

# MEMORANDUM



9900 Northwest Freeway  
Houston, TX 77092  
713-684-4000

**DATE:** July 20, 2015

**TO:** HCFCF Flood Watch/Partners

**FROM:** Jeff Lindner  
Meteorologist / Flood Watch Coordinator

Steve Fitzgerald  
Flood Watch Leader

**RE:** Immediate Report – Final  
May 25-27, 2015 Storm and Flood Information

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This is the third update and final report summarizing the flooding that occurred from excessive rainfall on the evening of May 25<sup>th</sup> into the morning of May 26, 2015.

## **GENERAL FLOODING STATEMENT**

After weeks of intermittent rainfall across Harris County, a slow moving line of thunderstorms moved into Harris County from central Texas during the evening hours of the 25<sup>th</sup>. Very heavy rainfall began around 8:30 p.m. across the northern portions of Harris County, while additional thunderstorms developed over central Fort Bend County and moved into Harris County from the southwest. A period of thunderstorm cell training occurred from 10:00 p.m. to 1:00 a.m. from Fort Bend County into north-central Harris County where the cells merged with the line of storms moving southward from northern Harris County. Thunderstorm cell mergers continued over central and southwest Harris County for several hours resulting in widespread significant flooding. A Flash Flood Emergency was issued for Harris County at 10:52 p.m. on the 25<sup>th</sup> for the first time ever. The worst rainfall was focused across the western portion of Harris County from the northwest side of the City of Houston to Addicks, Sharpstown, and Richmond in central Fort Bend County.

Heavy rainfall returned on the morning of the 27<sup>th</sup> with an additional 1.0-3.0 inches falling across the northern portions of Harris County. Several creeks were already running high from rainfall on the 26<sup>th</sup> and the additional rainfall on the morning of the 27<sup>th</sup> resulted in widespread street flooding and overbank flooding on several watersheds in northern Harris County. While overbank flooding occurred along several of the creeks in northern Harris County, water levels did not rise high enough to impact structures. All of the flooding from creeks was limited to roadways and rural lands near the channels from the additional rainfall received on the 27<sup>th</sup>.

Hundreds of water rescues were performed by various agencies during the height of the rainfall on the 25<sup>th</sup> and 26<sup>th</sup>. Rescues were mainly motorists stranded on area freeways

and roadways, and after daylight on the 26<sup>th</sup>, the Houston Fire Department responded to many requests for assistance from residents in flooded homes.

Seven fatalities were directly related and one additional fatality was indirectly related to the flooding. Three fatalities resulted from the capsizing of a Houston Fire Department rescue boat in Brays Bayou and three were related to submerged vehicles. No flood-related fatalities were reported in homes or businesses.

A federal disaster declaration was issued for Harris County on May 30<sup>th</sup> and covered the period from May 4<sup>th</sup> to June 8<sup>th</sup>.

### **MAY 25-26 RAINFALL**

**Duration** – The heaviest rainfall occurred from the northwest side of the City of Houston from Heights Blvd. southwest to near Beltway 8 and I-10, and then southwest into Fort Bend County. All of the rainfall occurred within 12-hrs with the heaviest rainfall rates observed in the 3-hr to 6-hr time frame.

**Total Amounts** – Total rainfall amounts averaged 3.0-4.0 inches across much of Harris County with totals of 4.0-6.0 inches from Humble to Jersey Village to Katy, and eastward to Galveston Bay. Rainfall totals of 8.0-10.0 inches were recorded on the northwest side of the City of Houston southwest to Sugar Land. A maximum rainfall accumulation of 11.0 inches was recorded at Brays Bayou and Beltway 8. The rainfall intensity report and various rainfall distribution and flood information maps are attached.

A CoCoRaHS observer 6.2 miles west of Downtown Houston recorded 10.03 inches of rainfall. Another observer 3.4 miles northeast of Richmond in Fort Bend County recorded 11.88 inches of rainfall.

An average rainfall of 5.3 inches occurred across Harris County in a 12-hr period which equates to 162 billion gallons of water.

**Exceedance Probability** – Rainfall on Brays, lower White Oak, Keegans, and Buffalo Bayous ranged between the 50% (2-yr) frequency to well in excess of the 1% (100-yr) frequency for the time periods of 15-min to 12-hrs. The highest rainfall amounts occurred in the Buffalo and Brays Bayou watersheds for the 2-6 hr time periods and are between the 1% (100-year) and 0.2% (500-year) frequency. A rainfall frequency map and rainfall, duration, frequency plot are attached.

All other watersheds were less than the 4% (25-yr) frequency.

## **CHANNEL FLOODING**

Overbank conditions occurred on the following named primary channels (plus numerous tributaries in the watersheds):

- Brays Bayou
- Keegans Bayou
- Buffalo Bayou (610 Loop to Downtown Houston)
- Spring Branch
- White Oak Bayou (Heights Blvd. to Downtown Houston)
- Little White Oak Bayou
- Halls Bayou
- South Mayde Creek (downstream (east) of Fry Road)
- West Fork of the San Jacinto River
- East Fork of the San Jacinto River
- San Jacinto River mainstem (downstream (south) of Lake Houston)
- Clear Creek
- Carpenters Bayou (downstream (south) of I-10)
- Armand Bayou
- Willow Waterhole
- Cypress Creek (I-45 downstream (east) to the San Jacinto River & upstream (west) of US 290)
- Little Cypress Creek (near Becker Road)
- Willow Creek
- Spring Creek (headwaters (east) to FM 2978)

A HCFCD water level sensor installed in the bottom of the Arthur Storey Park detention basin (D500-06-00) on Brays Bayou recorded a water level rise of 16.5 feet between 11:00 p.m. May 25<sup>th</sup> and 1:00 a.m. May 26<sup>th</sup>. The peak elevation in the basin reached 66.0 feet at 2:45 a.m.

## **HIGH WATER MARKS**

A total of 114 high water marks were identified and surveyed along the following channels and the data is attached at the end of this report for comparison to other historical floods in HCFCD's dataset and FEMA flood frequencies: Brays Bayou, Keegans Bayou, Buffalo Bayou, Hunting Bayou, Brickhouse Gully, and Little White Oak Bayou. Marks were also obtained along Poor Farm Ditch and Willow Waterhole, but no historical high water mark data is available for these channels as they were not marked in the past. High water marks were also obtained in HCFCD detention basins on upper Brays Bayou, Willow Waterhole, and in some of the flooded subdivisions along Brays Bayou.

The references in the paragraphs below to water level recurrence intervals and frequencies are based on the current effective FEMA Flood Insurance Study data. The terms used below regarding "record" flood levels relates to available HCFCD information, which generally is most detailed for the period starting in the early 1980s when HCFCD's stream gaging system was started. The term does not indicate that it

was the highest level ever observed, especially in watersheds that have significant flood damage reduction projects.

**Buffalo Bayou:**

“Record” high water levels were recorded along Buffalo Bayou from Woodway to Piney Point Dr. surpassing the previous record high water marks on April 28, 2009 and September 11, 1998 (Tropical Storm Frances). Water levels in this reach averaged at or above the 1% (100-yr) level. Downstream of Woodway to Downtown Houston water levels were the second highest recorded behind Tropical Storm Allison (2001). Water levels in this reach averaged between the 10% (10-yr) and 2% (50-yr) frequencies. West of Gessner to Hwy 6, water levels were below both the April 2009 flood and the March 1992 flood and averaged between the 10% (10-yr) and 2% (50-yr) frequencies. While similar to the April 2009 flood, the rainfall and highest water levels with the May 2015 flood were generally displaced slightly eastward of the April 2009 event resulting in lower water elevations on the upper end of Buffalo Bayou compared to April 2009.

**Brays Bayou:**

“Record” high water levels were recorded along Brays Bayou from South Post Oak upstream to US 59, exceeding the previous record high water marks in September 1983. Water levels in Brays Bayou averaged between the 10% (10-yr) and 2% (50-yr) frequencies between Calhoun and US 59. Water levels east of Calhoun to the confluence with the Houston Ship Channel and west of US 59 were below the 10% (10-yr) frequencies. [Note: The effective FEMA flood levels do not reflect lower flood levels created by the recently completed Project Brays flood damage reduction features. The flood frequency numbers above will be higher (less frequent) when compared to flood levels updated to reflect the reduced risk provided by completed Project Brays features.]

**Keegans Bayou:**

“Record” high water levels were recorded along the entire length of Keegans Bayou. Water levels exceeded the previous record high water marks on November 17, 2003 by as much as 2.0 feet at various bridge crossings. From the confluence of Brays Bayou upstream to South Kirkwood water levels were at or above the 1% (100-yr) frequency and at the Keegans and Dairy Ashford bridges were at or just below the 0.2% (500-yr) frequency. West of Dairy Ashford to the headwaters water levels were between the 10% (10-yr) and 2% (50-yr) frequencies. Flow went over the top of the Dairy Ashford bridge crossing for the first time.

**Willow Waterhole (D112-00-00):**

“Record” flood levels were recorded along Willow Waterhole from the headwaters to the confluence with Brays Bayou. High water marks exceeded the previous record high water marks on January 9, 2012 by 1.5-2.0 feet and water levels averaged at or above the 1% (100-yr) level. The May 2015 flood is the highest known water levels in HCFCD’s limited data set along Willow Waterhole although historical high water marks are not available for Tropical Storm Allison or the September 1983 flood.

The table below lists the May 2015 high water marks and the previous “record” high water levels for the locations where HCFCD flood gages are installed. A complete list of

HCFCFCD's historical high water marks at additional bridge crossings and channels are attached at the end of this report for the affected channels.

<b>Location</b>	<b>5-26-15 Crest</b>	<b>Previous "Record" Crest</b>	<b>Previous "Record" Date</b>
Keegans Bayou at Roark	74.50	73.30	01-09-2012
Keegans Bayou at Keegans Road	80.80	78.90	01-09-2012
Keegans Bayou at Rocky Valley	85.50	Not Available	Not Available
Brays Bayou at South Main	42.90	42.90	06-09-2001
Brays Bayou at Stella Link	48.30	48.38	06-09-2001
Brays Bayou at Rice	52.90	52.51	09-09-1983
Brays Bayou at Gessner	61.70	61.40	09-09-1983
Willow Waterhole at Willowbend	51.70	49.10	01-09-2012
Buffalo Bayou at San Felipe	54.50	53.00	04-28-2009
Brickhouse Gully at Costa Rica	65.54	64.73	05-10-2007

## **HOUSE FLOODING ESTIMATES**

Structure flooding resulted from both overbank channel flooding and street drainage systems (storm sewers and roadside ditches) being overwhelmed from the intense short term rainfall rates. In some instances, house flooding likely resulted from a combination of these two phenomena especially in the Brays Bayou, Little White Oak Bayou, Brickhouse Gully, and Keegans Bayou watersheds. The majority of the house flooding in the Buffalo Bayou watershed was likely from street drainage systems being overwhelmed.

The tables below show house flooding estimates by watershed and by jurisdiction based on information from damage assessment teams from the various jurisdictions and citizen reports during and immediately after the storm through Readyharris.org and the HCFCFCD phone bank (with duplicates removed). As jurisdictions and FEMA confirm individual house flooding, the estimates will change. Thanks are extended to the various jurisdictions and their damage assessment teams for their hard work in determining and confirming house flooding locations and water depths.

<b>Watershed</b>	<b>House Flooding Estimates</b>
Brays Bayou	1,185
Keegans Bayou	245
Willow Waterhole	295
Buffalo Bayou	270
Spring Branch	335
White Oak Bayou	130
Little White Oak Bayou	175
Brickhouse Gully	180
Halls Bayou	55
Hunting Bayou	35
Sims Bayou	30
Other	80
<i>Total</i>	<i>3,015</i>

<b>Jurisdiction</b>	<b>House Flooding Estimates</b>
City of Houston	2,660
City of Bellaire	160
City of Pasadena	20
The Villages	65
Unincorporated Harris County	110
<i>Total</i>	<i>3,015</i>

Based on FEMA flood insurance claim data, approximately 3,320 homes may have flooded in addition to the totals listed above. There is no way to know how many other homes may have flooded that did not have flood insurance if the damages were not noticed by the jurisdictions and the owners did not report damage. The total flooded houses in Harris County may be in excess of 6,335.

Additionally, approximately 3,540 multi-family units and 92 commercial buildings were flooded in the City of Houston.

The number of requests to FEMA for Individual Assistance in Harris County is 10,860, which does overlap with some of the numbers above. Some of the requests are likely from homeowners whose house flooded who did not have flood insurance.

Based on historical house flooding information that was gathered by the various jurisdictions (but did not include flood insurance claims), the Memorial Day flooding resulted in the 4<sup>th</sup> largest number of flooded homes.

<b>Flood Event</b>	<b>House Flooding Estimates*</b>
June 2001 (TS Allison*)	73,000*
June 19, 2006	3,370
October 1994	3,248
May 25, 2015	3,015 w/o FEMA claims 6,335 w/ FEMA claims
April 28, 2009	2,305

\*Note: Tropical Storm Allison values include only FEMA flood insurance claims. Other events do not include FEMA flood insurance claims unless noted.

### **ADDICKS AND BARKER RESERVOIRS**

Due to the consistent and well above average rainfall in April and May 2015, and then the May 25-26 significant rainfall event, the reservoir levels came close to putting water on SH 6 and Westheimer Parkway. The Addicks water level was the 7<sup>th</sup> highest (95.51 feet on May 31<sup>st</sup>) and the Barker level was the 5<sup>th</sup> highest (91.87 feet on June 1<sup>st</sup>) on record.

The stormwater storage in the Corps of Engineers' reservoirs helped reduce water levels downstream along Buffalo Bayou. The Corps of Engineers operates the reservoirs to maximize downstream flood protection on Buffalo Bayou. When rain is forecast, the gates are closed. Reservoir releases begin when flood flows at the Piney Point Road USGS gage are less than 2,000 cubic feet per second (cfs) and additional rain is not forecasted. Under normal operations, reservoir gate releases are controlled to achieve a total discharge of 2,000 cfs at the Piney Point gage (note, the May flood event produced a peak flow at Piney Point of about 8,500 cfs. Gates on Addicks and Berker were closed at 3:00 p.m. May 23<sup>rd</sup>).

Because of the elevated water levels inside the reservoirs, the Corps made the decision to increase the combined releases to 3,000 cfs at the Piney Point gage to more quickly restore the flood holding capacity of the reservoirs. A combined release of 2,700 cfs from both Addicks and Barker began on June 1, 2015 resulting in a flow of 3,000 cfs at the Piney Point control gage. Due to subsequent rainfall events that added water to the reservoirs, combined with having to close the gates when rain was forecast, it took about 7 weeks to empty the reservoirs. The Corps only operated releases at the 3,000 cfs level for a total of about 13 days during the following 7 weeks.

<b>Event</b>	<b>Addicks</b>	<b>Barker</b>
Starting Storage May 24 <sup>th</sup>	~ 11,000 acre-feet	~ 11,000 acre-feet
Peak Storage ~ June 2 <sup>nd</sup>	~ 49,000 acre-feet	~ 48,000 acre-feet
Date Empty	July 11 <sup>th</sup>	July 12 <sup>th</sup>

## **PROJECTS THAT HELPED REDUCE HOUSE FLOODING**

Capital projects and maintenance of the channels throughout the county helped reduce the risk of flooding and ensure the systems operated as designed. Completed buyouts also prevented flooding in many areas of the county. Major capital project efforts in the highest rainfall areas are discussed below.

### **Brays Bayou:**

Project Brays (a partnership project with the Corps of Engineers) construction completed to date prevented the flooding of about 1,000 homes and businesses that would have otherwise flooded without the project work. For example, the 8.9 miles of channel conveyance improvements and 10 bridge replacements/modifications downstream of Fannin Street helped lower flood levels from the mouth upstream though the Texas Medical Center. The excavation in the Eldridge, Old Westheimer, Arthur Storey Park, and Willow Waterhole regional detention basins held back a large volume of stormwater that otherwise would have rushed downstream. Those basins stored about 2.0 billion gallons of excess stormwater.

### **Sims Bayou:**

Without the near-complete HCFCD and Corps of Engineers' Sims Bayou Federal Project and supplemental detention basins constructed by HCFCD, several hundred homes would have flooded along Sims Bayou during the May 25-26 storm event.

### **Addicks and Barker Reservoirs:**

The U.S. Army Corps of Engineers' Addicks and Barker Reservoirs in western Harris County held back the Memorial Day Flood runoff from within the reservoirs and the upstream watersheds. The reservoirs' storage helped keep the water levels along Buffalo Bayou from being higher and potentially reaching flood levels.

## **HARRIS COUNTY FLOOD CONTROL DISTRICT ACTIONS**

- HCFCD Flood Watch team was activated from 6:00 p.m. May 23<sup>rd</sup> to 10:09 p.m. on May 30<sup>th</sup>.
- Clear Creek Second Outlet Gates were opened on May 23<sup>rd</sup> at 5:09 p.m. and closed on May 27<sup>th</sup> at 2:00 p.m. The gates were reopened on May 30<sup>th</sup> at 5:35 p.m. and closed on May 31<sup>st</sup> at 2:00 p.m.
- Conducted approximately 60 media interviews.
- Performed a helicopter reconnaissance flight the morning of the 26<sup>th</sup> over western and southwestern Harris County to document potential house flooding and performance of HCFCD facilities.
- Performed a helicopter reconnaissance flight the afternoon of June 1<sup>st</sup> over western and southwestern Harris County to document house flooding; look for HCFCD facility damage; document storage levels in the upper Cypress Creek watershed, Addicks Reservoir, and Barker Reservoir; and the 3,000 cfs flow in Buffalo Bayou.



- The HCFCD Flood Warning System alerted staff 89 times with rainfall alarms (set at 1 inch rainfall in 15-min) and 69 times with water level alarms (set at 3 feet below bank full) were reported from May 24<sup>th</sup> to May 26<sup>th</sup>.
- The only notable damage to HCFCD gages was a flood warning water level sensor on Buffalo Bayou at Milam St. that was destroyed by flood waters early on the morning of the 26<sup>th</sup> and was replaced and operational on May 27<sup>th</sup>.

## **HARRIS COUNTY FLOOD CONTROL DISTRICT FACILITIES CONDITIONS**

HCFCD contractors completed the removal of routine minor debris at a few locations (typically at culverts and bridge piers) that were identified before the May 25-26 rain event impacted the County. About 550 cubic yards of debris was removed from 14 separate channel locations. Work resumed on May 27<sup>th</sup> as receding water levels allowed crews to access new debris locations created by the storm. As of the date of this final report, debris removal is completed or progressing at 53 locations on 39 channels. More than 1400 cubic yards of debris has been identified as a direct result of the flood event.

Although mowing doesn't adversely affect flood levels, we are asked about the status frequently. Mowing began on Hunting Bayou and Little White Oak Bayou on April 20<sup>th</sup>, 2015, and all other watersheds began on May 4<sup>th</sup>, 2015. Progress was severely hampered by frequent rains that have kept soils difficult to traverse with mowing equipment. Prior to May 25, mowing on Brays Bayou, from MLK to US 59 was complete, and mowing was underway from MLK to the Gulf Freeway (I-45). Mowing on White Oak Bayou was complete from Tidwell to Alabonson and was underway from Alabonson to North Houston Rosslyn.

As of the date of this final report, bank erosion and failures as well as outfall pipe failures following the May 25<sup>th</sup> event are being documented and assessed at various locations impacted by the heavy rains.

### **Attachments:**

- Rainfall Intensity Report
- Various Rainfall Distribution and Flood Information Maps
- Rainfall Frequency Map
- Rainfall, Duration, Frequency Plot
- High Water Marks at Bridge Crossings

**Rainfall Intensity Report**  
**05-25-15 10 am to 05-27-15 10 am**

<b>Clear Creek, A100</b>											
Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	Site
100	0.4	0.7	1.0	1.3	2.4	2.5	2.6	2.6	2.6	3.0	A100 Clear Lake 2nd Outlet @ SH 146
105	0.5	1.0	1.9	2.5	3.8	4.4	5.8	6.0	6.1	6.3	Mary's Creek @ Melodywood Drive
110	0.2	0.6	0.9	1.6	2.5	2.6	3.1	3.1	3.1	3.2	A100 Clear Creek @ I-45
115	0.5	0.9	1.4	2.0	3.1	3.4	4.8	4.8	4.8	4.9	Cowart Creek @ Baker Road
120	0.3	0.8	1.5	2.6	3.7	3.9	5.0	5.0	5.0	5.0	A100 Clear Creek @ FM 528
125	0.3	0.7	1.2	1.6	2.4	2.7	3.8	3.8	3.8	3.9	Chigger Creek @ Windsong Lane
130	0.3	0.6	0.9	1.6	2.4	2.6	3.3	3.3	3.3	3.9	A100 Clear Creek @ Bay Area Boulevard
135	0.3	0.8	1.6	2.3	3.4	3.8	5.2	5.2	5.2	5.4	A100 Clear Creek @ FM 2351
140	0.5	1.0	1.7	2.6	3.8	4.7	6.6	6.6	6.6	6.8	A119 Turkey Creek @ FM 1959
150	0.5	0.9	1.6	2.1	3.3	4.2	6.2	6.2	6.2	6.3	A100 Clear Creek @ Country Club Drive
160	0.4	1.0	1.6	2.4	3.6	4.6	6.7	6.7	6.7	6.8	A120 Beamer Ditch @ Hughes Road
170	0.2	0.7	1.1	1.8	3.2	3.4	3.8	3.8	3.8	4.0	A100 Clear Creek @ Nassau Bay
180	0.3	0.8	1.4	2.2	3.3	3.9	5.5	5.5	5.6	5.7	A100 Clear Creek @ Mykawa Road
190	0.4	1.0	1.6	2.4	3.6	4.2	5.5	5.5	5.6	5.7	A100 Clear Creek @ SH 288
200	0.3	0.8	1.1	1.4	2.8	3.0	3.5	3.5	3.5	3.9	A104 Taylor Lake @ Nasa Road 1

<b>Armand Bayou, B100</b>											
Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	Site
210	0.4	1.0	1.3	1.8	3.3	3.5	4.1	4.1	4.1	4.5	B100 Armand Bayou @ Pasadena Lake (Nasa Road 1)
220	0.4	1.0	1.7	2.4	3.4	4.5	6.5	6.5	6.5	6.9	B100 Armand Bayou @ Genoa-Red Bluff Road
230	0.4	0.9	1.3	1.9	3.0	4.1	6.0	6.0	6.0	6.5	B106 Big Island Slough @ Fairmont Parkway
240	0.4	1.2	2.1	3.5	4.6	5.7	8.6	8.6	8.6	9.2	B100 Armand Bayou @ Beltway 8
250	0.8	0.9	1.2	1.9	2.3	3.0	3.6	3.6	3.6	4.0	B104 Horsepen Creek @ Bay Area Boulevard
270	0.4	1.0	1.6	2.4	3.5	4.6	6.8	6.8	6.8	7.6	B112 Willow Spring Bayou @ Fairmont Parkway

<b>Sims Bayou, C100</b>											
Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	Site
310	0.4	0.8	1.5	2.7	4.0	4.9	7.1	7.2	7.2	7.6	C106 Berry Bayou @ Nevada Avenue
320	0.4	1.0	1.7	3.0	4.1	4.9	6.7	6.7	6.8	7.2	C106 Berry Bayou @ Forest Oaks Boulevard
340	0.4	1.0	1.2	2.2	3.3	4.0	5.4	5.4	5.4	6.0	C100 Sims Bayou @ Telephone Road
360	0.4	0.6	1.2	1.8	3.1	4.1	5.5	5.5	5.5	5.6	C100 Sims Bayou @ Martin Luther King Road
370	0.3	0.7	1.1	1.8	2.6	3.9	5.6	5.6	5.6	5.6	C100 Sims Bayou @ SH 288
380	0.4	0.7	1.1	2.0	3.6	4.6	5.9	5.9	5.9	5.9	C100 Sims Bayou @ Hiram-Clarke Road

**Rainfall Intensity Report**  
**05-25-15 10 am to 05-27-15 10 am**

<b>Brays Bayou, D100</b>											
Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	Site
1020	0.3	0.7	1.0	1.8	3.4	4.2	6.2	6.4	6.4	6.6	NRG Park
400	0.3	0.6	1.0	1.7	3.3	4.0	6.2	6.4	6.4	6.8	D109 Harris Gully @ South McGregor Way
410	0.6	1.2	1.9	2.7	3.7	4.4	5.7	5.7	5.8	6.1	D100 Brays Bayou @ Lawndale Street
420	0.3	0.6	1.1	1.9	3.5	4.4	6.8	7.1	7.1	7.4	D100 Brays Bayou @ South Main Street
430	0.3	0.8	1.3	2.3	3.4	4.8	7.3	7.8	7.8	8.0	D100 Brays Bayou @ Stella Link Road
435	0.4	0.8	1.2	2.0	3.8	4.9	7.3	7.5	7.5	7.6	D100 Willow Water Hole @ Willowbend Boulevard
440	0.3	0.7	1.1	2.1	3.6	5.2	7.9	8.6	8.6	8.7	D100 Brays Bayou @ Rice Avenue
460	0.6	1.2	1.5	2.3	4.1	5.6	8.2	9.1	9.2	9.3	D100 Brays Bayou @ Gessner Road
465	0.6	1.2	2.3	3.6	6.4	8.0	10.0	11.0	11.0	11.1	D100 Brays Bayou @ Beltway 8
470	0.4	1.0	1.8	2.9	5.6	7.3	9.2	9.7	9.7	9.9	D100 Brays Bayou @ Belle Park Drive
475	0.6	1.2	2.2	3.5	6.4	7.9	10.0	10.7	10.7	10.8	D100 Brays Bayou @ Bellaire Boulevard
480	0.5	0.9	1.3	2.3	4.1	5.8	8.2	9.5	9.5	9.6	D118 Keegans Bayou @ Roark Road
485	0.4	0.9	1.4	2.3	3.6	4.8	6.4	6.6	6.6	6.7	D100 Brays Bayou @ SH 6
490	0.4	1.0	1.5	2.8	5.1	7.0	9.1	10.3	10.3	10.4	D118 Keegans Bayou @ Keegan Road
495	0.6	1.3	1.8	3.2	5.0	6.7	8.7	9.2	9.3	9.5	D118 Keegans Bayou @ Rocky Valley

<b>White Oak Bayou, E100</b>											
Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	Site
510	0.5	1.4	2.5	4.5	6.0	6.8	8.0	8.2	8.2	8.6	Harris County Flood Control @ Brookhollow
520	0.5	1.4	2.6	3.9	5.0	5.8	7.2	7.8	7.8	8.7	E100 White Oak Bayou @ Heights Boulevard
530	0.6	1.5	2.8	4.8	6.2	6.9	8.2	8.4	8.4	9.0	E100 White Oak Bayou @ Ella Boulevard
535	0.5	1.0	1.8	3.2	4.3	5.0	5.9	6.0	6.0	6.7	E100 White Oak Bayou @ Pinemont Drive
540	0.5	1.0	1.8	3.1	4.4	5.1	6.0	6.1	6.1	7.4	E100 White Oak Bayou @ Alabonson Road
545	0.4	1.1	1.9	3.2	4.8	5.5	6.2	6.2	6.3	8.2	E100 White Oak Bayou @ Fairbanks North Houston Road
550	0.5	1.0	1.8	3.0	4.4	5.0	5.8	5.8	5.8	7.4	E100 White Oak Bayou @ Lakeview Drive
555	0.4	1.0	1.4	2.2	3.1	3.6	4.3	4.3	4.3	6.3	E100 White Oak Bayou @ Jones Road
560	0.6	1.6	2.6	3.9	4.9	5.6	7.0	7.6	7.6	8.2	E101 Little White Oak Bayou @ Trimble Street
570	0.9	2.1	3.3	4.8	5.9	6.4	7.3	7.4	7.4	8.1	E101 Little White Oak Bayou @ Tidwell Road
575	0.4	0.8	1.5	2.8	4.0	4.8	5.7	5.8	5.8	6.5	E100 White Oak Bayou @ Tidwell Road
580	0.5	1.2	2.1	3.8	5.2	5.9	7.0	7.1	7.1	7.6	E115 Brickhouse Gully @ Costa Rica Road
585	0.4	1.0	1.8	3.1	4.4	5.0	6.0	6.1	6.1	7.2	E121 Vogel Creek @ Victory Drive
590	0.4	1.0	1.8	3.1	4.3	5.0	6.1	6.2	6.2	7.0	E117 Cole Creek @ Deihl Road
595	0.5	0.9	1.7	2.9	3.7	4.3	5.0	5.2	5.2	6.6	E121 Vogel Creek @ Gulf Bank Road

<b>Little Cedar Bayou, F216</b>											
Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	Site
610	0.4	1.0	1.3	1.6	3.0	3.5	4.6	4.6	4.6	4.9	A104 Taylor's Bayou @ Shoreacres Boulevard
620	0.3	1.0	1.5	2.0	3.4	4.1	5.5	5.5	5.5	5.9	F216 Little Cedar Bayou @ 8th Street
640	0.4	0.7	1.3	2.1	3.2	4.2	6.7	6.7	6.7	7.4	F101 Lateral @ Sens Road

**Rainfall Intensity Report**  
**05-25-15 10 am to 05-27-15 10 am**

<b>San Jacinto River, G103</b>											
Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	Site
710	0.4	1.2	1.5	2.0	2.6	3.4	5.0	5.3	5.3	6.8	G103 San Jacinto River @ Banana Bend Street
720	0.4	1.0	1.2	1.9	2.6	3.1	4.0	4.2	4.2	5.1	G103 San Jacinto River @ US 90
750	0.4	1.0	1.7	2.3	3.2	3.6	4.0	4.2	4.2	5.2	G103 Lake Houston Dam Spillway
755	0.4	0.7	1.2	1.8	3.2	3.4	3.6	3.6	3.6	4.7	G103 San Jacinto River @ Kingwood Country Club
760	0.4	0.7	1.2	2.2	3.5	3.8	4.0	4.0	4.2	5.3	G103 San Jacinto River @ US 59
790	0.5	1.2	1.6	2.0	3.0	3.0	3.2	3.2	3.2	4.2	G103 East Fork San Jacinto @ FM 1485

<b>Hunting Bayou, H100</b>											
Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	Site
820	0.5	1.1	1.4	2.1	3.0	3.7	4.9	5.0	5.0	6.0	H100 Hunting Bayou @ I-10
830	0.5	1.0	1.6	2.0	2.8	3.4	4.5	4.9	4.9	5.9	H100 Hunting Bayou @ Loop 610 East
840	0.7	1.7	2.4	3.3	4.2	4.8	6.0	6.5	6.5	6.9	H100 Hunting Bayou @ Lockwood Drive

<b>Vince Bayou, I 100</b>											
Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	Site
920	0.5	1.1	1.8	2.9	4.2	5.0	7.1	7.1	7.1	7.5	I100 Vince Bayou @ West Ellaine Down Stream
940	0.5	1.0	1.6	2.5	3.4	4.2	6.2	6.2	6.2	6.8	I101 Little Vince Bayou @ Jackson Avenue

<b>Spring Creek, J100</b>											
Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	Site
1040	0.6	0.8	1.6	2.3	3.2	3.2	3.5	3.6	3.6	6.3	J100 Spring Creek @ FM 2978
1050	0.5	1.2	1.9	2.6	3.4	3.4	3.7	3.7	3.7	5.4	J100 Spring Creek @ I-45
1060	0.6	1.4	2.1	2.4	2.8	3.1	3.2	3.3	3.3	5.9	J100 Spring Creek @ Kuykendahl Road
1070	0.6	1.1	1.8	2.2	3.0	3.1	3.4	3.6	3.6	6.3	J100 Spring Creek @ SH 249
1090	0.4	0.9	1.2	1.7	2.4	2.5	2.5	2.5	2.5	4.6	J100 Spring Creek @ Hegar Road

<b>Cypress Creek, K100</b>											
Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	Site
1110	0.3	0.7	1.3	2.4	3.4	3.6	3.9	4.0	4.0	5.4	K100 Cypress Creek @ Cypresswood Drive
1115	0.5	1.0	1.4	2.2	3.4	3.8	4.1	4.2	4.2	5.8	K600 Cypress Creek @ Inverness Forest
1120	0.6	0.9	1.6	2.1	3.2	3.2	3.6	3.7	3.7	5.3	K100 Cypress Creek @ I-45
1130	0.5	0.9	1.4	1.6	2.7	2.9	3.6	3.6	3.6	5.6	K100 Cypress Creek @ Kuykendahl Road
1140	0.5	0.9	1.5	2.2	3.1	3.4	4.1	4.1	4.2	6.9	K100 Cypress Creek @ Stuebner-Airline Road
1150	0.5	1.2	1.8	2.2	2.9	3.2	3.2	3.2	3.2	6.4	K100 Cypress Creek @ SH 249
1160	0.5	1.2	1.7	2.0	2.9	3.1	3.7	3.7	3.7	6.9	K100 Cypress Creek @ Grant Road
1165	0.5	0.9	1.4	1.9	2.9	3.2	4.0	4.0	4.1	6.8	K100 Cypress Creek @ Eldridge Parkway N.
1170	0.3	0.7	1.0	1.7	2.6	2.9	3.6	3.6	3.6	6.0	K100 Cypress Creek @ Huffmeister Road
1175	0.5	1.2	1.7	2.4	3.4	3.6	4.4	4.4	4.4	6.6	K100 Cypress Creek @ US 290
1180	0.4	0.8	1.3	2.2	2.7	2.8	2.8	2.8	2.8	5.3	K100 Cypress Creek @ Katy-Hockley Road
1185	0.4	0.8	1.4	2.2	2.6	2.7	2.7	2.7	2.8	5.2	K100 Cypress creek @ Sharp Road
1190	0.3	0.6	1.0	1.8	2.2	2.4	2.4	2.4	2.4	4.5	K166 Little Mound Creek @ Mathis Road
1210	0.4	0.8	1.2	1.6	2.5	2.8	3.3	3.3	3.3	6.1	L100 Little Cypress Creek @ Kluge Road
1220	0.4	0.9	1.2	1.7	2.9	3.0	3.5	3.5	3.6	6.5	L100 Little Cypress Creek @ Cypress Rosehill Road
1230	0.4	0.8	1.3	1.8	2.6	2.6	2.6	2.6	2.6	4.9	L100 Little Cypress Creek @ Becker Road

**Rainfall Intensity Report**  
**05-25-15 10 am to 05-27-15 10 am**

**Willow Creek, M100**

Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	Site
1320	0.3	0.8	1.2	1.7	2.1	2.3	2.6	3.0	3.0	5.3	M100 Willow Creek @ Kuykendahl Road
1340	0.4	0.7	1.2	1.6	2.6	2.8	3.3	3.3	3.4	5.2	M100 Willow Creek @ SH 249

**Carpenters Bayou, N100**

Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	Site
1420	1.0	1.9	2.4	3.4	4.2	5.0	6.9	6.9	7.0	8.0	N100 Carpenters Bayou @ I-10
1440	0.7	1.5	2.0	2.6	3.4	4.2	5.4	5.6	5.6	6.8	N100 Carpenters Bayou @ Wallisville Road
1460	0.6	1.5	2.0	2.6	3.4	4.1	5.2	5.5	5.5	7.0	N100 Carpenters Bayou @ US 90

**Goose Creek, O100**

Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	Site
1520	0.3	0.8	1.2	1.6	2.4	3.3	5.2	5.2	5.3	5.9	O100 Goose Creek @ SH 146
1540	0.4	0.8	1.2	1.9	2.6	3.6	6.2	6.2	6.3	7.3	O100 Goose Creek @ Baker Road

**Greens Bayou, P100**

Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	Site
1600	0.6	1.6	2.6	3.4	4.2	4.7	5.2	5.4	5.4	6.2	P100 Greens Bayou @ Mount Houston Parkway
1610	0.6	1.4	2.2	2.8	3.8	4.6	5.9	5.9	5.9	6.8	P100 Greens Bayou @ Normandy Street
1620	0.8	1.4	2.3	2.9	3.6	4.2	4.8	5.2	5.2	6.5	P100 Greens Bayou @ Ley Road
1630	0.5	1.3	2.2	3.0	4.0	4.2	4.7	4.8	4.8	6.1	P130 Garners Bayou @ Beltway 8
1640	0.4	1.1	2.0	3.1	4.2	4.4	4.9	5.1	5.1	7.2	P100 Greens Bayou @ US 59
1645	0.5	1.0	1.6	2.8	3.5	3.9	4.5	4.5	4.5	5.2	P100 Greens Bayou @ Beltway 8
1650	0.4	1.0	1.8	2.8	3.9	4.1	4.6	4.6	4.7	6.6	P130 Garners Bayou @ Rankin Road
1660	0.3	0.9	1.2	2.2	3.4	3.8	4.3	4.3	4.4	6.1	P100 Greens Bayou @ Knobcrest Drive
1665	0.6	1.1	1.7	3.2	4.4	4.9	5.4	5.4	5.5	7.4	P100 Greens Bayou @ Bammel N Houston Road
1670	0.5	0.8	1.3	1.9	2.8	3.2	3.6	3.6	3.7	5.8	P100 Greens Bayou @ Cutten Road
1685	0.4	1.1	1.5	2.2	3.0	3.5	4.2	4.5	4.6	5.6	P100 Greens Bayou @ Tidwell Road
1695	0.5	1.3	2.1	3.3	4.3	4.6	5.2	5.2	5.2	6.0	P138 @ Aldine Westfield Road

**Halls Bayou, P118**

Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	Site
1675	0.6	1.7	2.7	3.5	4.5	4.9	5.7	5.9	5.9	6.5	P118 Halls Bayou @ Tidwell Road
1680	0.7	1.7	2.6	3.7	4.8	5.0	5.8	5.8	5.9	6.9	P118 Halls Bayou @ Jensen Drive
1690	0.6	1.3	2.1	3.2	4.4	4.7	5.4	5.4	5.4	6.2	P118 Halls Bayou @ Airline Drive

**Cedar Bayou, Q100**

Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	Site
1720	0.3	0.5	0.7	1.3	2.2	3.1	5.0	5.1	5.1	6.2	Q100 Cedar Bayou @ SH 146
1740	0.3	0.7	1.1	1.6	2.5	2.7	3.0	3.2	3.2	4.7	Q100 Cedar Bayou @ US 90

Rainfall Intensity Report  
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**Jackson Bayou, R100**

Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	Site
1840	0.4	0.9	1.3	1.8	2.6	2.7	3.3	3.5	3.5	4.4	R102 Gum Gully @ Diamond Head Boulevard

**Luce Bayou, S100**

Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	Site
1940	0.4	0.8	1.3	1.6	3.0	3.0	3.2	3.2	3.3	4.2	S100 Luce Bayou @ FM 2100

**Barker Reservoir, T100**

Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	Site
2010	0.4	0.9	1.3	2.4	3.6	5.0	6.4	6.5	6.5	6.8	Barker Dam
2020	0.4	0.8	1.2	1.9	3.3	4.2	4.8	4.8	4.8	5.1	T101 Mason Creek @ Prince Creek Drive
2040	0.4	0.7	1.2	2.1	3.2	3.8	4.4	4.5	4.5	4.8	T100 Buffalo Bayou @ US 90

**Addicks Reservoir, U100**

Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	Site
2110	0.3	0.8	1.2	2.1	3.2	4.6	6.0	6.1	6.1	6.4	Addicks Dam
2120	0.4	0.9	1.4	2.4	3.4	3.9	4.4	4.4	4.4	5.1	U100 Langham Creek @ West Little York Road
2130	0.3	0.6	1.0	1.2	1.8	2.2	2.8	2.8	2.8	3.8	U106 Horsepen @ Trailside Drive
2140	0.6	1.3	1.9	3.0	4.1	4.6	5.1	5.2	5.2	6.2	U100 Langham Creek @ Longenbaugh Road
2150	0.3	0.9	1.5	2.4	3.7	4.4	5.0	5.0	5.0	5.4	U101 South Mayde @ Greenhouse Road
2160	0.4	0.9	1.5	2.4	3.5	4.2	4.6	4.7	4.7	5.0	U102 Bear Creek @ Clay Road
2170	0.4	0.8	1.5	2.5	3.7	4.6	5.2	5.3	5.3	5.5	U101 South Mayde @ Morton Road
2180	0.3	0.6	0.9	1.5	2.4	3.0	3.4	3.7	3.7	4.8	U102 Bear Creek @ FM 529
2190	0.4	0.6	1.1	1.8	2.8	3.5	3.9	4.0	4.0	4.6	U101 South Mayde Creek @ Peek Road

**Buffalo Bayou, W100**

Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	Site
1000	0.6	1.5	2.5	4.5	6.0	6.8	8.3	8.6	8.7	9.2	Houston Transtar
2210	0.6	1.2	1.6	2.5	3.2	3.9	4.9	5.0	5.0	5.5	W100 Buffalo Bayou @ Turning Basin
2220	0.5	1.3	2.0	2.5	3.3	4.2	6.2	7.3	7.3	7.6	W100 Buffalo Bayou @ Milam Street
2240	0.5	1.4	2.2	3.3	4.5	5.5	7.2	7.8	7.8	8.6	W100 Buffalo Bayou @ Shepherd Drive
2250	0.6	1.2	2.0	3.8	5.4	6.4	7.8	7.9	7.9	8.4	W140 Spring Branch @ Bingle Road
2260	0.5	1.4	2.2	3.9	5.9	6.9	8.6	9.0	9.0	9.2	W100 Buffalo Bayou @ San Felipe Drive
2270	0.6	1.4	2.4	4.3	7.0	8.3	10.1	10.3	10.3	10.6	W100 Buffalo Bayou @ West Beltway 8
2280	0.5	1.3	2.2	3.6	5.7	6.9	8.2	8.4	8.4	8.6	W156 Rummel Creek @ Brittmoore Road
2290	0.5	1.2	2.0	3.2	4.9	6.0	7.5	7.6	7.7	7.9	W100 Buffalo Bayou @ Dairy Ashford Road

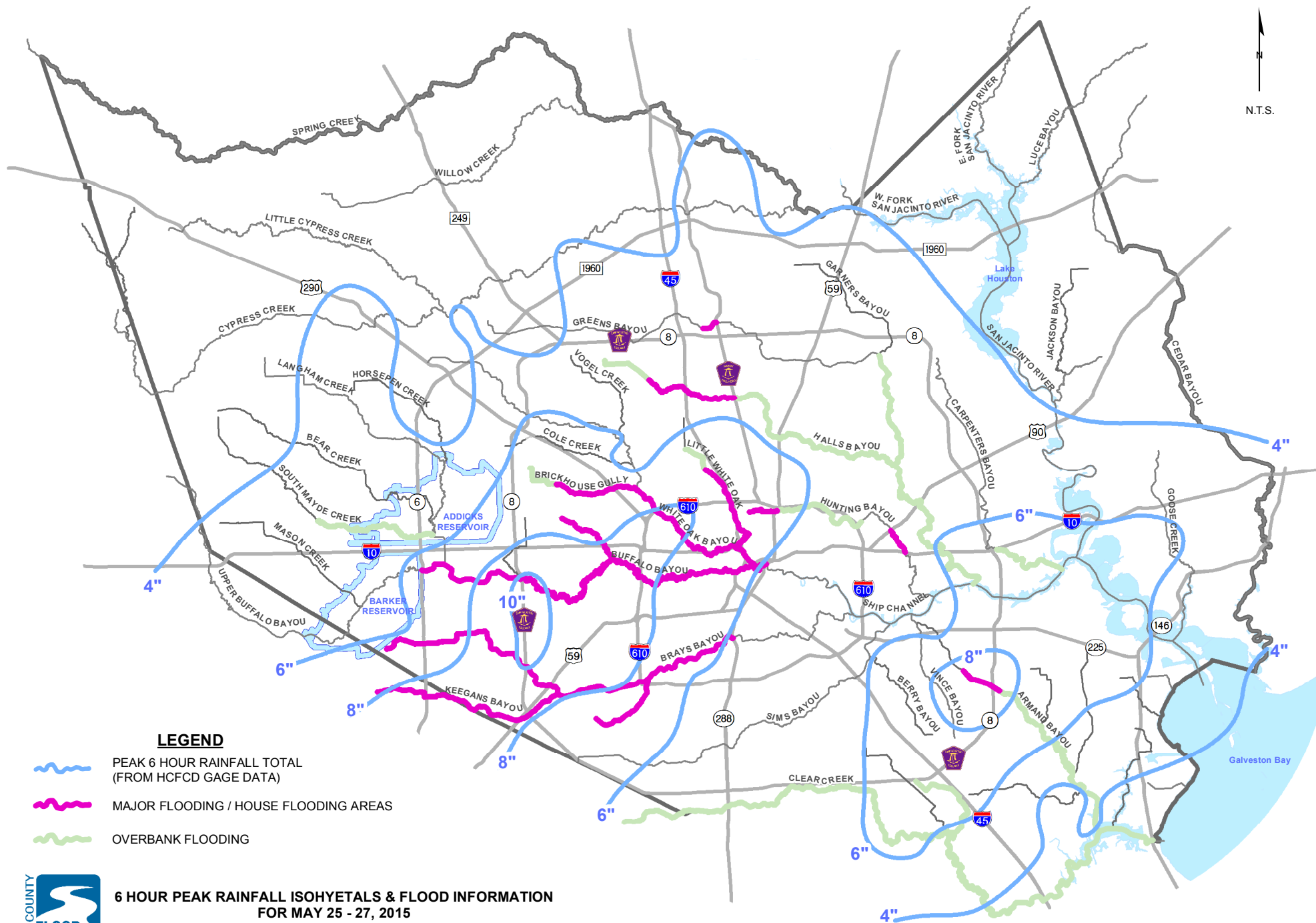
# Rainfall Intensity Report

## 05-25-15 10 am to 05-27-15 10 am

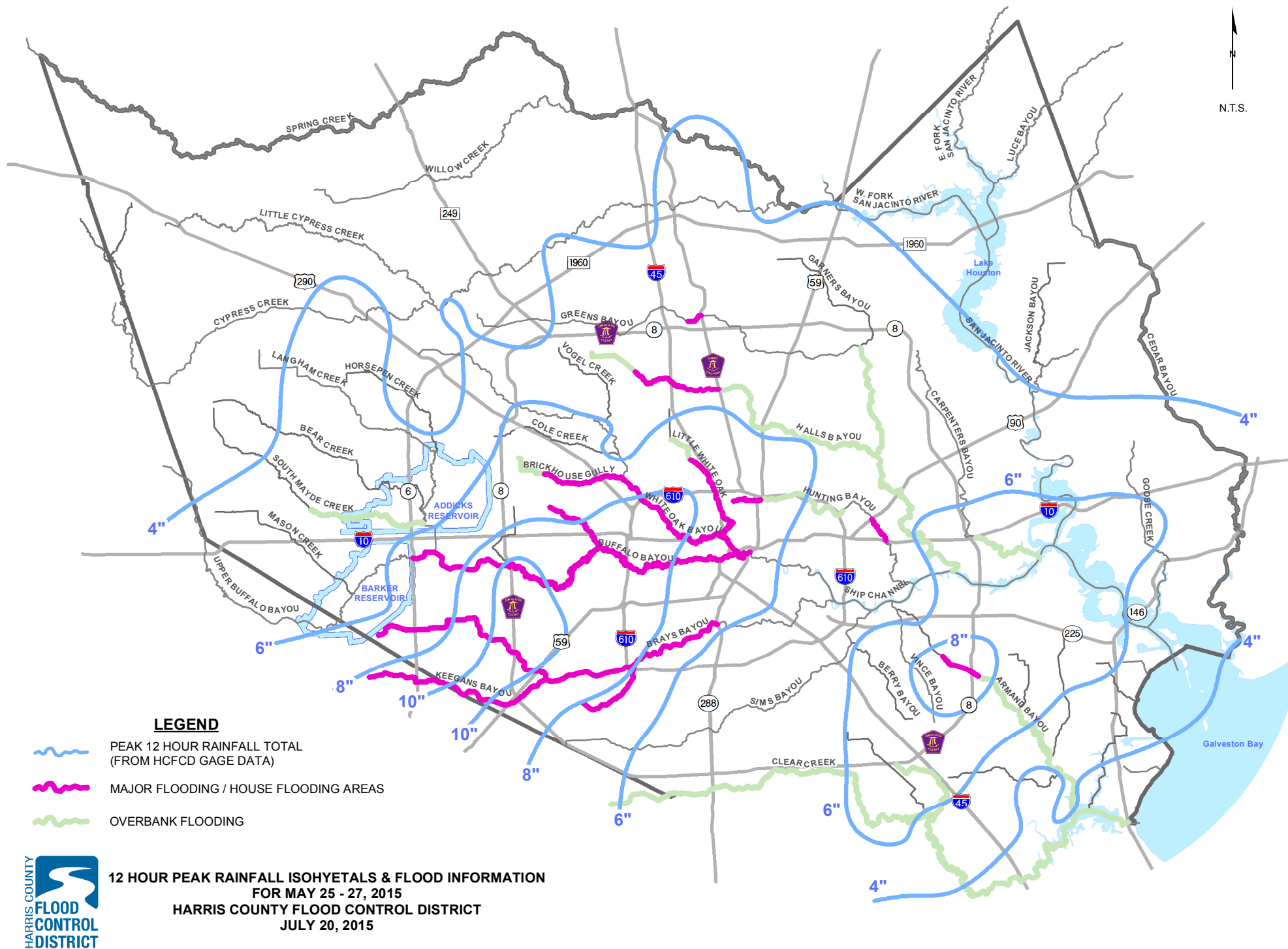
Region 1--Addicks, Barker, Cypress, Spring, and Willow										
Period	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day
2-year	0.7	1.1	1.4	1.9	2.2	2.5	2.9	3.4	4.1	4.7
5-year	0.9	1.4	1.8	2.5	3	3.3	4	4.8	5.8	6.6
10-year	1	1.5	2.1	2.8	3.5	3.9	4.9	5.9	7.1	8.1
25-year	1.1	1.8	2.4	3.4	4.2	4.8	6.1	7.4	9.0	10.1
50-year	1.2	2	2.7	3.8	4.9	5.6	7.2	8.7	10.6	11.8
100-year	1.3	2.2	3	4.2	5.5	6.5	8.5	10.2	12.4	13.6
500-year	1.5	2.7	3.9	5.5	7.5	9.0	12.2	14.7	17.7	18.7

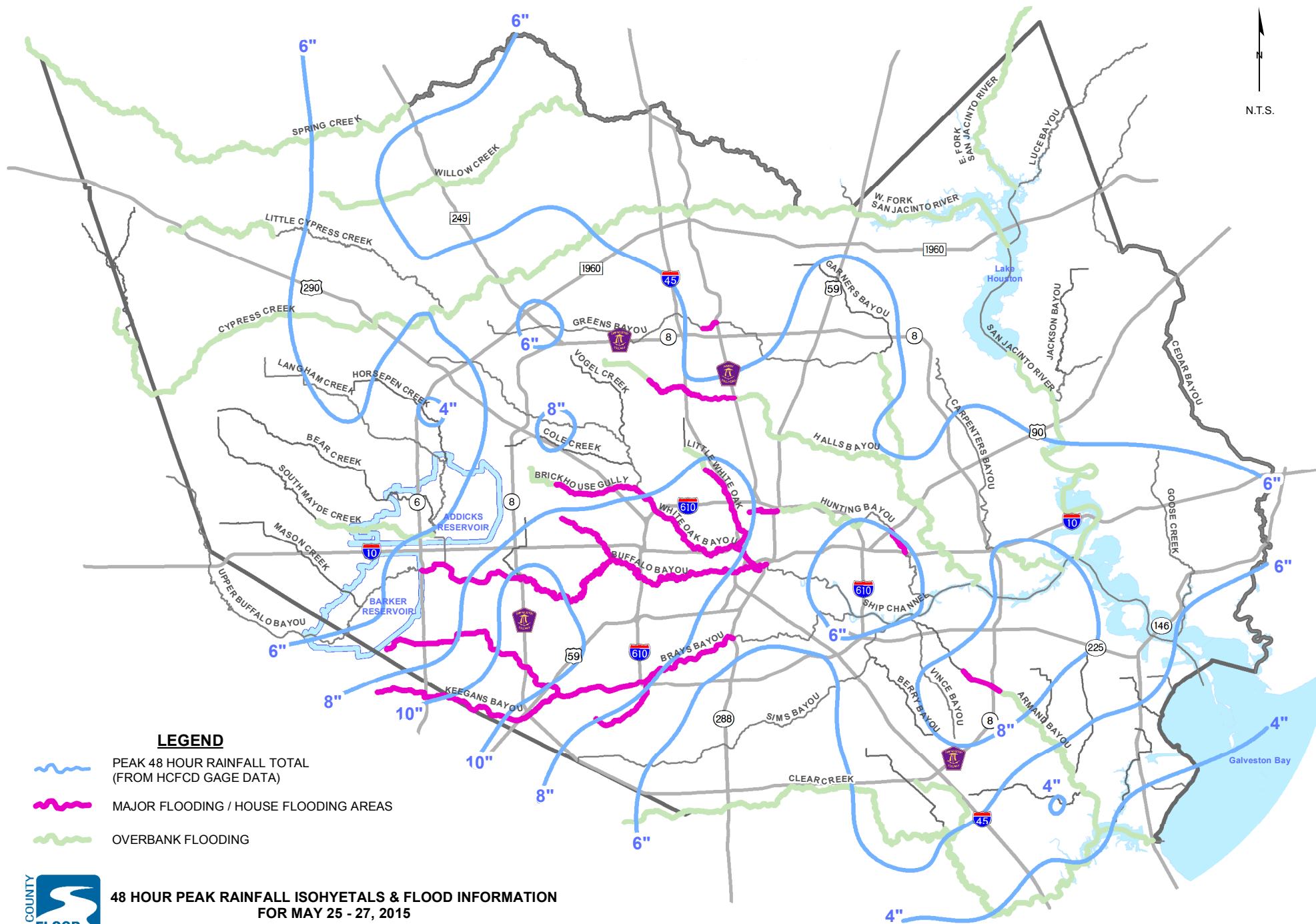
Region 2--Brays, Buffalo, Greens, Hunting, Luce, West Fork San Jacinto, and White Oak										
Period	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day
2-year	0.7	1.1	1.5	2.0	2.3	2.6	3.1	3.7	4.4	5.0
5-year	0.8	1.4	1.8	2.5	3.1	3.5	4.3	5.1	6.2	7.1
10-year	0.9	1.5	2.1	2.9	3.6	4.1	5.1	6.2	7.6	8.6
25-year	1.0	1.7	2.4	3.4	4.3	5.0	6.4	7.8	9.6	10.8
50-year	1.1	1.9	2.7	3.8	5.0	5.8	7.6	9.2	11.3	12.5
100-year	1.2	2.1	3.0	4.3	5.7	6.7	8.9	10.8	13.2	14.5
500-year	1.4	2.6	3.8	5.5	7.6	9.2	12.8	15.5	18.9	20.0

Region 3--Armand, Carpenters, Ceder, Clear, Galveston Bay, Goose, Jackson, Lower San Jacinto River, Sims, Ship Channel and Vince										
Period	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day
2-year	0.7	1.1	1.5	2.0	2.4	2.7	3.2	3.8	4.5	5.3
5-year	0.8	1.4	1.9	2.5	3.1	3.5	4.4	5.3	6.4	7.5
10-year	0.9	1.5	2.1	2.9	3.7	4.2	5.3	6.4	7.8	9.0
25-year	1.0	1.7	2.4	3.4	4.4	5.1	6.6	8.0	9.8	11.2
50-year	1.1	1.9	2.7	3.8	5.0	5.9	7.7	9.5	11.6	13.1
100-year	1.2	2.1	3.0	4.3	5.7	6.8	9.1	11.1	13.5	15.1
500-year	1.4	2.5	3.7	5.5	7.7	9.4	13.1	15.9	19.3	20.7

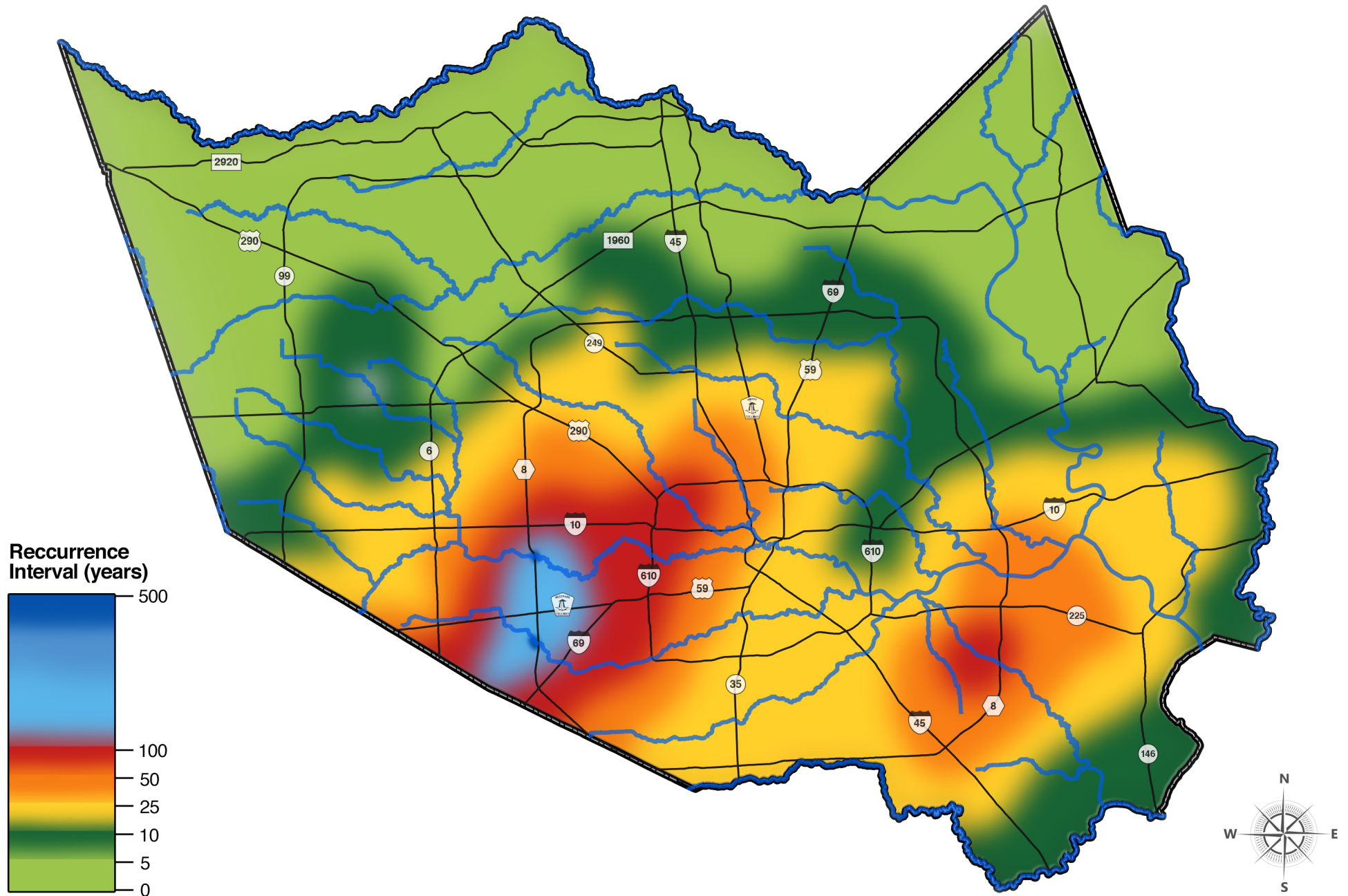




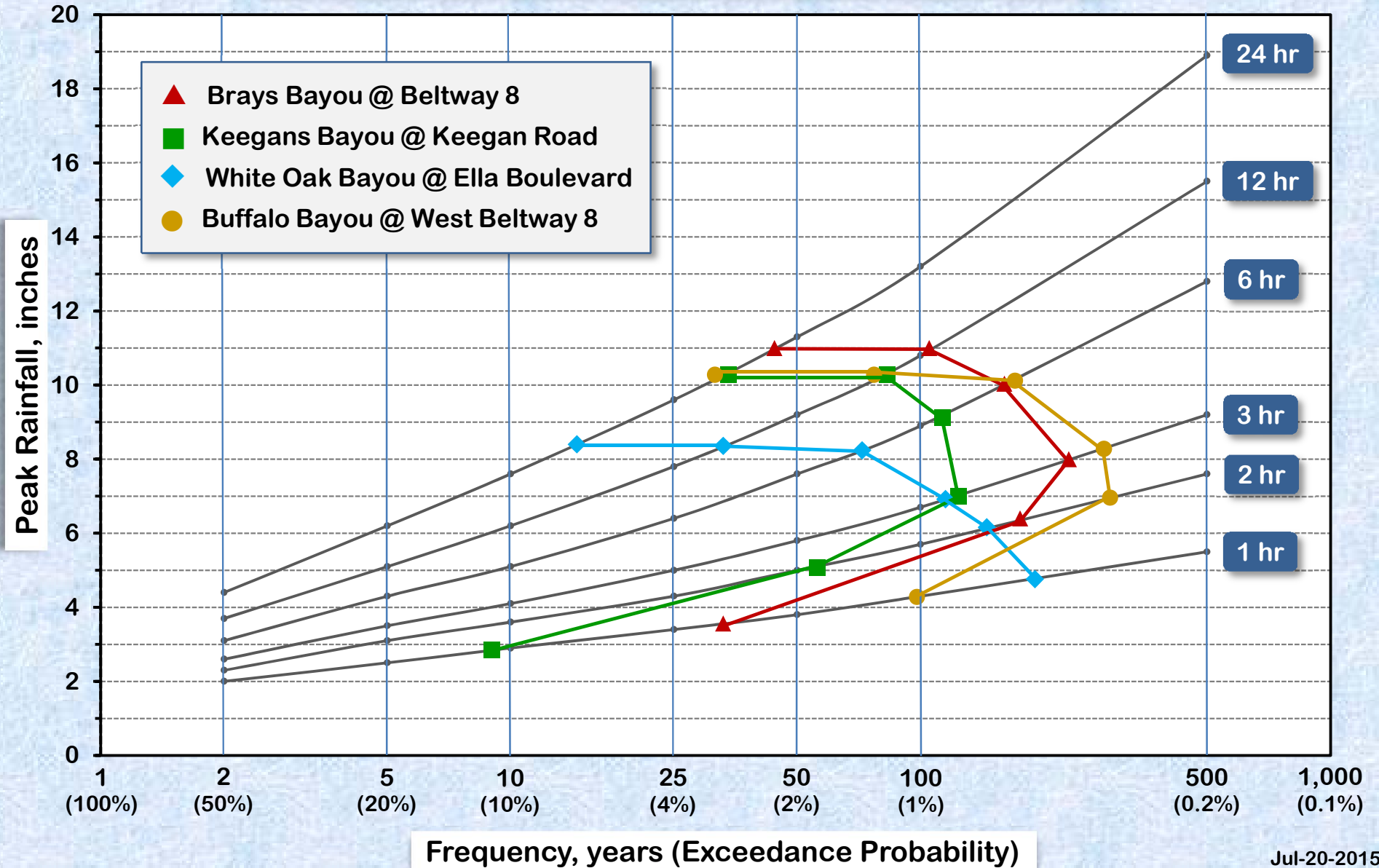




# SIX HOUR PEAK RAINFALL RECURRENCE INTERVALS for the May 25-27, 2015 Flood Event



**Rainfall - Duration - Frequency ▶ May 25 to 26, 2015**  
**Region 2 ▶ Brays, Buffalo, Greens, Hunting, Luce,**  
**West Fork San Jacinto, and White Oak**



## SUMMARY SHEET - HCFCD HIGH WATER MARKS

7/20/2015

BRAYS BAYOU D100-00-00 Page 1 of 2

ROAD NAME	STAGE GAGE	BRIDGE BM ELEV	78 TO '01 ADJUST	10.0%	2.0%	1.0%	0.2%	STORM EVENTS														
								7/30/54	6/18/73	8/31/81	ALICIA 8/18/83	9/19/83	CHANTAL 8/1/89	3/4/92	10/18/94	FRANCES 9/11/98	ALLISON 6/9/01	11/17/03	IKE 9/13/08	4/28/09	1/9/12	5/26/15
75 TH		20.35	-0.5	14.4	17.1	18.3	21.5				13.4	12.7			11.9	13.6	16.5	8.8	16.8	N/A	10.1	12.4
LAWNDALE	410	21.97	-0.6	18.1	20.7	21.9	24.7				16.7	17.0	13.9		17.6	17.9	22.8	14.9	17.0	9.2	15.6	18.4
IH 45 (IN BOUND)		31.49	-0.6	21.7	24.4	25.6	28.3		20.1			20.8			21.7	20.7	27.6	20.0	21.6	N/A	18.4	21.6
TELEPHONE RD		25.65	-0.6	23.4	26.0	27.3	30.2	22.4	21.7	20.2	18.7				22.1	21.8	27.8	15.7	22.9	14.8	19.9	22.2
WAYSIDE		32.17	-0.6	24.9	27.8	29.2	32.0		23.5						23.0	16.8	20.4 <sup>1</sup>			14.2	21.0	23.3
OLD SPANISH TRAIL (OST)		28.47	-0.7	25.4	28.3	29.9	32.8								26.3		27.8	16.6	25.0	15.7	20.9	23.8
MARTIN LUTHER KING		36.47	-0.8	29.7	32.4	33.7	36.1				24.9	26.8			26.0	29.5	32.8	26.6	29.9	20.9	26.2	29.3
CALHOUN		33.41	-0.8	30.3	32.8	34.0	36.5	31.9	29.2	29.0					29.5	30.1	32.8	27.8	30.7	22.0	28.2	28.9
SCOTT		37.92	-1.0	31.6	34.4	35.7	37.9								31.3	32.3	32.4	29.7	31.5	24.0	29.4	32.1
ARDMORE		37.36	-1.1	32.8	35.4	36.6	38.9								33.9		38.0	31.9	32.8	25.8	31.2	34.3
SH 288		51.01	-1.2	33.6	36.4	37.8	40.1				30.4				34.8	35.2	39.3	33.9	33.6	26.7	33.0	35.2
ALMEDA RD		41.10	-1.2	34.4	37.6	39.1	41.9		35.1	34.5					36.2	34.7	37.5	33.9	35.0	27.1	33.7	37.0
D109 @ MACGREGOR	400	39.11	-1.2	34.9	38.2	39.9	43.0												34.0	N/A	36.1	38.0
HOLCOMBE BLVD		43.31	-1.2	36.3	39.4	41.1	43.9		37.4	37.3	33.8	38.4			38.2	36.7	40.3	36.7	37.2	30.7	36.5	38.2
S. BRAESWOOD BLVD.		43.68	-1.2	37.1	40.0	41.9	44.8								39.4		42.9	38.0	38.7	32.0	37.3	39.9
FANNIN		45.81	-1.3	38.4	41.2	43.3	46.6			38.9	34.7				41.0	38.5	44.0	37.8	39.4	34.0	37.9	40.1
GREENBRIAR		45.11	-1.3	39.2	41.7	43.8	47.4								40.7		42.2	39.9	39.4	35.0	38.7	41.3
N. BRAESWOOD BLVD.		47.58	-1.4	40.2	42.4	44.9	48.6								41.7		44.5	46.5	40.8	N/A	40.6	42.2
SOUTH MAIN	420	46.53	-1.4	41.0	43.1	45.7	50.0		41.2	41.5	37.4	42.4	38.8		42.2	39.6	42.9	40.6	41.3	36.5	40.5	42.9
S. BRAESWOOD		47.47	-1.3	41.4	43.7	46.6	50.1								42.7		44.3	42.0	41.9	36.3	39.9	40.8
KIRBY		44.30	-1.3	42.1	44.3	47.1	50.7		41.6	42.5					42.7	40.6	47.2	42.1	41.8	37.4	41.6	43.9
BUFFALO SPEEDWAY		49.48	-1.3	43.7	46.1	48.4	51.1		42.8		40.9				44.4	43.1	47.4	43.7	43.3	39.3	43.7	45.5
STELLA LINK	430	49.55	-1.7	45.5	47.5	49.6	51.8		45.1	46.1	42.7			45.0	46.0	44.3	48.4	46.4	45.9	43.0	45.7	48.3
SPRR		53.36	-1.7	47.2	49.5	51.3	52.6								47.8	46.3	49.4	47.1	46.5	44.0	47.2	49.1
D112 @ WILLOWBEND	435	51.69	-2.0	47.2	49.8	50.7	52.9												47.8	43.2	49.1	51.7

NOTE: BRIDGE AND HIGH WATER ELEVATIONS ARE ON 1988 NAVD; 2001 ADJ

NOTE: D109 @ MacGregor added as a HWM location in summer of 2005

<sup>1</sup> = Suspect elevation, low confidence in field

Exceedance probability elevations are from the June 9th, 2006 TSARP Flood Insurance Study.  
 High water marks are approximate. HCFCD assumes no responsibility for their accuracy.



## SUMMARY SHEET - HCFCD HIGH WATER MARKS

7/20/2015

BRAYS BAYOU D100-00-00 Page 2 of 2

ROAD NAME	STAGE GAGE	BRIDGE BM ELEV	78 TO '01 ADJUST	10.0%	2.0%	1.0%	0.2%	STORM EVENTS														
								7/30/54	6/18/73	8/31/81	ALICIA 8/18/83	9/19/83	CHANTAL 8/1/89	3/4/92	10/18/94	FRANCES 9/11/98	ALLISON 06/09/01	11/17/03	IKE 9/13/08	4/28/09	1/9/12	5/26/15
SOUTH POST OAK		50.45	-2.1	49.9	52.1	53.6	55.0					47.4			50.2	46.7	50.8	50.8	47.3	46.3	48.9	51.4
RICE BLVD	440	53.81	-2.0	50.8	52.9	54.3	55.7		49.1		47.4	52.5	49.0		51.5	47.5	50.4	51.0	47.9	47.6	50.3	52.9
CHIMNEY ROCK		54.05	-2.1	52.4	54.6	55.5	56.8		50.9	50.8		53.7		51.4	52.5	50.6	52.5	53.3	48.4	49.0	51.2	53.6
HILLCROFT		59.78	-2.2	55.1	57.2	57.4	58.7		52.3	53.3	51.0	56.4			54.5	52.6	53.7	55.1	51.5	51.6	53.8	55.9
N. BRAESWOOD		58.37	-2.2	56.2	58.7	59.1	60.5								55.7			56.5	52.8	52.9	55.0	57.1
FONDREN		59.28	-2.4	58.5	61.1	61.5	62.7		53.7	55.5	52.5	58.4			57.3	52.9	55.4		53.4	54.6	56.5	59.0
BRAES BAYOU		64.22	-2.3	59.5	61.7	62.0	63.1								58.2		55.7	59.5	55.3	55.2	55.9	60.6
GESSNER	460	62.35	-2.7	60.4	62.6	63.0	64.4		55.2		54.4	61.4	57.1		59.4	56.7	56.0	60.7	56.6	56.9	58.2	61.7
BISSONNETT		66.11	-2.7	61.5	64.1	64.6	65.7		55.9							54.0			53.2	57.1	58.4	63.3
BRAEBURN GLEN		63.94	-2.7	61.7	64.6	65.1	66.4											61.8	57.4	57.0	58.7	62.9
US 59 (N BOUND)		69.93	-2.7	62.2	64.9	65.5	66.8				54.5	63.1			60.4	55.4			62.2 <sup>1</sup>	58.8	59.1	63.0
BEECHNUT		67.68	-2.8	65.1	67.5	68.0	69.4				56.1	65.0			61.8	60.6			55.2	60.9	59.5	63.0
WEST BELT	465	71.33	-3.0	66.2	69.0	69.6	71.1								63.5	59.0		65.0	58.7	60.9	59.6	64.8
BELLAIRE BLVD	475	70.31	-3.0	68.8	71.6	72.2	73.5				59.0	67.0			64.3	61.3		65.9	58.3	63.4	60.4	66.6
BOONE		70.90	-2.8	69.7	72.3	72.9	74.1								65.5	63.6			60.9	65.0	61.4	66.8
BELLE PARK	470	73.58	-2.7	70.6	73.1	73.6	74.7											69.6	63.8	63.9 <sup>1</sup>	62.7	67.0
HIGH STAR		73.84	-2.7	71.2	73.7	74.3	75.4								71.4			69.2	61.9	67.5	63.4	67.4
ALIEF CLODINE RD		78.91	-2.5	71.9	74.3	75.0	76.1					70.5			68.6			72.2	61.1	67.9	64.6	67.8
OLD WESTHEIMER		77.44	-2.5	73.6	75.7	76.4	77.7								69.7			75.3	65.8	69.6	N/A	69.2
DAIRY ASHFORD		80.38	-2.7	75.1	77.2	78.0	79.3								74.0				67.7	70.2	67.5	70.2
SYNOTT RD		80.56	-2.4	76.9	78.6	79.2	80.6				74.5	77.1			75.4	74.7			69.1	71.9	68.5	71.4
ELDRIDGE		80.77	-2.2	77.8	79.8	80.4	82.1								75.3			73.5	69.7	78.7	69.1	71.9
HWY 6	485	82.57	-2.0	80.7	82.6	82.9	83.9				78.7	79.4			78.6	79.3		77.7	76.3	78.8	77.3	77.4
ADDICKS CLODINE		90.19	-1.8	82.5	84.5	85.1	86.3				86.0	82.3						81.5	79.2	81.5	80.2	76.5

NOTE: BRIDGE AND HIGH WATER ELEVATIONS ARE ON 1988 NAVD; 2001 ADJ

<sup>1</sup> = Suspect elevation, low confidence in field

Exceedance probability elevations are from the June 9th, 2006 TSARP Flood Insurance Study.  
 High water marks are approximate. HCFCD assumes no responsibility for their accuracy.

## SUMMARY SHEET - HCFCD HIGH WATER MARKS

7/20/2015

## KEEGANS BAYOU D118-00-00

ROAD NAME	STAGE GAGE	BRIDGE BM ELEV	78 TO '01 ADJUST	10.0%	2.0%	1.0%	0.2%	STORM EVENTS															
								3/4/92	10/18/94	11/17/03	IKE 9/13/08	4/28/09	1/9/12	5/12/12	5/26/15								
SOUTH BRAESWOOD		63.03	-1.7	58.6	60.7	61.4	63.1	61.6		62.4	58.3	60.0	61.2	59.6	62.7								
BELTWAY 8		76.38	-2.8	69.3	70.9	71.5	72.7		69.1	69.6	66.6	64.7	70.0	68.3	71.1								
ROARK	480	76.35	-2.8	72.1	73.5	74.1	75.2		73.2	73.4	69.4	68.9	73.3	72.9	74.5								
WILCREST		75.52	-2.7	74.9	76.3	76.8	77.9	74.6	75.1	75.9	71.8	71.9	75.5	75.7	76.2								
S. KIRKWOOD		78.20	-2.7	76.6	77.9	78.4	79.6	77.5		77.4	74.6	75.5	77.5	77.1	78.3								
KEEGANS	490	81.07	-2.8	78.2	79.5	79.9	80.8				75.6	75.9	78.9	77.8	80.8								
DAIRY-ASHFORD		81.29	-2.8	78.7	80.2	80.7	81.9		78.7	80.2	76.8	78.3	79.8	79.5	81.6								
SYNOTT		86.83	-2.8	80.5	82.6	83.5	85.1								82.9								
HWY 6		91.68	-2.8	82.1	84.4	85.3	87.1								84.5								
ROCKY VALLEY	495	88.36	-2.8	82.9	85.2	86.0	87.9								85.5								
RICHMOND GAINES		88.81	-2.8	84.2	87.4	88.4	89.6								85.8								

NOTE: BRIDGE AND HIGH WATER ELEVATIONS ARE ON 1988 NAVD; 2001 ADJ  
SYNOTT, HWY 6, ROCKY VALLEY, AND RICHMOND GAINES ADDED IN JUNE 2013

Exceedance probability elevations are from the June 9th, 2006 TSARP Flood Insurance Study.  
High water marks are approximate. HCFCD assumes no responsibility for their accuracy.

ROAD NAME	STAGE GAGE	BRIDGE BM ELEV	78 TO '01 ADJUST	10.0%	2.0%	1.0%	0.2%	STORM EVENTS														
								ALLISON 6/9/01	10/29/02	11/17/03	12/14/05	6/19/06	10/16/06	5/10/07	IKE 9/13/08	4/28/09	5/26/15					
E101: LT WHITE OAK																						
E101 @ N MAIN		33.73		35.4	38.4	39.1	41.6										39.4					
E101 @ COTTAGE	560	48.22	-1.3	38.0	40.7	41.4	44.0		29.3	35.8		32.1 <sup>1</sup>			41.3		42.9					
E101 @ PATTON		N/A		39.8	42.4	43.2	46.0										43.8					
E101 @ CAVALCADE		47.24		44.5	47.5	48.3	50.0										48.8					
E101 @ CROSSTIMBERS		N/A		56.2	58.2	58.8	60.2										54.8					
E101 @ WERNER		63.42		63.7	64.0	64.3	64.9										63.5					
E101 @ TIDWELL	570	64.38	-1.9	65.2	65.9	66.1	67.0	70.1	64.2	62.5					67.1		65.6					
E115 BRICKHOUSE																						
E115 @ MANGUM		N/A	N/A	61.1	62.5	63.2	65.6							60.2	59.8	N/A	60.2					
E115 @ COSTA RICA	580	64.38		63.9	65.5	66.4	70.4		63.7	56.3		58.2	57.3	64.7	64.6	63.3	65.5					
E115 @ ANTOINE		65.72	-2.8	65.4	66.0	66.5	71.1							65.7	65.6	65.3	66.2					
E115 @ US 290		N/A	N/A	67.4	67.9	68.2	71.5							68.3	66.8	67.2	68.0					
E115 @ BOLIN		70.26	-2.8	69.4	71.3	71.8	73.6							69.7	66.4	69.4	70.2					
E115 @ LANG		74.25	-3.0	70.5	71.9	72.2	73.5							70.4	69.1	70.2	71.8					
E115 @ BINGLE		74.22														74.3	74.2					
E115 @ HOLLISTER		80.85														77.0	77.6					
E117 COLE CREEK																						
E117 @ DEIHL	590	80.94	-3.0	75.8	79.0	80.2	81.4		73.8	73.2	73.4	71.6			74.0							
E121 VOGEL CREEK																						
VICTORY	585	75.11	-1.6	74.7	75.2	75.6	76.0		77.1	73.7	72.6	73.3			69.1							
MAPLE TREE		78.79		77.6	78.2	78.5	78.9					77.1										
GULF BANK	595	78.97	-3.4	79.7	80.4	80.7	81.3		81.0	80.4	77.6	78.0			74.2							
RAMONA		98.39		98.7	99.3	99.5	99.9					99.1			98.4							

NOTE: ELEVATIONS ARE ON 1988 NAVD; 2001 ADJ

<sup>1</sup> = Suspect elevation, low confidence in field



## SUMMARY SHEET - HCFCD HIGH WATER MARKS

7/20/2015

## HUNTING BAYOU H100-00-00

ROAD NAME	STAGE GAGE	BRIDGE BM ELEV	78 TO '01 ADJUST	10.0%	2.0%	1.0%	0.2%	STORM EVENTS															
								3/20/72	3/4/92	FRANCES 9/11/98	ALLISON		6/19/06	10/16/06	Erin 8/16/07	IKE 9/13/08	5/26/15						
FEDERAL RD		13.41	0.0	7.0	10.6	12.0	15.1		4.1	7.5	6.6	9.4	5.8	5.9	5.2	13.3	4.8						
MARKET ST		22.36	0.0	18.1	20.6	22.0	25.3		19.8		21.4	25.7	19.7	17.4	19.1	21.4	10.4						
IH 10	820	27.21	-0.2	20.5	22.3	24.3	26.7		20.5	21.0	23.0	28.3	21.4	16.2	21.5	23.5	20.1						
WALLISVILLE		31.55	-0.6	28.9	30.9	31.6	33.0	29.4	29.6	30.1	30.3	31.3	27.2	28.5	31.2	31.0	27.3						
LOOP 610	830	39.32	-0.9	34.4	36.4	37.2	38.6		34.2	34.6	34.1	37.4	33.8	32.2	34.3	35.5							
McCARTY RD		39.79	-0.9	36.0	37.7	38.5	40.5	33.8		34.8	36.5	38.0	34.0	32.3	34.9	35.2							
WAYSIDE		40.64	-1.1	39.1	41.0	41.8	43.4				38.4	41.1	37.3	34.5	36.7	37.9	35.9						
LIBERTY RD		45.03	-1.1	40.0	42.1	42.9	45.3			39.7			37.9	40.4	36.7	39.1	37.3						
HOMESTEAD RD		48.23	-1.1	41.4	43.5	44.4	46.3	39.7	43.1		41.2	44.4	39.2	40.5	40.6	41.4	37.1						
PEDESTRIAN BR IN PARK	840	41.44	-1.1	41.9	44.1	45.0	46.8					42.0	40.4	40.5	42.0	42.1	40.7						
LOCKWOOD RD		41.44	-1.1	42.2	44.4	45.2	47.0	40.7	41.5	41.4	42.2		41.0	41.3	41.8	42.6	39.0						
WIPPRECHT		43.06	-1.1	42.3	44.5	45.3	47.0			41.9	42.6	44.8	40.6	40.7	42.4	42.5	41.0						
HIRSCH RD		45.13	-1.0	42.5	44.6	45.4	47.1	40.4	42.0	43.8	42.6	44.4	41.8	42.4	42.7	42.8	42.1						
US 59		44.00	-1.0	43.0	44.8	45.6	47.3	41.5	43.1	42.7	43.5	45.6	42.5	42.7	43.1	42.9	43.1						

NOTE: BRIDGE AND HIGH WATER ELEVATIONS ARE ON 1988 NAVD; 2001 ADJ

(?) = Survey Dept research needed to confirm elevation

Exceedance probability elevations are from the June 9th, 2006 TSARP Flood Insurance Study.  
 High water marks are approximate. HCFCD assumes no responsibility for their accuracy.

## SUMMARY SHEET - HCFCD HIGH WATER MARKS

7/20/2015

BUFFALO BAYOU W100-00-00

ROAD NAME	STAGE GAGE	BRIDGE BM ELEV	78 TO '01 ADJUST	10.0%	2.0%	1.0%	0.2%	STORM EVENTS																
								8/1/54	6/27/60	8/31/81	ALICIA 8/18/83	9/19/83	5/19/89	3/4/92	FRANCES 9/11/98	ALLISON 6/9/01	11/17/03	IKE 9/13/08	4/28/09	5/26/15				
TURNING BASIN	2210	17.07		6.0*	10.5*	12.2*	16.1*											15.0						
MCKEE ST		43.29		21.4	26.8	29.4	34.4											23.4	17.5	23.4				
SAN JACINTO ST		37.83		23.9	29.2	31.8	37.4											25.7	21.0	29.4				
MILAM	2220	26.35	-0.8	27.1	32.6	35.6	41.3								30.4	35.9	22.7	27.8	21.6	31.3				
SABINE ST		40.07		30.1	33.8	37.0	42.8											21.6	23.3	32.1				
SHEPHERD	2240	40.80	-1.2	30.8	34.7	38.0	43.9	18.5	26.2	22.7	22.5	23.3	27.2	31.6	33.9	40.5	25.4	31.0	28.0	33.8				
LOOP 610 FRONTAGE		49.68	-1.5	33.6	38.4	41.3	47.6	30.7	33.7	33.9		34.0	36.7	40.9	38.4	42.6	35.5	36.8	38.7	42.4				
WOODWAY		45.35	-1.5	35.6	40.5	43.3	49.1					35.3		38.5		42.8		36.5	38.2	41.0	44.2			
FARTHER POINT		51.52	-1.9	40.6	46.0	48.8	54.0								47.3		40.9	42.7	45.1	47.9				
VOSS		58.80	-1.6	44.4	49.6	52.2	57.1		47.8	43.9	40.5			48.0	46.8	47.1 (?)	46.1	45.7	50.3	53.3				
SAN FELIPE	2260	57.28	-1.6	47.5	52.8	55.3	60.0				46.9		49.2		51.8		48.3	46.0	53.0	54.5				
BLALOCK\PINEY PT		64.10	-1.7	51.8	56.4	58.6	63.3	50.0			52.9		51.9	53.3	57.7	56.1		53.7	51.7	57.5	57.9			
GESSNER		65.65	-1.5	56.0	60.7	62.8	66.7				58.3	53.4	55.2	56.8	61.7	60.0		56.4	52.6	64.9	60.6			
WEST BELT	2270	70.12	-1.9	58.5	63.2	65.3	69.2				60.2			60.1	64.5			59.8	59.1	65.4	62.9			
N. WILCREST		71.62	-1.6	62.3	66.8	68.6	71.8				62.3		60.4	61.4	67.4	64.5		62.8	64.4	67.5	65.5			
DAIRY ASHFORD	2290	76.75	-1.7	65.8	70.0	71.8	74.7		68.8	67.9	65.4	63.1	66.3	71.8	68.3		68.9	65.2	70.5	69.1				
HWY 6		82.43	-1.8	70.7	75.4	77.1	80.1				63.5			76.5	71.3		71.6	69.4	75.8	72.4				
W140 @ BINGLE	2250	71.55	-2.5	61.5	63.5	64.5	66.6											64.3	66.8	65.0	65.2			
W156 @ BRITTMORE	2280	76.00		73.3	75.9	76.8	79.0													73.6				

NOTE: BRIDGE AND HIGH WATER ELEVATIONS ARE ON 1988 NAVD; 2001 ADJ

(?) = Survey Dept research needed to confirm elevation

\* = Combined Probability (includes storm surge and rainfall)

Exceedance probability elevations are from the June 9th, 2006 TSARP Flood Insurance Study.

High water marks are approximate. HCFCD assumes no responsibility for their accuracy.