



US Army Corps
of Engineers®
Savannah District

Hartwell Lake Draft Integrated Water Supply Storage Reallocation Report and Environmental Assessment and Finding of No Significant Effect South Carolina and Georgia Appendix E: Economics Analysis



March 2024

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Introduction

The purpose of this economic evaluation is to assess the feasibility of reallocating water supply storage from Hartwell Lake for the purpose of municipal and industrial (M&I) water supply. Proposed changes (alternatives) to the base condition are compared and analyzed to determine the effects or potential effects and aid the planning process. In the case of the Hartwell Reallocation Study, the final array of alternatives compares reallocating 24.55 Millions of Gallons per Day (MGD) requested water supply storage solely from the multipurpose pool with and without return flow credits to users, against the base condition of users needing to obtain water from other sources and evaluates any effects that these changes have on hydropower benefits forgone and the cost of storage against the most likely alternative for obtaining the requested amount of water supply storage. Average annual dollars for this report are based on FY23 price levels, the FY23 discount rate of 2.5%, water supply rate of 2.875%, a period of analysis of 50 years, and a period of repayment of 30 years.

The U.S. Army Corps of Engineers (USACE) maintains adherence to the six-step planning process as defined in the 1983 Principles and Guidelines (P&G), the December 2023 ER 1105-2-103, and the 22 April 2000 Planning Guidance Notebook (ER 1105-2-100) to:

1. Define the Problems, Opportunities, Objectives, and Constraints
2. Inventory the study area and forecast future with-out project and conditions
3. Formulate alternative plans
4. Evaluate alternative plans
5. Compare alternative plans
6. Select a recommended plan

The Project Delivery Team (PDT) follows this planning process as laid out in the final report.

1. Problem—The problem is to address the inadequate supply of water for Hartwell Lake requestors along the Savannah River. The report will evaluate Hartwell Lake water supply storage reallocation requests to meet immediate and future water demands for municipalities in South Carolina and Georgia adjacent to Hartwell Lake. Based on historic water consumption, increasing populations, and industrial development, several non-Federal requestors sought Corps assistance for a suitable cost-effective solution. Combining the requestors current and future needs with a lack of readily available and reliable water supply, water demands would not be met through 2072. Significant losses in economic growth and development for both Georgia and South Carolina are anticipated if future demands are not met.

Opportunity—USACE identified opportunities to meet future water supply needs for the requestors through 2072.

Objectives—Objective 1: Reduce the risk of not meeting the future water supply of 24.55 MGD of Lake Hartwell users.

Objective 2: Alternatives will not alter the level of system flood risk or recreation surrounding Hartwell Lake.

Constraints

Constraints— The formulation of alternatives to address the study objective is limited by planning constraints. Constraints are statements of effects that the alternative plans should avoid. Constraints are designed to avoid undesirable changes between without and with-project future conditions.

Constraints could include resources, legal, or policy constraints. Constraints which are applicable to this study, are:

In April 2022, South Carolina approved legislation to require return flow credits, and the Corps decided to hold the existing draft report and develop a Return Flow Credit (RFC) alternative prior to the draft report's release to the public. As such, a new alternative (Alternative 5) was developed that was absent from the initial array.

As stated in the Institute for Water Resources (IWR) Water Supply Handbook (Revised IWR Report 96-PS-4):

“U.S. Army Corps of Engineers and other Federal reservoirs represent a combination of large economic investments and commitments of valuable natural resources. These reservoirs can make important contributions to the nation's economy. Over time, as population shifts and growth and need changes, the purposes of some Federal reservoirs may no longer satisfy the original project priorities. To meet these changing needs, the Corps is continually turning to reallocation. Reallocation of storage to municipal and industrial water supply has been considered in a number of different ways. However, any new reallocation agreement must provide the states or others with financial incentives not available elsewhere and the use of existing storage in Corps facilities must be cheaper for the potential user than the construction of new or additional facilities. Corps policy for reallocated storage is to charge the user the cost of the storage as if it were constructed today.”

1.0 Facility Background

1.1 Users

The purpose of this economic evaluation is to reallocate a total proposed 24.55 million gallons per day (MGD) across the users of Currahee. Pioneer, Lavonia, and Anderson from the water located in Hartwell Lake. Pioneer is requesting an additional 5 MGD because of 2019 installed “A 24-inch ductile iron raw water intake line delivers raw water from the screen has the ability to draw 5.0 MGD from Lake Hartwell.” Currahee Club previously requested 1.0 MGD in 2014, but after response from USACE, Currahee has changed the request from 1.0 MGD to 0.5 MGD. Anderson Regional Joint Water System (ARJWS) is requesting an additional 16.05 MGD according to Anderson and future water supply modeling.

1.2 Project Location

The Corps constructed, operates, and maintains three Lake and Dam projects on the Savannah River: J. Strom Thurmond (JST), Richard B. Russell (RBR), and Hartwell. Approximately two percent of the watershed lies in North Carolina, 42 percent lies in South Carolina, and the remaining 56 percent lies in Georgia. The watershed drains within 10,579 square miles. The Savannah River watershed embraces three distinct geographic areas: Mountain Section, the Piedmont Province, and the Coastal Plain.

1.3 Watershed

Figure 1 shows the locations of all Lake and Dam projects on the Savannah River Basin. Those with red dots indicate Corps Lake and Dam projects while those with yellow dots indicated Lake and Dam projects operated by Duke Energy.

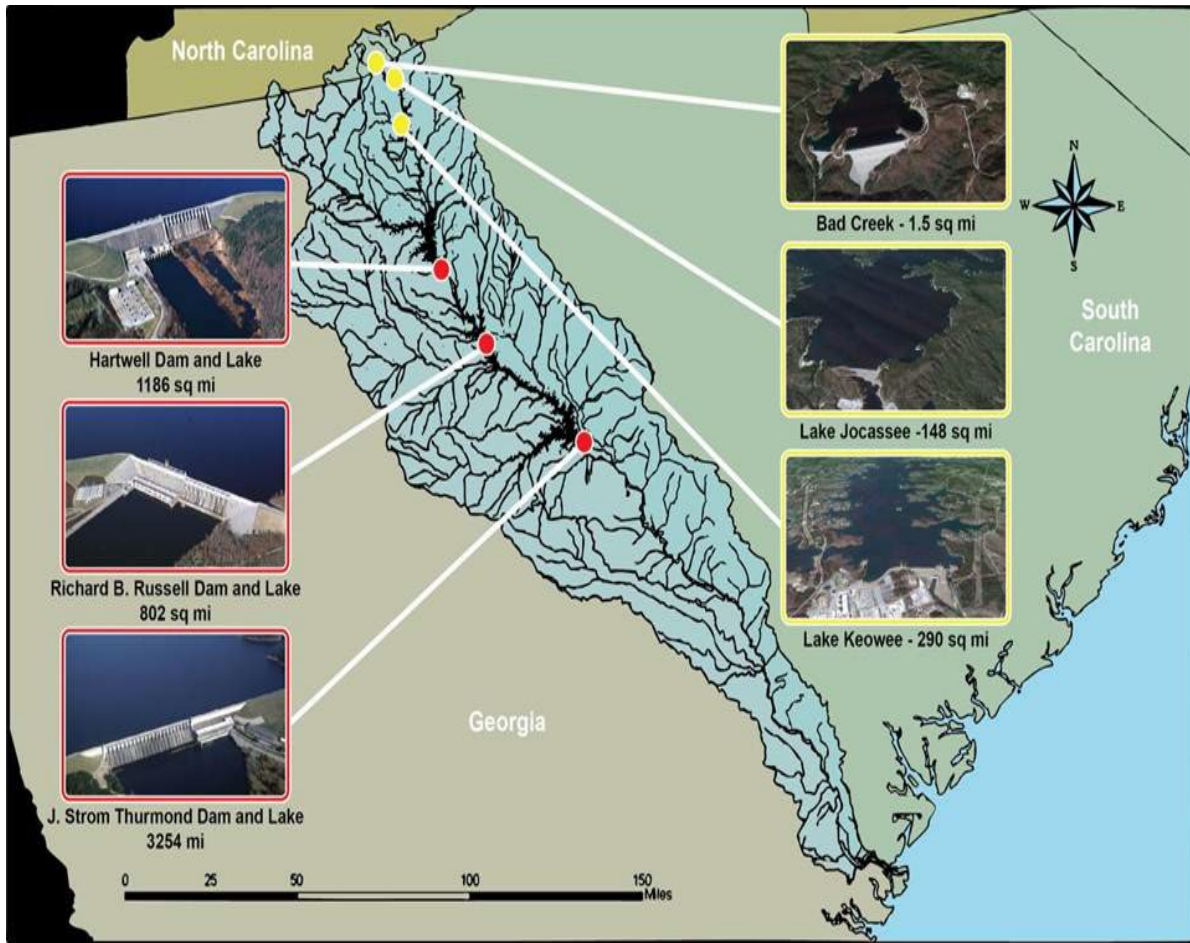


Figure 1: Savannah River Basin Project Map

Figure 2 also indicates the spatial extent of the local drainage basin for each of the Lake and Dam projects.



Figure 2: Savannah River Basin Project Map

Hartwell Lake’s 56,000 acres of water and approximately 962 miles of shoreline extends into six counties in two states: Hart County, GA; Franklin County, GA; Stephens County, GA; Anderson County, SC; Pickens County, SC; and Oconee County, SC. See Figure 3 below.

The service areas of the four requestors (Figure 3) include Franklin County and Stephens County, GA and Anderson County, Pickens County and Oconee County, SC.

1.4 Functions, Services and Benefits

The Flood Control Act of 22 December 1944, (Public Law 534, 78th Congress, 2d session), approved the general plan for the comprehensive development of the Savannah River Basin as recommended by House Document No. 657, 78th Congress, 2nd Session, dated 9 June 1944 which listed Hartwell Dam and Lake as the second dam to be constructed. The Hartwell Dam and Lake Project was authorized for

construction by the Flood Control Act, as approved on 17 May 1950. The original authorization included flood control, navigation, hydroelectric power, and other purposes. Subsequent general legislation authorized fish and wildlife management, water supply, water quality, and recreation as project purposes. The Water Resource Development Act of 1976 (P.L. 94-587) authorized construction of the fifth hydropower unit. Contemporary water management in the basin evolved over decades to include flood control and hydropower generation. The numerous dams within the watershed have significantly reduced flood damages and augmented water supply capacities through the region. In addition, the dams have generated a multitude of recreation opportunities, including fishing, boating and swimming, among other activities.

2.0 Demographics

2.1 Population

The following tables display the basic population, population projections, employment by occupation, demographic, and poverty statistics information for each portion of the study area as estimated by the Census Bureau 2021 American Community Survey 5-year estimates. Population projects are provided specifically by each state, and Georgia’s projections end at 2060 coming from the Governor’s Office of Planning and Budget, with South Carolina’s projections from the Revenues and Fiscal Affairs Office ending in 2035, per state data. The Georgia and South Carolina populations were projected out to the extent of the project analysis length by using the water demand requestors’ anticipated increase of 1% population per year increase.

Table 1: Population in Study Area

| County Name | Population (2021 ACS) |
|---------------------|------------------------------|
| Hart County, GA | 25,808 |
| Franklin County, GA | 23,256 |
| Stephens County, GA | 26,641 |
| Anderson County, SC | 202,223 |
| Pickens County, SC | 129,617 |
| Oconee County, SC | 77,932 |

Table 2: GA Study Area Population Projections

| Year | Combined GA Study Area | Franklin County, GA | Hart County, GA | Stephens County, GA |
|-------------|-------------------------------|----------------------------|------------------------|----------------------------|
| 2025 | 77,706 | 24,745 | 26,783 | 26,178 |
| 2030 | 79,107 | 25,974 | 26,822 | 26,311 |
| 2035 | 80,541 | 27,216 | 26,829 | 26,496 |

| | | | | |
|------|---------|--------|--------|--------|
| 2040 | 81,951 | 28,481 | 26,797 | 26,673 |
| 2045 | 83,253 | 29,752 | 26,665 | 26,836 |
| 2050 | 84,585 | 31,026 | 26,569 | 26,990 |
| 2055 | 85,878 | 32,294 | 26,465 | 27,119 |
| 2060 | 87,140 | 33,579 | 26,323 | 27,238 |
| 2065 | 91,585 | 35,292 | 27,666 | 28,627 |
| 2070 | 96,257 | 37,092 | 29,077 | 30,088 |
| 2075 | 101,167 | 38,984 | 30,560 | 31,622 |

¹ Georgia Governor’s Office of Planning and Budget

Population projections from 2025 through 2035 for Anderson, Oconee, and Pickens County were provided by the South Carolina Revenue and Fiscal Affairs Office. As the period of analysis for the proposed action extends beyond that of the SC Revenue and Fiscal Affairs Office analysis, 2035 population extrapolate upon following the expected requestors’ water demand increase reports at a rate of 1% population growth per year. Table 3 provides the resulting projections at five-year intervals.

Table 3: SC Study Area Population Projections

| Year | Combined SC Study Area | Anderson County, SC | Oconee County, SC | Pickens County, SC |
|------|------------------------|---------------------|-------------------|--------------------|
| 2025 | 437,838 | 214,208 | 81,142 | 142,488 |
| 2030 | 461,932 | 224,293 | 83,227 | 154,412 |
| 2035 | 485,197 | 233,986 | 84,774 | 166,437 |
| 2040 | 509,947 | 245,922 | 89,098 | 174,927 |
| 2045 | 535,959 | 258,466 | 93,643 | 183,850 |
| 2050 | 563,299 | 271,650 | 98,420 | 193,228 |
| 2055 | 592,033 | 285,507 | 103,440 | 203,085 |
| 2060 | 622,232 | 300,071 | 108,717 | 213,444 |
| 2065 | 653,972 | 315,378 | 114,263 | 224,332 |
| 2070 | 687,331 | 331,465 | 120,091 | 235,775 |
| 2075 | 722,392 | 348,373 | 126,217 | 247,802 |

² South Carolina’s projections from the Revenues and Fiscal Affairs Office Study area total employment by occupation is presented in Table 10. Data for the State of Georgia and South Carolina is included for the purpose of comparison.

¹ Georgia Governor’s Office of Planning and Budget

² South Carolina’s projections from the Revenues and Fiscal Affairs Office

Table 4: Total Employment by Occupation

| Area | Civilian employed population 16 years and over | Management, business, science, and arts occupations | Service occupations | Sales and office occupations | Natural resources, construction, and maintenance occupations | Production, transportation, and material moving occupations |
|-----------------|--|---|---------------------|------------------------------|--|---|
| GA | 4,983,753 | 1,963,375 | 784,435 | 1,074,970 | 430,761 | 730,212 |
| <i>Franklin</i> | 9,729 | 2,947 | 1,668 | 1,814 | 983 | 2,317 |
| <i>Hart</i> | 10,223 | 3,060 | 1,925 | 2,183 | 1,403 | 1,652 |
| <i>Stephens</i> | 11,497 | 2,953 | 2,346 | 2,396 | 768 | 3,034 |
| SC | 2,313,378 | 846,939 | 397,008 | 495,012 | 213,152 | 361,267 |
| <i>Anderson</i> | 91,536 | 32,608 | 14,690 | 17,283 | 8,397 | 18,558 |
| <i>Oconee</i> | 32,370 | 11,159 | 5,652 | 6,241 | 3,363 | 5,955 |
| <i>Pickens</i> | 59,910 | 23,089 | 10,944 | 10,753 | 6,055 | 9,069 |

³ ACS 2021 Census Data

2.2 Income & Poverty

One common measure of economic condition is per capita income. Per capita income measures the average income earned per person in a given area in a specified year. It is calculated by dividing the area's total income by its total population. Table 11 displays per capita income data in 2019 inflation-adjusted dollars based on 2021 American Community Survey 5-year estimates. Data for the states of Georgia and South Carolina is included for the purpose of comparison.

Table 5: Per Capita Income

| Area | Per Capita Income (In 2021 Inflation-Adjusted Dollars) |
|------|--|
| GA | \$34,515 |

³ 2021 ACS Data

| | |
|-----------------|----------|
| <i>Franklin</i> | \$25,394 |
| <i>Hart</i> | \$26,165 |
| <i>Stephens</i> | \$24,444 |
| SC | \$32,822 |
| <i>Anderson</i> | \$30,615 |
| <i>Oconee</i> | \$32,985 |
| <i>Pickens</i> | \$29,217 |

⁴ ACS 2021 Census Data

- Per capita Income for the Georgia counties included in the socioeconomic study area ranged from a low of \$24,444 in Stephens County to a high of \$26,165 in Hart County, with Franklin County at \$25,394. Those totals fall below the Georgia state rate of \$34,515.

Per capita Income for the SC counties included in the socioeconomic study area ranged from a high of \$32,9858 in Oconee County to a low of \$29,217 in Pickens County, with Anderson County at \$30,615. Those totals fall below the South Carolina state rate of \$32,822.

3.0 Alternatives and User Breakdown

Once the PDT analyzed the results and screened each of the alternatives based on completeness, acceptability, effectiveness, and efficiency, then they carried the following three forward for detailed consideration and analysis into the final array of alternatives. They include:

- Alternative 1: FWOP/NAA – Existing Plan of Regulation
- Alternative 2: Hartwell Lake Conservation Storage
- Alternative 5: Hartwell Lake Conservation Storage with RFC

While not explicitly part of the selection and screening process, a Least Cost Alternative must be identified for evaluation purposes. The FWOP/NAA does not meet the needs of water supply users, but it is the most likely scenario absent federal action. Future action would be required inevitably for the cities in the study area, and the totality of those actions are represented by the Least Cost Alternative. The purpose of the nonfederal alternative is to compute the next least costly/most likely alternative absent a reallocation from a USACE reservoir and to estimate the federal water supply benefit.

3.1 Future Without Project Condition/No Action Alternative (Alternative 1)

The FWOP/NAA includes existing authorized water supply storage agreements and projected shortfalls through 2072, but it would not result in new water supply storage

⁴ 2021 ACS Data

agreements. It would not meet the study objective of providing water supply storage for requests that are currently being evaluated. In short, the FWOP/NAA assumes that no means are possible to alleviate the water supply shortfalls forecasted in this analysis, and the project requestors shortfall is approximately 24.55 MGD under 2072 basin conditions and demands, even with implementation of additional water conservation methods.

3.2 Conservation Storage Water Supply Alternative (Alternative 2)

Alternative 2 would reallocate conservation storage for water supply from Hartwell Lake. The conservation storage alternative would result in new water supply storage agreements. The Corps would reallocate water storage from the existing conservation storage to water supply to meet the present and future needs of current requestors. All currently authorized water storage agreements would continue to receive their storage volumes at the same storage/yield ratio.

Table 6 Alternative 2 Contracted Storage

| Conservation Pool Withdrawal Conversion | | | | |
|---|---------------|---------------|--------------|--------------------------------------|
| | MGD Requested | CFS Requested | CFS Credited | Contract Storage sans RFC Mitigation |
| Anderson | 16.05 | 24.83 | | 13,140 |
| Pioneer | 5.00 | 7.74 | | 3,985 |
| Lavonia | 3.00 | 4.64 | | 2,437 |
| Currahee | 0.50 | 0.77 | | 411 |
| Total | 24.55 | 38.0 | | 19,973 |

3.3 Conservation Storage Water Supply Alternative (Alternative 5)

Alternative 5 would reallocate conservation storage for water supply from Hartwell Lake the same as Alternative 2 but includes RFC for the requestors. The conservation storage alternative would result in new water supply storage agreements. The Corps would reallocate water storage from the existing conservation storage to water supply to meet the present and future needs of current requestors. All currently authorized water storage agreements would continue to receive their storage volumes at the same storage/yield ratio.

Alternative 5 included RFC for Anderson, Pioneer, and Lavonia, which enabled them to hold smaller water accounts and still meet their 2035 demand during the critical period. However, granting RFC to those account holders reduced the portion of total inflow received by Currahee and Hart County. As such, those two requestors require larger accounts. As previously discussed in 3.7.5, granting RFC allows Anderson, Pioneer, and Lavonia to lessen their accounts, by 8,618 ac-ft, 874 ac-ft, and 135 ac-ft, respectively. Currahee would require an additional 4 ac-ft to continue meeting the same

level of demand during the critical period, while 15 ac-ft increase would meet Hart County's requirements.

Table 7 Alternative 5 Contracted Storage

| | MGD Requested | CFS Requested | CFS Credited | Contract Storage w/ RFC Mitigation |
|----------|---------------|---------------|--------------|------------------------------------|
| Anderson | 16.05 | 24.8 | 10.8 | 4,568 |
| Pioneer | 5.00 | 7.7 | 1.1 | 3,122 |
| Lavonia | 3.00 | 4.6 | 0.2 | 2,308 |
| Currahee | 0.50 | 0.8 | 0.0 | 412 |
| Total | 24.55 | 38.0 | 12.2 | 10,410 |

4.0 Derivation of User Cost

The Tentatively Selected Plan (TSP) includes a reallocation from storage at Hartwell Lake for water supply to meet an estimated need of 24.55 (MGD). USACE guidance requires four different methods to be used to determine the cost of water supply storage to the user, which is discussed in the below paragraph. In addition to determining user cost, USACE must ensure that reallocation of federal storage to water supply is the most economical alternative compared to other sources of water (including the Next Least Costly Alternative) which can be repaid over a period not to exceed 30 years.

USACE's Engineer Regulation (ER) 1105-2-100 specifies the four pricing methods used to calculate the value of storage considered for reallocation (i.e., the price to be charged for the capital investment for reallocated storage). The four methods include: benefits foregone, revenues foregone, replacement cost, and updated cost of storage. USACE must ensure that reallocation of federal storage to water supply is the most economical alternative compared to other sources of water (including the Next Least Costly Alternative) which is referred to as the "Test of Financial Feasibility" and is evaluated over a 50-year period of analysis.

- **Benefits Foregone.** Benefits foregone are generally estimated using the standard Nation Economic Development (NED) evaluation criteria in compliance with ER-1105-2-100. The benefits foregone are evaluated over a 50-year period of analysis.
- **Revenues Foregone.** Hydropower revenues foregone are defined as the reduction in revenues accruing to the Treasury as a result of reallocating storage from hydropower to water supply. The revenues are based on the existing repayment agreement between the power marketing agency and the USACE. Revenues forgone from other project purposes are the reduction in revenues accruing to the U.S.

- Treasury based on existing repayment agreements.
- Replacement Cost. Notwithstanding unforeseen circumstances, replacement costs are equal to benefits foregone. In the event that reallocated storage is being taken from the flood control pool, the USACE will estimate the replacement cost of equivalent protection if necessary. This is not relevant for Hartwell Lake.
- Updated Cost of Storage. The updated cost of reallocated storage is estimated by updating the final cost of the joint use features escalated from the midpoint of construction to the fiscal year in which the reallocation of storage is approved. The updated final cost of the joint use features is then multiplied by the proportion of usable storage that is the reallocated to estimate the value of reallocated storage.

4.1 Hydropower Benefits Foregone

Water flow operations through the power plant for the period of record (1960-2022) is made using HEC-RESSIM, a sequential streamflow model to simulate daily Hartwell operations under alternative operations for water supply.

Hydropower benefits foregone are identical for alternatives 2 and 5 because the only difference between is the accounting difference associated with the return flow credits. The below table summarizes the Annual Hydropower Benefits Foregone.

Table 8 Benefits Foregone

| | Energy (MWh) | Energy Revenue (2023\$) | Dependable Capacity (MW) | Capacity Revenue (2023\$) | Total Revenue (2023\$) | Change from Baseline (2023\$) | % Change from baseline |
|---------------------|-----------------|-------------------------------|--------------------------------|---------------------------------|---------------------------|--|---------------------------------|
| Baseline | 1,539,038 | \$46,698,012 | 1,107 | 95,917,262 | \$142,615,274 | n/a | |
| Alt. 2 | 1,535,153 | \$46,611,392 | 1,108 | 95,998,528 | \$142,609,920 | -\$5,354 | 0.00% |
| Alt. 5 ³ | 1,535,153 | \$46,611,392 | 1,108 | 95,998,528 | \$142,609,920 | -\$5,354 | 0.00% |

4.2 Revenues Foregone

“Revenues foregone to hydropower are the reduction in revenues accruing to the U.S. Treasury as a result of the reduction in hydropower outputs based on the existing rates charged by the power marketing agency.”

For the purpose of this alternative analysis for Hartwell Lake, revenues forgone are identical for Alternatives 2 and 5 because the only difference is the accounting difference inherent to the return flow credits.

“The Corps does not market the power it produces; marketing is done by the Federal power marketing agencies (Southeastern Power Administration, Southwestern Power Administration, Western Area Power Administration, Bonneville Power Administration, Alaska Power Administration) through the Secretary of Energy. The rates are set by the marketing agency to: (a) recover costs (producing and transmitting) over a reasonable period of years (50 years usually); and (b) encourage widespread use at the lowest possible rates to consumers, consistent with sound business principles. ...”

Revenue foregone is to be based on the current SEPA contract Rates applicable to power generation by Hartwell. The current rates are:

Energy Rate Total: \$12.80/MWh
 Monthly Capacity Charge: \$4.04/kW-month

To compute energy revenues foregone, the contract energy rate is applied to the average annual contract energy foregone, and the capacity charge is applied to foregone dependable capacity. The table below shows the Power Revenue Foregone for each of the alternatives.

Table 9: Revenues Foregone Summary

| | Energy (MWh) | Energy Revenue (2023\$) | Dependable Capacity (MW) | Capacity Revenue (2023\$) | Total Revenue (2023\$) | Change from Baseline (2023\$) | % Change from baseline |
|---------------------|-----------------|-------------------------------|--------------------------------|---------------------------------|------------------------------|-------------------------------------|------------------------------|
| Baseline | 1,539,038 | \$19,699,686 | 1,106.6 | 53,647,849 | \$73,347,535 | n/a | n/a |
| Alt. 2 | 1,535,153 | \$19,649,958 | 1,107.5 | 53,693,302 | \$73,343,260 | -\$4,275 | -0.01% |
| Alt. 5 ³ | 1,535,153 | \$19,649,958 | 1,107.5 | 53,693,302 | \$73,343,260 | -\$4,275 | -0.01% |

4.3 Updated Costs of Storage

The cost allocated to the user under this pricing method updates the joint-use portion of the first costs of reservoir construction to present day price levels and then assigns a percentage of the costs based on the “Use of Facilities” (UOF) cost allocation procedure. Costs are updated from “as built” costs in 1950 (the mid-point of construction) to 1967 prices by use of the Engineering News Record (ENR) Construction Cost Index, and then from 1967 to current prices by use of the USACE’s Civil Works Construction Cost Index System (CWCCIS).

Land values are updated by the weighted average update of all other project features. Costs are indexed from the midpoint of the physical construction period to the beginning of the FY in which the contract for reallocated storage is expected to be approved (FY2023). Joint-use costs exclude infrastructure costs allocated to specific project purposes such as recreation facilities, hydropower turbines, etc.

Construction is considered as having been initiated at the start of the month when lands for the project were first acquired or on the date when the first construction contract was awarded whichever was earlier. Construction is considered as having been completed at the end of the government FY in which final deliberated impoundment of the reservoir point was initiated.

The USACE policy on pricing storage reallocated from one authorized project purpose to another is based on the UOF methodology. UOF methodology allocates joint-use costs (costs that cannot be specifically allocated to a specific project purpose) based on overall percentage of storage reallocated. For example, if 15 percent of the usable storage is reallocated, then the reallocated storage is apportioned 15 percent of the joint-use costs. The cost of reallocated storage changes each government FY. This is due to the fact that the Federal discount rate changes on an annual basis as well as varying annual OMRR&R costs. Section 932 of the 1986 WRDA requires recalculation of the interest rate at 5-year intervals if the storage is paid annually over a 30-year period.

Table 10: Updated Joint Costs for Total Storage

| Hartwell Project Updated Joint Costs | | | | | |
|--------------------------------------|---------------------|---------------------|-------------------------------|----------------|-----------------------|
| ITEM | JOINT COSTS | ENR INDEX (1966-67) | CWCCIS FACTOR (1967 - 1Q2023) | COMBINED INDEX | UPDATED COST (1QFY23) |
| Lands/Acquisitions* | \$13,526,900 | | | 13 | \$175,832,510 |
| Relocations | \$21,500,200 | 1.08 | 12.36 | 13.35 | \$287,025,090 |
| Reservoirs | \$3,062,700 | 1.08 | 12.44 | 13.43 | \$41,135,748 |
| Dams, Spillway, Appurtenances | \$23,803,900 | 1.08 | 11.68 | 12.62 | \$300,325,903 |
| Roads, Rail Roads, Bridges | \$62,300 | 1.08 | 12.36 | 13.35 | \$831,698 |
| Buildings, Grounds, Utilities | \$308,400 | 1.08 | 12.39 | 13.38 | \$4,127,062 |
| Permanent Operating Equipment | \$208,800 | 1.08 | 12.39 | 13.38 | \$2,794,198 |
| TOTAL | \$62,473,200 | | | | \$812,072,209 |

Table 11 Capital Costs: Total NPV and AAC

| | NPV Total Capital Cost | | | |
|----------|------------------------|---------------|---------------|-----------------|
| | Alt 1 | Alt 2 | Alt 5 | Least Cost Alt |
| Pioneer | \$3,620,000 | \$7,781,000 | \$7,781,000 | \$41,846,000 |
| ARJWS | \$1,961,840,256 | \$785,723,362 | \$785,723,362 | \$1,961,840,256 |
| Currahee | \$1,200,000 | 428,276 | 428,276 | \$1,200,000 |

| | | | | |
|--------------|------------------------|----------------------|----------------------|------------------------|
| Lavonia | \$ 10,000,000 | \$ 933,300 | \$ 933,300 | \$ 10,000,000 |
| Total | \$1,976,660,256 | \$794,865,938 | \$794,865,938 | \$2,014,886,256 |

Capital Costs AACs

| | Alt 1 | Alt 2 | Alt 5 | Least Cost Alt |
|--------------|----------------------|----------------------|----------------------|-----------------------|
| Pioneer | \$ 127,634 | \$ 274,343 | \$ 274,343 | \$ 1,475,409 |
| ARJWS | \$ 69,170,675 | \$ 27,703,079 | \$ 27,703,079 | \$ 69,170,675 |
| Currahee | \$ 42,310 | \$ 15,100 | \$ 15,100 | \$ 42,310 |
| Lavonia | \$ 352,581 | \$ 32,906 | \$ 32,906 | \$ 352,581 |
| Total | \$ 69,693,200 | \$ 28,025,428 | \$ 28,025,428 | \$ 71,040,974 |

Table 12: Total Storage Summary

1 Alternative 2: Request from Conservation Pool

| Current Useable Storage - new request from conservation | | | | |
|---|------------------|--------------------|--|--------------------|
| | Con Storage (AF) | Flood Storage (AF) | | Total Storage (AF) |
| Hartwell | 1,415,500 | 293,100 | | 1,708,600 |

2 Alternative 5: Request from RFC Pool

| Current Useable Storage - new request from Conservation w/RFC | | | | |
|---|------------------|--------------------|--|--------------------|
| | Con Storage (AF) | Flood Storage (AF) | | Total Storage (AF) |
| Hartwell | 1,415,500 | 293,100 | | 1,708,600 |

| | | | |
|---------------------------------|----------------------|----------|-------------------------------------|
| Updated Cost of Storage= | (Joint Costs) | x | (Storage Reallocated) |
| | | | (Total Usable Storage Space) |

Source: Water Supply Handbook (IWR Report 96-PS-4)

Table 13 Average Annual Cost of Storage Calculation

| Alternative 2 (Conservation Pool) | Total Usable Storage: | Updated Joint Costs (FY23): | AF | % w/d of storage |
|--|--|--|-----------------------|-----------------------------------|
| Anderson | | | 13,140 | 0.769% |
| Pioneer | | | 3,985 | 0.233% |
| Lavonia | | | 2,437 | 0.143% |
| Currahee | | | 411 | 0.024% |
| Total | 1,708,600 | \$ 812,072,209 | 19,973 | 1.169% |
| | | | | |
| | | Total Cost | AAC | Annual O&MRR&R |
| 2 | Total Request Updated Cost of Storage | \$ 9,492,870.32 | \$334,70 0 | \$ 46,408 |
| | | | | |

*Cost are annualized using an FY23 discount rate of 2.5% over a 50 year analysis window.

| Alternative 5 (Conservation Pool w/ RFC) | Total Usable Storage: | Updated Joint Costs (FY23): | AF | % w/d of storage |
|---|--|--|------------------|-----------------------------------|
| Anderson | | | 4,568 | 0.27% |
| Pioneer | | | 3,122 | 0.18% |
| Lavonia | | | 2,308 | 0.14% |
| Currahee | | | 412 | 0.02% |
| Total | 1,708,600 | \$ 812,072,209 | 10,410 | 0.609% |
| | | | | |
| | | Total Cost | AAC | Annual O&MRR&R |
| 5 | Total Request Updated Cost of Storage | \$ 4,947,528 | \$174,440 | \$ 24,187 |
| | | | | |

*Cost are annualized using an FY23 discount rate of 2.5% over a 50 year analysis window.

5.0 National Economic Development and Screening of Final Array

Per ER 1105-2-100, National Economic Development (NED) benefits for water supply

storage are calculated by the willingness to pay for additional water supply. Benefits can be measured by the resource cost of the alternative most likely to be implemented in absence of the Federal plan, which in this case is construction of new pipelines to other water sources.

Table 15 displays annualized cost of the No Action condition (construction of a new pipeline), which is Alternative 1 (in the main report) and compares it against Alternative 2, Alternative 5, and the least cost alternative (construction of a new pipeline + water purchase agreements). While the Least Cost Alternative is used for an economic comparison because even though it is the most likely, the No Action alternative for a reliable water source, Alternative 1, No change is used for NEPA purposes. Under Alternative 2, the user would be responsible for 1.17% of the annual O&M and RR&R costs and under Alternative 5, they would be responsible for 0.61% of the costs. The O&M and RR&R costs were based off actual FY23 joint-use expenditures.

Table 14 O&M Breakdown

Actual FY23 Joint Use
Expenditures
\$ 1,710,000

| User | Alternative 2 | Alternative 5 |
|----------|---------------|---------------|
| Anderson | \$ 13,151 | \$ 4,572 |
| Pioneer | \$ 3,988 | \$ 3,124 |
| Lavonia | \$ 2,439 | \$ 2,310 |
| Currahee | \$ 411 | \$ 412 |
| Total | \$ 19,989 | \$ 10,418 |

Overall, alternative 5 is deemed to have the greatest amount of net benefits because the cost of storage for alternative 2 is significantly higher under the assumption of no return flow credits. Also, the least cost alternative incurs significantly higher capital costs thus alternative 5 is left as the alternative that maximizes benefits while legally satisfying water demand going into the future.

Table 15 NED Analysis

| | No Action Alternative (Alternative 1) | Conservation Storage (Alt 2) | Conservation Storage w/RFC (Alt 5) | Least Cost Alternative |
|---------------------------------|---|------------------------------------|--|---------------------------|
| Estimated Yield from Storage | 0.00 | 24.55 | 24.55 | 0.00 |
| Credited RFC | | | 12.17 | |

| | | | | |
|--|---------------|---------------|---------------|---------------|
| Reallocated Storage (ac-ft) | 0 | 19,973 | 10,414 | - |
| Meets Future Water Demand | NO | YES | YES | YES |
| Adheres to State Law | YES | NO | YES | YES |
| Annual Hydropower benefits forgone | - | \$ (5,354) | \$ (5,354) | - |
| Annual Hydropower Revenues Foregone | - | \$ (4,275) | \$ (4,275) | - |
| Annual Capital Costs – Cost of Storage | - | \$ 334,700 | \$ 174,440 | - |
| Annual Capital Costs – Pump Station, Transmission, and Treatment Plants* | \$ 69,693,200 | \$ 28,025,428 | \$ 28,025,428 | \$ 71,040,974 |
| O&MRR&R Annual Costs | \$ 186,000 | \$ 19,989 | \$ 10,418 | \$ 186,000 |
| All Figures are presented in AAC discounted at 2.5% for FY23 | | | \$ 28,035,851 | \$ 71,226,974 |

Note: These are rounded totals. FY2023 price level; average annual costs calculated over a 50-year period of analysis at the current FY2023 federal discount rate of 2.5%.

5.1 Test of Financial Feasibility

As a test of financial feasibility, the annual cost of the reallocated storage is compared to the annual cost of the most likely, least cost alternative that would provide an equivalent quality and quantity of water, and which users AJRWS, Currahee, Pioneer and Lavonia would undertake in the absence of utilizing additional reallocated storage from Hartwell Lake.

According to previous studies conducted by the users, the most likely, least costly alternative for a reliable water source in absence of reallocating storage at Hartwell Lake would be to acquire water from alternative sources and building new transmission and treatment lines.

O&M costs for water supply users at Hartwell Lake are based on actual FY23 joint-use expenditures and the associated percentage that the water supply user will be responsible for as described in the storage summary. Repair, replacement, and rehabilitation (RR&R) costs were determined in conjunction with the USACE, Kansas City District Operations Division. At this time, no RR&R projects have been identified in the next two budget years. Original construction, joint-use costs were updated to October 2022 dollars (FY2023 dollars) and apportioned to the new user using the water

storage user percentages under the Recommended Plan. A 50-year period of economic analysis was used, and all costs were inflated accordingly. The costs were discounted using the current FY2023 discount rate of 2.5 percent to find the net present value and the average annual equivalent cost. The resulting annual OMRR&R costs under the Recommended Plan are estimated to be \$10,422.

The capital costs for the Recommended Plan are the updated cost of storage and mitigation, which is approximately annually \$28,000,000 based upon water demand analyses provided by the users strictly to be used for feasibility analysis. An annualized capital cost, annualized over 50 years, combined with annual O&M, RR&R and hydropower benefits forgone, gives a total average annual cost of approximately \$28,200,000.

This analysis shows that the Recommended Plan is more financially feasible than the most likely, least costly alternative, which requires a connecting transmission line to another water supply and results in much higher capital costs per the water demand analysis provided by the users Anderson Regional Joint Water Supply.

Table 16 Test of Financial Feasibility

| Test of Financial Feasibility | | |
|---|-------------------------------|------------------------------------|
| Alternatives | Least Cost Alternative (FWOP) | Conservation Storage w/RFC (Alt 5) |
| Estimated Yield from Storage | | 24.55 |
| Credited RFC | | 12.17 |
| Reallocated Storage (ac-ft) | | 10,414 |
| Hydropower benefits forgone | - | \$ (5,354) |
| Capital Costs –Cost of Storage | | \$ 174,440 |
| Capital Costs – Pump Station, Transmission, and Treatment Plants* | \$ 71,040,974 | \$ 28,025,428 |
| O&MRR&R Annual Costs | \$ 186,000 | \$ 10,418 |
| Total Average Annual Cost | \$ 71,226,974 | \$ 28,205,000 |

Note: These are rounded totals. FY2023 price level; average annual costs calculated over a 50-year period of analysis at the current FY2023 federal discount rate of 2.5%.

6.0 Water Supply Repayment

Total usable storage was determined by adding the conservation pool and the top of flood control. The percent of total usable storage was determined by dividing the

storage recommendation by the total usable storage. The updated cost of storage was determined based off the construction costs given from the initial construction that was then updated with a CWCCIS index update factor. That updated cost of storage was then multiplied by the percent of total usable storage to determine the cost of storage recommendation. The annual cost of storage recommendation was then put into a payment formula which include the FY2023 water supply interest rate (2.875%) and the payment years (30). The annual O&M and annual RR&R were determined by multiplying the actual FY23 joint use expenditures by the additional percent of total usable storage for each user. The total annual cost is the addition of the annual cost of storage recommendation, the annual operation and maintenance estimate and the annual replace and rehabilitation (RR&R) estimate.

Table 17: Parameters Used to Calculate Repayment Costs for ARJWS

| Parameter | Item |
|--|-----------|
| Total water supply storage required under TSP (AF) | 4,568 |
| Water supply yield (MGD) | 16.05 |
| Interest rate | 2.875% |
| Repayment period | 30 |
| Conservation storage | 4,568 |
| Usable storage | 1,708,600 |
| Storage required as percent of useable storage | 0.27% |

Note: Costs are in FY2023 and annualized using the FY2023 Federal Water Supply discount rate of 2.875% over a 30-year repayment period.

Table 18: Updated Cost of Storage for ARJWS Annual Repayment Cost

| Costs (FY23) | Total Costs | Annual Cost |
|------------------------|-------------|-------------|
| Update Cost of Storage | \$4,947,528 | \$248,358 |
| Cost of Storage | \$2,171,141 | \$108,988 |
| OMR&RR Provided | \$129,667 | \$6,509 |
| Total Annual Repayment | | \$115,497 |

Note: Costs are in FY2023 and annualized using the FY2023 Federal Water Supply discount rate of 2.875% over a 30-year repayment period.

Table 19: Parameters Used to Calculate Repayment Costs for Pioneer RWD

| Parameter | Item |
|--|-------|
| Total water supply storage required under TSP (AF) | 3,122 |

| Parameter | Item |
|--|-----------|
| Water supply yield (MGD) | 5.0 |
| Interest rate | 2.875% |
| Repayment period | 30 |
| Conservation storage | 3,122 |
| Usable storage | 1,708,600 |
| Storage required as percent of useable storage | 0.18% |

Note: Costs are in FY2023 and annualized using the FY2023 Federal Water Supply discount rate of 2.875% over a 30-year repayment period.

Table 20: Updated Cost of Storage for Pioneer RWD Annual Repayment Cost

| Costs (FY23) | Total Costs | Annual Cost |
|-------------------------|-------------|-------------|
| Update Cost of Storage | \$4,947,528 | \$248,453 |
| Pioneer Cost of Storage | \$1,483,774 | \$74,483 |
| OMR&RR Provided | 88,616 | \$4,448 |
| Total Annual Repayment | | \$78,931 |

Note: Costs are in FY2023 and annualized using the FY2023 Federal Water Supply discount rate of 2.875% over a 30-year repayment period.

Table 21: Parameters Used to Calculate Repayment Costs for City of Lavonia

| Parameter | Item |
|--|-----------|
| Total water supply storage required under TSP (AF) | 2,308 |
| Water supply yield (MGD) | 3 |
| Interest rate | 2.875% |
| Repayment period | 30 |
| Conservation storage | 2,308 |
| Usable storage | 1,708,600 |
| Storage required as percent of useable storage | 0.14% |

Note: Costs are in FY2023 and annualized using the FY2023 Federal Water Supply discount rate of 2.875% over a 30-year repayment period.

Table 22: Updated Cost of Storage for City of Lavonia Annual Repayment Cost

| Costs (FY23) | Total Costs | Annual Cost |
|-------------------------|--------------------|--------------------|
| Update Cost of Storage | \$4,947,528 | \$248,358 |
| Lavonia Cost of Storage | \$1,096,841 | \$55,060 |
| OMR&RR | \$65,507 | \$3,288 |
| Total Annual Repayment | | \$58,348 |

Note: Costs are in FY2023 and annualized using the FY2023 Federal Water Supply discount rate of 2.875% over a 30-year repayment period.

Table 23: Parameters Used to Calculate Repayment Costs for Currahee Club

| Parameter | Item |
|--|-------------|
| Total water supply storage required under TSP (AF) | 412 |
| Water supply yield (MGD) | 0.5 |
| Interest rate | 2.875% |
| Repayment period | 30 |
| Conservation storage | 412 |
| Usable storage | 1,708,600 |
| Storage required as percent of useable storage | 0.02% |

Note: Costs are in FY2023 and annualized using the FY2023 Federal Water Supply discount rate of 2.875% over a 30-year repayment period.

Table 24: Updated Cost of Storage for Currahee Club Annual Repayment Cost

| Costs (FY23) | Total Costs | Annual Cost |
|------------------------|--------------------|--------------------|
| Update Cost of Storage | \$4,947,528 | \$248,358 |
| Cost of Storage | \$195,772 | \$9,827 |
| OMR&RR | \$11,692 | \$587 |
| Total Annual Repayment | | \$10,414 |

Note: Costs are in FY2023 and annualized using the FY2023 Federal Water Supply discount rate of 2.875% over a 30-year repayment period.