

Gapps Bayou Alternative Evaluations Watershed Study Fort Bend County Precinct 1



November 2013

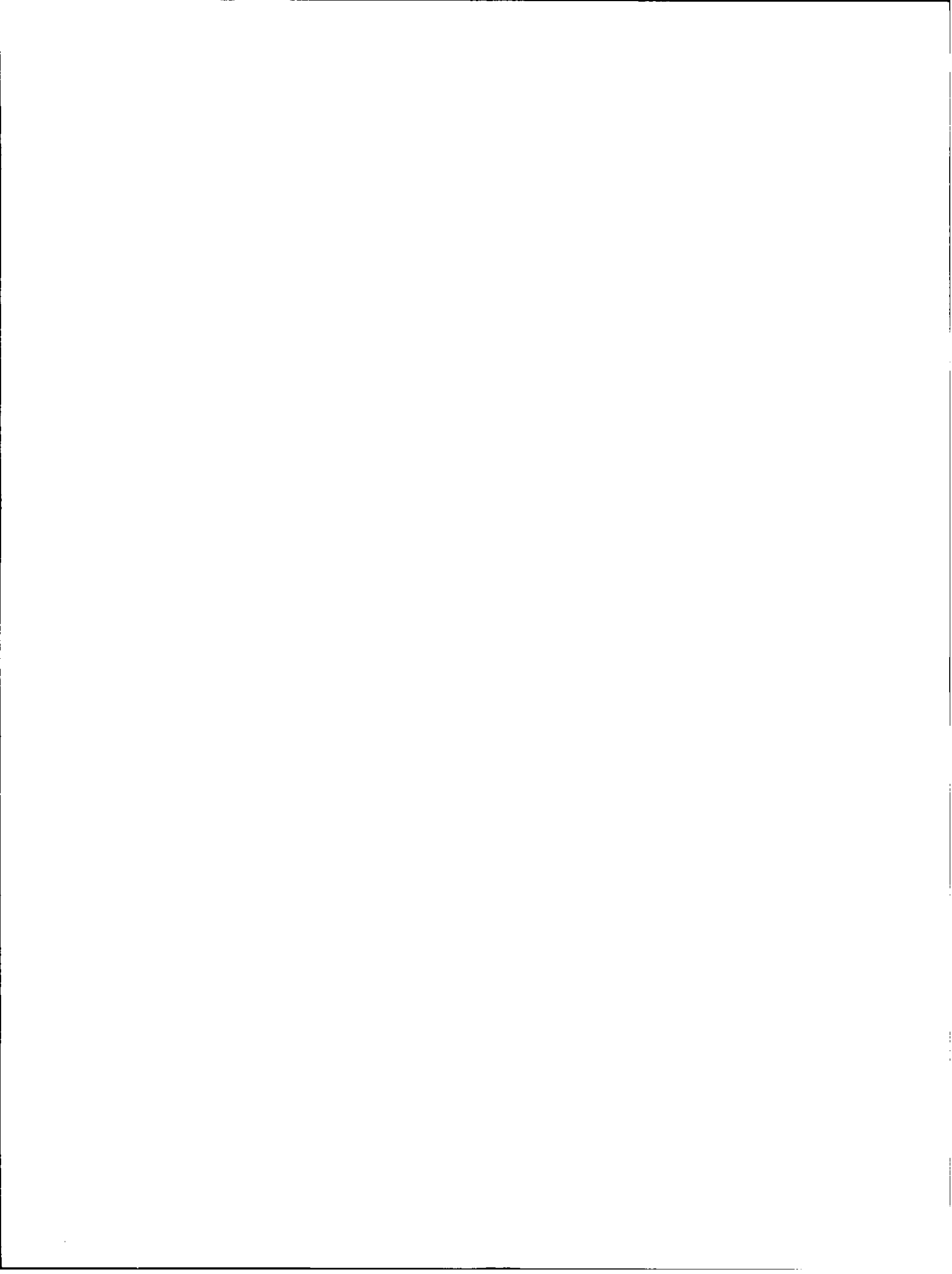
By:



Texas Firm Registration No. F-487

12121 wickchester lane suite 200, houston, tx 77079 • 713.461.9600 • fax 713.461.8455

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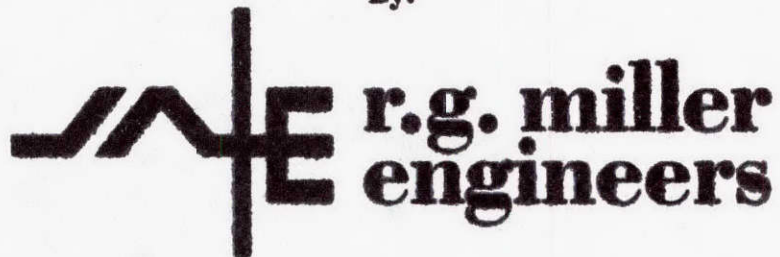


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1.0 Project Introduction

The Gapps Bayou Flood Protection Planning Study Phase II will develop a recommended alternative plan for flood damage reduction in the Gapps Bayou watershed in Fort Bend County, Texas. This will be accomplished by utilizing the results and hydrologic and hydraulic models established from the Gapps Bayou Existing Conditions Watershed Study, which was a Phase I Watershed Study. This report describes Phase II of a flood protection planning study for the Gapps Bayou watershed, which is funded with a flood protection planning grant from the Texas Water Development Board and matching funds from Fort Bend County Drainage District. The following paragraphs describe the purpose and scope of work of the watershed study.

1.1 Purpose of Project

The purpose of the Phase II flood protection planning study is to develop a recommended plan for flood damage reduction in the Gapps Bayou watershed. Although flooding issues are present throughout the watershed, historical flooding risks are concentrated within the Bridlewood Estates subdivision. While the study will focus on alleviating the flooding issues within the Bridlewood Estates subdivision, it will also provide a comprehensive look at any existing or potential needs elsewhere in the watershed. The primary end product will be an alternatives evaluation report documenting a recommended plan, cost estimates, and implementation consideration.

No overall flooding study or master drainage plan has been completed for the Gapps Bayou watershed. However, urbanization is proceeding at a rapid pace in the subject watershed. Drainage studies are prepared in a piecemeal fashion for individual developments, and there is no clearly defined overall flood protection plan that developers and engineers may reference to ensure that new developments are properly protected and that existing developments are not adversely impacted by new development. Therefore, it is beneficial to complete a flood protection planning study for the Gapps Bayou watershed, which will be based on the results of this phase of the study.

1.2 Scope of Work

The following scope of work describes the major tasks that will be undertaken and completed in connection with Phase II of the proposed flood protection planning study.

1. **Identify Flood Protection Alternatives:** Identify potential flood protection strategies and alternatives for the study watershed, including both structural and non-structural measures.
2. **Complete Environmental Evaluation:** Complete an environmental evaluation of the study watershed, identifying sensitive areas that should be avoided or for which mitigation may be required if disturbed.
3. **Evaluate Flood Protection Alternatives:** Evaluate and prioritize potential flood protection alternatives in relative order of anticipated cost-effectiveness.
4. **Develop Draft Flood Protection Plan:** Develop a preliminary flood protection plan that incorporates the most cost-effective alternatives for the study watershed.

5. **Develop Post-Project Hydrologic Model:** Prepare a post-project hydrologic model for the watershed to reflect the implementation of selected flood protection alternatives. Compute post-project conditions flow rates.
6. **Develop Post-Project Hydraulic Model:** Prepare a post-project hydrologic model for the watershed to reflect the implementation of selected flood protection alternatives. Compute post-project conditions flood levels.
7. **Adjust Flood Protection Plan As Needed:** Adjust the flood protection plan as needed, making necessary changes to post-project conditions hydrologic and hydraulic models. Compute final post-project conditions flood flow rates, flood elevations, and floodway data.
8. **Prepare Conceptual Phasing Plan:** Prepare a conceptual phasing plan for the watershed to allow flood protection measures to be implemented in a fiscally responsible manner.
9. **Analyze Phasing Plan:** Create interim conditions hydrologic and hydraulic models that represent significant milestones in the phasing plan for the watershed. Adjust phasing plans as needed to maximize performance and anticipated cost-effectiveness.
10. **Prepare Cost Estimates & B/C Ratios:** Develop preliminary cost estimates for the watershed to include both interim and fully-implemented flood protection plans. Analyze the potential annual benefits and costs associated with the proposed plans.
11. **Prepare Flood Protection Report:** Prepare a report that describes proposed flood protection measures, phasing plans, and post -project drainage conditions within the subject watershed.
12. **Present Results to Cities, County, FBCDD:** Present the results of the studies to representatives of participating cities, the Fort Bend County Drainage District, and Fort Bend County.
13. **Attend Meetings:** Attend regular monthly meetings with study stakeholders in addition to public meetings held in an effort to gather information or to educate the public with regard to the purposes of the planning effort and the results obtained.

1.3 Public Involvement

As a part of the scope of work, a series of three (3) public meetings were held to inform the general public the progress of the watershed study throughout the duration of the project. The public meetings were held on March 25th, 2013, June 26th, 2013, and July 29th, 2013 at The George Memorial Library, Richmond, Texas. Representatives from R.G. Miller Engineers, Inc. presented the preliminary findings of the study, and representatives from the Fort Bend County Drainage District were on hand to answer any questions as necessary. Prior to the study, the Fort Bend County Drainage District was informed of the grant application which ultimately funded a portion of this watershed study.

1.4 Executive Summary

We have completed a comprehensive hydrologic and hydraulic analysis of the existing condition of the Gapps Bayou watershed in Phase I. Based on the results of the hydrologic and hydraulic modeling data, we have mapped the floodplains of various storm events as shown in Exhibits 6 through 10.

Significant out-of-bank flooding is predicted within the Bridlewood Estates subdivision upstream of Berdett Road during a 1% annual chance (100-year) storm event. Much of this flooding can be attributed to the fact that Farm-to-Market Road (FM) 762 is elevated approximately 2 to 3 feet above natural ground and that the culverts at the Gapps Bayou crossing of FM 762 are undersized. Additionally, some out-of-bank flooding is predicted within the Royal Lakes Estates subdivision in the downstream portion of the watershed. Approximately 81 structures within the Bridlewood Estates and Royal Lakes Estates subdivisions are at risk of flooding during a 1% annual chance (100-year) storm event. The estimated value of these structures and properties is approximately \$8.6 million dollars.

Alternative One calls for culvert improvement under FM 762 and a regional basin located between FM 762 and Berdett Road. The proposed regional basin will provide 360 acre-feet of storage volume and will require 44 acres of land. We recommend that the existing four (4) 6-foot by 5-foot RCB culverts under FM 762 will be replaced with four (4) 8-foot by 7-foot RCBs. The proposed alternative plan will decrease the 100-year water surface elevation through Bridlewood subdivision up to 0.6 feet. The approximate cost of the alternative is \$8.1 million dollars.

Alternative Two calls for culvert improvement under FM 762 and Berdett Road, a regional basin located between FM 762 and Berdett Road, and a channel improvement between FM 762 and Berdett Road. The proposed regional basin will provide 330 acre-feet of storage volume and will require 38 acres of land. This alternative recommend that the existing three (3) 84-inch diameter and one (1) 78-inch diameter RCPs under Berdett Road will be replaced with three (3) 108-inch and two (2) 72-inch RCPs. Alternative 2 also recommend that the existing four (4) 6-foot by 5-foot RCB culverts under FM 762 will be replaced with four (4) 8-foot by 7-foot RCBs. The proposed alternative plan will decrease the 100-year water surface elevation through Bridlewood subdivision up to 0.8 feet. The approximate cost of the alternative is \$8.5 million dollars.

Alternative Three calls for culvert improvement under FM 762 and Berdett Road, a regional basin located approximately 1,800 feet downstream of the FM 762 and Gapps Bayou confluence, and a channel improvement between Berdett Road and proposed detention basin. The proposed regional basin will provide 280 acre-feet of storage volume and will require 33 acres of land. This alternative recommend that the existing three (3) 84-inch diameter and one (1) 78-inch diameter RCPs under Berdett Road will be replaced with three (3) 108-inch and two (2) 72-inch RCPs. Alternative 2 also recommend that the existing four (4) 6-foot by 5-foot RCB culverts under FM 762 will be replaced with four (4) 8-foot by 7-foot RCBs. The proposed alternative plan will decrease the 100-year water surface elevation through Bridlewood subdivision up to 1.1 feet. The approximate cost of the alternative is \$8.2 million dollars.

2.0 Existing Watershed Conditions

Data on the existing watershed conditions were collected from a number of available resources, including previous engineering studies, field surveys and observations, light detection and ranging (LiDAR) topographic information, aerial photographs, and soil surveys. The data has been collected from the Fort Bend County Drainage District, the Houston-Galveston Area Council, the Harris-Galveston Subsidence District, and the United States Geological Survey.

2.1 Watershed Location and Description

The Gapps Bayou watershed is located to the southwest of Houston, Texas in Fort Bend County, Texas. Adjoining watersheds include those of Dry Creek and Rabbs Bayou. Gapps Bayou empties into Lower Dry Creek, thence into Big Creek, and ultimately into the Brazos River. A majority of the watershed is located within the unincorporated areas of Fort Bend County, with a small portion in the northwest corner of the watershed located within the corporate limits of the City of Rosenberg. Exhibit 1 illustrates the location of the Gapps Bayou watershed.

Several major roads and railroads are located in the general vicinity of the watershed. The major roads include FM 762, FM 2759, and FM 2977. FM 762 crosses through the central portion of the watershed in a north-south direction, and FM 2977 crosses through the western portion of the watershed in a north-south direction. FM 2759 and a Burlington Northern Santa Fe (BNSF) railroad generally form the northern drainage boundary of the watershed. A map of the watershed is shown in Exhibit 2.

The topography of the watershed may best be described as gently sloping. Ground elevations vary from 97 feet in the western portion of the watershed to 61 feet at the downstream end of the watershed, based on the 2001 adjustment of the North American Vertical Datum of 1988. Ground slope in the watershed varies from about 2 feet per mile to about 11 feet per mile. No unusual changes in topography occur in the watershed except where fill has been placed to allow for development. Exhibit 3 shows a shaded topographic map of the watershed.

The Gapps Bayou watershed is generally developed in the western portions of the watershed and generally undeveloped in the eastern portions of the watershed. Subdivisions within the Gapps Bayou watershed include the Summer Lakes, Summer Creek, Bridlewood Estates, Royal Lakes Estates, Rivers Mist, and River Run at the Brazos. George Ranch High School and Antoinette Reading Junior High School of the Lamar Consolidated Independent School District are also located within the watershed.

2.2 Description of Gapps Bayou

Gapps Bayou is generally a well-maintained earthen channel which flows from west to east. Storm water runoff reaches Gapps Bayou via storm sewer or roadside ditch outfalls from developed areas and via surface flow in undeveloped areas. Within the Bridlewood Estates subdivision, the channel has been widened to provide in-line storm water detention to offset the increase in peak flow rates created by the development of the subdivision. This in-line detention basin maintains a static water surface elevation to provide an amenity to the residents of the Bridlewood Estates subdivision.

In the downstream end of the channel, a significant valley remains along the channel where the former Booth Lake existed. The dam that created the former Booth Lake was breached in the 1950s; however, no additional work has been done to the channel where the lake formerly existed. A significant embankment remains at the downstream end of the former Booth Lake.

2.3 Previous Studies

No overall flooding or master drainage plan has been completed for the Gapps Bayou watershed. Drainage studies are presented in a piecemeal fashion for individual developments, and there is no clearly defined overall flood protection plan that developers and engineers may use to ensure that new developments are properly protected and that existing developments are not adversely impacted by new development. Urbanization within the watershed is proceeding at a rapid pace, and plans for the proposed Grand Parkway (State Highway 99) to pass through the watershed will increase the rate of urbanization of the watershed.

The Bridlewood Estates subdivision, located in the central portion of the watershed, has experienced extensive street and lot flooding problems for a number of years. Approximate modeling data recently developed by Edminster, Hinshaw, Russ, & Stanley indicates that the Bridlewood subdivision would be severely affected during a 1% annual chance storm event. Additionally, drainage studies have been completed as development has occurred within the watershed in a piecemeal fashion.

The last official Flood Insurance Rate Map update for Fort Bend County was completed in 1997, but the Gapps Bayou watershed was not included in that study. Preliminary new FIRM panels for Fort Bend County were released for public review and comment on July 21, 2010. The comment period closed in October 2010, and appeals filed during the comment period are now being processed. Mapping of the floodplain of Gapps Bayou was not included in this set of maps either.

2.4 Phase I – Existing Watershed Conditions

R.G. Miller Engineers completed a comprehensive hydrologic and hydraulic analysis of the existing condition of the Gapps Bayou watershed in Phase I. Based on the results of the hydrologic and hydraulic modeling data, we have mapped the floodplains of various storm events.

The hydrologic analysis for the existing conditions model was based on Fort Bend County Standard Methodology, which is outlined in the “Fort Bend County Drainage Criteria Manual” adopted in 2011. The Fort Bend County Standard Methodology uses watershed parameters (like drainage area, watershed length, channel slope, watershed slope, impervious cover, Manning’s roughness coefficient along the watercourse, and percent of the watershed affected by detention) to compute the time-of-concentration and the storage coefficient of each sub-area. The computed time-of-concentration and the storage coefficient can be used to compute peak runoff rates using the Clark Unit Hydrograph Method. These values are shown in Appendix A. The peak runoff rates are shown in the table below.

Table 1: Peak Flow Rates along Gapps Bayou

Hydrologic Element	Description of Hydrologic Element	Peak Flow Rate (cfs)			
		10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Gapps 0302 J	Peak Flow at Reading Rd.	331	452	512	643
Gapps 0294 J	Peak Flow at Benton Rd.	512	697	795	1004
Gapps 0236 J	Peak Flow U/S of Bridlewood Estates	1051	1420	1599	2026
Gapps 0187 J	Peak Flow at Berdett Rd.	1236	1656	1896	2547
Gapps 0161 J	Peak Flow at FM 762	1096	1318	1414	1937
Gapps 0150 J	Peak Flow D/S of George Ranch H.S.	1220	1479	1589	2080
Gapps 0093 J	Peak Flow U/S of Royal Lakes Estates	1546	1984	2188	2666
Gapps 0056 J	Peak Flow D/S of Royal Lakes Estates	1706	2229	2472	3040
Gapps 0000 J	Peak Flow at D/S Limit of Study	1871	2541	2861	3602

Cross-section data for Gapps Bayou was created using field survey data provided by the Fort Bend County Drainage District for structures and points within the channel and LiDAR elevation data for the overbanks of the channel. The field survey data and the LiDAR data were combined to create continuous cross-sections at points along Gapps Bayou. All elevations in this study are based on the 2001 adjustment of the North American Vertical Datum of 1988. A map of the cross-sections used in the hydraulic analysis of Gapps Bayou is shown in Exhibit 5.

We determined the Manning’s roughness coefficient, “n”, using aerial photographs and field observations of the project site. Values used in this study range from 0.14 for wooded areas with dense vegetation to 0.04 for well-maintained channels.

We used the HEC-RAS Version 4.1 computer program to compute the 10% annual chance (10-year), 2% annual chance (50-year), 1% annual chance (100-year), and 0.2% annual chance (500-year) flood profiles. The flood profiles and detailed output from HEC-RAS are shown in Appendix D. Table 2 shows the water surface elevations for the 10% annual chance (10-year), 2% annual chance (50-year), 1% annual chance (100-year), and 0.2% annual chance (500-year) storm events at significant crossings in the watershed.

Table 2: Flood Levels along Gapps Bayou

River Station	Location of River Station	Flood Level (ft)			
		10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
30204.2	D/S of Reading Rd.	82.08	83.14	83.44	83.86
29428.5	U/S of Benton Rd.	81.81	82.89	83.19	83.54
29344.3	D/S of Benton Rd.	81.23	81.99	82.30	82.80
23757.9	U/S of Bridlewood Estates	77.73	77.97	78.03	78.31
18528.1	U/S of Berdett Rd.	77.68	77.91	77.96	78.24
18402.6	D/S of Berdett Rd.	77.68	77.90	77.95	78.23
16085.5	U/S of FM 762	77.66	77.88	77.92	78.19
15977.7	D/S of FM 762	75.58	75.85	75.95	76.34
15075.6	D/S of George Ranch H.S.	74.72	75.00	75.10	75.48
9354.3	U/S of Royal Lakes Estates	69.20	69.85	70.12	70.72
7595.5	U/S of Royal Lakes Ln.	68.48	69.08	69.34	69.92
7330.7	D/S of Royal Lakes Ln.	68.43	69.00	69.24	69.79
6557.7	U/S of King Forest Ln.	68.32	68.87	69.11	69.63
6350.4	D/S of King Forest Ln.	68.27	68.78	69.00	69.46
5682.4	D/S of Royal Lakes Estates	68.23	68.74	68.95	69.41
1.9	D/S Limit of Study	67.79	65.32	68.41	68.81

The HEC-RAS platform called GeoRAS, which interacts with ArcGIS software, was used to map the floodplain for the various storm events based on the computed flood levels along Gapps Bayou and the ground elevations obtained from LiDAR topographic elevation data. The floodplains for the 10% annual chance (10-year), 2% annual chance (50-year), 1% annual chance (100-year), and 0.2% annual chance (500-year) storm events are shown in Exhibits 6 through 9, respectively.

A floodway is a portion of the floodplain, centered about the channel, which is capable of conveying the 1% annual chance (100-year) flow at a water surface elevation 1.0 foot above the existing 100-year flood elevation. The HEC-RAS program offers five (5) methods for computing floodway data. The method used in this analysis is Method 4, in which preliminary floodway boundaries are determined based on equal reduction of flow conveyance from the floodplain on each side of the channel, then Method 1 in which the user defines the limits of the floodway on each side of the channel to finalize all floodway computations. The floodway boundaries computed for Gapps Bayou are shown on Exhibit 10. Detailed HEC-RAS output for the floodway computations is shown in Appendix F. The results of this analysis do not include backwater conditions from the Brazos River or a detailed localized analysis of storm sewer system or roadside ditch drainage infrastructure.

Significant out-of-bank flooding is predicted within the Bridlewood Estates subdivision upstream of Berdett Road during a 1% annual chance (100-year) storm event. Much of this flooding can be attributed to the fact that Farm-to-Market Road (FM) 762 is elevated approximately 2 to 3 feet above natural ground and that the culverts at the Gapps Bayou crossing of FM 762 are undersized. Additionally, some out-of-bank flooding is predicted within the Royal Lakes Estates subdivision in the downstream portion of the watershed. Approximately 79 structures within the Bridlewood Estates and Royal Lakes Estates subdivisions are at risk of flooding during a 1% annual chance (100-year) storm event. In addition, approximately 26 residential lots are at risk

of flood inundation during a 1% annual chance storm event, but its structures are located above 100-year flood elevation. The estimated value of these structures and properties is approximately \$8.6 million dollars.

During storm events with rainfall totals greater than a 20% annual chance (5-year) storm, the hydraulic modeling data predicts that Berdett Road becomes impassible due to flooding near its intersection with Gapps Bayou. Additionally, the hydraulic modeling data predicts that FM 762 will be overtopped with storm water when rainfall amounts exceed the 10% annual chance (10-year) storm. However, Royal Lakes Lane and King Forest Lane are not predicted to be overtopped during a storm event up to and including the 0.2% annual chance (500-year) storm.

Based on the results of Phase I analysis, we believe that flooding within the Gapps Bayou watershed poses a significant threat to public safety and homes within the northern section of the Bridlewood Estates subdivision and along Gapps Bayou within the Royal Lakes Estates subdivision. Additionally, two major thoroughfares within the watershed are predicted to become impassible during storm events greater than a 10% annual chance (10-year) storm, which poses a safety hazard to area residents.

Based on the results of Phase I analysis, we recommend that the results of Phase I analysis serve as a basis for publishing new flood insurance rate maps of the Gapps Bayou watershed and an addition to the Fort Bend County flood insurance study. Publication of the flood insurance rate maps would aid the general public in knowing the risk of flooding within the Gapps Bayou watershed.

3.0 Phase II Conditions – Alternative Evaluations

This section of the report describes the methods used to determine the peak flow rates and flood levels along Gapps Bayou for various flood reduction alternatives for the Flood Protection Planning Study of Gapps Bayou.

A recent hydraulic model prepared by R.G. Miller Engineers, Inc. indicates that 1% annual chance flood levels will reach an elevation of approximately 78.0 feet upstream of FM 762. At that elevation, a significant portion of the Bridlewood Estates subdivision will be flooded. The approximate extent of flooding is indicated on Figure 1. Potential overflows to the Dry Creek watershed are possible at the predicted 1% annual chance flood level.

Figure 1: Bridlewood Estates Flooding



Approximately 79 structures in the Gapps Bayou watershed are at risk of flooding during a 1% annual chance storm event. The estimated value of the homes potentially affected by flooding is approximately \$8.6 million dollars during a 1% annual chance storm event. Home values were determined based on the Fort Bend Central Appraisal District property values in the flood affected areas along Gapps Bayou. Undeveloped lots were not included in the estimate. Each lots were given three categories of damage: complete or partial structure inundation (100% damage), partial structure inundation with significant lot inundation (10% damage), and significant lot inundation but no visible structure inundation (5% damage). Appendix AC – Damage Cost Analysis shows the detailed calculations including exhibits. Please note that the 100-year floodplain delineation was based on the LiDAR contour lines, and the actual estimated damage value could be re-defined with the topographic survey data or elevation certificates of the affected lots.

By examining the existing conditions hydrologic and hydraulic model and evaluating different alternative solutions, we found that the most cost effective solution to the flood damage reduction to Gapps Bayou is by improving the culvert crossings under FM 762 and Berdett Road. By opening these culverts, it created the best flood reduction results for the Bridlewood subdivision; however, it may cause an impact on the downstream side of Gapps Bayou. A regional basin is proposed to mitigate the impact caused by improving culverts under FM 762 and Berdett Road. Storage volume required to mitigate the proposed improvements are relatively significant due to the presence of large floodplain storage between Berdett Road and FM 762, which was caused by the storm water backing from FM 762. We have developed three alternatives for providing sufficient flood damage reduction throughout the Gapps Bayou watershed.

3.1 *Alternative One – Regional Basin Between Berdett Road and FM 762*

Alternative One calls for culvert improvement under FM 762 and a regional basin located between FM 762 and Berdett Road. The existing conditions hydrologic model created by R.G. Miller Engineers, Inc. was modified to simulate reduced flows by adding a regional detention pond just upstream of FM 762 and a culvert improvement at the FM 762 crossing. We recommend that the existing four (4) 6-foot by 5-foot RCB culverts under FM 762 will be replaced with four (4) 8-foot by 7-foot RCBs or equivalent. The proposed detention pond is located just upstream of FM 762 and south of Gapps Bayou to maximize storage depth and prevent any issues with the proposed Grand Parkway and future major thoroughfare alignment. We are proposing to place the outfall pipe downstream of FM 762, which would allow the detention basin to be deeper due to the depth constraints of Gapps Bayou upstream of FM 762. The total area needed to construct proposed detention basin is 44 acres providing approximately 360 acre-feet of storage volume at elevation 76.7 feet. It consists of a 30 foot maintenance berm, 4:1 (horizontal to vertical) side slope, and a 48" RCP outfall pipe to Gapps Bayou. The toe of the bank elevation is set at 66.7 feet, and the top of the bank elevation is set at 76.7 feet. A diversion structure is proposed to be located to divert the flows from Gapps Bayou to the proposed regional detention basin. The diversion structure consists of an overflow weir and inflow pipe. The weir is proposed to have a crest elevation of 75.0 feet and a crest length of 50 feet. The inflow pipe is proposed to be a 60" RCP at a flowline elevation of 68.0 feet. Table 3 provides a summary of the Alternative 1 detention basin routing data. A layout map of Alternative 1 is shown in Exhibit 11.

Table 3: Elevation-Storage-Discharge Relationship for the Alternative 1 Basin

Elevation (ft)	Storage (ac-ft)	Discharge (cfs)
66.7	0.0	0.0
67.7	34.0	1.4
68.7	68.4	5.8
69.7	103.3	12.8
70.7	138.7	21.4
71.7	174.5	30.5
72.7	210.9	51.2
73.7	247.7	55.3
74.7	285.1	59.1
75.2	303.9	60.9
75.7	322.9	62.7
76.2	342.0	64.4
76.7	361.3	66.0

Modified Puls routing data for Gapps Bayou has been changed to reflect the improvements in the watershed for the Alternative 1 detention conditions. The existing discharge data of all the reaches in the watershed were incorporated into the Alternative 1 HEC-RAS steady flow model to create the storage outflow data for the channel. The Alternative 1 storage outflow from HEC-

RAS was then updated in the HEC-HMS Alternative 1 model to determine the peak outflows. Please see Appendix G for routing data.

The HEC-HMS Version 3.3 software package developed by the U.S. Army Corps of Engineers is used to compute the proposed peak runoff rates and runoff hydrographs for the 10%, 2%, 1% and 0.2% storm events of 24-hour duration. The peak flow rates computed with the Alternative 1 conditions HEC-HMS hydrologic model are shown below in Table 4 along with the existing conditions values. Detailed results of the Alternative 1 conditions HEC-HMS model are shown in Appendix H.

Table 4: Existing v. Alternative 1 Peak Flow Rates

Hydrologic Element	10% Annual Chance			2% Annual Chance			1% Annual Chance			0.2% Annual Chance		
	Existing	Alternative 1	Difference	Existing	Alternative 1	Difference	Existing	Alternative 1	Difference	Existing	Alternative 1	Difference
Gapps_0302_J	331.2	331.2	0.0	452.6	452.6	0.0	512.2	512.2	0.0	643.3	643.3	0.0
Gapps_0294_J	512.7	512.7	0.0	697.9	697.7	-0.2	795.1	795.0	-0.1	1004.4	1004.4	0.0
Gapps_0236_J	1051.2	1055.4	4.2	1420.8	1417.2	-3.6	1599.9	1596.5	-3.4	2026.2	2028.6	2.4
Gapps_0187_J	1236.2	1081.8	-154.4	1656.1	1671.1	15.0	1896.5	1879.4	-17.1	2547.6	2489.4	-58.2
Gapps_0161_J	1096.7	941.1	-155.6	1318.4	1205.8	-112.6	1414.1	1291.0	-123.1	1937.1	1514.5	-422.6
Gapps_0150_J	1220.5	1079.1	-141.4	1479.0	1389.1	-89.9	1589.4	1505.2	-84.2	2080.9	1768.5	-312.4
Gapps_0093_J	1546.2	1429.0	-117.2	1984.5	1891.2	-93.3	2188.3	2097.8	-90.5	2666.9	2577.5	-89.4
Gapps_0056_J	1706.3	1602.4	-103.9	2229.4	2137.4	-92.0	2472.2	2382.2	-90.0	3040.3	2951.2	-89.1
Gapps_0000_J	1871.8	1811.8	-60.0	2541.2	2474.2	-67.0	2861.0	2787.3	-73.7	3602.6	3521.2	-81.4

As shown in Table 4, minor impacts on flow rates along Gapps Bayou are shown after detention is applied for storm events up to and including the 0.2% annual chance (500-year) storm events. However, the increase in flow rates does not cause impact on the flood levels along Gapps Bayou.

The existing conditions HEC-RAS model created by R.G. Miller Engineers was modified to account for the proposed detention pond and the updated culvert crossing at FM 762. The table below shows the comparison between the existing and Alternative 1 conditions. HEC-RAS model results are included in Appendix I. The results of the analysis are shown in Table 5 below.

Table 5: Existing v. Alternative 1 Peak Water Surface Elevations

River Station	Location	Existing Conditions Flood Levels				Alternative 1 Conditions Flood Levels				Difference	
		10%	2%	1%	0.20%	10%	2%	1%	0.20%	10%	1%
29344.3	Bonbrook	81.24	81.99	82.30	82.80	81.22	81.99	82.30	82.80	-0.02	0.00
28494.4	Bonbrook	80.82	81.53	81.83	82.31	80.80	81.52	81.82	82.31	-0.02	-0.01
27602	Bonbrook	80.37	80.98	81.26	81.68	80.34	80.97	81.25	81.67	-0.03	-0.01
26717.3	Bonbrook	79.94	80.35	80.54	80.82	79.90	80.35	80.53	80.82	-0.04	-0.01
23757.9	Bridlewood	77.72	77.92	78.00	78.27	77.01	77.35	77.45	77.75	-0.71	-0.55
23044.2	Bridlewood	77.72	77.93	78.02	78.29	77.02	77.37	77.48	77.78	-0.70	-0.54
22087.5	Bridlewood	77.72	77.93	78.01	78.28	77.01	77.36	77.46	77.76	-0.71	-0.55
21218.3	Bridlewood	77.72	77.93	78.01	78.27	77.01	77.35	77.45	77.74	-0.71	-0.56
20195.4	Bridlewood	77.72	77.92	78.01	78.26	77.01	77.35	77.45	77.74	-0.71	-0.56
19150.5	Bridlewood	77.72	77.92	78.00	78.26	77.00	77.34	77.45	77.73	-0.72	-0.55
18693	Bridlewood	77.68	77.88	77.95	78.20	76.92	77.21	77.29	77.55	-0.76	-0.66
18528.1	Bridlewood	77.68	77.87	77.95	78.20	76.74	76.97	77.05	77.38	-0.94	-0.90
18402.6	Alt. 1 Detention	77.68	77.87	77.95	78.18	76.38	76.88	77.03	77.44	-1.30	-0.92
17679.2	Alt. 1 Detention	77.67	77.87	77.95	78.17	76.12	76.70	76.88	77.37	-1.55	-1.07
16850	Alt. 1 Detention	77.67	77.86	77.94	78.16	75.92	76.57	76.78	77.32	-1.75	-1.16
16085.5	Alt. 1 Detention	77.66	77.85	77.93	78.15	75.82	76.53	76.75	77.31	-1.84	-1.18
8175.8	Royal Lake Estates	68.61	69.23	69.51	70.09	68.50	69.14	69.41	70.01	-0.11	-0.10
7595.5	Royal Lake Estates	68.49	69.09	69.36	69.92	68.40	69.00	69.26	69.85	-0.09	-0.10
7330.7	Royal Lake Estates	68.44	69.00	69.26	69.78	68.35	68.93	69.18	69.72	-0.09	-0.08
6955.1	Royal Lake Estates	68.39	68.97	69.22	69.74	68.32	68.89	69.14	69.68	-0.07	-0.08
6557.7	Royal Lake Estates	68.32	68.88	69.13	69.63	68.26	68.81	69.05	69.57	-0.06	-0.08
6350.4	Royal Lake Estates	68.26	68.79	69.02	69.46	68.21	68.73	68.95	69.41	-0.05	-0.07
5682.4	Royal Lake Estates	68.24	68.75	68.98	69.41	68.18	68.69	68.90	69.36	-0.06	-0.08

As shown in the table above, water surface elevations along Gapps Bayou were decreased compared to the existing conditions hydraulic model. In Bonbrook Plantation, the 1% annual chance water surface elevation was lowered on average 0.01 feet. In Bridlewood Estates, the 1% annual chance water surface elevation was lowered on average 0.6 feet. In Royal Lake Estates, the 1% annual chance water surface elevation was lowered on average 0.1 feet. The figure below shows a comparison between the existing and Alternative 1 1% annual chance floodplain in the Bridlewood Estates subdivision. Exhibits 12-15 show the mapped floodplains for the 10%, 2%, 1% and 0.5% annual chance storm event.

Figure 2: Existing v. Alternative 1 1% Annual Chance Floodplain



Our floodway analysis indicates that the floodway between FM 762 and Berdett Road has reduced for Alternative One. The floodway boundaries computed for Alternative 1 are shown on Exhibit 16. Detailed HEC-RAS output for the floodway computations is shown in Appendix J.

The cost for construction of the Alternative 1 detention pond and culvert replacements would be approximately \$8.1 million dollars including \$1 million dollars for land acquisition. The total expected damage when the Alternative 1 is implemented is \$4.6 million dollars during a 1% annual chance storm event, which reduced approximately \$4.0 million dollars from the existing expected damage amount of \$8.6 million dollars. Therefore, the benefit amount for Alternative 1 is \$4.0 million dollars. The benefit to cost ratio for Alternative 1 is 0.5. Detailed computations are shown in Appendix K.

3.2 Alternative Two – Channel Improvements and Regional Detention Basin

Alternative Two calls for culvert improvement under FM 762 and Berdett Road, a regional basin located between FM 762 and Berdett Road, and a channel improvement between FM 762 and Berdett Road. The existing conditions hydrologic model created by R.G. Miller Engineers, Inc. was modified to reflect the drainage improvement proposed in Alternative 2. This alternative recommends that the existing three (3) 84-inch diameter and one (1) 78-inch diameter RCPs under Berdett Road will be replaced with three (3) 108-inch and two (2) 72-inch RCPs or equivalent. Alternative 2 also recommend that the existing four (4) 6-foot by 5-foot RCB culverts under FM 762 will be replaced with four (4) 8-foot by 7-foot RCBs or equivalent. Channel between FM 762 and Berdett Road is proposed to be deepened and widened with average of 200-foot wop width. The new channel will require maximum 300-foot R.O.W. for the channel improvements.

The proposed detention pond is located just upstream of FM 762 and south of Gapps Bayou to maximize storage depth and prevent any issues with the proposed Grand Parkway and future major thoroughfare alignment. The total area needed to construct proposed detention basin is 38 acres, which will provide approximately 330 acre-feet of storage at the elevation 76.5 feet. It

consists of a 30 foot maintenance berm, 4:1 (horizontal to vertical) side slope, and a 48" RCP outfall pipe to Gapps Bayou. The toe of the bank elevation is set at 66.7 feet and the top of the bank elevation is set at 76.5 feet. A diversion structure is proposed to be located to divert the flows from Gapps Bayou to the proposed regional detention basin. The diversion structure consists of an overflow weir and inflow pipe. The weir is proposed to have a crest elevation of 75.0 feet and a crest length of 100 feet. The inflow pipe is proposed to be a 48" RCP at a flowline elevation of 68.0 feet. Table 6 provides a summary of the Alternative 2 detention basin routing data. A layout map of Alternative 2 is shown in Exhibit 17.

Table 6: Elevation-Storage-Discharge Relationship for the Alternative 2 Basin

Elevation (ft)	Storage (ac-ft)	Discharge (cfs)
66.7	0.0	0.0
67.7	31.8	1.4
68.7	63.9	5.8
69.7	96.6	12.8
70.7	129.7	21.4
71.7	163.2	30.5
72.7	197.2	51.2
73.7	231.6	55.3
74.7	266.5	59.1
75.2	284.2	60.9
75.7	301.9	62.7
76.2	319.8	64.4
76.7	337.8	66.0

Modified Puls routing data for Gapps Bayou has been changed to reflect the improvements in the watershed for the Alternative 2 detention conditions. The existing discharge data of all the reaches in the watershed were incorporated into the Alternative 2 HEC-RAS steady flow model to create the storage outflow data for the channel. The Alternative 2 storage outflow from HEC-RAS was then updated in the HEC-HMS Alternative 2 model to determine the peak outflows. Please see Appendix L for routing data.

The HEC-HMS software package developed by the U.S. Army Corps of Engineers is used to compute the proposed peak runoff rates and runoff hydrographs for the 10%, 2%, 1% and 0.2% storm events of 24-hour duration. The peak flow rates computed with the Alternative 2 conditions HEC-HMS hydrologic model are shown below in Table 7 along with the existing conditions values. Detailed results of the Alternative 2 conditions HEC-HMS model are shown in Appendix M.

Table 7: Existing v. Alternative 2 Peak Flow Rates

Hydrologic Element	10% Annual Chance			2% Annual Chance			1% Annual Chance			0.2% Annual Chance		
	Existing	Alternative 2	Difference	Existing	Alternative 2	Difference	Existing	Alternative 2	Difference	Existing	Alternative 2	Difference
Gapps_0302_J	331.2	331.2	0.0	452.6	452.6	0.0	512.2	512.2	0.0	643.3	643.3	0.0
Gapps_0294_J	512.7	512.6	-0.1	697.9	697.3	-0.6	795.1	795.1	0.0	1004.4	1004.3	-0.1
Gapps_0236_J	1051.2	1055.3	4.1	1420.8	1423.2	2.4	1599.9	1606.3	6.4	2026.2	2022.0	-4.2
Gapps_0187_J	1236.2	1046.5	-189.7	1656.1	1561.7	-94.4	1896.5	1853.7	-42.8	2547.6	2483.1	-64.5
Gapps_0161_J	1096.7	937.1	-159.6	1318.4	1239.3	-79.1	1414.1	1365.4	-48.7	1937.1	1617.1	-320.0
Gapps_0150_J	1220.5	1065.2	-155.3	1479.0	1416.8	-62.2	1589.4	1571.9	-17.5	2080.9	1886.0	-194.9
Gapps_0093_J	1546.2	1398.2	-148.0	1984.5	1896.8	-87.7	2188.3	2128.0	-60.3	2666.9	2636.4	-30.5
Gapps_0056_J	1706.3	1563.0	-143.3	2229.4	2134.9	-94.5	2472.2	2401.5	-70.7	3040.3	2999.3	-41.0
Gapps_0000_J	1871.8	1765.2	-106.6	2541.2	2434.3	-106.9	2861.0	2763.4	-97.6	3602.6	3529.3	-73.3

As shown in Table 7, minor impacts on flow rates along Gapps Bayou are shown at node Gapps_0294_J after detention is applied for storm events up to and including the 1% annual chance (100-year) storm events. However, the increase in flow rates are negated by the proposed channel improvements along Gapps Bayou.

The existing conditions HEC-RAS model created by R.G. Miller Engineers was modified to account for the proposed detention pond and the updated culvert crossings at Berdett Road and FM 762. The table below shows the comparison between the existing and Alternative 2 conditions. HEC-RAS model results are included in Appendix N. The results of the analysis are shown in Table 8 below.

Table 8: Existing v. Alternative 2 Peak Water Surface Elevations

River Station	Location	Existing Conditions Flood Levels				Alternative 2 Conditions Flood Levels				Difference	
		10%	2%	1%	0.20%	10%	2%	1%	0.20%	10%	1%
29344.3	Bonbrook	81.24	81.99	82.30	82.80	81.20	81.99	82.29	82.80	-0.04	-0.01
28494.4	Bonbrook	80.82	81.53	81.83	82.31	80.78	81.52	81.82	82.31	-0.04	-0.01
27602	Bonbrook	80.37	80.98	81.26	81.68	80.32	80.97	81.24	81.68	-0.05	-0.02
26717.3	Bonbrook	79.94	80.35	80.54	80.82	79.87	80.34	80.52	80.82	-0.07	-0.02
23757.9	Bridlewood	77.72	77.92	78.00	78.27	76.29	77.00	77.18	77.71	-1.43	-0.82
23044.2	Bridlewood	77.72	77.93	78.02	78.29	76.32	77.02	77.21	77.74	-1.40	-0.81
22087.5	Bridlewood	77.72	77.93	78.01	78.28	76.31	77.01	77.20	77.72	-1.41	-0.81
21218.3	Bridlewood	77.72	77.93	78.01	78.27	76.30	77.00	77.18	77.70	-1.42	-0.83
20195.4	Bridlewood	77.72	77.92	78.01	78.26	76.30	77.00	77.18	77.70	-1.42	-0.83
19150.5	Bridlewood	77.72	77.92	78.00	78.26	76.29	76.99	77.18	77.69	-1.43	-0.82
18693	Bridlewood	77.68	77.88	77.95	78.20	76.24	76.91	77.08	77.58	-1.44	-0.87
18528.1	Bridlewood	77.68	77.87	77.95	78.20	76.20	76.85	77.01	77.55	-1.48	-0.94
18402.6	Alt. 2 Detention	77.68	77.87	77.95	78.18	75.83	76.62	76.94	77.57	-1.85	-1.01
17679.2	Alt. 2 Detention	77.67	77.87	77.95	78.17	75.82	76.61	76.93	77.56	-1.85	-1.02
16850	Alt. 2 Detention	77.67	77.86	77.94	78.16	75.82	76.61	76.92	77.56	-1.85	-1.02
16085.5	Alt. 2 Detention	77.66	77.85	77.93	78.15	75.81	76.60	76.92	77.56	-1.85	-1.01
8175.8	Royal Lake Estates	68.61	69.23	69.51	70.09	68.45	69.12	69.41	70.04	-0.16	-0.10
7595.5	Royal Lake Estates	68.49	69.09	69.36	69.92	68.35	68.98	69.26	69.88	-0.14	-0.10
7330.7	Royal Lake Estates	68.44	69.00	69.26	69.78	68.31	68.91	69.17	69.74	-0.13	-0.09
6955.1	Royal Lake Estates	68.39	68.97	69.22	69.74	68.27	68.87	69.13	69.70	-0.12	-0.09
6557.7	Royal Lake Estates	68.32	68.88	69.13	69.63	68.21	68.78	69.04	69.59	-0.11	-0.09
6350.4	Royal Lake Estates	68.26	68.79	69.02	69.46	68.16	68.70	68.93	69.42	-0.10	-0.09
5682.4	Royal Lake Estates	68.24	68.75	68.98	69.41	68.14	68.66	68.89	69.37	-0.10	-0.09

As shown in the table above, water surface elevations along Gapps Bayou were decreased compared to the existing conditions hydraulic model. In Bonbrook Plantation, the 1% annual chance water surface elevation was lowered on average 0.01 feet. In Bridlewood Estates, the 1% annual chance water surface elevation was lowered on average 0.85 feet. In Royal Lake Estates, the 1% annual chance water surface elevation was lowered on average 0.1 feet. The figure below shows a comparison between the existing and Alternative 2 1% annual chance floodplain in the Bridlewood Estates subdivision. Exhibits 18-21 show the mapped floodplains for the 10%, 2%, 1% and 0.5% annual chance storm event.

Figure 3: Existing v. Alternative 2 1% Annual Chance Floodplain



Our floodway analysis indicates that the floodway between FM 762 and Berdett Road has reduced for Alternative Two. The floodway boundaries computed for Alternative 2 are shown on Exhibit 22. Detailed HEC-RAS output for the floodway computations is shown in Appendix O.

The cost for construction of the Alternative 2 detention pond, channel improvements, and culvert replacements would be approximately \$8.5 million dollars including \$1.0 million dollars for land acquisition. This alternative may require individual permit from the U.S. Army Corps of Engineers for the proposed channel improvement. The total expected damage when the Alternative 2 is implemented is \$2.5 million dollars during a 100 year storm event, which reduced approximately \$6.1 million dollars from the existing expected damage amount of \$8.6 million dollars. Therefore, the benefit amount for Alternative 2 is \$6.1 million dollars. The benefit to cost ratio for Alternative 2 is 0.7. Detailed Computations are shown in Appendix P.

3.3 Alternative Three – Channel Improvements and Downstream Detention Basin

Alternative Three calls for culvert improvement under FM 762 and Berdett Road, a regional basin located approximately 1,800 feet downstream of the FM 762 and Gapps Bayou confluence, and a channel improvement between Berdett Road and proposed detention basin. The existing conditions hydrologic model created by R.G. Miller Engineers, Inc. was modified to reflect the drainage improvement proposed in Alternative 3. This alternative recommends that the existing three (3) 84-inch diameter and one (1) 78-inch diameter RCPs under Berdett Road will be replaced with three (3) 108-inch and two (2) 72-inch RCPs. Alternative 3 also recommend that the existing four (4) 6-foot by 5-foot RCB culverts under FM 762 will be replaced with four (4) 8-foot by 7-foot RCBs. Channel between Berdett Road and the proposed detention basin is proposed to be deepened and widened with average of 200-foot wop width. The new channel will require maximum 300-foot R.O.W. for the channel improvements.

The proposed detention pond is located approximately 1,800 feet downstream of FM 762 and south of Gapps Bayou to prevent any issues with any future major thoroughfare alignment. The total area needed to construct proposed detention basin is 33 acres, which will provide approximately 280 acre-feet of storage at the elevation 74.1 feet. It consists of a 30-foot maintenance berm, 4:1 (horizontal to vertical) side slope, and a 48" RCP outfall pipe to Gapps Bayou. The toe of the bank elevation is set at 64.2 feet and the top of the bank elevation is set at 75.2 feet. A diversion structure is proposed to be located to divert the flows from Gapps Bayou to the proposed regional detention basin. The diversion structure consists of an overflow weir and inflow pipe. The weir is proposed to have a crest elevation of 73.0 feet and a crest length of 30 feet. The inflow pipe is proposed to be a 60" RCP at a flowline elevation of 67.0 feet. Table 9 provides a summary of the Alternative 3 detention basin routing data. A layout map of Alternative 3 is shown in Exhibit 23.

Table 9: Elevation-Storage-Discharge Relationship for the Alternative 3 Basin

Elevation (ft)	Storage (ac-ft)	Discharge (cfs)
64.2	0.0	0.0
65.2	26.7	1.4
66.2	53.9	5.8
67.2	81.5	12.8
68.2	109.5	21.4
69.2	137.9	30.5
70.2	166.7	58.6
71.2	196.0	63.4
72.2	225.7	67.9
73.2	255.9	72.1
74.2	286.5	76.1
75.2	317.5	79.9
76.2	348.6	83.5

Modified Puls routing data for Gapps Bayou has been changed to reflect the improvements in the watershed for the Alternative 3 detention conditions. The existing discharge data of all the reaches in the watershed were incorporated into the Alternative 3 HEC-RAS steady flow model to create the storage outflow data for the channel. The Alternative 3 storage outflow from HEC-RAS was then updated in the HEC-HMS Alternative 3 model to determine the peak outflows. Please see Appendix Q for routing data.

The HEC-HMS software package developed by the U.S. Army Corps of Engineers is used to compute the proposed peak runoff rates and runoff hydrographs for the 10%, 2%, 1% and 0.2% storm events of 24-hour duration. The peak flow rates computed with the Alternative 3 conditions HEC-HMS hydrologic model are shown below in Table 10 along with the existing conditions values. Detailed results of the Alternative 3 conditions HEC-HMS model are shown in Appendix R.

Table 10: Existing v. Alternative 3 Peak Flow Rates

Hydrologic Element	10% Annual Chance			2% Annual Chance			1% Annual Chance			0.2% Annual Chance		
	Existing	Alternative 3	Difference	Existing	Alternative 3	Difference	Existing	Alternative 3	Difference	Existing	Alternative 3	Difference
Gapps_0302_J	331.2	331.2	0.0	452.6	452.6	0.0	512.2	512.2	0.0	643.3	643.3	0.0
Gapps_0294_J	512.7	512.6	-0.1	697.9	697.6	-0.3	795.1	794.9	-0.2	1004.4	1004.5	0.1
Gapps_0236_J	1051.2	1055.3	4.1	1420.8	1419.2	-1.6	1599.9	1588.7	-11.2	2026.2	2022.7	-3.5
Gapps_0187_J	1236.2	1034.6	-201.6	1656.1	1539.2	-116.9	1896.5	1829.3	-67.2	2547.6	2342.3	-205.3
Gapps_0161_J	1096.7	1093.4	-3.3	1318.4	1454.3	135.9	1414.1	1594.7	180.6	1937.1	1906.8	-30.3
Gapps_0150_J	1220.5	1212.8	-7.7	1479.0	1606.7	127.7	1589.4	1765.6	176.2	2080.9	2093.5	12.6
Gapps_0093_J	1546.2	1354.3	-191.9	1984.5	1820.6	-163.9	2188.3	2038.1	-150.2	2666.9	2512.9	-154.0
Gapps_0056_J	1706.3	1524.5	-181.8	2229.4	2056.8	-172.6	2472.2	2308.0	-164.2	3040.3	2875.0	-165.3
Gapps_0000_J	1871.8	1726.5	-145.3	2541.2	2358.9	-182.3	2861.0	2669.1	-191.9	3602.6	3400.9	-201.7

As shown in Table 10, minor impacts on flow rates along Gapps Bayou are shown after detention is applied for storm events up to and including the 1% annual chance (100-year) storm events. However, the increase in flow rates is mitigated by the proposed channel improvements along Gapps Bayou.

The existing conditions HEC-RAS model created by R.G. Miller Engineers was modified to account for the proposed detention pond and the updated culvert crossings at Berdett Road and FM 762. The table below shows the comparison between the existing and Alternative 3 conditions. HEC-RAS model results are included in Appendix S. The results of the analysis are shown in Table 11 below.

Table 11: Existing v. Alternative 3 Peak Water Surface Elevations

River Station	Location	Existing Conditions Flood Levels				Alternative 3 Conditions Flood Levels				Difference	
		10%	2%	1%	0.20%	10%	2%	1%	0.20%	10%	1%
29344.3	Bonbrook	81.24	81.99	82.30	82.80	81.20	81.98	82.30	82.80	-0.04	0.00
28494.4	Bonbrook	80.82	81.53	81.83	82.31	80.78	81.51	81.82	82.31	-0.04	-0.01
27602	Bonbrook	80.37	80.98	81.25	81.68	80.31	80.96	81.25	81.68	-0.06	0.00
26717.3	Bonbrook	79.94	80.35	80.54	80.82	79.86	80.33	80.52	80.82	-0.08	-0.02
23757.9	Bridlewood	77.72	77.92	78.03	78.27	75.33	76.65	76.96	77.71	-2.39	-1.07
23044.2	Bridlewood	77.72	77.93	78.05	78.29	75.37	76.69	77.00	77.75	-2.35	-1.05
22087.5	Bridlewood	77.72	77.93	78.04	78.28	75.36	76.67	76.98	77.73	-2.36	-1.06
21218.3	Bridlewood	77.72	77.93	78.03	78.27	75.35	76.66	76.97	77.71	-2.37	-1.06
20195.4	Bridlewood	77.72	77.92	78.03	78.26	75.34	76.65	76.96	77.70	-2.38	-1.07
19150.5	Bridlewood	77.72	77.92	78.02	78.26	75.34	76.65	76.96	77.70	-2.38	-1.06
18693	Bridlewood	77.68	77.88	77.98	78.20	75.26	76.56	76.84	77.60	-2.42	-1.14
18528.1	Bridlewood	77.68	77.87	77.96	78.20	75.18	76.47	76.75	77.58	-2.50	-1.21
18402.6	DA-05	77.68	77.87	77.95	78.18	74.78	75.80	76.17	77.60	-2.90	-1.78
17679.2	DA-05	77.67	77.87	77.93	78.17	74.76	75.78	76.14	77.59	-2.91	-1.79
16850	DA-05	77.67	77.86	77.92	78.16	74.75	75.76	76.12	77.58	-2.92	-1.80
16085.5	DA-05	77.66	77.85	77.92	78.15	74.74	75.75	76.11	77.58	-2.92	-1.81
15977.7	D/S FM 762	75.57	75.85	75.95	76.35	74.07	74.78	74.99	75.53	-1.50	-0.96
15075.6	D/S George Ranch H.S.	74.72	75.00	75.10	75.49	73.46	74.18	74.39	74.76	-1.26	-0.71
14123.4	Alt. 3 Detention	73.80	74.17	74.29	74.76	72.99	73.70	73.92	74.26	-0.81	-0.37
13183.6	Alt. 3 Detention	72.88	73.26	73.41	73.97	72.36	73.01	73.22	73.59	-0.52	-0.19
12867.8	Alt. 3 Detention	72.60	72.96	73.10	73.64	72.10	72.73	72.92	73.29	-0.50	-0.18
8175.8	Royal Lake Estates	68.61	69.23	69.49	70.09	68.48	69.11	69.38	69.99	-0.13	-0.11
7595.5	Royal Lake Estates	68.49	69.09	69.34	69.92	68.36	68.96	69.22	69.81	-0.13	-0.12
7330.7	Royal Lake Estates	68.44	69.00	69.24	69.78	68.31	68.88	69.12	69.67	-0.13	-0.12
6955.1	Royal Lake Estates	68.39	68.97	69.20	69.74	68.27	68.83	69.08	69.63	-0.12	-0.12
6557.7	Royal Lake Estates	68.32	68.88	69.11	69.63	68.19	68.74	68.98	69.51	-0.13	-0.13
6350.4	Royal Lake Estates	68.26	68.79	69.00	69.46	68.13	68.65	68.87	69.34	-0.13	-0.13
5682.4	Royal Lake Estates	68.24	68.75	68.95	69.41	68.10	68.61	68.83	69.29	-0.14	-0.12

As shown in the table above, water surface elevations along Gapps Bayou were decreased compared to the existing conditions hydraulic model. In Bonbrook Plantation, the 1% annual chance water surface elevation was lowered on average 0.01 feet. In Bridlewood Estates, the 1% annual chance water surface elevation was lowered on average 1.06 feet. In Royal Lake Estates, the 1% annual chance water surface elevation was lowered on average 0.12 feet. The figure below shows a comparison between the existing and Alternative 3 1% annual chance floodplain in the Bridlewood Estates subdivision. Exhibits 24-27 show the mapped floodplains for the 10%, 2%, 1% and 0.5% annual chance storm event.

Figure 4: Existing v. Alternative 3 1% Annual Chance Floodplain



The method used in to analyze the Alternative 3 floodway is Method 4, in which preliminary floodway boundaries are determined based on equal reduction of flow conveyance from the floodplain on each side of the channel, then Method 1 in which the user defines the limits of the floodway on each side of the channel to finalize all floodway computations. The floodway boundaries computed for Alternative 3 are shown on Exhibit 28. Detailed HEC-RAS output for the floodway computations is shown in Appendix T.

The cost for construction of the Alternative 3 detention pond, channel improvements, and culvert replacements would be approximately \$8.2 million dollars including \$1 million dollars for land acquisition. This alternative may require individual permit from the U.S. Army Corps of Engineers for the proposed channel improvement. The total expected damage when the Alternative 3 is implemented during a 100 year storm event is \$2.5 million dollars, which reduced approximately \$6.1 million dollars from the existing expected damage amount of \$8.6 million dollars. Therefore, the benefit amount for Alternative 3 is \$6.1 million dollars. The benefit to cost ratio for Alternative 3 is 0.7. Detailed computations are shown in Appendix U.

4.0 Ultimate Flood Protection Planning Evaluation

This section of the report describes the ultimate flood protection planning evaluation as a planning tool for a review agency to regulate the future development within the Gapps Bayou watershed. R.G. Miller Engineers, Inc. analyzed the impacts of a fully developed watershed on the peak flow rates and water surface elevations on Gapps Bayou. Please note that this report assumed that approximately 1,200 feet of undeveloped land on either side of Gapps Bayou would be developed without on-site detention requirements. This was done in recommendation by Fort Bend County Drainage District to account for the tracts that may place their detention basin near Gapps Bayou, which would be incorporated into ultimate channel size, if Gapps Bayou expanded in future. We fully recommend that all development within Gapps Bayou developed with detention basin on site as required by Fort Bend County Drainage District. For new development, we determined the impervious cover value would be 40% based on existing

landuse trends in the watershed. The time of concentration and storage coefficients for most of the drainage areas were modified to reflect the change in the percent impervious cover and ultimate development condition of the watershed. Drainage area DA-11 did not change because it is already considered fully developed. The ultimate development condition also considers the development of Grand Parkway in drainage area DA-05. The table below summarizes the model parameters for the existing and ultimate conditions. Detailed computations are shown in Appendix V.

Table 12: Existing v. Ultimate Hydrologic Parameters

Drainage Area	Existing Conditions			Ultimate Conditions		
	Percent Impervious (%)	Time of Concentration (hrs)	Storage Coefficient (hrs)	Percent Impervious (%)	Time of Concentration (hrs)	Storage Coefficient (hrs)
DA-01	25%	1.43	4.42	40.2%	1.45	4.49
DA-02	39%	0.50	3.97	40.9%	0.50	3.97
DA-03	13%	2.58	5.38	20.8%	2.07	4.30
DA-04	19%	3.24	11.69	19.4%	1.89	6.82
DA-05	0%	1.29	5.83	18.4%	0.77	3.51
DA-06	16%	1.59	5.06	40.0%	1.12	3.56
DA-07	0%	2.21	6.33	38.0%	1.19	3.40
DA-08	27%	4.62	10.00	29.5%	4.59	9.93
DA-09	0%	2.49	7.86	38.0%	1.57	4.96
DA-10	0%	2.15	3.28	38.0%	1.10	1.68
DA-11	40%	5.50	16.50	40.0%	5.00	16.50

In order to keep ultimate conditions peak water surface elevations at the same level or better than the existing conditions water surface elevation, channel improvements approach along Gapps Bayou were considered. Modified Puls routing data for Gapps Bayou was changed to reflect the improvements in the watershed for the ultimate conditions. Exhibit 29 shows the typical cross section for the channel improvements along Gapps Bayou. The existing discharge data of all the reaches in the watershed were incorporated into the ultimate conditions HEC-RAS steady flow model to create the storage outflow data for the channel. The ultimate conditions storage outflow from HEC-RAS was then updated in the HEC-HMS ultimate conditions model to determine the peak outflows. Please see Appendix W for routing data.

The HEC-HMS Version 3.3 software package developed by the U.S. Army Corps of Engineers is used to compute the proposed peak runoff rates and runoff hydrographs for the 10%, 2%, 1% and 0.2% storm events of 24-hour duration. The peak flow rates computed with the ultimate conditions HEC-HMS hydrologic model are shown below in Table 13 along with the existing conditions values. Detailed results of the ultimate conditions HEC-HMS model are shown in Appendix X.

Table 13: Existing v. Ultimate Peak Flow Rates

Hydrologic Element	1% Annual Chance		
	Existing	Ultimate	Difference
Gapps_0302_J	512.2	507.3	-4.9
Gapps_0294_J	795.1	784.5	-10.6
Gapps_0236_J	1599.9	1782.3	182.4
Gapps_0187_J	1896.5	2146.4	249.9
Gapps_0161_J	1414.1	2288.2	874.1
Gapps_0150_J	1589.4	2434.7	845.3
Gapps_0093_J	2188.3	3068.4	880.1
Gapps_0056_J	2472.2	3357.4	885.2
Gapps_0000_J	2861.0	3691.3	830.3

The existing conditions HEC-RAS model created by R.G. Miller Engineers, inc. was modified to account for the proposed channel improvements and the updated culvert crossings at Berdett Road and FM 762. The table below shows the comparison between the existing and ultimate conditions. HEC-RAS model results are included in Appendix Y. The results of the analysis are shown in Table 14 below.

Table 14: Existing v. Ultimate Peak Water Surface Elevations

River Station	Location	Existing 1% Annual Chance	Ultimate 1% Annual Chance
29344.3	Bonbrook	82.30	80.94
28494.4	Bonbrook	81.83	80.66
27602	Bonbrook	81.25	80.44
26717.3	Bonbrook	80.54	80.29
23757.9	Bridlewood	78.03	77.93
23044.2	Bridlewood	78.05	77.95
22087.5	Bridlewood	78.04	77.94
21218.3	Bridlewood	78.03	77.92
20195.4	Bridlewood	78.03	77.92
19150.5	Bridlewood	78.02	77.92
18693	Bridlewood	77.98	77.85
18528.1	Bridlewood	77.96	77.84
8175.8	Royal Lake Estates	69.49	69.20
7595.5	Royal Lake Estates	69.34	68.92
7330.7	Royal Lake Estates	69.24	68.71
6955.1	Royal Lake Estates	69.20	68.63
6557.7	Royal Lake Estates	69.11	68.39
6350.4	Royal Lake Estates	69.00	68.16
5682.4	Royal Lake Estates	68.95	68.02

As shown in the table above, water surface elevations along Gapps Bayou have generally decreased throughout Gapps Bayou. Exhibit 30 shows the 1% annual chance storm event floodplain.

The method used in to analyze the ultimate floodway is Method 4, in which preliminary floodway boundaries are determined based on equal reduction of flow conveyance from the floodplain on each side of the channel, then Method 1 in which the user defines the limits of the floodway on each side of the channel to finalize all floodway computations. The floodway boundaries computed for Alternative 1 are shown on Exhibit 31. Detailed HEC-RAS output for the floodway computations is shown in Appendix Z.

The ultimate right-of-way limits of Gapps Bayou were determined based on the 1% annual chance storm event. The right-of-way varies from 120 feet near the upstream limit of Gapps Bayou to 230 feet near the downstream limit. Existing right-of-way limits in areas that were developed along Gapps Bayou remained the same, such as Bonbrook Plantation, Bridlewood Estates and Royal Lake Estates. Exhibit 32 shows the right-of-way limits of Gapps Bayou.

5.0 Environmental Evaluation

Crouch Environmental Services, Inc. conducted an environmental study for the Gapps Bayou watershed. The objective was to identify potential features in or near the review area that might affect environmental permitting or construction requirements. It was determined that several fringe and isolated wetland areas were located within the watershed. Crouch also identified that the bald eagle, a threatened species, has a reported range area near the confluence of Gapps Bayou and Rabbs Bayou. Forested areas, known as Austin's Woods, were identified within the Gapps Bayou watershed. Also, a closed construction debris landfill was located on the northern boundary of the Gapps Bayou watershed. It was recommended by Crouch Environmental Services, Inc. that a detailed study would be needed prior to construction. The analysis by Crouch Environmental Services, Inc. is shown in Appendix AB.

6.0 Recommendations & Conclusion

Based on the results of our analysis, all three alternatives presented in this analysis mitigated existing flood damage within the Gapps Bayou watershed. Our preliminary cost estimate analysis indicates that the cost to implement each alternative is practically same, and they are within the error of margin. Although Alternative Three showed the best flood level reduction throughout the reach, each alternative presented viable solution to the flooding issues within the watershed. Alternative One is considered if channel improvement option is not available at the time of the construction. Alternative Two and Three showed that detention basin can be placed either upstream or downstream of FM 762. We consider that the Alternative Three is the best scenario for this watershed; however, it will depend on the availability and the cost of the tract, since the location of the proposed detention basin on Alternative Two is entirely located within the floodplain of Gapps Bayou, it might be more readily available and economical to be purchased.

After careful consideration and evaluation, we concluded that the real viable and economical option for flood damage reduction in the Gapps Bayou watershed is to open up culvert crossing under FM 762. The construction of proposed culvert improvement must be completed at the same time or after the completion of the regional detention basin. Therefore, implementation of phasing plan for any of the alternatives presented is not recommended. Furthermore, we recommend that the results of the Phase I analysis serve as a basis for publishing new Flood

Insurance Rate Maps of the Gapps Bayou watershed and an addition to the Fort Bend County Flood Insurance Study. Publication of the flood insurance rate maps would aid the general public in knowing the risks of flooding within the Gapps Bayou watershed.

7.0 References

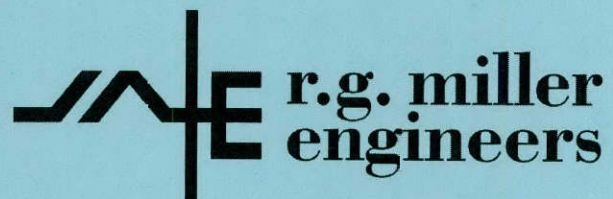
Fort Bend County Drainage District, 2011, Drainage Criteria Manual for Fort Bend County, Texas, p. 2-4.

Fort Bend County Drainage District, 2010, Flood Insurance Study for Fort Bend County, Texas and Incorporated Areas.

4Site Engineering, 2005, Drainage Analysis for the Proposed Summer Creek Subdivision, Fort Bend County, TX.

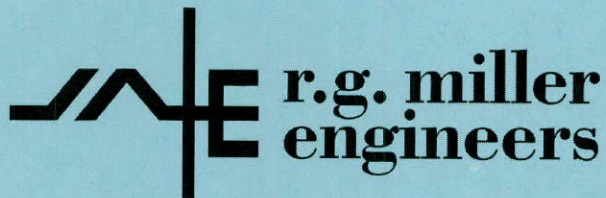
U.S. Army Corps of Engineers Hydrologic Engineering Center, 2000, HEC-HMS Technical Reference Manual, p. 38-51.

**Exhibit 1:
Vicinity Map**





**Exhibit 2:
Watershed Map**



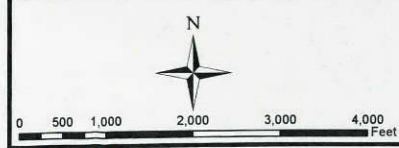
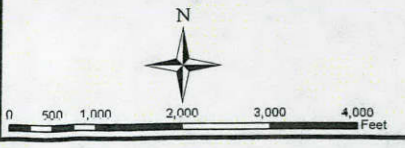
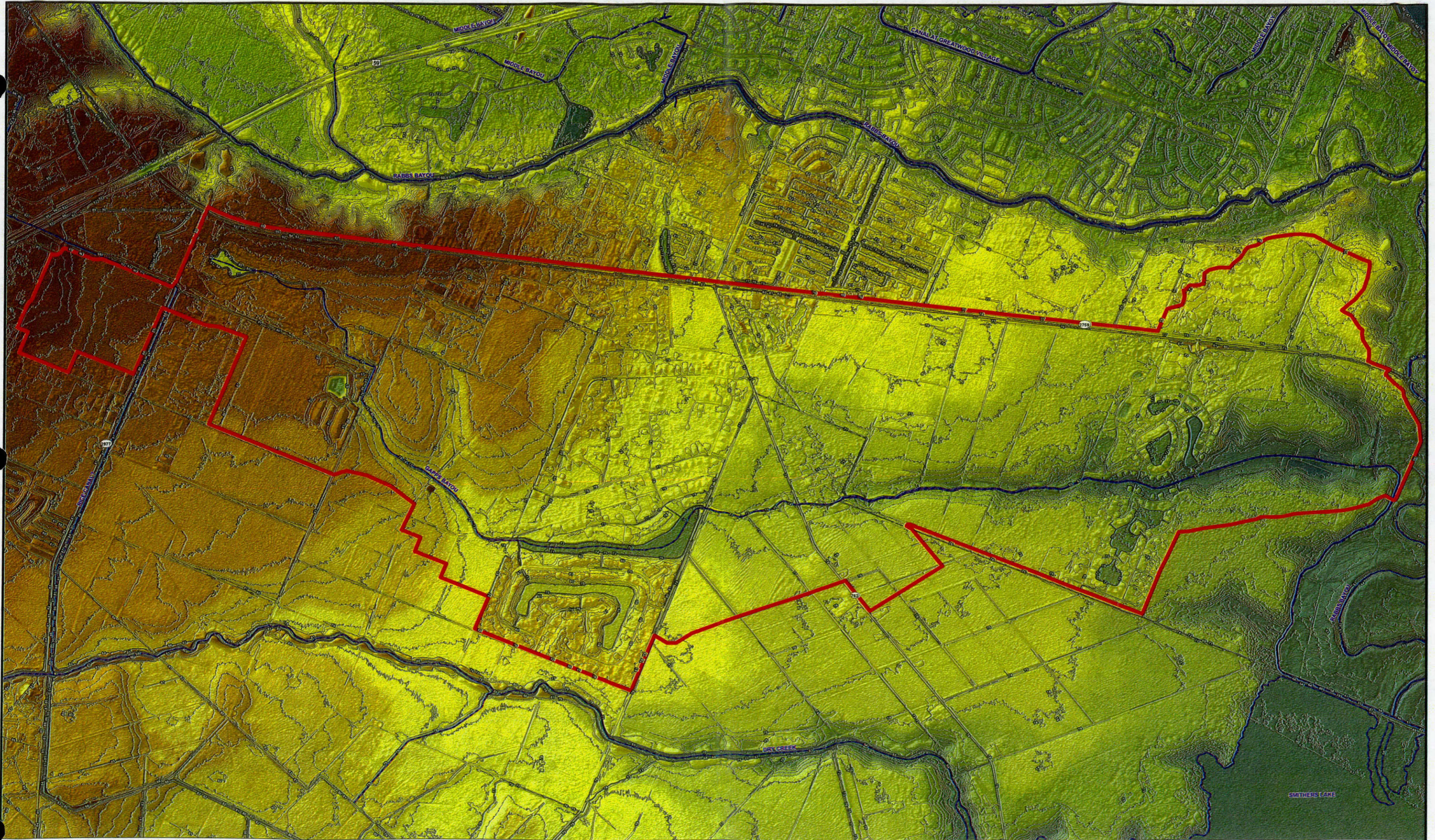


EXHIBIT 2
GAPPS BAYOU
WATERSHED MAP



**Exhibit 3:
Shaded Contour Map**



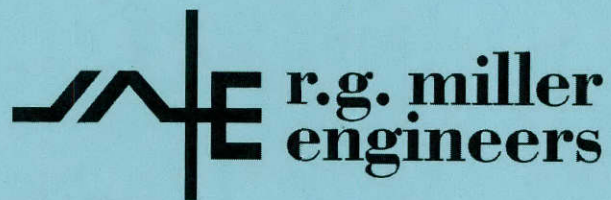


Note: Contours based on 2005 LiDAR

EXHIBIT 3
GAPP'S BAYOU
SHADED CONTOUR MAP



**Exhibit 4:
Drainage Area Map**





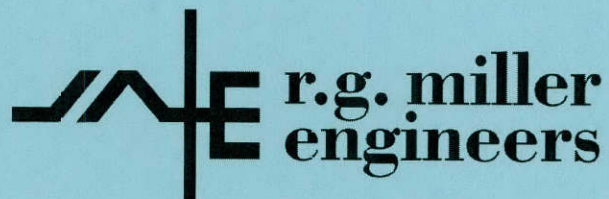
0 500 1,000 2,000 3,000 4,000 Feet

EXHIBIT 4
GAPPS BAYOU
DRAINAGE AREA MAP

r.g. miller
engineers
Texas Firm Registration No. F-187



**Exhibit 5:
Cross-Section Layout Map**



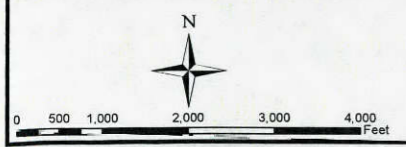
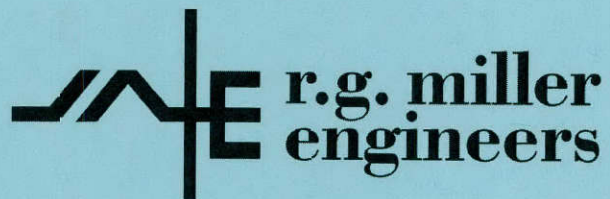


EXHIBIT 5
GAPPS BAYOU
CROSS-SECTION LAYOUT



**Exhibit 6:
Existing 10% Annual Chance
Floodplain Map**



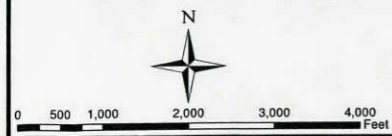


EXHIBIT 6
GAPPS BAYOU
10-YEAR FLOODPLAIN MAP



**Exhibit 7:
Existing 2% Annual Chance
Floodplain Map**



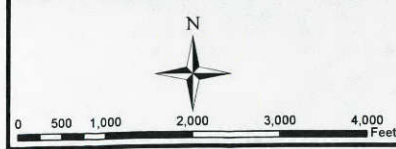


EXHIBIT 7
GAPPS BAYOU
50-YEAR FLOODPLAIN MAP



**Exhibit 8:
Existing 1% Annual Chance
Floodplain Map**





EXHIBIT 8
GAPPS BAYOU
100-YEAR FLOODPLAIN MAP

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Texas Firm Registration No. F-187



**Exhibit 9:
Existing 0.2% Annual Chance
Floodplain Map**



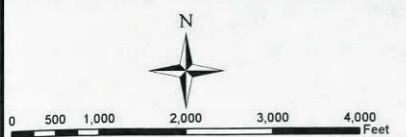
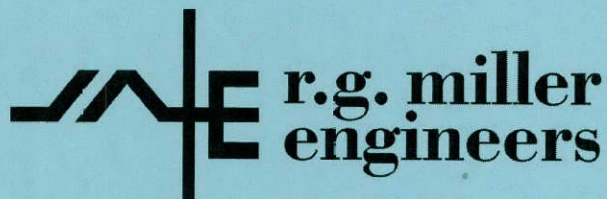


EXHIBIT 9
GAPPS BAYOU
500-YEAR FLOODPLAIN MAP



**Exhibit 10:
Existing Floodway Map**



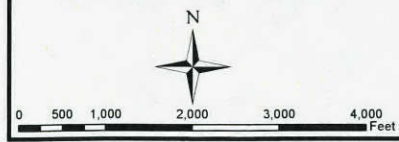


EXHIBIT 10
GAPPS BAYOU
FLOODWAY MAP



**Exhibit 11:
Alternative 1 Detention Pond
Layout**



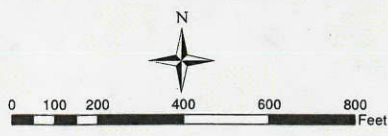
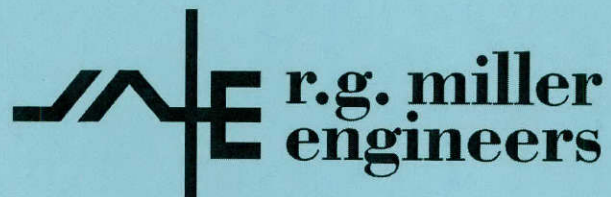


EXHIBIT 11
ALTERNATIVE 1
GAPPS BAYOU - PHASE II
FORT BEND COUNTY, TEXAS

r.g. miller
engineers
Texas Firm Registration No. F-487



**Exhibit 12:
Alternative 1 10% Annual Chance
Floodplain Map**



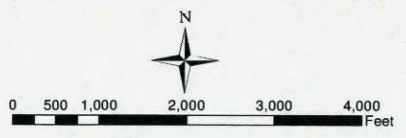
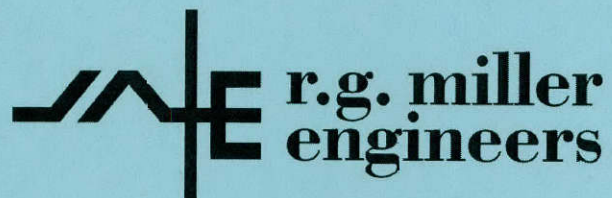


EXHIBIT 12
ALTERNATIVE 1
10% ANNUAL CHANCE FLOODPLAIN
GAPPS BAYOU - PHASE II
FORT BEND COUNTY, TEXAS



**Exhibit 13:
Alternative 1 2% Annual Chance
Floodplain Map**



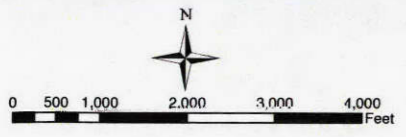


EXHIBIT 13
ALTERNATIVE 1
2% ANNUAL CHANCE FLOODPLAIN
GAPPS BAYOU - PHASE II
FORT BEND COUNTY, TEXAS

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engineers**
Texas Firm Registration No. F-487



**Exhibit 14:
Alternative 1 1% Annual Chance
Floodplain Map**

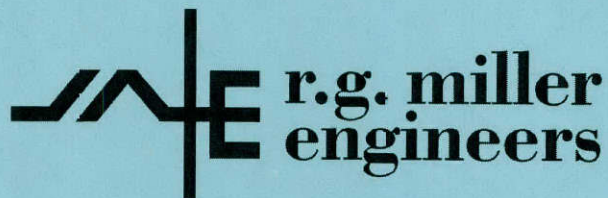


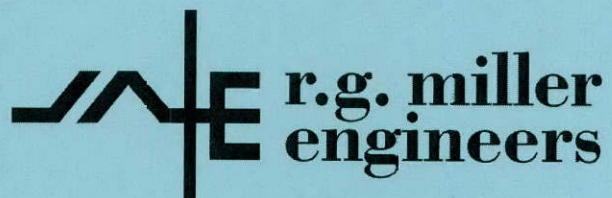


EXHIBIT 14
ALTERNATIVE 1
1% ANNUAL CHANCE FLOODPLAIN
GAPPS BAYOU - PHASE II
FORT BEND COUNTY, TEXAS

 **r.g. miller**
engineers
Texas Firm Registration No. F-487



**Exhibit 15:
Alternative 1 0.2% Annual Chance
Floodplain Map**



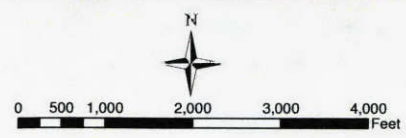


EXHIBIT 15
0.2% ANNUAL CHANCE FLOODPLAIN
GAPPS BAYOU - PHASE II
FORT BEND COUNTY, TEXAS



**Exhibit 16:
Alternative 1 Floodway Map**



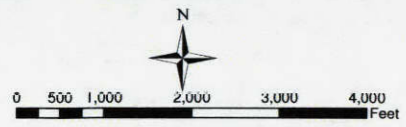
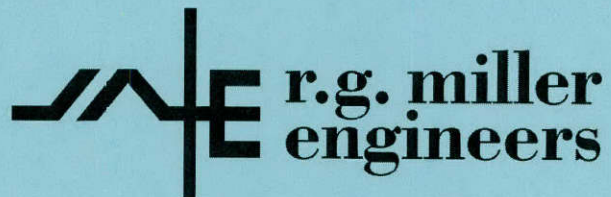


EXHIBIT 16
ALTERNATIVE 1 FLOODWAY
GAPPS BAYOU - PHASE II
FORT BEND COUNTY, TEXAS



**Exhibit 17:
Alternative 2 Detention Pond
Layout**





ALTERNATIVE 2
 PROPOSED CULVERT CROSSING
 AT BERDETT ROAD
 3 - 108" RCP CULVERTS
 2 - 72" RCP CULVERTS

Grand Parkway ROW

ALTERNATIVE 2
 IN-LINE DETENTION/CHANNEL IMPROVEMENTS
 (360 FT ROW)

ALTERNATIVE 2
 PROPOSED CULVERT CROSSING
 AT FM 762
 4 - 7'X8' RCB CULVERTS

48" RCP

48" RCP

ALTERNATIVE 2 DETENTION
 (33 ACRES)

WEIR CREST ELEVATION 75.0 FT
 WEIR LENGTH 100'

Gapps Bayou

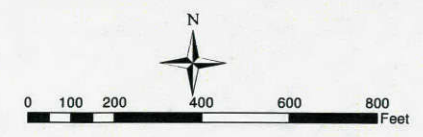
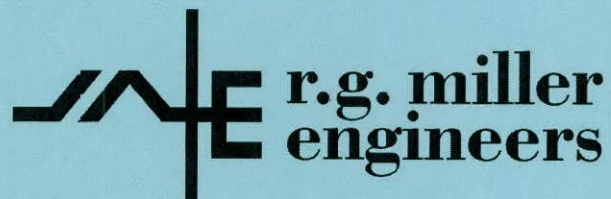


EXHIBIT 17
 ALTERNATIVE 2
 GAPPS BAYOU - PHASE II
 FORT BEND COUNTY, TEXAS

r.g. miller
engineers
 Texas Firm Registration No. F-487



**Exhibit 18:
Alternative 2 10% Annual Chance
Floodplain Map**



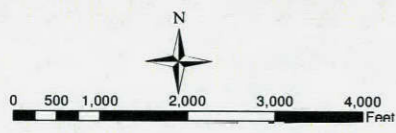
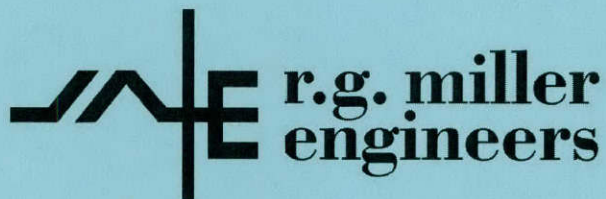


EXHIBIT 18
ALTERNATIVE 2
10% ANNUAL CHANCE FLOODPLAIN
GAPPS BAYOU - PHASE II
FORT BEND COUNTY, TEXAS

 **r.g. miller**
engineers
Texas Firm Registration No. F-487



**Exhibit 19:
Alternative 2 2% Annual Chance
Floodplain Map**



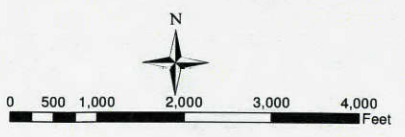
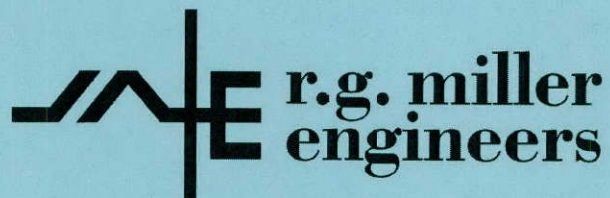


EXHIBIT 19
ALTERNATIVE 2
2% ANNUAL CHANCE FLOODPLAIN
GAPPS BAYOU - PHASE II
FORT BEND COUNTY, TEXAS

 **r.g. miller
engineers**
Texas Firm Registration No. F-487



**Exhibit 20:
Alternative 2 1% Annual Chance
Floodplain Map**



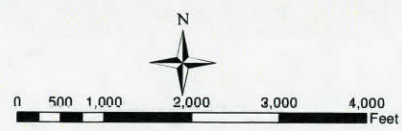
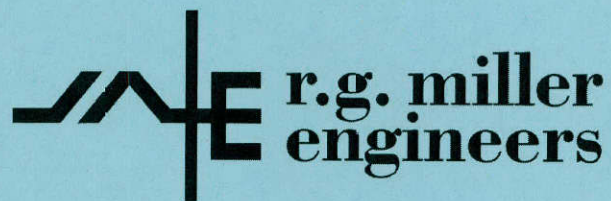


EXHIBIT 20
ALTERNATIVE 2
1% ANNUAL CHANCE FLOODPLAIN
GAPPS BAYOU - PHASE II
FORT BEND COUNTY, TEXAS

 **r.g. miller
engineers**
Texas Firm Registration No. F-487



**Exhibit 21:
Alternative 2 0.2% Annual Chance
Floodplain Map**



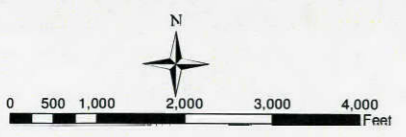
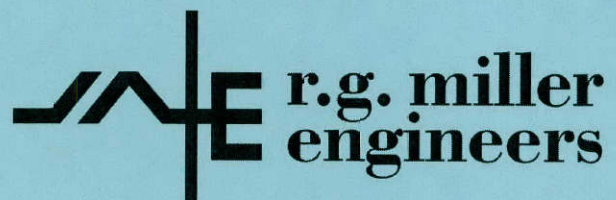


EXHIBIT 21
ALTERNATIVE 2
0.2% ANNUAL CHANCE FLOODPLAIN
GAPPS BAYOU - PHASE II
FORT BEND COUNTY, TEXAS

 **r.g. miller
engineers**
Texas Firm Registration No. F-487



**Exhibit 22:
Alternative 2 Floodway Map**





Grand Parkway ROW

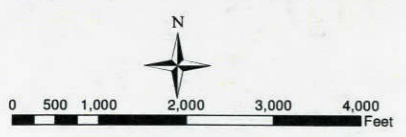
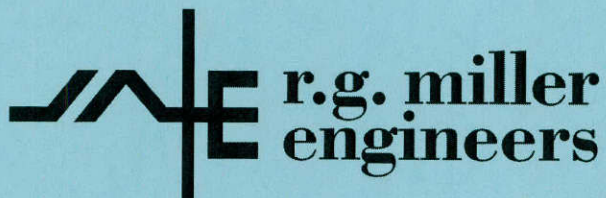


EXHIBIT 22
ALTERNATIVE 2 FLOODWAY
GAPPS BAYOU - PHASE II
FORT BEND COUNTY, TEXAS

 **r.g. miller
engineers**
Texas Firm Registration No. F-487



**Exhibit 23:
Alternative 3 Detention Pond
Layout**



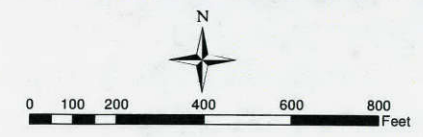
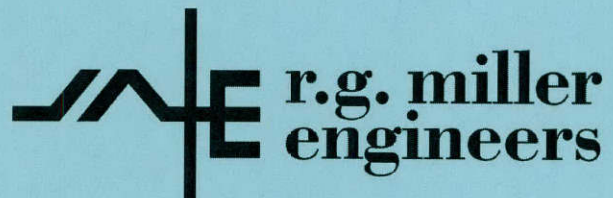


EXHIBIT 23
ALTERNATIVE 3
GAPPS BAYOU - PHASE II
FORT BEND COUNTY, TEXAS



**Exhibit 24:
Alternative 3 10% Annual Chance
Floodplain Map**



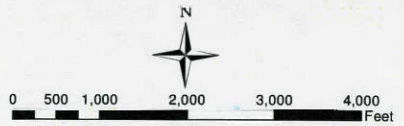
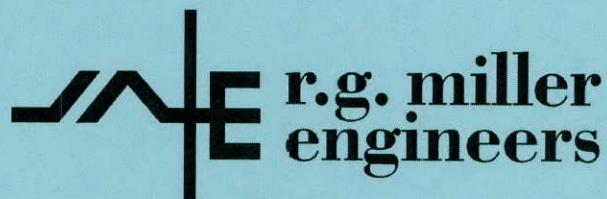


EXHIBIT 24
ALTERNATIVE 3
10% ANNUAL CHANCE FLOODPLAIN
GAPPS BAYOU - PHASE II
FORT BEND COUNTY, TEXAS

 **r.g. miller**
engineers
Texas Firm Registration No. F-487



**Exhibit 25:
Alternative 3 2% Annual Chance
Floodplain Map**



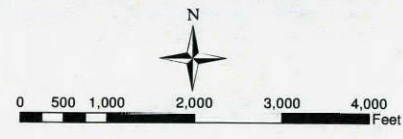


EXHIBIT 25
ALTERNATIVE 3
2% ANNUAL CHANCE FLOODPLAIN
GAPPS BAYOU - PHASE II
FORT BEND COUNTY, TEXAS

 **r.g. miller**
engineers
Texas Firm Registration No. F-487



**Exhibit 26:
Alternative 3 1% Annual Chance
Floodplain Map**



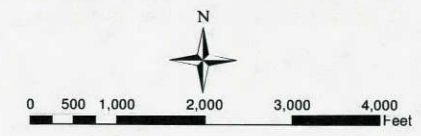
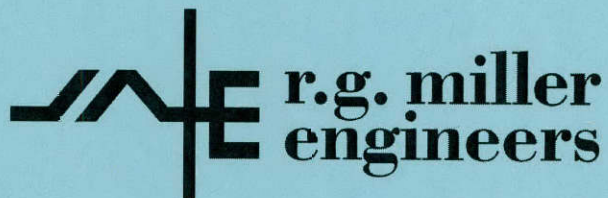


EXHIBIT 26
ALTERNATIVE 3
1% ANNUAL CHANCE FLOODPLAIN
GAPPS BAYOU - PHASE II
FORT BEND COUNTY, TEXAS

 **r.g. miller
engineers**
Texas Firm Registration No. F-487



**Exhibit 27:
Alternative 3 0.2% Annual Chance
Floodplain Map**



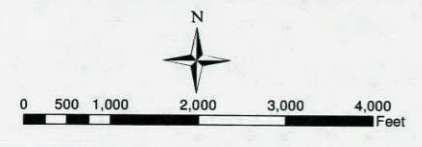


EXHIBIT 27
ALTERNATIVE 3
0.2% ANNUAL CHANCE FLOODPLAIN
GAPPS BAYOU - PHASE II
FORT BEND COUNTY, TEXAS

 **r.g. miller
engineers**
Texas Firm Registration No. F-487



**Exhibit 28:
Alternative 3 Floodway Map**

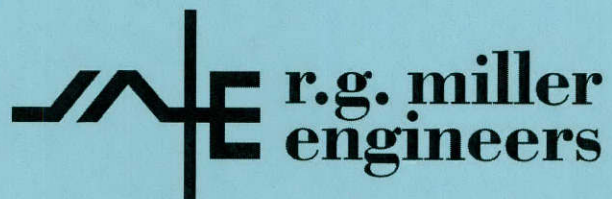


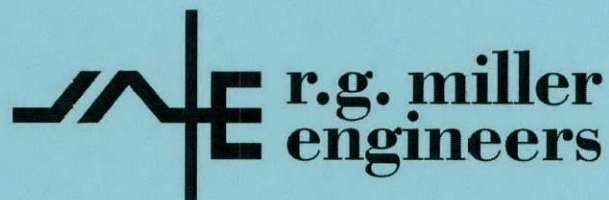


EXHIBIT 28
ALTERNATIVE 3
FLOODWAY
GAPPS BAYOU - PHASE II
FORT BEND COUNTY, TEXAS

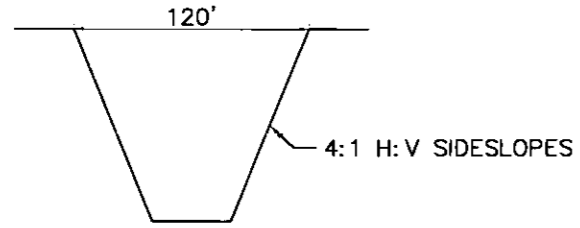
 **r.g. miller
engineers**
Texas Firm Registration No. F-487



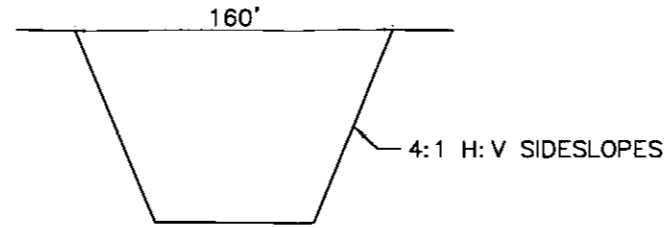
**Exhibit 29:
Ultimate Channel Improvement
Schematic**



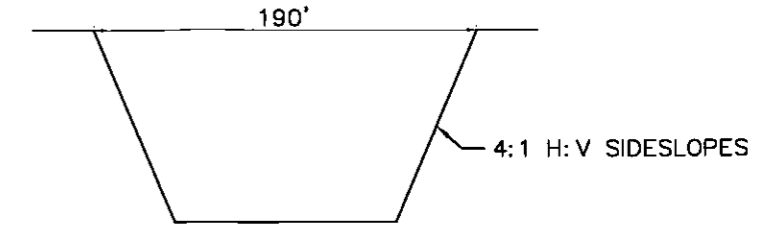
STATIONS
29428.5 - 30204.2



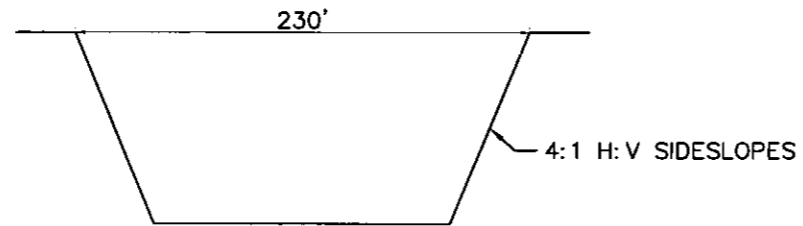
STATIONS
29428.5 - 30204.2
8187.8 - 15977.7



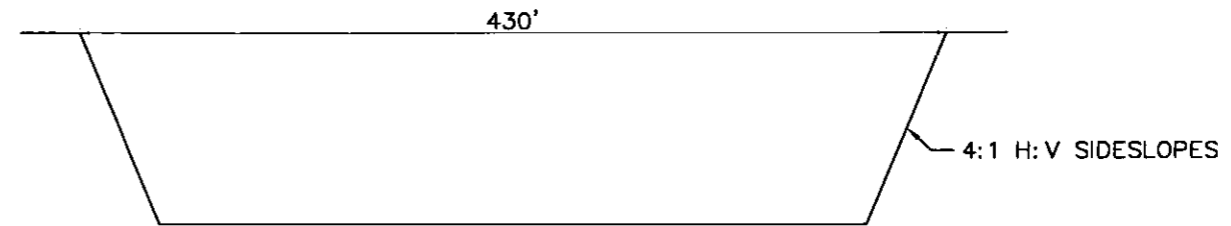
STATIONS
1872.5 - 5512.6



STATIONS
1.9 - 1872.5



STATIONS
16085.5 - 18402.6

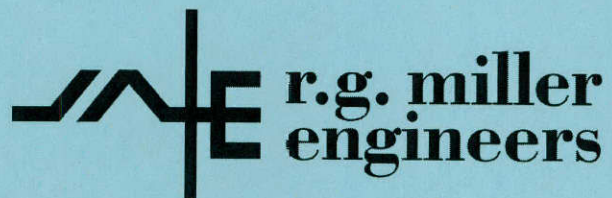


HORIZONTAL SCALE: 1":100'
VERTICAL SCALE: 1":10'

EXHIBIT 29
DRAFT CHANNEL IMPROVEMENT SCHEMATIC



**Exhibit 30:
Ultimate 1% Annual Chance
Floodplain Map**



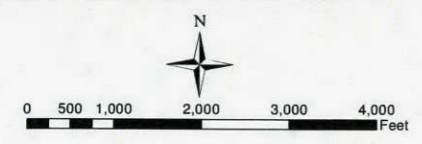
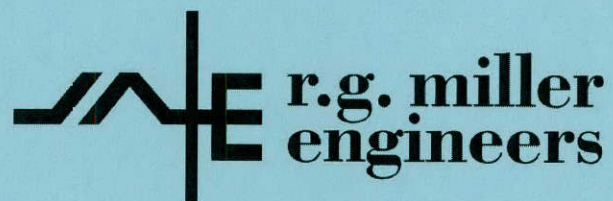


EXHIBIT 30
ULTIMATE 1% ANNUAL CHANCE FLOODPLAIN
GAPPS BAYOU - PHASE II
FORT BEND COUNTY, TEXAS



**Exhibit 31:
Ultimate Floodway Map**



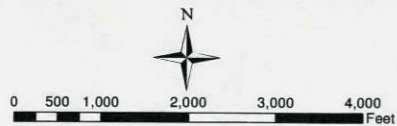
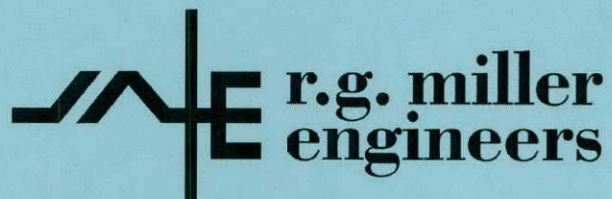


EXHIBIT 31
ULTIMATE FLOODWAY
GAPPS BAYOU - PHASE II
FORT BEND COUNTY, TEXAS

 **r.g. miller**
engineers
Texas Firm Registration No. F-487



**Exhibit 32:
Ultimate Gapps Bayou Right-of-Way
Map**



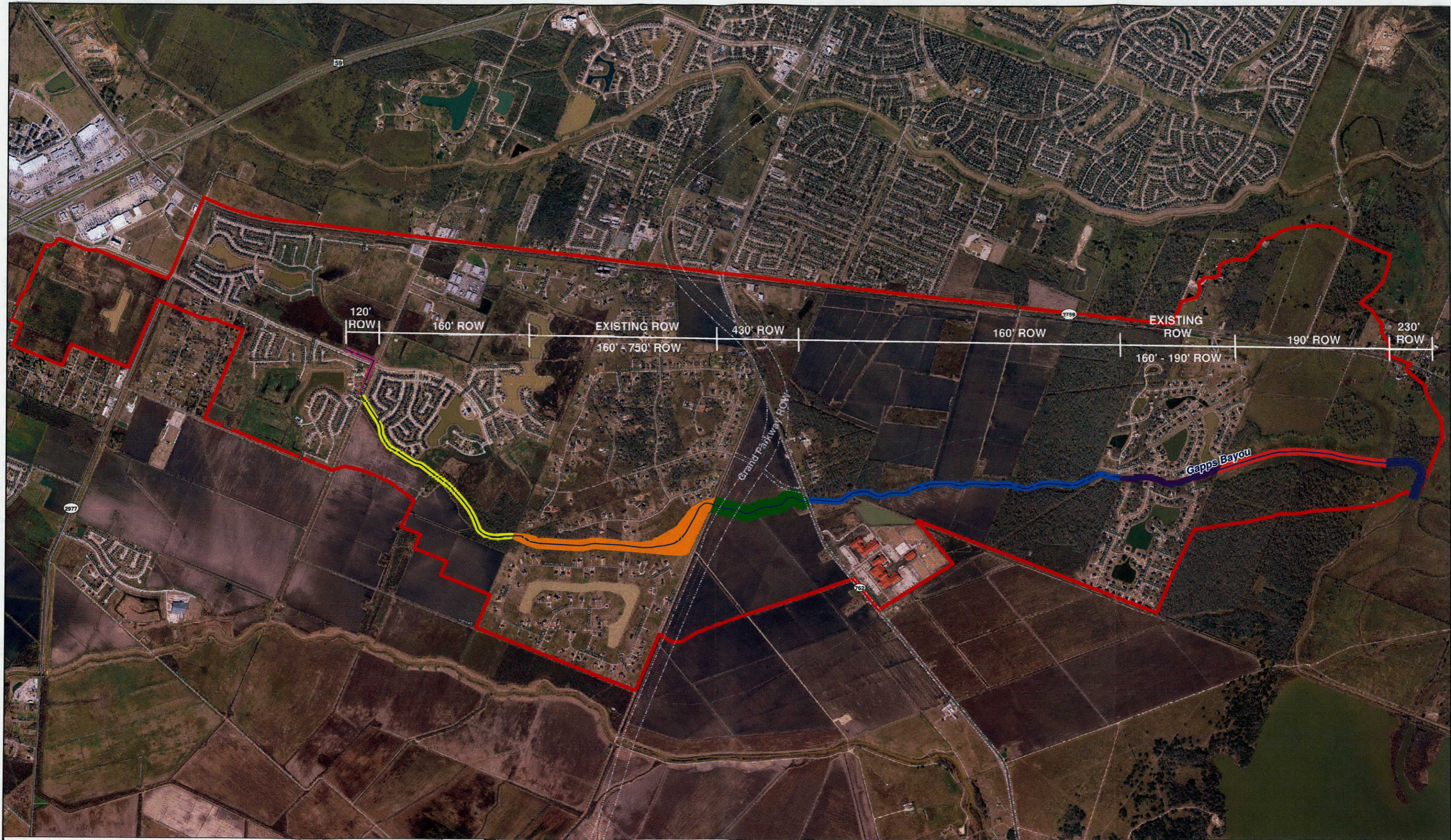
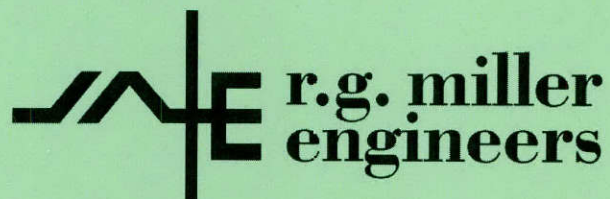


EXHIBIT 32
 RIGHT OF WAY
 ULTIMATE CONDITION
 GAPPS BAYOU - PHASE II
 FORT BEND COUNTY, TEXAS

r.g. miller
engineers
 Texas Firm Registration No. F-487



**Appendix A:
Phase I Hydrologic Calculations**



FORT BEND COUNTY STANDARD HYDROLOGIC METHODOLOGY

22-Feb-12
J. Blevins

PARAMETER	UNITS	SYMBOL	Drainage Area	Drainage Area	Drainage Area	Drainage Area	Drainage Area	Drainage Area	Drainage Area	Drainage Area	Drainage Area	Drainage Area	Drainage Area
			1	2	3	4	5	6	7	8	9	10	11
Drainage Area	acres	A	376.4	222.5	816.2	946.2	293.8	324.3	913.9	447	249.6	434.6	188.8
Watershed Length	miles	L	1.36	1.01	1.83	2.82	1.13	1.41	2.36	1.56	0.70	1.07	
Channel Slope	ft./mi.	S	4.41	16.70	5.67	3.73	4.72	12.77	25.10	0.29	1.58	11.05	
Watershed Slope	ft./mi.	So	4.41	1.98	7.14	3.73	2.99	4.26	4.80	6.79	4.30	11.05	
Upstream Manning "n"			0.045	0.045	0.045	0.06	0.05	0.08	0.0475	0.045	0.08	0.06	
Downstream Manning "n"			0.045	0.045	0.06	0.1	0.05	0.08	0.08	0.045	0.08	0.06	
Impervious Cover	%	I	25.30%	39.40%	13.20%	19.00%	0.00%	16.00%	0.00%	27.00%	0.00%	0.00%	40.00%
Percent Affected by Detention	%		67.00%	100.00%	64.00%	33.00%	0.00%	33.00%	0.00%	87.00%	0.00%	0.00%	
Adjusted Impervious Cover Value	%	I _{adj}	8.35%	0.00%	4.75%	12.73%	0.00%	10.72%	0.00%	3.51%	0.00%	0.00%	
Ponded Area	acres		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Area Affected by Ponding	acres	Ap	0	0	0	0	0	0	0	0	0	0	
COMPUTED RESULTS													
Drainage Area	sq. mi.	A	0.59	0.35	1.28	1.48	0.46	0.51	1.43	0.70	0.39	0.68	
Weighted Manning "n"	percent	I	0.045	0.045	0.056	0.090	0.050	0.080	0.072	0.045	0.080	0.060	
Percent Ponded Area	%	PPA	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
Percent Area Affected by Ponding	%	PAA	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
TC + R	hours	TC+R	5.86	4.48	7.96	14.93	7.12	6.65	8.53	14.63	10.35	5.43	
Time of Concentration	hours	TC	1.43	0.50	2.58	3.24	1.29	1.59	2.21	4.62	2.49	2.15	5.5
Storage Coefficient	hours	R	4.42	3.97	5.38	11.60	5.83	5.06	6.33	10.00	7.86	3.28	16.5
Adjusted Storage Coefficients													
5-Year	hours	R5	4.42	3.97	5.38	11.69	5.83	5.06	6.33	10.00	7.86	3.28	
10-Year	hours	R10	4.42	3.97	5.38	11.69	5.83	5.06	6.33	10.00	7.86	3.28	
25-Year	hours	R25	4.42	3.97	5.38	11.69	5.83	5.06	6.33	10.00	7.86	3.28	
50-Year	hours	R50	4.42	3.97	5.38	11.69	5.83	5.06	6.33	10.00	7.86	3.28	
100-Year	hours	R100	4.42	3.97	5.38	11.69	5.83	5.06	6.33	10.00	7.86	3.28	
500-Year	hours	R500	4.42	3.97	5.38	11.69	5.83	5.06	6.33	10.00	7.86	3.28	

Note: The TC & R for Sub-Area 11 was computed to have a 100-year peak discharge of 72 cfs per the Summer Creek Drainage study by 4Site Engineering.
The TC & R values reflect on-site detention where appropriate.



**Gapps Bayou Waterhsed
Routing Reach Data**

Gapps_0000_R

Elevation	Total Stor	Storage	Discharge
64.73	270.44	270.44	250.34
66.69	505.35	505.35	500.68
67.17	577.7	577.7	751.02
67.53	633.58	633.58	1001.36
67.83	681.71	681.71	1251.7
68.1	726.06	726.06	1502.04
68.35	766.58	766.58	1752.38
68.57	803.62	803.62	2002.72
68.78	839.2	839.2	2253.06
68.97	873.31	873.31	2503.4
69.16	906.35	906.35	2753.74
69.33	938.93	938.93	3004.08
69.82	1031.30	1031.30	3755.1

Gapps_0050_R

Elevation	Total Stor	Storage	Discharge
65.19	314	43.56	222.18
67.02	592.43	87.08	444.36
67.65	679.52	101.82	666.54
68.14	747.71	114.13	888.72
68.56	806.94	125.23	1110.9
68.93	861.7	135.64	1333.08
69.27	912.13	145.55	1555.26
69.59	958.72	155.1	1777.44
69.88	1003.95	164.75	1999.62
70.16	1047.32	174.01	2221.8
70.42	1089.77	183.42	2443.98
70.68	1132.07	193.14	2666.16
71.39	1255.35	223.96	3332.7

Gapps_0093_R

Elevation	Total Stor	Storage	Discharge
69.3	329.28	15.28	162.8
70.79	616.55	24.12	325.6
71.91	711.08	31.56	488.4
72.82	787.81	40.1	651.2
73.68	857.49	50.55	814
74.3	926.89	65.19	976.8
74.61	997.32	85.19	1139.6
74.82	1063.57	104.85	1302.4
74.99	1128.09	124.14	1465.2
75.13	1190.32	143	1628
75.26	1252.01	162.24	1790.8
75.4	1314.21	182.14	1953.6
75.74	1502.71	247.36	2442

Gapps_0150_R

Elevation	Total Stor	Storage	Discharge
70.36	331.17	1.89	146
71.94	619.79	3.24	292
73.15	715.57	4.49	438
74.3	793.55	5.74	584
75.72	867.01	9.52	730
76.72	945.73	18.84	876
77.51	1025.83	28.51	1022
77.74	1100.89	37.32	1168
77.86	1174.28	46.19	1314
77.98	1245.74	55.42	1460
78.02	1316.67	64.66	1606
78.08	1389.36	75.15	1752
78.25	1607.34	104.63	2190

Gapps_0161_R

Elevation	Total Stor	Storage	Discharge
74.35	336.93	5.76	180.27
76.5	631.01	11.22	378.54
76.79	734.31	18.74	567.81
76.93	825.85	32.3	757.08
77.02	936.53	69.52	946.35
77.1	1153.53	207.8	1135.62
77.56	1454.87	429.04	1324.89
77.79	1612.84	511.95	1514.16
77.93	1731.25	556.97	1703.43
78.03	1852.05	606.31	1892.7
78.08	1944.57	627.9	2081.97
78.15	2043.39	654.03	2271.24
78.32	2340.33	732.99	2839.05

Gapps_0187_R

Elevation	Total Stor	Storage	Discharge
74.37	628.78	291.85	159.97
76.52	1013.37	382.36	319.94
76.82	1134.06	399.75	479.91
76.97	1236.01	410.16	639.88
77.08	1354.49	417.96	799.85
77.18	1579.37	425.84	959.82
77.62	1922.33	467.46	1119.79
77.84	2107.66	494.87	1279.76
77.98	2246.5	515.25	1439.73
78.08	2383.9	531.85	1599.7
78.14	2486.47	541.9	1759.67
78.21	2598.57	555.18	1919.64
78.4	2932.97	592.64	2399.55

Gapps_0236_R

Elevation	Total Stor	Storage	Discharge
77.15	638.37	9.59	79.51
78.67	1032.40	19.11	159.07
79.88	1158.81	24.75	238.53
80.32	1262.69	26.68	318.04
80.98	1384.81	30.32	397.55
81.56	1613.43	34.06	477.06
82.11	1962.98	40.65	556.57
82.62	2156.25	48.59	636.08
82.96	2303.45	56.95	715.59
83.19	2450.26	66.36	795.1
83.36	2561.81	75.34	874.61
83.49	2683.49	84.92	954.12
83.7	3047.94	114.97	1192.65

Gapps_0294_R

Elevation	Total Stor	Storage	Discharge
78.25	639.14	0.77	51.22
79.18	1034.1	1.62	102.44
80.18	1161.44	2.63	153.66
80.66	1265.86	3.17	204.88
81.27	1388.82	4.01	256.1
81.82	1618.23	4.8	307.32
82.37	1968.89	5.91	358.54
82.86	2163.56	7.31	409.76
83.2	2311.75	8.3	460.98
83.44	2459.3	9.04	512.2
83.63	2571.41	9.6	563.42
83.78	2693.66	10.17	614.64
84.1	3059.93	11.99	768.3



**Appendix B:
Phase I Green-Ampt Loss Function
Parameters**



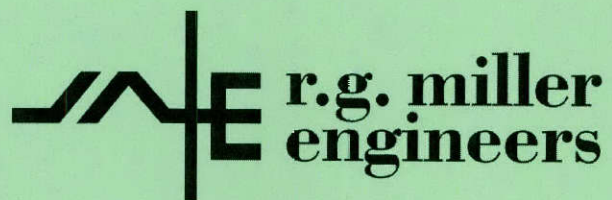
Gapps Bayou Watershed

Green-Ampt Loss Function Parameters

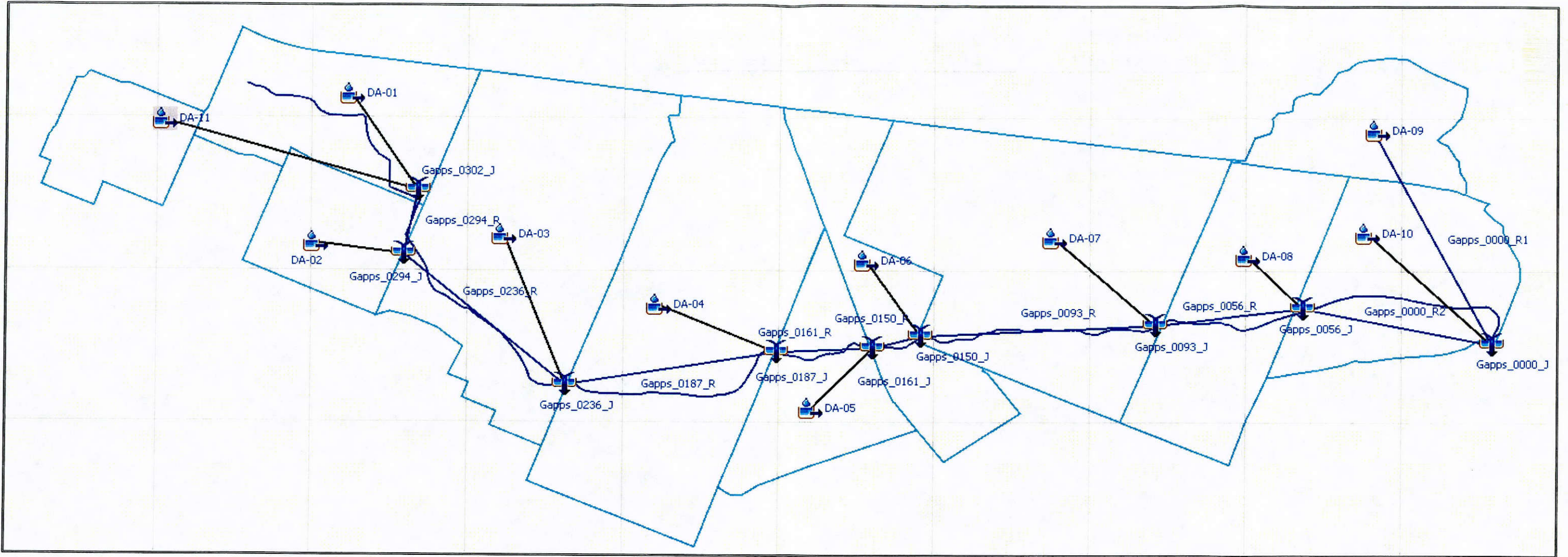
Initial Loss	(inches)	0.1
Moisture Deficit		0.385
Suction	(inches)	12.45
Hydraulic Conductivity	(in/hr)	0.024



**Appendix C:
Phase I HEC-HMS Model Schematic
and Results**



Gapps Bayou
Existing Conditions HEC-HMS Model Schematic





Project: Gapps Bayou 01312012 Simulat on Run: Existing: 10PCT_10yr

Start of Run: 26Oct2011, 00:00 Basin Model: Existing Conditions
 End of Run: 28Oct2011, 00:00 Meteorologic Model: 10PCT_10yr
 Compute Time: 31Jan2012, 10:10:30 Control Specifications: Control 48

Volume Units: AC-FT

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
DA-01	0.588	308.9	26Oct2011, 17:45	200.2
DA-02	0.348	204.4	26Oct2011, 17:00	124.9
DA-03	1.275	549.1	26Oct2011, 18:45	414.0
DA-04	1.479	351.9	26Oct2011, 19:30	456.3
DA-05	0.459	190.0	26Oct2011, 17:45	141.1
DA-06	0.507	236.9	26Oct2011, 18:00	166.5
DA-07	1.428	541.7	26Oct2011, 18:30	437.8
DA-08	0.698	185.7	26Oct2011, 20:45	227.6
DA-09	0.390	124.1	26Oct2011, 18:45	118.0
DA-10	0.679	409.7	26Oct2011, 18:15	208.9
DA-11	0.295	54.8	26Oct2011, 21:45	88.5
Gapps_0000_J	8.146	1871.8	27Oct2011, 00:30	2863.7
Gapps_0000_R1	0.390	124.1	26Oct2011, 19:30	117.7
Gapps_0000_R2	7.077	1695.6	27Oct2011, 01:15	2537.1
Gapps_0056_J	7.077	1706.3	26Oct2011, 23:30	2591.0
Gapps_0056_R	6.379	1544.0	26Oct2011, 23:30	2363.4
Gapps_0093_J	6.379	1546.2	26Oct2011, 23:00	2329.8
Gapps_0093_R	4.951	1215.1	27Oct2011, 00:00	1891.9
Gapps_0150_J	4.951	1220.5	26Oct2011, 22:15	1882.4
Gapps_0150_R	4.444	1089.2	26Oct2011, 23:00	1715.9
Gapps_0161_J	4.444	1096.7	26Oct2011, 22:00	1714.9
Gapps_0161_R	3.985	983.5	26Oct2011, 23:00	1573.3
Gapps_0187_J	3.985	1236.2	26Oct2011, 20:15	1549.2
Gapps_0187_R	2.506	890.6	26Oct2011, 20:15	1092.9
Gapps_0236_J	2.506	1051.2	26Oct2011, 18:45	966.8



Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Gapps_0236_R	1.231	502.4	26Oct2011, 19:00	552.9
Gapps_0294_J	1.231	512.7	26Oct2011, 17:45	491.1
Gapps_0294_R	0.883	327.1	26Oct2011, 18:15	366.3
Gapps_0302_J	0.883	331.2	26Oct2011, 17:45	288.7



Project: Gapps Bayou 01312012 Simulation Run: Existing: 2PCT_50yr

Start of Run: 26Oct2011, 00:00 Basin Model: Existing Conditions
 End of Run: 28Oct2011, 00:00 Meteorologic Model: 2PCT_50yr
 Compute Time: 31Jan2012, 10:11:16 Control Specifications: Control 48

Volume Units: AC-FT

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
DA-01	0.588	420.4	26Oct2011, 17:45	285.4
DA-02	0.348	276.5	26Oct2011, 17:00	175.6
DA-03	1.275	761.1	26Oct2011, 18:45	597.7
DA-04	1.479	496.1	26Oct2011, 19:45	654.8
DA-05	0.459	262.6	26Oct2011, 17:45	206.9
DA-06	0.507	324.9	26Oct2011, 18:00	239.6
DA-07	1.428	755.3	26Oct2011, 18:30	641.8
DA-08	0.698	262.0	26Oct2011, 20:45	324.0
DA-09	0.390	174.3	26Oct2011, 18:45	173.0
DA-10	0.679	561.5	26Oct2011, 18:15	306.3
DA-11	0.295	77.0	26Oct2011, 22:00	124.4
Gapps_0000_J	8.146	2541.2	26Oct2011, 23:15	3894.7
Gapps_0000_R1	0.390	174.3	26Oct2011, 19:30	172.6
Gapps_0000_R2	7.077	2219.2	27Oct2011, 00:00	3415.8
Gapps_0056_J	7.077	2229.4	26Oct2011, 22:15	3524.8
Gapps_0056_R	5.379	1982.7	26Oct2011, 22:30	3200.8
Gapps_0093_J	5.379	1984.5	26Oct2011, 22:00	3175.8
Gapps_0093_R	4.951	1476.0	27Oct2011, 00:15	2534.0
Gapps_0150_J	4.951	1479.0	26Oct2011, 22:45	2525.5
Gapps_0150_R	4.444	1316.0	27Oct2011, 00:45	2285.8
Gapps_0161_J	4.444	1318.4	27Oct2011, 00:00	2285.0
Gapps_0161_R	3.985	1199.5	27Oct2011, 01:15	2078.1
Gapps_0187_J	3.985	1656.1	26Oct2011, 21:00	2056.9
Gapps_0187_R	2.506	1176.3	26Oct2011, 21:15	1402.1
Gapps_0236_J	2.506	1420.8	26Oct2011, 19:00	1297.4



Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Gapps_0236_R	1.231	676.0	26Oct2011, 19:30	699.7
Gapps_0294_J	1.231	697.9	26Oct2011, 18:00	646.2
Gapps_0294_R	0.883	447.8	26Oct2011, 18:15	470.7
Gapps_0302_J	0.883	452.6	26Oct2011, 17:45	409.8



Project: Gapps Bayou 01312012 Simulation Run: Existing: 1PCT_100yr

Start of Run: 26Oct2011, 00:00 Basin Model: Existing Conditions
 End of Run: 28Oct2011, 00:00 Meteorologic Model: 1PCT_100yr
 Compute Time: 31Jan2012, 10:12:16 Control Specifications: Control 48

Volume Units: AC-FT

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
DA-01	0.588	474.4	26Oct2011, 17:45	330.9
DA-02	0.348	310.3	26Oct2011, 17:00	202.6
DA-03	1.275	863.1	26Oct2011, 18:45	695.6
DA-04	1.479	566.1	26Oct2011, 19:45	760.8
DA-05	0.459	298.4	26Oct2011, 17:45	241.9
DA-06	0.507	368.0	26Oct2011, 18:00	278.7
DA-07	1.428	859.8	26Oct2011, 18:30	750.5
DA-08	0.698	298.3	26Oct2011, 20:45	375.4
DA-09	0.390	198.9	26Oct2011, 18:45	202.3
DA-10	0.679	634.0	26Oct2011, 18:15	358.1
DA-11	0.295	87.8	26Oct2011, 22:00	143.6
Gapps_0000_J	3.146	2861.0	26Oct2011, 23:00	4445.9
Gapps_0000_R1	0.390	198.9	26Oct2011, 19:30	201.9
Gapps_0000_R2	7.077	2462.9	26Oct2011, 23:45	3885.9
Gapps_0056_J	7.077	2472.2	26Oct2011, 22:00	4018.5
Gapps_0056_R	6.379	2186.7	26Oct2011, 22:15	3643.1
Gapps_0093_J	6.379	2188.3	26Oct2011, 21:45	3624.5
Gapps_0093_R	4.951	1587.5	27Oct2011, 00:00	2874.0
Gapps_0150_J	4.951	1589.4	26Oct2011, 22:45	2866.0
Gapps_0150_R	4.444	1410.9	27Oct2011, 01:15	2587.3
Gapps_0161_J	4.444	1414.1	27Oct2011, 00:30	2586.6
Gapps_0161_R	3.985	1290.7	27Oct2011, 02:15	2344.7
Gapps_0187_J	3.985	1896.5	26Oct2011, 21:00	2326.2
Gapps_0187_R	2.506	1348.0	26Oct2011, 21:15	1565.4
Gapps_0236_J	2.506	1599.9	26Oct2011, 19:00	1473.3



Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Gapps_0236_R	1.231	763.4	26Oct2011, 19:30	777.7
Gapps_0294_J	1.231	795.1	26Oct2011, 18:00	729.2
Gapps_0294_R	0.883	509.6	26Oct2011, 18:00	526.6
Gapps_0302_J	0.883	512.2	26Oct2011, 17:45	474.5



Project: Gapps Bayou 01312012 Simulation Run: Existing: 0.2PCT_500yr

Start of Run: 26Oct2011, 00:00 Basin Model: Existing Conditions
 End of Run: 28Oct2011, 00:00 Meteorologic Model: 0.2PCT_500yr
 Compute Time: 31Jan2012, 10:12:56 Control Specifications: Control 48

Volume Units: AC-FT

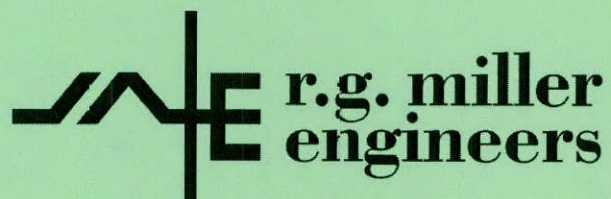
Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
DA-01	0.588	594.2	26Oct2011, 17:45	425.3
DA-02	0.348	386.7	26Oct2011, 17:00	258.5
DA-03	1.275	1093.2	26Oct2011, 18:45	900.4
DA-04	1.479	725.1	26Oct2011, 20:00	981.2
DA-05	0.459	376.5	26Oct2011, 17:45	315.6
DA-06	0.507	462.9	26Oct2011, 18:00	360.1
DA-07	1.428	1091.4	26Oct2011, 18:30	979.2
DA-08	0.698	382.0	26Oct2011, 20:45	482.0
DA-09	0.390	253.7	26Oct2011, 19:00	264.0
DA-10	0.679	796.8	26Oct2011, 18:15	467.3
DA-11	0.295	112.5	26Oct2011, 22:15	182.9
Gapps_0000_J	8.146	3602.6	26Oct2011, 22:30	5660.7
Gapps_0000_R1	0.390	253.7	26Oct2011, 19:45	263.4
Gapps_0000_R2	7.077	3030.8	26Oct2011, 23:15	4930.1
Gapps_0056_J	7.077	3040.3	26Oct2011, 21:30	5096.3
Gapps_0056_R	6.379	2664.8	26Oct2011, 21:45	4614.4
Gapps_0093_J	6.379	2666.9	26Oct2011, 21:15	4601.3
Gapps_0093_R	4.951	2069.2	27Oct2011, 03:15	3622.0
Gapps_0150_J	4.951	2080.9	27Oct2011, 01:30	3615.2
Gapps_0150_R	4.444	1914.3	27Oct2011, 02:00	3255.1
Gapps_0161_J	4.444	1937.1	27Oct2011, 01:15	3254.5
Gapps_0161_R	3.985	1774.0	27Oct2011, 01:45	2938.9
Gapps_0187_J	3.985	2547.6	26Oct2011, 20:45	2920.3
Gapps_0187_R	2.506	1829.1	26Oct2011, 21:00	1939.4
Gapps_0236_J	2.506	2026.2	26Oct2011, 19:15	1856.5



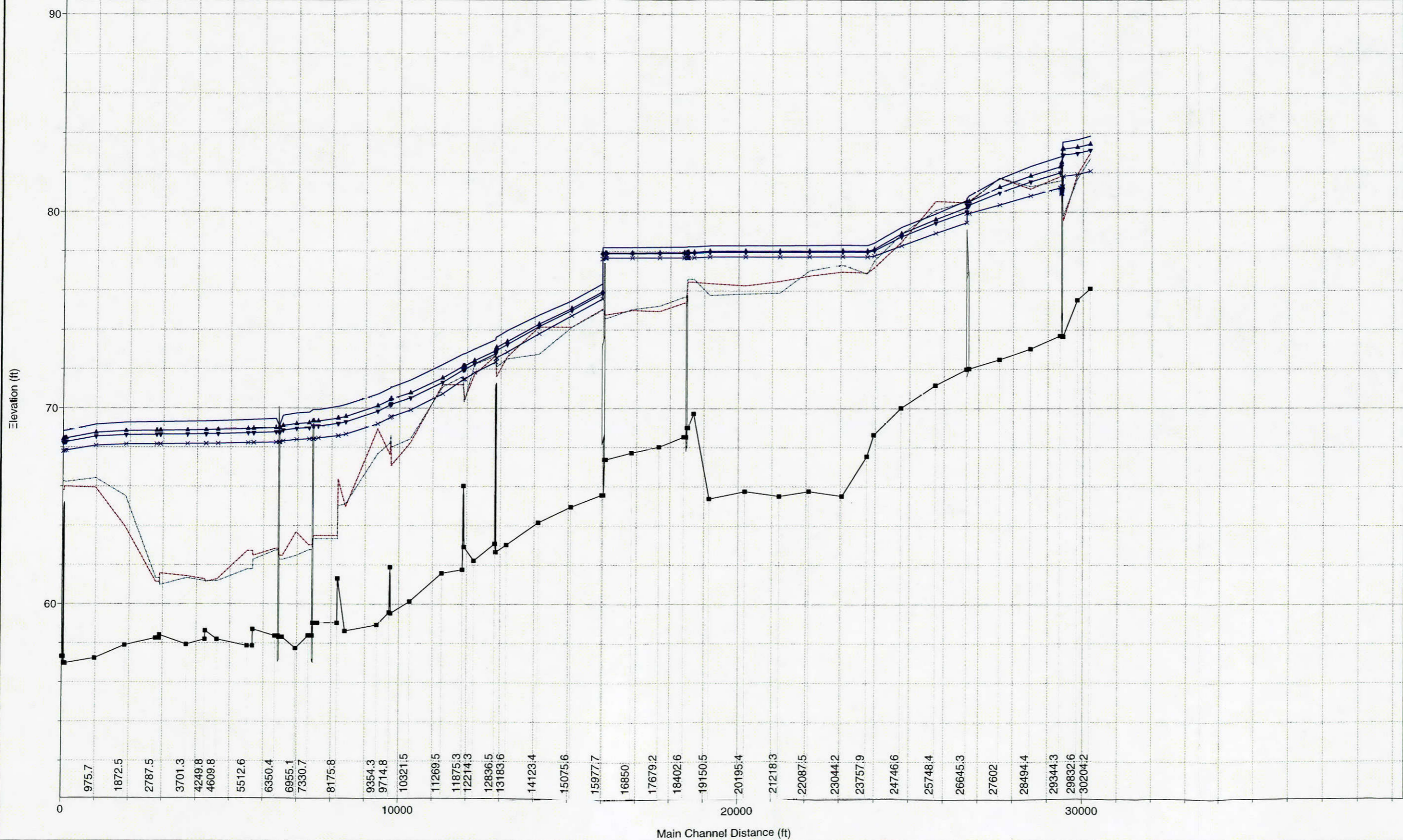
Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Gapps_0236_R	1.231	965.6	26Oct2011, 19:45	956.7
Gapps_0294_J	1.231	1004.4	26Oct2011, 17:45	912.2
Gapps_0294_R	0.883	642.4	26Oct2011, 18:00	653.7
Gapps_0302_J	0.883	643.3	26Oct2011, 18:00	608.2



**Appendix D:
Phase I HEC-RAS Profiles and
Output**



Gapps Bayou Plan: Multiprofile - GreenAmpt Loss 2/22/2012
 Gapps Bayou 1



Legend	
WS 0.2PCT_500yr	▲
WS 1PCT_100yr	▼
WS 2PCT_50yr	×
WS 10PCT_10yr	*
Ground	■
LOB	- - -
ROB	- - -

1 in Horiz. = 3000 ft 1 in Vert. = 5 ft



Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	30204.2	0.2PCT_500yr	643.30	76.10	83.86		83.90	0.000508	1.70	438.86	260.41	0.16
1	30204.2	1PCT_100yr	512.20	76.10	83.44		83.48	0.000491	1.54	362.96	158.88	0.15
1	30204.2	2PCT_50yr	452.60	76.10	83.14		83.17	0.000547	1.51	315.87	146.65	0.16
1	30204.2	10PCT_10yr	331.20	76.10	82.08		82.12	0.000601	1.64	201.61	68.49	0.17
1	29832.6	0.2PCT_500yr	643.30	75.51	83.67		83.73	0.000393	1.98	496.04	237.65	0.15
1	29832.6	1PCT_100yr	512.20	75.51	83.29		83.33	0.000320	1.71	420.27	162.50	0.13
1	29832.6	2PCT_50yr	452.60	75.51	82.98		83.02	0.000310	1.61	372.63	152.34	0.13
1	29832.6	10PCT_10yr	331.20	75.51	81.90		81.94	0.000399	1.54	218.48	91.78	0.14
1	29428.5	0.2PCT_500yr	1004.40	73.66	83.54	77.72	83.61	0.000275	2.01	912.00	556.89	0.13
1	29428.5	1PCT_100yr	795.10	73.66	83.19	77.31	83.24	0.000203	1.67	813.09	239.93	0.11
1	29428.5	2PCT_50yr	697.90	73.66	82.89	77.08	82.93	0.000182	1.54	741.69	234.41	0.11
1	29428.5	10PCT_10yr	512.70	73.66	81.81	76.63	81.84	0.000183	1.36	504.16	207.14	0.10
1	29411.9		Culvert									
1	29344.3	0.2PCT_500yr	1004.40	73.70	82.80		82.88	0.000565	2.43	627.99	473.80	0.18
1	29344.3	1PCT_100yr	795.10	73.70	82.30		82.38	0.000597	2.35	410.97	366.62	0.18
1	29344.3	2PCT_50yr	697.90	73.70	81.99		82.07	0.000592	2.24	322.46	156.73	0.18
1	29344.3	10PCT_10yr	512.70	73.70	81.23		81.29	0.000526	1.96	262.01	61.02	0.17
1	28494.4	0.2PCT_500yr	1004.40	73.03	82.31		82.39	0.000562	2.43	585.22	367.17	0.18
1	28494.4	1PCT_100yr	795.10	73.03	81.83		81.90	0.000530	2.22	439.35	265.36	0.17
1	28494.4	2PCT_50yr	697.90	73.03	81.53		81.60	0.000517	2.11	373.63	184.16	0.17
1	28494.4	10PCT_10yr	512.70	73.03	80.82		80.87	0.000455	1.84	282.07	81.02	0.16
1	27602	0.2PCT_500yr	1004.40	72.49	81.68		81.79	0.000859	2.80	463.15	316.62	0.22
1	27602	1PCT_100yr	795.10	72.49	81.25		81.35	0.000737	2.52	359.15	195.99	0.20
1	27602	2PCT_50yr	697.90	72.49	80.98		81.07	0.000688	2.38	311.40	144.27	0.19
1	27602	10PCT_10yr	512.70	72.49	80.36		80.43	0.000545	2.02	253.44	57.27	0.17
1	26717.3	0.2PCT_500yr	1004.40	72.02	80.83	76.55	80.93	0.001097	2.80	562.48	318.23	0.24
1	26717.3	1PCT_100yr	795.10	72.02	80.54	76.04	80.62	0.000917	2.45	482.33	249.64	0.22
1	26717.3	2PCT_50yr	697.90	72.02	80.36	75.78	80.43	0.000737	2.29	439.84	222.64	0.20
1	26717.3	10PCT_10yr	512.70	72.02	79.93	75.23	79.99	0.000450	1.82	357.79	172.66	0.15
1	26712.7		Culvert									
1	26645.3	0.2PCT_500yr	1004.40	71.99	80.59		80.69	0.000901	2.70	576.72	561.81	0.22
1	26645.3	1PCT_100yr	795.10	71.99	80.23		80.32	0.000728	2.47	428.38	305.79	0.20
1	26645.3	2PCT_50yr	697.90	71.99	80.01		80.09	0.000674	2.35	367.75	246.83	0.19
1	26645.3	10PCT_10yr	512.70	71.99	79.47		79.53	0.000555	2.04	259.54	126.88	0.17
1	25748.4	0.2PCT_500yr	1004.40	71.18	79.91		79.97	0.000698	2.35	941.65	1058.57	0.19
1	25748.4	1PCT_100yr	795.10	71.18	79.63		79.69	0.000661	2.24	680.12	821.21	0.19
1	25748.4	2PCT_50yr	697.90	71.18	79.45		79.51	0.000615	2.14	551.59	616.14	0.18
1	25748.4	10PCT_10yr	512.70	71.18	78.93		78.99	0.000638	2.09	331.18	282.94	0.18
1	24746.6	0.2PCT_500yr	1004.40	70.02	79.24		79.30	0.000661	2.34	1104.72	1462.87	0.19
1	24746.6	1PCT_100yr	795.10	70.02	78.92		78.99	0.000759	2.39	704.45	1029.54	0.20
1	24746.6	2PCT_50yr	697.90	70.02	78.76		78.83	0.000760	2.35	555.41	811.88	0.20
1	24746.6	10PCT_10yr	512.70	70.02	78.30		78.37	0.000619	2.13	316.62	246.22	0.18
1	23956.8	0.2PCT_500yr	1004.40	68.65	78.44		78.57	0.001359	3.05	701.60	1806.16	0.26
1	23956.8	1PCT_100yr	795.10	68.65	78.12		78.23	0.001218	2.74	373.07	440.55	0.25
1	23956.8	2PCT_50yr	697.90	68.65	78.04		78.14	0.001014	2.47	344.75	314.74	0.22
1	23956.8	10PCT_10yr	512.70	68.65	77.78		77.84	0.000711	1.97	285.59	179.35	0.19
1	23757.9	0.2PCT_500yr	2026.20	67.55	78.31		78.41	0.000601	2.55	1222.71	939.88	0.19
1	23757.9	1PCT_100yr	1599.90	67.55	78.03		78.10	0.000458	2.15	1009.83	594.49	0.16
1	23757.9	2PCT_50yr	1420.80	67.55	77.97		78.03	0.000378	1.94	974.96	546.32	0.15
1	23757.9	10PCT_10yr	1051.20	67.55	77.73		77.77	0.000246	1.52	855.67	456.67	0.12
1	23044.2	0.2PCT_500yr	2026.20	65.52	78.34		78.34	0.000019	0.66	3629.16	1255.95	0.04
1	23044.2	1PCT_100yr	1599.90	65.52	78.05		78.05	0.000013	0.54	3309.39	1011.05	0.03
1	23044.2	2PCT_50yr	1420.80	65.52	77.99		77.99	0.000011	0.48	3245.32	979.27	0.03
1	23044.2	10PCT_10yr	1051.20	65.52	77.74		77.75	0.000007	0.37	3031.40	804.93	0.02
1	22087.5	0.2PCT_500yr	2026.20	65.76	78.32		78.33	0.000017	0.61	3639.42	873.84	0.03
1	22087.5	1PCT_100yr	1599.90	65.76	78.04		78.04	0.000012	0.50	3619.18	742.83	0.03
1	22087.5	2PCT_50yr	1420.80	65.76	77.98		77.98	0.000010	0.45	3573.41	732.57	0.03
1	22087.5	10PCT_10yr	1051.20	65.76	77.74		77.74	0.000006	0.34	3402.80	696.72	0.02
1	21218.3	0.2PCT_500yr	2026.20	65.51	78.30		78.31	0.000017	0.85	4013.77	1808.62	0.04
1	21218.3	1PCT_100yr	1599.90	65.51	78.03		78.03	0.000012	0.53	3591.33	1320.69	0.03



HEC-RAS Plan: MultiGreenAmpt River: Gapps Bayou Reach: 1 (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	21218.3	2PCT_50yr	1420.80	65.51	77.97		77.97	0.000009	0.47	3513.30	1282.71	0.03
1	21218.3	10PCT_10yr	1051.20	65.51	77.73		77.73	0.000006	0.36	3251.28	1005.12	0.02
1	20195.4	0.2PCT_500yr	2026.20	65.76	78.30		78.30	0.000003	0.30	8120.10	2701.35	0.02
1	20195.4	1PCT_100yr	1599.90	65.76	78.03		78.03	0.000002	0.24	7450.43	2113.80	0.01
1	20195.4	2PCT_50yr	1420.80	65.76	77.97		77.97	0.000002	0.22	7331.47	1881.75	0.01
1	20195.4	10PCT_10yr	1051.20	65.76	77.73		77.73	0.000001	0.16	6958.52	1374.76	0.01
1	19150.5	0.2PCT_500yr	2026.20	65.39	78.30		78.30	0.000005	0.35	7620.95	3030.23	0.02
1	19150.5	1PCT_100yr	1599.90	65.39	78.02		78.02	0.000003	0.29	6856.77	2562.61	0.02
1	19150.5	2PCT_50yr	1420.80	65.39	77.96		77.96	0.000003	0.26	6707.69	2491.77	0.01
1	19150.5	10PCT_10yr	1051.20	65.39	77.73		77.73	0.000001	0.19	6165.18	2115.19	0.01
1	18693.0	0.2PCT_500yr	2547.60	69.73	78.25		78.25	0.000554	2.19	6054.89	6820.00	0.18
1	18693.0	1PCT_100yr	1896.50	69.73	77.97		78.01	0.000535	2.07	4349.88	5567.97	0.17
1	18693.0	2PCT_50yr	1656.10	69.73	77.92		77.96	0.000454	1.89	4064.43	5317.79	0.16
1	18693.0	10PCT_10yr	1236.20	69.73	77.69		77.72	0.000400	1.71	2950.19	4414.76	0.15
1	18528.1	0.2PCT_500yr	2547.60	69.01	78.24	76.50	78.25	0.000152	1.08	5962.78	6809.01	0.09
1	18528.1	1PCT_100yr	1896.50	69.01	77.96	75.45	77.97	0.000189	1.16	4233.77	5524.24	0.10
1	18528.1	2PCT_50yr	1656.10	69.01	77.91	74.77	77.92	0.000169	1.09	3954.56	5261.06	0.09
1	18528.1	10PCT_10yr	1236.20	69.01	77.68	74.10	77.69	0.000171	1.05	2842.10	4369.11	0.09
1	18501.7		Culvert									
1	18402.6	0.2PCT_500yr	2547.60	68.54	78.23		78.23	0.000025	0.55	12286.78	9341.11	0.04
1	18402.6	1PCT_100yr	1896.50	68.54	77.95		77.95	0.000026	0.54	9821.88	8348.48	0.04
1	18402.6	2PCT_50yr	1656.10	68.54	77.90		77.91	0.000022	0.49	9445.26	8154.38	0.04
1	18402.6	10PCT_10yr	1236.20	68.54	77.68		77.68	0.000021	0.48	7713.04	7477.74	0.03
1	17679.2	0.2PCT_500yr	2547.60	68.02	78.21		78.21	0.000017	0.42	12831.49	8407.71	0.03
1	17679.2	1PCT_100yr	1896.50	68.02	77.94		77.94	0.000016	0.38	10652.40	7262.55	0.03
1	17679.2	2PCT_50yr	1656.10	68.02	77.89		77.89	0.000013	0.35	10340.87	7173.05	0.03
1	17679.2	10PCT_10yr	1236.20	68.02	77.67		77.67	0.000011	0.31	8832.65	6434.96	0.03
1	16850	0.2PCT_500yr	2547.60	67.72	78.20		78.20	0.000016	0.44	12956.70	8005.78	0.03
1	16850	1PCT_100yr	1896.50	67.72	77.92		77.92	0.000014	0.40	10904.52	6965.56	0.03
1	16850	2PCT_50yr	1656.10	67.72	77.88		77.88	0.000011	0.36	10619.66	6874.80	0.03
1	16850	10PCT_10yr	1236.20	67.72	77.66		77.66	0.000009	0.32	9195.32	6157.35	0.02
1	16085.5	0.2PCT_500yr	1937.10	67.38	78.19	73.48	78.19	0.000008	0.30	13359.91	7763.11	0.02
1	16085.5	1PCT_100yr	1414.10	67.38	77.92	72.68	77.92	0.000006	0.26	11386.06	6649.37	0.02
1	16085.5	2PCT_50yr	1318.40	67.38	77.88	72.53	77.88	0.000006	0.25	11120.76	6543.23	0.02
1	16085.5	10PCT_10yr	1096.70	67.38	77.66	72.20	77.66	0.000006	0.25	9733.71	6138.72	0.02
1	16054.3		Culvert									
1	15977.7	0.2PCT_500yr	1937.10	65.57	76.34		76.40	0.000698	2.31	4563.07	5302.36	0.19
1	15977.7	1PCT_100yr	1414.10	65.57	75.95		76.00	0.000688	2.15	2694.03	3872.29	0.19
1	15977.7	2PCT_50yr	1318.40	65.57	75.85		75.91	0.000691	2.12	2333.07	3493.69	0.19
1	15977.7	10PCT_10yr	1096.70	65.57	75.58		75.64	0.000704	2.04	1522.72	2371.32	0.19
1	15075.6	0.2PCT_500yr	2080.90	64.96	75.48		75.59	0.001190	3.06	2566.51	2955.96	0.25
1	15075.6	1PCT_100yr	1589.00	64.96	75.10		75.20	0.001171	2.86	1607.98	2057.02	0.25
1	15075.6	2PCT_50yr	1479.00	64.96	75.00		75.10	0.001169	2.81	1414.79	1817.99	0.25
1	15075.6	10PCT_10yr	1220.50	64.96	74.72		74.82	0.001160	2.67	981.87	1245.23	0.24
1	14123.4	0.2PCT_500yr	2080.90	64.17	74.76		74.82	0.000584	2.59	1957.95	1354.90	0.19
1	14123.4	1PCT_100yr	1589.00	64.17	74.29		74.37	0.000679	2.65	1369.54	1175.18	0.20
1	14123.4	2PCT_50yr	1479.00	64.17	74.17		74.25	0.000710	2.67	1227.38	1107.09	0.20
1	14123.4	10PCT_10yr	1220.50	64.17	73.80		73.91	0.000811	2.78	853.08	944.42	0.21
1	13183.6	0.2PCT_500yr	2080.90	63.03	73.96		74.11	0.001025	3.56	971.21	596.54	0.25
1	13183.6	1PCT_100yr	1589.00	63.03	73.41		73.57	0.001093	3.46	677.91	487.89	0.25
1	13183.6	2PCT_50yr	1479.00	63.03	73.26		73.42	0.001115	3.43	605.73	465.01	0.25
1	13183.6	10PCT_10yr	1220.50	63.03	72.87		73.03	0.001076	3.22	456.66	307.04	0.25
1	12867.8	0.2PCT_500yr	2080.90	62.66	73.64	69.08	73.75	0.000816	3.17	1082.60	616.91	0.22
1	12867.8	1PCT_100yr	1589.00	62.66	73.10	68.27	73.22	0.000827	3.02	790.25	479.76	0.22
1	12867.8	2PCT_50yr	1479.00	62.66	72.95	68.07	73.07	0.000842	2.99	719.77	462.47	0.22
1	12867.8	10PCT_10yr	1220.50	62.66	72.59	67.60	72.70	0.000814	2.82	568.49	357.08	0.21
1	12860.8		Bridge									
1	12836.5	0.2PCT_500yr	2080.90	63.09	73.50		73.65	0.001069	3.59	954.45	542.86	0.25
1	12836.5	1PCT_100yr	1589.00	63.09	72.94		73.11	0.001157	3.51	671.67	459.37	0.26



HEC-RAS Plan: MultiGreenAmp River: Gapps Bayou Reach: 1 (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	12836.5	2PCT_50yr	1479.00	63.09	72.79		72.96	0.001192	3.50	601.44	443.09	0.26
1	12836.5	10PCT_10yr	1220.50	63.09	72.36		72.53	0.001176	3.37	440.52	309.11	0.26
1	12214.3	0.2PCT_500yr	2080.90	62.22	73.02		73.11	0.000697	2.93	1155.48	561.97	0.20
1	12214.3	1PCT_100yr	1589.00	62.22	72.43		72.53	0.000742	2.84	851.16	450.88	0.21
1	12214.3	2PCT_50yr	1479.00	62.22	72.27		72.36	0.000748	2.80	781.39	398.78	0.21
1	12214.3	10PCT_10yr	1220.50	62.22	71.82		71.92	0.000779	2.74	618.40	340.35	0.21
1	11922.7	0.2PCT_500yr	2080.90	62.92	72.78		72.88	0.000851	2.94	1154.77	628.00	0.22
1	11922.7	1PCT_100yr	1589.00	62.92	72.16		72.27	0.000991	2.92	809.60	458.84	0.24
1	11922.7	2PCT_50yr	1479.00	62.92	71.98		72.09	0.001068	2.96	729.06	437.94	0.24
1	11922.7	10PCT_10yr	1220.50	62.92	71.50		71.62	0.001315	3.05	534.05	357.08	0.26
1	11900.3	0.2PCT_500yr	2080.90	66.04	72.78		72.85	0.000706	2.54	1220.64	653.89	0.20
1	11900.3	1PCT_100yr	1589.00	66.04	72.16		72.24	0.000836	2.52	865.73	487.45	0.21
1	11900.3	2PCT_50yr	1479.00	66.04	71.98		72.06	0.000901	2.55	782.03	448.52	0.22
1	11900.3	10PCT_10yr	1220.50	66.04	71.49		71.59	0.001128	2.62	579.65	378.11	0.24
1	11875.3	0.2PCT_500yr	2080.90	61.76	72.77		72.84	0.000665	2.36	1274.72	674.59	0.19
1	11875.3	1PCT_100yr	1589.00	61.76	72.14		72.22	0.000816	2.37	895.32	511.28	0.21
1	11875.3	2PCT_50yr	1479.00	61.76	71.96		72.04	0.000874	2.38	808.11	471.42	0.21
1	11875.3	10PCT_10yr	1220.50	61.76	71.47		71.56	0.001120	2.50	581.09	422.09	0.24
1	11269.5	0.2PCT_500yr	2080.90	61.58	72.23		72.35	0.000959	3.05	892.39	516.58	0.23
1	11269.5	1PCT_100yr	1589.00	61.58	71.54		71.66	0.001034	2.89	706.37	337.29	0.24
1	11269.5	2PCT_50yr	1479.00	61.58	71.32		71.44	0.001113	2.90	636.95	299.12	0.24
1	11269.5	10PCT_10yr	1220.50	61.58	70.74		70.87	0.001153	2.92	486.01	226.41	0.25
1	10321.5	0.2PCT_500yr	2080.90	60.14	71.44		71.56	0.000711	3.20	1407.70	457.88	0.21
1	10321.5	1PCT_100yr	1589.00	60.14	70.79		70.90	0.000632	2.83	1124.18	425.04	0.20
1	10321.5	2PCT_50yr	1479.00	60.14	70.53		70.63	0.000658	2.81	1013.88	416.45	0.20
1	10321.5	10PCT_10yr	1220.50	60.14	69.91		70.02	0.000704	2.71	769.76	375.00	0.20
1	9759.4	0.2PCT_500yr	2080.90	59.53	71.07		71.18	0.000622	2.97	1511.53	509.93	0.20
1	9759.4	1PCT_100yr	1589.00	59.53	70.48		70.57	0.000519	2.56	1237.55	431.06	0.18
1	9759.4	2PCT_50yr	1479.00	59.53	70.21		70.29	0.000543	2.54	1120.74	414.85	0.18
1	9759.4	10PCT_10yr	1220.50	59.53	69.57		69.65	0.000583	2.45	871.47	372.19	0.18
1	9744.1	0.2PCT_500yr	2080.90	61.89	71.06		71.16	0.000448	2.22	1635.27	574.09	0.16
1	9744.1	1PCT_100yr	1589.00	61.89	70.50		70.55	0.000402	1.95	1319.09	485.15	0.15
1	9744.1	2PCT_50yr	1479.00	61.89	70.22		70.27	0.000429	1.94	1189.90	442.53	0.16
1	9744.1	10PCT_10yr	1220.50	61.89	69.58		69.63	0.000503	1.91	926.29	379.06	0.16
1	9714.8	0.2PCT_500yr	2080.90	59.58	71.02		71.14	0.000628	3.10	1632.09	646.83	0.20
1	9714.8	1PCT_100yr	1589.00	59.58	70.43		70.53	0.000541	2.73	1274.22	563.11	0.18
1	9714.8	2PCT_50yr	1479.00	59.58	70.16		70.25	0.000550	2.68	1141.09	444.82	0.18
1	9714.8	10PCT_10yr	1220.50	59.58	69.52		69.61	0.000582	2.58	877.77	384.79	0.19
1	9354.3	0.2PCT_500yr	2666.90	58.94	70.72		70.86	0.000894	3.54	2019.07	695.49	0.24
1	9354.3	1PCT_100yr	2188.30	58.94	70.12		70.26	0.000941	3.42	1611.70	660.26	0.24
1	9354.3	2PCT_50yr	1984.50	58.94	69.85		69.98	0.000946	3.34	1433.15	631.70	0.24
1	9354.3	10PCT_10yr	1546.20	58.94	69.20		69.33	0.000972	3.14	1055.85	549.18	0.24
1	8406.8	0.2PCT_500yr	2666.90	58.63	70.19		70.26	0.000440	2.84	2057.50	794.00	0.17
1	8406.8	1PCT_100yr	2188.30	58.63	69.58		69.65	0.000439	2.70	1677.18	533.20	0.17
1	8406.8	2PCT_50yr	1984.50	58.63	69.30		69.37	0.000435	2.63	1539.28	485.56	0.17
1	8406.8	10PCT_10yr	1546.20	58.63	68.88		68.74	0.000407	2.40	1264.61	411.07	0.16
1	8187.8	0.2PCT_500yr	2666.90	61.31	70.09		70.15	0.000420	2.47	1747.05	427.07	0.16
1	8187.8	1PCT_100yr	2188.30	61.31	69.49		69.54	0.000403	2.28	1518.03	352.19	0.16
1	8187.8	2PCT_50yr	1984.50	61.31	69.22		69.27	0.000396	2.20	1423.30	346.43	0.16
1	8187.8	10PCT_10yr	1546.20	61.31	68.60		68.64	0.000374	1.98	1212.60	334.06	0.15
1	8175.8	0.2PCT_500yr	2666.90	59.04	70.09		70.15	0.000274	2.25	1848.34	370.38	0.14
1	8175.8	1PCT_100yr	2188.30	59.04	69.49		69.54	0.000247	2.03	1637.73	337.80	0.13
1	8175.8	2PCT_50yr	1984.50	59.04	69.22		69.26	0.000233	1.93	1547.69	327.96	0.12
1	8175.8	10PCT_10yr	1546.20	59.04	68.60		68.63	0.000198	1.68	1359.09	289.66	0.11
1	7595.5	0.2PCT_500yr	2666.90	59.04	69.92	64.75	69.98	0.000296	2.31	1788.68	355.00	0.14
1	7595.5	1PCT_100yr	2188.30	59.04	69.34	64.33	69.39	0.000266	2.08	1587.93	332.39	0.13
1	7595.5	2PCT_50yr	1984.50	59.04	69.08	64.18	69.12	0.000251	1.98	1503.23	312.22	0.13
1	7595.5	10PCT_10yr	1546.20	59.04	68.48	63.74	68.52	0.000211	1.72	1325.91	269.69	0.12
1	7466.4		Culvert									
1	7330.7	0.2PCT_500yr	2666.90	58.40	69.79		69.66	0.000410	2.88	1584.03	298.54	0.17



HEC-RAS Plan: MultiGreenAmp1 River: Gapps Bayou Reach: 1 (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	7330.7	1PCT_100yr	2188.30	58.40	69.24		69.31	0.000356	2.58	1432.26	266.80	0.15
1	7330.7	2PCT_50yr	1984.50	58.40	69.00		69.06	0.000330	2.44	1368.38	253.40	0.15
1	7330.7	10PCT_10yr	1546.20	58.40	68.43		68.47	0.000269	2.10	1230.75	236.40	0.13
1	6955.1	0.2PCT_500yr	2666.90	57.75	69.75		69.77	0.000136	1.50	3096.27	621.79	0.09
1	6955.1	1PCT_100yr	2188.30	57.75	69.20		69.22	0.000125	1.37	2766.34	597.21	0.09
1	6955.1	2PCT_50yr	1984.50	57.75	68.96		68.98	0.000120	1.31	2621.43	586.95	0.09
1	6955.1	10PCT_10yr	1546.20	57.75	68.39		68.41	0.000105	1.16	2294.90	569.87	0.08
1	6557.7	0.2PCT_500yr	2666.90	58.32	69.63	63.71	69.69	0.000252	2.15	1722.42	326.15	0.13
1	6557.7	1PCT_100yr	2188.30	58.32	69.11	63.44	69.16	0.000217	1.91	1558.83	305.42	0.12
1	6557.7	2PCT_50yr	1984.50	58.32	68.87	63.31	68.91	0.000200	1.80	1485.82	294.46	0.11
1	6557.7	10PCT_10yr	1546.20	58.32	68.32	62.97	68.35	0.000160	1.53	1331.85	267.99	0.10
1	6466.7		Culvert									
1	6350.4	0.2PCT_500yr	2666.90	58.38	69.46		69.48	0.000112	1.40	3060.48	516.90	0.09
1	6350.4	1PCT_100yr	2188.30	58.38	69.00		69.01	0.000095	1.25	2824.07	504.71	0.08
1	6350.4	2PCT_50yr	1984.50	58.38	68.78		68.79	0.000088	1.17	2713.72	502.18	0.08
1	6350.4	10PCT_10yr	1546.20	58.38	68.27		68.28	0.000071	1.01	2457.47	493.30	0.07
1	5682.4	0.2PCT_500yr	3040.30	58.71	69.41		69.42	0.000077	1.25	4997.43	905.15	0.07
1	5682.4	1PCT_100yr	2472.20	58.71	68.95		68.96	0.000063	1.09	4597.06	861.70	0.07
1	5682.4	2PCT_50yr	2229.40	58.71	68.74		68.75	0.000058	1.02	4412.93	847.28	0.06
1	5682.4	10PCT_10yr	1706.30	58.71	68.23		68.24	0.000043	0.85	3997.60	795.55	0.05
1	5670.4	0.2PCT_500yr	3040.30	57.87	69.41		69.42	0.000075	1.22	5495.22	993.36	0.07
1	5670.4	1PCT_100yr	2472.20	57.87	68.96		68.96	0.000062	1.06	5053.12	945.36	0.06
1	5670.4	2PCT_50yr	2229.40	57.87	68.74		68.74	0.000056	0.99	4852.40	916.59	0.06
1	5670.4	10PCT_10yr	1706.30	57.87	68.23		68.24	0.000044	0.84	4396.94	890.38	0.05
1	5512.6	0.2PCT_500yr	3040.30	57.87	69.40		69.41	0.000076	1.22	5483.09	992.23	0.07
1	5512.6	1PCT_100yr	2472.20	57.87	68.95		68.95	0.000062	1.07	5043.66	945.02	0.06
1	5512.6	2PCT_50yr	2229.40	57.87	68.73		68.74	0.000056	1.00	4844.14	915.57	0.06
1	5512.6	10PCT_10yr	1706.30	57.87	68.23		68.23	0.000044	0.84	4390.67	890.05	0.05
1	4609.8	0.2PCT_500yr	3040.30	58.20	69.35		69.35	0.000046	1.00	7812.10	1651.77	0.06
1	4609.8	1PCT_100yr	2472.20	58.20	68.90		68.91	0.000039	0.89	7085.48	1606.86	0.05
1	4609.8	2PCT_50yr	2229.40	58.20	68.69		68.69	0.000036	0.85	6749.38	1583.62	0.05
1	4609.8	10PCT_10yr	1706.30	58.20	68.20		68.20	0.000029	0.73	5986.66	1505.44	0.04
1	4261.8	0.2PCT_500yr	3040.30	58.64	69.33		69.34	0.000047	1.01	6284.39	1064.19	0.06
1	4261.8	1PCT_100yr	2472.20	58.64	68.89		68.89	0.000038	0.87	5825.01	1009.82	0.05
1	4261.8	2PCT_50yr	2229.40	58.64	68.68		68.68	0.000033	0.80	5615.14	983.17	0.05
1	4261.8	10PCT_10yr	1706.30	58.64	68.19		68.19	0.000023	0.65	5154.73	905.01	0.04
1	4249.8	0.2PCT_500yr	3040.30	58.20	69.33		69.33	0.000046	1.00	7782.03	1650.60	0.06
1	4249.8	1PCT_100yr	2472.20	58.20	68.89		68.89	0.000040	0.90	7061.52	1605.73	0.05
1	4249.8	2PCT_50yr	2229.40	58.20	68.68		68.68	0.000036	0.85	6728.20	1578.81	0.05
1	4249.8	10PCT_10yr	1706.30	58.20	68.19		68.19	0.000029	0.73	5971.76	1504.68	0.04
1	3701.3	0.2PCT_500yr	3040.30	57.94	69.31		69.32	0.000026	0.74	7984.14	1322.53	0.04
1	3701.3	1PCT_100yr	2472.20	57.94	68.87		68.88	0.000021	0.64	7460.90	1238.96	0.04
1	3701.3	2PCT_50yr	2229.40	57.94	68.66		68.67	0.000018	0.60	7217.54	1182.72	0.04
1	3701.3	10PCT_10yr	1706.30	57.94	68.18		68.18	0.000014	0.50	6652.66	1152.42	0.03
1	2906.9	0.2PCT_500yr	3040.30	58.42	69.29		69.30	0.000022	0.69	8688.33	1760.24	0.04
1	2906.9	1PCT_100yr	2472.20	58.42	68.86		68.86	0.000018	0.60	8122.50	1694.87	0.04
1	2906.9	2PCT_50yr	2229.40	58.42	68.65		68.65	0.000016	0.55	7859.80	1656.09	0.03
1	2906.9	10PCT_10yr	1706.30	58.42	68.17		68.17	0.000011	0.45	7265.16	1578.83	0.03
1	2894	0.2PCT_500yr	3040.30	58.26	69.29		69.30	0.000026	0.74	7984.60	1973.87	0.04
1	2894	1PCT_100yr	2472.20	58.26	68.86		68.86	0.000021	0.64	7447.13	1870.11	0.04
1	2894	2PCT_50yr	2229.40	58.26	68.65		68.65	0.000018	0.59	7201.61	1830.73	0.04
1	2894	10PCT_10yr	1706.30	58.26	68.17		68.17	0.000013	0.49	6638.26	1756.74	0.03
1	2787.5	0.2PCT_500yr	3040.30	58.26	69.29		69.29	0.000027	0.74	7980.53	1973.39	0.04
1	2787.5	1PCT_100yr	2472.20	58.26	68.86		68.86	0.000021	0.64	7444.15	1859.59	0.04
1	2787.5	2PCT_50yr	2229.40	58.26	68.65		68.65	0.000018	0.59	7199.02	1830.37	0.04
1	2787.5	10PCT_10yr	1706.30	58.26	68.16		68.17	0.000013	0.49	6636.41	1756.53	0.03
1	1872.5	0.2PCT_500yr	3602.60	57.90	69.26		69.27	0.000031	0.69	10670.05	2078.92	0.04
1	1872.5	1PCT_100yr	2861.00	57.90	68.83		68.84	0.000025	0.60	9786.38	2038.87	0.04
1	1872.5	2PCT_50yr	2541.20	57.90	68.63		68.63	0.000023	0.56	9372.22	2019.30	0.04
1	1872.5	10PCT_10yr	1871.80	57.90	68.15		68.15	0.000016	0.45	8427.10	1948.29	0.03

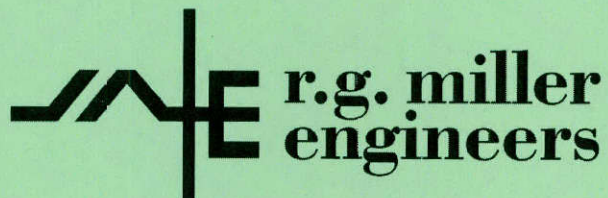


HE-D-RAS Plan: MultiGreenAmpt River: Gapps Bayou Reach: 1 (Continued)

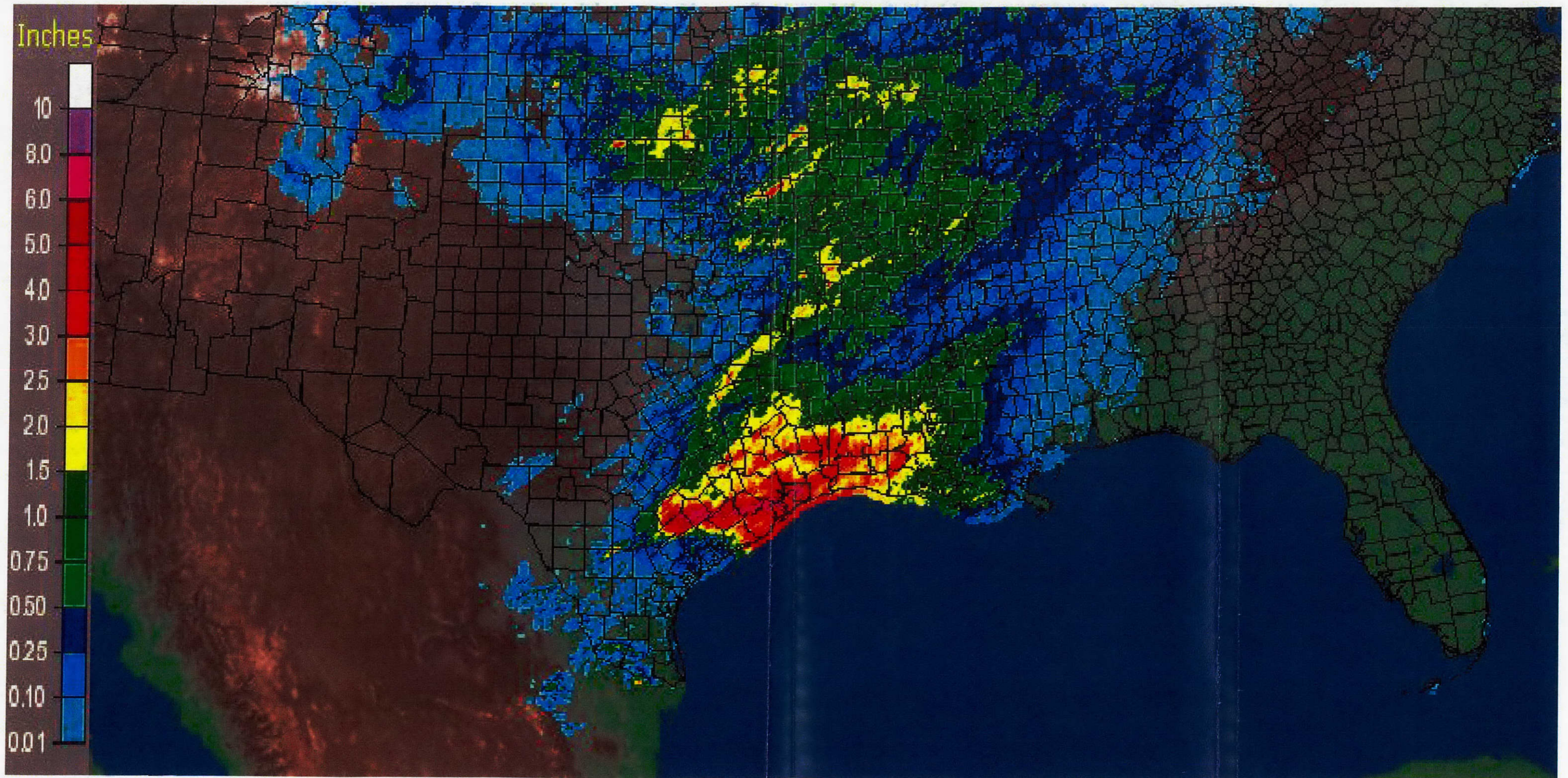
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	975.7	0.2PCT_50yr	3602.60	57.23	69.16		69.20	0.000400	2.19	4260.07	1741.54	0.16
1	975.7	1PCT_10Cyr	2861.00	57.23	68.75		68.78	0.000356	1.97	3622.03	1340.67	0.15
1	975.7	2PCT_50yr	2541.20	57.23	68.55		68.58	0.000334	1.86	3372.92	1221.73	0.14
1	975.7	10PCT_1Cyr	1871.80	57.23	68.09		68.12	0.000280	1.61	2819.23	1176.91	0.13
1	91.2	0.2PCT_500yr	3602.60	56.97	68.85	64.73	68.90	0.000427	2.35	4662.53	1817.47	0.16
1	91.2	1PCT_100yr	2861.00	56.97	68.45	63.74	68.50	0.000400	2.19	3947.46	1805.34	0.16
1	91.2	2PCT_50yr	2541.20	56.97	68.27	63.37	68.31	0.000385	2.10	3611.92	1799.42	0.15
1	91.2	10PCT_10yr	1871.80	56.97	67.83	62.46	67.87	0.000345	1.89	2833.98	1783.62	0.14
1	53.68	Bridge										
1	1.9	0.2PCT_500yr	3602.60	57.31	68.81	66.77	68.83	0.000300	1.83	6833.81	2699.30	0.13
1	1.9	1PCT_100yr	2861.00	57.31	68.41	65.60	68.43	0.000300	1.75	5772.93	2645.62	0.13
1	1.9	2PCT_50yr	2541.20	57.31	68.23	65.32	68.24	0.000300	1.71	5283.06	2598.46	0.13
1	1.9	10PCT_10yr	1871.80	57.31	67.79	63.74	67.81	0.000300	1.62	4151.30	2582.45	0.13



**Appendix E:
Phase I Field Observations from the
General Public**



NWS Southern Region: 4/19/2009 1-Day Observed Precipitation
Valid at 4/19/2009 1200 UTC- Created 5/30/10 16:06 UTC







Google earth

miles
km

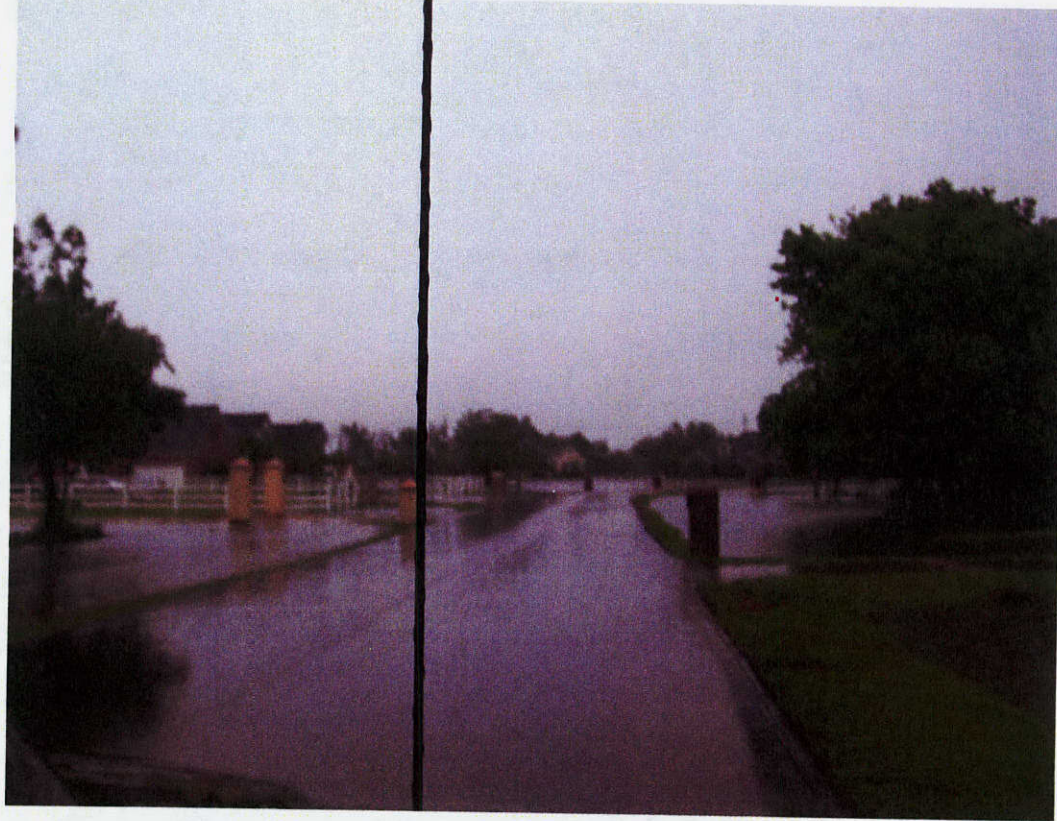




Evening Sun Near Rustling Oaks



Evening Sun toward Rustling Oaks





House Along Bridlewood Before Rustling Oaks



Rustling Oaks at Evening Sun





Rustling Oaks Near Bridlewood Dr.



Rustling Oaks toward Reading Road





Rustling Oaks toward Reading Road

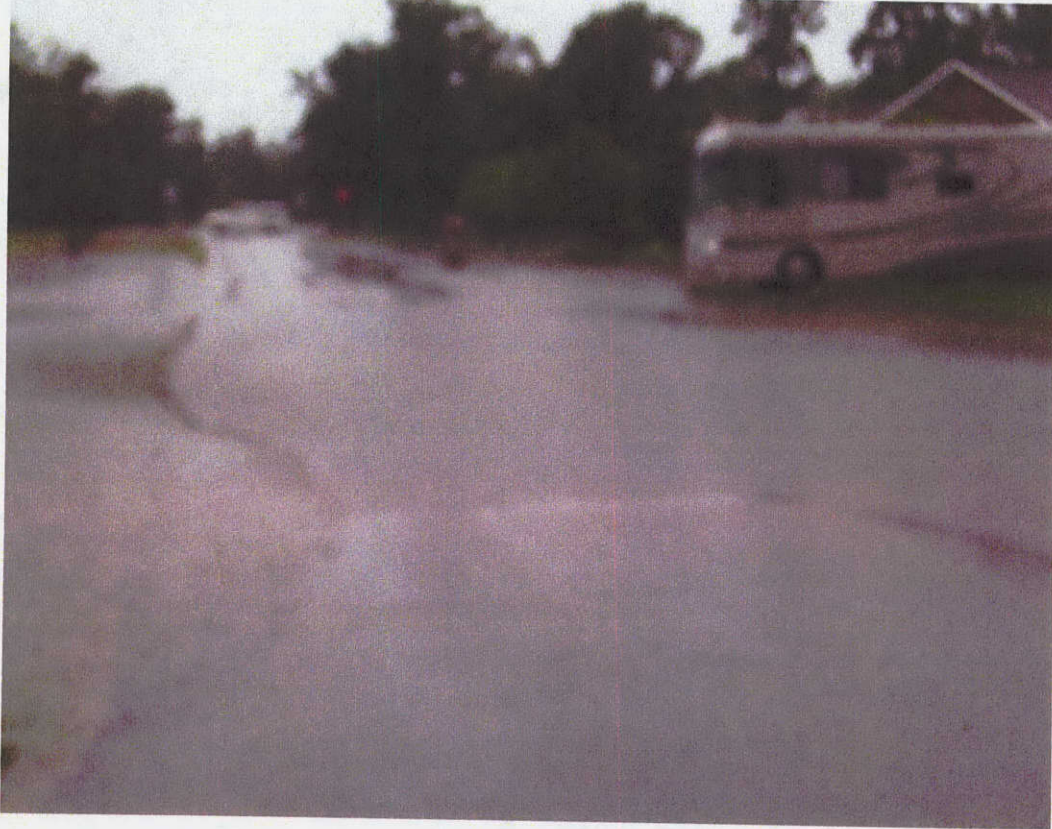


View behind Homes On Bridlewood at Rustling Oaks





Water Over Road at Rustling Oaks and Bridlewood



Waterwalk





6103 Bridlewood

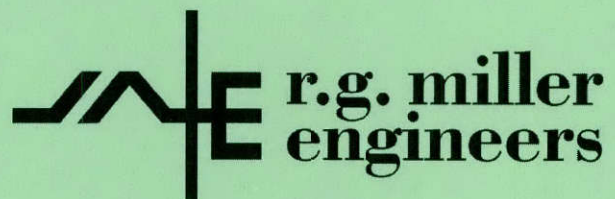


Bridlewood & Rustling Oaks





**Appendix F:
Phase I Floodway Computations**



HEC-RAS Plan: Floodway River: Gapps Bayou Reach: 1

Reach	River Sta	Profile	W.S. Elev (ft)	Prof Delta WS (ft)	E.G. Elev (ft)	Top Width Act (ft)	Q Left (cfs)	Q Channel (cfs)	Q Flight (cfs)	Enc Sta L (ft)	Ch Sta L (ft)	Ch Sta R (ft)	Enc Sta R (ft)
1	30204.2	1PCT_100yr	83.44		83.48	158.88	0.70	511.44	0.05		4938.80	5047.20	
1	30204.2	Floodway	83.99	0.54	84.01	108.40		512.20		4938.80	4938.80	5047.20	5047.20
1	29832.6	1PCT_100yr	83.29		83.33	162.50	2.73	508.36	1.10		4969.90	5029.30	
1	29832.6	Floodway	83.86	0.59	83.91	59.40		512.20		4969.90	4969.90	5029.30	5029.30
1	29428.5	1PCT_100yr	83.19		83.24	239.93	5.24	782.91	6.95		4966.90	5035.70	
1	29428.5	Floodway	83.79	0.60	83.83	68.80		785.10		4966.90	4966.90	5035.70	5035.70
1	29411.9												
1	29344.3	1PCT_100yr	82.30		82.38	366.62	0.23	773.84	20.94		4966.30	5030.60	
1	29344.3	Floodway	82.68	0.38	82.76	64.30		795.10		4966.30	4966.30	5030.60	5030.60
1	28494.4	1PCT_100yr	81.83		81.90	265.36	0.73	763.91	30.46		4966.30	5032.80	
1	28494.4	Floodway	82.28	0.45	82.35	66.50		795.10		4966.30	4966.30	5032.80	5032.80
1	27602	1PCT_100yr	81.25		81.35	195.99	0.02	772.17	22.92		4965.70	5031.00	
1	27602	Floodway	81.81	0.55	81.89	65.30		795.10		4965.70	4965.70	5031.00	5031.00
1	26717.3	1PCT_100yr	80.54		80.62	249.64	75.34	708.04	11.73		4969.60	5042.40	
1	26717.3	Floodway	81.36	0.82	81.41	182.63	54.11	703.42	37.57	4928.04	4969.60	5042.40	5157.18
1	26712.7												
1	26645.3	1PCT_100yr	80.23		80.32	305.79	9.23	728.30	57.57		4963.50	5031.70	
1	26645.3	Floodway	80.90	0.67	80.95	229.14	15.00	665.57	114.53	4919.64	4963.50	5031.70	5148.78
1	25748.4	1PCT_100yr	79.63		79.69	821.21	20.29	581.53	193.29		4969.20	5031.40	
1	25748.4	Floodway	80.35	0.72	80.44	92.07		766.26	28.82	4969.20	4969.20	5031.40	5061.91
1	24746.6	1PCT_100yr	78.92		78.99	1029.54	61.19	639.03	94.88		4965.60	5025.50	
1	24746.6	Floodway	79.58	0.66	79.68	59.90		795.10		4965.60	4965.60	5025.50	5025.50
1	23956.8	1PCT_100yr	78.12		78.23	440.55	12.00	778.28	4.83		4959.40	5033.30	
1	23956.8	Floodway	79.03	0.91	79.11	73.90		795.10		4959.40	4959.40	5033.30	5033.30
1	23757.9	1PCT_100yr	78.03		78.10	594.49	16.36	1548.54	35.00		4940.60	5074.10	
1	23757.9	Floodway	78.98	0.94	79.03	133.50		1599.90		4940.60	4940.60	5074.10	5074.10
1	23044.2	1PCT_100yr	78.05		78.05	1011.05	7.95	1580.70	1.25		4843.85	5152.85	
1	23044.2	Floodway	78.99	0.94	79.00	309.00		1589.80		4843.85	4843.85	5152.85	5152.85
1	22087.5	1PCT_100yr	78.04		78.04	742.63	18.12	1581.69	0.09		4823.50	5162.70	
1	22087.5	Floodway	78.88	0.95	78.99	339.20		1589.90		4823.50	4823.50	5162.70	5162.70
1	21218.3	1PCT_100yr	78.03		78.03	1320.69	14.24	1584.78	0.88		4851.80	5144.80	
1	21218.3	Floodway	78.99	0.95	78.99	293.00		1599.90		4851.80	4851.80	5144.80	5144.80
1	20195.4	1PCT_100yr	78.03		78.03	2113.80	12.40	1586.90	0.60		4698.75	5290.45	
1	20195.4	Floodway	78.97	0.95	78.97	591.70		1599.90		4698.75	4698.75	5290.45	5290.45
1	19150.5	1PCT_100yr	78.02		78.02	2562.61	21.18	1578.29	0.43		4735.25	5234.75	
1	19150.5	Floodway	78.97	0.95	78.97	300.00		1599.90		4850.00	4735.25	5234.75	5150.00
1	18693.0	1PCT_100yr	77.97		78.01	5587.97	690.19	1143.44	62.87		4931.90	5055.10	
1	18693.0	Floodway	78.86	0.89	78.95	300.00	124.17	1689.37	73.97	4850.00	4931.90	5055.10	5150.00
1	18528.1	1PCT_100yr	77.96		77.97	5524.24	1200.34	587.69	108.48		4931.90	5055.10	
1	18528.1	Floodway	78.79	0.82	78.85	300.00	332.34	1370.50	193.66	4850.00	4931.90	5055.10	5150.00
1	18501.7												
1	18402.6	1PCT_100yr	77.95		77.95	8348.48	845.17	192.96	858.37		4974.90	5034.40	
1	18402.6	Floodway	78.68	0.73	78.68	2214.20	945.44	258.66	692.40	3684.90	4974.90	5034.40	5809.10
1	17679.2	1PCT_100yr	77.94		77.94	7262.55	838.74	265.16	792.61		4913.60	5048.30	
1	17679.2	Floodway	78.66	0.73	78.66	2245.36	978.48	361.93	556.09	3454.68	4913.60	5048.30	5700.04
1	16850	1PCT_100yr	77.92		77.92	6965.56	919.89	182.25	794.36		4977.00	5054.10	
1	16850	Floodway	78.65	0.72	78.65	2240.85	1082.44	240.94	573.12	3500.40	4977.00	5054.10	5741.25
1	16085.5	1PCT_100yr	77.92		77.92	6649.37	618.44	233.34	562.32		4929.30	5083.30	
1	16085.5	Floodway	78.59	0.67	78.62	154.00		1414.10		4929.30	4929.30	5083.30	5083.30
1	16054.3												
1	15977.7	1PCT_100yr	75.95		76.00	3872.29	261.55	1115.95	36.80		4924.50	5054.60	
1	15977.7	Floodway	76.73	0.79	76.81	130.10		1414.10		4924.50	4924.50	5054.60	5054.60
1	15075.6	1PCT_100yr	75.10		75.20	2057.02	316.38	1259.81	12.80		4945.20	5052.30	
1	15075.6	Floodway	75.94	0.84	76.08	107.10		1589.00		4945.20	4945.20	5052.30	5052.30
1	14123.4	1PCT_100yr	74.29		74.37	1175.18	379.06	1091.88	117.96		4960.60	5033.90	
1	14123.4	Floodway	75.12	0.82	75.24	189.87	183.27	1405.73		4844.03	4960.60	5033.90	5033.90
1	13183.6	1PCT_100yr	73.41		73.57	487.89	156.18	1380.75	52.07		4968.70	5036.50	



HEC-RAS Plan: Floodway River: Gapps Bayou Reach: 1 (Continued)

Reach	River Sta	Profile	W.S. Elev (ft)	Prof Delta WS (ft)	E.G. Elev (ft)	Top Width Act (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Enc Sta L (ft)	Ch Sta L	Ch Sta R	Enc Sta R (ft)
1	13183.6	Floodway	74.25	0.84	74.44	67.80		1589.00		4968.70	4968.70	5036.50	5036.50
1	12867.8	1PCT_100yr	73.10		73.22	479.76	234.52	1296.91	57.57		4961.00	5033.90	
1	12867.8	Floodway	73.98	0.88	74.14	72.90		1589.00		4961.00	4961.00	5033.90	5033.90
1	12860.8 BR U	1PCT_100yr	73.10		73.20	479.41	440.30	1038.61	110.09		4961.00	5033.90	
1	12860.8 BR U	Floodway	73.87	0.77	74.11	72.90		1589.00		4961.00	4961.00	5033.90	5033.90
1	12860.8 BR D	1PCT_100yr	73.00		73.13	469.41	414.31	1070.64	104.05		4968.50	5035.00	
1	12860.8 BR D	Floodway	73.72	0.71	74.00	66.50		1589.00		4968.50	4968.50	5035.00	5035.00
1	12836.5	1PCT_100yr	72.94		73.11	459.37	190.60	1350.86	47.53		4968.50	5035.00	
1	12836.5	Floodway	73.74	0.80	73.95	66.50		1589.00		4968.50	4968.50	5035.00	5035.00
1	12214.3	1PCT_100yr	72.43		72.53	450.88	394.76	1186.83	7.41		4963.20	5034.90	
1	12214.3	Floodway	73.20	0.77	73.35	97.42	77.81	1511.19		4937.48	4963.20	5034.90	5034.90
1	11922.7	1PCT_100yr	72.16		72.27	458.84	376.14	1180.81	32.04		4952.10	5036.30	
1	11922.7	Floodway	72.89	0.73	73.07	88.95	16.05	1572.85		4947.35	4952.10	5036.30	5036.30
1	11900.3	1PCT_100yr	72.16		72.24	487.45	313.80	1265.18	10.02		4938.00	5054.20	
1	11900.3	Floodway	72.92	0.76	73.03	116.20		1589.00		4838.00	4938.00	5054.20	5054.20
1	11875.3	1PCT_100yr	72.14		72.22	511.28	260.67	1313.75	14.58		4922.30	5059.00	
1	11875.3	Floodway	72.91	0.77	73.00	136.70		1589.00		4922.30	4922.30	5059.00	5059.00
1	11269.5	1PCT_100yr	71.54		71.66	337.29	222.75	1358.81	7.45		4935.70	5037.90	
1	11269.5	Floodway	72.42	0.88	72.55	102.20		1589.00		4935.70	4935.70	5037.90	5037.90
1	10321.5	1PCT_100yr	70.79		70.90	425.04	82.94	1344.98	161.08		4953.70	5026.80	
1	10321.5	Floodway	71.74	0.95	71.87	73.10		1589.00		4953.70	4953.70	5026.80	5026.80
1	9759.4	1PCT_100yr	70.48		70.57	431.06	58.89	1325.77	204.34		4966.90	5047.20	
1	9759.4	Floodway	71.43	0.95	71.54	80.30		1589.00		4966.90	4966.90	5047.20	5047.20
1	9744.1	1PCT_100yr	70.50		70.55	485.15	13.79	1398.06	177.14		4914.30	5055.50	
1	9744.1	Floodway	71.46	0.97	71.52	141.20		1589.00		4914.30	4914.30	5055.50	5055.50
1	9714.8	1PCT_100yr	70.43		70.53	563.11	52.85	1318.21	217.94		4965.20	5035.20	
1	9714.8	Floodway	71.37	0.93	71.50	70.00		1589.00		4965.20	4965.20	5035.20	5035.20
1	9354.3	1PCT_100yr	70.12		70.26	660.26	355.41	1656.42	176.48		4957.40	5032.80	
1	9354.3	Floodway	71.00	0.88	71.21	151.85	129.22	2058.08		4880.95	4957.40	5032.80	5032.80
1	8406.8	1PCT_100yr	69.58		69.65	533.20	37.22	1241.72	909.36		4981.00	5038.80	
1	8406.8	Floodway	70.43	0.86	70.53	181.03		1459.18	729.13	4981.00	4981.00	5038.80	5162.03
1	8187.8	1PCT_100yr	69.49		69.54	352.19	25.45	1363.19	799.66		4957.20	5050.20	
1	8187.8	Floodway	70.34	0.85	70.42	169.65		1686.46	501.84	4957.20	4957.20	5050.20	5126.85
1	8175.8	1PCT_100yr	69.49		69.54	337.80	421.10	1464.28	302.92		4965.40	5056.80	
1	8175.8	Floodway	70.34	0.85	70.41	160.98	285.07	1754.19	149.04	4920.96	4965.40	5056.80	5081.94
1	7595.5	1PCT_100yr	69.34		69.39	332.39	417.19	1472.95	298.16		4965.40	5056.80	
1	7595.5	Floodway	70.18	0.84	70.25	148.10	145.99	1835.26	207.05	4942.21	4965.40	5056.80	5090.31
1	7466.4	Culvert											
1	7330.7	1PCT_100yr	69.24		69.31	266.80	450.56	1201.57	536.17		4974.20	5027.60	
1	7330.7	Floodway	70.10	0.85	70.18	148.10	329.75	1416.32	442.23	4932.01	4974.20	5027.60	5080.11
1	6955.1	1PCT_100yr	69.20		69.22	597.21	298.92	1167.19	722.20		4930.30	5047.90	
1	6955.1	Floodway	70.06	0.86	70.09	279.17	110.93	1419.42	657.95	4903.43	4930.30	5047.90	5182.60
1	6557.7	1PCT_100yr	69.11		69.16	305.42	282.65	1788.42	117.23		4950.00	5068.20	
1	6557.7	Floodway	70.00	0.89	70.04	264.03	337.46	1724.42	126.42	4848.30	4950.00	5068.20	5135.83
1	6466.7	Culvert											
1	6350.4	1PCT_100yr	69.00		69.01	504.71	518.74	1229.24	440.31		4942.25	5071.15	
1	6350.4	Floodway	69.88	0.88	69.90	287.53	418.88	1479.62	289.80	4845.80	4942.25	5071.15	5133.43
1	5882.4	1PCT_100yr	68.95		68.96	861.70	677.58	745.46	1049.17		4953.40	5033.30	
1	5882.4	Floodway	69.84	0.88	69.85	452.48	544.18	881.41	1046.61	4820.84	4953.40	5033.30	5273.32
1	5670.4	1PCT_100yr	68.96		68.96	945.96	950.02	396.15	1126.03		4970.90	5014.50	
1	5670.4	Floodway	69.84	0.89	69.85	505.18	950.13	468.38	1053.69	4750.40	4970.90	5014.50	5255.58
1	5512.6	1PCT_100yr	68.95		68.95	945.02	949.63	396.46	1126.11		4970.90	5014.50	
1	5512.6	Floodway	69.83	0.88	69.84	505.03	949.67	468.64	1053.90	4750.55	4970.90	5014.50	5255.58
1	4809.8	1PCT_100yr	68.90		68.91	1606.86	1110.95	355.73	1005.52		4872.50	5016.10	
1	4809.8	Floodway	69.79	0.89	69.79	599.73	1190.87	416.37	864.95	4642.50	4872.50	5016.10	5242.23
1	4261.8	1PCT_100yr	68.89		68.89	1009.82	883.41	690.75	898.04		4862.00	5051.50	
1	4261.8	Floodway	69.77	0.89	69.78	514.87	812.38	811.37	848.45	4745.41	4862.00	5051.50	5260.28

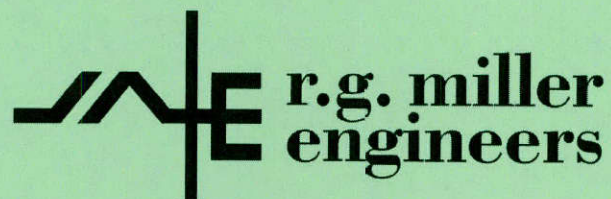


HEC-RAS Plan: Floodway River Gapps Bayou Reach: 1 (Continued)

Reach	River Sta	Profile	W.S. Elev (ft)	Prof Delta WS (ft)	E.G. Elev (ft)	Top Width Act (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Enc Sta L (ft)	Ch Sta L (ft)	Ch Sta R (ft)	Enc Sta R (ft)
1	4249.8	1PCT_100yr	68.89		68.89	1605.73	1109.12	356.45	1006.63		4972.50	5016.10	
1	4249.8	Floodway	69.77	0.89	69.78	597.99	1190.56	417.20	864.44	4643.75	4972.50	5016.10	5241.74
1	3701.3	1PCT_100yr	68.87		68.88	1172.25	612.88	572.91	1186.41		4906.20	5022.70	
1	3701.3	Floodway	69.76	0.89	69.76	698.11	450.81	789.41	1231.99	4743.35	4906.20	5022.70	5441.46
1	2906.9	1PCT_100yr	68.86		68.86	1284.08	693.95	648.62	1129.63		4913.00	5033.80	
1	2906.9	Floodway	69.74	0.89	69.75	712.56	595.62	760.79	1115.79	4694.35	4913.00	5033.80	5406.91
1	2894	1PCT_100yr	68.86		68.86	1202.65	549.36	742.47	1180.38		4911.20	5045.00	
1	2894	Floodway	69.74	0.89	69.75	644.14	404.30	874.77	1193.13	4774.61	4911.20	5045.00	5418.75
1	2787.5	1PCT_100yr	68.86		68.86	1202.30	549.39	742.48	1180.33		4911.20	5045.00	
1	2787.5	Floodway	69.74	0.89	69.74	644.10	404.19	874.83	1193.18	4774.65	4911.20	5045.00	5418.75
1	1872.5	1PCT_100yr	68.83		68.84	2038.87	2086.95	432.88	341.17		4932.30	5036.10	
1	1872.5	Floodway	69.72	0.89	69.72	1077.61	2265.25	529.98	65.78	4022.70	4932.30	5036.10	5100.31
1	975.7	1PCT_100yr	68.75		68.78	1340.66	1263.00	1558.68	39.32		4904.00	5042.80	
1	975.7	Floodway	69.61	0.87	69.67	554.58	876.07	1984.93		4489.22	4904.00	5042.80	5042.80
1	91.2	1PCT_100yr	68.45		68.50	1805.33	1197.35	1645.18	18.48		4925.85	5048.35	
1	91.2	Floodway	69.38	0.92	69.41	1220.32	1164.68	1696.32		3828.03	4925.85	5048.35	5048.35
1	53.68 BR U	1PCT_100yr	68.45		68.46	1805.00	1787.83	1046.83	26.34		4925.85	5048.35	
1	53.68 BR U	Floodway	69.37	0.93	69.39	1220.32	1733.19	1127.81		3828.03	4925.85	5048.35	5048.35
1	53.68 BR D	1PCT_100yr	68.44		68.45	2652.56	2241.18	611.00	8.82		4933.10	5043.10	
1	53.68 BR D	Floodway	69.36	0.92	69.38	1214.07	1989.68	871.32		3829.03	4933.10	5043.10	5043.10
1	1.9	1PCT_100yr	68.41		68.43	2645.62	1795.63	1058.37	7.00		4933.10	5043.10	
1	1.9	Floodway	69.33	0.92	69.36	1214.07	1515.17	1345.84		3829.03	4933.10	5043.10	5043.10



**Appendix G:
Alternative 1 Modified Puls Routing**



Gapps Bayou Watershed
Alternative 1 Routing Reach Data

Gapps_0000_R			
Elevation	Total Stor	Storage	Discharge
64.63	261.3	261.3	239.97
66.65	500.27	500.27	479.94
67.14	572.34	572.34	719.91
67.49	627.48	627.48	959.88
67.79	675.15	675.15	1199.85
68.06	718.73	718.73	1439.82
68.3	758.79	758.79	1679.79
68.52	795.09	795.09	1919.76
68.72	829.99	829.99	2159.73
68.91	863.43	863.43	2399.7
69.09	895.74	895.74	2639.67
69.27	927.54	927.54	2879.64
69.75	1018.21	1018.21	3599.55

Gapps_0056_R			
Elevation	Total Stor	Storage	Discharge
65.1	303.17	41.87	211.74
66.97	586.31	86.04	423.48
67.59	672.91	100.57	635.22
68.06	740.07	112.59	846.96
68.48	798.6	123.45	1058.7
68.85	852.33	133.6	1270.44
69.18	902.02	143.23	1482.18
69.49	947.53	152.44	1693.92
69.77	991.56	161.57	1905.66
70.05	1034.11	170.68	2117.4
70.3	1075.42	179.68	2329.14
70.55	1116.4	188.86	2540.88
71.25	1236.27	218.06	3176.1

Gapps_0093_R			
Elevation	Total Stor	Storage	Discharge
69.2	317.96	14.79	153.45
70.64	609.73	23.42	306.9
71.73	703.29	30.38	460.35
72.63	778.42	38.35	613.8
73.44	846.26	47.66	767.25
74.16	912.43	60.1	920.7
74.5	979.7	77.68	1074.15
74.73	1044.17	96.64	1227.6
74.91	1106.55	114.99	1381.05
75.05	1166.99	132.88	1534.5
75.18	1226.5	151.08	1687.95
75.31	1285.97	169.57	1841.4
75.64	1465.24	228.97	2301.75

Gapps_0150_R			
Elevation	Total Stor	Storage	Discharge
70.05	319.92	1.96	133.02
71.57	613	3.27	266.04
72.69	707.76	4.47	399.06
73.61	784.04	5.62	532.08
74.66	854.26	8	665.1
75.4	926.41	13.98	798.12
75.8	1000.29	20.59	931.14
76.16	1072.07	27.9	1064.16
76.5	1142.81	36.26	1197.18
76.82	1211.86	44.87	1330.2
77.15	1280.65	54.15	1463.22
77.5	1350.47	64.5	1596.24
77.89	1557.73	92.49	1995.3

Gapps_0161_R			
Elevation	Total Stor	Storage	Discharge
72.98	325.62	5.7	187.94
74.12	622.81	9.81	375.88
75.11	721.42	13.66	563.82
76.14	801.75	17.71	751.76
76.71	881.81	27.55	939.7
76.93	974.83	48.42	1127.64
77.05	1073.81	73.52	1315.58
77.14	1186.65	114.58	1503.52
77.23	1310.44	167.63	1691.46
77.3	1447.88	236.02	1879.4
77.43	1600.33	319.68	2067.34
77.66	1769.55	419.08	2255.28
77.98	2118.76	561.03	2819.1

Gapps_0187_R			
Elevation	Total Stor	Storage	Discharge
73.09	569	243.38	159.65
74.23	909.34	286.53	319.3
75.22	1047.06	325.64	478.95
76.22	1169.94	368.19	638.6
76.8	1280.29	398.48	798.25
77.03	1388.96	414.13	957.9
77.17	1498.28	424.47	1117.55
77.27	1619.6	432.95	1277.2
77.37	1752.19	441.75	1436.85
77.46	1897.99	450.11	1596.5
77.59	2064.11	463.78	1756.15
77.8	2257.8	488.25	1915.8
78.11	2654.08	535.32	2394.75

Gapps_0236_R			
Elevation	Total Stor	Storage	Discharge
77.13	577.04	8.04	79.5
78.41	922.92	13.58	159
79.66	1067.17	20.11	238.5
80.33	1194.63	24.69	318
80.97	1309.35	29.06	397.5
81.55	1422.33	33.37	477
82.1	1536.17	37.89	556.5
82.61	1663.22	43.62	636
82.96	1803.83	51.64	715.5
83.19	1958.35	60.36	795
83.36	2133.68	69.57	874.5
83.49	2336.88	79.08	954
83.7	2762.09	108.01	1192.5

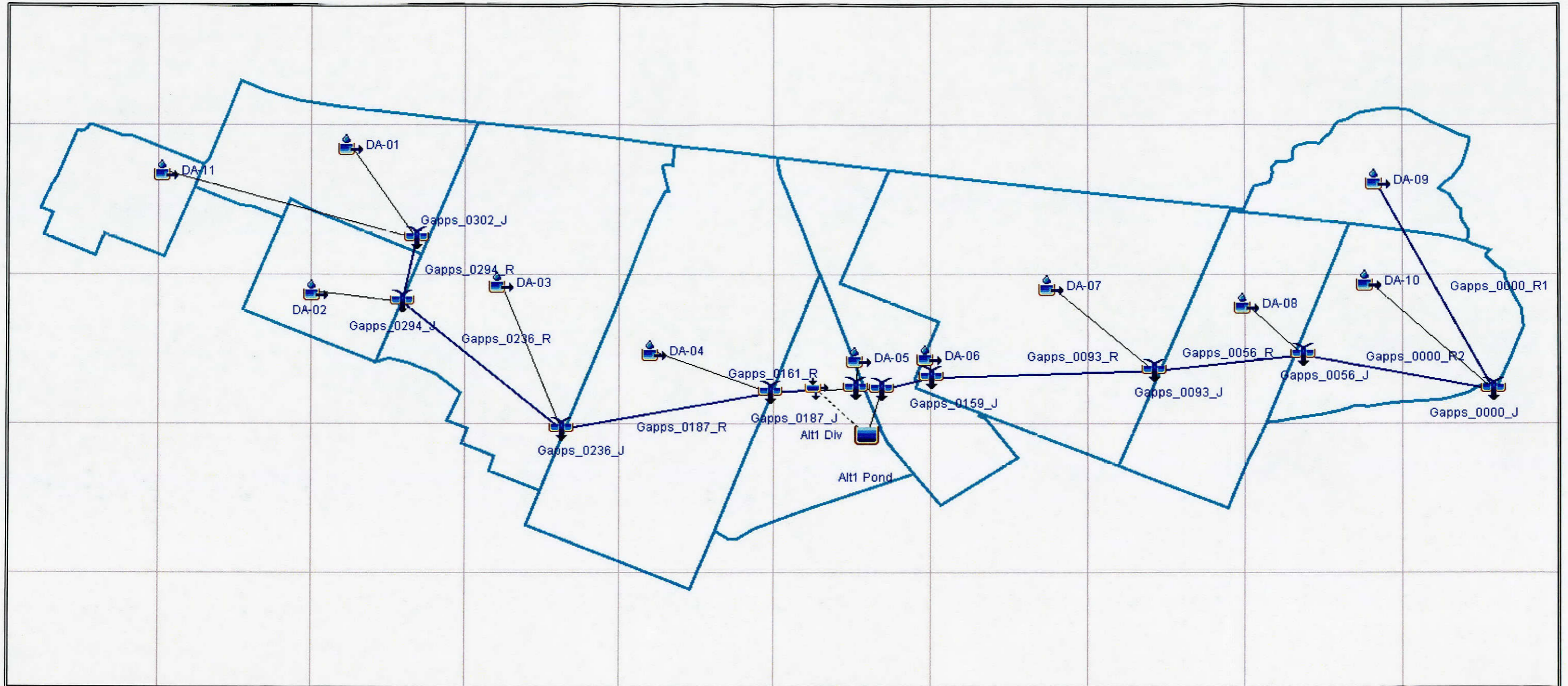
Gapps_0294_R			
Elevation	Total Stor	Storage	Discharge
78.25	577.8	0.76	51.22
79.08	924.39	1.47	102.44
80.03	1069.58	2.41	153.66
80.66	1197.82	3.19	204.88
81.26	1313.35	4	256.1
81.82	1427.12	4.79	307.32
82.36	1542.06	5.89	358.54
82.86	1670.5	7.28	409.76
83.2	1812.13	8.3	460.98
83.44	1967.39	9.04	512.2
83.63	2143.29	9.61	563.42
83.78	2347.05	10.17	614.64
84.1	2774.08	11.99	768.3



**Appendix H:
Alternative 1 HEC-HMS Model
Schematics and Results**



Gapps Bayou
Alternative 1 Conditions HEC-HMS Model Schematic





Project: Gapps Bayou 01312012 Simulation Run: Alt 1: 10PCT_10yr

Start of Run: 26Oct2011, 00:00 Basin Model: Alternative 1
 End of Run: 28Oct2011, 00:00 Meteorologic Model: 10PCT_10yr
 Compute Time: 30Jul2013, 20:42:22 Control Specifications: Control 48

Volume Units: AC-FT

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Alt1 Div	3.985	830.4	26Oct2011, 23:00	1235.1
Alt1 Pond	0.000	51.6	27Oct2011, 13:00	100.4
DA-01	0.588	308.9	26Oct2011, 17:45	200.2
DA-02	0.348	204.4	26Oct2011, 17:00	124.9
DA-03	1.275	549.1	26Oct2011, 18:45	414.0
DA-04	1.479	351.9	26Oct2011, 19:30	456.3
DA-05	0.459	190.0	26Oct2011, 17:45	141.1
DA-06	0.507	236.9	26Oct2011, 18:00	166.5
DA-07	1.428	541.7	26Oct2011, 18:30	437.8
DA-08	0.698	185.7	26Oct2011, 20:45	227.6
DA-09	0.390	124.1	26Oct2011, 18:45	118.0
DA-10	0.679	409.7	26Oct2011, 18:15	208.9
DA-11	0.295	54.8	26Oct2011, 21:45	88.5
Gapps_000C_J	8.146	1811.8	26Oct2011, 23:45	2658.8
Gapps_000C_R1	0.390	124.1	26Oct2011, 19:30	117.7
Gapps_0000_R2	7.077	1596.5	27Oct2011, 00:15	2332.1
Gapps_0056_J	7.077	1602.4	26Oct2011, 22:00	2410.5
Gapps_0056_R	6.379	1428.4	26Oct2011, 22:30	2182.9
Gapps_0093_J	6.379	1429.0	26Oct2011, 22:00	2137.7
Gapps_0093_R	4.951	1076.5	26Oct2011, 23:45	1699.8
Gapps_0150_J	4.951	1079.1	26Oct2011, 22:15	1693.3
Gapps_0150_R	4.444	950.6	26Oct2011, 23:15	1526.8
Gapps_0159_J	4.444	957.0	26Oct2011, 22:30	1526.6
Gapps_0161_J	4.444	941.1	26Oct2011, 22:15	1426.2
Gapps_0161_R	3.985	1030.1	26Oct2011, 23:00	1593.7



Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Gapps_0187_J	3.985	1081.8	26Oct2011, 21:15	1568.6
Gapps_0187_R	2.506	753.5	26Oct2011, 21:45	1112.3
Gapps_0236_J	2.506	1055.4	26Oct2011, 18:45	967.0
Gapps_0236_R	1.231	506.3	26Oct2011, 18:45	553.1
Gapps_0294_J	1.231	512.7	26Oct2011, 17:45	491.1
Gapps_0294_R	0.883	327.1	26Oct2011, 18:15	366.3
Gapps_0302_J	0.883	331.2	26Oct2011, 17:45	288.7



Project: Gapps Bayou 01312012 Simulation Run: Alt 1: 2PCT_50yr

Start of Run: 26Oct2011, 00:00 Basin Model: Alternative 1
 End of Run: 28Oct2011, 00:00 Meteorologic Model: 2PCT_50yr
 Compute Time: 30Jul2013, 20:42:34 Control Specifications: Control 48

Volume Units: AC-FT

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Alt1 Div	3.985	1059.5	27Oct2011, 00:00	1680.5
Alt1 Pond	0.000	60.8	27Oct2011, 13:45	124.2
DA-01	0.588	420.4	26Oct2011, 17:45	285.4
DA-02	0.348	276.5	26Oct2011, 17:00	175.6
DA-03	1.275	761.1	26Oct2011, 18:45	597.7
DA-04	1.479	496.1	26Oct2011, 19:45	654.8
DA-05	0.459	262.6	26Oct2011, 17:45	206.9
DA-06	0.507	324.9	26Oct2011, 18:00	239.6
DA-07	1.428	755.3	26Oct2011, 18:30	641.8
DA-08	0.698	262.0	26Oct2011, 20:45	324.0
DA-09	0.390	174.3	26Oct2011, 18:45	173.0
DA-10	0.679	561.5	26Oct2011, 18:15	306.3
DA-11	0.295	77.0	26Oct2011, 22:00	124.4
Gapps_0000_J	8.146	2474.2	26Oct2011, 22:45	3602.0
Gapps_0000_R1	0.390	174.3	26Oct2011, 19:30	172.6
Gapps_0000_R2	7.077	2131.2	27Oct2011, 00:00	3123.1
Gapps_0056_J	7.077	2137.4	26Oct2011, 22:15	3255.2
Gapps_0056_R	6.379	1889.9	26Oct2011, 22:30	2931.2
Gapps_0093_J	6.379	1891.2	26Oct2011, 22:00	2898.1
Gapps_0093_R	4.951	1386.4	27Oct2011, 00:15	2256.3
Gapps_0150_J	4.951	1389.1	26Oct2011, 22:45	2251.2
Gapps_0150_R	4.444	1222.4	27Oct2011, 00:00	2011.6
Gapps_0159_J	4.444	1230.2	26Oct2011, 23:00	2011.6
Gapps_0161_J	4.444	1205.8	26Oct2011, 23:00	1887.4
Gapps_0161_R	3.985	1334.8	27Oct2011, 00:00	2098.0



Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Gapps_0187_J	3.985	1671.1	26Oct2011, 21:00	2076.2
Gapps_0187_R	2.506	1188.6	26Oct2011, 21:15	1421.4
Gapps_0236_J	2.506	1417.2	26Oct2011, 19:00	1297.6
Gapps_0236_R	1.231	674.8	26Oct2011, 19:30	699.9
Gapps_0294_J	1.231	697.7	26Oct2011, 18:00	646.2
Gapps_0294_R	0.883	447.7	26Oct2011, 18:15	470.7
Gapps_0302_J	0.883	452.6	26Oct2011, 17:45	409.8



Project: Gapps Bayou 01312012 Simulation Run: Alt 1: 1PCT_100yr

Start of Run: 26Oct2011, 00:00 Basin Model: Alternative 1
 End of Run: 28Oct2011, 00:00 Meteorologic Model: 1PCT_100yr
 Compute Time: 30Jul2013, 22:28:10 Control Specifications: Control 48

Volume Units: AC-FT

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Alt1 Div	3.985	1138.6	27Oct2011, 00:45	1888.1
Alt1 Pond	0.000	65.4	27Oct2011, 14:15	133.6
DA-01	0.588	474.4	26Oct2011, 17:45	330.9
DA-02	0.348	310.3	26Oct2011, 17:00	202.6
DA-03	1.275	863.1	26Oct2011, 18:45	695.6
DA-04	1.479	566.1	26Oct2011, 19:45	760.8
DA-05	0.459	298.4	26Oct2011, 17:45	241.9
DA-06	0.507	368.0	26Oct2011, 18:00	278.7
DA-07	1.428	859.8	26Oct2011, 18:30	750.5
DA-08	0.698	298.3	26Oct2011, 20:45	375.4
DA-09	0.390	198.9	26Oct2011, 18:45	202.3
DA-10	0.679	634.0	26Oct2011, 18:15	358.1
DA-11	0.295	87.8	26Oct2011, 22:00	143.6
Gapps_0000_J	8.146	2787.3	26Oct2011, 22:45	4102.7
Gapps_0000_R1	0.390	198.9	26Oct2011, 19:30	201.9
Gapps_0000_R2	7.077	2375.5	26Oct2011, 23:45	3542.7
Gapps_0056_J	7.077	2382.2	26Oct2011, 22:00	3696.5
Gapps_0056_R	6.379	2096.6	26Oct2011, 22:15	3321.1
Gapps_0093_J	6.379	2097.8	26Oct2011, 21:45	3297.0
Gapps_0093_R	4.951	1502.7	27Oct2011, 00:00	2546.5
Gapps_0150_J	4.951	1505.2	26Oct2011, 22:30	2542.1
Gapps_0150_R	4.444	1321.0	27Oct2011, 01:00	2263.4
Gapps_0159_J	4.444	1325.5	27Oct2011, 00:15	2263.6
Gapps_0161_J	4.444	1291.0	26Oct2011, 23:15	2130.0
Gapps_0161_R	3.985	1440.8	27Oct2011, 00:45	2364.6



Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Gapps_0187_J	3.985	1879.4	26Oct2011, 21:00	2345.6
Gapps_0187_R	2.506	1332.1	26Oct2011, 21:15	1584.8
Gapps_0236_J	2.506	1596.5	26Oct2011, 19:15	1473.5
Gapps_0236_R	1.231	762.3	26Oct2011, 19:30	777.9
Gapps_0294_J	1.231	795.0	26Oct2011, 18:00	729.2
Gapps_0294_R	0.883	509.5	26Oct2011, 18:00	526.6
Gapps_0302_J	0.883	512.2	26Oct2011, 17:45	474.5



Project: Gapps Bayou 01312012 Simulation Run: Alt 1: 0.2PCT_500yr

Start of Run: 26Oct2011, 00:00 Basin Model: Alternative 1
 End of Run: 28Cct2011, 00:00 Meteorologic Model: 0.2PCT_500yr
 Compute Time: 30Jul2013, 20:43:07 Control Specifications: Control 48

Volume Units: AC-FT

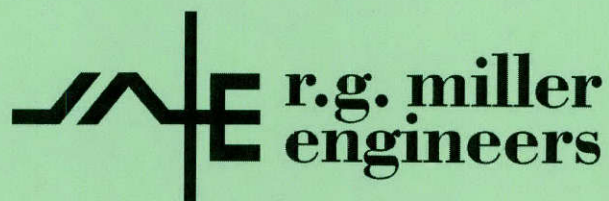
Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Alt1 Div	3.985	1308.1	27Oct2011, 04:00	2333.4
Alt1 Pond	0.000	225.4	27Oct2011, 11:30	228.4
DA-01	0.588	594.2	26Oct2011, 17:45	425.3
DA-02	0.348	386.7	26Oct2011, 17:00	258.5
DA-03	1.275	1093.2	26Oct2011, 18:45	900.4
DA-04	1.479	725.1	26Oct2011, 20:00	981.2
DA-05	0.459	376.5	26Oct2011, 17:45	315.6
DA-06	0.507	462.9	26Oct2011, 18:00	360.1
DA-07	1.428	1091.4	26Oct2011, 18:30	979.2
DA-08	0.698	382.0	26Oct2011, 20:45	482.0
DA-09	0.390	253.7	26Oct2011, 19:00	264.0
DA-10	0.679	796.8	26Oct2011, 18:15	467.3
DA-11	0.295	112.5	26Oct2011, 22:15	182.9
Gapps_0000_J	8.146	3521.2	26Oct2011, 22:30	5263.0
Gapps_0000_R1	0.390	253.7	26Oct2011, 19:45	263.4
Gapps_0000_R2	7.077	2942.0	26Oct2011, 23:15	4532.3
Gapps_0056_J	7.077	2951.2	26Oct2011, 21:30	4718.9
Gapps_0056_R	6.379	2575.4	26Oct2011, 21:45	4236.9
Gapps_0093_J	6.379	2577.5	26Oct2011, 21:15	4219.4
Gapps_0093_R	4.951	1766.2	27Oct2011, 01:00	3240.2
Gapps_0150_J	4.951	1768.5	26Oct2011, 23:30	3237.1
Gapps_0150_R	4.444	1545.0	27Oct2011, 00:45	2877.0
Gapps_0159_J	4.444	1561.7	27Oct2011, 00:00	2877.4
Gapps_0161_J	4.444	1514.5	26Oct2011, 23:45	2649.0
Gapps_0161_R	3.985	1759.9	27Oct2011, 02:00	2959.2



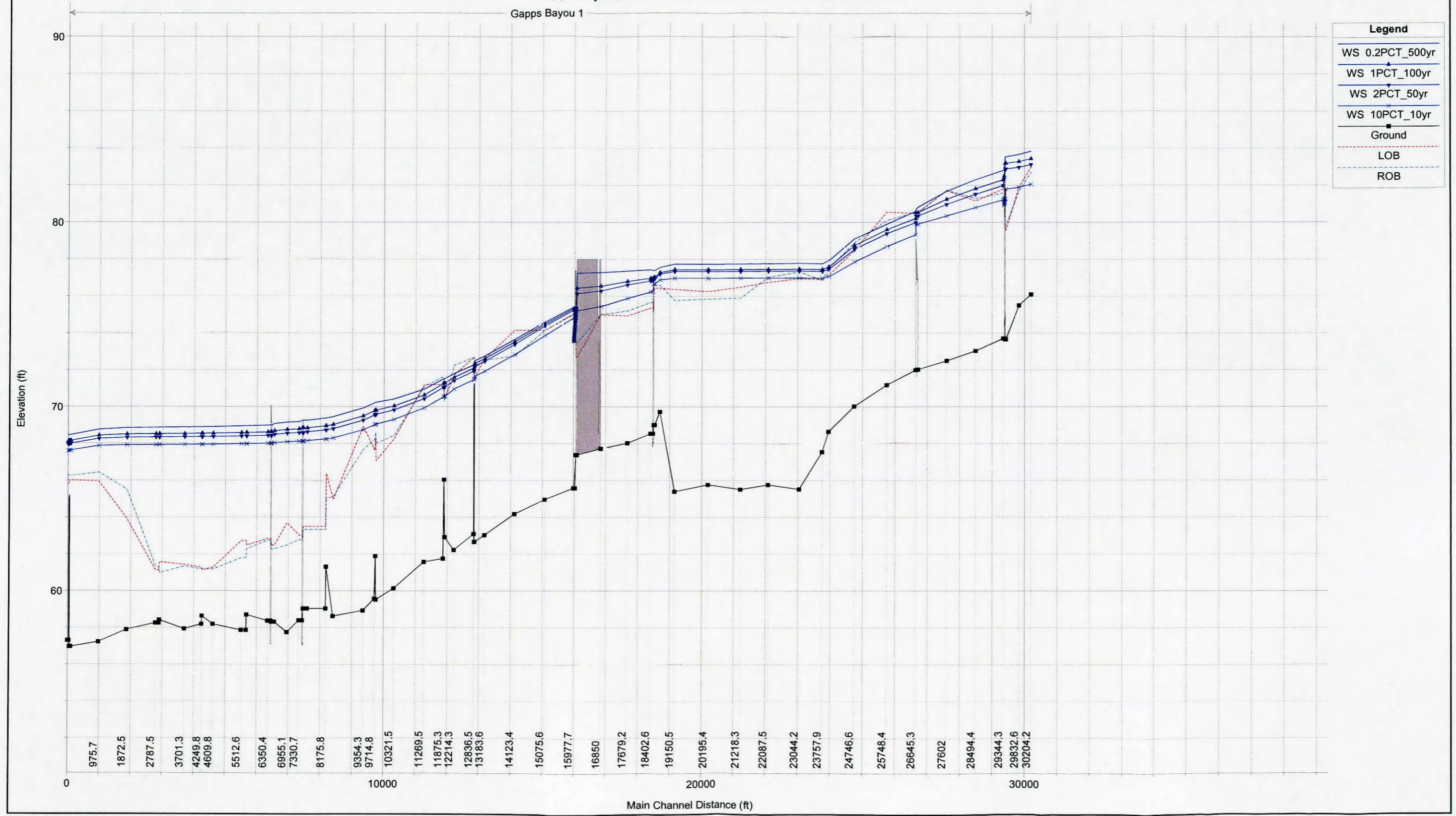
Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Gapps_0187_J	3.985	2489.4	26Oct2011, 21:00	2940.2
Gapps_0187_R	2.506	1776.0	26Oct2011, 21:15	1958.9
Gapps_0236_J	2.506	2028.6	26Oct2011, 19:15	1856.7
Gapps_0236_R	1.231	966.0	26Oct2011, 19:45	956.4
Gapps_0294_J	1.231	1004.4	26Oct2011, 17:45	912.2
Gapps_0294_R	0.883	642.4	26Oct2011, 18:00	653.7
Gapps_0302_J	0.883	643.3	26Oct2011, 18:00	608.2



**Appendix I:
Alternative 1 HEC-RAS Profiles and
Output**



Gapps Bayou Final Plan: Alternative 1 - Lateral 7/30/2013
 Gapps Bayou 1



Legend

- WS 0.2PCT_500yr
- WS 1PCT_100yr
- WS 2PCT_50yr
- WS 10PCT_10yr
- Ground
- LOB
- ROB

1 in Horiz. = 3000 ft 1 in Vert. = 5 ft



HEC-RAS Plan: Alt 1 - Lat River: Gapps Bayou Reach: 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	30204.2	0.2PCT_500yr	643.30	76.10	83.85		83.90	0.000511	1.70	437.53	258.33	0.16
1	30204.2	1PCT_100yr	512.20	76.10	83.44		83.48	0.000492	1.54	362.75	158.82	0.15
1	30204.2	2PCT_50yr	452.60	76.10	83.13		83.17	0.000550	1.51	315.17	146.46	0.16
1	30204.2	10PCT_10yr	331.20	76.10	82.07		82.11	0.000602	1.65	200.87	67.95	0.17
1	29832.6	0.2PCT_500yr	643.30	75.51	83.67		83.73	0.000395	1.99	494.66	236.77	0.15
1	29832.6	1PCT_100yr	512.20	75.51	83.29		83.33	0.000321	1.71	420.02	162.21	0.13
1	29832.6	2PCT_50yr	452.60	75.51	82.97		83.01	0.000311	1.61	371.81	152.29	0.13
1	29832.6	10PCT_10yr	331.20	75.51	81.89		81.93	0.000403	1.54	217.40	89.17	0.14
1	29428.5	0.2PCT_500yr	1004.40	73.66	83.54	77.72	83.60	0.000276	2.01	908.54	556.54	0.13
1	29428.5	1PCT_100yr	795.00	73.66	83.19	77.31	83.23	0.000203	1.67	812.71	239.91	0.11
1	29428.5	2PCT_50yr	697.70	73.66	82.89	77.08	82.92	0.000183	1.54	740.36	234.17	0.11
1	29428.5	10PCT_10yr	512.70	73.66	81.80	76.63	81.83	0.000184	1.37	501.53	206.56	0.10
1	29411.9		Culvert									
1	29344.3	0.2PCT_500yr	1004.40	73.70	82.80		82.88	0.000566	2.43	627.29	473.64	0.18
1	29344.3	1PCT_100yr	795.00	73.70	82.30		82.38	0.000598	2.35	409.73	365.99	0.18
1	29344.3	2PCT_50yr	697.70	73.70	81.99		82.06	0.000594	2.24	321.60	151.15	0.18
1	29344.3	10PCT_10yr	512.70	73.70	81.22		81.28	0.000531	1.96	261.18	60.93	0.17
1	28494.4	0.2PCT_500yr	1004.40	73.03	82.31		82.39	0.000563	2.43	584.34	356.92	0.18
1	28494.4	1PCT_100yr	795.00	73.03	81.82		81.90	0.000532	2.23	438.07	262.76	0.17
1	28494.4	2PCT_50yr	697.70	73.03	81.52		81.59	0.000520	2.12	372.20	183.30	0.17
1	28494.4	10PCT_10yr	512.70	73.03	80.80		80.86	0.000460	1.85	280.63	80.30	0.16
1	27602	0.2PCT_500yr	1004.40	72.49	81.67		81.79	0.000863	2.81	461.61	315.74	0.22
1	27602	1PCT_100yr	795.00	72.49	81.25		81.34	0.000741	2.52	357.67	195.18	0.20
1	27602	2PCT_50yr	697.70	72.49	80.97		81.06	0.000693	2.39	309.74	143.03	0.19
1	27602	10PCT_10yr	512.70	72.49	80.34		80.41	0.000553	2.03	252.08	57.13	0.17
1	26717.3	0.2PCT_500yr	1004.40	72.02	80.82	76.55	80.92	0.001110	2.81	558.72	316.03	0.24
1	26717.3	1PCT_100yr	795.00	72.02	80.53	76.04	80.61	0.000925	2.46	479.12	248.27	0.22
1	26717.3	2PCT_50yr	697.70	72.02	80.34	75.78	80.42	0.000738	2.31	436.50	220.25	0.20
1	26717.3	10PCT_10yr	512.70	72.02	79.90	75.23	79.96	0.000460	1.94	352.19	170.31	0.16
1	26712.7		Culvert									
1	26645.3	0.2PCT_500yr	1004.40	71.99	80.59		80.69	0.000904	2.71	574.97	560.10	0.22
1	26645.3	1PCT_100yr	795.00	71.99	80.21		80.30	0.000737	2.49	421.15	299.16	0.20
1	26645.3	2PCT_50yr	697.70	71.99	79.98		80.07	0.000691	2.37	360.42	238.48	0.19
1	26645.3	10PCT_10yr	512.70	71.99	79.33		79.40	0.000608	2.11	244.96	75.51	0.18
1	25748.4	0.2PCT_500yr	1004.40	71.18	79.89		79.95	0.000717	2.38	924.95	1052.97	0.20
1	25748.4	1PCT_100yr	795.00	71.18	79.60		79.66	0.000671	2.26	654.50	793.04	0.19
1	25748.4	2PCT_50yr	697.70	71.18	79.39		79.45	0.000662	2.21	515.52	566.03	0.19
1	25748.4	10PCT_10yr	512.70	71.18	78.69		78.77	0.000806	2.30	274.56	191.52	0.20
1	24746.6	0.2PCT_500yr	1004.40	70.02	79.11		79.18	0.000842	2.59	921.94	1265.45	0.21
1	24746.6	1PCT_100yr	795.00	70.02	78.76		78.85	0.000984	2.67	556.53	813.51	0.23
1	24746.6	2PCT_50yr	697.70	70.02	78.55		78.65	0.001005	2.63	410.74	550.36	0.23
1	24746.6	10PCT_10yr	512.70	70.02	77.86		77.95	0.000842	2.40	246.23	106.94	0.21
1	23956.8	0.2PCT_500yr	1004.40	68.65	77.93		78.14	0.002349	3.68	314.89	214.18	0.34
1	23956.8	1PCT_100yr	795.00	68.65	77.59		77.75	0.002077	3.24	257.00	116.42	0.31
1	23956.8	2PCT_50yr	697.70	68.65	77.47		77.60	0.001788	2.95	243.31	108.31	0.29
1	23956.8	10PCT_10yr	512.70	68.65	77.07		77.16	0.001186	2.47	207.72	61.45	0.24
1	23757.9	0.2PCT_500yr	2028.60	67.55	77.75		77.88	0.000904	2.92	864.42	466.52	0.23
1	23757.9	1PCT_100yr	1596.50	67.55	77.45		77.54	0.000701	2.47	736.01	393.40	0.20
1	23757.9	2PCT_50yr	1417.20	67.55	77.35		77.43	0.000596	2.24	697.10	382.13	0.18
1	23757.9	10PCT_10yr	1055.40	67.55	76.98		77.03	0.000437	1.82	597.58	187.94	0.15
1	23044.2	0.2PCT_500yr	2028.60	65.52	77.79		77.79	0.000024	0.71	3067.49	830.52	0.04
1	23044.2	1PCT_100yr	1596.50	65.52	77.47		77.48	0.000017	0.58	2839.97	628.85	0.03
1	23044.2	2PCT_50yr	1417.20	65.52	77.37		77.37	0.000014	0.52	2778.00	553.36	0.03
1	23044.2	10PCT_10yr	1055.40	65.52	77.00		77.00	0.000009	0.40	2616.28	319.30	0.02
1	22087.5	0.2PCT_500yr	2028.60	65.76	77.77		77.77	0.000021	0.66	3423.06	700.26	0.04
1	22087.5	1PCT_100yr	1596.50	65.76	77.46		77.46	0.000015	0.54	3211.79	679.12	0.03
1	22087.5	2PCT_50yr	1417.20	65.76	77.36		77.36	0.000012	0.48	3142.85	673.45	0.03
1	22087.5	10PCT_10yr	1055.40	65.76	76.99		76.99	0.000008	0.38	2904.22	597.77	0.02
1	21218.3	0.2PCT_500yr	2028.60	65.51	77.75		77.75	0.000020	0.69	3266.64	1011.68	0.04
1	21218.3	1PCT_100yr	1596.50	65.51	77.45		77.45	0.000014	0.56	2996.85	679.04	0.03
1	21218.3	2PCT_50yr	1417.20	65.51	77.35		77.35	0.000012	0.50	2933.46	604.30	0.03



HEC-RAS Plan: Alt 1 - Lat River: Gapps Bayou Reach: 1 (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	21218.3	10PCT_10yr	1055.40	65.51	76.98		76.98	0.000007	0.39	2746.16	456.40	0.02
1	20195.4	0.2PCT_500yr	2028.60	65.76	77.74		77.75	0.000004	0.32	6975.77	1381.96	0.02
1	20195.4	1PCT_100yr	1596.50	65.76	77.44		77.44	0.000003	0.26	6583.37	1230.48	0.01
1	20195.4	2PCT_50yr	1417.20	65.76	77.34		77.35	0.000002	0.23	6465.31	1150.63	0.01
1	20195.4	10PCT_10yr	1055.40	65.76	76.98		76.98	0.000001	0.18	6075.25	993.94	0.01
1	19150.5	0.2PCT_500yr	2028.60	65.39	77.74		77.74	0.000006	0.38	6183.23	2132.93	0.02
1	19150.5	1PCT_100yr	1596.50	65.39	77.44		77.44	0.000004	0.31	5685.85	1269.70	0.02
1	19150.5	2PCT_50yr	1417.20	65.39	77.34		77.34	0.000003	0.27	5568.30	1130.16	0.02
1	19150.5	10PCT_10yr	1055.40	65.39	76.98		76.98	0.000002	0.21	5190.65	995.06	0.01
1	18693.0	0.2PCT_500yr	2489.40	69.73	77.56		77.72	0.001914	3.66	2405.30	3808.65	0.32
1	18693.0	1PCT_100yr	1879.40	69.73	77.29		77.42	0.001678	3.27	1602.68	2238.29	0.30
1	18693.0	2PCT_50yr	1671.10	69.73	77.20		77.32	0.001510	3.06	1426.58	2010.45	0.28
1	18693.0	10PCT_10yr	1081.80	69.73	76.89		76.97	0.001024	2.37	886.95	1381.89	0.23
1	18528.1	0.2PCT_500yr	2489.40	69.01	77.40	76.42	77.47	0.001482	2.94	1833.09	2654.65	0.27
1	18528.1	1PCT_100yr	1879.40	69.01	77.02	75.39	77.15	0.002226	3.34	1047.04	1657.74	0.33
1	18528.1	2PCT_50yr	1671.10	69.01	76.96	74.81	77.08	0.002013	3.14	949.48	1514.37	0.31
1	18528.1	10PCT_10yr	1081.80	69.01	76.69	73.81	76.78	0.001556	2.59	607.79	851.08	0.27
1	18501.7		Culvert									
1	18402.6	0.2PCT_500yr	2489.40	68.54	77.44		77.45	0.000137	1.41	6075.60	6901.38	0.10
1	18402.6	1PCT_100yr	1879.40	68.54	76.98		77.01	0.000320	2.04	3066.23	5973.76	0.15
1	18402.6	2PCT_50yr	1671.10	68.54	76.83		76.88	0.000396	2.23	2285.71	4771.22	0.17
1	18402.6	10PCT_10yr	1081.80	68.54	76.23		76.32	0.000594	2.52	666.49	1172.00	0.20
1	17679.2	0.2PCT_500yr	2489.40	68.02	77.36		77.37	0.000078	1.11	7019.16	5713.76	0.08
1	17679.2	1PCT_100yr	1879.40	68.02	76.80		76.82	0.000203	1.69	3861.12	5428.34	0.12
1	17679.2	2PCT_50yr	1671.10	68.02	76.61		76.64	0.000258	1.86	2887.50	4903.14	0.14
1	17679.2	10PCT_10yr	1081.80	68.02	75.88		75.95	0.000439	2.21	861.64	1148.40	0.18
1	16850	0.2PCT_500yr	2489.40	67.72	77.28		77.29	0.000121	1.40	5716.01	5445.90	0.10
1	16850	1PCT_100yr	1879.40	67.72	76.54		76.59	0.000403	2.36	2142.10	2977.43	0.17
1	16850	2PCT_50yr	1671.10	67.72	76.28		76.35	0.000493	2.53	1464.27	2171.17	0.19
1	16850	10PCT_10yr	1081.80	67.72	75.44		75.52	0.000595	2.48	601.25	458.52	0.20
1	16467.8		Lat Struct									
1	16085.5	0.2PCT_500yr	1861.63	67.38	77.24	72.08	77.24	0.000031	0.78	7445.89	5345.54	0.05
1	16085.5	1PCT_100yr	1454.36	67.38	76.43	71.58	76.45	0.000085	1.20	3559.13	4039.54	0.08
1	16085.5	2PCT_50yr	1308.14	67.38	76.13	71.38	76.15	0.000133	1.45	2450.88	3192.81	0.10
1	16085.5	10PCT_10yr	870.28	67.38	75.20	70.69	75.24	0.000216	1.66	792.72	656.82	0.13
1	16054.3		Culvert									
1	15977.7	0.2PCT_500yr	917.43	65.57	75.41		75.45	0.000598	1.82	1186.52	1662.53	0.17
1	15977.7	1PCT_100yr	884.56	65.57	75.32		75.37	0.000619	1.82	1058.25	1498.81	0.18
1	15977.7	2PCT_50yr	852.04	65.57	75.24		75.29	0.000641	1.82	939.32	1367.79	0.18
1	15977.7	10PCT_10yr	730.18	65.57	74.82		74.87	0.000764	1.87	532.88	579.12	0.19
1	15075.6	0.2PCT_500yr	1125.63	64.96	74.59		74.69	0.001171	2.62	832.66	1056.70	0.24
1	15075.6	1PCT_100yr	1065.36	64.96	74.49		74.59	0.001190	2.59	734.19	909.39	0.24
1	15075.6	2PCT_50yr	1010.44	64.96	74.39		74.48	0.001224	2.57	644.50	782.02	0.25
1	15075.6	10PCT_10yr	854.08	64.96	73.86		73.97	0.001281	2.69	377.26	280.25	0.25
1	14123.4	0.2PCT_500yr	1125.63	64.17	73.65		73.76	0.000830	2.77	716.12	842.79	0.21
1	14123.4	1PCT_100yr	1065.36	64.17	73.52		73.63	0.000859	2.79	611.92	750.72	0.22
1	14123.4	2PCT_50yr	1010.44	64.17	73.38		73.50	0.000888	2.81	512.32	666.17	0.22
1	14123.4	10PCT_10yr	854.08	64.17	72.83		72.94	0.000922	2.73	346.28	131.04	0.22
1	13183.6	0.2PCT_500yr	1125.63	63.03	72.75		72.90	0.001016	3.08	421.53	286.77	0.24
1	13183.6	1PCT_100yr	1065.36	63.03	72.61		72.75	0.001025	3.04	383.25	228.12	0.24
1	13183.6	2PCT_50yr	1010.44	63.03	72.47		72.60	0.001014	2.99	354.14	161.62	0.24
1	13183.6	10PCT_10yr	854.08	63.03	71.93		72.05	0.000978	2.84	302.18	73.11	0.23
1	12867.8	0.2PCT_500yr	1125.63	62.66	72.50	67.40	72.60	0.000753	2.68	536.19	312.62	0.21
1	12867.8	1PCT_100yr	1065.36	62.66	72.35	67.27	72.45	0.000772	2.66	492.40	285.76	0.21
1	12867.8	2PCT_50yr	1010.44	62.66	72.20	67.13	72.31	0.000793	2.64	452.78	257.63	0.21
1	12867.8	10PCT_10yr	854.08	62.66	71.64	66.77	71.75	0.000886	2.63	336.54	157.20	0.22
1	12860.8		Bridge									
1	12836.5	0.2PCT_500yr	1125.63	63.09	72.27		72.42	0.001065	3.20	414.35	288.69	0.24
1	12836.5	1PCT_100yr	1065.36	63.09	72.09		72.25	0.001077	3.18	367.28	236.83	0.24



HEC-RAS Plan: Alt 1 - Lat River: Gapps Bayou Reach: 1 (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	12836.5	2PCT_50yr	1010.44	63.09	71.94		72.09	0.001064	3.14	336.33	170.73	0.24
1	12836.5	10PCT_10yr	854.08	63.09	71.47		71.60	0.000967	2.92	294.19	67.96	0.23
1	12214.3	0.2PCT_500yr	1125.63	62.22	71.80		71.89	0.000678	2.55	610.51	338.52	0.19
1	12214.3	1PCT_100yr	1065.36	62.22	71.60		71.69	0.000721	2.60	547.31	298.97	0.20
1	12214.3	2PCT_50yr	1010.44	62.22	71.42		71.52	0.000755	2.63	496.95	278.76	0.20
1	12214.3	10PCT_10yr	854.08	62.22	70.96		71.06	0.000767	2.58	387.23	202.50	0.20
1	11922.7	0.2PCT_500yr	1125.63	62.92	71.53		71.63	0.001085	2.78	545.06	371.11	0.24
1	11922.7	1PCT_100yr	1065.36	62.92	71.29		71.41	0.001285	2.91	465.73	304.55	0.26
1	11922.7	2PCT_50yr	1010.44	62.92	71.08		71.21	0.001462	2.99	408.09	258.42	0.27
1	11922.7	10PCT_10yr	854.08	62.92	70.57		70.72	0.001933	3.12	294.29	182.40	0.31
1	11900.3	0.2PCT_500yr	1125.63	66.04	71.52		71.60	0.000920	2.38	592.10	382.51	0.22
1	11900.3	1PCT_100yr	1065.36	66.04	71.28		71.37	0.001113	2.50	505.06	327.67	0.24
1	11900.3	2PCT_50yr	1010.44	66.04	71.07		71.17	0.001305	2.60	439.89	299.68	0.25
1	11900.3	10PCT_10yr	854.08	66.04	70.55		70.67	0.001752	2.71	317.37	150.24	0.29
1	11875.3	0.2PCT_500yr	1125.63	61.76	71.50		71.58	0.000915	2.27	597.20	436.52	0.21
1	11875.3	1PCT_100yr	1065.36	61.76	71.25		71.34	0.001077	2.40	496.45	384.85	0.23
1	11875.3	2PCT_50yr	1010.44	61.76	71.05		71.14	0.001092	2.46	427.94	246.95	0.23
1	11875.3	10PCT_10yr	854.08	61.76	70.53		70.63	0.001117	2.43	351.07	105.36	0.23
1	11269.5	0.2PCT_500yr	1125.63	61.58	70.95		71.04	0.000859	2.51	535.72	249.70	0.21
1	11269.5	1PCT_100yr	1065.36	61.58	70.64		70.74	0.000920	2.65	462.84	214.28	0.22
1	11269.5	2PCT_50yr	1010.44	61.58	70.43		70.54	0.000898	2.68	422.22	191.45	0.22
1	11269.5	10PCT_10yr	854.08	61.58	69.93		70.04	0.000850	2.60	339.27	128.25	0.21
1	10321.5	0.2PCT_500yr	1125.63	60.14	70.42		70.49	0.000412	2.20	969.41	413.26	0.16
1	10321.5	1PCT_100yr	1065.36	60.14	70.04		70.11	0.000488	2.29	816.09	380.69	0.17
1	10321.5	2PCT_50yr	1010.44	60.14	69.82		69.90	0.000517	2.30	736.21	372.25	0.17
1	10321.5	10PCT_10yr	854.08	60.14	69.31		69.39	0.000551	2.23	557.69	332.55	0.18
1	9759.4	0.2PCT_500yr	1125.63	59.53	70.23		70.28	0.000309	1.92	1131.68	416.76	0.14
1	9759.4	1PCT_100yr	1065.36	59.53	69.81		69.87	0.000371	2.01	963.11	383.31	0.15
1	9759.4	2PCT_50yr	1010.44	59.53	69.58		69.64	0.000395	2.02	877.25	372.90	0.15
1	9759.4	10PCT_10yr	854.08	59.53	69.05		69.11	0.000428	1.97	687.41	340.28	0.15
1	9744.1	0.2PCT_500yr	1125.63	61.89	70.24		70.27	0.000245	1.47	1198.74	448.35	0.12
1	9744.1	1PCT_100yr	1065.36	61.89	69.82		69.85	0.000311	1.56	1019.60	414.07	0.13
1	9744.1	2PCT_50yr	1010.44	61.89	69.59		69.63	0.000341	1.58	930.65	379.47	0.14
1	9744.1	10PCT_10yr	854.08	61.89	69.06		69.10	0.000408	1.57	733.53	359.81	0.15
1	9714.8	0.2PCT_500yr	1125.63	59.58	70.21		70.26	0.000308	2.01	1162.05	447.38	0.14
1	9714.8	1PCT_100yr	1065.36	59.58	69.78		69.84	0.000368	2.11	979.56	398.54	0.15
1	9714.8	2PCT_50yr	1010.44	59.58	69.55		69.61	0.000390	2.12	889.91	386.23	0.15
1	9714.8	10PCT_10yr	854.08	59.58	69.02		69.08	0.000417	2.06	691.08	359.51	0.15
1	9354.3	0.2PCT_500yr	1935.23	58.94	69.93		70.05	0.000858	3.20	1484.21	647.66	0.23
1	9354.3	1PCT_100yr	1657.36	58.94	69.50		69.62	0.000875	3.08	1222.77	578.11	0.23
1	9354.3	2PCT_50yr	1512.74	58.94	69.27		69.39	0.000884	3.02	1091.62	558.86	0.23
1	9354.3	10PCT_10yr	1209.98	58.94	68.74		68.85	0.000859	2.81	825.39	461.58	0.22
1	8406.8	0.2PCT_500yr	1935.23	58.63	69.45		69.51	0.000373	2.46	1614.07	502.37	0.16
1	8406.8	1PCT_100yr	1657.36	58.63	69.03		69.08	0.000366	2.35	1411.34	433.09	0.15
1	8406.8	2PCT_50yr	1512.74	58.63	68.80		68.86	0.000354	2.27	1317.44	416.23	0.15
1	8406.8	10PCT_10yr	1209.98	58.63	68.30		68.35	0.000334	2.10	1112.87	397.28	0.14
1	8187.8	0.2PCT_500yr	1935.23	61.31	69.38		69.42	0.000338	2.06	1480.30	349.91	0.14
1	8187.8	1PCT_100yr	1657.36	61.31	68.95		68.99	0.000331	1.95	1333.18	340.86	0.14
1	8187.8	2PCT_50yr	1512.74	61.31	68.73		68.77	0.000323	1.88	1258.98	336.67	0.14
1	8187.8	10PCT_10yr	1209.98	61.31	68.24		68.27	0.000304	1.71	1093.78	327.28	0.13
1	8175.8	0.2PCT_500yr	1935.23	59.04	69.38		69.42	0.000204	1.83	1601.59	333.89	0.12
1	8175.8	1PCT_100yr	1657.36	59.04	68.96		68.99	0.000187	1.69	1465.44	306.73	0.11
1	8175.8	2PCT_50yr	1512.74	59.04	68.74		68.77	0.000175	1.60	1399.45	296.91	0.11
1	8175.8	10PCT_10yr	1209.98	59.04	68.24		68.26	0.000149	1.41	1261.19	266.92	0.10
1	7595.5	0.2PCT_500yr	1935.23	59.04	69.26	64.14	69.30	0.000217	1.87	1561.29	329.46	0.12
1	7595.5	1PCT_100yr	1657.36	59.04	68.85	63.86	68.88	0.000198	1.72	1431.67	301.75	0.11
1	7595.5	2PCT_50yr	1512.74	59.04	68.63	63.70	68.66	0.000186	1.63	1368.81	292.24	0.11
1	7595.5	10PCT_10yr	1209.98	59.04	68.15	63.34	68.18	0.000157	1.43	1237.71	266.09	0.10
1	7466.4		Culvert									
1	7330.7	0.2PCT_500yr	1935.23	58.40	69.19		69.24	0.000287	2.30	1416.63	264.09	0.14
1	7330.7	1PCT_100yr	1657.36	58.40	68.79		68.83	0.000256	2.11	1316.06	243.74	0.13



HEC-RAS Plan: Alt 1 - Lat River: Gapps Bayou Reach: 1 (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	7330.7	2PCT_50yr	1512.74	58.40	68.58		68.62	0.000237	1.99	1267.24	237.76	0.12
1	7330.7	10PCT_10yr	1209.98	58.40	68.12		68.15	0.000195	1.74	1158.02	233.67	0.11
1	6955.1	0.2PCT_500yr	1935.23	57.75	69.15		69.17	0.000101	1.22	2735.72	595.06	0.08
1	6955.1	1PCT_100yr	1657.36	57.75	68.76		68.77	0.000095	1.14	2502.95	578.43	0.08
1	6955.1	2PCT_50yr	1512.74	57.75	68.55		68.56	0.000091	1.09	2386.20	573.65	0.08
1	6955.1	10PCT_10yr	1209.98	57.75	68.09		68.10	0.000080	0.98	2124.23	563.02	0.07
1	6557.7	0.2PCT_500yr	1935.23	58.32	69.08	63.27	69.11	0.000172	1.70	1547.19	304.00	0.11
1	6557.7	1PCT_100yr	1657.36	58.32	68.69	63.05	68.72	0.000153	1.55	1432.90	285.82	0.10
1	6557.7	2PCT_50yr	1512.74	58.32	68.49	62.95	68.52	0.000140	1.46	1377.53	276.21	0.10
1	6557.7	10PCT_10yr	1209.98	58.32	68.04	62.71	68.06	0.000113	1.26	1258.39	255.88	0.08
1	6466.7		Culvert									
1	6350.4	0.2PCT_500yr	1935.23	58.38	68.99		69.00	0.000075	1.10	2820.10	504.62	0.07
1	6350.4	1PCT_100yr	1657.36	58.38	68.62		68.63	0.000067	1.01	2635.71	500.39	0.07
1	6350.4	2PCT_50yr	1512.74	58.38	68.44		68.45	0.000062	0.95	2542.28	497.19	0.06
1	6350.4	10PCT_10yr	1209.98	58.38	68.01		68.01	0.000051	0.83	2330.27	487.40	0.06
1	5682.4	0.2PCT_500yr	2309.53	58.71	68.95		68.96	0.000055	1.02	4596.20	861.64	0.06
1	5682.4	1PCT_100yr	1942.56	58.71	68.59		68.60	0.000047	0.92	4288.73	836.42	0.06
1	5682.4	2PCT_50yr	1760.74	58.71	68.41		68.41	0.000042	0.85	4136.75	811.02	0.05
1	5682.4	10PCT_10yr	1383.88	58.71	67.98		67.99	0.000032	0.72	3800.31	775.99	0.05
1	5670.4	0.2PCT_500yr	2309.53	57.87	68.95		68.96	0.000054	0.99	5052.07	945.90	0.06
1	5670.4	1PCT_100yr	1942.56	57.87	68.59		68.60	0.000046	0.89	4718.03	905.80	0.05
1	5670.4	2PCT_50yr	1760.74	57.87	68.41		68.41	0.000042	0.84	4551.90	898.40	0.05
1	5670.4	10PCT_10yr	1383.88	57.87	67.98		67.99	0.000032	0.71	4174.82	867.56	0.05
1	5512.6	0.2PCT_500yr	2309.53	57.87	68.95		68.95	0.000054	1.00	5043.82	945.04	0.06
1	5512.6	1PCT_100yr	1942.56	57.87	68.58		68.59	0.000046	0.89	4711.29	905.53	0.06
1	5512.6	2PCT_50yr	1760.74	57.87	68.40		68.40	0.000042	0.84	4545.80	898.08	0.05
1	5512.6	10PCT_10yr	1383.88	57.87	67.98		67.98	0.000033	0.71	4170.29	865.50	0.05
1	4609.8	0.2PCT_500yr	2309.53	58.20	68.91		68.91	0.000034	0.83	7094.59	1607.29	0.05
1	4609.8	1PCT_100yr	1942.56	58.20	68.55		68.55	0.000030	0.76	6530.91	1560.47	0.05
1	4609.8	2PCT_50yr	1760.74	58.20	68.37		68.37	0.000027	0.72	6252.15	1526.94	0.04
1	4609.8	10PCT_10yr	1383.88	58.20	67.95		67.96	0.000022	0.63	5625.56	1472.94	0.04
1	4261.8	0.2PCT_500yr	2309.53	58.64	68.89		68.90	0.000033	0.81	5832.77	1010.35	0.05
1	4261.8	1PCT_100yr	1942.56	58.64	68.54		68.54	0.000026	0.71	5483.31	952.98	0.04
1	4261.8	2PCT_50yr	1760.74	58.64	68.36		68.36	0.000023	0.65	5315.08	923.49	0.04
1	4261.8	10PCT_10yr	1383.88	58.64	67.95		67.95	0.000017	0.54	4941.03	880.05	0.03
1	4249.8	0.2PCT_500yr	2309.53	58.20	68.90		68.90	0.000034	0.84	7073.76	1606.31	0.05
1	4249.8	1PCT_100yr	1942.56	58.20	68.54		68.54	0.000030	0.76	6514.08	1558.87	0.05
1	4249.8	2PCT_50yr	1760.74	58.20	68.36		68.36	0.000028	0.72	6237.45	1526.24	0.04
1	4249.8	10PCT_10yr	1383.88	58.20	67.95		67.95	0.000022	0.63	5614.80	1472.17	0.04
1	3701.3	0.2PCT_500yr	2309.53	57.94	68.88		68.89	0.000018	0.60	7472.07	1240.31	0.04
1	3701.3	1PCT_100yr	1942.56	57.94	68.53		68.53	0.000015	0.54	7061.49	1175.02	0.03
1	3701.3	2PCT_50yr	1760.74	57.94	68.35		68.35	0.000013	0.50	6854.73	1163.85	0.03
1	3701.3	10PCT_10yr	1383.88	57.94	67.94		67.94	0.000010	0.42	6381.72	1138.13	0.03
1	2906.9	0.2PCT_500yr	2309.53	58.42	68.87		68.87	0.000015	0.56	8137.24	1696.48	0.03
1	2906.9	1PCT_100yr	1942.56	58.42	68.52		68.52	0.000012	0.49	7695.66	1630.86	0.03
1	2906.9	2PCT_50yr	1760.74	58.42	68.34		68.34	0.000011	0.45	7478.15	1597.54	0.03
1	2906.9	10PCT_10yr	1383.88	58.42	67.93		67.93	0.000008	0.38	6983.83	1556.90	0.02
1	2894	0.2PCT_500yr	2309.53	58.26	68.87		68.87	0.000018	0.59	7461.08	1872.91	0.04
1	2894	1PCT_100yr	1942.56	58.26	68.52		68.52	0.000015	0.52	7047.18	1809.96	0.03
1	2894	2PCT_50yr	1760.74	58.26	68.34		68.34	0.000013	0.49	6840.54	1783.02	0.03
1	2894	10PCT_10yr	1383.88	58.26	67.93		67.93	0.000010	0.41	6371.54	1730.26	0.03
1	2787.5	0.2PCT_500yr	2309.53	58.26	68.87		68.87	0.000018	0.59	7458.47	1872.37	0.04
1	2787.5	1PCT_100yr	1942.56	58.26	68.52		68.52	0.000015	0.52	7045.09	1809.69	0.03
1	2787.5	2PCT_50yr	1760.74	58.26	68.34		68.34	0.000013	0.49	6838.71	1782.75	0.03
1	2787.5	10PCT_10yr	1383.88	58.26	67.93		67.93	0.000010	0.41	6370.18	1730.14	0.03
1	1872.5	0.2PCT_500yr	2881.93	57.90	68.85		68.85	0.000025	0.60	9812.63	2039.76	0.04
1	1872.5	1PCT_100yr	2351.36	57.90	68.50		68.50	0.000021	0.52	9114.57	1987.33	0.04
1	1872.5	2PCT_50yr	2102.64	57.90	68.33		68.33	0.000018	0.49	8768.95	1959.02	0.03
1	1872.5	10PCT_10yr	1593.68	57.90	67.92		67.92	0.000013	0.39	7983.38	1892.92	0.03
1	975.7	0.2PCT_500yr	2881.93	57.23	68.76		68.80	0.000358	1.98	3638.67	1344.97	0.15
1	975.7	1PCT_100yr	2351.36	57.23	68.43		68.46	0.000320	1.80	3223.08	1210.11	0.14

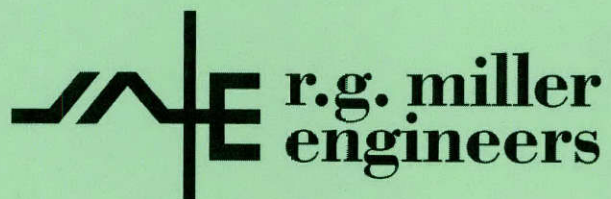


HEC-RAS Plan: Alt 1 - Lat River: Gapps Bayou Reach: 1 (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/R)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	975.7	2PCT_50yr	2102.64	57.23	68.26		68.29	0.000300	1.70	3019.51	1193.40	0.13
1	975.7	10PCT_10yr	1593.68	57.23	67.87		67.89	0.000255	1.49	2561.13	1156.09	0.12
1	91.2	0.2PCT_500yr	2881.93	56.97	68.47	63.75	68.51	0.000401	2.19	3968.74	1805.76	0.16
1	91.2	1PCT_100yr	2351.36	56.97	68.15	63.14	68.19	0.000376	2.05	3402.95	1796.29	0.15
1	91.2	2PCT_50yr	2102.64	56.97	67.39	62.80	68.03	0.000361	1.97	3117.21	1792.05	0.15
1	91.2	10PCT_10yr	1593.68	56.97	67.33	62.01	67.66	0.000324	1.79	2466.95	1775.84	0.14
1	53.68			Bridge								
1	1.9	0.2PCT_500yr	2881.93	57.31	68.42	65.62	68.44	0.000300	1.75	5804.28	2648.58	0.13
1	1.9	1PCT_100yr	2351.36	57.31	68.11	64.32	68.13	0.000300	1.69	4978.07	2592.82	0.13
1	1.9	2PCT_50yr	2102.64	57.31	67.95	64.04	67.97	0.000301	1.65	4564.04	2587.34	0.13
1	1.9	10PCT_10yr	1593.68	57.31	67.58	63.26	67.60	0.000300	1.57	3618.58	2539.90	0.13



**Appendix J:
Alternative 1 Floodway
Computations**



HEC-RAS Plan: Alt 1 Floodway River: Gapps Ba you Reach: 1

Reach	River Sta	Profile	W.S. Elev (ft)	Prof Delta WS (ft)	E.G. Elev (ft)	Top Width Act (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Enc Sta L (ft)	Ch Sta L (ft)	Ch Sta R (ft)	Enc Sta R (ft)
1	30204.2	1PCT_100yr	83.45		83.48	158.95	0.70	511.44	0.05		4938.80	5047.20	
1	30204.2	Floodway	83.92	0.48	83.95	118.40	0.11	511.97	0.12	4933.80	4938.80	5047.20	5052.20
1	29832.6	1PCT_100yr	83.29		83.34	162.90	2.74	508.36	1.11		4969.90	5029.30	
1	29832.6	Floodway	83.81	0.52	83.85	69.40	0.25	511.64	0.31	4964.90	4969.90	5029.30	5034.30
1	29428.5	1PCT_100yr	83.20		83.24	239.95	5.25	782.80	6.96		4966.90	5035.70	
1	29428.5	Floodway	83.74	0.54	83.78	90.80	1.84	791.60	1.56	4955.90	4966.90	5035.70	5046.70
1	29411.9	Culvert											
1	29344.3	1PCT_100yr	82.30		82.39	367.59	0.23	773.23	21.54		4966.30	5030.60	
1	29344.3	Floodway	82.68	0.38	82.76	84.30	0.24	788.85	5.91	4956.30	4966.30	5030.60	5040.60
1	28494.4	1PCT_100yr	81.83		81.91	267.53	0.74	766.62	27.84		4966.30	5032.80	
1	28494.4	Floodway	82.31	0.47	82.37	106.50	0.83	780.93	13.24	4946.30	4966.30	5032.80	5052.80
1	27602	1PCT_100yr	81.26		81.36	196.55	0.02	771.68	23.30		4965.70	5031.00	
1	27602	Floodway	81.88	0.62	81.95	125.30	0.31	785.76	8.92	4935.70	4965.70	5031.00	5061.00
1	26717.3	1PCT_100yr	80.55		80.63	250.79	75.73	707.25	12.02		4969.60	5042.40	
1	26717.3	Floodway	81.46	0.91	81.51	152.80	50.88	699.04	45.08	4929.60	4969.60	5042.40	5082.40
1	26712.7	Culvert											
1	26645.3	1PCT_100yr	80.23		80.32	305.65	9.21	728.28	57.51		4963.50	5031.70	
1	26645.3	Floodway	80.95	0.72	81.03	78.20	0.57	793.64	0.79	4958.50	4963.50	5031.70	5036.70
1	25748.4	1PCT_100yr	79.63		79.69	820.77	20.21	581.73	193.06		4969.20	5031.40	
1	25748.4	Floodway	80.30	0.67	80.41	75.90		789.72	5.28	4964.20	4969.20	5031.40	5045.88
1	24746.6	1PCT_100yr	78.89		78.97	1011.02	59.34	647.21	88.45		4965.60	5025.50	
1	24746.6	Floodway	79.51	0.61	79.61	69.90	2.06	791.90	1.04	4960.60	4965.60	5025.50	5030.50
1	23956.8	1PCT_100yr	78.05		78.17	323.18	9.57	781.81	3.62		4959.40	5033.30	
1	23956.8	Floodway	78.97	0.91	79.05	83.90	2.76	790.23	2.01	4954.40	4959.40	5033.30	5038.30
1	23757.9	1PCT_100yr	77.96		78.03	543.60	15.67	1550.86	29.98		4940.60	5074.10	
1	23757.9	Floodway	78.91	0.95	78.97	143.50	2.26	1592.10	2.14	4935.60	4940.60	5074.10	5079.10
1	23044.2	1PCT_100yr	77.98		77.98	974.64	6.70	1588.71	1.10		4843.85	5152.85	
1	23044.2	Floodway	78.93	0.95	78.93	319.00	0.34	1595.88	0.28	4838.85	4843.85	5152.85	5157.85
1	22087.5	1PCT_100yr	77.97		77.97	731.28	16.72	1579.71	0.08		4823.50	5162.70	
1	22087.5	Floodway	78.92	0.95	78.92	349.20	0.40	1595.83	0.27	4818.50	4823.50	5162.70	5167.70
1	21218.3	1PCT_100yr	77.96		77.96	1275.20	12.13	1583.59	0.78		4851.80	5144.80	
1	21218.3	Floodway	78.91	0.95	78.91	303.00	0.49	1595.42	0.59	4846.80	4851.80	5144.80	5149.80
1	20195.4	1PCT_100yr	77.95		77.96	1851.02	11.33	1584.61	0.56		4698.75	5290.45	
1	20195.4	Floodway	78.91	0.95	78.91	601.70	0.25	1595.97	0.29	4693.75	4698.75	5290.45	5295.45
1	19150.5	1PCT_100yr	77.95		77.95	2479.30	18.69	1577.42	0.39		4735.25	5234.75	
1	19150.5	Floodway	78.91	0.95	78.91	509.50	0.28	1595.88	0.34	4730.25	4735.25	5234.75	5239.75
1	18693.0	1PCT_100yr	77.90		77.94	5202.45	632.42	1193.35	53.63		4931.90	5055.10	
1	18693.0	Floodway	78.80	0.91	78.89	256.16	194.74	1681.07	3.59	4803.94	4931.90	5055.10	5060.10
1	18528.1	1PCT_100yr	77.88		77.89	5138.54	1138.78	640.25	100.37		4931.90	5055.10	
1	18528.1	Floodway	78.71	0.83	78.79	255.80	271.62	1469.88	137.90	4865.60	4931.90	5055.10	5121.40
1	18501.7	Culvert											
1	18402.6	1PCT_100yr	77.88		77.88	8058.16	756.87	336.59	785.93		4959.35	5042.15	
1	18402.6	Floodway	78.57	0.69	78.64	255.80	276.91	1396.41	206.08	4872.85	4959.35	5042.15	5128.65
1	17679.2	1PCT_100yr	77.86		77.86	7107.36	815.85	304.77	758.77		4958.90	5042.45	
1	17679.2	Floodway	78.38	0.52	78.44	241.55	270.68	1300.71	308.01	4879.90	4958.90	5042.45	5121.45
1	16850	1PCT_100yr	77.85		77.86	6765.68	622.54	223.15	292.92		4957.10	5042.90	
1	16850	Floodway	78.29	0.43	78.31	243.80	185.71	827.29	125.61	4878.10	4957.10	5042.90	5121.90
1	16467.8	Let Struct											
1	16085.5	1PCT_100yr	77.85		77.85	6479.33	548.32	231.60	511.09		4957.00	5043.00	
1	16085.5	Floodway	78.23	0.38	78.25	241.90	177.06	934.31	179.63	4878.60	4957.00	5043.00	5120.50
1	16054.3	Culvert											
1	15977.7	1PCT_100yr	75.87		75.92	3580.51	224.03	1072.10	29.37		4924.50	5054.60	
1	15977.7	Floodway	76.54	0.67	76.62	140.10	2.50	1322.68	0.32	4919.50	4924.50	5054.60	5059.60
1	15075.6	1PCT_100yr	75.02		75.12	1867.38	274.22	1220.40	10.58		4945.20	5052.30	
1	15075.6	Floodway	75.78	0.76	75.91	117.10	3.87	1501.00	0.33	4940.20	4945.20	5052.30	5057.30
1	14123.4	1PCT_100yr	74.20		74.28	1118.12	320.41	1078.51	106.28		4960.60	5033.90	
1	14123.4	Floodway	74.88	0.67	75.03	141.10	53.96	1447.12	4.22	4897.60	4960.60	5033.90	5038.90
1	13183.6	1PCT_100yr	73.30		73.46	471.52	120.69	1344.96	39.55		4968.70	5036.50	
1	13183.6	Floodway	74.02	0.72	74.19	77.80	7.02	1490.36	7.82	4963.70	4968.70	5036.50	5041.50



Reach	River Sta	Profile	W.S. Elev (ft)	Prof Delta WS (ft)	E.G. Elev (ft)	Top Width Act (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Enc Sta L (ft)	Ch Sta L (ft)	Ch Sta R (ft)	Enc Sta R (ft)
1	12867.8	1PCT_100yr	73.00		73.12	467.50	197.93	1261.98	45.29		4961.00	5033.90	
1	12867.8	Floodway	73.76	0.77	73.92	76.50	3.14	1499.87	2.20	4959.20	4961.00	5033.90	5035.70
1	12860.8 BR U	1PCT_100yr	72.99		73.10	466.76	379.28	1037.76	88.16		4961.00	5033.90	
1	12860.8 BR U	Floodway	73.66	0.67	73.88	76.50	5.33	1495.21	4.66	4959.20	4961.00	5033.90	5035.70
1	12860.8 BR D	1PCT_100yr	72.88		73.02	452.75	339.59	1082.99	82.62		4968.50	5035.00	
1	12860.8 BR D	Floodway	73.52	0.64	73.78	76.50	8.05	1487.80	9.35	4963.50	4968.50	5035.00	5040.00
1	12836.5	1PCT_100yr	72.83		73.00	448.02	151.00	1318.19	36.01		4968.50	5035.00	
1	12836.5	Floodway	73.54	0.71	73.73	76.50	3.47	1497.72	4.01	4963.50	4968.50	5035.00	5040.00
1	12214.3	1PCT_100yr	72.32		72.41	420.20	354.71	1145.70	4.79		4963.20	5034.90	
1	12214.3	Floodway	72.97	0.65	73.13	81.70	6.43	1496.18	2.58	4958.20	4963.20	5034.90	5039.90
1	11922.7	1PCT_100yr	72.05		72.15	446.21	327.12	1152.81	25.26		4952.10	5036.30	
1	11922.7	Floodway	72.68	0.64	72.85	94.20	14.75	1476.55	13.90	4947.10	4952.10	5036.30	5041.30
1	11900.3	1PCT_100yr	72.04		72.12	456.00	267.53	1228.68	8.99		4938.00	5054.20	
1	11900.3	Floodway	72.70	0.66	72.81	126.20	10.43	1483.09	11.69	4933.00	4938.00	5054.20	5059.20
1	11875.3	1PCT_100yr	72.03		72.10	477.00	227.54	1265.13	12.53		4922.30	5059.00	
1	11875.3	Floodway	72.70	0.67	72.79	146.70	6.77	1484.30	4.13	4917.30	4922.30	5059.00	5064.00
1	11269.5	1PCT_100yr	71.42		71.53	310.06	191.60	1306.90	6.70		4935.70	5037.90	
1	11269.5	Floodway	72.21	0.80	72.33	112.20	4.18	1499.00	2.02	4930.70	4935.70	5037.90	5042.90
1	10321.5	1PCT_100yr	70.67		70.78	421.02	73.30	1287.30	144.61		4953.70	5026.80	
1	10321.5	Floodway	71.60	0.93	71.73	83.10	6.33	1493.59	5.28	4948.70	4953.70	5026.80	5031.80
1	9759.4	1PCT_100yr	70.38		70.46	425.74	53.36	1266.04	185.80		4966.90	5047.20	
1	9759.4	Floodway	71.35	0.98	71.45	90.30	7.88	1492.40	5.12	4961.90	4966.90	5047.20	5052.20
1	9744.1	1PCT_100yr	70.39		70.44	473.13	11.36	1331.74	162.10		4914.30	5055.50	
1	9744.1	Floodway	71.38	0.99	71.43	151.20	3.62	1498.26	3.32	4909.30	4914.30	5055.50	5060.50
1	9714.8	1PCT_100yr	70.33		70.42	486.49	62.22	1245.16	197.82		4965.20	5035.20	
1	9714.8	Floodway	71.30	0.96	71.41	80.00	6.45	1493.60	5.16	4960.20	4965.20	5035.20	5040.20
1	9354.3	1PCT_100yr	70.03		70.16	655.18	325.46	1608.58	163.76		4957.40	5032.80	
1	9354.3	Floodway	70.94	0.91	71.15	113.15	33.42	2056.54	7.85	4924.65	4957.40	5032.80	5037.80
1	8406.8	1PCT_100yr	69.49		69.56	507.78	34.38	1203.37	860.05		4981.00	5038.80	
1	8406.8	Floodway	70.42	0.93	70.51	172.58	10.19	1472.78	614.83	4976.00	4981.00	5038.80	5148.58
1	8187.8	1PCT_100yr	69.40		69.46	350.43	23.28	1313.58	760.94		4957.20	5050.20	
1	8187.8	Floodway	70.33	0.93	70.41	163.78	11.73	1677.96	408.11	4952.20	4957.20	5050.20	5115.98
1	8175.8	1PCT_100yr	69.41		69.45	334.78	40.162	1408.34	287.84		4965.40	5056.80	
1	8175.8	Floodway	70.34	0.93	70.40	152.89	254.05	1722.94	120.81	4924.92	4965.40	5056.80	5077.81
1	7595.5	1PCT_100yr	69.26		69.31	329.61	397.93	1416.38	283.49		4965.40	5056.80	
1	7595.5	Floodway	70.18	0.92	70.25	142.28	120.82	1791.04	185.94	4945.32	4965.40	5056.80	5087.60
1	7486.4		Culvert										
1	7330.7	1PCT_100yr	69.18		69.24	263.66	429.86	1155.86	512.07		4974.20	5027.60	
1	7330.7	Floodway	70.11	0.93	70.19	142.28	299.02	1388.37	410.42	4935.12	4974.20	5027.60	5077.40
1	6955.1	1PCT_100yr	69.14		69.15	594.41	284.11	1124.33	689.36		4930.30	5047.90	
1	6955.1	Floodway	70.08	0.94	70.10	265.05	80.02	1398.21	619.57	4909.69	4930.30	5047.90	5174.74
1	6557.7	1PCT_100yr	69.05		69.09	302.65	268.95	1717.25	111.60		4950.00	5068.20	
1	6557.7	Floodway	70.02	0.98	70.05	256.50	323.16	1653.16	121.48	4855.90	4950.00	5068.20	5129.89
1	6466.7		Culvert										
1	6350.4	1PCT_100yr	68.95		68.96	504.10	495.34	1181.23	421.23		4942.25	5071.15	
1	6350.4	Floodway	69.91	0.97	69.93	273.99	387.78	1451.77	258.26	4853.50	4942.25	5071.15	5127.49
1	5682.4	1PCT_100yr	68.90		68.91	858.38	652.30	720.55	1009.34		4953.40	5033.30	
1	5682.4	Floodway	69.87	0.97	69.88	438.99	510.66	868.31	1003.23	4827.15	4953.40	5033.30	5266.14
1	5670.4	1PCT_100yr	68.90		68.91	939.66	913.49	383.26	1085.44		4970.90	5014.50	
1	5670.4	Floodway	69.87	0.97	69.88	491.44	912.64	461.85	1007.71	4756.32	4970.90	5014.50	5247.76
1	5512.6	1PCT_100yr	68.89		68.90	938.42	913.13	383.55	1085.52		4970.90	5014.50	
1	5512.6	Floodway	69.86	0.97	69.87	491.05	911.78	462.30	1008.11	4756.65	4970.90	5014.50	5247.70
1	4809.8	1PCT_100yr	68.85		68.86	1593.41	1068.18	344.16	969.86		4972.50	5016.10	
1	4809.8	Floodway	69.82	0.97	69.83	578.32	1152.20	409.95	820.05	4655.00	4972.50	5016.10	5233.32
1	4261.8	1PCT_100yr	68.84		68.84	1006.52	850.33	667.18	864.69		4962.00	5051.50	
1	4261.8	Floodway	69.81	0.97	69.81	501.23	775.34	797.90	808.96	4752.17	4962.00	5051.50	5253.40
1	4249.8	1PCT_100yr	68.84		68.84	1592.56	1066.42	344.85	970.93		4972.50	5016.10	
1	4249.8	Floodway	69.81	0.97	69.81	575.53	1149.84	411.22	821.14	4657.50	4972.50	5016.10	5233.03
1	3701.3	1PCT_100yr	68.83		68.83	1170.65	590.28	649.91	1142.01		4906.20	5022.70	



HEC-RAS Plan: Alt 1 Floodway River: Gapps Bayou Reach: 1 (Continued)

Reach	River Sta	Profile	W.S. Elev (ft)	Prof Delta WS (ft)	E.G. Elev (ft)	Top Width Act (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Enc Sta L (ft)	Ch Sta L (ft)	Ch Sta R (ft)	Enc Sta R (ft)
1	3701.3	Floodway	69.79	0.97	69.80	679.72	414.94	776.26	1191.00	4754.05	4906.20	5022.70	5433.77
1	2908.9	1PCT_100yr	68.81		68.81	1270.73	668.75	625.82	1087.63		4913.00	5033.80	
1	2906.9	Floodway	69.78	0.97	69.78	695.61	562.69	747.01	1072.51	4702.79	4913.00	5033.80	5398.60
1	2894	1PCT_100yr	68.81		68.81	1196.09	529.95	715.61	1136.64		4911.20	5045.00	
1	2894	Floodway	69.78	0.97	69.78	629.61	375.29	858.08	1148.83	4781.70	4911.20	5045.00	5411.31
1	2787.5	1PCT_100yr	68.81		68.81	1195.75	529.98	715.62	1136.60		4911.20	5045.00	
1	2787.5	Floodway	69.78	0.97	69.78	629.61	375.28	858.10	1148.82	4781.70	4911.20	5045.00	5411.31
1	1872.5	1PCT_100yr	68.79		68.79	2035.74	2034.15	423.22	329.93		4932.30	5036.10	
1	1872.5	Floodway	69.76	0.97	69.76	1026.66	2230.18	530.43	26.68	4037.70	4932.30	5036.10	5064.36
1	975.7	1PCT_100yr	68.71		68.74	1295.62	1223.18	1528.01	36.11		4904.00	5042.80	
1	975.7	Floodway	69.65	0.94	69.71	506.15	771.38	2010.17	5.75	4541.65	4904.00	5042.80	5047.80
1	91.2	1PCT_100yr	68.41		68.46	1803.84	1149.75	1619.97	17.58		4925.85	5048.35	
1	91.2	Floodway	69.42	1.00	69.45	1143.15	1090.84	1696.46		3905.20	4925.85	5048.35	5048.35
1	53.68 BR U	1PCT_100yr	68.40		68.42	1803.50	1727.22	1034.91	25.17		4925.85	5048.35	
1	53.68 BR U	Floodway	69.41	1.01	69.43	1143.15	1643.45	1143.85		3905.20	4925.85	5048.35	5048.35
1	53.68 BR D	1PCT_100yr	68.40		68.41	2642.92	2175.11	603.74	8.45		4933.10	5043.10	
1	53.68 BR D	Floodway	69.40	1.00	69.42	1141.90	1674.17	906.76	6.37	3906.20	4933.10	5043.10	5048.10
1	1.9	1PCT_100yr	68.37		68.39	2638.55	1735.74	1044.94	6.62		4933.10	5043.10	
1	1.9	Floodway	69.37	1.00	69.40	1141.90	1399.39	1383.15	4.77	3906.20	4933.10	5043.10	5048.10



**Appendix K:
Alternative 1 Cost Estimate
Computations**



**CONSTRUCTION COST ESTIMATE FOR THE GAPPS BAYOU IMPROVEMENTS
FLOOD PROTECTION PLANNING STUDY IN FORT BEND COUNTY, TEXAS
ALTERNATIVE 1**

Item No.	Description	Unit	Quantity	Unit Price	Total
1	Mobilization and Site Preparation and Restoration	L.S.	1	\$70,000.00	\$70,000
2	Detention Basin Earthwork (Excavation and Haul-off)	C.Y.	650,000	\$8.00	\$5,200,000
3	48" Reinforced Concrete Pipe, Complete In Place	L.F.	290	\$160.00	\$46,400
4	60" Corrugated Metal Pipe, Complete In Place	L.F.	120	\$180.00	\$21,600
5	8'x7' Reinforced Concrete Box, Complete In Place	L.F.	300	\$400.00	\$120,000
6	Weir Overflow Structure, 5" Concrete Slope Paving, Complete In Place	S.Y.	100	\$80.00	\$8,000
7	Headwall * (At FM 762 and Berdett Road)	C.Y.	55	\$300.00	\$16,500
8	Guardrail	EA	4	\$2,400.00	\$9,600
9	Remove and Dispose of All Pipes**	L.F.	432	\$12.00	\$5,184
10	Rock Filter Dam, Includes Installation & Removal, Complete In Place	EA	3	\$1,500.00	\$4,500
11	Silt Fence	L.F.	6,400	\$1.50	\$9,600
12	Stabilized Construction Access	EA	1	\$1,500.00	\$1,500
13	Turf Establishment	Ac.	44	\$2,500.00	\$110,000

Notes:

* Reflects TxDOT Standard Headwall.

** Includes 4-6'x5' RCB at FM 762.

Subtotal	\$5,622,900
Contingencies (15%)	\$843,400
Total Construction Cost	\$6,466,300

Engineering (10%)	\$646,600
Total	\$7,112,900

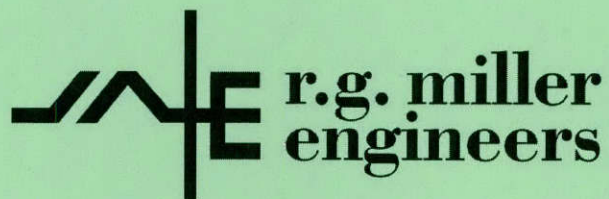


**r. g. miller
engineers, inc.**

Since 1966



**Appendix L:
Alternative 2 Modified Puls Routing**



Gapps Bayou Watershed
Alternative 2 Routing Reach Data

Gapps_0000_R			
Elevation	Total Stor	Storage	Discharge
64.63	261.02	261.02	241.97
66.65	500.12	500.12	483.94
67.14	572.19	572.19	725.91
67.49	627.33	627.33	967.88
67.79	674.97	674.97	1209.85
68.06	718.53	718.53	1451.82
68.3	758.6	758.6	1693.79
68.52	794.88	794.88	1935.76
68.72	829.77	829.77	2177.73
68.91	863.2	863.2	2419.7
69.09	895.5	895.5	2661.67
69.27	927.28	927.28	2903.64
69.75	1017.92	1017.92	3629.55

Gapps_0056_R			
Elevation	Total Stor	Storage	Discharge
65.1	302.86	41.84	214.27
66.97	586.17	86.05	428.54
67.6	672.8	100.61	642.81
68.08	740	112.67	857.08
68.49	798.54	123.57	1071.35
68.86	852.28	133.75	1285.62
69.2	902.02	143.42	1499.89
69.5	947.57	152.69	1714.16
69.79	991.63	161.86	1928.43
70.07	1034.22	171.02	2142.7
70.32	1075.56	180.06	2356.97
70.58	1116.61	189.33	2571.24
71.28	1236.71	218.79	3214.05

Gapps_0093_R			
Elevation	Total Stor	Storage	Discharge
69.25	317.81	14.95	157.91
70.71	609.85	23.68	315.82
71.81	703.59	30.79	473.73
72.72	778.97	38.97	631.64
73.55	847.25	48.71	789.55
74.23	914.22	61.94	947.46
74.56	982.84	80.82	1105.37
74.77	1047.57	100	1263.28
74.94	1110.34	118.71	1421.19
75.09	1171.28	137.06	1579.1
75.22	1231.14	155.58	1737.01
75.36	1291.45	174.84	1894.92
75.69	1473.18	236.47	2368.65

Gapps_0150_R			
Elevation	Total Stor	Storage	Discharge
70.14	320.28	2.47	136.54
71.67	613.81	3.96	273.08
72.79	708.89	5.3	409.62
73.72	785.54	6.57	546.16
74.8	856.69	9.44	682.7
75.5	930.24	16.02	819.24
75.89	1005.81	22.97	955.78
76.25	1078.31	30.74	1092.32
76.59	1149.86	39.52	1228.86
76.92	1219.84	48.56	1365.4
77.26	1289.59	58.45	1501.94
77.58	1361.04	69.59	1638.48
77.94	1571.57	98.39	2048.1

Gapps_0161_R			
Elevation	Total Stor	Storage	Discharge
70.44	365.29	45.01	185.94
71.97	680.51	66.7	371.88
73.12	792.32	83.43	557.82
74.10	883.5	97.96	743.76
75.22	972.68	115.99	929.7
76.03	1063.67	133.43	1115.64
76.48	1157.35	151.54	1301.58
76.77	1263.85	185.54	1487.52
76.94	1390.84	240.98	1673.46
77.09	1541.18	321.34	1859.4
77.31	1708.06	418.47	2045.34
77.60	1877.93	516.89	2231.28
77.94	2216.5	644.93	2789.1

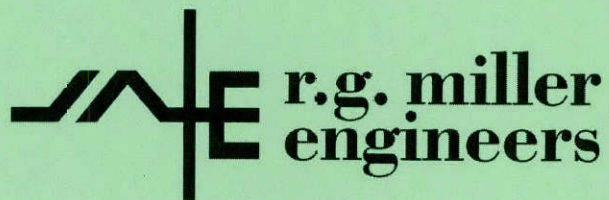
Gapps_0187_R			
Elevation	Total Stor	Storage	Discharge
70.47	517.09	151.8	160.56
72	885.92	205.41	321.12
73.16	1040.13	247.81	481.68
74.15	1168.87	285.37	642.24
75.28	1302.54	329.86	802.8
76.09	1427.69	364.02	963.36
76.55	1543.23	385.88	1123.92
76.85	1667.36	403.51	1284.48
77.03	1806.91	416.07	1445.04
77.19	1969.32	428.14	1605.6
77.41	2155.45	447.39	1766.16
77.71	2356.77	478.84	1926.72
78.06	2744.65	528.15	2408.4

Gapps_0236_R			
Elevation	Total Stor	Storage	Discharge
77.13	524.12	7.03	79.48
78.4	898.03	12.11	158.96
79.6	1058.08	17.95	238.44
80.33	1190.83	21.96	317.92
80.93	1328.33	25.79	397.4
81.53	1458.03	30.34	476.88
82.09	1578.21	34.98	556.36
82.61	1708.18	40.82	635.84
82.96	1856.58	49.67	715.32
83.19	2027.66	58.34	794.8
83.36	2223.89	68.44	874.28
83.49	2445.05	78.28	953.76
83.71	2851.68	107.03	1192.2

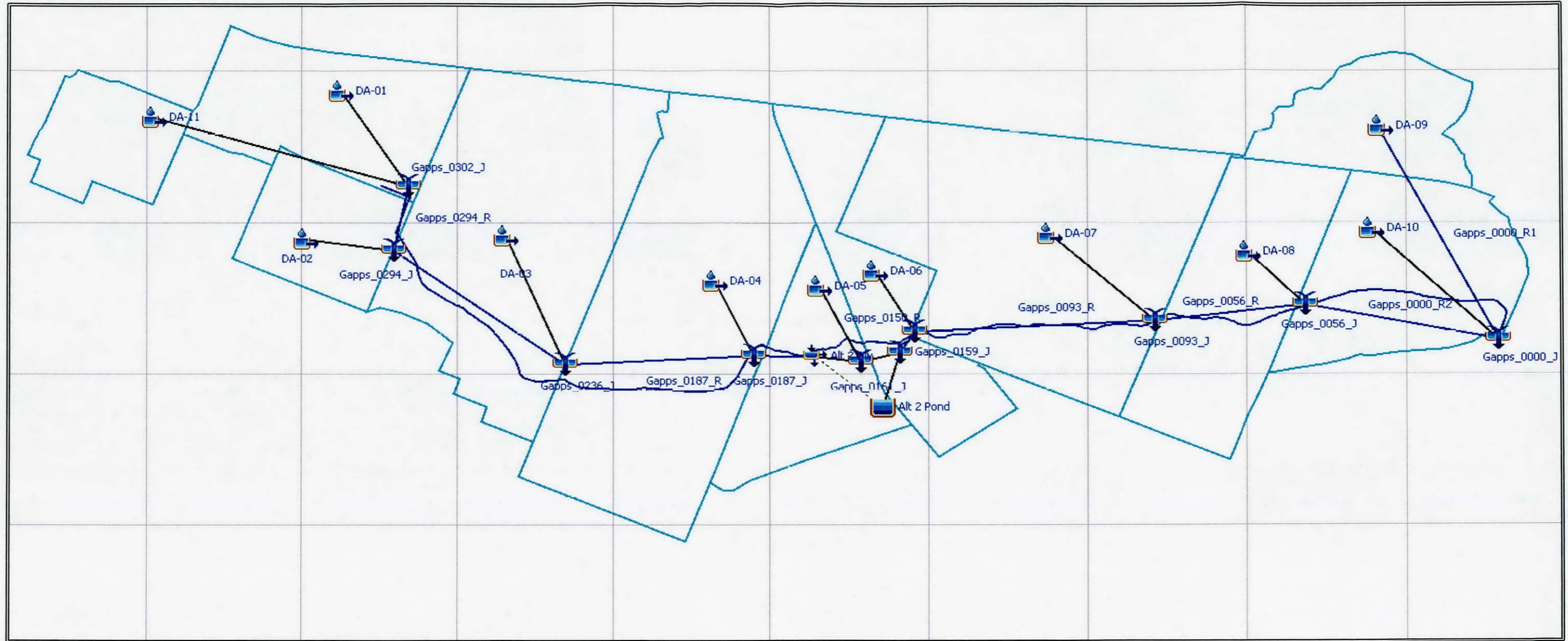
Gapps_0294_R			
Elevation	Total Stor	Storage	Discharge
78.25	524.88	0.76	51.22
79.07	899.49	1.46	102.44
79.99	1060.44	2.36	153.66
80.66	1194.02	3.19	204.88
81.23	1332.28	3.95	256.1
81.8	1462.79	4.76	307.32
82.35	1584.08	5.87	358.54
82.85	1715.44	7.26	409.76
83.2	1864.88	8.3	460.98
83.44	2036.69	9.03	512.2
83.63	2233.51	9.62	563.42
83.78	2445.22	10.17	614.64
84.1	2863.71	12.03	768.3



**Appendix M:
Alternative 2 HEC-HMS Model
Schematics and Results**



Gapps Bayou
Alternative 2 Conditions HEC-HMS Model Schematic





Project: Gapps Bayou 01312012 Simulation Run: Alt 2: 10PCT_10yr

Start of Run: 26Oct2011, 00:00 Basin Model: Alternative 2
 End of Run: 28Oct2011, 00:00 Meteorologic Model: 10PCT_10yr
 Compute Time: 30Jul2013, 23:53:52 Control Specifications: Control 48

Volume Units: AC-FT

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Alt 2 Div	3.985	825.9	26Oct2011, 23:00	1410.0
Alt 2 Pond	0.000	24.6	27Oct2011, 12:45	43.1
DA-01	0.568	308.9	26Oct2011, 17:45	200.2
DA-02	0.348	204.4	26Oct2011, 17:00	124.9
DA-03	1.275	549.1	26Oct2011, 18:45	414.0
DA-04	1.479	351.9	26Oct2011, 19:30	456.3
DA-05	0.459	190.0	26Oct2011, 17:45	141.1
DA-06	0.507	236.9	26Oct2011, 18:00	166.5
DA-07	1.428	541.7	26Oct2011, 18:30	437.8
DA-08	0.698	185.7	26Oct2011, 20:45	227.6
DA-09	0.390	124.1	26Oct2011, 18:45	118.0
DA-10	0.679	409.7	26Oct2011, 18:15	208.9
DA-11	0.295	54.8	26Oct2011, 21:45	88.5
Gapps_0C00_J	8.146	1765.2	26Oct2011, 23:45	2699.6
Gapps_0000_R1	0.390	124.1	26Oct2011, 19:30	117.7
Gapps_0000_R2	7.077	1558.0	27Oct2011, 00:45	2372.9
Gapps_0056_J	7.077	1563.0	26Oct2011, 23:00	2456.9
Gapps_0056_R	6.379	1396.9	26Oct2011, 23:15	2229.2
Gapps_0093_J	6.379	1398.2	26Oct2011, 22:45	2206.6
Gapps_0093_R	4.951	1061.0	26Oct2011, 23:45	1768.8
Gapps_0150_J	4.951	1065.2	26Oct2011, 22:15	1761.2
Gapps_0150_R	4.444	935.5	26Oct2011, 23:00	1594.7
Gapps_0159_J	4.444	940.4	26Oct2011, 22:30	1594.2
Gapps_0161_J	4.444	937.1	26Oct2011, 22:15	1551.1
Gapps_0161_R	3.985	1018.5	26Oct2011, 23:00	1582.3



Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Gapps_C187_J	3.985	1046.5	26Oct2011, 21:30	1564.6
Gapps_C187_R	2.506	721.7	26Oct2011, 22:00	1108.4
Gapps_0236_J	2.506	1055.3	26Oct2011, 18:45	967.0
Gapps_0236_R	1.231	506.2	26Oct2011, 18:30	553.0
Gapps_0294_J	1.231	512.6	26Oct2011, 17:45	491.1
Gapps_0294_R	0.883	327.1	26Oct2011, 18:15	366.3
Gapps_0302_J	0.883	331.2	26Oct2011, 17:45	288.7



Project: Gapps Bayou 01312012 Simulation Run: Alt 2: 2PCT_50yr

Start of Run: 26Oct2011, 00:00 Basin Model: Alternative 2
 End of Run: 28Oct2011, 00:00 Meteorologic Model: 2PCT_50yr
 Compute Time: 30Jul2013, 23:54:05 Control Specifications: Control 48

Volume Units: AC-FT

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Alt 2 Div	3.985	1084.7	26Oct2011, 23:15	1754.2
Alt 2 Pond	0.000	57.9	27Oct2011, 11:15	110.6
DA-01	0.588	420.4	26Oct2011, 17:45	285.4
DA-02	0.348	276.5	26Oct2011, 17:00	175.6
DA-03	1.275	761.1	26Oct2011, 18:45	597.7
DA-04	1.479	496.1	26Oct2011, 19:45	654.8
DA-05	0.459	262.6	26Oct2011, 17:45	206.9
DA-06	0.507	324.9	26Oct2011, 18:00	239.6
DA-07	1.428	755.3	26Oct2011, 18:30	641.8
DA-08	0.693	262.0	26Oct2011, 20:45	324.0
DA-09	0.390	174.3	26Oct2011, 18:45	173.0
DA-10	0.679	561.5	26Oct2011, 18:15	306.3
DA-11	0.295	77.0	26Oct2011, 22:00	124.4
Gapps_0000_J	8.146	2434.3	26Oct2011, 23:15	3318.7
Gapps_0000_R	0.390	174.3	26Oct2011, 19:30	172.6
Gapps_0000_R2	7.077	2127.3	27Oct2011, 00:30	3139.9
Gapps_0056_J	7.077	2134.9	26Oct2011, 22:45	3289.8
Gapps_0056_R	6.379	1895.2	26Oct2011, 23:00	2965.8
Gapps_0093_J	6.379	1896.8	26Oct2011, 22:30	2957.9
Gapps_0093_R	4.951	1412.5	27Oct2011, 00:15	2316.1
Gapps_0150_J	4.951	1416.8	26Oct2011, 22:45	2311.2
Gapps_0150_R	4.444	1243.5	26Oct2011, 23:45	2071.6
Gapps_0159_J	4.444	1252.5	26Oct2011, 22:45	2071.7
Gapps_0161_J	4.444	1239.3	26Oct2011, 22:30	1961.0
Gapps_0161_R	3.985	1448.6	26Oct2011, 23:15	2084.5



Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Gapps_C187_J	3.985	1561.7	26Oct2011, 21:30	2071.5
Gapps_0187_R	2.506	1089.7	26Oct2011, 21:45	1416.7
Gapps_0236_J	2.506	1423.2	26Oct2011, 19:00	1297.5
Gapps_0236_R	1.231	676.6	26Oct2011, 19:30	699.9
Gapps_0294_J	1.231	697.3	26Oct2011, 18:00	646.2
Gapps_0294_R	0.883	447.5	26Oct2011, 18:15	470.7
Gapps_0302_J	0.883	452.6	26Oct2011, 17:45	409.8



Project: Gapps Bayou 01312012 Simulation Run: Alt 2: 1PCT_100yr

Start of Run: 26Oct2011, 00:00 Basin Model: Alternative 2
 End of Run: 28Oct2011, 00:00 Meteorologic Model: 1PCT_100yr
 Compute Time: 30Jul2013, 23:53:56 Control Specifications: Control 48

Volume Units: AC-FT

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Alt 2 Div	3.935	1191.1	26Oct2011, 23:30	1932.1
Alt 2 Pond	0.000	65.2	27Oct2011, 11:45	127.7
DA-01	0.588	474.4	26Oct2011, 17:45	330.9
DA-02	0.348	310.3	26Oct2011, 17:00	202.6
DA-03	1.275	863.1	26Oct2011, 18:45	695.6
DA-04	1.479	566.1	26Oct2011, 19:45	760.8
DA-05	0.459	298.4	26Oct2011, 17:45	241.9
DA-06	0.507	368.0	26Oct2011, 18:00	278.7
DA-07	1.428	859.8	26Oct2011, 18:30	750.5
DA-08	0.658	298.3	26Oct2011, 20:45	375.4
DA-09	0.390	198.9	26Oct2011, 18:45	202.3
DA-10	0.679	634.0	26Oct2011, 18:15	358.1
DA-11	0.295	87.8	26Oct2011, 22:00	143.6
Gapps_0000_J	8.146	2763.4	26Oct2011, 23:15	4100.9
Gapps_0000_R1	0.390	198.9	26Oct2011, 19:30	201.9
Gapps_0000_R2	27.077	2394.3	27Oct2011, 00:30	3540.9
Gapps_0056_J	7.077	2401.5	26Oct2011, 22:45	3710.7
Gapps_0056_R	6.379	2126.5	26Oct2011, 23:00	3335.2
Gapps_0093_J	6.379	2128.0	26Oct2011, 22:30	3334.7
Gapps_0093_R	4.951	1567.9	27Oct2011, 00:15	2584.2
Gapps_0150_J	4.951	1571.9	26Oct2011, 22:45	2580.2
Gapps_0150_R	4.444	1377.2	27Oct2011, 00:00	2301.5
Gapps_0159_J	4.444	1386.2	26Oct2011, 23:00	2301.8
Gapps_0161_J	4.444	1365.4	26Oct2011, 22:45	2174.0
Gapps_0161_R	3.985	1623.0	26Oct2011, 23:30	2350.5



Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Gapps_0187_J	3.985	1853.7	26Oct2011, 21:15	2340.8
Gapps_0187_R	2.506	1311.1	26Oct2011, 21:30	1579.9
Gapps_0236_J	2.506	1606.3	26Oct2011, 19:00	1473.5
Gapps_0236_R	1.231	765.5	26Oct2011, 19:30	777.8
Gapps_0294_J	1.231	795.1	26Oct2011, 18:00	729.2
Gapps_0294_R	0.883	509.6	26Oct2011, 18:00	526.6
Gapps_C302_J	0.883	512.2	26Oct2011, 17:45	474.5



Project: Gapps Bayou 01312012 Simulation Run: Alt 2: 0.2PCT_500yr

Start of Run: 26Oct2011, 00:00 Basin Model: Alternative 2
 End of Run: 28Oct2011, 00:00 Meteorologic Model: 0.2PCT_500yr
 Compute Time: 30Jul2013, 23:53:49 Control Specifications: Control 48

Volume Units: AC-FT

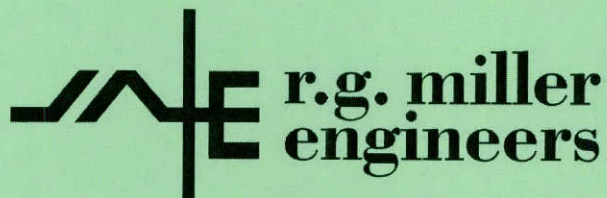
Hydrologic Elemen:	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Alt 2 Div	3.985	1402.0	27Oct2011, 00:15	2319.4
Alt 2 Pond	0.000	338.0	27Oct2011, 07:15	273.8
DA-01	0.588	594.2	26Oct2011, 17:45	425.3
DA-02	0.348	386.7	26Oct2011, 17:00	258.5
DA-03	1.275	1093.2	26Oct2011, 18:45	900.4
DA-04	1.479	725.1	26Oct2011, 20:00	981.2
DA-05	0.459	376.5	26Oct2011, 17:45	315.6
DA-06	0.507	462.9	26Oct2011, 18:00	360.1
DA-07	1.428	1091.4	26Oct2011, 18:30	979.2
DA-08	0.698	382.0	26Oct2011, 20:45	482.0
DA-09	0.390	253.7	26Oct2011, 19:00	264.0
DA-10	0.679	796.8	26Oct2011, 18:15	467.3
DA-11	0.295	112.5	26Oct2011, 22:15	182.9
Gapps_0000_J	8.146	3529.3	26Oct2011, 22:45	5267.3
Gapps_0000_R1	0.390	253.7	26Oct2011, 19:45	263.4
Gapps_0000_R2	7.077	2992.3	26Oct2011, 23:45	4536.7
Gapps_0056_J	7.077	2999.3	26Oct2011, 22:15	4726.8
Gapps_0056_R	6.379	2634.5	26Oct2011, 22:45	4244.8
Gapps_0093_J	6.379	2636.4	26Oct2011, 22:00	4250.4
Gapps_0093_R	4.951	1882.7	27Oct2011, 00:30	3271.1
Gapps_0150_J	4.951	1886.0	26Oct2011, 23:00	3268.4
Gapps_0150_R	4.444	1649.3	27Oct2011, 00:30	2908.3
Gapps_0159_J	4.444	1664.9	26Oct2011, 23:30	2908.8
Gapps_0161_J	4.444	1617.1	26Oct2011, 23:00	2635.0
Gapps_0161_R	3.985	1977.1	27Oct2011, 00:15	2942.8



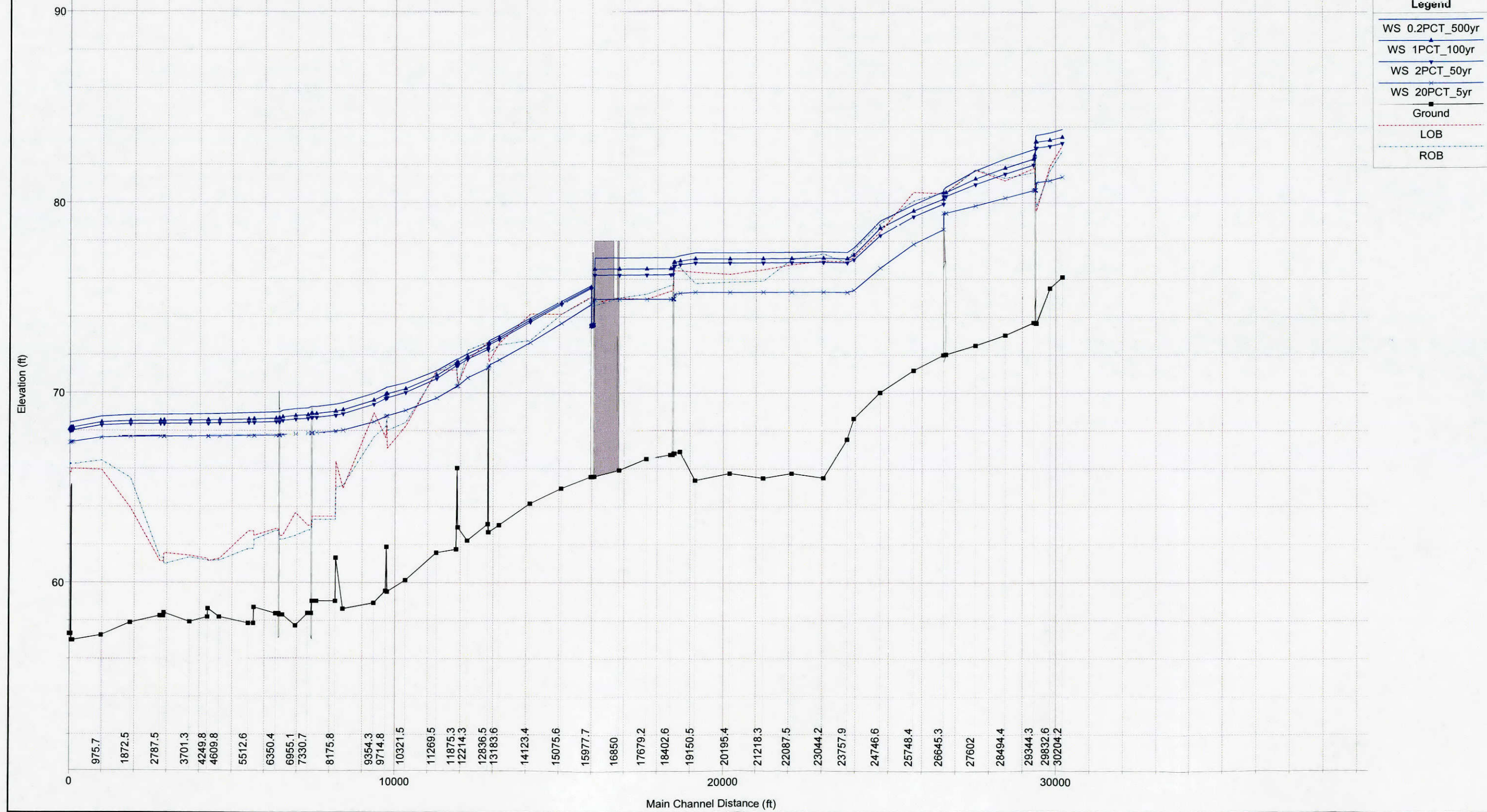
Hydrologic Elemen:	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Gapps_0187_J	3.985	2483.1	26Oct2011, 21:00	2935.2
Gapps_0187_R	2.506	1770.3	26Oct2011, 21:15	1954.0
Gapps_C236_J	2.506	2022.3	26Oct2011, 19:15	1856.7
Gapps_C236_R	1.231	964.2	26Oct2011, 19:45	956.3
Gapps_0294_J	1.231	1004.3	26Oct2011, 17:45	912.2
Gapps_0294_R	0.883	642.3	26Oct2011, 18:00	653.7
Gapps_0302_J	0.883	643.3	26Oct2011, 18:00	608.2



**Appendix N:
Alternative 2 HEC-RAS Profiles and
Output**



Gapps Bayou Final Plan: Alternative 2 - Lateral 7/30/2013
 Gapps Bayou 1



1 in Horiz. = 3000 ft 1 in Vert. = 5 ft



HEC-RAS Plan: Alt 2- Lat River: Gapps Bayou Reach: 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	30204.2	0.2PCT_500yr	643.30	76.10	83.86		83.90	0.000509	1.70	438.62	260.05	0.16
1	30204.2	1PCT_100yr	512.20	76.10	83.44		83.48	0.000492	1.54	362.80	158.84	0.15
1	30204.2	2PCT_50yr	452.60	76.10	83.13		83.16	0.000551	1.51	314.98	146.41	0.16
1	30204.2	10PCT_10yr	331.20	76.10	82.05		82.10	0.000603	1.66	199.94	67.26	0.17
1	29832.6	0.2PCT_500yr	643.30	75.51	83.67		83.73	0.000393	1.99	495.80	237.50	0.15
1	29832.6	1PCT_100yr	512.20	75.51	83.29		83.33	0.000320	1.71	420.08	162.29	0.13
1	29832.6	2PCT_50yr	452.60	75.51	82.97		83.01	0.000312	1.61	371.58	152.27	0.13
1	29832.6	10PCT_10yr	331.20	75.51	81.87		81.91	0.000408	1.55	216.07	86.16	0.14
1	29428.5	0.2PCT_500yr	1004.60	73.66	83.54	77.72	83.61	0.000275	2.01	911.35	556.86	0.13
1	29428.5	1PCT_100yr	794.80	73.66	83.19	77.31	83.23	0.000203	1.67	812.82	239.91	0.11
1	29428.5	2PCT_50yr	697.80	73.66	82.89	77.08	82.92	0.000183	1.54	739.99	234.11	0.11
1	29428.5	10PCT_10yr	512.60	73.66	81.78	76.63	81.81	0.000186	1.37	498.20	205.82	0.10
1	29411.9		Culvert									
1	29344.3	0.2PCT_500yr	1004.60	73.70	82.80		82.88	0.000566	2.43	627.74	473.74	0.18
1	29344.3	1PCT_100yr	794.80	73.70	82.30		82.38	0.000597	2.35	410.31	366.29	0.18
1	29344.3	2PCT_50yr	697.80	73.70	81.98		82.06	0.000595	2.25	321.16	147.81	0.18
1	29344.3	10PCT_10yr	512.60	73.70	81.20		81.26	0.000536	1.97	260.13	60.81	0.17
1	28494.4	0.2PCT_500yr	1004.60	73.03	82.31		82.39	0.000562	2.43	584.80	357.05	0.18
1	28494.4	1PCT_100yr	794.80	73.03	81.82		81.90	0.000530	2.22	438.76	264.18	0.17
1	28494.4	2PCT_50yr	697.80	73.03	81.52		81.58	0.000522	2.12	371.37	182.79	0.17
1	28494.4	10PCT_10yr	512.60	73.03	80.78		80.83	0.000467	1.86	278.85	79.41	0.16
1	27602	0.2PCT_500yr	1004.60	72.49	81.68		81.79	0.000861	2.80	462.30	316.13	0.22
1	27602	1PCT_100yr	794.80	72.49	81.25		81.35	0.000738	2.52	358.57	195.67	0.20
1	27602	2PCT_50yr	697.80	72.49	80.96		81.05	0.000697	2.40	308.71	142.26	0.19
1	27602	10PCT_10yr	512.60	72.49	80.31		80.38	0.000563	2.05	250.38	56.95	0.17
1	26717.3	0.2PCT_500yr	1004.60	72.02	80.82	76.55	80.93	0.001105	2.81	560.18	316.88	0.24
1	26717.3	1PCT_100yr	794.80	72.02	80.53	76.04	80.62	0.000919	2.45	481.24	249.18	0.22
1	26717.3	2PCT_50yr	697.80	72.02	80.34	75.78	80.41	0.000738	2.31	434.98	219.15	0.20
1	26717.3	10PCT_10yr	512.60	72.02	79.86	75.23	79.92	0.000473	1.96	345.33	167.39	0.16
1	26712.7		Culvert									
1	26645.3	0.2PCT_500yr	1004.60	71.99	80.59		80.69	0.000905	2.71	574.86	560.00	0.22
1	26645.3	1PCT_100yr	794.80	71.99	80.19		80.28	0.000747	2.51	416.34	295.00	0.20
1	26645.3	2PCT_50yr	697.80	71.99	79.94		80.02	0.000719	2.41	349.71	227.31	0.20
1	26645.3	10PCT_10yr	512.60	71.99	79.19		79.26	0.000664	2.19	235.47	64.37	0.19
1	25748.4	0.2PCT_500yr	1004.60	71.18	79.89		79.95	0.000720	2.39	922.70	1052.21	0.20
1	25748.4	1PCT_100yr	794.80	71.18	79.57		79.63	0.000680	2.27	634.91	738.84	0.19
1	25748.4	2PCT_50yr	697.80	71.18	79.28		79.35	0.000768	2.36	457.42	475.03	0.20
1	25748.4	10PCT_10yr	512.60	71.18	78.44		78.53	0.001013	2.53	232.32	146.98	0.23
1	24746.6	0.2PCT_500yr	1004.60	70.02	79.06		79.14	0.000935	2.71	858.14	1194.79	0.22
1	24746.6	1PCT_100yr	794.80	70.02	78.67		78.78	0.001105	2.80	492.37	719.57	0.24
1	24746.6	2PCT_50yr	697.80	70.02	78.30		78.42	0.001149	2.90	315.78	245.07	0.24
1	24746.6	10PCT_10yr	512.60	70.02	77.28		77.40	0.001262	2.80	197.80	70.83	0.25
1	23956.8	0.2PCT_500yr	1004.60	68.65	77.64		77.89	0.003149	4.03	263.18	132.36	0.39
1	23956.8	1PCT_100yr	794.80	68.65	77.26		77.46	0.002741	3.59	223.54	88.50	0.36
1	23956.8	2PCT_50yr	697.80	68.65	77.02		77.20	0.002147	3.40	205.26	58.49	0.32
1	23956.8	10PCT_10yr	512.60	68.65	76.15		76.30	0.001532	3.11	165.07	40.99	0.27
1	23757.9	0.2PCT_500yr	2021.30	67.55	77.40		77.55	0.001165	3.16	717.50	388.08	0.26
1	23757.9	1PCT_100yr	1605.60	67.55	77.07		77.19	0.000941	2.71	615.77	206.81	0.23
1	23757.9	2PCT_50yr	1425.10	67.55	76.86		76.96	0.000867	2.53	576.10	159.71	0.22
1	23757.9	10PCT_10yr	1055.30	67.55	76.03		76.11	0.000661	2.27	466.54	111.36	0.19
1	23044.2	0.2PCT_500yr	2021.30	65.52	77.44		77.45	0.000027	0.73	2821.20	612.58	0.04
1	23044.2	1PCT_100yr	1605.60	65.52	77.11		77.11	0.000019	0.61	2654.63	400.31	0.04
1	23044.2	2PCT_50yr	1425.10	65.52	76.89		76.89	0.000016	0.55	2583.05	301.67	0.03
1	23044.2	10PCT_10yr	1055.30	65.52	76.06		76.07	0.000011	0.45	2345.45	280.29	0.03
1	22087.5	0.2PCT_500yr	2021.30	65.76	77.42		77.43	0.000024	0.68	3185.14	676.93	0.04
1	22087.5	1PCT_100yr	1605.60	65.76	77.09		77.09	0.000017	0.57	2966.40	631.40	0.03
1	22087.5	2PCT_50yr	1425.10	65.76	76.87		76.88	0.000015	0.52	2838.06	551.57	0.03
1	22087.5	10PCT_10yr	1055.30	65.76	76.05		76.05	0.000010	0.42	2495.80	312.54	0.03
1	21218.3	0.2PCT_500yr	2021.30	65.51	77.40		77.41	0.000023	0.71	2965.78	637.90	0.04
1	21218.3	1PCT_100yr	1605.60	65.51	77.07		77.08	0.000016	0.59	2789.64	476.02	0.03
1	21218.3	2PCT_50yr	1425.10	65.51	76.86		76.87	0.000014	0.53	2693.21	423.54	0.03



HEC-RAS Plan: Alt 2- Lat River: Gapps Bayou Reach: 1 (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	21218.3	10PCT_10yr	1055.30	65.51	76.04		76.05	0.000010	0.43	2427.46	291.44	0.03
1	20195.4	0.2PCT_500yr	2021.30	65.76	77.39		77.40	0.000004	0.33	6523.61	1194.54	0.02
1	20195.4	1PCT_100yr	1605.60	65.76	77.07		77.07	0.000003	0.27	6168.02	1029.74	0.01
1	20195.4	2PCT_50yr	1425.10	65.76	76.86		76.86	0.000003	0.24	5956.71	939.99	0.01
1	20195.4	10PCT_10yr	1055.30	65.76	76.04		76.04	0.000002	0.20	5345.38	622.65	0.01
1	19150.5	0.2PCT_500yr	2021.30	65.39	77.39		77.39	0.000006	0.39	5622.24	1177.43	0.02
1	19150.5	1PCT_100yr	1605.60	65.39	77.07		77.07	0.000004	0.32	5279.70	1001.88	0.02
1	19150.5	2PCT_50yr	1425.10	65.39	76.85		76.86	0.000004	0.29	5071.95	906.50	0.02
1	19150.5	10PCT_10yr	1055.30	65.39	76.04		76.04	0.000003	0.23	4511.47	521.80	0.01
1	18693.0	0.2PCT_500yr	2456.60	66.90	77.24		77.37	0.000793	3.04	1770.61	2123.01	0.22
1	18693.0	1PCT_100yr	1859.40	66.90	76.96		77.05	0.000581	2.52	1265.39	1520.04	0.19
1	18693.0	2PCT_50yr	1559.20	66.90	76.77		76.84	0.000475	2.23	1008.61	1116.26	0.17
1	18693.0	10PCT_10yr	1042.70	66.90	75.98		76.03	0.000345	1.78	608.77	272.26	0.14
1	18528.1	0.2PCT_500yr	2456.60	66.81	77.15	72.33	77.25	0.000640	2.72	1609.46	1921.20	0.20
1	18528.1	1PCT_100yr	1859.40	66.81	76.88	71.68	76.96	0.000529	2.40	1157.17	1376.05	0.18
1	18528.1	2PCT_50yr	1559.20	66.81	76.70	71.28	76.77	0.000446	2.16	944.33	876.93	0.16
1	18528.1	10PCT_10yr	1042.70	66.81	75.92	70.52	75.97	0.000342	1.78	601.62	220.26	0.14
1	18501.7		Culvert									
1	18402.6	0.2PCT_500yr	2456.60	66.74	77.14		77.15	0.000022	0.75	6128.26	6516.91	0.04
1	18402.6	1PCT_100yr	1859.40	66.74	76.55		76.56	0.000020	0.69	3307.36	2737.84	0.04
1	18402.6	2PCT_50yr	1559.20	66.74	76.24		76.24	0.000017	0.61	2709.95	1215.76	0.04
1	18402.6	10PCT_10yr	1042.70	66.74	75.54		75.54	0.000010	0.45	2311.75	320.23	0.03
1	17679.2	0.2PCT_500yr	2456.60	66.52	77.12		77.13	0.000022	0.67	7430.22	5626.44	0.04
1	17679.2	1PCT_100yr	1859.40	66.52	76.54		76.54	0.000023	0.66	4296.46	4536.00	0.04
1	17679.2	2PCT_50yr	1559.20	66.52	76.22		76.23	0.000020	0.61	3230.69	2418.40	0.04
1	17679.2	10PCT_10yr	1042.70	66.52	75.53		75.53	0.000013	0.46	2343.18	643.36	0.03
1	16850	0.2PCT_500yr	2456.60	65.92	77.11		77.11	0.000022	0.69	6748.29	5347.71	0.04
1	16850	1PCT_100yr	1859.40	65.92	76.52		76.53	0.000021	0.65	4063.84	3083.73	0.04
1	16850	2PCT_50yr	1559.20	65.92	76.21		76.21	0.000018	0.58	3246.68	1945.86	0.04
1	16850	10PCT_10yr	1042.70	65.92	75.52		75.52	0.000011	0.44	2500.86	606.93	0.03
1	16467.8		Lat Struct									
1	16085.5	0.2PCT_500yr	1661.67	65.58	77.10	67.35	77.10	0.000007	0.40	8451.69	5297.62	0.02
1	16085.5	1PCT_100yr	1338.22	65.58	76.51	67.18	76.52	0.000008	0.40	5639.27	4220.26	0.02
1	16085.5	2PCT_50yr	1151.39	65.58	76.20	67.08	76.20	0.000008	0.39	4435.72	3427.51	0.02
1	16085.5	10PCT_10yr	839.78	65.58	75.52	66.91	75.52	0.000006	0.33	2829.94	1251.31	0.02
1	16054.3		Culvert									
1	15977.7	0.2PCT_500yr	1077.17	65.57	75.64		75.69	0.000627	1.95	1671.72	2694.47	0.18
1	15977.7	1PCT_100yr	1052.52	65.57	75.57		75.62	0.000655	1.96	1492.57	2279.84	0.18
1	15977.7	2PCT_50yr	1015.99	65.57	75.50		75.55	0.000656	1.94	1353.01	1926.99	0.18
1	15977.7	10PCT_10yr	826.08	65.57	75.14		75.19	0.000686	1.85	813.43	1197.45	0.18
1	15075.6	0.2PCT_500yr	1297.37	64.96	74.81		74.91	0.001158	2.71	1105.83	1459.15	0.24
1	15075.6	1PCT_100yr	1227.82	64.96	74.73		74.83	0.001158	2.67	994.43	1261.79	0.24
1	15075.6	2PCT_50yr	1174.89	64.96	74.66		74.76	0.001166	2.65	907.22	1154.61	0.24
1	15075.6	10PCT_10yr	948.68	64.96	74.23		74.33	0.001314	2.59	535.87	625.90	0.25
1	14123.4	0.2PCT_500yr	1297.37	64.17	73.93		74.03	0.000772	2.73	977.14	993.07	0.21
1	14123.4	1PCT_100yr	1227.82	64.17	73.82		73.92	0.000803	2.76	869.93	954.06	0.21
1	14123.4	2PCT_50yr	1174.89	64.17	73.73		73.83	0.000826	2.78	781.79	888.26	0.21
1	14123.4	10PCT_10yr	948.68	64.17	73.18		73.30	0.000913	2.80	409.44	313.03	0.22
1	13183.6	0.2PCT_500yr	1297.37	63.03	73.02		73.18	0.001066	3.26	506.31	357.44	0.25
1	13183.6	1PCT_100yr	1227.82	63.03	72.90		73.05	0.001061	3.21	465.64	317.93	0.24
1	13183.6	2PCT_50yr	1174.89	63.03	72.80		72.95	0.001062	3.17	435.25	295.18	0.24
1	13183.6	10PCT_10yr	948.68	63.03	72.26		72.40	0.001003	2.94	329.63	96.31	0.23
1	12867.8	0.2PCT_500yr	1297.37	62.66	72.74	67.73	72.85	0.000801	2.85	625.42	410.27	0.21
1	12867.8	1PCT_100yr	1227.82	62.66	72.62	67.61	72.74	0.000799	2.80	580.42	365.87	0.21
1	12867.8	2PCT_50yr	1174.89	62.66	72.53	67.50	72.64	0.000797	2.77	546.37	329.29	0.21
1	12867.8	10PCT_10yr	948.68	62.66	71.99	67.02	72.10	0.000837	2.65	401.97	225.54	0.21
1	12860.8		Bridge									
1	12836.5	0.2PCT_500yr	1297.37	63.09	72.55		72.71	0.001143	3.36	505.19	365.96	0.25
1	12836.5	1PCT_100yr	1227.82	63.09	72.40		72.57	0.001151	3.34	454.80	327.34	0.25



HEC-RAS Plan: Alt 2- Lat River: Gapps Bayou Reach: 1 (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	12836.5	2PCT_50yr	1174.89	63.09	72.29		72.45	0.001148	3.32	419.31	293.13	0.25
1	12836.5	10PCT_10yr	948.68	63.09	71.73		71.88	0.001045	3.08	312.88	76.60	0.24
1	12214.3	0.2PCT_500yr	1297.37	62.22	72.05		72.15	0.000709	2.67	699.75	373.42	0.20
1	12214.3	1PCT_100yr	1227.82	62.22	71.89		71.99	0.000735	2.68	642.67	345.92	0.20
1	12214.3	2PCT_50yr	1174.89	62.22	71.77		71.87	0.000745	2.67	601.78	323.64	0.20
1	12214.3	10PCT_10yr	948.68	62.22	71.20		71.30	0.000792	2.66	438.79	235.92	0.21
1	11922.7	0.2PCT_500yr	1297.37	62.92	71.78		71.89	0.001052	2.85	644.97	408.90	0.24
1	11922.7	1PCT_100yr	1227.82	62.92	71.59		71.71	0.001191	2.94	570.11	382.95	0.25
1	11922.7	2PCT_50yr	1174.89	62.92	71.46		71.58	0.001281	2.99	519.96	352.99	0.26
1	11922.7	10PCT_10yr	948.68	62.92	70.82		70.96	0.001776	3.14	343.23	214.97	0.30
1	11900.3	0.2PCT_500yr	1297.37	66.04	71.78		71.86	0.000889	2.45	694.16	418.85	0.22
1	11900.3	1PCT_100yr	1227.82	66.04	71.59		71.68	0.001010	2.52	617.51	397.05	0.23
1	11900.3	2PCT_50yr	1174.89	66.04	71.45		71.54	0.001099	2.57	564.82	373.81	0.24
1	11900.3	10PCT_10yr	948.68	66.04	70.80		70.92	0.001627	2.74	363.87	240.01	0.28
1	11875.3	0.2PCT_500yr	1297.37	61.76	71.76		71.83	0.000879	2.31	713.51	461.86	0.21
1	11875.3	1PCT_100yr	1227.82	61.76	71.57		71.65	0.001011	2.40	625.47	448.13	0.23
1	11875.3	2PCT_50yr	1174.89	61.76	71.43		71.52	0.001084	2.45	564.85	415.47	0.23
1	11875.3	10PCT_10yr	948.68	61.76	70.78		70.88	0.001131	2.51	377.35	115.72	0.24
1	11269.5	0.2PCT_500yr	1297.37	61.58	71.17		71.27	0.000982	2.67	593.21	276.15	0.23
1	11269.5	1PCT_100yr	1227.82	61.58	70.91		71.02	0.001047	2.77	526.90	245.36	0.24
1	11269.5	2PCT_50yr	1174.89	61.58	70.75		70.86	0.001065	2.81	487.33	227.08	0.24
1	11269.5	10PCT_10yr	948.68	61.58	70.13		70.25	0.000946	2.74	369.24	163.77	0.23
1	10321.5	0.2PCT_500yr	1297.37	60.14	70.53		70.61	0.000506	2.47	1014.37	416.48	0.17
1	10321.5	1PCT_100yr	1227.82	60.14	70.21		70.30	0.000571	2.53	884.32	400.92	0.18
1	10321.5	2PCT_50yr	1174.89	60.14	70.02		70.11	0.000601	2.54	809.90	379.71	0.19
1	10321.5	10PCT_10yr	948.68	60.14	69.44		69.53	0.000614	2.39	601.42	340.69	0.19
1	9759.4	0.2PCT_500yr	1297.37	59.53	70.29		70.35	0.000394	2.19	1156.39	421.06	0.15
1	9759.4	1PCT_100yr	1227.82	59.53	69.94		70.01	0.000448	2.24	1014.17	391.94	0.16
1	9759.4	2PCT_50yr	1174.89	59.53	69.73		69.80	0.000477	2.26	933.64	379.77	0.17
1	9759.4	10PCT_10yr	948.68	59.53	69.15		69.21	0.000489	2.13	720.27	346.78	0.17
1	9744.1	0.2PCT_500yr	1297.37	61.89	70.30		70.34	0.000311	1.67	1226.82	462.63	0.13
1	9744.1	1PCT_100yr	1227.82	61.89	69.95		69.99	0.000368	1.73	1075.55	418.90	0.14
1	9744.1	2PCT_50yr	1174.89	61.89	69.74		69.79	0.000403	1.75	989.16	389.72	0.15
1	9744.1	10PCT_10yr	948.68	61.89	69.16		69.20	0.000456	1.69	768.70	364.22	0.15
1	9714.8	0.2PCT_500yr	1297.37	59.58	70.26		70.33	0.000396	2.29	1185.22	450.86	0.16
1	9714.8	1PCT_100yr	1227.82	59.58	69.91		69.98	0.000448	2.36	1030.29	417.56	0.16
1	9714.8	2PCT_50yr	1174.89	59.58	69.69		69.77	0.000476	2.37	945.46	393.72	0.17
1	9714.8	10PCT_10yr	948.68	59.58	69.11		69.18	0.000480	2.23	723.78	364.52	0.17
1	9354.3	0.2PCT_500yr	1995.47	58.94	69.97		70.10	0.000884	3.27	1510.21	652.19	0.23
1	9354.3	1PCT_100yr	1772.52	58.94	69.61		69.73	0.000915	3.19	1286.25	586.54	0.23
1	9354.3	2PCT_50yr	1633.89	58.94	69.39		69.52	0.000928	3.14	1162.11	569.95	0.23
1	9354.3	10PCT_10yr	1274.18	58.94	68.82		68.93	0.000895	2.89	861.13	466.95	0.22
1	8406.8	0.2PCT_500yr	1995.47	58.63	69.47		69.53	0.000391	2.53	1623.84	504.77	0.16
1	8406.8	1PCT_100yr	1772.52	58.63	69.10		69.16	0.000401	2.48	1442.59	444.67	0.16
1	8406.8	2PCT_50yr	1633.89	58.63	68.89		68.95	0.000390	2.40	1353.24	422.31	0.16
1	8406.8	10PCT_10yr	1274.18	58.63	68.35		68.40	0.000356	2.17	1133.18	399.17	0.15
1	8187.8	0.2PCT_500yr	1995.47	61.31	69.39		69.44	0.000356	2.12	1485.69	350.24	0.15
1	8187.8	1PCT_100yr	1772.52	61.31	69.02		69.06	0.000362	2.05	1355.19	342.22	0.15
1	8187.8	2PCT_50yr	1633.89	61.31	68.81		68.86	0.000356	1.99	1285.31	338.14	0.15
1	8187.8	10PCT_10yr	1274.18	61.31	68.28		68.32	0.000325	1.78	1109.00	328.16	0.14
1	8175.8	0.2PCT_500yr	1995.47	59.04	69.40		69.44	0.000215	1.88	1606.76	334.45	0.12
1	8175.8	1PCT_100yr	1772.52	59.04	69.02		69.06	0.000206	1.78	1485.34	309.63	0.12
1	8175.8	2PCT_50yr	1633.89	59.04	68.82		68.85	0.000196	1.71	1422.81	300.42	0.11
1	8175.8	10PCT_10yr	1274.18	59.04	68.29		68.31	0.000161	1.47	1273.66	267.36	0.10
1	7595.5	0.2PCT_500yr	1995.47	59.04	69.27	64.19	69.31	0.000230	1.92	1564.07	329.77	0.12
1	7595.5	1PCT_100yr	1772.52	59.04	68.90	63.99	68.94	0.000220	1.82	1447.53	304.10	0.12
1	7595.5	2PCT_50yr	1633.89	59.04	68.70	63.84	68.73	0.000209	1.74	1388.03	295.18	0.12
1	7595.5	10PCT_10yr	1274.18	59.04	68.19	63.41	68.22	0.000170	1.50	1248.22	266.46	0.10
1	7466.4		Culvert									
1	7330.7	0.2PCT_500yr	1995.47	58.40	69.19		69.24	0.000304	2.37	1417.58	264.25	0.14
1	7330.7	1PCT_100yr	1772.52	58.40	68.83		68.88	0.000286	2.24	1326.94	245.59	0.14



HEC-RAS Plan: Alt 2- Lat River: Gapps Bayou Reach: 1 (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	7330.7	2PCT_50yr	1633.89	58.40	68.64		68.69	0.000268	2.13	1281.00	238.27	0.13
1	7330.7	10PCT_10yr	1274.18	58.40	68.16		68.19	0.000212	1.82	1166.44	233.99	0.12
1	6955.1	0.2PCT_500yr	1995.47	57.75	69.15		69.17	0.000107	1.26	2736.66	595.13	0.08
1	6955.1	1PCT_100yr	1772.52	57.75	68.80		68.81	0.000106	1.21	2526.66	579.78	0.08
1	6955.1	2PCT_50yr	1633.89	57.75	68.61		68.62	0.000102	1.17	2417.26	574.92	0.08
1	6955.1	10PCT_10yr	1274.18	57.75	68.13		68.14	0.000087	1.02	2143.23	563.78	0.07
1	6557.7	0.2PCT_500yr	1995.47	58.32	69.07	63.31	69.11	0.000184	1.76	1546.18	303.85	0.11
1	6557.7	1PCT_100yr	1772.52	58.32	68.72	63.15	68.76	0.000172	1.65	1442.24	287.37	0.11
1	6557.7	2PCT_50yr	1633.89	58.32	68.54	63.02	68.57	0.000160	1.56	1390.14	278.43	0.10
1	6557.7	10PCT_10yr	1274.18	58.32	68.07	62.76	68.09	0.000124	1.32	1265.88	256.61	0.09
1	6466.7		Culvert									
1	6350.4	0.2PCT_500yr	1995.47	58.38	68.98		69.00	0.000080	1.14	2815.64	504.52	0.07
1	6350.4	1PCT_100yr	1772.52	58.38	68.65		68.66	0.000075	1.07	2647.44	500.66	0.07
1	6350.4	2PCT_50yr	1633.89	58.38	68.47		68.48	0.000071	1.02	2560.49	498.02	0.07
1	6350.4	10PCT_10yr	1274.18	58.38	68.03		68.04	0.000055	0.87	2342.64	487.97	0.06
1	5682.4	0.2PCT_500yr	2354.07	58.71	68.94		68.95	0.000058	1.04	4586.90	860.95	0.06
1	5682.4	1PCT_100yr	2038.71	58.71	68.61		68.62	0.000051	0.96	4305.54	837.92	0.06
1	5682.4	2PCT_50yr	1865.59	58.71	68.44		68.45	0.000046	0.90	4163.67	814.00	0.06
1	5682.4	10PCT_10yr	1436.38	58.71	68.01		68.01	0.000035	0.75	3818.69	777.69	0.05
1	5670.4	0.2PCT_500yr	2354.07	57.87	68.94		68.95	0.000056	1.02	5041.90	944.78	0.06
1	5670.4	1PCT_100yr	2038.71	57.87	68.61		68.62	0.000050	0.93	4736.30	906.55	0.06
1	5670.4	2PCT_50yr	1865.59	57.87	68.44		68.44	0.000046	0.88	4581.74	899.91	0.05
1	5670.4	10PCT_10yr	1436.38	57.87	68.01		68.01	0.000035	0.74	4195.47	876.88	0.05
1	5512.6	0.2PCT_500yr	2354.07	57.87	68.93		68.94	0.000057	1.02	5033.27	943.59	0.06
1	5512.6	1PCT_100yr	2038.71	57.87	68.60		68.61	0.000050	0.93	4728.96	906.25	0.06
1	5512.6	2PCT_50yr	1865.59	57.87	68.43		68.44	0.000046	0.88	4575.01	899.58	0.06
1	5512.6	10PCT_10yr	1436.38	57.87	68.00		68.00	0.000035	0.74	4190.59	874.68	0.05
1	4609.8	0.2PCT_500yr	2354.07	58.20	68.90		68.90	0.000036	0.85	7073.85	1606.31	0.05
1	4609.8	1PCT_100yr	2038.71	58.20	68.57		68.57	0.000033	0.80	6556.87	1562.93	0.05
1	4609.8	2PCT_50yr	1865.59	58.20	68.40		68.40	0.000030	0.76	6297.28	1529.10	0.05
1	4609.8	10PCT_10yr	1436.38	58.20	67.98		67.98	0.000024	0.65	5657.75	1475.24	0.04
1	4261.8	0.2PCT_500yr	2354.07	58.64	68.88		68.89	0.000034	0.83	5819.12	1009.42	0.05
1	4261.8	1PCT_100yr	2038.71	58.64	68.56		68.56	0.000029	0.74	5498.18	954.50	0.04
1	4261.8	2PCT_50yr	1865.59	58.64	68.39		68.39	0.000026	0.69	5341.43	926.04	0.04
1	4261.8	10PCT_10yr	1436.38	58.64	67.97		67.97	0.000018	0.56	4959.77	884.39	0.04
1	4249.8	0.2PCT_500yr	2354.07	58.20	68.88		68.88	0.000036	0.86	7052.05	1605.28	0.05
1	4249.8	1PCT_100yr	2038.71	58.20	68.56		68.56	0.000033	0.80	6538.45	1561.18	0.05
1	4249.8	2PCT_50yr	1865.59	58.20	68.39		68.39	0.000030	0.76	6280.99	1528.32	0.05
1	4249.8	10PCT_10yr	1436.38	58.20	67.97		67.97	0.000024	0.65	5646.12	1474.41	0.04
1	3701.3	0.2PCT_500yr	2354.07	57.94	68.87		68.87	0.000019	0.61	7455.53	1238.31	0.04
1	3701.3	1PCT_100yr	2038.71	57.94	68.55		68.55	0.000016	0.56	7078.48	1175.91	0.03
1	3701.3	2PCT_50yr	1865.59	57.94	68.38		68.38	0.000015	0.53	6886.49	1165.64	0.03
1	3701.3	10PCT_10yr	1436.38	57.94	67.96		67.96	0.000011	0.44	6405.37	1138.97	0.03
1	2906.9	0.2PCT_500yr	2354.07	58.42	68.86		68.86	0.000016	0.57	8118.37	1694.41	0.03
1	2906.9	1PCT_100yr	2038.71	58.42	68.53		68.54	0.000014	0.51	7712.50	1636.51	0.03
1	2906.9	2PCT_50yr	1865.59	58.42	68.37		68.37	0.000012	0.48	7510.41	1600.83	0.03
1	2906.9	10PCT_10yr	1436.38	58.42	67.95		67.95	0.000009	0.39	7008.05	1558.80	0.02
1	2894	0.2PCT_500yr	2354.07	58.26	68.85		68.86	0.000019	0.61	7443.36	1869.45	0.04
1	2894	1PCT_100yr	2038.71	58.26	68.53		68.54	0.000016	0.55	7063.05	1812.02	0.03
1	2894	2PCT_50yr	1865.59	58.26	68.37		68.37	0.000015	0.51	6871.15	1787.52	0.03
1	2894	10PCT_10yr	1436.38	58.26	67.95		67.95	0.000011	0.42	6394.49	1732.42	0.03
1	2787.5	0.2PCT_500yr	2354.07	58.26	68.85		68.85	0.000019	0.61	7440.66	1868.98	0.04
1	2787.5	1PCT_100yr	2038.71	58.26	68.53		68.53	0.000016	0.55	7060.77	1811.72	0.03
1	2787.5	2PCT_50yr	1865.59	58.26	68.37		68.37	0.000015	0.51	6869.12	1787.22	0.03
1	2787.5	10PCT_10yr	1436.38	58.26	67.95		67.95	0.000011	0.42	6393.04	1732.29	0.03
1	1872.5	0.2PCT_500yr	2857.47	57.90	68.83		68.83	0.000025	0.60	9781.96	2038.72	0.04
1	1872.5	1PCT_100yr	2369.31	57.90	68.51		68.52	0.000021	0.53	9139.94	1990.14	0.04
1	1872.5	2PCT_50yr	2137.89	57.90	68.35		68.35	0.000019	0.49	8818.94	1960.67	0.03
1	1872.5	10PCT_10yr	1616.78	57.90	67.94		67.94	0.000013	0.39	8020.96	1896.09	0.03
1	975.7	0.2PCT_500yr	2857.47	57.23	68.75		68.78	0.000356	1.97	3619.23	1339.97	0.15
1	975.7	1PCT_100yr	2369.31	57.23	68.44		68.47	0.000321	1.80	3238.00	1210.99	0.14

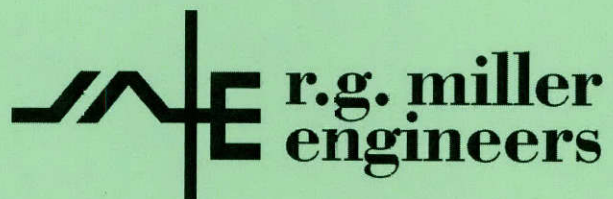


HEC-RAS Plan: Alt 2- Lat River: Gapps Bayou Feach: 1 (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	975.7	2PCT_50yr	2137.89	57.23	68.28		68.31	0.000302	1.72	3048.91	1196.81	0.13
1	975.7	10PCT_10yr	1616.78	57.23	67.89		67.91	0.000257	1.50	2583.37	1158.15	0.12
1	91.2	0.2PCT_500yr	2857.47	56.97	68.45	63.73	68.50	0.000400	2.18	3943.86	1805.26	0.16
1	91.2	1PCT_100yr	2369.31	56.97	68.16	63.16	68.20	0.000376	2.05	3423.31	1796.61	0.15
1	91.2	2PCT_50yr	2137.89	56.97	68.02	62.85	68.06	0.000363	1.98	3158.53	1792.66	0.15
1	91.2	10PCT_10yr	1616.78	56.97	67.65	62.05	67.68	0.000326	1.79	2498.70	1776.45	0.14
1	53.68	Bridge										
1	1.9	0.2PCT_500yr	2857.47	57.31	68.41	65.59	68.43	0.000300	1.75	5767.64	2645.13	0.13
1	1.9	1PCT_100yr	2369.31	57.31	68.12	65.12	68.14	0.000300	1.69	5009.05	2593.39	0.13
1	1.9	2PCT_50yr	2137.89	57.31	67.97	64.08	67.99	0.000300	1.66	4624.11	2588.00	0.13
1	1.9	10PCT_10yr	1616.78	57.31	67.60	63.30	67.62	0.000300	1.57	3664.50	2543.71	0.13



**Appendix O:
Alternative 2 Floodway
Computations**



HEC-RAS Plan: Alt 2 Floodway River: Gapps Ba you Reach: 1

Reach	River Sta	Profile	W.S. Elev (ft)	Prof Delta WS (ft)	E.G. Elev (ft)	Top Width Act (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Enc Sta L (ft)	Ch Sta L (ft)	Ch Sta R (ft)	Enc Sta R (ft)
1	30204.2	1PCT_100yr	83.44		83.48	158.84	0.70	511.45	0.05				
1	30204.2	Floodway	83.91	0.47	83.94	110.40	0.01	512.16	0.02	4937.80	4938.80	5047.20	5048.20
1	29832.6	1PCT_100yr	83.29		83.33	162.29	2.73	508.37	1.10		4969.90	5029.30	
1	29832.6	Floodway	83.80	0.51	83.84	61.40	0.03	512.13	0.04	4968.90	4969.90	5029.30	5030.30
1	29428.5	1PCT_100yr	83.19		83.23	239.91	5.24	782.62	6.94		4966.90	5035.70	
1	29428.5	Floodway	83.72	0.53	83.76	90.80	1.84	791.41	1.55	4955.90	4966.90	5035.70	5046.70
1	29411.9												
1	29344.3	1PCT_100yr	82.30		82.38	366.29	0.22	773.85	20.72		4966.30	5030.60	
1	29344.3	Floodway	82.66	0.36	82.73	84.30	0.23	788.86	5.71	4956.30	4966.30	5030.60	5040.60
1	28494.4	1PCT_100yr	81.82		81.90	264.18	0.73	763.71	30.37		4966.30	5032.80	
1	28494.4	Floodway	82.27	0.45	82.34	106.50	0.80	781.25	12.75	4946.30	4966.30	5032.80	5052.80
1	27602	1PCT_100yr	81.25		81.35	195.67	0.02	772.09	22.69		4965.70	5031.00	
1	27602	Floodway	81.83	0.58	81.91	125.30	0.27	786.47	8.05	4935.70	4965.70	5031.00	5061.00
1	26717.3	1PCT_100yr	80.53		80.62	249.18	75.10	708.11	11.59		4969.60	5042.40	
1	26717.3	Floodway	81.40	0.87	81.46	152.80	50.26	701.47	43.07	4929.60	4969.60	5042.40	5082.40
1	26712.7												
1	26645.3	1PCT_100yr	80.19		80.28	295.00	8.21	733.23	53.36		4963.50	5031.70	
1	26645.3	Floodway	80.77	0.57	80.86	70.20	0.04	794.70	0.06	4962.50	4963.50	5031.70	5032.70
1	25748.4	1PCT_100yr	79.57		79.63	738.84	15.27	579.97	199.56		4969.20	5031.40	
1	25748.4	Floodway	80.00	0.43	80.13	77.67		791.12	3.68	4968.20	4969.20	5031.40	5050.41
1	24746.6	1PCT_100yr	78.67		78.78	719.57	47.07	708.34	39.39		4965.60	5025.50	
1	24746.6	Floodway	78.91	0.24	79.05	61.03	0.09	794.71	0.00	4964.60	4965.60	5025.50	5026.50
1	23956.8	1PCT_100yr	77.26		77.46	88.50	0.32	794.48			4959.40	5033.30	
1	23956.8	Floodway	77.78	0.52	77.93	75.90	0.13	794.63	0.04	4958.40	4959.40	5033.30	5034.30
1	23757.9	1PCT_100yr	77.07		77.19	206.81	4.57	1600.73	0.31		4940.60	5074.10	
1	23757.9	Floodway	77.65	0.58	77.74	135.50	0.11	1605.38	0.11	4939.60	4940.60	5074.10	5075.10
1	23044.2	1PCT_100yr	77.11		77.11	400.31	0.03	1605.57			4843.85	5152.85	
1	23044.2	Floodway	77.68	0.57	77.69	311.00	0.01	1605.58	0.01	4842.85	4843.85	5152.85	5153.85
1	22087.5	1PCT_100yr	77.09		77.09	631.40	3.30	1602.30	0.00		4823.50	5162.70	
1	22087.5	Floodway	77.67	0.58	77.67	341.20	0.02	1605.57	0.01	4822.50	4823.50	5162.70	5163.70
1	21218.3	1PCT_100yr	77.07		77.08	476.02	1.03	1604.41	0.16		4851.80	5144.80	
1	21218.3	Floodway	77.65	0.58	77.66	295.00	0.03	1605.53	0.05	4850.80	4851.80	5144.80	5145.80
1	20195.4	1PCT_100yr	77.07		77.07	1029.74	2.34	1603.11	0.15		4698.75	5290.45	
1	20195.4	Floodway	77.65	0.58	77.65	593.70	0.02	1605.56	0.02	4697.75	4698.75	5290.45	5291.45
1	19150.5	1PCT_100yr	77.07		77.07	1001.88	3.37	1602.11	0.12		4735.25	5234.75	
1	19150.5	Floodway	77.65	0.58	77.65	501.50	0.02	1605.56	0.03	4734.25	4735.25	5234.75	5235.75
1	18693.0	1PCT_100yr	76.96		77.05	1520.04	82.17	1776.74	0.49		4931.90	5055.10	
1	18693.0	Floodway	77.55	0.59	77.63	125.20	0.15	1859.12	0.12	4930.90	4931.90	5055.10	5056.10
1	18528.1	1PCT_100yr	76.88		76.96	1376.05	177.07	1681.91	0.43		4931.90	5055.10	
1	18528.1	Floodway	77.49	0.61	77.56	315.80	125.59	1709.00	24.81	4835.60	4931.90	5055.10	5151.40
1	18501.7												
1	18402.6	1PCT_100yr	76.55		76.56	2737.84	18.44	1814.20	26.76		4843.85	5157.65	
1	18402.6	Floodway	76.71	0.16	76.72	315.80	0.12	1859.21	0.07	4842.85	4843.85	5157.65	5158.65
1	17679.2	1PCT_100yr	76.54		76.54	4536.00	71.23	1703.67	84.50		4850.90	5150.45	
1	17679.2	Floodway	76.69	0.16	76.70	301.55	0.19	1859.05	0.16	4849.90	4850.90	5150.45	5151.45
1	16850	1PCT_100yr	76.52		76.53	3083.73	106.00	1729.90	23.50		4849.10	5150.90	
1	16850	Floodway	76.67	0.15	76.68	303.80	0.18	1859.05	0.18	4848.10	4849.10	5150.90	5151.90
1	16467.8												
1	16085.5	1PCT_100yr	76.51		76.52	4220.26	105.04	1117.37	115.81		4848.60	5150.50	
1	16085.5	Floodway	76.67	0.15	76.67	301.90		1276.63		4848.60	4848.60	5150.50	5150.50
1	16054.3												
1	15977.7	1PCT_100yr	75.57		75.62	2279.84	118.70	920.88	12.94		4924.50	5054.60	
1	15977.7	Floodway	75.80	0.24	75.86	132.10	0.13	990.78	0.02	4923.50	4924.50	5054.60	5055.60
1	15075.6	1PCT_100yr	74.73		74.83	1261.79	151.21	1072.29	4.31		4945.20	5052.30	
1	15075.6	Floodway	75.01	0.28	75.12	109.10	0.22	1165.99	0.02	4944.20	4945.20	5052.30	5053.30
1	14123.4	1PCT_100yr	73.82		73.92	954.06	120.87	1043.67	63.27		4960.60	5033.90	
1	14123.4	Floodway	74.06	0.24	74.20	73.81		1165.96	0.27	4959.60	4960.60	5033.90	5034.90
1	13183.6	1PCT_100yr	72.90		73.05	317.93	36.02	1170.91	20.88		4968.70	5036.50	
1	13183.6	Floodway	73.24	0.34	73.38	69.80	0.29	1165.59	0.36	4967.70	4968.70	5036.50	5037.50



HEC-RAS Plan: Alt 2 Floodway River: Gapps Ba you Reach: 1 (Continued)

Reach	River Sta	Profile	W.S. Elev (ft)	Prof Delta WS (ft)	E.G. Elev (ft)	Top Width Act (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Enc Sta L (ft)	Ch Sta L (ft)	Ch Sta R (ft)	Enc Sta R (ft)
1	12867.8	1PCT_100yr	72.62		72.74	365.87	107.24	1106.13	14.45		4961.00	5033.90	
1	12867.8	Floodway	73.00	0.38	73.12	72.90		1166.23		4961.00	4961.00	5033.90	5033.90
1	12860.8 BR U	1PCT_100yr	72.59		72.72	356.15	209.62	992.11	26.08		4961.00	5033.90	
1	12860.8 BR U	Floodway	72.91	0.32	73.09	72.90		1166.23		4961.00	4961.00	5033.90	5033.90
1	12860.8 BR D	1PCT_100yr	72.40		72.60	327.15	102.77	1086.13	38.91		4968.50	5035.00	
1	12860.8 BR D	Floodway	72.77	0.36	72.99	68.50	0.04	1166.13	0.06	4967.50	4968.50	5035.00	5036.00
1	12836.5	1PCT_100yr	72.40		72.57	327.34	42.69	1168.99	16.14		4968.50	5035.00	
1	12836.5	Floodway	72.79	0.38	72.94	68.50	0.02	1166.18	0.03	4967.50	4968.50	5035.00	5036.00
1	12214.3	1PCT_100yr	71.89		71.99	345.92	207.52	1019.21	1.08		4963.20	5034.90	
1	12214.3	Floodway	72.27	0.37	72.39	73.70	0.24	1165.98	0.00	4962.20	4963.20	5034.90	5035.90
1	11922.7	1PCT_100yr	71.59		71.71	382.95	171.02	1048.42	8.37		4952.10	5036.30	
1	11922.7	Floodway	71.99	0.39	72.12	86.20	1.06	1164.07	1.10	4951.10	4952.10	5036.30	5037.30
1	11900.3	1PCT_100yr	71.59		71.68	397.05	123.87	1098.60	5.34		4938.00	5054.20	
1	11900.3	Floodway	72.00	0.41	72.09	118.20	0.72	1164.50	1.01	4937.00	4938.00	5054.20	5055.20
1	11875.3	1PCT_100yr	71.57		71.65	448.13	86.22	1139.24	2.36		4922.30	5059.00	
1	11875.3	Floodway	71.99	0.42	72.07	138.70	0.37	1165.73	0.12	4921.30	4922.30	5059.00	5060.00
1	11269.5	1PCT_100yr	70.91		71.02	245.36	100.79	1125.68	1.35		4935.70	5037.90	
1	11269.5	Floodway	71.51	0.60	71.61	104.20	0.10	1166.06	0.07	4934.70	4935.70	5037.90	5038.90
1	10321.5	1PCT_100yr	70.21		70.30	400.92	43.52	1094.99	89.31		4953.70	5026.80	
1	10321.5	Floodway	70.98	0.76	71.06	75.10	0.46	1165.36	0.41	4952.70	4953.70	5026.80	5027.80
1	9759.4	1PCT_100yr	69.94		70.01	391.94	35.90	1064.35	127.56		4966.90	5047.20	
1	9759.4	Floodway	70.77	0.83	70.84	82.30	0.58	1165.24	0.41	4965.90	4966.90	5047.20	5048.20
1	9744.1	1PCT_100yr	69.95		69.99	418.90	4.48	1108.21	115.12		4914.30	5055.50	
1	9744.1	Floodway	70.79	0.84	70.83	143.20	0.29	1165.68	0.26	4913.30	4914.30	5055.50	5056.50
1	9714.8	1PCT_100yr	69.91		69.98	417.56	41.96	1050.65	135.21		4965.20	5035.20	
1	9714.8	Floodway	70.73	0.83	70.81	72.00	0.49	1165.36	0.38	4964.20	4965.20	5035.20	5036.20
1	9354.3	1PCT_100yr	69.61		69.73	586.54	232.91	1420.69	118.91		4957.40	5032.80	
1	9354.3	Floodway	70.42	0.81	70.59	77.40	0.30	1709.98	0.65	4956.40	4957.40	5032.80	5033.80
1	8406.8	1PCT_100yr	69.10		69.16	444.67	24.83	1070.21	677.47		4981.00	5038.80	
1	8406.8	Floodway	69.94	0.84	70.02	153.73	0.87	1281.18	428.88	4980.00	4981.00	5038.80	5133.73
1	8187.8	1PCT_100yr	69.02		69.06	342.22	15.56	1138.44	618.51		4957.20	5050.20	
1	8187.8	Floodway	69.86	0.84	69.93	152.21	1.04	1425.94	283.95	4956.20	4957.20	5050.20	5108.41
1	8175.8	1PCT_100yr	69.02		69.06	309.63	330.49	1208.42	233.60		4965.40	5056.80	
1	8175.8	Floodway	69.87	0.85	69.92	145.56	191.18	1441.93	77.82	4928.06	4965.40	5056.80	5073.62
1	7595.5	1PCT_100yr	68.90		68.94	304.10	327.42	1214.56	230.53		4965.40	5056.80	
1	7595.5	Floodway	69.74	0.84	69.79	137.61	87.89	1485.71	137.33	4947.24	4965.40	5056.80	5084.85
1	7466.4												
1	7330.7	1PCT_100yr	68.83		68.88	245.59	353.87	994.10	424.55		4974.20	5027.60	
1	7330.7	Floodway	69.70	0.87	69.76	137.61	231.91	1162.30	316.72	4937.04	4974.20	5027.60	5074.65
1	6955.1	1PCT_100yr	68.80		68.81	579.78	229.29	974.69	568.54		4930.30	5047.90	
1	6955.1	Floodway	69.67	0.87	69.69	249.25	40.94	1182.49	487.49	4916.60	4930.30	5047.90	5165.85
1	6557.7	1PCT_100yr	68.72		68.76	287.37	218.61	1463.24	90.67		4950.00	5068.20	
1	6557.7	Floodway	69.62	0.90	69.65	245.87	243.97	1370.83	96.12	4865.18	4950.00	5068.20	5127.38
1	6466.7												
1	6350.4	1PCT_100yr	68.65		68.66	500.66	408.83	1012.14	351.55		4942.25	5071.15	
1	6350.4	Floodway	69.56	0.91	69.57	262.20	295.91	1210.67	204.35	4862.78	4942.25	5071.15	5124.98
1	5682.4	1PCT_100yr	68.61		68.62	837.92	555.77	627.40	855.54		4953.40	5033.30	
1	5682.4	Floodway	69.52	0.91	69.53	429.51	403.08	738.80	835.25	4834.52	4953.40	5033.30	5264.03
1	5670.4	1PCT_100yr	68.61		68.62	906.55	782.67	333.03	923.02		4970.90	5014.50	
1	5670.4	Floodway	69.52	0.91	69.53	464.56	742.91	392.26	841.96	4762.29	4970.90	5014.50	5246.85
1	5512.6	1PCT_100yr	68.60		68.61	906.25	782.43	333.24	923.05		4970.90	5014.50	
1	5512.6	Floodway	69.51	0.91	69.52	484.35	742.36	392.52	842.25	4762.50	4970.90	5014.50	5246.85
1	4609.8	1PCT_100yr	68.57		68.57	1562.93	876.89	304.57	857.25		4972.50	5016.10	
1	4609.8	Floodway	69.48	0.91	69.48	551.43	926.00	354.34	694.78	4680.00	4972.50	5016.10	5231.43
1	4261.8	1PCT_100yr	68.56		68.56	954.50	709.97	567.28	761.46		4962.00	5051.50	
1	4261.8	Floodway	69.47	0.91	69.47	504.71	645.16	662.34	669.63	4749.48	4962.00	5051.50	5254.19
1	4249.8	1PCT_100yr	68.56		68.56	1561.18	875.79	305.02	857.91		4972.50	5016.10	
1	4249.8	Floodway	69.47	0.91	69.47	550.11	926.31	355.08	695.73	4681.25	4972.50	5016.10	5231.38
1	3701.3	1PCT_100yr	68.55		68.55	1161.13	503.64	564.15	970.92		4966.20	5022.70	



HEC-RAS Plan: Alt 2 Floodway River: Gapps Bayou Reach: 1 (Continued)

Reach	River Sta	Profile	W.S. Elev (ft)	Prof Delta WS (ft)	E.G. Elev (ft)	Top Width Act (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Enc Sta L (ft)	Ch Sta L (ft)	Ch Sta R (ft)	Enc Sta R (ft)
1	3701.3	Floodway	69.46	0.91	69.46	667.82	364.96	657.55	954.62	4746.58	4906.20	5022.70	5414.40
1	2906.9	1PCT_100yr	68.53		68.54	1240.46	575.29	536.42	927.01		4913.00	5033.80	
1	2906.9	Floodway	69.45	0.91	69.45	692.56	463.55	624.89	888.68	4704.35	4913.00	5033.80	5396.91
1	2894	1PCT_100yr	68.53		68.54	1171.46	451.43	616.81	970.48		4911.20	5045.00	
1	2894	Floodway	69.45	0.91	69.45	620.72	301.17	722.22	953.73	4788.88	4911.20	5045.00	5407.60
1	2787.5	1PCT_100yr	68.53		68.53	1171.34	451.40	616.85	970.46		4911.20	5045.00	
1	2787.5	Floodway	69.44	0.91	69.45	620.66	301.08	722.27	953.77	4786.92	4911.20	5045.00	5407.60
1	1872.5	1PCT_100yr	68.51		68.52	1990.14	1736.93	363.13	269.25		4932.30	5036.10	
1	1872.5	Floodway	69.43	0.91	69.43	1004.46	1850.02	447.41	10.30	4046.45	4932.30	5036.10	5050.91
1	975.7	1PCT_100yr	68.44		68.47	1210.99	997.59	1349.03	22.70		4904.00	5042.80	
1	975.7	Floodway	69.34	0.89	69.38	456.50	552.53	1754.67	0.53	4587.30	4904.00	5042.80	5043.80
1	91.2	1PCT_100yr	68.16		68.20	1796.61	884.44	1472.27	12.60		4925.85	5048.35	
1	91.2	Floodway	69.10	0.94	69.14	993.70	734.50	1573.23		4054.65	4925.85	5048.35	5048.35
1	53.68 BR U	1PCT_100yr	68.15		68.17	1796.33	1383.76	967.01	18.55		4925.85	5048.35	
1	53.68 BR U	Floodway	69.10	0.94	69.12	993.70	1185.75	1121.98		4054.65	4925.85	5048.35	5048.35
1	53.68 BR D	1PCT_100yr	68.15		68.16	2594.75	1800.98	562.19	6.15		4933.10	5043.10	
1	53.68 BR D	Floodway	69.09	0.94	69.11	988.45	1447.89	859.17	0.67	4055.65	4933.10	5043.10	5044.10
1	1.9	1PCT_100yr	68.12		68.14	2593.39	1398.47	966.14	4.70		4933.10	5043.10	
1	1.9	Floodway	69.06	0.94	69.09	988.45	1033.56	1273.69	0.48	4055.65	4933.10	5043.10	5044.10



**Appendix P:
Alternative 2 Cost Estimate
Computations**



**CONSTRUCTION COST ESTIMATE FOR THE GAPPS BAYOU IMPROVEMENTS
FLOOD PROTECTION PLANNING STUDY IN FORT BEND COUNTY, TEXAS
ALTERNATIVE 2**

Item No.	Description	Unit	Quantity	Unit Price	Total
1	Mobilization and Site Preparation and Restoration	L.S.	1	\$70,000.00	\$70,000
2	Excavation (Channel Clean Out and Re-Grading)	C.Y.	90,000	\$8.00	\$720,000
3	Detention Basin Earthwork (Excavation and Haul-off)	C.Y.	600,000	\$8.00	\$4,800,000
4	48" Reinforced Concrete Pipe, Complete In Place	L.F.	410	\$160.00	\$65,600
5	72" Reinforced Concrete Pipe, Complete In Place	L.F.	80	\$170.00	\$13,600
6	108" Corrugated Metal Pipe, Complete In Place	L.F.	120	\$200.00	\$24,000
7	8'x7' Reinforced Concrete Box, Complete In Place	L.F.	300	\$400.00	\$120,000
8	Weir Overflow Structure, 5" Concrete Slope Paving, Complete In Place	S.Y.	100	\$80.00	\$8,000
9	Headwall ** (At FM 762 and Berdett Road)	C.Y.	55	\$300.00	\$16,500
10	Guardrail	EA	4	\$2,400.00	\$9,600
11	Remove and Dispose of All Pipes***	L.F.	432	\$12.00	\$5,184
12	Rock Filter Dam, Includes Installation & Removal, Complete In Place	EA	3	\$1,500.00	\$4,500
13	Silt Fence*	L.F.	5,100	\$1.50	\$7,650
14	Stabilized Construction Access	EA	1	\$1,500.00	\$1,500
15	Turf Establishment	Ac.	38	\$2,500.00	\$95,000

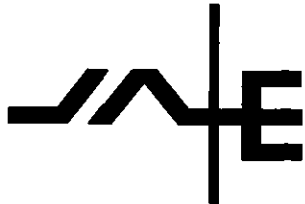
Notes:

* Reflects entire length of the channel improvements and detention basin.

** Reflects TxDOT Standard Headwall.

*** Includes 4-6'x5' RCB at FM 762 and 4 - 84" CMP at Berdett Road.

Subtotal	\$5,961,100
Contingencies (15%)	\$894,200
Total Construction Cost	\$6,855,300
Engineering (10%)	\$685,500
Total	\$7,540,800



**r. g. miller
engineers, inc.**

Since 1966



**Appendix Q:
Alternative 3 Modified Puls Routing**



**Gapps Bayou Watershed
Alternative 3 Routing Reach Data**

Gapps_0000_R			
Elevation	Total Stor	Storage	Discharge
64.7	267.88	267.88	247.22
66.68	503.94	503.94	494.44
67.16	576.22	576.22	741.66
67.52	631.77	631.77	988.88
67.82	679.85	679.85	1236.1
68.09	723.99	723.99	1483.32
68.33	764.37	764.37	1730.54
68.55	801.22	801.22	1977.76
68.76	836.63	836.63	2224.98
68.95	870.53	870.53	2472.2
69.14	903.36	903.36	2719.42
69.32	935.74	935.74	2966.64
69.8	1027.66	1027.66	3708.3

Gapps_0056_R			
Elevation	Total Stor	Storage	Discharge
65.17	310.97	43.09	218.83
67	590.73	86.79	437.66
67.63	677.69	101.47	656.49
68.11	745.43	113.66	875.32
68.53	804.55	124.7	1094.15
68.91	859.02	135.03	1312.98
69.24	909.23	144.86	1531.81
69.56	955.53	154.31	1750.64
69.85	1000.36	163.73	1969.47
70.12	1043.55	173.02	2188.3
70.39	1085.64	182.28	2407.13
70.64	1127.58	191.84	2625.96
71.35	1249.81	222.15	3282.45

Gapps_0093_R			
Elevation	Total Stor	Storage	Discharge
69.26	326.07	15.1	158.94
70.73	614.58	23.85	317.88
71.84	708.8	31.11	476.82
72.75	784.87	39.44	635.76
73.58	853.99	49.44	794.7
74.25	922.05	63.03	953.64
74.57	991.47	82.24	1112.58
74.78	1057.15	101.62	1271.52
74.95	1120.84	120.48	1430.46
75.1	1182.61	139.06	1589.4
75.23	1243.47	157.83	1748.34
75.36	1305.07	177.49	1907.28
75.7	1490.22	240.41	2384.1

Gapps_0150_R			
Elevation	Total Stor	Storage	Discharge
70.3	328.63	2.56	174.53
71.86	618.68	4.1	349.06
73.03	714.27	5.47	523.59
73.99	791.66	6.79	698.12
75.14	864.24	10.25	872.65
75.87	940.27	18.22	1047.18
76.35	1017.7	26.23	1221.71
76.82	1092.95	35.8	1396.24
77.28	1166.85	46.01	1570.77
77.64	1238.92	56.31	1745.3
77.81	1309.84	66.37	1919.83
77.92	1382.22	77.15	2094.36
78.15	1500.56	106.34	2617.95

Gapps_0161_R			
Elevation	Total Stor	Storage	Discharge
70.55	371.51	42.88	185.14
72.11	682.37	63.69	370.28
73.31	794.38	80.11	555.42
74.32	886.03	94.37	740.56
75.53	978.38	114.14	925.7
76.34	1085.43	145.16	1110.84
76.74	1222.15	204.45	1295.98
76.98	1404.97	312.02	1481.12
77.31	1614.64	447.79	1666.26
77.65	1805.14	566.22	1851.4
77.81	1938.85	629.01	2036.54
77.92	2055.48	673.26	2221.68
78.16	2373.97	777.41	2777.1

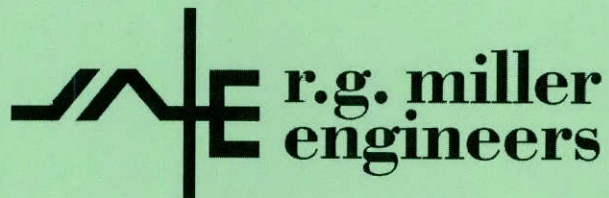
Gapps_0187_R			
Elevation	Total Stor	Storage	Discharge
70.57	526.71	155.2	160.21
72.15	892.84	210.47	320.42
73.35	1049.09	254.71	480.63
74.37	1179.89	293.86	640.84
75.58	1320.56	342.18	801.05
76.39	1463.3	377.87	961.26
76.8	1622.6	400.45	1121.47
77.06	1822.74	417.77	1281.68
77.39	2059.43	444.79	1441.89
77.72	2285.8	480.66	1602.1
77.88	2441.21	502.36	1762.31
78	2574.81	519.33	1922.52
78.25	2937.11	563.14	2403.15

Gapps_0236_R			
Elevation	Total Stor	Storage	Discharge
77.13	533.76	7.05	79.5
78.4	904.99	12.15	159
79.6	1067.16	18.07	238.5
80.34	1207.02	22.13	318
80.93	1346.78	26.22	397.5
81.53	1494.34	31.04	477
82.09	1658.47	35.87	556.5
82.61	1865.18	42.44	636
82.95	2111.14	51.71	715.5
83.19	2348.05	62.25	795
83.37	2513.04	71.83	874.5
83.49	2656.1	81.29	954
83.7	3048.38	111.27	1192.5

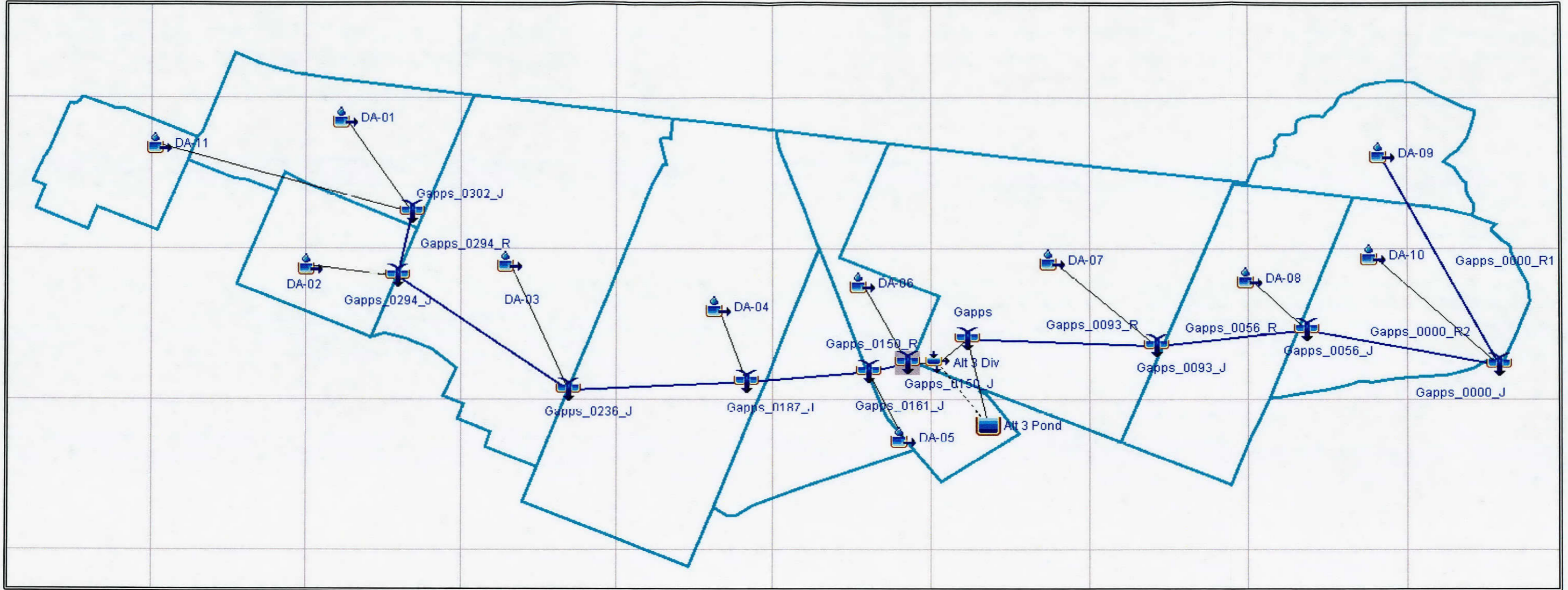
Gapps_0294_R			
Elevation	Total Stor	Storage	Discharge
78.25	534.52	0.76	51.22
79.07	906.46	1.47	102.44
79.99	1069.52	2.36	153.66
80.66	1205.21	3.19	204.88
81.24	1350.73	3.95	256.1
81.81	1499.1	4.76	307.32
82.35	1664.34	5.87	358.54
82.86	1872.47	7.29	409.76
83.19	2119.43	8.29	460.98
83.44	2357.09	9.04	512.2
83.63	2522.67	9.63	563.42
83.78	2666.27	10.17	614.64
84.1	3060.37	11.99	768.3



**Appendix R:
Alternative 3 HEC-HMS Model
Schematics and Results**



Gapps Bayou
Alternative 3 Conditions HEC-HMS Model Schematic





Project: Gapps Bayou 01312012 Simulation Run: Alt 3: 10PCT_10yr

Start of Run: 26Oct2011, 00:00 Basin Model: Alternative 3
 End of Run: 28Oct2011, 00:00 Meteorologic Model: 10PCT_10yr
 Compute Time: 31Jul2013, 00:52:26 Control Specifications: Control 48

Volume Units: AC-FT

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Alt 3 Div	4.951	1023.8	26Oct2011, 22:45	1684.7
Alt 3 Pond	0.000	51.2	27Oct2011, 09:30	77.3
DA-01	0.588	308.9	26Oct2011, 17:45	200.2
DA-02	0.348	204.4	26Oct2011, 17:00	124.9
DA-03	1.275	549.1	26Oct2011, 18:45	414.0
DA-04	1.479	351.9	26Oct2011, 19:30	456.3
DA-05	0.459	190.0	26Oct2011, 17:45	141.1
DA-06	0.507	236.9	26Oct2011, 18:00	166.5
DA-07	1.428	541.7	26Oct2011, 18:30	437.8
DA-08	0.696	185.7	26Oct2011, 20:45	227.6
DA-09	0.39C	124.1	26Oct2011, 18:45	118.0
DA-10	0.679	409.7	26Oct2011, 18:15	208.9
DA-11	0.295	54.8	26Oct2011, 21:45	88.5
Gapps	4.951	1034.8	26Oct2011, 23:00	1732.0
Gapps_0000_J	8.146	1726.5	26Oct2011, 23:45	2731.6
Gapps_0000_R1	0.390	124.1	26Oct2011, 19:30	117.7
Gapps_0000_R2	7.077	1519.4	27Oct2011, 00:30	2374.9
Gapps_0053_J	7.077	1524.5	26Oct2011, 22:15	2461.4
Gapps_0056_R	6.379	1353.6	26Oct2011, 23:15	2233.8
Gapps_0093_J	6.379	1354.3	26Oct2011, 22:45	2207.1
Gapps_0093_R	4.951	1031.8	27Oct2011, 00:30	1769.3
Gapps_0150_J	4.951	1212.8	26Oct2011, 22:45	1889.1
Gapps_0150_R	4.444	1089.9	26Oct2011, 23:30	1722.6
Gapps_0161_J	4.444	1093.4	26Oct2011, 23:00	1721.1
Gapps_0161_R	3.985	990.5	26Oct2011, 23:30	1560.0



Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Gapps_0137_J	3.985	1034.6	26Oct2011, 21:30	1562.7
Gapps_0137_R	2.506	711.3	26Oct2011, 22:15	1106.4
Gapps_0236_J	2.506	1055.3	26Oct2011, 18:45	967.0
Gapps_0236_R	1.231	506.2	26Oct2011, 18:45	553.1
Gapps_0294_J	1.231	512.6	26Oct2011, 17:45	491.1
Gapps_0294_R	0.883	327.1	26Oct2011, 18:15	366.3
Gapps_0302_J	0.883	331.2	26Oct2011, 17:45	288.7



Project: Gapps Bayou 01312012 Simulation Run: Alt 3: 2PCT_50yr

Start of Run: 26Oct2011, 00:00 Basin Model: Alternative 3
 End of Run: 28Oct2011, 00:00 Meteorologic Model: 2PCT_50yr
 Compute Time: 31Jul2013, 00:52:41 Control Specifications: Control 48

Volume Units: AC-FT

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Alt 3 Div	4.951	1350.1	26Oct2011, 23:15	2209.7
Alt 3 Pond	0.000	69.6	27Oct2011, 11:00	133.0
DA-01	0.588	420.4	26Oct2011, 17:45	285.4
DA-02	0.348	276.5	26Oct2011, 17:00	175.6
DA-03	1.275	761.1	26Oct2011, 18:45	597.7
DA-04	1.479	496.1	26Oct2011, 19:45	654.8
DA-05	0.459	262.6	26Oct2011, 17:45	206.9
DA-06	0.507	324.9	26Oct2011, 18:00	239.6
DA-07	1.428	755.3	26Oct2011, 18:30	641.8
DA-08	0.698	262.0	26Oct2011, 20:45	324.0
DA-09	0.390	174.3	26Oct2011, 18:45	173.0
DA-10	0.679	561.5	26Oct2011, 18:15	306.3
DA-11	0.295	77.0	26Oct2011, 22:00	124.4
Gapps	4.951	1374.1	26Oct2011, 23:30	2342.8
Gapps_0000_J	8.146	2358.9	26Oct2011, 23:00	3654.7
Gapps_0000_R1	0.390	174.3	26Oct2011, 19:30	172.6
Gapps_0000_R2	7.077	2051.0	27Oct2011, 00:45	3175.8
Gapps_0056_J	7.077	2056.8	26Oct2011, 23:00	3323.5
Gapps_0056_R	6.379	1819.5	26Oct2011, 23:15	2999.5
Gapps_0093_J	6.379	1820.6	26Oct2011, 22:45	2938.8
Gapps_0093_R	4.951	1370.6	27Oct2011, 01:00	2347.0
Gapps_0150_J	4.951	1606.7	26Oct2011, 23:15	2530.1
Gapps_0150_R	4.444	1447.4	27Oct2011, 00:15	2290.4
Gapps_0160_J	4.444	1454.3	26Oct2011, 23:15	2289.1
Gapps_0160_R	3.985	1318.6	27Oct2011, 00:30	2082.2



Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Gapps_0187_J	3.985	1539.2	26Oct2011, 21:45	2069.5
Gapps_0187_R	2.506	1070.7	26Oct2011, 21:45	1414.7
Gapps_0236_J	2.506	1419.2	26Oct2011, 19:00	1297.6
Gapps_0236_R	1.231	675.4	26Oct2011, 19:30	699.9
Gapps_0294_J	1.231	697.6	26Oct2011, 18:00	646.2
Gapps_0294_R	0.883	447.7	26Oct2011, 18:15	470.7
Gapps_0302_J	0.883	452.6	26Oct2011, 17:45	409.8



Project: Gapps Bayou 01312012 Simulation Run: Alt 3 : 1PCT_100Yr

Start of Run: 26Oct2011, 00:00 Basin Model: Alternative 3
 End of Run: 28Oct2011, 00:00 Meteorologic Model: 1PCT_100yr
 Compute Time: 31Jul2013, 00:52:30 Control Specifications: Control 48

Volume Units: AC-FT

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Alt 3 Div	4.951	1485.6	26Oct2011, 23:30	2490.7
Alt 3 Pond	0.000	75.5	27Oct2011, 11:45	147.1
DA-01	0.588	474.4	26Oct2011, 17:45	330.9
DA-02	0.348	310.3	26Oct2011, 17:00	202.6
DA-03	1.275	863.1	26Oct2011, 18:45	695.6
DA-04	1.479	566.1	26Oct2011, 19:45	760.8
DA-05	0.459	298.4	26Oct2011, 17:45	241.9
DA-06	0.507	368.0	26Oct2011, 18:00	278.7
DA-07	1.428	859.8	26Oct2011, 18:30	750.5
DA-08	0.698	298.3	26Oct2011, 20:45	375.4
DA-09	0.390	198.9	26Oct2011, 18:45	202.3
DA-10	0.679	634.0	26Oct2011, 18:15	353.1
DA-11	0.295	87.8	26Oct2011, 22:00	143.6
Gapps	4.951	1522.7	27Oct2011, 00:30	2637.9
Gapps_0000_J	8.146	2669.1	26Oct2011, 23:15	4163.7
Gapps_0000_R1	0.390	198.9	26Oct2011, 19:30	201.9
Gapps_0000_R2	7.077	2302.9	27Oct2011, 00:30	3603.7
Gapps_0056_J	7.077	2308.0	26Oct2011, 23:00	3770.3
Gapps_0056_R	6.379	2036.8	26Oct2011, 23:15	3394.9
Gapps_0093_J	6.379	2038.1	26Oct2011, 22:45	3391.6
Gapps_0093_R	4.951	1519.9	27Oct2011, 01:45	2641.1
Gapps_0150_J	4.951	1765.6	26Oct2011, 23:30	2870.1
Gapps_0150_R	4.444	1589.1	27Oct2011, 00:45	2591.4
Gapps_0161_J	4.444	1594.7	27Oct2011, 00:00	2590.2
Gapps_0161_R	3.985	1447.5	27Oct2011, 01:00	2348.3



Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Gapps_0187_J	3.985	1829.3	26Oct2011, 21:30	2338.8
Gapps_0187_R	2.506	1288.0	26Oct2011, 21:30	1577.9
Gapps_0236_J	2.506	1588.7	26Oct2011, 19:15	1473.5
Gapps_0236_R	1.231	758.9	26Oct2011, 19:45	777.9
Gapps_0294_J	1.231	794.9	26Oct2011, 18:00	729.2
Gapps_0294_R	0.883	509.4	26Oct2011, 18:00	526.6
Gapps_03C2_J	0.883	512.2	26Oct2011, 17:45	474.5



Project: Gapps Bayou 01312012 Simulation Run: Alt 3: 0.2PCT_500yr

Start of Run: 26Oct2011, 00:00 Basin Model: Alternative 3
 End of Run: 28Oct2011, 00:00 Meteorologic Model: 0.2PCT_500yr
 Compute Time: 31Jul2013, 00:52:20 Control Specifications: Control 48

Volume Units: AC-FT

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Alt 3 Div	4.951	1765.0	27Oct2011, 00:15	3111.7
Alt 3 Pond	0.000	224.9	27Oct2011, 10:15	251.1
DA-01	0.588	594.2	26Oct2011, 17:45	425.3
DA-02	0.348	386.7	26Oct2011, 17:00	258.5
DA-03	1.275	1093.2	26Oct2011, 18:45	900.4
DA-04	1.479	725.1	26Oct2011, 20:00	981.2
DA-05	0.459	376.5	26Oct2011, 17:45	315.6
DA-06	0.507	462.9	26Oct2011, 18:00	360.1
DA-07	1.428	1091.4	26Oct2011, 18:30	979.2
DA-08	0.698	382.0	26Oct2011, 20:45	482.0
DA-09	0.390	253.7	26Oct2011, 19:00	264.0
DA-10	0.679	796.8	26Oct2011, 18:15	467.3
DA-11	0.295	112.5	26Oct2011, 22:15	182.9
Gapps	4.951	1826.4	27Oct2011, 00:30	3362.7
Gapps_0000_J	8.146	3400.9	26Oct2011, 22:45	5369.3
Gapps_0000_R1	0.390	253.7	26Oct2011, 19:45	263.4
Gapps_0000_R2	7.077	2868.6	27Oct2011, 00:00	4638.6
Gapps_0056_J	7.077	2875.0	26Oct2011, 22:15	4824.3
Gapps_0056_R	6.379	2511.6	26Oct2011, 22:45	4342.4
Gapps_0093_J	6.379	2512.9	26Oct2011, 22:15	4344.2
Gapps_0093_R	4.951	1823.6	27Oct2011, 02:00	3365.0
Gapps_0150_J	4.951	2093.5	27Oct2011, 00:15	3617.4
Gapps_0150_R	4.444	1900.5	27Oct2011, 01:45	3257.3
Gapps_0161_J	4.444	1906.8	27Oct2011, 01:00	3256.2
Gapps_0161_R	3.985	1747.3	27Oct2011, 02:00	2940.6



Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Gapps_0187_J	3.985	2342.3	26Oct2011, 21:45	2933.2
Gapps_0187_R	2.506	1644.6	26Oct2011, 22:00	1951.9
Gapps_0236_J	2.506	2022.7	26Oct2011, 19:15	1856.7
Gapps_0236_R	1.231	964.6	26Oct2011, 19:45	956.4
Gapps_0294_J	1.231	1004.5	26Oct2011, 17:45	912.2
Gapps_0294_R	0.883	642.4	26Oct2011, 18:00	653.7
Gapps_0302_J	0.883	643.3	26Oct2011, 18:00	608.2

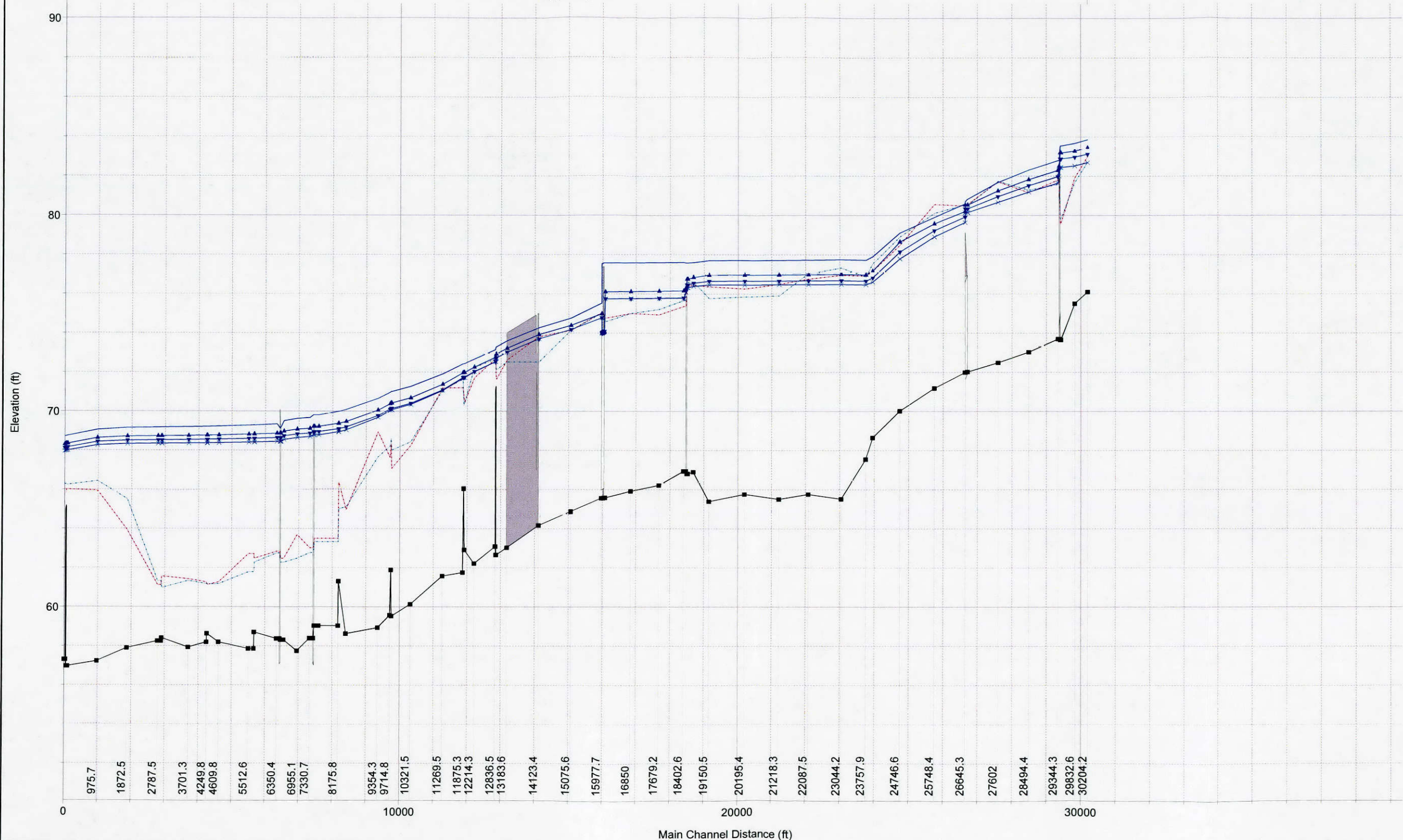


**Appendix S:
Alternative 3 HEC-RAS Profiles and
Output**



Gapps Bayou Final Plan: Alternative 3 Final 7/31/2013

Gapps Bayou 1



Legend	
WS 0.2PCT_500yr	▲
WS 1PCT_100yr	◆
WS 2PCT_50yr	✕
WS 4PCT_25yr	*
Ground	■
LOB	- - -
ROB	- - - -

975.7 1872.5 2787.5 3701.3 4249.8 4609.8 5512.6 6350.4 6955.1 7330.7 8175.8 9354.3 9714.8 10321.5 11269.5 11875.3 12214.3 12836.5 13183.6 14123.4 15075.6 15977.7 16850 17679.2 18402.6 19150.5 20195.4 21218.3 22087.5 23044.2 23757.9 24746.6 25748.4 26645.3 27602 28494.4 29344.3 29832.6 30204.2

1 in Horiz. = 3000 ft 1 in Vert. = 5 ft



HEC-RAS Plan: Alt 3 Final River: Gapps Bayou Reach: 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit *V.S. (f)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	30204.2	0.2PCT_500yr	643.30	76.10	83.85		83.90	0.000509	1.70	438.47	259.80	0.16
1	30204.2	1PCT_100yr	512.20	76.10	83.44		83.48	0.000492	1.54	362.70	158.81	0.15
1	30204.2	2PCT_50yr	452.60	76.10	83.13		83.16	0.000552	1.51	314.79	146.36	0.16
1	30204.2	10PCT_10yr	331.20	76.10	82.05		82.09	0.000603	1.66	199.80	67.16	0.17
1	29832.6	0.2PCT_500yr	643.30	75.51	83.67		83.73	0.000393	1.99	495.64	237.39	0.15
1	29832.6	1PCT_100yr	512.20	75.51	83.29		83.33	0.000321	1.71	419.97	162.15	0.13
1	29832.6	2PCT_50yr	452.60	75.51	82.97		83.01	0.000312	1.61	371.35	152.25	0.13
1	29832.6	10PCT_10yr	331.20	75.51	81.87		81.91	0.000409	1.55	215.88	85.73	0.14
1	29428.5	0.2PCT_500yr	1004.50	73.66	83.54	77.72	83.61	0.000275	2.01	910.97	556.84	0.13
1	29428.5	1PCT_100yr	794.90	73.66	83.19	77.31	83.23	0.000203	1.67	812.63	239.91	0.11
1	29428.5	2PCT_50yr	697.60	73.66	82.88	77.08	82.92	0.000183	1.54	739.62	234.04	0.11
1	29428.5	10PCT_10yr	512.60	73.66	81.78	76.63	81.81	0.000186	1.37	497.73	205.72	0.10
1	29411.9		Culvert									
1	29344.3	0.2PCT_500yr	1004.50	73.70	82.80		82.88	0.000566	2.43	627.72	473.74	0.18
1	29344.3	1PCT_100yr	794.90	73.70	82.30		82.38	0.000598	2.35	409.57	365.91	0.18
1	29344.3	2PCT_50yr	697.60	73.70	81.98		82.06	0.000596	2.25	320.86	145.52	0.18
1	29344.3	10PCT_10yr	512.60	73.70	81.20		81.26	0.000537	1.97	259.98	60.79	0.17
1	28494.4	0.2PCT_500yr	1004.50	73.03	82.31		82.39	0.000562	2.43	584.83	357.06	0.18
1	28494.4	1PCT_100yr	794.90	73.03	81.82		81.89	0.000532	2.23	437.94	262.50	0.17
1	28494.4	2PCT_50yr	697.60	73.03	81.51		81.58	0.000523	2.12	370.88	182.50	0.17
1	28494.4	10PCT_10yr	512.60	73.03	80.78		80.83	0.000468	1.86	278.59	79.28	0.16
1	27602	0.2PCT_500yr	1004.50	72.49	81.68		81.79	0.000861	2.80	462.40	316.19	0.22
1	27602	1PCT_100yr	794.90	72.49	81.25		81.34	0.000741	2.52	357.55	195.12	0.20
1	27602	2PCT_50yr	697.60	72.49	80.96		81.05	0.000698	2.40	308.19	141.87	0.19
1	27602	10PCT_10yr	512.60	72.49	80.31		80.37	0.000564	2.05	250.13	56.93	0.17
1	26717.3	0.2PCT_500yr	1004.50	72.02	80.82	76.55	80.93	0.001104	2.81	560.53	317.09	0.24
1	26717.3	1PCT_100yr	794.90	72.02	80.52	76.04	80.61	0.000925	2.46	478.93	248.19	0.22
1	26717.3	2PCT_50yr	697.60	72.02	80.33	75.78	80.41	0.000738	2.32	433.78	218.28	0.20
1	26717.3	10PCT_10yr	512.60	72.02	79.86	75.23	79.91	0.000475	1.96	344.30	166.95	0.16
1	26712.7		Culvert									
1	26645.3	0.2PCT_500yr	1004.50	71.99	80.59		80.69	0.000905	2.71	574.75	559.89	0.22
1	26645.3	1PCT_100yr	794.90	71.99	80.19		80.28	0.000748	2.51	415.83	294.56	0.20
1	26645.3	2PCT_50yr	697.60	71.99	79.92		80.00	0.000732	2.43	344.80	226.00	0.20
1	26645.3	10PCT_10yr	512.60	71.99	79.14		79.22	0.000684	2.21	232.56	61.87	0.19
1	25748.4	0.2PCT_500yr	1004.50	71.18	79.89		79.95	0.000721	2.39	922.17	1052.04	0.20
1	25748.4	1PCT_100yr	794.90	71.18	79.57		79.63	0.000684	2.27	631.87	734.98	0.19
1	25748.4	2PCT_50yr	697.60	71.18	79.22		79.30	0.000825	2.43	432.55	439.62	0.21
1	25748.4	10PCT_10yr	512.60	71.18	78.34		78.45	0.001104	2.62	219.17	133.75	0.24
1	24746.6	0.2PCT_500yr	1004.50	70.02	79.10		79.18	0.000855	2.61	912.55	1257.73	0.21
1	24746.6	1PCT_100yr	794.90	70.02	78.65		78.76	0.001138	2.84	477.89	691.70	0.24
1	24746.6	2PCT_50yr	697.60	70.02	78.15		78.28	0.001286	3.03	284.54	176.05	0.26
1	24746.6	10PCT_10yr	512.60	70.02	77.01		77.15	0.001535	3.02	179.67	63.46	0.27
1	23956.8	0.2PCT_500yr	1004.50	68.65	77.90		78.11	0.002434	3.72	307.37	203.98	0.34
1	23956.8	1PCT_100yr	794.90	68.65	77.17		77.38	0.002961	3.71	214.98	84.72	0.37
1	23956.8	2PCT_50yr	697.60	68.65	76.82		77.02	0.002024	3.59	194.56	48.41	0.32
1	23956.8	10PCT_10yr	512.60	68.65	75.50		75.71	0.002191	3.65	140.37	35.52	0.32
1	23757.9	0.2PCT_500yr	2022.70	67.55	77.71		77.84	0.000924	2.93	846.28	446.68	0.23
1	23757.9	1PCT_100yr	1588.70	67.55	76.96		77.08	0.001004	2.75	594.36	185.11	0.23
1	23757.9	2PCT_50yr	1419.20	67.55	76.65		76.76	0.000936	2.65	544.61	143.57	0.22
1	23757.9	10PCT_10yr	1055.30	67.55	75.33		75.44	0.000964	2.66	396.02	92.74	0.23
1	23044.2	0.2PCT_500yr	2022.70	65.52	77.75		77.76	0.000024	0.71	3035.40	808.31	0.04
1	23044.2	1PCT_100yr	1588.70	65.52	77.00		77.00	0.000019	0.61	2617.06	319.85	0.04
1	23044.2	2PCT_50yr	1419.20	65.52	76.69		76.69	0.000016	0.56	2523.01	291.60	0.03
1	23044.2	10PCT_10yr	1055.30	65.52	75.37		75.37	0.000014	0.49	2154.55	271.48	0.03
1	22087.5	0.2PCT_500yr	2022.70	65.76	77.73		77.73	0.000021	0.66	3395.62	695.77	0.04
1	22087.5	1PCT_100yr	1588.70	65.76	76.98		76.99	0.000018	0.57	2899.91	595.88	0.03
1	22087.5	2PCT_50yr	1419.20	65.76	76.67		76.67	0.000016	0.53	2730.69	499.64	0.03
1	22087.5	10PCT_10yr	1055.30	65.76	75.36		75.36	0.000013	0.46	2283.47	300.72	0.03
1	21218.3	0.2PCT_500yr	2022.70	65.51	77.71		77.72	0.000021	0.69	3227.03	993.56	0.04
1	21218.3	1PCT_100yr	1588.70	65.51	76.97		76.97	0.000017	0.59	2738.96	452.40	0.03
1	21218.3	2PCT_50yr	1419.20	65.51	76.66		76.66	0.000015	0.54	2614.87	350.52	0.03



HEC-RAS Plan: Alt 3 Final River: Gapps Bayou Reach: 1 (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	21218.3	10PCT_10yr	1055.30	65.51	75.35		75.35	0.000013	0.47	2227.18	283.29	0.03
1	20195.4	0.2PCT_500yr	2022.70	65.76	77.70		77.71	0.000004	0.32	6921.56	1360.23	0.02
1	20195.4	1PCT_100yr	1588.70	65.76	76.96		76.96	0.000003	0.27	6057.75	986.40	0.02
1	20195.4	2PCT_50yr	1419.20	65.76	76.65		76.65	0.000003	0.25	5782.32	813.69	0.01
1	20195.4	10PCT_10yr	1055.30	65.76	75.34		75.34	0.000002	0.21	4931.86	580.56	0.01
1	19150.5	0.2PCT_500yr	2022.70	65.39	77.70		77.70	0.000006	0.38	6100.48	2048.56	0.02
1	19150.5	1PCT_100yr	1588.70	65.39	76.96		76.96	0.000004	0.32	5170.72	986.18	0.02
1	19150.5	2PCT_50yr	1419.20	65.39	76.65		76.65	0.000004	0.29	4894.28	826.33	0.02
1	19150.5	10PCT_10yr	1055.30	65.39	75.34		75.34	0.000003	0.25	4161.86	489.09	0.02
1	18693.0	0.2PCT_500yr	2342.30	66.90	77.60		77.68	0.000511	2.54	2830.14	4036.18	0.18
1	18693.0	1PCT_100yr	1829.30	66.90	76.84		76.94	0.000620	2.57	1103.01	1326.60	0.19
1	18693.0	2PCT_50yr	1539.20	66.90	76.56		76.64	0.000536	2.31	840.76	570.15	0.18
1	18693.0	10PCT_10yr	1034.60	66.90	75.26		75.33	0.000507	2.05	504.59	108.81	0.17
1	18528.1	0.2PCT_500yr	2342.30	66.81	77.58	72.21	77.62	0.000303	1.96	2740.86	3906.04	0.14
1	18528.1	1PCT_100yr	1829.30	66.81	76.75	71.64	76.84	0.000581	2.48	999.57	1071.73	0.19
1	18528.1	2PCT_50yr	1539.20	66.81	76.47	71.25	76.55	0.000520	2.27	803.41	489.31	0.17
1	18528.1	10PCT_10yr	1034.60	66.81	75.18	70.50	75.24	0.000512	2.06	501.64	107.98	0.17
1	18501.7		Culvert									
1	18402.6	0.2PCT_500yr	2342.30	66.94	77.60		77.61	0.000033	0.76	8160.19	7319.83	0.05
1	18402.6	1PCT_100yr	1829.30	66.94	76.17		76.20	0.000143	1.39	1506.40	1053.33	0.09
1	18402.6	2PCT_50yr	1539.20	66.94	75.80		75.83	0.000125	1.25	1278.24	391.38	0.09
1	18402.6	10PCT_10yr	1034.60	66.94	74.78		74.80	0.000097	1.01	1024.55	185.91	0.08
1	17679.2	0.2PCT_500yr	2342.30	66.22	77.59		77.59	0.000011	0.51	10126.94	6224.34	0.03
1	17679.2	1PCT_100yr	1829.30	66.22	76.14		76.15	0.000029	0.72	3054.01	2018.50	0.04
1	17679.2	2PCT_50yr	1539.20	66.22	75.78		75.79	0.000025	0.65	2529.11	882.38	0.04
1	17679.2	10PCT_10yr	1034.60	66.22	74.76		74.77	0.000018	0.51	2047.22	296.44	0.03
1	16850	0.2PCT_500yr	2342.30	65.92	77.58		77.58	0.000010	0.47	10638.75	5939.29	0.03
1	16850	1PCT_100yr	1829.30	65.92	76.12		76.13	0.000025	0.69	3544.62	2878.83	0.04
1	16850	2PCT_50yr	1539.20	65.92	75.76		75.77	0.000022	0.62	2790.24	1209.56	0.04
1	16850	10PCT_10yr	1034.60	65.92	74.75		74.75	0.000016	0.49	2134.50	323.06	0.03
1	16085.5	0.2PCT_500yr	1937.10	65.58	77.58	67.47	77.58	0.000006	0.38	11084.91	5927.73	0.02
1	16085.5	1PCT_100yr	1414.10	65.58	76.11	67.22	76.11	0.000012	0.49	4134.00	3106.87	0.03
1	16085.5	2PCT_50yr	1318.40	65.58	75.75	67.17	75.75	0.000013	0.50	3205.67	2035.90	0.03
1	16085.5	10PCT_10yr	1096.70	65.58	74.74	67.05	74.74	0.000015	0.49	2276.44	430.40	0.03
1	16054.3		Culvert									
1	15977.7	0.2PCT_500yr	1937.10	65.57	75.53		75.65	0.000746	2.93	1563.68	2066.39	0.24
1	15977.7	1PCT_100yr	1414.10	65.57	74.99		75.09	0.000595	2.53	804.50	849.29	0.19
1	15977.7	2PCT_50yr	1318.40	65.57	74.78		74.87	0.000582	2.47	665.79	486.58	0.18
1	15977.7	10PCT_10yr	1096.70	65.57	74.07		74.16	0.000594	2.38	478.61	141.91	0.18
1	15075.6	0.2PCT_500yr	2080.90	64.89	74.76		74.91	0.000898	3.26	1219.37	1330.08	0.24
1	15075.6	1PCT_100yr	1589.00	64.89	74.39		74.51	0.000694	2.77	838.15	789.80	0.21
1	15075.6	2PCT_50yr	1479.00	64.89	74.18		74.29	0.000701	2.73	695.01	549.62	0.22
1	15075.6	10PCT_10yr	1220.50	64.89	73.46		73.57	0.000707	2.61	492.03	157.50	0.20
1	14123.4	0.2PCT_500yr	1718.60	64.17	74.26		74.32	0.000396	2.26	1507.54	1149.51	0.16
1	14123.4	1PCT_100yr	1442.70	64.17	73.92		73.99	0.000411	2.23	1142.91	999.69	0.16
1	14123.4	2PCT_50yr	1297.00	64.17	73.70		73.77	0.000414	2.19	932.89	886.63	0.16
1	14123.4	10PCT_10yr	973.50	64.17	72.99		73.05	0.000383	1.98	535.32	180.52	0.15
1	13650		Lat Struct									
1	13183.6	0.2PCT_500yr	1718.60	63.03	73.59		73.75	0.001043	3.45	771.24	518.20	0.25
1	13183.6	1PCT_100yr	1442.70	63.03	73.22		73.38	0.001106	3.40	587.79	460.38	0.25
1	13183.6	2PCT_50yr	1297.00	63.03	73.01		73.17	0.001074	3.27	503.24	355.50	0.25
1	13183.6	10PCT_10yr	973.50	63.03	72.36		72.50	0.000998	2.95	340.37	117.27	0.23
1	12867.8	0.2PCT_500yr	1718.60	62.66	73.29	68.51	73.40	0.000797	3.02	885.03	529.60	0.22
1	12867.8	1PCT_100yr	1442.70	62.66	72.92	68.01	73.04	0.000828	2.96	704.97	454.76	0.22
1	12867.8	2PCT_50yr	1297.00	62.66	72.73	67.73	72.84	0.000809	2.86	620.89	406.44	0.21
1	12867.8	10PCT_10yr	973.50	62.66	72.10	67.07	72.20	0.000806	2.63	427.07	237.73	0.21
1	12860.8		Bridge									
1	12836.5	0.2PCT_500yr	1718.60	63.09	73.14		73.30	0.001087	3.48	768.03	500.97	0.25
1	12836.5	1PCT_100yr	1442.70	63.09	72.76		72.92	0.001170	3.45	588.85	437.21	0.26



HEC-RAS Plan: Alt 3 Final River: Gapps Bayou Reach: 1 (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	12836.5	2PCT_50yr	1297.00	63.09	72.53		72.70	0.001159	3.38	498.97	360.85	0.25
1	12836.5	10PCT_10yr	973.50	63.09	71.84		71.99	0.001040	3.09	322.76	109.42	0.24
1	12214.3	0.2PCT_500yr	1718.60	62.22	72.67		72.76	0.000684	2.80	967.12	503.72	0.20
1	12214.3	1PCT_100yr	1442.70	62.22	72.25		72.35	0.000720	2.74	776.74	397.18	0.20
1	12214.3	2PCT_50yr	1297.00	62.22	72.03		72.12	0.000726	2.70	689.59	367.02	0.20
1	12214.3	10PCT_10yr	973.50	62.22	71.32		71.42	0.000762	2.63	470.01	269.46	0.21
1	11922.7	0.2PCT_500yr	1718.60	62.92	72.43		72.53	0.000857	2.82	948.00	550.03	0.22
1	11922.7	1PCT_100yr	1442.70	62.92	71.99		72.09	0.001015	2.88	729.86	438.63	0.24
1	11922.7	2PCT_50yr	1297.00	62.92	71.74		71.85	0.001108	2.91	628.52	406.73	0.24
1	11922.7	10PCT_10yr	973.50	62.92	70.97		71.11	0.001561	3.03	379.43	252.42	0.28
1	11900.3	0.2PCT_500yr	1718.60	66.04	72.43		72.50	0.000724	2.45	1006.33	565.37	0.20
1	11900.3	1PCT_100yr	1442.70	66.04	71.98		72.06	0.000855	2.48	783.01	448.76	0.22
1	11900.3	2PCT_50yr	1297.00	66.04	71.74		71.82	0.000932	2.49	677.49	410.85	0.22
1	11900.3	10PCT_10yr	973.50	66.04	70.96		71.07	0.001404	2.63	406.42	290.60	0.26
1	11875.3	0.2PCT_500yr	1718.60	61.76	72.42		72.48	0.000691	2.28	1047.81	604.40	0.19
1	11875.3	1PCT_100yr	1442.70	61.76	71.97		72.04	0.000828	2.32	809.56	471.57	0.21
1	11875.3	2PCT_50yr	1297.00	61.76	71.72		71.80	0.000929	2.35	694.35	459.94	0.22
1	11875.3	10PCT_10yr	973.50	61.76	70.94		71.03	0.001070	2.46	402.77	199.06	0.23
1	11269.5	0.2PCT_500yr	1718.60	61.58	71.91		72.01	0.000872	2.79	841.30	418.06	0.22
1	11269.5	1PCT_100yr	1442.70	61.58	71.38		71.48	0.001004	2.78	653.37	305.31	0.23
1	11269.5	2PCT_50yr	1297.00	61.58	71.09		71.20	0.001035	2.74	572.73	267.33	0.23
1	11269.5	10PCT_10yr	973.50	61.58	70.33		70.44	0.000886	2.66	403.50	180.13	0.22
1	10321.5	0.2PCT_500yr	1718.60	60.14	71.27		71.36	0.000538	2.74	1332.05	446.16	0.18
1	10321.5	1PCT_100yr	1442.70	60.14	70.69		70.78	0.000559	2.64	1080.74	421.48	0.18
1	10321.5	2PCT_50yr	1297.00	60.14	70.40		70.49	0.000554	2.55	962.39	412.76	0.18
1	10321.5	10PCT_10yr	973.50	60.14	69.73		69.80	0.000514	2.27	701.65	362.92	0.17
1	9759.4	0.2PCT_500yr	1718.60	59.53	71.00		71.08	0.000442	2.49	1477.64	501.29	0.17
1	9759.4	1PCT_100yr	1442.70	59.53	70.42		70.49	0.000446	2.36	1211.11	427.91	0.16
1	9759.4	2PCT_50yr	1297.00	59.53	70.14		70.21	0.000436	2.26	1094.07	410.14	0.16
1	9759.4	10PCT_10yr	973.50	59.53	69.49		69.55	0.000394	1.99	842.75	368.63	0.15
1	9744.1	0.2PCT_500yr	1718.60	61.89	71.02		71.07	0.000322	1.86	1593.21	564.30	0.14
1	9744.1	1PCT_100yr	1442.70	61.89	70.43		70.48	0.000348	1.80	1288.32	477.92	0.14
1	9744.1	2PCT_50yr	1297.00	61.89	70.15		70.19	0.000348	1.73	1160.17	433.82	0.14
1	9744.1	10PCT_10yr	973.50	61.89	69.50		69.53	0.000345	1.56	895.36	376.16	0.14
1	9714.8	0.2PCT_500yr	1718.60	59.58	70.97		71.05	0.000443	2.60	1598.73	643.38	0.17
1	9714.8	1PCT_100yr	1442.70	59.58	70.38		70.46	0.000451	2.48	1245.77	544.99	0.17
1	9714.8	2PCT_50yr	1297.00	59.58	70.10		70.18	0.000439	2.38	1116.65	441.81	0.16
1	9714.8	10PCT_10yr	973.50	59.58	69.46		69.52	0.000388	2.09	854.30	381.98	0.15
1	9354.3	0.2PCT_500yr	2666.90	58.94	70.66		70.80	0.000938	3.61	1972.73	692.25	0.24
1	9354.3	1PCT_100yr	2188.30	58.94	70.06		70.20	0.000990	3.49	1568.50	656.84	0.24
1	9354.3	2PCT_50yr	1984.50	58.94	69.78		69.92	0.000997	3.40	1390.88	620.04	0.24
1	9354.3	10PCT_10yr	1546.20	58.94	69.14		69.27	0.001027	3.20	1019.37	535.96	0.24
1	8406.8	0.2PCT_500yr	2666.90	58.63	70.09		70.16	0.000467	2.90	1982.20	743.47	0.18
1	8406.8	1PCT_100yr	2188.30	58.63	69.47		69.55	0.000470	2.77	1624.39	504.97	0.17
1	8406.8	2PCT_50yr	1984.50	58.63	69.20		69.27	0.000469	2.70	1488.15	470.76	0.17
1	8406.8	10PCT_10yr	1546.20	58.63	68.57		68.63	0.000442	2.48	1220.02	406.77	0.17
1	8187.8	0.2PCT_500yr	2666.90	61.31	69.99		70.05	0.000445	2.52	1703.72	413.93	0.17
1	8187.8	1PCT_100yr	2188.30	61.31	69.38		69.44	0.000432	2.34	1480.12	349.90	0.16
1	8187.8	2PCT_50yr	1984.50	61.31	69.10		69.16	0.000428	2.25	1384.20	344.02	0.16
1	8187.8	10PCT_10yr	1546.20	61.31	68.48		68.53	0.000409	2.05	1173.95	331.87	0.16
1	8175.8	0.2PCT_500yr	2666.90	59.04	69.99		70.04	0.000288	2.29	1810.98	358.41	0.14
1	8175.8	1PCT_100yr	2188.30	59.04	69.38		69.43	0.000261	2.07	1601.63	333.89	0.13
1	8175.8	2PCT_50yr	1984.50	59.04	69.11		69.15	0.000247	1.97	1511.79	313.45	0.13
1	8175.8	10PCT_10yr	1546.20	59.04	68.48		68.52	0.000211	1.72	1326.65	270.25	0.12
1	7595.5	0.2PCT_500yr	2666.90	59.04	69.81	64.75	69.87	0.000313	2.35	1749.35	350.44	0.14
1	7595.5	1PCT_100yr	2188.30	59.04	69.22	64.33	69.27	0.000283	2.13	1549.55	328.16	0.14
1	7595.5	2PCT_50yr	1984.50	59.04	68.96	64.8	69.00	0.000268	2.02	1465.54	306.75	0.13
1	7595.5	10PCT_10yr	1546.20	59.04	68.36	63.74	68.39	0.000227	1.76	1292.63	268.06	0.12
1	7466.4		Culvert									
1	7330.7	0.2PCT_500yr	2666.90	58.40	69.67		69.75	0.000432	2.93	1550.95	288.30	0.17
1	7330.7	1PCT_100yr	2188.30	58.40	69.12		69.19	0.000377	2.63	1400.70	260.94	0.16



HEC-RAS Plan: Alt 3 Final River: Gapps Bayou Reach: 1 (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	7330.7	2PCT_50yr	1984.50	58.40	68.88		68.94	0.000351	2.49	1337.48	247.36	0.15
1	7330.7	10PCT_10yr	1546.20	58.40	68.31		68.35	0.000287	2.15	1201.52	235.31	0.14
1	6955.1	0.2PCT_500yr	2666.90	57.75	69.63		69.65	0.000145	1.53	3023.98	616.44	0.10
1	6955.1	1PCT_100yr	2188.30	57.75	69.08		69.10	0.000135	1.41	2692.96	592.04	0.09
1	6955.1	2PCT_50yr	1984.50	57.75	68.83		68.85	0.000130	1.35	2546.88	581.41	0.09
1	6955.1	10PCT_10yr	1546.20	57.75	68.27		68.28	0.000115	1.20	2222.16	566.95	0.08
1	6557.7	0.2PCT_500yr	2666.90	58.32	69.51	63.71	69.57	0.000267	2.19	1682.68	321.31	0.13
1	6557.7	1PCT_100yr	2188.30	58.32	68.98	63.44	69.03	0.000231	1.95	1517.78	299.56	0.12
1	6557.7	2PCT_50yr	1984.50	58.32	68.74	63.31	68.78	0.000213	1.84	1447.03	288.15	0.12
1	6557.7	10PCT_10yr	1546.20	58.32	68.19	62.97	68.22	0.000171	1.57	1296.70	261.60	0.10
1	6466.7		Culvert									
1	6350.4	0.2PCT_500yr	2666.90	58.38	69.34		69.36	0.000119	1.43	2998.54	512.71	0.09
1	6350.4	1PCT_100yr	2188.30	58.38	68.87		68.89	0.000102	1.27	2758.31	503.21	0.08
1	6350.4	2PCT_50yr	1984.50	58.38	68.65		68.66	0.000095	1.20	2646.36	500.63	0.08
1	6350.4	10PCT_10yr	1546.20	58.38	68.13		68.14	0.000077	1.03	2391.86	490.26	0.07
1	5682.4	0.2PCT_500yr	2875.00	58.71	69.29		69.30	0.000073	1.20	4890.80	888.58	0.07
1	5682.4	1PCT_100yr	2308.00	58.71	68.83		68.83	0.000059	1.04	4486.19	853.10	0.06
1	5682.4	2PCT_50yr	2056.80	58.71	68.61		68.61	0.000052	0.97	4301.09	837.53	0.06
1	5682.4	10PCT_10yr	1524.50	58.71	68.10		68.11	0.000037	0.78	3894.12	784.60	0.05
1	5670.4	0.2PCT_500yr	2875.00	57.87	69.29		69.30	0.000071	1.17	5377.63	982.30	0.07
1	5670.4	1PCT_100yr	2308.00	57.87	68.83		68.83	0.000057	1.01	4931.85	926.89	0.06
1	5670.4	2PCT_50yr	2056.80	57.87	68.61		68.61	0.000051	0.94	4731.48	906.35	0.06
1	5670.4	10PCT_10yr	1524.50	57.87	68.10		68.11	0.000038	0.77	4280.62	884.31	0.05
1	5512.6	0.2PCT_500yr	2875.00	57.87	69.28		69.29	0.000072	1.18	5366.27	981.23	0.07
1	5512.6	1PCT_100yr	2308.00	57.87	68.82		68.82	0.000057	1.01	4923.31	925.31	0.06
1	5512.6	2PCT_50yr	2056.80	57.87	68.60		68.60	0.000051	0.94	4723.99	906.05	0.06
1	5512.6	10PCT_10yr	1524.50	57.87	68.10		68.10	0.000038	0.77	4275.25	884.03	0.05
1	4609.8	0.2PCT_500yr	2875.00	58.20	69.23		69.24	0.000044	0.97	7620.59	1644.32	0.06
1	4609.8	1PCT_100yr	2308.00	58.20	68.78		68.78	0.000037	0.86	6884.87	1588.77	0.05
1	4609.8	2PCT_50yr	2056.80	58.20	68.56		68.57	0.000033	0.80	6547.11	1562.00	0.05
1	4609.8	10PCT_10yr	1524.50	58.20	68.07		68.07	0.000025	0.67	5797.48	1495.83	0.04
1	4261.8	0.2PCT_500yr	2875.00	58.64	69.21		69.22	0.000044	0.97	6162.67	1051.04	0.06
1	4261.8	1PCT_100yr	2308.00	58.64	68.76		68.77	0.000035	0.83	5699.69	1001.24	0.05
1	4261.8	2PCT_50yr	2056.80	58.64	68.55		68.55	0.000029	0.75	5491.98	953.87	0.05
1	4261.8	10PCT_10yr	1524.50	58.64	68.06		68.06	0.000020	0.59	5042.94	891.77	0.04
1	4249.8	0.2PCT_500yr	2875.00	58.20	69.21		69.22	0.000044	0.97	7592.25	1643.21	0.06
1	4249.8	1PCT_100yr	2308.00	58.20	68.76		68.77	0.000037	0.86	6862.81	1587.93	0.05
1	4249.8	2PCT_50yr	2056.80	58.20	68.55		68.55	0.000034	0.81	6528.31	1560.22	0.05
1	4249.8	10PCT_10yr	1524.50	58.20	68.06		68.06	0.000025	0.67	5784.82	1495.19	0.04
1	3701.3	0.2PCT_500yr	2875.00	57.94	69.20		69.20	0.000024	0.72	7846.71	1304.55	0.04
1	3701.3	1PCT_100yr	2308.00	57.94	68.75		68.75	0.000019	0.61	7316.17	1203.56	0.04
1	3701.3	2PCT_50yr	2056.80	57.94	68.54		68.54	0.000017	0.57	7070.65	1175.50	0.03
1	3701.3	10PCT_10yr	1524.50	57.94	68.05		68.05	0.000012	0.46	6511.60	1144.42	0.03
1	2906.9	0.2PCT_500yr	2875.00	58.42	69.18		69.18	0.000021	0.66	8539.77	1738.61	0.04
1	2906.9	1PCT_100yr	2308.00	58.42	68.74		68.74	0.000016	0.57	7965.88	1677.66	0.03
1	2906.9	2PCT_50yr	2056.80	58.42	68.53		68.53	0.000014	0.52	7703.86	1633.62	0.03
1	2906.9	10PCT_10yr	1524.50	58.42	68.05		68.05	0.000009	0.41	7118.78	1567.45	0.03
1	2894	0.2PCT_500yr	2875.00	58.26	69.18		69.18	0.000025	0.71	7841.36	1954.65	0.04
1	2894	1PCT_100yr	2308.00	58.26	68.74		68.74	0.000019	0.60	7300.96	1843.87	0.04
1	2894	2PCT_50yr	2056.80	58.26	68.53		68.53	0.000017	0.55	7054.86	1810.95	0.03
1	2894	10PCT_10yr	1524.50	58.26	68.04		68.05	0.000011	0.44	6499.49	1742.27	0.03
1	2787.5	0.2PCT_500yr	2875.00	58.26	69.18		69.18	0.000025	0.71	7837.64	1950.62	0.04
1	2787.5	1PCT_100yr	2308.00	58.26	68.73		68.74	0.000019	0.60	7298.26	1843.49	0.04
1	2787.5	2PCT_50yr	2056.80	58.26	68.52		68.53	0.000017	0.55	7052.54	1810.65	0.03
1	2787.5	10PCT_10yr	1524.50	58.26	68.04		68.04	0.000011	0.44	6497.93	1742.12	0.03
1	1872.5	0.2PCT_500yr	3400.90	57.90	69.15		69.15	0.000029	0.67	10439.15	2069.98	0.04
1	1872.5	1PCT_100yr	2669.10	57.90	68.71		68.72	0.000024	0.57	9540.63	2029.66	0.04
1	1872.5	2PCT_50yr	2358.90	57.90	68.51		68.51	0.000021	0.52	9125.76	1988.57	0.04
1	1872.5	10PCT_10yr	1726.50	57.90	68.03		68.03	0.000014	0.41	8195.63	1918.57	0.03
1	975.7	0.2PCT_500yr	3400.90	57.23	69.05		69.09	0.000390	2.14	4076.91	1661.20	0.15
1	975.7	1PCT_100yr	2669.10	57.23	68.63		68.67	0.000343	1.91	3471.91	1252.76	0.14



HEC-RAS Plan: Alt 3 Final River: Gapps Bayou Reach: 1 (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	975.7	2PCT_50yr	2358.90	57.23	68.44		68.46	0.000320	1.80	3229.70	1210.50	0.14
1	975.7	10PCT_10yr	1726.50	57.23	67.98		68.00	0.000267	1.55	2686.36	167.09	0.12
1	91.2	0.2PCT_500yr	3400.90	56.97	68.75	64.49	68.79	0.000421	2.31	4474.76	1814.70	0.16
1	91.2	1PCT_100yr	2669.10	56.97	68.34	63.54	68.39	0.000391	2.14	3748.56	1801.45	0.15
1	91.2	2PCT_50yr	2358.90	56.97	68.16	63.15	68.20	0.000376	2.05	3411.71	1796.44	0.15
1	91.2	10PCT_10yr	1726.50	56.97	67.73	62.23	67.77	0.000335	1.84	2644.93	1779.25	0.14
1	53.68		B ridge									
1	1.9	0.2PCT_500yr	3400.90	57.31	68.71	66.66	68.72	0.000300	1.81	6554.19	2686.93	0.13
1	1.9	1PCT_100yr	2669.10	57.31	68.30	65.47	68.32	0.000300	1.73	5481.57	2603.07	0.13
1	1.9	2PCT_50yr	2358.90	57.31	68.11	65.09	68.13	0.000300	1.69	4992.22	2593.08	0.13
1	1.9	10PCT_10yr	1726.50	57.31	67.68	63.51	67.70	0.000300	1.59	3876.33	2559.12	0.13



**Appendix T:
Alternative 3 Floodway
Computations**



Reach	River Sta	Profile	W.S. Elev (ft)	Prof Delta WS (ft)	E.G. Elev (ft)	Top Width Act (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Enc Sta L (ft)	Ch Sta L (ft)	Ch Sta R (ft)	Enc Sta R (ft)
1	30204.2	1PCT_100yr	83.44		83.48	58.81	0.70	511.45	0.05				
1	30204.2	Floodway	83.91	0.47	83.94	10.40	0.01	512.16	0.02	4937.80	4938.80	5047.20	5048.20
1	29832.6	1PCT_100yr	83.29		83.33	62.15	2.73	508.37	1.10		4969.90	5029.30	
1	29832.6	Floodway	83.80	0.51	83.84	61.40	0.03	512.13	0.04	4968.90	4969.90	5029.30	5030.30
1	29428.5	1PCT_100yr	83.19		83.23	239.91	5.24	782.72	6.94		4966.90	5035.70	
1	29428.5	Floodway	83.72	0.53	83.76	90.80	1.84	791.50	1.55	4955.90	4966.90	5035.70	5046.70
1	29411.9	Culvert											
1	29344.3	1PCT_100yr	82.30		82.38	55.91	0.22	774.18	20.49		4966.30	5030.60	
1	29344.3	Floodway	82.65	0.36	82.73	34.30	0.23	788.97	5.71	4956.30	4966.30	5030.60	5040.60
1	28494.4	1PCT_100yr	81.82		81.89	292.50	0.72	763.92	30.26		4966.30	5032.80	
1	28494.4	Floodway	82.27	0.45	82.34	136.50	0.80	781.37	12.73	4946.30	4966.30	5032.80	5052.80
1	27602	1PCT_100yr	81.25		81.34	135.12	0.02	772.56	22.32		4965.70	5031.00	
1	27602	Floodway	81.83	0.58	81.91	125.30	0.27	786.62	8.00	4935.70	4965.70	5031.00	5061.00
1	26717.3	1PCT_100yr	80.52		80.61	218.19	74.66	708.93	11.30		4969.60	5042.40	
1	26717.3	Floodway	81.40	0.87	81.45	132.80	50.22	701.73	42.95	4929.60	4969.60	5042.40	5082.40
1	26712.7	Culvert											
1	26645.3	1PCT_100yr	80.19		80.28	214.56	8.17	733.53	53.20		4963.50	5031.70	
1	26645.3	Floodway	80.77	0.58	80.86	70.20	0.04	794.80	0.06	4962.50	4963.50	5031.70	5032.70
1	25748.4	1PCT_100yr	79.57		79.63	724.98	14.95	580.72	199.23		4969.20	5031.40	
1	25748.4	Floodway	80.02	0.45	80.14	77.17		791.35	3.55	4968.20	4969.20	5031.40	5049.61
1	24746.6	1PCT_100yr	78.65		78.76	661.70	45.70	713.75	35.45		4965.60	5025.50	
1	24746.6	Floodway	78.94	0.29	79.08	61.52	0.10	794.80	0.00	4964.60	4965.60	5025.50	5026.50
1	23956.8	1PCT_100yr	77.17		77.38	64.72	0.05	794.85			4959.40	5033.30	
1	23956.8	Floodway	77.87	0.71	78.01	75.90	0.15	794.69	0.06	4958.40	4959.40	5033.30	5034.30
1	23757.9	1PCT_100yr	76.96		77.08	165.11	3.53	1585.12	0.05		4940.60	5074.10	
1	23757.9	Floodway	77.76	0.80	77.85	125.50	0.12	1588.45	0.13	4939.60	4940.60	5074.10	5075.10
1	23044.2	1PCT_100yr	77.00		77.00	319.85	0.00	1588.70			4843.85	5152.85	
1	23044.2	Floodway	77.79	0.79	77.79	311.00	0.02	1588.68	0.01	4842.85	4843.85	5152.85	5153.85
1	22087.5	1PCT_100yr	76.98		76.99	595.88	2.34	1586.36			4823.50	5162.70	
1	22087.5	Floodway	77.77	0.79	77.78	341.20	0.02	1588.66	0.01	4822.50	4823.50	5162.70	5163.70
1	21218.3	1PCT_100yr	76.97		76.97	452.40	0.60	1587.98	0.12		4851.80	5144.80	
1	21218.3	Floodway	77.76	0.80	77.77	295.00	0.03	1588.62	0.05	4850.80	4851.80	5144.80	5145.80
1	20195.4	1PCT_100yr	76.96		76.96	983.40	1.72	1586.87	0.12		4698.75	5290.45	
1	20195.4	Floodway	77.76	0.80	77.76	593.70	0.02	1588.66	0.02	4697.75	4698.75	5290.45	5291.45
1	19150.5	1PCT_100yr	76.96		76.96	983.18	2.45	1586.15	0.09		4735.25	5234.75	
1	19150.5	Floodway	77.76	0.80	77.76	50.50	0.02	1588.66	0.03	4734.25	4735.25	5234.75	5235.75
1	18693.0	1PCT_100yr	76.84		76.94	1324.60	55.47	1773.74	0.09		4931.90	5055.10	
1	18693.0	Floodway	77.66	0.82	77.74	125.20	0.17	1829.00	0.14	4930.90	4931.90	5055.10	5056.10
1	18528.1	1PCT_100yr	76.75		76.84	107.73	131.02	1698.21	0.06		4931.90	5055.10	
1	18528.1	Floodway	77.60	0.84	77.67	195.30	40.98	1777.03	11.29	4895.85	4931.90	5055.10	5091.15
1	18501.7	Culvert											
1	18402.6	1PCT_100yr	76.17		76.20	1053.33	31.28	1791.48	6.54		4959.35	5152.65	
1	18402.6	Floodway	76.62	0.46	76.65	195.30	0.27	1828.85	0.18	4958.35	4959.35	5152.65	5153.65
1	17679.2	1PCT_100yr	76.14		76.15	2016.50	25.84	1776.79	26.67		4850.90	5150.45	
1	17679.2	Floodway	76.60	0.46	76.61	301.55	0.18	1828.97	0.15	4849.90	4850.90	5150.45	5151.45
1	16850	1PCT_100yr	76.12		76.13	2876.83	38.66	1745.23	45.41		4849.10	5150.90	
1	16850	Floodway	76.58	0.46	76.59	303.80	0.17	1828.97	0.16	4848.10	4849.10	5150.90	5151.90
1	16085.5	1PCT_100yr	76.11		76.11	3106.87	55.03	1301.60	57.47		4848.60	5150.50	
1	16085.5	Floodway	76.57	0.46	76.57	301.90		1414.10		4848.60	4848.60	5150.50	5150.50
1	16054.3	Culvert											
1	15977.7	1PCT_100yr	74.99		75.09	849.29	38.54	1374.30	1.25		4924.50	5054.60	
1	15977.7	Floodway	75.45	0.46	75.54	132.10	0.05	1414.05	0.01	4923.50	4924.50	5054.60	5055.60
1	15075.6	1PCT_100yr	74.39		74.51	789.80	54.47	1533.89	0.64		4945.20	5052.30	
1	15075.6	Floodway	74.97	0.58	75.08	109.10	0.14	1588.84	0.02	4944.20	4945.20	5052.30	5053.30
1	14123.4	1PCT_100yr	73.92		73.99	999.89	118.71	1272.25	51.75		4948.68	5040.63	
1	14123.4	Floodway	74.56	0.64	74.64	93.95	0.25	1442.14	0.30	4947.68	4948.68	5040.63	5041.63
1	13650	Lat Struct											
1	13183.6	1PCT_100yr	73.22		73.38	460.38	96.88	1315.01	30.82		4968.70	5036.50	
1	13183.6	Floodway	73.94	0.72	74.11	69.30	0.81	1441.00	0.89	4967.70	4968.70	5036.50	5037.50



HEC-RAS Plan: Alt 3 Floodway River: Gapps Bayou Reach: 1 (Continued)

Reach	River Sta	Profile	W.S. Elev (ft)	Prof Delta WS (ft)	E.G. Elev (ft)	Top Width Act (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Enc Sta L (ft)	Ch Sta L (ft)	Ch Sta R (ft)	Enc Sta R (ft)
1	12867.8	1PCT_100yr	72.92		73.04	454.76	174.49	1231.13	37.08		4961.00	4961.00	5033.90
1	12867.8	Floodway	73.69	0.76	73.83	72.90		1442.70		4961.00	4961.00	5033.90	5033.90
1	12860.8 BR U	1PCT_100yr	72.91		73.03	452.42	339.51	1030.42	72.77		4961.00	4961.00	5033.90
1	12860.8 BR U	Floodway	73.59	0.67	73.80	72.90		1442.70		4961.00	4961.00	5033.90	5033.90
1	12860.8 BR D	1PCT_100yr	72.78		72.94	442.88	284.47	1091.71	66.52		4968.50	4968.50	5035.00
1	12860.8 BR D	Floodway	73.44	0.66	73.70	88.50	1.00	1440.67	1.04	4967.50	4968.50	5035.00	5036.00
1	12836.5	1PCT_100yr	72.76		72.92	437.21	125.99	1287.27	29.44		4968.50	4968.50	5035.00
1	12836.5	Floodway	73.46	0.71	73.65	88.50	0.43	1441.83	0.44	4967.50	4968.50	5035.00	5036.00
1	12214.3	1PCT_100yr	72.25		72.35	397.18	327.07	1111.17	4.46		4963.20	4963.20	5034.90
1	12214.3	Floodway	72.92	0.66	73.07	73.70	0.70	1441.88	0.32	4962.20	4963.20	5034.90	5035.90
1	11922.7	1PCT_100yr	71.99		72.09	438.63	299.06	1121.91	21.74		4952.10	4952.10	5036.30
1	11922.7	Floodway	72.63	0.65	72.80	86.20	1.63	1439.39	1.68	4951.10	4952.10	5036.30	5037.30
1	11900.3	1PCT_100yr	71.98		72.06	448.76	241.22	1193.37	8.11		4938.00	4938.00	5054.20
1	11900.3	Floodway	72.66	0.68	72.76	118.20	1.18	1440.04	1.47	4937.00	4938.00	5054.20	5055.20
1	11875.3	1PCT_100yr	71.97		72.04	471.57	203.56	1228.47	10.67		4922.30	4922.30	5059.00
1	11875.3	Floodway	72.65	0.69	72.74	138.70	0.79	1441.41	0.50	4921.30	4922.30	5059.00	5060.00
1	11269.5	1PCT_100yr	71.38		71.48	305.31	177.91	1258.79	5.99		4935.70	4935.70	5037.90
1	11269.5	Floodway	72.19	0.82	72.31	104.20	0.52	1441.94	0.25	4934.70	4935.70	5037.90	5038.90
1	10321.5	1PCT_100yr	70.69		70.78	421.48	70.83	1232.39	139.48		4953.70	4953.70	5028.80
1	10321.5	Floodway	71.63	0.94	71.74	75.10	0.62	1441.50	0.58	4952.70	4953.70	5028.80	5027.80
1	9759.4	1PCT_100yr	70.42		70.49	427.91	52.12	1209.39	181.20		4966.90	4966.90	5047.20
1	9759.4	Floodway	71.40	0.98	71.49	82.30	0.74	1441.40	0.56	4965.90	4966.90	5047.20	5048.20
1	9744.1	1PCT_100yr	70.43		70.48	477.92	11.52	1273.61	157.57		4914.30	4914.30	5055.50
1	9744.1	Floodway	71.43	1.00	71.47	143.20	0.40	1441.95	0.36	4913.30	4914.30	5055.50	5056.50
1	9714.8	1PCT_100yr	70.38		70.46	544.99	81.58	1188.55	192.57		4965.20	4965.20	5035.20
1	9714.8	Floodway	71.35	0.97	71.46	72.00	0.65	1441.52	0.53	4964.20	4965.20	5035.20	5036.20
1	9354.3	1PCT_100yr	70.06		70.20	656.84	344.73	1670.88	172.69		4957.40	4957.40	5032.80
1	9354.3	Floodway	70.96	0.91	71.19	120.65	53.01	2134.41	0.88	4913.15	4957.40	5032.80	5033.80
1	8406.8	1PCT_100yr	69.47		69.55	504.97	35.62	1257.82	894.86		4981.00	4981.00	5038.80
1	8406.8	Floodway	70.39	0.92	70.50	169.42	1.05	1541.06	646.19	4980.00	4981.00	5038.80	5149.42
1	8187.8	1PCT_100yr	69.38		69.44	349.90	23.94	1372.41	791.96		4957.20	4957.20	5050.20
1	8187.8	Floodway	70.30	0.92	70.38	160.50	1.32	1754.75	432.24	4956.20	4957.20	5050.20	5116.70
1	8175.8	1PCT_100yr	69.38		69.43	333.89	418.29	1470.53	299.48		4965.40	4965.40	5056.80
1	8175.8	Floodway	70.31	0.92	70.37	152.42	263.77	1800.28	124.26	4925.11	4965.40	5056.80	5077.53
1	7595.5	1PCT_100yr	69.22		69.27	328.16	413.99	1479.85	294.46		4965.40	4965.40	5056.80
1	7595.5	Floodway	70.13	0.90	70.21	141.60	124.31	1872.75	191.24	4945.57	4965.40	5056.80	5087.17
1	7466.4	Culvert											
1	7330.7	1PCT_100yr	69.12		69.19	280.94	446.76	1208.88	532.66		4974.20	4974.20	5027.60
1	7330.7	Floodway	70.05	0.93	70.14	141.60	310.03	1453.65	424.62	4935.37	4974.20	5027.60	5076.97
1	6955.1	1PCT_100yr	69.08		69.10	592.04	294.19	1177.70	716.41		4930.30	4930.30	5047.90
1	6955.1	Floodway	70.02	0.94	70.05	262.51	78.57	1466.89	642.84	4910.78	4930.30	5047.90	5173.29
1	6557.7	1PCT_100yr	68.98		69.03	299.56	278.28	1794.51	115.51		4950.00	4950.00	5068.20
1	6557.7	Floodway	69.96	0.98	69.99	253.85	333.09	1729.11	126.10	4858.32	4950.00	5068.20	5129.26
1	6466.7	Culvert											
1	6350.4	1PCT_100yr	68.87		68.89	503.21	513.70	1236.55	438.05		4942.25	4942.25	5071.15
1	6350.4	Floodway	69.84	0.97	69.86	270.94	398.09	1522.73	267.48	4855.92	4942.25	5071.15	5126.86
1	5682.4	1PCT_100yr	68.82		68.83	853.10	631.02	701.38	975.60		4953.40	4953.40	5033.30
1	5682.4	Floodway	69.80	0.97	69.81	436.31	489.26	846.68	972.07	4828.95	4953.40	5033.30	5265.26
1	5670.4	1PCT_100yr	68.83		68.83	926.89	893.08	370.77	1044.15		4970.90	4970.90	5014.50
1	5670.4	Floodway	69.80	0.97	69.80	492.70	880.40	447.47	980.14	4756.85	4970.90	5014.50	5249.35
1	5512.6	1PCT_100yr	68.82		68.82	925.31	892.79	371.03	1044.19		4970.90	4970.90	5014.50
1	5512.6	Floodway	69.79	0.97	69.79	492.41	879.58	447.82	980.60	4756.94	4970.90	5014.50	5249.35
1	4609.8	1PCT_100yr	68.78		68.78	1586.77	1025.57	337.10	945.34		4972.50	4972.50	5016.10
1	4609.8	Floodway	69.75	0.97	69.75	568.00	1108.37	402.36	797.27	4663.75	4972.50	5016.10	5231.75
1	4261.8	1PCT_100yr	68.76		68.77	1001.24	822.44	648.87	836.70		4962.00	4962.00	5051.50
1	4261.8	Floodway	69.73	0.97	69.74	498.58	747.83	777.12	783.05	4753.80	4962.00	5051.50	5252.38
1	4249.8	1PCT_100yr	68.76		68.77	1587.93	1023.85	337.77	946.38		4972.50	4972.50	5016.10
1	4249.8	Floodway	69.73	0.97	69.74	566.52	1107.07	403.20	797.73	4665.00	4972.50	5016.10	5231.52
1	3701.3	1PCT_100yr	68.75		68.75	1168.06	571.43	632.05	1104.51		4906.20	4906.20	5022.70

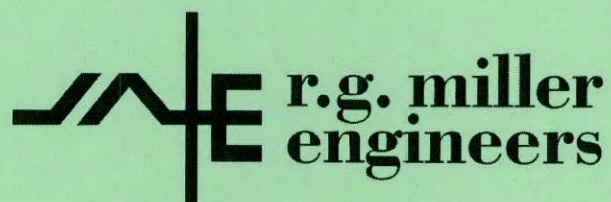


HEC-RAS Plan: Alt 3 Floodway River: Gapps Bayou Reach: 1 (Continued)

Reach	River Sta	Profile	W.S. Elev (ft)	Prof Delta WS (ft)	E.G. Elev (ft)	Top Width Act (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Enc Sta L (ft)	Ch Sta L (ft)	Ch Sta R (ft)	Enc Sta R (ft)
1	3701.3	Floodway	68.72	0.97	69.72	676.71	403.44	755.74	1148.82	4753.94	4906.20	5022.70	5430.85
1	2906.9	1PCT_100yr	68.74		68.74	1272.64	648.06	607.60	1052.34		4913.00	5033.80	
1	2906.9	Floodway	69.71	0.97	69.71	693.00	542.45	726.74	1038.81	4704.35	4913.00	5033.80	5397.35
1	2894	1PCT_100yr	68.74		68.74	1185.60	514.30	693.62	1100.08		4911.20	5045.00	
1	2894	Floodway	69.71	0.97	69.71	628.54	360.77	832.98	1114.24	4782.77	4911.20	5045.00	5411.31
1	2787.5	1PCT_100yr	68.73		68.74	1185.40	514.25	693.66	1100.09		4911.20	5045.00	
1	2787.5	Floodway	69.70	0.97	69.71	628.37	360.35	833.18	1114.47	4782.94	4911.20	5045.00	5411.31
1	1872.5	1PCT_100yr	68.71		68.72	2029.66	1949.25	407.60	312.26		4932.30	5036.10	
1	1872.5	Floodway	69.68	0.97	69.69	1015.69	2139.17	511.71	18.22	4041.45	4932.30	5036.10	5057.14
1	975.7	1PCT_100yr	68.63		68.67	1252.76	1158.58	1477.52	33.00		4904.00	5042.80	
1	975.7	Floodway	69.58	0.95	69.63	492.68	718.84	1949.65	0.61	4551.12	4904.00	5042.80	5043.80
1	91.2	1PCT_100yr	68.34		68.39	1801.45	1073.77	1579.16	16.17		4925.85	5048.35	
1	91.2	Floodway	69.35	1.00	69.39	1110.75	1003.39	1865.72		3937.60	4925.85	5048.35	5048.35
1	53.88 BR U	1PCT_100yr	68.33		68.35	1801.19	1829.94	1015.84	23.31		4925.85	5048.35	
1	53.88 BR U	Floodway	69.34	1.01	69.36	1110.75	1533.19	1135.91		3937.60	4925.85	5048.35	5048.35
1	53.88 BR D	1PCT_100yr	68.33		68.34	2617.19	2069.24	592.13	7.73		4933.10	5043.10	
1	53.88 BR D	Floodway	69.34	1.01	69.35	1105.50	1771.87	896.51	0.72	3638.60	4933.10	5043.10	5044.10
1	1.9	1PCT_100yr	68.30		68.32	2603.07	1839.98	1023.08	6.04		4933.10	5043.10	
1	1.9	Floodway	69.30	1.00	69.33	1105.50	1309.89	1358.68	0.53	3938.60	4933.10	5043.10	5044.10



**Appendix U:
Alternative 3 Cost Estimate
Computations**



**CONSTRUCTION COST ESTIMATE FOR THE GAPPS BAYOU IMPROVEMENTS
FLOOD PROTECTION PLANNING STUDY IN FORT BEND COUNTY, TEXAS
ALTERNATIVE 3**

Item No.	Description	Unit	Quantity	Unit Price	Total
1	Mobilization and Site Preparation and Restoration	L.S.	1	\$70,000.00	\$70,000
2	Excavation (Channel Clean Out and Re-Grading)	C.Y.	150,000	\$8.00	\$1,200,000
3	Detention Basin Earthwork (Excavation and Haul-off)	C.Y.	510,000	\$8.00	\$4,080,000
4	48" Reinforced Concrete Pipe, Complete In Place	L.F.	290	\$160.00	\$46,400
5	60" Reinforced Concrete Pipe, Complete In Place	L.F.	120	\$170.00	\$20,400
6	84" Corrugated Metal Pipe, Complete In Place	L.F.	120	\$180.00	\$21,600
7	8'x7' Reinforced Concrete Box, Complete In Place	L.F.	300	\$400.00	\$120,000
8	Weir Overflow Structure, 5" Concrete Slope Paving, Complete In Place	S.Y.	100	\$80.00	\$8,000
9	Headwall *** (At FM 762 and Berdett Road)	C.Y.	55	\$300.00	\$16,500
10	Guardrail	EA	4	\$2,400.00	\$9,600
11	Remove and Dispose of All Pipes****	L.F.	432	\$12.00	\$5,184
12	Rock Filter Dam, Includes Installation & Removal, Complete In Place	EA	3	\$1,500.00	\$4,500
13	Silt Fence**	L.F.	5,100	\$1.50	\$7,650
14	Stabilized Construction Access	EA	1	\$1,500.00	\$1,500
15	Turf Establishment	Ac.	33	\$2,500.00	\$82,500

Notes:

* Reflects entire length of the channel improvements.

** Reflects TxDOT Standard Headwall.

*** Includes 4-6'x5' RCB at FM 762 and 4 - 84" CMP at Berdett Road.

Subtotal	\$5,693,800
Contingencies (15%)	<u>\$854,100</u>
Total Construction Cost	\$6,547,900

Engineering (10%) \$654,800

Total \$7,202,700



**r. g. miller
engineers, inc.**

Since 1966



**Appendix V:
Ultimate Hydrologic Computations**



FORI BEND COUNTY STANDARD HYDROLOGIC METHODOLOGY

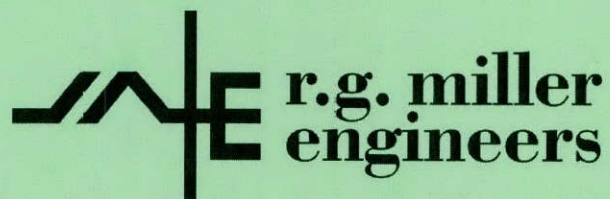
30-Jul-13

PARAMETER	UNITS	SYMBOL	Drainage Area	Drainage Area	Drainage Area	Drainage Area	Drainage Area	Drainage Area	Drainage Area	Drainage Area	Drainage Area	Drainage Area	Drainage Area
			1	2	3	4	5	6	7	8	9	10	11
Drainage Area	acres	A	376.4	222.5	816.2	946.2	293.8	324.3	913.9	447	249.6	434.6	188.8
Watershed Length	miles	L	1.36	1.01	1.83	2.82	1.13	1.41	2.36	1.56	0.70	1.07	
Channcl Slope	ft./mi.	S	4.41	16.70	5.67	3.73	4.72	12.77	25.10	0.29	1.58	11.05	
Watershed Slope	ft./mi.	So	4.41	1.98	7.14	3.73	2.99	4.26	4.80	6.79	4.30	11.05	
Upstream Manning "n"			0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	
Downstream Manning "n"			0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	
Impervious Cover	%	I	40.20%	40.90%	20.80%	19.35%	18.40%	40.00%	38.00%	29.50%	38.00%	38.00%	40.00%
Percent Affected by Detention	%		80.70%	100.00%	68.00%	37.66%	0.00%	85.00%	72.00%	87.00%	100.00%	50.00%	
Adjusted Impervious Cover Value	%	I _{adj}	7.76%	0.00%	6.66%	12.06%	18.40%	6.00%	10.64%	3.84%	0.00%	19.00%	
Ponded Area	acres		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Area Affected by Ponding	acres	Ap	0	0	0	0	0	0	0	0	0	0	
COMPUTED RESULTS													
Drainage Area	sq. mi.	A	0.59	0.35	1.28	1.48	0.46	0.51	1.43	0.70	0.39	0.68	
Weighted Manning "n"	percent	I	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	
Percent Ponded Area	%	PPA	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
Percent Area Affected by Ponding	%	PAA	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
TC + R	hours	TC+R	5.94	4.48	6.37	8.71	4.28	4.68	4.59	14.52	6.53	2.79	
Time of Concentration	hours	TC	1.45	0.50	2.07	1.89	0.77	1.12	1.19	4.59	1.57	1.10	5.5
Storage Coefficient	hours	R	4.49	3.97	4.30	6.82	3.51	3.56	3.40	9.93	4.96	1.68	16.5
Adjusted Storage Coefficients													
5-Year	hours	R5	4.49	3.97	4.30	6.82	3.51	3.56	3.40	9.93	4.96	1.68	
10-Year	hours	R10	4.49	3.97	4.30	6.82	3.51	3.56	3.40	9.93	4.96	1.68	
25-Year	hours	R25	4.49	3.97	4.30	6.82	3.51	3.56	3.40	9.93	4.96	1.68	
50-Year	hours	R50	4.49	3.97	4.30	6.82	3.51	3.56	3.40	9.93	4.96	1.68	
100-Year	hours	R100	4.49	3.97	4.30	6.82	3.51	3.56	3.40	9.93	4.96	1.68	
500-Year	hours	R500	4.49	3.97	4.30	6.82	3.51	3.56	3.40	9.93	4.96	1.68	

Note: The TC & R for Sub-Area 11 was computed to have a 100-year peak discharge of 72 cfs per the Summer Creek Drainage study by 4Site Engineering.
The TC & R values reflect on-site detention where appropriate.



**Appendix W:
Ultimate Modified Puls Routing**



Gapps Bayou Watershed
Ultimate Conditions Routing Results Data

Gapps_0000_R

Elevation	Total Stor	Storage	Discharge
61.43	41.57	41.57	247.22
62.53	85.87	85.87	494.44
63.09	153.83	153.83	741.66
63.85	222.88	222.88	988.88
64.55	291.65	291.65	1236.10
65.20	359.85	359.85	1483.32
65.81	430.90	430.90	1730.54
66.39	504.56	504.56	1977.76
66.90	575.91	575.91	2224.98
67.25	628.70	628.70	2472.20
67.54	673.53	673.53	2719.42
67.79	713.74	713.74	2966.64
68.44	821.03	821.03	3708.30

Gapps_0056_R

Elevation	Total Stor	Storage	Discharge
63.36	59.24	17.67	718.83
64.58	113.21	27.34	437.66
65.35	189.59	35.76	656.49
66.01	268.77	45.89	875.32
66.60	349.63	57.98	1094.15
67.14	430.89	71.04	1312.98
67.65	516.60	85.70	1531.81
68.12	605.74	101.18	1750.64
68.56	692.16	116.25	1969.47
68.93	756.87	128.17	2188.30
69.26	812.38	138.85	2407.13
69.57	862.59	148.85	2625.96
70.40	998.82	177.79	3282.45

Gapps_0093_R

Elevation	Total Stor	Storage	Discharge
67.25	74.61	15.37	158.94
68.41	138.00	24.79	317.88
69.30	222.05	32.46	476.82
70.04	308.27	39.50	635.76
70.68	395.75	46.12	794.70
71.25	483.47	52.58	953.64
71.78	576.39	59.79	1112.58
72.26	673.79	68.05	1271.52
72.73	769.45	77.29	1430.46
73.15	843.77	86.90	1589.40
73.55	909.75	97.37	1748.34
73.92	972.36	109.77	1907.28
74.81	1166.05	167.23	2384.10

Gapps_0150_R

Elevation	Total Stor	Storage	Discharge
68.14	77.22	2.61	141.41
69.38	142.22	4.22	282.82
70.35	227.65	5.60	424.23
71.17	315.14	6.87	565.64
71.90	403.80	8.05	707.05
72.56	492.64	9.17	848.46
73.18	586.63	10.24	989.87
73.75	685.07	11.28	1131.28
74.30	781.76	12.31	1272.69
74.94	857.33	13.56	1414.10
75.56	924.97	15.22	1555.51
76.17	990.53	18.17	1696.92
77.72	1208.62	42.57	2121.15

Gapps_0161_R

Elevation	Total Stor	Storage	Discharge
69.85	106.63	29.41	189.65
70.95	192.63	50.41	379.30
71.80	295.10	67.45	568.95
72.56	397.44	82.30	758.60
73.26	499.54	95.74	948.25
73.94	600.83	108.19	1137.90
74.59	706.53	119.90	1327.55
75.23	816.08	131.01	1517.20
75.88	923.61	141.85	1706.85
76.48	1012.95	155.62	1896.50
76.82	1099.75	174.78	2086.15
77.02	1215.50	224.97	2275.80
77.73	1851.99	643.37	2844.75

Gapps_0187_R

Elevation	Total Stor	Storage	Discharge
69.85	238.75	132.12	159.99
70.99	363.56	170.93	319.98
71.86	496.84	201.74	479.97
72.64	627.28	229.84	639.96
73.36	756.11	256.57	799.95
74.05	883.49	282.66	959.94
74.72	1015.04	308.51	1119.93
75.38	1150.75	334.67	1279.92
76.03	1285.53	361.92	1439.91
76.64	1403.78	390.83	1599.90
76.99	1512.39	412.64	1759.89
77.19	1643.49	427.99	1919.88
77.89	2353.47	501.48	2399.85

Gapps_0236_R

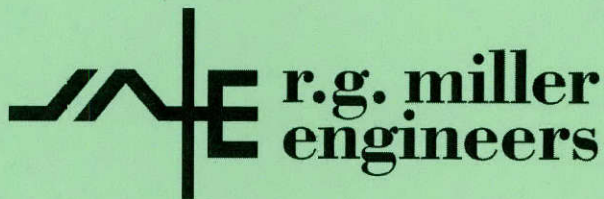
Elevation	Total Stor	Storage	Discharge
77.02	249.08	10.33	79.51
77.87	380.89	17.33	159.02
78.55	521.17	24.33	238.53
79.30	659.59	32.31	318.04
79.87	793.29	37.18	397.55
80.35	924.79	41.30	477.06
80.90	1061.72	46.68	556.57
81.41	1202.65	51.90	636.08
81.90	1342.67	57.14	715.59
82.37	1466.09	62.31	795.10
82.74	1578.61	66.22	874.61
82.99	1713.07	69.58	954.12
83.45	2436.02	82.55	1192.65

Gapps_0294_R

Elevation	Total Stor	Storage	Discharge
78.26	249.80	0.72	51.22
78.96	382.10	1.21	102.44
79.52	522.84	1.67	153.66
80.08	661.81	2.22	204.88
80.56	796.05	2.76	256.10
80.99	928.11	3.32	307.32
81.46	1065.73	4.01	358.54
81.91	1207.34	4.69	409.76
82.37	1348.23	5.56	460.98
82.80	1472.89	6.80	512.20
83.14	1586.44	7.83	563.42
83.39	1721.67	8.60	614.64
83.90	2446.36	10.34	768.30

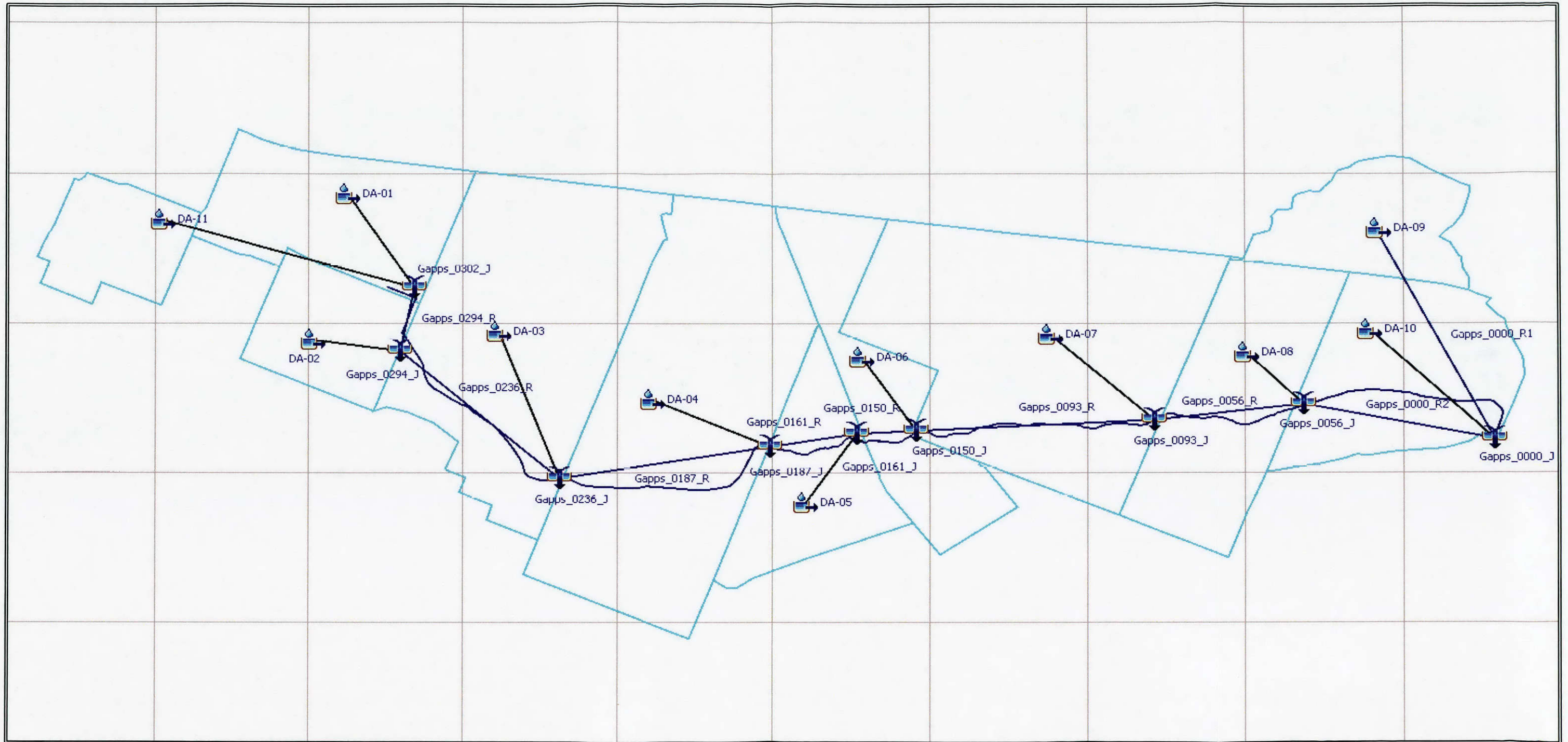


**Appendix X:
Ultimate HEC-HMS Model
Schematics and Results**



Gapps Bayou

Ultimate Conditions HEC-HMS Model Schematic





Project: Gapps Bayou Ph 2 Simulation Run: Ultimate: 10PCT_10yr

Start of Run: 26Oct2011, 00:00 Basin Model: Ultimate
 End of Run: 28Oct2011, 00:00 Meteorologic Model: 10PCT_10yr
 Compute Time: 31Jul2013, 19:17:41 Control Specifications: Control 48

Volume Units: AC-FT

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
DA-01	0.588	308.9	26Oct2011, 17:45	200.2
DA-02	0.348	204.4	26Oct2011, 17:00	124.9
DA-03	1.275	557.3	26Oct2011, 18:45	430.1
DA-04	1.479	351.9	26Oct2011, 19:30	456.3
DA-05	0.459	190.0	26Oct2011, 17:45	141.1
DA-06	0.507	236.9	26Oct2011, 18:00	166.5
DA-07	1.428	558.1	26Oct2011, 18:30	470.9
DA-08	0.698	185.7	26Oct2011, 20:45	227.6
DA-09	0.390	124.1	26Oct2011, 18:45	118.0
DA-10	0.679	420.7	26Oct2011, 18:15	230.6
DA-11	0.295	54.8	26Oct2011, 21:45	88.5
Gapps_0000_J	8.146	1834.1	26Oct2011, 23:30	2905.3
Gapps_0000_R1	0.390	124.1	26Oct2011, 19:30	117.7
Gapps_0000_R2	7.077	1652.4	27Oct2011, 02:00	2556.9
Gapps_0056_J	7.077	1657.2	27Oct2011, 00:15	2619.7
Gapps_0056_R	6.379	1502.9	27Oct2011, 00:30	2392.1
Gapps_0093_J	6.379	1504.0	27Oct2011, 00:00	2371.3
Gapps_0093_R	4.951	1206.9	27Oct2011, 01:15	1900.4
Gapps_0150_J	4.951	1218.6	26Oct2011, 22:45	1891.4
Gapps_0150_R	4.444	1095.8	26Oct2011, 23:30	1724.9
Gapps_0161_J	4.444	1113.9	26Oct2011, 22:00	1724.0
Gapps_0161_R	3.985	999.9	26Oct2011, 23:00	1582.9
Gapps_0187_J	3.985	1254.9	26Oct2011, 20:00	1557.9
Gapps_0187_R	2.506	907.4	26Oct2011, 20:15	1101.6
Gapps_0236_J	2.506	1057.1	26Oct2011, 18:45	983.0



Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Gapps_0236_R	1.231	501.5	26Oct2011, 19:00	552.9
Gapps_0294_J	1.231	512.3	26Oct2011, 17:45	491.1
Gapps_0294_R	0.883	327.0	26Oct2011, 18:15	366.3
Gapps_0302_J	0.883	331.2	26Oct2011, 17:45	288.7



Project: Gapps Bayou Ph 2 Simulator Run: Ultimate: 2PCT_50yr

Start of Run: 26Oct2011, 00:00 Basin Model: Ultimate
 End of Run: 28Oct2011, 00:00 Meteorologic Model: 2PCT_50yr
 Compute Time: 31Jul2013, 19:18:36 Control Specifications: Control 48

Volume Units: AC-FT

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
DA-01	0.588	420.4	26Oct2011, 17:45	285.4
DA-02	0.348	276.5	26Oct2011, 17:00	175.6
DA-03	1.275	769.1	26Oct2011, 18:45	614.6
DA-04	1.479	496.1	26Oct2011, 19:45	654.8
DA-05	0.459	262.6	26Oct2011, 17:45	206.9
DA-06	0.507	324.9	26Oct2011, 18:00	239.6
DA-07	1.428	771.5	26Oct2011, 18:30	676.4
DA-08	0.698	262.0	26Oct2011, 20:45	324.0
DA-09	0.390	174.3	26Oct2011, 18:45	173.0
DA-10	0.679	571.9	26Oct2011, 18:15	328.9
DA-11	0.295	77.0	26Oct2011, 22:00	124.4
Gapps_0000_J	8.146	2419.9	26Oct2011, 22:30	3941.4
Gapps_0000_R1	0.390	174.3	26Oct2011, 19:30	172.6
Gapps_0000_R2	7.077	2104.3	27Oct2011, 01:15	3439.9
Gapps_0056_J	7.077	2108.3	26Oct2011, 23:30	3556.5
Gapps_0056_R	6.379	1879.5	27Oct2011, 00:00	3232.5
Gapps_0093_J	6.379	1880.4	26Oct2011, 23:30	3220.0
Gapps_0093_R	4.951	1461.7	27Oct2011, 02:30	2543.7
Gapps_0150_J	4.951	1469.7	26Oct2011, 23:15	2535.7
Gapps_0150_R	4.444	1328.6	27Oct2011, 01:30	2296.1
Gapps_0161_J	4.444	1343.4	27Oct2011, 00:00	2295.3
Gapps_0161_R	3.985	1222.8	27Oct2011, 01:15	2088.5
Gapps_0187_J	3.985	1672.5	26Oct2011, 21:15	2065.9
Gapps_0187_R	2.506	1195.5	26Oct2011, 21:30	1412.1
Gapps_0236_J	2.506	1386.0	26Oct2011, 19:15	1314.3



Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Gapps_0236_R	1.231	659.3	26Oct2011, 20:15	699.7
Gapps_0294_J	1.231	696.5	26Oct2011, 18:00	646.2
Gapps_0294_R	0.883	447.2	26Oct2011, 18:15	470.7
Gapps_0302_J	0.883	452.6	26Oct2011, 17:45	409.8



Project: Gapps Bayou Ph 2 Simulation Run: Ultimate: 1PCT_100yr

Start of Run: 26Oct2011, 00:00 Basin Model: Ultimate
 End of Run: 28Oct2011, 00:00 Meteorologic Model: 1PCT_100yr
 Compute Time: 31Jul2013, 19:18:09 Control Specifications: Control 48

Volume Units: AC-FT

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
DA-01	0.588	474.4	26Oct2011, 17:45	330.9
DA-02	0.348	310.3	26Oct2011, 17:00	202.6
DA-03	1.275	871.0	26Oct2011, 18:45	713.0
DA-04	1.479	566.1	26Oct2011, 19:45	760.8
DA-05	0.459	298.4	26Oct2011, 17:45	241.9
DA-06	0.507	368.0	26Oct2011, 18:00	278.7
DA-07	1.428	875.9	26Oct2011, 18:30	786.0
DA-08	0.698	298.3	26Oct2011, 20:45	375.4
DA-09	0.390	198.9	26Oct2011, 18:45	202.3
DA-10	0.679	644.1	26Oct2011, 18:15	381.4
DA-11	0.295	87.8	26Oct2011, 22:00	143.6
Gapps_0000_J	8.146	2691.7	26Oct2011, 22:45	4496.9
Gapps_0000_R1	0.390	198.9	26Oct2011, 19:30	201.9
Gapps_0000_R2	7.077	2313.8	27Oct2011, 00:45	3913.7
Gapps_0056_J	7.077	2318.8	26Oct2011, 23:00	4053.2
Gapps_0056_R	6.379	2048.8	26Oct2011, 23:30	3677.7
Gapps_0093_J	6.379	2049.5	26Oct2011, 22:45	3670.3
Gapps_0093_R	4.951	1566.3	27Oct2011, 03:00	2884.3
Gapps_0150_J	4.951	1573.5	27Oct2011, 00:00	2876.9
Gapps_0150_R	4.444	1423.2	27Oct2011, 02:15	2598.2
Gapps_0161_J	4.444	1440.2	27Oct2011, 00:30	2597.6
Gapps_0161_R	3.985	1315.9	27Oct2011, 02:15	2355.7
Gapps_0187_J	3.985	1900.6	26Oct2011, 21:30	2336.9
Gapps_0187_R	2.506	1359.3	26Oct2011, 21:30	1576.1
Gapps_0236_J	2.506	1537.3	26Oct2011, 19:30	1490.7



Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Gapps_0236_R	1.231	737.2	26Oct2011, 20:30	777.7
Gapps_0294_J	1.231	794.3	26Oct2011, 18:00	729.2
Gapps_0294_R	0.883	508.9	26Oct2011, 18:15	526.6
Gapps_0302_J	0.883	512.2	26Oct2011, 17:45	474.5



Project: Gapps Bayou Ph 2 Simulation Run: Ultimate: 0.2PCT_500yr

Start of Run: 26Oct2011, 00:00 Basin Model: Ultimate
 End of Run: 28Oct2011, 00:00 Meteorologic Model: 0.2PCT_500yr
 Compute Time: 31Jul2013, 19:16:58 Control Specifications: Control 48

Volume Units: AC-FT

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
DA-01	0.588	594.2	26Oct2011, 17:45	425.3
DA-02	0.348	386.7	26Oct2011, 17:00	258.5
DA-03	1.275	1101.1	26Oct2011, 18:45	917.7
DA-04	1.479	725.1	26Oct2011, 20:00	981.2
DA-05	0.459	376.5	26Oct2011, 17:45	315.6
DA-06	0.507	462.9	26Oct2011, 18:00	360.1
DA-07	1.428	1107.4	26Oct2011, 18:30	1014.5
DA-08	0.698	382.0	26Oct2011, 20:45	482.0
DA-09	0.390	253.7	26Oct2011, 19:00	264.0
DA-10	0.679	807.0	26Oct2011, 18:15	490.4
DA-11	0.295	112.5	26Oct2011, 22:15	182.9
Gapps_0000_J	8.146	3320.5	26Oct2011, 22:30	5713.7
Gapps_0000_R1	0.390	253.7	26Oct2011, 19:45	263.4
Gapps_0000_R2	7.077	2780.6	27Oct2011, 00:00	4959.9
Gapps_0056_J	7.077	2787.0	26Oct2011, 22:30	5130.8
Gapps_0056_R	6.379	2425.5	26Oct2011, 22:45	4648.8
Gapps_0093_J	6.379	2427.8	26Oct2011, 22:15	4647.4
Gapps_0093_R	4.951	1940.3	27Oct2011, 07:00	3632.9
Gapps_0150_J	4.951	1992.2	27Oct2011, 02:45	3626.6
Gapps_0150_R	4.444	1858.4	27Oct2011, 03:15	3266.5
Gapps_0161_J	4.444	1974.6	27Oct2011, 01:30	3266.1
Gapps_0161_R	3.985	1814.9	27Oct2011, 01:45	2950.5
Gapps_0187_J	3.985	2461.1	26Oct2011, 21:30	2931.8
Gapps_0187_R	2.506	1759.1	26Oct2011, 21:45	1950.6
Gapps_0236_J	2.506	1883.7	26Oct2011, 19:45	1873.8



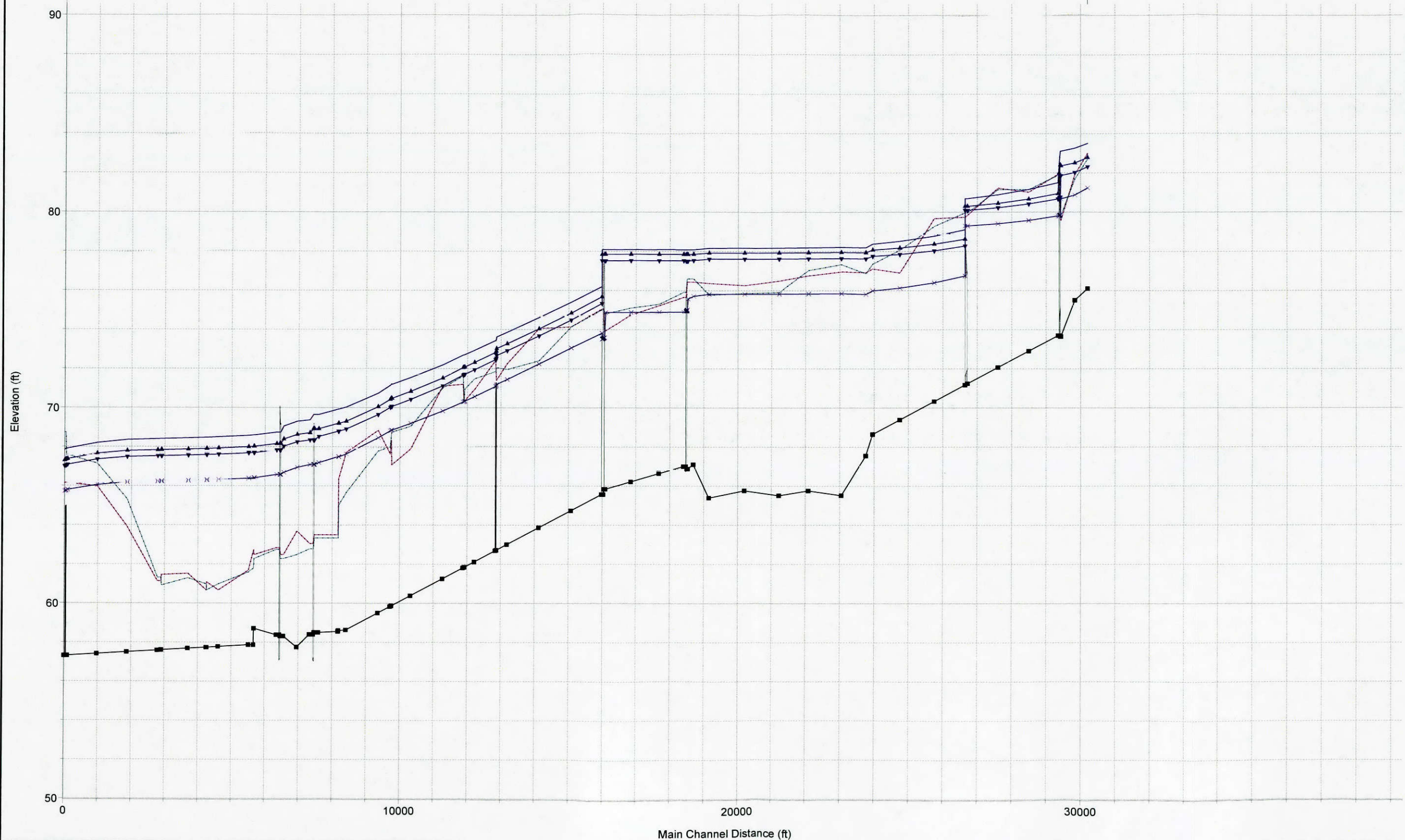
Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Gapps_0236_R	1.231	913.3	26Oct2011, 21:15	956.1
Gapps_0294_J	1.231	1000.7	26Oct2011, 18:00	912.2
Gapps_0294_R	0.883	641.0	26Oct2011, 18:15	653.7
Gapps_0302_J	0.883	643.3	26Oct2011, 18:00	608.2



**Appendix Y:
Ultimate HEC-RAS Profiles and
Output**



Gapps Bayou 1



Legend	
WS 0.2PCT_500yr	▲
WS 1PCT_100yr	▼
WS 2PCT_50yr	◆
WS 10PCT_10yr	×
Ground	■
LOB	—
ROB	—

1 in Horiz. = 3000 ft 1 in Vert. = 5 ft



Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	30204.2	0.2PCT_500yr	637.90	76.10	83.50		83.56	0.000714	1.87	372.69	161.28	0.19
1	30204.2	1PCT_100yr	507.30	76.10	82.78		82.84	0.000990	1.93	267.57	123.64	0.21
1	30204.2	2PCT_50yr	448.20	76.10	82.32		82.38	0.001022	2.04	219.73	82.80	0.22
1	30204.2	10PCT_10yr	327.90	76.10	81.24		81.31	0.001039	2.14	153.25	52.67	0.22
1	29832.6	0.2PCT_500yr	637.90	75.51	83.27		83.34	0.000505	2.13	416.57	158.12	0.17
1	29832.6	1PCT_100yr	507.30	75.51	82.51		82.57	0.000557	2.01	301.97	147.43	0.17
1	29832.6	2PCT_50yr	448.20	75.51	82.02		82.08	0.000657	2.01	231.90	127.80	0.18
1	29832.6	10PCT_10yr	327.90	75.51	80.87		80.94	0.000927	2.07	158.05	52.15	0.21
1	29428.5	0.2PCT_500yr	997.00	73.66	83.11	77.72	83.18	0.000332	2.12	793.12	239.06	0.14
1	29428.5	1PCT_100yr	784.50	73.66	82.36	77.28	82.41	0.000308	1.89	621.33	218.79	0.14
1	29428.5	2PCT_50yr	697.70	73.66	81.86	77.09	81.91	0.000329	1.84	514.24	208.38	0.14
1	29428.5	10PCT_10yr	514.60	73.66	80.67	76.63	80.72	0.000407	1.74	337.48	123.99	0.15
1	29411.9		Culvert									
1	29344.3	0.2PCT_500yr	997.00	73.70	81.49		81.56	0.000462	2.09	476.62	92.34	0.16
1	29344.3	1PCT_100yr	784.50	73.70	80.94		80.99	0.000388	1.84	426.51	87.89	0.15
1	29344.3	2PCT_50yr	697.70	73.70	80.67		80.71	0.000358	1.73	403.06	85.73	0.14
1	29344.3	10PCT_10yr	514.60	73.70	79.80		79.84	0.000333	1.55	331.85	78.80	0.13
1	28494.4	0.2PCT_500yr	997.00	72.90	81.15		81.21	0.000361	1.92	536.08	140.90	0.14
1	28494.4	1PCT_100yr	784.50	72.90	80.66		80.70	0.000291	1.66	475.91	104.38	0.13
1	28494.4	2PCT_50yr	697.70	72.90	80.41		80.45	0.000263	1.55	451.49	94.44	0.12
1	28494.4	10PCT_10yr	514.60	72.90	79.57		79.60	0.000232	1.36	378.25	83.38	0.11
1	27602	0.2PCT_500yr	997.00	72.07	80.88		80.93	0.000278	1.73	588.60	171.74	0.13
1	27602	1PCT_100yr	784.50	72.07	80.44		80.48	0.000212	1.48	531.73	96.99	0.11
1	27602	2PCT_50yr	697.70	72.07	80.22		80.25	0.000188	1.37	510.35	95.21	0.10
1	27602	10PCT_10yr	514.60	72.07	79.41		79.43	0.000158	1.18	435.51	88.70	0.09
1	26717.3	0.2PCT_500yr	997.00	71.24	80.68	74.07	80.72	0.000191	1.56	845.65	264.19	0.11
1	26717.3	1PCT_100yr	784.50	71.24	80.29	73.70	80.32	0.000146	1.30	749.18	235.55	0.09
1	26717.3	2PCT_50yr	697.70	71.24	80.09	73.53	80.11	0.000130	1.20	702.02	223.19	0.09
1	26717.3	10PCT_10yr	514.60	71.24	79.30	73.15	79.31	0.000107	1.02	555.58	138.35	0.08
1	26712.7		Culvert									
1	26645.3	0.2PCT_500yr	997.00	71.17	79.10		79.17	0.000429	2.04	490.05	98.93	0.16
1	26645.3	1PCT_100yr	784.50	71.17	78.62		78.67	0.000344	1.76	445.83	89.63	0.14
1	26645.3	2PCT_50yr	697.70	71.17	78.27		78.32	0.000331	1.68	414.95	86.83	0.14
1	26645.3	10PCT_10yr	514.60	71.17	76.75		76.80	0.000475	1.76	291.71	74.62	0.16
1	25748.4	0.2PCT_500yr	997.00	70.33	78.77		78.83	0.000330	1.85	618.00	268.08	0.14
1	25748.4	1PCT_100yr	784.50	70.33	78.37		78.41	0.000251	1.57	530.92	181.99	0.12
1	25748.4	2PCT_50yr	697.70	70.33	78.03		78.06	0.000238	1.49	479.31	124.49	0.12
1	25748.4	10PCT_10yr	514.60	70.33	76.40		76.43	0.000340	1.56	329.18	78.53	0.13
1	24746.6	0.2PCT_500yr	997.00	69.39	78.51		78.56	0.000220	1.66	739.46	526.93	0.12
1	24746.6	1PCT_100yr	784.50	69.39	78.17		78.20	0.000164	1.38	627.09	215.76	0.10
1	24746.6	2PCT_50yr	697.70	69.39	77.85		77.87	0.000154	1.30	571.31	142.23	0.10
1	24746.6	10PCT_10yr	514.60	69.39	76.13		76.16	0.000223	1.34	384.83	89.04	0.11
1	23956.8	0.2PCT_500yr	997.00	68.65	78.37		78.40	0.000166	1.50	929.91	1462.69	0.10
1	23956.8	1PCT_100yr	784.50	68.65	78.07		78.09	0.000120	1.24	687.49	335.85	0.09
1	23956.8	2PCT_50yr	697.70	68.65	77.75		77.77	0.000113	1.16	614.72	169.10	0.08
1	23956.8	10PCT_10yr	514.60	68.65	75.99		76.01	0.000158	1.18	435.53	88.70	0.09
1	23757.9	0.2PCT_500yr	2260.90	67.55	78.18		78.31	0.000826	2.94	1109.32	764.29	0.22
1	23757.9	1PCT_100yr	1782.30	67.55	77.93		78.02	0.000613	2.46	952.38	535.52	0.19
1	23757.9	2PCT_50yr	1580.30	67.55	77.62		77.70	0.000606	2.35	804.50	416.73	0.19
1	23757.9	10PCT_10yr	1160.30	67.55	75.81		75.91	0.000893	2.62	442.39	102.56	0.22
1	23044.2	0.2PCT_500yr	2260.90	65.52	78.21		78.22	0.000025	0.75	3482.62	1134.76	0.04
1	23044.2	1PCT_100yr	1782.30	65.52	77.95		77.96	0.000017	0.61	3213.70	952.98	0.03
1	23044.2	2PCT_50yr	1580.30	65.52	77.64		77.64	0.000015	0.56	2951.73	732.70	0.03
1	23044.2	10PCT_10yr	1160.30	65.52	75.85		75.85	0.000014	0.51	2285.26	277.54	0.03
1	22087.5	0.2PCT_500yr	2260.90	65.76	78.19		78.20	0.000022	0.70	3734.62	779.69	0.04
1	22087.5	1PCT_100yr	1782.30	65.76	77.94		77.94	0.000015	0.57	3545.46	726.67	0.03
1	22087.5	2PCT_50yr	1580.30	65.76	77.63		77.63	0.000014	0.52	3325.21	688.76	0.03
1	22087.5	10PCT_10yr	1160.30	65.76	75.83		75.84	0.000013	0.48	2428.03	307.34	0.03
1	21218.3	0.2PCT_500yr	2260.90	65.51	78.17		78.18	0.000022	0.73	3793.80	1499.94	0.04
1	21218.3	1PCT_100yr	1782.30	65.51	77.92		77.93	0.000015	0.59	3458.42	1240.37	0.03
1	21218.3	2PCT_50yr	1580.30	65.51	77.61		77.62	0.000013	0.55	3135.53	940.15	0.03



HEC-RAS Plan: Ultimate River: Gapps Bayou Reach: 1 (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	21218.3	10PCT_10yr	1160.30	65.51	75.82		75.83	0.000014	0.49	2363.21	288.59	0.03
1	20195.4	0.2PCT_500yr	2260.90	65.76	78.17		78.17	0.000004	0.34	7771.83	2434.47	0.02
1	20195.4	1PCT_100yr	1782.30	65.76	77.92		77.92	0.000003	0.27	7250.71	1755.15	0.01
1	20195.4	2PCT_50yr	1580.30	65.76	77.61		77.61	0.000002	0.25	6796.60	1324.03	0.01
1	20195.4	10PCT_10yr	1160.30	65.76	75.82		75.82	0.000002	0.22	5210.25	592.94	0.01
1	19150.5	0.2PCT_500yr	2260.90	65.39	78.16		78.16	0.000006	0.40	7224.41	2785.57	0.02
1	19150.5	1PCT_100yr	1782.30	65.39	77.92		77.92	0.000004	0.32	6594.43	2437.77	0.02
1	19150.5	2PCT_50yr	1580.30	65.39	77.61		77.61	0.000003	0.30	5926.73	1736.54	0.02
1	19150.5	10PCT_10yr	1160.30	65.39	75.82		75.82	0.000003	0.26	4397.08	503.73	0.02
1	18693.0	0.2PCT_500yr	2803.10	67.10	78.08		78.15	0.000419	2.39	5251.13	6027.57	0.16
1	18693.0	1PCT_100yr	2146.40	67.10	77.85		77.91	0.000338	2.09	3975.67	5047.54	0.14
1	18693.0	2PCT_50yr	1887.80	67.10	77.54		77.60	0.000370	2.12	2582.26	3675.48	0.15
1	18693.0	10PCT_10yr	1308.20	67.10	75.72		75.80	0.000525	2.36	557.16	126.83	0.18
1	18528.1	0.2PCT_500yr	2803.10	66.88	78.08	72.70	78.10	0.000191	1.52	5165.24	6019.92	0.11
1	18528.1	1PCT_100yr	2146.40	66.88	77.84	71.97	77.86	0.000199	1.50	3850.76	4983.41	0.11
1	18528.1	2PCT_50yr	1887.80	66.88	77.51	71.63	77.54	0.000287	1.74	2416.34	3540.94	0.13
1	18528.1	10PCT_10yr	1308.20	66.88	75.58	70.80	75.69	0.000768	2.75	476.56	89.58	0.21
1	18501.7	Culvert										
1	18402.6	0.2PCT_500yr	2803.10	67.00	78.09		78.10	0.000009	0.46	13785.68	8867.71	0.03
1	18402.6	1PCT_100yr	2146.40	67.00	77.86		77.86	0.000007	0.39	11792.74	7961.90	0.02
1	18402.6	2PCT_50yr	1887.80	67.00	77.53		77.53	0.000007	0.40	9334.21	7149.93	0.02
1	18402.6	10PCT_10yr	1308.20	67.00	74.90		74.91	0.000017	0.50	2621.09	363.23	0.03
1	17679.2	0.2PCT_500yr	2803.10	66.64	78.09		78.09	0.000007	0.42	14306.21	7979.83	0.02
1	17679.2	1PCT_100yr	2146.40	66.64	77.85		77.85	0.000005	0.36	12559.14	7070.74	0.02
1	17679.2	2PCT_50yr	1887.80	66.64	77.53		77.53	0.000006	0.36	10426.81	6062.96	0.02
1	17679.2	10PCT_10yr	1308.20	66.64	74.89		74.90	0.000014	0.48	2748.41	366.03	0.03
1	16850	0.2PCT_500yr	2803.10	66.22	78.08		78.08	0.000006	0.40	14724.43	7541.88	0.02
1	16850	1PCT_100yr	2146.40	66.22	77.85		77.85	0.000004	0.34	13069.14	6743.07	0.02
1	16850	2PCT_50yr	1887.80	66.22	77.52		77.52	0.000005	0.34	11034.38	5790.78	0.02
1	16850	10PCT_10yr	1308.20	66.22	74.88		74.89	0.000012	0.45	2905.49	440.02	0.03
1	16085.5	0.2PCT_500yr	2634.00	65.84	78.08	67.17	78.08	0.000005	0.37	15094.57	7288.18	0.02
1	16085.5	1PCT_100yr	2288.20	65.84	77.85	67.05	77.85	0.000004	0.35	13500.19	6465.57	0.02
1	16085.5	2PCT_50yr	2037.20	65.84	77.52	66.95	77.52	0.000005	0.35	11485.96	5833.02	0.02
1	16085.5	10PCT_10yr	1411.80	65.84	74.87	66.72	74.88	0.000012	0.46	3077.44	554.73	0.03
1	16054.3	Culvert										
1	15977.7	0.2PCT_500yr	2634.00	65.57	76.20		76.35	0.000841	3.16	4060.37	4929.90	0.23
1	15977.7	1PCT_100yr	2288.20	65.57	75.68		75.82	0.000906	3.09	2031.59	2873.29	0.23
1	15977.7	2PCT_50yr	2037.20	65.57	75.33		75.47	0.000905	2.96	1311.82	1509.52	0.23
1	15977.7	10PCT_10yr	1411.80	65.57	73.82		73.93	0.000732	2.72	527.90	137.17	0.21
1	15075.6	0.2PCT_500yr	2779.70	64.74	75.40		75.59	0.000840	3.52	2627.37	2745.19	0.23
1	15075.6	1PCT_100yr	2434.70	64.74	74.85		75.02	0.000869	3.39	1451.36	1559.59	0.23
1	15075.6	2PCT_50yr	2227.10	64.74	74.49		74.66	0.000884	3.29	1027.79	904.16	0.23
1	15075.6	10PCT_10yr	1577.70	64.74	73.07		73.21	0.000880	2.99	532.56	133.35	0.23
1	14123.4	0.2PCT_500yr	2779.70	63.87	74.61		74.80	0.000813	3.52	2067.89	1301.48	0.23
1	14123.4	1PCT_100yr	2434.70	63.87	74.03		74.21	0.000837	3.38	1384.33	1045.44	0.23
1	14123.4	2PCT_50yr	2227.10	63.87	73.67		73.84	0.000833	3.28	1031.46	877.60	0.23
1	14123.4	10PCT_10yr	1577.70	63.87	72.24		72.38	0.000860	2.97	543.20	119.40	0.22
1	13183.6	0.2PCT_500yr	2779.70	63.01	73.86		74.05	0.000780	3.52	1214.57	550.55	0.22
1	13183.6	1PCT_100yr	2434.70	63.01	73.27		73.45	0.000788	3.36	914.14	467.26	0.22
1	13183.6	2PCT_50yr	2227.10	63.01	72.91		73.08	0.000787	3.24	770.91	322.50	0.22
1	13183.6	10PCT_10yr	1577.70	63.01	71.45		71.58	0.000832	2.93	537.97	97.51	0.22
1	12867.8	0.2PCT_500yr	2779.70	62.72	73.62	67.82	73.81	0.000758	3.50	1342.19	604.04	0.22
1	12867.8	1PCT_100yr	2434.70	62.72	73.03	67.46	73.20	0.000765	3.33	1025.22	470.89	0.22
1	12867.8	2PCT_50yr	2227.10	62.72	72.67	67.23	72.83	0.000763	3.22	868.57	385.85	0.22
1	12867.8	10PCT_10yr	1577.70	62.72	71.19	66.42	71.32	0.000820	2.92	540.92	97.75	0.22
1	12860.8	Bridge										
1	12836.5	0.2PCT_500yr	2779.70	62.69	73.44		73.63	0.000830	3.55	1241.20	536.17	0.23
1	12836.5	1PCT_100yr	2434.70	62.69	72.83		73.01	0.000856	3.40	941.50	447.92	0.23
1	12836.5	2PCT_50yr	2227.10	62.69	72.46		72.63	0.000865	3.30	792.44	367.73	0.23
1	12836.5	10PCT_10yr	1577.70	62.69	71.09		71.23	0.000848	2.95	534.29	97.20	0.22



HEC-RAS Plan: Ultimate River: Gapps Bayou Reach: 1 (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	12214.3	0.2PCT_500yr	2779.70	62.12	72.94		73.13	0.000782	3.52	1396.59	551.68	0.22
1	12214.3	1PCT_100yr	2434.70	62.12	72.32		72.49	0.000805	3.37	1088.89	419.64	0.23
1	12214.3	2PCT_50yr	2227.10	62.12	71.95		72.11	0.000812	3.27	945.16	360.79	0.22
1	12214.3	10PCT_10yr	1577.70	62.12	70.57		70.70	0.000826	2.92	563.95	171.44	0.22
1	11922.7	0.2PCT_500yr	2779.70	61.85	72.71		72.90	0.000760	3.52	1405.69	609.41	0.22
1	11922.7	1PCT_100yr	2434.70	61.85	72.08		72.26	0.000780	3.37	1069.41	450.30	0.22
1	11922.7	2PCT_50yr	2227.10	61.85	71.71		71.88	0.000784	3.26	912.05	405.14	0.22
1	11922.7	10PCT_10yr	1577.70	61.85	70.33		70.47	0.000814	2.91	547.25	154.70	0.22
1	11900.3	0.2PCT_500yr	2779.70	61.83	72.70		72.88	0.000713	3.46	1426.26	625.10	0.22
1	11900.3	1PCT_100yr	2434.70	61.83	72.07		72.24	0.000740	3.33	1079.10	466.49	0.22
1	11900.3	2PCT_50yr	2227.10	61.83	71.70		71.86	0.000748	3.24	916.13	406.50	0.22
1	11900.3	10PCT_10yr	1577.70	61.83	70.32		70.45	0.000813	2.91	542.58	97.88	0.22
1	11875.3	0.2PCT_500yr	2779.70	61.81	72.69		72.86	0.000904	3.29	1431.88	662.91	0.23
1	11875.3	1PCT_100yr	2434.70	61.81	72.06		72.22	0.001012	3.23	1060.58	483.27	0.24
1	11875.3	2PCT_50yr	2227.10	61.81	71.68		71.83	0.001080	3.18	883.92	458.08	0.25
1	11875.3	10PCT_10yr	1577.70	61.81	70.30		70.43	0.000813	2.91	542.55	97.88	0.22
1	11269.5	0.2PCT_500yr	2779.70	61.25	72.19		72.37	0.000717	3.44	1230.73	501.35	0.22
1	11269.5	1PCT_100yr	2434.70	61.25	71.52		71.69	0.000760	3.33	956.54	325.71	0.23
1	11269.5	2PCT_50yr	2227.10	61.25	71.12		71.28	0.000781	3.24	838.41	274.64	0.23
1	11269.5	10PCT_10yr	1577.70	61.25	69.84		69.96	0.000716	2.86	559.99	146.20	0.21
1	10321.5	0.2PCT_500yr	2779.70	60.39	71.54		71.72	0.000652	3.43	1657.22	465.34	0.21
1	10321.5	1PCT_100yr	2434.70	60.39	70.84		71.01	0.000678	3.30	1345.64	426.78	0.21
1	10321.5	2PCT_50yr	2227.10	60.39	70.43		70.59	0.000687	3.20	1172.86	413.50	0.21
1	10321.5	10PCT_10yr	1577.70	60.39	69.20		69.31	0.000652	2.76	719.83	324.18	0.20
1	9759.4	0.2PCT_500yr	2779.70	59.87	71.19		71.36	0.000613	3.37	1767.17	560.08	0.20
1	9759.4	1PCT_100yr	2434.70	59.87	70.48		70.64	0.000635	3.24	1426.58	430.75	0.20
1	9759.4	2PCT_50yr	2227.10	59.87	70.06		70.21	0.000642	3.14	1252.52	403.72	0.20
1	9759.4	10PCT_10yr	1577.70	59.87	68.85		68.96	0.000593	2.68	812.29	325.50	0.19
1	9744.1	0.2PCT_500yr	2779.70	59.86	71.22		71.34	0.000608	2.87	1834.95	598.35	0.20
1	9744.1	1PCT_100yr	2434.70	59.86	70.49		70.61	0.000690	2.83	1445.79	484.55	0.20
1	9744.1	2PCT_50yr	2227.10	59.86	70.07		70.19	0.000740	2.80	1254.29	423.12	0.21
1	9744.1	10PCT_10yr	1577.70	59.86	68.85		68.95	0.000864	2.56	787.69	350.11	0.22
1	9714.8	0.2PCT_500yr	2779.70	59.83	71.15		71.32	0.000604	3.36	1913.00	686.11	0.20
1	9714.8	1PCT_100yr	2434.70	59.83	70.43		70.59	0.000629	3.23	1470.14	562.82	0.20
1	9714.8	2PCT_50yr	2227.10	59.83	70.02		70.17	0.000633	3.13	1275.36	437.00	0.20
1	9714.8	10PCT_10yr	1577.70	59.83	68.82		68.93	0.000580	2.67	816.37	349.53	0.19
1	9354.3	0.2PCT_500yr	3629.50	59.50	70.74		71.01	0.001057	4.28	2266.70	697.01	0.26
1	9354.3	1PCT_100yr	3068.40	59.50	70.05		70.29	0.001038	4.00	1796.88	656.25	0.26
1	9354.3	2PCT_50yr	2758.50	59.50	69.65		69.87	0.001017	3.82	1544.99	594.23	0.25
1	9354.3	10PCT_10yr	2024.40	59.50	68.46		68.64	0.001018	3.41	921.36	455.65	0.25
1	8406.8	0.2PCT_500yr	3629.50	58.63	70.03		70.19	0.000668	3.54	2125.36	699.55	0.21
1	8406.8	1PCT_100yr	3068.40	58.63	69.31		69.46	0.000696	3.40	1725.61	486.05	0.21
1	8406.8	2PCT_50yr	2758.50	58.63	68.91		69.05	0.000697	3.29	1544.26	423.46	0.21
1	8406.8	10PCT_10yr	2024.40	58.63	67.63		67.77	0.000806	3.13	1042.92	366.50	0.22
1	8187.8	0.2PCT_500yr	3629.50	58.60	69.93		70.04	0.000513	3.13	1850.55	403.18	0.19
1	8187.8	1PCT_100yr	3068.40	58.60	69.20		69.30	0.000534	3.01	1588.29	346.07	0.19
1	8187.8	2PCT_50yr	2758.50	58.60	68.79		68.90	0.000543	2.93	1449.80	337.79	0.19
1	8187.8	10PCT_10yr	2024.40	58.60	67.48		67.59	0.000679	2.89	1023.36	314.54	0.20
1	8175.8	0.2PCT_500yr	3629.50	58.55	69.93		70.03	0.000440	3.01	1866.94	355.10	0.18
1	8175.8	1PCT_100yr	3068.40	58.55	69.20		69.30	0.000439	2.84	1619.41	327.32	0.17
1	8175.8	2PCT_50yr	2758.50	58.55	68.80		68.89	0.000432	2.73	1494.84	299.62	0.17
1	8175.8	10PCT_10yr	2024.40	58.55	67.50		67.58	0.000476	2.55	1142.83	259.91	0.17
1	7595.5	0.2PCT_500yr	3629.50	58.50	69.65	64.65	69.76	0.000493	3.13	1774.15	343.83	0.18
1	7595.5	1PCT_100yr	3068.40	58.50	68.92	64.17	69.03	0.000497	2.97	1536.62	305.31	0.18
1	7595.5	2PCT_50yr	2758.50	58.50	68.53	63.86	68.62	0.000491	2.85	1418.57	278.52	0.18
1	7595.5	10PCT_10yr	2024.40	58.50	67.19	62.76	67.28	0.000569	2.71	1066.20	256.99	0.19
1	7466.4		Culvert									
1	7330.7	0.2PCT_500yr	3629.50	58.40	69.37		69.54	0.000762	4.04	1510.68	272.75	0.23
1	7330.7	1PCT_100yr	3068.40	58.40	68.71		68.86	0.000741	3.80	1341.56	240.64	0.22
1	7330.7	2PCT_50yr	2758.50	58.40	68.35		68.49	0.000718	3.64	1254.61	235.67	0.22
1	7330.7	10PCT_10yr	2024.40	58.40	67.09		67.22	0.000779	3.40	964.70	224.55	0.22



HEC-RAS Plan: Ultimate River: Gappus Bayou Reach: 1 (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	6955.1	0.2PCT_500yr	3629.50	57.75	69.30		69.35	0.000269	2.17	2915.85	601.27	0.13
1	6955.1	1PCT_100yr	3068.40	57.75	68.63		68.67	0.000286	2.11	2519.98	575.38	0.14
1	6955.1	2PCT_50yr	2758.50	57.75	68.25		68.30	0.000292	2.06	2306.82	566.67	0.14
1	6955.1	10PCT_10yr	2024.40	57.75	66.94		66.99	0.000401	2.11	1584.20	526.00	0.15
1	6557.7	0.2PCT_500yr	3629.50	58.32	69.06	64.13	69.19	0.000585	3.17	1555.06	303.16	0.20
1	6557.7	1PCT_100yr	3068.40	58.32	68.39	63.83	68.51	0.000578	2.97	1364.16	271.40	0.19
1	6557.7	2PCT_50yr	2758.50	58.32	68.03	63.37	68.14	0.000564	2.84	1268.42	255.53	0.19
1	6557.7	10PCT_10yr	2024.40	58.32	66.69	63.22	66.79	0.000665	2.67	940.31	229.76	0.20
1	6466.7		Culvert									
1	6350.4	0.2PCT_500yr	3629.50	58.38	68.74		68.79	0.000301	2.16	2694.26	501.74	0.14
1	6350.4	1PCT_100yr	3068.40	58.38	68.16		68.20	0.000298	2.04	2403.19	490.79	0.14
1	6350.4	2PCT_50yr	2758.50	58.38	67.83		67.87	0.000293	1.96	2245.45	483.89	0.14
1	6350.4	10PCT_10yr	2024.40	58.38	66.58		66.62	0.000373	1.91	1655.91	454.32	0.15
1	5682.4	0.2PCT_500yr	3987.40	58.71	68.60		68.62	0.000198	1.88	4295.37	837.02	0.12
1	5682.4	1PCT_100yr	3357.40	58.71	68.02		68.04	0.000188	1.74	3827.35	778.49	0.11
1	5682.4	2PCT_50yr	3010.70	58.71	67.70		67.72	0.000181	1.66	3581.44	755.29	0.11
1	5682.4	10PCT_10yr	2202.20	58.71	66.41		66.43	0.000219	1.61	2664.90	672.31	0.12
1	5670.4	0.2PCT_500yr	3987.40	57.87	68.60		68.62	0.000193	1.83	4726.95	906.17	0.11
1	5670.4	1PCT_100yr	3357.40	57.87	68.02		68.03	0.000192	1.73	4206.35	879.58	0.11
1	5670.4	2PCT_50yr	3010.70	57.87	67.70		67.71	0.000175	1.61	3936.86	812.89	0.11
1	5670.4	10PCT_10yr	2202.20	57.87	66.41		66.42	0.000224	1.60	2924.19	755.18	0.12
1	5512.6	0.2PCT_500yr	3987.40	57.87	68.58		68.60	0.000095	1.51	5102.25	905.22	0.08
1	5512.6	1PCT_100yr	3357.40	57.87	68.00		68.01	0.000088	1.40	4584.37	872.60	0.08
1	5512.6	2PCT_50yr	3010.70	57.87	67.68		67.69	0.000080	1.31	4318.11	811.15	0.08
1	5512.6	10PCT_10yr	2202.20	57.87	66.39		66.40	0.000086	1.23	3305.53	753.56	0.08
1	4609.8	0.2PCT_500yr	3987.40	57.78	68.51		68.52	0.000074	1.35	6774.92	1553.24	0.07
1	4609.8	1PCT_100yr	3357.40	57.78	67.93		67.94	0.000072	1.28	5903.35	1470.06	0.07
1	4609.8	2PCT_50yr	3010.70	57.78	67.61		67.63	0.000068	1.22	5456.16	1363.93	0.07
1	4609.8	10PCT_10yr	2202.20	57.78	66.32		66.33	0.000069	1.11	3864.97	1113.56	0.07
1	4261.8	0.2PCT_500yr	3987.40	57.74	68.48		68.49	0.000076	1.37	5701.65	941.03	0.07
1	4261.8	1PCT_100yr	3357.40	57.74	67.90		67.92	0.000066	1.23	5181.94	868.09	0.07
1	4261.8	2PCT_50yr	3010.70	57.74	67.59		67.60	0.000060	1.15	4920.25	825.76	0.07
1	4261.8	10PCT_10yr	2202.20	57.74	66.30		66.31	0.000063	1.06	3874.93	790.24	0.07
1	4249.8	0.2PCT_500yr	3987.40	57.74	68.48		68.49	0.000074	1.35	6735.94	1547.39	0.07
1	4249.8	1PCT_100yr	3357.40	57.74	67.90		67.91	0.000073	1.29	5869.90	1466.77	0.07
1	4249.8	2PCT_50yr	3010.70	57.74	67.59		67.60	0.000068	1.22	5428.26	1347.49	0.07
1	4249.8	10PCT_10yr	2202.20	57.74	66.29		66.31	0.000069	1.12	3842.21	1109.66	0.07
1	3701.3	0.2PCT_500yr	3987.40	57.69	68.45		68.46	0.000051	1.11	7217.01	1169.98	0.06
1	3701.3	1PCT_100yr	3357.40	57.69	67.87		67.88	0.000047	1.03	6559.16	1135.47	0.06
1	3701.3	2PCT_50yr	3010.70	57.69	67.56		67.57	0.000044	0.98	6209.86	1113.65	0.06
1	3701.3	10PCT_10yr	2202.20	57.69	66.27		66.27	0.000047	0.92	4808.10	1038.22	0.06
1	2906.9	0.2PCT_500yr	3987.40	57.61	68.41		68.42	0.000044	1.04	7813.05	1606.02	0.06
1	2906.9	1PCT_100yr	3357.40	57.61	67.84		67.85	0.000040	0.95	7126.05	1543.16	0.05
1	2906.9	2PCT_50yr	3010.70	57.61	67.53		67.54	0.000036	0.89	6768.08	1492.96	0.05
1	2906.9	10PCT_10yr	2202.20	57.61	66.23		66.24	0.000038	0.83	5313.38	1373.06	0.05
1	2894	0.2PCT_500yr	3987.40	57.60	68.41		68.42	0.000051	1.11	7185.35	1793.77	0.06
1	2894	1PCT_100yr	3357.40	57.60	67.84		67.85	0.000047	1.03	6533.47	1720.17	0.06
1	2894	2PCT_50yr	3010.70	57.60	67.53		67.54	0.000044	0.97	6189.74	1683.99	0.06
1	2894	10PCT_10yr	2202.20	57.60	66.23		66.24	0.000043	0.87	4868.74	1430.49	0.05
1	2787.5	0.2PCT_500yr	3987.40	57.59	68.40		68.41	0.000051	1.12	7179.51	1792.90	0.06
1	2787.5	1PCT_100yr	3357.40	57.59	67.83		67.84	0.000047	1.03	6528.45	1719.57	0.06
1	2787.5	2PCT_50yr	3010.70	57.59	67.53		67.53	0.000044	0.97	6185.27	1683.11	0.06
1	2787.5	10PCT_10yr	2202.20	57.59	66.23		66.23	0.000043	0.87	4865.19	1429.86	0.05
1	1872.5	0.2PCT_500yr	4525.90	57.50	68.36		68.36	0.000052	1.06	9463.08	1960.94	0.06
1	1872.5	1PCT_100yr	3691.30	57.50	67.79		67.80	0.000044	0.94	8376.93	1869.48	0.06
1	1872.5	2PCT_50yr	3298.80	57.50	67.49		67.49	0.000043	0.90	7815.20	1816.55	0.05
1	1872.5	10PCT_10yr	2277.00	57.50	66.19		66.19	0.000050	0.88	5546.40	1626.23	0.06
1	975.7	0.2PCT_500yr	4525.90	57.41	68.20		68.27	0.000299	2.42	3700.38	1187.04	0.14
1	975.7	1PCT_100yr	3691.30	57.41	67.65		67.72	0.000274	2.22	3069.71	1087.08	0.14
1	975.7	2PCT_50yr	3298.80	57.41	67.35		67.42	0.000261	2.12	2751.32	1062.68	0.13
1	975.7	10PCT_10yr	2277.00	57.41	66.05		66.10	0.000267	1.94	1409.39	878.43	0.13



HEC-RAS Plan: Ultimate River: Gaps Bayou Reach: 1 (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	91.2	0.2PCT_500yr	4525.90	57.32	67.91	61.09	68.00	0.000361	2.59	3691.20	1787.55	0.16
1	91.2	1PCT_100yr	3691.30	57.32	67.37	60.64	67.45	0.000345	2.43	2737.36	1773.04	0.15
1	91.2	2PCT_50yr	3298.80	57.32	67.08	60.41	67.16	0.000327	2.33	2234.41	1703.23	0.15
1	91.2	10PCT_10yr	2277.00	57.32	65.79	59.75	65.86	0.000294	2.01	1135.11	172.93	0.14
1	53.68		Bridge									
1	1.9	0.2PCT_500yr	4525.90	57.31	67.84	61.08	67.90	0.000300	2.34	5149.37	2600.11	0.14
1	1.9	1PCT_100yr	3691.30	57.31	67.30	60.63	67.37	0.000300	2.26	3785.20	2426.83	0.14
1	1.9	2PCT_50yr	3298.80	57.31	67.00	60.40	67.07	0.000300	2.22	3084.45	2358.92	0.14
1	1.9	10PCT_10yr	2277.00	57.31	65.72	59.74	65.79	0.000301	2.02	1153.76	246.00	0.14



**Appendix Z:
Ultimate Floodway Computations**



HEC-RAS Plan Ult Floodway River Gapps Bayou Reach: 1

Reach	River Sta	Profile	W.S. Elev (ft)	Prof Delta WS (ft)	E.G. Elev (ft)	Top Width Act (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Enc Sta L (ft)	Ch Sta L (ft)	Ch Sta R (ft)	Enc Sta R (ft)
1	30204.2	1PCT_100yr	82.78		82.84	123.64	0.10	507.20	0.00		4938.80	5047.20	
1	30204.2	Floodway	83.07	0.29	83.12	122.55	0.03	507.26	0.01	4928.80	4938.80	5047.20	5057.20
1	29832.6	1PCT_100yr	82.51		82.57	147.43	0.85	506.08	0.37		4969.90	5029.30	
1	29832.6	Floodway	82.86	0.35	82.91	79.40	0.21	506.78	0.31	4959.90	4969.90	5029.30	5039.30
1	29428.5	1PCT_100yr	82.36		82.41	218.79	4.20	776.94	3.37		4966.90	5035.70	
1	29428.5	Floodway	82.74	0.38	82.79	115.56	3.54	778.53	2.43	4943.52	4966.90	5035.70	5059.08
1	29411.9												
		Culvert											
1	29344.3	1PCT_100yr	80.94		80.99	87.89		784.50			4950.46	5046.02	
1	29344.3	Floodway	81.39	0.45	81.43	91.51		784.50		4920.46	4950.46	5046.02	5076.02
1	28494.4	1PCT_100yr	80.66		80.70	104.38		784.48	0.02		4952.39	5047.80	
1	28494.4	Floodway	81.18	0.52	81.21	141.15	0.03	784.29	0.17	4922.39	4952.39	5047.80	5077.80
1	27602	1PCT_100yr	80.44		80.48	96.99		784.50			4946.56	5049.47	
1	27602	Floodway	81.02	0.57	81.04	129.21		784.41	0.09	4916.56	4946.56	5049.47	5079.47
1	26717.3	1PCT_100yr	80.29		80.32	235.55	2.91	781.48	0.11		4956.71	5055.96	
1	26717.3	Floodway	80.91	0.61	80.93	159.43	2.59	781.53	0.39	4926.62	4956.71	5055.96	5086.05
1	26712.7												
		Culvert											
1	26645.3	1PCT_100yr	78.62		78.67	89.63		784.50			4948.34	5047.77	
1	26645.3	Floodway	78.74	0.11	78.78	90.54		784.50		4938.34	4948.34	5047.77	5057.77
1	25748.4	1PCT_100yr	78.37		78.41	181.99		784.09	0.41		4947.93	5051.06	
1	25748.4	Floodway	78.50	0.13	78.53	100.04		784.48	0.02	4937.93	4947.93	5051.06	5061.06
1	24746.6	1PCT_100yr	78.17		78.20	215.76	0.68	783.75	0.08		4950.50	5045.25	
1	24746.6	Floodway	78.32	0.14	78.35	114.75	0.52	783.92	0.06	4940.50	4950.50	5045.25	5055.25
1	23956.8	1PCT_100yr	78.07		78.09	335.85	0.33	784.09	0.08		4947.55	5046.14	
1	23956.8	Floodway	78.22	0.15	78.24	118.99	0.15	784.26	0.09	4937.55	4947.55	5046.14	5056.14
1	23757.9	1PCT_100yr	77.93		78.02	535.52	16.98	1734.24	31.08		4940.60	5074.10	
1	23757.9	Floodway	78.08	0.15	78.17	153.50	3.49	1776.19	2.63	4930.60	4940.60	5074.10	5084.10
1	23044.2	1PCT_100yr	77.95		77.96	952.98	6.97	1774.22	1.11		4843.85	5152.85	
1	23044.2	Floodway	78.11	0.16	78.11	329.00	0.25	1781.83	0.22	4833.85	4843.85	5152.85	5162.85
1	22087.5	1PCT_100yr	77.94		77.94	726.67	18.02	1764.20	0.08		4823.50	5162.70	
1	22087.5	Floodway	78.09	0.16	78.10	357.94	0.46	1781.72	0.12	4813.50	4823.50	5162.70	5172.70
1	21218.3	1PCT_100yr	77.92		77.93	1240.37	12.54	1768.93	0.83		4851.80	5144.80	
1	21218.3	Floodway	78.08	0.16	78.09	313.00	0.69	1780.89	0.72	4841.80	4851.80	5144.80	5154.80
1	20195.4	1PCT_100yr	77.92		77.92	1755.15	12.41	1769.29	0.60		4698.75	5290.45	
1	20195.4	Floodway	78.08	0.16	78.08	611.70	0.38	1781.48	0.44	4688.75	4698.75	5290.45	5300.45
1	19150.5	1PCT_100yr	77.92		77.92	2437.77	20.01	1761.87	0.42		4735.25	5234.75	
1	19150.5	Floodway	78.07	0.16	78.08	519.50	0.43	1781.41	0.46	4725.25	4735.25	5234.75	5244.75
1	18693.0	1PCT_100yr	77.85		77.91	5047.54	427.50	1680.79	38.11		4931.90	5055.10	
1	18693.0	Floodway	77.95	0.10	78.06	144.71	5.40	2138.02	2.98	4920.39	4931.90	5055.10	5065.10
1	18528.1	1PCT_100yr	77.84		77.86	4983.41	960.18	1097.95	88.27		4931.90	5055.10	
1	18528.1	Floodway	77.96	0.11	77.99	1520.47	799.18	1217.99	129.23	4050.13	4931.90	5055.10	5570.60
1	18501.7												
		Culvert											
1	18402.6	1PCT_100yr	77.86		77.86	7961.90	336.26	1451.52	358.62		4822.72	5193.02	
1	18402.6	Floodway	77.97	0.11	77.98	1520.47	177.31	1860.32	108.76	4064.50	4822.72	5193.02	5584.97
1	17679.2	1PCT_100yr	77.85		77.85	7070.74	402.26	1366.16	377.98		4795.46	5164.45	
1	17679.2	Floodway	77.97	0.11	77.97	1689.10	282.81	1755.58	108.00	3761.41	4795.46	5164.45	5450.51
1	16850	1PCT_100yr	77.85		77.85	6743.07	427.10	1347.59	371.71		4832.85	5202.52	
1	16850	Floodway	77.96	0.11	77.96	1721.66	318.25	1719.62	108.52	3783.16	4832.85	5202.52	5504.82
1	16085.5	1PCT_100yr	77.85		77.85	6465.57	445.53	1433.33	409.33		4824.24	5192.53	
1	16085.5	Floodway	77.95	0.10	77.95	368.29		2288.20		4824.24	4824.24	5192.53	5192.53
1	16054.3												
		Culvert											
1	15977.7	1PCT_100yr	75.68		75.82	2873.29	20.79	2246.99	20.42		4924.50	5054.60	
1	15977.7	Floodway	75.76	0.09	75.91	150.10	0.25	2287.67	0.29	4914.50	4924.50	5054.60	5064.60
1	15075.6	1PCT_100yr	74.85		75.02	1559.61	20.16	2409.27	5.27		4945.20	5052.30	
1	15075.6	Floodway	74.96	0.11	75.13	123.49	0.36	2434.27	0.06	4935.20	4945.20	5052.30	5062.30
1	14123.4	1PCT_100yr	74.03		74.21	1045.44	11.85	2409.69	13.16		4938.92	5043.78	
1	14123.4	Floodway	74.18	0.15	74.35	121.51	0.00	2433.61	1.09	4928.92	4938.92	5043.78	5053.78
1	13183.6	1PCT_100yr	73.27		73.45	467.26	4.25	2429.46	0.99		4950.31	5053.03	
1	13183.6	Floodway	73.48	0.20	73.64	122.72	0.57	2433.22	0.91	4940.31	4950.31	5053.03	5063.03
1	12867.8	1PCT_100yr	73.03		73.20	470.89	9.20	2423.63	1.86		4949.42	5051.48	



HEC-RAS Plan: Ult Floodway River Gapps Bayou Reach: 1 (Continued)

Reach	River Sta	Profile	W.S. Elev (ft)	Prof Delta WS (ft)	E.G. Elev (ft)	Top Width Act (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Enc Sta L (ft)	Ch Sla L (ft)	Ch Sta R (ft)	Enc Sta R (ft)
1	12867.8	Floodway	73.25	0.23	73.42	125.54	1.16	2432.57	0.98	4937.68	4949.42	5051.48	5063.22
1	12860.8 BR U	1PCT_100yr	72.90		73.16	448.70	20.39	2410.58	3.73		4949.42	5051.48	
1	12860.8 BR U	Floodway	73.13	0.23	73.38	125.54	2.07	2430.63	2.00	4937.68	4949.42	5051.48	5063.22
1	12860.8 BR D	1PCT_100yr	72.81		73.06	445.76	15.62	2416.08	3.00		4946.92	5052.46	
1	12860.8 BR D	Floodway	73.05	0.25	73.29	125.54	0.65	2432.21	1.84	4936.92	4946.92	5052.46	5062.46
1	12836.5	1PCT_100yr	72.83		73.01	447.92	6.54	2426.89	1.27		4946.92	5052.46	
1	12836.5	Floodway	73.08	0.25	73.24	125.54	0.27	2433.67	0.76	4936.92	4946.92	5052.46	5062.46
1	12214.3	1PCT_100yr	72.32		72.49	419.65	18.15	2416.44	0.11		4950.12	5052.84	
1	12214.3	Floodway	72.62	0.30	72.78	122.72	1.08	2433.31	0.32	4940.12	4950.12	5052.84	5062.84
1	11922.7	1PCT_100yr	72.08		72.26	450.30	14.58	2419.44	0.68		4945.39	5045.86	
1	11922.7	Floodway	72.42	0.33	72.58	120.47	1.21	2433.00	0.49	4935.39	4945.39	5045.86	5055.86
1	11900.3	1PCT_100yr	72.07		72.24	466.50	32.11	2381.24	21.35		4947.14	5045.06	
1	11900.3	Floodway	72.41	0.34	72.57	117.92	24.05	2384.55	26.10	4937.14	4947.14	5045.06	5055.06
1	11875.3	1PCT_100yr	72.06		72.22	483.28	13.32	2420.63	0.75		4922.30	5059.00	
1	11875.3	Floodway	72.40	0.34	72.54	156.70	0.63	2433.74	0.33	4912.30	4922.30	5059.00	5069.00
1	11269.5	1PCT_100yr	71.52		71.69	325.72	9.36	2424.58	0.77		4932.37	5040.83	
1	11269.5	Floodway	71.96	0.44	72.11	128.46	0.35	2433.96	0.40	4922.37	4932.37	5040.83	5050.83
1	10321.5	1PCT_100yr	70.84		71.01	426.79	12.32	2397.89	24.48		4946.92	5041.57	
1	10321.5	Floodway	71.41	0.57	71.56	114.65	2.58	2430.74	1.37	4936.92	4946.92	5041.57	5051.57
1	9759.4	1PCT_100yr	70.48		70.64	430.76	9.50	2392.64	32.56		4965.58	5059.93	
1	9759.4	Floodway	71.11	0.64	71.26	114.35	2.76	2430.69	1.24	4955.58	4965.58	5059.93	5069.93
1	9744.1	1PCT_100yr	70.49		70.61	484.57	2.72	2396.92	35.06		4914.30	5055.50	
1	9744.1	Floodway	71.13	0.64	71.24	161.20	1.39	2431.95	1.36	4904.30	4914.30	5055.50	5065.50
1	9714.8	1PCT_100yr	70.43		70.59	562.84	7.11	2394.10	33.49		4954.74	5048.62	
1	9714.8	Floodway	71.08	0.65	71.22	113.88	2.24	2430.56	1.90	4944.74	4954.74	5048.62	5058.62
1	9354.3	1PCT_100yr	70.05		70.29	656.26	52.43	2990.87	25.10		4939.80	5040.30	
1	9354.3	Floodway	70.77	0.72	70.98	120.50	1.35	3064.76	2.29	4929.80	4939.80	5040.30	5050.30
1	8406.8	1PCT_100yr	69.31		69.46	486.07	4.12	2533.95	530.33		4953.86	5048.26	
1	8406.8	Floodway	70.05	0.74	70.26	114.40	7.26	3006.73	54.41	4943.86	4953.86	5048.26	5058.26
1	8187.8	1PCT_100yr	69.20		69.30	346.07	22.52	2231.22	814.66		4957.20	5050.20	
1	8187.8	Floodway	69.94	0.74	70.10	154.27	25.40	2727.59	315.41	4947.20	4957.20	5050.20	5101.47
1	8175.8	1PCT_100yr	69.20		69.30	327.33	512.01	2192.55	363.84		4965.40	5056.80	
1	8175.8	Floodway	69.95	0.75	70.08	145.49	297.99	2647.97	122.44	4928.22	4965.40	5056.80	5073.71
1	7595.5	1PCT_100yr	68.92		69.03	305.32	496.12	2222.68	349.61		4965.40	5056.80	
1	7595.5	Floodway	69.61	0.69	69.78	133.14	111.53	2757.16	199.71	4950.08	4965.40	5056.80	5083.22
1	7466.4												
1	7330.7	1PCT_100yr	68.71		68.86	240.66	530.08	1887.99	650.34		4972.32	5028.42	
1	7330.7	Floodway	69.46	0.74	69.67	133.14	326.42	2267.42	474.56	4939.35	4972.32	5028.42	5072.49
1	6955.1	1PCT_100yr	68.63		68.67	575.39	347.97	1849.87	870.56		4930.30	5047.90	
1	6955.1	Floodway	69.38	0.75	69.45	235.56	44.99	2290.49	732.92	4920.30	4930.30	5047.90	5155.86
1	6557.7	1PCT_100yr	68.39		68.51	271.41	356.62	2565.22	146.56		4950.00	5068.20	
1	6557.7	Floodway	69.22	0.83	69.31	233.95	399.78	2506.02	162.60	4875.74	4950.00	5068.20	5121.21
1	6466.7												
1	6350.4	1PCT_100yr	68.16		68.20	490.79	684.38	1791.55	592.48		4942.25	5071.15	
1	6350.4	Floodway	69.01	0.85	69.07	245.47	482.33	2253.35	332.73	4873.34	4942.25	5071.15	5118.81
1	5682.4	1PCT_100yr	68.02		68.04	778.51	900.56	1057.05	1399.79		4953.40	5033.30	
1	5682.4	Floodway	68.87	0.85	68.90	417.15	700.49	1304.77	1352.13	4832.70	4953.40	5033.30	5249.85
1	5670.4	1PCT_100yr	68.02		68.03	879.64	1255.29	575.00	1527.11		4970.90	5014.50	
1	5670.4	Floodway	68.87	0.85	68.89	463.70	1168.44	710.29	1478.67	4782.25	4970.90	5014.50	5245.95
1	5512.6	1PCT_100yr	68.00		68.01	872.74	719.33	1763.09	874.98		4926.51	5056.65	
1	5512.6	Floodway	68.85	0.85	68.87	438.44	534.39	2086.81	736.20	4794.13	4926.51	5056.65	5232.57
1	4609.8	1PCT_100yr	67.93		67.94	1470.10	853.27	1570.82	933.31		4932.94	5057.33	
1	4609.8	Floodway	68.77	0.85	68.79	481.02	840.23	1854.53	662.63	4733.65	4932.94	5057.33	5214.67
1	4261.8	1PCT_100yr	67.90		67.92	868.19	907.79	1517.39	932.22		4943.40	5068.48	
1	4261.8	Floodway	68.75	0.85	68.77	491.12	771.71	1791.04	794.66	4753.80	4943.40	5068.48	5244.92
1	4249.8	1PCT_100yr	67.90		67.92	1466.82	844.49	1582.78	930.13		4932.79	5057.47	
1	4249.8	Floodway	68.75	0.85	68.77	478.47	829.35	1868.73	659.33	4735.87	4932.79	5057.47	5214.34
1	3701.3	1PCT_100yr	67.87		67.88	1135.49	696.00	1308.68	1352.72		4899.12	5028.87	
1	3701.3	Floodway	68.72	0.84	68.73	626.71	469.50	1548.02	1339.89	4763.94	4899.12	5028.87	5390.85



HEC-RAS Plan: Ult Floodway River: Gapps Bayou Reach: 1 (Continued)

Reach	River Sta	Profile	W.S. Elev (ft)	Prof Delta WS (ft)	E.G. Elev (ft)	Top Width Act (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Enc Sta L (ft)	Ch Sta L (ft)	Ch Sta R (ft)	Enc Sta R (ft)
1	2906.9	1PCT_100yr	67.84		67.85	1182.40	813.33	1201.73	1342.35		4908.02	5036.63	
1	2906.9	Floodway	68.68	0.84	68.69	663.31	641.22	1419.27	1296.91	4718.51	4908.02	5036.63	5381.82
1	2894	1PCT_100yr	67.84		67.85	1126.67	631.36	1334.14	1391.90		4911.20	5045.00	
1	2894	Floodway	68.68	0.84	68.69	585.22	417.94	1578.05	1361.41	4797.53	4911.20	5045.00	5382.75
1	2787.5	1PCT_100yr	67.83		67.84	1126.37	630.69	1335.95	1390.76		4911.20	5045.00	
1	2787.5	Floodway	68.67	0.84	68.69	585.09	417.14	1579.80	1360.46	4797.66	4911.20	5045.00	5382.75
1	1872.5	1PCT_100yr	67.79		67.80	1869.55	2116.38	1331.04	243.88		4908.52	5065.50	
1	1872.5	Floodway	68.63	0.84	68.64	972.92	2082.22	1601.02	8.06	4102.58	4908.52	5065.50	5075.50
1	975.7	1PCT_100yr	67.65		67.72	1087.15	500.73	3190.22	0.35		4889.10	5062.30	
1	975.7	Floodway	68.47	0.82	68.55	193.20	7.91	3680.93	2.46	4879.10	4889.10	5062.30	5072.30
1	91.2	1PCT_100yr	67.37		67.45	1773.05	271.19	3420.11			4901.83	5078.10	
1	91.2	Floodway	68.22	0.85	68.31	201.03	7.26	3683.29	0.75	4889.45	4901.83	5078.10	5090.48
1	53.68 BR U	1PCT_100yr	67.34		67.43	1772.94	572.43	3118.87			4901.83	5078.10	
1	53.68 BR U	Floodway	68.17	0.83	68.28	201.03	16.57	3673.15	1.57	4889.45	4901.83	5078.10	5090.48
1	53.68 BR D	1PCT_100yr	67.34		67.39	2446.52	1045.76	2645.54			4902.76	5083.79	
1	53.68 BR D	Floodway	68.15	0.81	68.25	188.69	12.40	3678.91		4892.76	4902.76	5083.79	5093.79
1	1.9	1PCT_100yr	67.30		67.37	2426.83	536.24	3155.06			4902.76	5083.79	
1	1.9	Floodway	68.14	0.84	68.22	188.65	5.70	3685.60		4892.76	4902.76	5083.79	5093.79



**Appendix AA:
Phase II Public Meetings**



Gapps Bayou Watershed Study Public Meeting
Wednesday, June 26, 2013
George Memorial Library
6:30 PM

Name	Subdivision/Entity	E-mail Address
Jung P. JANG	R.G. Miller Engineers, Inc.	jjang@rgmiller.com
Dana Neuneker	R.G. Miller Engineers, Inc.	dneuneker@gmail.com
Fran Ortiz	TWDB	ivan.ortiz@twdb.texas.gov
Juling Bao	FBCDD	juling.bao@co.fort-bend.tx.us
Duane Chambers	Royal Lakes Estates	duanecc@gmail.com
Fred Bauhof	R.G. Miller Engineers	fbauhof@rgmiller.com



Gapps Bayou Watershed Study Public Meeting
Thursday, July 29, 2013
George Memorial Library
6:30 PM

Name	Subdivision/Entity	E-mail Address
Dana Neuncker	RGME	dneuncker@rgmiller.com
RUBY SHAW	Bonbrook	ruby_shaw@sbcglobal.net
Jing Sang	RGME	jsang@rgmiller.com
Juling Bao	FB CDD	
PESS ANTES	BONBROOK PLANTATION 9	ronbessantes@yahoo.com
RALPH STAFFORD	BON BROOK PLANTATION 9	STAFFORD, RALPH@AST.NET
BERNADETTE MONTGOMERY	" "	BM7704@GMAIL.COM
James Steesbergen	Bridlewood Estates	jc95stees@comcast.net
Michael Stein	Bridlewood Estates	mhsteineing@yahoo.com
GARY MENSNIK	Bonbrook Plantation	gmensik@LJAEngineering.com
DAVID CHERAY	Bonbrook Plantation	DLC148@hotmail.com
CHRIS GUATE	BONBROOK PLANTATION	CMLFG@SUNBELL.NET
MONA L. NINO	Bonbrook Subd.	MONANINO22@yahoo.com
THURMAN THICKS	Bridlewood Estates	thicks@wvumc.com
DAN NELSON	Bridlewood ESTATES	DNEL2002@gmail.com
Ivan Ortiz	TWDB	ivan.ortiz@twdb.texas.gov
Lawrence & Dolores Mills	Bonbrook	doloresmills77469@yahoo.com
Celeste Feast	Bonbrook	C.feast@aol.com

MISS



PUBLIC MEETING NOTICE FOR THE FINAL FLOOD PROTECTION PLANNING STUDY PHASE II ON GAPPS SLOUGH

Fort Bend County and Fort Bend County Drainage District, in cooperation with the Texas Water Development Board, is performing a Flood Protection Planning Study Phase II on Gapps Slough in Precinct 1 and is seeking public input for the study.

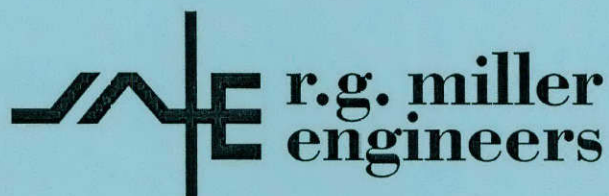
A “Public Meeting” to receive input will be held at
The George Memorial Library
1001 Golfview Dr.
Richmond TX
1st Floor Meeting Room
Monday, July 29, 2013 at 6:30 p.m.



We respectfully request and encourage residents and representatives of businesses, churches, etc. in the vicinity to attend. Including but not limited to Royal Lakes Estates, Bridlewood Estates, Summer Lakes, Rivers Mist, Rivers Run, and Bonbrook Plantation.



**Appendix AB:
Environmental Evaluation
Provided by:
Crouch Environmental Services, Inc.**







February 27, 2013

Mr. Jung P. Jang, P.E., CFM
R.G. Miller Engineers, Inc.
12121 Wickchester Lane, Suite 200
Houston, Texas 77079

**RE: Phase I Investigations for Preliminary Watershed Evaluation of Potential Environmental Constraints
Texas Water Development Board Flood Protection Grant Application – Gapps Bayou Watershed Study**

Dear Mr. Jang:

Crouch Environmental Services, Inc. (CESI) submits this Phase I Investigation Letter Report for Gapps Bayou Watershed Study Area (the Review Area) to R.G. Miller Engineers, Inc. (R.G. Miller). The results of the Phase I Investigations carried out by CESI are presented as map overlays in the appendices that follow this brief letter report. The information reviewed includes the location and description of existing wetlands, habitats, endangered species, potential hazardous materials, and cultural resource constraints within the Gapps Bayou watershed.

The review area for this Phase I investigation is an approximately 7.9-square-mile area in Fort Bend County, Texas. A **Vicinity Map** depicting the review area is included in **Appendix A**. The objective of the Phase I investigation is to identify potential features in or near the review area that might affect environmental permitting or construction requirements.

This Phase I investigation provides screening level information to guide land use planning for the review area, and to identify critical environmental issues that are likely to confront the project. This Phase I investigation does not replace the detailed studies, surveys and assessments that will be required for the project going forward.

REVIEW AREA EVALUATION

Background Studies

CESI reviewed public records to evaluate the review area including information produced through National Environmental Policy Act (NEPA) studies conducted by the Texas Department of Transportation (TxDOT) – Houston District and other agencies. Maps depicting the background studies performed in the Review Area are included in Appendix A.

Previous NEPA Studies: In August 2012 the Federal Highway Administration (FHWA) released the Final Environmental Impact Statement (FEIS) for Grand Parkway (State Highway 99) Segment C. **Figure A1** depicts a section of the proposed highway which will pass through the review area. An extensive study was completed for Segment C, which included project need and purpose, affected environment, direct and indirect impacts, environmental consequences, and historical and archeological resources. The FEIS listed six Underground Storage Tanks (USTs) located along Crabb River Road although none were located within the review area. Three schools/day-cares were identified along Crabb River Road though none were located within the review area. In the vicinity of the Segment C alignment there were 23 water wells listed although only 5 are located in the review area. Portions of Austin's Woods, a sensitive community of 80-year-old hardwood forests found within Brazoria and Fort Bend counties, were identified adjacent to the proposed Segment C alignment and approximately 364 acres of these woods are located within the review area. Natural gas, crude oil, and gasoline pipelines were observed crossing the Segment C alignment. In the vicinity of the Segment C alignment there were 18 oil and gas wells listed although only 5 wells were located within the review area. A mix of natural bayous and agriculture drainage ditches cross throughout the proposed alignment. The George Ranch Historical Park is approximately 0.75 miles from the Segment C alignment.



Previous Archeological Surveys: The Texas Historical Commission (THC) database was reviewed to determine the location of archeological surveys that have been conducted within the review area. **Figure A2** indicates that four records (Atkins Global, formerly known as PBS&J, [Texas Antiquities Committee (TAC) Permit #5511], HRA Gray & Pape, LLC. [TAC Permit #3809, TxDOT [TAC Permit #2553], and Moore Archeological Consulting [TAC Permit #4673]) of archeological surveys in the review area were identified. Approximately 1.5 miles south of the review area, an archeological survey was performed at the bridge spanning Dry Creek along Farm-to-Market (FM) 762. This record did not contain a TAC Permit # or company who performed the survey.

Subdivisions: The Fort Bend County GIS database was reviewed to determine the location of subdivisions and master planned communities within the review area. **Figure A3** depicts seven Subdivisions (Summer Lakes, River Run at the Brazos, River Mist, Bonbrook Plantation North, Bonbrook Plantation South, Benton Park, and Lonely Oak) and two Master Planned Communities (Roya Lake Estates and Bridlewood) that were identified within the review area.

Land Use: The Houston-Galveston Area Council (H-GAC) Geographic Information Systems (GIS) database was reviewed to determine the types of land use within the review area. **Figure A4** indicates that the majority of the review area is listed as *residential*, while the remaining land is divided between *vacant developable*, *commercial*, and *government/medical/education*. A few small parcels of land have been listed classified as *industrial*, *park/open spaces*, and *undevelopable*.

On-Site Sewage Facilities (OSSFs): The Fort Bend County GIS database was reviewed to determine the type of OSSFs at residences within the review area. A residential analysis of the neighborhoods within the review area, depicted in **Figure A5**, identifies three types of OSSFs. The majority of the neighborhoods are listed as *residential areas without services*, while the remaining neighborhoods are split between *residential areas with OSSFs* and *residential areas with services*.

Cultural Resources

This section presents the results of a review of data for the location of schools, cemeteries, museums, health service centers, Texas State historical sites, National Historic Registry sites, parks, and Native American Tribal Lands. These datasets were obtained from the THC, the H-GAC, and the Fort Bend County GIS Department. **Appendix B** contains a set of maps indicating cultural resources in the review area.

Schools: The Fort Bend County GIS database was reviewed to determine the location of public and private schools within the review area. **Figure B1** depicts three schools (Williams Elementary, Antoinette Reading Jr. High, and George Ranch High) identified within the review area. Four schools (Thomas Elementary, Susanna Dickinson Elementary, Bess Campbell Elementary, and Velasquez Elementary) were identified within 1 mile of the review area.

Churches: The Fort Bend County GIS database was reviewed to determine the location of churches and other places of worship within the review area. **Figure B2** depicts six churches (Brethren Church, Zion Hill Church, Southwest Church of Nazarene, Cornerstone Community Bible Church, St. Mark's Episcopal Church, and Mount Zion Church) in the review area. Two other churches (Greater New Prospect Baptist Church and Holy Angels Lutheran Church) are located within 1 mile of the review area.



Cemeteries: The Fort Bend County GIS database was reviewed to determine the location of cemeteries within the review area. **Figure B3** indicates that no cemeteries are located within the review area. Five Cemeteries (Murphy Jones Cemetery [THC ID# FB-C098], Kuykerdall Cemetery [THC ID# FB-C073], Eddie Kirk Grave [THC ID# FB-C089], Sansbury Cemetery [THC ID# FB-C020], and Pickens-Davis Memorial [THC ID# FB-C070]) in Fort Bend County, Appendix B) are located within 1 mile of the review area.

Museums: The Fort Bend County GIS database was reviewed to determine the location of museums within the review area. This database indicates that no museums are located within the review area.

Health Service Centers: The Fort Bend County GIS database was reviewed to determine the location of health service centers within the review area. This database indicates that no health service centers are located within the review area.

Texas State Historical Sites: The THC GIS database was reviewed to determine the location of Texas State Historical Sites within the review area. **Figure B4** indicates that no state historical sites are located within the review area. Two sites (Booth Public School and George Ranch Historic Park) are located within 1.25-miles of the review area.

Registered National Historical Sites: The National Parks Service National Register of Historic Places database was reviewed to determine the location of registered national historic sites within the review area. This database indicates that no registered national historic sites are located within the review area.

Parks: The Fort Bend County GIS database was reviewed to determine the location of public parks within the review area. **Figure B5** depicts one park (Bonbrook Plantation Clubhouse [Park ID# 9400]) identified in the review area.

Native American Tribal Lands: The National Atlas GIS database was reviewed to determine the location of Native American Tribal Lands within the review area. This database indicates that no Native American Tribal Lands are located within the review area.

Wetlands and Waters of the United States

This section presents the results of a review of remote sensing data for estimates of the extent of wetlands and waters of the United States in the Review Area. These datasets were obtained from the National Wetland Inventory (NWI) database and the National Hydrographic Dataset (NHD) database. **Appendix C** contains a set of maps indicating wetlands and waters of the United States in the review area.

Wetlands: The presence of wetlands within the review area was determined by examination of NWI data. **Figure C1** depicts several fringe and isolated wetland areas within the review area north of Smithers Lake. Most isolated wetland features located within the review area are either emergent or forested. The largest feature is an emergent wetland located just upstream from the confluence of Gapps Bayou and Rabbs Bayou. The majority of the wetlands within the review area are 2 acres or smaller in size. The total acreage of NWI wetlands within the review area is 121.74 acres.

Waters of the United States: The NHD database was reviewed to determine the presence of waters of the United States within the review area. **Figure C2** depicts the review area to contain five features: four streams including Gapps Bayou (comprised of four NHD Unique Identifiers (COM) ID# 3123308, COM ID# 3123306, COM ID# 3123304, and COM ID# 3123310), three small unnamed streams (NHD COM ID# 3123674, COM ID# 3123302, and COM ID# 3123300), and one small unnamed wetland (NHD COM ID# 3122972) that is 4.45 acres in size.

100-Year Floodplain: Approximately 1,021 acres of 100-year floodplain occur within the review area. The data depicted in **Figure C3**, provided by R.G. Miller, indicates that the majority of the floodplain is centered along Gapps Bayou, man-made detention ponds, low-lying streets, and Bottomland Forest ecological types.



NRCS Soil Survey: The Natural Resources Conservation Services (NRCS) Soil Survey was reviewed to determine the soil types within the review area. **Figure C4** depicts nine soil types that have been identified within the review area: Asa Silty Clay Loam (Ab); Beaumont Clay (Ba); Bernard Clay Loam (Bb); Bernard-Edna Clay Loams, 1-4 percent slopes (Bc); Bernard-Edna Complex (Be); Fulsher Fine Sandy Loam (Fa); Lake Charles Clay, 0-1 percent slopes (La); Lake Charles Clay, 1-4 percent slopes (Lb); and Water (W).

Ecological Types: The H-GAC GIS database was reviewed to determine the ecological types located within the review area. **Figure C5** depicts one ecological type (Bottomland Forest 2) in the review area. This ecological type in the eastern portion of the review area lies on and adjacent to Gapps Bayou. The total amount of Bottomland Forest in the review area is 381 acres.

National Wild and Scenic Rivers: The National Wild and Scenic Rivers System Database was reviewed to determine the presence of national wild and scenic rivers within the review area. **Figure C6** indicates that no records of national wild or scenic rivers in the review area were found.

Threatened and Endangered Species and Protected Habitats

This section presents the results of a review of available data for sightings of threatened and endangered species within the Review Area, as well as areas of ecological interest or protection. **Appendix D** contains a map indicating threatened and endangered species and protected habitats in the review area. This data was obtained from the Texas Parks and Wildlife Department (TPWD) Natural Diversity Database (NDD), and the US Fisheries and Wildlife Service (USFWS).

Rookeries: The TPWD NDD database was reviewed to determine the presence of rookeries within the review area. This database indicates that no rookeries are located within the review area.

Threatened and Endangered Species: NDD threatened and endangered species data are presented as combination of geographic location of a species sighting and the uncertainty associated with the sighting. The interpretation of this data is slightly counterintuitive. For example, a circle drawn on the map for a given species and given instance indicates that the individual animal or plant in question was definitively present somewhere within that circle on the day of the reported sighting. Small circles represent greater certainty. A larger circle or shape represents greater uncertainty (rather than a greater number of said species or a greater extent of habitat). TWFD guidance indicates that these data should be used only as a guide to reduce potential impact to threatened and endangered species. An on-site evaluation by qualified biologists would be required evaluate potential impacts. TPDW also recommends regular review of updated versions of the data on a quarterly basis throughout the duration of a project (as the database is continuously updated).

Species listed below are those identified in the NDD data within and surrounding the review area. These species are listed as threatened or endangered under county level listings, unless state or federal status is specifically noted. **Figure D1** depicts the location of NDD data in relation to the review area.

NDD Sightings within and in the vicinity of the Review Area

Scientific Name	Common Name	Status	Distance from Review Area
<i>Haliaeetus leucocephalus</i>	Bald Eagle	Threatened	0.00 mi

Hazardous Materials

This section presents the results of a review of open access records for potentially-contaminated properties in the vicinity of the review area. The sources reviewed include the Texas Commission on Environmental Quality (TCEQ) Leaking Petroleum Storage Tank (LPST) and Voluntary Cleanup Program (VCP) databases, and Superfund Site County Lists. In addition, the Railroad Commission of Texas (RRC) VCP database was reviewed. TCEQ LPST sites include underground and aboveground petroleum storage facilities with reported releases of refined petroleum products (e.g., diesel, gasoline, motor oil, lubricants, aviation fuels, etc.). TCEQ VCP sites may include LPST sites and facilities with reported releases of other



chemicals (e.g., dry cleaners, industrial facilities, etc.). TCEQ Superfund Sites include abandoned industrial facilities with reported chemical contamination that are under assessment and remediation activities managed by the TCEQ (State Superfund) or U.S. Environmental Protection Agency (EPA, Federal Superfund). RRC VCP sites include oil and gas exploration and production facilities with reported releases of unrefined petroleum products and chemicals used in the exploration and production activities.

USGS Topographic Map: The 1995 United States Geological Survey (USGS) topographic map depicts two pipelines traversing the central and eastern portions of the review area. The two pipelines converge in the far northeastern portion of the review area and continue to the east outside of the review area. Details of the USGS topographic map can be seen on **Figure E1**.

TCEQ LPST Database: The TCEQ database was reviewed to determine the location of LPST sites in the review area. This database indicates that no TCEQ LPST sites are located within the review area.

TCEQ VCP Database: The TCEQ database was reviewed to determine the location of TCEQ VCP sites in the review area. This database indicates that no TCEQ VCP sites are located within the review area.

RRC VCP Database: The RRC database was reviewed to determine the location of RRC VCP sites in the review area. This database indicates that no RRC VCP sites are located within the review area.

TCEQ Superfund Site County Lists: The TCEQ database was reviewed to determine the location of superfund sites in the review area. This database indicates that no superfund sites are located within the review area.

Radioactive Waste Sites: The Fort Bend County GIS database was reviewed to determine the location of radioactive waste sites in the review area. This database indicates that no radioactive waste sites are located within the review area.

TCEQ Water Well Database: The TCEQ database was reviewed to determine the location of water wells in the review area. This database indicates that no TCEQ water wells are located within the review area. **Figure E2** depicts four water wells (TCEQ ID #s 803096, 803102, 803106, and 803108) located within 1 mile of the review area.

Brownfield Site Inventory: The Fort Bend County GIS database was reviewed to determine the location of hazardous substance or petroleum Brownfield sites. This database indicates that no hazardous substance or petroleum Brownfield sites are located within the review area.

Closed Landfill Sites: The H-GAC Solid Waste Database was reviewed to determine the location of closed landfill sites. **Figure E3** depicts one record (Archie Lee West Estate, ID# U2448) which was identified on the border of the review area along FM 762. Additional research indicates that this record is associated with a 236.042-acre parcel recorded as "0049 J Kuykendall, Tract 3(PT)." The owner is listed as 274 Brazos Ltd., 5851 San Felipe Street, Houston, Texas 77057. This landfill was recorded as closed on September 12, 1985. The estimated size of the closed landfill is 6 to 10 acres, and the landfill was reported used for disposal of brush and construction/demolition waste.

Recycle Centers: The H-GAC Solid Waste Database was reviewed to determine the location of recycle centers in the review area. This database indicates that no recycle centers are located within the review area.

SUMMARY OF FINDINGS

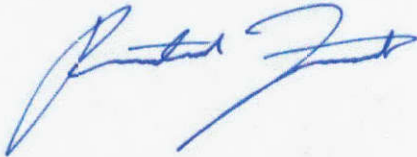
Figure A1 shows the locations of oil and gas wells, pipelines, water wells and hazardous materials locations within the review area. In addition, the location of waters of the United States and wetlands are shown at water crossings along the Grand Parkway alignment.



Appendices B, C, D and E present the locations of other features to be considered in land use planning for the review area. **Figure A2** shows the location of previous archeological studies. **Figure C1** shows the location of potential areas of wetland. The largest area of potential wetlands is in the western portion of the review area along Gapps Bayou. **Figure C5** shows the location of forested areas, which may require additional study prior to construction activities. **Figure D1** indicates that the reported range of the Bald Eagle includes a portion of the eastern end of the review area. **Figure E3** shows the location of the closed construction debris landfill located on the northern boundary of the review area (Archie Lee West Estate, ID# U2448).

There is considerable published documentation in the public record concerning potential environmental constraints identified in this Phase I Investigation. Detailed review of this documentation would provide an opportunity to gain valuable site-specific data that would facilitate land use planning decisions for the Gapps Bayou Watershed Study. CESI would welcome the opportunity to review the results of this Phase I Investigation with R.G. Miller and identify those areas that may require supplemental detailed study.

Sincerely,



Patrick Forrest
GIS Specialist/Project Manager

Douglas W. Jackson, C.E.P.
Chief Operating Officer

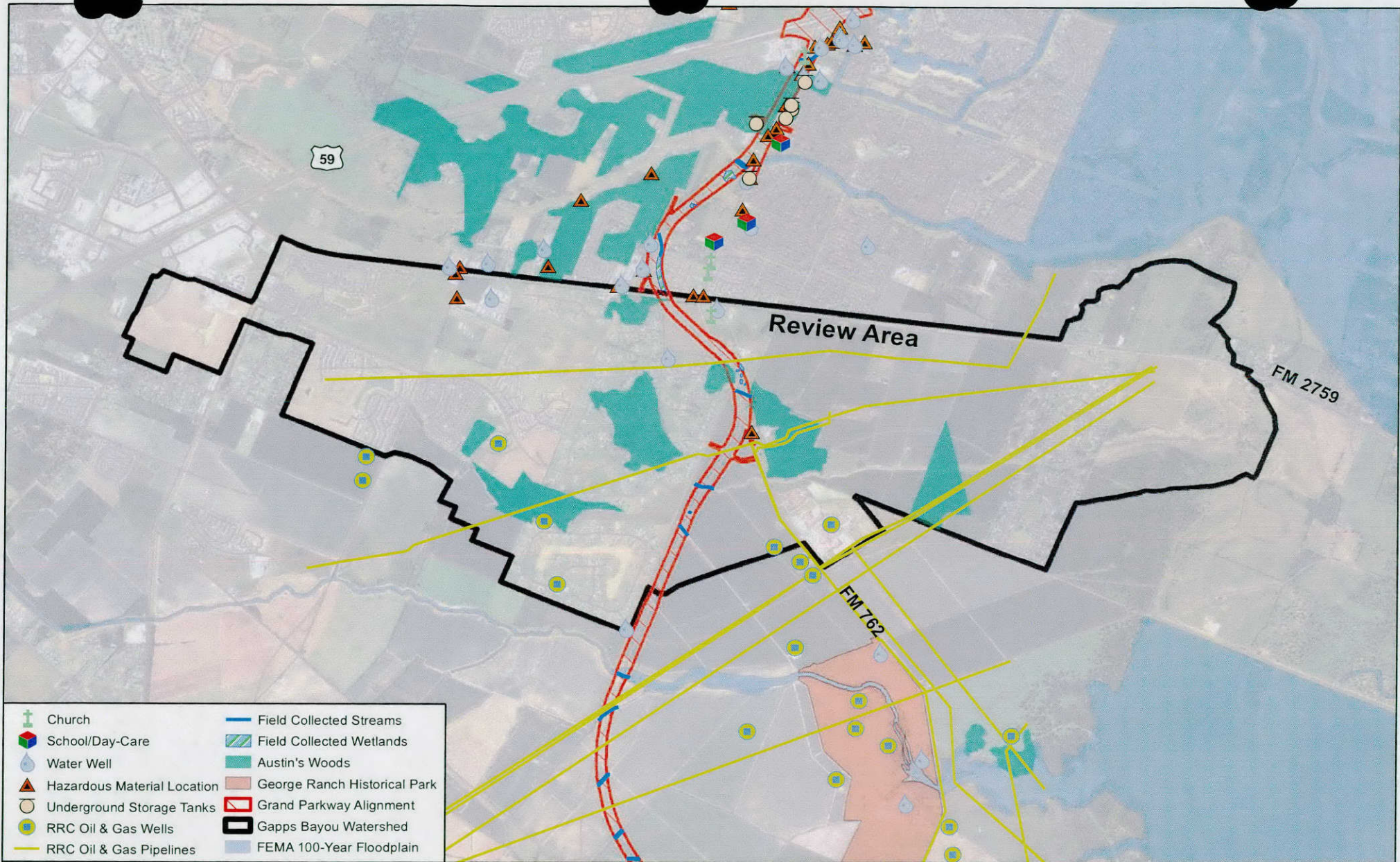
Attachments:

- Appendix A – Background Studies Maps
- Appendix B – Cultural Resource Maps
- Appendix C – Wetlands and Waters of the United States Maps
- Appendix D – Threatened and Endangered Species Maps
- Appendix E – Hazardous Materials Maps



Appendix A
Background Studies Maps





- | | |
|-----------------------------|------------------------------|
| Church | Field Collected Streams |
| School/Day-Care | Field Collected Wetlands |
| Water Well | Austin's Woods |
| Hazardous Material Location | George Ranch Historical Park |
| Underground Storage Tanks | Grand Parkway Alignment |
| RRC Oil & Gas Wells | Gapps Bayou Watershed |
| RRC Oil & Gas Pipelines | FEMA 100-Year Floodplain |

N

0 0.375 0.75 1.5 Miles

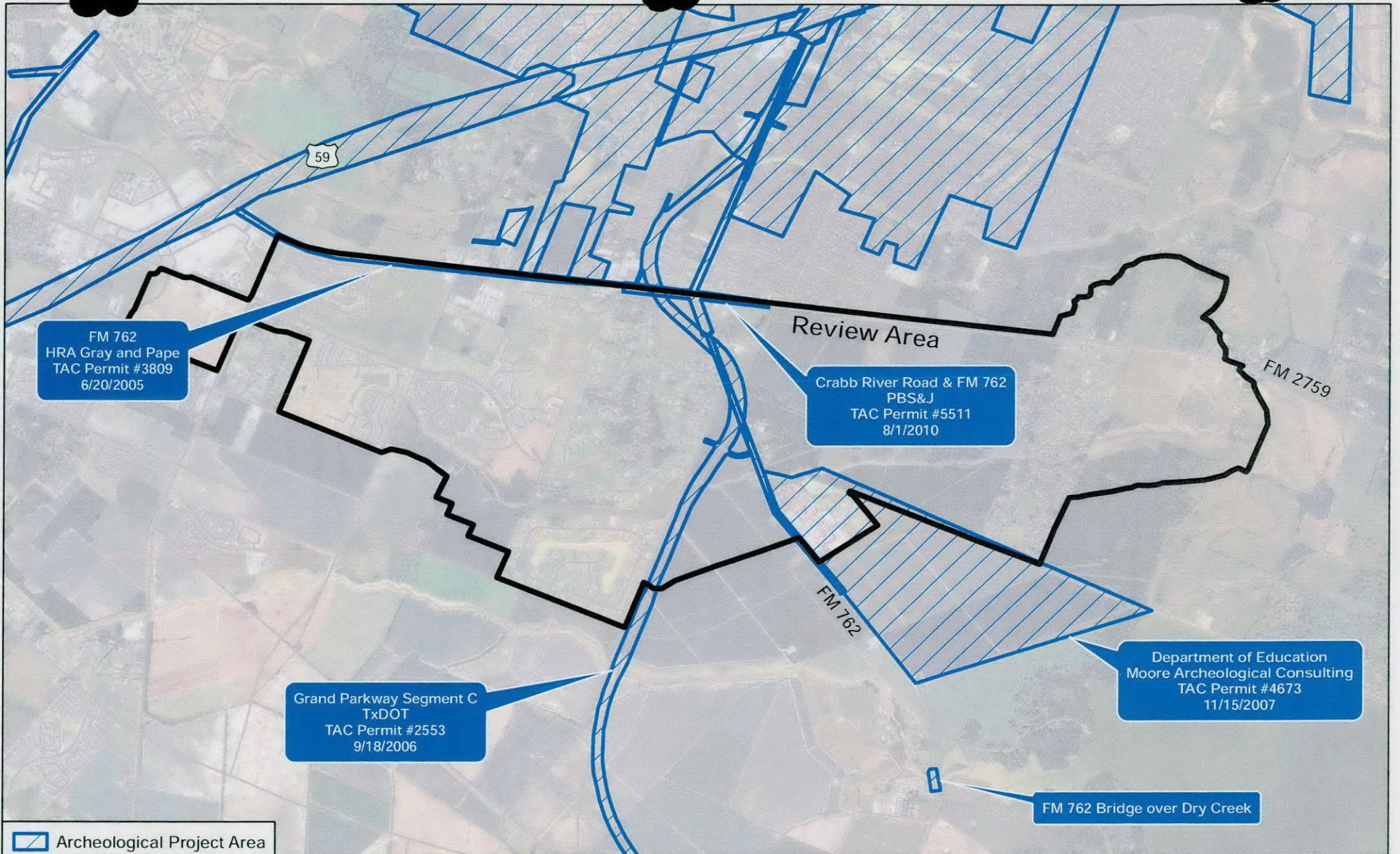
CROUCH ENVIRONMENTAL SERVICES, INC.




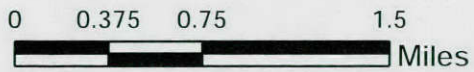
R.G. Miller Engineers
Gapps Bayou Watershed Study - Phase 1 Investigations
FIGURE A1
2012 AERIAL PHOTOGRAPH WITH GRAND
PARKWAY SEGMENT C ALIGNMENT AND
FEIS STUDY DATA OVERLAYS

Fort Bend County, Texas





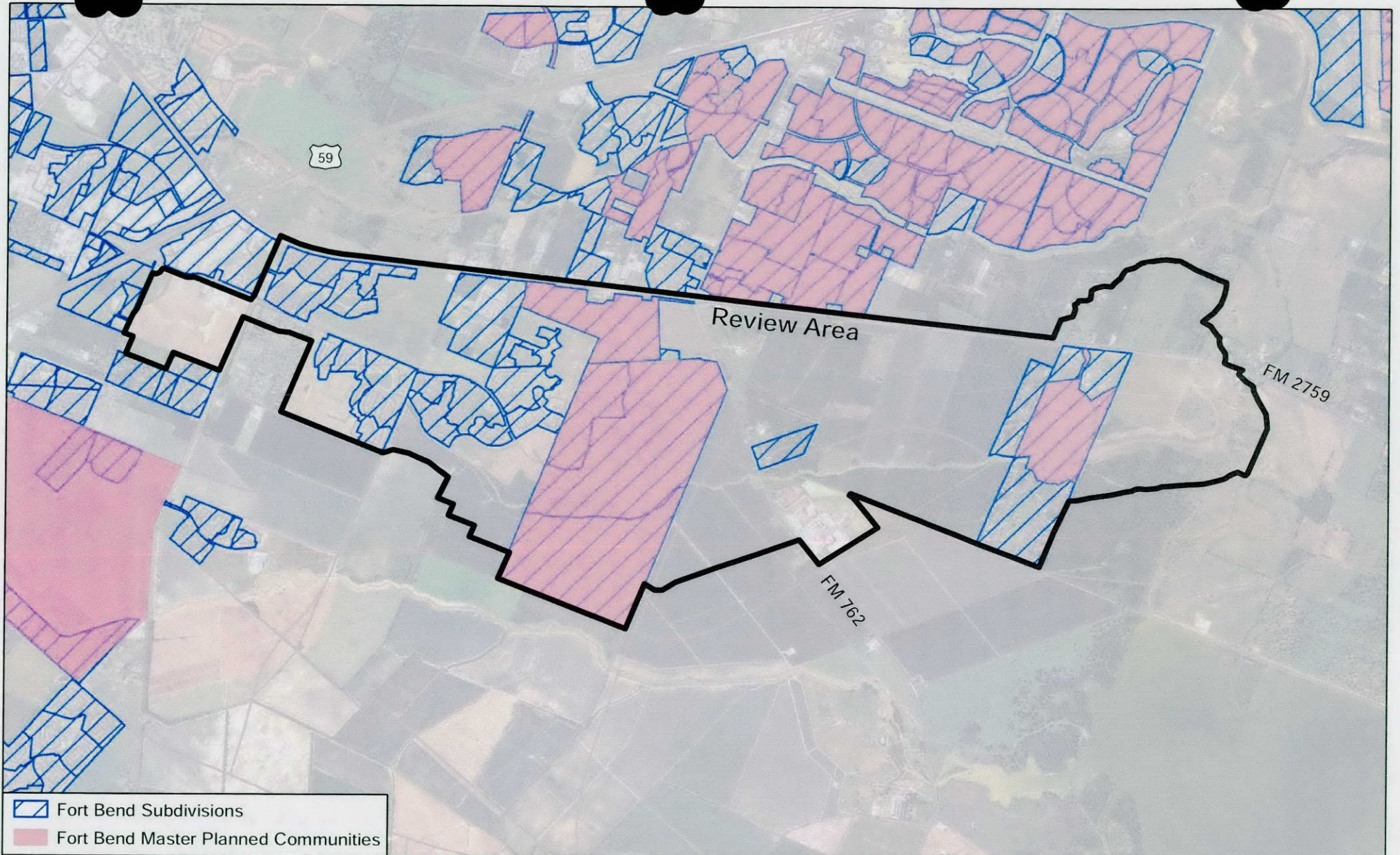
 Archeological Project Area



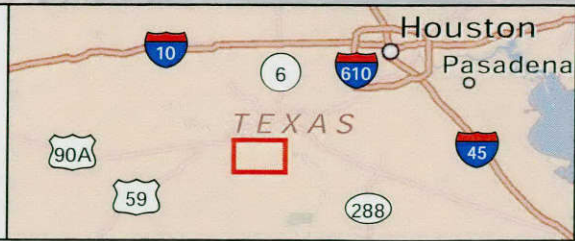
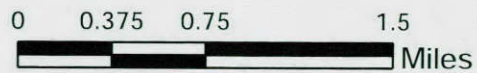
R.G. Miller Engineers
Gapps Bayou Watershed Study - Phase 1 Investigations
FIGURE A2
2012 AERIAL PHOTOGRAPH WITH GAPPS BAYOU
WATERSHED AND PREVIOUS ARCHEOLOGICAL
SURVEY OVERLAYS

Fort Bend County, Texas





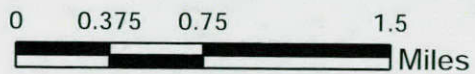
- Fort Bend Subdivisions
- Fort Bend Master Planned Communities



R.G. Miller Engineers
 Gapps Bayou Watershed Study - Phase 1 Investigations
 FIGURE A3
 2012 AERIAL PHOTOGRAPH WITH GAPPS BAYOU
 WATERSHED, SUBDIVISIONS AND MASTER
 PLANNED COMMUNITIES OVERLAYS

Fort Bend County, Texas



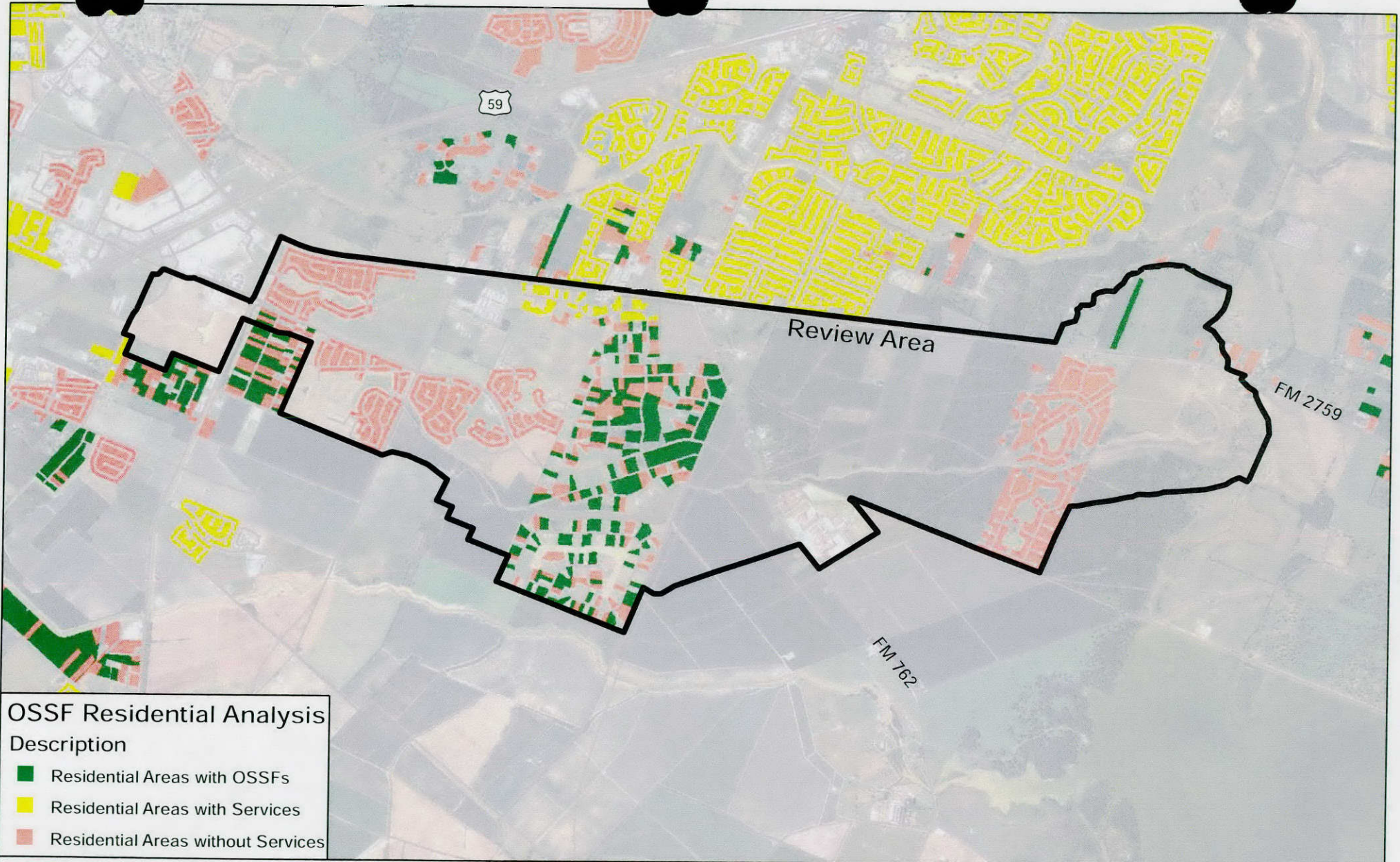


R.G. Miller Engineers
 Gapps Bayou Watershed Study - Phase 1 Investigations
 FIGURE A4

2012 AERIAL PHOTOGRAPH WITH GAPPS BAYOU
 WATERSHED AND CURRENT LAND USE OVERLAYS

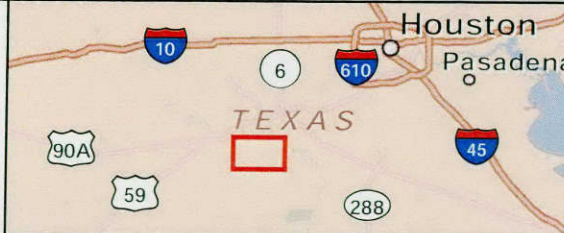
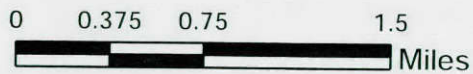
Fort Bend County, Texas





OSSF Residential Analysis
 Description

- Residential Areas with OSSFs
- Residential Areas with Services
- Residential Areas without Services



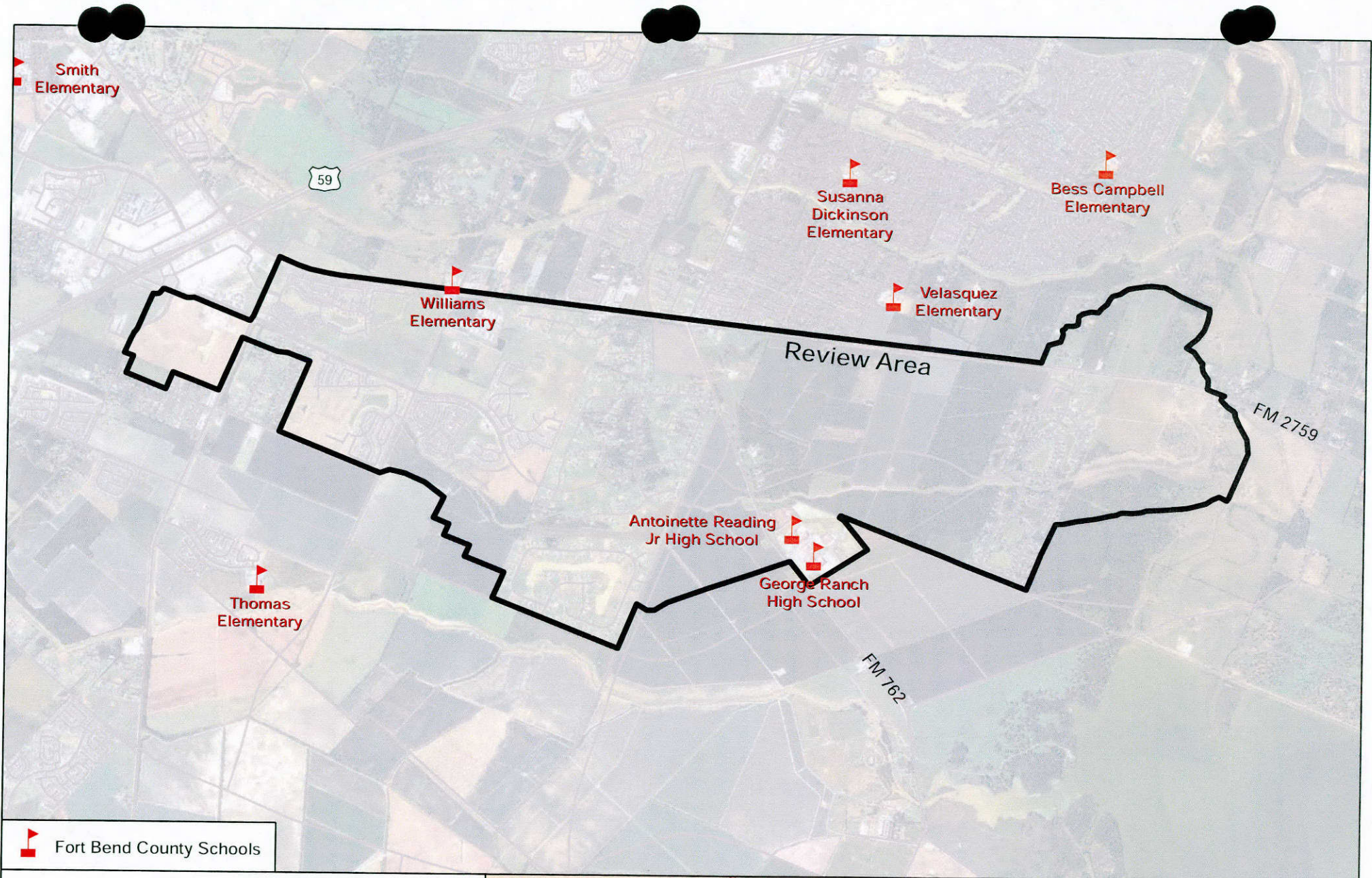
R.G. Miller Engineers
 Gapps Bayou Watershed Study - Phase 1 Investigations
 FIGURE A5
 2012 AERIAL PHOTOGRAPH WITH GAPPS BAYOU
 WATERSHED AND OSSF RESIDENTIAL
 ANALYSIS OVERLAYS

Fort Bend County, Texas



Appendix B
Cultural Resources Maps

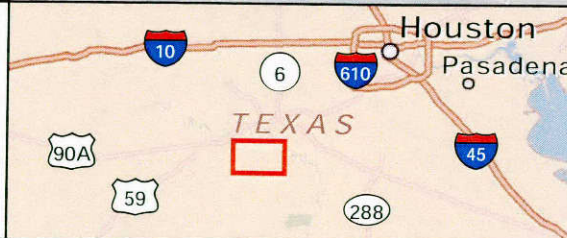




 Fort Bend County Schools



0 0.375 0.75 1.5
Miles

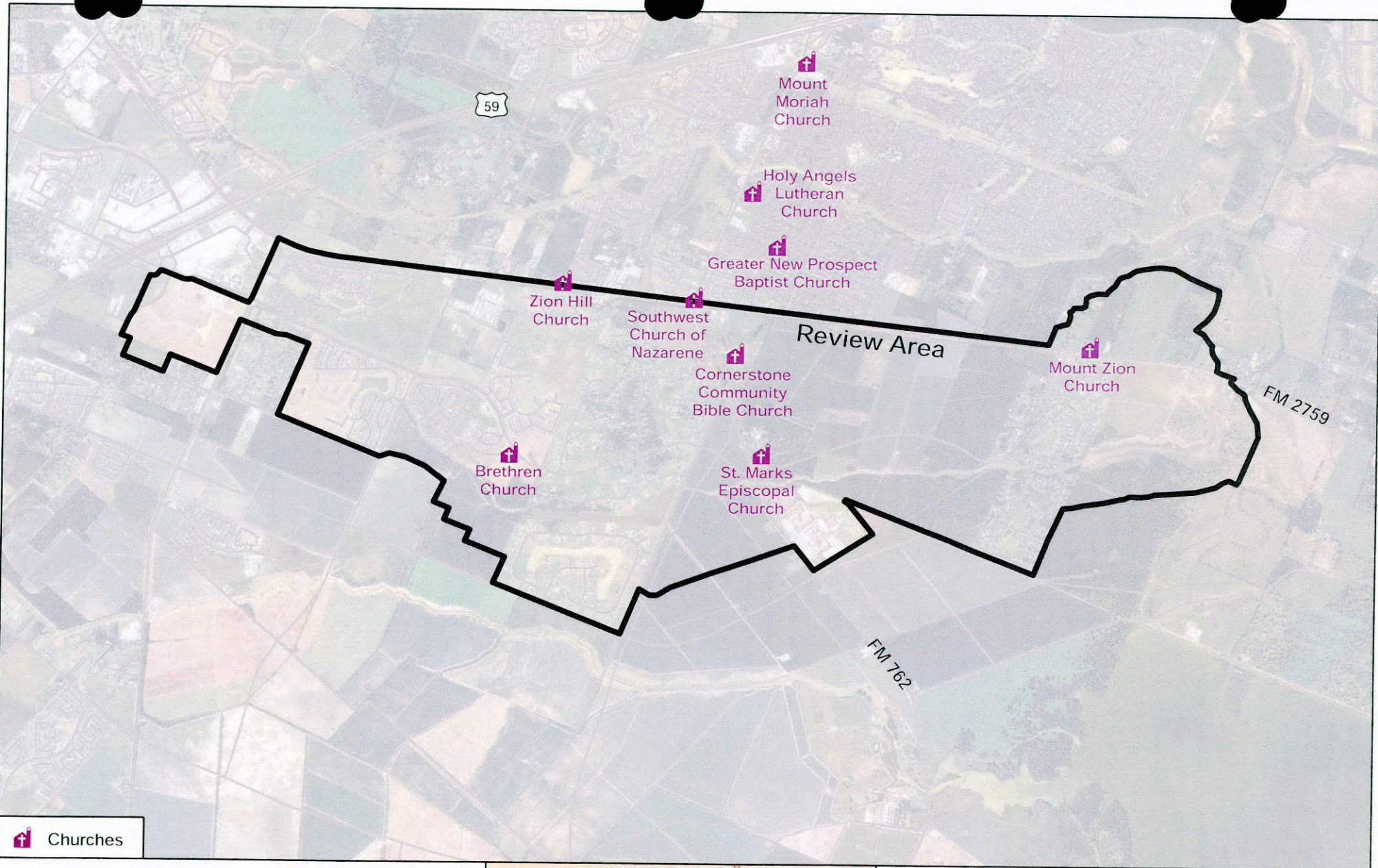



R.G. Miller Engineers
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FIGURE B1

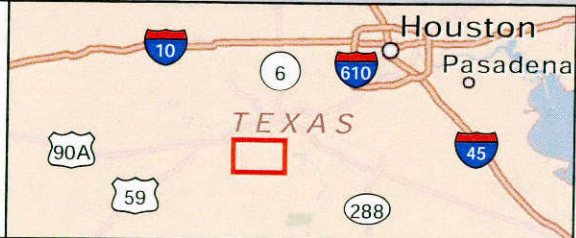
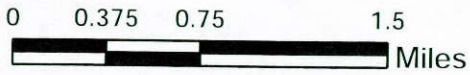
2012 AERIAL PHOTOGRAPH WITH GAPPS BAYOU
WATERSHED AND NEARBY SCHOOLS OVERLAYS

Fort Bend County, Texas





 Churches



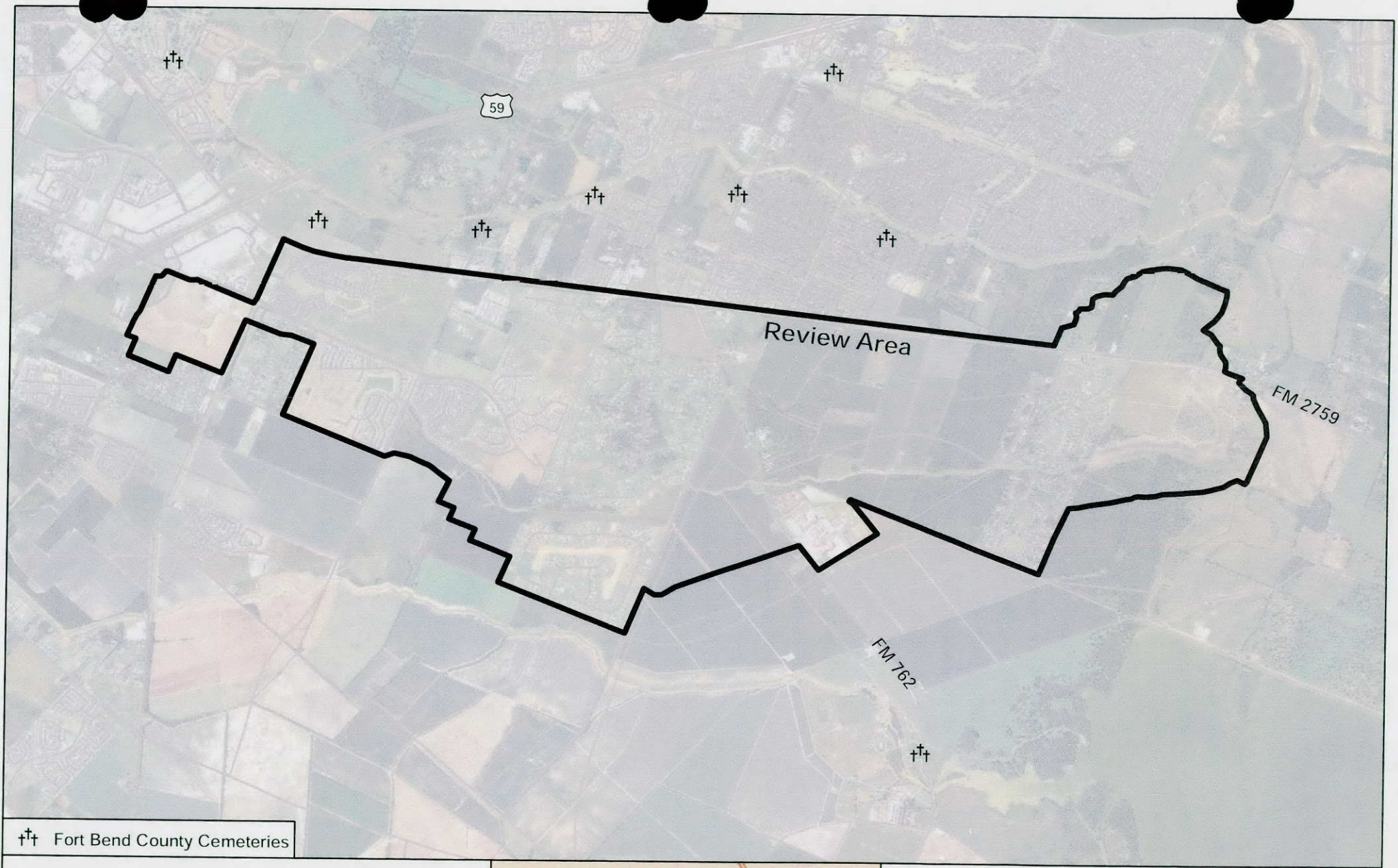
R.G. Miller Engineers
 Gapps Bayou Watershed Study - Phase 1 Investigations
 FIGURE B2

2012 AERIAL PHOTOGRAPH WITH GAPPS BAYOU
 WATERSHED AND CHURCH OVERLAYS

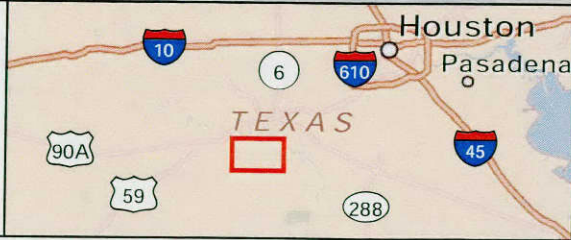
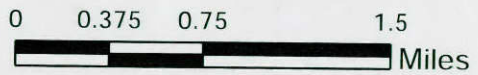
Fort Bend County, Texas







†† Fort Bend County Cemeteries



R.G. Miller Engineers
 Gapps Bayou Watershed Study - Phase 1 Investigations
 FIGURE B3
 2012 AERIAL PHOTOGRAPH WITH GAPPS BAYOU
 WATERSHED AND FORT BEND COUNTY
 CEMETERIES OVERLAYS

Fort Bend County, Texas





◆ Deaf Smith School

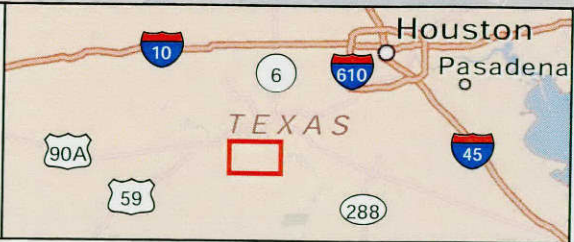
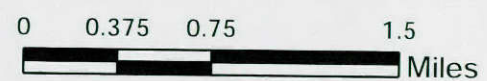
59



◆ Booth Public School

◆ George Ranch Historic Park

◆ Texas State Historical Sites

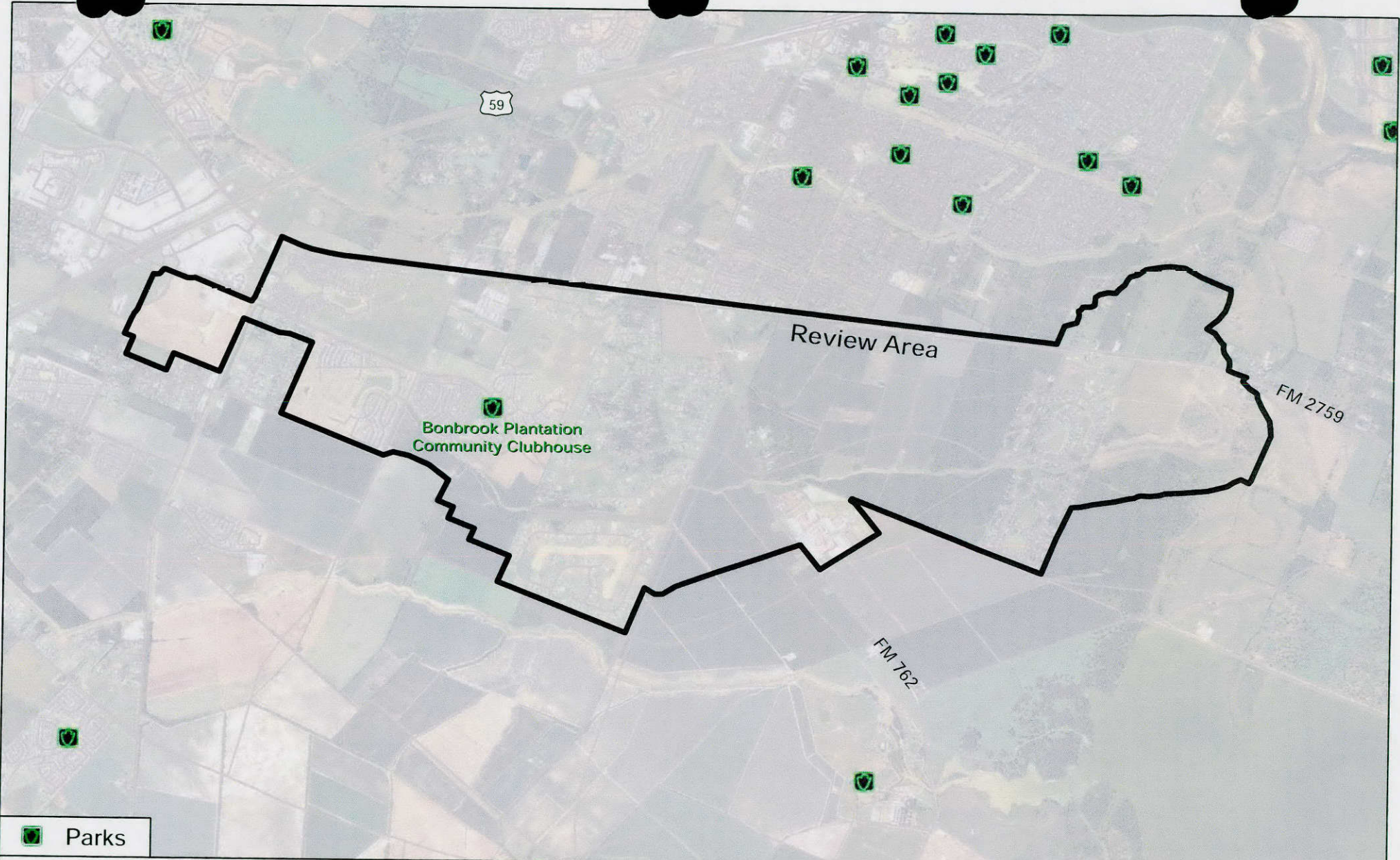



R.G. Miller Engineers
Gapps Bayou Watershed Study - Phase 1 Investigations
FIGURE B4
2012 AERIAL PHOTOGRAPH WITH GAPPS BAYOU
WATERSHED AND TEXAS STATE HISTOIRCAL
SITES OVERLAYS

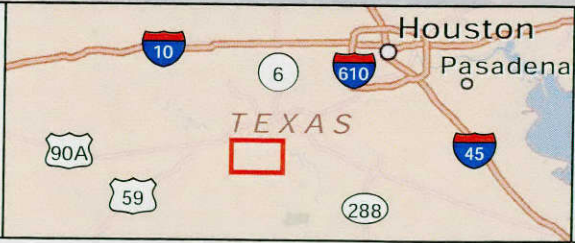
CROUCH ENVIRONMENTAL SERVICES, INC.

Fort Bend County, Texas





 Parks



R.G. Miller Engineers
 Gapps Bayou Watershed Study - Phase 1 Investigations
 FIGURE B5
 2012 AERIAL PHOTOGRAPH WITH GAPPS BAYOU
 WATERSHED AND FORT BEND COUNTY
 PARKS OVERLAYS

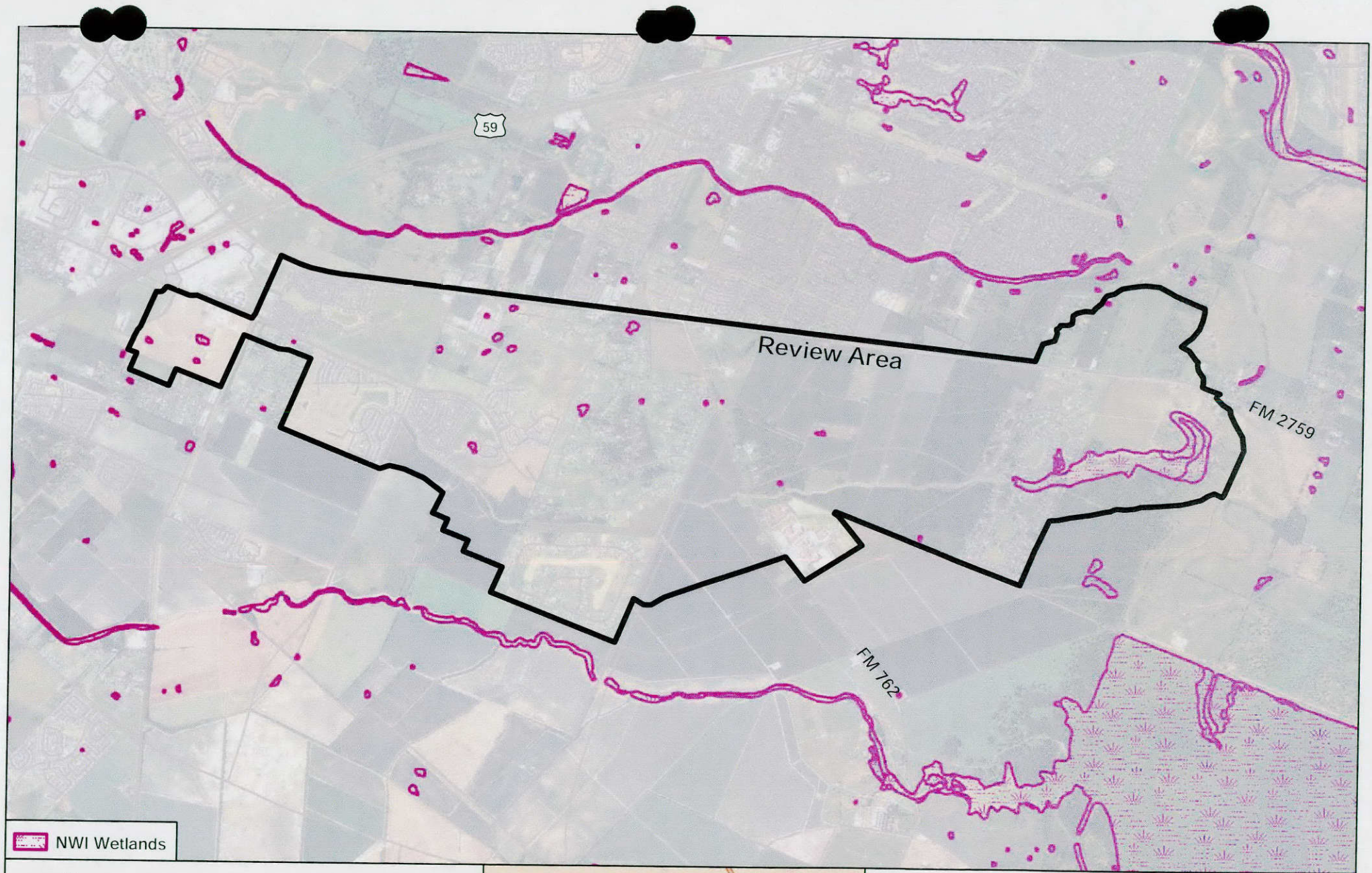
Fort Bend County, Texas




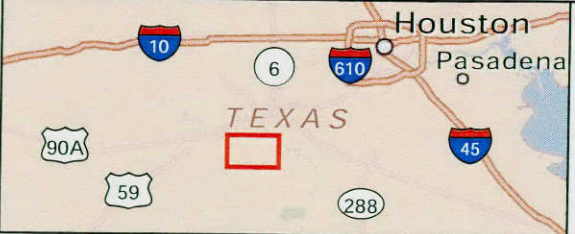
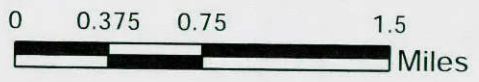


Appendix C
Wetlands and Waters of the United States Maps





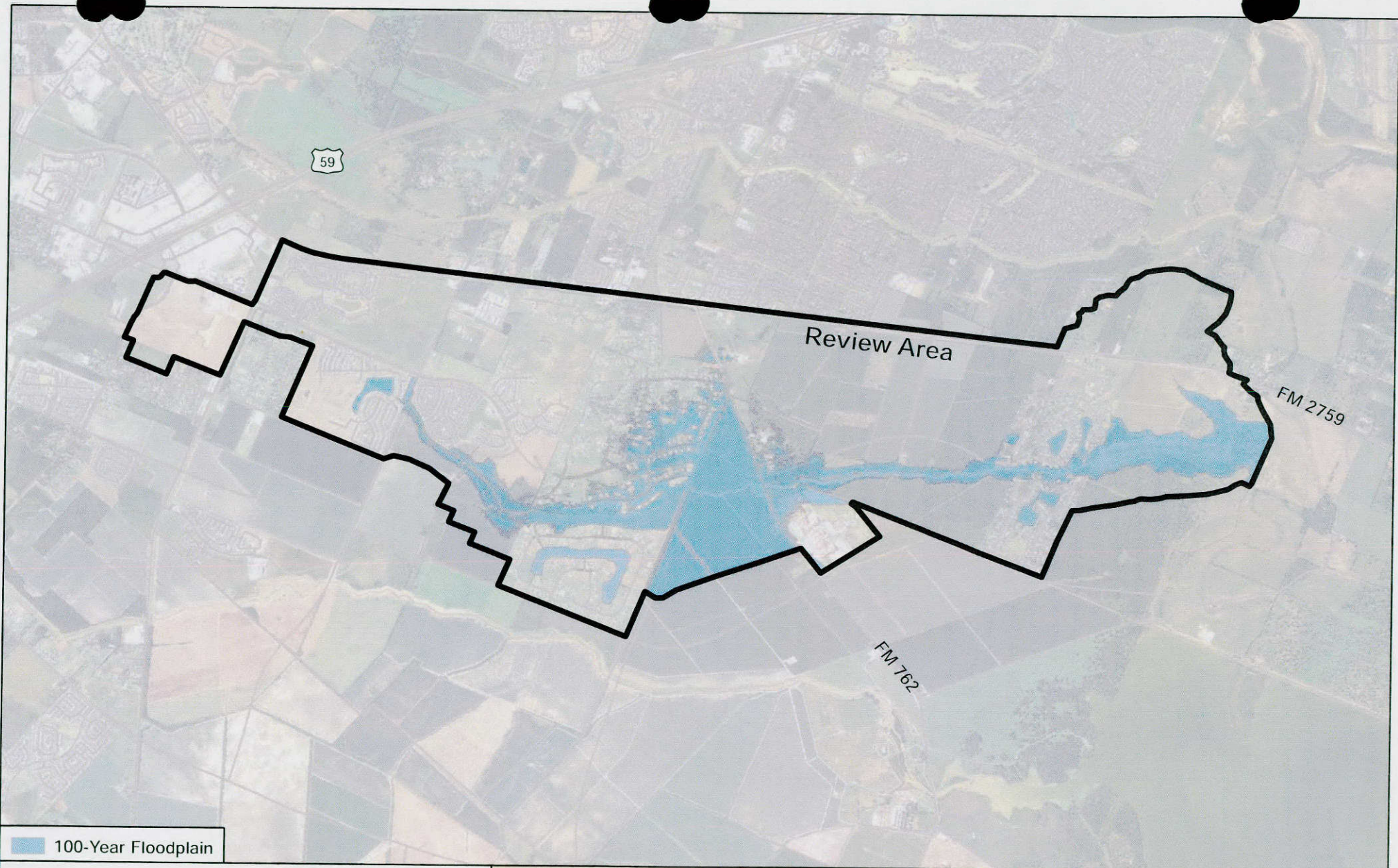
 NWI Wetlands



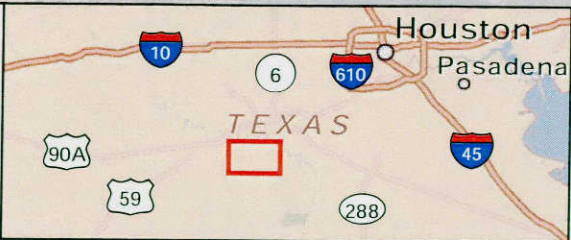
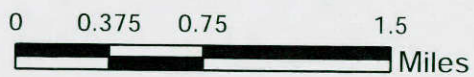
R.G. Miller Engineers
 Gapps Bayou Watershed Study - Phase 1 Investigations
 FIGURE C1
 2012 AERIAL PHOTOGRAPH WITH GAPPS BAYOU
 WATERSHED AND NATIONAL WETLANDS
 INVENTORY OVERLAYS
 Fort Bend County, Texas







100-Year Floodplain



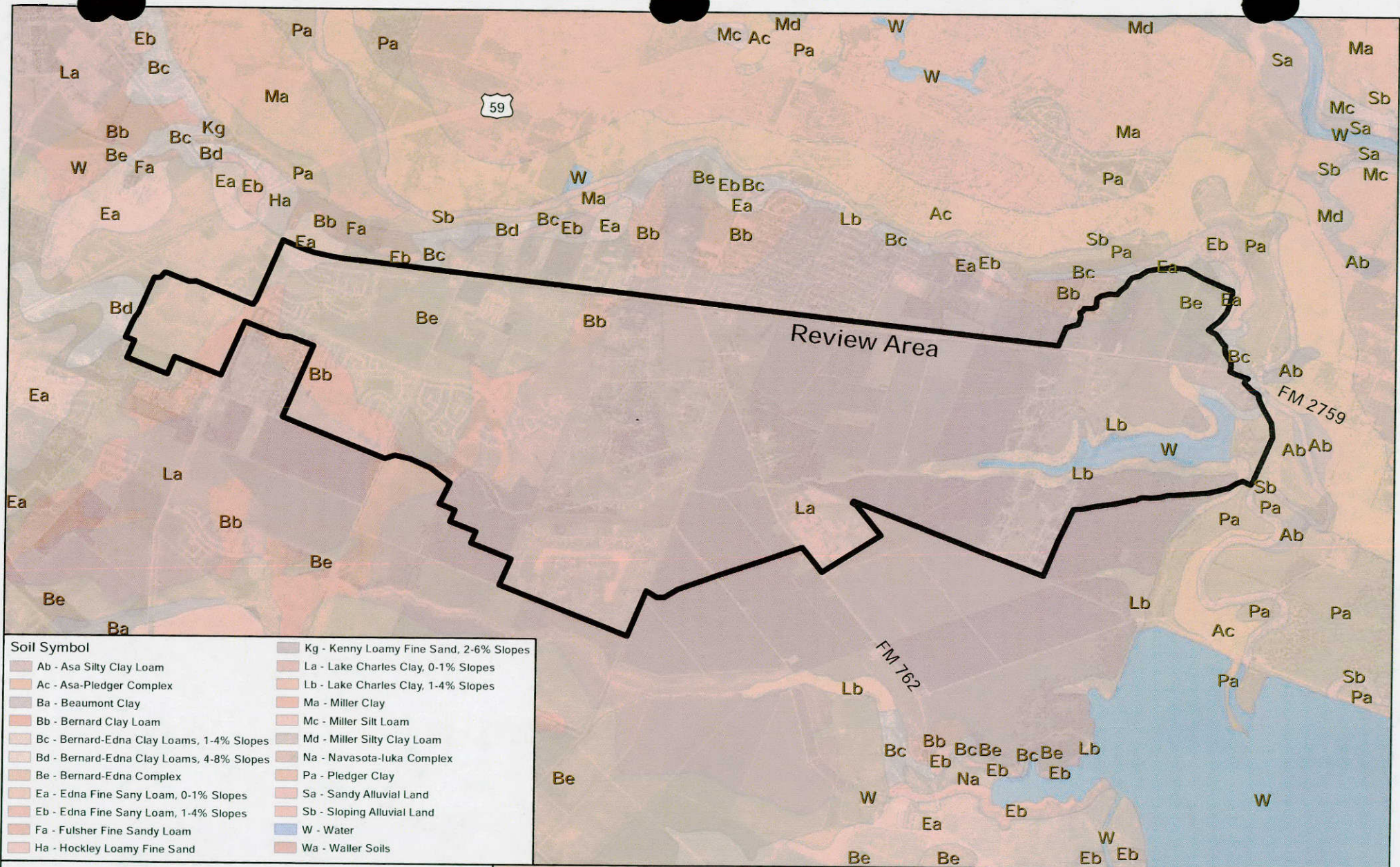
R.G. Miller Engineers
 Gapps Bayou Watershed Study - Phase 1 Investigations
 FIGURE C3

2012 AERIAL PHOTOGRAPH WITH GAPPS BAYOU
 WATERSHED AND 100-YEAR FLOODPLAIN OVERLAYS

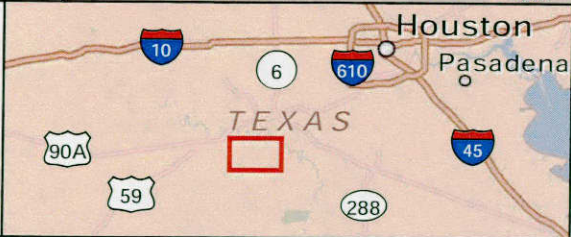
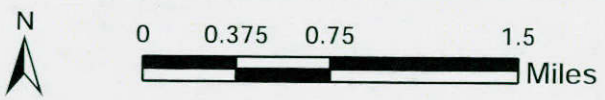
Fort Bend County, Texas







Soil Symbol	
Ab - Asa Silty Clay Loam	Kg - Kenny Loamy Fine Sand, 2-6% Slopes
Ac - Asa-Pledger Complex	La - Lake Charles Clay, 0-1% Slopes
Ba - Beaumont Clay	Lb - Lake Charles Clay, 1-4% Slopes
Bb - Bernard Clay Loam	Ma - Miller Clay
Bc - Bernard-Edna Clay Loams, 1-4% Slopes	Mc - Miller Silt Loam
Bd - Bernard-Edna Clay Loams, 4-8% Slopes	Md - Miller Silty Clay Loam
Be - Bernard-Edna Complex	Na - Navasota-Iuka Complex
Ea - Edna Fine Sany Loam, 0-1% Slopes	Pa - Pledger Clay
Eb - Edna Fine Sany Loam, 1-4% Slopes	Sa - Sandy Alluvial Land
Fa - Fulsher Fine Sandy Loam	Sb - Sloping Alluvial Land
Ha - Hockley Loamy Fine Sand	W - Water
	Wa - Waller Soils



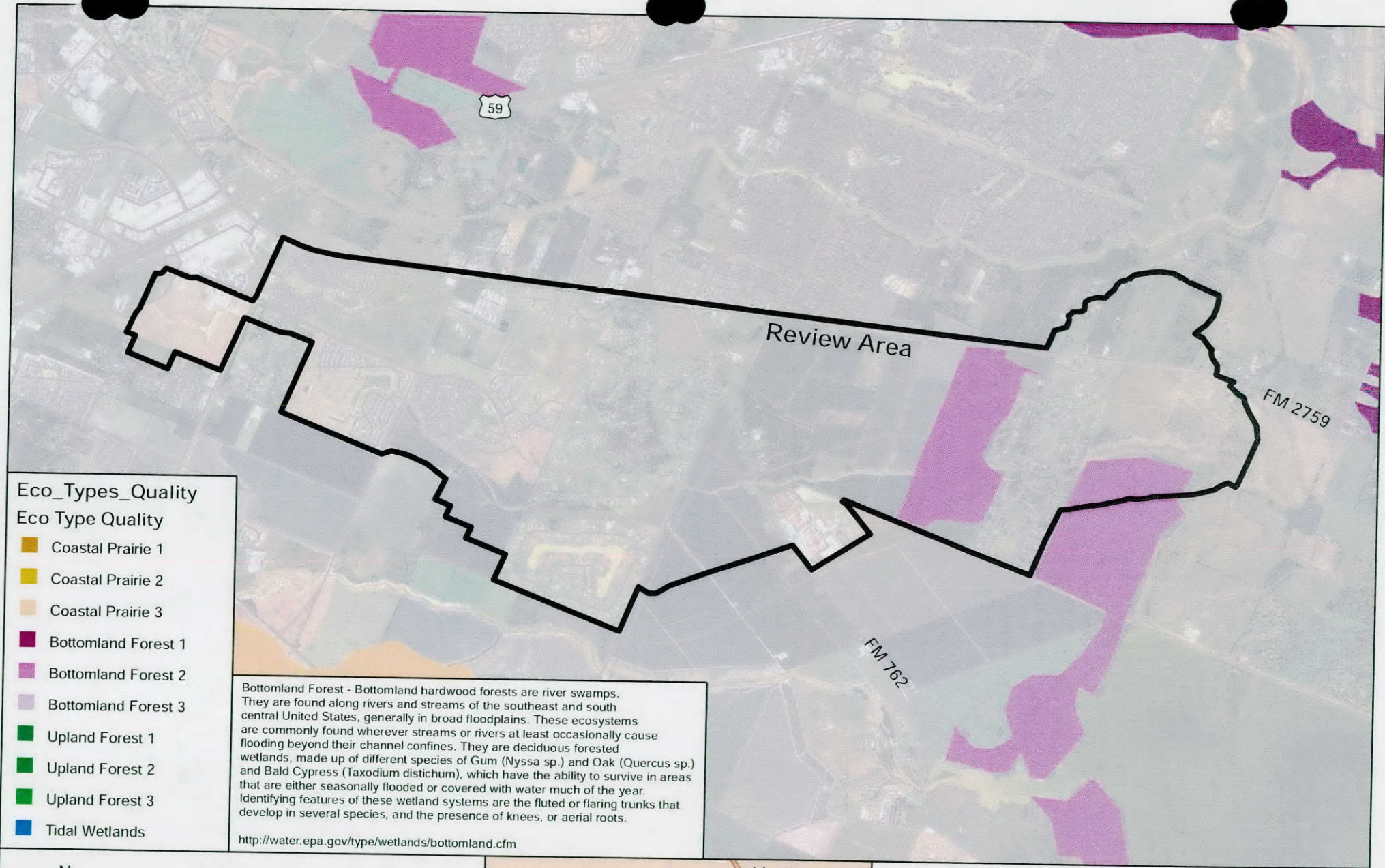
R.G. Miller Engineers
 Gapps Bayou Watershed Study - Phase 1 Investigations
 FIGURE C4

2012 AERIAL PHOTOGRAPH WITH GAPPS BAYOU
 WATERSHED AND NRCS SOIL SURVEY OVERLAYS

Fort Bend County, Texas







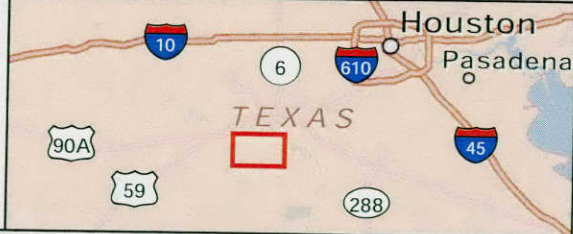
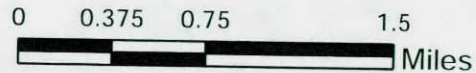
Eco_Types_Quality

Eco Type Quality

- Coastal Prairie 1
- Coastal Prairie 2
- Coastal Prairie 3
- Bottomland Forest 1
- Bottomland Forest 2
- Bottomland Forest 3
- Upland Forest 1
- Upland Forest 2
- Upland Forest 3
- Tidal Wetlands

Bottomland Forest - Bottomland hardwood forests are river swamps. They are found along rivers and streams of the southeast and south central United States, generally in broad floodplains. These ecosystems are commonly found wherever streams or rivers at least occasionally cause flooding beyond their channel confines. They are deciduous forested wetlands, made up of different species of Gum (*Nyssa* sp.) and Oak (*Quercus* sp.) and Bald Cypress (*Taxodium distichum*), which have the ability to survive in areas that are either seasonally flooded or covered with water much of the year. Identifying features of these wetland systems are the fluted or flaring trunks that develop in several species, and the presence of knees, or aerial roots.

<http://water.epa.gov/type/wetlands/bottomland.cfm>



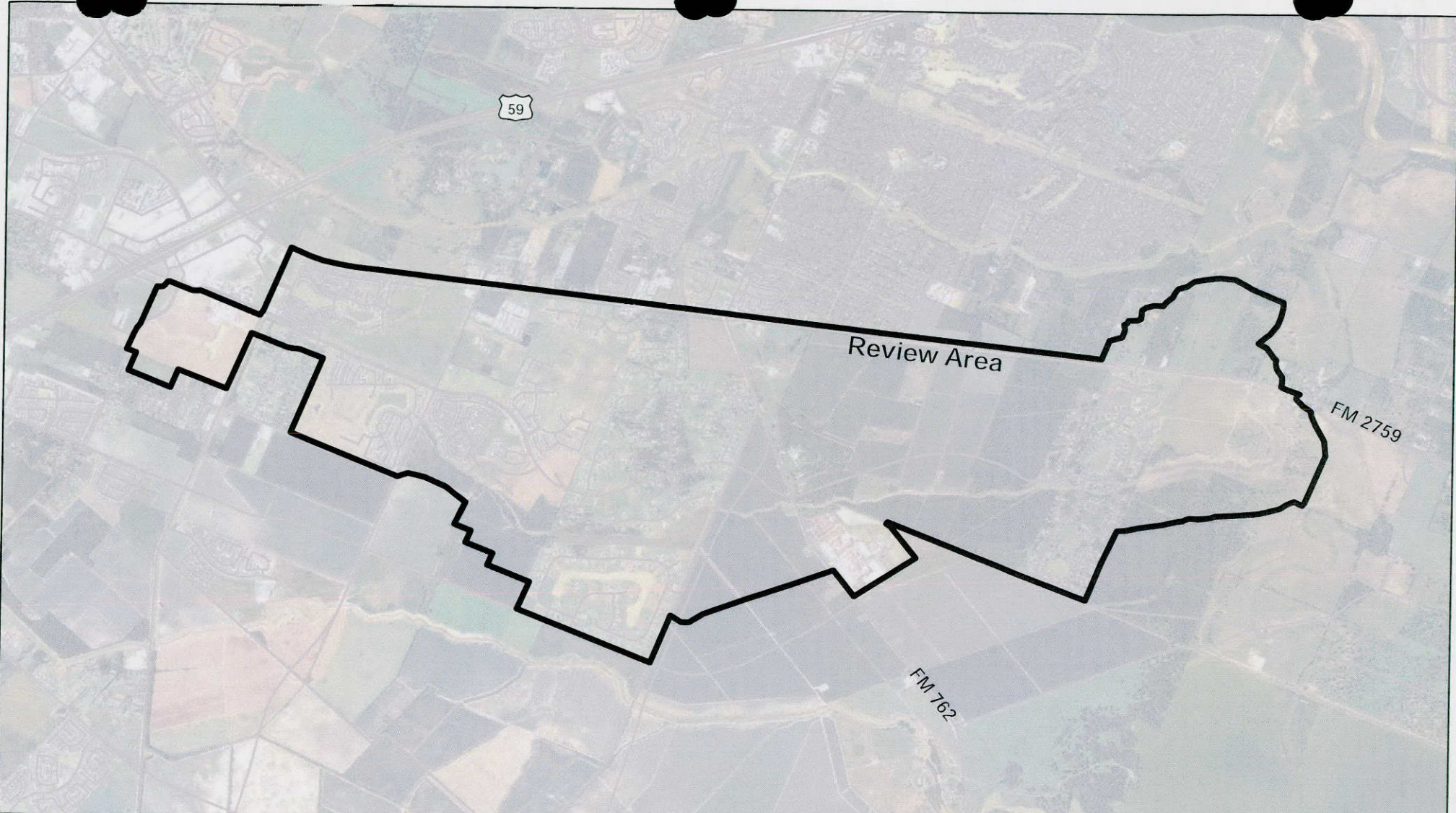
R.G. Miller Engineers
Gapps Bayou Watershed Study - Phase 1 Investigations
FIGURE C5

2012 AERIAL PHOTOGRAPH WITH GAPPS BAYOU
WATERSHED AND ECOLOGICAL TYPES OVERLAYS

Fort Bend County, Texas



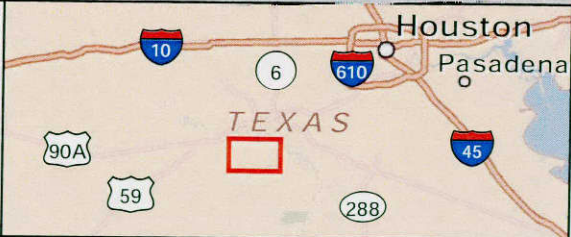
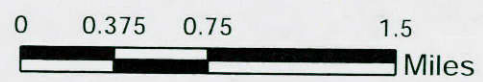




Texas Natural Diversity Database

— National Wild and Scenic Rivers

No National Wild or Scenic Rivers within view



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Gapps Bayou Watershed Study - Phase 1 Investigations
FIGURE C6

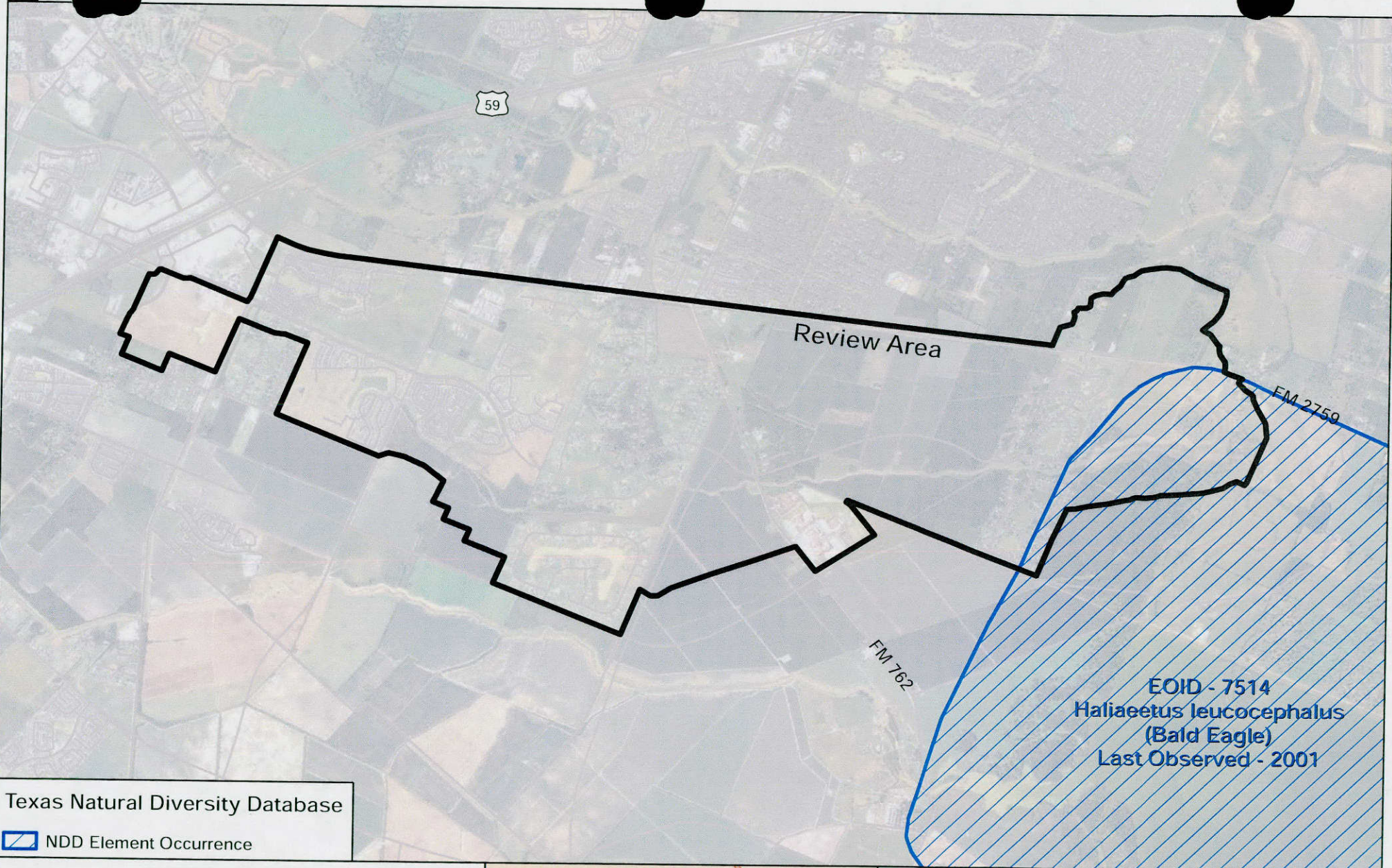
2012 AERIAL PHOTOGRAPH WITH GAPPS BAYOU
WATERSHED AND NATIONAL WILD AND SCENIC
RIVERS OVERLAYS

Fort Bend County, Texas




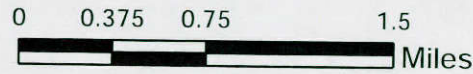
Appendix D
Threatened and Endangered Species Maps





Texas Natural Diversity Database

 NDD Element Occurrence



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 Gapps Bayou Watershed Study - Phase 1 Investigations
 FIGURE D1
 2012 AERIAL PHOTOGRAPH WITH GAPPS BAYOU
 WATERSHED AND TPWD NATURAL DIVERSITY
 DATABASE OVERLAYS

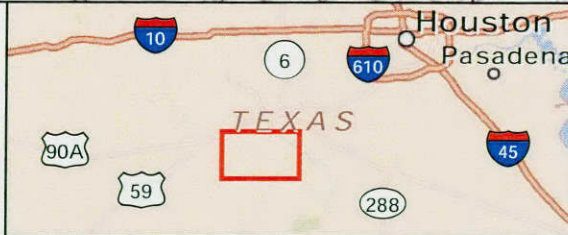
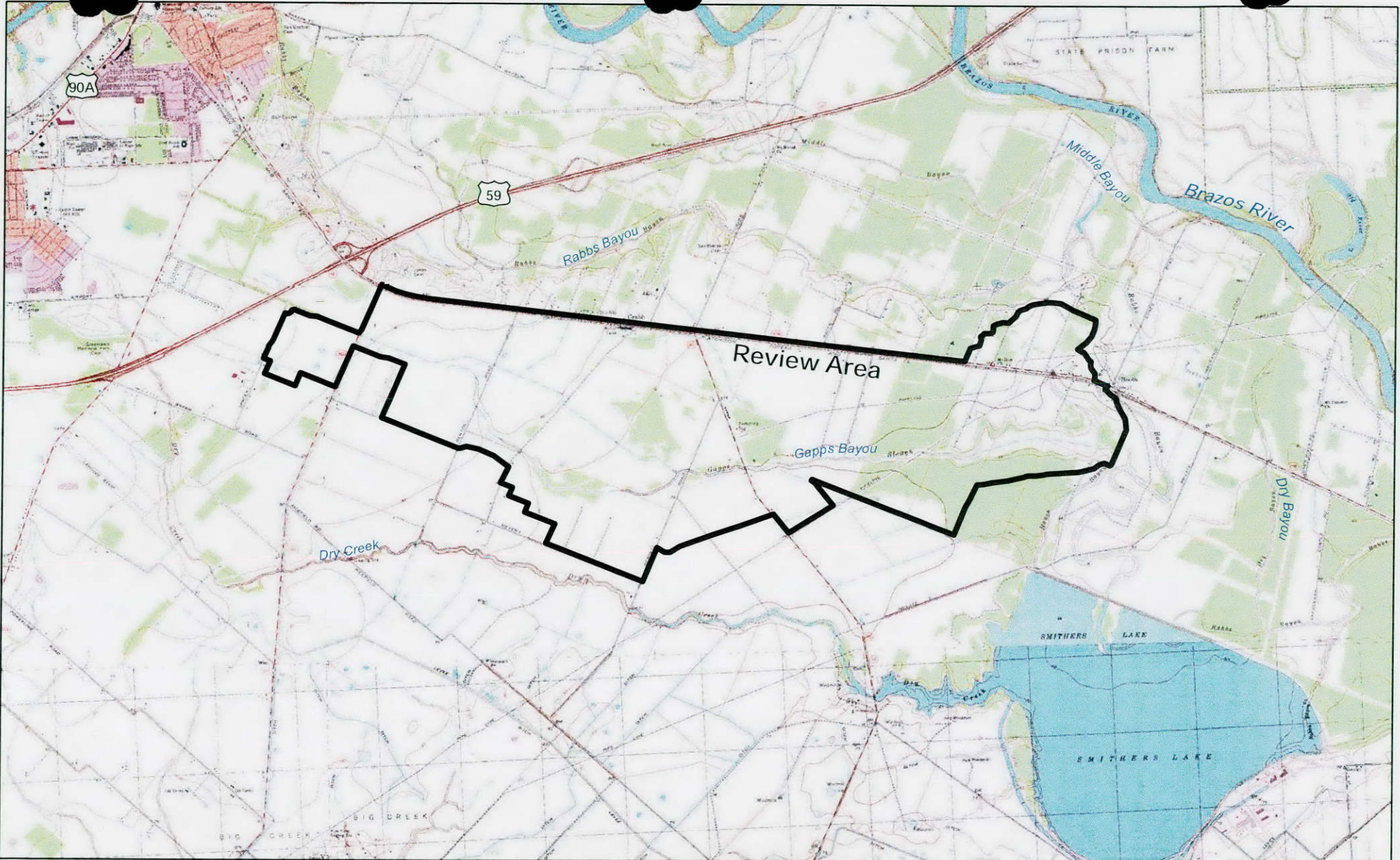
Fort Bend County, Texas





Appendix E
Hazardous Materials Maps

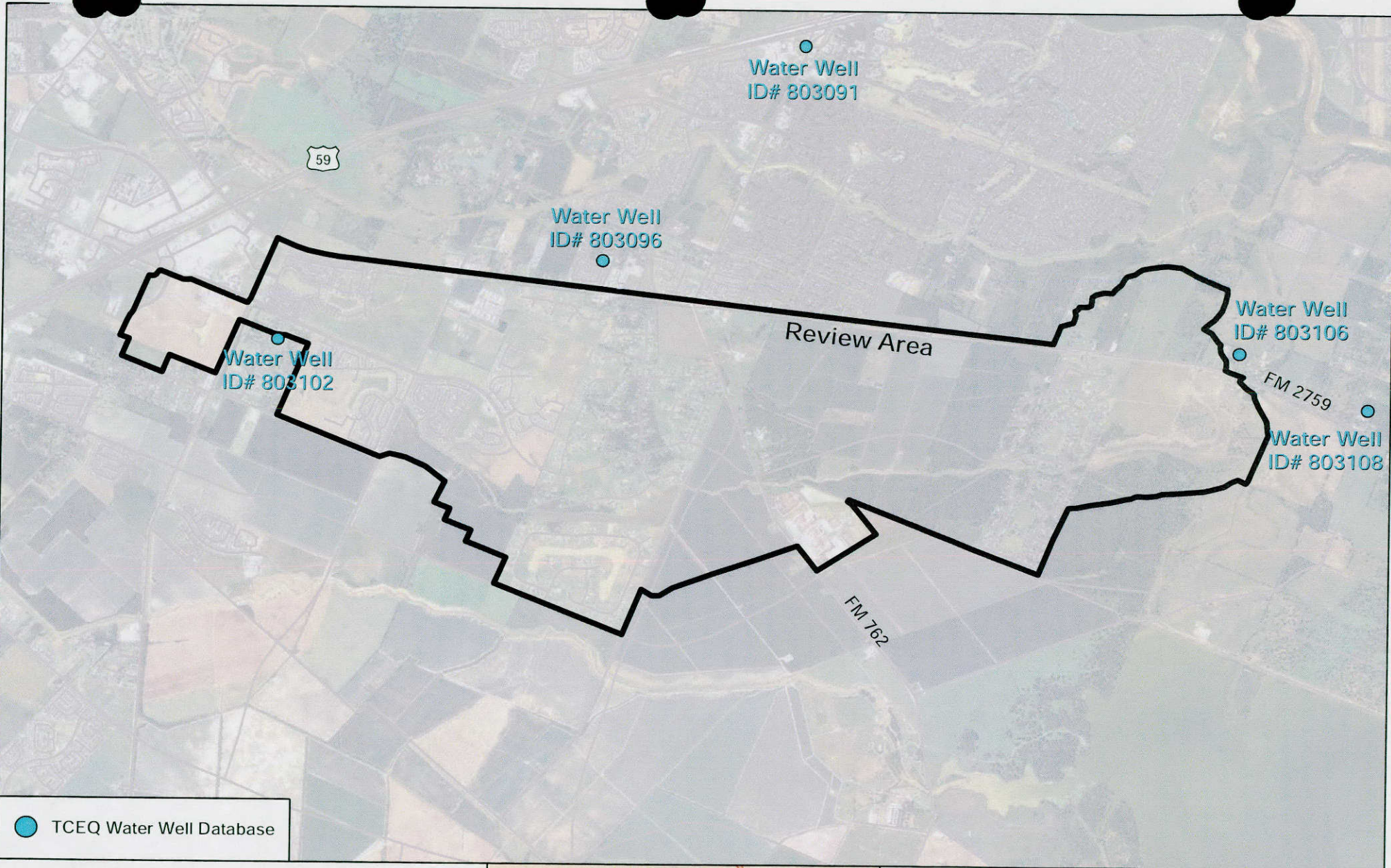




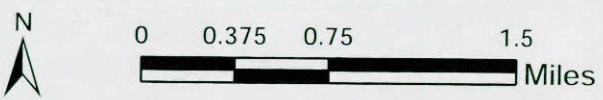
R.G. Miller Engineers
 Gapps Bayou Watershed Study - Phase 1 Investigations
 FIGURE E1
 1995 USGS TOPOGRAPHIC MAP
 7.5' Missouri City, Needville, Richmond, Smithers Lake,
 Sugar Land, Thompsons, Texas Quadrangles

Fort Bend County, Texas

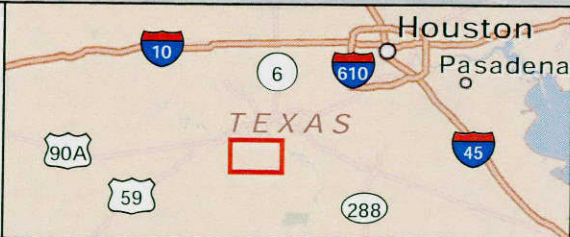




● TCEQ Water Well Database

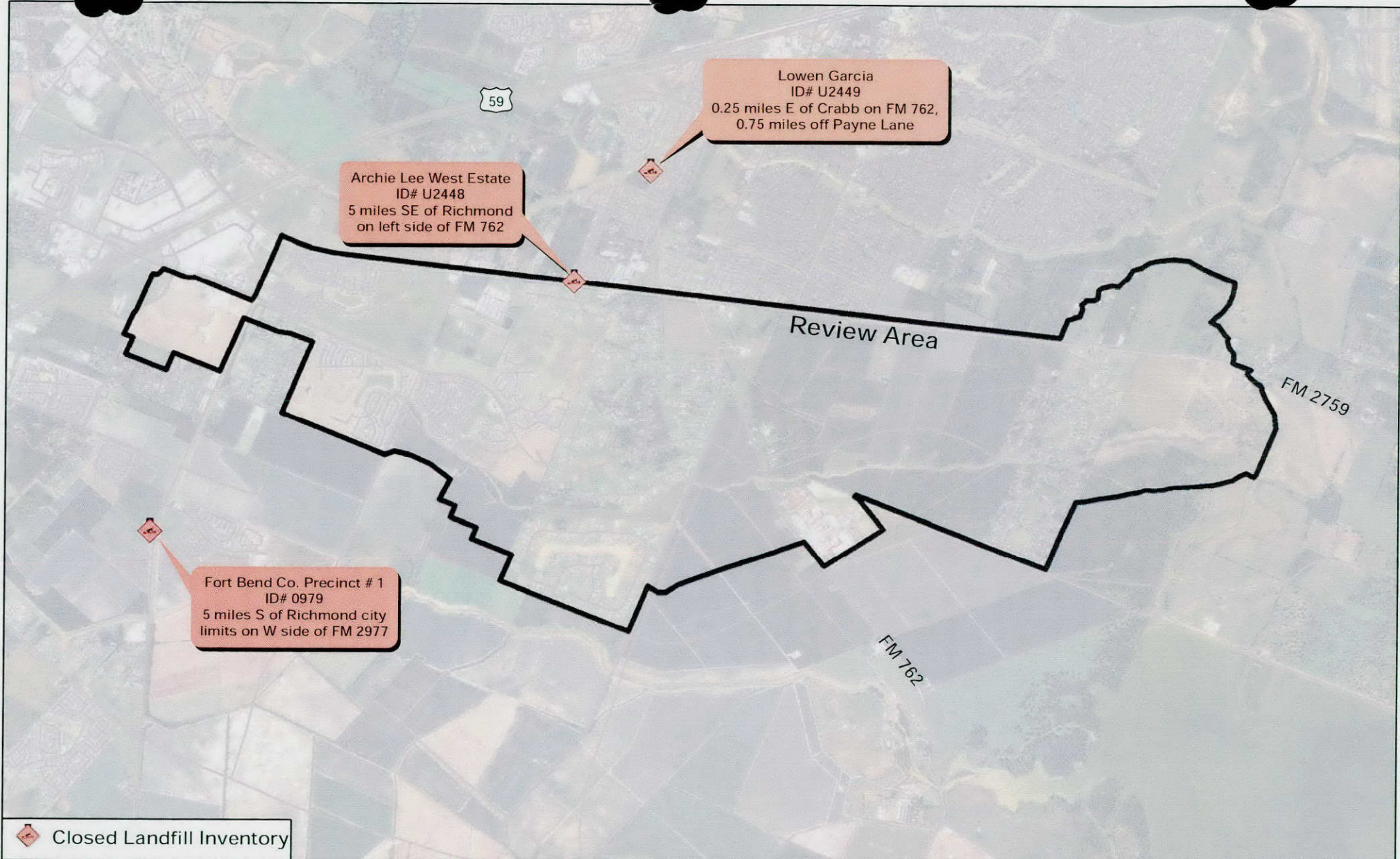


CROUCH ENVIRONMENTAL SERVICES, INC.

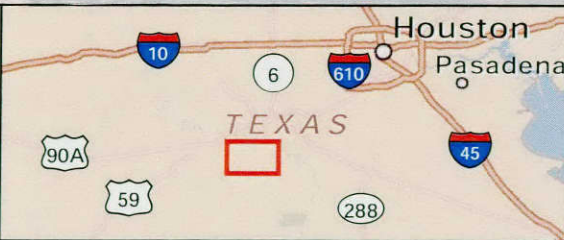


R.G. Miller Engineers
 Gapps Bayou Watershed Study - Phase 1 Investigations
 FIGURE E2
 2012 AERIAL PHOTOGRAPH WITH GAPPS BAYOU
 WATERSHED AND TCEQ WATER WELL
 LOCATION OVERLAYS
 Fort Bend County, Texas





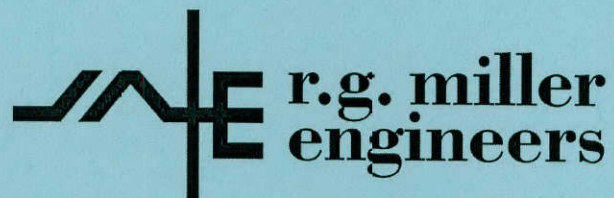
CROUCH ENVIRONMENTAL SERVICES, INC.

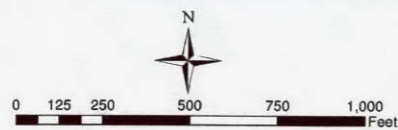


R.G. Miller Engineers
Gapps Bayou Watershed Study - Phase 1 Investigations
FIGURE E3
2012 AERIAL PHOTOGRAPH WITH GAPPS BAYOU
WATERSHED AND CLOSED LANDFILL
INVENTORY OVERLAYS
Fort Bend County, Texas



**Appendix AC:
Damage Cost Analysis**





EFFECTIVE COST ESTIMATE
 2010 ACRIL IMAGES
 GAPPS BAYOU - PHASE II
 FORT BEND COUNTY, TEXAS

r.g. miller
engineers
 Texas Firm Registration No. F-487



Gapps Bayou Appraisal Effective Condition

House Number	Inundated Legend	Appraisal	Damage Assessment	Cost per Property
Bridlewood Estates Subdivision				
1	Partial Lot Inundation	\$328,350	0%	\$0
2	Partial Lot Inundation	\$369,830	0%	\$0
3	Partial Lot Inundation	\$318,880	0%	\$0
4	Partial Lot Inundation	\$318,880	5%	\$15,944
5	Partial Lot Inundation	\$304,860	0%	\$0
6	Partial Lot Inundation	\$593,510	5%	\$29,676
7	Structure Inundated	\$522,380	100%	\$522,380
8	Structure Inundated	\$726,470	100%	\$726,470
9	Partial Lot Inundation	\$304,640	5%	\$15,232
10	Partial Lot Inundation	\$497,030	5%	\$24,852
11	Structure Inundated	\$694,180	100%	\$694,180
12	Partial Lot Inundation	\$400,090	0%	\$0
13	Lot Inundated	\$1,466,360	10%	\$146,636
14	Structure Inundated	\$445,840	100%	\$445,840
15	Structure Inundated	\$456,050	100%	\$456,050
16	Partial Lot Inundation	\$373,190	5%	\$18,660
17	Partial Lot Inundation	\$315,950	5%	\$15,798
18	Partial Lot Inundation	\$325,810	0%	\$0
19	Structure Inundated	\$416,450	100%	\$416,450
20	Partial Lot Inundation	\$433,020	0%	\$0
21	Partial Lot Inundation	\$751,020	5%	\$37,551
22	Lot Inundated	\$430,920	10%	\$43,092
23	Partial Lot Inundation	\$565,220	0%	\$0
24	Partial Lot Inundation	\$272,390	5%	\$13,620
25	Lot Inundated	\$431,670	10%	\$43,167
26	Partial Lot Inundation	\$528,860	5%	\$26,443
27	Partial Lot Inundation	\$421,290	5%	\$21,065
28	Partial Lot Inundation	\$355,050	5%	\$17,753
29	Partial Lot Inundation	\$379,830	5%	\$18,992
30	Partial Lot Inundation	\$360,590	5%	\$18,030
31	Partial Lot Inundation	\$419,510	5%	\$20,976
32	Partial Lot Inundation	\$612,810	5%	\$30,641
33	Partial Lot Inundation	\$410,010	5%	\$20,501
34	Partial Lot Inundation	\$356,010	5%	\$17,801
35	Partial Lot Inundation	\$102,650	5%	\$5,133
36	Partial Lot Inundation	\$310,880	5%	\$15,544
37	Partial Lot Inundation	\$349,580	5%	\$17,479
38	Partial Lot Inundation	\$337,020	0%	\$0
39	Partial Lot Inundation	\$311,670	0%	\$0
40	Partial Lot Inundation	\$355,670	5%	\$17,784
41	Structure Inundated	\$276,520	100%	\$276,520
42	Partial Lot Inundation	\$358,330	5%	\$17,917
43	Lot Inundated	\$488,280	10%	\$48,828
44	Partial Lot Inundation	\$314,520	5%	\$15,726
45	Partial Lot Inundation	\$329,840	5%	\$16,492
46	Partial Lot Inundation	\$310,200	5%	\$15,510
47	Partial Lot Inundation	\$314,960	5%	\$15,748
48	Partial Lot Inundation	\$333,660	5%	\$16,683
49	Partial Lot Inundation	\$381,460	5%	\$19,073
50	Partial Lot Inundation	\$325,460	5%	\$16,273
51	Lot Inundated	\$391,380	10%	\$39,138



Gapps Bayou Appraisal Effective Condition

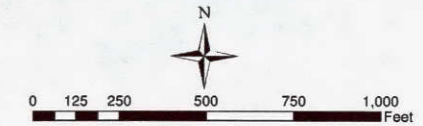
House Number	Inundated Legend	Appraisal	Damage Assessment	Cost per Property
52	Lot Inundated	\$479,780	10%	\$47,978
53	Partial Lot Inundation	\$337,080	5%	\$16,854
54	Partial Lot Inundation	\$322,230	0%	\$0
55	Partial Lot Inundation	\$266,970	0%	\$0
56	Partial Lot Inundation	\$304,060	0%	\$0
57	Partial Lot Inundation	\$329,660	0%	\$0
58	Partial Lot Inundation	\$290,690	5%	\$14,535
59	Structure Inundated	\$66,340	100%	\$66,340
60	Structure Inundated	\$286,880	100%	\$286,880
61	Structure Inundated	\$812,050	100%	\$812,050
62	Structure Inundated	\$348,530	100%	\$348,530
63	Structure Inundated	\$477,260	100%	\$477,260
64	Lot Inundated	\$990,390	10%	\$99,039
65	Lot Inundated	\$395,400	10%	\$39,540
66	Lot Inundated	\$420,680	10%	\$42,068
67	Lot Inundated	\$403,920	10%	\$40,392
68	Lot Inundated	\$480,640	10%	\$48,064
69	Partial Lot Inundation	\$407,760	5%	\$20,388
70	Lot Inundated	\$458,670	10%	\$45,867
71	Partial Lot Inundation	\$426,220	5%	\$21,311
72	Structure Inundated	\$446,050	100%	\$446,050
73	Partial Lot Inundation	\$441,990	5%	\$22,100
74	Partial Lot Inundation	\$427,750	5%	\$21,388
75	Partial Lot Inundation	\$424,670	5%	\$21,234
76	Lot Inundated	\$598,260	10%	\$59,826
77	Partial Lot Inundation	\$338,760	0%	\$0
78	Partial Lot Inundation	\$433,080	0%	\$0
79	Partial Lot Inundation	\$433,080	0%	\$0
80	Partial Lot Inundation	\$421,550	0%	\$0
81	Partial Lot Inundation	\$362,890	0%	\$0
82	Partial Lot Inundation	\$371,440	0%	\$0
83	Partial Lot Inundation	\$434,210	0%	\$0
84	Partial Lot Inundation	\$347,540	0%	\$0
85	Partial Lot Inundation	\$582,240	0%	\$0
86	Partial Lot Inundation	\$558,900	0%	\$0
87	Partial Lot Inundation	\$442,450	0%	\$0
88	Partial Lot Inundation	\$417,580	0%	\$0
89	Partial Lot Inundation	\$304,980	5%	\$15,249
90	Partial Lot Inundation	\$379,960	0%	\$0
Royal Lakes Estates Subdivision				
1	Partial Lot Inundation	\$343,580	0%	\$0
2	Partial Lot Inundation	\$354,470	0%	\$0
3	Lot Inundated	\$361,770	10%	\$36,177
4	Lot Inundated	\$370,240	10%	\$37,024
5	Partial Lot Inundation	\$361,270	5%	\$18,064
6	Structure Inundated	\$563,910	100%	\$563,910
7	Lot Inundated	\$398,740	10%	\$39,874
8	Partial Lot Inundation	\$357,340	5%	\$17,867
9	Partial Lot Inundation	\$430,620	0%	\$0
10	Partial Lot Inundation	\$313,750	0%	\$0
11	Partial Lot Inundation	\$362,810	5%	\$18,141
12	Structure Inundated	\$361,490	100%	\$361,490



Gapps Bayou Appraisal Effective Condition

House Number	Inundated Legend	Appraisal	Damage Assessment	Cost per Property
13	Partial Lot Inundation	\$313,690	5%	\$15,685
14	Partial Lot Inundation	\$297,350	5%	\$14,868
15	Partial Lot Inundation	\$413,230	5%	\$20,662
16	Partial Lot Inundation	\$358,920	5%	\$17,946
17	Partial Lot Inundation	\$398,090	0%	\$0
18	Partial Lot Inundation	\$293,560	0%	\$0
19	Partial Lot Inundation	\$323,110	5%	\$16,156
20	Partial Lot Inundation	\$540,260	5%	\$27,013
Royal Lakes Estates Total:				\$1,204,874
Bridlewood Estates Total:				\$7,424,581
Watershed Total:				\$8,629,455





ALTERNATIVE 1 COST ESTIMATE
 2010 AERIAL IMAGES
 GAPPS BAYOU - PHASE II
 FORT BEND COUNTY, TEXAS

r.g. miller
engineers
 Texas Firm Registration No. F-487



Gapps Bayou Appraisal Alternative One

House Number	Inundated Legenc	Appraisal	Damage Assessment	Cost per Property
Bridlewood Estates Subdivision				
1	No Inundation	\$328,350	0%	\$0
2	No Inundation	\$369,830	0%	\$0
3	No Inundation	\$318,880	0%	\$0
4	Partial Lot Inundation	\$318,880	5%	\$15,944
5	No Inundation	\$304,860	0%	\$0
6	No Inundation	\$593,510	0%	\$0
7	Lot Inundated	\$522,380	10%	\$52,238
8	Structure Inundated	\$726,470	100%	\$726,470
9	No Inundation	\$304,640	0%	\$0
10	No Inundation	\$497,030	0%	\$0
11	Structure Inundated	\$694,180	100%	\$694,180
12	No Inundation	\$400,090	0%	\$0
13	No Inundation	\$1,466,360	0%	\$0
14	Lot Inundated	\$445,840	10%	\$44,584
15	Lot Inundated	\$456,050	10%	\$45,605
16	Partial Lot Inundation	\$373,190	5%	\$18,660
17	Partial Lot Inundation	\$315,950	5%	\$15,798
18	No Inundation	\$325,810	0%	\$0
19	Structure Inundated	\$416,450	100%	\$416,450
20	No Inundation	\$433,020	0%	\$0
21	Partial Lot Inundation	\$751,020	5%	\$37,551
22	Partial Lot Inundation	\$430,920	5%	\$21,546
23	No Inundation	\$565,220	0%	\$0
24	Partial Lot Inundation	\$272,390	5%	\$13,620
25	Partial Lot Inundation	\$431,670	5%	\$21,584
26	No Inundation	\$528,860	0%	\$0
27	Partial Lot Inundation	\$421,290	5%	\$21,065
28	Partial Lot Inundation	\$355,050	5%	\$17,753
29	Partial Lot Inundation	\$379,830	5%	\$18,992
30	Partial Lot Inundation	\$360,590	5%	\$18,030
31	No Inundation	\$419,510	0%	\$0
32	Partial Lot Inundation	\$612,810	5%	\$30,641
33	Partial Lot Inundation	\$410,010	5%	\$20,501
34	Partial Lot Inundation	\$356,010	5%	\$17,801
35	No Inundation	\$102,650	0%	\$0
36	No Inundation	\$310,880	0%	\$0
37	No Inundation	\$349,580	0%	\$0
38	No Inundation	\$337,020	0%	\$0
39	No Inundation	\$311,670	0%	\$0
40	No Inundation	\$355,670	0%	\$0
41	Partial Lot Inundation	\$276,520	5%	\$13,826
42	No Inundation	\$358,330	0%	\$0
43	No Inundation	\$488,280	0%	\$0
44	No Inundation	\$314,520	0%	\$0
45	No Inundation	\$329,840	0%	\$0
46	No Inundation	\$310,200	0%	\$0
47	No Inundation	\$314,960	0%	\$0
48	No Inundation	\$333,660	0%	\$0
49	Partial Lot Inundation	\$381,460	5%	\$19,073



Gapps Bayou Appraisal Alternative One

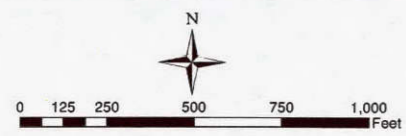
House Number	Inundated Legenc	Appraisal	Damage Assessment	Cost per Property
50	No Inundation	\$325,460	0%	\$0
51	Partial Lot Inundation	\$391,380	5%	\$19,569
52	Lot Inundated	\$479,780	10%	\$47,978
53	No Inundation	\$337,080	0%	\$0
54	No Inundation	\$322,230	0%	\$0
55	No Inundation	\$266,970	0%	\$0
56	No Inundation	\$304,060	0%	\$0
57	No Inundation	\$329,660	0%	\$0
58	No Inundation	\$290,690	0%	\$0
59	Structure Inundated	\$66,340	100%	\$66,340
60	Structure Inundated	\$286,880	100%	\$286,880
61	No Inundation	\$812,050	0%	\$0
62	Structure Inundated	\$348,530	100%	\$348,530
63	Partial Lot Inundation	\$477,260	5%	\$23,863
64	Partial Lot Inundation	\$990,390	5%	\$49,520
65	Partial Lot Inundation	\$395,400	5%	\$19,770
66	Partial Lot Inundation	\$420,680	5%	\$21,034
67	Lot Inundated	\$403,920	10%	\$40,392
68	Lot Inundated	\$480,640	10%	\$48,064
69	Partial Lot Inundation	\$407,760	5%	\$20,388
70	Partial Lot Inundation	\$458,670	5%	\$22,934
71	Partial Lot Inundation	\$426,220	5%	\$21,311
72	Partial Lot Inundation	\$446,050	5%	\$22,303
73	Partial Lot Inundation	\$441,990	5%	\$22,100
74	No Inundation	\$427,750	0%	\$0
75	No Inundation	\$424,670	0%	\$0
76	No Inundation	\$598,260	0%	\$0
77	No Inundation	\$338,760	0%	\$0
78	No Inundation	\$433,080	0%	\$0
79	No Inundation	\$433,080	0%	\$0
80	No Inundation	\$421,550	0%	\$0
81	No Inundation	\$362,890	0%	\$0
82	No Inundation	\$371,440	0%	\$0
83	No Inundation	\$434,210	0%	\$0
84	No Inundation	\$347,540	0%	\$0
85	No Inundation	\$582,240	0%	\$0
86	No Inundation	\$558,900	0%	\$0
87	No Inundation	\$442,450	0%	\$0
88	No Inundation	\$417,580	0%	\$0
89	No Inundation	\$304,980	0%	\$0
90	No Inundation	\$379,960	0%	\$0
Royal Lakes Estates Subdivision				
1	Partial Lot Inundation	\$343,580	0%	\$0
2	Partial Lot Inundation	\$354,470	0%	\$0
3	Partial Lot Inundation	\$361,770	10%	\$36,177
4	Partial Lot Inundation	\$370,240	10%	\$37,024
5	Partial Lot Inundation	\$361,270	5%	\$18,064
6	Structure Inundated	\$563,910	100%	\$563,910
7	Lot Inundated	\$398,740	10%	\$39,874
8	Partial Lot Inundation	\$357,340	5%	\$17,867



Gapps Bayou Appraisal Alternative One

House Number	Inundated Legend	Appraisal	Damage Assessment	Cost per Property
9	Partial Lot Inundation	\$430,620	0%	\$0
10	Partial Lot Inundation	\$313,750	0%	\$0
11	Partial Lot Inundation	\$362,810	5%	\$18,141
12	Structure Inundated	\$361,490	100%	\$361,490
13	Partial Lot Inundation	\$313,690	5%	\$15,685
14	Partial Lot Inundation	\$297,350	5%	\$14,868
15	Partial Lot Inundation	\$413,230	5%	\$20,662
16	Partial Lot Inundation	\$358,920	5%	\$17,946
17	Partial Lot Inundation	\$398,090	0%	\$0
18	Partial Lot Inundation	\$293,560	0%	\$0
19	Partial Lot Inundation	\$323,110	5%	\$16,156
20	Partial Lot Inundation	\$540,260	5%	\$27,013
Royal Lakes Estates Total:				\$1,204,874
Bridlewood Estates Total:				\$3,382,881
Watershed Total:				\$4,587,755





ALTERNATIVE 2 COST ESTIMATE
 2010 AERIAL IMAGES
 GAPPS BAYOU - PHASE II
 FORT BEND COUNTY, TEXAS

r.g. miller
engineers
 Texas Firm Registration No. F-487



Gapps Bayou Appraisal Alternative Two

House Number	Inundated Legend	Appraisal	Damage Assessment	Cost per Property
Bridlewood Estates Subdivision				
1	No Inundation	\$328,350	0%	\$0
2	No Inundation	\$369,830	0%	\$0
3	No Inundation	\$318,880	0%	\$0
4	No Inundation	\$318,880	0%	\$0
5	No Inundation	\$304,860	0%	\$0
6	No Inundation	\$593,510	0%	\$0
7	No Inundation	\$522,380	0%	\$0
8	Structure Inundated	\$726,470	100%	\$726,470
9	No Inundation	\$304,640	0%	\$0
10	No Inundation	\$497,030	0%	\$0
11	No Inundation	\$694,180	0%	\$0
12	No Inundation	\$400,090	0%	\$0
13	No Inundation	\$1,466,360	0%	\$0
14	No Inundation	\$445,840	0%	\$0
15	Partial Lot Inundation	\$456,050	5%	\$22,803
16	Partial Lot Inundation	\$373,190	5%	\$18,660
17	Partial Lot Inundation	\$315,950	5%	\$15,798
18	No Inundation	\$325,810	0%	\$0
19	Structure Inundated	\$416,450	100%	\$416,450
20	No Inundation	\$433,020	0%	\$0
21	No Inundation	\$751,020	0%	\$0
22	No Inundation	\$430,920	0%	\$0
23	No Inundation	\$565,220	0%	\$0
24	No Inundation	\$272,390	0%	\$0
25	No Inundation	\$431,670	0%	\$0
26	No Inundation	\$528,860	0%	\$0
27	Partial Lot Inundation	\$421,290	5%	\$21,065
28	Partial Lot Inundation	\$355,050	5%	\$17,753
29	No Inundation	\$379,830	0%	\$0
30	No Inundation	\$360,590	0%	\$0
31	No Inundation	\$419,510	0%	\$0
32	No Inundation	\$612,810	0%	\$0
33	No Inundation	\$410,010	0%	\$0
34	No Inundation	\$356,010	0%	\$0
35	No Inundation	\$102,650	0%	\$0
36	No Inundation	\$310,880	0%	\$0
37	No Inundation	\$349,580	0%	\$0
38	No Inundation	\$337,020	0%	\$0
39	No Inundation	\$311,670	0%	\$0
40	No Inundation	\$355,670	0%	\$0
41	Partial Lot Inundation	\$276,520	5%	\$13,826
42	No Inundation	\$358,330	0%	\$0
43	No Inundation	\$488,280	0%	\$0
44	No Inundation	\$314,520	0%	\$0
45	No Inundation	\$329,840	0%	\$0
46	No Inundation	\$310,200	0%	\$0
47	No Inundation	\$314,960	0%	\$0
48	No Inundation	\$333,660	0%	\$0
49	No Inundation	\$381,460	0%	\$0



Gapps Bayou Appraisal Alternative Two

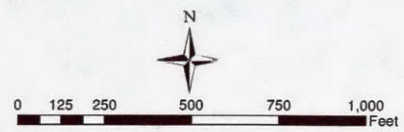
House Number	Inundated Legend	Appraisal	Damage Assessment	Cost per Property
50	No Inundation	\$325,460	0%	\$0
51	No Inundation	\$391,380	0%	\$0
52	No Inundation	\$479,780	0%	\$0
53	No Inundation	\$337,080	0%	\$0
54	No Inundation	\$322,230	0%	\$0
55	No Inundation	\$266,970	0%	\$0
56	No Inundation	\$304,060	0%	\$0
57	No Inundation	\$329,660	0%	\$0
58	No Inundation	\$290,690	0%	\$0
59	Partial Lot Inundation	\$66,340	5%	\$3,317
60	No Inundation	\$286,880	0%	\$0
61	No Inundation	\$812,050	0%	\$0
62	No Inundation	\$348,530	0%	\$0
63	No Inundation	\$477,260	0%	\$0
64	No Inundation	\$990,390	0%	\$0
65	No Inundation	\$395,400	0%	\$0
66	No Inundation	\$420,680	0%	\$0
67	No Inundation	\$403,920	0%	\$0
68	No Inundation	\$480,640	0%	\$0
69	No Inundation	\$407,760	0%	\$0
70	No Inundation	\$458,670	0%	\$0
71	No Inundation	\$426,220	0%	\$0
72	No Inundation	\$446,050	0%	\$0
73	No Inundation	\$441,990	0%	\$0
74	No Inundation	\$427,750	0%	\$0
75	No Inundation	\$424,670	0%	\$0
76	No Inundation	\$598,260	0%	\$0
77	No Inundation	\$338,760	0%	\$0
78	No Inundation	\$433,080	0%	\$0
79	No Inundation	\$433,080	0%	\$0
80	No Inundation	\$421,550	0%	\$0
81	No Inundation	\$362,890	0%	\$0
82	No Inundation	\$371,440	0%	\$0
83	No Inundation	\$434,210	0%	\$0
84	No Inundation	\$347,540	0%	\$0
85	No Inundation	\$582,240	0%	\$0
86	No Inundation	\$558,900	0%	\$0
87	No Inundation	\$442,450	0%	\$0
88	No Inundation	\$417,580	0%	\$0
89	No Inundation	\$304,980	0%	\$0
90	No Inundation	\$379,960	0%	\$0
Royal Lakes Estates Subdivision				
1	Partial Lot Inundation	\$343,580	0%	\$0
2	Partial Lot Inundation	\$354,470	0%	\$0
3	Partial Lot Inundation	\$361,770	10%	\$36,177
4	Partial Lot Inundation	\$370,240	10%	\$37,024
5	Partial Lot Inundation	\$361,270	5%	\$18,064
6	Structure Inundated	\$563,910	100%	\$563,910
7	Lot Inundated	\$398,740	10%	\$39,874
8	Partial Lot Inundation	\$357,340	5%	\$17,867



Gapps Bayou Appraisal Alternative Two

House Number	Inundated Legend	Appraisal	Damage Assessment	Cost per Property
9	Partial Lot Inundation	\$430,620	0%	\$0
10	Partial Lot Inundation	\$313,750	0%	\$0
11	Partial Lot Inundation	\$362,810	5%	\$18,141
12	Structure Inundated	\$361,490	100%	\$361,490
13	Partial Lot Inundation	\$313,690	5%	\$15,685
14	Partial Lot Inundation	\$297,350	5%	\$14,868
15	Partial Lot Inundation	\$413,230	5%	\$20,662
16	Partial Lot Inundation	\$358,920	5%	\$17,946
17	Partial Lot Inundation	\$398,090	0%	\$0
18	Partial Lot Inundation	\$293,560	0%	\$0
19	Partial Lot Inundation	\$323,110	5%	\$16,156
20	Partial Lot Inundation	\$540,260	5%	\$27,013
Royal Lakes Estates Total:				\$1,204,874
Bridlewood Estates Total:				\$1,256,140
Watershed Total:				\$2,461,014





ALTERNATIVE 3 COST ESTIMATE
 2010 AERIAL IMAGES
 GAPPS BAYOU - PHASE II
 FORT BEND COUNTY, TEXAS

r.g. miller
engineers
 Texas Firm Registration No. F-487



Gapps Bayou Appraisal Alternative Three

House Number	Inundated Legend	Appraisal	Damage Assessment	Cost per Property
Bridlewood Estates Subdivision				
1	No Inundation	\$328,350	0%	\$0
2	No Inundation	\$369,830	0%	\$0
3	No Inundation	\$318,880	0%	\$0
4	No Inundation	\$318,880	0%	\$0
5	No Inundation	\$304,860	0%	\$0
6	No Inundation	\$593,510	0%	\$0
7	No Inundation	\$522,380	0%	\$0
8	Structure Inundated	\$726,470	100%	\$726,470
9	No Inundation	\$304,640	0%	\$0
10	No Inundation	\$497,030	0%	\$0
11	No Inundation	\$694,180	0%	\$0
12	No Inundation	\$400,090	0%	\$0
13	No Inundation	\$1,466,360	0%	\$0
14	No Inundation	\$445,840	0%	\$0
15	Partial Lot Inundation	\$456,050	5%	\$22,803
16	Partial Lot Inundation	\$373,190	5%	\$18,660
17	Partial Lot Inundation	\$315,950	5%	\$15,798
18	No Inundation	\$325,810	0%	\$0
19	Structure Inundated	\$416,450	100%	\$416,450
20	No Inundation	\$433,020	0%	\$0
21	No Inundation	\$751,020	0%	\$0
22	No Inundation	\$430,920	0%	\$0
23	No Inundation	\$565,220	0%	\$0
24	No Inundation	\$272,390	0%	\$0
25	No Inundation	\$431,670	0%	\$0
26	No Inundation	\$528,860	0%	\$0
27	Partial Lot Inundation	\$421,290	5%	\$21,065
28	Partial Lot Inundation	\$355,050	5%	\$17,753
29	No Inundation	\$379,830	0%	\$0
30	No Inundation	\$360,590	0%	\$0
31	No Inundation	\$419,510	0%	\$0
32	No Inundation	\$612,810	0%	\$0
33	No Inundation	\$410,010	0%	\$0
34	No Inundation	\$356,010	0%	\$0
35	No Inundation	\$102,650	0%	\$0
36	No Inundation	\$310,880	0%	\$0
37	No Inundation	\$349,580	0%	\$0
38	No Inundation	\$337,020	0%	\$0
39	No Inundation	\$311,670	0%	\$0
40	No Inundation	\$355,670	0%	\$0
41	Partial Lot Inundation	\$276,520	5%	\$13,826
42	No Inundation	\$358,330	0%	\$0
43	No Inundation	\$488,280	0%	\$0
44	No Inundation	\$314,520	0%	\$0
45	No Inundation	\$329,840	0%	\$0
46	No Inundation	\$310,200	0%	\$0
47	No Inundation	\$314,960	0%	\$0
48	No Inundation	\$333,660	0%	\$0



Gapps Bayou Appraisal Alternative Three

House Number	Inundated Legend	Appraisal	Damage Assessment	Cost per Property
49	No Inundation	\$381,460	0%	\$0
50	No Inundation	\$325,460	0%	\$0
51	No Inundation	\$391,380	0%	\$0
52	No Inundation	\$479,780	0%	\$0
53	No Inundation	\$337,080	0%	\$0
54	No Inundation	\$322,230	0%	\$0
55	No Inundation	\$266,970	0%	\$0
56	No Inundation	\$304,060	0%	\$0
57	No Inundation	\$329,660	0%	\$0
58	No Inundation	\$290,690	0%	\$0
59	Partial Lot Inundation	\$66,340	5%	\$3,317
60	No Inundation	\$286,880	0%	\$0
61	No Inundation	\$812,050	0%	\$0
62	No Inundation	\$348,530	0%	\$0
63	No Inundation	\$477,260	0%	\$0
64	No Inundation	\$990,390	0%	\$0
65	No Inundation	\$395,400	0%	\$0
66	No Inundation	\$420,680	0%	\$0
67	No Inundation	\$403,920	0%	\$0
68	No Inundation	\$480,640	0%	\$0
69	No Inundation	\$407,760	0%	\$0
70	No Inundation	\$458,670	0%	\$0
71	No Inundation	\$426,220	0%	\$0
72	No Inundation	\$446,050	0%	\$0
73	No Inundation	\$441,990	0%	\$0
74	No Inundation	\$427,750	0%	\$0
75	No Inundation	\$424,670	0%	\$0
76	No Inundation	\$598,260	0%	\$0
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83	No Inundation	\$434,210	0%	\$0
84	No Inundation	\$347,540	0%	\$0
85	No Inundation	\$582,240	0%	\$0
86	No Inundation	\$558,900	0%	\$0
87	No Inundation	\$442,450	0%	\$0
88	No Inundation	\$417,580	0%	\$0
89	No Inundation	\$304,980	0%	\$0
90	No Inundation	\$379,960	0%	\$0
Royal Lakes Estates Subdivision				
1	Partial Lot Inundation	\$343,580	0%	\$0
2	Partial Lot Inundation	\$354,470	0%	\$0
3	Partial Lot Inundation	\$361,770	10%	\$36,177
4	Partial Lot Inundation	\$370,240	10%	\$37,024
5	Partial Lot Inundation	\$361,270	5%	\$18,064
6	Structure Inundated	\$563,910	100%	\$563,910



Gapps Bayou Appraisal Alternative Three

House Number	Inundated Legend	Appraisal	Damage Assessment	Cost per Property
7	Lot Inundated	\$398,740	10%	\$39,874
8	Partial Lot Inundation	\$357,340	5%	\$17,867
9	Partial Lot Inundation	\$430,620	0%	\$0
10	Partial Lot Inundation	\$313,750	0%	\$0
11	Partial Lot Inundation	\$362,810	5%	\$18,141
12	Structure Inundated	\$361,490	100%	\$361,490
13	Partial Lot Inundation	\$313,690	5%	\$15,685
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18	Partial Lot Inundation	\$293,560	0%	\$0
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Royal Lakes Estates Total:				\$1,204,874
Bridlewood Estates Total:				\$1,256,140
Watershed Total:				\$2,461,014

