



**US Army Corps  
of Engineers ®**

Fort Worth District

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**SOMERVILLE DAM AND LAKE  
YEGUA CREEK, TEXAS  
BRAZOS RIVER BASIN, TEXAS**

**WATER CONTROL MANUAL  
APPENDIX 6  
MASTER RESERVOIR REGULATION MANUAL**

**DEPARTMENT OF THE ARMY  
CORPS OF ENGINEERS  
FORT WORTH DISTRICT**

**SEPTEMBER 2019**

**ORIGINAL DECEMBER 1966**



**SOMERVILLE DAM AND LAKE**

## **NOTICE TO USERS OF THIS MANUAL**

Regulations specify that this Water Control Manual be used in loose-leaf form, and only those sections or parts thereof requiring changes will be revised and printed. Therefore, this copy should be preserved in good condition so that inserts can be made to keep the manual current. All elevations referred to in this Water Control Manual, unless noted otherwise, are in feet, National Geodetic Vertical Datum of 1929 (NGVD29). The datum conversion from NGVD29 to NAVD88 is:  $NGVD29 + 0.1 \text{ feet} = NAVD88$  for Somerville Dam and Lake.

## **EMERGENCY REGULATION ASSISTANCE PROCEDURES**

Assistance with the flood control regulations of Somerville Dam will be provided during duty hours by the Fort Worth District Water Management Branch 817-886-1551. During non-duty hours, assistance can be obtained by contacting the Primary Regulator 817-791-0973 cell number and in the order listed, one of the following persons:

## **EMERGENCY PERSONNEL ROSTER**

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Title and Name	Residence/Cell Telephone
Primary Regulator	817-791-0973
Chief, Water Resources Branch Redacted PII	817-886-1542
Chief, Water Management Section Redacted PII	817-886-1682
Chief, E&C Division Redacted PII	Redacted PII
Chief, Operations Division Redacted PII	Redacted PII
Manager, Three Rivers Regional Office Redacted PII	Redacted PII
Manager, Somerville Lake Redacted PII	Redacted PII
Water Management, Southwestern Division–Dallas CESWD-RBT-W (Water Management and Infrastructure Safety)	
Chief, Redacted PII, PhD. P.E.	Redacted PII
Hydraulic Engineer, Redacted PII	Redacted PII

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**SOMERVILLE DAM AND LAKE  
BRAZOS RIVER BASIN, TEXAS**

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**Pertinent Data – Somerville Dam and Lake**  
(See Exhibit A for Supplementary Pertinent Data)

**LOCATION:** On Yegua Creek 20 miles upstream from the confluence with the Brazos River, in Burleson and Washington Counties, 2 miles south of Somerville, Texas.

**DRAINAGE AREA:**

1,006 square miles  
One inch of runoff 53,653 ac-ft

**DAM:**

Type: Rolled earth fill  
Length: 20,210 feet (plus 4,715' dike)  
Maximum Height: 80 ft  
Top Width: 34 feet (dike 17')

**SPILLWAY:**

Crest Elev.: 258.0 ft  
Length: 1,250 ft  
Type: Ogee  
Control: None

**POWER FEATURES:**

None

**INFLOW:**

Spillway Design Flood peak, cfs (1961 Study) 415,700  
Spillway Design Flood volume, ac-ft (1961 Study) 1,374,800  
Spillway Design Flood runoff, inches (1961 Study) 25.47

Probable Maximum Flood peak, cfs (2018 Study) 744,220  
Probable Maximum Flood volume, ac-ft (2018 Study) 2,354,948  
Probable Maximum Flood runoff, inches (2018 Study) 29.73

**OUTFLOW (Spillway Design Flood):**

Total routed peak outflow, cfs 292,000  
Spillway, cfs 289,400  
Outlet works, cfs 2,600

**OUTLET WORKS:**

Type: 1 gate controlled conduit  
Dimension: 10 ft diameter  
Invert Elev: 206.0 ft above msl  
Control: 2 tractor type gates 5 X 10 ft each

Feature	Elev Feet* (NGVD 29)	Reser- voir Area (acres)	Reservoir Capacity			Total Spillway Capacity (cfs)	Outlet Work Capacity (cfs)	
			Accumu- lative (ac-ft)	Runoff (inches)	Incremental (ac-ft)		1 gate	2 gates
Top of Dam	280.0	47,400	1,257,633	23.44				
PMF Water Surface (2018 Study)	279.89							
Max. Design Water Surface (1961 Study)	274.5	39,800	1,019,133	18.99	289,400	2,000	2,600	
Top of Flood Control Pool & Spillway Crest	258.0	24,400	497,693	9.27		2,400	3,450	
Top of Conservation Pool (2012 Survey)	238.0	11,395	150,293	2.80			2,500	
Maximum Tailwater	243.8							
Streambed (2012 Survey)	200.0							

\* The elevations listed on the Reservoir Capacity table are based on the datum of NGVD29. The datum conversion from NGVD29 to NAVD88 is: NGVD29 + 0.1 feet = NAVD88.

AUTHORIZATION: Federal: Flood Control Act of 3 September 1954 (PL 780, 83<sup>rd</sup> Congress, 2<sup>nd</sup> Session) | (HD 535, 81<sup>st</sup> Congress, 2<sup>nd</sup> Session)

PROJECT COST ESTIMATE (APR 73):

Federal:	\$24,274,893.19
Non-Federal:	None*
Total:	\$24,274,893.19

ANNUAL O&M COST (FY 81):

Federal:	\$943,700
Non-Federal:	\$28,500
Total:	\$972,200

COST ALLOCATION METHOD: Use of facilities (pro rata)

LOCAL AGENCY: Brazos River Authority

LAND ACQUISITION:

	: Guide Contour (NGVD29)	: Area (Acres)
Fee Simple	263.0	29,232
Easement		<u>3,572</u>
Total		32,804

FLOOD DATA:

Date	: Peak Inflow
	: (cfs)
Dec 1913 (Est.)	82,000
Jul 1940	56,800*
Jun 1968	55,000
Apr 1969	60,000
Jun 1979	47,000

Minimum bankfull capacity below dam: 500 cfs \*\*

\* Maximum of record

\*\* Channel improvement proposal to increase this to 2,500 cfs are being considered in connection with the comprehensive survey report on the Brazos River Basin.

STATUS OF PROJECT: Somerville Lake was constructed by the USACE and is operated under the immediate supervision of the District Engineer, Fort Worth District. Construction of Somerville Lake began in June 1962 and deliberate impoundment of water began on 3 January 1967. Project is complete and operational.

\*NON-FEDERAL PARTICIPATION AND LOCAL COOPERATION:

A contract with the Brazos River Authority was approved on 10 May 1962 for 10 percent (143,900 acre-ft) of the conservation storage below elevation 238.0 ft msl. A supplemental agreement to this contract was approved on 28 Jun 1974 divided the total conservation storage between elevations 238.0 and 200 ft msl into 5 percent (7,200 ac-ft) for present water supply and 95 percent (136,700 ac-ft) for future water supply storage. BRA will pay \$7,197,452.19 in addition to their share of the annual O&M cost, for this total water supply storage space.

REMARKS:

Dependable yield\*\*: 56 cfs or 36.2 MGD

\*\* Based on critical dry period from Jan 1954 – Feb 1957 and 50 years sedimentation.

Visitation (1981): 3,170,970

Shoreline at top of conservation pool (elevation 239.8): 85 miles

**SOMERVILLE DAM AND LAKE  
YEGUA CREEK, TEXAS  
WATER CONTROL MANUAL**

**CHAPTER I – INTRODUCTION**

**1-01. Authorization** This manual is submitted as required by Engineering Regulation (ER) 1110-2-240, Water Control Management, dated 30 May 2016, and is prepared in accordance with ER 1110-2-8156, Engineering and Design, Preparation of Water Control Manuals, dated 30 September 2018.

**1-02. Purpose and Scope** The purpose of this manual is to document the Somerville Dam and Lake Regulation plan. This manual also provides a concise reference source for higher authority personnel who will be concerned with or responsible for reservoir regulations during the life of the project. This manual also includes the regulation plan for Somerville Dam and Lake and the background material necessary to understand the purpose and application of the plan.

**1-03. Related Manuals and Reports** This is Appendix 6 to the Brazos River Basin Master Reservoir Regulation Manual. The Somerville Dam and Lake project on Yegua Creek was authorized by the Flood Control Act approved 3 September 1954 (Public Law 780, 83rd Congress, 2nd Session) for construction substantially in accordance with the recommendation of the Chief of Engineers contained in House Document No. 535 (81st Congress, 2nd Session), entitled “Report of Survey of Brazos River and Tributaries, Texas, Oyster Creek, Texas and Jones Creek, Texas”. Authority to initiate advance planning is contained in the Public Works Appropriation Act of 1959, approved 2 September 1958 (Public Law 85-863) and in Advice of Allotment C-126, dated 6 October 1958.

The project document (House Document No. 535) recommended the construction of a reservoir project with the dam site at river mile 22.0 on the Yegua Creek for flood control, water conservation, and allied purposes. In December 1966, the Fort Worth District (SWF) of the United States Army Corps of Engineers (USACE) published a reservoir regulation manual for Somerville Dam and Lake. The manual contains plans and procedures for regulation of the reservoir during both normal and flood conditions. In addition, portions of the December 1966 Somerville Water Control Manual were revised in September 1973.

The reports and design memorandums important to the regulation of Somerville Dam and Lake are listed in Table 1-1.

**1-04. Project Owner** USACE-SWF owns and operates Somerville Dam and Lake.

**TABLE 1-1**

**Related Manuals and Reports for Somerville Dam and Lake**

Title	Date
1. Report on Survey of Brazos River	16 August 1947
2. Design Memorandum No.1 - Hydrology	June 1960
3. Design Memorandum No.4 - Relocation	January 1964
- Part I - County Roads	November 1962
- Part II - State Highway	January 1964
- Part III - Access Roads	January 1965
- Part IV - Lower Colorado River Electric Cooperative	March 1964
- Part V - Caldwell Telephone Company	September 1962
- Part VI - Dam Construction Area	December 1964
- Part VII - Railroad	
4. Design Memorandum No. 5 - General	June 1961
5. Design Memorandum No. 5 on Laneport, North Fork and South Fork Reservoirs San Gabriel River	
- General	March 1967
6. Design Memorandum No. 7 - Earthen Dam	May 1963
7. Design Memorandum No. 8 - Access Road and Earth Dike	April 1961
8. Design Memorandum No. 9 - Maintenance Facilities	February 1962
9. Design Memorandum No.10 - Spillway	August 1962
10. Design Memorandum No. 12 - Outlet Works	May 1963
11. Design Memorandum No. 14 - Channel Improvement	August 1962
12. Design Memorandum No. 15 - Clearing	September 1962
13. Public Meeting Real Estate Acquisition	October 1962
14. Design Memorandum No. 16	
- Sedimentation and Degradation Ranges, Vol. 11-67	April 1963
15. Reservoir Regulation, Somerville Reservoir	December 1966
- Revised	September 1973
16. Operation & Maintenance Manual	May 1967
17. Dam Safety Assurance Study, Hydrology and Hydraulics	March 1983
18. Specifications for Repair of Stilling Basin	September 1986
19. Plans and Specifications for Stilling Basin Slab Repair	July 1987
20. Periodic Inspection No. 13 and Periodic Assessment No. 1	March 2019

**1-05. Operating Agency.** USACE-SWF is the operating agency for Somerville Dam and Lake. The Lake Manager at Somerville Lake has the responsibility for its operations and management of the lake. The Fort Worth District Engineer, through the Water Resources Branch of the Engineering and Construction Division, directs water control activities.

The project is staffed during normal working hours throughout the year. The Lake Manager at Somerville Lake has the responsibility for its operations. Lake Rangers are also available on holidays and weekends to provide assistance with the lake operations. The project will be staffed 24 hours a day when the lake level is, or is forecast to rise above elevation 260.0 feet.

The Lake Manager will have a current list of the Water Resources Branch personnel including home telephone numbers to contact when necessary. The Lake Manager will furnish the Water Resources Branch a list of project personnel, giving their office and home telephone numbers. The Lake Manager resides as close to the project as is considered prudent to carry out his official duties.

**1-06. Regulating Agencies.** USACE is the regulatory agency for Somerville Dam and Lake. The regulation of the dam is the responsibility of the Water Resources Branch of the Engineering and Construction Division, Fort Worth District.

## **CHAPTER II – DESCRIPTION OF PROJECT**

**2-01. Location.** Somerville Dam and Lake are located on Yegua Creek at river mile 20 within the Brazos River Basin, approximately 2 miles south of Somerville, Texas. The lake is located in Burleson and Washington Counties. The total drainage area above Somerville Dam is 1,006 square miles, or about 76 percent of the Yegua Creek watershed. The location of the Dam and Reservoir are shown on Plates 2-1a, 2-1b, and 2-1c, respectively.

**2-02. Purpose.** Somerville Dam and Lake is a multi-purpose project for flood risk reduction, water conservation, fish and wildlife habitat and recreation. In addition, it is a unit of the Brazos River Basin System which consists of nine USACE lakes and various channel improvements operated to provide flood protection along the Brazos River. Somerville Dam and Lake is part of the Three Rivers Regional Office in USACE-SWF which operates and maintains the project. An aerial view of Somerville Dam is shown in Figure 2-1.



**Figure 2-1. Aerial View of Somerville Dam**

**2-03. Physical Components.** Somerville Dam consists of an earth fill embankment, outlet works, uncontrolled spillway and a dike. The general plan of the embankment and spillway is shown on Plate 2-2. Additional information on Somerville Dam and Lake is provided in Exhibit A, Supplementary Pertinent Data.

a. **Embankment.** The embankment is 20,210 feet long and consists of a compacted impervious earth fill dam plus a 4,715-foot dike. The upstream slope is protected by 24 inches of dumped riprap on 9 inches of bedding material between elevations 232 and 280, from stations 0+00 to 36+00. Between station 36+00 and the end of the dam, approximate station 205+00, and the dike, 24 inches of riprap on 9 inches of bedding is provided. The downstream slope is protected by grasses above the top of the drainage blanket. The top of the dam is 34 feet wide and the dike is 17 feet wide. The top of the embankment is at elevation 280.0 feet. The embankment plan and profile and sections are shown on Plates 2-3 and 2-4.



**Figure 2-2. Upstream Embankment**



**Figure 2-3. Downstream Channel**



**Figure 2-4. Spillway**



**Figure 2-5. Outlet Works Tower**

b. **Spillway.** The spillway is located in a saddle to the right bank and is a 1,250-foot wide uncontrolled ogee weir with a crest elevation of 258 feet. Spillway plan, elevation and section are shown on Plate 2-5 and the Spillway finished grading is detailed on Plate 2-6.

c. **Outlet.** Outlet works consists of one 10-foot diameter conduit, 342.5 feet in length, through the base of the dam with invert at elevation 206.0. The outlet works is controlled by two 5x10 foot tractor type gates. Details of the outlet works are displayed in Plates 2-7 and 2-8.

d. Stilling Basin. The stilling basin is 170 feet long. The floor of the stilling basin is 40 feet wide and has an elevation of 480.0 feet. The basin has two rows of baffle blocks and an end sill to assist in dissipation of kinetic energy and reduce erosion velocities in the existing downstream channel. Details of the stilling basin are displayed along with the outlet works details in Plates 2-7 and 2-8.

e. Hydropower Facilities. There are no hydropower facilities at Somerville Dam.

f. Water Supply Facilities. A 24-inch, 14-mile long water line is owned by the city of Brenham which pumps 4,200 acre-feet per year of raw water from Somerville Dam to Brenham, Texas. The Brazos River Authority currently has a contract with the U.S. Government (Contract No. DA 41 443 CIVENG 62 1043 dated 9 March 1962) to utilize the storage space at Somerville Lake below elevation 238.0 feet as a source of water supply.



Figure 2-6. Spillway Crest



Figure 2-7. Outlet at high flows

**2-04. Related Control Facilities.** The Somerville Dam and Lake is a part of a system of reservoirs for controlling the floodwaters on the Yegua Creek and the Lower Brazos River. Somerville Dam is operated in conjunction with eight other USACE dams (Whitney Dam, Waco Dam, Proctor Dam, Belton Dam, Stillhouse Hollow Dam, North San Gabriel Dam, Granger Dam and Aquilla Dam) in the central Brazos River Basin to provide flood protection, fish and wildlife habitat, and water supply in the downstream reaches all the way to the Gulf Coast.

**2-05. Public Facilities.** There are 11 boat ramps, 7 parks and 2 marinas providing access to the reservoir. The USACE operates three of these parks and 4 boat ramps. Details about access points and recreation facilities are listed in Table 2-1 and their locations are shown on Plate 2-9.

**TABLE 2-1**

**Recreation Areas at Somerville Dam and Lake**

1. Nails Creek State Park
2. Birch Creek State Park
3. Rocky Creek Park
4. Big Creek Marina and Campground
5. Welch Park
6. Lake Somerville Marina Overlook Campground
7. Yegua Creek Access Park

### **CHAPTER III – HISTORY OF PROJECT**

**3-01. Authorization.** The Somerville Dam and Lake project on Yegua Creek was authorized by the Flood Control Act approved 3 September 1954 (Public Law 780, 83rd Congress, 2nd Session) for construction substantially in accordance with the recommendation of the Chief of Engineers contained in House Document No. 535 (81st Congress, 2nd Session) "Report of Survey of Brazos River and Tributaries, Texas, Oyster Creek, Texas, and Jones Creek, Texas, dated 16 August 1947".

Authority to initiate advance planning is contained in the Public Works Appropriation Act of 1959, approved 2 September 1958 (Public Law 85-863) and in Advice of Allotment C-126, dated 6 October 1958. Construction of the project was started on 25 June 1962 when work was started on the access road dike.

**3-02. Planning and Design.** A public hearing was held at Waco, Texas, on 16 November 1937 for the purpose of affording all interested parties an opportunity to present their views concerning improvement of the Brazos River and its tributaries, in connection with the preliminary examination and review of reports on the Brazos River, Texas. It was at this public hearing that the Brazos River Authority (then known as the Brazos River Conservation and Reclamation District) as the state authorized agency, requested improvement for flood control and water conservation on the Brazos River and its tributaries.

Preconstruction planning studies on Somerville Dam and Lake were authorized on 3 September 1954 (Public Law 780) and in Advice of Allotment C-126 dated 6 October 1958. Major changes were required between the time that the project document was prepared and the beginning of the preconstruction planning. The authorized Somerville Reservoir project as set forth in House Document No. 535, provided for 38,800 acre-feet of conservation storage. The state of Texas indicated that the USACE lakes in Texas should be developed to their full potential for water conservation in view of the critical drought situation experienced in recent years.

In the Water Supply Act of 1958, Congress provided a general policy for considering water supply in civil works projects including submission to Congress of new dam and modification of authorized projects to include water supply. Accordingly, the water resources of the Yegua Creek watershed were restudied to provide sufficient conservation storage in the proposed Somerville Dam to fully develop the resources. The final plan for the dam and lake presents changes from the original plan. The significant changes are discussed in the following paragraphs.

a. To reduce the cost of the project, the spillway was changed from a spillway with sixteen tainter-gates (40' x 26') with a crest elevation of 225.0 feet to an uncontrolled 1,250 foot ogee weir spillway with crest elevation at 258.0.

b. The conservation storage for the proposed project was increased from 38,800 to 143,000 acre-feet in order to develop the resources of the project to their fullest and still maintain sound engineering and economic practices.

c. A separate outlet works was provided instead the gated spillway. The proposed outlet works will be used for diversion during construction and for the passage of flood releases and low-flow discharges. The outlet works were changed to a 10-foot diameter conduit controlled by two 5' x 10' foot tractor type gates.

d. The top of the dam has been raised from elevation 261.0 feet as provided in the original project document to elevation 280.0 feet. The crown width of the dam is 34.0 feet.

The reports and design memorandums relating to the design, construction, and operation of Somerville Dam and Lake are listed in Table 1-1.

**3-03. Construction.** The construction of Somerville Dam began with the first construction contract award on 25 June 1962 and was completed in December 1967. Deliberate impoundment began on 3 January 1967. The construction cost of the dam was \$23,700,000. Table 3-1 outlines the important dates in the construction of Somerville Dam. Figures 3-1 through 3-8 show the dam construction.



Figure 3-1. Profile view of Intake Structure



Figure 3-2. View of Intake Structure

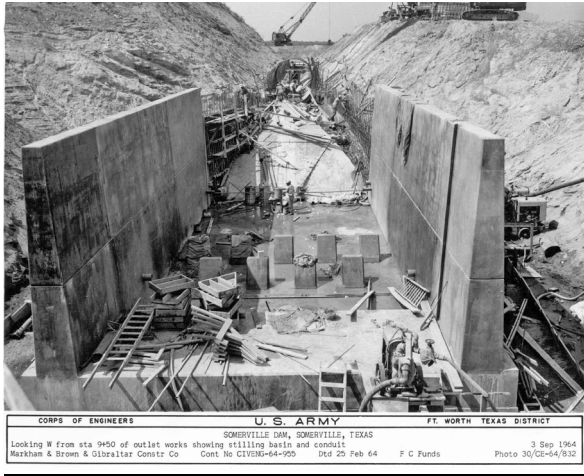


Figure 3-3. Construction of Outlet Works



Figure 3-4. Formwork for the Outlet Structure

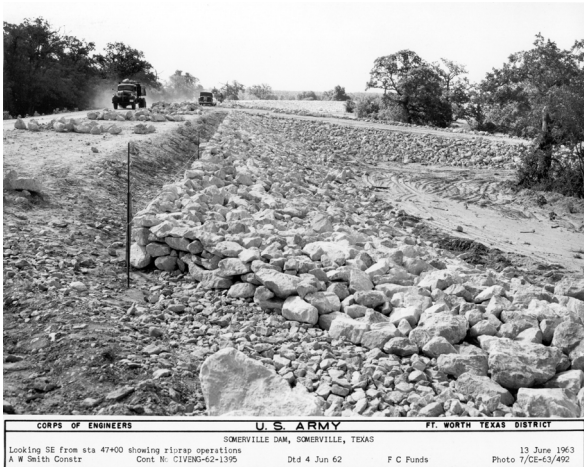


Figure 3-5. Riprap Operations

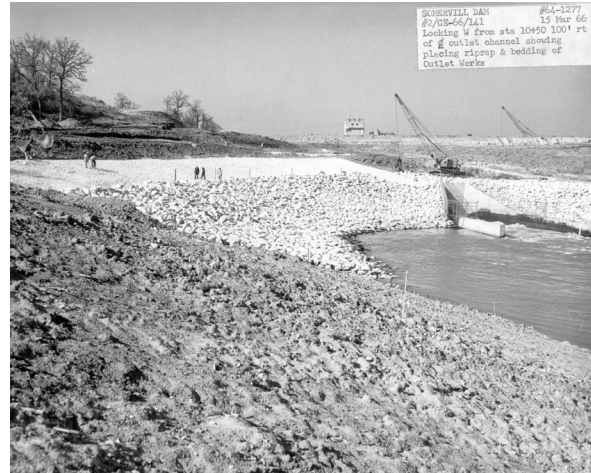


Figure 3-6. Construction of Outlet Works  
 Placing Riprap and Bedding



Figure 3-7. Completed Spillway and Riprap



Figure 3-8. Profile View: Completed Spillway, Riprap and Baffling Blocks

**TABLE 3-1**

**Resume of Construction Activities**

Activity	Date
First construction contract award	25 June 1962
Construction began on earthen dam	12 June 1964
Closure of embankment section began	3 February 1966
Flow diverted through outlet works	3 February 1966
Deliberate impoundment initiated	3 January 1967
Completion of embankment, spillway and outlet works	December 1967

**3-04. Related Projects.** Somerville Dam and Lake is an integral part of USACE’s plan for flood control on the Lower Brazos River and its tributaries. The plan presently consists of nine USACE flood control projects, known as Whitney Dam, Aquilla Dam, Waco Dam, Proctor Dam, Belton Dam, Stillhouse Hollow Dam, North San Gabriel Dam (Lake Georgetown), Granger Dam, and Somerville Dam. BRA also owns and operates three other dams in the Brazos River

basin for purposes of water conservation: Morris Sheppard Dam (Possum Kingdom Lake), De Cordova Bend Dam (Lake Granbury), and Sterling C. Robertson Dam (Lake Limestone). The nine USACE dam projects in the Brazos River system control 36,830 square miles of drainage area, of which 8,950 square miles are non-contributing<sup>1</sup>. The Brazos River Master Reservoir Regulation Manual presents the proposed plan and individual projects in more detail. The Dam and Reservoir projects of the Brazos River basin are listed in Table 3-2.

**TABLE 3-2**  
**Brazos River Basin Projects**

Project	Stream	Year of Completion
Morris Sheppard Dam, BRA Project		
- Possum Kingdom Lake	Brazos River	1941
Whitney Dam	Brazos River	1951
Belton Dam	Leon River	1954
Proctor Dam	Leon River	1963
Waco Dam	Bosque River	1965
Somerville Dam	Yegua Creek	1967
Stillhouse Hollow Dam	Lampasas River	1968
De Cordova Bend Dam, BRA Project		
- Lake Granbury	Brazos River	1969
Sterling C. Robertson Dam, BRA Project		
- Lake Limestone	Navasota River	1978
North San Gabriel Dam	San Gabriel River	1980
Granger Dam	San Gabriel River	1980
Aquilla Dam	Aquilla Creek	1983

**3-05. Modification to Regulations.** There have been no known modifications to regulations.

**3-06. Principal Regulation Problems.** Currently there are no regulation problems.

<sup>1</sup> “Reservoir Regulation Manual, Whitney Lake, Brazos River Basin, Texas”, USACE, Feb. 1975.

## **CHAPTER IV – WATERSHED CHARACTERISTICS**

**4-01. General Characteristics.** The Yegua Creek watershed is located in the southeastern portion of the state of Texas and within the lower portion of the Brazos River basin between north latitudes 30°08' and 30°40' and west longitude 96°18' and 97°20'. It is roughly a rectangular area about 62 miles long and 32 miles wide, having a drainage area of 1,321 square miles. The total drainage area above Somerville Dam is 1,006 square miles, or about 76 percent of the Yegua Creek watershed.

Yegua Creek, a principal tributary of the Brazos River, is formed by the confluence of the East Yegua Creek (formally known as First Yegua), and Middle Yegua Creek at a point about 14 miles west of Somerville, Texas. The Middle Yegua Creek rises in Williamson County about 9 miles south of Taylor at an elevation of about 500 feet above the mean sea level and flows in an easterly direction for a distance of 48.7 river miles to its confluence with the East Yegua Creek at about elevation 239 feet above mean sea level. The East Yegua Creek rises in Milam County at an elevation of above 400 feet above mean sea level and flows in a southeasterly direction for a distance of 33 river miles to its confluence with Middle Yegua Creek. Yegua Creek then flows in a general easterly direction for 41.8 river miles to its junction with the Brazos River. Profiles of the Yegua Creek and Lower Brazos River are shown on Plate 4-2.

The Yegua Creek watershed is crossed by US highway 77 as well as state highways TX-21 and TX-36. The largest city in the basin is Rockdale which is in Milam County and has a population of 5,643. Brenham, which receives its drinking water from Somerville Lake, lay just south of the watershed boundary. The Yegua Creek watershed is predominantly rural and the primary employment sectors in the region are education and healthcare, though there are more oil and gas extraction and mining jobs per population than other counties.

The Yegua Creek watershed lies within the boundaries of Burleson, Lee and Washington Counties. Washington County's county seat is Brenham and its population is 33,708 according to the 2010 Census. Caldwell is the county seat of Burleson County, which had a population of 17,233 as of 2010. Lastly, Lee County had a population of 16,591 and its county seat is Giddings.

**4-02. Topography.** The Balcones fault system crosses the Yegua Creek watershed about 25 miles upstream from the dam. The watershed is characterized by undulating topography in which moderate slopes, wide valleys and ranges of low rolling hills predominate. The Yegua Creek and its major tributaries have cut wide valleys into the soft sedimentary deposits and have subsequently refilled the valleys with a heavy blanket of alluvium. The alluvial soils covering the valleys of the watershed are productive for growing of crops. The total fall of the streambed is about 360 feet, averaging 4.0 feet per mile. The slope of Yegua Creek near Somerville Lake is approximately four 2.5 feet per mile.

The watershed has two principal drainage systems, the East Yegua and Middle Yegua Creeks. Above their confluence, the Middle Yegua Creek has a drainage area of 441 square miles and the East Yegua Creek has a drainage area of 286 square miles. Between their confluence and the mouth of the Yegua Creek, the drainage area is 1,321 square miles. The general configuration of the watershed is shown in Plate 4-1 and drainage areas upstream from points in the Yegua Creek watershed are given in Table 4-1.

**TABLE 4-1**  
**Drainage Areas and Mileages for Yegua Creek Watershed**

Point of Measurement	Drainage Area (sq. mi.)		River Mile Above Mouth
	Component	Total	
Source of Middle Yegua Creek	0	0	48.7
Mouth of Middle Yegua Creek	441	441	0.0
Source of East Yegua Creek	0	0	33.0
Mouth of East Yegua Creek	286	286	0.0
Below confluence of East and Middle Yegua Creeks	-	728	41.8
Above Somerville Dam	278	1,006	20.0
Above USGS gage near Somerville, TX	3	1,009	18.4
Above mouth of Yegua Creek	312	1,321	0.0

**4-03. Geology and Soils.** The Yegua Creek watershed is underlain by strata of the Wilcox, Claiborne, and Jackson groups of the Eocene Age. The upper reaches of the watershed are underlain by the sand and clay sediments of the Wilcox group. South and east of this area the watershed crosses over areas composed of the Clairborne strata. This group, which underlines the principal portion of the drainage area, is made up of seven formations: Carizo sand, Recklaw glauconitic sand and clay, Queen City sands, Weches glauconite clay strata, Sparta sands and shales, Crocket clay and shales, and the sand and sandy clay of the Yegua sediments. Yegua Creek crosses the Claiborne and Jackson groups about ten miles upstream from the Somerville Dam. The Jackson group is made up of four formations: Caddel, Wellborne, Manning and Whitsett. These formations consist chiefly of sands and clays.

**4-04. Sediment.** In 1991, the Texas Legislature authorized the Texas Water Development Board (TWDB) to develop a non-profit, self-supporting, reservoir volumetric survey program, which is named the Hydrographic Survey Program. The program includes a standard volumetric survey and a sedimentation survey. Since 1992, TWDB's Hydrographic Survey Program has completed 147 hydrographic surveys on 104 unique reservoirs. This includes 81 of the 109

water supply reservoirs monitored for inclusion in TWDB's monthly Water Conditions Report. The TWDB web site is: (<http://www.twdb.texas.gov/surfacewater/conditions/report/index.asp>).

The TWDB performed a standard volumetric survey for Somerville Lake in 2012<sup>2</sup>. Results from the survey indicate Somerville Lake encompasses 11,395 surface acres and contains a total volume of 150,307 acre-feet at a conservation pool elevation of 238.0 feet. Sedimentation in Somerville Lake was measured using acoustic signal returns at three frequencies, 200 kHz, 50 kHz and 24 kHz. Sediment core samples were collected to determine the location of the pre-impoundment surface in the acoustic signals. The difference between the pre-impoundment surface and current surface gives the sediment thickness at each testing location.

The original USACE design of the lake indicates a total surface area of 11,656 acres and a volume of 164,974 acre-feet of water at the top of conservation pool elevation. In 1995, a TWDB survey of the lake determined a surface area of 11,456 acres with a total volume capacity of 155,062 acre-feet. Survey methodologies have changed sufficiently since design of the dam and reservoir. Therefore, determining the loss in capacity by direct comparison of the survey results is an unreliable assessment. However, 2012 data processing techniques were applied to data collected in the 1995 and 2003 surveys and compared to survey data from the 2012 survey. Based on these evaluations, Somerville Lake loses between 326 and 469 acre-feet per year of capacity due to sedimentation. Comparisons between the original USACE design (1959) and the 1995, 2003, and the 2012 TWDB volumetric survey are presented in Table 4-2.

**TABLE 4-2**

**Area and Capacity Comparisons of Somerville Lake**

Feature	USACE Original Design	TWDB Volumetric Survey	TWDB Volumetric Survey	TWDB Volumetric Survey
Year	1959	1995	2003	2012
Surface Area at Conservation Pool Elevation 537.5 feet NGVD29 (acres)	11,656	11,456	11,127	11,395
Volume at Conservation Pool Elevation 537.5 feet NGVD29 (acre-feet)	164,974	156,184	149,072	150,293

NOTE: Data is obtained from "Volumetric Survey Report of Somerville Lake, TWDB April 2012."

<sup>2</sup> [https://www.twdb.texas.gov/hydro\\_survey/somerville/2012-04/Somerville2012\\_FinalReport.pdf](https://www.twdb.texas.gov/hydro_survey/somerville/2012-04/Somerville2012_FinalReport.pdf)

**4-05. Climate.** The Yegua Creek Watershed lies in a moderately humid region and experiences a generally mild climate. In summer, the days are hot and the nights warm. The winter temperatures are generally mild but occasional cold periods of short duration are experienced. Freezing temperatures are experienced occasionally, but subzero temperatures are rare. Snowfall is light and has little effect on runoff characteristics of the watershed.

a. Temperature. Temperatures are generally moderate with a mean annual temperature over the basin is about 68 degrees Fahrenheit. January, the coldest month, has an average minimum daily temperature of about 39 degrees. August, the warmest month, has an average maximum daily temperature of about 96 degrees. Temperatures in and near the watershed have ranged from a maximum of 114 degrees recorded at Somerville Dam to a minimum of minus -3 degrees recorded at College Station, Texas<sup>3</sup>. The average length of the growing season between killing frosts is 267 days for Burleson, Lee, Milam, Washington and Williamson counties, the counties within the watershed<sup>4</sup>. Table 4-3 gives temperature data for several National Weather Service (NWS) stations in or near the Yegua Creek basin.

**TABLE 4-3**

**Temperatures in/near the Yegua Creek Basin**

Station	Period of Record	Temperatures (°F)				
		Mean Annual	Average January Minimum	Average August Maximum	Minimum Recorded	Maximum Recorded
Somerville Dam	1963-2019	67.9	36.3	96.4	3	114
College Station, Easterwood Field	1951-2019	68.5	40.1	95.8	2	112
College Station, TX	1900-1957*	68.8	41.2	97.0	-3	110
Somerville, TX	1908-1928*	67.7	40.4	97.0	4	111
Lexington, TX	1962-2019	67.4	37.4	95.2	2	111

NOTE: \*Period of available NOAA data ends in year indicated.

b. Precipitation. The normal annual precipitation over the Yegua Creek watershed and surrounding areas is approximately 35 inches.<sup>5</sup> Across the watershed, precipitation levels are higher in the late-spring, early-summer months, peaking in May-June and lowest in November-February. The monthly distribution of the average annual precipitation at eight NWS stations in the watershed area is shown in Table 4-4.

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<sup>3</sup> www.ncdc.noaa.gov/cdo-web/datasets

<sup>4</sup> texasalmanac.com/sites/default/files/images/almanac-feature/countyweatherA.pdf

<sup>5</sup> www.ncdc.noaa.gov/cdo-web/datasets

**TABLE 4-4**  
**Average Monthly and Annual Rainfall in/near the Yegua Creek Basin**

Month	Precipitation (Inches)							
	Lexington	Rockdale	Dime Box	Post Oak School	Somerville	College Station	College Station, Easterwood	Somerville Dam
	1948-2019	1963-2015	1941-2019	1963-1981	1908-1951*	1882-1984	1951-2019	1963-2019
January	2.54	2.63	2.82	2.51	1.99	2.89	2.84	2.80
February	2.42	2.58	2.63	2.74	2.57	2.99	2.68	2.52
March	2.70	2.74	2.70	2.03	2.87	2.90	2.76	2.90
April	2.83	2.90	3.16	3.81	3.61	3.60	3.31	3.16
May	4.64	4.86	4.43	5.20	3.98	5.09	4.60	4.68
June	3.40	3.44	3.85	3.44	2.83	3.04	3.67	3.93
July	1.75	2.03	1.90	1.71	1.31	2.48	2.20	1.90
August	2.20	2.11	2.41	2.69	2.20	2.14	2.66	2.71
September	3.53	3.34	3.88	4.53	2.40	2.45	4.10	3.69
October	4.33	3.53	3.90	2.92	3.41	3.21	4.23	4.02
November	3.04	2.99	2.87	3.12	2.66	3.22	3.22	3.42
December	2.77	2.85	3.02	2.54	3.59	3.60	3.78	3.07
Annual Average	35.08	34.36	36.49	31.32	28.64	35.70	39.51	37.33
Minimum	18.05	20.54	17.20	25.87	16.96	16.66	17.80	18.94
Year Recorded	(2008)	(1988)	(1943)	(1971)	(1917)	(1917)	(1988)	(1988)
Maximum	65.52	57.78	62.97	58.48	58.72	55.88	61.04	66.57
Year Recorded	(2015)	(1968)	(2015)	(1976)	(1919)	(1919)	(1968)	(1968)

NOTES: 1. The average annual precipitation is computed by summation of the monthly averages.

2. Data source "Climatological Data" from the NWS. Data as of 2019.

\*No data between 1928-1948

c. Snowfall. Minor accumulations of snowfall occur periodically during the winter months, however, snowfall does not contribute significantly to area precipitation or runoff.

d. Evaporation. The evaporation loss from Somerville Lake during the period of May 1924 through September 1959 (used in preconstruction planning studies) was determined by using evaporation records at: College Station, located about 16 miles north of Somerville Dam; Temple, about 75 miles northwest of the dam; and Prairie View, about 40 miles southeast of the dam. A correlation was developed between the annual rainfall and the net annual evaporation loss from a lake surface (adjusted for the natural runoff from the lake area) based on College Station, Temple and Prairie View records. The net annual evaporation losses for Somerville Lake were then scaled from the annual net evaporation curve by entering with the observed annual rainfall at College Station for the period 1924-1947 and the observed rainfall at Somerville for the period 1948-1959.

The monthly distribution of the net annual evaporation losses at the lake was based on the observed annual distributions as indicated by the College Station record from May 1924 through December 1947, the Temple record from January 1948 through February 1951, and the Prairie View record from March 1951 through September 1959. Table 4-5 shows pertinent evaporation data for each of the three stations. The estimated average annual net evaporation loss from the proposed Somerville Lake would amount to 17.60 inches over the period 1924-1959. During the critical period (January 1954 to March 1957), the net annual evaporation loss would be 35.10 inches. The maximum annual net evaporation loss was 47.75 inches in 1948. This data is summarized in Table 4-5.

The USACE has collected lake evaporation data from 1954 through 2018 from the National Oceanic and Atmospheric Administration (NOAA) and the National Climatic Data Center (NCDC).<sup>6</sup> The average monthly and annual evaporation from TWDB data are given in Table 4-6. The evaporation rates for the Yegua Creek watershed are computed using the pan coefficients in the ThEvap program for quadrangle 711.

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<sup>6</sup> [www.twdb.texas.gov/surfacewater/conditions/evaporation/](http://www.twdb.texas.gov/surfacewater/conditions/evaporation/)

Figures 4-1 through 4-6 show examples of the weather station instruments and equipment.



**Figure 4-1. Overview of Weather Station at Somerville Lake**



**Figure 4-2. Evaporation Pan**



**Figure 4-3. Recording Rain Gage**



**Figure 4-4. Inside Recording Rain Gage**



**Figure 4-5. Standard Rain Gauge**



**Figure 4-6. Thermometer housing Box**

e. Wind. Severe winds have been experienced near Somerville Lake, though the average wind speeds vary through the year. The windier part of the year lasts from late October

to early June with average speeds over 9 mph. During the calmer part of the year, wind speeds average 7.9 mph. The winds in the Yegua Creek watershed are primarily from the south, though from December to February, the winds shift and blow primarily from the north.

A wind velocity of 52 miles per hour over water was used to calculate the freeboard requirement for the dam. At the Maximum Design Water Surface of 274.5 feet, the maximum fetch is approximately 5.7 miles. The computed freeboard to protect the dam from wave overtopping based on this design wind speed, fetch and elevation was 5.50 feet. At this elevation, the dam (280 feet) will provide adequate freeboard.

**TABLE 4-5****Average Monthly Evaporation Data: College Station, Temple and Prairie View, Texas**

Month	College Station, Texas 1916 - 1947			Temple, Texas 1915 - 1958			Prairie View, Texas 1951 - 1959		
	Bureau of Plant Industry. pan coefficient = 0.94			Bureau of Plant Industry. pan coefficient = 0.94			Bureau of Plant Industry. Young pan coefficient = 0.94		
	Observed Pan Evap. (in)	Evap from Reservoir Surface (in)	Observed Precip. (in)	Observed Pan Evap. (in)	Evap from Reservoir Surface (in)	Observed Precip. (in)	Observed Pan Evap. (in)	Evap from Reservoir Surface (in)	Observed Precip. (in)
January	2.13	2.00	3.65	2.13	2.00	2.48	2.88	2.71	2.49
February	2.47	2.32	3.17	2.47	2.63	2.40	2.90	2.73	2.97
March	3.84	3.61	3.07	3.94	4.19	2.09	4.42	4.15	1.85
April	4.59	4.31	3.58	4.63	4.93	4.01	4.77	4.48	3.93
May	5.61	5.27	5.33	5.44	5.79	4.28	5.80	5.45	3.76
June	6.64	6.24	3.37	6.61	7.03	2.95	7.20	6.77	4.04
July	7.40	6.96	2.65	7.60	8.09	1.87	6.96	6.54	2.48
August	7.13	6.70	2.55	7.57	8.05	1.99	7.11	6.68	1.61
September	5.48	5.15	2.73	5.73	6.10	3.17	5.75	5.41	3.78
October	4.42	4.15	3.23	4.51	4.80	2.96	5.17	4.86	3.54
November	2.98	2.80	3.40	3.06	3.25	2.65	4.03	3.79	2.96
December	2.33	2.19	3.61	2.29	2.15	2.55	3.34	3.23	3.21
Annual	55.02	51.70	40.34	58.51	55.00	33.31	60.98	57.32	36.14

Note: Somerville DM No. 1 June 1960.

**TABLE 4-6**

**TWDB Average Monthly and Annual Evaporation Somerville Lake, 1954-2018**

Month	Quadrangular lake Evaporation rate (inches)	Monthly Pan Coefficients for quadrangle 711 of ThEvap Program
January	2.24	0.73
February	2.49	0.71
March	3.77	0.71
April	4.52	0.70
May	5.00	0.65
June	6.33	0.70
July	7.17	0.71
August	6.87	0.71
September	4.50	0.73
October	4.48	0.76
November	3.06	0.77
December	2.21	0.76
Annual	53.49	0.71

**4-06. Storms and Floods.** Periods of excessive precipitation has been experienced over the watershed. Generally, the highest 24-hour and monthly periods of precipitation have occurred during major storms. However, there are some instances of heavy precipitation resulting from local thunderstorms. Floods occur frequently and during any time of the year in the Yegua Creek watershed. Based on historical information the maximum known flood in the vicinity of the gaging station on Yegua Creek near Somerville in December 1913. The peak flow was estimated to be 82,000 cfs. Table 4-7 gives data on major storm events in the watershed. Tables 4-8 and 4-9 give stage and flow data for major historic floods in the watershed.

**TABLE 4-7****Recorded Storms in the Yegua Creek Watershed, 1905-2017**

Storm Date	Precipitation in Inches					
	Somerville Gage	Somerville Dam Gage	College Station 6 SW Gage	College Station, Easterwood Field Gage	Dime Box Gage	Lexington Gage
1905, Jun 21-28	—	—	15.03	—	—	—
1913, Nov 18-Dec 5	24.55	—	13.28	—	—	—
1920, Oct 14-26	11.75	—	5.83	—	—	—
1925, Oct 9-16	9.20	—	9.22	—	—	—
1929, May 23-29	—	—	9.56	—	—	—
1930, May 10-18	—	—	9.70	—	—	—
1936, Jun 27-Jul 4	—	—	10.85	—	—	—
1968, Jun 15-26	—	9.45	—	8.32	7.66	5.87
1973, Jun 3-25	—	9.53	—	8.15	11.21	5.00
1973, Oct 5-17	—	9.59	—	9.30	7.89	8.12
1994, Oct 14-19	—	16.99	—	16.99	9.34	12.30
2001, Aug 26-Sep 10	—	10.04	—	11.96	9.02	10.54
2015, May 6-29	—	8.63	—	9.73	14.86	16.54
2016, May 26-Jun 5	—	14.78	—	9.36	9.48	5.73
2016, Aug 13-22	—	11.25	—	8.12	10.89	9.81
2017, Aug 23-28	—	13.97	—	18.23	14.85	13.25

NOTE: The rainfall data were tabulated from published precipitation records from the NWS

**TABLE 4-8****Pertinent Data for Somerville Dam and Lake and Gages in the Brazos and Yegua Creek Basins**

Station	Stream	Period of Record	Miles Above Mouth	Datum (ft)	Drainage Area (Sq. Mi.)	Maximum Floods of Record		
						Date	Gage Height (ft)	Peak Discharge (cfs)
near Dime Box, 08109700	Middle Yegua Creek	1962-2019	17.5	295.40	236	31 Oct 2015	16.12	17,300
						4 May 2019	15.56	14,100
						22 Dec 1991	15.39	12,500
near Dime Box, 08109800	East Yegua Creek	1962-2019	12.2	284.00	244	4 May 2019	15.25	16,800
						24 May 1975	13.91	14,000
						26 May 2015	13.08	10,700
near Somerville, 08110000	Yegua Creek	1924-1991 2008-2019	18.4	199.21	1,009	1 Jul 1940	19.27	56,800
						30 May 1929	—	41,200
						22 Apr 1926	—	34,600
near Hempstead, 08111500	Brazos River	1938-2019	193.8	107.90	43,880	8 Dec 1913	66.10	350,000
						27 May 2016	54.89	153,000
						2 May 1957	44.21	143,000
Lake	Stream	Period of Record	Miles Above Mouth	Datum (ft)	Drainage Area (Sq. Mi.)	Maximum Lake Elevation		
						Date	Elev. (ft)	Volume (ac-ft)
Somerville Lake, 08109900	Yegua Creek	1966-2019	20.0	—	1,006	29 May 2016	259.81	543,230

Note: The information is derived from the United States Geological Survey (USGS) Peak Streamflow and Annual Water-Data Reports.

**TABLE 4-9**  
**Recorded Major Floods on the Yegua Creek Watershed, 1926-2019**

Date	East Yegua Creek near Dime Box, 08109800		Middle Yegua Creek near Dime Box, 08109700		Yegua Creek near Somerville, 08110000*		Somerville Lake, 08109900	
	Gage Height (ft)	Peak Discharge (cfs)	Gage Height (ft)	Peak Discharge (cfs)	Gage Height (ft)	Peak Discharge (cfs)	Water Surface Elev.(ft)	Lake Volume (ac-ft)
1926, Apr	—	—	—	—	—	34,600	—	—
1929, May	—	—	—	—	17.02	41,200	—	—
1936, May	—	—	—	—	15.17	23,500	—	—
1940, Jul	—	—	—	—	19.27	56,800	—	—
1947, Aug	—	—	—	—	15.62	29,600	—	—
1961, Sep	—	—	—	—	15.42	23,900	—	—
1974, Sep	13.07	9,720	13.84	7,580	—	2,590	245.81	265,900
1975, May	13.91	14,000	15.16	11,400	8.89	2,790	247.08	286,200
1991, Dec	12.94	8,910	15.39	12,500	—	—	249.61	330,000
1992, Mar	11.05	3,240	12.78	4,190	—	—	259.60	547,600
1992, Jun	11.29	3,730	13.50	5,680	—	—	255.30	444,800
1994, Oct	12.98	9,080	13.74	6,060	—	—	250.41	344,500
2002, Nov	12.98	10,200	14.60	10,200	—	—	246.25	263,000
2015, May	13.08	10,700	14.27	8,900	10.22	2,790	258.33	505,900
2015, Oct	11.52	4,680	16.12	17,300	8.94	2,010	245.97	258,500
2016, May	11.65	4,910	12.54	4,370	12.16	7,510	259.81	543,200
2017, Aug	12.39	5,780	13.36	5,640	9.66	2,650	255.00	428,000
2019, May	15.25	16,800	15.56	14,100	7.28	1,060	253.32	392,100

NOTES: 1. Data retrieved from USGS Peak Streamflow for Texas database. Some major floods in the basin occurred prior to available gage data. 2. The major floods were generally basin wide events at most of the gages; however, certain gages may not have experienced a flood during the same event. For more details on all major floods refer to Table 4-8 (pg. 4.8-1). \*Deliberate Impoundment for Somerville Lake began on 3 January 1967. Therefore, peak flood flows at this gage after the impoundment date are captured by Somerville Lake.

Historical descriptions of the major floods that have been experienced in the Yegua Creek watershed are as follows:

a. Storm of December 1913. The December 1913 storm was preceded by general rains during the last week of November. That week Brenham reported a total of 4.86 inches, Somerville reported 13.55 inches which saturated the Yegua Creek watershed and had many creeks flowing prior to the storm. The December 1913 flood resulted from heavy rains, which fell during the period 1-5 December. The area of heavy rainfall extended over the Brazos River Basin from the vicinity of Glen Rose to Hempstead. This storm had centers of 13.58 inches near Leander, about 10 miles southwest Georgetown, 11.84 inches at Hewitt, just south of Waco, and 13.55 inches at Somerville. College Station 6SW recorded 9.88 inches during the first 5 days of December 1913.

The flood of December 1913 produced the maximum stage at all points in the Brazos River Valley downstream from Waco and also the maximum known stage on the Middle Yegua Creek at Dine Box and the Yegua Creek at Somerville. From information provided by local residents the Middle Yegua Creek reached of 16 feet and the Yegua Creek at Somerville reached a peak stage 22.0 feet on 5 December from information provided by the Colorado & Santa Fe Railway Co. with an estimated peak flow of 82,000 cfs.

b. Storm of April 1926. This storm produced 4.2 inches of rain in under a 24 hour period at the Somerville, TX on April 22, 1926. The peak stage on the near Yegua Creek near Somerville gage reached a stage of 18.02 feet. The peak flow associated with this storm near Somerville was 34,600 cfs.

c. Storm of May 1929. The storm of 24-31 May 1929 resulted in heavy rainfall on the Brazos River below the city of Waco. The rainfall recorded during the last week of May near the Yegua Creek watershed were as follows: Brenham 7.52 inches, College Station 9.66 inches, and Taylor 8.4 inches. The heaviest and most intense rainfall occurred on 28-29 May. The resulting flood reached a stage of 17.02 feet on Yegua Creek near Somerville gage with a corresponding peak discharge of 41,200 cfs on 30 May. The peak discharge was originally estimated at 33,600 cfs, but was revised by USGS in 1957. Based on the estimated runoff of 195,400 acre-feet from this storm and the hypothetical reservoir operation made in accordance with the plan of regulation, Somerville Lake would have reached a peak elevation of 251.2 feet, which is 13.2 feet above the top of the conservation pool.

d. Storm of July 1940. A slow moving cold front crossed central and south Texas on June 29-30 bringing torrential rains of 8 to 22 inches over an area approximately 50 miles wide by 100 miles long. It covered large sections of eight counties, including Lee County. Most of the Yegua Creek watershed above Somerville Dam is in Lee County. This rainfall caused destructive floods along the lower portion of the Brazos, Colorado and Guadalupe Rivers and along the upper portion of the Lavaca River. Nine lives were lost during this storm event and damages at the time were estimated at more than \$1,000,000.

The rainfall recorded at Dime Box between the afternoon of 28 June and the afternoon of 30 June was 17.5 inches. During the same time period, the weather station in the city of Somerville recorded 9.30 inches of rainfall. These intense rains generated high volumes of runoff. The flow in Yegua Creek near Somerville reached a stage of 19.27 feet with a peak flow of 56,800 cfs on 1 July. This flow is the maximum recorded stage and flow at this gage. Based on the estimated runoff of 206,800 acre-feet in the month of July, and the hypothetical reservoir operation made in accordance with the plan of reservoir regulation, Somerville Lake would have reached a peak elevation of 251.0 feet, which is 13 feet above the top of the conservation pool.

e. Storm of August 1947. In August of 1947, the third hurricane of the season, named “Dog-Easy” struck Galveston and tracked northward to Dallas, Texas, passing over the Yegua Creek basin. The heaviest rains were reported on the morning of 26 August. The rain gage at Brenham recorded 8.41 inches and College Station recorded 9.89 inches that morning. The flood resulting from this storm reached a stage of 15.62 feet on Yegua Creek near Somerville gage, and an associated peak flow of 29,600 cfs.

f. Storm of 1961. The storm of 11-13 September 1961, resulted in heavy thunderstorms on the Yegua Creek watershed. The rainfall recorded were as follows: Lexington 8.21 inches, Dime Box 9.79 inches, and Brenham 9.86 inches. The flood resulting from this storm reached a stage of 15.42 feet on Yegua Creek near Somerville gage, and an associated peak flow of 23,900 cfs.

g. Storm of June 1968. In June 1968, 8 to 10 consecutive days of rain from Hurricane “Candy” caused torrential downpours that damaged melon and vegetable crops and reduced yields of grain. A total of 9.45 inches of precipitation was recorded at the Somerville Dam rain gage. At College Station, Easterwood Field, 8.32 inches of precipitation was recorded. The Lexington, gage recorded 5.87 inches of rain, and the gage at Dime Box recorded 7.66 inches of precipitation. The flood resulting from this storm produced a peak flow at the East Yegua Creek of 6,600 cfs. The peak inflow into Somerville Lake was 44,500 cfs. Somerville Dam reduced the downstream flow to a peak of 2,590 cfs.

h. Storm of September 1974. During this storm, 8.38 inches of rain were recorded at Somerville Dam over a period of several days. At the gage a Dime Box, 3.95 inches of precipitation were recorded in under a 24 hour period. The flood resulting from this storm reached a flow of 9,720 and 7,580 cfs on East Yegua and Middle Yegua Creeks, respectively. Below the Somerville Dam, Yegua Creek had a flow of 2,590 cfs.

i. Storm of December 1991. Rainfall on a large area of central Texas during December 18-23, 1991, caused extensive flooding in many locations. On 18 December, a warm moist unstable air mass spread northward from the Gulf of Mexico and overran a cold surface ridge that had settled over Texas. Simultaneously, a deep, cold upper level trough over the southwestern United States and northern Mexico pumped tropical moisture from the Pacific into central and northern Texas. Embedded thunderstorms produced heavy rainfall throughout central Texas and expanded northward late on 18 December. This combination of moisture and

movement persisted until 27 December, with thunderstorms producing heavy rainfall throughout central Texas. Daily total in excess of 4 inches were recorded at numerous locations.

Most of the Yegua Creek watershed above Somerville Dam received rainfall amounts of 8 to over 10 inches during the six days between 18 and 23 December. Some of the recorded rainfall amounts on or near the Yegua Creek watershed were as follows: Brenham 5.58 inches, Dime Box 7.81 inches, Giddings 7.36 inches, Lexington 10.39 inches, Rockdale 10.8 inches, and Somerville Dam 5.63 inches. These storm events generated high runoff and local flooding.

The East Yegua Creek near Dime Box crested at 12.94 feet with a flow of 8,910 cfs. The Middle Yegua Creek near Dime Box crested at 15.39 feet with a flow of 12,500 cfs, setting a new record high stage surpassing the 1975 stage of 15.16 feet. The peak inflow into Somerville Lake was approximately 38,600 cfs. Between 18 December 1991 and 2 January 1992, Somerville Lake rose 12.5 feet to elevation 249.61 feet. Due to subsequent storms and high flows in the main stem of the Brazos River in the following months, the releases from Somerville Lake were suspended several times and the lake continued to rise another 10 feet to a peak elevation of 259.60 feet on 7 March 1992. This was the first time Somerville Dam had water flowing over its spillway.

j. Storm of October 1994. On 17 October 1994, 15.25 inches of precipitation fell at the Somerville Dam within a 24 hour period. The total for the five-day event was 16.99 inches of precipitation at this site. The gages at Lexington and Dime Box received 12.30 and 9.34 inches of precipitation, respectively. East Yegua Creek reached a stage of 12.98 feet, and Middle Yegua Creek reached a stage of 13.74 feet. The flows of East and Middle Yegua Creeks were 9,080 and 6,060 cfs respectively.

k. Storm of November 2002. Near the end of October, an upper level trough stalled over the region and combined with the remnants of Hurricane Kenna moving Northeast across the area from Mexico to produce a period of heavy rainfall that spread across south central Texas and into Louisiana. The peak flow at East Yegua Creek near Dime Box was 10,200 cfs with a stage of 12.98 feet. The peak flow at Middle Yegua Creek near Dime Box was 10,200 cfs with a stage of 14.60 feet.

l. Storm of February 2003. During this storm, the peak discharge at East and Middle Yegua Creeks near Dime Box were 6,150 cfs and 5220 cfs respectively with stages of 13.15 and 11.68 feet.

m. Storm of May 2015. During the spring of 2015, El Niño produced an active weather pattern across the western United States. A persistent upper-level low in the northern polar jet stream dropped storm after storm down the Pacific coastline. These storms tracked into the central plains. One cold front after another moved across Texas and these fronts lead to flash flooding. Texas remained in an upper air flow pattern almost the entire month of May, which generated heavy rains almost every day between 5 and 29 May. Many locations in central Texas received 10 to 20 inches of rainfall during this storm period.

Somerville Lake watershed received 15 to 20 inches of rainfall in May, which is about three times the monthly May average. Some of the recorded rainfall amounts on or near the Yegua Creek watershed were as follows: Brenham 15.09 inches, Dime Box 14.86 inches, Fedor 14.43 inches, Giddings 17.13 inches, Lexington 16.54 inches, and Somerville Dam 8.63 inches. The steady rainfall created large runoff and wide spread flooding.

The Middle Yegua Creek recorded a peak stage of 14.27 feet with corresponding flow of 8,900 cfs. The East Yegua Creek peaked at 13.06 feet with a flow of 10,600 cfs. The peak inflow into Somerville Lake was about 40,000 cfs. The inflow to Somerville Lake during the month of May was 375,000 acre-feet, when 36,600 acre-feet is the monthly average. Somerville Lake rose 18.33 feet in May to a peak elevation of 258.33 feet, which is 0.33 feet above the spillway crest. This is the second time that water had flowed over the spillway. The flow in Yegua Creek near Somerville was reduced to a peak of 2,300 cfs by the regulation of Somerville Dam.

n. Storm of May 2016. The spring of 2016 proved to be one of the wettest in Texas history. The heaviest rains occurred during the months of April and May. The two month total at Somerville Dam was 27.08 inches with 19.64 falling in the month of May alone. In May, an upper level trough moved out of the southern Rockies and provided sufficient lift to form thunderstorms along a dry line in west Texas. These storms moved into South Central Texas and were further enhanced by an outflow boundary that moved out of north Texas. In the middle two weeks in May, the rainfall pattern was erratic and sporadic varying widely in amounts and intensities throughout the Yegua Creek watershed. During this time period accumulations of 4 to 6 inches were common.

The heaviest and most intense rainfall occurred on the night of the 26<sup>th</sup> and the morning of the 27<sup>th</sup> of May on the southeast corner of the Yegua Creek watershed. These thunderstorms produced large hail, damaging wind gusts, heavy rains that led to flash flooding and the closing numerous roads across Texas. At Brenham, an astonishing overnight rainfall amount of 20.50 inches was reported on the morning of the 27<sup>th</sup>. That same morning, Gibbings 5E reported 12.42 inches and Somerville Dam reported 11.80 inches. The weather stations located in the central and northwest portions of the watershed received smaller amounts of 4 to 7 inches of rain that day. Flood waters from this event inundated homes and caused multiple road closures including sections of Highway 36 between Brenham and Somerville, FM 2935 at New Year's Creek and all of FM 390 from Burton to FM 105. This flood necessitated numerous water rescues in the town of Brenham and resulted in four fatalities.

The Middle Yegua Creek peaked on 27 May at a stage of 12.54 feet with a corresponding flow of 4,370 cfs. The East Yegua Creek peaked at a stage of 11.65 feet with a corresponding flow of 4,910 cfs. Somerville Lake had a peak inflow of 155,000 cfs on 27 May. Somerville Lake rose to elevation 259.81 feet on 29 May to set a new record high pool. This is the third time that flows has gone over the dam's spillway. Somerville Dam captured most of the storm runoff and reduced the peak flow in the Yegua Creek below Somerville Dam to 7,510 cfs with a peak stage of 12.16 feet. These are the highest stage and flow recorded at the Yegua Creek near Somerville

since the construction of the dam. The inflow for the month of May 2017 was 414,000 acre-feet where 40,000 acre-feet is the monthly norm.

o. Storm of August 2017. In the first week of August 2017, moderate rains fell on the Yegua Creek watershed drenching the soil. The super intense rains caused by Hurricane Harvey occurred during the last week of August. Overnight rainfall amounts of 8 inches were common. These heavy rains produced catastrophic flooding across Central and Southeast Texas. Nearly 100 deaths and at least \$125 billion in damages were attributed to this storm across Texas.

Rainfall amounts recorded on or near the Yegua Creek watershed between 25 and 29 August were as follows: Brenham 16.90 inches, Caldwell 14.57 inches, Dime Box 14.85 inches, Fedor 3SE 16.34, Gibbings 21.06 inches, Lexington 13.25, and Somerville Dam 13.97 inches. The heavy rains brought by Harvey triggered moderate to major flooding in lowlands along the Yegua Creek and its tributaries in Lee, Burlleson and Lee Counties. Homes, businesses, and roads were flooded due to the intense rains.

The Middle Yegua Creek peaked on 28 August at a stage of 13.36 feet with a corresponding flow of 5,640 cfs. The East Yegua Creek peaked at a stage of 12.39 feet with a corresponding flow of 5,780 cfs. Somerville Lake had a peak inflow of 101,000 cfs on 28 August. Between 27-29 August, Somerville Lake experienced an inflow of 243,800 acre-feet. On 27 August the lake elevation was one foot below the top of conservation pool and rose 15 feet in less than 48 hours. The lake continued to rise over the next week to a peak elevation of 255.00 feet on 5 September. Somerville Dam reduced the flow in the Yegua Creek in the city of Somerville to a peak of 2,640 cfs.

p. Storm of May 2019. In May of 2019, warm moist air from the Gulf of Mexico caused widespread flooding that spanned from Texas to Michigan. Heavy rains fell in the Yegua Creek watershed during this event and caused record flows at the East and Middle Yegua Creek gages near Dime Box. The peak stage at the East Yegua Creek was 13.95 feet, with a corresponding flow of 11,300 cfs. The peak stage of the Middle Yegua Creek was 15.56 feet, with a corresponding flow of 14,100 cfs.

The USGS historical information of all Major Floods is listed in Supplementary Table 4-8 (pg. T4.8-1). The data shown in the table covers the period 1900 to 2019. Figures 4-7 through 4-14 show the high lake elevation and releases at Somerville Lake during the flood events.



Figure 4-7. Somerville Dam Overtopped



Figure 4-8. High Releases in Channel



Figure 4-9. High Releases at Dam Outlet



Figure 4-10. High Releases in Channel

**4-07. Runoff Characteristics.**—The Yegua watershed is characterized by undulating topography with moderate slopes, wide valleys, and a range of low rolling hills. There are no upstream or downstream projects. There are levees downstream, located along the Brazos River, in Fort Bend and Brazoria Counties. Seven storms during the period of 1926–1947 were analyzed to calculate the infiltration rates and initial losses for the SDF. Based on the rainfall and run-off data used in the study, the infiltration rates and initial loss varied from 0.08 to 0.20 inches per hour and 0.90 to 1.60 inches, respectively. The infiltration rate and initial loss used for the SDF was 0.08 inch per hour and 1.0 inches, respectively.

The computed monthly and annual inflow volumes, based on change in lake storage, are shown in Table 4-9 (pg. T4.9-1). The monthly inflow volume exceedance frequency curves, based on data from 1939 to 2016 are shown on Plates 4-4 through 4-15. Table 4-10 shows the monthly inflow volume frequency for the 5-, 10-, 25-, and 50-year events.



**Figure 4-11. High Lake Elevation**



**Figure 4-12. High Water in Park**



**Figure 4-13. High Water in Park**



**Figure 4-14. High Water During Flooding**

**TABLE 4-10**

**Somerville Lake Monthly Inflow Volume Frequency**

MONTH	Inflow Volume in Acre-Feet			
	Frequency of Occurrence in Years			
	5	10	25	50
January	41,688	71,981	81,337	112,872
February	52,059	71,793	75,673	198,407
March	43,313	77,334	89,127	94,488
April	43,273	79,288	124,127	140,524
May	58,752	84,600	181,711	385,038
June	51,719	95,780	140,849	175,423
July	9,457	18,752	62,278	156,118
August	5,926	11,988	82,291	142,906
September	10,097	15,177	66,354	122,438
October	23,082	53,769	126,468	157,200
November	29,357	68,365	114,772	151,332
December	39,601	95,164	131,757	173,542

NOTE: Based on computed inflows for period January 1939 to December 2019.

**4-08. Water Quality.** Texas Commission on Environmental Quality (TCEQ) publishes the assessment reports for the quality of surface waters for the Brazos River basin in the biennial Integrated Report (formerly called the “Texas Water Quality Inventory and 303(d) List”) that evaluates the quality of all surface waters in Texas. The Integrated Report is prepared according to Clean Water Act Sections 305(b) and 303(d). In the report, the TCEQ classifies water bodies based on the body’s ability to support its designated uses, in other words its “Level of Support”.<sup>7</sup>

According to, the 2016 Region G Water Plan, Somerville Lake has experienced several fish kills which may be attributed to both elevated and depressed pH levels. Such shifts in pH level can be caused by fluctuations in blue-green algae population. The results of the TCEQ 2018 Integrated Report are reproduced in Tables 4-11A and 4-11B. In this report, elevated chlorophyll levels may be an indication of blue-green algae growth in the reservoir.

The USGS sampled six sites for Somerville Lake on three different occasions in 2005 (11 January 2005, 19 April 2005, 9 August 2005)<sup>8</sup>. The mean concentrations of the various

<sup>7</sup> [www.tceq.state.tx.us/waterquality/assessment/12twqi/twqi12](http://www.tceq.state.tx.us/waterquality/assessment/12twqi/twqi12)

parameters are shown in Table 4-11C. The sampling results indicate that the levels of the various biological and chemical constituents monitored are generally within the criteria set by the Texas Department of Water Resources.

**TABLE 4-11A**

**TCEQ Integrated Assessment Report General Use, Water Supply Use, and Recreation Use,**

**2018**

Major Constituents	Mean Concentration	LOS
Dissolved Oxygen Screening Level	—	NC
E. coli	99.67	FS
Total Dissolved Solids	366.70	FS
pH (Standard Units)	—	FS
Temperature, F	—	FS
Ammonia Nitrogen (mg/l as N)	—	NC
Nitrate (NO4)	—	NC
Chloride (CL)	76.83	FS
Sulfate (SO4)	59.09	FS
Orthophosphorus	—	NA
Phosphorus	—	NC
Chlorophyll	23.09	CS
Fish Kill Reports	—	NA

LOS: Level of Support

FS: Fully Supporting

NC: No Concern

NA: Not Assessed

CS: Screening Level Concern

CN: Use Concern

<sup>8</sup>nwis.waterdata.usgs.gov/nwis/qwdata?state\_cd=tx&format=station\_list&group\_key=county\_cd&inventory\_output=0&rdb\_inventory\_output=file&TZoutput=0&pm\_cd\_compare=Greater%20than&radio\_parm\_cds=all\_parm\_cds&qw\_attributes=0&qw\_sample\_wide=wide&rdb\_qw\_attributes=0&date\_format=YYYY-MM-DD&rdb\_compression=file&list\_of\_search\_criteria=state\_cd

**TABLE 4-11B**

**TCEQ Integrated Assessment Report Aquatic Life Use and Fish Consumption Use, 2018**

Major Constituents	Mean Concentration	LOS
Dissolved Oxygen 24hr average	—	NA
Selenium	0.29	FS
Chrysene	0.10	NC
Naphthalene	—	NA
Phenanthrene	—	NA
Pyrene	—	NA
Benz(a)anthracene	—	NA
Hexachloroethane	—	NA
Nitrobenzene	—	NA
Chloroform	0.50	NC
Di-n-butyl phthalate	—	NA
Hexachlorobutadiene (HCBd)	0.11	NC
Fluorene	—	NA
Dibenz(a,h)anthracene	—	NA
Benzo(a)pyrene	—	NA
Anthracene	0.13	NC
Acenaphthylene	—	NA
Acenaphthene	—	NA
Fluoranthene	—	NA
Ethylbenzene	0.50	NC
Benzene	0.50	NC
Toluene	1	NC
Fluoride	0.33	FS

LOS: Level of Support  
 FS: Fully Supporting  
 NC: No Concern  
 NA: Not Assessed  
 CN: Use Concern

**TABLE 4-11C**  
**USGS Water Quality Sampling**

Major Constituents	Mean Concentrations (1)				
	Station AC (2006)	Station BC (1991)	Station DC (1991)	Station EC (1991)	Station FC (1991)
Dissolved Oxygen@ 1.0 ft depth	9.8	7.8	7	5.4	6.8
Dissolved Oxygen @ 10.0 ft depth	—	3.7	4.9	3.7	0.6
Specific Conductance, mho/cm	540	320	291	330	360
Total Dissolved Solids	—	—	—	—	—
pH (Standard Units)	9.4	8.1	8.7	8.2	8.6
Temperature, F	88.5	87.8	86.9	86	87.8
Alkalinity (mg/l as CaCO <sub>3</sub> )	—	—	54	—	52
Hardness (mg/L as CaCO <sub>3</sub> )	—	—	95	—	107
Transparency (M)	1.5	—	—	—	0.4
Turbidity (NTU)	4.7	—	—	—	—
Geosmin	0.005	—	—	—	—
2-Methylisoborneo	0.01	—	—	—	—
Microcystin	< 0.1	—	—	—	—

(1) Measurements are in mg/L unless otherwise stated. Mean averages are taken at a 1.0-foot depth unless otherwise stated.

**4-09. Channel and Floodway Characteristics.** Yegua Creek from river mile 20.0 to confluence of the Brazos River has a capacity of 2,500 cfs. The existing channel capacities are shown in Table 4-12.

The estimated travel time for flood flows from Somerville Dam (river mile 20.0) to the mouth of Yegua Creek is about 24 hours, to the Washington gage is about 35-63 hours, to Brazos River near Hempstead gage (river mile 193.8) is about 43-75 hours, and to Brazos River near Richmond gage (river mile 92.7) is about 68-110 hour. The flood peak travel times in the Brazos River basin are shown in Table 4-13 and Plate 4-23.

The locations of the USGS stream gages in the Brazos River basin are shown on Plate 5-1. Discharge rating curves for the key control points are shown on Plates 4-16 through 4-18. These curves are only valid for rough use. The rating curves used by the Water Resources Branch are adjusted by the USGS for changing conditions and reflect the current stage-flow relationships at the gages.

**TABLE 4-12**

**Channel Capacities on the Yegua Creek and the Brazos River**

Reach	Channel Capacity (cfs)
Yegua Creek from the Somerville Dam to the mouth	2,500
Brazos River confluence of Yegua Creek to Hempstead gage	60,000
Brazos River from Hempstead to Richmond gage	60,000
Brazos River Richmond gage to the Gulf of Mexico	60,000

Table 4-13 and Plate 4-23 show flood peak travel times and between Somerville Lake and downstream gages.

**TABLE 4-13**  
**Flood Peak Travel Times between Somerville Dam**  
**and the Gage at Richmond on the Brazos River**

Stream Gaging Station and Stream	Travel Time in Hours From:								
	Aquilla Dam	Waco Dam	Belton Dam	Stillhouse Hollow Dam	Cameron Gage	North San Gabriel Dam	Granger Dam	Somerville Dam	Bryan Gage Navasota River
<u>Aquilla Creek:</u>									
Aquilla	1								
<u>Brazos River:</u>									
Waco	12 to 16	3 to 5	—	—	—	—	—	—	—
Highbank	32 to 40	23 to 29	—	—	—	—	—	—	—
Lake Granger	—	—	—	—	—	24*	—	—	—
Cameron Gage	—	—	43 to 57	43 to 57	—	48*	24*	—	—
Valley Junction (Discontinued)	38 to 48	35 to 45	67 to 89	67 to 89	24 to 32	72 to 80	48 to 56	—	—
Bryan	54 to 70	45 to 59	77 to 103	77 to 103	34 to 46	82 to 94	58 to 70	—	—
Hempstead	80 to 106	71 to 95	95 to 127	95 to 127	60 to 82	108 to 130	84 to 106	43 to 75	30 to 42
Richmond	122 to 154	113 to 143	—	—	102 to 130	150 to 178	126 to 154	85 to 123	72 to 90

NOTES: 1. \* Retrieved from “Granger Lake Water Control Manual”, revised in April 2017.

**4-10. Upstream Structures.** There are no other structures upstream of Somerville Lake on Yegua Creek.

**4-11. Downstream Structures.** There are no other structures downstream of Somerville Lake on Yegua Creek. Somerville Lake is part of the Brazos River basin system, which is comprised of nine USACE flood control projects, known as Whitney Dam on the Brazos River, Somerville Dam on the Yegua Creek, Waco Dam on the Bosque River, Proctor Dam and Belton Dam on the Leon River, Stillhouse Hollow Dam on the Lampasas River, North San Gabriel Dam and Granger Dam on the San Gabriel River, and Aquilla Dam on Aquilla Creek.

**4-12. Economic Data.** The Yegua Creek watershed is predominantly rural, with an economy based on wholesale and retail trade, education and healthcare. Small-sized metropolitan areas such as Giddings, Rockdale, and Caldwell are located within or near the basin.

Based on the information published by U.S. Census Bureau, the population within the Yegua Creek basin has slowly increased over the last 30 years, particularly Williamson County, which contains suburbs of Austin, TX. Washington and Williamson Counties, which partially intersect the edges of the watershed, have grown more rapidly than the rural Burleson and Lee Counties which make up the majority of the watershed. Population projections indicate that growth is anticipated to continue. Sectors that are typically heavy consumers of water include: agriculture and livestock. Most employment in the area comes from education and healthcare as well as transportation. Water use in the watershed area is approximately 40 percent municipal, 40 percent agricultural, and 20 percent mining, manufacturing and steam-electric.<sup>9</sup> The most concentrated water uses in Hill County is agricultural use.

The following sections provide information on population, agricultural production, and industries in the counties within the Yegua Creek basin and surrounding areas.

a. **Population.** Somerville Lake lies primarily in Lee and Burleson Counties, though the watershed intersects Washington, Williamson and Milam Counties as well. Based on the 2010 U.S. Census Bureau data, Lee County has a population of 16,612, of which 29 percent (or 4,868) is in Giddings, the county seat. According to the same data, Burleson County has a population of 17,187 of which 24 percent (4,116) is in its county seat, Caldwell. Washington County has a population of 33,718, of which 47 percent (or 15,846) is in Brenham. Milam County has a population of 24,757, of which 22 percent (or 5,518) is in Cameron. Williamson County has a population of 422,679, of which 11 percent (or 47,400) is in Georgetown. Caldwell is 16 miles north-northwest of the lake. Giddings is 20 miles southwest of the lake. Brenham is 16 miles southeast of the lake. Cameron is 43 miles northwest of the lake. Georgetown is 66 miles west-northwest of the lake.

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<sup>9</sup> [www.twdb.texas.gov/waterplanning/rwp/regions/g/](http://www.twdb.texas.gov/waterplanning/rwp/regions/g/)

The population growth of the five counties within the Yegua Creek basin since the construction of Somerville Lake is shown in Table 4-14. Although varying proportions of the total population of the counties listed lie within the watershed boundaries, the entire population of each county is provided.

**TABLE 4-14**

**Population Growth of Counties within the Yegua Creek Basin**

County	1980	1990	2000	2010
Lee	10,952	12,854	15,657	16,612
Burleson	12,313	13,625	16,470	17,187
Washington	21,998	26,154	30,373	33,718
Milam	22,732	22,946	24,238	24,757
Williamson	76,521	139,551	249,967	422,679

NOTE: Source: Census.gov

b. Agriculture. The predominant land use in the Somerville Lake watershed and surrounding area is for agriculture. According to the 2011 Brazos G Regional Water Plan, irrigation and livestock comprises about 40 percent of the region’s water use.<sup>10</sup> This amount of water use is projected to hold constant in coming decades. Table 4-15 lists the acreage of cropland planted in each major crop, the total agricultural acreage, the quantity of livestock, and the agricultural income for each county during the year 2012.

c. Industry. The Yegua Creek basin primarily covers Lee and Burleson Counties, though it also contains parts of Washington, Milam, and Williamson Counties. According to U.S. Census employment data, the major industries in the region are wholesale and retail trade, education and agriculture, ranching and hospitality. According to the 2016 Region G Water Plan, municipal and industrial use comprises about 40% of the region’s total water use and is projected to increase to 50 percent by 2060.<sup>11</sup> Table 4-16 gives the estimated number of people employed in various industries in each county, as compiled by the 2012 United States Census.

<sup>10</sup> [www.twdb.texas.gov/waterplanning/rwp/regions/g/](http://www.twdb.texas.gov/waterplanning/rwp/regions/g/)

<sup>11</sup> [www.twdb.texas.gov/waterplanning/rwp/regions/g/](http://www.twdb.texas.gov/waterplanning/rwp/regions/g/)

**TABLE 4-15****Agricultural Production for Major Counties in the Yegua Creek Basin, 2012**

Product	Lee County	Burleson County	Washington County	Milam County	Williamson County
Corn (acres)	782	14,194	71	26,443	77,643
Cotton (acres)	—	12,625	1,070	6,285	17,942
Oats (acres)	343	D	D	806	2,845
Sorghum (acres)	102	2,842	170	13,411	23,464
Wheat (acres)	112	D	1,300	14,156	17,939
Cropland Planted (acres)	44,136	81,183	89,366	143,011	211,581
Land in Farms and Ranches (acres)	318,216	335,346	368,823	527,871	558,622
Cattle (1000 head)	57	53	61	65	70
Crop Market Value*	120,870	34,301	11,393	38,485	74,987
Livestock Market Value*	25,691	55,785	34,334	106,243	54,661
All Agriculture Market Value*	38,561	90,059	45,727	144,728	129,648

NOTES: 1. (D) Withheld to avoid disclosing data for individual farms.

2. Data from 2012 Census of Agriculture, prepared by National Agricultural Statistics Service, U.S. Department of Agriculture.

3. \*Quantity given in \$1,000s.

**TABLE 4-16**

**Employment in Counties within the Yegua Creek Basin, 2016**

Industry	Number Employed				
	Lee County	Burleson County	Washington County	Milam County	Williamson County
Agriculture, Forestry, Fishing & Hunting	741	721	597	927	2,430
Construction, Mining, Oil & Gas	934	590	1,209	788	21,961
Manufacturing	742	1,000	2,349	823	28,551
Trade, Transportation & Utilities	1,354	1,335	2,678	1,769	48,965
Finance, Insurance, & Real Estate	321	247	691	498	20,884
Professional, Scientific & Business Services	480	469	780	379	39,467
Education & Healthcare	1,516	1,940	3,743	2,202	53,428
Arts, Leisure & Hospitality	596	467	1,114	673	21,191
Communication & Information	103	79	229	101	7,191
Public Administration	391	254	503	644	15,343
Other Services	467	397	784	456	13,391
<b>Total</b>	<b>7,645</b>	<b>7,499</b>	<b>14,677</b>	<b>9,260</b>	<b>272,802</b>

NOTE: Data from the United States Census, 2012.

d. Flood Damages. The flood damages prevented in the Yegua Creek basin by Somerville Dam and Lake during fiscal year 2019 were estimated to be \$45,299,400. The cumulative damages prevented since the completion of the project in 1967 through 2019 are \$290,671,900, and the average is \$5.59 million per year.

**CHAPTER V – DATA COLLECTION AND COMMUNICATION NETWORKS**

**5-01. Hydrometeorological Stations**

a. Facilities. The Water Resources Branch of the USACE, Fort Worth District, the NWS, and the USGS cooperate to collect hydrometeorological data and maintain a reliable communication network. Plate 5-1 shows the locations of the USGS stream gages in the Brazos River basin. Commercial television weather services provide current radar and forecasted weather conditions to assist the Water Resource Branch in monitoring storm events.

1. Precipitation Gages. The NWS and USGS maintain a network of rain gages throughout the Yegua Creek basin. The NWS precipitation gages used to forecast runoff in the Yegua Creek watershed are listed in Table 5-1 and all the pertinent rain gages in the basin are shown on Plate 5-3, respectively.

**TABLE 5-1**

**Upstream NWS Precipitation Gages**

Name of Station	Description	Name of Station	Description
Brenham 8.7 NW		Lexington 2.3 SSW	
Burton 5.3 NNE		Lexington 2.4 E	
Carmine 3.1 WNW		Paige 7.5 NNW	
Dime Box		Rockdale 3.6 SSW	
Fedor 3 SE		Rockdale 1.7 S	
Giddings 5 E		Somerville 6.7 WSW	
Giddings 7.3 NW		Somerville Dam	
Lexington		Thrall 10.8 SSE	
Lexington 4.8 W		Thrall 10.5 SSE	

2. Weather Radar Sites. The NWS maintains 12 Doppler radar sites across Texas for surveillance of immediate weather conditions. The NWS also cooperates with the Department of Defense to obtain radar information from four military sites in Texas.

3. Stream Gages. The USGS maintains data for 4 stream gages in the Yegua Creek basin, with all of those currently recording. These gages are listed in Table 5-2A. The stream gages designated as key stations for forecasting and regulating Somerville Dam are listed in Table 5-2B. A hydrologic gage network was established for use in connection with the operation of the Somerville Dam. The travel times for flows from points in the middle and lower Brazos River basin are shown on Plate 5-2.

**TABLE 5-2A**

**USGS Stream Gages in the Yegua Creek Basin**

Station Number	Name of Station	Description
08109700	Middle Yegua Creek near Dime Box	Recording
08109800	E. Yegua Creek near Dime Box	Recording
08110000	Yegua Creek near Somerville	Recording
08110100	Davidson Creek near Lyons	Recording

**TABLE 5-2B**

**Regulating Stations for Somerville Dam**

Station Number	USGS Gage Station	Description
08108700	Brazos River at SH 21 nr Bryan	Recording
08109700	Middle Yegua Creek near Dime Box	Recording
08109800	East Yegua Creek near Dime Box	Recording
08110000	Yegua Creek near Somerville	Recording
08110500	Navasota River near Easterly	Recording
08111500	Brazos River near Hempstead	Recording
08114000	Brazos River at Richmond	Recording

b. Reporting. Data Collection Platforms (DCPs) have been installed at all USACE Fort Worth District lakes, and at numerous stream gages and precipitation stations. The DCPs transmit hydrometeorological data using the Geostationary Operational Environmental Satellite (GOES) to the NOAA Center in Wallops Island, Virginia. The data are then decoded and re-

transmitted using Domestic Satellites (DOMSATs), making the data available for nationwide reception. The Water Management Office captures, processes, and stores the data in the Fort Worth District's Water Control Data System (WCDS).

The Water Management Office collects and stores the majority of hydrometeorological data in the WCDS. Thus, hourly lake elevations and stream gage stages are stored in the WCDS network. Some meteorological and hydropower data are collected by telephone. Project personnel collect precipitation, evaporation, and maximum and minimum air temperature data from weather stations. The information is reported to the Water Management Office by e-mail or sometimes by facsimile and telephone.

The Water Management Office personnel use the data in the WCDS to operate the 27 lakes that the Fort Worth District manages. All the data entered into the WCDS is stored in a database and used for water management decisions, to generate reports, and to conduct hydrologic studies. The Water Management Office also serves as a source of hydrologic data for state and local government agencies and the general public.

c. Maintenance. Maintenance costs are shared amongst USGS, NWS, USACE, TWDB, and various river authorities. Maintenance and repair of the weather station instrumentation are the responsibilities of the NWS. Maintenance and repair of stream gaging stations are the responsibilities of the USGS. Assistance in gage repair can be obtained by contacting the USGS in Fort Worth, Texas, at (817) 263-9545.

**5-02. Water Quality Stations** TCEQ and BRA monitor water quality using 124 active monitoring stations throughout the Brazos River basin.<sup>12</sup>

a. Facilities. The six designated sites where USGS water quality samples were taken for Somerville Lake are Stations AC, BC, DC, EC and FC. The chemical, biological, and field parameters were measured at these seven sites. Table 4-11C shows the most recent data for constituents sampled on Somerville Lake.

The Brazos River basin is divided into 124 segmented water bodies by TCEQ to report water quality information. The Segment 1212, "Somerville Reservoir", is designated to provide the water quality data for the reservoir.

b. Reporting. The USGS summarizes and publishes its collected water quality data annually in the "Water Resources Data: Texas" book for its current sampling locations. However, Somerville Lake is not sampled yearly and only years for which it was sampled are published in the yearly data book.

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<sup>12</sup> <https://www.tceq.texas.gov/waterquality/assessment/02twqi/basins/brazos.html>

The “Texas Integrated Report of Surface Water Quality”, formerly called the “Texas Water Quality Inventory and 303(d) List”, evaluates the quality of surface waters in Texas, and provides resource managers with a tool for making informed decisions when directing agency programs. The TCEQ publishes the report every 2 years (in even-numbered years). The water quality assessment results for Somerville Lake are included in the report.

c. Maintenance. Maintenance and calibration of the equipment related to water quality are conducted or monitored by USGS and TCEQ.

### **5-03. Sedimentation and Degradation Ranges**

a. Facilities. The sedimentation ranges, which are needed to determine the rate of sedimentation and the location of sediment deposits, were established as directed in ER 1100-2-240 and Engineer Manual (EM) 1100-2-4000.

1. Sedimentation Ranges. Somerville Lake was divided into sedimentation ranges which run normal to the original stream flow of water through the basin. These are shown on Plate 4-3. The elevations and locations of the monuments are referenced to appropriate datum systems established by other Federal agencies. Monuments are used at multiple locations for future survey at common reference points. The TWDB uses bathymetric survey independent of the USACE established sedimentation ranges.

2. Degradation Ranges. The degradation ranges in the Somerville Lake area are shown on Plate 4-3. Each range consists of two or more permanent monuments placed at selected locations along the discharge channel downstream of the dam.

b. Reporting. The frequency of sedimentation surveys will depend on hydrologic conditions and the need for determining sediment deposition and storage depletion. Normally, a period of no more than 20 years would elapse between sedimentation surveys. However, sedimentation surveys are currently done periodically depending on need and funding availability. Complete or partial surveys will be made of degradation ranges, as found necessary on the basis of reconnaissance.

For Somerville Lake, five surveys have been performed since 1959. USACE completed the original volumetric survey in 1959 and in 1992. The other volumetric surveys were completed by TWDB in 1995, 2003, and 2012. The 2012 TWDB survey results indicated that the surface area had reduced from 11,656 acres to 11,395 acres and the volume reduced from 164,974 acre-feet of water in the original design to 150,293 acre-feet of water at the top of the conservation pool elevation 238.0 feet.

c. Maintenance. Project personnel will inspect the survey monuments to determine their respective conditions. A report will be forwarded to the Water Management Office

following the inspection that describes the condition of the monuments not found, destroyed, or otherwise disturbed. Monuments and witness points that have been damaged or are missing will be replaced and reset. Completion of monument surveys is dependent on funds and personnel availability.

**5-04. Recording Hydrologic Data.** Hydrologic information is recorded as the Water Management Office receives it. The recording procedures for each type of data are as follows:

a. Stages and Lake Elevations. Stream stage and lake stage data are recorded every 15 minutes and transmitted every hour by the DCPs through a GOES Satellite to Wallops Island, VA, then retransmitted to a DOMSAT. The District's WCDS accesses the data by a downlink. The recorded data and monthly data summaries are kept in the reservoir logbooks and in other Water Management Office files. Additional data sets from non-Corps reservoirs are received from the Internet, and/or by telephone.

b. Precipitation. Hourly precipitation data from numerous DCPs across the state are transmitted to the Water Management Office in the manner described in paragraph 5-04. A. The Water Management Office also receives precipitation data from the NWS and other precipitation observers through the Automated Field Observations and Services (AFOS) system and stores the data in the WCDS. The NWS daily state precipitation summary is filed and retained for approximately 1 year. The Water Management Office receives daily rainfall and weather reports from 22 of the 25 District lakes, including Somerville Lake.

c. Temperature Data. The lake personnel record the daily maximum and minimum air temperatures at the lake.

d. Radar Reports. The Water Management Office receives radar images and weather information from commercial weather services by cable TV. This information is used primarily for short-term decision making. The weather reports are updated throughout the day by the NWS.

**5-05. Communication Network.** Somerville Lake is served by telephone, facsimile, email, and cell phone. The telephone number for the Somerville Lake project office is (254) 622-3332.

The National Telecommunications and Information Administration (NTIA), Department of Commerce, assigned radio frequencies exclusively to USACE. The assigned VHF FM frequencies are 163.5125 and 163.4375 MHz. Both VHF FM frequencies are maintained at most project offices and in some vehicles assigned to the Fort Worth District. The radio equipment using the VHF FM frequencies will only transmit about 20 miles. Therefore, radio communications cannot be made between the Somerville Lake project office and the Fort Worth District Office, or between the other district lakes.

If necessary, the Fort Worth District Emergency Operation Center (EOC) can contact other districts in the SWD by HF side-band radio during an emergency. This radio frequency is good for communications between the EOCs in Fort Worth, Texas, Galveston, Texas, Little Rock, Arkansas, and Tulsa, Oklahoma.

**5-06. Communication with the Project.**

a. Water Resources Branch with Project Office. The primary mode of communication between the Somerville Lake project office and the Water Resources Branch is by telephone. In addition, the project is served by email, and cell phone as backups to the primary mode of telephone. Should communication between the project and the District be disrupted, the Lake Manager would direct regulation of the lake on his or her own initiative in accordance with the Emergency Rules and Regulations listed in Section 7-05 and Exhibit C of this manual.

b. Between Project Office and Others. The Lake Manager will maintain a current list of the residents and/or property endangered or inconvenienced by large and/or prolonged releases in order to give adequate warning before such releases. Warning of possible flood conditions can be conveyed by telephone, radio, television, citizens-band radio, use of law enforcement personnel, and civil defense agencies and their communications systems. National Guard, Reserve Military Units, and citizen volunteers may also be needed to convey warning messages. Plate 5-4 shows a schematic of the primary lines of communication for use in routine communications and in case of an emergency.

**5-07. Project Reporting Instructions.** Both daily lake operation information and emergency lake operation information will be submitted to the Water Management Office of the Fort Worth District.

a. Daily Operations. Daily reservoir data will be submitted to the Water Management Office on regular working days by electronic mailing between 0800 and 0845 hours each morning for transmission of hydrologic data. For electronic mailing, the Internet Website is: (<http://www.swf-wc.usace.army.mil>). Project personnel will confirm release changes and promptly report all scheduled or unscheduled equipment outages affecting water control by telephone at (817) 886-1551 or by email at CESWF-OD-L@usace.army.mil. The Water Resources Branch may request additional information as needed.

Daily data reported to the District Office include the following: (1) As of 0800 hours – Reservoir elevation: number of gates open and increments of opening, precipitation and evaporation for the preceding 24 hours, weather conditions and maximum and minimum temperatures, if required. (2) Each gate operation – All changes in gate operation, including time of gate operation, increments of opening, and reservoir elevation at time of each gate operation for the preceding 24 hours. (3) Stage report – During flood periods, besides the regular 0800-hour reading from

the reservoir and reporting gages, include the 0000-hour (midnight) reading, which may be read from the recorder charts.

b. Emergency Operations. In the event of an emergency or flood situation, the Lake Manager will notify key personnel in the Fort Worth District Water Management Office. A list of these names will be posted on the project bulletin board. These names are shown on page iii, Notice to Users of This Manual. If unusual conditions arise during non-working hours, one of the persons listed on page iii should be contacted.

**5-08. Warnings**. Before any major increase in discharge due to operation of the gates, warning of such operation shall be given to parties in the immediate area downstream of the dam. A warning horn will be sounded for 10 seconds to alert people downstream at least 2 minutes before any appreciable increase or decrease in the release rate from the dam. After the horn sounds, the operator will observe the downstream area to ensure that no one remains there. Signs in the discharge area shall state the meaning of the warning signal. The law enforcement agencies shown in Table 5-3 may also be contacted to assist in warning the public and evacuating downstream areas.

**TABLE 5-3**

**Law Enforcement and Key Somerville Project Telephone Numbers**

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Agency	Telephone Number
Texas Department of Public Safety, Austin, Texas	(514) 424-2000
Texas Department of Public Safety, Caldwell, Texas	(979) 567-0106
Texas Department of Public Safety, Brenham, Texas	(979) 542-1726
City of Somerville Police	(617) 625-1600
Somerville Lake Manager	(979) 596-1622
Three Rivers Regional Office	(254) 978-0031
BRA Office Dispatch	(254) 939-2461
Sheriff, Lee County	(979) 542-2800
Sheriff, Burleson County	(979) 567-4343

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## **CHAPTER VI – HYDROLOGIC FORECASTS**

**6-01. General.** Hydrologic forecasts of stream flow amounts are made daily to maintain the status of the Yegua Creek basin for flood control and water supply.

a. Role of Corps of Engineers. Hydrologic forecasts are made by the Water Management Office for use in the regulation of lakes to maximize flood control, water supply, and other authorized purposes. The forecasts are furnished to project personnel and other USACE personnel with a need for this information. Planned changes in the release rates are furnished to the National Weather Service River Forecast Center (NWS-RFC) in Fort Worth, Texas. The Public Affairs Office, which is kept informed of the lake conditions, makes news releases.

b. Role of Other Agencies. The NWS-RFC provides information about river flow and flood forecasts to USACE and the general public. The NWS Weather Wire circuit disseminates this information to subscribing government agencies and news media. The National Weather Service-Weather Service Forecast Offices (NWS-WSFO) issues routine reports containing the following information:

1. Weather forecasts. (daily forecasts, severe weather forecasts, and 5-day extended forecasts).
2. Quantitative precipitation forecasts: Four successive 6-hour precipitation forecasts are updated every 12 hours. Three successive 24-hour precipitation forecasts are updated every 12 hours.
3. Three-day river stage forecasts, when conditions warrant, from the NWS-RFC.
4. Urgent priority messages such as severe weather warnings, severe weather watches and statements, and instructions from civil defense centers during emergency situations.
5. Other information reports, on a periodic basis:
  - (a). Winter weather and road conditions
  - (b). River and flood warning bulletins
  - (c). Damage reports
  - (d). Thirty-day weather forecasts

**6-02. Flood Control Forecasts.**

a. Requirements. Flood forecasts are required whenever substantial rainfall has fallen above or below Somerville Dam or during the evacuation of the flood pool from Somerville Lake.

b. Methods. Water Managers continually monitor and adjust water releases at USACE projects based on ever-changing hydrometeorological conditions. The Corps Water Management System (CWMS) is the automated decision support tool developed for USACE Water Managers. CWMS track the hydrologic cycle and performs scenario-based forecasts that can include stage and flow forecasts, project release scheduling and release review, emergency activation alerts, inundation mapping and economic damage reporting. The CWMS Automated Information System was developed by USACE Hydrologic Engineering Center (HEC) under funding from the Water Management Community of Practice and has been implemented to varying degrees at various USACE Water Management Offices. A CWMS forecasting model has been developed for the Brazos River basin by the Fort Worth District, HEC, and USACE MMC (Modeling, Mapping, and Consequences) Production Center. The USACE makes the following forecasts with assistance from the NWS.

1. Predicting Inflow into Somerville Lake. A rainfall-runoff HEC-HMS model was developed within CWMS by the Fort Worth District for the Yegua Creek basin above Somerville Dam. This model is used to predict the inflow into Somerville Lake. The inflow forecasting model consists of HEC-METVUE and HEC-HMS models that are linked to real-time data with CWMS. Both models use a 1-hour time interval.

Precipitation estimates are available from two main sources: precipitation gages and radar. The NWS uses the data from these sources to produce a suite of hydrologic forecasts. Weather Surveillance Radar–1988 Doppler (WSR-88D), also known as Next Generation Weather Radar (NEXRAD), observes the presence of severe weather and calculates the speed and direction of the weather. The WSR-88D also provides estimated quantitative area precipitation amounts.

The NWS adds to the accuracy of the WSR-88D quantitative precipitation estimates (QPE) through a procedure for improving the radar estimates of rainfall that is referred to as “ground truthing”. The precipitation data set produced from the ground truthing is known as the Multi-Sensor Precipitation Estimate (MPE). The NWS and other agencies may poll some automated gages on a 4-hour basis, and the poll results may also be used for ground truthing.

Hourly NWS gridded rainfall data is downloaded from the NWS West Gulf Forecasting Center in real-time and processed into HEC-DSS format using HEC-METVUE. The HEC-HMS model is then used to compute runoff from the gridded precipitation. Initial and uniform losses are adjusted to real-time basin conditions within CWMS. These losses are subtracted from the precipitation hyetograph at each subbasin grid cell to obtain the rainfall runoff hyetograph. Each grid cell hyetograph is then routed and combined by the HEC-HMS model to obtain the total

inflow hydrograph for Somerville Lake. The Yegua Creek Model subbasin is shown on the watershed map, Plate 4-1.

There is a DCP at Somerville Lake which records the lake elevation. An inflow hydrograph can be computed using observed lake elevations, an elevation-capacity table, and hourly lake releases.

The HEC-HMS model is executed with forecast time and an initial estimate of loss rates as determined by the user. The computed hydrographs at Somerville Lake are compared with observed runoff volume, shape, and time of peak. If the comparison is not favorable, then subbasin loss rates are adjusted accordingly and the HEC-HMS model is re-executed. This calibration process is repeated until the comparisons are favorable. This process ultimately results in a forecasted inflow into Somerville Lake.

2. Predicting Lake Levels. The forecasted inflows as computed by the HEC-HMS model are routed into Somerville Lake. The model will add the routed inflows to the storage in the lake and subtract the releases to forecast the lake elevations.

3. Predicting Flow at Downstream Control Points. The flood forecasting system is used to predict flows downstream of Somerville Lake in the Brazos River at Waco, Bryan, Highbank, Hempstead, and Richmond gages. The predicted flows for the control points located downstream of the project are computed by combining the estimated local flow in the river channel and the potential routed releases from Somerville Lake. If the predicted flows exceed the downstream channel capacity, no releases will be made.

(a). Estimating Local Flow. Local flow forecasts can be obtained from two sources: the NWS-RFC's river forecast model or Water Management Office HEC-HMS model. If the latter method is used, the subbasin hydrographs for the uncontrolled areas above Somerville Lake are computed using the same procedure discussed in paragraph 6-02.b.(1).

(b). Routing Reservoir Releases to Downstream Control Points. The HEC-HMS model is used to route releases from Somerville Lake to downstream points by using the Modified Puls and Muskingum flow routing methods. The releases are determined based on the predicted available channel capacity at the downstream control points. The determined releases are then incorporated into the HEC-HMS model. The observed flows at the downstream control points on the Brazos River are provided by stream gages. The downstream control points are located on the Brazos River at Hempstead and Richmond gages. Plate 4-21 shows flood crest travel times in the Brazos River basin from Whitney Dam to the Brazos River at Richmond gage.

(c). Regulated Flow. The releases from Somerville Lake are measured by the gage on the Brazos River at Hempstead.

**6-03. Conservation Purpose Forecast.** The BRA has contracted for conservation storage in Somerville Lake of 100 percent of the total storage space in the reservoir below elevation 238.0, which was estimated to be 160,000 acre-feet in the initial design. The conservation storage is used for water supply, fish and wildlife, and general recreation. Conservation storage forecasts are made when needed based on forecasted inflow, historical average evaporation, and estimated demand. Releases from the reservoir for conservation purposes will be made on receipt of written daily requests from the BRA. In the event that the BRA finds it necessary to modify its schedules for releases because of varied demands during any period, then its designated representative will contact Fort Worth District Water Management Office and indicate the revised demands, a confirmation of which will be furnished in writing.

**6-04. Long-Range Forecast.** Long-range weather forecasts are made by the NWS Climate Prediction Center, and available at the “Outlooks Index” in the website [http://www.cpc.ncep.noaa.gov/products/OUTLOOKS\\_index.shtml](http://www.cpc.ncep.noaa.gov/products/OUTLOOKS_index.shtml). The Outlooks website contains both temperature and precipitation forecast for “Monthly to Seasonal” and “Extended Range” categories. Special products, such as current UV Index forecasts and soil moisture outlooks are also available on this website.

**6-05. Drought Forecast.** Appendix X, Drought Contingency Plan, for the Brazos River Basin Master Manual provides information on historical droughts in the basin and methods to determine the severity of a drought. In general, the three factors used to determine the severity of a drought are the lake content, lake inflow, and the Palmer Drought Severity Index (PDSI). The PDSI reflects the cumulative excess or deficiency in moisture relative to seasonal norms and typically ranges from +4 to -4 but may exceed these values. A PDSI of -4 indicates that abnormally dry conditions have prevailed. The NWS publishes the PDSI about once a week. Drought conditions can be accessed at this website:  
[http://www.cpc.ncep.noaa.gov/products/monitoring\\_and\\_data/drought.shtml](http://www.cpc.ncep.noaa.gov/products/monitoring_and_data/drought.shtml)

## **CHAPTER VII – WATER CONTROL PLAN**

**7-01. General Objectives.** Somerville Dam and Lake was authorized for flood control, water conservation storage for water supply, fish and wildlife and recreation, and to provide flood protection on Yegua Creek, a tributary of the Brazos River. Flood control releases from Somerville Dam and Lake require coordination with the other flood control projects within the Brazos River basin to optimize basin wide benefits. Emergency regulations must be coordinated with the Fort Worth District Water Management Office as discussed in paragraph 7-04.

*All elevations referred to in Chapter 7, unless noted otherwise, are in feet, National Geodetic Vertical Datum of 1929 (NGVD29). The datum conversion from NGVD29 to North American Vertical Datum of 1988 (NAVD88) is:  $NGVD29 + 0.1 \text{ feet} = NAVD88$  for Somerville Dam and Lake.*

**7-02. Project Constraints.** The top of the conservation pool is at elevation 238.0 feet. The top of the flood control pool and the crest of the uncontrolled emergency spillway are at elevation 258.0 feet. Top of dam is elevation 280.0 feet. Results of the 2018 PMF Study indicate a PMF event would result in a maximum water surface elevation of 279.89 feet, with an associated spillway discharge of 487,714 cfs.

a. **Outlet Works.** The outlet works consists of a 10 foot diameter conduit, with an inlet invert at elevation 206.0 feet. The inlet is controlled by two gated sluiceways, each of which is equipped with a 5' x 10' tractor-type emergency gate (upstream position) and a 5' x 10' tractor-type service gate (downstream position). The normal rate of change in opening height for the two service gates will not exceed 1.0 gate-foot per half hour. This rate of change in gate opening height results in a rate of change in release of about 200 cfs per half hour. The gates should be operated in as symmetrical a manner as practical with an allowable difference in gate openings not to exceed one foot.

Both service gates set at 6.0 feet opening height is the normal maximum discharge (~2,000 cfs) operating condition. When both service gates are set at 6.0 feet opening height and an *emergency situation* dictates a greater rate of discharge is required, one gate should be opened from 6.0 feet to full open in one continuous operation, followed immediately by opening the other gate to full open in one continuous operation. The service gates should not be set for continuous operation at any opening height between 6.0 feet and full open, as this could produce abnormal and possibly damaging flow regimes in the outlet works and/or stilling basin.

The service gates have never been operated at full open, however, if the gates were opened fully, the rating curve estimates that discharges would exceed the downstream control capacity along Yegua Creek if the pool is above top of conservation elevation 238.0 feet. Full open operation should be considered only if an *emergency situation* dictates such action is required, and must be accompanied by careful monitoring of the outlet works and stilling basin for abnormal behavior

which might lead to significant damage. Maximum recommended gate opening height for single gate operation is 5.0 feet. A single service gate was operated at 6.0 feet opening height from 13 June to 8 August 2019 with the pool elevation ranging from ~244 to ~251 feet and no abnormal behavior was observed – but the practice is not generally recommended.

At top of flood pool elevation (258.0 feet), the maximum release through the outlet works is approximately 3,450 cfs. The Outlet Works Rating Curves for one and two gates are shown on Plate 7-3.

b. Spillway. The emergency spillway is 1,250 feet in width with a crest elevation of 258.0 feet and has a discharge capacity of 286,000 cfs, according to the 1960 Maximum Design Water Surface elevation of 274.5 feet.

The normal rates of change in release may be exceeded at the discretion of the Chief, Water Management Office. Additionally, the Fort Worth District Water Management Office, or the Lake Manager, at their discretion, may exceed the normal rates of change in release in the event of drowning, accidents, failure of operational facilities, severe weather, or other emergencies deemed to require a more rapid rate of increase or decrease in the rate of release.

**7-03. Overall Plan for Water Control.** There are eight other multi-purpose projects operated by the Fort Worth District Water Management Office within the Brazos River Basin. These eight flood control projects include Whitney, Aquilla, Waco, Proctor, Belton, Stillhouse Hollow, Georgetown, and Granger Lakes. Somerville Dam and Lake is an integral part of the USACE plan for flood control in the Brazos River Basin.

**7-04. Standing Instructions to Project Personnel.** The Fort Worth District Water Management Office will give instructions for making releases from Somerville Dam to the project personnel, as applicable. Project personnel will make gate changes as instructed to provide the required rate of release. The Fort Worth District Water Management Office should be notified if irregularities are observed such as abnormal turbulence, abnormal flow patterns, riprap displacement, and/or significant erosion. The lake will normally be regulated in accordance with the plan of regulation presented in paragraph 7-05 of this chapter.

Should an emergency situation occur, such as a power outage, inoperable gates, or a drowning, the Fort Worth District Water Management Office will be notified immediately. In the event communications with the Fort Worth District Water Management Office are disrupted, the lake regulation will become the responsibility of the Lake Manager, in accordance with Plate 7-2, “Emergency Regulation Plan” and Exhibit C, “Standing Instructions for Lake Manager” of this manual. The Lake Manager will make every effort to re-establish communications with the Fort Worth District Water Management Office.

**7-05. Flood Control**

a. General. Release of flood water from Somerville Dam and Lake will be coordinated with releases from the other eight Brazos River basin flood control projects to reduce flooding in the Brazos River basin. The lake levels will be lowered to their respective conservation pools at the earliest practical date in order to provide flood protection against potential subsequent storms.

Releases from Somerville Dam and Lake will generally be made at a rate, so that when combined with the runoff from downstream areas, will not exceed the control point capacities at the gage locations shown in Table 7-1, “Downstream Control Points”. Control point capacities will not be modified for minor stage shifts; however, control point capacities will be reassessed for significant stage changes that impact structures and/or property. For downstream travel times refer to Table 7-2. Table 7-3 refers to low flood pool typical release rates. Should the Fort Worth District Water Management Office need to deviate from the reservoir regulation plan, the Southwestern Division Water Management Office will need to be contacted for a deviation approval. Refer to Section 7-15 (Deviation from Normal Regulation) for more details regarding deviations.

b. Normal Regulation for Flood Control. Somerville Dam and Lake will be regulated to provide flood damage reduction on Yegua Creek, a tributary of the Brazos River, and function as a component of the Brazos Basin system of flood control reservoirs. Gates will be closed and will remain closed until it has been determined that the flow downstream from the dam has crested or is forecast to crest below the control point capacities shown in Table 7-1. The Normal Regulation for Flood Control schedule is described below and is also shown on Plate 7-1.

**TABLE 7-1**

**Downstream Control Points**

River Channel and USGS Gaging Station	Control Capacity (cfs)
Yegua Creek near Somerville	2,500
Brazos River near Hempstead	60,000
Brazos River at Richmond	60,000

**TABLE 7-2**

**Travel Times from Dam Site to Richmond Gage**

River Channel and USGS Gaging Station	Estimate Travel Time	Cumulative Travel Time
Somerville Dam to near Somerville	4 hrs	4 hrs
Somerville gage to Brazos River near Hempstead	48 hrs	52 hrs
Brazos River near Hempstead to near Richmond	48 hrs	100 hrs

**TABLE 7-3**

**Low Flood Pool Typical Release Rates**

Pool Elevation Range (ft)	Flood Pool Range (%)	*Daily Avg Release Rates (cfs)
238.0 – 238.5	0.0 – 1.7	80 – 100
238.5 – 239.0	1.7 – 3.4	100 – 200
239.0 – 239.5	3.4 – 5.1	200 – 400

\* Desired rate of release will vary with prevailing rates of inflow, lake evaporation, and water supply withdrawals. General objective is to evacuate from 5.1% to 3.4% of the flood pool in about one week, from 3.4% to 1.7% the following week, then from 1.7% to top of conservation pool (238.0) over an additional two to three week period.

1. **Lake elevation at or below 238.0.** No flood control releases will be made when the lake level is at or below the top of conservation pool (elevation 238.0). Releases from the conservation storage will be made as instructed by the Fort Worth District Water Management Office at the request of the Brazos River Authority (BRA).

2. **Lake elevation between 238.0 and 258.0.** When the lake elevation is above top of conservation pool elevation 238.0 feet and is forecasted to remain below top of flood pool elevation 258.0 feet, gated releases should not contribute to exceeding the control point capacities shown in Table 7-1.

3. **Lake elevation above 258.0.** When the lake elevation is above top of flood control pool and spillway crest elevation 258.0 feet, gated releases should not contribute to exceeding the control point capacities shown in Table 7-1. All flood gates should be fully closed when spillway flows equal or exceed 2,500 cfs.

c. **Emergency Regulation for Flood Control.** If communications between the Fort Worth District Water Management Office and the Somerville Dam Project Office are disrupted, the Lake Manager, on his own initiative, will direct regulation of the reservoir as described in Exhibit C - Standing Instructions to Lake Manager until communication is restored. The term "emergency reservoir regulation" applies at any time when personnel at the dam have lost communications between the District Office and the project office are disrupted. In the event of a communication failure during imminent failure of the dam due to any of the possible failure modes as described in Chapter 5 of the "Somerville Dam - Operation and Maintenance Manual", the Project Manager may open or close the outlet work gates as deemed necessary in an attempt to prevent a dam failure. Continued efforts will be made to re-establish communications with the Fort Worth District Water Management Office. The Emergency Regulation Plan is shown on Plate 7-2.

d. **Brazos River System Balancing**

1. **Unbalanced System.** In general, the Brazos River projects will be operated to approximately balance the percent of flood pool storage space utilized at each project. During the time that the Brazos River projects are not balanced, priority of releases will be given to the project with the least amount of storage capacity left in percent of storage space. Next priority goes to the project having the second least amount of capacity in percent of storage space and so forth, until all lakes are balanced or all channel capacity in the Brazos River is used. For tandem projects or projects which have significantly greater flood storage capacity, additional weighting may be given. These releases when combined with flows downstream will not exceed discharge as shown in Table 7-1.

2. **Balanced System.** Lakes in the system will be regulated insofar as practical, to maintain approximately the same available storage space in their flood control pools as measured in terms of percent flood storage occupied. For tandem projects, or projects which have significantly greater flood storage capacity, additional weighting resulting in a beneficial imbalance may be given.

**7-06. Recreation.** Recreation for Somerville Dam and Lake is included as a project purpose, however there is no authorized storage or releases specifically designated for recreation. Requests for special releases will be considered as the situation warrants. All recreation area access roads are constructed above the top of conservation pool, elevation 238.0. Access roads may be inundated as the lake level rises into the flood control pool, which may cause temporary closure of some or all parks and recreation facilities.

**7-07. Water Quality.** Water quality is not an authorized project purpose, however, compliance with Public Law 92-500 requires that all federal facilities be managed, operated, and maintained to protect and enhance the quality of water and land resources through conformance with applicable federal, state, interstate, and local substantive standards.

**7-08. Fish and Wildlife.** Fish and wildlife is an authorized purpose. The enhancement of the fish and wildlife habitat is an incidental project purpose.

**7-09. Water Supply.** The Brazos River Authority has contracted for all storage space below elevation 238.0 feet NGVD. Copies of water supply contracts dated 9 March 1962, and 21 June 1973, are in Exhibit B of this manual. Somerville Lake contains 150,293 acre-feet of conservation storage for water supply and 16,200 acre-feet for sediment accumulation.

**7-10. Hydroelectric Power.** Hydroelectric power is not a project purpose.

**7-11. Navigation.** Navigation is not a project purpose.

**7-12. Drought Contingency Plans.** When the Brazos River basin is in a drought condition and the lake levels are lower than normal, refer to the Drought Contingency Plan for the Brazos Basin, Appendix X of the Brazos River Master Manual. The plan presents a broad outline of actions necessary to manage the water resources in the Fort Worth District Water Management Office during a drought.

**7-13. Emergency Action Plan** The Emergency Action Plan (EAP) contains detailed instructions and procedures to be followed by USACE personnel at the Somerville Dam and Lake Project Office to properly handle any event at the project that could develop into an emergency condition. The most current edition of the EAP is located in the Geotechnical Branch, Fort Worth District and is dated September 2018. The contact information in the EAP is updated annually. Copies of this EAP are also available in the Fort Worth District Water Management Office and at the Somerville Dam and Lake Project Office.

**7-14. Other.** There are no other issues associated with this project.

**7-15. Deviation from Normal Regulation.** There are occasions when it is necessary or desirable to deviate from the water control plan for short periods of time. Prior approval for a deviation is obtained from the Southwestern Division Water Management Office (CESWD-RBT-W). The requirement for prior approval of action from CESWD may be suspended in extreme emergencies. All deviations will be recorded and will be stored in electronic format. Analysis of the expected impacts of a proposed deviation will include consideration of its effect on dam safety. Deviation requests usually fall into the following categories:

a. Emergencies. Emergencies that can occur are drowning(s), accidents, failure of the operation facilities, and flushing of pollutants. Under emergency conditions necessary action is

taken immediately by the Lake Manager, unless such an action creates an equal or worse condition. For emergencies, the Fort Worth District Water Management Office will be informed as soon as practicable as to the nature of the emergency and the subsequent response by telephone, email, or fax. Follow-up written documentation explaining the deviation will be furnished to the Southwestern Division Water Management Office as soon as practical.

b. Unplanned Minor Deviations. There are unplanned instances that create a temporary need for minor deviations from the normal regulation of the lake. These unplanned instances are not considered emergencies and require prior approval for deviations. Construction accounts for the majority of unplanned deviations. Possible reasons for unplanned deviations include stream crossings of pipelines, bridge work, embankment repair, utility placement, and other major construction contracts. Requests for changing release rates can vary from a few hours to a few days.

Each request is analyzed on its own merit. Consideration is given to upstream and downstream watershed conditions, potential flood threats, conditions of the lake, and possible alternative measures. In the interest of maintaining good public relations, the requests for deviation are usually approved, provided that there are no adverse effects on the overall operation of the project, or other projects. Approval of these minor deviations will be obtained from the Southwestern Division Water Management Office.

c. Unplanned Major Deviations There are unplanned instances that may be considered for major deviations from the normal regulation plan but are not emergencies. Requests for changes in release rates generally involve short time periods ranging from a few hours to a few days in an effort to minimize damages or optimize benefits. Flood control releases account for the major portion of these incidents and typical examples include project pre-releases or flows exceeding downstream channel capacity.

Each request is analyzed on its own merit. In evaluating the proposed deviation, consideration must be given to the upstream and downstream watershed conditions, potential flood threats, condition of the lakes, and possible alternative measures that can be taken. Approval of these major deviations will be obtained from the Southwestern Division Water Management Office.

d. Planned Deviations Each planned deviation is analyzed on its own merit. Sufficient data on flood potential, lake and watershed conditions, possible alternate measures, benefits to be expected and possible effects on other authorized and useful purposes will be presented with each deviation. Each recommended deviation is submitted in writing to the Southwestern Division Water Management Office for review and approval. An example of a planned deviation is a need to maintain or inspect an aspect of the project. Approval of such deviations will only be granted when the evaluations have been fully reviewed and verified to be necessary. Any concerns with “Dam Safety” will be taken into consideration as well with deviation approvals.

**7-16. Operation Curves and Tables.** The Spillway Rating Curve is shown on Plate 7-4. The Evaporation Curves are shown on Plate 7-5. The Tailwater Rating Curve in the stilling basin and at the dam site are shown on Plates 7-6 and 7-7. The Area Capacity Curves are shown on Plate 7-8. The tabulated values are shown on pages T7.4-1 thru T7.4-26 of this water control manual.

## **CHAPTER VIII – EFFECT OF WATER CONTROL PLAN**

**8-01. General.** Somerville Lake is the only reservoir in the Yegua Creek watershed above its confluence with the Brazos River and is operated in conjunction with eight other USACE dams (Whitney Dam, Aquilla Dam, Waco Dam, Proctor Dam, Belton Dam, Stillhouse Hollow Dam, North San Gabriel Dam, and Granger Dam) and three BRA dams (Morris Sheppard Dam, De Cordova Bend Dam, and Sterling C. Robertson Dam) on the Brazos River System, to provide flood control at the Brazos River near Hempstead, Texas gage and supply water to the BRA. The lake is also used for recreation and wildlife management.

### **8-02. Flood Control.**

a. Spillway Design Flood. A Spillway Design Flood study was performed for Somerville Dam at the time it was initially designed. “Design Memorandum No. 1, Somerville Reservoir, Yegua Creek, Texas, Hydrology”, dated June 1960, was prepared by USACE, Fort Worth District and later revised in Hydrology, Supplement No. 1, dated March 1961. The spillway design flood hydrographs for Somerville Dam and Lake were discussed therein.

1. Spillway Design Storm. The selection of the Spillway Design Storm as described in paragraph 3-01 of D.M. No.1, was based upon Hydrometeorological Report No. 33 (HMR-33), dated April 1956, subject: “Seasonal Variations of the Probable Maximum Precipitation East of the 105th Meridian for areas from 10 to 1,000 square miles and Durations of 6, 12, 24 and 48 Hours.”

Two pattern storms (the storm of 8-10 September 1921, at Thrall, Texas, and the storm of 27 June - 1 July 1899 at Hearne, Texas), were transposed over the watershed above the dam. Transposition of these storms produced a basin shape factor of 73 and 94 percent for the 1921 and the 1899 storms, respectively. The higher basin shape factor was adopted and the six-hour increments of the probable maximum precipitation, arranged, and adjusted by application of a 94 percent basin shape factor and adopted as the spillway design storm rainfall.

A total rainfall of 29.61 inches in 48 hours was adopted as the spillway design storm rainfall and was used in the development of the Spillway Design Storm for Somerville Dam. Rainfall excesses were computed by subtracting adopted loss rates from the rainfall rates. Flood hydrographs were computed by applying the appropriate rainfall-excesses to the appropriate unit hydrograph.

2. Minimum Infiltration Rates. Runoff factors and infiltration indices were computed on the Yegua Creek watershed above the Somerville Gage following a method described in EM 1110-2-1405, "Flood Hydrograph Analysis and Computations." Seven of the largest storms between 1926-1947 were studied to develop loss factors. Based on the rainfall and run-off data used in the study, the infiltration rates and initial loss varied from 0.08 to 0.20 inches

per hour and 0.90 to 1.60 inches, respectively. The infiltration rate and initial loss used for the SDF was 0.08 inch per hour and 1.0 inches, respectively. The total volume of rainfall runoff is 25.47 inches. The rainfall excess for the Spillway Design-Storm is shown on Plate 8-1.

3. Unit Hydrographs. Unit-hydrographs (UH) were developed from six selected storms for which hydrographs were available at the Somerville gage on Yegua Creek. Based on these storms, a  $C_t$  coefficient of 3.0 and a  $C_p$ 640 value of 500 was used to represent the natural flow. UH's were developed for 9 subareas, including the area adjacent to the reservoir, and the eight creeks above the dam site (Middle Yegua, First Yegua (East Yegua), Birch, Nails, Cedar, McCain, Burns, and Rocky). The runoff from the reservoir area was not included in the UH, but runoff rates from the reservoir area were equal to the rainfall rates and added directly to the computed spillway design flood. The 6-hour synthetic UH for flow into full reservoir was obtained by plotting the 9 UH's and adding the ordinates graphically.

4. Spillway Design Flood Hydrographs. A spillway design flood was computed for natural at dam site based on the synthetic unit hydrograph for natural flow at dam site and the 6-hour rates of rainfall-excess. The computed hydrograph has a peak inflow of 359,800 cfs and volume of 1,366,100 acre-feet.

A spillway design flood hydrograph representing flow into full reservoir was computed using the unit hydrograph derived for flow into full reservoir, the 6-hour rates of rainfall-excess, and runoff equal to the rate of rainfall from a reservoir surface of 38 square miles. This hydrograph has a peak inflow of 415,700 cfs and volume of 1,374,800 acre-feet.

5. Spillway Design Flood Routing. Spillway design flood was routed through the reservoir under the assumptions that the outlet works would be operative during passage of the flood, with the reservoir level at the beginning of the flood to be at elevation 258.0 feet, the spillway crest or top of the flood control pool. The maximum water surface reached during routing of the flood was 274.5 feet and the peak outflow would be 292,000 cfs. Operation hydrographs of the spillway design flood are shown on Plate 8-1.

b. Standard Project Flood. The standard project storm rainfall of 18.70 inches for the area above Somerville dam site was determined in accordance with EM 1110-2-1411 (Civil Works Engineering Bulletin No. 52-8, dated 26 March 1952, Subject "Standard Project Flood Determinations"). An initial loss of 1.0 inch and a uniform infiltration rate of 0.08 inch per hour were applied to the 6-hour increments of standard project storm rainfall to obtain a total of 13.84 inches of rainfall excess. The standard project flood hydrograph, representing flow into the full reservoir was then computed by applying these 6-hour increments of rainfall excess to the unit hydrograph for flow into full reservoir, and adding to the resulting hydrograph runoff at a rate equal to the rate of rainfall on a reservoir surface of 38 square miles. The computed standard project flood hydrograph has a peak discharge of 226,700 cfs and a volume of 784,900 acre-feet.

c. 2018 Inflow Design Flood. For the 2018 Somerville Periodic Assessment (PA), the Inflow Design Flood (IDF) was brought up to date with the ER 1110-8-2 (FR) guidance.

1. Probable Maximum Storm. The Probable Maximum Storm rainfall above Somerville Dam was determined in accordance with the method described in HMR-51 and HMR-52. HEC-MetVue, which has HMR-51 and HMR-52 built in, was used to develop the Probable Maximum Precipitation (PMP). The 72-hour duration PMP has a basin average precipitation total of 36.28 inches with a basin average excess of 29.73 inches.

2. Unit Hydrographs. The Corps Water Management System (CWMS) Brazos HEC-HMS model was utilized to develop the IDF. Somerville Dam hydrologic model contains eight subbasins and four routing reaches. Subbasins use Deficit and Constant Loss, Clark Transform, and Recession Baseflow numerical modeling methods. Clark unit hydrograph method was selected because it is the standard method for CWMS HMS model development and HEC-HMS converts Snyder's to Clark method internally in the program. Routing reaches used Muskingum numerical model method.

The model had previously been calibrated to eight recent historical events which include the period of record peak inflow and elevation events: November 1991, November 1998, November 2002, November 2004, June 2010, May 2015, May 2016 (peak elevation), and August 2017 (Hurricane Harvey). The average of the calibrated parameters (Deficit Constant Loss, Clark Transform, Recession Baseflow, and Muskingum Routing) were used as a base parameter estimate for the antecedent and PMF model parameters. The basin average initial deficit of 1.00 inches with a constant loss of 0.094 inches/hour was used.

A one inch unit hydrograph was applied to the watershed to make sure the resulting runoff volume was one inch. To bring the PMF up to current standards, the subbasins' unit hydrographs were peaked to achieve 25% and 50% peaking at the dam to evaluate the effect the peaking had on the PMF maximum water surface elevation. HEC-HMS outputs unit hydrographs for each subbasin. By decreasing the Clark Transform parameters storage coefficient and time of concentration, the unit hydrographs were evaluated in the HEC-HMS output and compared to the original unit hydrograph until the desired 25% or 50% peaked unit hydrographs were achieved. The results of the 25% and 50% peaking of the unit hydrographs had some impact on the PMF water surface elevations. With all other parameters set the same, the 50% peaked unit hydrograph resulted in a 1.0 foot higher elevation than the 25% peaked unit hydrograph. For this PMF development, the 50% peaking factor was used for the final PMF as a conservative measure.

3. Antecedent Conditions. According to Section 8.f of ER 1110-8-2 (FR), an antecedent pool should be assumed to occur prior to the PMF event. Experience has demonstrated that an unusual sequence of floods can result in filling all or a major portion of the flood control storage in a reservoir immediately before the beginning of the PMF. ER 1110-8-2 (FR) states two scenarios to establish the minimum starting pool elevation prior to the PMF

routing:

(a) the full flood control pool level.

(b) The elevation prevailing 5 days after the last significant rainfall of a storm that produces one-half of the PMF hydrograph.

The “more appropriate” of the two starting elevations should be used for the best estimate of adequacy, using engineering judgment.

Two routing scenarios were performed to compare sensitivity to antecedent floods and to assess hydrologic adequacy of the dam. The first scenario assumed the reservoir was at the top of flood control pool, elevation of 258.1 feet NAVD88, and routes 100 percent of the estimated PMF. The second scenario uses a starting pool elevation at the top of conservation pool, elevation of 238.1 feet NAVD88, and routes 50 percent of the PMF volume with a 5-day routing period following the last significant rainfall before 100 percent of the PA PMF storm is routed. This analysis used scenario two, antecedent storm of 50 percent of the PMP, 5 days prior to the PMP to represent the antecedent condition for the PA PMF. This decision is based on the limited sensitivity of the pool to its starting stage in combination with normal pool operations for the project, and the low probability the reservoir pool is at the spillway crest due to the ability of the project to regulate its pool.

At the start of the PMF event, the reservoir elevation is at 260.45 feet NAVD88. The peak inflow into Somerville Lake and maximum water surface elevation resulting from the routing of Scenario 2 unit hydrograph peaked 50% were 744,220 cfs and 279.99 feet NAVD88 (279.89 NGVD29), 0.10 feet above the lowest surveyed point on the dam. The peak spillway discharge is 486,347 cfs.

d. Other Floods. Based on historical data, the maximum known flood in the vicinity of the dam on Yegua Creek occurred May 2016. The peak inflow during this event was 155,280 cfs, and the highest record lake elevation is 259.81 feet on 29 May 2016. This event resulted in a spillway flow of approximately 7,400 cfs. Additional information on historical floods can be found in Section 4-06 of this manual.

**8-03. Recreation.** Facilities such as public boat ramps, docks, restrooms, and fishing piers have been provided. Public use of USACE lakes is governed by Title 36 of the Code of Federal Regulations. Recreation facilities at Somerville Lake receive several hundred thousand visitors each year.

A rise or fall in the lake elevation at Somerville Lake has some effect on the lands surrounding the lake, recreational facilities, and visitation. A rise above the spillway crest elevation temporarily restricts the use of many recreational facilities due to inundation or loss of access.

Other effects associated with high water levels include the accumulation of driftwood, the degradation of surrounding vegetation, and increased shoreline erosion.

A substantial lowering of the pool elevation, due to water supply or hydropower requirements or drought, exposes aesthetically unpleasing banks and mud flats, and creates a boating hazard due to increased shallow areas. Boat ramps and beaches may also become unusable during drawdown periods. Although fluctuation of the pool level is unavoidable, the effects on recreational opportunities can be reduced by placing roads, utilities, and recreational facilities in locations less prone to flooding.

**8-04. Water Quality.** The main water quality objective is to maintain the temperature of the releases as close to the natural stream temperature as possible. Current statistics indicate the impacts from the lake have been minimal. The temperature of the water released from the project is slightly higher during the summer months than the temperature of the natural stream. Although there is a slight temperature variation, the impacts to the aquatic ecosystem downstream of the project are non-detrimental. Additional water quality data can be found in Section 4-08.

**8-05. Fish and Wildlife.** The management of fish and wildlife resources is conducted in cooperation with the Texas Parks and Wildlife Department and U.S. Fish and Wildlife. The species of fish that the Texas Parks and Wildlife Department has stocked the lake with are: largemouth bass, white bass, and coppernose bluegill. There are several small wildlife management areas surrounding the lake, within which hunting dove, waterfowl, rabbit, squirrel, turkey, feral hog and white-tailed deer are permitted. Other species of wildlife found in the area include deer, gray and red foxes, coyotes, fox squirrels, armadillos, owls, and more than one hundred bird species.

**8-06. Water Supply.** The BRA, an agency of the State of Texas, is authorized to use 100 percent (143,900 acre-feet) of the conservation storage space below elevation 238.0 feet. BRA is paying \$7,197,452.19 over 50 years, in addition to their share of the annual O&M cost, for this water supply storage space. A copy of the water supply contract is in Exhibit B of this manual.

**8-07. Hydroelectric Power.** Hydroelectric power is not a project purpose.

**8-08. Navigation.** Navigation is not a project purpose.

**8-09. Drought Contingency Plans.** The purpose of the Drought Contingency Plan is to provide a basic reference for water management decisions and responses to a water shortage in the Brazos River basin due to a drought. The Drought Contingency Plan provides a plan for implementing actions necessary for conservation of water supply depending on the severity of the drought and the reservoir level. This plan enables the Water Resources Branch to effectively coordinate with the public and other district elements during drought conditions. The latest Drought Contingency Plan for Somerville Lake is dated October 2012.

**8-10. Emergency Action Plan.** The EAP contains detailed instructions and procedures to be followed by USACE personnel for Somerville Dam located at the Somerville Dam Project Office to properly handle any event at the project that could develop into an emergency condition. The most current edition of the EAP is located at the Geotechnical Office – Fort Worth District and is dated September 2019. Copies of this EAP are also available in the Fort Worth District Water Management Office.

**8-11. Frequencies.** Somerville Lake levels for the period of record, since deliberate impoundment began on 3 January 1967, are displayed on Plate 8-4.

a. Annual Peak Elevation Frequency. The annual peak lake levels for the period 1967 through 2019 were tabulated. The annual peak elevations were arranged in descending order and assigned median plotting positions. The elevation probability was derived from studies based on methods discussed in "Statistical Methods in Hydrology," by Leo R. Beard, dated January 1962. The annual peak elevation frequency curve is shown on Plate 8-5. Data from this analysis indicated that the 50-year and the 100-year flood frequency pool level to be 256.48 feet and 260.51 feet, respectively.

b. Lake Elevation Duration. The lake-elevation-duration curve shown on Plate 8-6 is based on the midnight lake elevations for the period 29 September 1988 to 10 July 2001, and the maximum lake elevations for the period 11 July 2001 to 18 March 2018. The top of conservation pool elevation at Somerville Lake is 537.5 feet. Somerville Lake reached the current top of the conservation pool for the first time on 17 February 1989. The lake-elevation-duration curve shows the percent of time that the lake level equals or exceeds a given elevation.

c. Control Points. Control points are located on East and Middle Yegua Creeks above Somerville, and Yegua Creek at Somerville. Rating curves for the key control points are shown on Plates 4-16 through 4-18, respectively.

**8-12. Other Studies.** The vision for the CWMS (Corps Water Management System) National Implementation Effort is to have all USACE watersheds fully modeled within CWMS. These models will be operated daily to provide decision support to local Water Managers and to have results automatically consolidated into standardized briefing tools within a CorpsMap for executive and public use. CorpsMap viewer supports visualization and analysis of the USACE infrastructure, and real-time display of atmospheric, coastal, critical infrastructure, and watershed data.

The CWMS Automated Information System was developed by the HEC under funding from the Water Management Community of Practice and has been implemented to varying degrees at USACE Water Management Offices. USACE offices apply CWMS data flow elements (data acquisition, verification, validation, transformation, storage, visualization, dissemination

elements). For this effort, USACE Leadership, the Critical Infrastructure Protection and Resilience (CIPR) Program, and the Dam Safety Program have recognized the value of these watershed models to the Nation and have committed funding for watershed model development to support the needs of multiple programs.

**CHAPTER IX – WATER CONTROL MANAGEMENT**

**9-01. Responsibilities and Organizations.**

a. Corps of Engineers. Somerville Lake is owned by the USACE. As the owner of the project, the USACE is responsible for the overall operation and maintenance of the lake. Somerville Dam and Lake is operated by the Three Rivers Project Office personnel from Whitney Dam. The operations Division is responsible for the Lake's maintenance and operation. Project reporting instructions are presented in Chapter V, and project operating instructions are presented in Chapter VII of this manual. Water Resources Branch, Engineering and Construction Division, is responsible for the lake regulation and associated data and studies.

1. Responsibilities and Duties During Normal Operations. The Water Resources Branch, Engineering and Construction Division, Fort Worth District is charged with the following responsibilities and duties under the general supervision of the SWD Office in Dallas, Texas.

- (a). Regulation of lakes and dissemination of data.
- (b). Investigations and refinement of regulation procedures, including the following:
  - (1). Analysis of past floods.
  - (2). Reconnaissance to determine channel capacities.
  - (3). Improvement of forecasting techniques.
  - (4). Plan and coordinate the hydrometeorologic reporting network with the NWS and the USGS.
- (c). Train personnel in flood control duties, including the following:
  - (1). Periodic visits to projects by the branch personnel to familiarize themselves with regulation facilities and become acquainted with the operating personnel.
  - (2). Instruct personnel of other branches in flood control procedures to supplement the Water Resources Branch during flood emergencies, when necessary.
- (d). Prepare reports on lake regulation.

- (1). Recurring reports.
- (2). Water Control Manuals.
- (3). Post Flood reports.

2. Responsibilities and Duties During Flood Emergencies. During flood emergency, the Fort Worth District Water Resources Branch is responsible for the following:

- (a). Evaluation of current meteorologic, hydrologic, and hydraulic data.
- (b). Provide analysis of the storm and effects of the flooding to the District Engineer and other District personnel.
- (c). When necessary, furnish personnel to assist lake personnel in flood regulations.
- (d). Regulation of lakes in accordance with flood control schedules.
- (e). Furnish information to higher authority, which will include:
  - (1). Initial reports to the SWD and Office of the Chief of Engineers by telephone or E-mail.
  - (2). Provide information for situation reports.

3. Assignment of Personnel. During non-flood periods, personnel of the Fort Worth District Water Resources Branch issue instructions for the routine regulation of the lake. However, during flood periods, assistance from other personnel may be required to maintain effective regulation of the lakes. The area and magnitude of the flood will determine the number of people engaged in each particular activity. Plate 9-1 shows the organization during flood control regulation.

4. Provision for 24-Hour Alert. The NWS and Lake Manager have been provided with a list of names and telephone numbers of key personnel of the Engineering and Construction Division with instruction to provide warning if unusual conditions occur. Responsible personnel are on duty at the Fort Worth District Office 24 hours a day during flood emergencies and/or whenever project conditions warrant. Responsible personnel will be on duty or on call at the lake at all times.

5. Role of the Lake Manager. The Lake Manager will regulate the lake according to instructions issued by personnel of the Fort Worth District Water Resources Branch. The instructions will follow the "Normal Regulations for Flood Control" and "Emergency

Regulations for Flood Control" contained in Chapter VII and Exhibit C of this manual. If the Lake Manager loses communication with the District Office, he will immediately make every effort to reestablish communication while initiating emergency regulations for flood control. The Lake Manager will make daily observations at the lake project's weather station and report those observations as directed in paragraph 5-07.

b. Other Federal Agencies. The NWS is officially responsible for issuing flood warnings to the public. The NWS provides weather and river forecast information, which is used to make real time operation decisions for Somerville Dam and Lake. The USGS develops and maintains stage versus discharge curves for each stream gage. The USGS also collects and maintains reservoir storage and water quality data for USACE lakes in the Fort Worth District.

**9-02. Interagency Coordination.** The USACE, NWS, and the USGS cooperate to accumulate rainfall and streamflow data used in forecasting river stages, stream flows and lake levels. The Fort Worth District's Supplement A to ER 500-1-1 gives a list of Federal Agencies with which the District will coordinate in emergencies.

a. Local Press and Corps Bulletins. The USACE, through their Public Affairs Office, makes press releases to the news media of flood situations in the area of concern. The Water Resources Branch may supplement this information with observed conditions and technical advice to enable local interests to obtain optimum flood protection and to perform rescue and relief functions. USACE further assists in flood fighting through the office of the Emergency Operations, who furnishes sandbags and other necessary equipment based on equipment on hand and need.

b. National Weather Service. The NWS and USACE exchange hydrometeorologic data and reports in obtaining and disseminating data. This exchange of data is discussed in great detail in Chapter VI of this manual.

c. United States Geological Survey. The USGS and USACE cooperate in a program for the operation and maintenance of stream gages throughout the Fort Worth District. During floods, the USGS and USACE coordinate field activities to maximize the number of stream discharge measurements.

d. Other Federal, State, or Local Agencies. The Fort Worth District exchanges information with State government officials, Texas Department of Public Safety (TxDPS) Highway Patrol Division, and others during flood emergencies. The Fort Worth District also coordinates with State agencies concerning fish and wildlife throughout normal operation.

Releases from Somerville Lake are coordinated with the releases from other reservoirs in the Brazos River basin system. These reservoirs are listed in Table 3-2.

**9-03. Interagency Agreements.** The BRA, an agency of the State of Texas, has a contract with USACE dated April 5, 1976 and approved June 29, 1976 for 100 percent (33,600 acre-feet) of the conservation storage space below elevation 537.5. In return, the BRA is paying \$2,841,700 over 50 equal annual payments, in addition to their share of annual O&M costs for this water supply storage space.

**9-04. Commissions, River Authority, Compacts, and Committees.** The TCEQ issues and regulates permits for water use in the State of Texas. The BRA is informed of the lake regulations at Somerville Lake.

**9-05. Non-Federal Hydropower.** There are no non-federal hydropower facilities at Somerville Lake.

**9-06. Reports.** Table 9-1 lists reports prepared by the Water Resources Branch. The tabulation also describes when each report is required and the regulation requiring the report.

**TABLE 9-1**

**Tabulation of Reports**

Name of Report	When Required	Regulation Requiring Report
Daily Report	Daily	—
Monthly Reservoir Report	Monthly	ER 1110-2-240
Flood Situation Reports	During Floods	ER 500-1-1
Post Flood Reports	Following a Flood Causing Major Damage	ER 500-1-1
Annual Reports	Annually	ER 1110-2-240

a. Daily Report. The daily report is prepared by the Water Resources Branch. It contains water control information on all of the major lakes in the Fort Worth District. An example of daily report is shown on Plate 9-2. Copies of the report are sent to all subscribing

offices and agencies. The daily report is also posted on the Internet at the following URL address: <http://www.swf-wc.usace.army.mil/>.

b. Monthly Reports. The Water Resources Branch prepares monthly reservoir reports in accordance with ER 1110-2-240. The monthly report, shown on Plate 9-3, is a tabular record of lake operations. It is prepared for all lakes under the supervision or of direct interest to the Fort Worth District.

c. Flood Situation Reports. The Water Resources Branch supplies the Emergency Operations Center (EOC) in the Fort Worth District with information in accordance with ER 500-1-1. This report contains hydrometeorological conditions for the area, the name of the lake, pertinent lake data, lake elevation, predicted maximum elevation and anticipated data, inflow and outflow rates in cfs, percent of flood control storage utilized to date, and any other data relevant to the flood situation. The EOC then provides the information to the appropriate government officials and community organizations concerned or effected by the flooding.

d. Post Flood Reports. The post flood reports are prepared in accordance with ER 500-1-1, when a flood has resulted in major damage. The report describes flood emergency operations performed by the USACE. Included are available hydrologic information, damage estimates, and other engineering data considered essential for flood control and flood plain studies performed to review possible damage claims against the United States. The report is prepared using information compiled by the Water Resources Branch and when completed, includes a paragraph on the final damage costs from the flood event, including damages to USACE property, parks, and other structures.

e. Annual Report. The Water Resources Branch prepares an annual report for the SWD Reservoir Control Center. The report summarizes general river basin conditions and the activities and accomplishments of the Water Resources Branch during the preceding year.

**EXHIBIT A**

**SUPPLEMENTARY PERTINENT DATA**

**SOMERVILLE DAM AND LAKE**

**EXHIBIT A**

**SUPPLEMENTARY PERTINENT DATA**

**SOMERVILLE DAM AND LAKE**

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**1. GENERAL INFORMATION**

Item	Description
Other Name for Project	None
Location	Brazos River Basin, Texas Yegua Creek, at river mile 20.0
Type of Project	Dam and Reservoir
Objective of Regulations	Multipurpose lake project for Flood Control, Water Supply, Fish and Wildlife, and Recreation.
Project Owner	USACE
Operating Agency	USACE The working hours of operation for weekdays are 0800 to 1645; Working hours for weekends and holiday vary. During flood emergency conditions 24-hour per day duty is the general procedure.
Regulating Agency	USACE
Water Supply Contracts	The BRA has contracted with USACE for drawing from the lake 100 percent (143,900 ac-ft) of the conservation storage space below elevation 238.0 feet NGVD29. The BRA is paying \$7,197,452.19 over 50 annual payments, in addition to their share of the annual O&M cost for this water supply storage space (Contract No. DA-41-443-CIVENG- 62-1043 dated 9 March 1962 and approved on 10 May 1962).
Project Cost	\$24,274,893.19
Deliberate Impoundment Date	3 January 1967

**2. LAKE INFORMATION**

Feature	Elevation (Feet NGVD29)	Lake Area (Acres)	Storage (Acre-Feet)	Runoff (Inches)
Top of Dam	280.0	—	—	—
IDF Design (PMF) Water Surface Elevation (2018 Study)	279.89			
Spillway Crest & Top of Flood Control Pool	258.00	24,400	497,693	9.27
Top Conservation Pool	238.00	11,395	150,293	2.80
Invert of Outlet Works (2012 Survey)	206.00	100	220	0
Streambed (1961 Study)	200.00	0	0	0

Item	Description
Real Estate (Fee Title)	Upper guide contour of elevation 263.0. Fee simple title includes 29,233 acres
Real Estate (Flowage Easement)	Upper guide contour of elevation 263.0 feet. Flowage easement includes 3,572 acres
Lake length at top of conservation pool	9 miles from the dam to the most upstream shoreline

**2. LAKE INFORMATION (CONTINUED)**

<b>Item</b>	<b>Description</b>
Shoreline length at top of normal pool	85 miles
Safety aspects	Access roads where practicable are constructed above elev. 279.82. For all other releases, a warning horn will sound for 10 seconds to alert those downstream at least 5 minutes before significant changes in discharge.
Emergency Drawdown	16 days
Datum	All elevations referred to in Exhibit A, unless noted otherwise, are in feet, National Geodetic Vertical Datum of 1929 (NGVD29). The datum conversion from NGVD29 to NAVD88 is: NGVD29 + 0.1 feet = NAVD88 for Somerville Dam and Lake.

**3. HYDROLOGY**

<b>Item</b>	<b>Description</b>
Drainage Area	1,006 square miles
Volume from One-Inch Runoff	53,653 ac-ft
<b>Spillway Design Flood (1961 Study)</b>	
Maximum Water Surface Elevation	274.5 feet
Duration of Storm	48 hours
Average Infiltration Rate	0.08 inches/hour
Total Volume of Rainfall	29.61 inches
Total Volume of Runoff	25.47 inches
Volume (into full pool)	1,374,800 ac-ft
Peak Inflow (into full pool)	415,700 cfs
Peak Outflow	292,000 cfs
<b>Inflow Design Flood (2018 Study)</b>	
Maximum Water Surface Elevation	279.89 feet
Duration of Storm	72 hours
Average Infiltration Rate	0.094 inches/hour
Total Volume of Rainfall	36.28 inches
Total Volume of Runoff	29.73 inches
Volume (into full pool)	2,354,948 acre-feet
Peak Inflow (into full pool)	744,220 cfs
Peak Outflow	486,347 cfs
Climate	Moderate, with hot summers, and cool winters
Average Precipitation (Gages listed in Table 4-3)	37 inches per year (1963-2019)
Average Evaporation from lake (Data listed in Table 4-4A)	53.49 inches per year (1954-2018)
Storm Type	Primarily local thunderstorms, frontal storms, and tropical cyclones

**3. HYDROLOGY (CONTINUED)**

<b>Item</b>	<b>Description</b>
Flood Seasons	April through June, frequently occur during February, but floods can occur at any time of year
Low Flood Seasons	July, August, November through March
Minimum Monthly Inflow and Date of Occurrence	Zero (0) flow occurred
Minimum Annual Inflow and Date of Occurrence	9,998 ac-ft (in CY 1951)
Mean Annual Inflow	259,003 ac-ft (Jan 1939-Aug 2019 records)
Maximum Annual Inflow and Date of Occurrence	780,862 ac-ft (CY 1992)
Maximum Monthly Inflow and Date of Occurrence	415,227 ac-ft (May 2016)
Maximum average 24-Hour Inflow and Date of Occurrence	82,700 dsf 27 May 2016
Maximum Instantaneous Inflow and Date of Occurrence	155,000 cfs (estimated) (27 May 2016) Into Somerville Lake
Names and Locations of Key Stream Flow Stations	East Yegua Creek near Dime Box Middle Yegua Creek near Dime Box Yegua Creek near Somerville Davidson Creek near Lyons Brazos River at SH21 near Bryan Navasota River near Easterly Brazos River near Hempstead Brazos River at Richmond

**3. HYDROLOGY (CONTINUED)**

<b>Item</b>	<b>Description</b>
Type of Hydrometeorologic Data Recorded at Damsite	Automatic water stage recorders to furnish continuous records of lake levels and river stage below the dam. Tile staff gages provide lake level and tailwater elevations. NWS station at Somerville Dam consists of: a rain gage, recording rain gage, Type A evaporation pan, anemometer and maximum-minimum thermometer.
Precipitation Stations Used in Hydrologic Forecasting (NWS)	Somerville Dam – Recording gage Dime Box – Recording gage Lexington – Recording gage Fedor 3 SE – Recording gage Giddings 5 E – Recording gage
Number of Sediment Ranges	50 (Periodic surveys)
Number of Degradation Ranges	10 (Periodic surveys)

**4. EMBANKMENTS**

<b>Item</b>	<b>Description</b>
Location	Brazos River Basin of the Yegua Creek at river mile 20.0
Purpose	Impoundment
Type	Rolled earth fill
Slope Protection	Riprap upstream, turf downstream
Height	80 feet above streambed
Length	24,925 feet including spillway and dike
Top Elevation	280.0 feet
Freeboard	5.50 feet from original Spillway Design Flood
Used for Roadway	Yes, Thornberry Drive (renamed LBJ Drive)
Elevation of Streambed	200.0 feet
Closure date	January 1967

**5. SPILLWAY**

<b>Item</b>	<b>Description</b>
Location	In a saddle on the right bank
Uncontrolled Spillway	
Crest Elevation	258.0 feet
Length	1,250 feet
Type	Ogee
Capacity	289,400 cfs (1961 Study, Maximum Lake elev. 274.5 feet NGVD29)
Total Maximum Capacity at 274.5 feet	292,000 cfs (with gated releases)
Type of Energy Dissipater	Stilling basin

**6. OUTLET FACILITIES**

<b>Item</b>	<b>Description</b>
<b>A. <u>Control Gates</u></b>	
Location	Outlet works
Purpose	Regulation of outflow
Type	Gate controlled conduit
Number and Size of Gates	Two 5 foot by 10 foot tractor type gates
Entrance Invert Elevation	206.0 feet NGVD29
<b>B. <u>Low Flow Outlet Works – N/A</u></b>	

**7. CONTROL POINTS**

<b>Item</b>	<b>Description</b>
<b>A. <u>Yegua Creek near Somerville, No. 08110000</u></b>	
Location	River mile 18.4 of Yegua Creek
Purpose of control	To indicate the total flow at the gage.
Channel description	The Yegua runs through flat terrain and supports water-tolerant hardwoods, conifers and grasses on clay loam and sandy loam soils.
Total Drainage area	1,009 square miles
Treatment of uncontrolled runoff	Contributes to target flow at gage
Target Flow Rate	2,500 cfs
Time of Water Travel from Somerville Dam.	Between 1 and 4 hours
Monitoring provisions	Recording river gage with DCP
Dikes or levees downstream	Somerville Dam

**7. CONTROL POINTS (CONTINUED)**

<b>Item</b>	<b>Description</b>
<b>B. <u>Brazos River at SH 21 near Bryan Gage No. 08108700</u></b>	
Location	River mile 285.9 of the Brazos River
Purpose of control	To indicate the total flow at the gage, including releases from upstream reservoirs and local flow
Channel description	The channel is characterized by a very flat gradient of about 1 foot per mile, and moderately steep, vegetated banks with intermittent forested overbanks.
Total Drainage Area	39,049 square miles
Treatment of uncontrolled runoff.	Contributes to target flow at gage
Target Flow Rate	60,000 cfs at SH 21 near Bryan Gage
Monitoring provisions	Recording river gage with DCP
Dikes or levees downstream	None

**7. CONTROL POINTS (CONTINUED)**

<b>Item</b>	<b>Description</b>
<b>C. <u>Brazos River near Hempstead Gage, No. 08111500</u></b>	
Location	River mile 193.8 of the Brazos River
Purpose of control	To indicate the total flow at the gage, including releases from upstream reservoirs and local flow
Channel description	Coastal plains channel with tree-lined, steep banks and a very flat gradient. Bedding is sandy, with frequent sandbars. Overbank is predominantly farmland.
Total Drainage area	43,880 square miles
Treatment of uncontrolled runoff	Contributes to target flow at gage
Target Flow Rate	60,000 cfs
Time of Water Travel From Somerville Lake	26-62 hours to the Brazos River at Hempstead Gage
Monitoring provisions	Recording river gage with DCP
Dikes or levees downstream	None

**7. CONTROL POINTS (CONTINUED)**

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<b>Item</b>	<b>Description</b>
<b>D. <u>Brazos River at Richmond Gage, No. 08114000</u></b>	
Location	River mile 92.0 of the Brazos River
Purpose of control	To indicate the total flow at the gage, including releases from upstream reservoirs and local flow
Channel description	Coastal plains channel with tree-lined, steep banks and a very flat gradient. Bedding is sandy, with frequent sandbars. Overbank is predominantly farmland. Closer to Houston the channel is controlled by levees.
Total Drainage area	45,107 square miles
Treatment of uncontrolled runoff	Contributes to target flow at gage
Target Flow Rate	60,000 cfs at Richmond Gage
Time of Water Travel From Somerville Lake	68-110 hours to the Brazos River at Richmond Gage
Monitoring provisions	Recording river gage with DCP
Dikes or levees downstream	None

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**EXHIBIT B**

**CONTRACT BETWEEN THE BRAZOS RIVER AUTHORITY OF TEXAS AND THE  
UNITED STATES OF AMERICA**

**FOR**

**SOMERVILLE DAM AND LAKE, TEXAS**

as amended by Federal Water Pollution Control Act, Amendments of 1961, Public Law 87-88;  
75 Stat. 204.

Contract No. DA-41-443-CIVENG-62-1043

CONTRACT BETWEEN THE UNITED STATES OF AMERICA  
AND  
THE BRAZOS RIVER AUTHORITY  
FOR  
WATER STORAGE SPACE IN SOMERVILLE RESERVOIR

THIS CONTRACT, entered into this 9th day of March 1962, by and between the United States of America (hereinafter called the Government) represented by the Contracting Officer executing this contract, and the Brazos River Authority, an agency of the State of Texas with its offices and seat of Government in the City of Waco, McLennan County, Texas (hereinafter called the Authority), WITNESSETH THAT:

WHEREAS, construction of the Somerville Reservoir on Yegua Creek in Burleson, Lee, and Washington Counties, Texas (hereinafter called the Project) has been authorized by the Flood Control Act approved 3 September 1954 (Public Law No. 780, 83d Congress, 2nd Session) substantially in accordance with the recommendations of the Chief of Engineers in House Document No. 535 (81st Congress, 2nd Session); and,

WHEREAS, the Authority is a duly authorized State agency with powers to control, store, preserve, use, distribute, and sell the waters of the Brazos River and its tributaries, including the aforementioned Yegua Creek, for such uses and purposes as set forth in the Act of the Texas Legislature creating such Authority and acts amendatory thereto; and,

*AMT*  
*CGE*  
*now*  
WHEREAS, the Government is authorized by the Water Supply Act of 1958 (Title III of the Act approved 3 July 1958, Public Law 85-500, 85th Congress, 2nd Session) to include storage in any reservoir project to be constructed by the Corps of Engineers to impound water for present or anticipated future demand or need for municipal or industrial water; and,

WHEREAS, storage space has been included in the Project for municipal and industrial water below elevation 238.0 feet above mean sea level; and,

WHEREAS, the Authority desires to utilize the storage space below elevation 238.0 feet above mean sea level for its needs as a source of future water supply; and,

WHEREAS, the Authority hereby agrees to fulfill the local interest requirements of the Water Supply Act of 1958, as amended. *AMT*  
*CGE*  
*now*

NOW, THEREFORE, the parties do mutually agree as follows:

*Margaret E. B.*

ARTICLE 1. WATER STORAGE SPACE.- The Authority shall have the right to utilize the storage space in the Project below elevation 238.0 feet above mean sea level for storage of industrial or municipal water as deemed necessary by the Authority to impound water in the Project and make such diversions as granted to the Authority by law or by the Board of Water Engineers for the State of Texas, or its successors, to the extent that such storage will provide.

The Government shall not be responsible for diversion by others, nor will it become a party to any controversies between users of the aforesaid storage space.

The Authority shall have the right to withdraw water from the aforesaid storage space; or to order releases therefrom to be made by the Government at any time so long as sufficient water is available within the aforesaid storage space to permit direct release through the flood-control conduit located in the main embankment, provided, that such releases when combined with local runoff below the dam will not cause flooding.

The Authority shall have the right to construct installations or facilities for the purpose of diversions or withdrawals from the Project above elevation 206.0 feet above mean sea level, subject to the approval of the Contracting Officer as to design and location; the cost of such installations or facilities, or any modifications thereof, shall be borne by the Authority.

The authority hereby agrees that releases or withdrawals which would lower the water level below elevation 210.0 feet above mean sea level will not be made unless specifically approved by the Contracting Officer.

The Government reserves the right to take such measures as may be necessary in the operation of the Project to preserve life and/or property.

In the event the Authority should desire to utilize a part of the said storage space as a present water supply, it is understood and agreed that the contract will be amended to provide a division of said storage space into present and future storage. In such event, payment for the present storage, including operation and maintenance therefor, will commence immediately upon election of the Authority to utilize a part of said storage space as a present water supply, or if such election is made prior to initiation of deliberate impoundment payment will commence upon said date of deliberate impoundment, and in either event Exhibit "A" will be amended accordingly.

The term "deliberate impoundment" as used in this contract shall mean the date upon which closure is made and the Project becomes operative for storage of water for any of the purposes contained in the authorizing Act.

SEE M-18

ARTICLE 2. METERING.- For the purpose of maintaining an accurate record of water resources at the Project, the Authority agrees to install suitable meters or metering devices satisfactory to the Contracting Officer, without cost to the Government, at such time as the Authority may withdraw water from the Project by any means other than through the flood control conduit located in the main embankment. The Authority shall furnish the Government periodically, at least monthly, a record of all such withdrawals from the Project.

ARTICLE 3. FEDERAL AND STATE LAWS.- The Authority shall utilize such storage space in a manner consistent with Federal and State laws.

ARTICLE 4. REGULATION OF THE USE OF WATER.- The regulation of the use of water stored in the aforesaid storage space shall be the responsibility of the Authority and shall not be considered a part of this contract.

ARTICLE 5. CONSIDERATION AND PAYMENT.- In consideration of the payments provided in this contract to be paid by the Authority to the Government, it is agreed that the Government will provide storage space in the Project as provided in Article 1. In consideration of the Government's providing the aforesaid storage space to the Authority it is agreed that the Authority shall pay the following sums to the Government:

(1) \$4,871,815 which is 29.880 percent of the total estimated cost (exclusive of the cost of recreation facilities) of the joint-use facilities, plus interest during construction, and is the estimated cost of providing the said storage space to be utilized by the Authority as stated in Article 1. The sum of \$4,871,815 and interest thereon shall be paid in fifty (50) consecutive annual installments in the amount of \$175,366.82 each, beginning on the first day of January ten (10) years after the date of initiation of deliberate impoundment, and annually thereafter on the aforesaid anniversary date of each year until fifty (50) equal consecutive yearly payments have been made. Except for the first installment, which shall be applied solely to reduction of the principal, all installments shall include accrued interest at the rate of two and seven hundred forty-two thousandths percent (2.742%) per annum on the unpaid balance.

The Authority shall have the right if it so elects to make additional principal payments so as to discharge the aforesaid indebtedness prior to the fiftieth (50th) year after the date of the first annual installment. Any additional number of principal payments in the amounts and order designated in column four (payment to principal) of Exhibit "A" may be made at the same time the annual installment of \$175,366.82 is made. Payment by the Authority of such additional principal payments shall relieve the Authority of the interest charges corresponding to such additional principal payments as shown in column three (payment to interest) of Exhibit "A". Such additional principal payments shall not relieve the

Authority of payment of the subsequent annual installment of \$175,366.82 as set forth in the preceding paragraph.

The aforesaid payments are more specifically set forth in Exhibit "A" attached hereto and made a part hereof, and the last payment of Item (1) above shall be adjusted upward or downward when due to assure the repayment of all capital costs within the contract period.

(2) 29.880 percent of the cost of sedimentation resurveys when incurred.

(3) 29.880 percent of the cost of major capital replacements. Provided this amount does not exceed \$10,000 it will be paid when incurred. In the event this amount does exceed \$10,000 it will be paid when incurred or, at the option of the Authority, in 5 equal yearly installments with the first payment due when the expense is incurred and annually thereafter on the anniversary date of each year until 5 equal yearly payments have been made. Except for the first installment, which shall be applied solely to reduction of the incurred cost, all installments shall include accrued interest at the rate of two and seven hundred forty-two thousandths percent (2.742%) per annum on the unpaid balance. The last payment due shall be adjusted upward or downward to assure the repayment of 29.880 percent of the major capital replacements including accrued interest within 4 years.

In the event water is first used from the said storage space prior to the first day of January ten (10) years after the date of initiation of deliberate impoundment, the initial payment provided in (1) above shall be due and payable on the date of first use of water from the said storage space with annual payments thereafter on the anniversary date of the first use of said storage space.

In the event the actual first cost of the Project exceeds the presently estimated first cost, the aforesaid annual payments shall be increased to reflect the actual first cost, including interest during construction, as determined by the Contracting Officer. In the event such first cost of the Project is less than the presently estimated first cost the aforesaid annual payments shall be decreased to reflect the actual cost, including interest during construction, as determined by the Contracting Officer.

In the event the annual payments are increased or decreased, as provided above, an adjustment, as determined by the Contracting Officer, of payments made prior to the determination of the final Project cost shall be made in the first payment due after such costs are determined. At the time that the final Project costs are determined Exhibit "A" shall be modified to reflect the increased or decreased annual payments and such modification will form a part of this contract.

(4) 28.655 percent of the annual experienced cost of ordinary operation and maintenance of the Project, exclusive of the operation and maintenance cost for land management and public utilization. The first payment estimated to be \$19,600 will be due and payable on the first day of January ten (10) years after the initiation of deliberate impoundment. Annual payments will be due and payable in advance on the first day of January thereafter and will be equal to 28.655 percent of the actual experienced cost of ordinary operation and maintenance for the preceding Government fiscal year. The second payment shall be increased or decreased in an amount to reflect the difference between the first payment and 28.655 percent of the actual experienced cost of ordinary operation and maintenance for the preceding fiscal year.

In the event water is first used from the said storage space prior to the first day of January ten (10) years after the initiation of deliberate impoundment, the estimated initial annual payment of \$19,600 for operation and maintenance shall be due and payable on the date of first use. Annual payments thereafter will be due and payable in advance on the anniversary date of the first use of said storage space and will be equal to 28.655 percent of the actual cost of ordinary operation and maintenance for the preceding Government fiscal year, except that payments due before the first complete fiscal year of operation will be based on the estimated annual operation and maintenance cost. The first payment following the first complete fiscal year of operation shall be increased or decreased in an amount to reflect the difference between the prior payments and 28.655 percent of the actual experienced cost of ordinary operation and maintenance for the period from the date water is first used to the ending date of the first complete fiscal year of operation.

Records of cost of operation and maintenance of the Project shall be available for inspection and examination by the Authority.

The extent of operation and maintenance of the Project shall be determined by the Contracting Officer and all records and accounting shall be maintained by the Contracting Officer. In the event the Authority should require additional operation and maintenance for the conservation storage over and above that deemed necessary by the Contracting Officer, the Authority shall bear the entire cost of such additional expense.

(5) In the event of default in the payment of the costs contained in Article 5(1), (2), (3), and (4), the amount of such payments shall be increased by an amount equal to interest on such overdue payments at the rate of two and seven hundred forty-two thousandths percent (2.742%) per annum thereon, compounded annually, and such amount equal to interest shall be charged from the date such payments are due until paid.

ARTICLE 6. CONTRACT MODIFICATION.- Fish and Wildlife is scheduled to be made a project purpose. If such results in a reduction in costs to the Authority the costs allocated to the storage space to be utilized by the Authority as stated in Article 1 shall be redetermined by the Contracting Officer and the contract shall be modified accordingly. If such does not result in a reduction in costs to the Authority the contract shall remain the same.

ARTICLE 7. PERIOD OF CONTRACT.- This contract shall become effective as of the date of approval by the Secretary of the Army, or his duly authorized representative, and shall continue in full force and effect until fifty (50) years after the date of the first annual installment as set forth in Article 5, or the life of the project, whichever is less.

ARTICLE 8. RENEWALS.- Upon expiration of the period as prescribed in Article 7 above, the Authority shall have the right, subject to required approvals of appropriate authorities, to negotiate for continued use of storage space then available for water storage purposes. The terms of the renewal contract shall be subject to mutual agreement of the contractual parties at the time. It is understood and agreed that in determining the allocable charges to be specified in the renewal contract, due consideration will be given to the fact that the payments prescribed herein and any other expenses which are attributable to the Authority may have been paid. It is further understood and agreed that consideration will be given to any expenditures made or expected to be made by the Government which have not been recovered during the contract period.

ARTICLE 9. DEFAULT.- In the event the Authority refuses or fails to comply with the provisions of this contract with respect to payments and transfer and assignment, the Government reserves the right to terminate this contract.

ARTICLE 10. OPERATION AND MAINTENANCE.- The Government shall operate and maintain the Project owned by the Government. The Authority shall have the right to make withdrawals of water for its purposes as needed in accordance with Article 1. The Authority shall be responsible for operation and maintenance of all features and appurtenances which may be provided and owned by the Authority. In the event the Government should suspend operation and maintenance of the Project, during the period of this contract, due to lack of appropriated funds, then and in that event the Authority shall be privileged and shall have the right to enter upon the premises and operate the same for its own use and benefit in supplying itself with water to the extent provided in this contract.

ARTICLE 11. RIGHTS-OF-WAY.- The grant of an easement for right-of-way over, across, in and upon Government-owned lands, under the control of the Secretary of the Army, required for transmission of water from point

of withdrawal, shall be by separate instrument in a form satisfactory to the Secretary of the Army without additional cost to the Authority, under the authority, and in accordance with, the provisions of 10 U.S.C. 2669.

ARTICLE 12. RELEASE OF CLAIMS.- The Authority shall hold and save the Government including its officers, agents, and employees, harmless from liability of any nature or kind for or on account of any claim for damage which may be filed or asserted as a result of the storage in the Project, or withdrawal or release of water from the Project, made or ordered by the Authority, or as a result of the construction, operation, or maintenance of the features or appurtenances owned and operated by the Authority.

ARTICLE 13. TRANSFER OR ASSIGNMENT.- The Authority shall not transfer or assign this contract nor any rights acquired thereunder, nor suballot said water supply storage space or any part thereof, nor grant any interest, privilege or license whatsoever in connection with this contract, without approval of the Secretary of the Army; provided, that this restriction shall not be construed to apply to any water which may be obtained from the conservation storage space by the Authority and furnished to any third party or parties nor any method of allocation thereof.

ARTICLE 14. OFFICIALS NOT TO BENEFIT.- No member of or delegate to Congress, or resident commissioner, shall be admitted to any share or part of this contract, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this contract if made with a corporation for its general benefit.

ARTICLE 15. COVENANT AGAINST CONTINGENT FEES.- The Authority warrants that no person or selling agency has been employed or retained to solicit or secure this contract upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees or bona fide established commercial or selling agencies maintained by the Authority for the purpose of securing business. For breach or violation of this warranty the Government shall have the right to annul this contract without liability or in its discretion to add to the contract price or consideration, or otherwise recover, the full amount of such commission, percentage, brokerage, or contingent fee.

ARTICLE 16. DISPUTES.- (a) Except as otherwise provided in this contract, any dispute concerning a question of fact arising under this contract which is not disposed of by agreement shall be decided by the Contracting Officer, who shall reduce his decision to writing and mail or otherwise furnish a copy thereof to the Authority. The decision of the Contracting Officer shall be final and conclusive unless, within 30 days from the date of receipt of such copy, the Authority mails or otherwise

furnishes to the Contracting Officer a written appeal addressed to the head of the agency involved. The decision of the head of the agency or his duly authorized representative for the determination of such appeals shall be final and conclusive. This provision shall not be pleaded in any suit involving a question of fact arising under this contract as limiting judicial review of any such decision to cases where fraud by such official or his representative or board is alleged: Provided, however, that any such decision shall be final and conclusive unless the same is fraudulent or capricious or arbitrary or so grossly erroneous as necessarily to imply bad faith or is not supported by substantial evidence. In connection with any appeal proceeding under this clause, the Authority shall be afforded an opportunity to be heard and to offer evidence in support of its appeal. Pending final decision of a dispute hereunder, the Authority shall proceed diligently with the performance of the contract and in accordance with the Contracting Officer's decision.

(b) This Disputes clause does not preclude consideration of questions of law in connection with decisions provided for in paragraph (a) above. Nothing in this contract, however, shall be construed as making final the decision of any administrative official, representative, or board on a question of law.

ARTICLE 17. APPROVAL OF CONTRACT.- This contract shall be subject to the written approval of the Secretary of the Army or his duly authorized representative and shall not be binding until so approved.

ARTICLE 18. DEFINITIONS.- (a) The term "head of the agency" or "Secretary" as used herein means the Secretary of the Army; and the term "his duly authorized representative" in Article 16 means the Chief of Engineers, Department of the Army, or an individual or board designated by him.

(b) The term "Contracting Officer" as used herein means the person executing this contract on behalf of the Government, and includes a duly appointed successor or authorized representative.

ARTICLE 19. ALTERATIONS.- The following alterations have been made in the provisions of this contract:

None.

Contract No. DA-41-443-CIVENG-62-1043

IN WITNESS WHEREOF, the parties hereto have executed this agreement as of the day and year first above written.

APPROVED:

THE UNITED STATES OF AMERICA

W. F. Schaub  
W. F. Schaub  
Assistant Secretary of the Army  
(Financial Management)

By R. P. West  
(Contracting Officer) R. P. WEST  
Colonel, CE  
Contracting Officer

Date 5-10-62

BRAZOS RIVER AUTHORITY

BY J. H. F. President

P. O. Drawer 7555, Waco, Texas  
(Post Office Address)

ATTEST:

C. G. Lee  
Secretary, Brazos River Authority  
C. G. Lee

APPROVED AS TO FORM:

David B. Kultgen  
Attorney, Brazos River Authority  
David B. Kultgen

Contract No. DA-41-443-CIVENG-62-1043

I, C. G. Lee, certify that I am the Secretary of the Brazos River Authority herein, that J. Howard Fox, who signed this contract on behalf of the Authority was then President of said Brazos River Authority; that said contract was duly signed for and on behalf of the Brazos River Authority by authority of its governing body and is within the scope of its legal powers.

In witness whereof, I have hereunto affixed my hand and the seal of said Brazos River Authority, this 1st day of April 1962.

CORPORATE SEAL

C. G. Lee  
(Secretary, Brazos River Authority)  
C. G. Lee



EXHIBIT "A" (CONT'D)

Year	Payment No.	Payment to interest : 2.742 percent	Payment to principal	Total annual payment	Balance due
37	27	\$83,745.81	\$91,621.01	"	\$2,962,566.13
38	28	81,233.56	94,133.26	"	2,868,432.87
39	29	78,652.43	96,714.39	"	2,771,718.48
40	30	76,000.52	99,366.30	"	2,672,352.18
41	31	73,275.90	102,090.92	"	2,570,261.26
42	32	70,476.56	104,890.26	"	2,465,371.00
43	33	67,600.47	107,766.35	"	2,357,604.65
44	34	64,645.52	110,721.30	"	2,246,883.35
45	35	61,609.54	113,757.28	"	2,133,126.07
46	36	58,490.32	116,876.50	"	2,016,249.57
47	37	55,285.56	120,081.26	"	1,896,168.31
48	38	51,992.94	123,373.88	"	1,772,794.43
49	39	48,610.02	126,756.80	"	1,646,037.63
50	40	45,134.35	130,232.47	"	1,515,805.16
51	41	41,563.38	133,803.44	"	1,382,001.72
52	42	37,894.49	137,472.33	"	1,244,529.39
53	43	34,125.00	141,241.82	"	1,103,287.57
54	44	30,252.15	145,114.67	"	958,172.90
55	45	26,273.10	149,093.72	"	809,079.18
56	46	22,184.95	153,181.87	"	655,897.31
57	47	17,984.70	157,382.12	"	498,515.19
58	48	13,669.29	161,697.53	"	336,817.66
59	49	9,235.54	166,131.28	"	170,686.38
60	50	4,680.22	170,686.38	\$175,366.60	-0-

SOMERVILLE DAM AND RESERVOIR

Flood control and  
water conservation  
project

Federal first cost \$15,864,575 (1)

<u>Allocation of first cost</u>	<u>Flood control</u>	<u>Water conservation</u>	<u>Total</u>
Usable reservoir capacity (ac.-ft.)	337,700	143,900	481,600
Percent of reservoir capacity	70.12	29.88	100.00
Specific cost	\$407,700	-	\$407,700
Allocated joint cost	10,838,360	\$4,618,515	15,456,875
Total allocation	11,246,060	4,618,515	15,864,575

Allocation of interest during construction (construction period 4 years)

Interest rate, percent	2.625	2.742	
Total allocation	590,400	253,300	843,700

Payment (interest 2.742% - amortization 0.9920307%)

$$\text{Payment} = X = \frac{\text{Sum } -X}{1} = \frac{.02742}{.009920307}$$

$$X = \frac{\$4,871,815 - X}{26.7807117}$$

$$X = \$175,366.82$$

(1) First cost of \$17,100,000 less \$1,235,425 for recreation.

SOMERVILLE DAM AND RESERVOIR

OPERATION AND MAINTENANCE

	<u>Flood control</u>	<u>Water conservation</u>	<u>Total</u>
Specific cost	\$7,500	\$2,000	\$9,500
Percent of costs, joint-use facilities	70.120	29.880	100.000
Allocated cost, joint-use facilities	41,300	17,600	58,900
Total allocation	48,800	19,600	68,400

$\frac{19,600}{68,400} = 28.655\%$  of annual operation and maintenance cost, exclusive of operation and maintenance cost for land management and public utilization.

RESOLUTION

Pertaining to Contract No. DA-41-443-CIVENG-62-1043  
between United States of America and Brazos River  
Authority re Water Storage Space in Somerville Reservoir.

WHEREAS, a form of Contract No. DA-41-443-CIVENG-62-1043 has been prepared and submitted by the United States of America for acceptance by Brazos River Authority involving the acquisition by the Authority of storage rights at the Somerville Reservoir (Texas); and,

WHEREAS, said Contract is considered to be in proper form and should be approved and executed by the Authority.


BE IT RESOLVED BY THE BOARD OF DIRECTORS OF  
BRAZOS RIVER AUTHORITY:

- (1) That the Contract by and between the United States of America and Brazos River Authority be executed in words and figures as indicated in the copy attached hereto.
- (2) That the President be and he is hereby authorized and directed to execute said contract and the Secretary be and he is hereby authorized and directed to attest such action.
- (3) That the President be and he is authorized to transmit executed counterparts of the Contract to the United States of America through its proper officers.

ADOPTED AND APPROVED the 15th day of January 1962.

I, C. G. Lee, Secretary of Brazos River Authority do hereby certify that the foregoing is a true and correct copy of a Resolution adopted by the Board of Directors of Brazos River Authority at a Regular Meeting held in Waco, Texas, on January 15, 1962.

S E A L

  
C. G. Lee  
Secretary, Board of Directors  
Brazos River Authority

DUPLICATE ORIGINAL

Contract No. DA-41-443-CIVENG-62-1043  
Modification No. 1

SOMERVILLE RESERVOIR  
SUPPLEMENTAL AGREEMENT

Date: 73 JUN 21

THIS SUPPLEMENTAL AGREEMENT, entered into on the above date by and between the United States of America (hereinafter called the Government), represented by the Contracting Officer executing this Agreement, and the Brazos River Authority of Texas, an agency of the State of Texas, with its principal office in the City of Waco, McLennan County, Texas (hereinafter called the Authority),

WITNESSETH THAT:

WHEREAS, under the terms and conditions of the original contract the Authority acquired the right to utilize the storage space in Somerville Reservoir (hereinafter called the Project) below elevation 238.0 feet above mean sea level as a source of future water supply for municipal and industrial uses; and

WHEREAS, ARTICLE 1 of said original contract provides that in the event the Authority should desire to utilize a part of the said storage space as a present water supply, the contract will be amended to provide a division of said storage space into present and future storage; and

WHEREAS, the Authority desires to utilize an undivided 5 percent of said storage space as a source of present water supply (hereinafter called present water supply); and

WHEREAS, the Authority desires to utilize an undivided 95 percent of said storage space as a source of future water supply (hereinafter called future water supply); and

WHEREAS, deliberate impoundment of water began at the Project and the Project was placed in operation and became available for the storage of water for municipal and industrial purposes on 3 January 1967; and

WHEREAS, the actual first cost of construction of the Project, including interest during construction, has been determined by the Contracting Officer; and

WHEREAS, ARTICLE 5(3) of the original contract provides for adjustment, as determined by the Contracting Officer, of the estimated first cost of providing the water supply storage space in the Project and the annual payments therefor to reflect the actual first cost of providing such storage space, including interest during construction; and

WHEREAS, the Authority is empowered so to contract with the Government and is vested with all necessary powers for accomplishment of the purposes of this Supplemental Agreement;

NOW, THEREFORE, the original contract is hereby modified in the following particulars but in no others:

1. ARTICLE 1, WATER STORAGE SPACE, is revised as follows:

a. Replace the first paragraph in its entirety with the following:

The Authority shall have the right to utilize an undivided 100 percent (estimated to contain 143,900 acre-feet after adjustment for sediment deposits) of the total storage space in the Project between elevations 200.0 feet above mean sea level and 238.0 feet above mean sea level. This storage space is to be used to impound water for present and anticipated future demand or need for municipal and industrial water supply. Five (5) percent (an estimated 7,200 acre-feet) of the space which the Authority has a right to utilize is for present use water storage, effective on the date of first use of water therefrom or 1 July 1974, whichever first occurs, and 95 percent (an estimated 136,700 acre-feet) is for future use water storage. The Authority may make such diversions as granted to the Authority by law or by the Texas Water Rights Commission, or its successors, to the extent that such storages proportionately will provide.

\* b. In the third line of the fourth paragraph, delete the words . . . "above elevation 206.0 feet above mean sea level."

c. Delete the fifth and seventh paragraphs.

d. Add the following paragraph:

The Authority recognizes that this contract provides storage space for raw water only. The Government makes no representations with respect to the quality or availability of water and assumes no responsibility therefor, or for the treatment of the water.

2. ARTICLE 3, FEDERAL AND STATE LAWS, is revised in its entirety to read as follows:

a. In acting under its rights and obligations hereunder, the Authority agrees to comply with all applicable Federal and State laws and regulations, including but not limited to the provisions of the Davis-Bacon Act (40 U.S.C. 276a et seq); the Contract Work Hours and Safety Standards Act (40 U.S.C. 327-333); and Title 29, Code of Federal Regulations, Part 3.

b. The Authority furnishes, as part of this contract, an assurance (Exhibit "D") that it will comply with Title VI of the Civil Rights Act of 1964 (78 Stat. 241, 42 U.S.C. 2000d et seq) and Department of Defense Directive 5500.11 issued pursuant thereto and published in Part 300 of Title 32, Code of Federal Regulations.

3. ARTICLE 5, CONSIDERATION AND PAYMENT, is revised in its entirety to read as follows:

In consideration of the right to utilize the aforesaid storage space in the Project for municipal and industrial water supply purposes, the Authority shall pay the following sums to the Government:

*actual costs*  
↓

a. For present water supply storage space:

(1) \$360,113.00, which is the cost, including interest during construction, of providing the present water supply storage space, said cost being 1.495 percent of the actual first cost of construction of the joint use facilities of the Project, plus interest during construction (or 5 percent of the investment cost of the Project allocated to the total water supply storage to be utilized by the Authority as stated in Article 1). The costs of providing and operating and maintaining the said storage space are specifically described in Exhibit "A" of this contract. The sum of \$360,113.00 and interest thereon shall be paid in 50 consecutive payments of \$12,962.70 each, beginning on 1 July 1974 and each year thereafter on 1 July to and including 1 July 2023. The Authority may elect to commence utilization of the present water supply storage space prior to 1 July 1974; but in such event, 50 consecutive payments of \$12,962.70 each will be due and payable beginning on the day of first use and each year thereafter on the anniversary date of such first use. Except for the first payment, which shall be applied solely to reduction of the principal, all payments shall include accrued interest on the unpaid balance at the rate of two and seven hundred forty-two thousandths percent (2.742%) per annum. The last annual payment shall be adjusted upward or downward when due to assure the repayment of all the investment cost allocated to the present water supply storage space within the 50 years. The schedule of annual payments for the present water supply storage is attached as Exhibit "B" of this contract.

(2) 1.462 percent of the annual experienced cost of operation and maintenance of the Project, exclusive of the operation and maintenance costs for land management and public utilization. The first payment, for the year ending 30 June 1975, estimated to be \$1,000.00, will be due and payable in advance in 1 July 1974. Annual payments thereafter will be due and payable in advance on 15 August and will be equal to 1.462 percent of the experienced cost of operation and maintenance for the preceding Government fiscal year. The second payment shall be increased or decreased by the difference between the first payment and 1.462 percent of the experienced cost of operation and maintenance for the preceding Government fiscal year.

If water is first used from the present water supply storage space prior to 1 July 1974, the estimated initial advance annual payment of \$1,000.00 for operation and maintenance will be due and payable on the day of first use. Annual payments thereafter will be due and payable in advance on the anniversary date of such first use and will be equal to 1.462 percent of the experienced cost of operation and maintenance for the preceding Government fiscal year. The second payment shall be increased or decreased by the difference between the first payment and 1.462 percent of the experienced cost of operation and maintenance for the preceding Government fiscal year.

b. For future water supply storage space:

(1) \$6,837,339.19, which is the cost, including interest during construction, of providing the future water supply storage space, said cost being 28.385 percent of the actual first cost of construction of the joint use facilities of the Project, plus interest during construction (or 95 percent of the investment cost of the Project allocated to the total water supply storage

to be utilized by the Authority as stated in Article 1). The costs of providing and operating and maintaining the said storage space are specifically described in Exhibit "A" of this contract. The sum of \$6,837,339.19 shall be interest free until 3 January 1977 unless water is first used from such future water supply storage space prior to such date. If water is first used from such future water supply storage space prior to 3 January 1977, the interest free period shall terminate as of the date of first use, and interest shall begin to accrue on the unpaid balance at the rate of two and seven hundred forty-two thousandths percent (2.742%) per annum.

The Authority may elect to commence utilization of the future water supply storage space at any time subsequent to the first use of water from the present water supply storage. The Authority may elect to begin repayment of the cost of the future water supply storage space on the day water is first used from such storage space or at any time prior thereto. If repayment of the cost is started subsequent to 3 January 1977, the Authority may further elect to pay the interest accruing from 3 January 1977 annually as it becomes due or allow it to accumulate until repayment is started. If this latter option is exercised, the interest will be compounded annually and added to the principal to obtain the total sum to be repaid.

If the Authority elects to start repayment of the cost of the future water supply storage space:

(a) prior to the date water is first used from such storage space and such date of first use is on or before 3 January 1977, payments made on or before such date of first use shall be applied solely to reduction of the principal and all subsequent payments shall include accrued interest on the unpaid balance at the rate of two and seven hundred forty-two thousandths percent (2.742%) per annum.

(b) prior to the date water is first used from such storage space and such date of first use is subsequent to 3 January 1977, and payments are started on or before 3 January 1977, payments made on or before 3 January 1977 shall be applied solely to reduction of the principal and all subsequent payments shall include accrued interest on the unpaid balance at the rate of two and seven hundred forty-two thousandths percent (2.742%) per annum.

(c) on the date water is first used from such storage space and such date of first use is on or before 3 January 1977, the first payment shall be applied solely to reduction of the principal and all subsequent payments shall include accrued interest on the unpaid balance at the rate of two and seven hundred forty-two thousandths percent (2.742%) per annum.

(d) prior to the date water is first used from such storage space and such date of first use is subsequent to 3 January 1977, and payments are started subsequent to 3 January 1977, or on the date water is first used from such storage space and such date of first use is subsequent to 3 January 1977, any unpaid accrued interest from 3 January 1977 to the date of the first payment shall be added to the principal amount to obtain the amount to be repaid. The first payment shall be applied solely to reduction of said amount to be repaid and all subsequent payments shall include accrued interest on the unpaid

balance at the rate of two and seven hundred forty-two thousandths percent (2.742%) per annum.

For any of the above stated options, the repayment schedule for the cost of the future water supply storage space will be prepared and provided to the Authority by the Contracting Officer when the Authority makes a specific selection. The repayment schedule for any option selected shall provide for equal annual payments and shall assure the repayment of all the investment cost allocated to water supply storage space by 1 January 2027 or not to exceed 50 years from the date water is first used from the future water supply storage space if such first use is prior to 1 January 1978.

If the Authority elects to start repayment of the cost of the future water supply storage space with the first payment being due and payable on 1 January 1978, the sum of \$6,837,339.19 plus accrued interest from 3 January 1977 of \$185,938.94, a total of \$7,023,278.13 as shown in Exhibit "A" of this contract, and interest thereon shall be paid in 50 consecutive payments of \$252,811.31 each, beginning on 1 January 1978 and each year thereafter on 1 January to and including 1 January 2027. Except for the first payment, which shall be applied solely to reduction of the principal sum due on 1 January 1978 (\$7,023,278.13), all payments shall include accrued interest on the unpaid balance at the rate of two and seven hundred forty-two thousandths percent (2.742%) per annum. The last annual payment shall be adjusted upward or downward when due to assure the repayment of all the investment cost allocated to the future water supply storage space. The schedule of annual payments for this option is attached as Exhibit "C" of this contract.

(2) 27.193 percent of the annual experienced cost of operation and maintenance of the Project, exclusive of the operation and maintenance costs for land management and public utilization. The first annual payment, estimated to be \$18,600.00, will be due and payable in advance on the day of first use of water from the future water supply storage space. Annual payments thereafter will be due and payable in advance on the anniversary date of such first use and will be equal to 27.193 percent of the experienced cost of operation and maintenance for the preceding Government fiscal year. The second payment shall be increased or decreased by the difference between the first payment and 27.193 percent of the experienced cost of operation and maintenance for the preceding Government fiscal year.

c. 29.880 percent of the cost of sedimentation resurveys when incurred.

d. 29.880 percent of the cost of major capital replacements. Provided such amount does not exceed \$10,000, it will be paid when incurred. If such amount exceeds \$10,000, it will be paid when incurred or, at the option of the Authority, in 5 equal annual payments with the first payment due when the expense is incurred and each year thereafter on the anniversary date of the first payment until the five payments have been made. Except for the first payment, which shall be applied solely to reduction of the allocated cost, all payments shall include accrued interest on the unpaid balance at the rate of two and seven hundred forty-two thousandths percent (2.742%) per annum. The last payment shall be adjusted upward or downward when due to assure the repayment of all the allocated cost and interest thereon within four years.

If the Authority shall fail to make any of the payments as provided in Articles 5a, 5b, 5c, and 5d when due, the overdue payments shall bear interest, compounded annually, at the rate of two and seven hundred forty-two thousandths percent (2.742%) per annum, charged from the dates such payments are due until paid.

The Authority shall have the right at any time it so elects to prepay the indebtedness under Articles 5a and 5b above, in whole or in part, with accrued interest thereon to the date of such prepayment, either before or after annual repayments are started. Subsequent to 3 January 1977, if a principal prepayment for future water supply storage space is made prior to the establishment of a repayment schedule, all accrued interest due to the date of such prepayment must be paid in full before application of any amount to reduction of the principal sum. Prepayment of the principal in part, under any selected repayment schedule, shall not relieve the Authority from payment, to discharge the remaining indebtedness, of the subsequent annual payments when due.

The extent of operation and maintenance of the Project shall be determined by the Contracting Officer and all records and accounting shall be maintained by the Contracting Officer. If the Authority should require additional operation and maintenance for the water supply storage over and above that deemed necessary by the Contracting Officer, the Authority shall bear the entire cost of such additional expense.

Records of cost of operation and maintenance of the Project shall be available for inspection and examination by the Authority.

4. ARTICLE 7, PERIOD OF CONTRACT, is revised in its entirety to read as follows:

This contract shall be effective when approved by the Secretary of the Army and shall continue in full force and effect for the life of the Project.

5. ARTICLE 8, RENEWALS, is revised in its entirety to read as follows:

ARTICLE 8, PERMANENT RIGHTS TO STORAGE. Upon completion of payments by the Authority, as provided in Articles 5a and 5b herein, the Authority shall have a permanent right, under the provisions of the Act of 16 October 1963 (Public Law 88-140, 43 U.S.C. 390e), to the use of the water supply storage space in the Project as provided in Article 1, subject to the following:

a. The Authority shall continue payment of annual operation and maintenance costs allocated to water supply.

b. The Authority shall bear the costs allocated to water supply of any necessary reconstruction, rehabilitation, or replacement of Project features which may be required to continue satisfactory operation of the Project. Such costs will be established by the Contracting Officer. Repayment arrangements, including schedules, will be in writing and will be made a part of this contract.

c. Upon completion of payments by the Authority as provided in Articles 5a and 5b herein, the Contracting Officer shall redetermine the storage space

for municipal and industrial water supply, taking into account such equitable reallocation of reservoir storage capacities among the purposes served by the Project as may be necessary due to sedimentation. Such findings, and the storage space allocated to municipal and industrial water supply, shall be defined and described in an exhibit which will be made a part of this contract. Following the same principle, such reallocation of reservoir storage capacity may be further adjusted from time to time as the result of sedimentation resurveys to reflect actual rates of sedimentation and the exhibit revised to show the revised storage space allocated to municipal and industrial water supply.

d. The permanent rights of the Authority under this contract shall be continued so long as the Government continues to operate the Project. In the event the Government no longer operates the Project, such rights may be continued subject to the execution of a separate contract, or additional supplemental agreement, providing for:

(1) continued operation by the Authority of such part of the facility as is necessary for the utilization of the water supply storage space allocated to it;

(2) terms which will protect the public interest; and

(3) effective absolvment of the Government by the Authority from all liability in connection with such continued operation.

6. Add the following ARTICLE:

Environmental Quality. During any construction, operation, and maintenance by the Authority of any facilities, specific actions will be taken to control environmental pollution which could result from such activity and to comply with applicable Federal, State, and local laws and regulations concerning environmental pollution. Particular attention should be given to (1) reduction of air pollution by control of burning, minimization of dust, containment of chemical vapors, and control of engine exhaust gases and of smoke from temporary heaters; (2) reduction of water pollution by control of sanitary facilities, storage of fuels and other contaminants, and control of turbidity and siltation of erosion; (3) minimization of noise levels; (4) onsite and offsite disposal of waste and spoil; and (5) prevention of landscape defacement and damage.

7. All other terms and conditions of the original contract shall be and remain the same.

8. This Supplemental Agreement shall be subject to the written approval of the Secretary of the Army and shall not be binding until so approved.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement as of the day and year first above written.

APPROVED:

Howard H. Callaway  
Secretary of the Army

Date: 28 JUN 1974

THE UNITED STATES OF AMERICA

By Floyd H. Henk  
Floyd H. HENK 73 JUN 21  
Colonel, CE  
Contracting Officer

BRAZOS RIVER AUTHORITY OF TEXAS

By A. L. Brooks, Jr.  
A. L. BROOKS, JR.  
President

I, Harry H. Moore, certify that I am the Secretary of the Brazos River Authority of Texas herein; that A. L. Brooks, Jr. who signed this supplemental agreement on behalf of the Authority was then President of said Brazos River Authority of Texas; that said supplemental agreement was duly signed for and on behalf of the Brazos River Authority of Texas by authority of its governing body and is within the scope of its legal powers.

IN WITNESS WHEREOF, I have hereunto affixed my hand and the seal of said Brazos River Authority of Texas this 8th day of June 1973.

CORPORATE SEAL

Harry H. Moore  
Harry H. MOORE  
Secretary, Brazos River Authority  
of Texas

SOMERVILLE RESERVOIR

EXHIBIT "A"

I-- RESERVOIR STORAGES

<u>Feature</u>	<u>Elevation (feet msl)</u>	<u>Gross storage (acre-feet)</u>	<u>Usable storage (acre-feet)</u>	<u>Percent of usable storage</u>
Flood control	238.0 - 258.0	347,400 <sup>(1)</sup>	337,700	70.120
Water supply	200.0 - 238.0	160,100 <sup>(2)</sup>	143,900	29.880
Present supply			(7,200)	( 1.495)
Future supply			(136,700)	(28.385)
Totals		<u>507,500</u>	<u>481,600</u>	<u>100.000</u>

(1) Includes 9,700 acre-feet sediment reserve.

(2) Includes 16,200 acre-feet sediment reserve.

II - PROJECT CONSTRUCTION COST

Federal construction cost	\$ 24,274,893.19
Recreation purpose cost (Specific facilities)	1,326,000.00
Project construction cost to be allocated	\$ 22,948,893.19
Interest during construction on cost to be allocated	1,104,888.13
Project construction investment to be allocated	\$ 24,053,781.32

*see DF dtd 13 APR 73*

III - ALLOCATION OF CONSTRUCTION INVESTMENT  
(Use of Facilities, or Pro Rata, Method)

	<u>Flood control</u>	<u>Water supply</u>		<u>Total</u>
		<u>Present</u>	<u>Future</u>	
1. Specific facilities cost	-	-	-	None
2. Distribution of joint use facilities cost (percent)	70.120	1.495	28.385	100.000
3. Allocated joint use facilities cost	\$16,091,763.91	\$343,085.95	\$6,514,043.33	\$22,948,893.19
Subtotals - cost	\$16,091,763.91	\$343,085.95	\$6,514,043.33	\$22,948,893.19
4. Interest during construction	764,565.22 <sup>(1)</sup>	17,027.05 <sup>(2)</sup>	323,295.86 <sup>(2)</sup>	1,104,888.13
5. Allocation of construction investment	\$16,856,329.13	\$360,113.00 <sup>(3)</sup>	\$6,837,339.19 <sup>(3)</sup>	\$24,053,781.32

(1) Interest rate - 2.625%.

(2) Interest rate - 2.742%.

(3) Investment for water supply to be repaid by the Authority:

Present water supply	\$ 360,113.00
Future water supply	6,837,339.19
Total	\$ 7,197,452.19

IV - ALLOCATION OF ESTIMATED OPERATION AND MAINTENANCE COST

	<u>Flood control</u>	<u>Water supply<sup>(2)</sup></u>		<u>Total</u>
		<u>Present</u>	<u>Future</u>	
1. Specific cost	\$ 7,500	\$ 100	\$ 1,900	\$ 9,500
2. Distribution of joint use cost (percent)	70.120	1.495	28.385	100.000
3. Allocated joint use cost	<u>41,300</u>	<u>900</u>	<u>16,700</u>	<u>58,900</u>
4. Total allocation	<u>\$48,800</u>	<u>\$1,000</u>	<u>\$18,600</u>	<u>\$68,400<sup>(1)</sup></u>

(1) Total estimated annual operation and maintenance cost for the Project, exclusive of operation and maintenance costs for land management and public utilization.

(2) To be paid by the Authority:

Present water supply:  $\frac{1,000}{68,400} \times 100 = 1.462\%$  of total annual operation and maintenance cost.

Future water supply:  $\frac{18,600}{68,400} \times 100 = 27.193\%$  of total annual operation and maintenance cost.

Project total: 28.655% of total annual operation and maintenance cost.

V - COMPUTATIONS FOR ANNUAL PAYMENTS FOR INTEREST AND AMORTIZATION

Present water supply:

$$P = \frac{A - P}{\frac{1}{i + c}}$$

P = annual payment

A = amount to be repaid = \$360,113.00

i = interest rate = 2.742%

c = amortization coefficient for 49 years = 0.00992031

$$P = \frac{360,113.00 - P}{\frac{1}{0.02742 + 0.00992031}}$$

$$26.7807096P = 360,113.00 - P$$

$$27.7807096P = 360,113.00$$

$$P = \$12,962.70$$

Future water supply: (Amortization option scheduled in Exhibit "C")

4 January 1977 through 31 December 1977 = 362 days

$$\frac{362 \text{ days}}{365 \text{ days}} = 0.991781 \text{ years}$$

$$\begin{aligned} \text{Interest} &= \$6,837,339.19 \times 0.02742 \times 0.991781 \\ \text{Interest} &= \$185,938.94 \end{aligned}$$

$$A = \$6,837,339.19 + \$185,938.94 = \$7,023,278.13$$

$$P = \frac{A - P}{\frac{1}{1 + c}}$$

$$P = \frac{7,023,278.13 - P}{0.02742 + 0.00992031}$$

$$26.7807096P = 7,023,278.13 - P$$

$$27.7807096P = 7,023,278.13$$

$$P = \$252,811.31$$

P = annual payment

A = amount to be repaid = \$7,023,278.13

i = interest rate = 2.742%

c = amortization coefficient for 49 years = 0.00992031

SOMERVILLE RESERVOIR

EXHIBIT "B"

PAYMENT SCHEDULE - PRESENT WATER SUPPLY

<u>Payment No.</u>	<u>Payment to interest</u>	<u>Payment to principal</u>	<u>Total payment</u>	<u>Balance due</u>
1	0.00	12962.70	12962.70	360113.00
2	9518.86	3443.84	12962.70	347150.30
3	9424.43	3538.27	12962.70	343706.46
4	9327.41	3635.29	12962.70	340168.20
5	9227.73	3734.97	12962.70	336532.91
6	9125.32	3837.38	12962.70	332797.94
7	9020.10	3942.60	12962.70	328960.56
8	8911.99	4050.71	12962.70	325017.96
9	8800.92	4161.78	12962.70	320967.25
10	8686.81	4275.89	12962.70	316805.47
11	8569.56	4393.14	12962.70	312529.58
12	8449.10	4513.60	12962.70	308136.44
13	8325.34	4637.36	12962.70	303622.84
14	8198.18	4764.52	12962.70	299395.48
15	8067.54	4895.16	12962.70	294220.96
16	7933.31	5029.39	12962.70	289325.80
17	7795.41	5167.29	12962.70	284296.41
18	7653.72	5308.98	12962.70	279129.12
19	7508.15	5454.55	12962.70	273820.14
20	7358.59	5604.11	12962.70	268365.59
21	7204.92	5757.78	12962.70	262761.48
22	7047.04	5915.66	12962.70	257003.70
23	6884.83	6077.87	12962.70	251038.04
24	6718.18	6244.52	12962.70	245010.17
25	6546.95	6415.75	12962.70	238765.65
				232349.90

<u>Payment No.</u>	<u>Payment to interest</u>	<u>Payment to principal</u>	<u>Total payment</u>	<u>Balance due</u>
26	6371.04	6591.66	12962.70	225758.24
27	6190.29	6772.41	12962.70	218985.83
28	6004.59	6958.11	12962.70	212027.72
29	5813.80	7148.90	12962.70	204378.82
30	5617.78	7344.92	12962.70	197533.90
31	5416.38	7546.32	12962.70	189987.58
32	5209.46	7753.24	12962.70	182234.34
33	4996.87	7965.83	12962.70	174268.51
34	4778.44	8184.26	12962.70	166084.25
35	4554.03	8408.67	12962.70	157675.58
36	4323.46	8639.24	12962.70	149036.34
37	4086.58	8876.12	12962.70	140160.22
38	3843.19	9119.51	12962.70	131040.72
39	3593.14	9369.56	12962.70	121671.16
40	3336.22	9626.48	12962.70	112044.68
41	3072.27	9890.43	12962.70	102154.25
42	2801.07	10161.63	12962.70	91992.62
43	2522.44	10440.26	12962.70	81552.36
44	2236.17	10726.53	12962.70	70825.83
45	1942.04	11020.66	12962.70	59805.17
46	1639.86	11322.84	12962.70	48482.33
47	1329.39	11633.31	12962.70	36849.02
48	1010.40	11952.30	12962.70	24896.72
49	682.67	12280.03	12962.70	12616.69
50	345.95	12616.69	12962.64	0.00

SOMERVILLE RESERVOIR

EXHIBIT "C"

PAYMENT SCHEDULE - FUTURE WATER SUPPLY

<u>Payment No.</u>	<u>Payment to interest</u>	<u>Payment to principal</u>	<u>Total payment</u>	<u>Balance due</u>
1	0.00	252811.31	252811.31	7023278.13
2	185646.20	67165.11	252811.31	6770466.82
3	183804.53	69006.78	252811.31	6703301.71
4	181912.37	70898.94	252811.31	6634294.93
5	179968.32	72842.99	252811.31	6563395.99
6	177970.96	74840.35	252811.31	6490553.00
7	175918.84	76892.47	252811.31	6415712.65
8	173810.45	79000.86	252811.31	6338820.18
9	171644.25	81167.06	252811.31	6259819.32
10	169418.64	83392.67	252811.31	6178652.26
11	167132.02	85679.29	252811.31	6095259.59
12	164782.69	88028.62	252811.31	6009580.30
13	162368.95	90442.36	252811.31	5921551.68
14	159889.02	92922.29	252811.31	5831109.32
15	157341.09	95470.22	252811.31	5738187.03
16	154723.29	98088.02	252811.31	5642716.81
17	152033.72	100777.59	252811.31	5544628.79
18	149270.40	103540.91	252811.31	5443851.20
19	146431.31	106380.00	252811.31	5340310.29
20	143514.37	109296.94	252811.31	5233930.29
21	140517.45	112293.86	252811.31	5124633.35
22	137438.35	115372.96	252811.31	5012339.49
23	134274.82	118536.49	252811.31	4896966.53
24	131024.55	121786.76	252811.31	4778430.04
25	127685.16	125126.15	252811.31	4656643.28
				4531517.13

<u>Payment No.</u>	<u>Payment to interest</u>	<u>Payment to principal</u>	<u>Total payment</u>	<u>Balance due</u>
26	124254.20	128557.11	252811.31	4402960.02
27	120729.16	132082.15	252811.31	4270877.87
28	117107.47	135703.84	252811.31	4135174.03
29	113386.47	139424.84	252811.31	3995749.19
30	109563.44	143247.87	252811.31	3852501.32
31	105635.59	147175.72	252811.31	3705325.60
32	101600.03	151211.28	252811.31	3554114.32
33	97453.81	155357.50	252811.31	3398756.82
34	93193.91	159617.40	252811.31	3239139.42
35	88817.20	163994.11	252811.31	3075145.31
36	84320.48	168490.83	252811.31	2906654.43
37	79700.47	173110.84	252811.31	2733543.64
38	74953.77	177857.54	252811.31	2555686.10
39	70076.91	182734.40	252811.31	2372951.70
40	65066.34	187744.97	252811.31	2185206.73
41	59918.37	192892.94	252811.31	1992313.79
42	54629.24	198182.07	252811.31	1794131.72
43	49195.09	203616.22	252811.31	1590515.50
44	43611.94	209199.37	252811.31	1381316.13
45	37875.69	214935.62	252811.31	1166380.51
46	31982.15	220829.16	252811.31	945551.35
47	25927.02	226884.29	252811.31	718667.06
48	19705.85	233105.46	252811.31	485561.60
49	13314.10	239497.21	252811.31	246064.39
50	6747.09	246064.39	252811.48	0.00

SOMERVILLE RESERVOIR

EXHIBIT "D"

ASSURANCE OF COMPLIANCE WITH THE  
DEPARTMENT OF DEFENSE DIRECTIVE UNDER  
TITLE VI OF THE CIVIL RIGHTS ACT OF 1964

The Brazos River Authority of Texas (hereinafter called "Applicant-Recipient") HEREBY AGREES THAT it will comply with title VI of the Civil Rights Act of 1964 (Public Law 88-352) and all requirements imposed by or pursuant to the Directive of the Department of Defense (32 CFR Part 300, issued as Department of Defense Directive 5500.11, December 28, 1964) issued pursuant to that title, to the end that, in accordance with title VI of that Act and the Directive, no person in the United States shall, on the ground of race, color, or national origin be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which the Applicant-Recipient receives Federal financial assistance from the U. S. Army Corps of Engineers and HEREBY GIVES ASSURANCE THAT it will immediately take any measures necessary to effectuate this agreement.

If any real property or structure thereon is provided or improved with the aid of Federal financial assistance extended to the Applicant-Recipient by this U. S. Army Corps of Engineers, assurance shall obligate the Applicant-Recipient, or in the case of any transfer of such property, any transferee, for the period during which the real property or structure is used for a purpose for which Federal financial assistance is extended or for another purpose involving the provision of similar services or benefits. If any personal property is so provided, this assurance shall obligate the Applicant-Recipient for the period during which it retains ownership or possession of the property. In all other cases, this assurance shall obligate the Applicant-Recipient for the period during which the Federal financial assistance is extended to it by the U. S. Army Corps of Engineers.

THIS ASSURANCE is given in consideration of and for the purpose of obtaining any and all Federal grants, loans, contracts, property, discounts or other Federal financial assistance extended after the date hereof to the Applicant-Recipient by the Department, including installment payments after such date on account of arrangements for Federal financial assistance which were approved before such date.

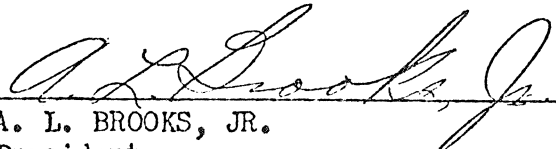
The Applicant-Recipient recognizes and agrees that such Federal assistance will be extended in reliance on the representations and agreements made in this assurance, and that the United States shall have the right to seek

judicial enforcement of this assurance. This assurance is binding on the Applicant-Recipient, its successors, transferees and assignees, and the person or persons whose signatures appear below are authorized to sign this assurance on behalf of the Applicant-Recipient.

THE BRAZOS RIVER AUTHORITY OF TEXAS

Dated June 8, 1973

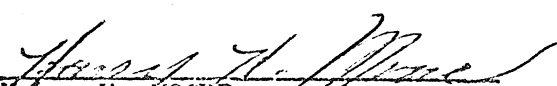
By

  
A. L. BROOKS, JR.  
President

P. O. Box 7555

Waco, Texas 76710  
(Mailing address)

ATTEST:

  
Harry H. MOORE  
Secretary, Brazos River Authority  
of Texas

RESOLUTION

RESOLVED by the Board of Directors of Brazos River Authority that the President be, and he is hereby, authorized to execute the Somerville Reservoir Supplemental Agreement (Modification No. 1 to Contract No. DA-41-443-CIVENG-62-1043) in the form attached hereto.

I, Walter J. Wells, Assistant Secretary of the Brazos River Authority, hereby certify that the above and foregoing is a true and correct copy of a Resolution adopted by the Board of Directors of Brazos River Authority at its regular quarterly Board meeting held in Waco, Texas, on April 16, 1973.

WITNESS MY HAND this 4th day of June, 1973.

  
Assistant Secretary  
Brazos River Authority

**EXHIBIT C**

**STANDING INSTRUCTIONS TO LAKE MANAGER**

**SOMERVILLE DAM AND RESERVOIR**

EXHIBIT C

STANDING INSTRUCTIONS TO LAKE MANAGER

SOMERVILLE DAM AND RESERVOIR

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**STANDING INSTRUCTIONS TO LAKE MANAGER  
SOMERVILLE DAM AND RESERVOIR**

**I. GENERAL**

**1. Instructions.** Detailed instructions to the project personnel at Somerville Dam and Reservoir are presented below.

a. Regulation. The Fort Worth District Water Management Office will normally issue instructions for the storage and discharge of water. In the event communications with the Fort Worth District Water Management Office are disrupted, the Lake Manager will direct regulation in accordance with the Emergency Regulation guidance provided in Section II of this exhibit.

b. Data Reporting. The Water Management Office is staffed from 0700 hours to 1600 hours daily, and 0700 hours to 1100 hours on weekends and holidays (except Christmas Day). During these hours reservoir regulators may be reached via telephone at 817-886-1551, via e-mail at [ceswf-od-1@usace.army.mil](mailto:ceswf-od-1@usace.army.mil), or (as a backup) via FAX at 817-886-6472. Outside of these hours the Water Management Office Duty Regulator may be reached via mobile telephone at 817-791-0973, or, as a backup, via the above e-mail address.

(1). Daily Report. Each day lake and hydrometeorological data will be submitted to the Fort Worth District Water Management Office between 0800 and 0830 hours. The primary means of submission will be the Internet at <http://www.swf-wc.usace.army.mil>. The secondary means of submission will be via telephone, and FAX may be used as a backup. The following data should be included in the daily report.

(a). Weather. For the 24-hour period preceding 0800 hours each day, report cumulative precipitation and evaporation values, in inches, and the maximum and minimum experienced temperature readings.

(b). Gate Settings. Gate number of each open gate, with the height of opening in feet as of 0800 hours on the date of report.

(c). Spillway Discharge. In the event discharge occurs over the spillway, report the respective dates and times discharge begins and ends.

(2). Reporting Severe Weather. During normal project duty hours, including weekends as applicable, severe weather will be reported as it develops, to include information and data that may be requested by the Water Management Office. Severe weather conditions outside of normal project duty hours will be reported when and as requested by the Water Management Office.

(3). Reporting Gate Operations. Upon completion of any change in gate settings,

details of the gate operations will be reported to the Water Management Office via telephone, e-mail, or FAX (as backup). The report shall include the gate settings prior to change, the date and time of beginning of change, the date and time of completion of change, and the gate settings upon completion of change.

c. Reporting Unusual Events. Events or conditions not normally encountered in the routine operation of the Dam and Reservoir that might endanger the integrity of the dam or necessitate temporary or permanent revision of the operating procedures shall be promptly reported to the Operations Division and the Water Management Office. Settlement, movement, or cracking of the earth embankment or abutments, unusual change in seepage rates or development of new seepage areas, landslides, rockslides, displacement of riprap, or indication of an impending movement should be reported to the Dam Safety Program Manager in the Geotechnical Office. Any changes to the outlet works or spillway including structural settlement or movement, cracking, or vibrations; mechanical malfunction or failure shall be reported immediately to the Water Management Office and the Dam Safety Coordinator. Reference the Somerville Dam **Flood Emergency Plan** should an event occur indicating any degree of jeopardy to the safety of the dam or to the safety of the public. The stilling basin and protected/armored downstream areas must be visually monitored closely during all high releases. Outside of normal duty hours one of the persons listed on the Fort Worth District Notification List for Somerville Lake will be notified, and the Duty Regulator of the Water Management Office will be notified at mobile phone 817-791-0973.

d. Warnings. It is the responsibility of the Lake Manager to maintain a list in current status of residents, and/or property, which would be endangered or inconvenienced by large and/or prolonged releases, and to give adequate warning of such impending releases. Notification will be made by whatever means are available, in accordance with current Fort Worth District emergency notifications protocol. In every case, before an increase in release rate is made, a warning horn shall be sounded and the area immediately below the stilling basin visually checked for person(s) in a dangerous area.

e. Gate Changes. Gate changes will normally be directed by the Water Management Office. In the event communications with the Fort Worth District Office are disrupted, the Lake Manager will direct gate changes. During flood periods, gate changes may be required as often as every half hour. Only under unusual circumstances will gate changes be required more frequently than every half hour. Examples of such unusual circumstances include unexpectedly high rates of change in inflow to the reservoir, or a required response to a dam safety issue. The gates will be operated in a manner prescribed by the manufacturer. A complete log of all gate operations will be kept for each gate.

## II. REGULATION PROCEDURES

**1. Normal Regulation.** Normally, instructions for storage and release of water for conservation and flood control purposes will be issued by the Water Management Office in accordance with the plan of regulation prescribed in Chapter 7 of this water control manual.

**2. Emergency Regulation.** In the event of disruption of communications with the Fort Worth District Water Management Office, the Lake Manager will, on his own initiative, direct operation of the reservoir in accordance with the rules outlined below:

a. Make conservation releases in accordance with the current request from the BRA as last related by the Water Management Office prior to loss of communications.

b. Take immediate steps to re-establish communication with the Fort Worth District Water Management Office.

c. Until communications are restored, regulate the reservoir in accordance with Chapter 7, Somerville Dam Reservoir Emergency Regulation Plan on Plate 7-2, and Surge Curve for Flood Control on Plate 7-1A. During the passage of flood waters, gate changes will be required at frequent intervals in order to maintain the pool in its normal operating range, insofar as possible. When induced surge operation begins, both frequent gate changes and close monitoring of the event will be required.

**3. Temporary Deviations.** During the course of normal or emergency regulation of the reservoir, the Lake Manager may temporarily deviate from the current release rates in the event an immediate short-term departure is deemed necessary to protect the safety of the dam, or to avoid serious hazards to life. As soon as practicable, the Fort Worth District Water Management Office will be informed via telephone, e-mail, or FAX, as to the nature of the emergency and the subsequent response. If the deviation is conducted in the interest of dam safety, the Dam Safety Coordinator will also be notified as soon as practicable. Such actions shall be confirmed in writing, as soon as practicable, to the Fort Worth District Water Management Office and the Southwestern Division Water Management Office and shall include justification for the action.

**EXHIBIT D**

**OEI-URS TEAM**

**QUALITY CONTROL REVIEW FORMS**

## Quality Control Review Form

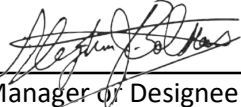
Project Name	Update Water Control Manual for Somerville Dam and Lake	Client	USACE
Project Location	Burleson County, Texas	Project Manager	Joshua McClure
Project Number	458.0009	Task Manager	Stephen Bolster

<b>Project Information</b>	<p style="text-align: center;"><i>(This section is to be completed by the Project Manager or the PM's Designee.)</i></p> <p>Work Product Originator: Becky Taylor and Taylor Townsend</p> <p>Work Product to be Reviewed: Bardwell Dam and Lake Water Control Manual Chapters 1 to 9 (30%)</p> <p>Review Scope: Review for correctness, completeness, and technical accuracy. Perform technical edit for format, spelling, grammar, pagination and readability</p> <p><b>Specific Instructions: Reviewer to complete review and detail check using OEI internal review checklist</b></p>
----------------------------	--

<b>Comments</b>	<p style="text-align: center;"><i>(This section is to be completed by the Reviewer)</i></p> <p>Select:</p> <p style="margin-left: 40px;"><input type="checkbox"/> Reviewer has no comments</p> <p style="margin-left: 20px;">or</p> <p style="margin-left: 40px;"><input checked="" type="checkbox"/> Comments have been provided on:</p> <div style="margin-left: 80px;"> <input checked="" type="checkbox"/> Marked directly on work product  <input checked="" type="checkbox"/> Comments provided in OEI internal checklist         </div> <div style="display: flex; justify-content: space-between;"> <div style="width: 60%;"> <p style="text-align: center;">Becky Taylor</p> <hr/> <p style="text-align: center;">Reviewer</p> </div> <div style="width: 35%;"> <p style="text-align: center;">8/30/2019</p> <hr/> <p style="text-align: center;">Date</p> </div> </div>
-----------------	--

<b>Verification</b>	<p style="text-align: center;"><i>(Section to be completed by the Reviewer once Comments section completed)</i></p> <p>Select:</p> <p style="margin-left: 40px;"><input type="checkbox"/> Comments have been incorporated by reviewer. There are no outstanding issues</p> <p style="margin-left: 20px;">or</p> <p style="margin-left: 40px;"><input checked="" type="checkbox"/> Comments have been incorporated by Reviewer. Unresolved issues have been submitted to PM for resolution</p> <p style="margin-left: 20px;">and</p> <p style="margin-left: 40px;"><input checked="" type="checkbox"/> Reviewer asserts that product review is complete</p> <div style="display: flex; justify-content: space-between;"> <div style="width: 60%;"> <p style="text-align: center;">Becky Taylor</p> <hr/> <p style="text-align: center;">Reviewer</p> </div> <div style="width: 35%;"> <p style="text-align: center;">9/4/2019</p> <hr/> <p style="text-align: center;">Date</p> </div> </div>
---------------------	---

**APPROVAL**

<input checked="" type="checkbox"/> Internal QC review is complete	
 <hr/> Project Manager or Designee Signature	<p>9/12/2019</p> <hr/> Date

### Quality Control Review Form

Project Name	Update Water Control Manual for Somerville Dam and Lake	Client	USACE
Project Location	Burleson County, Texas	Project Manager	Joshua McClure
Project Number	458.0009	Task Manager	Stephen Bolster

<b>Project Information</b>	<p style="text-align: center;"><i>(This section is to be completed by the Project Manager or the PM's Designee.)</i></p> <p>Work Product Originator: Becky Taylor and Taylor Townsend          Work Product to be Reviewed: Bardwell Dam and Lake Water Control Manual Chapters 1 to 9 (60%)          Review Scope: Review for correctness, completeness, and technical accuracy. Perform technical edit for format, spelling, grammar, pagination and readability</p> <p><b>Specific Instructions: Reviewer to complete review and detail check using OEI internal review checklist</b></p>
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<b>Comments</b>	<p style="text-align: center;"><i>(This section is to be completed by the Reviewer)</i></p> <p>Select:</p> <p style="margin-left: 40px;"><input type="checkbox"/> Reviewer has no comments</p> <p style="margin-left: 20px;">or</p> <p style="margin-left: 40px;"><input checked="" type="checkbox"/> Comments have been provided on:</p> <div style="margin-left: 60px;"> <input checked="" type="checkbox"/> Marked directly on work product  <input checked="" type="checkbox"/> Comments provided in OEI internal checklist         </div> <p style="text-align: right; margin-right: 100px;">             _____              Stephen Bolster              Reviewer         </p> <p style="text-align: right; margin-right: 100px;">             _____              9/16/2019              Date         </p>
-----------------	--

<b>Verification</b>	<p style="text-align: center;"><i>(Section to be completed by the Reviewer once Comments section completed)</i></p> <p>Select:</p> <p style="margin-left: 40px;"><input type="checkbox"/> Comments have been incorporated by reviewer. There are no outstanding issues</p> <p style="margin-left: 20px;">or</p> <p style="margin-left: 40px;"><input checked="" type="checkbox"/> Comments have been incorporated by Reviewer. Unresolved issues have been submitted to PM for resolution</p> <p style="margin-left: 20px;">and</p> <p style="margin-left: 40px;"><input checked="" type="checkbox"/> Reviewer asserts that product review is complete</p> <p style="text-align: right; margin-right: 100px;">             _____              Stephen Bolster              Reviewer         </p> <p style="text-align: right; margin-right: 100px;">             _____              9/18/2019              Date         </p>
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#### APPROVAL

<input checked="" type="checkbox"/>	Internal QC review is complete
_____ Project Manager or Designee Signature	_____ 9/20/2019 Date

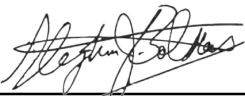
### Quality Control Review Form

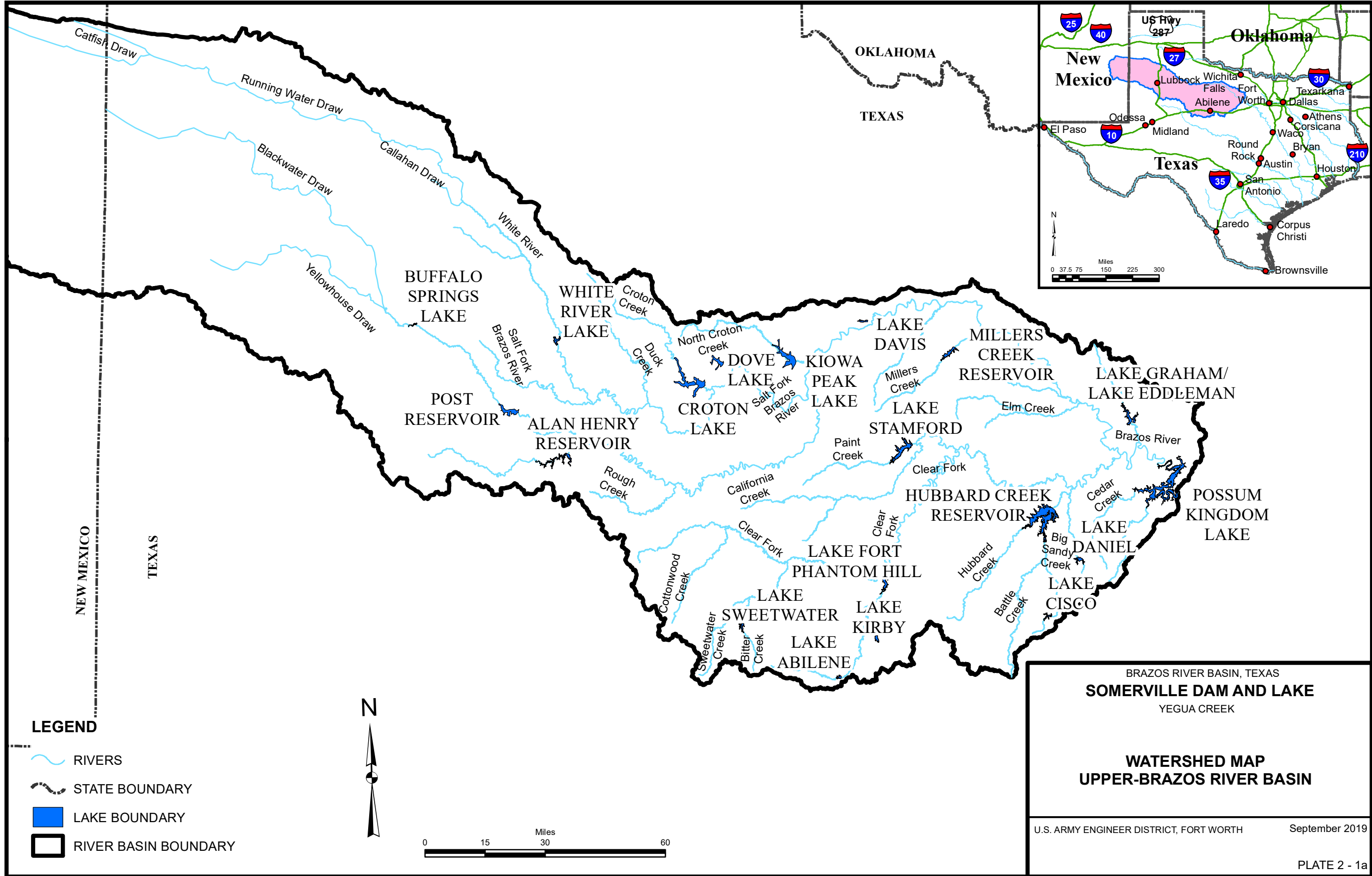
Project Name	Update Water Control Manual for Somerville Dam and Lake	Client	USACE
Project Location	Burleson County, Texas	Project Manager	Joshua McClure
Project Number	458.0009	Task Manager	Stephen Bolster

<b>Project Information</b>	<p style="text-align: center;"><i>(This section is to be completed by the Project Manager or the PM's Designee.)</i></p> <p>Work Product Originator: Becky Taylor and Taylor Townsend            Work Product to be Reviewed: Bardwell Dam and Lake Water Control Manual Chapters 1 to 9 (90%)            Review Scope: Review for correctness, completeness, and technical accuracy. Perform technical edit for format, spelling, grammar, pagination and readability</p> <p><b>Specific Instructions: Reviewer to complete review and detail check using OEI internal review checklist</b></p>
----------------------------	--

<b>Comments</b>	<p style="text-align: center;"><i>(This section is to be completed by the Reviewer)</i></p> <p>Select:</p> <p style="margin-left: 40px;"><input type="checkbox"/> Reviewer has no comments</p> <p style="margin-left: 20px;">or</p> <p style="margin-left: 40px;"><input checked="" type="checkbox"/> Comments have been provided on:</p> <div style="margin-left: 80px;"> <input checked="" type="checkbox"/> Marked directly on work product  <input checked="" type="checkbox"/> Comments provided in OEI internal checklist         </div> <div style="display: flex; justify-content: space-between;"> <div style="width: 60%; text-align: center;">             Sandy Endy              _____              Reviewer           </div> <div style="width: 35%; text-align: center;">             9/27/2019              _____              Date           </div> </div>
-----------------	--

<b>Verification</b>	<p style="text-align: center;"><i>(Section to be completed by the Reviewer once Comments section completed)</i></p> <p>Select:</p> <p style="margin-left: 40px;"><input type="checkbox"/> Comments have been incorporated by reviewer. There are no outstanding issues</p> <p style="margin-left: 20px;">or</p> <p style="margin-left: 40px;"><input checked="" type="checkbox"/> Comments have been incorporated by Reviewer. Unresolved issues have been submitted to PM for resolution</p> <p style="margin-left: 20px;">and</p> <p style="margin-left: 40px;"><input checked="" type="checkbox"/> Reviewer asserts that product review is complete</p> <div style="display: flex; justify-content: space-between;"> <div style="width: 60%; text-align: center;">             Stephen Bolster              _____              Reviewer           </div> <div style="width: 35%; text-align: center;">             9/30/2019              _____              Date           </div> </div>
---------------------	---

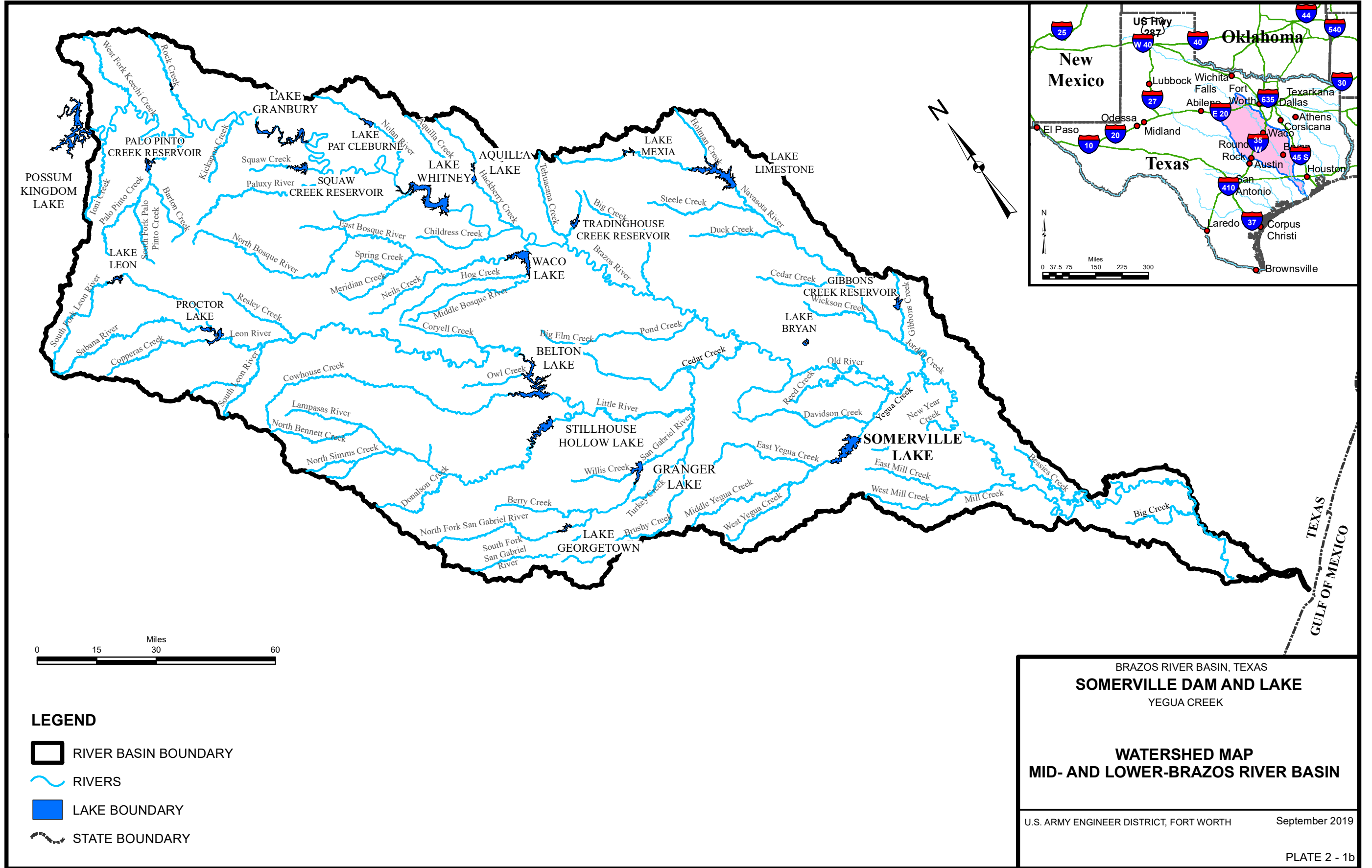
<b>APPROVAL</b>	
<input checked="" type="checkbox"/> Internal QC review is complete	
 _____ Project Manager or Designee Signature	9/30/2019 _____ Date

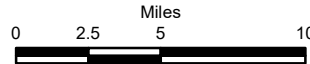
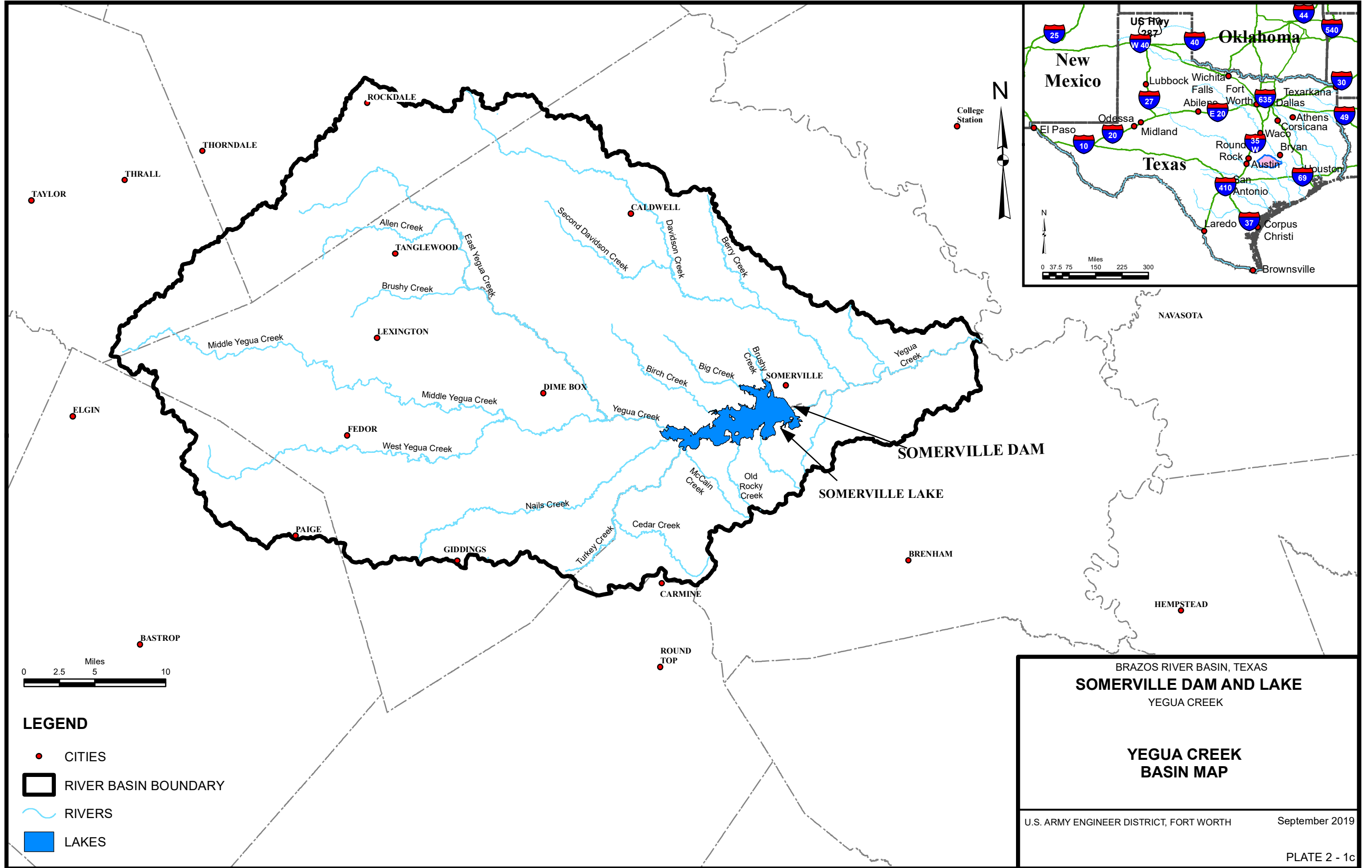


BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
 YEGUA CREEK

**WATERSHED MAP**  
**UPPER-BRAZOS RIVER BASIN**

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2019





College Station

NAVASOTA

HEMPSTEAD

SOMERVILLE DAM

SOMERVILLE LAKE

BRENHAM

ROUND TOP

CARMINE

GIDDINGS

PAIGE

FEDOR

DIME BOX

LEXINGTON

TANGLEWOOD

CALDWELL

THORNDALE

THRALL

TAYLOR

ROCKDALE

ELGIN

BASTROP

Allen Creek

Brushy Creek

Middle Yegua Creek

Middle Yegua Creek

West Yegua Creek

Nails Creek

Turkey Creek

Cedar Creek

McCain Creek

Old Rocky Creek

Yegua Creek

Birch Creek

Big Creek

Brushy Creek

SOMERVILLE

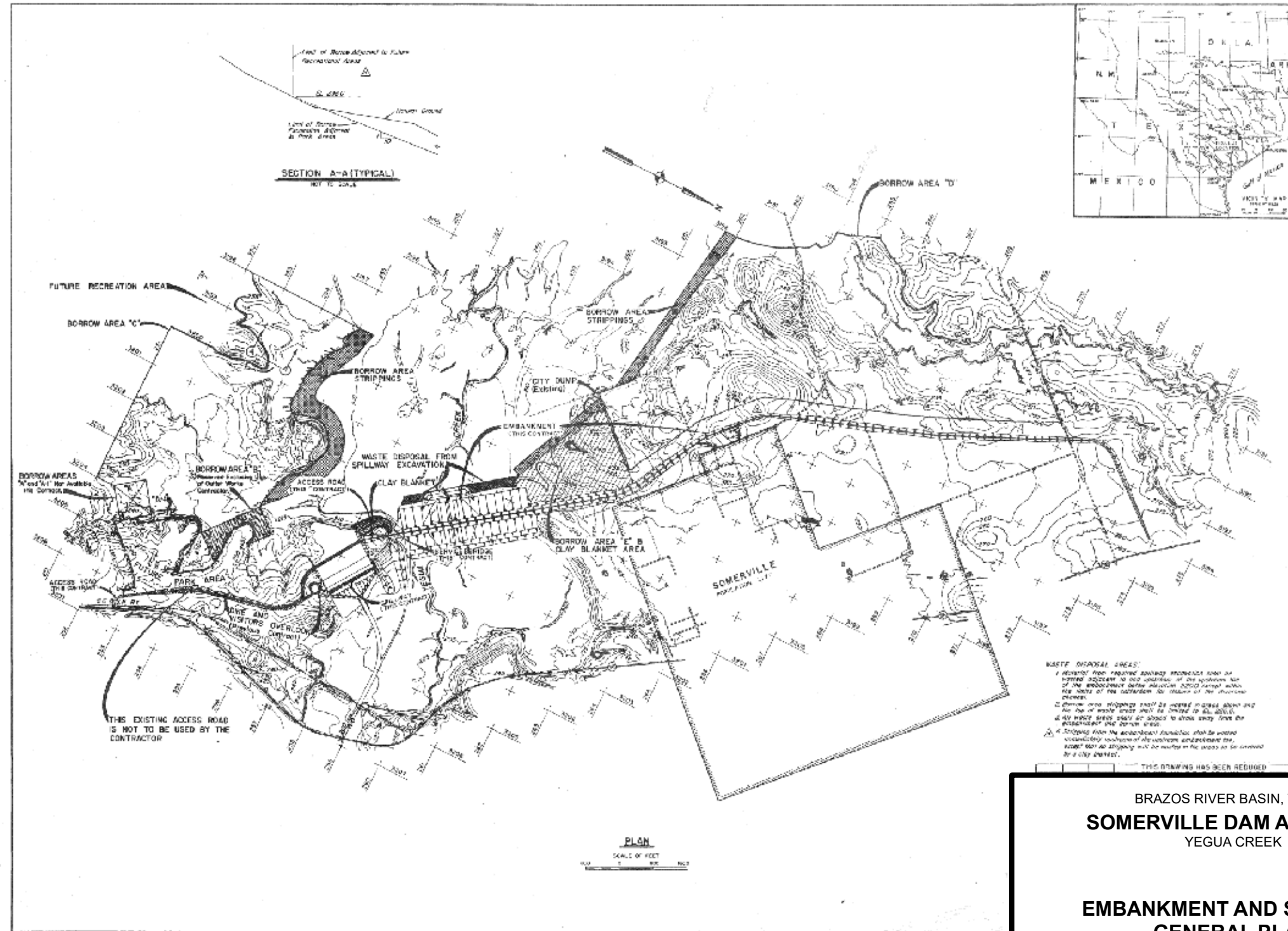
Yegua Creek

Second Davidson Creek

Davidson Creek

Bent Creek

East Yegua Creek



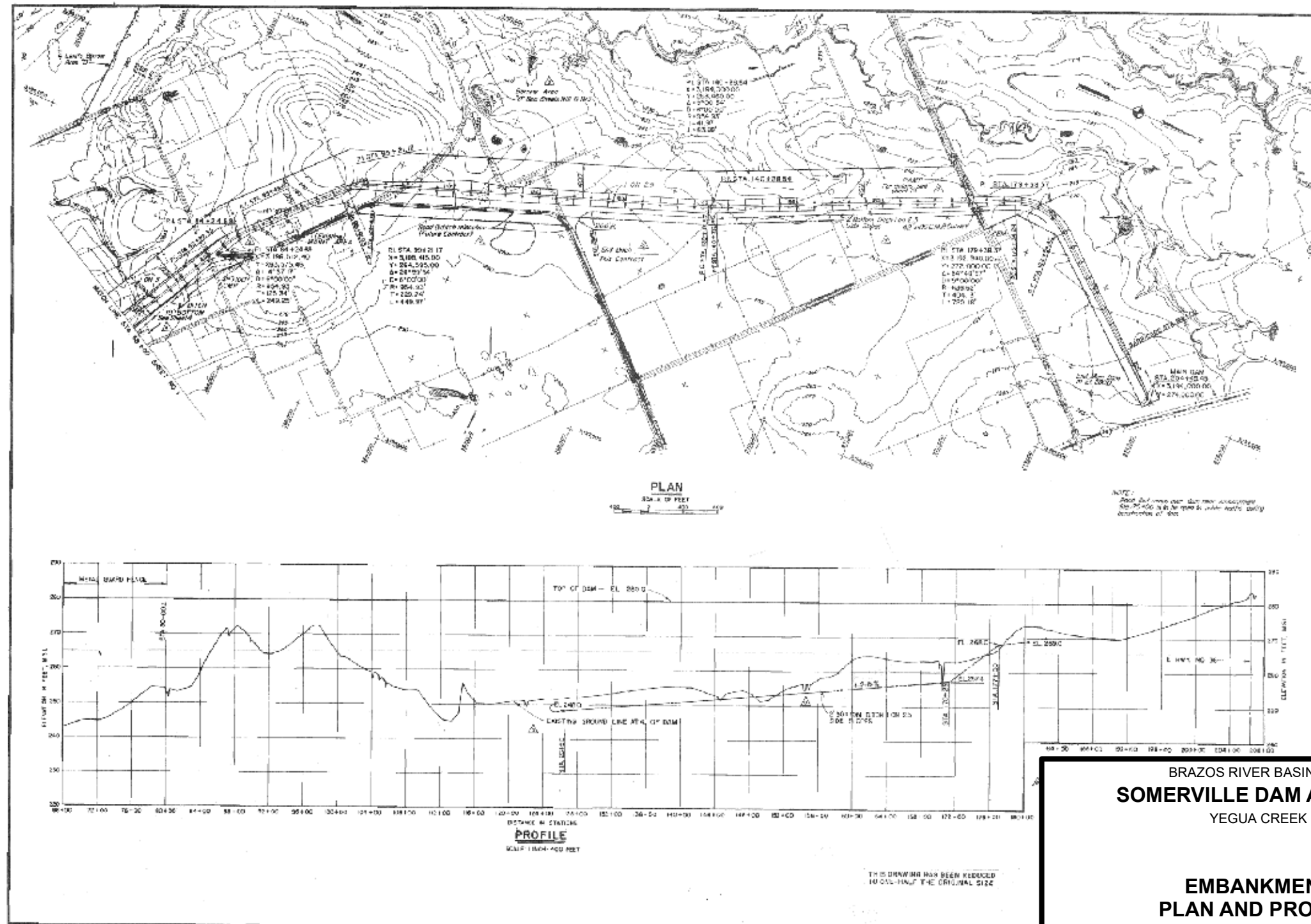
BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
 YEGUA CREEK

**EMBANKMENT AND SPILLWAY  
 GENERAL PLAN**

U.S. ARMY ENGINEER DISTRICT, FORT WORTH      September 2019

PLATE 2 - 2

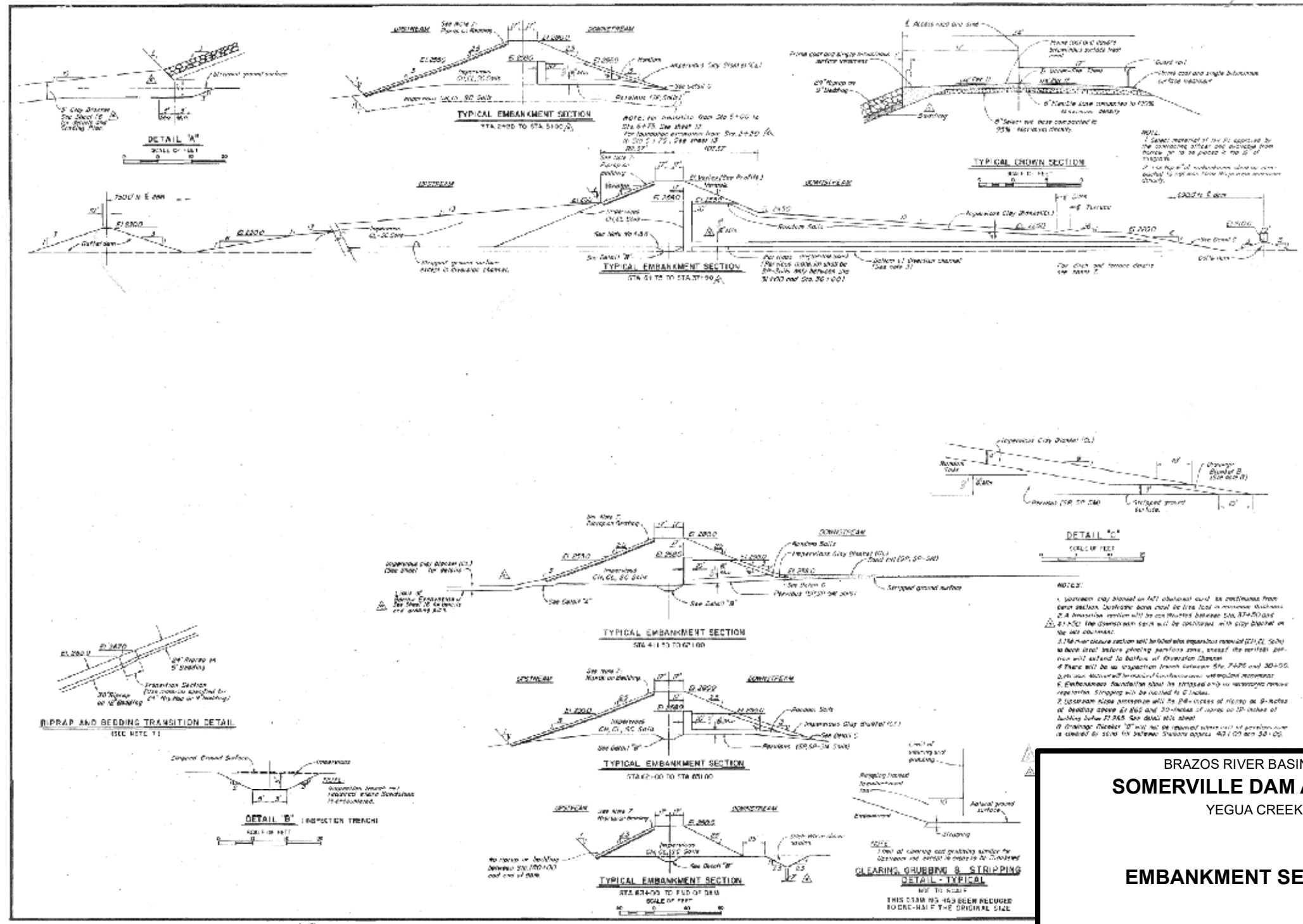
ALL ELEVATIONS REFERRED TO ON THIS PLATE, UNLESS NOTED OTHERWISE, ARE IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29). THE DATUM CONVERSION FROM NGVD29 TO NAVD88 IS: NGVD29 + 0.1 FEET = NAVD88 FOR SOMERVILLE DAM AND LAKE.



ALL ELEVATIONS REFERRED TO ON THIS PLATE, UNLESS NOTED OTHERWISE, ARE IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29). THE DATUM CONVERSION FROM NGVD29 TO NAVD88 IS: NGVD29 + 0.1 FEET = NAVD88 FOR SOMERVILLE DAM AND LAKE.

U.S. ARMY ENGINEER DISTRICT, FORT WORTH

September 2019



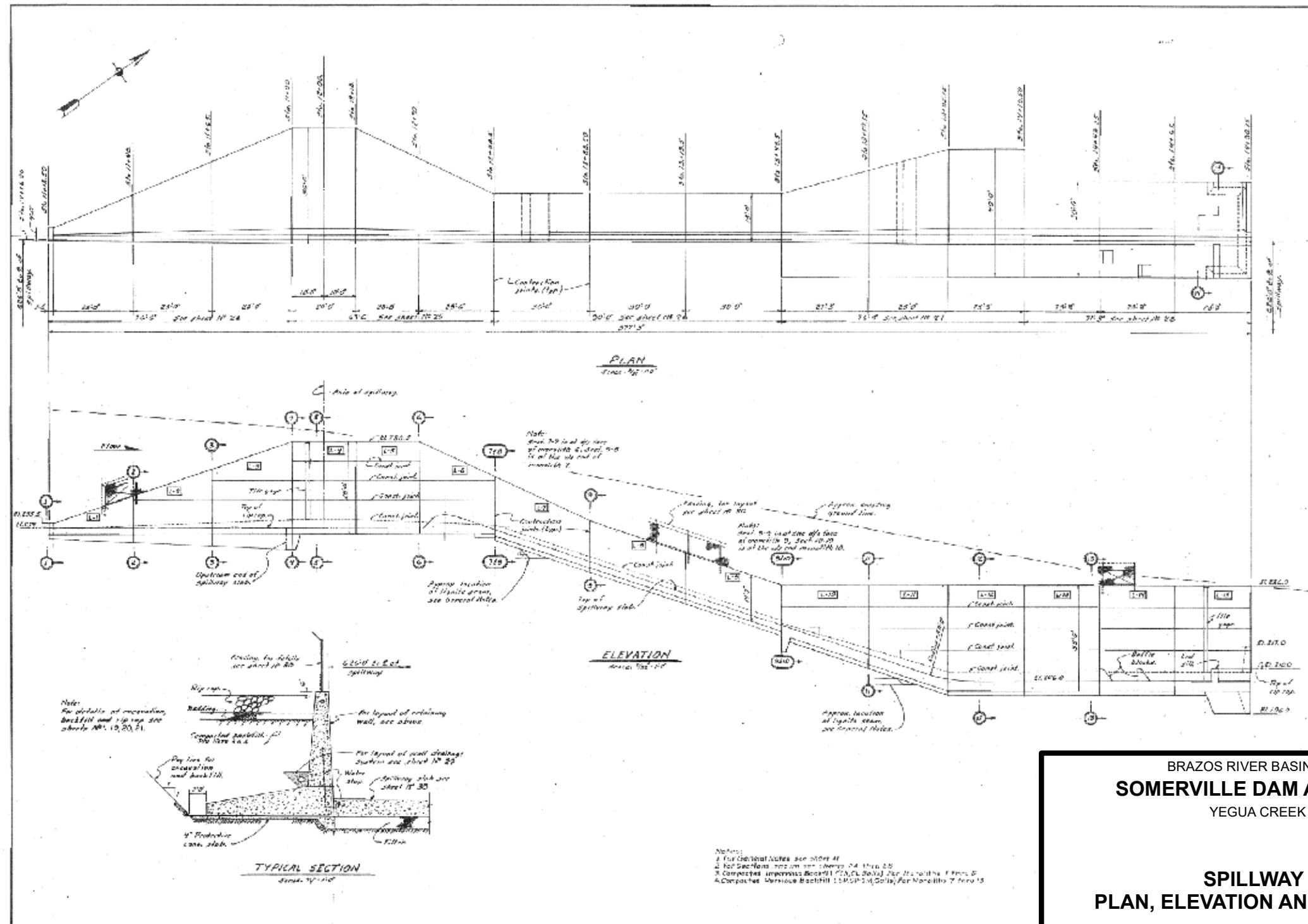
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BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
 YEGUA CREEK

**EMBANKMENT SECTIONS**

U.S. ARMY ENGINEER DISTRICT, FORT WORTH      September 2019

THIS DRAWING HAS BEEN RECORDED TO ONE-HALF THE ORIGINAL SIZE

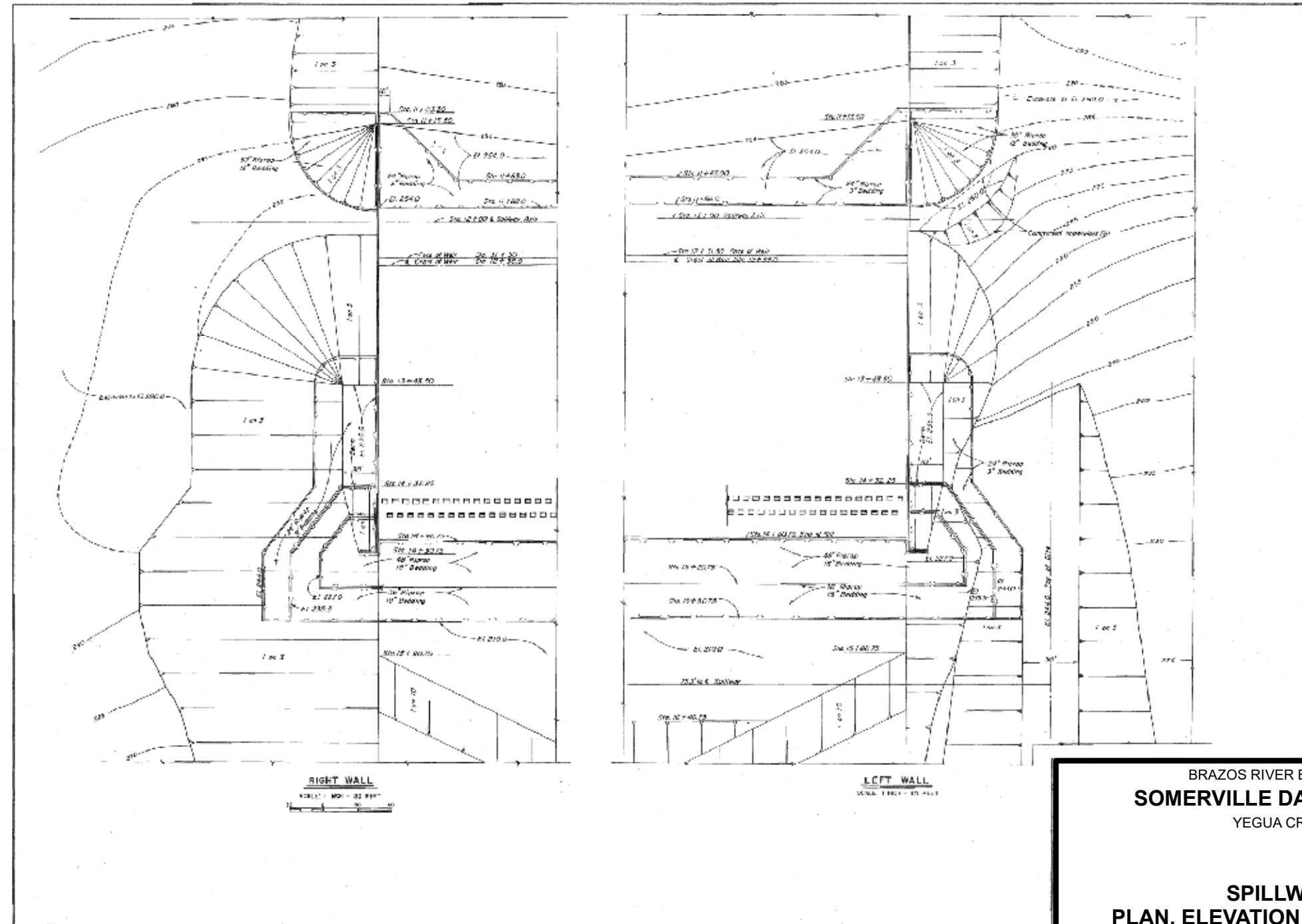


BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
 YEGUA CREEK

**SPILLWAY**  
**PLAN, ELEVATION AND SECTION**

ALL ELEVATIONS REFERRED TO ON THIS PLATE, UNLESS NOTED OTHERWISE, ARE IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29). THE DATUM CONVERSION FROM NGVD29 TO NAVD88 IS: NGVD29 + 0.1 FEET = NAVD88 FOR SOMERVILLE DAM AND LAKE.

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2019

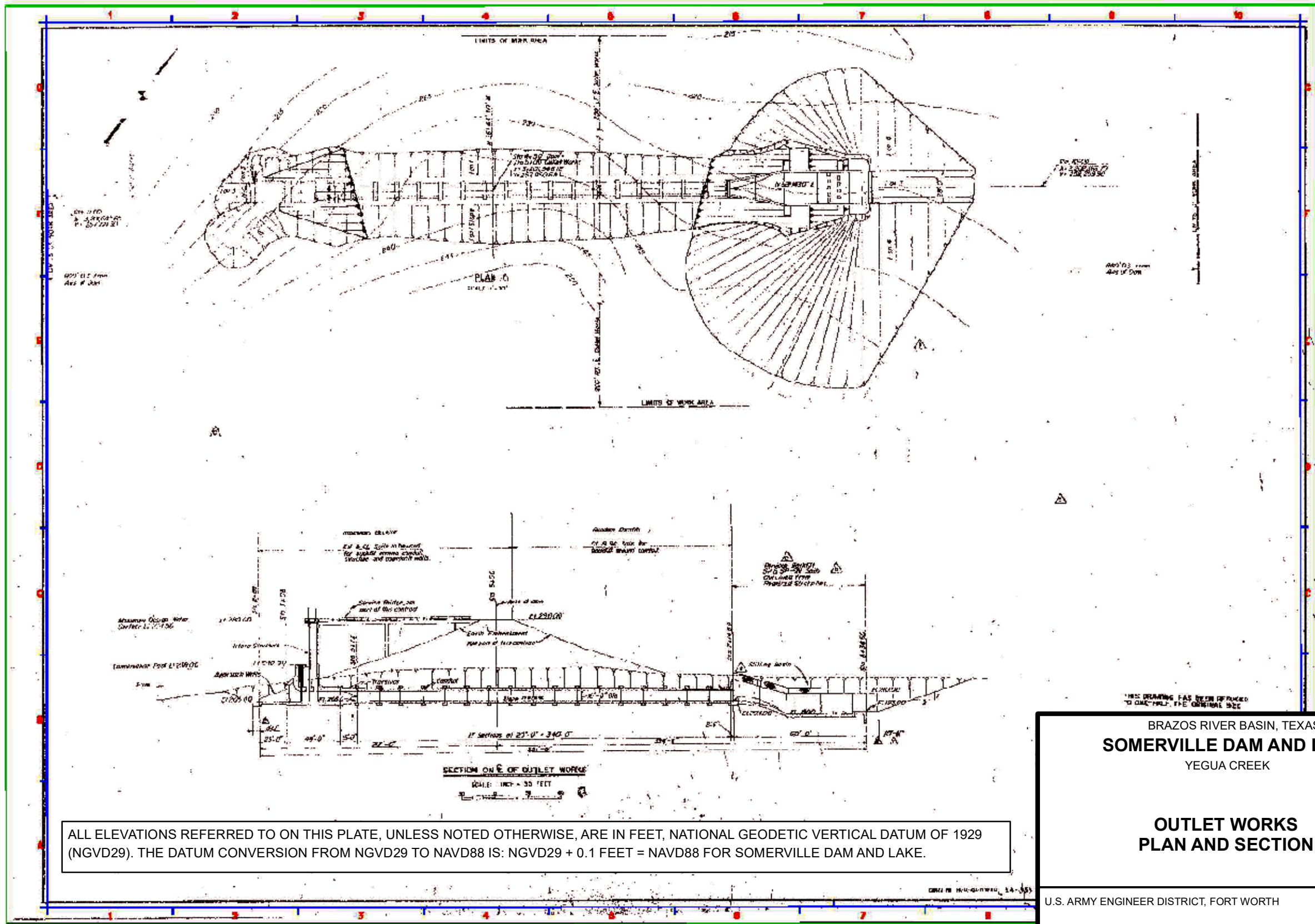


BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
 YEGUA CREEK

**SPILLWAY  
 PLAN, ELEVATION AND SECTION**

ALL ELEVATIONS REFERRED TO ON THIS PLATE, UNLESS NOTED OTHERWISE, ARE IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29).  
 THE DATUM CONVERSION FROM NGVD29 TO NAVD88 IS: NGVD29 + 0.1 FEET = NAVD88 FOR SOMERVILLE DAM AND LAKE.

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2019



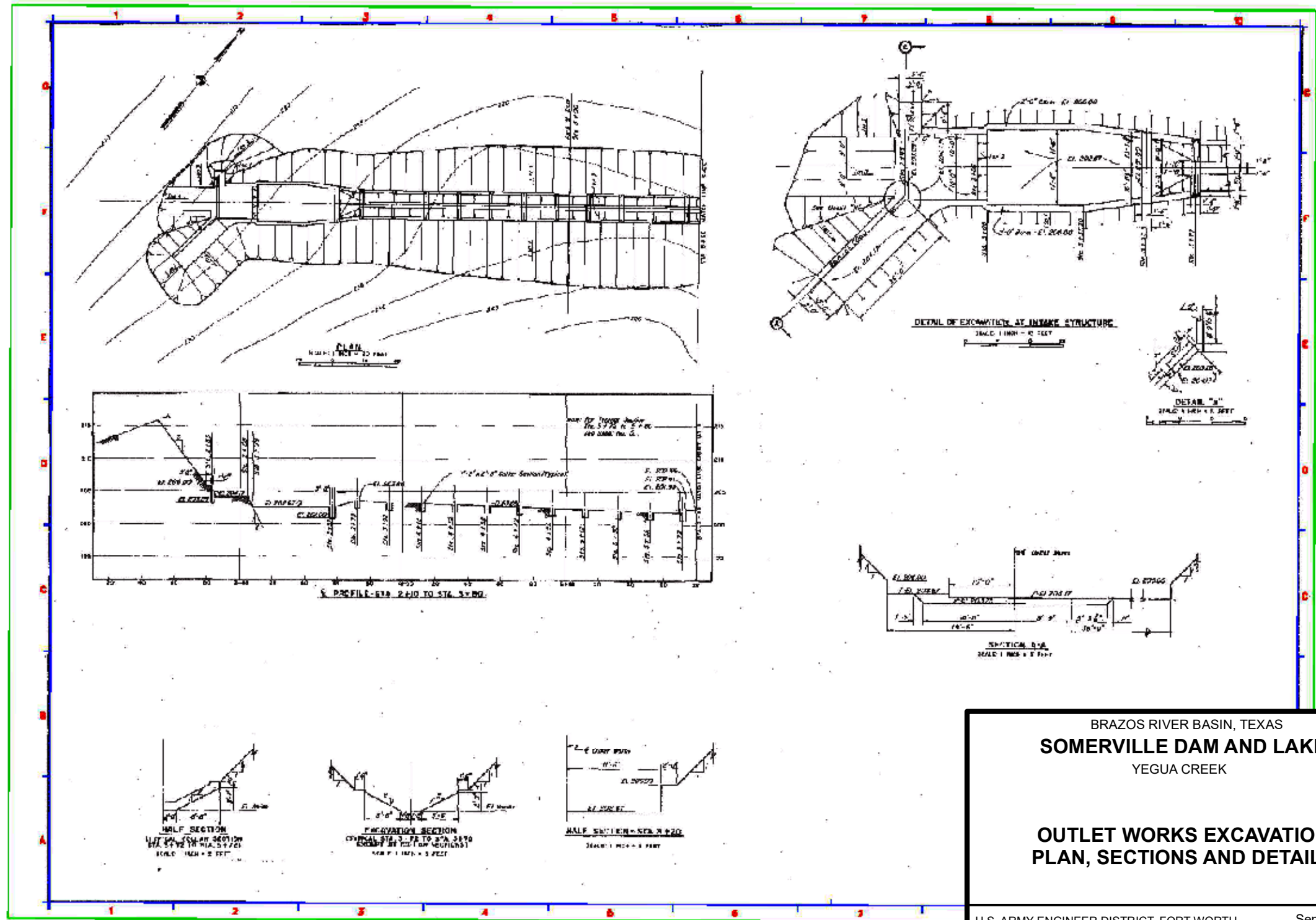
ALL ELEVATIONS REFERRED TO ON THIS PLATE, UNLESS NOTED OTHERWISE, ARE IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29). THE DATUM CONVERSION FROM NGVD29 TO NAVD88 IS: NGVD29 + 0.1 FEET = NAVD88 FOR SOMERVILLE DAM AND LAKE.

THIS DRAWING HAS BEEN REFINISHED TO CORRECTLY REFLECT THE ORIGINAL SIZE

**BRAZOS RIVER BASIN, TEXAS  
SOMERVILLE DAM AND LAKE  
YEGUA CREEK**

**OUTLET WORKS  
PLAN AND SECTION**

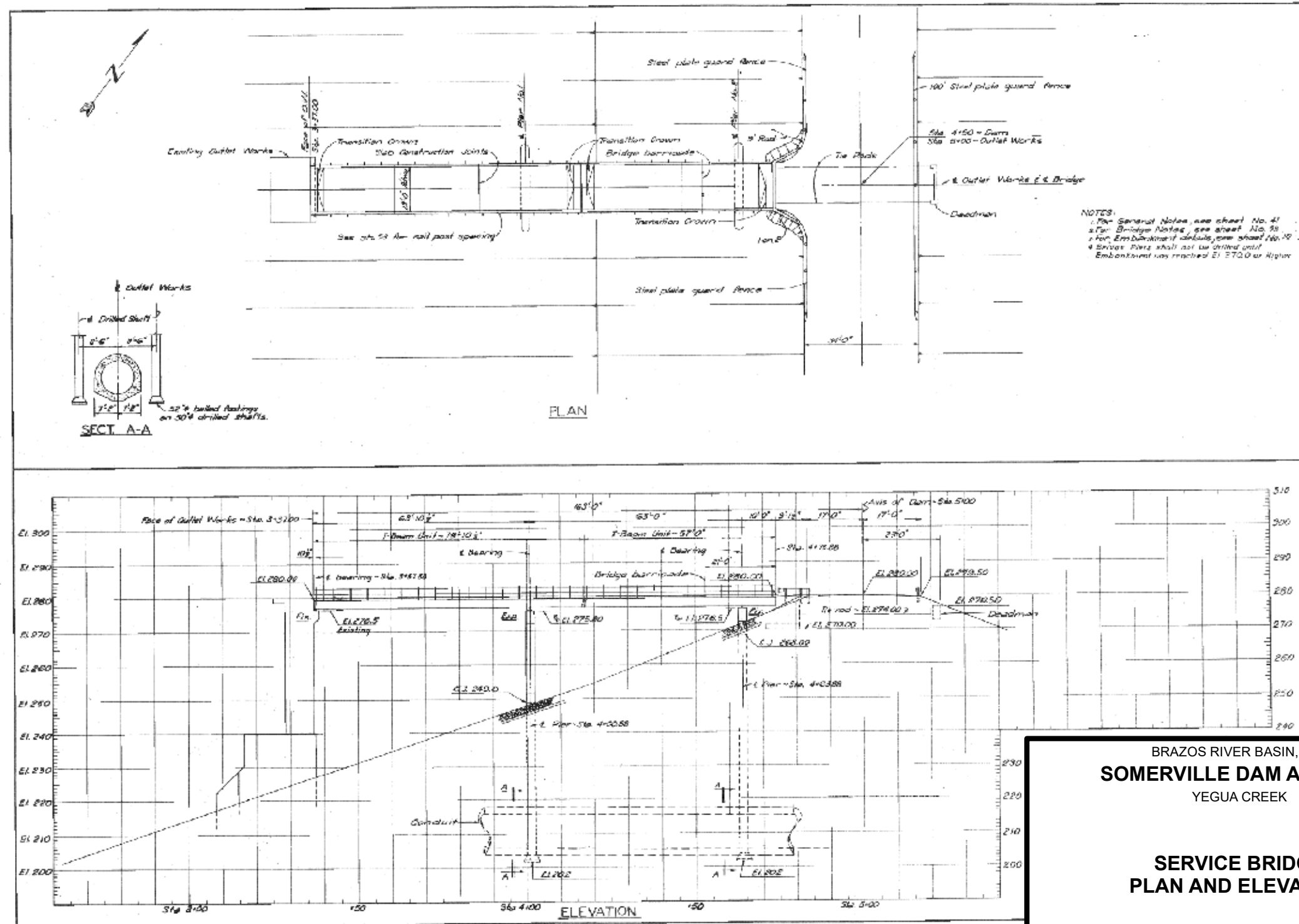
U.S. ARMY ENGINEER DISTRICT, FORT WORTH      September 2019



ALL ELEVATIONS REFERRED TO ON THIS PLATE, UNLESS NOTED OTHERWISE, ARE IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29). THE DATUM CONVERSION FROM NGVD29 TO NAVD88 IS: NGVD29 + 0.1 FEET = NAVD88 FOR SOMERVILLE DAM AND LAKE.

BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
 YEGUA CREEK

**OUTLET WORKS EXCAVATION  
 PLAN, SECTIONS AND DETAILS**



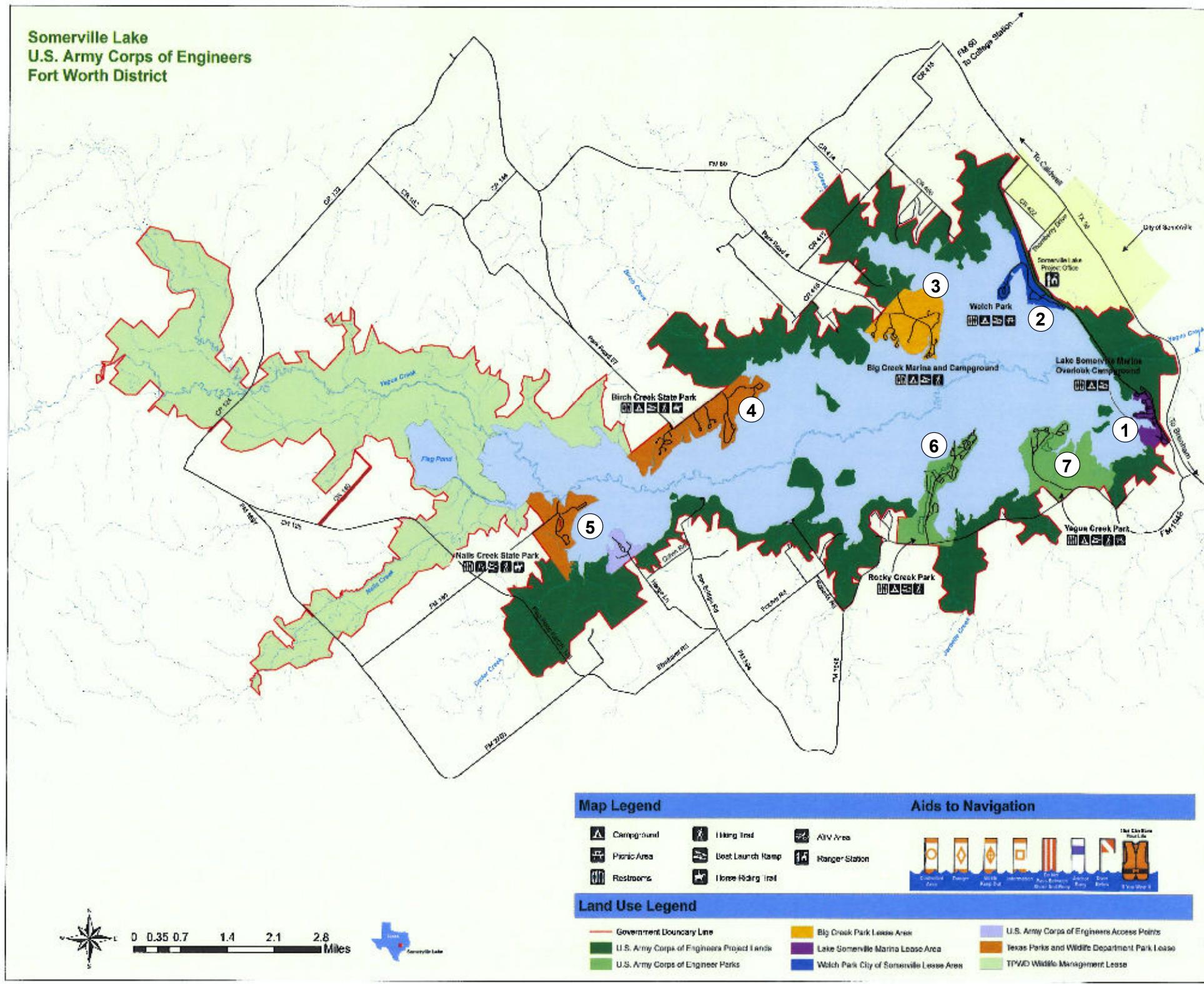
NOTES:  
 1. For General Notes, see sheet No. 41.  
 2. For Bridge Notes, see sheet No. 38.  
 3. For Embankment details, see sheet No. 39.  
 4. Bridge Piers shall not be drilled until Embankment has reached El. 270.0 or Higher.

BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
 YEGUA CREEK

**SERVICE BRIDGE**  
**PLAN AND ELEVATION**

ALL ELEVATIONS REFERRED TO ON THIS PLATE, UNLESS NOTED OTHERWISE, ARE IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29). THE DATUM CONVERSION FROM NGVD29 TO NAVD88 IS: NGVD29 + 0.1 FEET = NAVD88 FOR SOMERVILLE DAM AND LAKE.

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2019



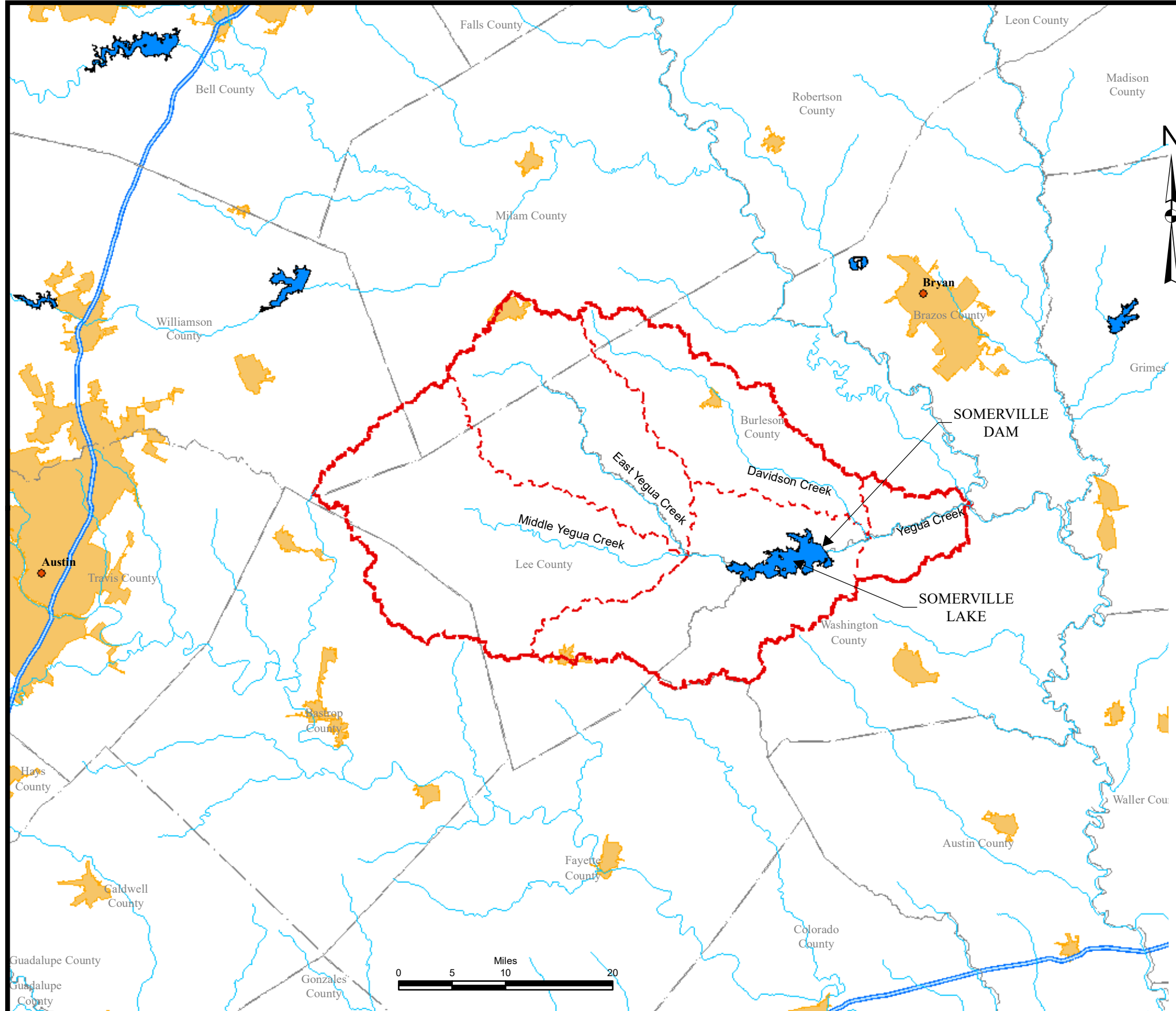
Recreation Areas at Somerville Dam and Lake:

1. Lake Somerville Marina Overlook Campground
2. Welch Park
3. Big Creek Marina and Campground (Closed)
4. Birch Creek State Park
5. Nails Creek State Park
6. Rocky Creek Park (Partially Closed)
7. Yegua Creek Park (Partially Closed)









Numbers can be used to locate the recreation areas on the map.

BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
 YEGUA CREEK

**PUBLIC USE AREAS**



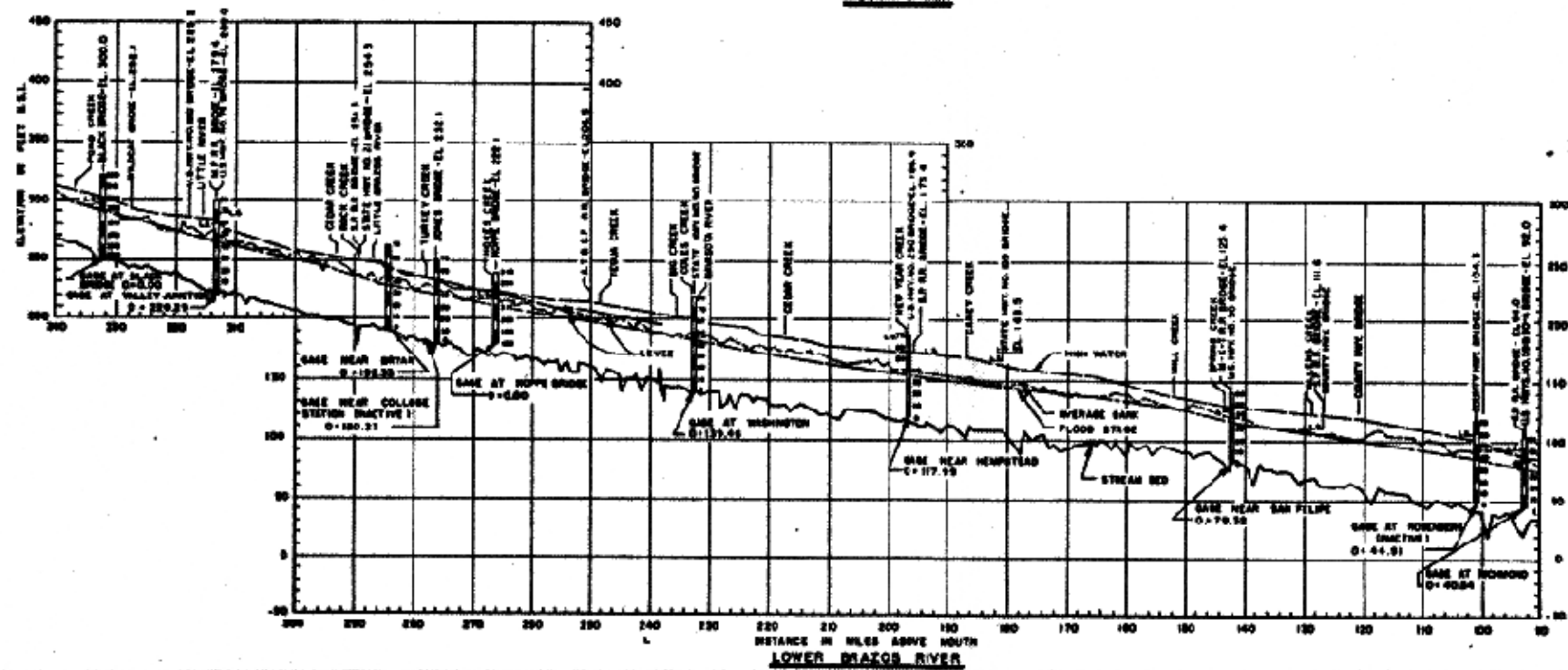
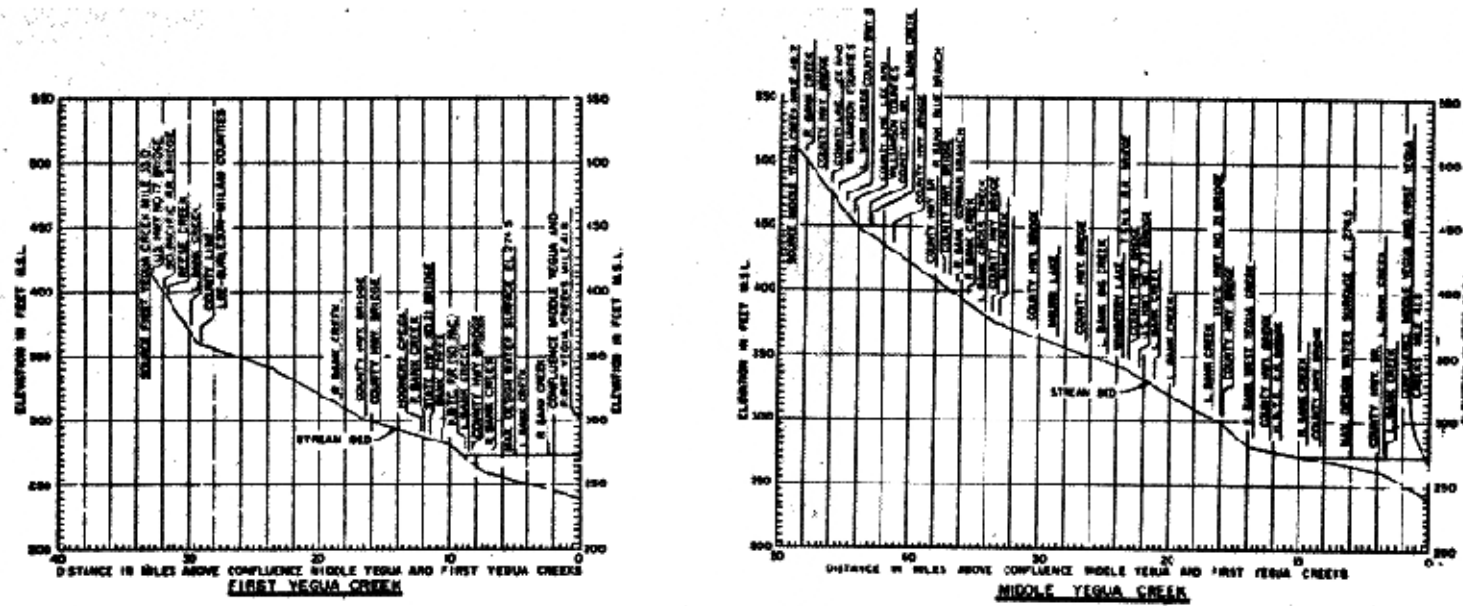
**LEGEND**

-  RIVER BASIN BOUNDARY
-  SUB BASIN BOUNDARY
-  LAKES
-  RIVERS
-  CITY
-  INTERSTATE
-  COUNTY
-  METRO AREAS

BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
 YEGUA CREEK

**WATERSHED MAP**  
**LOCAL SUBAREAS**

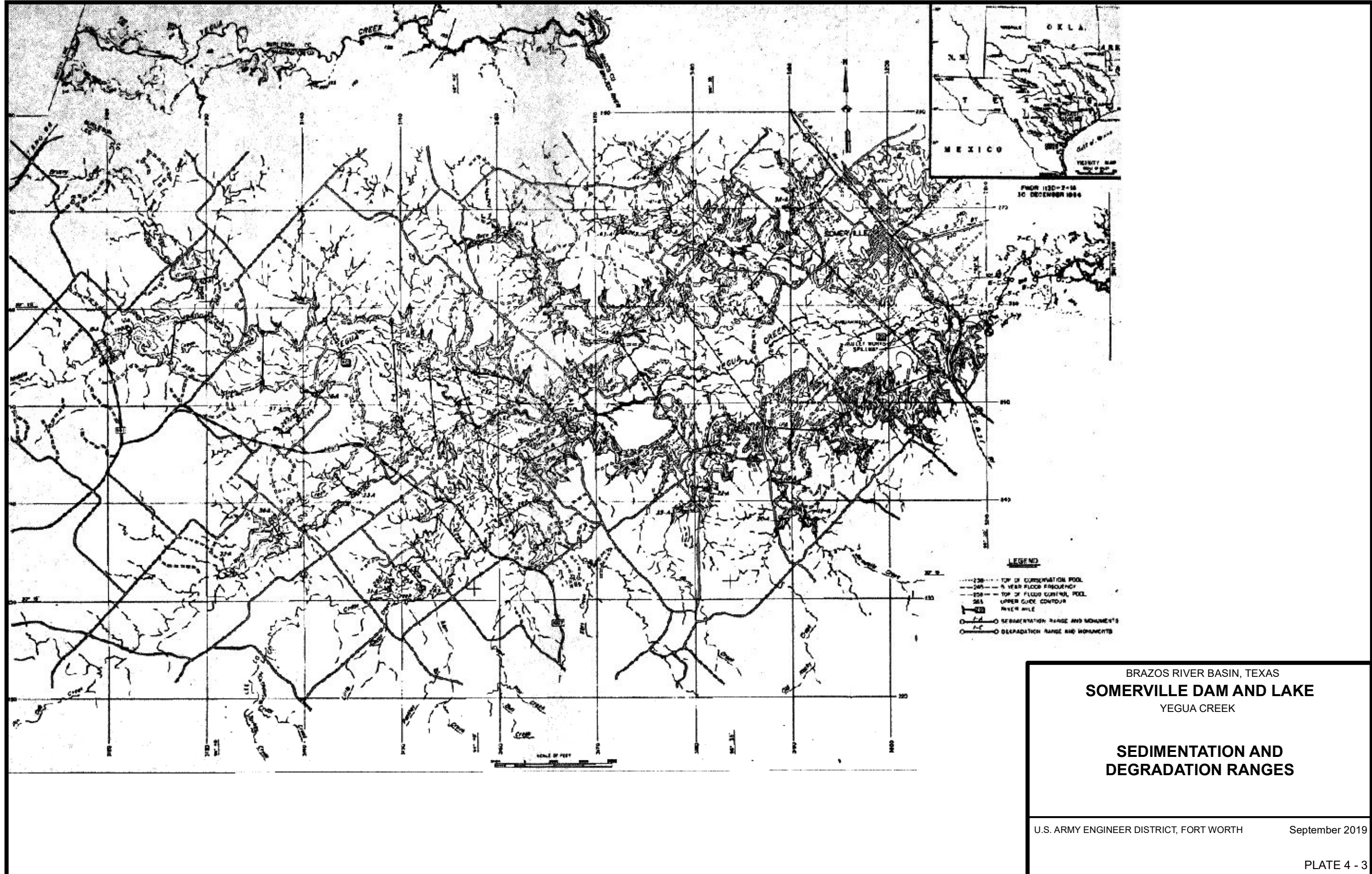
U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2019



ALL ELEVATIONS REFERRED TO ON THIS PLATE, UNLESS NOTED OTHERWISE, ARE IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29). THE DATUM CONVERSION FROM NGVD29 TO NAVD88 IS: NGVD29 + 0.1 FEET = NAVD88 FOR SOMERVILLE DAM AND LAKE.

BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
 YEGUA CREEK  
**YEGUA CREEK AND LOWER BRAZOS RIVER NATURAL PROFILE**

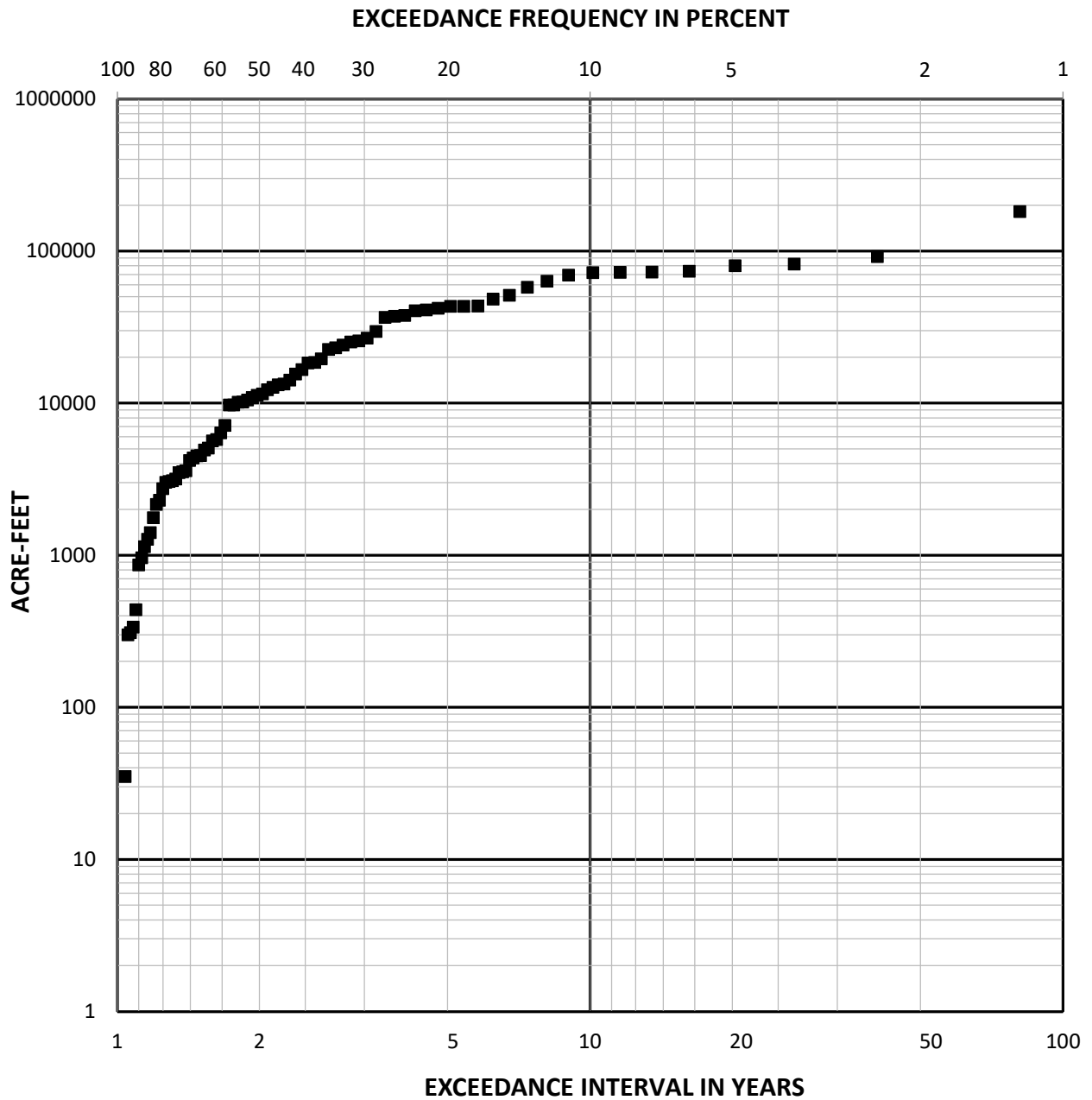
U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2019



BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
 YEGUA CREEK

**SEDIMENTATION AND  
 DEGRADATION RANGES**

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2019

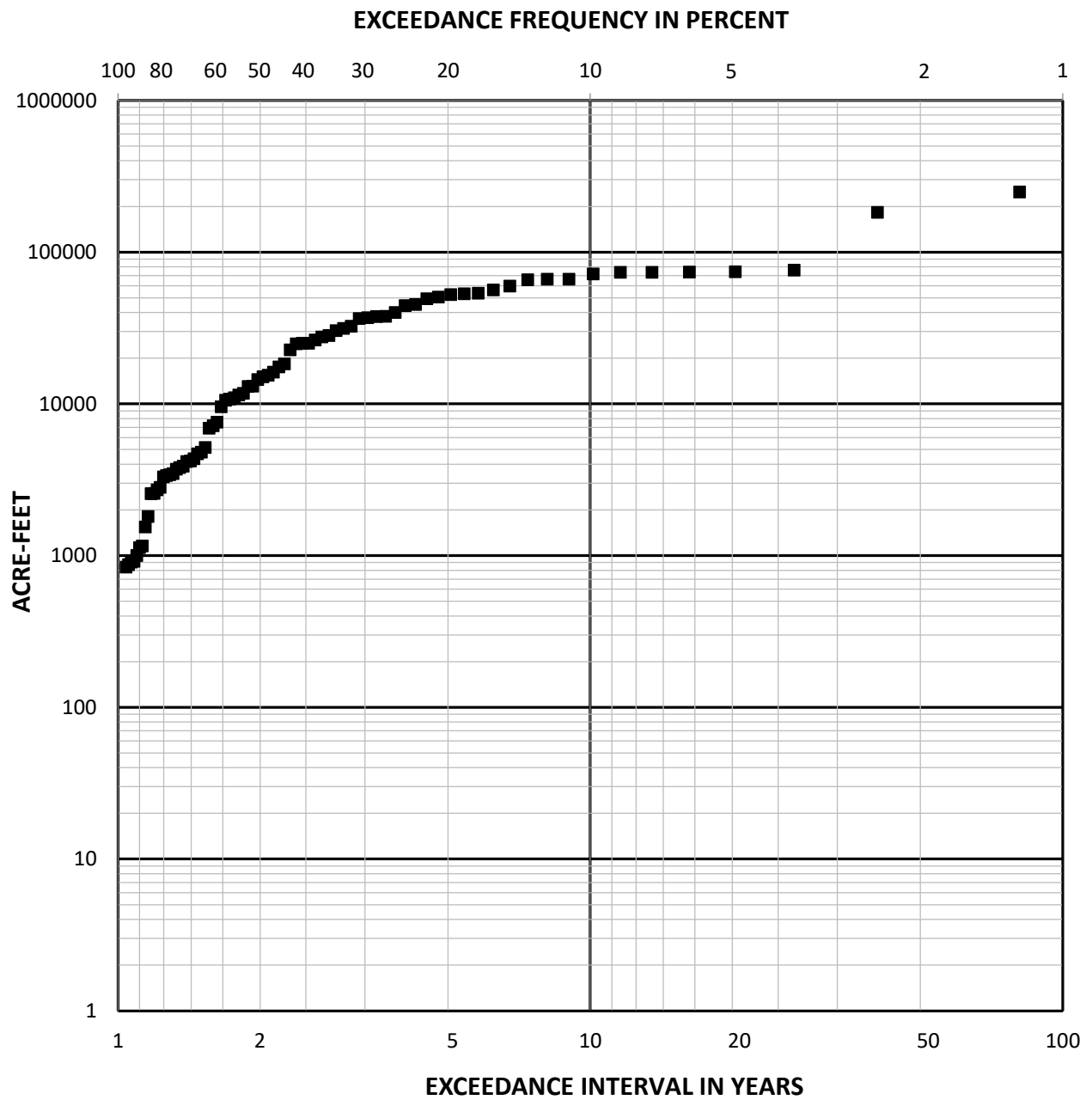


BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
YEGUA CREEK

**JANUARY INFLOW FREQUENCY**  
**1939-2019**

U.S. ARMY ENGINEER DISTRICT, FORT WORTH

September 2019

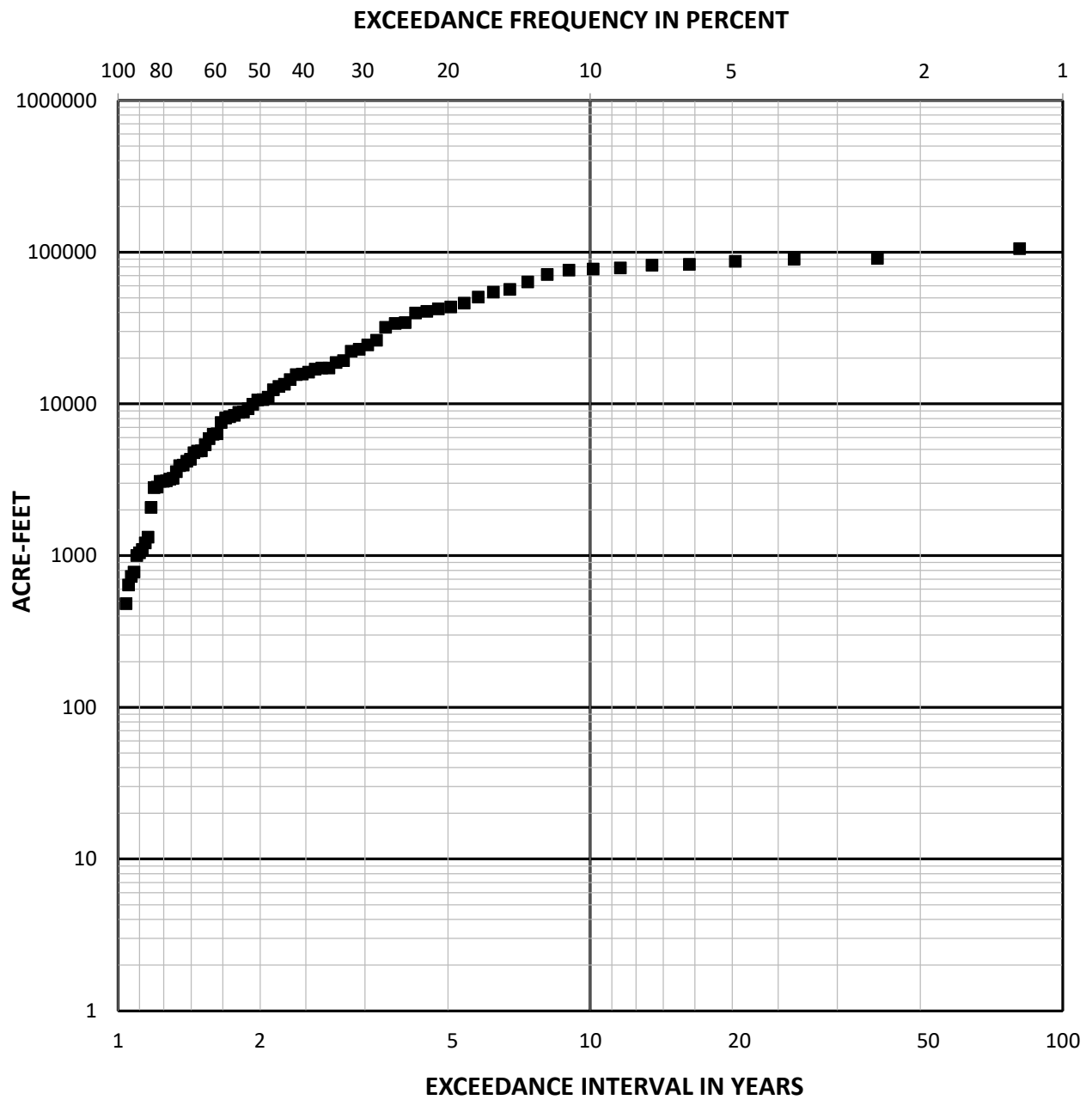


BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
YEGUA CREEK

**FEBRUARY INFLOW FREQUENCY**  
**1939-2019**

U.S. ARMY ENGINEER DISTRICT, FORT WORTH

September 2019

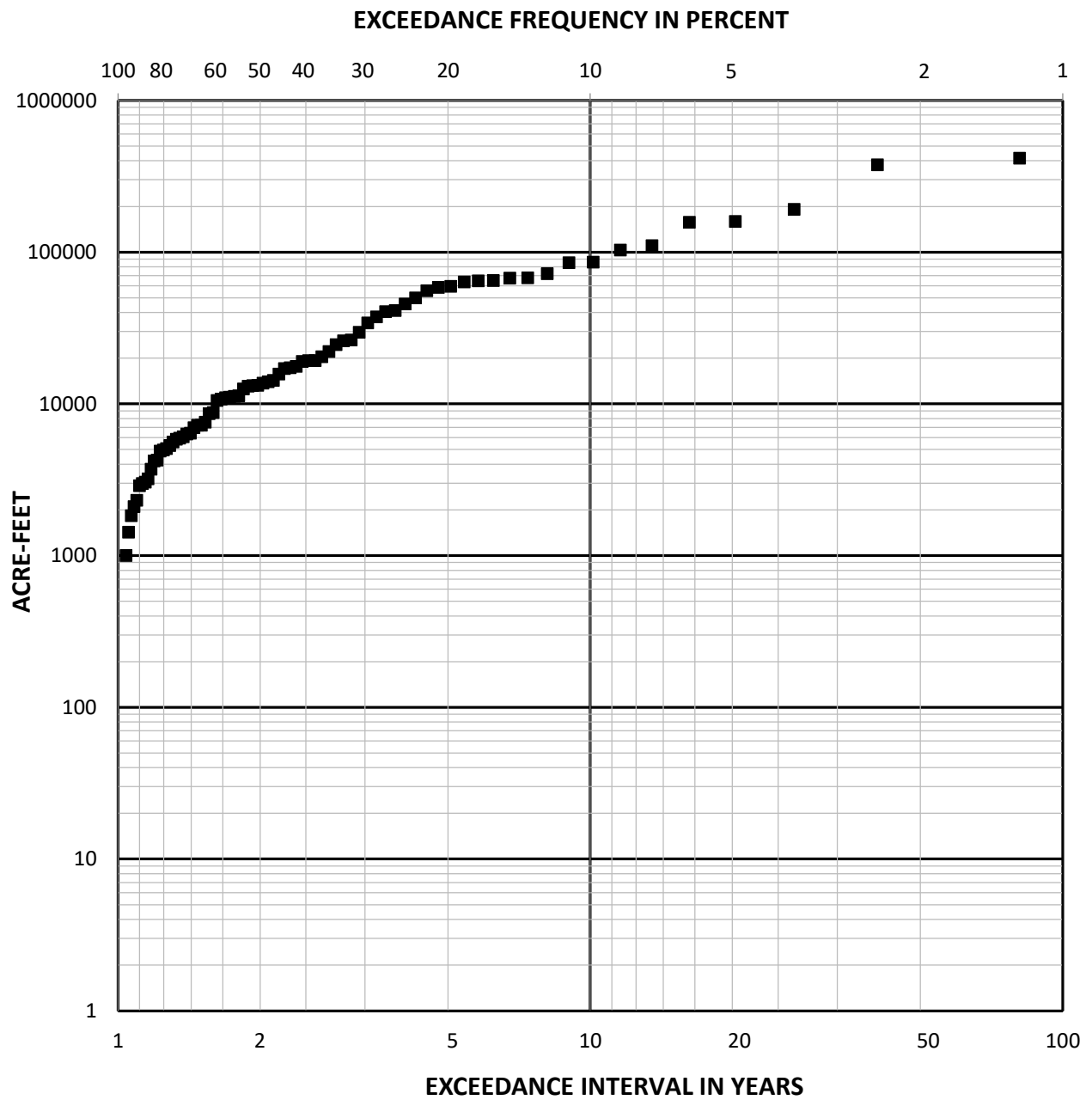


BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
 YEGUA CREEK

**MARCH INFLOW FREQUENCY**  
**1939-2019**

U.S. ARMY ENGINEER DISTRICT, FORT WORTH

September 2019

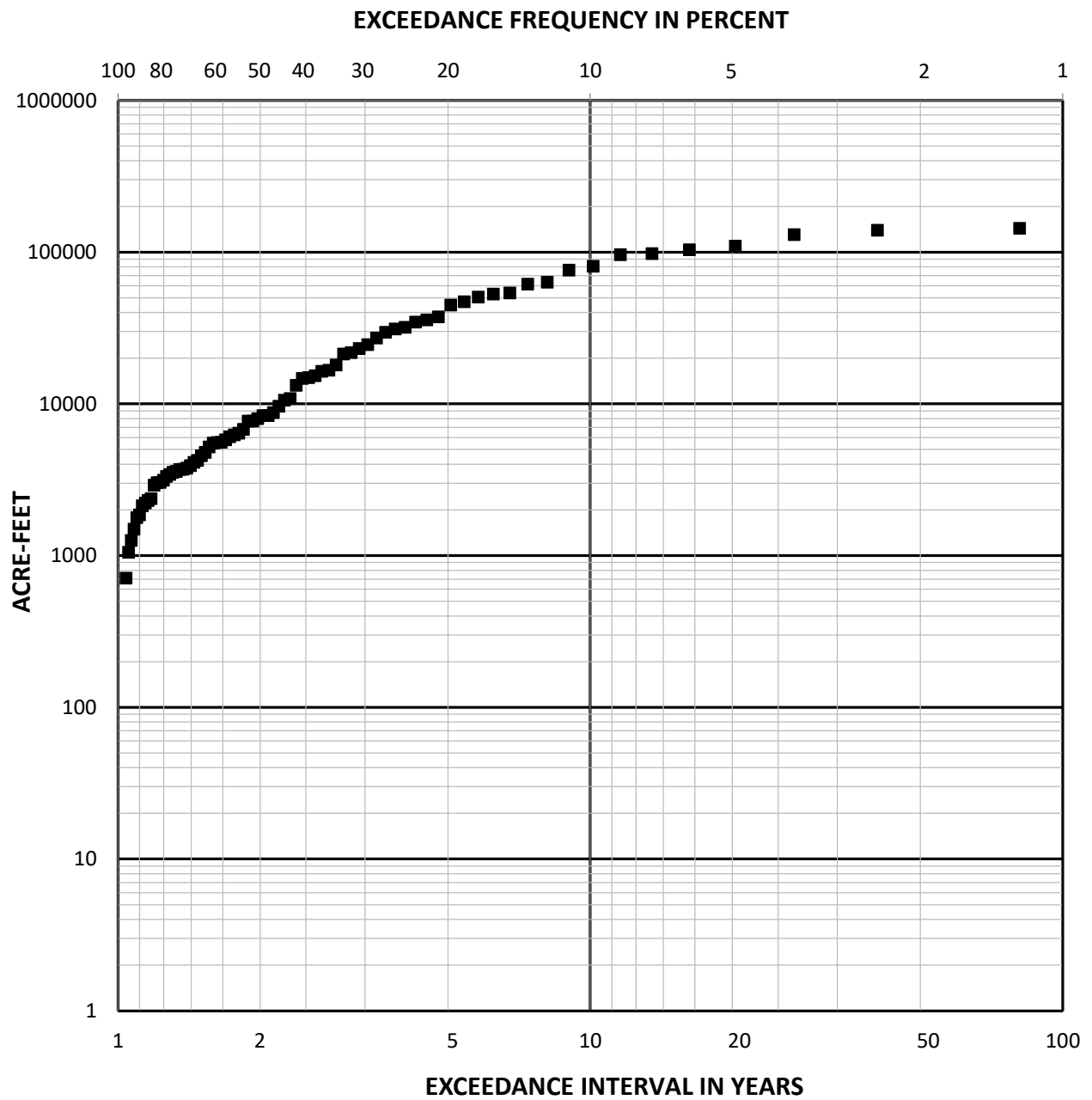


BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
YEGUA CREEK

**MAY INFLOW FREQUENCY**  
**1939-2019**

U.S. ARMY ENGINEER DISTRICT, FORT WORTH

September 2019

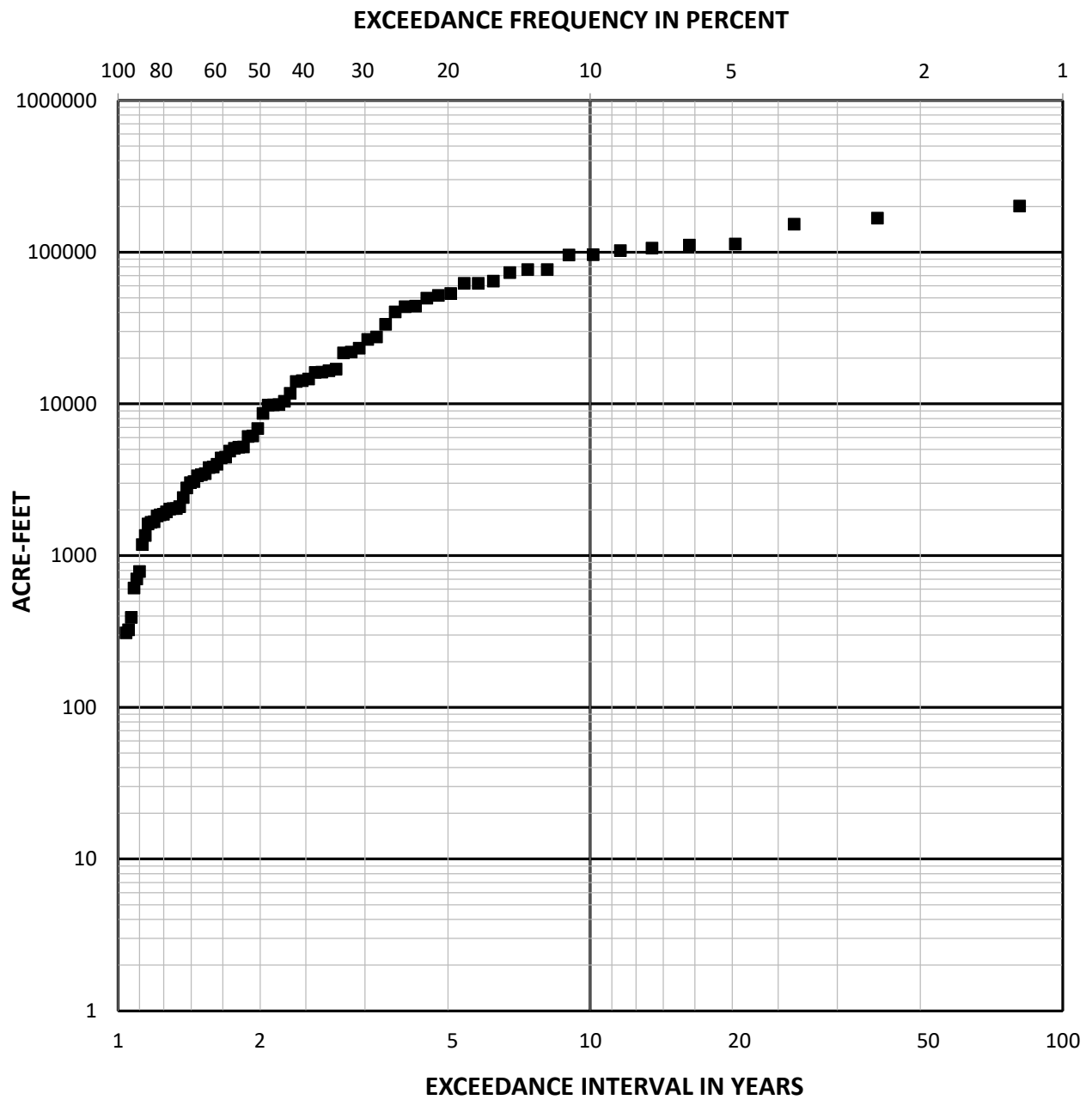


BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
YEGUA CREEK

**APRIL INFLOW FREQUENCY**  
**1939-2019**

U.S. ARMY ENGINEER DISTRICT, FORT WORTH

September 2019

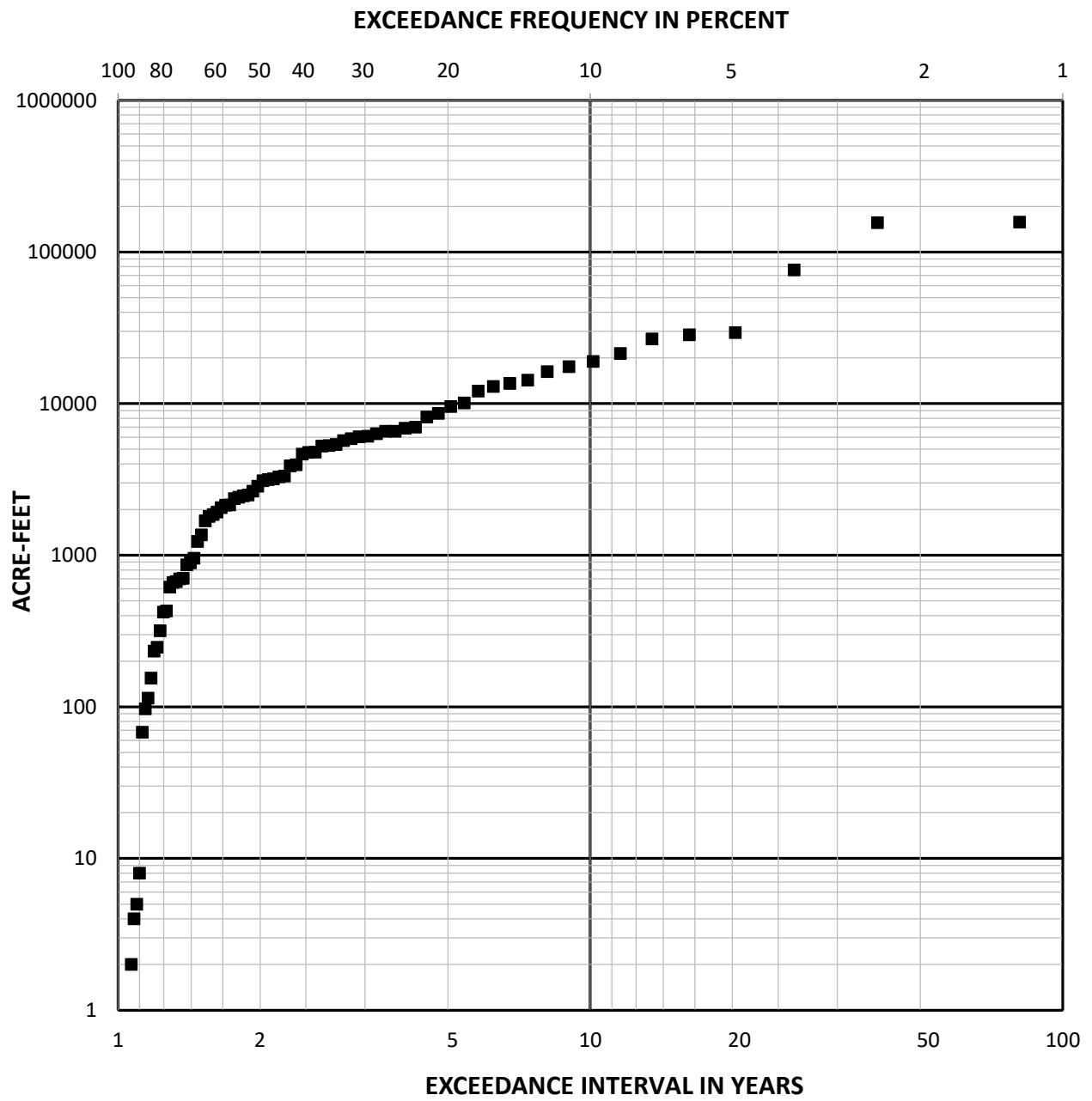


BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
YEGUA CREEK

**JUNE INFLOW FREQUENCY**  
**1939-2019**

U.S. ARMY ENGINEER DISTRICT, FORT WORTH

September 2019



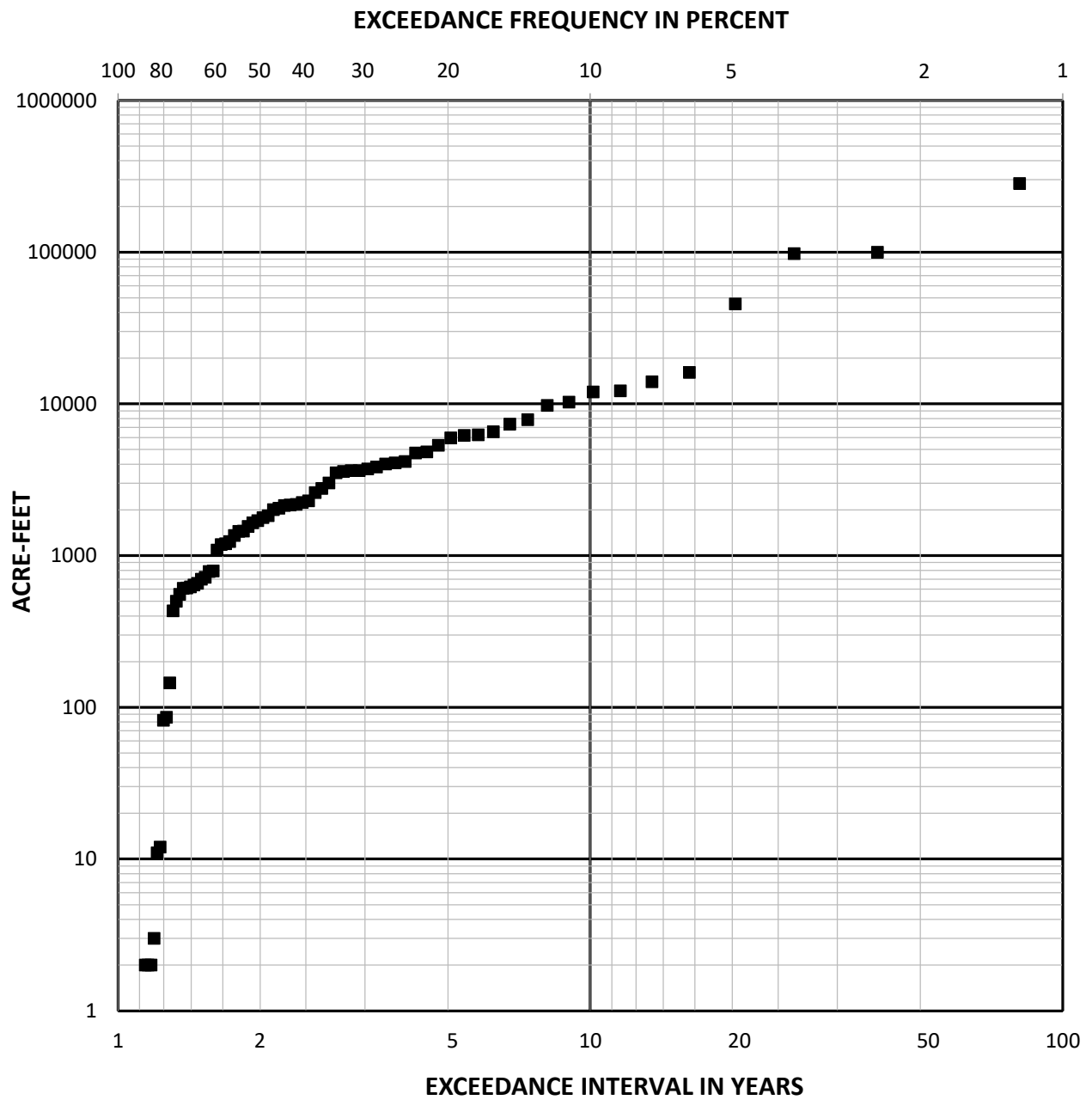
BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
YEGUA CREEK

**JULY INFLOW FREQUENCY**  
**1939-2019**

U.S. ARMY ENGINEER DISTRICT, FORT WORTH

September 2019

PLATE 4 - 10



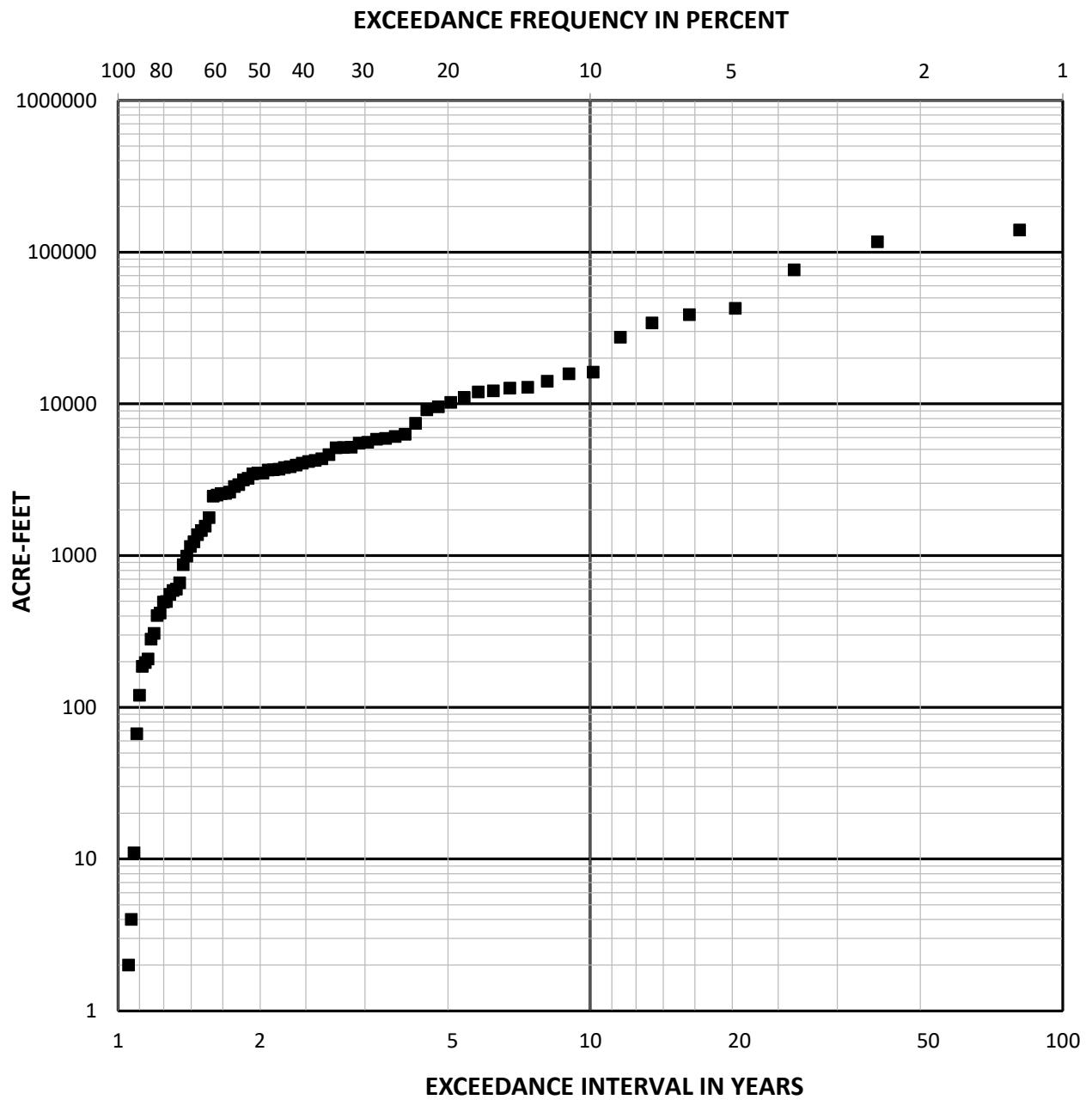
BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
 YEGUA CREEK

**AUGUST INFLOW FREQUENCY**  
**1939-2019**

U.S. ARMY ENGINEER DISTRICT, FORT WORTH

September 2019

PLATE 4 - 11

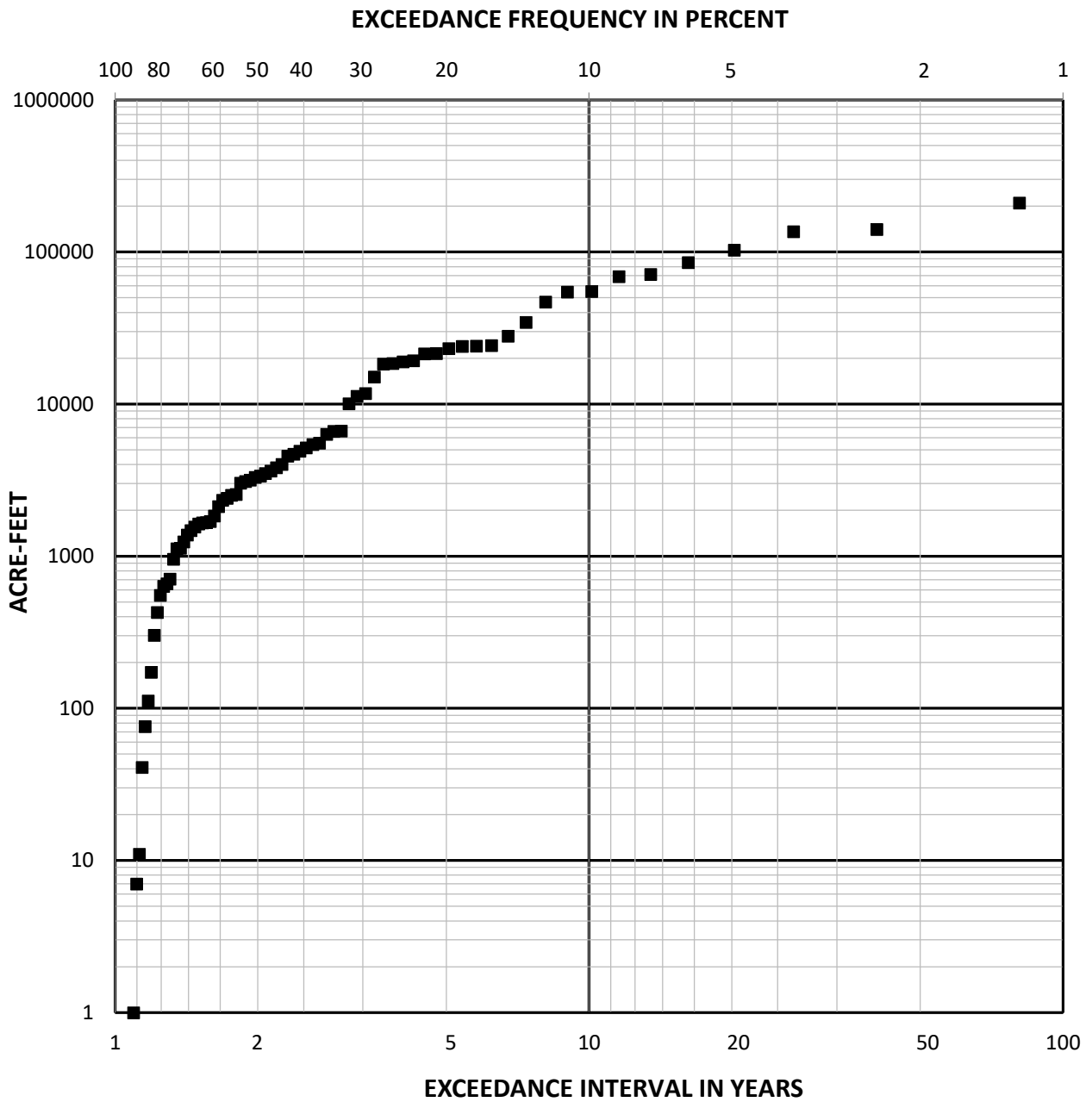


BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
YEGUA CREEK  
  
**SEPTEMBER INFLOW FREQUENCY**  
**1939-2019**

U.S. ARMY ENGINEER DISTRICT, FORT WORTH

September 2019

PLATE 4 - 12



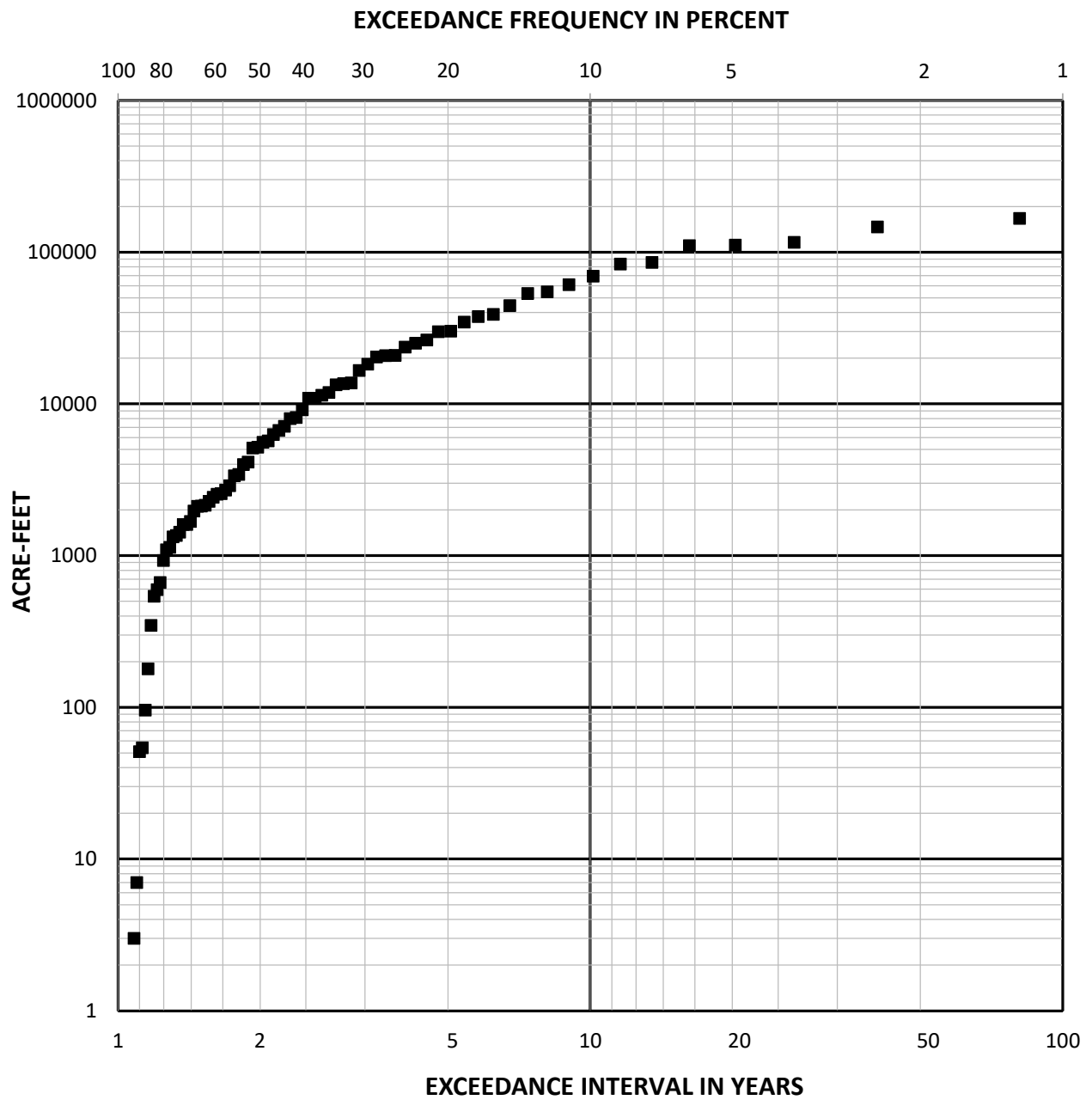
BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
YEGUA CREEK

**OCTOBER INFLOW FREQUENCY**  
**1939-2019**

U.S. ARMY ENGINEER DISTRICT, FORT WORTH

September 2019

PLATE 4 - 13



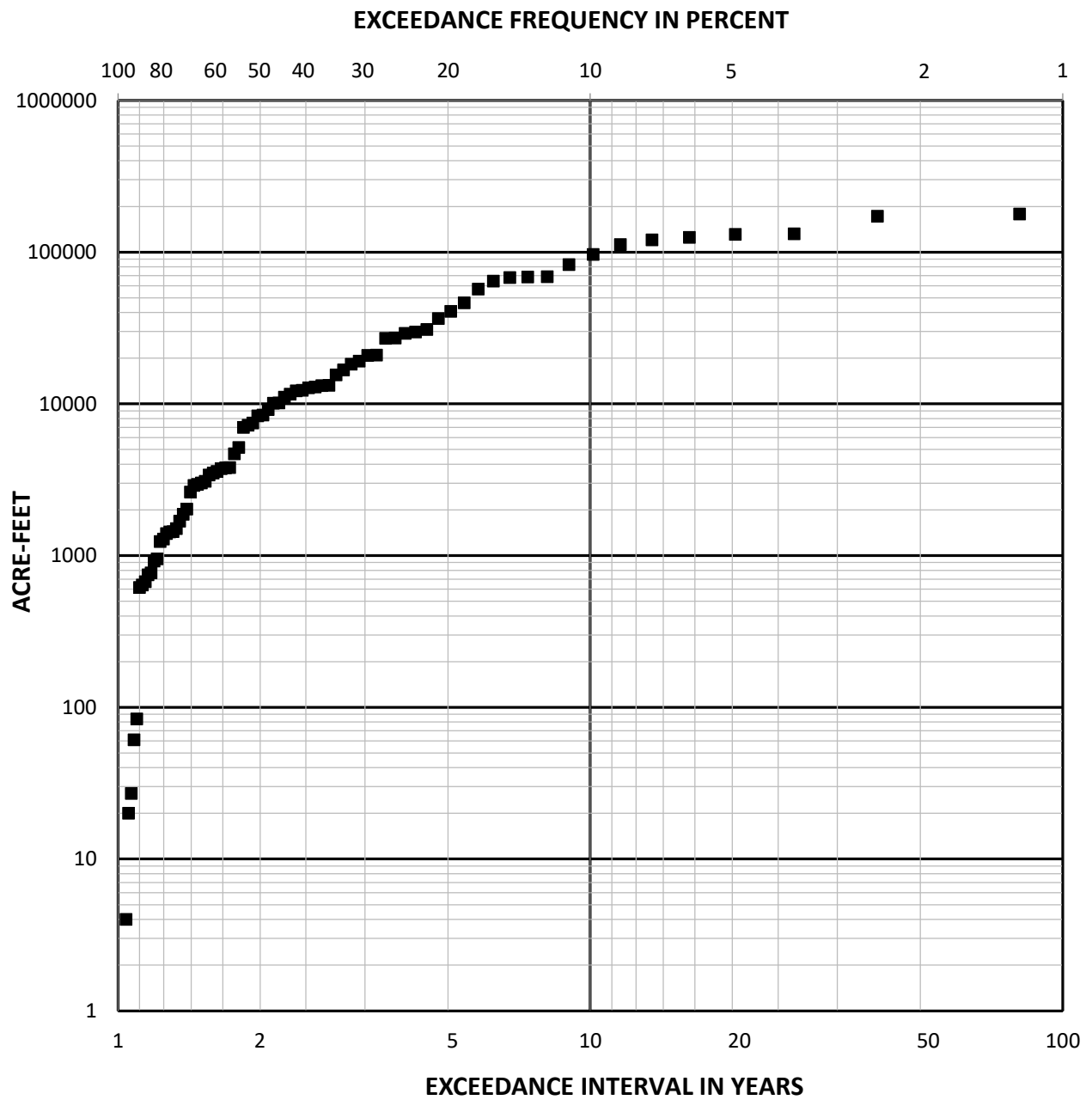
BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
 YEGUA CREEK

**NOVEMBER INFLOW FREQUENCY**  
**1939-2019**

U.S. ARMY ENGINEER DISTRICT, FORT WORTH

September 2019

PLATE 4 - 14



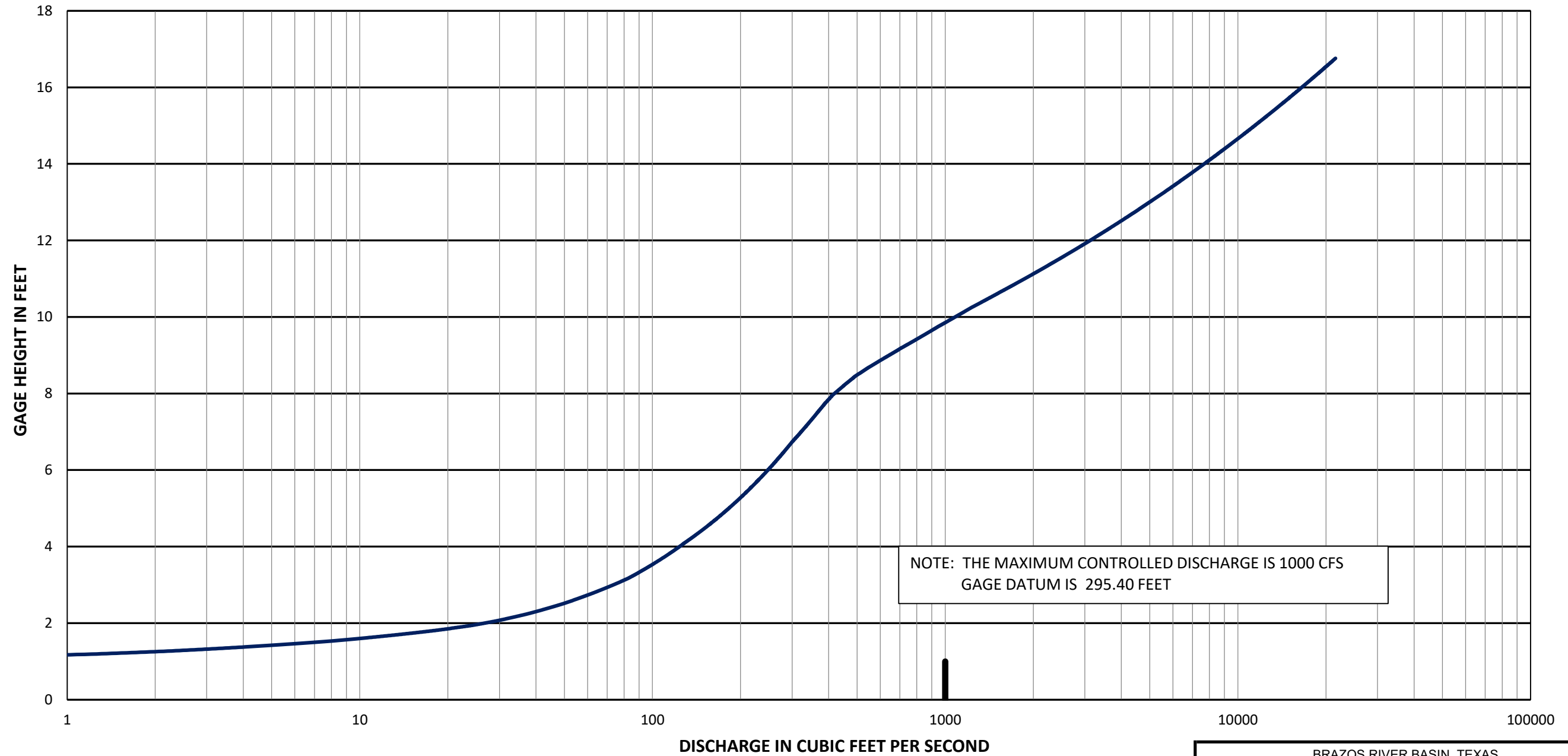
BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
 YEGUA CREEK

**DECEMBER INFLOW FREQUENCY**  
**1939-2019**

U.S. ARMY ENGINEER DISTRICT, FORT WORTH

September 2019

PLATE 4 - 15



ALL ELEVATIONS REFERRED TO ON THIS PLATE, UNLESS NOTED OTHERWISE, ARE IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NVGD29). THE DATUM CONVERSION FROM NGVD TO NAVD88 IS: NGVD29 + 0.1 FEET = NAVD88 FOR SOMERVILLE DAM AND LAKE.

BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
YEGUA CREEK

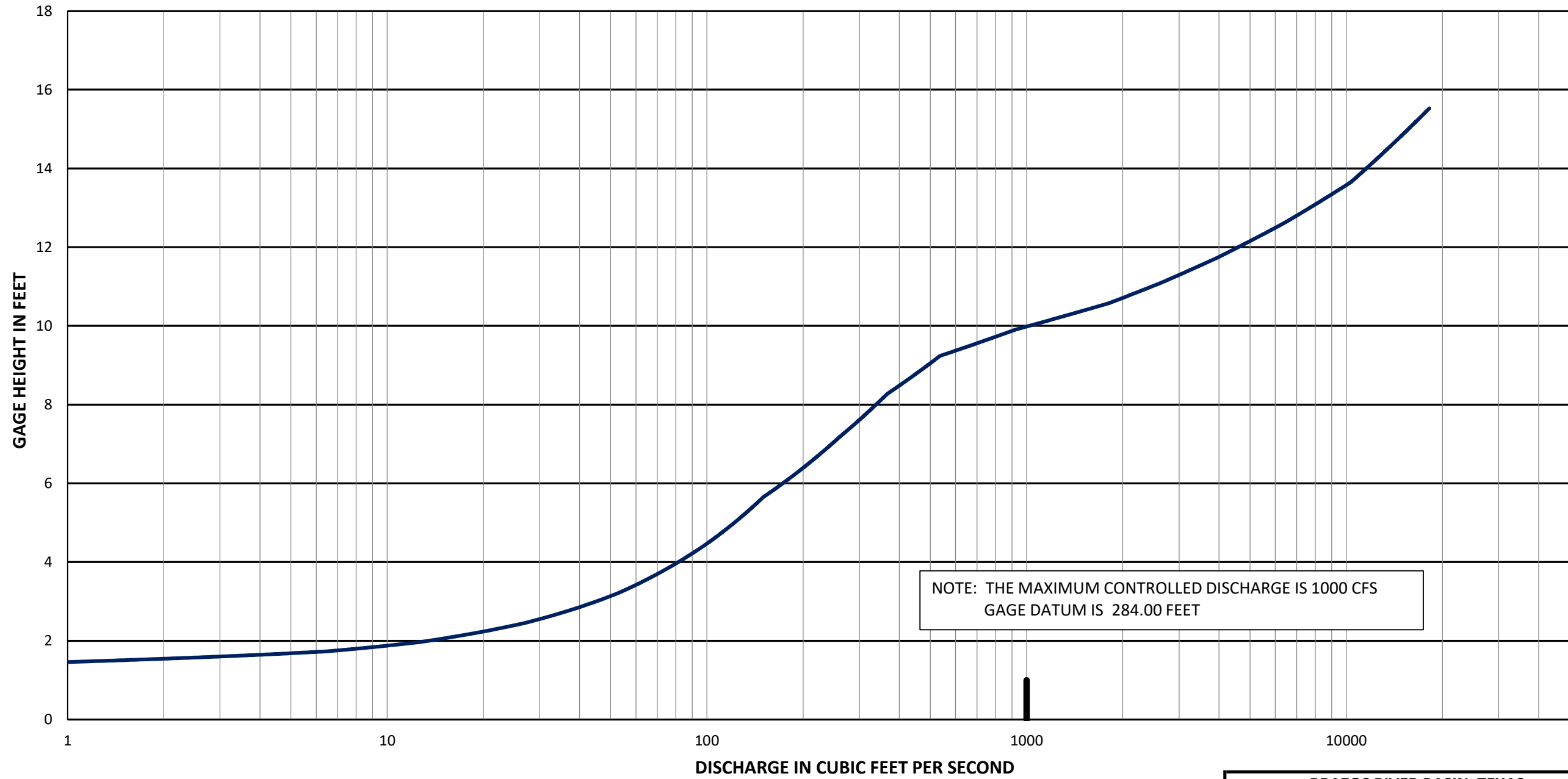
**RATING CURVE**  
**MIDDLE YEGUA CREEK NEAR**  
**DIME BOX**

**USGS GAGE NO. 08109700**

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U.S. ARMY ENGINEER DISTRICT, FORT WORTH      September 2019

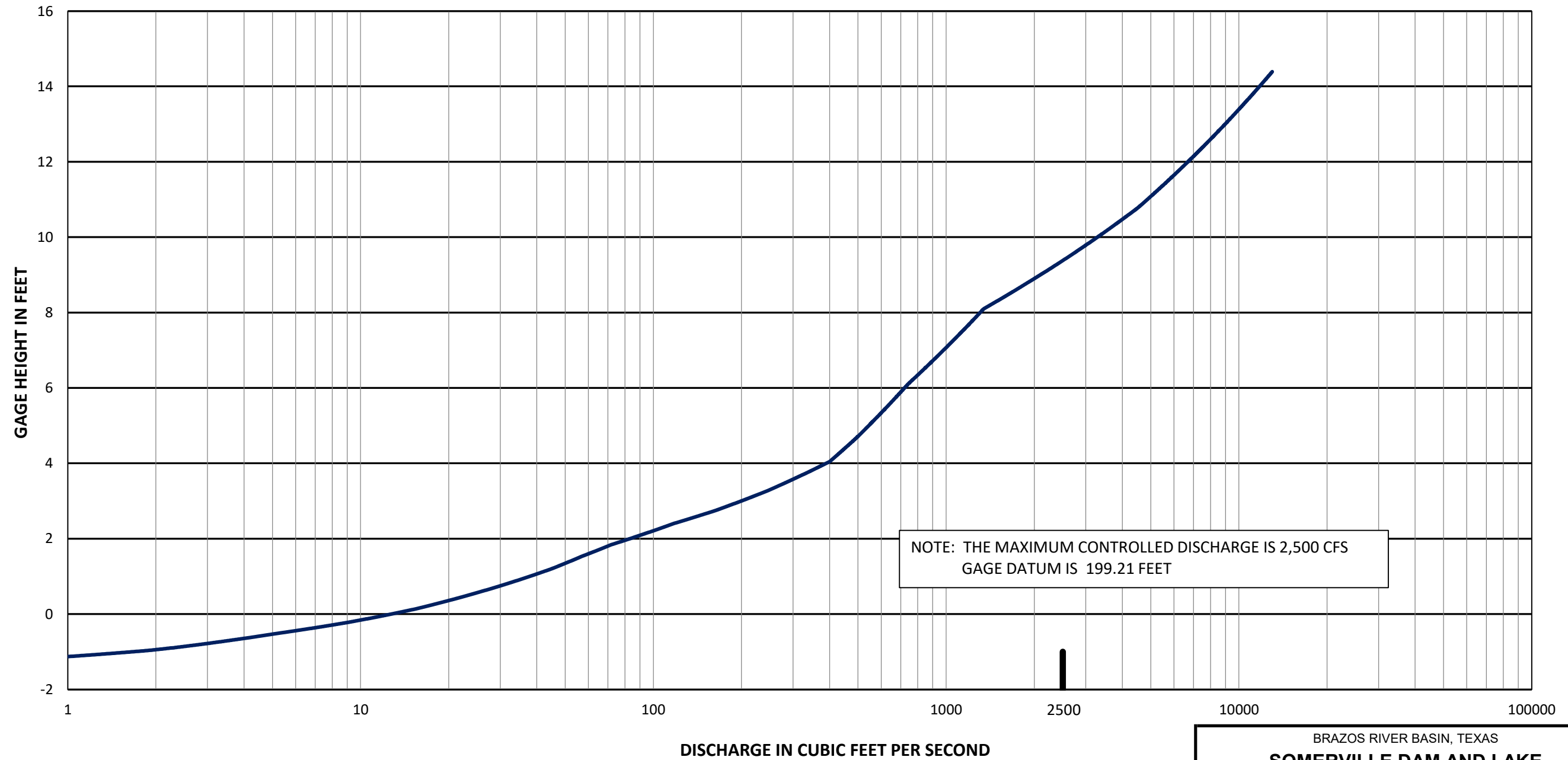
PLATE 4 - 16



ALL ELEVATIONS REFERRED TO ON THIS PLATE, UNLESS NOTED OTHERWISE, ARE IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NVGD29). THE DATUM CONVERSION FROM NGVD TO NAVD88 IS:  $NGVD29 + 0.1 \text{ FEET} = NAVD88$  FOR SOMERVILLE DAM AND LAKE.

**BRAZOS RIVER BASIN, TEXAS**  
**SOMERVILLE DAM AND LAKE**  
 YEGUA CREEK  
**RATING CURVE**  
**EAST YEGUA CREEK NEAR**  
**DIME BOX**  
 USGS GAGE NO. 08109800

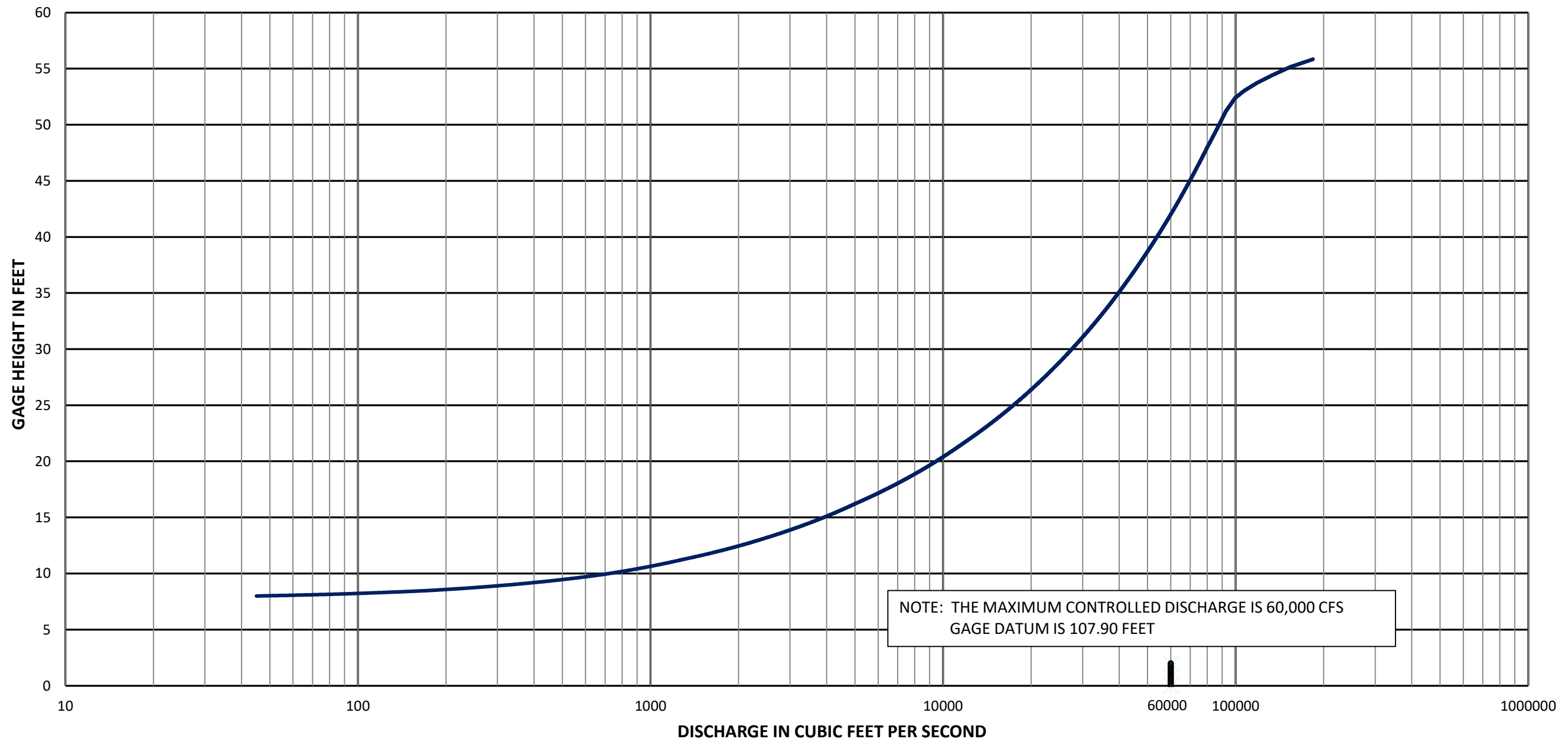
U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2019



ALL ELEVATIONS REFERRED TO ON THIS PLATE, UNLESS NOTED OTHERWISE, ARE IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NVD29). THE DATUM CONVERSION FROM NGVD TO NAVD88 IS: NGVD29 + 0.1 FEET = NAVD88 FOR SOMERVILLE DAM AND LAKE.

BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
 YEGUA CREEK  
  
**RATING CURVE**  
**YEGUA CREEK NEAR SOMERVILLE**  
 USGS GAGE NO. 08110000

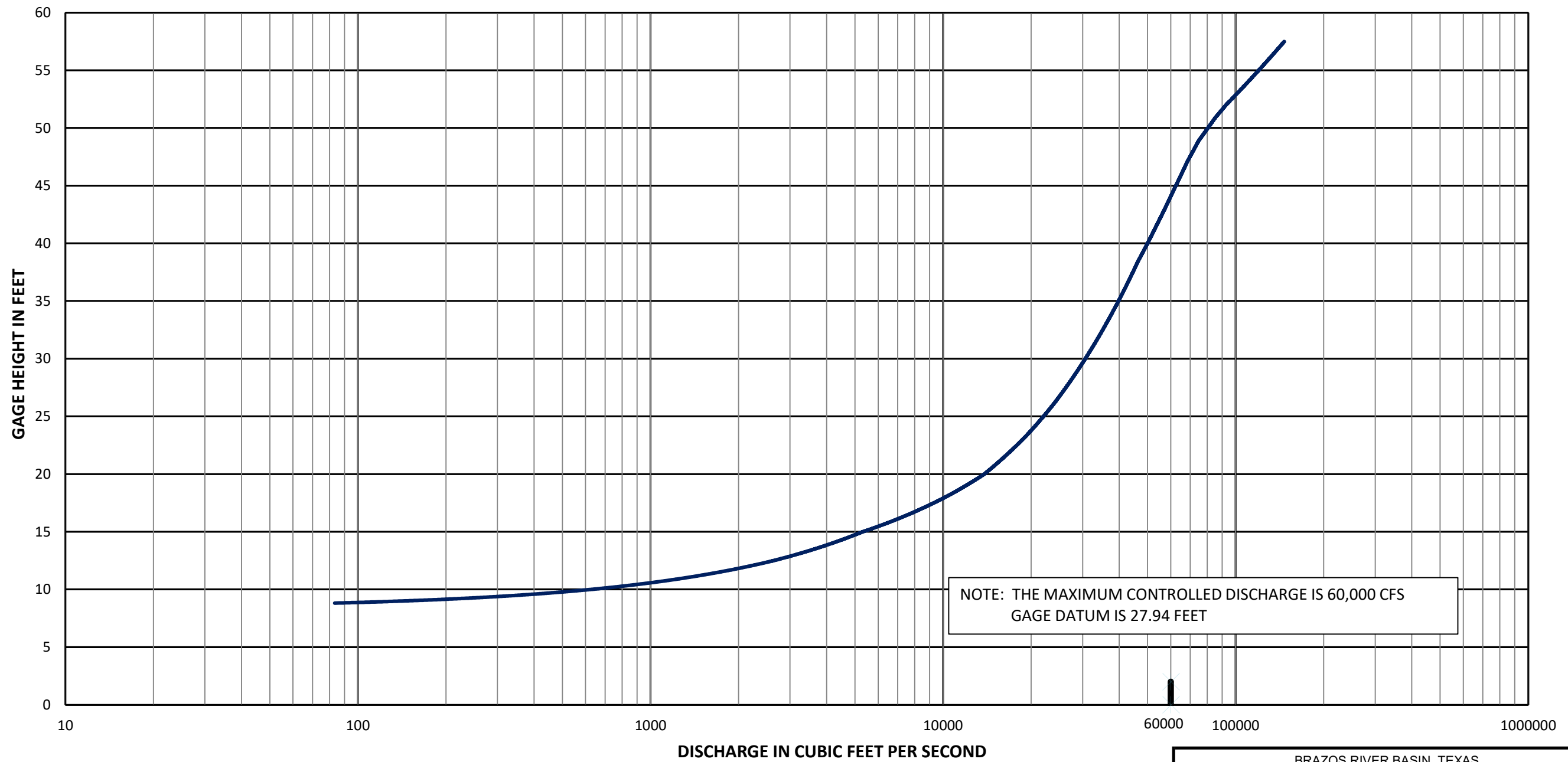
U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2019



ALL ELEVATIONS REFERRED TO ON THIS PLATE, UNLESS NOTED OTHERWISE, ARE IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NVD29). THE DATUM CONVERSION FROM NGVD TO NAVD88 IS: NGVD29 + 0.1 FEET = NAVD88 FOR AQUILLA DAM AND LAKE.

BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
YEGUA CREEK  
  
**RATING CURVE**  
**BRAZOS RIVER NEAR HEMPSTEAD**  
USGS GAGE NO. 08111500

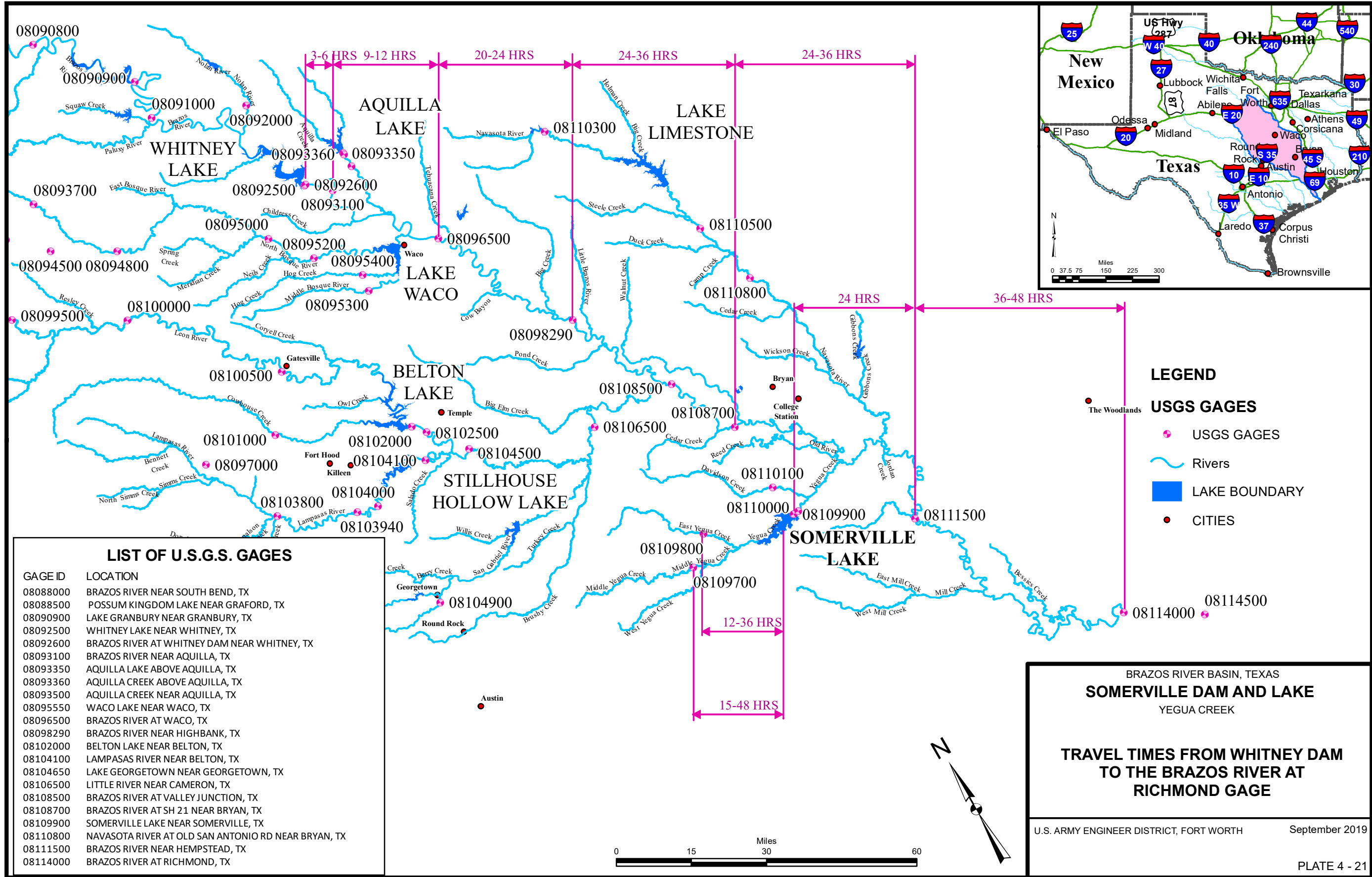
U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2019



ALL ELEVATIONS REFERRED TO ON THIS PLATE, UNLESS NOTED OTHERWISE, ARE IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29). THE DATUM CONVERSION FROM NGVD TO NAVD88 IS: NGVD29 + 0.1 FEET = NAVD88 FOR AQUILLA DAM AND LAKE.

BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
YEGUA CREEK  
  
**RATING CURVE**  
**BRAZOS RIVER AT RICHMOND**  
USGS GAGE NO. 08114000

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2019



**LIST OF U.S.G.S. GAGES**

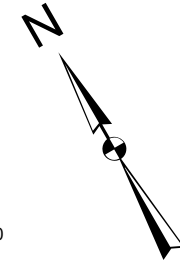
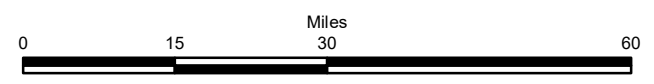
GAGE ID	LOCATION
08088000	BRAZOS RIVER NEAR SOUTH BEND, TX
08088500	POSSUM KINGDOM LAKE NEAR GRAFORD, TX
08090900	LAKE GRANBURY NEAR GRANBURY, TX
08092500	WHITNEY LAKE NEAR WHITNEY, TX
08092600	BRAZOS RIVER AT WHITNEY DAM NEAR WHITNEY, TX
08093100	BRAZOS RIVER NEAR AQUILLA, TX
08093350	AQUILLA LAKE ABOVE AQUILLA, TX
08093360	AQUILLA CREEK ABOVE AQUILLA, TX
08093500	AQUILLA CREEK NEAR AQUILLA, TX
08095550	WACO LAKE NEAR WACO, TX
08096500	BRAZOS RIVER AT WACO, TX
08098290	BRAZOS RIVER NEAR HIGHBANK, TX
08102000	BELTON LAKE NEAR BELTON, TX
08104100	LAMPASAS RIVER NEAR BELTON, TX
08104650	LAKE GEORGETOWN NEAR GEORGETOWN, TX
08106500	LITTLE RIVER NEAR CAMERON, TX
08108500	BRAZOS RIVER AT VALLEY JUNCTION, TX
08108700	BRAZOS RIVER AT SH 21 NEAR BRYAN, TX
08109900	SOMERVILLE LAKE NEAR SOMERVILLE, TX
08110800	NAVASOTA RIVER AT OLD SAN ANTONIO RD NEAR BRYAN, TX
08111500	BRAZOS RIVER NEAR HEMPSTEAD, TX
08114000	BRAZOS RIVER AT RICHMOND, TX

BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
 YEGUA CREEK

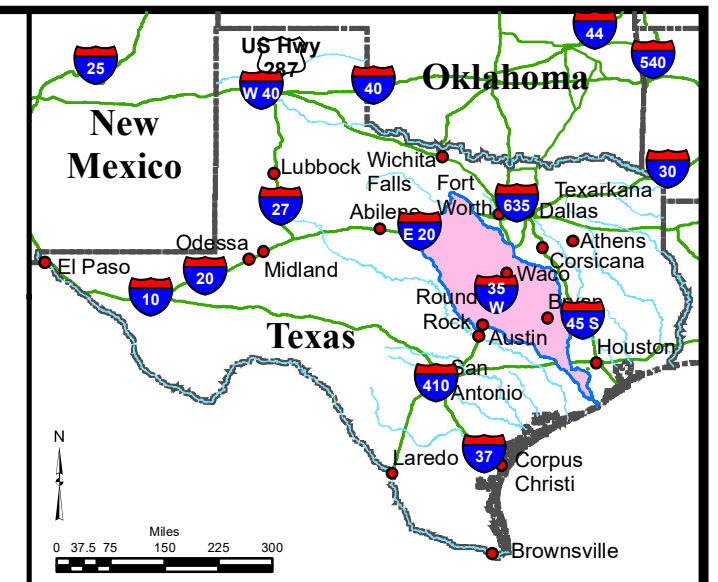
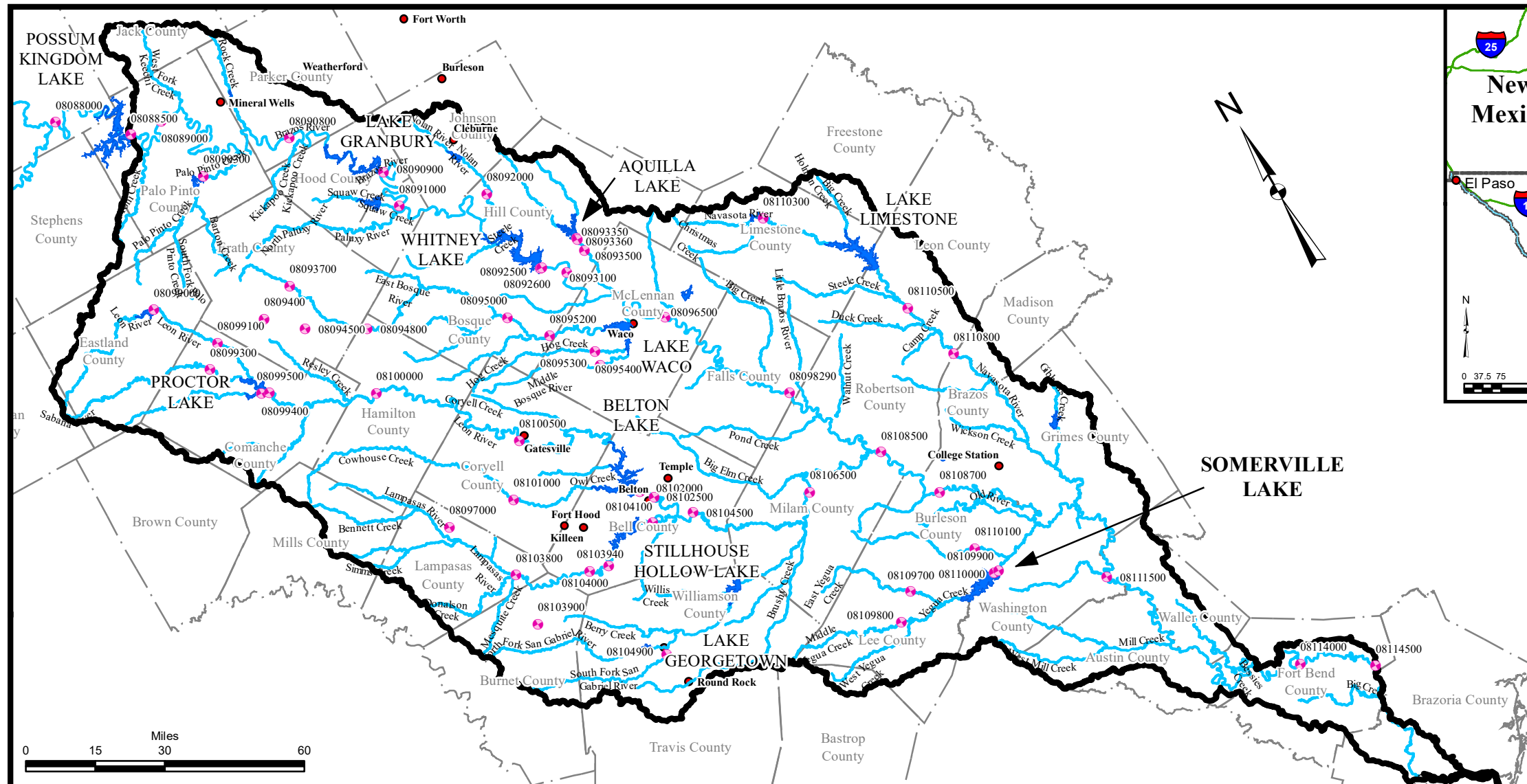
**TRAVEL TIMES FROM WHITNEY DAM TO THE BRAZOS RIVER AT RICHMOND GAGE**

U.S. ARMY ENGINEER DISTRICT, FORT WORTH  
 September 2019

PLATE 4 - 21



- LEGEND**
- USGS GAGES
  - Rivers
  - LAKE BOUNDARY
  - CITIES



**LEGEND**

- USGS GAGES
- RIVER BASIN BOUNDARY
- ~ RIVERS
- LAKE BOUNDARY
- CITIES
- COUNTY BOUNDARY

**LIST OF U.S.G.S GAGES**

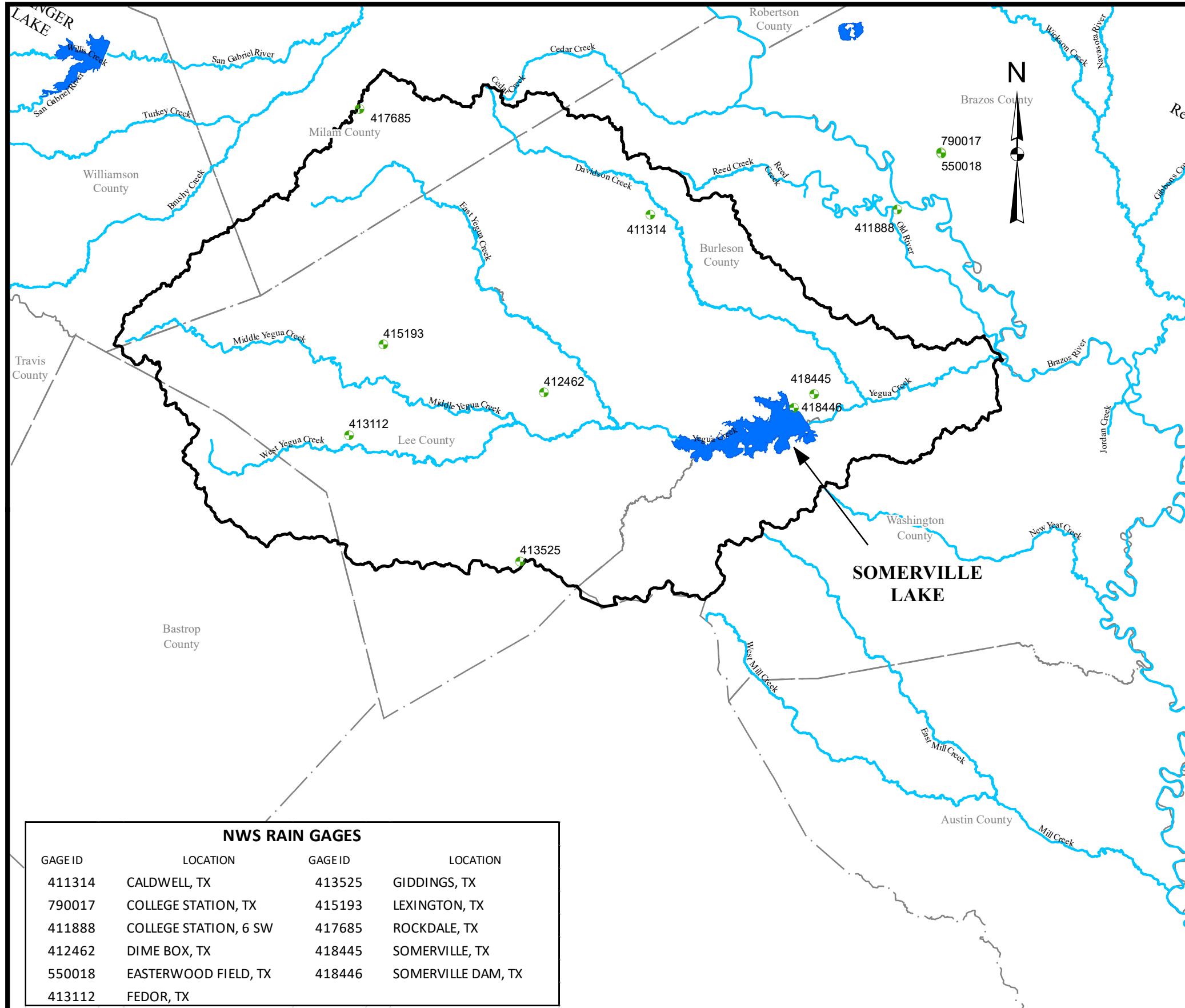
GAGE ID:	LOCATION:	GAGE ID:	LOCATION:	GAGE ID:	LOCATION:
08082500	BRAZOS RIVER AT SEYMOUR, TX	08095000	NORTH BOSQUE RIVER NEAR CLIFTON, TX	08104000	LAMPASAS RIVER AT YOUNGSPORT, TX (DISCONTINUED)
08085500	CLEAR FORK BRAZOS RIVER AT FORT GRIFFIN, TX	08095200	NORTH BOSQUE RIVER AT VALLEY MILLS, TX	08104100	LAMPASAS RIVER NEAR BELTON, TX
08088000	BRAZOS RIVER NEAR SOUTH BEND, TX	08095300	MIDDLE BOSQUE RIVER NEAR MCGREGOR, TX	08104500	LITTLE RIVER NEAR LITTLE RIVER, TX
08088500	POSSUM KINGDOM LAKE NEAR GRAFORD, TX	08095400	HOG CREEK NEAR CRAWFORD, TX	08104900	S FORK SAN GABRIEL RIVER AT GEORGETOWN, TX
08089000	BRAZOS RIVER NEAR PALO PINTO, TX	08096500	BRAZOS RIVER AT WACO, TX	08106500	LITTLE RIVER NEAR CAMERON, TX
08090300	LAKE PALO PINTO NEAR SANTO, TX	08097000	COW BAYOU AT MOOREVILLE, TX	08108500	BRAZOS RIVER AT VALLEY JUNCTION, TX (DISCONTINUED)
08090800	BRAZOS RIVER NEAR DENNIS, TX	08098290	BRAZOS RIVER NEAR HIGHBANK, TX	08108700	BRAZOS RIVER AT SH21 NEAR BRYAN, TX
08090900	LAKE GRANBURY NEAR GRANBURY, TX	08099000	LEON RESERVOIR NEAR RANGER, TX	08109700	MIDDLE YEGUA CREEK NEAR DIME BOX, TX
08091000	BRAZOS RIVER NEAR GLEN ROSE, TX	08099100	LEON RIVER NEAR DE LEON, TX	08109800	EAST YEGUA CREEK NEAR DIME BOX, TX
08092000	NOLAN RIVER AT BLUM, TX	08099300	SABANA RIVER NEAR DE LEON, TX	08109900	SOMERVILLE LAKE NEAR SOMERVILLE, TX
08092500	WHITNEY LAKE NEAR WHITNEY, TX	08099400	PROCTOR LAKE NEAR PROCTOR, TX	08110000	YEGUA CREEK NEAR SOMERVILLE, TX
08092600	BRAZOS RIVER AT WHITNEY DAM NEAR WHITNEY, TX	08099500	LEON RIVER NEAR HASSE, TX	08110100	DAVIDSON CREEK NEAR LYONS, TX
08093100	BRAZOS RIVER NEAR AQUILLA, TX	08100000	LEON RIVER NEAR HAMILTON, TX	08110300	LAKE MEXIA NEAR MEXIA, TX
08093350	AQUILLA CREEK ABOVE AQUILLA, TX	08100500	LEON RIVER AT GATESVILLE, TX	08110500	NAVASOTA RIVER NEAR EASTERLY, TX
08093360	AQUILLA LAKE ABOVE AQUILLA	08101000	COWHOUSE CREEK AT PIDCOKE, TX	08110800	NAVASOTA RIVER AT OLD SAN ANTONIO RD NEAR BRYAN, TX
08093500	AQUILLA CREEK NEAR AQUILLA, TX	08102000	BELTON LAKE NEAR BELTON, TX	08111500	BRAZOS RIVER NEAR HEMPSTEAD, TX
08093700	NORTH BOSQUE RIVER AT STEPHENVILLE, TX	08102500	LEON RIVER NEAR BELTON, TX	08114000	BRAZOS RIVER AT RICHMOND, TX
08094000	GREEN CREEK SUBWATERSHED 1 NEAR DUBLIN, TX	08103800	LAMPASAS RIVER NEAR KEMPNER, TX	08114500	BRAZOS RIVER NEAR JULIFF, TX (DISCONTINUED)
08094500	GREEN CREEK NEAR ALEXANDER, TX	08103900	SOUTH FORK ROCKY CREEK NEAR BRIGGS, TX		
08094800	NORTH BOSQUE RIVER AT HICO, TX	08103940	LAMPASAS RIVER AT DING DONG, TX		

BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
 YEGUA CREEK

**HYDROLOGIC NETWORK**  
**LOWER BRAZOS RIVER BASIN**

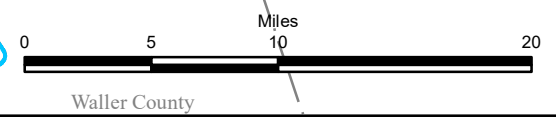
U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2019

PLATE 5 - 1



**LEGEND**

- NWS GAGES
- SOMERVILLE WATERSHED
- ~ RIVERS
- LAKE BOUNDARY
- COUNTY BOUNDARY



NWS RAIN GAGES			
GAGE ID	LOCATION	GAGE ID	LOCATION
411314	CALDWELL, TX	413525	GIDDINGS, TX
790017	COLLEGE STATION, TX	415193	LEXINGTON, TX
411888	COLLEGE STATION, 6 SW	417685	ROCKDALE, TX
412462	DIME BOX, TX	418445	SOMERVILLE, TX
550018	EASTERWOOD FIELD, TX	418446	SOMERVILLE DAM, TX
413112	FEDOR, TX		

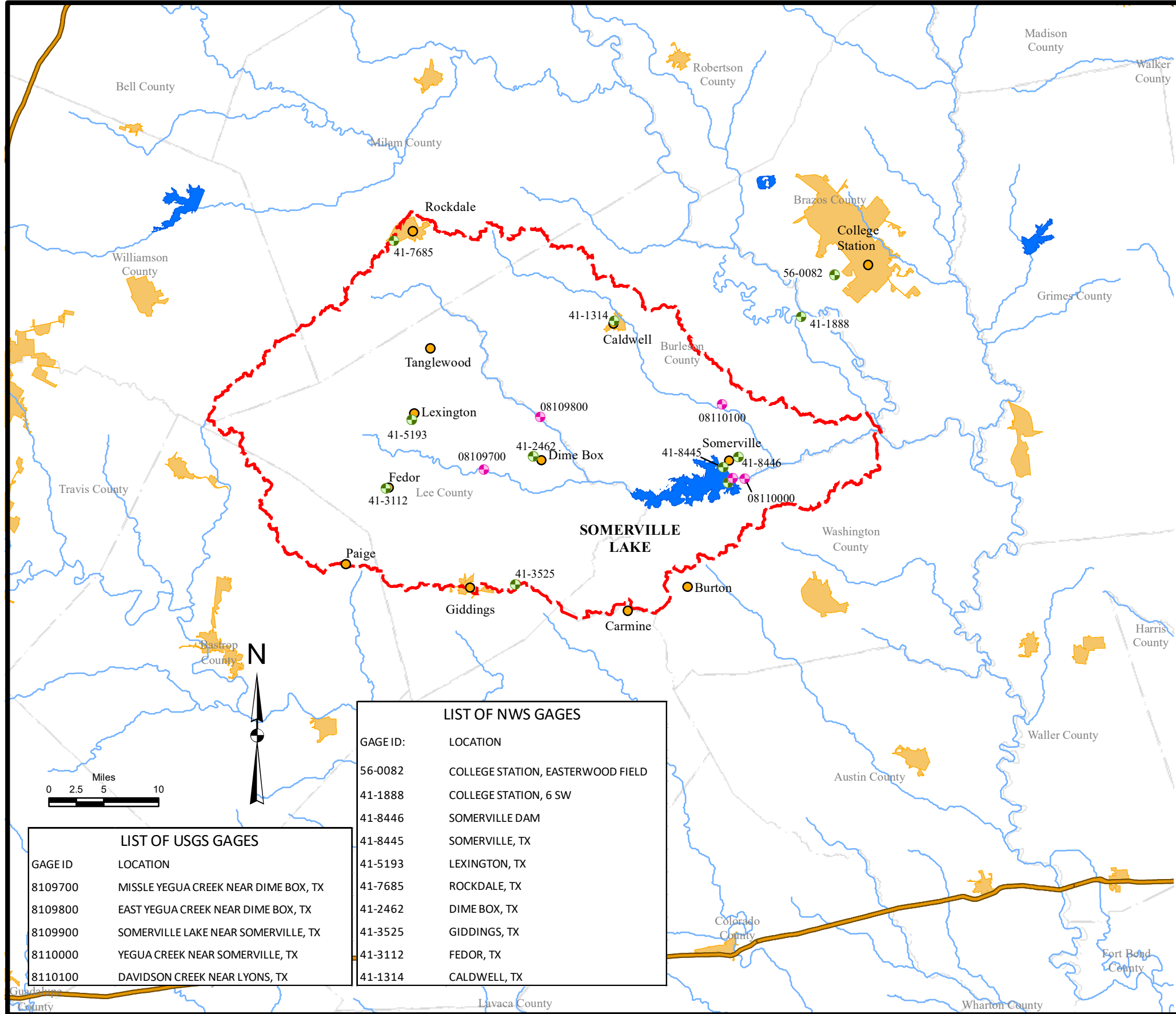
BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
 YEGUA CREEK

**YEGUA CREEK BASIN**  
**RAIN GAGES MAP**

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2019

PLATE 5 - 2





**LEGEND**

- CITIES
- USGS GAGES
- NWS GAGES
- RIVER BASIN BOUNDARY
- ~ RIVERS
- INTERSTATE
- STATE BOUNDARY
- METRO AREAS

LIST OF NWS GAGES	
GAGE ID:	LOCATION
56-0082	COLLEGE STATION, EASTERWOOD FIELD
41-1888	COLLEGE STATION, 6 SW
41-8446	SOMERVILLE DAM
41-8445	SOMERVILLE, TX
41-5193	LEXINGTON, TX
41-7685	ROCKDALE, TX
41-2462	DIME BOX, TX
41-3525	GIDDINGS, TX
41-3112	FEDOR, TX
41-1314	CALDWELL, TX

LIST OF USGS GAGES	
GAGE ID	LOCATION
8109700	MISSILE YEGUA CREEK NEAR DIME BOX, TX
8109800	EAST YEGUA CREEK NEAR DIME BOX, TX
8109900	SOMERVILLE LAKE NEAR SOMERVILLE, TX
8110000	YEGUA CREEK NEAR SOMERVILLE, TX
8110100	DAVIDSON CREEK NEAR LYONS, TX

BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
 YEGUA CREEK

**REAL TIME WATER CONTROL  
 BASE MAP**

**SOMERVILLE DAM AND LAKE  
NORMAL SCHEDULE FOR LAKE REGULATION**

**FORECASTED LAKE ELEVATION**

**DOWNSTREAM CONTROL DISCHARGES**

**SCHEDULE OF CONTROL OPERATIONS**

**1. CONSERVATION WATER CONTROL**

At or below 238.0

Gated releases should not contribute to exceeding the control point capacities shown in Table 7-1 (below).

No flood control releases will be made when the lake level is at or below the top of conservation pool (elevation 238.0 feet). Releases from the conservation storage will be made as instructed from the Fort Worth District Water Management Office at the request of the Brazos River Authority (BRA).

a. Above 238.0 to 258.0

Gated releases should not contribute to exceeding the control point capacities shown in Table 7-1.

When the lake is above top of conservation pool elevation 238.0 feet and is forecasted to remain below top of flood pool elevation elevation 258.0 feet, gated releases should not contribute to exceeding the control point capacities shown in Table 7-1 (below).

b. Above 258.0

Gated releases should not contribute to exceeding the control point capacities shown in Table 7-1.

When the lake elevation is above top of flood control pool and spillway crest elevation 258.0 feet, gated releases should not contribute to exceeding the control point capacities shown in Table 7-1 (below). All flood gates should be fully closed when spillway flows equal or exceed 2,500 cfs.

CAUTION: When gated releases are being made in conjunction with spillway flows the outlet works and the stilling basin should be closely monitored for evidence of abnormal behavior.

**TABLE 7-1**

**Downstream Control Points**

	Control Capacity (cfs)
River Channel and USGS Gaging Station	
Yegua Creek near Somerville	2,500
Brazos River near Hempstead	60,000
Brazos River at Richmond	60,000

**TABLE 7-3**

**Low Flood Pool Typical Release Rates**

Pool Elevation Range (ft)	Flood Pool Range (%)	*Daily Avg Release Rates (cfs)
238.0 – 238.5	0.0 – 1.7	95 – 185
238.5 – 239.0	1.7 – 3.4	270 - 505
239.0 – 239.5	3.4 – 5.1	270 - 505

\* Desired rate of release will vary with prevailing rates of inflow, lake evaporation, and water supply withdrawals. General objective is to evacuate from 5.1% to 3.4% of the flood pool in about one week, from 3.4% to 1.7% the following week, then from 1.7% to top of conservation pool (238.0) over an additional two to three week period.

BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
YEGUA CREEK  
  
**NORMAL REGULATION PLAN  
FOR FLOOD CONTROL**

**SOMERVILLE DAM AND LAKE  
EMERGENCY REGULATION PLAN  
INSTRUCTIONS TO LAKE MANAGER FOR USE WHEN COMMUNICATIONS WITH DISTRICT OFFICE FAIL**

**LAKE STAGE****LAKE CONDITIONS****OPERATION**

A. Below elevation 238.0

Rising, Standing, or Falling

Continue the releases from the conservation pool as previously instructed by Fort Worth District Water Management Office.

B. Lake elevation between 238.0 and 258.0

Rising, Standing, or Falling

Maintain releases in effect at the time communications was lost. The Lake Manager will initiate gate closing operations as soon as one of the following conditions occurs:

1. Should the Lake Manager have knowledge of pending flood condition on the Yegua Creek or the Brazos River below the project, or
2. Two or more inches of rain has been recorded at the dam in a two hour period or less, or
3. Six hours of time has elapsed after losing communications.

C. Lake elevation above 258.0

Flood gates will be fully open above elevation 258.0. Do not reduce releases until the lake level falls below elevation 258.0, then reduce the releases to 2,500 cfs. When the lake recedes to elevation 238.0, reduce releases to maintain elevation 238.0.

D. Lake elevation above 258.0 up to about 258.5

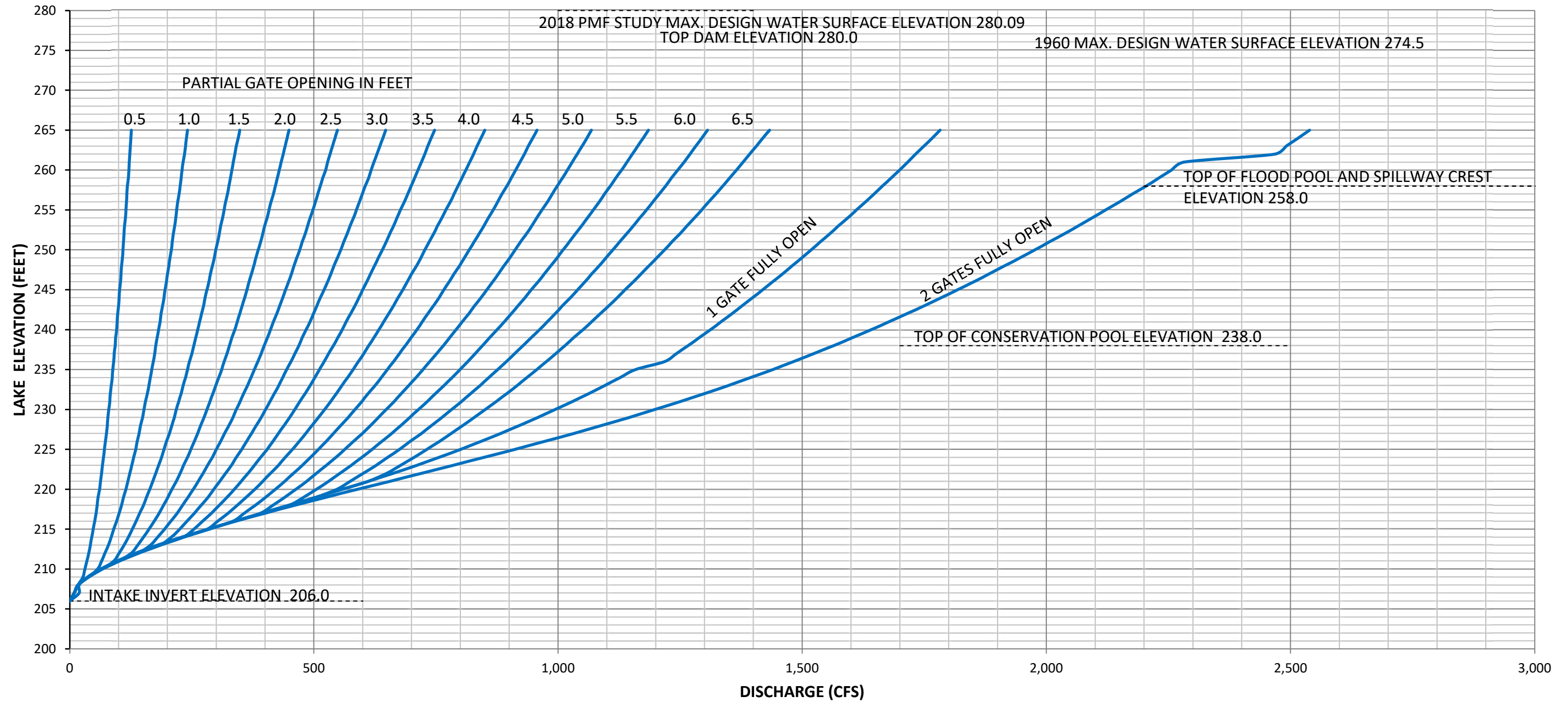
As the lake rising above elevation 258.0 and up to elevation 258.5 maintain current gate settings. If the lake elevation continues to rise then begin to close the gates until the lake recedes back to elevation 258.5 feet.

BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
YEGUA CREEK

**EMERGENCY REGULATION PLAN  
FOR CONSERVATION AND  
FLOOD CONTROL OPERATIONS**

U.S. ARMY ENGINEER DISTRICT, FORT WORTH

September 2019



1. THE OUTLET WORKS CONSISTS OF ONE 10.0' DIAMETER TUNNEL CONTROLLED BY TWO 5.0' X 10.0' SERVICE GATES.
2. ALL ELEVATIONS REFERRED TO ON THIS PLATE, UNLESS NOTED OTHERWISE, ARE IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29). THE DATUM CONVERSION FROM NGVD29 TO NAVD88 FOR SOMERVILLE DAM AND LAKE IS: NGVD29 + 0.1 FEET = NAVD88

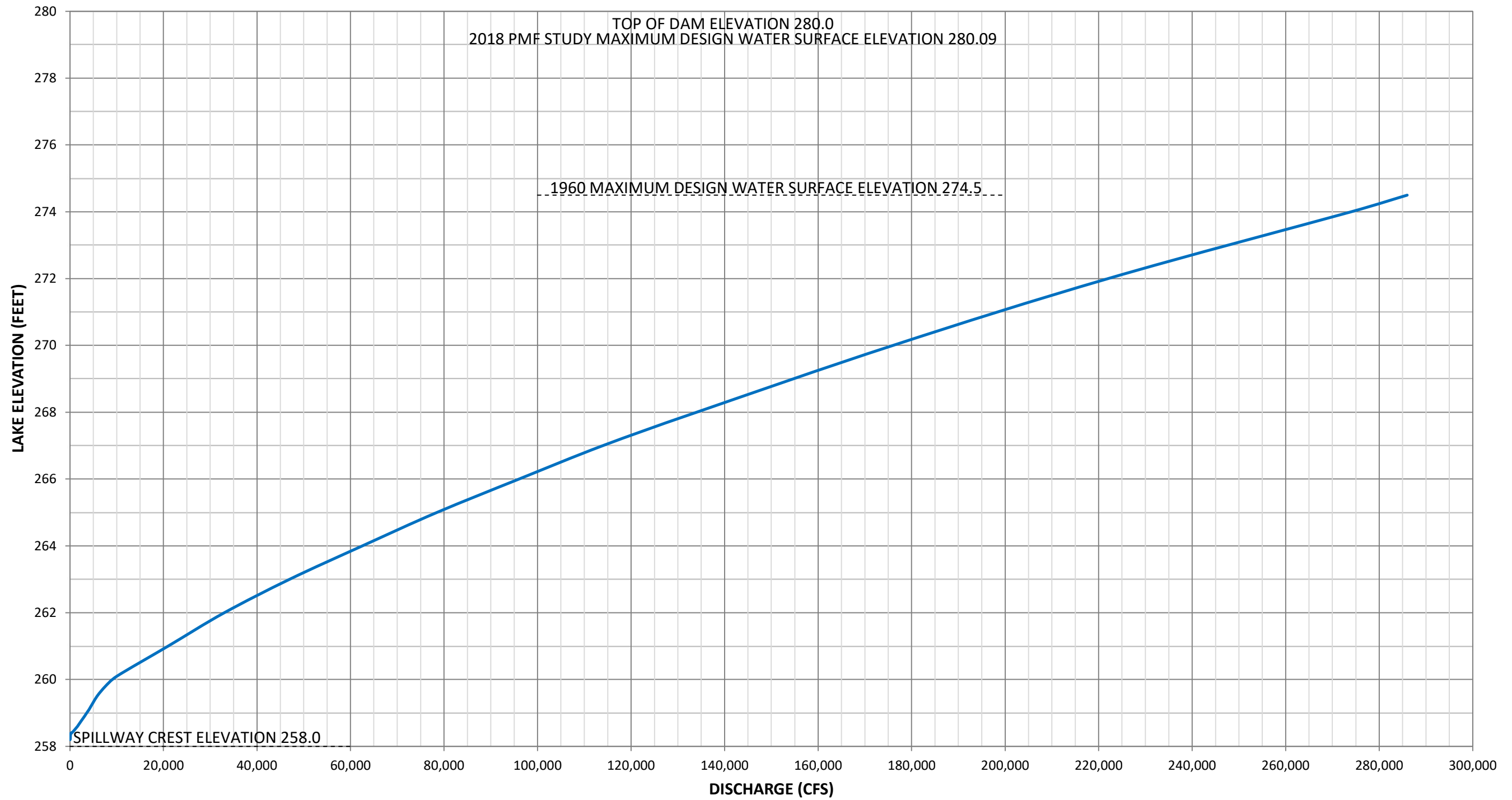
BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
 YEGUA CREEK

**OUTLET WORKS RATING CURVES**  
**2 - 5.0' X 10.0' FLOOD CONTROL GATES**  
**10.0' DIAMETER CONDUIT**

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U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2019

PLATE 7 - 3

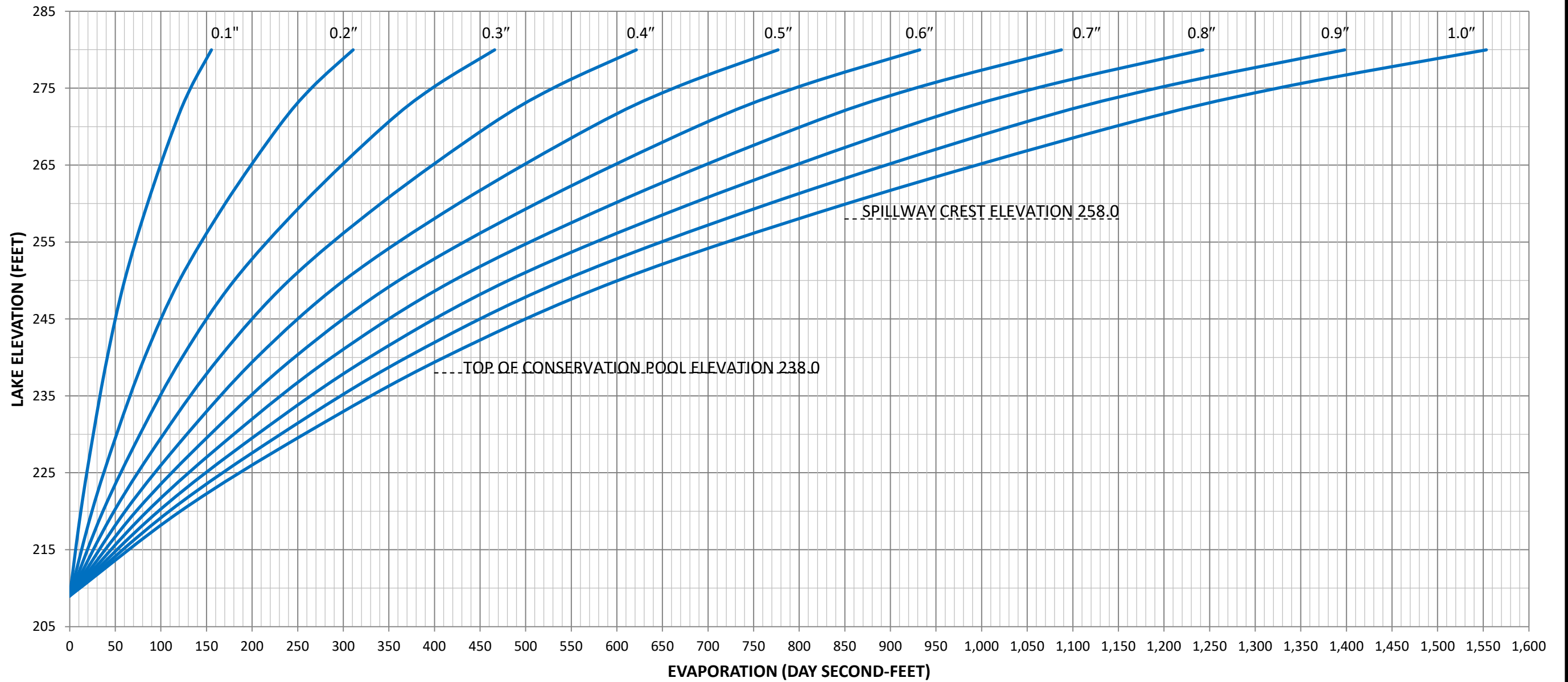


THE SPILLWAY IS AN UNCONTROLLED OGEE WEIR. WEIR LENGTH = 1,250 FEET.

ALL ELEVATIONS REFERRED TO ON THIS PLATE, UNLESS NOTED OTHERWISE, ARE IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29). THE DATUM CONVERSION FROM NGVD29 TO NAVD88 FOR SOMERVILLE DAM AND LAKE IS:

BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
YEGUA CREEK  
**SPILLWAY RATING CURVE**

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2019



ONE DAY SECOND-FEET = 1.9835 ACRE-FEET

ALL ELEVATIONS REFERRED TO ON THIS PLATE, UNLESS NOTED OTHERWISE, ARE IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29). THE DATUM CONVERSION FROM NGVD29 TO NAVD88 IS: NGVD29 + 0.1 FEET = NAVD88 FOR SOMERVILLE DAM AND LAKE.

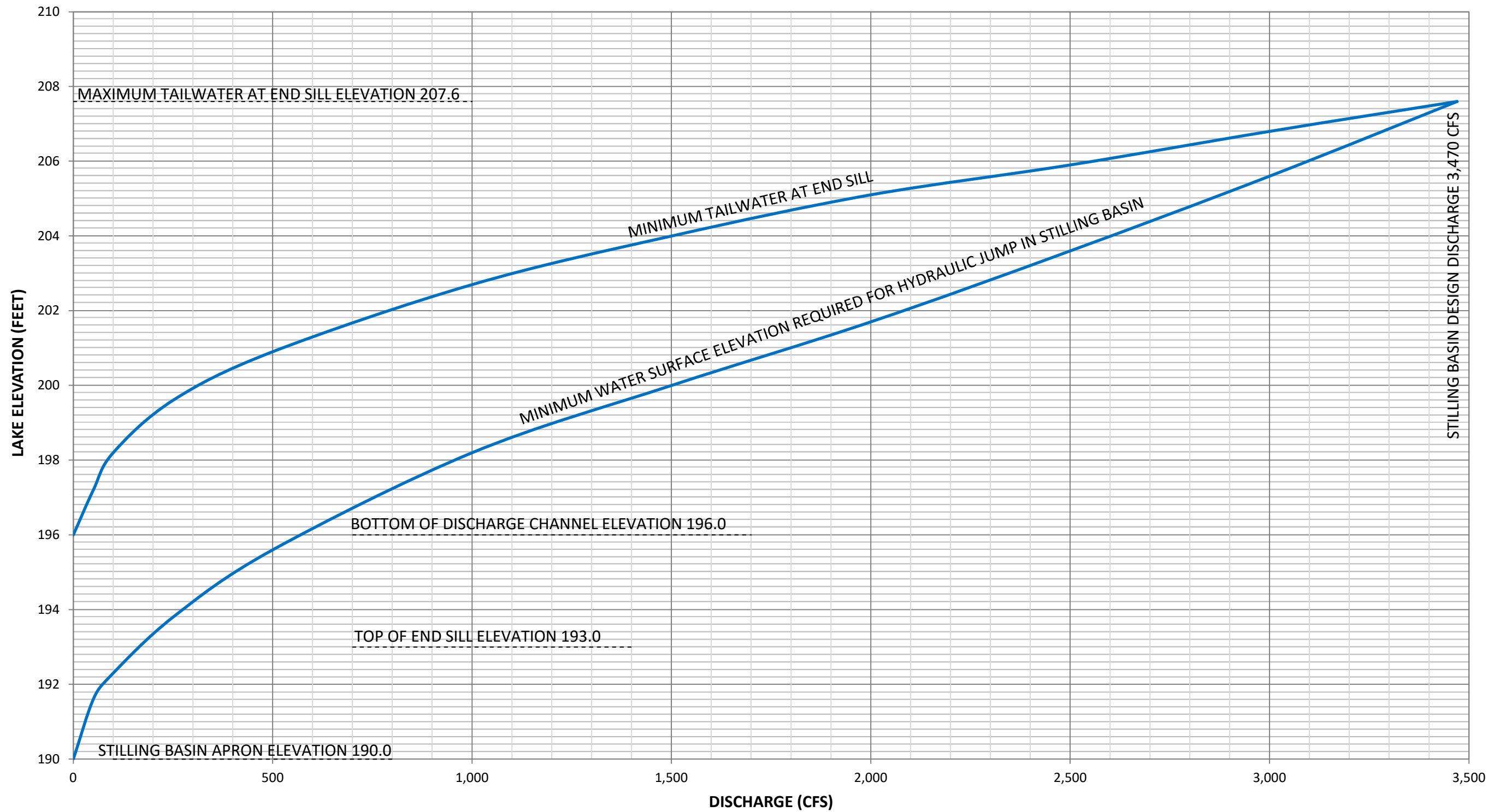
BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
YEGUA CREEK

**LAKE EVAPORATION CURVES**

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U.S. ENGINEER DISTRICT, FORT WORTH      September 2019

PLATE 7 - 5



MINIMUM WATER SURFACE LEVEL REQUIRED FOR HYDRAULIC JUMP IN STILLING BASIN EQUALS APRON ELEVATION PLUS  $0.9D_2$ .

ALL ELEVATIONS REFERRED TO ON THIS PLATE, UNLESS NOTED OTHERWISE, ARE IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29). THE DATUM CONVERSION FROM NGVD29 TO NAVD88 FOR SOMERVILLE DAM AND LAKE IS:

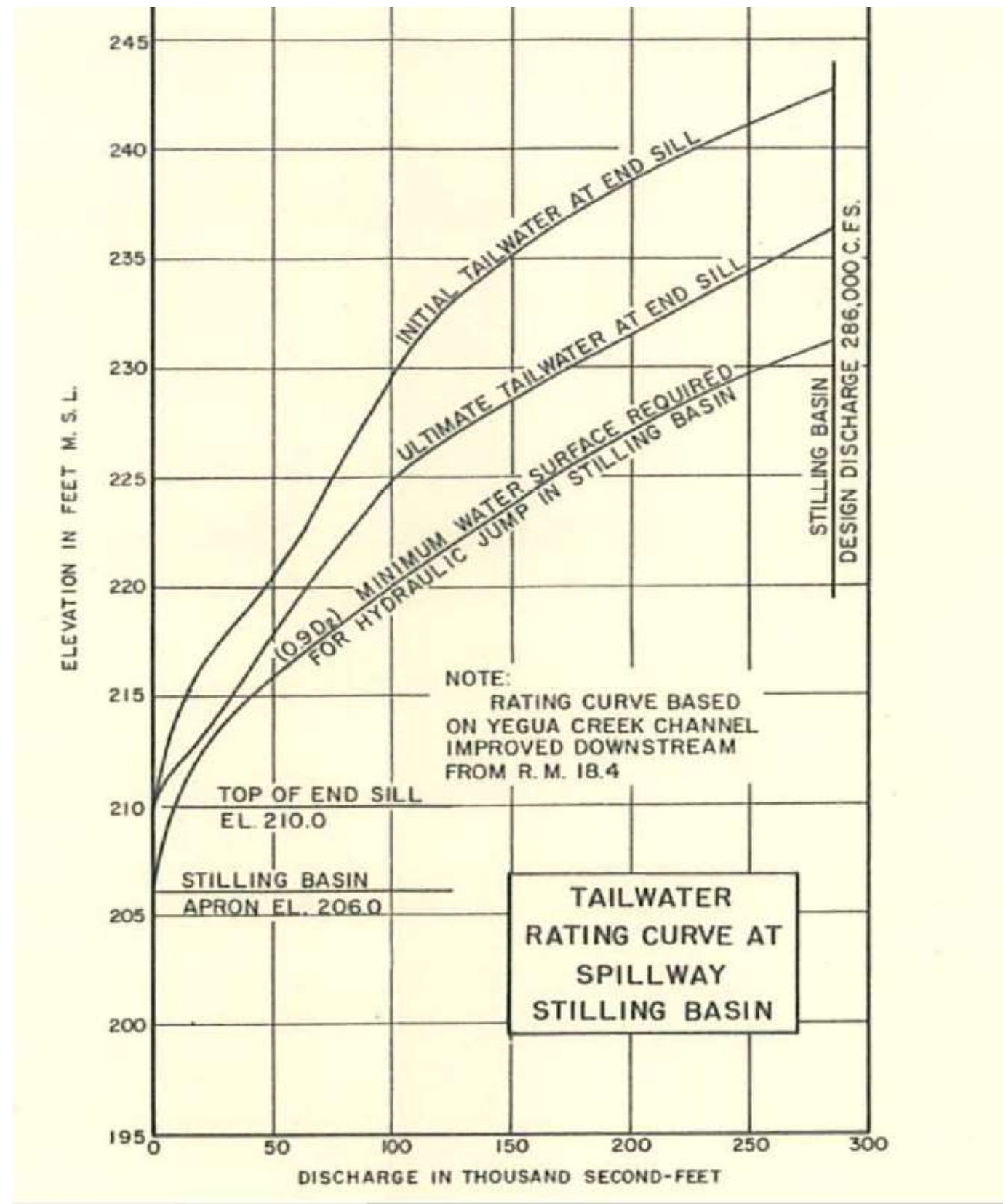
BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
 YEGUA CREEK

**OUTLET WORKS  
 TAILWATER RATING CURVES**

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U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2019

PLATE 7 - 6



ALL ELEVATIONS REFERRED TO ON THIS PLATE, UNLESS NOTED OTHERWISE, ARE IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29). THE DATUM CONVERSION FROM NGVD29 TO NAVD88 FOR SOMERVILLE DAM AND LAKE IS: NGVD29 + 0.1 FEET =

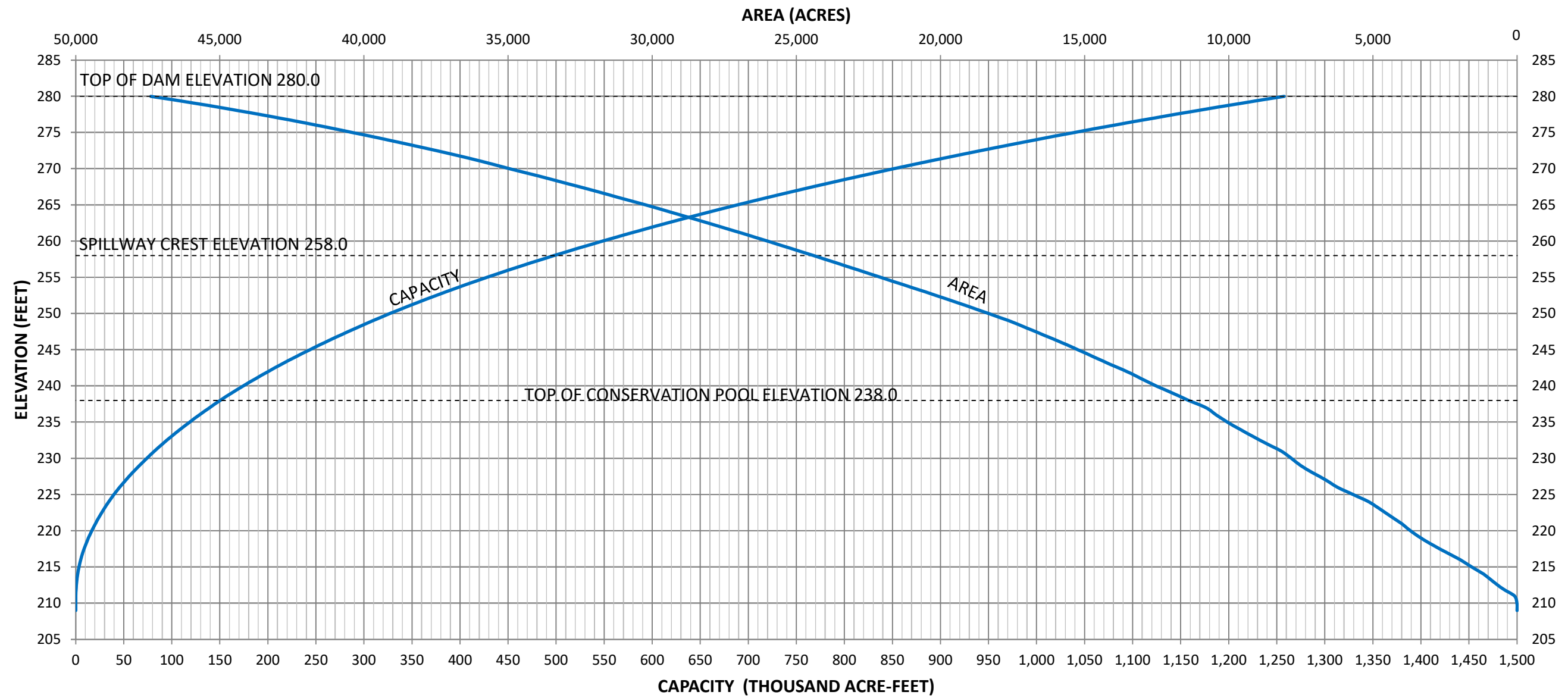
BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
 YEGUA CREEK

**SPILLWAY  
 TAILWATER RATING CURVES**

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U.S. ARMY ENGINEER DISTRICT, FORT WORTH      September 2019

PLATE 7 -7



SOMERVILLE LAKE VOLUMETRIC AND SEDIMENT SURVEY PERFORMED BY THE TEXAS WATER DEVELOPMENT BOARD IN 2012.

ALL ELEVATIONS REFERRED TO ON THIS PLATE, UNLESS NOTED OTHERWISE, ARE IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29). THE DATUM CONVERSION FROM NGVD29 TO NAVD88 IS: NGVD29 + 0.1 FEET = NAVD88 FOR SOMERVILLE DAM AND LAKE.

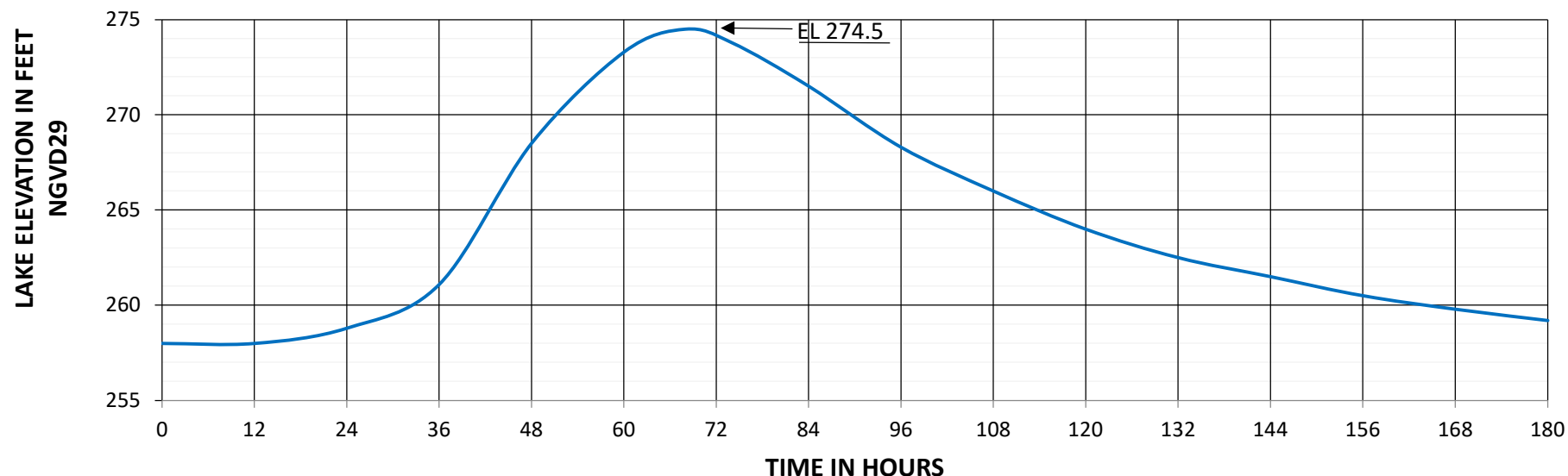
BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
 YEGUA CREEK

**AREA - CAPACITY CURVES**

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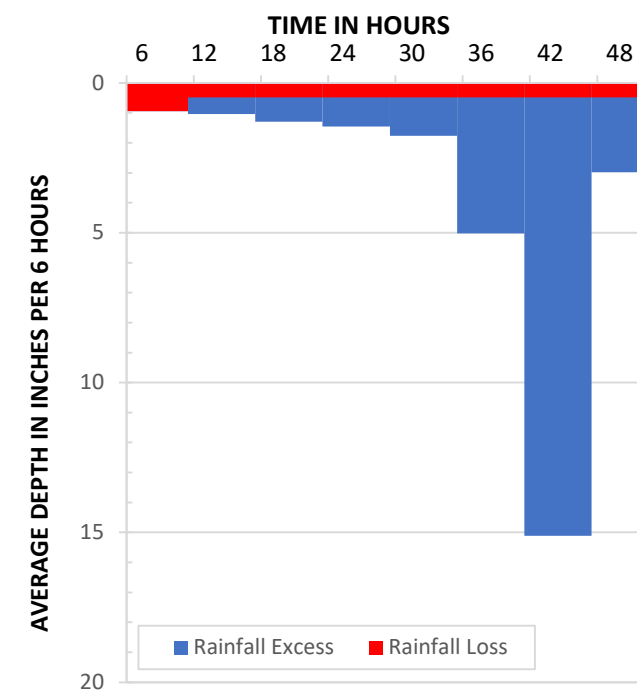
U.S. ENGINEER DISTRICT, FORT WORTH September 2019

PLATE 7 - 8

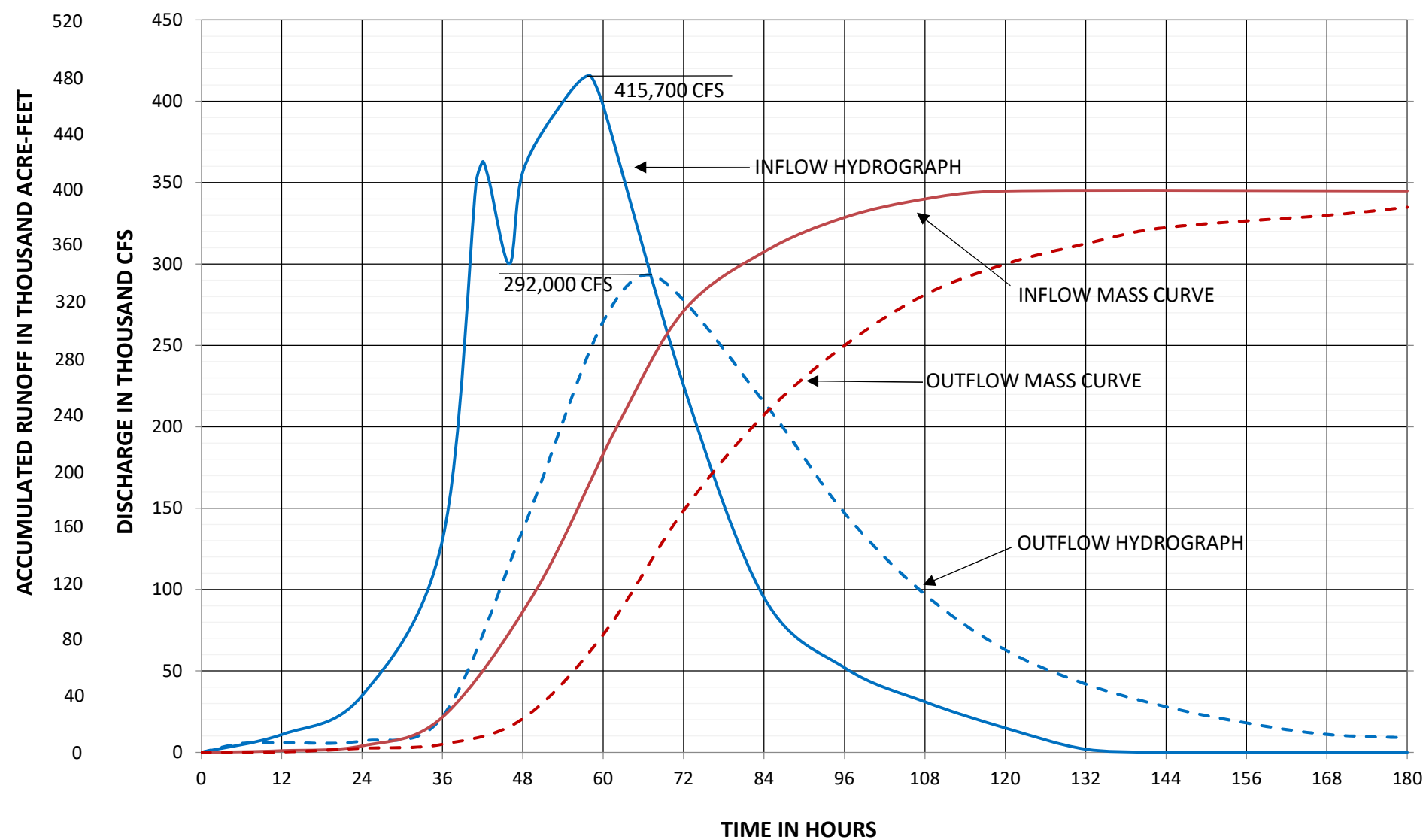


**HYETOGRAPH (INCHES)**

RAINFALL TOTAL	29.61
LOSS TOTAL	4.30
RAINFALL-EXCESS TOTAL	25.31
INFILTRATION INDEX (F.A.V.G)	0.08/HR
INITIAL LOSS	1.00

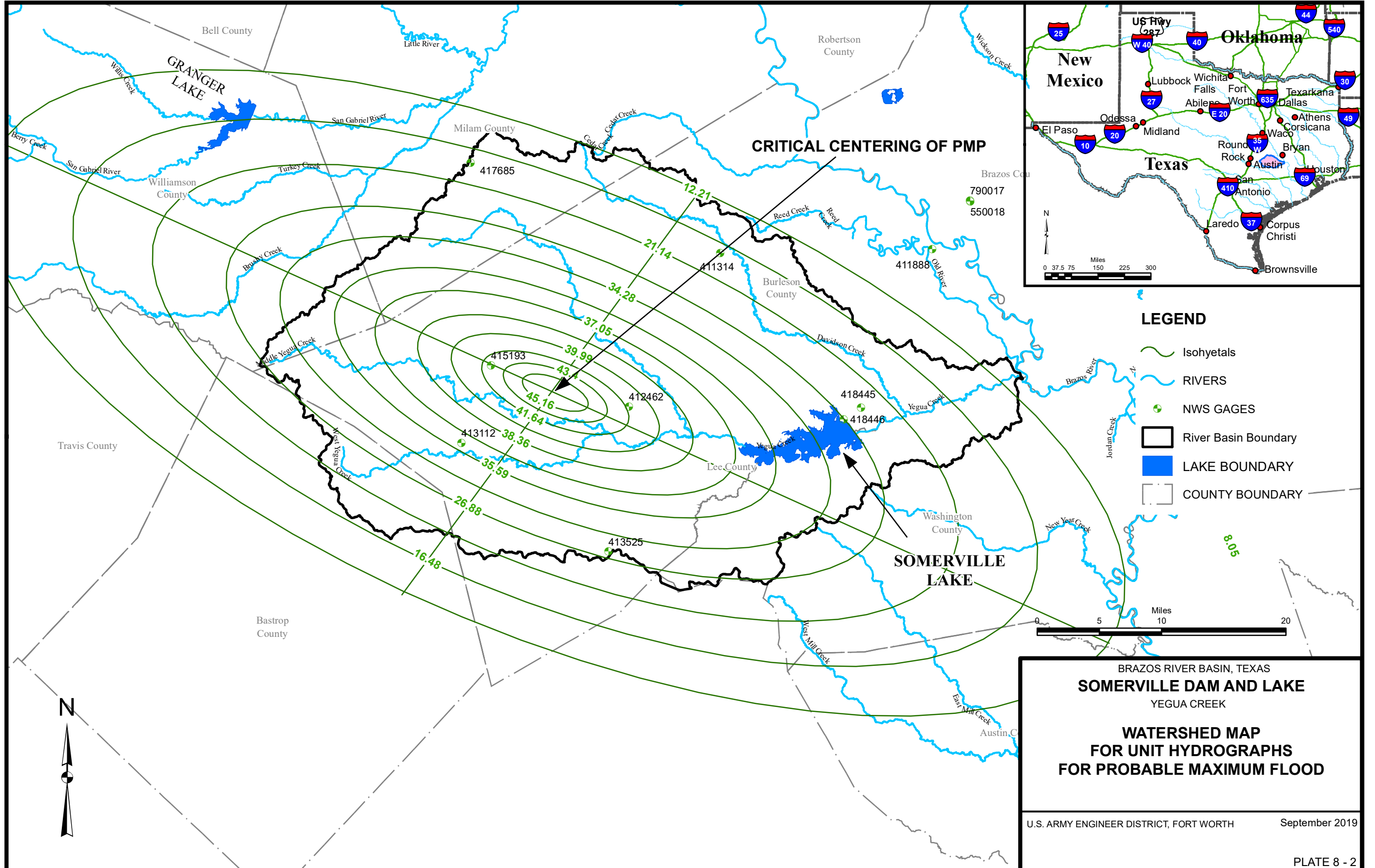


NOTE: DATA OBTAINED FROM 2018 SPILLWAY DESIGN FLOOD STUDY



BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
 YEGUA CREEK

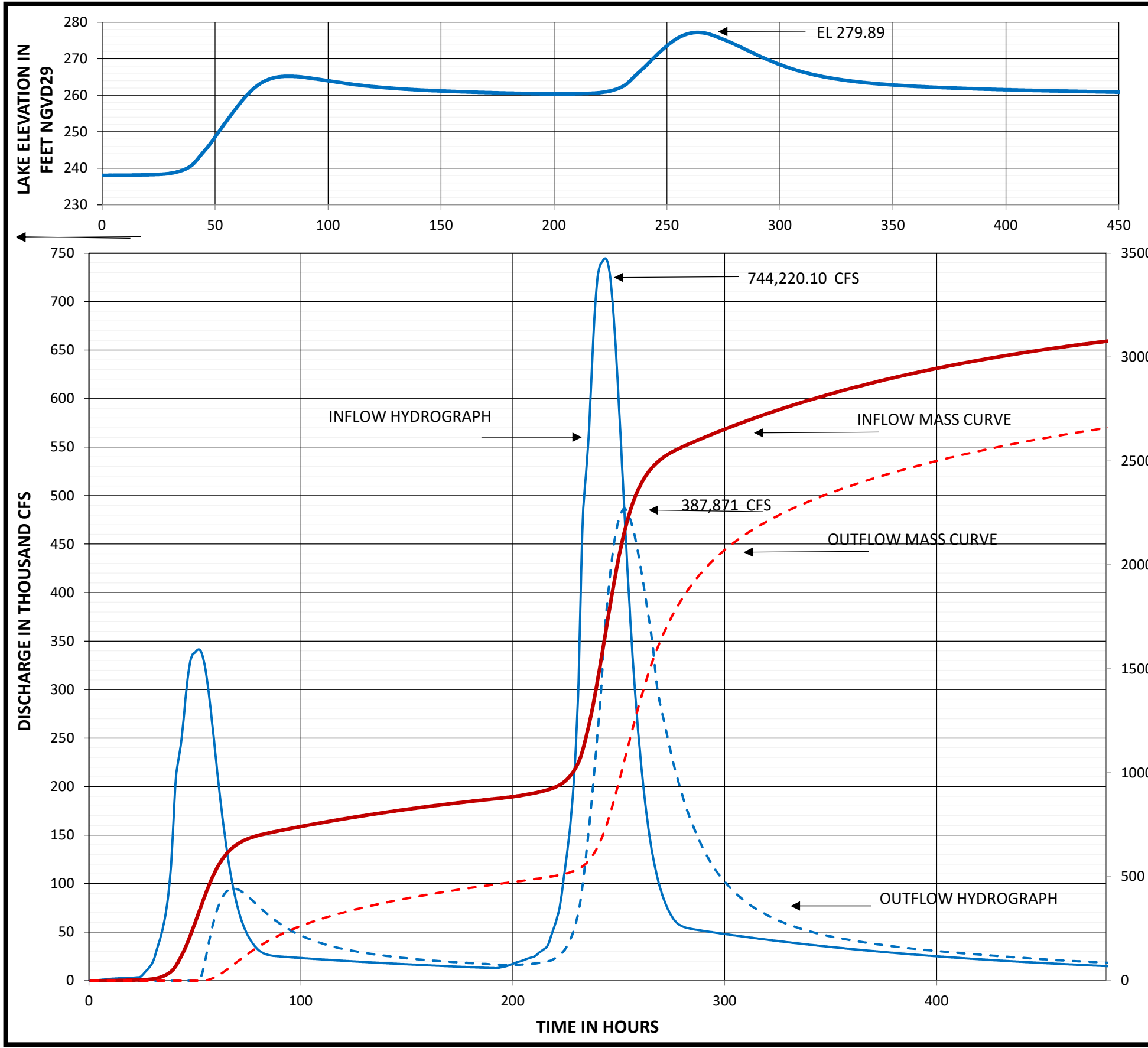
**SPILLWAY DESIGN FLOOD**



BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
 YEGUA CREEK

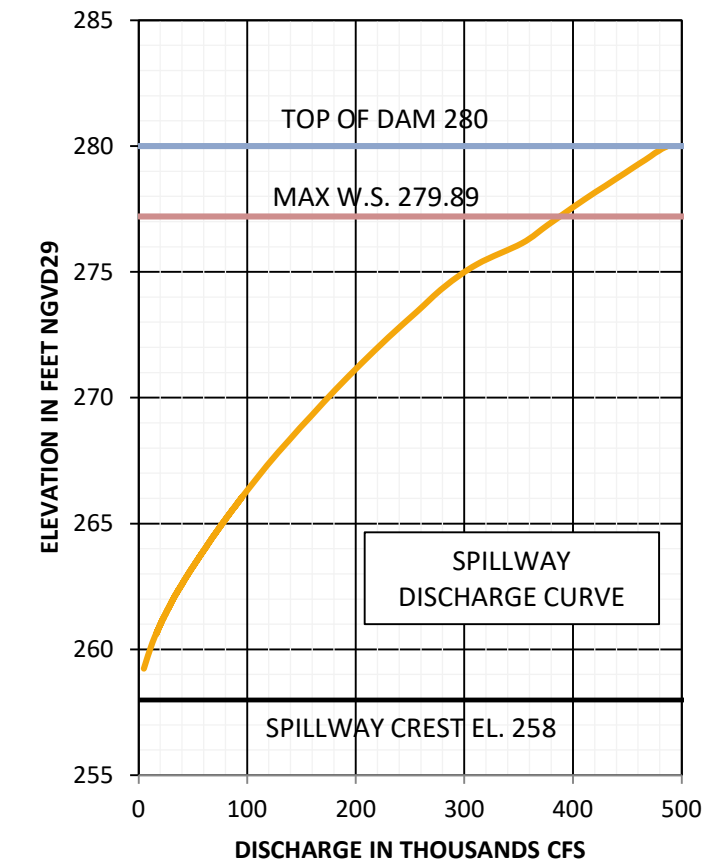
**WATERSHED MAP**  
**FOR UNIT HYDROGRAPHS**  
**FOR PROBABLE MAXIMUM FLOOD**

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2019



**HYETOGRAPH (INCHES)**

RAINFALL TOTAL	36.28
LOSS TOTAL	6.55
RAINFALL-EXCESS TOTAL	29.73
INITIAL LOSS	1.00
INFILTRATION INDEX (F.A.V.G)	0.094/HR



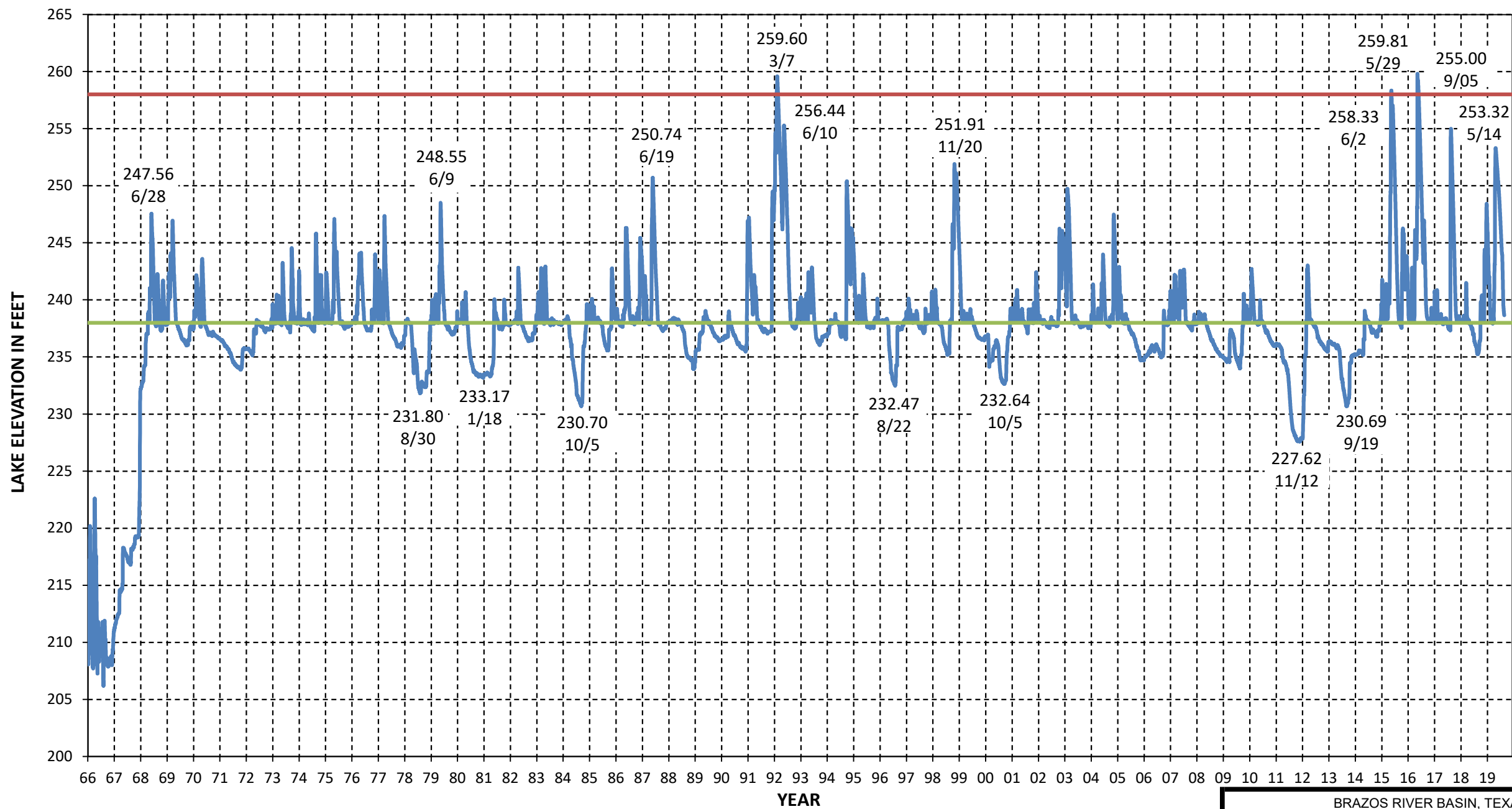
NOTE: DATA OBTAINED FROM 2018 INFLOW DESIGN FLOOD STUDY

BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
 YEGUA CREEK

**INFLOW DESIGN FLOOD  
 INFLOW-OUTFLOW HYDROGRAPHS**

U.S. ARMY ENGINEER DISTRICT, FORT WORTH      September 2019

PLATE 8 - 3



- Lake Elevation
- Sillway Crest Elevation 258.0
- Conservation Pool Elevation 238.0

DELIBERATE IMPOUNDMENT BEGAN: 01/01/1967

RECORD LAKE ELEVATION AND DATE: 259.81 NGVD29, 5/29/2016

ALL ELEVATIONS REFERRED TO ON THIS PLATE, UNLESS NOTED OTHERWISE, ARE IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29). THE DATUM CONVERSION FROM NGVD29 TO NAVD88 IS: NGVD29 + 0.1 FEET = NAVD88 FOR SOMERVILLE DAM AND LAKE.

BRAZOS RIVER BASIN, TEXAS

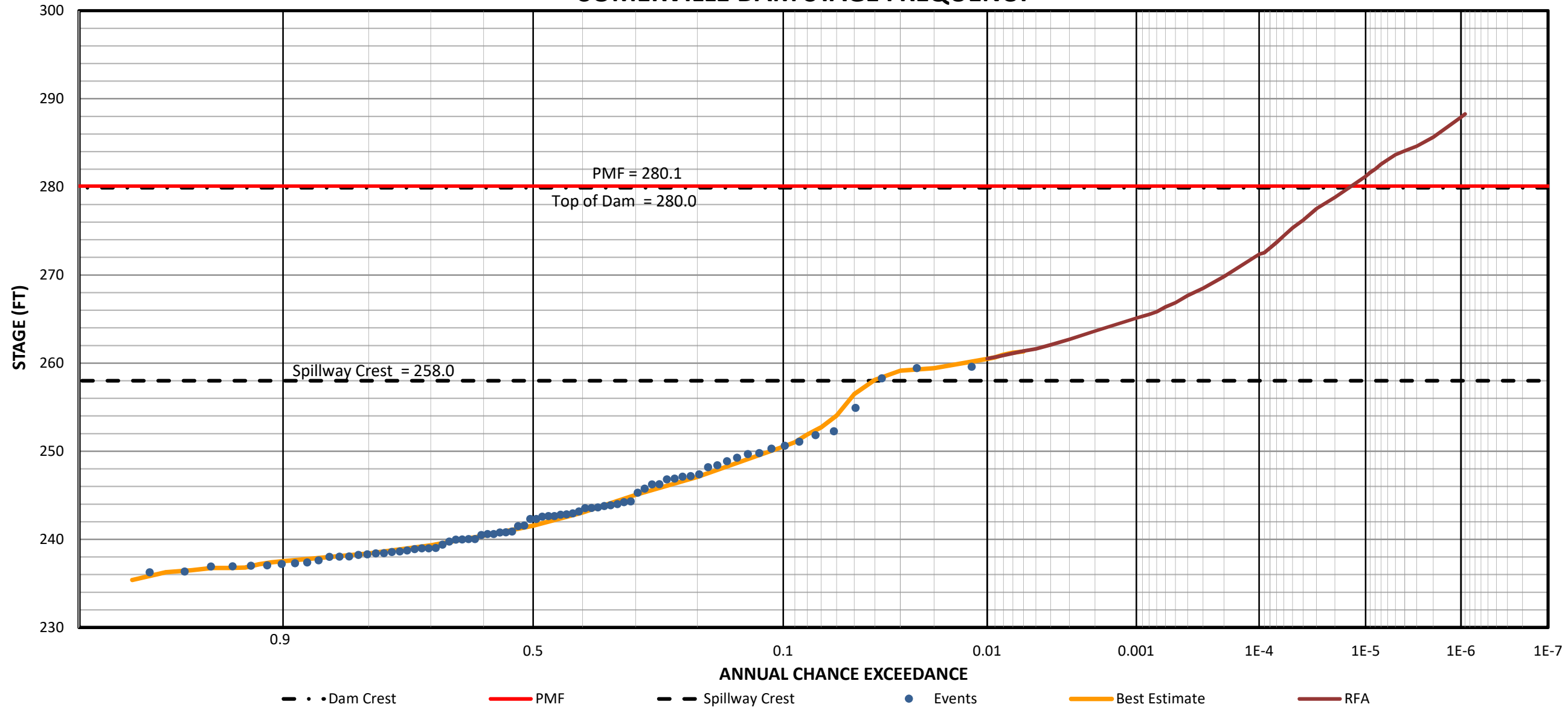
**SOMERVILLE DAM AND LAKE**

YEGUA CREEK

**PERIOD OF RECORD LAKE LEVEL**

U.S. ARMY ENGINEER DISTRICT, FORT WORTH      September 2019

### SOMERVILLE DAM STAGE FREQUENCY



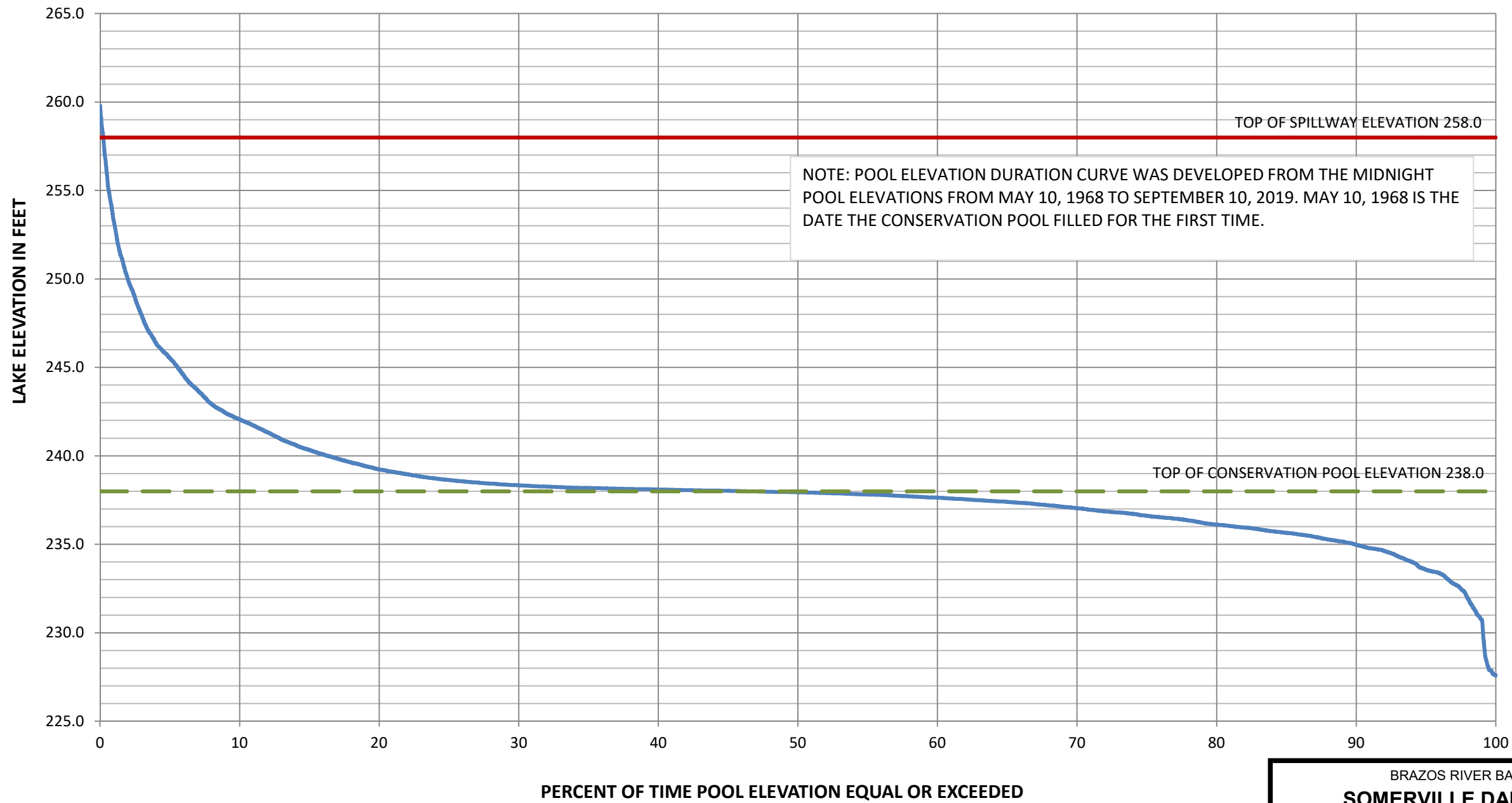
ALL ELEVATIONS REFERRED TO ON THIS PLATE, UNLESS NOTED OTHERWISE, ARE IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29). THE DATUM CONVERSION FROM NGVD29 TO NAVD88 IS: NGVD29 + 0.1 FEET = NAVD88 FOR SOMERVILLE DAM AND LAKE.

BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
 YEGUA CREEK

**ANNUAL PEAK  
 ELEVATION FREQUENCY**

U.S. ARMY ENGINEER DISTRICT, FORT WORTH      September 2019

### SOMERVILLE LAKE



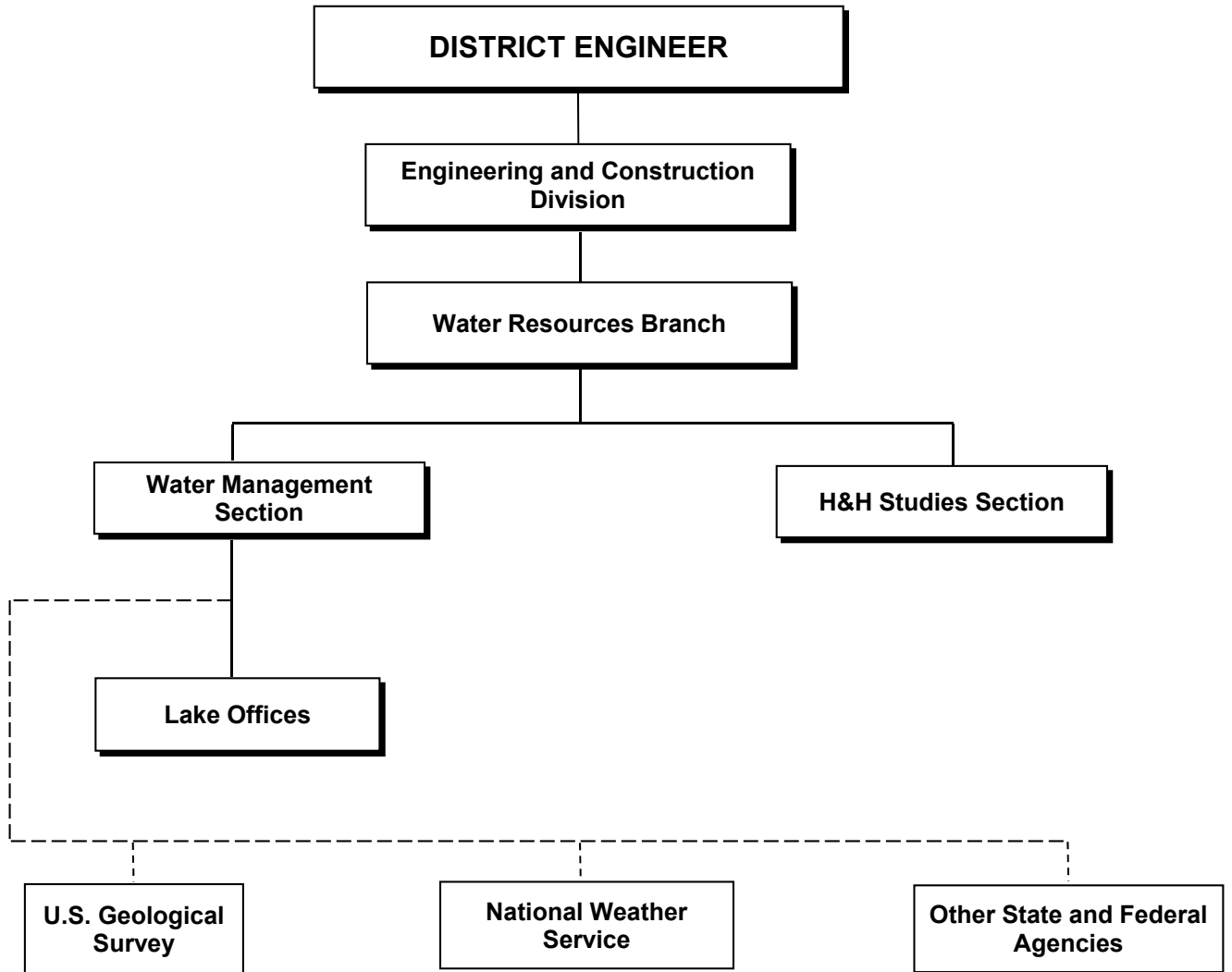
ALL ELEVATIONS REFERRED TO ON THIS PLATE, UNLESS NOTED OTHERWISE, ARE IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29). THE DATUM CONVERSION FROM NGVD29 TO NAVD88 IS: NGVD29 + 0.1 FEET = NAVD88 FOR SOMERVILLE DAM AND LAKE.

BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
 YEGUA CREEK

**LAKE ELEVATION DURATION**

U.S. ARMY ENGINEER DISTRICT, FORT WORTH      September 2019

**FORT WORTH DISTRICT  
ORGANIZATION FOR LAKE REGULATION**



— LINES OF COMMAND AUTHORITY  
- - - LINES OF DIRECT COMMUNICATION

BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
YEGUA CREEK  
  
**ORGANIZATION FOR  
FLOOD CONTROL REGULATION**

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2019

FORT WORTH DISTRICT CORPS OF ENGINEERS  
RESERVOIR REPORT FOR THURSDAY 12SEP2019

RESERVOIR	ELEVATION 0800 FT-NGVD	TOP CONS POOL	MEAN INFLOW DSF	MEAN TURBINE DSF	DAILY PUMP MGD	RELEASES OTHER DSF	RAIN INCHES	EVAP INCHES	0800 RELEASE CFS	POOL OCCUPIED %	A-F
RED RIVER BASIN											
Cooper	439.11	440.0	-226	--	--	5	0.00	.25	5	94	C 244842
Wright Patm	225.69	225.4	160	--	--	878	0.00	.25	877	0	F 7546
Bob Sandlin	336.66	337.5	-94	--	--	0	--	--	0	96	C 194492
Lake O Pine	230.23	230.0	-111	--	--	69	0.00	--	69	1	F 4645
Caddo	168.55	168.5	51	--	--	173	0.00	--	160	1	S 1335
NECHES RIVER BASIN											
Sam Rayburn	162.64	164.4	714	2360	--	0	0.25	.21	0	86	P 1220304
B.A. Steinh	82.05	81.0	2410	0	--	1200	0.38	.21	1200	86	C 59803
TRINITY RIVER BASIN											
Bridgeport	833.26	836.0	-77	--	--	204	0.00	--	204	91	C 325974
Eagle Mount	647.36	649.0	-20	--	--	86	0.00	--	86	92	C 167834
Lake Worth	592.94	594.0	-5	--	--	0	0.48	--	0	89	C 29888
Benbrook	687.69	694.0	-73	--	--	3	0.00	.28	3	70	C 50142
Joe Pool	520.05	522.0	-111	--	--	20	0.00	.30	20	90	C 128641
Mountain Ck	457.30	457.0	71	--	--	0	--	--	0	9	S 864
Ray Roberts	632.09	632.5	-254	--	--	16	--	--	16	98	C 776708
Lewisville	521.14	522.0	-306	0	--	240	0.00	--	240	96	C 540295
Grapevine	534.71	535.0	-159	--	--	281	0.00	.30	281	99	C 144912
Lavon	489.13	492.0	286	--	--	1	0.00	.29	1	86	C 349073
Ray Hubbard	433.23	435.5	-284	--	--	0	0.00	--	0	90	C 393939
Cedar Creek	320.67	322.0	-236	--	--	0	0.30	--	0	93	C 602005
Navarro Mil	422.99	424.5	-14	--	--	0	0.06	.33	0	86	C 42940
Bardwell	419.82	421.0	-24	--	--	0	0.01	.31	0	92	C 42516
Richland Cr	313.36	315.0	307	--	--	5	0.54	--	5	94	C 1036668
BRAZOS RIVER BASIN											
Possum King	998.02	1000.0	100	--	--	86	0.00	.36	89	97	C 521162
Granbury	692.50	693.0	19	--	--	18	0.00	.56	18	99	C 132357
Whitney	527.20	533.0	208	0	--	25	0.40	.33	25	49	P 115317
Aquilla	535.95	537.5	-0	--	--	3	--	--	3	85	C 26172
Waco	460.06	462.0	15	--	--	5	0.64	.31	5	92	C 165404
Proctor	1160.11	1162.0	-54	--	--	35	0.01	.29	35	83	C 41703
Belton	593.24	594.0	-60	--	--	34	--	--	34	98	C 373212
Stillhouse	621.27	622.0	-14	--	--	1	0.00	.28	1	98	C 221761
Georgetown	783.16	791.0	3	--	--	0	0.10	.22	0	75	C 28509
Granger	503.99	504.0	55	--	--	0	0.46	.25	0	100	C 35407
Somerville	238.61	238.0	34	--	--	179	0.00	.25	179	2	F 7137
Limestone	361.17	363.0	67	--	--	6	0.16	.16	6	88	C 185956
COLORADO RIVER BASIN											
Twin Buttes	1932.00	1940.2	6	--	--	80	0.01	--	70	66	C 119859
O.C. Fisher	1871.83	1900.0	-0	--	--	1	0.02	.28	1	33	D 12052
O.H. Ivie	1542.58	1551.5	--	--	--	--	--	--	--	72	C 400136
Hords Creek	1897.59	1900.0	9	--	--	0	0.81	.31	0	83	C 5656
Buchanan	1016.00	1020.5	--	--	--	--	--	--	--	92	C 790664
Marshall Fo	674.95	681.0	-247	722	--	0	0.00	.20	2520	90	C 1005159
GUADALUPE RIVER BASIN											
Canyon	908.00	909.0	68	114	--	31	0.11	.23	145	98	C 367748

Pumpage below dam (MGD): Grapevine 0.000, and Belton 58.553.  
Total outflow includes this and pumpage tabulated.  
Preliminary data--Inflow not adjusted for wind effect, etc.

D = Sediment Pool  
C = Conservation Pool  
P = Power Pool  
F = Flood Pool  
S = Surcharge Pool  
nr = Not reported today

BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
YEGUA CREEK

**DAILY REPORT**

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2019

Somerville  
 Monthly Report  
 SEP2013

DAY:	ELEVATIONS		STORAGE:	EVAP:	PUMP:	RELEASES		ADJ. :	RAIN
:	0800 :	2400 :	2400 :	:	:	TURBINE:	OTHER :	INFLOW:	:
:	FEET-NGVD		A-F :	DSF:	DSF:	DSF :	DSF :	DSF :	INCH
1	231.45	231.46	84472	102	5.7	0	83	20	0.00
2	231.41	231.42	84148	98	5.7	0	83	9	0.00
3	231.37	231.38	83825	134	5.6	0	83	9	0.00
4	231.33	231.34	83502	98	7.4	0	83	9	0.00
5	231.28	231.29	83100	98	7.3	0	83	9	0.00
6	231.24	231.25	82779	106	6.7	0	83	35	0.20
7	231.20	231.21	82459	100	6.4	0	83	29	0.00
8	231.16	231.17	82140	50	5.9	0	83	4	0.04
9	231.12	231.14	81901	61	5.3	0	83	30	0.00
10	231.08	231.10	81583	73	5.6	0	83	14	0.08
11	231.04	231.05	81186	90	5.3	0	83	0	0.00
12	231.00	231.01	80870	84	5.4	0	83	2	0.00
13	230.97	230.97	80554	61	6.1	0	83	11	0.01
14	230.94	230.94	80318	107	5.7	0	83	78	0.00
15	230.88	230.89	79924	75	5.1	0	83	11	0.00
16	230.84	230.85	79610	87	5.2	0	83	5	0.00
17	230.80	230.81	79296	81	5.7	0	83	3	0.00
18	230.76	230.77	78983	104	6.2	0	83	2	0.00
19	230.72	230.73	78671	89	6.4	0	83	6	0.00
20	230.70	230.69	78358	95	6.4	0	82	26	1.06
21	230.82	230.81	79296	28	5.9	0	28	536	1.51
22	230.81	230.82	79375	66	4.7	0	1	112	0.00
23	230.79	230.79	79140	89	4.6	0	1	21	0.00
24	230.77	230.77	78983	54	4.6	0	1	16	0.00
25	230.76	230.76	78905	86	4.6	0	1	16	0.00
26	230.74	230.75	78827	101	5.0	0	1	9	0.00
27	230.72	230.73	78671	104	5.9	0	1	7	0.00
28	230.70	230.70	78436	63	6.1	0	1	4	0.00
29	230.73	230.70	78436	66	4.6	0	1	72	1.24
30	230.83	230.83	79453	28	3.9	0	1	547	0.03
MONTHLY TOTAL (DSF)				2493	169	0.	1696.	1660.	4.17
			(A-F)	-6360	4945	335	0	3363	3292

BRAZOS RIVER BASIN, TEXAS  
**SOMERVILLE DAM AND LAKE**  
 YEGUA CREEK  
  
**MONTHLY RESERVOIR REPORT**

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2019

**TABLE 4-8**

**All Recorded Major Floods in the Brazos River Watershed, 1885-2016**

**Table 4-8 All Recorded Major Floods In The Brazos River Watershed, 1885-2016**

Date	Brazos River at Seymour (1924-2016)		Brazos River near Palo Pinto (1924-2016)	
	Gage Height (ft)	Peak Discharge (cfs)	Gage Height (ft)	Peak Discharge (cfs)
1924, Apr 25	7.40	21,00	—	—
1924, Sep 22	—	—	10.50	17,100
1925, Apr 27	9.50	40,200	—	—
1925, Sep 13	—	—	15.40	46,900
1926, Aug 29-31	13.77	82,600	15.23	46,900
1926, Oct 16-18	15.16	95,400	17.35	55,000
1928, May 18-Jul 29	7.00	23,000	12.50	28,300
1929, Sep 9-10	11.00	54,000	17.00	66,200
1930, Jun 14-16	13.00	79,600	28.43	95,600
1930, Oct 13	6.70	18,500	13.90	31,400
1932, Sep 7-9	11.40	61,000	19.40	59,000
1933, May 26-Aug 2	8.40	33,100	15.33	39,100
1934, Apr 5-19	4.28	5,450	6.85	9,320
1935, May 20-Jun 2	11.55	63,000	15.60	47,200
1936, Sep 17-23	10.58	53,300	13.70	38,600
1937, Aug 22-23	8.62	34,800	10.90	26,200
1938, Feb 16-Mar 28	7.20	26,300	12.56	33,700
1939, May 19-Jun 22	8.00	30,500	10.70	25,400
1940, Jul 3-Aug 18	8.80	32,100	14.46	42,200
1941, May 4-26	12.45	62,200	14.53	38,500
1941, Oct 5-16	10.30	43,300	17.30	51,200
1942, Oct 17-21	6.95	18,900	17.42	46,600
1944, May 7-Jul 23	5.10	8,480	—	—
1945, Apr 26-Jul 12	5.96	9,780	7.50	10,700
1946, Aug 30-Sep 29	8.55	15,500	7.87	11,700
1947, May 17-19	12.66	49,700	10.45	21,100
1949, Apr 29-Jun 14	8.17	18,600	8.26	11,800
1950, Jul 27-Sep 6	8.40	16,700	10.50	18,800

**Table 4-8 All Recorded Major Floods In The Brazos River Watershed, 1885-2016 (Continued)**

Date	Brazos River at Seymour (1924-2016)		Brazos River near Palo Pinto (1924-2016)	
	Gage Height (ft)	Peak Discharge (cfs)	Gage Height (ft)	Peak Discharge (cfs)
1953, May 15-Jul 19	8.10	20,000	5.23	3,860
1954, May 13-14	10.90	22,500	12.56	25,700
1955, Sep 27-28	21.00	71,200	20.53	51,800
1955, Oct 5-7	16.98	50,500	14.19	29,800
1957, Apr 29-May 19	10.10	28,000	28.87	85,400
1958, May 14-Jul 6	6.85	16,000	14.61	31,500
1959, Apr 18-Jul 5	9.27	26,000	7.46	9,260
1959, Oct 4-8	—	—	10.94	19,000
1960, Jul 8	10.67	23,600	—	—
1960, Oct 20-23	16.54	45,800	11.87	21,700
1962, Sep 7-16	11.16	29,100	16.99	38,300
1963, Jun 2-14	7.58	16,500	8.78	12,700
1964, Jun 19-Sep 22	6.48	11,700	4.52	2,870
1965, May 10-22	8.50	17,600	9.72	15,300
1965, Oct 19	9.30	26,000	—	—
1966, May 1-Sep 28	—	—	18.42	43,200
1967, Apr 12-Jul 19	10.66	22,600	10.02	16,100
1968, May 13-Jun 11	5.94	8,460	—	—
1969, Apr 14-May 8	6.75	13,300	15.90	34,600
1972, Aug 16-Sep 6	18.35	42,700	9.24	14,000
1972, Oct 31-Nov 2	8.65	10,900	12.85	24,600
1974, Sep 14-26	6.95	5,820	—	—
1974, Oct 31	—	—	13.37	24,000
1976, Apr 21-May 25	—	—	7.33	8,770
1977, Apr 20-May 20	6.09	4,620	—	—
1978, Aug 5-8	14.20	28,200	22.93	54,500
1979, May 22-Jun 7	—	—	8.71	12,400
1980, May 17-Jun 1	13.53	25,300	4.77	3,080

**Table 4-8 All Recorded Major Floods In The Brazos River Watershed, 1885-2016 (Continued)**

Date	Brazos River at Seymour (1924-2016)		Brazos River near Palo Pinto (1924-2016)	
	Gage Height (ft)	Peak Discharge (cfs)	Gage Height (ft)	Peak Discharge (cfs)
1980, Oct 5	—	—	13.12	27,000
1981, Jun 5-19	6.90	5,940	—	—
1981, Oct-Nov	—	—	26.53	69,300
1982, Jun 26	12.29	20,100	—	—
1983, May 14-23	9.22	12,900	7.12	8,220
1983, Oct 22	14.80	26,100	—	—
1986, Sep 6-Oct 4	10.77	13,800	12.87	25,100
1987, May 30-Jun 16	14.95	21,900	—	—
1989, May 16-21	12.47	15,600	12.77	14,600
1990, Apr 27-May 6	17.37	32,600	23.25	44,300
1991, Jun 5-12	14.62	23,300	17.34	25,500
1991, Dec 20-28	—	—	21.67	39,300
1992, Jun 8	10.40	11,500	—	—
1993, Jul 11-23	5.94	3,460	—	—
1994, May 12-16	8.26	7,380	9.10	7,850
1995, Aug 3-7	10.53	11,400	11.99	13,500
1996, Sep 16-21	12.02	15,300	15.93	23,300
1997, Feb 20-Mar 13	—	—	21.18	38,700
1998, Mar 16-18	4.36	1,560	10.66	10,800
1999, Jun 14	10.75	12,500	—	—
2000, Mar 24	12.00	13,100	—	—
2001, Mar 8-17	5.96	3,840	12.29	14,200
2004, Jul 28-Aug 3	14.94	21,800	12.17	14,000
2005, Aug 17-23	18.60	25,000	15.56	22,300
2006, Oct 16	11.83	11,300	—	—
2007, Jun 30-Jul 18	27.55	49,600	22.88	45,000
2008, May 17-Jun 21	3.44	969	—	—
2010, Apr 18	—	—	19.91	34,500

**Table 4-8 All Recorded Major Floods In The Brazos River Watershed, 1885-2016 (Continued)**

---

<b>Date</b>	<b>Brazos River at Seymour (1924-2016)</b>		<b>Brazos River near Palo Pinto (1924-2016)</b>	
	<b>Gage Height (ft)</b>	<b>Peak Discharge (cfs)</b>	<b>Gage Height (ft)</b>	<b>Peak Discharge (cfs)</b>
2010, Jul 10	12.46	12,100	—	—
2015, May-Jun	7.38	4,390	20.33	32,700
2015, Oct-Nov	2.55	415	14.63	19,600
2016, May-Jun	3.51	841	21.14	35,000

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**Table 4-8 All Recorded Major Floods In The Brazos River Watershed, 1885-2016 (Continued)**

Date	Brazos River at Waco (1885-2016)		Brazos River near Bryan (1900-2016)		Brazos River near Hempstead (1899-2016)	
	Gage Height (ft)	Peak Discharge (cfs)	Gage Height (ft)	Peak Discharge (cfs)	Gage Height (ft)	Peak Discharge (cfs)
1885, May 28	34.63	—	—	—	—	—
1899, Jul 4	—	—	—	—	53.60	—
1899, Jun 30	—	117,000	—	—	—	—
1900, Apr	—	—	—	135,000	—	—
1900, Sep 28	—	69,800	—	—	—	—
1902, July 26	32.10	106,000	—	—	—	—
1903, Feb 27	20.45	43,600	—	—	—	—
1905, May 14	28.60	85,800	—	—	—	—
1906, Jun 6	19.80	40,900	—	—	—	—
1908, May 25	36.30	132,000	—	—	—	—
1911, Jul 18	18.50	35,400	—	—	—	—
1913, Dec	39.70	211,000	61.00	—	56.10	350,000
1915, Apr 26	26.00	73,300	—	—	—	—
1916, Apr 2	33.80	113,000	—	—	—	—
1918, Nov	36.40	125,000	—	69,300	—	—
1919, Oct 23	27.90	78,100	—	—	—	—
1922, May 10	35.90	122,000	—	—	—	—
1923, Apr 27	24.60	66,900	—	—	—	—
1923, Dec 13	20.20	41,900	—	—	—	—
1925, May 9	21.10	49,300	—	—	—	—
1926, Jun 22	19.30	40,500	—	—	—	—
1927, Jun 14	26.40	62,000	—	—	—	—
1929, Sep 13	20.66	31,300	—	—	—	—
1930, May 18	28.90	74,800	—	—	—	—
1930, Oct 7	31.40	93,500	—	—	—	—
1932, Feb 19	26.95	62,500	—	—	—	—
1933, Jul 30	23.05	41,100	—	—	—	—
1934, Apr 6	24.00	45,400	—	—	—	—

**Table 4-8 All Recorded Major Floods In The Brazos River Watershed, 1885-2016 (Continued)**

Date	Brazos River at Waco (1885-2016)		Brazos River near Bryan (1900-2016)		Brazos River near Hempstead (1899-2016)	
	Gage Height (ft)	Peak Discharge (cfs)	Gage Height (ft)	Peak Discharge (cfs)	Gage Height (ft)	Peak Discharge (cfs)
1935, May 19-Jun 2	34.90	112,000	42.30	139,000	43.20	—
1936, Sep 27	40.90	246,000	41.96	133,000	—	—
1938, Jan 24	30.75	88,400	—	—	—	—
1939, May 19-Jun 20	24.10	43,500	—	—	32.43	58,000
1940, Jun 29	20.78	38,500	—	—	—	—
1940, Jul 3	—	—	—	—	42.80	83,100
1940, Nov	—	—	42.50	150,000	44.04	116,000
1941, May 5	29.24	68,800	—	—	—	—
1942, Apr 25-29	35.70	126,000	38.48	103,000	37.52	90,500
1942, Oct 18-21	27.68	67,400	—	—	27.40	47,100
1944, May 20-Jul 23	36.60	137,000	43.20	172,000	42.00	108,000
1945, Apr 22-Jul 12	36.70	144,000	41.70	139,000	39.30	106,000
1946, Mar 13	20.73	37,600	—	—	—	—
1946, May 20	—	—	—	—	35.30	85,300
1947, Jan 20	—	—	—	—	26.73	57,000
1948, Feb 26	20.48	36,800	—	—	—	—
1949, Apr 29-May 18	27.27	71,400	—	—	27.18	52,000
1950, Feb 13-14	15.67	16,700	—	—	25.80	49,400
1953, May 12-18	25.97	61,100	—	—	35.40	79,200
1954, May 17	17.54	22,600	—	—	—	—
1956, May 2	22.94	46,100	—	—	—	—
1957, Apr-May	32.30	101,000	42.00	137,000	44.21	143,000
1958, Feb 26	—	—	—	—	35.80	91,800
1958, May 3	28.10	70,600	—	—	—	—
1959, Apr 18	—	—	—	—	22.10	37,600
1959, Jun 25	12.32	10,600	—	—	—	—
1959, Oct 5-8	29.73	80,900	—	—	32.29	74,000
1961, Jan 8-15	26.82	62,800	—	—	35.10	78,200

**Table 4-8 All Recorded Major Floods In The Brazos River Watershed, 1885-2016 (Continued)**

Date	Brazos River at Waco (1885-2016)		Brazos River near Bryan (1900-2016)		Brazos River near Hempstead (1899-2016)	
	Gage Height (ft)	Peak Discharge (cfs)	Gage Height (ft)	Peak Discharge (cfs)	Gage Height (ft)	Peak Discharge (cfs)
1961, Oct 10	20.96	35,400	—	—	—	—
1962, Sep 16	—	—	—	—	18.10	22,600
1964, Jun 16-19	25.43	49,500	—	—	15.13	18,700
1965, May	24.24	45,800	42.10	137,000	41.23	106,000
1966, May 3	19.90	33,700	—	—	—	—
1966, Sep 28	—	—	—	—	34.30	75,000
1967, May 4-Jun 12	14.53	18,800	—	—	—	11,200
1968, May 10-13	22.83	39,000	—	—	32.43	73,400
1969, Apr 14-May 11	21.35	38,600	—	—	28.09	53,400
1970, Mar 3-10	16.41	15,100	—	—	25.08	43,300
1973, Apr 25	23.00	32,000	—	—	—	—
1973, Jun 13	—	—	—	—	29.97	58,100
1974, Sep 14	—	—	—	—	26.58	48,000
1974, Oct 31	25.32	40,000	—	—	—	—
1975, May 28	—	—	—	—	31.66	66,600
1976, Apr 21	—	—	—	—	23.92	41,300
1977, Apr 20	23.49	33,700	—	—	33.13	84,700
1979, May 11-Jun 7	18.49	19,700	—	—	35.93	83,800
1980, May 15-18	14.71	12,000	—	—	24.22	40,700
1981, Jun 16-19	23.63	34,200	—	—	29.41	59,200
1981, Nov 1	—	—	—	—	27.02	50,700
1983, May 23	—	—	—	—	27.05	49,800
1984, Oct 29	—	—	—	—	22.24	34,900
1986, Feb 6	—	—	—	—	27.50	50,600
1987, Jun 13-16	20.97	26,200	—	—	31.64	58,900
1989, May 21-Jun 17	20.43	25,200	—	—	36.20	44,300
1990, May 6-12	24.35	40,800	—	—	40.28	60,700
1991, Jan 12	—	—	—	—	38.09	52,800

**Table 4-8 All Recorded Major Floods In The Brazos River Watershed, 1885-2016 (Continued)**

Date	Brazos River at Waco (1885-2016)		Brazos River near Bryan (1900-2016)		Brazos River near Hempstead (1899-2016)	
	Gage Height (ft)	Peak Discharge (cfs)	Gage Height (ft)	Peak Discharge (cfs)	Gage Height (ft)	Peak Discharge (cfs)
1991, Jun 8	17.29	18,700	—	—	—	—
1991, Dec 21-28	26.50	50,000	—	—	53.00	116,000
1993, Jun 23	—	—	—	—	36.11	46,200
1994, May 13-16	12.98	11,300	22.30	20,900	27.98	23,600
1994, Oct 17	—	—	—	—	51.58	109,000
1996, Sep 18-21	10.87	9,580	20.21	16,300	26.65	20,600
1997, Mar 10-Apr 6	23.45	38,000	38.79	68,500	39.09	57,800
1998, Jan 8-10	—	—	36.30	59,700	38.23	54,700
1998, Mar 19	22.47	36,100	—	—	—	—
1998, Oct 20-22	—	—	42.55	78,600	43.66	79,100
2001, Mar 17	—	—	—	—	34.92	45,900
2001, Dec 17-20	16.40	20,400	39.67	68,400	38.98	59,200
2003, Feb 23-24	—	—	35.32	48,600	43.01	74,400
2004, May 1-Jun 28	17.86	22,000	41.74	61,200	42.61	72,800
2004, Nov 24-27	—	—	42.47	69,800	45.42	84,100
2007, Mar 30	26.46	39,900	—	—	—	—
2007 Jul 16-18	—	—	46.49	85,900	45.66	80,100
2008, May 14-17	15.32	16,300	26.86	28,800	29.79	28,600
2009, Apr 29	10.90	9,210	—	—	27.65	23,700
2009, Sep 14	—	—	25.24	25,300	—	—
2009, Oct 28-30	—	—	37.80	57,200	38.93	59,100
2012, Mar 20-24	21.92	29,600	38.88	60,400	39.97	57,600
2013, Oct 16-Nov 3	10.75	8,990	37.95	55,300	37.20	48,400
2015, May-Jun	22.48	30,800	46.45	79,800	49.97	92,500
2015, Oct-Nov	25.22	37,000	43.23	74,200	41.82	54,100
2016, May-Jun	22.54	33,200	35.91	51,800	54.89	153,000

**TABLE 4-9**

**Somerville Dam and Lake Monthly and Annual Inflow Volumes in Acre-Feet**

**Table 4-9**  
**Somerville Dam and Lake Monthly and Annual Inflow Volumes in Acre-Feet**

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1939	5,654	14,431	1,097	46	10,518	2,102	2	786	2	41	0	953	35,631
1940	35	3,803	21	2,221	14,287	106,351	157,364	82	281	1,121	85,519	132,190	503,275
1941	24,121	25,058	63,622	29,636	58,589	95,595	155,736	1,238	208	1,698	8,134	1,396	465,032
1942	863	871	780	53,006	2,311	1,941	3,286	86	3,155	428	2,889	3,396	73,012
1943	9,711	1,158	8,842	1,494	7,561	3,020	97	3	870	553	54	746	34,109
1944	43,260	37,041	31,935	3,023	37,473	4,002	616	3,629	9,556	11	53,295	67,924	291,766
1945	79,900	22,650	17,192	61,602	5,847	21,652	1,854	45,494	5,520	23,997	1,606	5,165	292,479
1946	37,258	31,386	86,905	8,001	26,067	14,208	429	2	3,491	4,020	61,086	8,341	281,194
1947	36,666	2,560	56,798	10,852	26,398	1,660	1,925	99,806	403	7	3	1,688	238,766
1948	337	6,911	1,041	304	5,602	309	700	0	0	0	0	0	15,204
1949	1,139	28,140	15,578	109,533	11,215	5,100	233	0	662	34,532	540	12,189	218,860
1950	6,366	53,552	2,800	53,793	20,443	64,390	2,135	12	12,695	76	0	4	216,265
1951	14	201	4,904	2,376	614	1,672	0	0	120	1	96	0	9,998
1952	1	904	482	5,519	17,697	1,869	18,963	11	11	0	3,985	20,953	70,395
1953	12,720	4,344	2,072	8,762	67,444	234	6,086	609	3,856	19,021	7,117	12,262	144,525
1954	2,300	1,002	340	1,052	6,317	53	422	2,139	0	0	51	84	13,762
1955	299	17,501	106	3,773	227	4,461	4	555	197	173	0	27	27,322
1956	310	13,066	3,114	6,406	1,835	391	0	0	0	0	0	640	25,762
1957	3	358	14,445	143,364	64,739	62,238	247	2	15,796	136,289	54,819	12,778	505,077
1958	43,355	74,374	12,391	24,573	55,749	701	12,967	0	38,657	11,756	7,987	2,903	285,414
1959	3,585	36,550	4,309	97,931	13,970	1,358	68	0	4	4,690	11,867	20,908	195,241
1960	18,513	26,360	6,344	16,360	22,143	40,279	3,324	1,646	186	54,709	83,488	64,387	337,741
1961	69,493	59,674	10,635	4,541	7,222	113,113	16,283	699	140,194	2,403	18,256	11,597	454,111
1962	12,249	4,807	4,756	4,246	6,402	9,846	8,163	2	12,203	15,134	26,409	57,047	161,264
1963	10,500	37,802	3,578	16,674	1,426	324	114	0	307	0	347	1,433	72,504
1964	1,407	3,368	13,462	2,907	2,890	2,046	5	0	2,563	3,828	1,965	3,494	37,934
1965	5,057	73,799	4,188	3,589	191,247	23,253	318	719	67	1,671	29,915	82,603	416,426
1966	11,491	32,511	18,697	27,194	59,526	3,797	671	1,700	9,152	1,845	1,606	2,025	170,216
1967	1,764	1,130	1,210	3,908	10,998	1,183	865	501	4,629	2,521	3,356	921	32,987
1968	81,942	7,166	15,725	32,013	64,856	167,601	28,384	3,509	76,323	5,550	34,530	46,385	563,985
1969	7,128	73,520	82,166	103,706	29,611	2,411	1,364	432	2,574	1,380	5,115	15,521	324,927

**Table 4-9 (CONT'D)**  
**Somerville Dam and Lake Monthly and Annual Inflow Volumes in Acre-Feet**

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1970	10,889	37,674	82,966	35,764	110,285	27,663	704	1,780	3,807	5,161	7	770	317,470
1971	438	1,810	729	1,856	2,102	1,617	8	2,293	1,561	2,334	2,144	18,297	35,188
1972	1,274	2,716	1,324	3,035	24,586	16,177	5,377	4,165	993	3,301	1,132	1,287	65,368
1973	40,527	30,402	43,575	44,840	13,268	76,649	4,789	639	11,040	103,142	13,348	9,185	391,405
1974	72,476	7,574	10,655	4,125	10,760	16,081	2,364	14,010	116,997	18,550	111,436	36,451	421,481
1975	23,151	73,744	8,404	10,569	157,028	51,921	26,744	7,849	4,062	4,560	1,357	4,678	374,068
1976	4,194	3,890	11,091	80,622	67,819	44,119	6,869	621	5,170	21,546	23,651	112,375	381,966
1977	13,335	71,930	7,527	139,654	8,601	1,854	662	1,088	1,146	710	2,559	3,808	252,875
1978	10,166	16,186	9,273	3,329	6,080	21,970	1,801	1,180	10,244	302	13,604	10,098	104,233
1979	41,961	44,460	40,751	37,374	103,065	102,233	12,095	2,159	2,622	112	928	7,473	395,234
1980	22,565	10,733	24,486	7,696	41,160	2,040	155	0	2,510	636	2,124	61	114,166
1981	3,088	2,568	3,081	3,420	12,543	73,351	10,093	2,012	1,780	24,332	16,582	617	153,468
1982	2,156	3,707	5,375	15,310	86,069	9,895	891	655	498	4,915	2,427	10,154	142,051
1983	19,534	56,447	77,442	1,257	72,211	5,193	2,849	12,003	6,089	3,100	2,700	1,867	260,692
1984	4,362	3,409	8,784	97	6,964	1,823	3,097	1,447	418	46,907	20,847	40,661	138,815
1985	29,558	40,002	34,332	5,577	11,055	4,883	2,057	1,358	4,230	21,461	69,568	19,093	243,173
1986	10,139	25,030	640	6,243	45,626	152,527	13,584	5,970	11,985	11,279	37,528	120,559	441,110
1987	14,153	53,138	26,300	3,694	19,315	200,948	21,407	9,755	3,943	660	5,183	7,221	365,717
1988	3,531	4,209	5,886	5,210	5,063	6,889	2,493	4,008	3,450	2,553	1,326	3,590	48,206
1989	16,576	3,300	16,917	4,785	19,248	16,919	6,329	3,721	589	1,561	664	20	90,630
1990	3,173	5,167	3,227	23,149	11,285	610	2,640	1,832	3,678	1,663	2,541	672	59,637
1991	181,458	65,840	16,183	76,161	34,087	11,726	3,193	3,010	5,925	3,642	3,429	178,030	582,685
1992	72,624	248,861	91,163	34,649	159,064	111,166	17,498	2,597	1,376	3,370	11,397	27,096	780,862
1993	57,760	27,591	39,718	50,659	85,028	76,650	9,556	1,557	1,461	6,626	5,700	3,747	366,053
1994	3,009	10,580	8,074	6,062	17,326	4,400	955	16,147	2,941	210,392	20,355	130,729	430,971
1995	63,433	24,885	46,048	47,076	40,575	53,363	5,858	7,338	5,852	6,680	10,900	29,193	341,202
1996	3,045	3,472	2,824	8,362	3,205	5,173	2,148	10,256	42,677	3,166	6,286	7,000	97,614
1997	18,351	45,178	33,835	14,909	7,225	26,610	2,409	6,534	5,158	28,052	13,732	12,928	214,920
1998	43,387	66,288	19,322	2,307	2,981	3,828	2,463	6,206	34,177	140,899	166,672	68,472	557,003
1999	25,601	15,465	22,265	8,359	13,704	16,548	6,992	1,452	495	3,023	2,110	2,624	118,638
2000	5,752	4,165	3,917	5,787	15,699	9,787	0	145	2,463	6,328	38,842	29,742	122,629

**Table 4-9 (CONT'D)**  
**Somerville Dam and Lake Monthly and Annual Inflow Volumes in Acre-Feet**

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
2001	37,727	10,965	90,063	14,693	17,051	14,573	4,770	12,175	27,537	19,293	30,165	68,788	133,209
2002	9,720	11,727	3,185	9,627	3,051	6,086	14,278	5,322	3,662	24,072	116,176	125,204	64,271
2003	48,167	182,945	42,329	3,141	4,203	14,017	5,297	3,636	5,572	5,427	4,136	3,784	57,265
2004	15,553	49,249	9,949	21,780	13,064	96,293	29,391	6,257	2,852	23,225	146,631	16,765	170,991
2005	41,023	76,220	54,530	6,783	19,056	3,362	6,571	4,750	600	1,635	1,425	2,952	53,536
2006	4,908	163	6,298	7,696	4,256	6,140	6,042	2,767	5,141	54,976	1,679	13,211	41,997
2007	73,711	9,577	78,696	13,227	63,708	43,653	76,125	3,835	4,175	1,477	10,884	13,261	194,084
2008	4,495	15,100	22,909	5,559	13,168	786	1,230	3,593	555	1,129	1,092	1,503	79,008
2009	960	916	3,953	31,162	1,000	2,022	1,688	2,170	14,097	68,948	20,820	30,922	136,677
2010	25,222	66,334	17,210	3,709	8,764	33,477	5,243	792	4,354	0	179	1,238	110,022
2011	3,494	1,547	1,002	711	3,711	2,787	3,148	2,049	1,231	956	2,276	3,005	23,460
2012	13,205	50,610	105,338	3,535	4,962	3,469	3,946	4,074	3,238	1,243	596	1,440	75,613
2013	11,272	838	3,081	1,780	5,304	3,406	4,650	2,236	3,501	18,383	25,046	3,090	31,632
2014	2,734	2,812	4,878	2,127	49,922	8,661	5,697	1,199	6,303	2,122	9,140	8,429	22,407
2015	72,020	4,688	71,235	63,355	375,786	49,646	6,573	4,826	3,701	85,395	110,365	96,533	268,492
2016	26,695	18,375	76,150	130,272	415,227	62,383	8,619	97,784	7,433	3,512	6,685	27,047	122,065
2017	51,192	52,444	13,007	21,280	4,875	10,415	0	283,550	16,160	10,081	5,577	11,053	44,266
2018	4,524	11,453	50,621	18,016	5,945	3,075	3,884	611	12,847	71,418	44,379	172,167	187,356
2019	91,854	13,012	8,213	96,056									209,133
<b>TOTAL</b>	<b>1.89E+06</b>	<b>2.29E+06</b>	<b>1.86E+06</b>	<b>1.99E+06</b>	<b>3.08E+06</b>	<b>2.28E+06</b>	<b>7.88E+05</b>	<b>7.39E+05</b>	<b>7.66E+05</b>	<b>1.41E+06</b>	<b>1.65E+06</b>	<b>2.09E+06</b>	<b>2.08E+07</b>
<b>AVG</b>	<b>23,303</b>	<b>28,215</b>	<b>22,942</b>	<b>24,554</b>	<b>38,466</b>	<b>28,450</b>	<b>9,848</b>	<b>9,238</b>	<b>9,575</b>	<b>17,646</b>	<b>20,655</b>	<b>26,111</b>	<b>259,003</b>

**TABLE 7-4**

**Tabulated Area and Capacity Curves**

**Table 7-4**

**Area and Capacity Curves**

**BARDWELL DAM AND LAKE - ELEVATIONS vs. AREA**  
**AREA (IN THOUSAND ACRES)**

ELEV	0	1	2	3	4	5	6	7	8	9
210	0.003	0.094	0.503	0.835	1.158	1.576	1.977	2.450	2.911	3.338
220	3.699	4.012	4.383	4.758	5.146	5.686	6.230	6.629	7.084	7.504
230	7.827	8.178	8.675	9.149	9.606	10.050	10.436	10.790	11.395	11.940
240	12.520	13.030	13.540	14.120	14.680	15.230	15.800	16.400	17.000	17.630
250	18.340	19.050	19.790	20.540	21.310	22.080	22.850	23.620	24.400	25.200
260	26.000	26.810	27.650	28.500	29.360	30.230	31.150	32.050	33.000	33.950
270	34.950	35.900	36.940	38.050	39.200	40.400	41.630	42.940	44.330	45.800
280	47.400									

ELEV	0	1	2	3	4	5	6	7	8	9
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**Table 7-4 (Continued)**  
**SOMERVILLE LAKE - ELEVATION vs. CAPACITY**  
 CAPACITY (IN THOUSAND ACRE-FEET)

ELEV	0	1	2	3	4	5	6	7	8	9
210	0	0.0298	0.2895	0.9264	1.8904	3.2140	4.9421	7.1188	9.7647	12.8465
220	16.3333	20.1519	24.3116	28.8431	33.7532	39.1269	45.0366	51.4209	58.2245	65.4853
230	73.1208	81.0790	89.4632	98.3214	107.6549	117.4409	127.6454	138.2145	149.1912	160.8230
240	173.0000	185.7205	198.9545	212.7300	227.0730	241.9725	257.4315	273.4730	290.1130	307.3665
250	325.2845	343.9085	363.2560	383.3465	404.1955	425.8135	448.2015	471.3595	495.2920	520.0130
260	545.5330	571.8575	599.0050	626.9955	655.8400	685.5485	716.1490	747.6580	780.0905	813.4705
270	847.8230	883.1505	919.4710	956.8585	995.3705	1035.0530	1075.9465	1118.1045	1161.6045	1206.5265
280	1252.9730									

ELEV	0	1	2	3	4	5	6	7	8	9
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ELEVATIONS IN FEET-NGVD

**Table 7-4 (Continued)**  
**SOMERVILLE LAKE -ELEVATION CAPACITY TABLE**  
 ELEVATIONS IN FEET-NGVD, CAPACITIES IN THOUSAND ACRE-FEET

ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090
210.0	0.001	0.001	0.002	0.002	0.002	0.003	0.003	0.003	0.004	0.004
210.1	0.004	0.005	0.005	0.005	0.005	0.006	0.006	0.006	0.007	0.007
210.2	0.007	0.008	0.008	0.008	0.009	0.009	0.009	0.010	0.010	0.010
210.3	0.011	0.011	0.011	0.012	0.012	0.012	0.013	0.013	0.013	0.013
210.4	0.014	0.014	0.014	0.015	0.015	0.015	0.016	0.016	0.016	0.017
210.5	0.017	0.017	0.018	0.018	0.018	0.019	0.019	0.019	0.020	0.020
210.6	0.020	0.021	0.021	0.021	0.021	0.022	0.022	0.022	0.023	0.023
210.7	0.023	0.024	0.024	0.024	0.025	0.025	0.025	0.026	0.026	0.026
210.8	0.027	0.027	0.027	0.028	0.028	0.028	0.029	0.029	0.029	0.029
210.9	0.030	0.030	0.030	0.031	0.031	0.031	0.032	0.032	0.032	0.033
211.0	0.033	0.036	0.039	0.042	0.044	0.047	0.050	0.053	0.056	0.059
211.1	0.062	0.064	0.067	0.070	0.073	0.076	0.079	0.081	0.084	0.087
211.2	0.090	0.093	0.096	0.099	0.101	0.104	0.107	0.110	0.113	0.116
211.3	0.119	0.121	0.124	0.127	0.130	0.133	0.136	0.138	0.141	0.144
211.4	0.147	0.150	0.153	0.156	0.158	0.161	0.164	0.167	0.170	0.173
211.5	0.176	0.178	0.181	0.184	0.187	0.190	0.193	0.195	0.198	0.201
211.6	0.204	0.207	0.210	0.213	0.215	0.218	0.221	0.224	0.227	0.230
211.7	0.233	0.235	0.238	0.241	0.244	0.247	0.250	0.252	0.255	0.258
211.8	0.261	0.264	0.267	0.270	0.272	0.275	0.278	0.281	0.284	0.287
211.9	0.290	0.292	0.295	0.298	0.301	0.304	0.307	0.309	0.312	0.315
212.0	0.318	0.325	0.332	0.338	0.345	0.352	0.359	0.365	0.372	0.379
212.1	0.386	0.392	0.399	0.406	0.413	0.419	0.426	0.433	0.440	0.446
212.2	0.453	0.460	0.467	0.473	0.480	0.487	0.494	0.501	0.507	0.514
212.3	0.521	0.528	0.534	0.541	0.548	0.555	0.561	0.568	0.575	0.582
212.4	0.588	0.595	0.602	0.609	0.615	0.622	0.629	0.636	0.642	0.649
212.5	0.656	0.663	0.670	0.676	0.683	0.690	0.697	0.703	0.710	0.717
212.6	0.724	0.730	0.737	0.744	0.751	0.757	0.764	0.771	0.778	0.784
212.7	0.791	0.798	0.805	0.811	0.818	0.825	0.832	0.839	0.845	0.852
212.8	0.859	0.866	0.872	0.879	0.886	0.893	0.899	0.906	0.913	0.920
212.9	0.926	0.933	0.940	0.947	0.953	0.960	0.967	0.974	0.980	0.987
ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090

**Table 7-4 (Continued)**  
**SOMERVILLE LAKE -ELEVATION CAPACITY TABLE**  
 ELEVATIONS IN FEET-NGVD, CAPACITIES IN THOUSAND ACRE-FEET

ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090
213.0	0.994	1.004	1.014	1.024	1.034	1.044	1.054	1.064	1.074	1.084
213.1	1.094	1.104	1.114	1.123	1.133	1.143	1.153	1.163	1.173	1.183
213.2	1.193	1.203	1.213	1.223	1.233	1.243	1.253	1.263	1.273	1.283
213.3	1.293	1.303	1.313	1.323	1.333	1.343	1.353	1.363	1.372	1.382
213.4	1.392	1.402	1.412	1.422	1.432	1.442	1.452	1.462	1.472	1.482
213.5	1.492	1.502	1.512	1.522	1.532	1.542	1.552	1.562	1.572	1.582
213.6	1.592	1.602	1.612	1.621	1.631	1.641	1.651	1.661	1.671	1.681
213.7	1.691	1.701	1.711	1.721	1.731	1.741	1.751	1.761	1.771	1.781
213.8	1.791	1.801	1.811	1.821	1.831	1.841	1.851	1.861	1.870	1.880
213.9	1.890	1.900	1.910	1.920	1.930	1.940	1.950	1.960	1.970	1.980
214.0	1.990	2.004	2.017	2.031	2.044	2.058	2.072	2.085	2.099	2.112
214.1	2.126	2.140	2.153	2.167	2.180	2.194	2.208	2.221	2.235	2.248
214.2	2.262	2.276	2.289	2.303	2.316	2.330	2.344	2.357	2.371	2.384
214.3	2.398	2.412	2.425	2.439	2.452	2.466	2.480	2.493	2.507	2.520
214.4	2.534	2.548	2.561	2.575	2.588	2.602	2.616	2.629	2.643	2.656
214.5	2.670	2.684	2.697	2.711	2.724	2.738	2.752	2.765	2.779	2.792
214.6	2.806	2.820	2.833	2.847	2.860	2.874	2.888	2.901	2.915	2.928
214.7	2.942	2.956	2.969	2.983	2.996	3.010	3.024	3.037	3.051	3.064
214.8	3.078	3.092	3.105	3.119	3.132	3.146	3.160	3.173	3.187	3.200
214.9	3.214	3.228	3.241	3.255	3.268	3.282	3.296	3.309	3.323	3.336
215.0	3.350	3.368	3.385	3.403	3.421	3.438	3.456	3.474	3.492	3.509
215.1	3.527	3.545	3.562	3.580	3.598	3.615	3.633	3.651	3.668	3.686
215.2	3.704	3.721	3.739	3.757	3.775	3.792	3.810	3.828	3.845	3.863
215.3	3.881	3.898	3.916	3.934	3.951	3.969	3.987	4.005	4.022	4.040
215.4	4.058	4.075	4.093	4.111	4.128	4.146	4.164	4.181	4.199	4.217
215.5	4.235	4.252	4.270	4.288	4.305	4.323	4.341	4.358	4.376	4.394
215.6	4.411	4.429	4.447	4.464	4.482	4.500	4.518	4.535	4.553	4.571
215.7	4.588	4.606	4.624	4.641	4.659	4.677	4.694	4.712	4.730	4.748
215.8	4.765	4.783	4.801	4.818	4.836	4.854	4.871	4.889	4.907	4.924
215.9	4.942	4.960	4.977	4.995	5.013	5.031	5.048	5.066	5.084	5.101
ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090

**Table 7-4 (Continued)**  
**SOMERVILLE LAKE -ELEVATION CAPACITY TABLE**  
 ELEVATIONS IN FEET-NGVD, CAPACITIES IN THOUSAND ACRE-FEET

ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090
216.0	5.341	5.363	5.386	5.408	5.430	5.452	5.475	5.497	5.519	5.541
216.1	5.563	5.586	5.608	5.630	5.652	5.675	5.697	5.719	5.741	5.763
216.2	5.786	5.808	5.830	5.852	5.874	5.897	5.919	5.941	5.963	5.986
216.3	6.008	6.030	6.052	6.074	6.097	6.119	6.141	6.163	6.186	6.208
216.4										
	6.230	6.252	6.274	6.297	6.319	6.341	6.363	6.386	6.408	6.430
216.5	6.452	6.474	6.497	6.519	6.541	6.563	6.586	6.608	6.630	6.652
216.6	6.674	6.697	6.719	6.741	6.763	6.786	6.808	6.830	6.852	6.874
216.7	6.897	6.919	6.941	6.963	6.985	7.008	7.030	7.052	7.074	7.097
216.8	7.119	7.141	7.163	7.185	7.208	7.230	7.252	7.274	7.297	7.319
216.9										
	7.341	7.368	7.395	7.422	7.449	7.476	7.503	7.530	7.556	7.583
217.0	7.610	7.637	7.664	7.691	7.718	7.745	7.772	7.799	7.826	7.853
217.1	7.880	7.907	7.933	7.960	7.987	8.014	8.041	8.068	8.095	8.122
217.2	8.149	8.176	8.203	8.230	8.257	8.284	8.310	8.337	8.364	8.391
217.3	8.418	8.445	8.472	8.499	8.526	8.553	8.580	8.607	8.634	8.661
217.4										
	8.688	8.714	8.741	8.768	8.795	8.822	8.849	8.876	8.903	8.930
217.5	8.957	8.984	9.011	9.038	9.065	9.091	9.118	9.145	9.172	9.199
217.6	9.226	9.253	9.280	9.307	9.334	9.361	9.388	9.415	9.442	9.468
217.7	9.495	9.522	9.549	9.576	9.603	9.630	9.657	9.684	9.711	9.738
217.8	9.765	9.792	9.819	9.845	9.872	9.899	9.926	9.953	9.980	10.007
217.9										
	10.034	10.065	10.097	10.128	10.159	10.190	10.222	10.253	10.284	10.315
218.0	10.347	10.378	10.409	10.440	10.472	10.503	10.534	10.565	10.597	10.628
218.1	10.659	10.690	10.722	10.753	10.784	10.815	10.847	10.878	10.909	10.940
218.2	10.972	11.003	11.034	11.065	11.097	11.128	11.159	11.190	11.222	11.253
218.3	11.284	11.315	11.347	11.378	11.409	11.440	11.472	11.503	11.534	11.565
218.4										
	11.597	11.628	11.659	11.690	11.722	11.753	11.784	11.815	11.847	11.878
218.5	11.909	11.940	11.972	12.003	12.034	12.065	12.097	12.128	12.159	12.190
218.6	12.222	12.253	12.284	12.315	12.347	12.378	12.409	12.440	12.472	12.503
218.7	12.534	12.565	12.597	12.628	12.659	12.690	12.722	12.753	12.784	12.815
218.8	12.847	12.878	12.909	12.940	12.972	13.003	13.034	13.065	13.097	13.128
218.9										
ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090

**Table 7-4 (Continued)**  
**SOMERVILLE LAKE -ELEVATION CAPACITY TABLE**  
 ELEVATIONS IN FEET-NGVD, CAPACITIES IN THOUSAND ACRE-FEET

ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090
219.0	13.159	13.194	13.230	13.265	13.300	13.335	13.371	13.406	13.441	13.476
219.1	13.512	13.547	13.582	13.618	13.653	13.688	13.723	13.759	13.794	13.829
219.2	13.864	13.900	13.935	13.970	14.005	14.041	14.076	14.111	14.147	14.182
219.3	14.217	14.252	14.288	14.323	14.358	14.393	14.429	14.464	14.499	14.535
219.4	14.570	14.605	14.640	14.676	14.711	14.746	14.781	14.817	14.852	14.887
219.5	14.923	14.958	14.993	15.028	15.064	15.099	15.134	15.169	15.205	15.240
219.6	15.275	15.310	15.346	15.381	15.416	15.452	15.487	15.522	15.557	15.593
219.7	15.628	15.663	15.698	15.734	15.769	15.804	15.840	15.875	15.910	15.945
219.8	15.981	16.016	16.051	16.086	16.122	16.157	16.192	16.227	16.263	16.298
219.9	16.333	16.369	16.404	16.439	16.474	16.510	16.545	16.580	16.615	16.651
220.0	16.686	16.725	16.763	16.802	16.840	16.879	16.917	16.956	16.994	17.033
220.1	17.071	17.110	17.148	17.187	17.225	17.264	17.302	17.341	17.379	17.418
220.2	17.456	17.495	17.533	17.572	17.610	17.649	17.687	17.726	17.764	17.803
220.3	17.841	17.880	17.918	17.957	17.995	18.034	18.072	18.111	18.149	18.188
220.4	18.226	18.265	18.303	18.342	18.380	18.419	18.457	18.496	18.534	18.573
220.5	18.612	18.650	18.689	18.727	18.766	18.804	18.843	18.881	18.920	18.958
220.6	18.997	19.035	19.074	19.112	19.151	19.189	19.228	19.266	19.305	19.343
220.7	19.382	19.420	19.459	19.497	19.536	19.574	19.613	19.651	19.690	19.728
220.8	19.767	19.805	19.844	19.882	19.921	19.959	19.998	20.036	20.075	20.113
220.9	20.152	20.190	20.229	20.267	20.306	20.344	20.383	20.421	20.460	20.498
221.0	20.537	20.579	20.621	20.663	20.705	20.747	20.789	20.831	20.873	20.914
221.1	20.956	20.998	21.040	21.082	21.124	21.166	21.208	21.250	21.292	21.334
221.2	21.376	21.418	21.460	21.502	21.544	21.586	21.627	21.669	21.711	21.753
221.3	21.795	21.837	21.879	21.921	21.963	22.005	22.047	22.089	22.131	22.173
221.4	22.215	22.257	22.298	22.340	22.382	22.424	22.466	22.508	22.550	22.592
221.5	22.634	22.676	22.718	22.760	22.802	22.844	22.886	22.928	22.970	23.011
221.6	23.053	23.095	23.137	23.179	23.221	23.263	23.305	23.347	23.389	23.431
221.7	23.473	23.515	23.557	23.599	23.641	23.683	23.724	23.766	23.808	23.850
221.8	23.892	23.934	23.976	24.018	24.060	24.102	24.144	24.186	24.228	24.270
221.9	24.312	24.354	24.395	24.437	24.479	24.521	24.563	24.605	24.647	24.689
ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090

**Table 7-4 (Continued)**  
**SOMERVILLE LAKE -ELEVATION CAPACITY TABLE**  
 ELEVATIONS IN FEET-NGVD, CAPACITIES IN THOUSAND ACRE-FEET

ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090
222.0	24.731	24.777	24.822	24.868	24.914	24.959	25.005	25.051	25.097	25.142
222.1	25.188	25.234	25.279	25.325	25.371	25.416	25.462	25.508	25.553	25.599
222.2	25.645	25.690	25.736	25.782	25.828	25.873	25.919	25.965	26.010	26.056
222.3	26.102	26.147	26.193	26.239	26.284	26.330	26.376	26.422	26.467	26.513
222.4	26.559	26.604	26.650	26.696	26.741	26.787	26.833	26.878	26.924	26.970
222.5	27.016	27.061	27.107	27.153	27.198	27.244	27.290	27.335	27.381	27.427
222.6	27.472	27.518	27.564	27.609	27.655	27.701	27.747	27.792	27.838	27.884
222.7	27.929	27.975	28.021	28.066	28.112	28.158	28.203	28.249	28.295	28.341
222.8	28.386	28.432	28.478	28.523	28.569	28.615	28.660	28.706	28.752	28.797
222.9	28.843	28.889	28.934	28.980	29.026	29.072	29.117	29.163	29.209	29.254
223.0	29.300	29.349	29.399	29.448	29.498	29.547	29.597	29.646	29.696	29.745
223.1	29.795	29.844	29.894	29.943	29.993	30.042	30.092	30.141	30.191	30.240
223.2	30.290	30.339	30.389	30.438	30.488	30.537	30.586	30.636	30.685	30.735
223.3	30.784	30.834	30.883	30.933	30.982	31.032	31.081	31.131	31.180	31.230
223.4	31.279	31.329	31.378	31.428	31.477	31.527	31.576	31.626	31.675	31.725
223.5	31.774	31.823	31.873	31.922	31.972	32.021	32.071	32.120	32.170	32.219
223.6	32.269	32.318	32.368	32.417	32.467	32.516	32.566	32.615	32.665	32.714
223.7	32.764	32.813	32.863	32.912	32.962	33.011	33.060	33.110	33.159	33.209
223.8	33.258	33.308	33.357	33.407	33.456	33.506	33.555	33.605	33.654	33.704
223.9	33.753	33.803	33.852	33.902	33.951	34.001	34.050	34.100	34.149	34.199
224.0	34.248	34.302	34.356	34.411	34.465	34.519	34.573	34.627	34.682	34.736
224.1	34.790	34.844	34.899	34.953	35.007	35.061	35.115	35.170	35.224	35.278
224.2	35.332	35.386	35.441	35.495	35.549	35.603	35.657	35.712	35.766	35.820
224.3	35.874	35.929	35.983	36.037	36.091	36.145	36.200	36.254	36.308	36.362
224.4	36.416	36.471	36.525	36.579	36.633	36.687	36.742	36.796	36.850	36.904
224.5	36.959	37.013	37.067	37.121	37.175	37.230	37.284	37.338	37.392	37.446
224.6	37.501	37.555	37.609	37.663	37.717	37.772	37.826	37.880	37.934	37.988
224.7	38.043	38.097	38.151	38.205	38.260	38.314	38.368	38.422	38.476	38.531
224.8	38.585	38.639	38.693	38.747	38.802	38.856	38.910	38.964	39.018	39.073
224.9	39.127	39.181	39.235	39.290	39.344	39.398	39.452	39.506	39.561	39.615
ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090

**Table 7-4 (Continued)**  
**SOMERVILLE LAKE -ELEVATION CAPACITY TABLE**  
 ELEVATIONS IN FEET-NGVD, CAPACITIES IN THOUSAND ACRE-FEET

ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090
225.0	39.669	39.729	39.788	39.848	39.908	39.967	40.027	40.086	40.146	40.206
225.1	40.265	40.325	40.385	40.444	40.504	40.564	40.623	40.683	40.743	40.802
225.2	40.862	40.921	40.981	41.041	41.100	41.160	41.220	41.279	41.339	41.399
225.3	41.458	41.518	41.577	41.637	41.697	41.756	41.816	41.876	41.935	41.995
225.4	42.055	42.114	42.174	42.234	42.293	42.353	42.412	42.472	42.532	42.591
225.5	42.651	42.711	42.770	42.830	42.890	42.949	43.009	43.068	43.128	43.188
225.6	43.247	43.307	43.367	43.426	43.486	43.546	43.605	43.665	43.725	43.784
225.7	43.844	43.903	43.963	44.023	44.082	44.142	44.202	44.261	44.321	44.381
225.8	44.440	44.500	44.559	44.619	44.679	44.738	44.798	44.858	44.917	44.977
225.9	45.037	45.096	45.156	45.216	45.275	45.335	45.394	45.454	45.514	45.573
226.0	45.633	45.697	45.762	45.826	45.890	45.955	46.019	46.083	46.147	46.212
226.1	46.276	46.340	46.405	46.469	46.533	46.598	46.662	46.726	46.791	46.855
226.2	46.919	46.984	47.048	47.112	47.176	47.241	47.305	47.369	47.434	47.498
226.3	47.562	47.627	47.691	47.755	47.820	47.884	47.948	48.012	48.077	48.141
226.4	48.205	48.270	48.334	48.398	48.463	48.527	48.591	48.656	48.720	48.784
226.5	48.849	48.913	48.977	49.041	49.106	49.170	49.234	49.299	49.363	49.427
226.6	49.492	49.556	49.620	49.685	49.749	49.813	49.877	49.942	50.006	50.070
226.7	50.135	50.199	50.263	50.328	50.392	50.456	50.521	50.585	50.649	50.713
226.8	50.778	50.842	50.906	50.971	51.035	51.099	51.164	51.228	51.292	51.357
226.9	51.421	51.485	51.550	51.614	51.678	51.742	51.807	51.871	51.935	52.000
227.0	52.064	52.132	52.201	52.269	52.338	52.406	52.475	52.543	52.612	52.680
227.1	52.749	52.817	52.885	52.954	53.022	53.091	53.159	53.228	53.296	53.365
227.2	53.433	53.501	53.570	53.638	53.707	53.775	53.844	53.912	53.981	54.049
227.3	54.118	54.186	54.254	54.323	54.391	54.460	54.528	54.597	54.665	54.734
227.4	54.802	54.870	54.939	55.007	55.076	55.144	55.213	55.281	55.350	55.418
227.5	55.487	55.555	55.623	55.692	55.760	55.829	55.897	55.966	56.034	56.103
227.6	56.171	56.239	56.308	56.376	56.445	56.513	56.582	56.650	56.719	56.787
227.7	56.856	56.924	56.992	57.061	57.129	57.198	57.266	57.335	57.403	57.472
227.8	57.540	57.608	57.677	57.745	57.814	57.882	57.951	58.019	58.088	58.156
227.9	58.225	58.293	58.361	58.430	58.498	58.567	58.635	58.704	58.772	58.841
ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090

**Table 7-4 (Continued)**  
**SOMERVILLE LAKE -ELEVATION CAPACITY TABLE**  
 ELEVATIONS IN FEET-NGVD, CAPACITIES IN THOUSAND ACRE-FEET

ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090
228.0	58.909	58.982	59.055	59.128	59.201	59.274	59.347	59.420	59.494	59.567
228.1	59.640	59.713	59.786	59.859	59.932	60.005	60.078	60.151	60.224	60.297
228.2	60.370	60.443	60.517	60.590	60.663	60.736	60.809	60.882	60.955	61.028
228.3	61.101	61.174	61.247	61.320	61.393	61.466	61.540	61.613	61.686	61.759
228.4	61.832	61.905	61.978	62.051	62.124	62.197	62.270	62.343	62.416	62.489
228.5	62.563	62.636	62.709	62.782	62.855	62.928	63.001	63.074	63.147	63.220
228.6	63.293	63.366	63.439	63.512	63.585	63.659	63.732	63.805	63.878	63.951
228.7	64.024	64.097	64.170	64.243	64.316	64.389	64.462	64.535	64.608	64.682
228.8	64.755	64.828	64.901	64.974	65.047	65.120	65.193	65.266	65.339	65.412
228.9	65.485	65.558	65.631	65.705	65.778	65.851	65.924	65.997	66.070	66.143
229.0	66.216	66.293	66.369	66.446	66.523	66.600	66.676	66.753	66.830	66.906
229.1	66.983	67.060	67.137	67.213	67.290	67.367	67.444	67.520	67.597	67.674
229.2	67.750	67.827	67.904	67.981	68.057	68.134	68.211	68.287	68.364	68.441
229.3	68.518	68.594	68.671	68.748	68.824	68.901	68.978	69.055	69.131	69.208
229.4	69.285	69.362	69.438	69.515	69.592	69.668	69.745	69.822	69.899	69.975
229.5	70.052	70.129	70.205	70.282	70.359	70.436	70.512	70.589	70.666	70.742
229.6	70.819	70.896	70.973	71.049	71.126	71.203	71.280	71.356	71.433	71.510
229.7	71.586	71.663	71.740	71.817	71.893	71.970	72.047	72.123	72.200	72.277
229.8	72.354	72.430	72.507	72.584	72.660	72.737	72.814	72.891	72.967	73.044
229.9	73.121	73.198	73.274	73.351	73.428	73.504	73.581	73.658	73.735	73.811
230.0	73.888	73.968	74.048	74.128	74.208	74.288	74.367	74.447	74.527	74.607
230.1	74.687	74.767	74.847	74.927	75.007	75.087	75.166	75.246	75.326	75.406
230.2	75.486	75.566	75.646	75.726	75.806	75.886	75.965	76.045	76.125	76.205
230.3	76.285	76.365	76.445	76.525	76.605	76.685	76.764	76.844	76.924	77.004
230.4	77.084	77.164	77.244	77.324	77.404	77.484	77.563	77.643	77.723	77.803
230.5	77.883	77.963	78.043	78.123	78.203	78.283	78.362	78.442	78.522	78.602
230.6	78.682	78.762	78.842	78.922	79.002	79.082	79.161	79.241	79.321	79.401
230.7	79.481	79.561	79.641	79.721	79.801	79.881	79.960	80.040	80.120	80.200
230.8	80.280	80.360	80.440	80.520	80.600	80.680	80.759	80.839	80.919	80.999
230.9	81.079	81.159	81.239	81.319	81.399	81.479	81.558	81.638	81.718	81.798
ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090

**Table 7-4 (Continued)**  
**SOMERVILLE LAKE -ELEVATION CAPACITY TABLE**  
 ELEVATIONS IN FEET-NGVD, CAPACITIES IN THOUSAND ACRE-FEET

ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090
231.0	81.878	81.962	82.047	82.131	82.215	82.299	82.384	82.468	82.552	82.637
231.1	82.721	82.805	82.889	82.974	83.058	83.142	83.226	83.311	83.395	83.479
231.2	83.564	83.648	83.732	83.816	83.901	83.985	84.069	84.154	84.238	84.322
231.3	84.406	84.491	84.575	84.659	84.744	84.828	84.912	84.996	85.081	85.165
231.4	85.249	85.333	85.418	85.502	85.586	85.671	85.755	85.839	85.923	86.008
231.5	86.092	86.176	86.261	86.345	86.429	86.513	86.598	86.682	86.766	86.851
231.6	86.935	87.019	87.103	87.188	87.272	87.356	87.440	87.525	87.609	87.693
231.7	87.778	87.862	87.946	88.030	88.115	88.199	88.283	88.368	88.452	88.536
231.8	88.620	88.705	88.789	88.873	88.958	89.042	89.126	89.210	89.295	89.379
231.9	89.463	89.547	89.632	89.716	89.800	89.885	89.969	90.053	90.137	90.222
232.0	90.306	90.395	90.484	90.573	90.662	90.751	90.840	90.929	91.018	91.108
232.1	91.197	91.286	91.375	91.464	91.553	91.642	91.731	91.820	91.909	91.998
232.2	92.087	92.176	92.265	92.354	92.443	92.533	92.622	92.711	92.800	92.889
232.3	92.978	93.067	93.156	93.245	93.334	93.423	93.512	93.601	93.690	93.779
232.4	93.868	93.957	94.047	94.136	94.225	94.314	94.403	94.492	94.581	94.670
232.5	94.759	94.848	94.937	95.026	95.115	95.204	95.293	95.382	95.471	95.561
232.6	95.650	95.739	95.828	95.917	96.006	96.095	96.184	96.273	96.362	96.451
232.7	96.540	96.629	96.718	96.807	96.896	96.986	97.075	97.164	97.253	97.342
232.8	97.431	97.520	97.609	97.698	97.787	97.876	97.965	98.054	98.143	98.232
232.9	98.321	98.410	98.500	98.589	98.678	98.767	98.856	98.945	99.034	99.123
233.0	99.212	99.306	99.400	99.493	99.587	99.681	99.775	99.869	99.962	100.056
233.1	100.150	100.244	100.338	100.432	100.525	100.619	100.713	100.807	100.901	100.994
233.2	101.088	101.182	101.276	101.370	101.463	101.557	101.651	101.745	101.839	101.932
233.3	102.026	102.120	102.214	102.308	102.402	102.495	102.589	102.683	102.777	102.871
233.4	102.964	103.058	103.152	103.246	103.340	103.433	103.527	103.621	103.715	103.809
233.5	103.903	103.996	104.090	104.184	104.278	104.372	104.465	104.559	104.653	104.747
233.6	104.841	104.934	105.028	105.122	105.216	105.310	105.403	105.497	105.591	105.685
233.7	105.779	105.873	105.966	106.060	106.154	106.248	106.342	106.435	106.529	106.623
233.8	106.717	106.811	106.904	106.998	107.092	107.186	107.280	107.373	107.467	107.561
233.9	107.655	107.749	107.843	107.936	108.030	108.124	108.218	108.312	108.405	108.499
ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090

**Table 7-4 (Continued)**  
**SOMERVILLE LAKE -ELEVATION CAPACITY TABLE**  
 ELEVATIONS IN FEET-NGVD, CAPACITIES IN THOUSAND ACRE-FEET

ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090
234.0	108.593	108.691	108.790	108.888	108.986	109.085	109.183	109.281	109.379	109.478
234.1	109.576	109.674	109.773	109.871	109.969	110.068	110.166	110.264	110.363	110.461
234.2	110.559	110.658	110.756	110.854	110.952	111.051	111.149	111.247	111.346	111.444
234.3	111.542	111.641	111.739	111.837	111.936	112.034	112.132	112.230	112.329	112.427
234.4	112.525	112.624	112.722	112.820	112.919	113.017	113.115	113.214	113.312	113.410
234.5	113.509	113.607	113.705	113.803	113.902	114.000	114.098	114.197	114.295	114.393
234.6	114.492	114.590	114.688	114.787	114.885	114.983	115.081	115.180	115.278	115.376
234.7	115.475	115.573	115.671	115.770	115.868	115.966	116.065	116.163	116.261	116.359
234.8	116.458	116.556	116.654	116.753	116.851	116.949	117.048	117.146	117.244	117.343
234.9	117.441	117.539	117.638	117.736	117.834	117.932	118.031	118.129	118.227	118.326
235.0	118.424	118.526	118.629	118.731	118.834	118.936	119.039	119.141	119.244	119.346
235.1	119.449	119.551	119.654	119.756	119.858	119.961	120.063	120.166	120.268	120.371
235.2	120.473	120.576	120.678	120.781	120.883	120.986	121.088	121.190	121.293	121.395
235.3	121.498	121.600	121.703	121.805	121.908	122.010	122.113	122.215	122.317	122.420
235.4	122.522	122.625	122.727	122.830	122.932	123.035	123.137	123.240	123.342	123.445
235.5	123.547	123.649	123.752	123.854	123.957	124.059	124.162	124.264	124.367	124.469
235.6	124.572	124.674	124.777	124.879	124.981	125.084	125.186	125.289	125.391	125.494
235.7	125.596	125.699	125.801	125.904	126.006	126.109	126.211	126.313	126.416	126.518
235.8	126.621	126.723	126.826	126.928	127.031	127.133	127.236	127.338	127.440	127.543
235.9	127.645	127.748	127.850	127.953	128.055	128.158	128.260	128.363	128.465	128.568
236.0	128.670	128.776	128.882	128.988	129.094	129.200	129.306	129.412	129.518	129.624
236.1	129.731	129.837	129.943	130.049	130.155	130.261	130.367	130.473	130.579	130.685
236.2	130.791	130.897	131.003	131.109	131.215	131.321	131.427	131.533	131.639	131.745
236.3	131.852	131.958	132.064	132.170	132.276	132.382	132.488	132.594	132.700	132.806
236.4	132.912	133.018	133.124	133.230	133.336	133.442	133.548	133.654	133.760	133.866
236.5	133.973	134.079	134.185	134.291	134.397	134.503	134.609	134.715	134.821	134.927
236.6	135.033	135.139	135.245	135.351	135.457	135.563	135.669	135.775	135.881	135.987
236.7	136.094	136.200	136.306	136.412	136.518	136.624	136.730	136.836	136.942	137.048
236.8	137.154	137.260	137.366	137.472	137.578	137.684	137.790	137.896	138.002	138.108
236.9	138.215	138.321	138.427	138.533	138.639	138.745	138.851	138.957	139.063	139.169
ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090

**Table 7-4 (Continued)**  
**SOMERVILLE LAKE -ELEVATION CAPACITY TABLE**  
 ELEVATIONS IN FEET-NGVD, CAPACITIES IN THOUSAND ACRE-FEET

ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090
237.0	139.275	139.385	139.495	139.606	139.716	139.826	139.936	140.046	140.156	140.267
237.1	140.377	140.487	140.597	140.707	140.818	140.928	141.038	141.148	141.258	141.368
237.2	141.479	141.589	141.699	141.809	141.919	142.030	142.140	142.250	142.360	142.470
237.3	142.580	142.691	142.801	142.911	143.021	143.131	143.241	143.352	143.462	143.572
237.4	143.682	143.792	143.903	144.013	144.123	144.233	144.343	144.453	144.564	144.674
237.5	144.784	144.894	145.004	145.115	145.225	145.335	145.445	145.555	145.665	145.776
237.6	145.886	145.996	146.106	146.216	146.327	146.437	146.547	146.657	146.767	146.877
237.7	146.988	147.098	147.208	147.318	147.428	147.539	147.649	147.759	147.869	147.979
237.8	148.089	148.200	148.310	148.420	148.530	148.640	148.750	148.861	148.971	149.081
237.9	149.191	149.301	149.412	149.522	149.632	149.742	149.852	149.962	150.073	150.183
238.0	150.293	150.410	150.527	150.644	150.761	150.878	150.995	151.112	151.229	151.346
238.1	151.463	151.580	151.697	151.814	151.931	152.048	152.165	152.282	152.399	152.516
238.2	152.633	152.750	152.867	152.984	153.101	153.218	153.335	153.452	153.569	153.686
238.3	153.803	153.920	154.037	154.154	154.271	154.388	154.505	154.622	154.739	154.856
238.4	154.973	155.090	155.207	155.324	155.441	155.558	155.675	155.792	155.909	156.026
238.5	156.143	156.260	156.377	156.494	156.611	156.728	156.845	156.962	157.079	157.196
238.6	157.313	157.430	157.547	157.664	157.781	157.898	158.015	158.132	158.249	158.366
238.7	158.483	158.600	158.717	158.834	158.951	159.068	159.185	159.302	159.419	159.536
238.8	159.653	159.770	159.887	160.004	160.121	160.238	160.355	160.472	160.589	160.706
238.9	160.823	160.940	161.057	161.174	161.291	161.408	161.525	161.642	161.759	161.876
239.0	161.993	162.115	162.238	162.360	162.482	162.605	162.727	162.849	162.971	163.094
239.1	163.216	163.338	163.461	163.583	163.705	163.828	163.950	164.072	164.194	164.317
239.2	164.439	164.561	164.684	164.806	164.928	165.051	165.173	165.295	165.417	165.540
239.3	165.662	165.784	165.907	166.029	166.151	166.274	166.396	166.518	166.640	166.763
239.4	166.885	167.007	167.130	167.252	167.374	167.497	167.619	167.741	167.863	167.986
239.5	168.108	168.230	168.353	168.475	168.597	168.720	168.842	168.964	169.086	169.209
239.6	169.331	169.453	169.576	169.698	169.820	169.943	170.065	170.187	170.309	170.432
239.7	170.554	170.676	170.799	170.921	171.043	171.166	171.288	171.410	171.532	171.655
239.8	171.777	171.899	172.022	172.144	172.266	172.389	172.511	172.633	172.755	172.878
239.9	173.000	173.122	173.245	173.367	173.489	173.612	173.734	173.856	173.978	174.101
ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090

**Table 7-4 (Continued)**  
**SOMERVILLE LAKE -ELEVATION CAPACITY TABLE**  
 ELEVATIONS IN FEET-NGVD, CAPACITIES IN THOUSAND ACRE-FEET

ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090
240.0	174.223	174.351	174.479	174.606	174.734	174.862	174.990	175.117	175.245	175.373
240.1	175.501	175.628	175.756	175.884	176.012	176.139	176.267	176.395	176.523	176.650
240.2	176.778	176.906	177.034	177.161	177.289	177.417	177.545	177.672	177.800	177.928
240.3	178.056	178.183	178.311	178.439	178.567	178.694	178.822	178.950	179.078	179.205
240.4	179.333	179.461	179.589	179.716	179.844	179.972	180.100	180.227	180.355	180.483
240.5	180.611	180.738	180.866	180.994	181.122	181.249	181.377	181.505	181.633	181.760
240.6	181.888	182.016	182.144	182.271	182.399	182.527	182.655	182.782	182.910	183.038
240.7	183.166	183.293	183.421	183.549	183.677	183.804	183.932	184.060	184.188	184.315
240.8	184.443	184.571	184.699	184.826	184.954	185.082	185.210	185.337	185.465	185.593
240.9	185.721	185.848	185.976	186.104	186.232	186.359	186.487	186.615	186.743	186.870
241.0	186.998	187.131	187.264	187.397	187.529	187.662	187.795	187.928	188.061	188.194
241.1	188.327	188.459	188.592	188.725	188.858	188.991	189.124	189.256	189.389	189.522
241.2	189.655	189.788	189.921	190.054	190.186	190.319	190.452	190.585	190.718	190.851
241.3	190.984	191.116	191.249	191.382	191.515	191.648	191.781	191.913	192.046	192.179
241.4	192.312	192.445	192.578	192.711	192.843	192.976	193.109	193.242	193.375	193.508
241.5	193.641	193.773	193.906	194.039	194.172	194.305	194.438	194.570	194.703	194.836
241.6	194.969	195.102	195.235	195.368	195.500	195.633	195.766	195.899	196.032	196.165
241.7	196.298	196.430	196.563	196.696	196.829	196.962	197.095	197.227	197.360	197.493
241.8	197.626	197.759	197.892	198.025	198.157	198.290	198.423	198.556	198.689	198.822
241.9	198.955	199.087	199.220	199.353	199.486	199.619	199.752	199.884	200.017	200.150
242.0	200.283	200.421	200.560	200.698	200.836	200.975	201.113	201.251	201.389	201.528
242.1	201.666	201.804	201.943	202.081	202.219	202.358	202.496	202.634	202.772	202.911
242.2	203.049	203.187	203.326	203.464	203.602	203.741	203.879	204.017	204.155	204.294
242.3	204.432	204.570	204.709	204.847	204.985	205.124	205.262	205.400	205.538	205.677
242.4	205.815	205.953	206.092	206.230	206.368	206.507	206.645	206.783	206.921	207.060
242.5	207.198	207.336	207.475	207.613	207.751	207.890	208.028	208.166	208.304	208.443
242.6	208.581	208.719	208.858	208.996	209.134	209.273	209.411	209.549	209.687	209.826
242.7	209.964	210.102	210.241	210.379	210.517	210.656	210.794	210.932	211.070	211.209
242.8	211.347	211.485	211.624	211.762	211.900	212.039	212.177	212.315	212.453	212.592
242.9	212.730	212.868	213.007	213.145	213.283	213.422	213.560	213.698	213.836	213.975
ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090

**Table 7-4 (Continued)**  
**SOMERVILLE LAKE -ELEVATION CAPACITY TABLE**  
 ELEVATIONS IN FEET-NGVD, CAPACITIES IN THOUSAND ACRE-FEET

ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090
243.0	214.113	214.257	214.401	214.545	214.689	214.833	214.977	215.121	215.265	215.409
243.1	215.553	215.697	215.841	215.985	216.129	216.273	216.417	216.561	216.705	216.849
243.2	216.993	217.137	217.281	217.425	217.569	217.713	217.857	218.001	218.145	218.289
243.3	218.433	218.577	218.721	218.865	219.009	219.153	219.297	219.441	219.585	219.729
243.4	219.873	220.017	220.161	220.305	220.449	220.593	220.737	220.881	221.025	221.169
243.5	221.313	221.457	221.601	221.745	221.889	222.033	222.177	222.321	222.465	222.609
243.6	222.753	222.897	223.041	223.185	223.329	223.473	223.617	223.761	223.905	224.049
243.7	224.193	224.337	224.481	224.625	224.769	224.913	225.057	225.201	225.345	225.489
243.8	225.633	225.777	225.921	226.065	226.209	226.353	226.497	226.641	226.785	226.929
243.9	227.073	227.217	227.361	227.505	227.649	227.793	227.937	228.081	228.225	228.369
244.0	228.513	228.663	228.812	228.962	229.111	229.261	229.410	229.560	229.709	229.859
244.1	230.009	230.158	230.308	230.457	230.607	230.756	230.906	231.055	231.205	231.354
244.2	231.504	231.654	231.803	231.953	232.102	232.252	232.401	232.551	232.700	232.850
244.3	233.000	233.149	233.299	233.448	233.598	233.747	233.897	234.046	234.196	234.345
244.4	234.495	234.645	234.794	234.944	235.093	235.243	235.392	235.542	235.691	235.841
244.5	235.991	236.140	236.290	236.439	236.589	236.738	236.888	237.037	237.187	237.336
244.6	237.486	237.636	237.785	237.935	238.084	238.234	238.383	238.533	238.682	238.832
244.7	238.982	239.131	239.281	239.430	239.580	239.729	239.879	240.028	240.178	240.327
244.8	240.477	240.627	240.776	240.926	241.075	241.225	241.374	241.524	241.673	241.823
244.9	241.973	242.122	242.272	242.421	242.571	242.720	242.870	243.019	243.169	243.318
245.0	243.468	243.623	243.778	243.933	244.089	244.244	244.399	244.554	244.709	244.864
245.1	245.020	245.175	245.330	245.485	245.640	245.795	245.950	246.106	246.261	246.416
245.2	246.571	246.726	246.881	247.036	247.192	247.347	247.502	247.657	247.812	247.967
245.3	248.123	248.278	248.433	248.588	248.743	248.898	249.053	249.209	249.364	249.519
245.4	249.674	249.829	249.984	250.139	250.295	250.450	250.605	250.760	250.915	251.070
245.5	251.226	251.381	251.536	251.691	251.846	252.001	252.156	252.312	252.467	252.622
245.6	252.777	252.932	253.087	253.242	253.398	253.553	253.708	253.863	254.018	254.173
245.7	254.329	254.484	254.639	254.794	254.949	255.104	255.259	255.415	255.570	255.725
245.8	255.880	256.035	256.190	256.345	256.501	256.656	256.811	256.966	257.121	257.276
245.9	257.432	257.587	257.742	257.897	258.052	258.207	258.362	258.518	258.673	258.828
ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090

**Table 7-4 (Continued)**  
**SOMERVILLE LAKE -ELEVATION CAPACITY TABLE**  
 ELEVATIONS IN FEET-NGVD, CAPACITIES IN THOUSAND ACRE-FEET

ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090
246.0	258.983	259.144	259.305	259.466	259.627	259.788	259.949	260.110	260.271	260.432
246.1	260.593	260.754	260.915	261.076	261.237	261.398	261.559	261.720	261.881	262.042
246.2	262.203	262.364	262.525	262.686	262.847	263.008	263.169	263.330	263.491	263.652
246.3	263.813	263.974	264.135	264.296	264.457	264.618	264.779	264.940	265.101	265.262
246.4	265.423	265.584	265.745	265.906	266.067	266.228	266.389	266.550	266.711	266.872
246.5	267.033	267.194	267.355	267.516	267.677	267.838	267.999	268.160	268.321	268.482
246.6	268.643	268.804	268.965	269.126	269.287	269.448	269.609	269.770	269.931	270.092
246.7	270.253	270.414	270.575	270.736	270.897	271.058	271.219	271.380	271.541	271.702
246.8	271.863	272.024	272.185	272.346	272.507	272.668	272.829	272.990	273.151	273.312
246.9	273.473	273.634	273.795	273.956	274.117	274.278	274.439	274.600	274.761	274.922
247.0	275.083	275.250	275.417	275.584	275.751	275.918	276.085	276.252	276.419	276.586
247.1	276.753	276.920	277.087	277.254	277.421	277.588	277.755	277.922	278.089	278.256
247.2	278.423	278.590	278.757	278.924	279.091	279.258	279.425	279.592	279.759	279.926
247.3	280.093	280.260	280.427	280.594	280.761	280.928	281.095	281.262	281.429	281.596
247.4	281.763	281.930	282.097	282.264	282.431	282.598	282.765	282.932	283.099	283.266
247.5	283.433	283.600	283.767	283.934	284.101	284.268	284.435	284.602	284.769	284.936
247.6	285.103	285.270	285.437	285.604	285.771	285.938	286.105	286.272	286.439	286.606
247.7	286.773	286.940	287.107	287.274	287.441	287.608	287.775	287.942	288.109	288.276
247.8	288.443	288.610	288.777	288.944	289.111	289.278	289.445	289.612	289.779	289.946
247.9	290.113	290.280	290.447	290.614	290.781	290.948	291.115	291.282	291.449	291.616
248.0	291.783	291.956	292.129	292.302	292.476	292.649	292.822	292.995	293.168	293.341
248.1	293.515	293.688	293.861	294.034	294.207	294.380	294.553	294.727	294.900	295.073
248.2	295.246	295.419	295.592	295.765	295.939	296.112	296.285	296.458	296.631	296.804
248.3	296.978	297.151	297.324	297.497	297.670	297.843	298.016	298.190	298.363	298.536
248.4	298.709	298.882	299.055	299.228	299.402	299.575	299.748	299.921	300.094	300.267
248.5	300.441	300.614	300.787	300.960	301.133	301.306	301.479	301.653	301.826	301.999
248.6	302.172	302.345	302.518	302.691	302.865	303.038	303.211	303.384	303.557	303.730
248.7	303.904	304.077	304.250	304.423	304.596	304.769	304.942	305.116	305.289	305.462
248.8	305.635	305.808	305.981	306.154	306.328	306.501	306.674	306.847	307.020	307.193
248.9	307.367	307.540	307.713	307.886	308.059	308.232	308.405	308.579	308.752	308.925
ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090

**Table 7-4 (Continued)**  
**SOMERVILLE LAKE -ELEVATION CAPACITY TABLE**  
 ELEVATIONS IN FEET-NGVD, CAPACITIES IN THOUSAND ACRE-FEET

ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090
249.0	787.360	787.695	788.030	788.364	788.699	789.034	789.369	789.703	0.000	0.000
249.1	790.708	791.042	791.377	791.712	792.047	792.381	792.716	793.051	0.000	0.000
249.2	794.055	794.390	794.725	795.059	795.394	795.729	796.064	796.398	0.000	0.000
249.3	797.403	797.737	798.072	798.407	798.742	799.076	799.411	799.746	0.000	0.000
249.4	800.750	801.085	801.420	801.754	802.089	802.424	802.759	803.093	0.000	0.000
249.5	804.098	804.432	804.767	805.102	805.437	805.771	806.106	806.441	0.000	0.000
249.6	807.445	807.780	808.115	808.449	808.784	809.119	809.454	809.788	0.000	0.000
249.7	810.793	811.127	811.462	811.797	812.132	812.466	812.801	813.136	0.000	0.000
249.8	814.140	814.475	814.810	815.144	815.479	815.814	816.149	816.483	0.000	0.000
249.9	817.507	817.852	818.196	818.541	818.885	819.230	819.574	819.919	0.000	0.000
250.0	820.952	821.297	821.641	821.986	822.330	822.675	823.019	823.364	0.000	0.000
250.1	824.397	824.742	825.086	825.431	825.775	826.120	826.464	826.809	0.000	0.000
250.2	827.842	828.187	828.531	828.876	829.220	829.565	829.909	830.254	0.000	0.000
250.3	831.287	831.632	831.976	832.321	832.665	833.010	833.354	833.699	0.000	0.000
250.4	834.732	835.077	835.421	835.766	836.110	836.455	836.799	837.144	0.000	0.000
250.5	838.177	838.522	838.866	839.211	839.555	839.900	840.244	840.589	0.000	0.000
250.6	841.622	841.967	842.311	842.656	843.000	843.345	843.689	844.034	0.000	0.000
250.7	845.067	845.412	845.756	846.101	846.445	846.790	847.134	847.479	0.000	0.000
250.8	848.512	848.857	849.201	849.546	849.890	850.235	850.579	850.924	0.000	0.000
250.9	851.977	852.331	852.685	853.039	853.394	853.748	854.102	854.456	0.000	0.000
251.0	855.519	855.873	856.228	856.582	856.936	857.290	857.645	857.999	0.000	0.000
251.1	859.062	859.416	859.770	860.124	860.479	860.833	861.187	861.541	0.000	0.000
251.2	862.604	862.958	863.313	863.667	864.021	864.375	864.730	865.084	0.000	0.000
251.3	866.147	866.501	866.855	867.209	867.564	867.918	868.272	868.626	0.000	0.000
251.4	869.689	870.043	870.398	870.752	871.106	871.460	871.815	872.169	0.000	0.000
251.5	873.232	873.586	873.940	874.294	874.649	875.003	875.357	875.711	0.000	0.000
251.6	876.774	877.128	877.483	877.837	878.191	878.545	878.900	879.254	0.000	0.000
251.7	880.317	880.671	881.025	881.379	881.734	882.088	882.442	882.796	0.000	0.000
251.8	883.859	884.213	884.568	884.922	885.276	885.630	885.985	886.339	0.000	0.000
251.9	887.421	887.786	888.150	888.514	888.878	889.242	889.607	889.971	0.000	0.000
ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090

**Table 7-4 (Continued)**  
**SOMERVILLE LAKE -ELEVATION CAPACITY TABLE**  
 ELEVATIONS IN FEET-NGVD, CAPACITIES IN THOUSAND ACRE-FEET

ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090
252.0	365.198	365.400	365.601	365.803	366.005	366.206	366.408	366.610	366.811	367.013
252.1	367.215	367.416	367.618	367.819	368.021	368.223	368.424	368.626	368.828	369.029
252.2	369.231	369.433	369.634	369.836	370.038	370.239	370.441	370.643	370.844	371.046
252.3	371.248	371.449	371.651	371.852	372.054	372.256	372.457	372.659	372.861	373.062
252.4	373.264	373.466	373.667	373.869	374.071	374.272	374.474	374.676	374.877	375.079
252.5	375.281	375.482	375.684	375.885	376.087	376.289	376.490	376.692	376.894	377.095
252.6	377.297	377.499	377.700	377.902	378.104	378.305	378.507	378.709	378.910	379.112
252.7	379.314	379.515	379.717	379.918	380.120	380.322	380.523	380.725	380.927	381.128
252.8	381.330	381.532	381.733	381.935	382.137	382.338	382.540	382.742	382.943	383.145
252.9	383.347	383.548	383.750	383.951	384.153	384.355	384.556	384.758	384.960	385.161
253.0	385.363	385.572	385.782	385.991	386.200	386.409	386.619	386.828	387.037	387.246
253.1	387.456	387.665	387.874	388.083	388.293	388.502	388.711	388.920	389.130	389.339
253.2	389.548	389.757	389.967	390.176	390.385	390.594	390.804	391.013	391.222	391.431
253.3	391.641	391.850	392.059	392.268	392.478	392.687	392.896	393.105	393.315	393.524
253.4	393.733	393.942	394.152	394.361	394.570	394.779	394.989	395.198	395.407	395.616
253.5	395.826	396.035	396.244	396.453	396.663	396.872	397.081	397.290	397.500	397.709
253.6	397.918	398.127	398.337	398.546	398.755	398.964	399.174	399.383	399.592	399.801
253.7	400.011	400.220	400.429	400.638	400.848	401.057	401.266	401.475	401.685	401.894
253.8	402.103	402.312	402.522	402.731	402.940	403.149	403.359	403.568	403.777	403.986
253.9	404.196	404.405	404.614	404.823	405.033	405.242	405.451	405.660	405.870	406.079
254.0	406.288	406.505	406.722	406.939	407.156	407.373	407.590	407.807	408.024	408.241
254.1	408.458	408.674	408.891	409.108	409.325	409.542	409.759	409.976	410.193	410.410
254.2	410.627	410.844	411.061	411.278	411.495	411.712	411.929	412.146	412.363	412.580
254.3	412.797	413.013	413.230	413.447	413.664	413.881	414.098	414.315	414.532	414.749
254.4	414.966	415.183	415.400	415.617	415.834	416.051	416.268	416.485	416.702	416.919
254.5	417.136	417.352	417.569	417.786	418.003	418.220	418.437	418.654	418.871	419.088
254.6	419.305	419.522	419.739	419.956	420.173	420.390	420.607	420.824	421.041	421.258
254.7	421.475	421.691	421.908	422.125	422.342	422.559	422.776	422.993	423.210	423.427
254.8	423.644	423.861	424.078	424.295	424.512	424.729	424.946	425.163	425.380	425.597
254.9	425.814	426.030	426.247	426.464	426.681	426.898	427.115	427.332	427.549	427.766
ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090

**Table 7-4 (Continued)**  
**SOMERVILLE LAKE -ELEVATION CAPACITY TABLE**  
 ELEVATIONS IN FEET-NGVD, CAPACITIES IN THOUSAND ACRE-FEET

ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090
255.0	427.983	428.208	428.432	428.657	428.882	429.106	429.331	429.556	429.780	430.005
255.1	430.230	430.454	430.679	430.903	431.128	431.353	431.577	431.802	432.027	432.251
255.2	432.476	432.701	432.925	433.150	433.375	433.599	433.824	434.049	434.273	434.498
255.3	434.723	434.947	435.172	435.396	435.621	435.846	436.070	436.295	436.520	436.744
255.4	436.969	437.194	437.418	437.643	437.868	438.092	438.317	438.542	438.766	438.991
255.5	439.216	439.440	439.665	439.889	440.114	440.339	440.563	440.788	441.013	441.237
255.6	441.462	441.687	441.911	442.136	442.361	442.585	442.810	443.035	443.259	443.484
255.7	443.709	443.933	444.158	444.382	444.607	444.832	445.056	445.281	445.506	445.730
255.8	445.955	446.180	446.404	446.629	446.854	447.078	447.303	447.528	447.752	447.977
255.9	448.202	448.426	448.651	448.875	449.100	449.325	449.549	449.774	449.999	450.223
256.0	450.448	450.680	450.913	451.145	451.377	451.610	451.842	452.074	452.307	452.539
256.1	452.772	453.004	453.236	453.469	453.701	453.933	454.166	454.398	454.630	454.863
256.2	455.095	455.327	455.560	455.792	456.024	456.257	456.489	456.721	456.954	457.186
256.3	457.419	457.651	457.883	458.116	458.348	458.580	458.813	459.045	459.277	459.510
256.4	459.742	459.974	460.207	460.439	460.671	460.904	461.136	461.368	461.601	461.833
256.5	462.066	462.298	462.530	462.763	462.995	463.227	463.460	463.692	463.924	464.157
256.6	464.389	464.621	464.854	465.086	465.318	465.551	465.783	466.015	466.248	466.480
256.7	466.713	466.945	467.177	467.410	467.642	467.874	468.107	468.339	468.571	468.804
256.8	469.036	469.268	469.501	469.733	469.965	470.198	470.430	470.662	470.895	471.127
256.9	471.360	471.592	471.824	472.057	472.289	472.521	472.754	472.986	473.218	473.451
257.0	473.683	473.923	474.163	474.403	474.643	474.884	475.124	475.364	475.604	475.844
257.1	476.084	476.324	476.564	476.804	477.044	477.285	477.525	477.765	478.005	478.245
257.2	478.485	478.725	478.965	479.205	479.445	479.686	479.926	480.166	480.406	480.646
257.3	480.886	481.126	481.366	481.606	481.846	482.087	482.327	482.567	482.807	483.047
257.4	483.287	483.527	483.767	484.007	484.247	484.488	484.728	484.968	485.208	485.448
257.5	485.688	485.928	486.168	486.408	486.648	486.889	487.129	487.369	487.609	487.849
257.6	488.089	488.329	488.569	488.809	489.049	489.290	489.530	489.770	490.010	490.250
257.7	490.490	490.730	490.970	491.210	491.450	491.691	491.931	492.171	492.411	492.651
257.8	492.891	493.131	493.371	493.611	493.851	494.092	494.332	494.572	494.812	495.052
257.9	495.292	495.532	495.772	496.012	496.252	496.493	496.733	496.973	497.213	497.453
ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090

**Table 7-4 (Continued)**  
**SOMERVILLE LAKE -ELEVATION CAPACITY TABLE**  
 ELEVATIONS IN FEET-NGVD, CAPACITIES IN THOUSAND ACRE-FEET

ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090
258.0	497.693	497.941	498.189	498.437	498.685	498.933	499.181	499.429	499.677	499.925
258.1	500.173	500.421	500.669	500.917	501.165	501.413	501.661	501.909	502.157	502.405
258.2	502.653	502.901	503.149	503.397	503.645	503.893	504.141	504.389	504.637	504.885
258.3	505.133	505.381	505.629	505.877	506.125	506.373	506.621	506.869	507.117	507.365
258.4	507.613	507.861	508.109	508.357	508.605	508.853	509.101	509.349	509.597	509.845
258.5	510.093	510.341	510.589	510.837	511.085	511.333	511.581	511.829	512.077	512.325
258.6	512.573	512.821	513.069	513.317	513.565	513.813	514.061	514.309	514.557	514.805
258.7	515.053	515.301	515.549	515.797	516.045	516.293	516.541	516.789	517.037	517.285
258.8	517.533	517.781	518.029	518.277	518.525	518.773	519.021	519.269	519.517	519.765
258.9	520.013	520.261	520.509	520.757	521.005	521.253	521.501	521.749	521.997	522.245
259.0	522.493	522.749	523.005	523.261	523.517	523.773	524.029	524.285	524.541	524.797
259.1	525.053	525.309	525.565	525.821	526.077	526.333	526.589	526.845	527.101	527.357
259.2	527.613	527.869	528.125	528.381	528.637	528.893	529.149	529.405	529.661	529.917
259.3	530.173	530.429	530.685	530.941	531.197	531.453	531.709	531.965	532.221	532.477
259.4	532.733	532.989	533.245	533.501	533.757	534.013	534.269	534.525	534.781	535.037
259.5	535.293	535.549	535.805	536.061	536.317	536.573	536.829	537.085	537.341	537.597
259.6	537.853	538.109	538.365	538.621	538.877	539.133	539.389	539.645	539.901	540.157
259.7	540.413	540.669	540.925	541.181	541.437	541.693	541.949	542.205	542.461	542.717
259.8	542.973	543.229	543.485	543.741	543.997	544.253	544.509	544.765	545.021	545.277
259.9	545.533	545.789	546.045	546.301	546.557	546.813	547.069	547.325	547.581	547.837
260.0	548.093	548.357	548.621	548.885	549.149	549.413	549.677	549.941	550.205	550.469
260.1	550.734	550.998	551.262	551.526	551.790	552.054	552.318	552.582	552.846	553.110
260.2	553.374	553.638	553.902	554.166	554.430	554.694	554.958	555.222	555.486	555.750
260.3	556.015	556.279	556.543	556.807	557.071	557.335	557.599	557.863	558.127	558.391
260.4	558.655	558.919	559.183	559.447	559.711	559.975	560.239	560.503	560.767	561.031
260.5	561.296	561.560	561.824	562.088	562.352	562.616	562.880	563.144	563.408	563.672
260.6	563.936	564.200	564.464	564.728	564.992	565.256	565.520	565.784	566.048	566.312
260.7	566.577	566.841	567.105	567.369	567.633	567.897	568.161	568.425	568.689	568.953
260.8	569.217	569.481	569.745	570.009	570.273	570.537	570.801	571.065	571.329	571.593
260.9	571.858	572.122	572.386	572.650	572.914	573.178	573.442	573.706	573.970	574.234
ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090

**Table 7-4 (Continued)**  
**SOMERVILLE LAKE -ELEVATION CAPACITY TABLE**  
 ELEVATIONS IN FEET-NGVD, CAPACITIES IN THOUSAND ACRE-FEET

ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090
261.0	574.498	574.770	575.043	575.315	575.587	575.860	576.132	576.404	576.676	576.949
261.1	577.221	577.493	577.766	578.038	578.310	578.583	578.855	579.127	579.399	579.672
261.2	579.944	580.216	580.489	580.761	581.033	581.306	581.578	581.850	582.122	582.395
261.3	582.667	582.939	583.212	583.484	583.756	584.029	584.301	584.573	584.845	585.118
261.4	585.390	585.662	585.935	586.207	586.479	586.752	587.024	587.296	587.568	587.841
261.5	588.113	588.385	588.658	588.930	589.202	589.475	589.747	590.019	590.291	590.564
261.6	590.836	591.108	591.381	591.653	591.925	592.198	592.470	592.742	593.014	593.287
261.7	593.559	593.831	594.104	594.376	594.648	594.921	595.193	595.465	595.737	596.010
261.8	596.282	596.554	596.827	597.099	597.371	597.644	597.916	598.188	598.460	598.733
261.9	599.005	599.277	599.550	599.822	600.094	600.367	600.639	600.911	601.183	601.456
262.0	601.728	602.009	602.290	602.570	602.851	603.132	603.413	603.693	603.974	604.255
262.1	604.536	604.816	605.097	605.378	605.659	605.939	606.220	606.501	606.782	607.062
262.2	607.343	607.624	607.905	608.185	608.466	608.747	609.028	609.308	609.589	609.870
262.3	610.151	610.431	610.712	610.993	611.274	611.554	611.835	612.116	612.397	612.677
262.4	612.958	613.239	613.520	613.800	614.081	614.362	614.643	614.923	615.204	615.485
262.5	615.766	616.046	616.327	616.608	616.889	617.169	617.450	617.731	618.012	618.292
262.6	618.573	618.854	619.135	619.415	619.696	619.977	620.258	620.538	620.819	621.100
262.7	621.381	621.661	621.942	622.223	622.504	622.784	623.065	623.346	623.627	623.907
262.8	624.188	624.469	624.750	625.030	625.311	625.592	625.873	626.153	626.434	626.715
262.9	626.996	627.276	627.557	627.838	628.119	628.399	628.680	628.961	629.242	629.522
263.0	629.803	630.092	630.382	630.671	630.960	631.250	631.539	631.828	632.117	632.407
263.1	632.696	632.985	633.275	633.564	633.853	634.143	634.432	634.721	635.010	635.300
263.2	635.589	635.878	636.168	636.457	636.746	637.036	637.325	637.614	637.903	638.193
263.3	638.482	638.771	639.061	639.350	639.639	639.929	640.218	640.507	640.796	641.086
263.4	641.375	641.664	641.954	642.243	642.532	642.822	643.111	643.400	643.689	643.979
263.5	644.268	644.557	644.847	645.136	645.425	645.715	646.004	646.293	646.582	646.872
263.6	647.161	647.450	647.740	648.029	648.318	648.608	648.897	649.186	649.475	649.765
263.7	650.054	650.343	650.633	650.922	651.211	651.501	651.790	652.079	652.368	652.658
263.8	652.947	653.236	653.526	653.815	654.104	654.394	654.683	654.972	655.261	655.551
263.9	655.840	656.129	656.419	656.708	656.997	657.287	657.576	657.865	658.154	658.444
ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090

**Table 7-4 (Continued)**  
**SOMERVILLE LAKE -ELEVATION CAPACITY TABLE**  
 ELEVATIONS IN FEET-NGVD, CAPACITIES IN THOUSAND ACRE-FEET

ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090
264.0	658.733	659.031	659.329	659.627	659.925	660.223	660.521	660.819	661.117	661.415
264.1	661.713	662.010	662.308	662.606	662.904	663.202	663.500	663.798	664.096	664.394
264.2	664.692	664.990	665.288	665.586	665.884	666.182	666.480	666.778	667.076	667.374
264.3	667.672	667.969	668.267	668.565	668.863	669.161	669.459	669.757	670.055	670.353
264.4	670.651	670.949	671.247	671.545	671.843	672.141	672.439	672.737	673.035	673.333
264.5	673.631	673.928	674.226	674.524	674.822	675.120	675.418	675.716	676.014	676.312
264.6	676.610	676.908	677.206	677.504	677.802	678.100	678.398	678.696	678.994	679.292
264.7	679.590	679.887	680.185	680.483	680.781	681.079	681.377	681.675	681.973	682.271
264.8	682.569	682.867	683.165	683.463	683.761	684.059	684.357	684.655	684.953	685.251
264.9	685.549	685.846	686.144	686.442	686.740	687.038	687.336	687.634	687.932	688.230
265.0	688.528	688.835	689.142	689.449	689.756	690.063	690.369	690.676	690.983	691.290
265.1	691.597	691.904	692.211	692.518	692.825	693.132	693.438	693.745	694.052	694.359
265.2	694.666	694.973	695.280	695.587	695.894	696.201	696.507	696.814	697.121	697.428
265.3	697.735	698.042	698.349	698.656	698.963	699.270	699.576	699.883	700.190	700.497
265.4	700.804	701.111	701.418	701.725	702.032	702.339	702.645	702.952	703.259	703.566
265.5	703.873	704.180	704.487	704.794	705.101	705.408	705.714	706.021	706.328	706.635
265.6	706.942	707.249	707.556	707.863	708.170	708.477	708.783	709.090	709.397	709.704
265.7	710.011	710.318	710.625	710.932	711.239	711.546	711.852	712.159	712.466	712.773
265.8	713.080	713.387	713.694	714.001	714.308	714.615	714.921	715.228	715.535	715.842
265.9	716.149	716.456	716.763	717.070	717.377	717.684	717.990	718.297	718.604	718.911
266.0	719.218	719.534	719.850	720.166	720.482	720.798	721.114	721.430	721.746	722.062
266.1	722.378	722.694	723.010	723.326	723.642	723.958	724.274	724.590	724.906	725.222
266.2	725.538	725.854	726.170	726.486	726.802	727.118	727.434	727.750	728.066	728.382
266.3	728.698	729.014	729.330	729.646	729.962	730.278	730.594	730.910	731.226	731.542
266.4	731.858	732.174	732.490	732.806	733.122	733.438	733.754	734.070	734.386	734.702
266.5	735.018	735.334	735.650	735.966	736.282	736.598	736.914	737.230	737.546	737.862
266.6	738.178	738.494	738.810	739.126	739.442	739.758	740.074	740.390	740.706	741.022
266.7	741.338	741.654	741.970	742.286	742.602	742.918	743.234	743.550	743.866	744.182
266.8	744.498	744.814	745.130	745.446	745.762	746.078	746.394	746.710	747.026	747.342
266.9	747.658	747.974	748.290	748.606	748.922	749.238	749.554	749.870	750.186	750.502
ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090

**Table 7-4 (Continued)**  
**SOMERVILLE LAKE -ELEVATION CAPACITY TABLE**  
 ELEVATIONS IN FEET-NGVD, CAPACITIES IN THOUSAND ACRE-FEET

ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090
267.0	750.818	751.143	751.469	751.794	752.119	752.444	752.770	753.095	753.420	753.745
267.1	754.071	754.396	754.721	755.046	755.372	755.697	756.022	756.347	756.673	756.998
267.2	757.323	757.648	757.974	758.299	758.624	758.949	759.275	759.600	759.925	760.250
267.3	760.576	760.901	761.226	761.551	761.877	762.202	762.527	762.852	763.178	763.503
267.4	763.828	764.153	764.479	764.804	765.129	765.454	765.780	766.105	766.430	766.755
267.5	767.081	767.406	767.731	768.056	768.382	768.707	769.032	769.357	769.683	770.008
267.6	770.333	770.658	770.984	771.309	771.634	771.959	772.285	772.610	772.935	773.260
267.7	773.586	773.911	774.236	774.561	774.887	775.212	775.537	775.862	776.188	776.513
267.8	776.838	777.163	777.489	777.814	778.139	778.464	778.790	779.115	779.440	779.765
267.9	780.091	780.416	780.741	781.066	781.392	781.717	782.042	782.367	782.693	783.018
268.0	783.343	783.678	784.013	784.347	784.682	785.017	785.352	785.686	786.021	786.356
268.1	786.691	787.025	787.360	787.695	788.030	788.364	788.699	789.034	789.369	789.703
268.2	790.038	790.373	790.708	791.042	791.377	791.712	792.047	792.381	792.716	793.051
268.3	793.386	793.720	794.055	794.390	794.725	795.059	795.394	795.729	796.064	796.398
268.4	796.733	797.068	797.403	797.737	798.072	798.407	798.742	799.076	799.411	799.746
268.5	800.081	800.415	800.750	801.085	801.420	801.754	802.089	802.424	802.759	803.093
268.6	803.428	803.763	804.098	804.432	804.767	805.102	805.437	805.771	806.106	806.441
268.7	806.776	807.110	807.445	807.780	808.115	808.449	808.784	809.119	809.454	809.788
268.8	810.123	810.458	810.793	811.127	811.462	811.797	812.132	812.466	812.801	813.136
268.9	813.471	813.805	814.140	814.475	814.810	815.144	815.479	815.814	816.149	816.483
269.0	816.818	817.163	817.507	817.852	818.196	818.541	818.885	819.230	819.574	819.919
269.1	820.263	820.608	820.952	821.297	821.641	821.986	822.330	822.675	823.019	823.364
269.2	823.708	824.053	824.397	824.742	825.086	825.431	825.775	826.120	826.464	826.809
269.3	827.153	827.498	827.842	828.187	828.531	828.876	829.220	829.565	829.909	830.254
269.4	830.598	830.943	831.287	831.632	831.976	832.321	832.665	833.010	833.354	833.699
269.5	834.043	834.388	834.732	835.077	835.421	835.766	836.110	836.455	836.799	837.144
269.6	837.488	837.833	838.177	838.522	838.866	839.211	839.555	839.900	840.244	840.589
269.7	840.933	841.278	841.622	841.967	842.311	842.656	843.000	843.345	843.689	844.034
269.8	844.378	844.723	845.067	845.412	845.756	846.101	846.445	846.790	847.134	847.479
269.9	847.823	848.168	848.512	848.857	849.201	849.546	849.890	850.235	850.579	850.924
ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090

**Table 7-4 (Continued)**  
**SOMERVILLE LAKE -ELEVATION CAPACITY TABLE**  
 ELEVATIONS IN FEET-NGVD, CAPACITIES IN THOUSAND ACRE-FEET

ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090
270.0	851.268	851.622	851.977	852.331	852.685	853.039	853.394	853.748	854.102	854.456
270.1	854.811	855.165	855.519	855.873	856.228	856.582	856.936	857.290	857.645	857.999
270.2	858.353	858.707	859.062	859.416	859.770	860.124	860.479	860.833	861.187	861.541
270.3	861.896	862.250	862.604	862.958	863.313	863.667	864.021	864.375	864.730	865.084
270.4	865.438	865.792	866.147	866.501	866.855	867.209	867.564	867.918	868.272	868.626
270.5	868.981	869.335	869.689	870.043	870.398	870.752	871.106	871.460	871.815	872.169
270.6	872.523	872.877	873.232	873.586	873.940	874.294	874.649	875.003	875.357	875.711
270.7	876.066	876.420	876.774	877.128	877.483	877.837	878.191	878.545	878.900	879.254
270.8	879.608	879.962	880.317	880.671	881.025	881.379	881.734	882.088	882.442	882.796
270.9	883.151	883.505	883.859	884.213	884.568	884.922	885.276	885.630	885.985	886.339
271.0	886.693	887.057	887.421	887.786	888.150	888.514	888.878	889.242	889.607	889.971
271.1	890.335	890.699	891.063	891.428	891.792	892.156	892.520	892.884	893.249	893.613
271.2	893.977	894.341	894.705	895.070	895.434	895.798	896.162	896.526	896.891	897.255
271.3	897.619	897.983	898.347	898.712	899.076	899.440	899.804	900.168	900.533	900.897
271.4	901.261	901.625	901.989	902.354	902.718	903.082	903.446	903.810	904.175	904.539
271.5	904.903	905.267	905.631	905.996	906.360	906.724	907.088	907.452	907.817	908.181
271.6	908.545	908.909	909.273	909.638	910.002	910.366	910.730	911.094	911.459	911.823
271.7	912.187	912.551	912.915	913.280	913.644	914.008	914.372	914.736	915.101	915.465
271.8	915.829	916.193	916.557	916.922	917.286	917.650	918.014	918.378	918.743	919.107
271.9	919.471	919.835	920.199	920.564	920.928	921.292	921.656	922.020	922.385	922.749
272.0	923.113	923.488	923.863	924.238	924.613	924.988	925.363	925.738	926.113	926.488
272.1	926.863	927.237	927.612	927.987	928.362	928.737	929.112	929.487	929.862	930.237
272.2	930.612	930.987	931.362	931.737	932.112	932.487	932.862	933.237	933.612	933.987
272.3	934.362	934.736	935.111	935.486	935.861	936.236	936.611	936.986	937.361	937.736
272.4	938.111	938.486	938.861	939.236	939.611	939.986	940.361	940.736	941.111	941.486
272.5	941.861	942.235	942.610	942.985	943.360	943.735	944.110	944.485	944.860	945.235
272.6	945.610	945.985	946.360	946.735	947.110	947.485	947.860	948.235	948.610	948.985
272.7	949.360	949.734	950.109	950.484	950.859	951.234	951.609	951.984	952.359	952.734
272.8	953.109	953.484	953.859	954.234	954.609	954.984	955.359	955.734	956.109	956.484
272.9	956.859	957.233	957.608	957.983	958.358	958.733	959.108	959.483	959.858	960.233
ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090

**Table 7-4 (Continued)**  
**SOMERVILLE LAKE -ELEVATION CAPACITY TABLE**  
 ELEVATIONS IN FEET-NGVD, CAPACITIES IN THOUSAND ACRE-FEET

ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090
273.0	960.608	960.994	961.381	961.767	962.153	962.539	962.926	963.312	963.698	964.084
273.1	964.471	964.857	965.243	965.629	966.016	966.402	966.788	967.174	967.561	967.947
273.2	968.333	968.719	969.106	969.492	969.878	970.264	970.651	971.037	971.423	971.809
273.3	972.196	972.582	972.968	973.354	973.741	974.127	974.513	974.899	975.286	975.672
273.4	976.058	976.444	976.831	977.217	977.603	977.989	978.376	978.762	979.148	979.534
273.5	979.921	980.307	980.693	981.079	981.466	981.852	982.238	982.624	983.011	983.397
273.6	983.783	984.169	984.556	984.942	985.328	985.714	986.101	986.487	986.873	987.259
273.7	987.646	988.032	988.418	988.804	989.191	989.577	989.963	990.349	990.736	991.122
273.8	991.508	991.894	992.281	992.667	993.053	993.439	993.826	994.212	994.598	994.984
273.9	995.371	995.757	996.143	996.529	996.916	997.302	997.688	998.074	998.461	998.847
274.0	999.233	999.631	1000.029	1000.427	1000.825	1001.223	1001.621	1002.019	1002.417	1002.815
274.1	1003.213	1003.611	1004.009	1004.407	1004.805	1005.203	1005.601	1005.999	1006.397	1006.795
274.2	1007.193	1007.591	1007.989	1008.387	1008.785	1009.183	1009.581	1009.979	1010.377	1010.775
274.3	1011.173	1011.571	1011.969	1012.367	1012.765	1013.163	1013.561	1013.959	1014.357	1014.755
274.4	1015.153	1015.551	1015.949	1016.347	1016.745	1017.143	1017.541	1017.939	1018.337	1018.735
274.5	1019.133	1019.531	1019.929	1020.327	1020.725	1021.123	1021.521	1021.919	1022.317	1022.715
274.6	1023.113	1023.511	1023.909	1024.307	1024.705	1025.103	1025.501	1025.899	1026.297	1026.695
274.7	1027.093	1027.491	1027.889	1028.287	1028.685	1029.083	1029.481	1029.879	1030.277	1030.675
274.8	1031.073	1031.471	1031.869	1032.267	1032.665	1033.063	1033.461	1033.859	1034.257	1034.655
274.9	1035.053	1035.451	1035.849	1036.247	1036.645	1037.043	1037.441	1037.839	1038.237	1038.635
275.0	1039.033	1039.443	1039.853	1040.263	1040.674	1041.084	1041.494	1041.904	1042.314	1042.724
275.1	1043.135	1043.545	1043.955	1044.365	1044.775	1045.185	1045.595	1046.006	1046.416	1046.826
275.2	1047.236	1047.646	1048.056	1048.466	1048.877	1049.287	1049.697	1050.107	1050.517	1050.927
275.3	1051.338	1051.748	1052.158	1052.568	1052.978	1053.388	1053.798	1054.209	1054.619	1055.029
275.4	1055.439	1055.849	1056.259	1056.669	1057.080	1057.490	1057.900	1058.310	1058.720	1059.130
275.5	1059.541	1059.951	1060.361	1060.771	1061.181	1061.591	1062.001	1062.412	1062.822	1063.232
275.6	1063.642	1064.052	1064.462	1064.872	1065.283	1065.693	1066.103	1066.513	1066.923	1067.333
275.7	1067.744	1068.154	1068.564	1068.974	1069.384	1069.794	1070.204	1070.615	1071.025	1071.435
275.8	1071.845	1072.255	1072.665	1073.075	1073.486	1073.896	1074.306	1074.716	1075.126	1075.536
275.9	1075.947	1076.357	1076.767	1077.177	1077.587	1077.997	1078.407	1078.818	1079.228	1079.638
ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090

**Table 7-4 (Continued)**  
**SOMERVILLE LAKE -ELEVATION CAPACITY TABLE**  
 ELEVATIONS IN FEET-NGVD, CAPACITIES IN THOUSAND ACRE-FEET

ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090
276.0	1080.048	1080.471	1080.894	1081.317	1081.739	1082.162	1082.585	1083.008	1083.431	1083.854
276.1	1084.277	1084.699	1085.122	1085.545	1085.968	1086.391	1086.814	1087.236	1087.659	1088.082
276.2	1088.505	1088.928	1089.351	1089.774	1090.196	1090.619	1091.042	1091.465	1091.888	1092.311
276.3	1092.734	1093.156	1093.579	1094.002	1094.425	1094.848	1095.271	1095.693	1096.116	1096.539
276.4	1096.962	1097.385	1097.808	1098.231	1098.653	1099.076	1099.499	1099.922	1100.345	1100.768
276.5	1101.191	1101.613	1102.036	1102.459	1102.882	1103.305	1103.728	1104.150	1104.573	1104.996
276.6	1105.419	1105.842	1106.265	1106.688	1107.110	1107.533	1107.956	1108.379	1108.802	1109.225
276.7	1109.648	1110.070	1110.493	1110.916	1111.339	1111.762	1112.185	1112.607	1113.030	1113.453
276.8	1113.876	1114.299	1114.722	1115.145	1115.567	1115.990	1116.413	1116.836	1117.259	1117.682
276.9	1118.105	1118.527	1118.950	1119.373	1119.796	1120.219	1120.642	1121.064	1121.487	1121.910
277.0	1122.333	1122.769	1123.206	1123.642	1124.078	1124.515	1124.951	1125.387	1125.824	1126.260
277.1	1126.697	1127.133	1127.569	1128.006	1128.442	1128.878	1129.315	1129.751	1130.187	1130.624
277.2	1131.060	1131.496	1131.933	1132.369	1132.805	1133.242	1133.678	1134.114	1134.551	1134.987
277.3	1135.424	1135.860	1136.296	1136.733	1137.169	1137.605	1138.042	1138.478	1138.914	1139.351
277.4	1139.787	1140.223	1140.660	1141.096	1141.532	1141.969	1142.405	1142.841	1143.278	1143.714
277.5	1144.151	1144.587	1145.023	1145.460	1145.896	1146.332	1146.769	1147.205	1147.641	1148.078
277.6	1148.514	1148.950	1149.387	1149.823	1150.259	1150.696	1151.132	1151.568	1152.005	1152.441
277.7	1152.878	1153.314	1153.750	1154.187	1154.623	1155.059	1155.496	1155.932	1156.368	1156.805
277.8	1157.241	1157.677	1158.114	1158.550	1158.986	1159.423	1159.859	1160.295	1160.732	1161.168
277.9	1161.605	1162.041	1162.477	1162.914	1163.350	1163.786	1164.223	1164.659	1165.095	1165.532
278.0	1165.968	1166.419	1166.869	1167.320	1167.771	1168.221	1168.672	1169.123	1169.573	1170.024
278.1	1170.475	1170.925	1171.376	1171.826	1172.277	1172.728	1173.178	1173.629	1174.080	1174.530
278.2	1174.981	1175.432	1175.882	1176.333	1176.784	1177.234	1177.685	1178.136	1178.586	1179.037
278.3	1179.488	1179.938	1180.389	1180.839	1181.290	1181.741	1182.191	1182.642	1183.093	1183.543
278.4	1183.994	1184.445	1184.895	1185.346	1185.797	1186.247	1186.698	1187.149	1187.599	1188.050
278.5	1188.501	1188.951	1189.402	1189.852	1190.303	1190.754	1191.204	1191.655	1192.106	1192.556
278.6	1193.007	1193.458	1193.908	1194.359	1194.810	1195.260	1195.711	1196.162	1196.612	1197.063
278.7	1197.514	1197.964	1198.415	1198.865	1199.316	1199.767	1200.217	1200.668	1201.119	1201.569
278.8	1202.020	1202.471	1202.921	1203.372	1203.823	1204.273	1204.724	1205.175	1205.625	1206.076
278.9	1206.527	1206.977	1207.428	1207.878	1208.329	1208.780	1209.230	1209.681	1210.132	1210.582
ELEV	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090