APPENDIX A
MIDDLE BRAZOS
AQUILLA LAKE POOL REALLOCATION, TEXAS
FEASIBILITY STUDY

CIVIL DESIGN &
RELOCATIONS

GENERAL

This appendix addresses Civil Design and Relocations, but does not address recreational roads and facilities. Refer to the Recreation Appendix for a discussion of the recreation facilities found within the boundaries of the U.S. Army Corps of Engineers parks and access points. Refer to the Geotechnical Appendix for a detailed discussion of the issues related to the dam embankment.

The initial construction of Aquilla Lake included the relocation of numerous roads, utilities, and other facilities in the immediate project area required for the construction of Aquilla Lake and Dam. Refer to Table 1 below for a list of the existing relocation agreements. The Government acquired various real estate interests under the subject agreements in exchange for the necessary relocation of facilities at that time. The proposed revision to the conservation pool will require the acquisition of addition real estate interests related to some of the existing facilities. The vehicle for obtaining these interests will be a supplemental agreement to the original relocation agreements, as discussed below. Subsequent to the initial construction of the lake, the Government provided numerous easements (out-grants) to various utility companies. However, the subject easements retained the prior rights to use the property for project purposes and no additional property rights will be required with regard to the out-grants.

EXISTING CONDITIONS

The primary study area consists of Aquilla Lake. The current top of conservation pool is at elevation 537.5 and covers approximately 3,060 acres. The top of the flood control pool is at elevation 556.0 and covers approximately 7,000 acres. The earthen dam embankment is approximately 11,821 feet long and 104 feet high. The dam construction was completed in 1983. Seepage around the outlet works has been observed and monitored since the construction of Aquilla Lake. Some of the seepage has been remediated through the construction of a system of relief wells. However, some seepage continues to be observed and the issue will have to be resolved prior to pool reallocation. Refer to the Geotechnical Appendix for a detailed discussion of the issues related to the seepage issue and the dam embankment in general.

The lake is crossed by numerous roads and utilities, which are discussed below. See Exhibit A.2-1 for general layout and vicinity plan.

ROADS AND BRIDGES

Road relocations were generally constructed with the roadway crown at the top of the flood pool plus 3’ of minimum freeboard. Additional freeboard was sometimes added for wave run-up and the effects of the water profile envelope curve. Several existing county road crossings were allowed to remain in service with elevations above the conservation pool, but below the flood control pool. Roadways in the area include the following:

Farm to Market Road 310 - This two lane roadway crosses the Aquilla dam embankment. The road was relocated at the time the dam embankment was constructed.

Farm to Market Road 1534 – This two lane roadway crosses approximately midway up the west arm of the lake (Aquilla Creek). The bridge and embankment were relocated at the time the lake was built. The roadway has approximately 1660 linear feet of bridge. The roadway embankment has 12-inch rock riprap on the upstream slope to elevation 540.5 and 18-inch rock riprap on the downstream side up to elevation 559.89. Currently, about 450 linear feet of the embankment is within the conservation pool.

Farm to Market Road 1947 – This two lane roadway crosses approximately midway up the east arm of the lake (Hackberry Creek). The bridge and embankment were relocated at the time the lake was built. The roadway has approximately 1300 linear feet of bridge. The roadway embankment has 12" rock riprap on the upstream slope to elevation 559.19 and 12" rock riprap on the downstream slope to elevation 559.86. Approximately 200 linear feet of the embankment is currently within the conservation pool.

State Highway 22 – This two lane roadway crosses both the east and west arms in the upper reaches of the lake. The downstream slope of the roadway embankment at the Little Aquilla Creek crossing was flattened from 3:1 to 6:1 when the lake was constructed. No other alterations to the highway were made at that time.

Hill County Roads – There are numerous county roads around the perimeter of the lake that cross the various tributaries in the area. These crossings generally have embankments that are well above the existing conservation pool. Hill County has recently designed and completed construction of a bridge replacement for the bridge on County Road 2415 that crosses Aquilla Creek in the upper reach of the west arm of the lake.

UTILITIES

Water - Hill County Water Supply Corporation has a crossing along Farm to Market Road 1534 at the crossing on the west arm of the lake (Aquilla Creek). Aquilla Water Supply District (AWSD) has a raw water intake and pumping plant on the southeast side of the lake. The top deck of the water intake tower, at elevation 543, is 5.5 feet above the conservation pool and supports three floor stand controls that operate the two gates and butterfly valve contained within the tower. AWSD also owns a 3' diameter water line that is attached to the F.M. 1947 bridge that crosses the east arm of the lake.

Natural Gas Enserch, a diversified energy company with interests including natural gas transmission and distribution, has a 10" gas line that extends across the upper reach of the east arm of the lake (Hackberry Creek).Anchor weights were installed on the 10" Enserch line prior to the original lake impoundment. Enserch also has a 3" gas line that crosses the west arm of the lake on the south side of State Highway 22. No remedial measures were taken for the 3" line in preparation of the original lake inundation.

Electric - HILCO Electric Cooperative (formerly Hill County Electric) owns several electric distribution lines that extend into the lake area. The most notable line is a three phase buried line that runs along FM 1947. TXU (formerly Texas Power and Light) owns both electric distribution and transmission lines in the lake area. The two TXU transmission lines are both 138 KV. Brazos Electric Power Cooperative has both a 69 KV transmission line and a 24.9 KV transmission line in the lake area.

Fiber Optic - There are no known fiber optic lines in the lake area.

Telephone & Cable - AT&T (formerly Southwestern Bell and Continental Telephone) owns several lines around the perimeter of the lake. The lines which were affected by the lake impoundment were altered as necessary to meet clearance requirements on aerial lines and to ensure that cable splices would not be inundated by the flood pool.

Petroleum - The Arco Pipeline Company has a 10" petroleum line that extends across the upper reach of the east arm of the lake (Hackberry Creek). Weights were installed on the Arco line prior to the original lake impoundment.

EFFECTS OF THE POOL RAISE AND PROPOSED ALTERATIONS

General – The only change in the elevation of the top of conservation pool to the proposed pool elevations will be the 50-year pool. The 544.0 pool raise will have a 50-year pool elevation 557.0. The original bridge design criteria, for the bridges that cross the lake, were based on the 50-year pool elevation plus freeboard (Elevation 559.0). The relocation design files were examined for all of the major county roads and their respective bridges. All of these structures, including their roadways, are currently above elevation 559.0, and most of them are near or above elevation 560.0. The bridges and roads on the lesser traveled county roads, which may become temporarily inundated during 50-year pool event, are covered under an agreement approved by Hill County prior to construction of the embankment. This document is still active and specifies that these locations may be permanently inundated to the existing conservation pool elevation 537.5, and temporarily flooded to elevation 559.0. If the bridges and roadways require modifications, this will have to be performed, or possibly covered under a revised agreement. See Exhibit A.2-1 for the project location plan.

Dam Embankment – Placement of 2-foot thick rock riprap is proposed to protect the dam embankment at the existing conservation pool elevation 537.50 and the alternative elevations of 540.00, 542.00, and 544.00. See Exhibit A.2-3 for the overall plan view of the proposed riprap placement for the existing conservation pool and the alternatives. Typical sections of the riprap at the four proposed elevations are shown on Exhibit A.2-4 and riprap placement details and dimensions are shown on Exhibit A.2-5.

Roads – The existing county road low water crossings were checked for effects of raising the conservation pool to the three proposed pool elevations 540, 542, and 544. No effects were found for the low water crossings for a pool raise to 542'. The relocation agreement DACW63-81-C-0010, Exhibit C, indicates that the road embankment for Farm to Market Road 1534, which crosses the west arm of the lake, has rock riprap slope protection up to elevation 540.5. An increase in the conservation pool to elevation 542.0 or above would extend the permanent pool above the top of the existing protection. However, the design memorandum for the county road relocations does not show the protection on the upstream side of the typical section for the embankment. The upstream embankment also appears unprotected on available aerial photos. The condition of the upstream slope can be confirmed by on site reconnaissance, if necessary, and the placement of new riprap evaluated.

Pipelines – Two 10" diameter pipelines cross the upper reach of the east arm of the lake: one natural gas pipeline and one petroleum pipeline. These pipelines are currently in the flood pool. Prior to constructing the embankment, the two lines were uncovered, cleaned and resurfaced, and connections were revised utilizing concrete and screw type anchors. This reinforced the existing

lines and provided resistance to floating. This was performed on all lines from elevation 556.0 and below. Only the proposed conservation pool raise to 544.0, which changes the flood pool to elevation 557.0, would temporarily inundate the existing pipes that were not reworked between elevation 556.0 and 557.0. The two utility companies need to be contacted and provided this information. They will be required to make the decision concerning the existing lines. No research has been done to confirm the current owners of the lines and discuss this issue.

Electric – An existing TXU transmission line extends across the western arm of the lake, just upstream of FM 1534. The transmission line includes two steel lattice towers that are located in the middle of the lake, and one steel tower at the edge of the lake on the western shore. It is expected that the owners will require some remedial measures to these structures before granting the Government the right to permanently flood to a higher elevation. ONCOR has been contacted for their opinion of the impacts that the pool raise would have on their facilities. ONCOR has indicated that a pool raise to elevation 540.0 would not require any alterations because the current concrete footings on the towers are above that elevation. For a pool raise to elevation 542.0, ONCOR would need to replace the two steel lattice towers that are within the lake. For a pool raise to elevation 544.0, ONCOR would need to replace the two steel lattice towers within the lake and also replace the steel tower on the west bank. Construction of the towers within the lake would likely be performed from barges, which would add a significant cost to the work. The ONCOR estimated costs (Not including the cost for working within the lake) are:

Pool raise to elevation 537.5 - $0.00
Pool raise to elevation 540.0 - $0.00
Pool raise to elevation 542.0 - $355000.00 (2 towers)
Pool raise to elevation 544.0 - $465000.00 (2 towers in lake and 1 steel pole on shore)

In addition, the vertical clearance required for electric lines is based on the 50-year pool elevation, in accordance with ER 1110-2-4401. Although the flood pool could be affected by the conservation pool raise, it appears that the current clearances are sufficient to avoid any future impacts from the pool raise.

Telephone – No anticipated impacts.

Water Supply – The top deck of the raw water intake tower for the Aquilla Water Supply District (AWSD) is at elevation 543.0. It would be inundated by 1 foot of water for the highest proposed pool raise to elevation 544.0. The alternative to raise the pool to elevation 542.0 would reduce the current 5.5 foot freeboard on the intake tower to 1 foot of freeboard. The alternative to raise the pool to elevation 540.0 would reduce the intake tower freeboard to 3 feet. The final decision for the required amount of freeboard will be decided by AWSD. Since the reservoir rises above the conservation frequently, it would be expected that the operation of the structure would require the original 5.5 foot freeboard. The tower could be extended higher if necessary for a fairly nominal cost. .

TABLE 1

EXISTING RELOCATION AGREEMENTS

CONTRACT NO.	**NOTES**
State of Texas	
DACW63-77-C-0006	Relocation of FM Rd 310 across the dam

DACW63-80-C-0014	Relocation of FM Rd 1947
DACW63-82-C-0080	Relocation of State Highway 22
Hill County	
DACW63-77-C-0015	Relocate roads below the dam
DACW63-77-C-0010	Relocation of county roads, part II
City of Hillsboro	
DACW63-82-C-0095	Relocation of Wastewater Plant
Enserch Corporation	
DACW63-81-C-0036	Relocation of 10” Gas Pipeline
Arco Pipe Line Company	
DACW63-81-C-0097	Relocation of 10” Petroleum Pipeline
Southwestern Bell Telephone Company	
DACW63-77-C-0086	Quitclaim to Government
DACW63-83-C-0021	
Continental Telephone Company of Texas	
DACW63-77-C-0069	Relocation of rural lines
Texas Power and Light Company (TXU)	
DACW63-80-C-0052	Relocation of 138 Kv Transmission Line
DACW63-80-C-0063	
DACW63-80-C-0138	Relocation of 138 Kv Transmission Line
Hill County Electric Cooperative	
DACW63-78-C-0032	Quitclaim to Government
DACW63-78-C-0023	Quitclaim to Government
DACW63-80-C-0111	
DACW63-82-C-0005	
Brazos Electric Power Cooperative	Relocation of Transmission Line
DACW63-80-C-0013	
Hill County Water Supply Corporation	
DACW63-82-C-0026	
Chatt Water Supply Corporation	
DACW63-78-C-0079	Quitclaim to Government