture of runoff); and it provides an opportunity to gain additional use of an existing federal resource. Alternative 3 is most acceptable to the water providers because it is the least costly, reduces NTGW usage, and provides renewable water supply.

Extensive agency and public coordination has occurred. Representatives from federal, state, and local governments, as well as technical advisors from nongovernmental groups such as Sierra Club and Audubon Society, provided extensive input to the development of this FR/EIS. Because of the comprehensive transparent collaboration that has occurred, consideration was given to varying aspects attempting to present a plan that balances numerous interests. The expectation is that the plan presented in this FR/EIS during Draft Public Review will be socially and environmentally acceptable (see Appendix DD for a summary of the public comments and the Corps' responses).

5.5.2.2 Section 116

Section 116 of Division C of the Omnibus Appropriations Act of 2009 authorizes the CDNR to perform the work for design and implementation of modifications for Chatfield Reservoir and any required mitigation for the project. It also requires the Secretary to determine a cost of storage that reflects the limited reliability of the resource and user's capability to use the storage space.

The Implementation Guidance for Section 116, dated May 12, 2010, requires that this FR/EIS identify the work items to be performed by CDNR and that the ASA(CW) approval of the report includes the determination of whether the proposed work items are integral to the project. In a letter, dated February 10, 2012 (see end of Section 5.5.2.3), CWCB proposes to accomplish through its agencies and non-federal project partners, the water providers, all the modification and mitigation work for the project. Of the overall total project implementation cost estimated to be \$179,000,000, the cost of the CDNR work is estimated to be \$123,200,000. The work will consist of design, construction, project management and coordination for all project features, including on-site and off-site environmental mitigation; modification/re-construction of all impacted recreation facilities; utility relocations; earthwork and shoreline contouring; road, bridge and parking lot construction; demolition, clearing, and grubbing; and vegetation management. The Omaha District Corps of Engineers may decide to perform the work related to modification or instrumentation of the dam or other Chatfield Project safety features, as well as modifications to project operating documents and processes. The district would also retain responsibility for oversight of the CDNR work and inherent government responsibilities, including agency approvals and decisions. The Corps work is estimated to cost \$1,730,000 and will be funded 100 percent non-federal. The proposed CDNR work is integral to the reallocation project, because all the work and features are essential components of the Selected Plan, would otherwise have been performed by the Corps, are not inherent governmental responsibilities and are not already a task required to be performed by the non-federal sponsor (such as LERRDs). All the work is eligible to be performed by CDNR, because it is within the non-Federal cost-share, which for water supply is 100 percent non-federal. Design and construction of environmental mitigation features and recreation modifications will follow Corps standards and regulations, as well as applicable federal laws governing non-federal construction. All plans will be approved by the Corps. The ASA(CW) approval of this FR/EIS and determination of whether the proposed CDNR work items are integral will identify what CDNR work might be eligible for Section 116 credit. The acceptance of the work and the affording of credit towards the non-federal share will be determined by the Omaha District inspection and certification in accordance with the terms of the WSA. The Corps continues to have discussions with the state and the water providers to further refine the legal relationship between the entities.

The second provision of Section 116 regarding the cost of storage was addressed in the ASA(CW) letter, dated January 22, 2009, which approved a modified method, supported by CDNR, for determining the costs to be repaid by CDNR for storage in Chatfield Lake. This exemption of the policy for determining the updated cost of storage is described in Section 5.3.1.2.

5.5.2.3 Land and Water Conservation Fund Act

Chatfield State Park must remain in outdoor recreation uses pursuant to Section 6(f) of the Land and Water Conservation Fund Act (LWCF), because LWCF assistance was used by the Colorado Division of Parks and Outdoor Recreation to construct the existing recreation facilities at Chatfield Lake. If facilities purchased with LWCF grants are inundated, they will be replaced elsewhere in the

park, and Colorado State Park staff will submit a formal letter to the National Park Service recognizing the changes and stating that the park is not in default. If the facilities are removed and not relocated, then the state would be in default. However, because all recreation facilities are planned to be relocated in-kind under the Selected Plan, the Selected Plan complies with the LWCF Act. As indicated in Section 5.4.4.2, the National Park Service has issued a letter (dated October 4, 2010) concurring with Colorado State Parks that the Chatfield Reservoir Storage Reallocation project will not result in a Section 6(f)(3) conversion. Letters from CDNR, CWCBC and the National Park Service regarding the requirements of Section 808, Section 116 and the LWCF Act are included at the end of this section.

5.5.3 Consistency of the Selected Plan with the Corps' Seven Environmental Operating Principles

The Selected Plan is consistent in the following major ways with each of the Corps' seven Environmental Operating Principles (EOP) (see Table 2-11 for additional details).

EOP 1—The Selected Plan fosters sustainability by increasing opportunities to better utilize renewable surface water, including facilitating recapture and reuse of upstream effluents, to complement water conservation efforts already implemented by the water providers (sponsors). The Selected Plan also does not entail any increase in use (mining) of NTGW, thereby promoting the conservation of NTGW for future generations and utilizes an existing federal water storage facility.

EOP 2—The Selected Plan proactively considers the environmental consequences of Corps activities regarding sustainable water resources solutions to the consequences in the near-term and long-term of not having adequate multi-year storage for surface water or not having enough NTGW to weather droughts, which may become more frequent and severe in the future due to climate change. The Selected Plan also considers environmental consequences of the impacts of storage reallocation; avoids and minimizes these consequences to the extent practicable; and provides for full mitigation of all remaining significant environmental impacts (including proactive use of monitoring and adaptive management), giving priority attention to sustained compliance with environmental laws and regulations.

EOP 3—The Selected Plan achieves a mutually supporting economic and environmentally sustainable water resources solution to the problem of adequate water availability. The Selected Plan facilitates continuation of (sustainable) economic development and quality of life while fully mitigating environmental impacts in a manner that includes monitoring and adaptive management, to better ensure recovery of impaired ecological functions and result in healthy ecosystems.

EOP 4—The Selected Plan enables the Corps to continue to meet its corporate responsibility and accountability to ensure that resources, including water resources, are used wisely while adhering to all environmental laws and regulations. Early collaboration with an interagency team of wildlife habitat experts, including representatives of the USFWS, CDOW, Corps Regulatory staff, and non-governmental organizations ensured the Corps' accountability for achieving full mitigation of human and natural environmental impacts. Impacts to recreational facilities and recreation facility operators' incomes will also be offset. The Selected Plan was also developed in conjunction with 26 Cooperating Agencies and 11 Special Technical Advisors (non-governmental organizations) that ensured compliance with the National Environmental Policy Act and all other environmental laws.

The Corps continues to have discussions with the state and the water providers to further refine the legal relationship between the entities.

EOP 5—A risk management and systems approach was employed to consider the environment throughout the life of the Selected Plan, which includes an assessment of cumulative environmental impacts and, where required, mitigation (which incorporates adaptive management to reduce risk of failure). The mitigation plan for Preble’s meadow jumping mouse habitat, called the “Systems Approach,” focuses on enabling the USFWS’ Recovery Plan for Preble’s to be achieved by concentrating on maximizing habitat connectivity in addition to habitat attributes, and ecological functional units rather than acres alone. Risk assessments were related to costs, effects of mining non-sustainable NTGW, and effects of increased storage of surface water (including recapture and reuse of upstream effluents). The residual risk that reallocation at Chatfield would fulfill only a fraction of the unmet water needs during the 50-year period of analysis was clearly communicated.

EOP 6—The Selected Plan resulted from collaborative leveraging and integration of economic data and social knowledge from the non-federal sponsor with scientific knowledge provided by Corps staff, contractors, and representatives of other federal, state, and local agencies and non-governmental organizations. These entities shared their knowledge in FR/EIS progress meetings coordinated by the CWCB and open to the public; in working groups comprised of Cooperating Agencies and Special Technical Advisors (who also provided comments on preliminary draft FR/EIS chapters); on a panel of experts providing input to decision-making on mitigation for impacts to three types of wildlife habitat; and in a group of Chatfield State Park recreation activity participants who assessed short-term and long-term impacts of reallocation on recreation enjoyment based on the Corps’ Unit Day Value method of calculating recreation benefits.

EOP 7—The Selected Plan, the level of quality, and progress on the FR/EIS was made possible by all stakeholders respecting others’ views and perspectives and feeling free to share information with the group, because of the open, transparent process used. This process included public scoping meetings, FR/EIS progress meetings open to the public, public involvement meetings, public review and comment on the draft FR/EIS, and internet-based outreach efforts. The collaboration among stakeholders and customers fostered and strengthened strategic alliances that resulted in innovative win-win solutions for all participating agencies, organizations, and individuals to achieve the maximum amount of reallocated storage available while protecting and enhancing the human and physical environment.

STATE OF COLORADO

OFFICE OF THE EXECUTIVE DIRECTOR

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1313 Sherman Street, Room 718
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January 31, 2012

Gwyn M. Jarrett, PMP
Project Manager/Plan Formulator
CENWO-PM-AA
1616 Capitol Ave
Omaha, NE 68102

Dear Ms. Jarrett,



John W. Hickenlooper
Governor

Mike King
Executive Director

The Colorado Department of Natural Resources (DNR) is pleased to submit this letter to the U.S. Army Corps of Engineers (USACE) to formally confirm our interest in reallocation of existing storage space in Chatfield Reservoir.

Pursuant to authorizing language in the 1986 Water Resources Development Act (WRDA Bill), "the project... is modified to authorize the Secretary, upon request of and in coordination with the Colorado Department of Natural Resources and upon the Chief Engineers' finding of feasibility and economic justification, to reassign a portion of the storage space in the Chatfield Lake project..."

As you know, the State's water policy agency within DNR, the Colorado Water Conservation Board (CWCB), contracted with USACE over a decade ago to complete a Feasibility Report and Environmental Impact Statement. We look forward to having USACE release the draft document to the public as soon as possible for review and comment.

Your partnership on this important water supply project is greatly appreciated. We also urge your continued diligence in protecting and mitigating the important recreation and wildlife assets in and around the reservoir. Please do not hesitate to contact my staff member, Becky Mitchell, at (303) 866-3311 if you have any questions about this request.

Sincerely,

Mike King

Board of Land Commissioners • Division of Reclamation, Mining & Safety • Colorado Geological Survey
Oil & Gas Conservation Commission • Water Conservation Board • Division of Forestry
Division of Water Resources • Division of Parks and Wildlife

STATE OF COLORADO

Colorado Water Conservation Board Department of Natural Resources

1580 Logan Street, Suite 200
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John W. Hickenlooper
Governor

Mike King
DNR Executive Director

Jennifer L. Gimbel
CWCB Director

February 10, 2012
Gwyn M. Jarrett, PMP
CENWO-PM-AA
1616 Capitol Ave
Omaha, NE 68102

Dear Ms. Jarrett,

On behalf of the Colorado Department of Natural Resources (CDNR), the Colorado Water Conservation Board (CWCB) is the formal non-Federal sponsor of the Chatfield Reservoir Reallocation project. The CWCB executed a Feasibility Cost Share Agreement with the U.S. Army Corps of Engineers, and has been working with a large group of stakeholders to investigate the feasibility for storage reallocation at Chatfield.

CDNR has requested the reallocation project. Proposed implementation will be 100% completed through State and local partner funding, at no cost to the Federal government pursuant to the 1958 Water Supply Act. Implementation work will involve all phases of design and construction such as: 1) on-site and off-site environmental mitigation; 2) modification of impacted recreation facilities; 3) utility relocations; 4) earthwork and shoreline contouring; 5) road, bridge and parking lot construction; 6) demolition, clearing, and grubbing; and 7) vegetation management. All of the identified implementation work is integral to the project.

Feel free to call me at (303) 866-3441 ext. 3208 if you have any questions about this matter.

Sincerely,

Thomas W. Browning, Assistant Director
Colorado Water Conservation Board

Interstate & Federal • Watershed & Flood Protection • Stream & Lake Protection • Finance
Water Information • Water Conservation & Drought Planning • Water Supply Planning



United States Department of the Interior

National Park Service

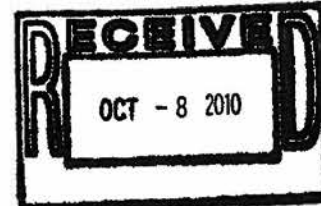
Midwest Region
601 Riverfront Drive
Omaha, Nebraska 68102-4226



08-00741(MWR-P/G)
08-00715;08-00512

04 OCT 2010

Mr. Gary Thorson
Deputy Director
Colorado Division of Parks and Outdoor Recreation
1313 Sherman Street, Room 618
Denver, Colorado 80203



Dear Mr. Thorson:

This is in response to your August 31 letter requesting a determination as to whether or not the proposed Chatfield Reservoir Storage Reallocation Project (Reallocation Project) within Chatfield State Park constitutes a section 6(f) (3) conversion under the Land and Water Conservation Fund (L&WCF) program. This park was improved with assistance from the L&WCF program under grants 08-00512, 08-00715, and 08-00741. In our opinion, it does not constitute a section 6(f)(3) conversion.

The original project scope for grant 08-00512 states in part: "The Colorado Division of Parks and Recreation will acquire water rights and adjudicated use therefore to maintain a minimum pool for outdoor recreation use by the general public at Chatfield Lake..." We do not believe that raising the surface water table from 5,426.94' to 5,444' will negatively impact the scope for grant 08-00512 or for grants 08-00715 and 08-00741. Rather, the proposed Reallocation Project could potentially promote additional outdoor recreational use within Chatfield State Park.

In summary, based upon our understanding of the Reallocation Project in relationship to the three L&WCF grants at Chatfield State Park, we concur with your analysis that this proposal will not result in a section 6(f)(3) conversion.

Please feel free to contact me at 402-661-1556, or Carol Edmondson at 402-661-1548, with any future questions or concerns related to this matter.

Sincerely,

Dennis B. Burmeister
Outdoor Recreational Planner



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