

U. S. DEPARTMENT OF COMMERCE, WEATHER BUREAU

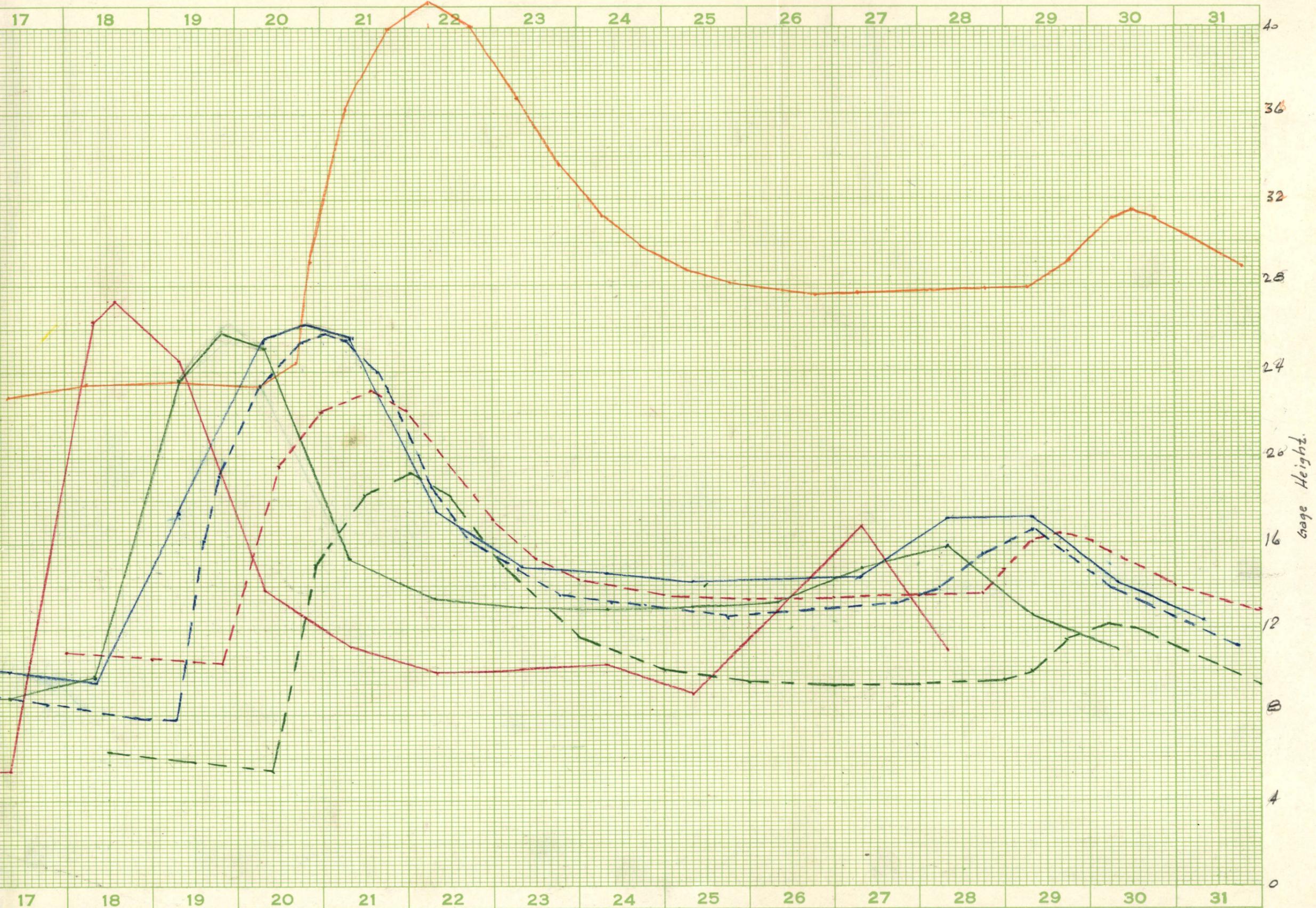
OFFICE _____



Gage Height

Plotted by _____ Checked by _____ Date _____

HYDROGRAPH FOR BRAZOS RIVER - May-1949



MEMORANDUM to Houston Subdistrict Office:

Brazos River at Richmond, Tex.

The maximum stage known since at least 1884 occurred in December 1913. On the basis of the following information obtained from newspapers, this date of 1884 can be extended back to 1852.

The following information was obtained from the Galveston News, May 29, 1884 - by-line Wallis (just upstream from Richmond) May 28, 1884: The Brazos River is higher here than it has been in 32 years. The water is 2 ft deep in N. P. Ward's gin house floor, 1-1/2 miles from the river.

From the Galveston News, June 6, 1884 - by-line Richmond, June 5, 1884: The Brazos River commenced falling Tuesday morning and is now slowly receding. It has been about 7 ft higher than at any time since 1852. The oldest inhabitant has never witnessed anything like it. A statement appears in the Texas State Gazette, dated March 27, 1852, that there was a great flood on the Brazos during this year.

From the above we know that the flood of December 1913 was the greatest since at least 1852. The historical floods paragraph in the station description should be corrected to include this information.

R. U. Grozier
9-24-59

MEMORANDUM to Austin District Office:

This information has been added to our copies of station description.

V. B. Sauer
12-9-59

FLOOD

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
Austin 14, Texas

October 27, 1944

Mr. W. H. Goines
Houston 14, Texas.

Brazos River at Richmond, Tex.

Information in this office concerning the elevation of the 1913 flood at Richmond indicates that the figure of 45.4 ft. which has been published since the establishment of the station, is 2 feet or more too low. This elevation was determined by levels of Aug. 24, 1931, by determining the elevation of the top of a piece of timber nailed to a cottonwood tree located on left bank 75 feet downstream from highway bridge said to mark the 1913 flood.

In order that we may have the best information now available concerning the elevation of the 1913 flood, it would be well for you to try to find additional floodmarks in the vicinity of Richmond, preferably below the railroad and near the gage. It would be well also to tie in the base of rail at the railroad bridge to gage datum and to find out from the railroad company if any changes in the elevation of the base of rail have been made.

Please do this at your first convenient opportunity.

C. E. Ellsworth

C. E. Ellsworth
District Engineer

*20.8 m.s.l. gage
45.4
86.2*
*1913 RR datum
tie RR datum to gage.*

95.3

level bridge

95.3 ft. R.R. datum T/R 95.8

1913	5.1 ft. below B/R
1922	12.7 ✓
1929	12.4, 12.6
1935	16.2 ?



10/2/36 7pm 20.6 reading called crest
5/12/30 EI-70.4
33.1 9.5
32.17 Oct 5

1913 5.1 B/R ✓
 1922 12.7 ✓
 1949 12.4 or 12.6 ✓

5/27/35 16.2 ✓
 May 1935

1936 7pm 10/4 20.6
rust

North of ...
 ...

Top rail 95.8
 rail 6" high
 Base rail 95.3
 1929 rail 80.9
 5/17/30 rail 70.4
 1922 863
 90 rail
 15.7
 1899
 1901
 1905
 1910
 1915
 1920
 1925
 1930
 1935
 1940
 1945
 1950
 1955
 1960
 1965
 1970
 1975
 1980
 1985
 1990
 1995
 2000

3.6

Same elev since about 1905
 when bridge was raised about
 12 ft.

7.6 miles upstr

Brazos - Richmond
Flood data

↓
Rosenberg

Rich

Jan to

Dec 1913

55.5

48.2

$7.3 - 4.0 = 3.3$

June 1929

46.2

40.6

$5.6 - 4.0 = 1.6$

Date 44.9

40.94

SA

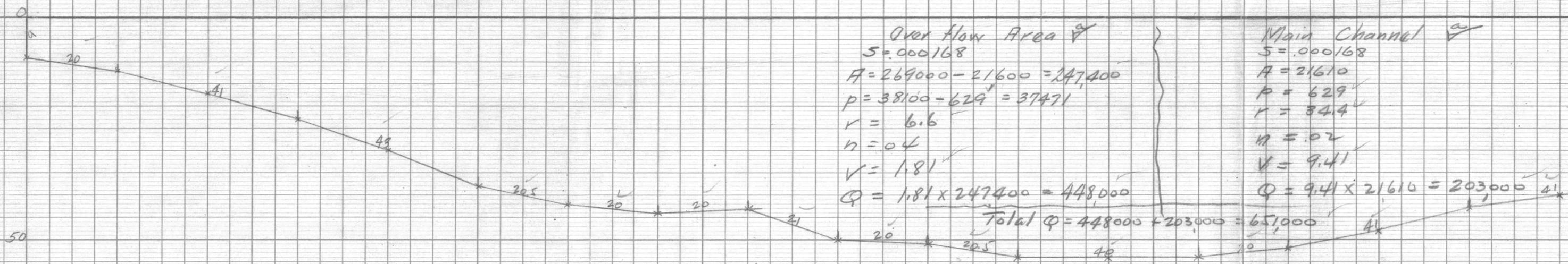
7-12-61

BRAZOS RIVER AT S.P. RR BRIDGE
AT

RICHMOND, TEX.

Comp. by T.T. 2-19-27

Checked by A.S.B. 2-24-27



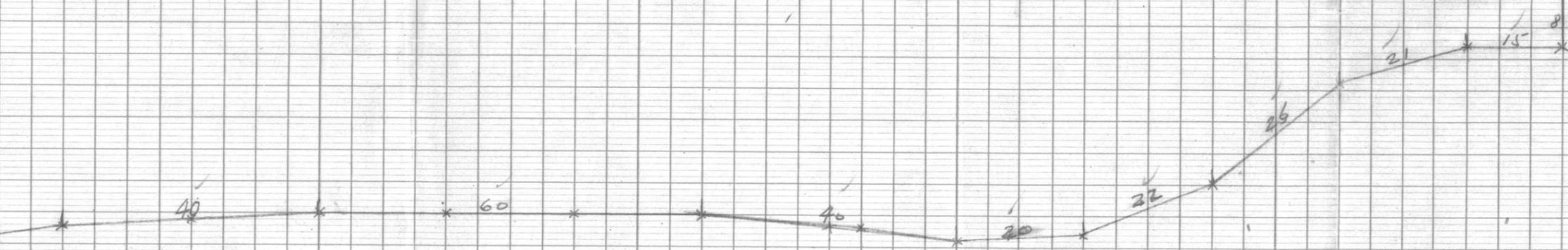
Over flow Area ✓
 $S = .000168$
 $A = 269000 - 21600 = 247400$
 $P = 38100 - 629 = 37471$
 $V = 6.6$
 $n = 0.4$
 $V = 1.81$
 $Q = 1.81 \times 247400 = 448,000$

Main Channel ✓
 $S = .000168$
 $A = 21610$
 $P = 629$
 $V = 34.4$
 $n = 0.2$
 $V = 9.41$
 $Q = 9.41 \times 21610 = 203,000$

Total $Q = 448,000 + 203,000 = 651,000$

✓ Data obtained from Army Engineers Brazos River Survey maps. The area and "p" were determined from the long cross section at S.P. R.R. bridge at Richmond, Tex. The main channel was replotted, using the same scale in the vert. and horizontal to obtain "p".

High Water 1899



400

500

600

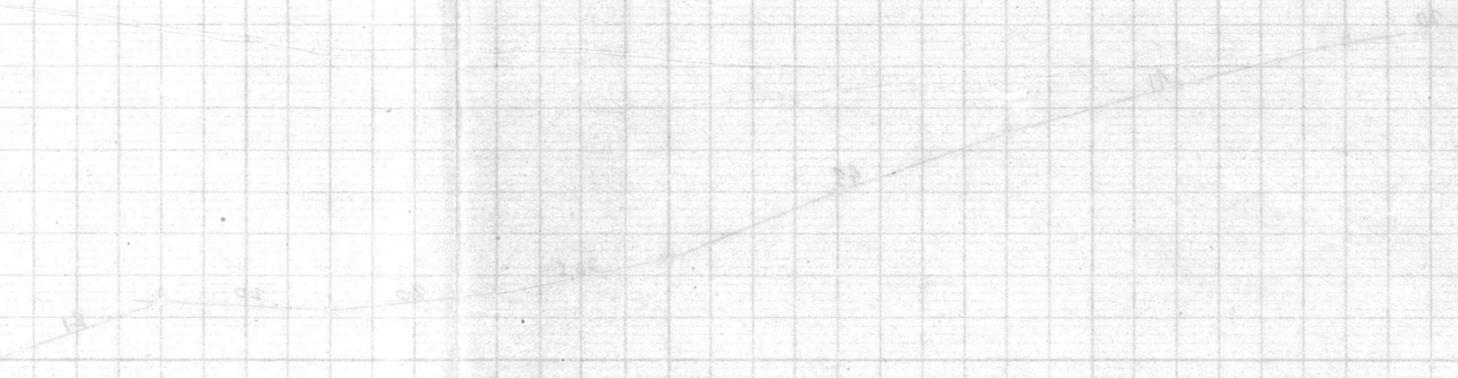
1899 Flood

Brazos River at Richmond
X-section at S.P.R.R. Bridge
Plotted from Army Eng. X-section
Plotted by T.T. 2-19-27

BRAZOS RIVER AT S.P.R.R. BRIDGE
AT
RICHMOND, TEX.
Comp. by T.T. 2-19-27
Checked by T.T. 2-19-27

$Q = 181 \times 242400 = 43872000$
 $Q = 38100 - 429 = 37671$
 $R = 288000 - 21500 = 266500$
 $2 = 00018$
 Main Channel
 $Q = 241 \times 21610 = 5208010$
 $Q = 181 \times 242400 = 43872000$
 Total $Q = 44200 + 202000 = 246200$

Data obtained from Army Engineer's Report
Survey maps. The area and Q are determined from
the long cross section at S.P.R.R. Bridge at Richmond, Tex.
The main channel was re-plotted using the same scale as
the rest and horizontal to 1/1000.



Manuscript to accompany FLOOD DATA, June-July, 1960
BRAZOS RIVER BASIN

1140. Brazos River at Richmond, Tex.

Location.--Lat $29^{\circ}35'$, long $95^{\circ}45'$, near right bank on downstream side of pier of bridge on U. S. Highway 59 in Richmond, Fort Bend County, 925 ft downstream from Texas and New Orleans Railroad Co. bridge and at mile 93.

Drainage area.--44,020 sq mi, approximately, of which 9,240 sq mi is probably noncontributing.

Gage-height record.--Water-stage recorder graph. Datum of gage is 40.94 ft above mean sea level, datum of 1929, Houston supplementary adjustment of 1943.

Discharge record.--Stage-discharge relation defined by current-meter measurements.

Maxima.--June-July 1960: Discharge, 58,100 cfs 10 p.m. June 27 (gage height, 24.45 ft).

1903-5, 1922 to May 1960: Discharge, 123,000 cfs June 6, 1929 (gage height, 40.6 ft).

Maximum stage since at least 1852, 48.2 ft Dec. 10, 1913. From information by Southern Pacific Railroad, other floods are: May 1884, stage 43.7 ft; June 13, 1885, stage 44.7 ft; July 1899, stage 45.6 ft; May 2, 1915, stage 43.3 ft; May 9, 1922, stage 40.9 ft.

Remarks.--Some regulation by reservoirs above Bryan.

Flood

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
Austin 14, Texas

January 15, 1945

Mr. W. H. Goines
Houston 14, Texas.

Brazos River at Richmond, Tex.

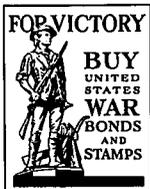
Your levels and other notes of Jan. 9, 1945, tend to confirm the opinion that the gage height of 45.4 feet, which has been published for the crest of the 1913 flood at this station, is 2 feet or more too low, and that it will be necessary to revise the figure in future publications.

However, as the new figure of 47.5 feet for the crest of the flood is based entirely on information from the Railroad, it would be well to verify it if possible. Your notes do not show that you looked for additional high-water marks as suggested in my letter of Oct. 27, 1944. According to a map prepared by the U. S. Army Engineers showing the limits of the 1913 flood, parts of Richmond must have been under water, especially that part of town north or upstream from the railroad. When convenient it would be well to look for additional high-water marks and run levels to them if found.

Your level notes of Jan. 9, 1945, are returned herewith.

C. E. Ellsworth

C. E. Ellsworth
District Engineer



Drays R. n. Richmond

Flood of 1899

Data for Peak discharge obtained from Army
Eng's Drays River Survey Maps.

Slope determined from Elevations between
Miles 100-165.

Areas computed from long χ -sections on the maps
at M.K.T., S.A. & A.P. and S.P. R.R. bridges.

An average "A", "p", and "n" for the over flow area was
obtained from the three χ -sections, using $n = .04$.

In the main channel the section at S.P. R.R. bridge
was replotted and worked separate using the
same slope. But using only the "A", "p" and "n" obtained
at this section, $n = .02$.

Disch. considering channel in 2 sections

Main channel

$S = .000168$
 $A = 21610$
 $p = 629$
 $r = 34.4$
 $n = .02$
 $V = 9.41$
 $Q = 203000$

Over flow area

$S = .000168$
 $A = 269000 - 21610 = 247400$
 $p = 38100 - 629 = 37471$
 $r = 6.6$
 $n = .04$
 $V = 1.81$
 $Q = 448000$

Total Area = $203000 + 448000 = 651000$ S. F.

Discharge considering channel as one section

$S = .000168$
 $n = .04$
 $V = 2.00$
 $Q = 538000$

$p = 38100$
 $n = .05$
 $V = 1.63$
 $Q = 438000$

$r = 7.50$
 $n = .06$
 $V = 1.38$
 $Q = 371000$

Correct

1899 flood in Piedmont

Slope determined from Army Engineers
 Brazos River survey maps.

Elevation at Mile 100 near Refined 89.0 ✓

✓ ✓ ✓ 1.65 ✓ M.K.T.R.R. 146.7 ✓

57.7 ✓

$$\text{slope} = .8876923 \text{ ft. per mile}$$

$$= .0016812 \text{ per ft.}$$

Area at M.K.T.R.R. = 166,500 ✓

2x " " S.A. + A.P.R.R. = 611,400 ✓

" " S.P.R.R. = 298,000 ✓

$$4 \overline{) 1,075,900}$$

$$268,975 = 269,000 \text{ } \frac{1}{4} \text{ } \checkmark$$

width of M.K.T.R.R. = 24,000 ✓

2x ✓ ✓ S.A. + A.P.R.R. = 72,600 ✓

✓ ✓ S.P.R.R. = 47,800 ✓

$$4 \overline{) 1,44,400}$$

$$38,100 \text{ } \checkmark \text{ ft.}$$

n at M.K.T.R.R. = $\frac{166,500}{24,000} = 6.94 \checkmark$

2n at S.A. + A.P.R.R. = $\frac{305,700}{18.42} = 16.84 \checkmark$

n at S.P.R.R. = $\frac{29,800}{47,800} = 6.24 \checkmark$

$$4 \overline{) 30.02} = 7.50 \checkmark$$

Brazos River Flood 1899

man ~~Proving~~
Rehmann

$$n = .04$$

$$\begin{aligned} \text{Slope} &= .00016812' \\ \text{Area} &= 269,000' \\ p &= 38,100' \\ r &= 7.50' \\ V &= 2,200' \\ \underline{Q} &= 538,000' \end{aligned}$$

$$n = .05$$

$$\begin{aligned} \text{Area} &= 269,000 \\ V &= 1.63' \\ Q &= 4,38,000' \end{aligned}$$

$$n = .06$$

$$\begin{aligned} \text{Area} &= 269,000 \\ V &= 1.38' \\ Q &= 371,000' \end{aligned}$$

These figures consider the
channel far ~~more~~ and do not
separate the main channel
from the over flow area

Richard Coates
Houston Post

9-275
May, 1916

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
WATER RESOURCES BRANCH

File No.
Washington-----
Field-----
No. of Meas.-----

Date 1899 flood 1916

DISCHARGE MEASUREMENT NOTES

Brazos River, at S.P.R.R. Br. at Richmond

Dist. from initial point	Depth	Depth of observation	Revolutions	Time in seconds	VELOCITY			Area	Mean depth	Width	Discharge
					At point	Mean in vertical	Mean in section				
0	9										
20	12						210	10.5	20		
40	17						290	14.5	20		
60	23						400	20.	20		
80	30						530	26.5	20		
100	38						680	34.	20		
120	42						800	40	20		
140	44						860	43	20		
160	43						870	43.5	20		
180	50						930	46.5	20		
200	51						1010	50.5	20		
220	54						1050	52.5	20		
240	54						1080	54	20		
260	54						1080	54	20		
280	52						1060	53	20		
300	48						1000	50	20		
320	43						910	45.5	20		
340	40						830	41.5	20		
360	37						770	38.5	20		
380	36						730	36.5	20		
400	35						710	35.5	20		
420	35						700	35.0	20		
440	35						700	35.	20		
460	35						700	35	20		
Totals.											

9-275
May, 1916

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
WATER RESOURCES BRANCH

File No.
Washington-----
Field-----

Date 1899 Flood 190

DISCHARGE MEASUREMENT NOTES

No. of Meas.
Brazos River, at S.P.R.R. br. at Richmond

Dist. from initial point	Depth	Depth of observation	Revolutions	Time in seconds	VELOCITY			Area	Mean depth	Width	Discharge
					At point	Mean in vertical	Mean in section				
480	37							720	36	20	
500	39							760	38	20	
520	38							770	38.5	20	
540	30							680	34	20	
560	14							440	22	20	
580	8							220	11	20	
595	8							120	8	15	
Totals								21610			

Annual Flood data for Brazos River at Richmond, Tex.
 Drainage area 34,810 Net sq. miles. Period of record Oct. 1922 -
 Gage _____ Datum elevation _____ ft. msl
 The maximum flood listed is known to be the greatest in at least _____ years (or since _____)
 Annual Flood data for momentary peak discharges greater than Base 37,000 second - feet.

8396

WATER YEAR	MONTH	DAY	GAGE HEIGHT (feet)	DISCHARGE (second - feet)	ANNUAL FLOODS		PARTIAL DURATION SERIES		REFERENCE
					ORDER (M)	RECURRENCE INTERVAL (years)	ORDER (M)	RECURRENCE INTERVAL (years)	
✓ 1947	Aug.	28	22.06	51,000					
✓ 1946	May	20	30.1	82,500					
✓ 1945	Apr.	27	32.60	85,000					
✓ 1944	May	8	34.70	93,800					
✓ 1943	Oct.	22	22.17 ⁺³	45,500					
✓ 1942	May	1	32.42 ⁺⁴	79,400					
✓ 1941	Nov.	28	38.40 ^{+1.8}	117,000					
✓ 1940	July	5	31.22 ^{+2.40}	82,100	2	8			
✓ 1939	May	21	20.52 ⁺⁸⁰	41,900	2	1.18			
✓ 1938	Jan.	28	29.70	68,600					
✓ 1937	Oct.	5	32.17	77,100					
✓ 1936	Dec.	9	33.1 ^{-1.6}	74,700					
✓ 1935	May	27	36.12	90,900					
✓ 1934	Apr.	10	29.4	71,400	4	8			
✓ 1933	May	31	18.70	34,000	2	1.08			
✓ 1932	Feb.	24	31.85	80,500					
✓ 1931	Oct.	10	27.6	52,100					Sta. at Rosenberg
✓ 1930	May	23	36.8	78,800					do
✓ 1929	June	6	46.2	123,000	3	3			
✓ 1928	Oct.	5	20.6	36,800	2	1.18			Sta. at Rosenberg
✓ 1927	June	25	22.4	42,500					do
✓ 1926	Apr.	26	37.1	86,900	5				do
✓ 1925	May	12	17.1	24,200	2	1.04			do
✓ 1924	Feb.	16	33.0	73,000					do
✓ 1923	Apr.	15	29.35	54,900					do
1948	May	15	13.22	22,100					
✓ 1950	Feb.	15	-	44,500					
✓ 1951	June	17	9.48	11,100					
✓ 1952	May	28	15.75	31,400					
✓ 1953	May	19	29.66	82,100					
✓ 1954	Oct.	30	15.42 ^{+1.80}	32,400					
✓ 1955	May	23	12.76	19,300					
✓ 1956	May	6	12.25	12,900					
✓ 1957	May	5	37.13 ^{+2.5}	119,000					
✓ 1958	Oct.	20	31.90	87,600					
1959	Apr.	19	19.19	39,200					
1960	Oct.	9	25.00	60,300					

Mean annual flood for period

Notes:- Separate water years by drawing solid lines (—). Indicate breaks in period of record by double solid lines (==). Recurrence Interval = $\frac{N+1}{M}$.

EK

U. S. DEPARTMENT OF COMMERCE
WEATHER BUREAU

REPORT ON RIVER - GAGE STATION

RECEIVED
HOUSTON, TEXAS
OCT 25 1963
U. S. G. S.
WATER RESOURCES DIVISION
SURFACE WATER BRANCH

At ~~Neas~~ Richmond, Texas on the Brazos River ~~Creek~~

WITH SUPPLEMENTAL REPORTS OF INSPECTION

(West Gulf of Mexico River system, Houston, Texas district.)

SOURCES OF INFORMATION:

WB Forms: 4004B, C, D; 530-2, 530-3, 530-6; 531-2, 531-3, 531-6; 612-13
IRS; Brazos River Profile (Galv. USE); Topographic Maps (Quadrangles)
Tabulation: Max & Min monthly & annual stages

INSTRUCTIONS

A report on this form should be prepared upon establishment of a new river-gage station by the Weather Bureau, or upon the beginning of joint use by the Weather Bureau and some other agency of a gage not owned by the Weather Bureau. Gaging stations for which this form should be prepared include all those operated by the Weather Bureau; or for which public forecasts are issued; and/or those from which official records are maintained or published by the Bureau. The form is intended to contain data that are of a permanent, or fairly permanent, nature. However, when for any reason, the information in a previous report is made obsolete by new conditions, the page or pages containing that information should be completely rewritten, with the date of the revision given at the bottom of the appropriate pages. At least every ten years, the data should be reviewed and, unless there are no significant changes, the entire form should be rewritten.

Form 531-4 consists of a cover and eleven numbered pages. Appropriate blanks or spaces have been provided in the form for the entry of the various data. If more space is needed, information should be continued on extra sheets in as much detail as is considered essential. These continuation sheets should be inserted immediately following the pertinent page of the form.

This form together with WB Forms 531-5 and 500-9 will constitute the history of the station and the gage to which they pertain. If a descriptive form prepared by another agency for the station is available a copy should be incorporated with this report. The originals will be forwarded to the Central Office, mailed flat, copies furnished the appropriate Area Hydrologic Engineer, River Forecast Center, and a copy retained at the River District Office.

The following abbreviations will be used:

HW for high water.
LW for low water.
US for upstream.
DS for downstream.
RB for right bank and LB for left bank. (Instead of designating banks by points of the compass, refer to them as right or left, considering that the observer is standing with his back upstream, also use in preparing BM and other descriptions.)
BM for bench mark.
MSL for mean sea level.
MGL for mean gulf level.
MLW for mean low water.

MT or MLT for mean tide, or mean low tide.
USWB for U. S. Weather Bureau.
USGS for U. S. Geological Survey.
USC & GS for U. S. Coast and Geodetic Survey.
Miss. Riv. Com. for Mississippi River Commission.
Mo. Riv. Com. for Missouri River Commission.
(Not in existence now, but its publications are still referred to.)
USE for Corps of Engineers, U. S. Army.
TVA for Tennessee Valley Authority.
USB for U. S. Bureau of Reclamation.
IB & WC for International Boundary and Water Commission.

HS Div., SCAHE, RFC, USGS, WRAS HOU.

3. Type of gage(s) used by USWB: Wire-weight (inclined) Water stage recorder Staff (vertical) Telemark

Other (Specify) _____

4. Owned by USWB USGS USE Other (Specify) _____

Maintained by USWB USGS USE Other (Specify) _____

5. Elevation of gage zero 40.94 ft. above m.s.l. 1943
(Year of adj. to level net)

Source WSP 1962

Is value obtained by leveling? Yes No

6. Bench-mark description (Include 2 or more BM's, if possible. If BM's are on building, bridge, or monument; references to height of floor, or street would be of value. Use additional sheets if necessary.)

	Elev. above gage zero (feet)	Elev. above MSL (feet)
<u>BM- 1925: Bronze tablet set in concrete post along S edge of sidewalk, 3 ft west of inside sidewalk intersection at NE corner of court-house yard, 2 blocks W of gage.</u>	<u>52.96</u>	<u>93.90</u>

R.M. 5: Standard USGS bronze tablet set in top of 5" reinforced concrete post, set 32 ft below and 0.5 foot above grad, 16 ft US from 36" pecan tree, 85 ft US from bridge, 180 ft directly US from left cable anchorage, and 545 ft left of recorder.

<u>40.86</u>	<u>81.80</u>
--------------	--------------

R.M. 6: Standard USGS bronze tablet set in top of DS end of right concrete abutment of bridge, to which gage is attached, located 4 ft below roadway, and 220 ft to right of recorder.

<u>51.275</u>	<u>92.215</u>
---------------	---------------

7. USC & GS 1943
(Name of person, or agency, responsible for leveling) (Date)

8. Is station rated by any agency? Yes No If yes, by whom USGS

9. If wire-weight gage, give 58.68 (by dial) feet.
(Correct check bar reading)

Station Richmond, Texas Date September 23, 1963

recording
 10. If automatic gage, state _____ (Make) _____ (Model No.)
 Chart is Continuous , Weekly , Other ; Time scale _____ in./day
 Stage scale _____ in./ft. Is there an outside staff? Inside staff? Float tape?
 Where are recorder charts filed? _____

11. Description of gage and structure to which attached (serial numbers of wire-weight gages should be included).
 Use separate sheet for photographs or sketch.
 Type A wire-weight gage, attached to US handrail of walkway on US side of US 59 Hwy Bridge, (serial No. 359)
 (Wire-weight is lighted with battery operated device for readings during poor visibility or early morning darkness.)

12. Alternate location available:
 S.P.R.R. Bridge, 925 ft US

13. Other river gage(s) now at same site, or in immediate vicinity:
 a. Type Recorder (bubble) Owned by USGS
 Distance from gage checked in item 3 40 ^{feet US} _{miles DS.} Are records comparable? Yes
 Zero elevation 40.34 ^{above} _{feet below MSL.}
 b. Type _____ Owned by _____
 Distance from gage checked in item 3 _____ ^{feet US} _{miles DS.} Are records comparable? _____
 Zero elevation _____ ^{above} _{feet below MSL.}

Station Richmond, Texas Date September 23, 1963

PART B.--STATION HISTORY.

1. Records available:

(Agency)	1900	1910	1920	1930	1940	1950	1960	1970
USWB *								
USGS								

2. Types of gages:

Staff *								
Wire-weight								
Chain-weight								
Recorder								
Telemark								

3. Zero elevations:

unknown *								
41.84								
44.9								
40.94								

4. Site: 1900 1910 1920 1930 1940 1950 1960 1970

(1) Booth *								
(2) Richmond RR Bridge								
(3) Rosenberg								
(4) Richmond Hwy Bridge								
(5)								

5. Published records:

Daily River Stages - USWB *								
Water Supply Paper - USGS								

*Type in dates prior to 1900

Station Richmond, Texas Date September 24, 1963

Location #1 - Booth, Texas: 5/10/01 - 6/30/14
Lat. 29-33; Long. 95-38.

Station established at Booth, Texas May 10, 1901. Gage was inclined staff gage in 5 sections: (1) - 4 to 6 ft, (2) 6 - 16 ft, (3) 16 - 26 ft, (4) 26 - 36 ft, and (5) 36 - 42 ft. Gage made of 2 X 4 inch pine painted white with graduations burnt into the wood. Located on S side of river (RB) on line between lots 1 and 2, where the division of Kuykendall League touches the river. First two sections fastened to posts set in river bed. Third and fourth sections fastened to willow tree. Fifth section fastened to a bearing pecan tree. Flood stage 39 ft; width of river at average LW, 350 ft; BM's not available, and MSL datum unknown. Brazos River Profile (USE, Galveston, 1946) indicates Booth as 82 miles above mouth, about 11 miles DS from present site at Richmond, and plots zero of gage about 30 ft. MSL. Sugar Land Quadrangle indicates bed of river near Booth as 30 ft., and elevation of Booth about 70 ft. MSL. This seems to verify flood stage near 39 or 40 ft. Since station was discontinued June 30, 1914, it will not be practical to determine zero datum accurately, but approximate datum may be set as 30 ft. MSL. Because of unknown zero datum, and lack of information regarding slope of river, it is not practicable to convert Booth readings to present site and datum at Richmond.

Location #2 - Richmond RR Bridge:
(925 ft. US from present site)
Lat. 29-35; Long 95-45.
1/1/03 - 6/30/06

On Jan. 1, 1903, USGS established a reference point on RR bridge 925 ft. US from present recording gage. Gage heights were obtained with a weighted plumber's chain graduated in ft, measured down from reference point to water surface during 1903. During 1904-06, heights were obtained from standard chain gage attached to RR bridge. (BM's are described in WSP 99, 132, and 174; since station is discontinued, BM's will not be repeated here.) Gage discontinued June 30, 1906. Datum of gage was 41.64 ft. MSL, datum of 1929. (Authority: USGS Description Revised 10/9/61, copy attached.)

Location #3 - Rosenberg, Texas:
(7.6 miles US from present gage)
Lat. 29-34; Long 95-48.
7/1/14 - 12/30/34

On July 1, 1914, a chain gage established by USWB on FM Road at Rosenberg on Hwy bridge 260 ft. from S end. Distance from marker to lower end of weight, 70.10 ft. Datum of zero elevation was 44.9 ft. MSL, unadjusted.

BM: USGS bronze tablet set in toe of S concrete abutment of bridge DS side, 49.07 ft. above zero; 93.97 ft. MSL.

Oct. 1, 1922 - Sept. 30, 1931: Station used by USGS. Station discontinued by USWB on Dec. 30, 1934.

Corrections to Records: Readings from July 1914 to December 1916 in error. Add 3.9 ft. to correct for error. (Corrigenda, DRS 1917, pg. 37)

Break in Record: June 1- October 18, 1919, only occasional readings during this period.

Rosenberg stages may have been affected by differing amounts of backwater from Jones Creek during HW readings. Corrections to present station and site are not practicable because of differing slope during HW.

Location #4 - Richmond Hwy Bridge:
Lat. 29-35; Long. 95-45.
6/7/31 to present date.

On June 7, 1931, USGS installed water-stage recorder housed in timber shelter over corrugated pipe well attached to DS end of left main pier to hwy bridge on U.S. Hwy 59 and 90A. During June 1931 a cableway was installed about 270 ft. DS from gage. Recorder failed to obtain satisfactory gage-height record at LW because of building up of sand bar around pier to which gage was attached.

1/31/35: USGS installed for USWB Type A wire-weight gage (serial No. 359) attached to US handrail of walkway on US side of bridge on U.S. Hwy 59, 90 ft. left of present recording gage.

10-23/43: USGS moved recording gage structure from DS end of left pier and re-installed recorder in circular metal shelter cover over corrugated metal pipe well attached to DS end of right main pier on hwy bridge.

May 1957: Caving banks threatened cableway and it was removed during flood.

12/1/58: Lighting device installed by G. W. Hunn on wire-weight gage for obtaining more accurate readings during poor visibility and winter mornings.

2/1/60: Inspection by O. W. Hunn reported that batteries had been in gage for 14 months, and still working. Long life of batteries attributed to care by observer, who dries the weight with tissue paper after each observation.

6/15/61: USGS removed corrugated metal pipe well from DS end of right main pier. Metal gage shelter only was left in place and a bubble gage installed inside of shelter on 6/20/61. Bubble tube is 1/8 inch I. D. polyethylene tubing about 60 ft. long and encased in 2" diameter galvanized pipe. Recorder will function through 50 ft. range.

All gages at Richmond in use after 6/7/31, were set to same datum, 40.94 ft. MSL, datum of 1929, Houston supplementary adjustment of 1943.

Top of shelter floor is 49.7 ft. above zero.

Top of instrument shelf is 52.6 ft. above zero.

Elevation of check bar by levels, 58.64 ft; by dial, 58.68 ft.

Bubble gage is equipped with counter which reads to hundredths and is set to read with the wire-weight gage.

Bench Marks:

37M - 1925: Bronze tablet set in concrete post along S edge of sidewalk, 3 ft. West of inside sidewalk intersection at NE corner of courthouse yard, 2 blocks W of gage; 52.96 ft. above zero; 93.90 ft. above MSL.

R.M.3: Top of right bolt in row of four anchor bolts in top of DS end of pier about 0.3 ft. above top of pier cap and 265 ft. to left of recorder; 49.315 ft. above zero; 90.255 ft. MSL.

R.M.4: Top of 1/2" round reinforcing bar set in right cable anchorage near eyebar and about 3/4" above top of anchor; 49.88 ft. above zero; 90.82 ft. MSL.

R.M.5: Standard USGS bronze tablet set in top of 5" reinforced concrete post, set 32 ft. below and 0.5 ft. above ground, 16 ft. US from 36" pecan tree, 65 ft. US from bridge, 180 ft. directly US from left cable anchorage, and 545 ft. left of recorder; 40.86 ft. above zero; 81.80 ft. MSL.

R.M.6: Standard USGS bronze tablet set in top of DS end of right concrete abutment of bridge, to which gage is attached, located 4 ft. below roadway, and 220 ft. to right of recorder; 51.275 ft. above zero; 92.215 ft. MSL.

R.M.7: Top of 5/8" galvanized bolt set horizontally in right side of DS end of pier to which gage is attached; 5.830 ft. above zero; 46.77 ft. MS.

Remarks: Records during Jan, 1935 were from the USGS recorder to fill the gap between the last Rosenberg record and the first observation of wire-weight gage at present site, taken on Feb. 1, 1935. During LW, there is considerable shifting of sand bars. One flood scours sand bars, making lower readings possible while another flood causes bank caving and deposits of new sand on bed of stream. Bank caving during the 1957 flood was observed by Mr. Crooker of this office. Please note the following evidences of shifting:

Jan. 13, 1957, low gage reading of 0.1 ft; bank caving at Washington State Park made it necessary to abandon staff gage at the site; bank caving endangered SPRR bridge at Wallis; bank caving observed even in Freeport area during inspection of supplementary river gages established by Dow Chemical Company; USGS on 8/13/57 computed zero flow as 0.5 ft; low gage reading on Aug. 28, 1963 was -0.1 ft, indicating scouring since Aug. 1957.

PART C.--STATION HYDROLOGY.

1. Distance of gage above mouth of river 93.0 miles. Authority DRS Vol. LVI - 1960
2. Drainage area above gage 44,020 sq. miles. Authority XXX USGS, 1962
 (9,240 sq. mi. noncontributing.) SWR (Surface Water Records of Texas)
3. Bankful stage 42 ft. Width of river at this stage abt. 600 ft.
4. Flood stage 35 ft. How determined? LB overflows into fishing camp and RR
overflows into pasture land few miles DS.

5. High water records (list in chronological order):

	Date	Stage			
		From gage readings		From HW marks	
		(a)	(b) #	(a)	(b)
(1)	May 84				43.7
(2)	Jul 99				45.6
(3)	Dec 10 13	47.5 ←			48.2 ←
(4)	May 2 15	50.3			43.3
(5)	May 9 22	49.8			40.9
(6)	Jun 6 29	46.2			40.6
(7)	May 27 36	38.5	38.5		
(8)	Nov 28 40	38.7	38.7		
(9)	May 10 44	35.0	35.0		
(10)	May 5 57	37.5	37.5		

HW readings at Rosenberg, 9 miles US affected by differing amounts of backwater from Jones Cr.
 1913 flood crest observed at Booth, 11 miles DS.
 Readings prior to 2/1/35 not comparable; so HW mark of 48.2 feet on 12/10/13 believed to be reliable for present datum and site.

- (a) Stage referred to gage datum and site then in use.
 (b) Stage referred to present gage datum and site.

6. Low water records (list in chronological order): (since 2/1/35)

	Date	Stage			
		From gage readings		From LW marks	
		(a)	(b)	(a)	(b)
(1)	Oct 10 1952		-0.1		
(2)	Apr 4 1953		0.1		
(3)	Mar 31 1954		-0.5		
(4)	Mar 24 1955		-0.1		
(5)	Apr 6 1956		-0.1		
(6)	Jul 5 1956		-0.9		
(7)	Aug 15 1956		-0.2		
(8)	Sep 19 1956		0.1		
(9)	Jan 13 1957		0.1		
(10)	Aug 28 1963		-0.1		

Min discharge 35 cfs 8/23/54. Readings prior to 2/1/35 are at different
 (a) Stage referred to gage datum and site then in use. datum, and not comparable.
 (b) Stage referred to present gage datum and site.

7. Conditions affecting flow of stream at or near gage.

a. Bed of stream is composed mainly of Sand and silt
 (Specify as sand, gravel, rock, or silt, etc.)

b. Control below gage. Yes No . If control is natural, is it permanent or, shifting
 If controlled by a dam give type of structure. _____

If gage is in pool, give normal pool stage _____ ft.

c. Is flow affected by dam upstream? Yes No . If yes, describe dam. _____

Describe effect of dam, if any, on flow at gage _____
 (Specify whether fluctuations are diurnal, seasonal, or only during high water, etc., and whether slight, moderate, or heavy.)

Is part of water diverted? Yes No Irrigation and municipal supply

d. Winter flow. Is channel subject to: Freezing ; Anchor ice ; Ice jams No icing

e. Zero flow. Does flow at gage ever cease? Yes No . If so, what is gage height of zero flow? 0.5 ft. (8-13-57) (subject to change because of shifting sand bars)

f. Topography. Describe briefly the topography of both banks along the reach.

In coastal plains, gently sloping toward Gulf of Mexico. At gage site LB overflows at 42 ft. and RB at 48 ft., however 35 ft. (flood stage) floods pasture land a few miles DS. Near 37 ft. Brazos overflows LB into Oyster Creek below Juliff.

Station Richmond, Texas Date September 27, 1963

8. Gage elevations of areas subject to overflow.--Give elevation of both banks, mentioning any particularly low banks in the reach of the river served by this station. List a number of gage heights at which various significant areas are affected by overflow. Particular reference should be made to railroads, streets, roads, residence and business section, farmlands, etc. If possible, include a table showing relationship between stage and acres flooded, or between stage and flood damage. Use the staff on page 9 for further illustration.

Flood stage of 35 ft. is based on overflow of pasture land a few miles DS below the gage. LB overflows at 42 ft. and RB at 48 ft. According to topographic maps, the MSL elevation of Richmond is 89 ft. The 1913 flood crest based on present site was 48.2 ft, which should indicate flooding in the city of Richmond. Extracts from the 1913 flood report by Mr. Bunnemeyer indicates that only a small portion of Rosenberg was flooded, mostly on the north side of the RR tracks. The flooded area from Richmond to Booth had a width of 10 miles. East of the Brazos, the flood area extended about 30 miles, to Chocolate Bayou near Alvin. On the west side of the Brazos, flood waters were reported to join those of the Colorado River. This report has not been verified. However, a reliable report from Velasco near the mouth of the river indicated that the flood water extended to the San Bernard River.

The 1957 flood overflowed into Oyster Creek below Juliff, causing flooding near Angleton; State Hwy 35 between Angleton and West Columbia served as a temporary levee, but flooding of 1 to 10 inches was extensive in the Freeport area. According to Geological Survey paper on "Discharge in Buffalo Camp Bayou during the flood period of April - June, 1957," Brazos River water flooded into Buffalo Camp Bayou, Oyster Creek, and Bastrop Bayou. The river was approximately $5\frac{1}{2}$ miles wide, flooding into the low lands on both sides of the river.

S.P.R.R. reported that their bridge near Wallis was endangered by considerable bank caving. Railroad crews emptied several car loads of gravel and rock to save the piers. Bank caving was extensive along the Brazos below Washington. According to the Thompsons Quadrangle sheet, the probable overflow point was near Juliff, and the critical level of LB seems to be 55 ft MSL.

Where flood protective works (levees, bypasses, etc.) are in existence in the reach of river served by this gage, they will be listed below with the design protection, or operation grade referred to the gage at this station.

Station

Richmond, Texas

Date

September 25, 1963

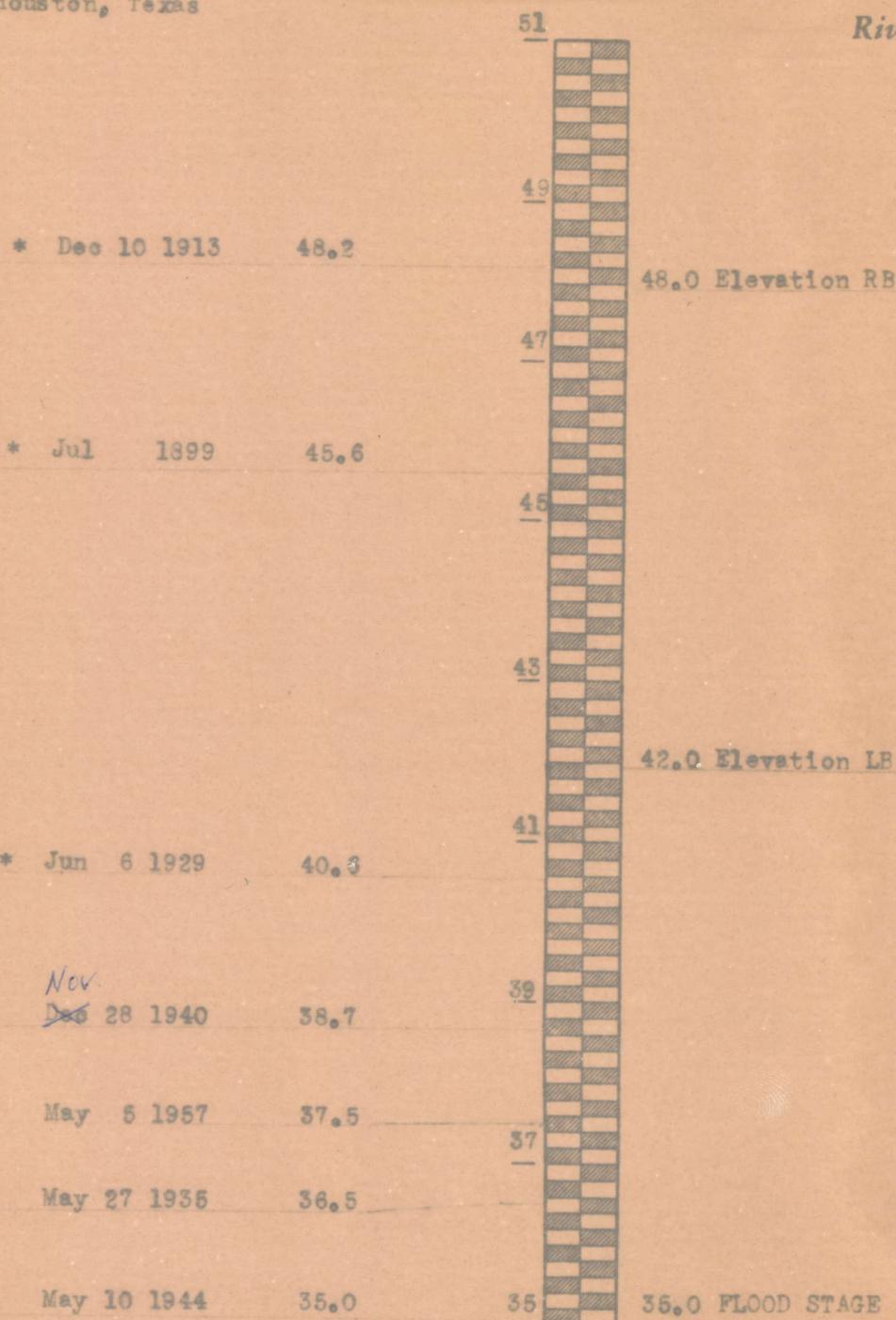
The 1957 flood damage in Fort Bend County according to the County Engineer amounted to approximately \$668,000; 65,000 acres were flooded. Crop loss amounted to \$803,000; live stock loss at \$5000; and buildings, fences, and other farm property at \$60,000. This amount of damage occurred when the crest at Richmond was 37.5 ft. The above damage does not include damages reported by public utilities and rail roads.

According to the Brazos River profile, the low steel elevation of the Hwy bridge at Richmond would be 51 ft. and of the RR bridge at Richmond 53 ft.

RIVER STAGE DATA

RIVER DISTRICT OFFICE
Houston, Texas

Station Richmond
Texas
River Brazos



* High Water Mark

REACH: from RR bridge near Wallis
to RR bridge near Thompsons.

Elevation Zero 40.94

Data Credits USWB, USGS

Date September 13, 1963

PART D.--STATION OPERATION.

1. Observations.

a. Regular daily observations. Yes No ; throughout the year , from _____ (Date)
_____ to _____ (Date) , at _____ a.m. _____ S.T.

Are these readings telegraphed or telephoned to district center daily , are they sent under special conditions only or not at all

b. Special observations are telegraphed or telephoned under the following conditions: _____
When requested by district center or by Corps of Engineers at either Galv or FTW, particularly when crest is expected in afternoon.

2. Communications.

a. Observer's reports are telegraphed telephoned . Does observer have a telephone? Yes
No . Is report telephoned to a telegraph office? Yes No . Telegraph office is located
in _____ (Name of town or city)

b. Cost of transmission per message \$ 0.35

3. Stage forecasts and warnings.

a. Are stage forecasts made daily or during flood , or are only flood warnings (not in terms of stage) sent? Warning stage, if other than flood stage _____ ft.

b. Describe method of dissemination of forecasts and warnings.

- (1) telephone to observer;
- (2) daily river bulletins;
- (3) radio broadcasts from Houston, Rosenberg, Austin, Brenham, and College Station.
- (4) teletype to Dow Chemical Co., Freeport.

c. What is importance of stage forecasts and warnings for this station?

Cattle grazing near river a few miles DS; several cabin sites DS like Lake Alaska subject to overflow; Dow Chemical Co., Freeport use Brazos water for fresh water supply at William Harris Reservoir and Brazoria Reservoir, routing water down Oyster Creek. City of West Columbia concerned with flooding in East Columbia.

Station Richmond, Texas Date September 11, 1963

4. Observer. (List as far as possible and in chronological order, all observers who have maintained readings at this station.)

a.	<u>Name of observer</u>	<u>Dates of service</u>	<u>Compensation</u>
	C. S. Mc Elroy	1/1/03 - 6/5/06 (Booth)	
	T. R. Booth	6/6/06 - 6/30/14 (")	
	W. J. Meininger	7/1/14 - 10/15/19 (Rosenberg)	
	James B. Jones	10/16/19- 1/16/20 (")	
	Geo. W. Nelson	1/17/20 - 11/21/27 (")	
	Oliver Cochran	11/22/27- 3/26/30 (")	
	Robert S. O'Brien	3/27/30 - 8/22/31 (")	
	Lewis A. Goss	8/23/31 - 12/31/34 (")	
	Leon J. Helwig	2/1/35 - 4/30/44	\$7/mo + 25¢ ea.
	Sanford J. Butler	5/1/44 - 3/31/52	10/1/45 to date:
	Earl Wright	4/1/52 - 5/31/55	\$8.50/mo (S & E);
	Sanford J. Butler	6/1/55 - 3/31/57	3.50/mo (RH-1); 60¢
	Mrs. Willie H. Butler	4/1/57 to date	ea. extra (RH-1).

b. If present observer has other duties to perform for WB, in addition to reading river gage, describe duties briefly, and give type of equipment and location of same.

Also measures and reports rainfall from raingage at residence.

c. Name of substitute or alternate observers available.

Mr. Sanford J. Butler, husband of observer and also former observer, takes most of observations. He is retired Water Supt. If Mrs. Butler resigns, the Water Dept. may be able to recommend a successor.

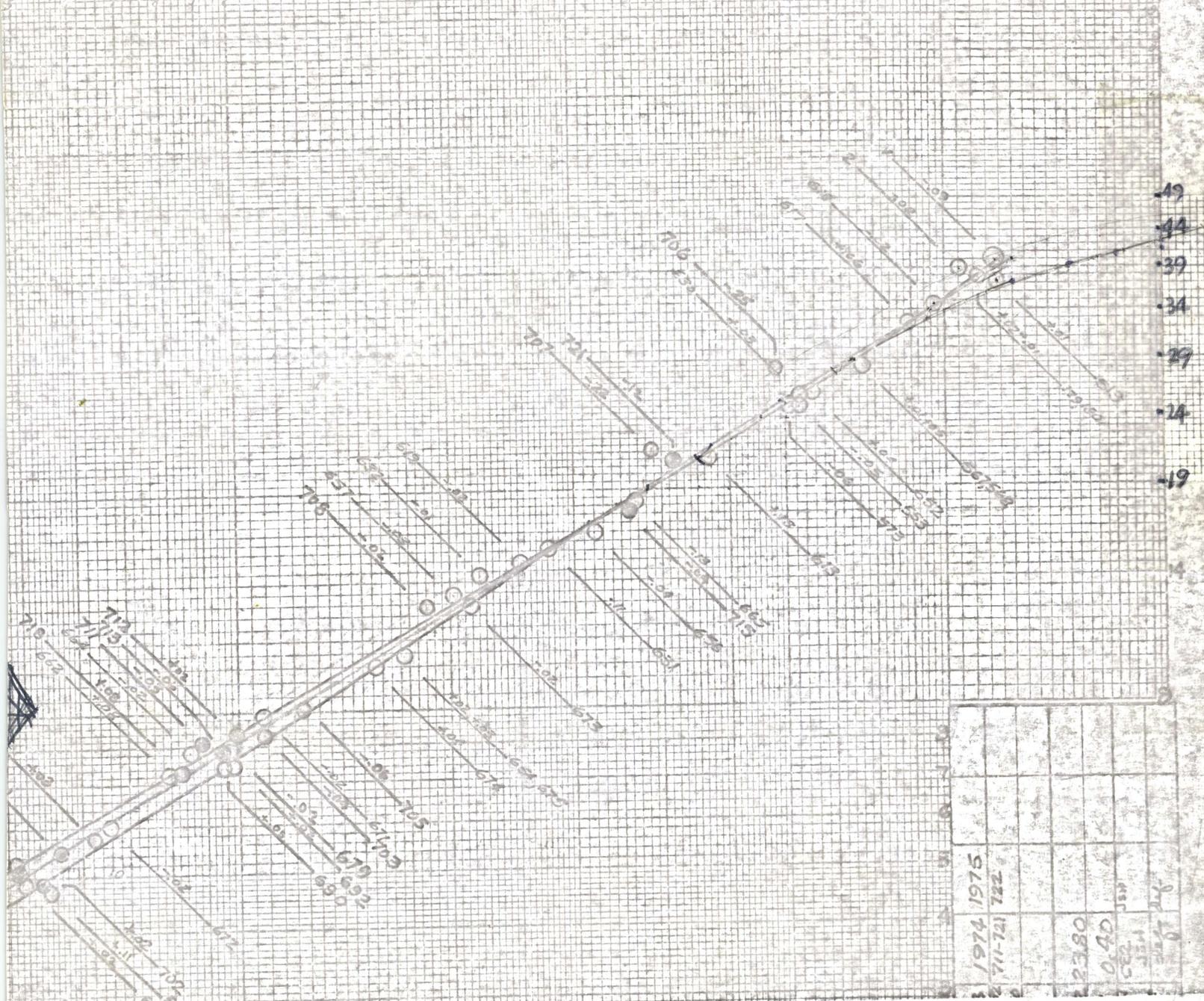
Station Richmond, Texas

Date September 11, 1963

File: Brazos Richmond misc

OR 08114000... Brazos River at Richmond, Tex. File No. _____
Drainage area... 44,020 sq. mi. (9,240 sq. mi. probably non-contributing) Field _____

0 6,000 8,000 10,000 20,000 30,000 40,000 50,000 60,000 80,000 100,000 200,000



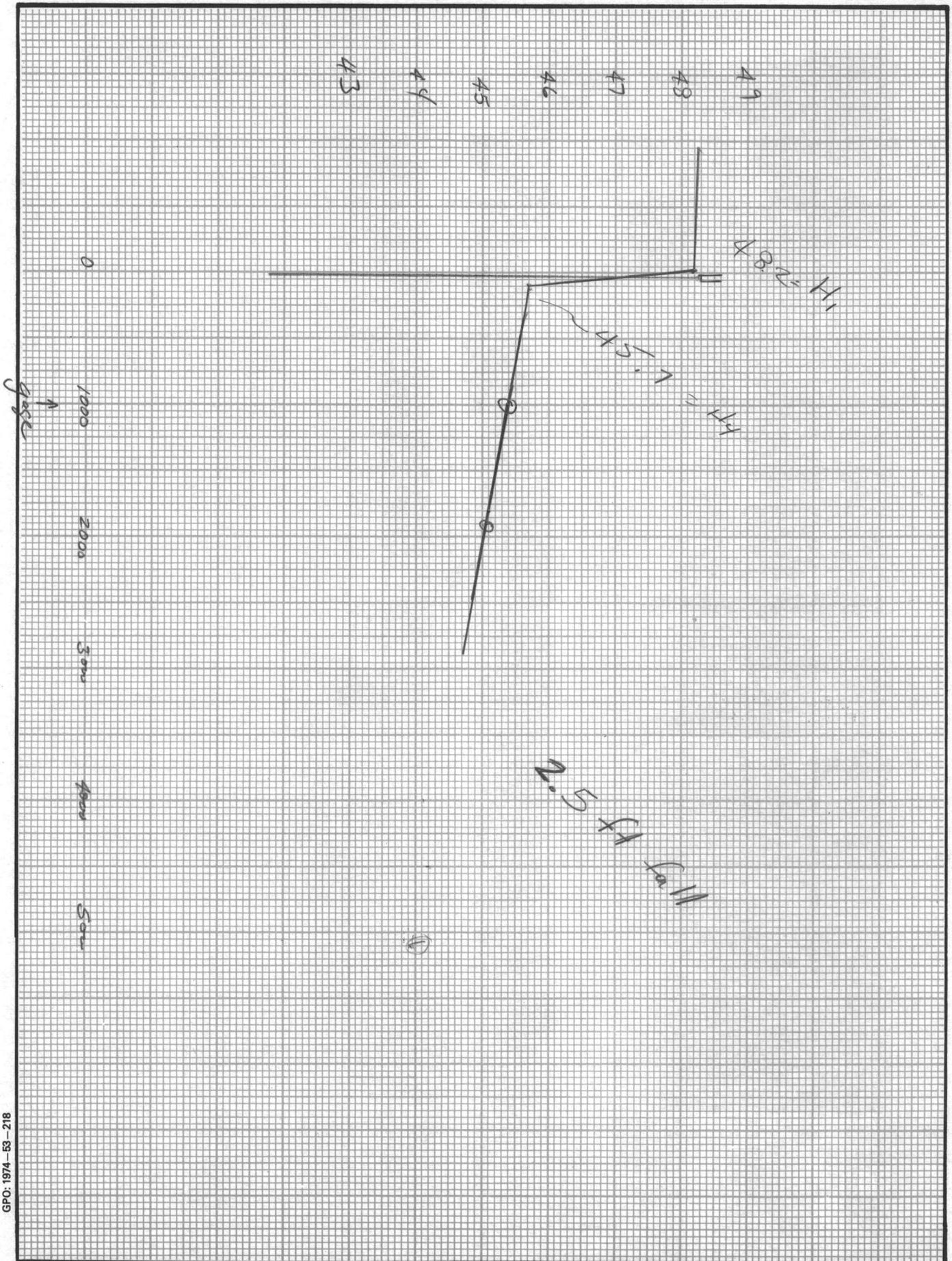
1974	1975
711-721	722
08	08
0.40	0.40
1581	1581
JUN	JUN
1974	1975

Corps of Engineers extension
(Geo Hare & Roy Dittmar)

△ Probably 1913 flood

plotted 9-17-75

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

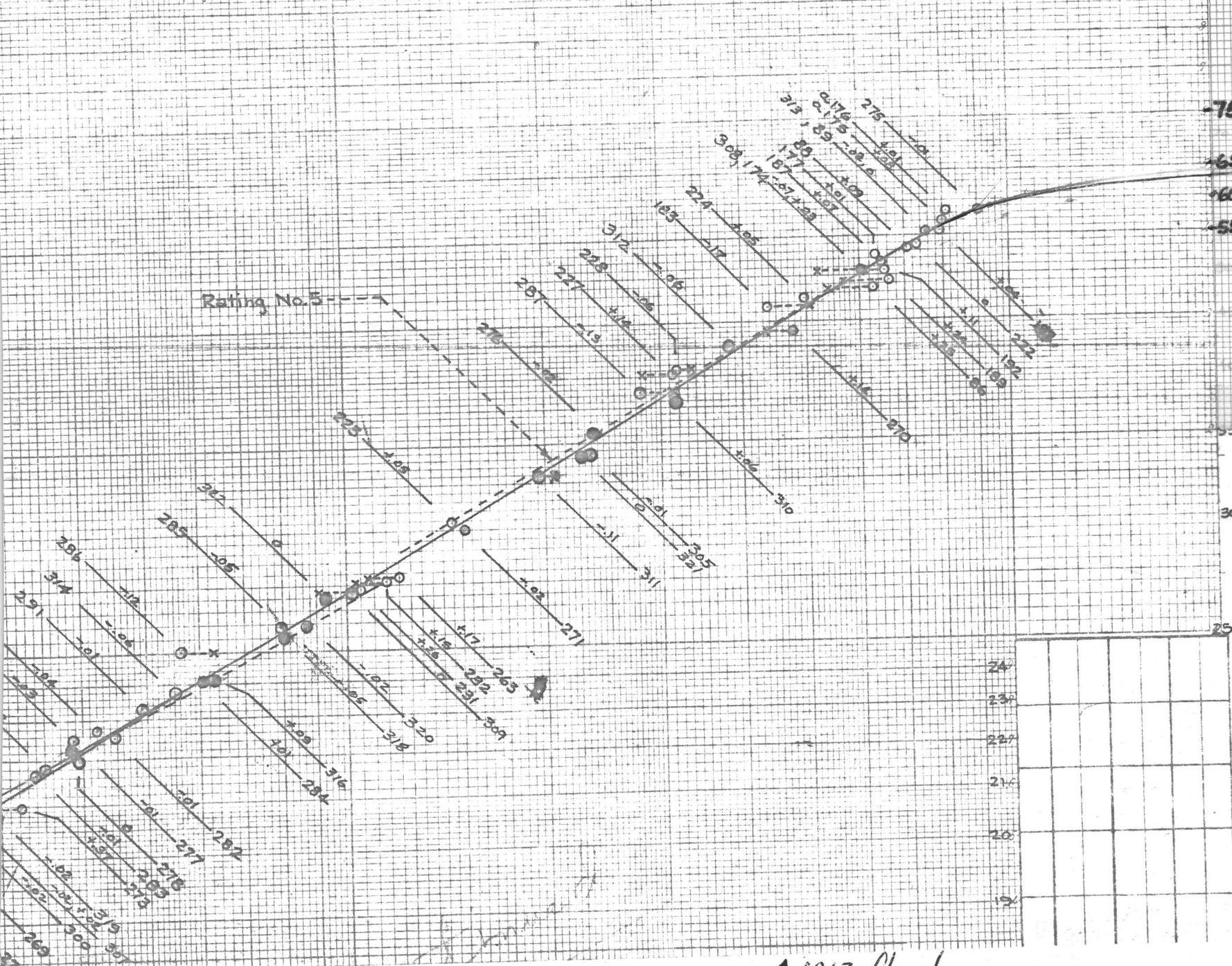


File: Brazos-Richmond - misc

Rating Curve FOR 08-1145.00 Brazos River near Juliff, Tex.
 Drainage area... 44,100 sq. mi. (9,240 sq. mi. probably non-contributing)

File No. { Washington
 Field

1,000 5,000 6,000 8,000 10,000 20,000 30,000 40,000 50,000 60,000 80,000 100,000 200,000 300K 400K 500K



Gave to Robt Furchman,
 FIA, Washington
 3-16-76

180,000 cfs = 62.8 ft
 210,000 = 63.2
 220,000 = 63.4

EGK

△ 1913 flood

BRAZOS RIVER BASIN

1140. Brazos River at Richmond, Tex.

(Published as "at Rosenberg" October 1922 to September 1931)

Location.--Lat $29^{\circ}35'$, long $95^{\circ}45'$, near right bank on downstream side of pier of bridge on U. S. Highway 59 in Richmond, Fort Bend County, 925 ft downstream from Texas and New Orleans Railroad Co. bridge and at mile 93.

Drainage area.--44,020 sq mi, approximately, of which 9,240 sq mi is probably noncontributing.

Gage.--Nonrecording prior to June 7, 1931; recording thereafter. January 1903 to June 1906 at site 925 ft upstream at datum 0.90 ft higher; at site 7.6 miles upstream at datum 4.0 ft higher 1913 to September 1931. Datum of gage is 40.94 ft above mean sea level, datum of 1929, Houston supplementary adjustment of 1943.

Stage-discharge relation.--Defined by current-meter measurements.

Bankfull stage.--35 ft (U. S. Weather Bureau).

Historical data.--Maximum stage since at least 1852, that of Dec. 10, 1913.

Remarks.--Flow partly regulated by upstream reservoirs since 1930. Gage heights furnished by U. S. Weather Bureau for water years 1915-31. Beginning 1944 loop curves were drawn to adjust for the change-in-stage effect. Boyer's method was used in 1953 and 1954 after which the loop-curve method was used again. Only annual peaks are shown.

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

1140. Brazos River at Richmond, Tex.

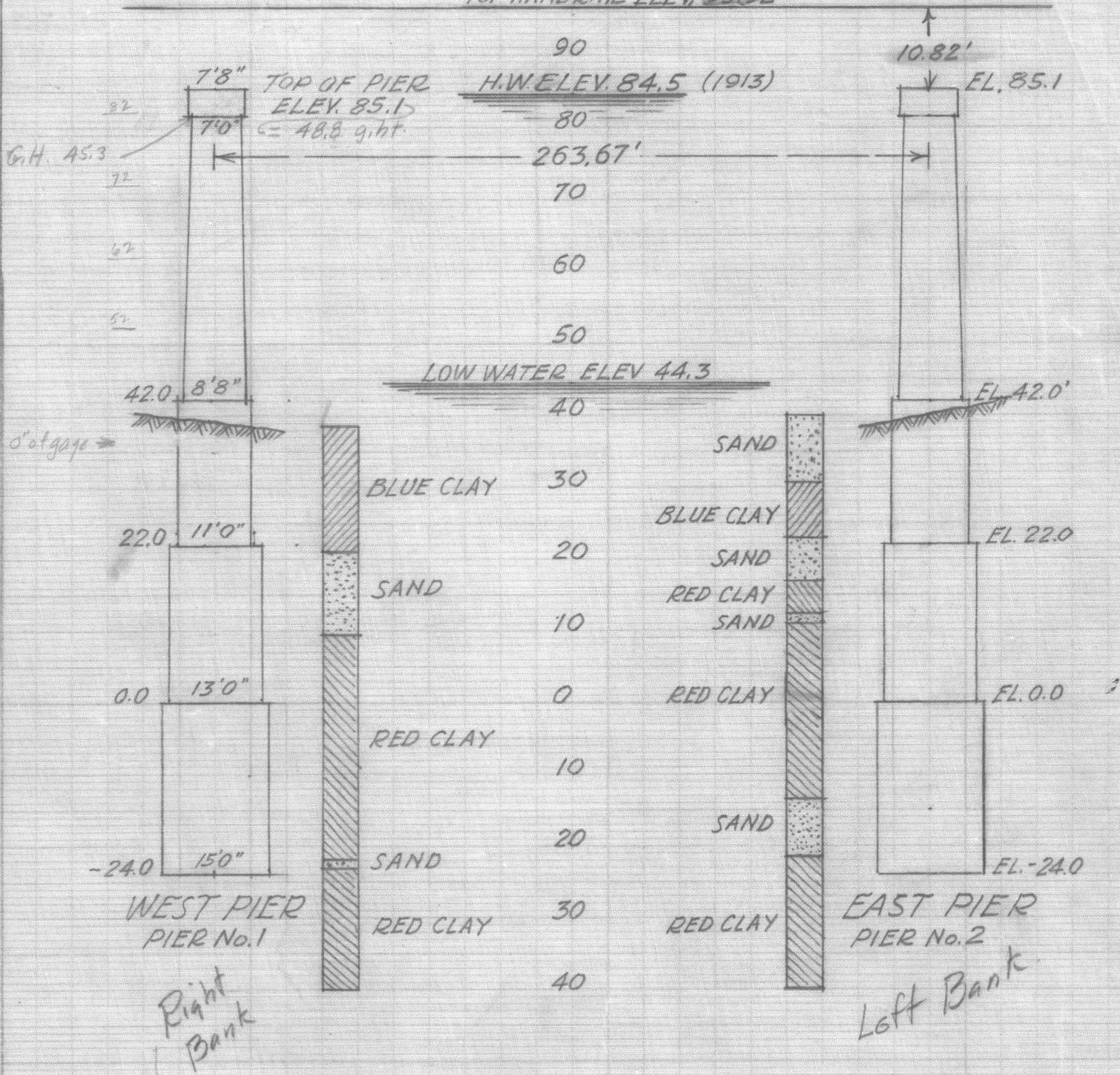
Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
				1925	May 12, 1925	17.1	24,200
				1926	Apr. 26, 1926	37.1	86,900
				1927	June 25, 1927	22.4	42,500
1884	May --, 1884	^a 43.7	—	1928	Oct. 5, 1927	20.6	36,800
1885	June 13, 1885	^a 44.7	—	1929	June 6, 1929	46.2	123,000
				1930	May 23, 1930	36.8	78,800
1899	July --, 1899	^a 45.6	—	1931	Oct. 10, 1930	27.6	52,100
				1932	Feb. 24, 1932	31.85	80,500
1903	Mar. 7, 1903		^b 66,600	1933	May 31, 1933	18.70	34,000
1904	May 10, 11, 1904		^b 47,600	1934	Apr. 10, 1934	29.4	71,400
1905	May 6, 1905		^b 65,600	1935	May 27, 1935	36.12	90,900
1906	June 9, 1906		^c 37,300	1936	May 31, 1936	33.1	^g 74,700
				1937	Oct. 5, 1936	32.17	77,100
1914	Dec. 9, 1913	^d 56.4	—	1938	Jan. 28, 1938	29.70	68,600
1915	May 1, 1915	50.3	—	1939	May 21, 1939	20.52	41,900
1916	May 6, 1916	30.7	—	1940	July 5, 1940	31.22	82,100
1917	Oct. 24, 1916	6.9	—	1941	Nov. 28, 1940	38.40	117,000
1918	Apr. 17, 1918	15.0	—	1942	May 1, 1942	32.42	79,400
1919	July 1, 1919	^e 30.0	—	1943	Oct. 22, 1942	22.17	45,500
1920	Jan. 26, 1920	^f 36.4	—	1944	May 8, 1944	^h 34.70	93,800
1921	Sept. 16, 1921	37.7	—	1945	Apr. 27, 1945	32.60	85,000
1922	May 9, 1922	49.8	—	1946	May 20, 1946	30.1	82,500
1923	Apr. 15, 1923	29.35	54,900	1947	Aug. 28, 1947	^j 22.06	51,000
1924	Dec. 16, 1923	33.0	64,800	1948	May 15, 1948	13.22	22,100

1140. Brazos River at Richmond, Tex.

- a From Southern Pacific Railroad Co. at site 925 ft upstream,
present datum.
- b Maximum daily.
- c Maximum daily for period Oct. 1, 1905 - June 30, 1906.
- d Maximum stage of 48.2 ft ^{present datum,} occurred on Dec. 10, 1913 at point 1,000 ft
upstream from present site ~~and datum.~~
- e Highest published by U. S. Weather Bureau; no gage readings from
June to September except June 29, 30, July 1, 6, 24.
- f Probably highest; no gage readings published by U. S. Weather Bureau
October 1-18, 1919.
- g Discharge of 74,700 cfs also occurred Dec. 9, 1935.
- h Occurred May 10, 1944.
- ~~i Discharge computed by adjusting for rate of change in stage; peak
stage occurs several hours later.~~
- j Occurred January 21.
- k Occurred Dec. 6, 1953.
- m Discharge of 17,900 cfs also occurred Oct. 14, 1955.

TOP HANDRAIL ELEV. 95.92



**TWO MAIN PIERS
 BRAZOS RIVER BRIDGE
 U.S. HWY. 59 & 90 AT RICHMOND
 FT. BEND CO, TEXAS.
 BUILT 1923**

Data taken from
 Bridge Plans on file
 in Bridge Div. Hwy. Dept.
 Austin, Texas.
 PROJECT NO. FAP 334

Bridge datum 36.3' lower than gage datum