7.7 Lake Granger Reallocation

7.7.1 Description of Option

Reservoirs owned by the United States Army Corps of Engineers (USACE) typically serve multiple functions, including flood control, water supply and recreation. Most USACE reservoirs contain a significant amount of storage dedicated to flood control. This flood control storage is used to temporarily hold flood waters in the top few feet of the reservoir to reduce flooding downstream. It is possible to increase the available water supply from these reservoirs by changing some of the flood control storage to the reservoir storage dedicated to water supply, or conservation storage. This process is commonly called reallocation. The USACE has the authority to reallocate at its own discretion up to 50,000 acre-feet or 15 percent of the total flood storage, whichever is less. Additional reallocation of flood storage to conservation storage requires the approval of the U.S. Congress. The Brazos River Authority (BRA) and the USACE have been continuing an evaluation of the feasibility of reallocating storage in several federal reservoirs. This section evaluates reallocation in Lake Granger as a potential water management strategy.

Lake Granger is located in Williamson County, Texas approximately seven miles east of the City of Granger and 10 miles northeast of Taylor (Figure 7.7-1). The Flood Control Act of 1953 authorized the construction of Granger Lake for flood control, water conservation, fish and wildlife habitat, and recreation. Construction of Granger Dam began in 1972 and it began impounding the San Gabriel River in the Brazos River Basin in 1980. The original conservation storage capacity was 65,500 acft at elevation 504 ft-msl, but has since been reduced by sedimentation to 51,822 acft (Table 7.7-1). The total storage in Lake Granger is approximately 230,522 acft, with 77.5% of the storage reserved for flood control, and 22.5% for water supply (Table 7.7-1).

Lake Granger was intended to be one of three lakes on the San Gabriel River. However, the proposed South Fork Lake was never constructed. Granger Dam was originally designed to support a conservation pool elevation of 512 ft-msl, so that when the South Fork Lake was completed the conservation pool at Lake Granger could be raised eight feet above its current level. This unique history makes Lake Granger an appealing option for reallocation because it requires few dam improvements and relocations, and the USACE already owns the necessary real estate.

Figure 7.7-1 Map of Lake Granger showing Contour at 510 ft

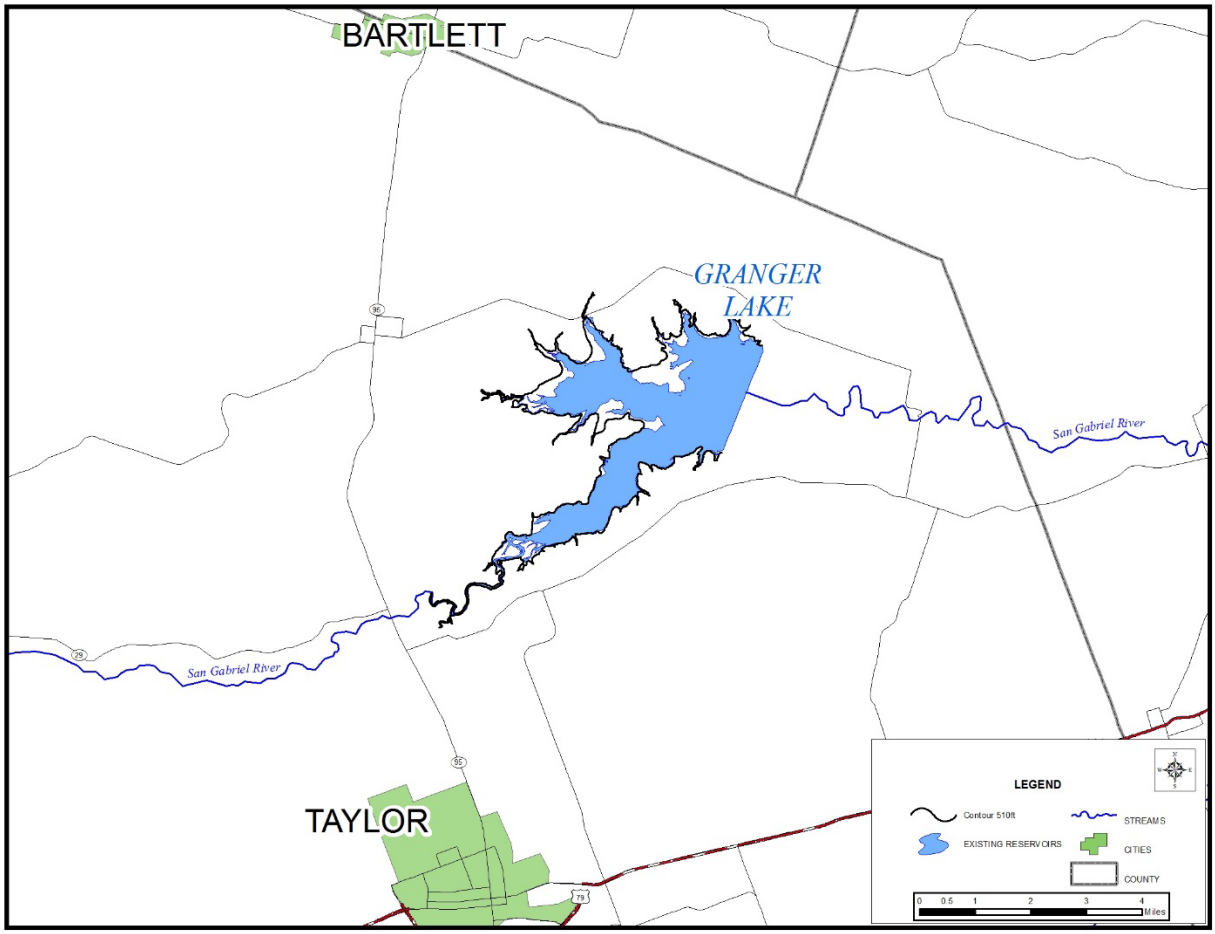

Table 7.7-1 Lake Granger Characteristics

Owner	U.S. Army Corps of Engineers
Water Supply Contract	
Owner	Brazos River Authority
Storage amount	65,500 acft
Texas Water Right	
Number	CA 12-5163
Owner	Brazos River Authority
Diversion	19,840 acft/yr
Storage	65,500 acft
Priority date	February 12, 1968
Flood Pool[1]	
Top elevation	528 ft-msl
Storage	178,700 acft
Conservation Pool[2]	
Top elevation	504 ft-msl
Surface area	4,159 ac
Storage	51,822 acft
Inactive Storage[3]	
Storage	0 acft

1. Based on original 1980 survey. Represents volume of flood pool only (i.e., volume between 504 ft-msl and 528 ft-msl assuming no sedimentation in flood pool).
2. Based on 2013 TWDB volumetric survey. Represents volume from 528 ft-msl and below.
3. Based on 2013 TWDB volumetric survey. Invert elevation (outlet works) at 457 ft-msl,

7.7.2 Available Supply

The Brazos Water Availability Model (WAM) Run 3 with Senate Bill 3 environmental flows was used to calculate yields for Lake Granger under the following two scenarios:

Existing – Current conservation storage elevation of 504.0 ft-msl

Scenario 2 – Raise conservation elevation to 510.0 ft-msl, an increase of 6 feet, which corresponds to the maximum discretionary authority of the USACE.

Figure 7.7-1 shows the surface area of the reservoir after reallocation. Table 7.7-2 is a summary of the firm yield analyses. The current storage in Lake Granger is expected to decrease from 47,917 to 36,271 acre-feet by 2070 due to sedimentation. Based on the WAM, the estimated firm yield in 2070 at the current conservation storage of elevation of 504.0 feet is 11,810 acre-feet per year. In Scenario 2 (elevation 510.0 feet), the yield of Lake Granger is 13,750 acre-feet per year, resulting in 1,940 acre-feet of additional yield in 2070, or a 16% increase over the existing scenario yield. This strategy could potential be provided supply under the BRA System Operation permit (See Section 7.12), currently pending at the Texas Commission on Environmental Quality. If an entity other than the BRA were to sponsor and pursue this strategy, then an agreement with the BRA would be required to address concerns related to the potential subordination of the System Operation strategy.

Table 7.7-2 Storage Capacities and Yields for Existing and Reallocation Scenarios in Lake Granger

Scenario	Top of Conservation Elevation (feet)	2020 conditions			2070 conditions		
		Storage (acft)	Firm Yield (acft/yr)	Yield Increase (acft/yr)	Storage (acft)	Firm Yield (acft/yr)	Yield Increase (acft/yr)
Existing	504.00	47,971	15,290	0	36,271	11,810	0
Scenario 2	510.00	77,976	16,860	1,570	66,276	13,750	1,940

7.7.3 Environmental Issues

In Scenario 2, which corresponds to the maximum discretionary authority of the USACE, the reservoir will inundate an additional 1,586 acres at the new conservation elevation. Most of the private property around the lake consists of farm fields, but there is wildlife habitat in the floodplain above the lake and in other government property around the lake which would be adversely affected by the pool raise. The impacts could be significant due to the lack of available habitat in this area. Although Golden Cheeked Warblers habitat is found in Williamson County, it is unlikely to find adequate habitat around Lake Granger for the Warbler or other threatened and endangered species. A more detailed study of the expected habitat loss needs to be conducted in order to determine mitigation requirements. According to the Phase I Information Paper, there are currently 98 known cultural resources sites at Lake Granger. These sites need to be evaluated to determine if they are eligible for inclusion in the National Register of Historic Places. A complete survey of impacted cultural resources needs to be conducted to determine the full extent of cultural resources within the flood pool of Lake Granger.

7.7.4 Engineering and Costing

Table 7.7-3 summarizes the estimated cost for this option. The dam improvements costs include minor improvements to Granger Dam to store the additional capacity as well as slope stability, seepage and geotechnical studies. There are very few recreational facilities located at Lake Granger, so the reallocation of flood storage will have a low impact on recreation. The USACE owns the land up to 533 ft-msl, which is above the top of the flood pool at 528 ft-msl, so the real estate costs are zero. The estimated cost for water supply storage was based on the updated investment cost of the reallocated flood control storage as a proportion of the additional storage to total useable storage, which is 30,005 acft (15 percent increase). The updated total investment cost for Lake Granger was estimated to be about $123,013,000, so the increase in cost for water supply storage was estimated to be $18,452,000. The estimate for annual operation and maintenance cost is based on a 3-year average (2013-2015) operation and maintenance bill for the BRA based on 7.7% of the total usable storage. The reallocation will provide the BRA with 34% of the storage, so the increase in their O&M bill is expected to be about $609,000 per year. The total project costs for the reallocation of storage to an elevation of 510 ft-msl is $28.7 million. Given a yield of 1,940 acft/yr and a cost of $3,011,000 per year, the annual cost of water is $1,552 per acre-foot ($4.76 per 1,000 gallons).

Table 7.7-3 Cost Estimate Summary for Reallocation of Storage in Lake Granger

Item	Estimated Costs
Capital Costs	
Improvements to Dam	$3,300,000
Relocations	$354,000
Total Capital Cost	$3,654,000
Engineering, Legal Costs and Contingencies	$1,279,000
Environmental & Archaeology Studies and Mitigation	$893,000
Real Estate	$0
Storage Reallocation (15 percent)	$18,452,000
Water Rights Permit from TCEQ	$1,500,000
Administrative Cost for USACE Storage Reallocation Process	$2,585,000
Interest During Construction (12 months)	$347,000
Total Project Cost	$28,710,000
Annual Costs	

Table 7.7-3 Cost Estimate Summary for Reallocation of Storage in Lake Granger

Item	Estimated Costs
Debt Service (5.5 percent, 20 years)	$2,402,000
Operation and Maintenance	$609,000
Total Annual Cost	$3,011,000
Available Project Yield (acft/yr)	1,940
Annual Cost of Water ($ per acft)	$1,552
Annual Cost of Water ($ per 1,000 gallons)	$4.76

7.7.5 Implementation Issues

This water supply option has been compared to the plan development criteria, as shown in Table 7.7-4, and the option meets each criterion.

Table 7.7-4 Comparison of Reallocation of Storage in Lake Granger Option to Plan Development Criteria

Impact Category	Comment(s)
A. Water Supply	
1. Quantity	1. Sufficient to meet needs
2. Reliability	2. High reliability
3. Cost	3. Reasonable
B. Environmental factors	
1. Environmental Water Needs	1. Low impact
2. Habitat	2. Low to moderate impacts possible
3. Cultural Resources	3. Low to moderate impact
4. Bays and Estuaries	4. Low impact due to distance from coast
5. Threatened and Endangered Species	5. Low impact
6. Wetlands	6. Low impact
C. Impact on Other State Water Resources	No apparent negative impacts on state water resources; no effect on navigation
D. Threats to Agriculture and Natural Resources	Low to none
E. Equitable Comparison of Strategies Deemed Feasible	Option is considered to meet municipal shortages

Table 7.7-4 Comparison of Reallocation of Storage in Lake Granger Option to Plan Development Criteria

Impact Category	Comment(s)
F. Requirements for Interbasin Transfers	None
G. Third Party Social and Economic Impacts from Voluntary Redistribution	None

7.7.6 Potential Regulatory Requirements

Implementation of reallocation of storage in Lake Granger will require several steps including a detailed reallocation study performed by the U.S. Army Corps of Engineers and authorization from the U.S. Congress. An outline of the reallocation process is provided below:

1. Local sponsor requests the U.S. Army Corps of Engineers perform a reallocation study. Indicate local interest, purpose, financial capability, etc.
2. Reallocation studies are performed in two phases and follow the General Investigation Process consisting of a Reconnaissance Report and a Feasibility Study. Specific funding would be required for a reallocation study. A reallocation study includes the following:
    a. Define existing project
    b. Define current and projected water supply needs
    c. Alternative solutions considered
    d. Analysis of alternatives
        i. Reallocation of flood control storage
        ii. Raise top of flood control pool
        iii. Reallocate existing conservation pool/power pool
        iv. Hydropower compensation and other hydropower issues
        v. Other
        vi. No action
        vii. Screening of alternatives
        viii. Selection rationale and selection of a plan
    e. Selected plan
        i. Value of storage reallocation
        ii. Impacts of reallocation
        iii. Public involvement
        iv. Environmental impacts

v. Hydropower compensation and other hydropower issues

f. Recommended plan

3. NEPA Compliance
4. U.S. Army Corps of Engineers Headquarter Approval of Reallocation Study
5. Authorization from U.S. Congress
6. U.S. Army Corps of Engineers and Local Sponsor execute water supply contract based on Water Supply Storage Reallocation
7. Water Rights Permits from TCEQ, potentially dependent on the granting of the BRA System Operations permit