

April 27th & 28th Storm Analysis

Executive Summary

On April 27th and 28th, 2009 a major storm event occurred in the northwestern portion of Harris County bringing substantial rainfall which resulted in significant runoff and flooding within portions of the Buffalo Bayou watershed, including Spring Valley Village. As a result of the large amount of rainfall and the wet ground conditions (due to rainfall events in the previous 10 days) existing prior to the start of this event, runoff from this storm was extremely heavy and resulted in flooding conditions on many of the streams within the area. This storm event eclipsed the previous **storm of record** (worst storm in history) on Buffalo Bayou for the Memorial Villages area, which occurred in March of 1992. Substantial house flooding occurred within the western portion of Harris County, with more than 2300 homes throughout the area being flooded. As a result of rainfall runoff from this storm, Spring Valley Village experienced overbank flooding along portions of Briar Branch upstream of Fries Road, with structure flooding reported at 27 addresses. The vast majority of the properties that experienced flooding are in close proximity to Briar Branch. The majority of the homes that flooded were located within the defined flood plain areas of the city. In other locations, outside the defined flood plain areas, reports indicate that there were specific circumstances that caused the flooding such as debris causing clogged drainage structures. Exhibit 1 illustrates both the 100 year and the 500 year flood plain and shows the structures in which flooding occurred.

Harris County's Office of Emergency Management maintains a network of rainfall and stream flow gauges throughout the County. In addition, there is an extensive network of private gauges throughout the area that provide supplemental data on rainfall events. During the storm event which occurred on the 27th and 28th, the rainfall was measured to be in excess of 25-year amounts for the duration of the storm, with rainfall amounts in the 50 to 100 year range for portions of the Buffalo Bayou watershed. Rainfall from this event averaged 1-2 inches more than experienced in the March 1992 storm (the previous storm of record) that produced widespread flooding in Spring Valley.

Runoff associated with this storm was significantly higher than the associated rainfall, due to antecedent moisture conditions in the watershed, resulting in stream flow measurements in the range of 65 to 70 year levels on Spring Branch Creek, and in excess of the **storm of record** on Buffalo Bayou for the Memorial Villages area. Harris County Flood Control District (HCFCD) reported that the stream flow measured at the gauge on Buffalo Bayou at Piney Point exceeded the previous **storm of record**. At the gauge on Spring Branch Creek at Bingle, the water level reached a height that would put this event in the range of a 65 to 70-year water level. Briar Branch does not have a stream gauge, so the water levels reached are not recorded. However, there is documentation from observations, photographs and high water marks to indicate the levels the water reached **may have exceeded the 100 year storm**. Throughout the portion of Briar Branch between Adkins and Voss Road, there is extensive evidence of high water marks at or above the top of bank level. The actual capacity of the channel is two-thirds to three-quarters of that needed for the 100-year runoff, based on previously published reports. Exhibit 9 illustrates the 100 year flood, the high banks of the creek and the finished floor elevations of the structures flooded.

Based on the data available, the runoff from the storm of April 27-28 substantially exceeded the relative rainfall amounts, in terms of probability of recurrence; i.e. a 25-year rainfall produced a 100-year runoff. This is possible because the runoff resulting from a given amount of rainfall is highly dependent

on the conditions in the watershed, particularly in terms of antecedent moisture – i.e., if recent rainfall has saturated the ground and filled the depressions, more runoff will occur than if conditions have been dry. Following the prior events over the previous 10 days, the initial rainfall event on the afternoon of the 27th completely saturated the ground, so that the extremely heavy rainfall rates on the 28th resulted in significantly higher runoff than would have been experienced if the same rainfall had occurred with “normal” antecedent moisture conditions. Hence, a 25-year rainfall resulted in a 100-year runoff. Further, because of the way in which the storm event moved across the watershed, the capacity of Briar Branch was already greatly taxed from runoff originating further upstream before the second rainfall event started in Spring Valley Village on April 28th. In addition, sheet flow from areas outside of Spring Valley Village contributed to the extraordinarily high water levels reached in Briar Branch.

By comparison, the 1992 storm resulted in 122 locations in Spring Valley that had some type of structural flooding. HCFCFCD has estimated that the 1992 flood represented only a 40-50 year event, as compared to a ***possible 100-year event*** for the April 2009 storm. On this basis, the improvements and policies that have been implemented in the interim period appear to have made considerable progress in reducing the flooding risks within Spring Valley Village.

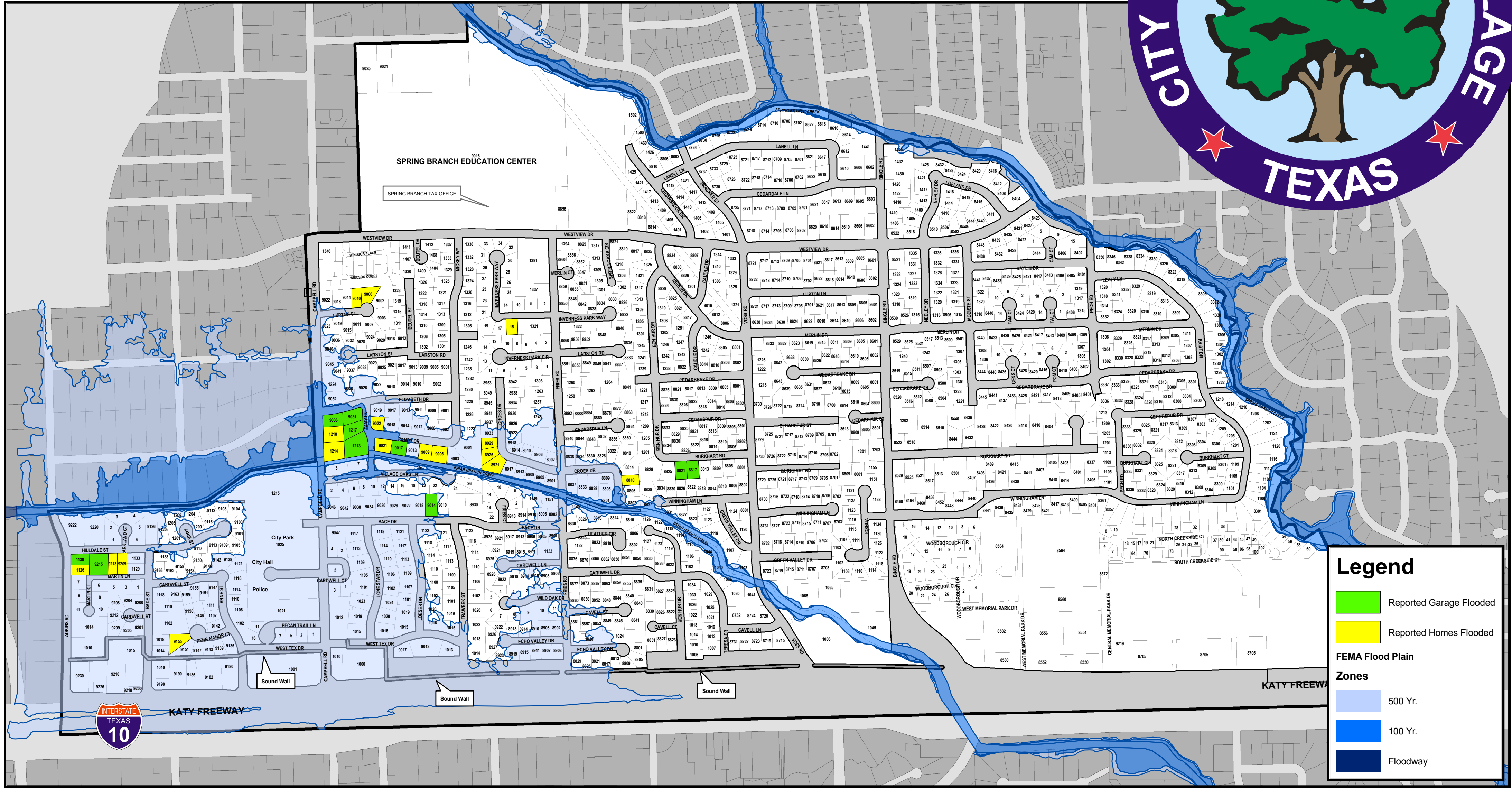
Based on reports received, the drainage systems within the recently constructed project areas performed properly in the initial event on April 27th. However, in the subsequent rainfall on the 28th, Briar Branch reached or exceeded its bank full capacity because of contributing runoff from outside Spring Valley Village and surcharged the drainage systems upstream, leaving no available relief for the local rainfall runoff. Briar Branch overtopped the bridge structure at Campbell Road, and reached or exceeded bank full levels throughout the channel segment from just upstream of Voss Road to west of Adkins. Due to the high water levels in Briar Branch, tributary ditches and storm sewer systems backed up, resulting in flooding in the adjacent areas served by these systems. In some cases, water levels in the creek were so high that flow directions in the lateral systems were reversed, with water flowing out of the creek into the storm sewers and lateral ditches. In particular, the storm sewer system along Campbell Road was observed to be discharging water into the neighborhoods that it serves, rather than draining them. Survey data gathered after the storm event confirmed that the observed water surface elevation on Briar Branch at Campbell Road was higher than the inlets and culverts connected to the Campbell Road storm sewer system at Elizabeth, Larston cul-de-sac, Westview at Buetel, and Westview at Mickey Way. The Adkins Road drainage system was also observed to reverse flow direction.

The lack of capacity in Briar Branch and the resulting high water levels is the primary cause of the flooding that occurred. Drainage basin transfers (such as the sheet flow from the Spring Branch Creek watershed into the Briar Branch watershed) and flow reversals contributed to the flooding that occurred.

The Short-Term and Mid-Term actions proposed herein will help to alleviate some of the drainage issues during storm events; however their significance is minimal and will lessen significantly as the intensity of future storms increases. Long-Term action will be required to alleviate the probability of flooding during events such as occurred on April 27th and 28th. The primary recommendation for Long-Term action is to pursue the implementation of major drainage improvements to Briar Branch such as the Briar Branch Diversion project. Since Briar Branch is a Harris County Flood Control District channel, and is not under the direct jurisdiction of Spring Valley Village, a coordinated effort between the two agencies will be required to accomplish improvements of significant magnitude.

City of Spring Valley Village, Texas

Flooded Properties
April 27 - 28, 2009 Storm



0 270 540 1,080 1,620 2,160 Feet
1 inch = 500 feet
Printed January, 2007

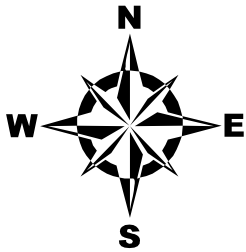


Exhibit 1
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Briar Branch W140-01-00

