Appendix G Aquilla Lake Pool Rise Recreational Resources

1. INTRODUCTION

The purpose of this appendix is to document the impacts of a 2.5 ft (Alternative A), 4.5 ft (Alternative B), and 6.5 ft. (Alternative C) pool raise on the existing recreation resources and to provide for the relocation and/or protection of those effected facilities. Since the Brazos River Authority is currently under contract with the U.S. Army Corps of Engineers (Corps) for the additional water storage capacity, this study will identify all the effected recreation facilities and resources, assign a cost to those facilities/resources, and provide for either relocation of those facilities from more frequent inundation by flood waters.

Aquilla Lake is an existing Corps project located in Hill County, Texas with the major tributaries of Aquilla, Little Aquilla, and Hackberry Creeks all flowing into Aquilla Lake. At the existing conservation pool elevation of 537.5 feet mean sea level (MSL), the lake covers 3,060 surface acres. When the lake is at the top of the flood control pool elevation of 556.0 feet (MSL), it covers approximately 6,999 surface acres.

The Aquilla Creek and Hackberry Creek areas comprise the two major arms of Aquilla Lake, with each being roughly equal in size and basically running on a north-south axis. Due to the generally clayey soils and cropland in the drainage area, lake water tends to be moderately turbid. Water depth averages 16 feet in the main body of the lake, with maximum depth of 59 feet. Water temperatures fluctuate more in this relatively shallow lake than they do in deeper reservoirs.

2. DESCRIPTION OF RECREATION AREAS

a. Corps Operated Areas:

(1) **Dairy Hill Boat Ramp**: Dairy Hill Boat Ramp is located on the south bank of the Hackberry Creek arm, approximately one mile north of Vaughn just west of FM 1947. The area contains one vault-type masonry toilet, a one-lane concrete boat ramp, courtesy dock and two paved parking lots. Dairy Hill has the highest annual visitation when compared to the other access areas at Aquilla Lake.

(2) Old School Boat Ramp: Old School Boat Ramp is located on the lower west end of Aquilla Lake, approximately one mile north of the dam and two miles east of FM 933. The area contains a one-lane concrete boat ramp, two paved parking lots, and a masonry vault toilet. This area has the second highest annual visitation on Aquilla Lake.

(3) Visitor's Overlook (currently closed): Visitors Overlook is located on the east end of Aquilla Dam. It consists of one paved parking lot and has been closed for a number of years.

(4) **Outlet Works and Fishing Platform**: This area is located just below the dam on old Highway 310, and contains a masonry vault toilet, paved parking lot, and fishing platform.

(5) Aquilla Creek Access Area: (closed): Aquilla Access Area is located on the west side of the Aquilla Creek arm of the lake, west of the FM 1534 bridge. The area contains one masonry vault toilet and paved parking lot.

(6) FM 1534 Access Area: This area is located on FM 1534, on the east side of the bridge spanning the Aquilla Creek arm of Aquilla Lake. The area contains a gravel parking lot and portable toilets. The area is the third most heavily used access area.

(7) Hunting/Fishing Access Areas: The iron bridge on HCR 2415 and all hunting area access points were reviewed for inundation at each alternative level considered. None of these locations will be effected at any level of rise.

(8) Hackberry Creek Access Area (closed): This area is located at the end of County Road 2428, approximately 2 miles east of FM 1947. It is situated on the north shore of the Hackberry Creek arm of Aquilla Lake. The area contains one masonry vault toilet, one small parking lot, and gravel access lane to the water.

b. Commercial Concessions:

There are currently no commercial concessions on Aquilla Lake.

3. VISITATION

Visitation numbers were compiled from 2002 to 2009 in order to create an average number of visits per year. This formula was used due to the fluctuation of visitor totals from year to year because of extenuating circumstances such as flooding and drought during this time period. The average number of visits per year at all Aquilla Lake recreation areas is 76,421.

4. IMPACTS OF POOL RAISE ON RECREATION FACILITIES/RESOURCES

a. Assessment Factors:

In performing the assessment of impacts due to the pool raise, a number of factors were taken into consideration:

Inundation: Inundation was a prominent factor in site assessment. Areas were assessed on not only if the new pool level would inundate a recreational facility, but also if areas or facilities will be frequently inundated by minor fluctuations in the pool level. Due to the increased operation and maintenance cost of facilities that are frequently inundated, consideration was given to the frequency and duration of possible inundation. The new flood frequency levels were also considered to assess the minimum elevations for recreational facilities.

Site Attributes: Recreation facilities were also assessed for attributes that make them popular to the visiting public. Occupancy information was tracked to determine the level of use of a facility. Once a facility or area was identified as very popular, it was evaluated to determine its special features. Items identified were shade, grade of adjacent shoreline, proximity to other facilities, and view of the lake. Facilities and areas were reviewed to determine if they would lose the unique site attributes that make them desirable. Attention was also given to the natural resources in the area to determine if facilities could be relocated nearby and retain the desirable site attributes.

Support Facilities: Each recreation area contains basic support facilities. Support facilities shall be defined as restrooms, parking lots, lighting and boat ramps which support the recreational area. Recreation areas were reviewed to determine if each alternative pool raise would impact these facilities or if areas served by these facilities would be lost to inundation.

Shoreline Stability: Recreation areas were also evaluated to determine if the new pool level would have the potential to cause erosion damage. Depending upon the determined pool rise protective riprap that stabilizes the highly erodible soils in many areas may be effected and may need to be replaced. Areas were reviewed to determine if erosion would threaten facilities, site attributes, or support facilities. This review considered prevailing winds, soil types, and vegetation.

b. Facility and Resource Ranking

As the facilities and resources were evaluated, a system of rankings was devised that placed everything into one of four categories based on the degree of impact. These rankings are:

Major: This finding was given to facilities that would be totally inundated, inundated within 3 feet, or inundated at a higher elevation depending on the type of facility. Major findings were given to facilities that lost all support facilities and/or adjacent sites. Major findings were also given to some support facilities if the basic facilities they serve are lost. A major finding resulted in the recommendation to relocate the site and/or support facilities to areas with suitable site attributes in compliance with current policy and design criteria.

Significant: This finding was given to facilities that were in areas that would experience frequent and prolonged inundation by minor fluctuations. These facilities would be located within the new five year flood frequencies for the specific pool rise elevations. Significant findings were also given to facilities that would lose most site attributes or support facilities. Facilities with this finding have to be either relocated or modified (hardened using riprap, vegetative plantings, or other appropriate methods) to protect against more frequent inundation, erosion, etc.

Minor: This finding was given to recreation or support facilities that would be frequently inundated or could be subject to increased erosion or loss of area or support feature. Minor findings resulted in recommendations to leave facilities in place and modify (harden using riprap, vegetative plantings, or other appropriate methods) to protect against more frequent inundation, erosion, etc.

No Impact: This finding was given to recreational facilities that would see little or no impact from the new pool level or flood frequency. Recommendation for these sites was to leave in place with no changes.

c. Relocation and Removal

When each proposed level of rise is considered, as well as the 5 year flood frequency, it is recommended to relocate most of the facilities at the Old School Boat Ramp. In addition, the FM 1534 Access Area will be rendered unusable. Since Aquilla Creek Access Area and Hackberry Creek Access Area have been closed, these facilities will not be replaced, however the existing facilities will be demolished prior to impoundment.

5. FIVE (5) YEAR FLOOD FREQUENCIES

Five year flood frequencies were used as a guide to help assess the impact of a pool rise at each alternative level. The following is a representation of the five year flood frequencies at each considered level including the current level of 537.5 ft (MSL).

	Conservation Elevations	Five year flood elevation
Current	537.5 ft	545.0 ft
2.5 ft rise	540.0 ft	546.3 ft
4.5 ft rise	542.0 ft	547.5 ft
6.5 ft rise	544.0 ft	549.0 ft

6. SUMMARY

Within the attachments section the impacts/costs for each potential pool level is considered. A cost analysis at each alternative pool level is shown in the tables. These costs are based on 2012 rates for each facility type or structure. Since a detailed redesign of the recreation areas was not in the scope of this study, it should be noted that these prices do not reflect actual costs of relocating or redesigning the recreation area to achieve a no net loss of recreation function. For example, in some cases only part of a parking lot might be affected, and only the costs of the square footage of the pavement affected is shown. However, the actual costs of redesigning and/or relocating this parking lot in relation to the entire recreation area cannot be determined at this time. To determine these costs a detailed planning and design plan would be required for the entire recreation area. Thus the costs shown in the tables are meant solely as a reflection of the existing cost for a particular affected facility and not for what would be needed to achieve the no net loss of recreation function at the area or lake.

7. ATTACHMENTS

Aerial maps depicting each level of rise are included in the next section which includes the effected facilities in the recreation areas. The facility cost impacts and ratings for each pool rise level are shown on the following pages as well.

8. PHOTOS OF FACILITIES

a. Dairy Hill Boat Ramp





b. Old School Boat Ramp







c. Visitor Overlook



d. Outlet Area



e. Aquilla Creek Access



Appendix G – Recreational Resources

f. FM 1534 Access



g. Hackberry Creek Access





Appendix G – Recreational Resources

Alternative A 2.5 Pool Rise to 540.00' Elevation Dairy Hill Boat Ramp

Facility	Description	Finding	Quantity Effected	Recommendation	Special Considerations	Estimated Infrastructure Costs Assessment
Restroom	1 Vault style restroom	No Impact		Leave in place		\$0
Main Paved Trailer Parking Lot	29,200 SF with 24 trailer spaces	No Impact		Leave in place		\$0
Park Road	24,900 SF of paved roads	Significant	7100 SF	Relocate		\$43,443
Ramp Parking Lot	1,600 SF with 3 trailer spaces and 2,412 SF with 6 vehicle spaces	Minor	1,600 SF	Relocate		\$9,107
Utility Post	2 Poles	No Impact				\$0
Boat Ramp	Concrete single lane 175 feet long	Major	1	Relocate		\$40,296
Fence	600 LF pipe rail	Minor	280 LF	Relocate		\$3,360
Dock	1 Aluminum Dock 20x17 and Walkway 20x4, Concrete Bulkhead	Major	1	Relocate		\$60,000
Signs	8 Park Signs	Minor	5	Relocate		\$3,748
Bouys	"No Wake" Bouys	Minor	4	Relocate		\$910
Shoreline Stability						\$20,000
					Grand Total	\$180,864

Alternative B 4.5 Pool Rise to 542.00' Elevation Dairy Hill Boat Ramp

Facility	Description	Finding	Quantity Effected	Recommendation	Special Considerations	Estimated Infrastructure Costs Assessment
Restroom	1 Vault style restroom	No Impact		Leave in place		\$0
Main Paved Trailer Parking Lot	29,200 SF with 24 trailer spaces	No Impact		Leave in place		\$0
Park Road	24,900 SF of paved roads	Major	12,800 SF	Relocate		\$78,322
Ramp Parking Lot	1,600 SF with 3 trailer spaces and 2,412 SF with 6 vehicle spaces	Significant	1,600 SF Trailer parking	Relocate		\$9,107
Utility Post	2 Poles	Minor	1	Relocate		\$6,500
Boat Ramp	1 Concrete single lane 175 feet long	Major	1	Relocate		\$40,296
Fence	600 LF pipe rail	Major	400 LF	Relocate		\$4,800
Dock	1 Aluminum Dock 20x17 and Walkway 20x4, Concrete Bulkhead	Major	1	Relocate		\$60,000
Signs	8 Park Signs	Minor	5	Relocate		\$3,748
Bouys	4 "No Wake"	Minor	4	Relocate		\$910
Shoreline Stability						\$20,000
	1	1	1		Grand Total	\$223,683

Alternative C 6.5 Pool Rise to 544.00' Elevation Dairy Hill Boat Ramp

Facility	Description	Finding	Quantity Effected	Recommendation	Special Considerations	Estimated Infrastructure Costs Assessment
Restroom	1 Vault style restroom	Major	1	Relocate		\$69,000
Main Paved Trailer Parking Lot	29,200 SF with 24 trailer spaces	Major	19,200 SF	Relocate		\$117,483
Park Road	24,900 SF of paved roads	Major	16,200 SF	Relocate		\$99,126
Ramp Parking Lot	1,600 SF with 3 trailer spaces and 2,412 SF with 6 vehicle spaces	Major	4,100 SF	Relocate		\$23,220
Utility Post	2 Poles	Minor	1	Relocate		\$6,500
Boat Ramp	1 Concrete single lane 175 feet long	Major	1	Relocate		\$40,296
Fence	600 LF pipe rail	Major	600 LF	Relocate		\$7,200
Dock	1 Aluminum Dock 20x17 and Walkway 20x4, Concrete Bulkhead	Major	1	Relocate		\$60,000
Signs	8 Park Signs	Major	8	Relocate		\$6,000
Bouys	4 "No Wake"	Minor	4	Relocate		\$910
Shoreline Stability					Grand Total	\$20,000 \$449 735
					Grand Total	\$449,735

Alternative A 2.5 Pool Rise to 544.00' Elevation FM 1534 Access Area

Facility	Description	Finding	Quantity Effected	Recommendation	Special Considerations	Estimated Infrastructure Cost Assessment
Gravel Parking Lot	14,800 SF gravel parking lot	Major	14,800 SF	Relocate		\$18,461
Gravel Park Road	9,200 SF gravel park road	Major	9,200 SF	Relocate		\$37,840
Fence	980 LF pipe rail	Major	980 LF	Relocate		\$11,762
Shoreline Stability						

Grand Total

\$68,063

Alternative B 4.5 Pool Rise to 542.00' Elevation FM 1534 Access Area

Facility	Description	Finding	Quantity Effected	Recommendation	Special Considerations	Estimated Infrastructure Cost Assessment	
Gravel Parking Lot	14,800 SF gravel parking lot	Major	14,800 SF	Relocate		\$18,461	
Gravel Park Road	9,200 SF gravel park road	Major	9,200 SF	Relocate		\$37,840	
Fence	980 LF pipe rail	Major	980 LF	Relocate		\$11,762	
Shoreline Stability							
Grand Total \$68,063							

Alternative C 6.5 Pool Rise to 544.00' Elevation FM 1534 Access Area

Facility	Description	Finding	Quantity Effected	Recommendation	Special Considerations	Estimated Infrastructure Cost Assessment
Gravel Parking Lot	14,800 SF gravel parking lot	Major	14,800 SF	Relocate		\$18,461
Gravel Park Road	9,200 SF gravel park road	Major	9,200 SF	Relocate		\$37,840
Fence	980 LF pipe rail	Major	980 LF	Relocate		\$11,762
Shoreline Stability						
					Grand Total	\$68,063

Alternative A 2.5 Pool Rise to 540.00' Elevation Old School Boat Ramp

Facility	Description	Finding	Quantity Effected	Recommendation	Special Considerations	Estimated Infrastructure Cost Assessment
Restroom	1 Vault style restroom	Major	1	Relocate		\$69,000
Main Parking	3100 SF with 8 paved parking spaces	Major	3100 SF	Relocate		\$17,594
Overflow Parking Lot	24,600 SF paved with no traffic wheel stops	No Impact		Leave in Place	Might be converted to turnaround for boat ramp	\$0
Road Paved	32,100 SF Paved Road	Major	20,300 SF	Relocate		\$124,211
Dock	1 Aluminum Dock 20x17 and Walkway 20x4, Concrete Bulkhead	Major	1	Relocate		\$60,000
Boat Ramp	1 Concrete single lane 175 feet long	Major	1	Relocate		\$40,296
Fence	650 LF of post and cable	Major	650 LF	Relocate	Replace with Pipe Rail	\$7,801
Sidewalk	1000 SF concrete	Major	1000 SF	Relocate		\$2,175
Utility Pole	3 Poles	Major	3	Relocate		\$12,950
Bouys	4 "No Wake"	Minor	4	Relocate		\$911
Signs	7 Park Signs	Major	5	Relocate		\$3,748
Shoreline Stability						\$20,000
					Grand Total	\$358,686

Alternative B 4.5 Pool Rise to 542.00' Elevation Old School Boat Ramp

Facility	Description	Finding	Quantity Effected	Recommendation	Special Considerations	Estimated Infrastructure Cost Assessment
Restroom	1 Vault style restroom	Major	1	Relocate		\$69,000
Main Parking	3100 SF with 8 paved parking spaces	Major	3100 SF	Relocate		\$17,594
Overflow Parking Lot	24,600 SF paved with no traffic wheel stops	No Impact		Leave in Place	Might be converted to turnaround for boat ramp	\$0
Road Paved	32,100 SF Paved Road	Major	20,300 SF	Relocate		\$124,214
Dock	1 Aluminum Dock 20x17 and Walkway 20x4, Concrete Bulkhead	Major	1	Relocate		\$60,000
Boat Ramp	1 Concrete single lane 175 feet long	Major	1	Relocate		\$40,297
Fence	650 LF of post and cable	Major	650 LF	Relocate	Replace with Pipe Rail	\$32,478
Sidewalk	1000 SF concrete	Major	1000 SF	Relocate		\$2,175
Utility Pole	3 Poles	Major	3	Relocate		\$12,950
Bouys	4 "No Wake"	Minor	4	Relocate		\$911
Signs	7 Park Signs	Major	5	Relocate		\$3,748
Shoreline Stability						\$20,000
					Grand Total	\$383,367

Alternative C 6.5 Pool Rise to 544.00' Elevation Old School Boat Ramp

Facility	Description	Finding	Quantity Effected	Recommendation	Special Considerations	Estimated Infrastructure Cost Assessment
Restroom	1 Vault style restroom	Major	1	Relocate		\$69,000
Main Parking	3100 SF with 8 paved parking spaces	Major	3100 SF	Relocate		\$17,594
Overflow Parking Lot	24,600 SF paved with no traffic wheel stops	No Impact		Leave in Place	Might be converted to turnaround for boat ramp	\$0
Road Paved	32,100 SF Paved Road	Major	20,300 SF	Relocate		\$124,214
Dock	1 Aluminum Dock 20x17 and Walkway 20x4, Concrete Bulkhead	Major	1	Relocate		\$60,000
Boat Ramp	1 Concrete single lane 175 feet long	Major	1	Relocate		\$40,297
Fence	650 LF of post and cable	Major	650 LF	Relocate	Replace with Pipe Rail	\$32,478
Sidewalk	1000 SF concrete	Major	1000 SF	Relocate		\$2,175
Utility Pole	3 Poles	Major	3	Relocate		\$12,950
Bouys	4 "No Wake"	Minor	4	Relocate		\$911
Signs	7 Park Signs	Major	5	Relocate		\$3,748
Shoreline Stability						\$20,000
					Grand Total	\$383,367