FINAL SCOPE TECHNICAL MEMORANDUM

Addendum to Final Pre-Engineering Report N-2013T-0013

WBS No.: N-000100-005-3
Work Order No. 12 and 13
Antoine Drive South from US 290 to Victory

Prepared For: City of Houston - Public Works
Planning and Development Services Division

PLANNING & DEVELOPMENT DEPARTMENT

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1.0 Executive Summary

The City of Houston Infrastructure Planning Branch of the Public Works Planning and Development Services Division has contracted with OMEGA Engineers, Inc., (OMEGA) to perform Single Phase Engineering Services in order to qualify various project areas for further development and inclusion into the City's CIP under WBS No. N-000100-0005-3, Outline Agreement No. 4600011900, Work Order No. 3. The study area in this Technical Memorandum is N-2013T-0013, Antoine Drive from US 290 to Bridge Forest.

This Final Scope Technical Memorandum focuses on updates to the candidate project (Alternative 1A) for both Antoine North, and Antoine South Road. The Final Technical Scope Memorandum provides detailed data, layouts, and exhibits pertinent to Alternative 1A.

At the direction of the COH the proposed lane configuration and other project elements for the study area was updated to address the public input that was obtained during the public meeting held on October 20th, 2015 for resident and stakeholders along Antoine study area. The configuration was also revised to meet the updated COH Infrastructure Design Manual 2015. Other factors taken in consideration in finalization this scope update; third party traffic study resources mainly the Northwest Houston Mobility Study 2015. In addition to another third party report (Antoine Drive-Corridor Analysis) prepared by Walter P. Moore, along with comments and recommendations generated by COH-IPB.

Alternative 1A consists of the construction of Antoine Drive from US 290 to Victory Drive. The segment from US 290 to W. Tidwell will be widened to a six-lane divided roadway section with shared use paths. The segment from W. Tidwell to Victory to four-lane divided roadway section with shared use path within the existing 100-foot ROW. Additionally, a proposed grade separation (overpass) over the railroad track north of the intersection with W. Tidwell. Proposed Pavement, Drainage and Utility Improvements are described in the memorandum.

This Final Scope Memorandum has incorporated ideas, concepts, and suggestions raised at the public meeting event and the input acquired later by mail and email messages from the resident and stakeholders at the study area, as appropriate.
In addition, certain design related public comments should be taken in consideration and incorporated during final design phase following further research and deliberation.
The public meeting comments included drainage concerns, vehicular and pedestrian traffic issues, bike lanes, right-of-way requirements, and roadway improvement aesthetics.

The probable construcition cost for the Alternative 1A – 6 and 4 lanes with wide medians, ROW: 120 and 100-ft has a **Total Candidate Cost of $ $ 66,967,145.72** with a **Project Priority Score of 96.1**

2.0 Background

2.1 Project Limits and Description

The City of Houston Infrastructure Planning Branch of the Public Works Planning and Development Services Division has contracted with OMEGA Engineers, Inc., (OMEGA) to perform Single Phase Engineering Services in order to qualify various project areas for further development and inclusion into the City's CIP under WBS No. N-000100-0005-3, Outline Agreement No. 4600011900, Work Order No. 3. The study area in this Technical memorandum is N-2013T-0013, Antoine Drive from US 290 to Bridge Forest.

This project went through three stages of planning and development. The first phase (Planning1) was dedicated to research, data, gathering, and evaluating existing conditions and possible solutions to deficiencies found and to improve the condition of the study area like roadway capacity, pavement condition, mobility, pedestrian facilities, safety, and storm drainage. In the second phase (Planning 2) multiple alternative solutions were presented in conceptual form, to facilitate discussion and reach a consensus on which alternatives should be further developed, at the end of the Planning 2 presentation, Alternative 1A was selected by the committee for further development.

Due to the size of the project and the cost, OMEGA was instructed by COH-IPB during Planning 3 work, to break the Project into 2 projects; Antoine North, and Antoine South.

Planning 3 focuses on the candidate project (Alternative 1A) for both Antoine North, and Antoine South Road. Along with comments and recommendations generated by COH-IPB during this process, all previous work relative to Planning 1, 2 and 3 has been incorporated into the pre-engineering report submitted to the COH-IPB on October 2014.

This Final Scope technical Memorandum focuses on updates to the candidate project (Alternative 1A) for both Antoine North, and Antoine South Road. The Final Technical Scope Memorandum provides detailed data, layouts, and exhibits pertinent to Alternative 1A.

At the direction of the COH the proposed lane configuration and other project elements for the study area was updated to address the public input that was obtained during the public meeting held on October 20th, 2015 for resident and stakeholders along Antoine study area. Also, to meet the updated COH Infrastructure Design Manual 2015. Other factors taken in consideration in the finalization of this scope update; third party traffic study resources mainly the Northwest Houston Mobility Study 2015. In addition to another third party report (Antoine Drive-Corridor Analysis) prepared by Walter P. Moore, along with comments and recommendations generated by COH-IPB.

Figure (1) – Antoine South

3.0 Summary of Candidate Project

Name of Project: Need Area No:	Antoine (South) N-2013T-0013
Project Scope & Description	Widen existing Antoine Road from 4 lanes to 6 lanes from US 290 to Tidwell and reconstruct the segment from Tidwell to Victory with 4 lane section, shared use path; construct overpass over the railroad intersecting Antoine, replace traffic signals, and provide necessary upgrades to storm sewer system and utilities.
Project Limits	Northwest Freeway (US 290) to Victory Drive
Type	Major Thoroughfares/Collector Street
Council District	C and A
Key Map No.	411Q, U, Y, 451C, G
Super Neighborhood	Greater Inwood and Oak Forest/Garden Oaks
Project Length	3 miles
Project Cost	$ 66,967,145.72
Number of Sub-Projects	3
Sub-Project 1 Cost	$ 24,650,247.41 (De Soto to Victory Drive)
Sub-Project 2 Cost	$ 29,280,088.32 (Northwest Fwy to North of Cole Creek)
Sub-Project 3 Cost	$ 13,046,090.57 Overpass over the Railroad track North of Tidwell Road (North of Cole Creek to De Soto)

Summary of Candidate Project

Need Area N-2013T-0013 (Antoine South)

4.0 Summary of the Need Area

The need area is a 3 mile section located approximately 13 miles southwest of downtown Houston. Antoine Drive from Northwest Fwy to Victory Drive is an Urban Boulevard Section with two lanes (4X12 ft.) in each direction and raised medians. The median width ranges from 8 to 22-ft. within a 100 ft. Right-of-Way (ROW). Antoine Drive is designated as a Major Thoroughfare (T-4-100) in the 2012 Major Thoroughfare and Freeway Plan (MTFP). The speed limit throughout the study area is 35 miles per hour (mph).

The roadways within the study area consist of concrete pavement, with pedestrian facilities, metro system facilities and schools. The pedestrian system includes a 4-ft concrete sidewalk, wheel chair ramps, and pedestrian traffic control.

5.0 Brief Summary of the Problems

The following provides a list of the existing problems recognized in this need area.

- ✓ The pavement is generally in fair condition with PCR of 70.3. There are numerous sections with a range of deficiencies such as asphaltic patches that are in poor condition.
- ✓ The sidewalks are in fair condition with sections missing along the northern portion of the study area.
- ✓ The 4-lane roadway has insufficient capacity for the projected 2035 traffic volumes.
- ✓ The existing drainage system was found inadequate to convey the 2-year design standard and the 100-year extreme event.
- ✓ Utilities: Existing wastewater and water lines in the project area are generally over 30 years old and require replacement.

Candidate Project

6.0 Alternative 1A

The Recommended Alternative "Alternative 1A" was selected by the City of Houston Infrastructure Planning Branch (IPB-COH) based on various criteria unique to this alignment.

This alternative have been updated based on The City of Houston Infrastructure Planning Branch to incorporate the recommendations for Antoine corridor from The City Mobility Planning- Houston Northwest Sub-regional Study, January 2015.

Alternative 1A consists of the construction of Antoine Drive from U.S-290 to Tidwell Road to a 6-Lane divide roadway section with a portion of the alignment from Tidwell Road to Victory configured to 4-Lane divided roadway section with shared use path within the proposed 120-ft ROW for the 6-lane segment and 100-ft for the 4-lane segment. Proposed Pavement, Bridge Expansions, Traffic, Real Estate Acquisition, Drainage and Utility Improvements are described in the following sections.

6.1 Pavement

This alternative will address many deficiencies found in Planning 1. It will increase the PCR and rebuild the pedestrian circulation system to meet current ADA standards and add off-road bike lanes (Shared Use Paths). Bridge expansion for three bridge are also included in this alternative. These bridges are over Brick House Gully, Cole Creek, and White Oak Bayou. Additionally, this alternative will improve storm water collection and drainage systems by reconstructing the curb and gutter along both sides of the road including the replacement of broken manholes.

An overpass at the railroad track north of Tidwell Road was added as proposed by the IPB-COH with maximum roadway slopes to avoid conflict with the intersection of Antoine Drive with Tidwell Road. The overpass will improve the traffic level of service (LOS). The overpass is comprised of a 4-Lane bridge structure including pedestrian and bike paths along with a 2-Lane access road. To minimize the length of the bridge structure, a slope of 4% to 6% was utilized.

6.2 Traffic

Following the previous report the items which impact the traffic portion of the study including COH input, Houston NW Mobility Study, Walter P Moore corridor study and public meeting input along with intersection improvements have incorporated into the report.

To avoid ROW acquisition along the Antoine Drive corridor and to address community concerns, the corridor improvement was recommended to remain four lane roadway from Tidwell Road to Victory. The current capacity was shown to save intersection delay along the corridor and reduced intersection LOS from D to E at a certain location.

Antoine Drive (2011 ADT)						
Street	**Segment**	**2011 ADT**	**Existing No. of Lanes**	**2011 V/C Ratio^1**	**2011 V/C Ratio^1**	**2011 Rdwy Level of Service^2**
				NB	**SB**	
Antoine Drive	US 290 to 43rd	23,054	4	0.71	0.74	C
Antoine Drive	43rd to Pinemont	26,477	4	0.92	0.96	E
Antoine Drive	Pinemont to Tidwell	26,761	4	0.92	0.96	E
Antoine Drive	Tidwell to N Houston Rosslyn	31,767	4	0.98	1.01	E
Antoine Drive	N Houston Rosslyn to Little York	24,890	4	0.9	0.85	D
Antoine Drive	Little York to Victory	23,489	4	0.85	0.8	D

^1 2011 Volume/Capacity (V/C) Ratio Given by the City w/Existing Lanes

^2 2011 Rdwy LOS with Existing No. of Lanes

Note: All Existing 2011 LOSs Calculated as Per COH MTFP Policy Statement Criteria

Antoine Dr (2035 ADT)					
Segment	2035 ADT	2035 V/C Ratio^3	2035 V/C Ratio^3	Existing No. of Lanes	2035 Rdwy Level of Service^4
		NB	SB		
IH290 to 43rd	30,569	1.1	1.1	4	F
43rd to Pinemont	33,000	1.16	1.11	4	F
Pinemont to Tidwell	33000	1.16	1.11	4	F
Tidwell to N Houston Rosslyn	35000	1.24	1.18	4	F
N Houston Rosslyn to Little York	31872	1.16	1.08	4	E
Little York to Victory	30164	1.1	1.02	4	E

^3 2035 Volume/Capacity (V/C) Ratio Given by the City w/Existing Lanes

^4 2035 Rdwy LOS with Existing No. of Lanes (MT,Major Thoroughfare-Currently Listed for 4lanes-100' ROW,

Note: All Future 2035 LOSs Calculated as Per COH MTFP Policy Statement Criteria.

Level-of-Service (LOS)	Control Delay (seconds/vehicle)		Description
	Signalized Intersection	Un-signalized Intersection	
A	≤10.0	≤10.0	Very low vehicle delay, free traffic flow, good signal progression
B	10.1 to 20.0	10.1 to 15.0	Good signal progression, more vehicle stops and higher delay than LOS A
C	20.1 to 35.0	15.1 to 25.0	Stable traffic flow, fair signal progression, significant number of vehicle stops
D	35.1 to 55.0	25.1 to 35.0	Noticeable traffic congestion, longer delays and unfavorable signal progression
E	55.1 to 80.0	35.1 to 50.0	Limit of acceptable vehicle delay, unstable traffic flow, poor signal progression
F	> 80.0	> 50.0	Unacceptable delay, extremely unstable flow, heavy congestion, traffic exceeds capacity

Table 1._Level-of-Service Criteria for Signalized and Un-signalized Intersections

Traffic operations at study area intersections were analyzed using the existing 2013 turning movement volumes and assuming the existing roadway geometry and traffic control. Alternative 1A is referred to as Alternative 3 in the Traffic report. Please see Appendix 4.

Results of the traffic operations analysis including control delay and LOS by intersection approach are summarized in Table 2 and 3 for existing and proposed during AM and PM peak hours:

Antoine Drive Intersections	Existing (2013)		Projected (2035)		Projected (2035) Alternative 3	
	Delay (Sec/Veh)	LOS	Delay (Sec/Veh)	LOS	Delay (Sec/Veh)	LOS
Antoine Dr and Bridge Forest Dr	7.3	A	9.1	A	9.1	A
Antoine Dr and W Gulf Bank Rd	16.7	B	18.9	B	19.1	B
Antoine Dr and Long Creek Ln	6.3	A	5.4	A	5.3	A
Antoine Dr and Victory Dr	27.4	C	35.4	D	32.3	C
Antoine Dr and W Little York Rd	20.2	C	23.6	C	27.4	C
Antoine Dr and De Soto St	7.6	A	8.1	A	9.1	A
Antoine Dr and W Tidwell Rd	35.4	D	50.4	D	74.7	E
Antoine Dr and Pinemont Dr	40.3	D	58.8	E	33.5	C
Antoine Dr and Acorn St	2.8	A	5.4	A	7.5	A
Antoine Dr and W 43rd St	17.8	B	22.0	C	26.4	C
Antoine Dr and Saxon Dr	3.1	A	7.7	A	4.7	A
Antoine Dr and US Hwy 290 North	35.1	D	54.4	D	51.5	D
Antoine Dr and US Hwy 290 South	49.4	D	72.8	E	41.0	D

Table 2._Intersection Level of Service for Antoine Drive Study Corridor Morning (AM) Peak Hour

Based on the results, there are one intersection that will have a negative change in LOS during the morning with Tidwell Road Drive having the least benefit changing from 35.4.1 (Sec/Veh) – D to 74.7 (Sec/Veh) – E.

Table 1._Intersection Level of Service for Antoine Drive Study Corridor Evening (PM) Peak Hour

Antoine Drive Intersections	Existing (2013)		Projected (2035)		Projected (2035) Alternative 3	
	Delay (Sec/Veh)	LOS	Delay (Sec/Veh)	LOS	Delay (Sec/Veh)	Delay (Sec/Veh)
Antoine Dr and Bridge Forest Dr	5.2	A	6.0	A	6.7	A
Antoine Dr and W Gulf Bank Rd	23.0	C	29.3	C	28.9	C
Antoine Dr and Long Creek Ln	6.5	A	7.0	A	7.2	A
Antoine Dr and Victory Dr	46.4	D	68.1	E	69.0	E
Antoine Dr and W Little York Rd	19.8	B	20.2	C	21.2	C
Antoine Dr and De Soto St	10.4	B	5.8	A	11.2	B
Antoine Dr and W Tidwell Rd	37.7	D	47.4	D	42.0	D
Antoine Dr and Pinemont Dr	27.9	C	40.0	D	24.7	C
Antoine Dr and Acorn St	3.4	A	7.7	A	6.8	A
Antoine Dr and W 43rd St	30.6	C	39.6	D	30.8	C
Antoine Dr and Saxon Dr	7.9	A	25.2	D	24.8	C
Antoine Dr and US Hwy 290 North	29.5	C	50.8	D	33.2	C
Antoine Dr and US Hwy 290 South	25.7	C	50.9	D	23.3	C

The results shown in Table 3 indicate four intersections with negative change in LOS. The intersections with the least benefit is Victory Drive changing from 46.4 (Sec/Veh) – LOS D to 69.0 (Sec/Veh) – LOS E

Intersections along the Antoine Drive corridor were reviewed for minimum corner clearances and median lengths as recommended by the City of Houston Infrastructure Design Manual and the following intersection improvements are recommended:

1) **Intersection: Antoine Drive and W Little York**
   a) No changes made
2) **Intersection: Antoine Drive and De Soto Street**
   a) No changes made
3) **Intersection: Antoine Drive and W Tidwell Road**
   a) Extend SB, EB, and WB left-turn lanes to 200'
   b) Operate traffic signal with protected-permissive left-turns
4) **Intersection: Antoine Drive and Pinemont Drive**
   a) Extend NB, SB, EB, and WB left-turn lanes to 200'
   b) Operate traffic signal with protected-permissive left-turns
5) **Intersection: Antoine Drive and Acorn Street**
   a) No changes Made
6) **Intersection: Antoine Drive and W 43rd Street**
   a) No changes made
7) **Intersection: Antoine Drive and Saxon Drive**
   a) No changes made
8) **Intersection: Antoine Drive and US Highway 290 North**
   a) Add exclusive southbound right-turn lane (250')
   b) Add one westbound through lane to match three lane departure
   c) Add exclusive westbound right-turn lane (250')
9) **Intersection: Antoine Drive and US Highway 290 South**
   a) Add exclusive southbound right-turn lane (250')
   b) Add exclusive westbound right-turn lane (250')

An access management assessment of the corridor intersections has determined that all of the intersections have one or more non-compliant access management measures as described in the City of Houston Infrastructure Design Manual. The majority of the intersections do not meet the minimum corner clearances or median lengths as recommended (or required) by the City of Houston Infrastructure Design Manual.

6.3 Rail Road Overpass

As recommended an overpass at the railroad track north of Tidwell Road was added as proposed by the IPB-COH with maximum roadway slopes to avoid conflict with the intersection of Antoine Drive with Tidwell Road. The overpass will improve the traffic level of service (LOS).

Antoine Drive Intersections	Projected (2035) With RR Crossing Overpass		Projected (2035) Without RR Crossing Overpass	
	Delay (Sec/Veh)	Delay (Sec/Veh)	Delay (Sec/Veh)	LOS
Antoine Dr and W Tidwell Rd	74.7	E	95.8	F

Table 4._Intersection Level of Service for Antoine Drive Study Corridor (AM) Peak Hour

The results shown in Table 4 indicate that the W Tidwell crossing has a positive change in LOS. The intersections with at W Tidwell Road improves from 74.7 (Sec/Veh) – LOS E from 95.8 (Sec/Veh) – LOS F if Railroad Crossing Overpass is utilized.

Antoine Drive Intersections	Projected (2035) With RR Crossing Overpass		Projected (2035) Without RR Crossing Overpass	
	Delay (Sec/Veh)	Delay (Sec/Veh)	Delay (Sec/Veh)	LOS
Antoine Dr and W Tidwell Rd	42.0	D	72.0	E

Table 5._Intersection Level of Service for Antoine Drive Study Corridor Evening (PM) Peak Hour

The results shown in Table 5 indicate that the W Tidwell crossing has a positive change in LOS. The intersections with at W Tidwell Road improves from 42.0 (Sec/Veh) – LOS D from 72.0 (Sec/Veh) – LOS E utilizing a Railroad Overpass. A benefit-to-cost analysis using project cost and savings in delay would determine the feasibility of such an improvement.

6.4 Shared Use Paths

According to the COH Bikeway master plan. Antoine Drive has a planned bike lanes. For safety and design considerations these bike lanes were taken off-road and to be incorporated with the sidewalks. This will create an 11-ft wide shared use paths on both bound of Antoine for bicyclists and pedestrians. These shared use paths will also improve the pedestrian circulation, mobility and safety along Antoine and bring these facilities up to ADA standards.

7.0 Real Estate Acquisition/Right-of-Way

Omega used a combination of resources to estimate Right-of-Way acquisitions. Sources range from field investigations, using Geographic Information Systems (GIS) and Harris County Appraisal District (HCAD). Acquisition of additional ROW will be required in order execute Alternative 1. The existing ROW varies within the study area from 100-ft to 120-ft. Based on HCAD Real Property Records, the price per square-foot range from $5.00 to $7.50. For analysis purposes, a strip area of the parcels was determine and then the HCAD rate was multiplied by three (3) to match City of Houston recommendations.

Alternative 1 (120-ft ROW) will require land from approximately 156 parcels/properties with an equivalent total area of 30,525 square-feet and a cost of $485,550.

Antoine Drive-Alternative 1					
No	**Segment**	**ACQUISITION (SF)**	**HCAD (SF)**	**COH (SF)**	**Cost**
1	Northwest Fwy to Acorn St	0	~		$0.00
2	Acorn St to Weeping Willow St	6200	$7.50	$22.50	$139,500.00
3	Weeping Willow St to Hoover St	0	~		$0.00
4	Hoover St to Hardway St	2725	$5.00	$15.00	$40,875.00
5	Hardway St to Pinemont Dr	0	~		$0.00
6	Pinemont Dr to Golden Forest	4150	$5.00	$15.00	$62,250.00
7	Golden Forest to Birchmont Dr	12600	$5.00	$15.00	$189,000.00
8	Birchmont Dr to W. Tidwell Rd	4850	$3.50	$10.50	$50,925.00
	Square Footage	**30,525**			
	Cost				**$482,550**

8.0 Drainage

Antoine Drive from Bridge Forest to US 290 in Northwest Houston is a four lane divided boulevard roadway with curb and gutter and storm sewer drainage. The project reach is approximately 22,300 feet in length with ten storm sewer systems and drainage outfalls: two (2) into Vogel Creek (E121-00-00), four (4) into White Oak Bayou (E100-00-00), two (2) into Cole Creek (E117-00-00), and two (2) into Brickhouse Gully (E115-00-00). Flood Insurance Study mapped 100-year floodplains from all four outfall channels inundates a significant portion of the study reach. Of the ten storm sewer systems the two shortest systems are 18-years old and the remaining systems vary from 38 to 58 years old. The analysis found that most of the storm sewer systems have discharge capacities that are less than the current 2-year design standard.

There are identified CDP 2-Yr Proposed Storm Upgrades for six (6) storm sewer systems along Antoine Drive.

The proposed condition consists of rebuilding Antoine Drive to a 6-lanes with shared use paths and wide median in a proposed 120-ft ROW from Northwest Fwy to Tidwell and 4-lanes with shared use paths in each direction and wide median in a proposed 100-ft ROW from Tidwell to Bridge forest. Please see attached typical sections for your reference. Antoine is divided to two projects, Antoine North and Antoine South within the original project limits. The breaking point between the two projects is at Victory Drive.

Storm sewer trunk lines were sized for proposed conditions such that the 2-year runoff did not exceed the normal flow capacity of the storm sewer and that the 100-year HGL did not exceed the ROW elevations. Alternative drainage systems were studied at two outfalls. The first alternative considered rerouting the drainage along Antoine that currently drains to W Gulf Bank Road. The rerouted drainage would flow southward to the Long Creek Lane storm sewer system. The benefit of this alternative would eliminate the need to replace the storm sewer system and the associated street repairs along W Gulf Bank Road. The second alternative considered diverting flow from Antoine Drive at DeSoto Street to White Oak Bayou. The benefit of this alternative would eliminate the need to replace the existing storm sewer along Antoine Drive north of DeSoto Street to White Oak Bayou because the size of the existing system is adequate for the reduced drainage area.

Storm water detention volume needs were computed based on the additional impervious cover created by the added pavement width of the proposed roadway. The volume was computed based on a factor 0.5 ac-ft. /acre of additional impervious cover. The total volume of storm water detention needed is 6.77 ac-ft. It is understood that the City has purchase land within Inwood Forest that will provide regional storm water storage volume and compensate for impacts created by this project.

Cost estimates were prepared for each studied outfall and alternative drainage scenario. The total estimate drainage cost for maintaining the existing drainage outfalls is $5.48M. Note that this cost does not include the associated street repairs that would be required along W Gulf Bank Road. The total estimated drainage cost with the alternative drainage conditions is $4.94M, a savings of $535K plus the repairs of W Gulf Bank Road would not be needed. However, any associated repairs for the DeSoto Street diversion have not been included. Storm water detention costs were also estimated based on the storage volume required. Specific locations for storm water detention were not identified because of the regional facility the City will be constructing in the Inwood Forest area. The total cost for storm water detention is estimated to be $2.25M.

The study reach has been divided into two sub-projects, with the divides set at Victory Drive. The estimated drainage system costs for the reach from Bridge Forest to Victory is $0.90M using existing outfalls, and $0.96M using the alternative outfall. Storm water detention cost estimate for this reach is $0.55M. The estimated drainage system costs for the reach from Victory to US 290 is approximately $4.57M. There is no alternative system for this reach. Storm water detention cost estimate for this reach is $1.69M.

Note, these cost estimates are intended to be included with the overall project costs and therefore do not include a contingency factor, construction management costs, engineering fees, and design management costs.

Proposed Drainage Systems

Drainage will be provided in underground storm sewers. The proposed storm sewer trunk lines were determine with HouStorm, a computer program that models storm sewers with drainage areas, nodes and links. Using defined drainage areas and the 1-ft topographic contours for approximate slopes, storm sewer trunk lines were sized for the length of the study area. The trunk lines were sized so that the 2-year HGL remained below an assumed gutter elevation and that the 100-year HGL remained below the natural ground elevation at the ROW. The starting water surface elevation for each storm sewer was set at the soffit of the proposed storm sewer for both the 2-year and 100-year storm events, because the 100-year water surface elevation at each outfall is above the banks of the channel, as indicated by the mapped floodplains. Additionally, above ground storm water conveyance within the ROW during the 100-year storm event was not considered because proposed roadway profiles have not been prepared.

The increased impervious cover increases the storm water runoff which needs to be mitigated with storm water detention. The amount of storm water detention is determined by using the factor of 0.5 ac-ft of storage volume for every acre of additional impervious cover. This factor is from the City of Houston Infrastructure Design Manual, Chapter 9 Stormwater Design Requirements. Multiplying the additional pavement width of 28-ft by the reach length provides the amount of additional impervious cover. Using the detention rate of 0.5 ac-ft/ac, the amount of storage volume was determined. The following table lists the outfalls and required storm water storage volume based on the roadway length associated with each outfall.

Outfall	Roadway Length	Require Storage Volume	
	LF	CF	Ac-Ft
W Gulf Bank Road	1,280	14,080	0.32
Long Creek Lane	3,500	38,500	0.88
Maple Hill Road	1,320	14,520	0.33
Victory Drive	760	8,360	0.19
White Oak Bayou North	550	6,050	0.14
White Oak Bayou South	4,940	54,340	1.25
Cole Creek North	1,650	26,400	0.61
Cole Creek South	3,000	48,000	1.10
Brickhouse Gully North	3,800	60,800	1.40
Brickhouse Gully South	1,500	24,000	0.55
Total	**22,300**	**295,050**	**6.77**

The storm water detention basins needed to mitigate the impact created by additional impervious cover will be provided in a regional storm water facility being created by the City of Houston within the Inwood Forest area.

The storm sewer trunk lines were sized using the existing drainage outfalls. Alternative analyses were performed on two systems where significant cost savings may be realized.

Alternative 1

The drainage along Antoine at W Gulf Bank Road was routed southward and combined with the outfall at Long Creek Lane. With this alternative the existing storm sewer and roadway paving along W Gulf Bank Road would not need to be rebuilt. Additionally, the capacity of the existing storm sewer along W Gulf Bank Road would become adequate to maintain the 100-year flows below ROW elevations.

Alternative 2

The White Oak Bayou South storm sewer runs from the railroad tracks northward and discharges directly into White Oak Bayou. This alternative truncates the upstream end of the drainage area from south of DeSoto Street and diverts the storm water through a proposed new storm sewer pipe toward the east to outfall directly into White Oak Bayou. By removing the drainage area south of DeSoto Street the White Oak Bayou South storm sewer system will have sufficient capacity to maintain the 100-year HGL below street ROW elevations.

The following table lists the results of the modeling and calculations. The table includes for each outfall the size and length of the existing storm sewer system, the proposed storm sewer system, and the required replacement pipes. The required replacement pipes lists only those storm sewer segments that need to be replaced, whereas the proposed storm sewer system lists the entire system and includes those existing pipes that do not need to be replaced. Appendix A of the Drainage Report contains the HouStorm models of the

proposed storm sewer systems, and Exhibits 2A, 2B, 2C, 2D and 2E shows the various drainage areas and outfalls for the proposed conditions.

9.0 Utilities

Water and wastewater improvements discussed in this section were recommended by the City of Houston. These recommendations are unchanged from the previous report. The water improvements will consist of replacing the existing line with a proposed 16" waterline (15,990-ft). The wastewater recommendation is to incorporate 5,244-ft of 36" line. The respective exhibits for water and wastewater recommendations are included in Appendix- D.

10.0 Recommended Alternative Summary

Alternative 1A- 6 and 4 lane with wide medians, ROW: 120-ft and 100-ft

- Total Candidate project Cost : **$ $66,967,145.72** Project Priority Score 1A: **96.1**
- Sub-Project 1 cost: **$ $24,650,247.41 (De Soto to Victory)**
- Sub-Project 2 cost: **$ $29,280,088.32 (Northwest Fwy to North of Cole Creek)**
- Sub-Project 3 cost: **$ 13,046,090.57 Overpass over the railroad track North of Tidwell (From North of Cole Creek to De Soto)**

Figure 2 _ Alternative Summary

10.0 Public Comments

The comments received from the public at the public meeting brought up by residents and other stakeholders along Antoine Drive and its vicinity were collected during the meeting and after the meeting via email and mail (Appendix 6). The most common issue that arose in the comments was Traffic related issues like Speeding, Congestions, Safety, street signs, Drainage issues, and construction phases. The comments are categorized as the following:

I. **Drainage Concerns:**
   a. Flooding: Some areas at Antoine suffer from flooding and ponding after storm events. Residents mentioned several locations; in particular the intersection of Antoine and Green falls, and Antoine and Arncliff.
   b. Curb inlets are mostly blocked be debris which cause ponding along the street.

II. **Traffic Issues:**
   a. Speed limit and speed control was the concerns of many residents, the common observation is many drivers exceed posted speed limits and cause safety concerns. Solutions were requested like adding permanent speed meters and other enforcement measures like increasing police patrols.
   b. Traffic volume will increase by widening the road, which is not preferred by many residents for many reasons; like speeding, safety, littering and noise.
   c. Car accidents: because of the current street condition, residents reported the reoccurrence of accidents in particular locations like the entrance and exit of Eisenhower High School.
   d. Traffic congestions mainly at Antoine at Tidwell north bound and Antoine and 43rd south bound.

III. Public Transportation:
Plans to extend the light rail to reach this area.

IV. Trash collection and street cleaning:
With increased mobility litter and trash will increase. Is the city committed to increase their services to keep with the growth.

V. Bike lanes:
Some residents have mentioned that walking and biking are not a viable mode of transportation in Houston given the vast area of the city and its climate, the urge the City of Houston to reconsider allocating the resources of these elements to be spent on other more urgent needs in Antoine. Also, the volume of traffic going through Antoine makes it unsafe for bikers and pedestrians to travel along the corridor. Other residents at the project area felt that the shared used paths are going to be helpful.

VI. Roadway:
the reduction from 6 to 4 lane will cause traffic to back up where the transition occurs widening the road will bring more 18 wheelers through the street, which is not a positive point knowing that a lot of properties along Antoine are residential pavement condition is bad along the corridor.

VII. Street Signage along Antoine:
As the new improvements will bring more people by different modes; driving, walking and biking. More street signage, lighting, and pedestrian safety is required.

VIII. Right of Way:
Residents wanted to know if there will be properties lost due to additional Right of Way acquisition For medians; some medians will be reduced from both sides to accommodate the new road elements and the shared use paths.

IX. Aesthetics:
a. Bridges are old and with little aesthetic value
b. Some of the medians are well groomed and others are neglected and plain

Conclusions and Recommendations

This Final Scope Memorandum has incorporated ideas, concepts, and suggestions raised at the public meeting event and the input acquired later by mail and email messages from the resident and stakeholders at the study area, as appropriate.
In addition, certain design related public comments should be taken in consideration and incorporated during final design phase following further research and deliberation.

Appendix 1

Candidate Project Priority Score Forms

FY 2016 Candidate Projects ($ Thousands)
Street & Traffic Control Program - Thoroughfares

Candidate Project Summary Information			
Need Area:	*N-2013T -0013*	**Alternative No.:**	**1A**
Name:	*Antoine Drive*	**Council District:**	**A & C**
Limits:	*Victory to Northwest Fwy*	**Key Map No.:**	**411Q, U, Y, 451C,G**
Type:	Major Thoroughfare and Collector	**Super Neighborhood:**	**Greater Inwood/Oak Forest**
WBS No.:	N-000100-0005-3	**Total No. of Sub-projects:**	**3**
Description:	*Project provides for the ROW acquisition, design and full reconstruction of a 6-Lane Divided concrete section (120 ROW) from Tidwell to US290, and 4-Lane Divided concrete section (100 ROW) with grade separation at the rail track near the intersection with Tidwell, with curbs, share use paths, driveways, traffic control and necessary underground utilities with drainage improvement .*		
Justification:	*Project will replace and widen a street that has been deteriorated beyond economical repair and normal maintenance. It will improve traffic level of service, traffic circulation, mobility and drainage in service area. These improvements will upgrade existing roadway to MTFP standards, if applicable.*		

Implementation - Estimated Cost and Duration

	City Funds	Other Entities Funds	Total	Duration
Total Project Cost	$ 66,967	$ -	$ -	
Acquisition	$ 483	$ -	$ -	18 Months
Design	$ 9,915	$ -	$ -	18 Months
Construction	$ 44,865	$ -	$ -	12 Months
Contingency	$ 11,704	$ -	$ -	NA
Private Utility Reloc.	$ -	$ -	$ -	Months
Warranty	$ -	$ -	$ -	12 Months

Candidate Project Priority Scores

Infrastructure Categories	Benefit Scores (Total Maximum 100)	
	Maximum	**Actual**
Streets	**75**	20.38
Drainage System	**15**	15.00
Water	**5**	3.82
Wastewater	**5**	4.00
Total	**100**	**43.20**
	Service Area Benefit score:	43.203
	Benefitted Population:	40024
	Rebuild Houston Funds:	$53,951
	Candidate Project Priority Score:	**96.1**
	Candidate Project Priority Rank No.:	(To be assigned by the City)

Other Entities & Jurisdictions Coordination

Entities		Coordination For
TxDOT	☐	
Metro	X	
HCFCD	X	
Gulf Coast Railroad District	☐	
Union Pacific Rail Road	X	
Harris County	X	
Fort Bend County	☐	
Private Utilities	X	
AT&T		
Center Point Energy		
Municipalities	☐	
(Name of municipality)		
(Name of municipality)		
Other	☐	
Other	☐	

Sequencing Requirements (SR) and Other Considerations

SR:	
Permits:	
Other:	

Maintenance - Estimated Cost and Frequency (By the City)

Asset Categories	Estimated Asset Life	Maintenance Items	Cost	Schedule/Frequency
Streets	40-years	Street Sweeping	$ -	4 Times Annually
		Overlay	$ -	N/A
		Pot Hole Patch	$ -	As needed - typically starts year 25
		Panel Repair	$ -	As needed
Storm Drainage	50-years	Point Repair	$ -	
			$ -	
Water	50-years	Point Repair	$ -	
			$ -	
Wastewater	50-years	Point Repair	$ -	
			$ -	

Major Thoroughfare and Collectors Candidate Project Priority Score Determination

Antoine South-Alternative 1A (Change in Classification)

Infrastructure Category	Weight	Criteria	Project Parameter	Point Range	Measurement or Calculation	Points
Streets	75%	Pavement Condition 15%	Weighted Avg. PCR= 70.3	0-15	0.15x(100-PCR)	4.455
		Traffic level of Service 55%	VHT= 2,537	0-55	(Study Area Reduced Delay/Maximum reduced delay Citywide)x55	15.928653
		Precence Of Fatal Crashes 5%	Safety	0-5	None=0 1 or more=5	0
Drainage System	15%	Extreme Event Level of Service	Improve to convey extreme event	0-5	No improvements=0; Partial improvements=3; Conveys extreme event=5	5
		Design Level of Service	Improve to convey design event	0-10	No improvements=0; Partial improvements=5; Conveys extreme event=10	10
Water	5%	WIRP Rank (1045 total area)	Avg. WIRP Rank = 247	0-5	Replace since 2000=0; ((Total WIRP Areas-WIRP Rank)/Total WIRP Areas)x5	3.82
Wastewater	5%	Sanitary Sewer Overflow	SSO	0-2	No SSO=0; SSO=1; Repeat SSO=2	2
		Point Repair	No. 9	0-2	Point Repairs less than 5 =0 Point Repairs from 5-10=1 Point Repairs more than 10	1
		Age of Pipe	30+Years	0-1	30 years or less=0; More than 30 years=1; Agreed Order=1	1
					Service Area Benefit Factor =	**43.20**

Candidate Project Priority Score =	Service Area Benefit Factor	X	Length of the Project	X	Benefitted Population City / ReBuild Houston Funds
	43.20	X	3.00	X	40,024 / 53,951
					Candidate Project Priority Score = **96.1**

Note: Benefitted Population = 35%Current Average Daily Traffic+65% Future Average Daily Traffic+ Current Metro Ridership = 35% X 26761 veh + 65%X 36216 veh +7117 per= 40024

Pre-Engineering Services Contracts

Total Project Cost Estimate Breakdown (FY16 Dollars)

Need No. N-2013T-0013 ANTOINE SOUTH FROM VICTORY TO NORTHWEST FWY (US 290)

Alt #: 1A

1	**410 (Summarized based on FY 16 List of Unit Prices)**		$39,013,347.25
	1.1	Total Unit Price, Paving Items	$25,888,265.46
	1.2	Total Unit Price, Storm Sewer Items	$5,487,375.67
	1.3	Total Unit Price, Water Items	$3,398,194.80
	1.4	Total Unit Price, Wastewater Items	$4,239,511.32
2	**Contingency (30% of 410)**		**$11,704,004.18**
3	**Construction Management (15% of 410)**		**$5,852,002.09**
4	**Engineering Fee Estimate (17% of Sum of 410 and Contingency)**		**$8,621,949.74**
5	**Design Management (15% of Engineering Fee Estimate)**		**$1,293,292.46**
6	**Land Acquisition (Engineer's Best Estimate)**		**$482,550.00**
	Total Project Cost		**$66,967,145.72**

Note: General Items are prorated in Paving, Storm, Water & Wastewater items.

Pre-Engineering Services Contracts

COH Rebuild Funds

Need No. N-2013T-0013 ANTOINE SOUTH FROM VICTORY TO NORTHWEST FWY (US 290)

Alt #: 1A

1	**410 (Summarized based on FY 16 List of Unit Prices)**		$31,375,641.13
	1.1	Total Unit Price, Paving Items	$25,888,265.46
	1.2	Total Unit Price, Storm Sewer Items	$5,487,375.67
2	**Contingency (30% of 410)**		**$9,412,692.34**
3	**Construction Management (15% of 410)**		**$4,706,346.17**
4	**Engineering Fee Estimate (17% of Sum of 410 and Contingency)**		**$6,934,016.69**
5	**Design Management (15% of Engineering Fee Estimate)**		**$1,040,102.50**
6	**Land Acquisition (Engineer's Best Estimate)**		**$482,550.00**
	Total Project Cost		**$53,951,348.83**

Note: General Items are prorated in Paving & Storm items.

MODIFIED SAMPLE 410

NEED AREA: N-2013T-0013 ANTOINE DRIVE SOUTH FROM VICTORY TO NORTHWEST FWY (US 290) **BID FORM**
ALTERNATIVE: 1A **PART B**

Document 00410B Note 1

BID FORM - PART B

1.0 TOTAL BID PRICE HAS BEEN CALCULATED BY BIDDER, USING THE FOLLOWING COMPONENT PRICES AND

A. STIPULATED PRICE **$ N/A**

(Total Bid Price; minus Base Unit Prices, Extra Unit Process, Cash Allowance and All Alternates, if any)

B. BASE UNIT PRICE TABLE:

Item No.	Item Reference No. Note 2	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - PAVING ITEMS							
1	222101	2221	Remove and Dispose of Existing Pavement and Curb -Assumes all concrete pavement thicknesses with or without asphalt overlay	SY	109,593	$6.00	$657,558.00
2	222102	2221	Remove and Dispose of Existing Driveways and Sidewalks	SY	19,487	$5.00	$97,435.00
3	275106	2751	11" Reinforced Concrete Pavement (Complete in Place)	SY	127,035	$66.00	$8,384,310.00
4	233602	2336	Lime stabilized subgrade (8" thick)	SY	152,442	$4.00	$609,768.00
5	233603	2336	Lime (6, 7% By Weight)	Ton	2,287	$160.00	$365,860.80
6	277101	2771	6" Concrete Curb	LF	57,228	$3.00	$171,684.00
7	275201	2752	Board Expansion Joint	LF	15,983	$8.00	$127,864.00
8	275401	2754	6" Concrete for Driveways	SF	34,446	$6.00	$206,676.00
9	277501	2775	4-1/2" Concrete for Sidewalks	SF	256,590	$5.00	$1,282,950.00
10	289301	2776	Traffic Signal/Intersection	EA	7	$225,000.00	$1,575,000.00
			Bridge (All Items Required for Bridge Expansion)	SF	16,400	$200.00	$3,280,000.00
			Ancillary items (5%)	LS		5.00%	$673,955.29
			SubTotal of Paving				$17,433,061.09
			General Items (10% of Paving Subtotal)	LS		10.00%	$1,743,306.11
TOTAL - PAVING ITEMS							**$19,176,367.20**
UNIT PRICES - Overpass ITEMS							
Item No.	Item Reference No. Note 2	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
1	222101	2221	Remove/Dispose of Existing Pavement and Curb-Assumes all concrete pavement	SY	5,114	$6.00	$30,684.00
2	222102	2221	Remove/Dispose of Existing Driveways and	SY	1,252	$5.00	$6,260.00
3	275103	2751	11" Reinforced Concrete Pavement (Complete in	SY	10,400	$66.00	$686,400.00
4	233601	2336	8" Subgrade Statbilization	SY	11,000	$4.00	$44,000.00
5	233603	2336	Lime (6%,7% By Weight)	TON	231	$160.00	$36,960.00
6			Embackment (backfill)	CY	38,444	$30.00	$1,153,320.00
7			Retaining Wall	SF	19,680	$35.00	$688,800.00
8			Rail	LF	2,000	$150.00	$300,000.00
9			Bridge	SF	22,000	$150.00	$3,300,000.00
10			Conc curb	LF	3,200	$3.00	$147,321.20
11			Ancillary items	LS	1	5.00%	$318,153.06
TOTAL - UNIT PRICES - Overpass ITEMS							**$6,711,898.26**

Bidders Initials [ ]

MODIFIED SAMPLE 410

NEED AREA: N-2013T-0013 ANTOINE DRIVE SOUTH FROM VICTORY TO NORTHWEST FWY (US 290) **BID FORM**
ALTERNATIVE: 1A **PART B**

Item No.	Item Reference No. Note 2	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - STORM SEWER ITEMS							
1	222106	2221	Remove Manholes (All Types, All Depths)	EA	37	$388.00	$14,356.00
2	222105	2221	Remove Inlets (All Types)	EA	74	$347.00	$25,678.00
3	222103	2221	Remove Storm Sewer Pipe (All Types)	LF	13,173	$15.00	$197,595.00
4	263301	2633	Curb Inlets (All Types)	EA	77	$2,450.00	$188,650.00
5	226001	2260	Trench Safety System	LF	13,173	$2.00	$26,346.00
6	208201	2082	Manholes (For 42" Dia. Pipe and Smaller) (All Types)	EA	16	$3,100.00	$49,600.00
7	208202	2082	Manholes (For 48" to 72" Dia. Pipe) (All Types)	EA	12	$6,000.00	$72,000.00
8	208203	2082	Manholes (For 78" Dia. Pipe and Larger) (All Types)	EA	8	$10,000.00	$80,000.00
9	263101	2631	24-inch RCP	LF	822	$85.00	$69,870.00
10	263102	2631	30-inch RCP	LF	1,226	$110.00	$134,860.00
11	263103	2631	36-inch RCP	LF	540	$138.00	$74,520.00
12	263104	2631	42-inch RCP	LF	3,400	$159.00	$540,600.00
13	263105	2631	48-inch RCP	LF	257	$184.00	$47,288.00
14	263106	2631	54-inch RCP	LF	539	$225.00	$121,275.00
15	263107	2631	60-inch RCP	LF	288	$277.00	$79,776.00
16	263108	2630	66-inch RCP	LF	723	$311.00	$224,853.00
17	263109	2631	72-inch RCP	LF	2,555	$355.00	$907,025.00
18	263110	2631	78-inch RCP	LF	1,750	$523.00	$915,250.00
19	263111	2631	84-inch RCP	LF	1,073	$625.00	$670,625.00
20			72-inch CMP	LF	56	$185.00	$10,360.00
			Ancillary items (10%)			10.00%	$445,052.70
			SubTotal of Storm Sewer				$4,895,579.70
			General Items (10% of Storm Sewer Subtotal)			10.00%	$489,557.97
TOTAL UNIT PRICES - STORM SEWER ITEMS							**$5,385,137.67**

Item No.	Item Reference No. Note 2	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - WASTEWATER							
1	222108	2221	Remove Existing Sanitary Sewer Manhole (All Types)	EA	7	$800.00	$5,600.00
2	22109	2221	Remove Existing Sanitary Sewer Pipe (All Types)	LF	5,244	$20.00	$104,880.00
3	253109	2531	36" PVC	LF	5,244	$586.00	$3,072,984.00
4	208204	2082	Sanitary Sewer Manholes	EA	7	$4,041.00	$28,287.00
5			Ancillary Items (20%)			20.00%	$642,350.20
6			SubTotal of Wastewater				$3,854,101.20
7			General Items (10% of Wastewater Subtotal)			10.00%	$385,410.12
TOTAL UNIT PRICES - WASTEWATER							**$4,239,511.32**

Bidders Initials [ ]

MODIFIED SAMPLE 410

NEED AREA: N-2013T-0013 ANTOINE DRIVE SOUTH FROM VICTORY TO NORTHWEST FWY (US 290) **BID FORM**
ALTERNATIVE: 1A **PART B**

Item No.	Item Reference No. Note 2	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - WATER							
1	251105	2511	16" Water Line	LF	15,990	161	$2,574,390.00
		-	Ancillary items (20%)	LS	1	20.00%	$514,878.00
			SubTotal				$3,089,268.00
		-	General Items (10% of Water SubTotal)			10.00%	$308,926.80
TOTAL UNIT PRICES - WATER							**$3,398,194.80**

Item No.	Item Reference No. Note 2	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - DETENTION							
1	500001	-	Excavation (Detention Pond) (Dry)	AC-FT	5.1	$20,000.00	$102,238.00
2		-	Excavation (Detention Pond) (Wet)	AC-FT			$0.00
TOTAL UNIT PRICES - DETENTION							**$102,238.00**

TOTAL BASE UNIT PRICE: Note 3 **$39,013,347.25**

C. EXTRA UNIT PRICE TABLE:

Item No.		Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - EXTRA UNIT PRICE TABLE ITEMS							
TOTAL UNIT PRICES - EXTRA UNIT PRICE TABLE ITEMS							

D. CASH ALLOWANCE TABLE:

Item No.		Spec No.	Cash Allowance Short Table		Cash Allowance in Figures (1)
TOTAL CASH ALLOWANCES					

E. ALTERNATES TABLE:

Item No.		Spec No.	Alternate Short Tittle	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total Price for Alternates in Figures
TOTAL CASH ALLOWANCES							

Note:

1. This is not a Standard Document 00410B (Form 410). The Form 410 was modified for the purpose of planning level cost estimates for Pre-Engineering Studies.
2. The "Item Reference No." shall be designated for each item listed. The numbers serve as reference and will be used for the future cost updates.
3. The unit prices used to develop this cost estimate are based on FY16 unit prices.

Bidders Initials [ ]

FY 2015 Candidate Projects ($ Thousands)
Street & Traffic Control Program - Thoroughfares

Candidate Project Summary Information

Need Area:	*N-2013T -0013*	**Alternative No.:**	**1A**
Name:	*Antoine Drive*	**Council District:**	**A & C**
Limits:	*Victory to De Soto*	**Key Map No.:**	**411Q, U, Y, 451C,G**
Type:	Major Thoroughfare and Collector	**Super Neighborhood:**	**Greater Inwood/Oak Forest**
WBS No.:	(To be assigned by the City)	**Sub-project No.:**	1 of 3
Description:	*Project provides for the ROW acquisition, design and full reconstruction of a 4-Lane Divided concrete section with grade separation at the rail track near the intersection with Tidwell, with curbs, shared use path, driveways, traffic control and necessary underground utilities with drainage improvement (100 ROW).*		
Justification:	*Project will replace and widen a street that has been deteriorated beyond economical repair and normal maintenance. It will improve traffic level of service, traffic circulation, mobility and drainage in service area. These improvements will upgrade existing roadway to MTFP standards, if applicable.*		

Implementation - Estimated Cost and Duration

	City Funds	Other Entities Funds	Total	Duration
Total Project Cost	$ 24,650	$ -	$ -	
Acquisition	$ -	$ -	$ -	18 Months
Design	$ 3,676	$ -	$ -	18 Months
Construction	$ 16,635	$ -	$ -	12 Months
Contingency	$ 4,339	$ -	$ -	NA
Private Utility Reloc.	$ -	$ -	$ -	Months
Warranty	$ -	$ -	$ -	12 Months

Candidate Project Priority Scores

Infrastructure Categories	Benefit Scores (Total Maximum 100)	
	Maximum	**Actual**
Streets	**75**	**N/A**
Drainage System	**15**	**N/A**
Water	**5**	**N/A**
Wastewater	**5**	**N/A**
Total	**100**	**N/A**
	Service Area Benefit score:	N/A
	Benefitted Population:	N/A
	Rebuild Houston Funds:	N/A
	Candidate Project Priority Score:	**N/A**
	Candidate Project Priority Rank No.:	(To be assigned by the City)

Other Entities & Jurisdictions Coordination

Entities		Coordination For
TxDOT	☐	
Metro	☐	
HCFCD	☐	
Gulf Coast Railroad District	☐	
Union Pacific Rail Road	☐	
Harris County	☐	
Fort Bend County	☐	
Private Utilities	☐	
(Name of Private Utility)		
(Name of Private Utility)		
Municipalities	☐	
(Name of municipality)		
(Name of municipality)		
Other	☐	
Other	☐	

Sequencing Requirements (SR) and Other Considerations

SR:	
Permits:	
Other:	

Maintenance - Estimated Cost and Frequency (By the City)

Asset Categories	Estimated Asset Life	Maintenance Items	Cost	Schedule/Frequency
Streets	40-years	Street Sweeping	$ -	4 Times Annually
		Overlay	$ -	N/A
		Pot Hole Patch	$ -	As needed - typically starts year 25
		Panel Repair	$ -	As needed
Storm Drainage	50-years	Point Repair	$ -	
			$ -	
Water	50-years	Point Repair	$ -	
			$ -	
Wastewater	50-years	Point Repair	$ -	
			$ -	

Pre-Engineering Services Contracts

Total Project Cost Estimate Breakdown (FY16 Dollars)

Sub-Project No. 1 Of 3

Need No. N-2013T-0013 ANTOINE SOUTH FROM VICTORY TO NORTHWEST FWY (US 290)
Alt #: 1A SUB-PROJECT 1 (FROM VICTORY TO DE SOTO)

1	**410 (Summarized based on FY 16 List of Unit Prices)**		$14,464,834.32
	1.1	Total Unit Price, Paving Items	$7,293,141.12
	1.2	Total Unit Price, Storm Sewer Items	$1,460,693.40
	1.3	Total Unit Price, Water Items	$1,471,488.48
	1.4	Total Unit Price, Wastewater Items	$4,239,511.32
2	**Contingency (30% of 410)**		**$4,339,450.30**
3	**Construction Management (15% of 410)**		**$2,169,725.15**
4	**Engineering Fee Estimate (17% of Sum of 410 and Contingency)**		**$3,196,728.39**
5	**Design Management (15% of Engineering Fee Estimate)**		**$479,509.26**
6	**Land Acquisition (Engineer's Best Estimate)**		**$0.00**
	Total Project Cost		**$24,650,247.41**

Note: General Items are prorated in Paving, Storm, Water & Wastewater items.

Pre-Engineering Services Contracts

COH Rebuild Funds

Sub-Project No. 1 Of 3

Need No. N-2013T-0013 ANTOINE SOUTH FROM VICTORY TO NORTHWEST FWY (US 290)

Alt #: 1A SUB-PROJECT 1 (FROM VICTORY TO DE SOTO)

1	**410 (Summarized based on FY 16 List of Unit Prices)**		$8,753,834.52
	1.1	Total Unit Price, Paving Items	$7,293,141.12
	1.2	Total Unit Price, Storm Sewer Items	$1,460,693.40
2	**Contingency (30% of 410)**		**$2,626,150.36**
3	**Construction Management (15% of 410)**		**$1,313,075.18**
4	**Engineering Fee Estimate (17% of Sum of 410 and Contingency)**		**$1,934,597.43**
5	**Design Management (15% of Engineering Fee Estimate)**		**$290,189.61**
6	**Land Acquisition (Engineer's Best Estimate)**		**$0.00**
	Total Project Cost		**$14,917,847.10**

Note: General Items are prorated in Paving & Storm items.

Document 00410B Note 1

BID FORM - PART B

1.0 TOTAL BID PRICE HAS BEEN CALCULATED BY BIDDER, USING THE FOLLOWING COMPONENT PRICES AND

A. STIPULATED PRICE **$ N/A**

(Total Bid Price; minus Base Unit Prices, Extra Unit Process, Cash Allowance and All Alternates, if any)

B. BASE UNIT PRICE TABLE:

Item No.	Item Reference No. Note 2	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - PAVING ITEMS							
1	222101	2221	Remove and Dispose of Existing Pavement and Curb -Assumes all concrete pavement thicknesses with or without asphalt overlay	SY	45,776	$6.00	$274,653.95
2	222102	2221	Remove and Dispose of Existing Driveways and Sidewalks	SY	8,139	$5.00	$40,696.92
3	275106	2751	11" Reinforced Concrete Pavement (Complete in Place)	SY	45,409	$66.00	$2,997,015.57
4	233602	2336	Lime stabilized subgrade (8" thick)	SY	54,491	$4.00	$217,965.54
5	233603	2336	Lime (6, 7% By Weight)	Ton	659	$160.00	$105,415.54
6	277101	2771	6" Concrete Curb	LF	24,780	$3.00	$74,339.59
7	275201	2752	Board Expansion Joint	LF	6,676	$8.00	$53,406.59
8	275401	2754	6" Concrete for Driveways	SF	14,388	$6.00	$86,326.81
9	277501	2775	4-1/2" Concrete for Sidewalks	SF	91,251	$5.00	$456,254.06
10	289301	2893	Traffic Signal/Intersection	EA	3	$225,000.00	$675,000.00
			Bridge (All Items Required for Bridge Expansion)	SF	7,000	$200.00	$1,400,000.00
11			Ancillary items (5%)	LS	1	5.00%	$249,053.73
12			SubTotal of Paving				$6,630,128.29
13			General Items (10% of Paving Subtotal)	LS		10.00%	$663,012.83
TOTAL - PAVING ITEMS							**$7,293,141.12**

Bidders Initials [ ]

MODIFIED SAMPLE 410

NEED AREA: N-2013T-0013 ANTOINE DRIVE SOUTH FROM VICTORY TO NORTHWEST FWY (US 290) **BID FORM**
ALTERNATIVE: 1A SUB-PROJECT 1 (FROM VICTORY TO DE SOTO) **PART B**

Item No.	Item Reference No. Note 2	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - STORM SEWER ITEMS							
1	222106	2221	Remove Manholes (All Types, All Depths)	EA	14	$388.00	$5,432.00
2	222105	2221	Remove Inlets (All Types)	EA	28	$347.00	$9,716.00
3	222103	2221	Remove Storm Sewer Pipe (All Types)	LF	5,072	$15.00	$76,080.00
4	263301	2633	Curb Inlets (All Types)	EA	30	$2,450.00	$73,500.00
5	226001	2260	Trench Safety System	LF	5,072	$2.00	$10,144.00
6	208201	2082	Manholes (For 42" Dia. Pipe and Smaller) (All Types)	EA	12	$3,100.00	$37,200.00
7	208202	2082	Manholes (For 48" to 72" Dia. Pipe) (All Types)	EA	2	$6,000.00	$12,000.00
8	208203	2082	Manholes (For 78" Dia. Pipe and Larger) (All Types)	EA	0	$10,000.00	$0.00
9	263102	2631	30-inch RCP	LF	360	$110.00	$39,600.00
10	263103	2631	36-inch RCP	LF	540	$138.00	$74,520.00
11	263104	2631	42-inch RCP	LF	3,400	$159.00	$540,600.00
12	263109	2631	72-inch RCP	LF	772	$355.00	$274,060.00
13			72-inch CMP	LF	56	$448.00	$25,088.00
14			Ancillary items (10%)			10.00%	$117,794.00
15			SubTotal of Storm Sewer				$1,295,734.00
16			General Items (10% of Storm Sewer Subtotal)			10.00%	$129,573.40
TOTAL UNIT PRICES - STORM SEWER ITEMS							**$1,425,307.40**

Item No.	Item Reference No. Note 2	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - WASTEWATER							
1	222108	2221	Remove Existing Sanitary Sewer Manhole (All Types)	EA	7	$800.00	$5,600.00
2	22109	2221	Remove Existing Sanitary Sewer Pipe (All Types)	LF	5,244	$20.00	$104,880.00
3	253109	2531	36" PVC	LF	5,244	$586.00	$3,072,984.00
4	208204	2082	Sanitary Sewer Manholes	EA	7	$4,041.00	$28,287.00
5			Ancillary Items (20%)			20.00%	$642,350.20
6			SubTotal of Wastewater				$3,854,101.20
7			General Items (10% of Wastewater Subtotal)			10.00%	$385,410.12
TOTAL UNIT PRICES - WASTEWATER							**$4,239,511.32**

Bidders Initials [ ]

MODIFIED SAMPLE 410

NEED AREA: N-2013T-0013 ANTOINE DRIVE SOUTH FROM VICTORY TO NORTHWEST FWY (US 290) **BID FORM**
ALTERNATIVE: 1A SUB-PROJECT 1 (FROM VICTORY TO DE SOTO) **PART B**

Item No.	Item Reference No. Note 2	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - WATER							
1	251105	2511	16" Water Line	LF	6,924	161	$1,114,764.00
		-	Ancillary items (20%)	LS	1	20.00%	$222,952.80
			SubTotal				$1,337,716.80
		-	General Items (10% of Water SubTotal)			10.00%	$133,771.68
TOTAL UNIT PRICES - WATER							**$1,471,488.48**

Item No.	Item Reference No. Note 2	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - DETENTION							
1	500001	-	Excavation (Detention Pond) (Dry)	AC-FT	1.8	$20,000.00	$35,386.00
2		-	Excavation (Detention Pond) (Wet)	AC-FT			$0.00
TOTAL UNIT PRICES - DETENTION							**$35,386.00**

TOTAL BASE UNIT PRICE: Note 3 **$14,464,834.32**

C. EXTRA UNIT PRICE TABLE:

Item No.		Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - EXTRA UNIT PRICE TABLE ITEMS							
TOTAL UNIT PRICES - EXTRA UNIT PRICE TABLE ITEMS							

D. CASH ALLOWANCE TABLE:

Item No.		Spec No.	Cash Allowance Short Table		Cash Allowance in Figures (1)
TOTAL CASH ALLOWANCES					

E. ALTERNATES TABLE:

Item No.		Spec No.	Alternate Short Tittle	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total Price for Alternates in Figures
TOTAL CASH ALLOWANCES							

Note:

1. This is not a Standard Document 00410B (Form 410). The Form 410 was modified for the purpose of planning level cost estimates for Pre-Engineering Studies.
2. The "Item Reference No." shall be designated for each item listed. The numbers serve as reference and will be used for the future cost updates.
3. The unit prices used to develop this cost estimate are based on FY16 unit prices.

Bidders Initials [ ]

FY 2015 Candidate Projects ($ Thousands)
Street & Traffic Control Program - Thoroughfares

Candidate Project Summary Information			
Need Area:	*N-2013T -0013*	**Alternative No.:**	**1A**
Name:	*Antoine Drive*	**Council District:**	**A & C**
Limits:	*North of Cole Creek to Northwest Fwy*	**Key Map No.:**	**411Q, U, Y, 451C,G**
Type:	Major Thoroughfare and Collector	**Super Neighborhood:**	**Greater Inwood/Oak Forest**
WBS No.:	(To be assigned by the City)	**Sub-project No.:**	2 of 3
Description:	*Project provides for the ROW acquisition, design and full construction of a 6-Lane Divided concrete section with curbs, shared use paths, driveways, traffic control and necessary underground utilities with drainage improvement (120 ROW).*		
Justification:	*Project will replace and widen a street that has been deteriorated beyond economical repair and normal maintenance. It will improve traffic level of service, traffic circulation, mobility and drainage in service area. These improvements will upgrade existing roadway to MTFP standards, if applicable.*		

Implementation - Estimated Cost and Duration

	City Funds	Other Entities Funds	Total	Duration
Total Project Cost	$ 29,280	$ -	$ -	
Acquisition	$ 483	$ -	$ -	18 Months
Design	$ 4,295	$ -	$ -	18 Months
Construction	$ 19,433	$ -	$ -	12 Months
Contingency	$ 5,069	$ -	$ -	NA
Private Utility Reloc.	$ -	$ -	$ -	Months
Warranty	$ -	$ -	$ -	12 Months

Candidate Project Priority Scores

Infrastructure Categories	Benefit Scores (Total Maximum 100)	
	Maximum	**Actual**
Streets	**75**	**N/A**
Drainage System	**15**	**N/A**
Water	**5**	**N/A**
Wastewater	**5**	**N/A**
Total	**100**	**N/A**
	Service Area Benefit score:	N/A
	Benefitted Population:	N/A
	Rebuild Houston Funds:	N/A
	Candidate Project Priority Score:	**N/A**
	Candidate Project Priority Rank No.:	(To be assigned by the City)

Other Entities & Jurisdictions Coordination

Entities		Coordination For
TxDOT	☐	
Metro	☐	
HCFCD	☐	
Gulf Coast Railroad District	☐	
Union Pacific Rail Road	☐	
Harris County	☐	
Fort Bend County	☐	
Private Utilities	☐	
(Name of Private Utility)		
(Name of Private Utility)		
Municipalities	☐	
(Name of municipality)		
(Name of municipality)		
Other	☐	
Other	☐	

Sequencing Requirements (SR) and Other Considerations

SR:	
Permits:	
Other:	

Maintenance - Estimated Cost and Frequency (By the City)

Asset Categories	Estimated Asset Life	Maintenance Items	Cost	Schedule/Frequency
Streets	40-years	Street Sweeping	$ -	4 Times Annually
		Overlay	$ -	N/A
		Pot Hole Patch	$ -	As needed - typically starts year 25
		Panel Repair	$ -	As needed
Storm Drainage	50-years	Point Repair	$ -	
			$ -	
Water	50-years	Point Repair	$ -	
			$ -	
Wastewater	50-years	Point Repair	$ -	
			$ -	

Pre-Engineering Services Contracts

Total Project Cost Estimate Breakdown (FY16 Dollars)

Sub-Project No. 2 Of 3

Need No. N-2013T-0013 ANTOINE SOUTH FROM VICTORY TO NORTHWEST FWY (US 290)
Alt #: 1A SUB-PROJECT 2 (FROM NORTH OF COLE CREEK TO US 290)

1	**410 (Summarized based on FY 16 List of Unit Prices)**		$16,898,476.26
	1.1	Total Unit Price, Paving Items	$10,927,266.79
	1.2	Total Unit Price, Storm Sewer Items	$4,044,503.15
	1.3	Total Unit Price, Water Items	$1,926,706.32
	1.4	Total Unit Price, Wastewater Items	$0.00
2	**Contingency (30% of 410)**		**$5,069,542.88**
3	**Construction Management (15% of 410)**		**$2,534,771.44**
4	**Engineering Fee Estimate (17% of Sum of 410 and Contingency)**		**$3,734,563.25**
5	**Design Management (15% of Engineering Fee Estimate)**		**$560,184.49**
6	**Land Acquisition (Engineer's Best Estimate)**		**$482,550.00**
	Total Project Cost		**$29,280,088.32**

Note: General Items are prorated in Paving, Storm, Water & Wastewater items.

Pre-Engineering Services Contracts

COH Rebuild Funds

Sub-Project No. 2 Of 3

Need No. N-2013T-0013 ANTOINE SOUTH FROM VICTORY TO NORTHWEST FWY (US 290)

Alt #: 1A SUB-PROJECT 2 (FROM NORTH OF COLE CREEK TO US 290)

1	**410 (Summarized based on FY 16 List of Unit Prices)**		$14,971,769.94
	1.1	Total Unit Price, Paving Items	$10,927,266.79
	1.2	Total Unit Price, Storm Sewer Items	$4,044,503.15
2	**Contingency (30% of 410)**		**$4,491,530.98**
3	**Construction Management (15% of 410)**		**$2,245,765.49**
4	**Engineering Fee Estimate (17% of Sum of 410 and Contingency)**		**$3,308,761.16**
5	**Design Management (15% of Engineering Fee Estimate)**		**$496,314.17**
6	**Land Acquisition (Engineer's Best Estimate)**		**$482,550.00**
	Total Project Cost		**$25,996,691.75**

Note: General Items are prorated in Paving & Storm items.

Document 00410B Note 1

BID FORM - PART B

1.0 TOTAL BID PRICE HAS BEEN CALCULATED BY BIDDER, USING THE FOLLOWING COMPONENT PRICES AND

A. STIPULATED PRICE **$ N/A**

(Total Bid Price; minus Base Unit Prices, Extra Unit Process, Cash Allowance and All Alternates, if any)

B. BASE UNIT PRICE TABLE:

Item No.	Item Reference No. Note 2	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - PAVING ITEMS							
1	222101	2221	Remove and Dispose of Existing Pavement and Curb -Assumes all concrete pavement thicknesses with or without asphalt overlay	SY	58,703	$6.00	$352,219.76
2	222102	2221	Remove and Dispose of Existing Driveways and Sidewalks	SY	10,438	$5.00	$52,190.26
3	275106	2751	11" Reinforced Concrete Pavement (Complete in Place)	SY	75,662	$66.00	$4,993,721.58
4	233602	2336	Lime stabilized subgrade (8" thick)	SY	90,795	$4.00	$363,179.00
5	233603	2336	Lime (6, 7% By Weight)	Ton	1,236	$160.00	$197,708.07
6	277101	2771	6" Concrete Curb	LF	30,654	$3.00	$91,962.76
7	275201	2752	Board Expansion Joint	LF	8,561	$8.00	$68,489.29
8	275401	2754	6" Concrete for Driveways	SF	18,451	$6.00	$110,706.61
9	277501	2775	4-1/2" Concrete for Sidewalks	SF	153,037	$5.00	$765,183.52
10	289301	2893	Traffic Signal/Intersection	EA	3	$225,000.00	$675,000.00
11			Bridge (All Items Required for Bridge Expansion)	SF	9,400	$200.00	$1,880,000.00
12			Ancillary items (5%)	LS	1	5.00%	$383,518.04
13			SubTotal of Paving				$9,933,878.90
14			General Items (10% of Paving Subtotal)	LS		10.00%	$993,387.89
TOTAL - PAVING ITEMS							**$10,927,266.79**

Bidders Initials [ ]

MODIFIED SAMPLE 410

NEED AREA: N-2013T-0013 ANTOINE DRIVE SOUTH FROM VICTORY TO NORTHWEST FWY (US 290) **BID FORM**
ALTERNATIVE: 1A SUB-PROJECT 2 (FROM NORTH OF COLE CREEK TO US 290) **PART B**

Item No.	Item Reference No.[Note 2]	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - STORM SEWER ITEMS							
1	222106	2221	Remove Manholes (All Types, All Depths)	EA	23	$388.00	$8,924.00
2	222105	2221	Remove Inlets (All Types)	EA	46	$347.00	$15,962.00
3	222103	2221	Remove Storm Sewer Pipe (All Types)	LF	8,101	$15.00	$121,515.00
4	263301	2633	Curb Inlets (All Types)	EA	47	$2,450.00	$115,150.00
5	226001	2260	Trench Safety System	LF	8,101	$2.00	$16,202.00
6	208201	2082	Manholes (For 42" Dia. Pipe and Smaller) (All Types)	EA	4	$3,100.00	$12,400.00
7	208202	2082	Manholes (For 48" to 72" Dia. Pipe) (All Types)	EA	10	$6,000.00	$60,000.00
8	208203	2082	Manholes (For 78" Dia. Pipe and Larger) (All Types)	EA	8	$10,000.00	$80,000.00
9	263101	2631	24-inch RCP	LF	822	$85.00	$69,870.00
10	263102	2631	30-inch RCP	LF	866	$110.00	$95,260.00
11	263105	2631	48-inch RCP	LF	257	$184.00	$47,288.00
12	263106	2631	54-inch RCP	LF	539	$225.00	$121,275.00
13	263107	2631	60-inch RCP	LF	288	$277.00	$79,776.00
14	263108		66-inch RCP	LF	723	$311.00	$224,853.00
15	263109	2631	72-inch RCP	LF	1,783	$355.00	$632,965.00
16	263110	2631	78-inch RCP	LF	1,750	$523.00	$915,250.00
17	263111	2631	84-inch RCP	LF	1,073	$625.00	$670,625.00
18			Ancillary items (10%)			10.00%	$328,731.50
19			SubTotal of Storm Sewer				$3,616,046.50
20			General Items (10% of Storm Sewer Subtotal)			10.00%	$361,604.65
TOTAL UNIT PRICES - STORM SEWER ITEMS							**$3,977,651.15**

Item No.	Item Reference No.[Note 2]	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - WASTEWATER							
1	222108	2221	Remove Existing Sanitary Sewer Manhole (All Types)	EA		$800.00	$0.00
2	22109	2221	Remove Existing Sanitary Sewer Pipe (All Types)	LF		$20.00	$0.00
3	253109	2531	36" PVC	LF		$586.00	$0.00
4	208204	2082	Sanitary Sewer Manholes	EA		$4,041.00	$0.00
5			Ancillary Items (20%)			20.00%	$0.00
6			SubTotal of Wastewater				$0.00
7			General Items (10% of Wastewater Subtotal)			10.00%	$0.00
TOTAL UNIT PRICES - WASTEWATER							**$0.00**

Bidders Initials [ ]

MODIFIED SAMPLE 410

NEED AREA: N-2013T-0013 ANTOINE DRIVE SOUTH FROM VICTORY TO NORTHWEST FWY (US 290) **BID FORM**
ALTERNATIVE: 1A SUB-PROJECT 2 (FROM NORTH OF COLE CREEK TO US 290) **PART B**

Item No.	Item Reference No. Note 2	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - WATER							
1	251105	2511	16" Water Line	LF	9,066	161	$1,459,626.00
		-	Ancillary items (20%)	LS	1	20.00%	$291,925.20
			SubTotal				$1,751,551.20
		-	General Items (10% of Water SubTotal)			10.00%	$175,155.12
TOTAL UNIT PRICES - WATER							**$1,926,706.32**

Item No.	Item Reference No. Note 2	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - DETENTION							
1	500001	-	Excavation (Detention Pond) (Dry)	AC-FT	3.3	$20,000.00	$66,852.00
2		-	Excavation (Detention Pond) (Wet)	AC-FT			$0.00
TOTAL UNIT PRICES - DETENTION							**$66,852.00**

TOTAL BASE UNIT PRICE: Note 3 **$16,898,476.26**

C. EXTRA UNIT PRICE TABLE:

Item No.		Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - EXTRA UNIT PRICE TABLE ITEMS							
TOTAL UNIT PRICES - EXTRA UNIT PRICE TABLE ITEMS							

D. CASH ALLOWANCE TABLE:

Item No.		Spec No.	Cash Allowance Short Table		Cash Allowance in Figures (1)
TOTAL CASH ALLOWANCES					

E. ALTERNATES TABLE:

Item No.		Spec No.	Alternate Short Tittle	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total Price for Alternates in Figures
TOTAL CASH ALLOWANCES							

Note:

1. This is not a Standard Document 00410B (Form 410). The Form 410 was modified for the purpose of planning level cost estimates for Pre-Engineering Studies.
2. The "Item Reference No." shall be designated for each item listed. The numbers serve as reference and will be used for the future cost updates.
3. The unit prices used to develop this cost estimate are based on FY16 unit prices.

Bidders Initials [ ]

FY 2015 Candidate Projects ($ Thousands)
Street & Traffic Control Program - Thoroughfares

Candidate Project Summary Information

Need Area:	*N-2013T -0013*	**Alternative No.:**	**1A**
Name:	*Antoine Drive South (Overpass)*	**Council District:**	**A & C**
Limits:	*OVERPASS OVER THE THE RAILROAD TRACK NORTH OF COLE CREEK TO DE SOTO*	**Key Map No.:**	**411Q, U, Y, 451C,G**
Type:	Major Thoroughfare and Collector	**Super Neighborhood:**	**Greater Inwood/Oak Forest**
WBS No.:	(To be assigned by the City)	**Sub-project No.:**	3 of 3
Description:	*Project provides for the design and construction of a 4-Lane Divided concrete grade separation with curbs, shared use path, traffic control and necessary utilities with drainage improvement (100 ROW).*		
Justification:	*Project will replace and widen a street that has been deteriorated beyond economical repair and normal maintenance. It will improve traffic level of service, traffic circulation, mobility and drainage in service area. These improvements will upgrade existing roadway to MTFP standards, if applicable.*		

Implementation - Estimated Cost and Duration

	City Funds	Other Entities Funds	Total	Duration
Total Project Cost	$ 13,046	$ -	$ -	
Acquisition		$ -	$ -	18 Months
Design	$ 1,946	$ -	$ -	18 Months
Construction	$ 8,803	$ -	$ -	12 Months
Contingency	$ 2,297	$ -	$ -	NA
Private Utility Reloc.	$ -	$ -	$ -	Months
Warranty	$ -	$ -	$ -	12 Months

Candidate Project Priority Scores

Infrastructure Categories	Benefit Scores (Total Maximum 100)	
	Maximum	**Actual**
Streets	**75**	**N/A**
Drainage System	**15**	**N/A**
Water	**5**	**N/A**
Wastewater	**5**	**N/A**
Total	**100**	**N/A**
	Service Area Benefit score:	N/A
	Benefitted Population:	N/A
	Rebuild Houston Funds:	N/A
	Candidate Project Priority Score:	**N/A**
	Candidate Project Priority Rank No.:	(To be assigned by the City)

Other Entities & Jurisdictions Coordination

Entities		Coordination For
TxDOT	☐	
Metro	☐	
HCFCD	☐	
Gulf Coast Railroad District	☐	
Union Pacific Rail Road	☐	
Harris County	☐	
Fort Bend County	☐	
Private Utilities	☐	
(Name of Private Utility)		
(Name of Private Utility)		
Municipalities	☐	
(Name of municipality)		
(Name of municipality)		
Other	☐	
Other	☐	

Sequencing Requirements (SR) and Other Considerations

SR:	
Permits:	
Other:	

Maintenance - Estimated Cost and Frequency (By the City)

Asset Categories	Estimated Asset Life	Maintenance Items	Cost	Schedule/Frequency
Streets	40-years	Street Sweeping	$ -	4 Times Annually
		Overlay	$ -	N/A
		Pot Hole Patch	$ -	As needed - typically starts year 25
		Panel Repair	$ -	As needed
Storm Drainage	50-years	Point Repair	$ -	
			$ -	
Water	50-years	Point Repair	$ -	
			$ -	
Wastewater	50-years	Point Repair	$ -	
			$ -	

Pre-Engineering Services Contracts

Total Project Cost Estimate Breakdown (FY16 Dollars)

Sub-Project No. 3 Of 3

Need No. N-2013T-0013 ANTOINE SOUTH FROM VICTORY TO NORTHWEST FWY (US 290)

Alt #: 1A SUB-PROJECT 3 (OVERPASS OVER THE THE RAILROAD TRACK NORTH OF COLE CREEK TO DE SOTO)

1	**410 (Summarized based on FY 16 List of Unit Prices)**		$7,655,482.54
	1.1	Total Unit Price, Paving Items	$7,655,482.54
	1.2	Total Unit Price, Storm Sewer Items	
	1.3	Total Unit Price, Water Items	
	1.4	Total Unit Price, Wastewater Items	
2	**Contingency (30% of 410)**		**$2,296,644.76**
3	**Construction Management (15% of 410)**		**$1,148,322.38**
4	**Engineering Fee Estimate (17% of Sum of 410 and Contingency)**		**$1,691,861.64**
5	**Design Management (15% of Engineering Fee Estimate)**		**$253,779.25**
6	**Land Acquisition (Engineer's Best Estimate)**		
	Total Project Cost		**$13,046,090.57**

Note: General Items are prorated in Paving, Storm, Water & Wastewater items.

Pre-Engineering Services Contracts

COH Rebuild Funds

Sub-Project No. 3 Of 3

Need No. N-2013T-0013 ANTOINE SOUTH FROM VICTORY TO NORTHWEST FWY (US 290)

Alt #: 1A SUB-PROJECT 3 (OVERPASS OVER THE THE RAILROAD TRACK NORTH OF COLE CREEK)

1	**410 (Summarized based on FY 16 List of Unit Prices)**		$7,655,482.54
	1.1	Total Unit Price, Paving Items	$7,655,482.54
	1.2	Total Unit Price, Storm Sewer Items	
2	**Contingency (30% of 410)**		**$2,296,644.76**
3	**Construction Management (15% of 410)**		**$1,148,322.38**
4	**Engineering Fee Estimate (17% of Sum of 410 and Contingency)**		**$1,691,861.64**
5	**Design Management (15% of Engineering Fee Estimate)**		**$253,779.25**
6	**Land Acquisition (Engineer's Best Estimate)**		
	Total Project Cost		**$13,046,090.57**

Note: General Items are prorated in Paving & Storm items.

MODIFIED SAMPLE 410

NEED AREA: N-2013T-0013 ANTOINE DRIVE SOUTH FROM VICTORY TO NORTHWEST FWY (US 290) **BID FORM**
ALTERNATIVE: 1A SUB-PROJECT 3 (OVERPASS OVER THE THE RAILROAD TRACK NORTH OF COLE CREEK) TC **PART B**

Document 00410B Note 1

BID FORM - PART B

1.0 TOTAL BID PRICE HAS BEEN CALCULATED BY BIDDER, USING THE FOLLOWING COMPONENT PRICES AND PROCESS

A. STIPULATED PRICE **$ N/A**

(Total Bid Price; minus Base Unit Prices, Extra Unit Process, Cash Allowance and All Alternates, if any)

B. BASE UNIT PRICE TABLE:

Item No.	Item Reference No. Note 2	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - PAVING ITEMS							
1	222101	2221	Remove and Dispose of Existing Pavement and Curb -Assumes all concrete pavement thicknesses with or without asphalt overlay	SY	5,114.05	$6.00	$30,684.29
2	222102	2221	Remove and Dispose of Existing Driveways and Sidewalks	SY	909.56	$5.00	$4,547.82
3	275106	2751	11" Reinforced Concrete Pavement (Complete in Place)	SY	5,963.22	$66.00	$393,572.84
4	233602	2336	Lime stabilized subgrade (8" thick)	SY	7155.87	$4.00	$28,623.46
5	233603	2336	Lime (6, 7% By Weight)	Ton	392.11	$160.00	$62,737.19
6	277101	2771	6" Concrete Curb	LF	1,793.88	$3.00	$5,381.65
7	275201	2752	Board Expansion Joint	LF	746.01	$8.00	$5,968.12
8	275401	2754	6" Concrete for Driveways	SF	1,607.10	$6.00	$9,642.58
9	277501	2775	4-1/2" Concrete for Sidewalks	SF	12,302.49	$5.00	$61,512.43
	289301	2775	Traffic Signal/Intersection	EA	1.00	$225,000.00	$225,000.00
10			Ancillary items (5%)	LS		5.00%	$30,133.52
11			SubTotal of Paving				$857,803.89
12			General Items (10% of Paving Subtotal)	LS		10.00%	$85,780.39
TOTAL - PAVING ITEMS							**$943,584.28**
UNIT PRICES - Overpass ITEMS							
Item No.	Item Reference No. Note 2	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
1	222101	2221	Remove/Dispose of Existing Pavement and Curb-Assumes all concrete pavement	SY	5,114	$6.00	$30,684.00
2	222102	2221	Remove/Dispose of Existing Driveways and	SY	1,252	$5.00	$6,260.00
3	275103	2751	11" Reinforced Concrete Pavement (Complete in	SY	10,400	$66.00	$686,400.00
4	233601	2336	8" Subgrade Statbilization	SY	11,000	$4.00	$44,000.00
5	233603	2336	Lime (6%,7% By Weight)	TON	231	$160.00	$36,960.00
6			Embackment (backfill)	CY	38,444	$30.00	$1,153,320.00
7			Retaining Wall	SF	19,680	$35.00	$688,800.00
8			Rail	LF	2,000	$150.00	$300,000.00
9			Bridge	SF	22,000	$150.00	$3,300,000.00
10			Conc curb	LF	3,200	$3.00	$147,321.20
11			Ancillary items	LS	1	5.00%	$318,153.06
TOTAL - UNIT PRICES - Overpass ITEMS							**$6,711,898.26**

Bidders Initials [ ]

MODIFIED SAMPLE 410

NEED AREA: N-2013T-0013 ANTOINE DRIVE SOUTH FROM VICTORY TO NORTHWEST FWY (US 290) **BID FORM**
ALTERNATIVE: 1A SUB-PROJECT 3 (OVERPASS OVER THE THE RAILROAD TRACK NORTH OF COLE CREEK) TC **PART B**

Item No.	Item Reference No.[Note 2]	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - STORM SEWER ITEMS							
1	222106	2221	Remove Manholes (All Types, All Depths)	EA		$388.00	$0.00
2	222105	2221	Remove Inlets (All Types)	EA		$347.00	$0.00
3	222103	2221	Remove Storm Sewer Pipe (All Types)	LF		$15.00	$0.00
4	263301	2633	Curb Inlets (All Types)	EA		$2,450.00	$0.00
5	226001	2260	Trench Safety System	LF		$2.00	$0.00
6	208201	2082	Manholes (For 42" Dia. Pipe and Smaller) (All Types)	EA		$3,100.00	$0.00
7	208202	2082	Manholes (For 48" to 72" Dia. Pipe) (All Types)	EA		$6,000.00	$0.00
8	263102	2631	30-inch RCP	LF		$110.00	$0.00
9	263103	2631	36-inch RCP	LF		$138.00	$0.00
10	263104	2631	42-inch RCP	LF		$159.00	$0.00
11	263105	2631	48-inch RCP	LF		$184.00	$0.00
12			Ancillary items (10%)			10.00%	$0.00
13			SubTotal of Storm Sewer				$0.00
14			General Items (10% of Storm Sewer Subtotal)			10.00%	$0.00
TOTAL UNIT PRICES - STORM SEWER ITEMS							**$0.00**

Item No.	Item Reference No.[Note 2]	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - WASTEWATER							
1	222108	2221	Remove Existing Sanitary Sewer Manhole (All Types)	EA		$800.00	$0.00
2	22109	2221	Remove Existing Sanitary Sewer Pipe (All Types)	LF		$20.00	$0.00
3	253107	2531	24" PVC	LF		$360.00	$0.00
4	208204	2082	Sanitary Sewer Manholes	EA		$4,041.00	$0.00
5			Ancillary Items (20%)			20.00%	$0.00
6			SubTotal of Wastewater				$0.00
7			General Items (10% of Wastewater Subtotal)			10.00%	$0.00
TOTAL UNIT PRICES - WASTEWATER							**$0.00**

Bidders Initials [ ]

MODIFIED SAMPLE 410

NEED AREA: N-2013T-0013 ANTOINE DRIVE SOUTH FROM VICTORY TO NORTHWEST FWY (US 290) **BID FORM**
ALTERNATIVE: 1A SUB-PROJECT 3 (OVERPASS OVER THE THE RAILROAD TRACK NORTH OF COLE CREEK) TC **PART B**

Item No.	Item Reference No. Note 2	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - WATER							
1	251105	2511	16" Water Line	LF		161	$0.00
		-	Ancillary items (20%)	LS	1	20.00%	$0.00
			SubTotal				$0.00
		-	General Items (10% of Water SubTotal)			10.00%	$0.00
TOTAL UNIT PRICES - WATER							**$0.00**

Item No.	Item Reference No. Note 2	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - DETENTION							
1	500001	-	Excavation (Detention Pond) (Dry)	AC-FT		$20,000.00	$0.00
2		-	Excavation (Detention Pond) (Wet)	AC-FT			$0.00
TOTAL UNIT PRICES - DETENTION							**$0.00**

TOTAL BASE UNIT PRICE: Note 3 **$7,655,482.54**

C. EXTRA UNIT PRICE TABLE:

Item No.		Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - EXTRA UNIT PRICE TABLE ITEMS							
TOTAL UNIT PRICES - EXTRA UNIT PRICE TABLE ITEMS							

D. CASH ALLOWANCE TABLE:

Item No.		Spec No.	Cash Allowance Short Table		Cash Allowance in Figures (1)
TOTAL CASH ALLOWANCES					

E. ALTERNATES TABLE:

Item No.		Spec No.	Alternate Short Tittle	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total Price for Alternates in Figures
TOTAL CASH ALLOWANCES							

Note:

1. This is not a Standard Document 00410B (Form 410). The Form 410 was modified for the purpose of planning level cost estimates for Pre-Engineering Studies.
2. The "Item Reference No." shall be designated for each item listed. The numbers serve as reference and will be used for the future cost updates.
3. The unit prices used to develop this cost estimate are based on FY16 unit prices.

Bidders Initials [ ]

Appendix 2

Traffic & Utilities Layouts

EXISTNG R.O.W.
EXISTING EDGE OF PAVEMENT
PROPOSED R.O.W.
PROPOSED CONCRETE PAVEMENT
PROPOSED MEDIAN
POTENTIAL MEDIAN CLOSURE
PROPOSED EDGE OF PAVEMENT

0 50 100
SCALE: 1"=100'

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
PRE-ENGINEERING FOR THOROUGHFARE IMPROVEMENTS
ANTOINE FROM US290 TO BRIDGE FOREST DR
WORK NO. N100-005-3

OMEGA ENGINEERS, INC.
16360 PARK TEN PLACE, Ste. #325
HOUSTON TEXAS, 77084
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P: 281 647 9182 F: 281 647 9184

"FOR EXHIBIT PURPOSES ONLY, NOT FOR BIDDING OR CONSTRUCTION"

SHEET TITLE: ANTOINE DR. US 290 TO BRIDGE FOREST DR. (SOUTH) ALTERNATIVE 1 & TRAFFIC

JOB NO. XXXXXX
DATE: December 21, 2015
SHEET NO. EXHIBIT 1 OF 6

H:\2013-003\WO 03\3.Antoine Road\CAD\N-2013T-ANTOINE-ALT01(S)-traff.dwg Plotted: Dec 22, 2015 - 2:56pm

EXISTNG R.O.W.
EXISTING EDGE OF PAVEMENT
PROPOSED R.O.W.
PROPOSED CONCRETE PAVEMENT
PROPOSED MEDIAN
POTENTIAL MEDIAN CLOSURE
PROPOSED EDGE OF PAVEMENT

0 50 100
SCALE: 1"=100'

CITY OF HOUSTON

DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

PRE-ENGINEERING FOR THOROUGHFARE IMPROVEMENTS

ANTOINE FROM US290 TO BRIDGE FOREST DR

WORK NO. N100-005-3

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SHEET TITLE: ANTOINE DR. US 290 TO BRIDGE FOREST DR. (SOUTH) ALTERNATIVE 1 & TRAFFIC

JOB NO: XXXXXX

DATE: December 21, 2015

SHEET NO: EXHIBIT 2 OF 6

H:\2013-003\WO 03\Antoine Road\CADD\N-2013T-ANTOINE-ALT01(S)-traff.dwg Plotted: Dec 22, 2015 - 2:57pm

EXISTNG R.O.W.
EXISTING EDGE OF PAVEMENT
PROPOSED R.O.W.
PROPOSED CONCRETE PAVEMENT
PROPOSED MEDIAN
POTENTIAL MEDIAN CLOSURE
PROPOSED EDGE OF PAVEMENT

0 50 100
SCALE: 1"=100'

CITY OF HOUSTON

DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

PRE-ENGINEERING FOR THOROUGHFARE IMPROVEMENTS

ANTOINE FROM US290 TO BRIDGE FOREST DR

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JOB NO: XXXXXX

DATE: December 21, 2015

SHEET NO: EXHIBIT 3 OF 6

H:\2013-003\WO 03\Antoine Road\CADD\N-2013T-ANTOINE-ALT01(S)-traff.dwg Plotted: Dec 22, 2015 - 2:58pm

EXISTNG R.O.W.
EXISTING EDGE OF PAVEMENT
PROPOSED R.O.W.
PROPOSED CONCRETE PAVEMENT
PROPOSED MEDIAN
POTENTIAL MEDIAN CLOSURE
PROPOSED EDGE OF PAVEMENT

0 50 100
SCALE: 1"=100'

CITY OF HOUSTON

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PRE-ENGINEERING FOR THOROUGHFARE IMPROVEMENTS

ANTOINE FROM US290 TO BRIDGE FOREST DR

WORK NO. N100-005-3

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SHEET TITLE: ANTOINE DR. US 290 TO BRIDGE FOREST DR. (SOUTH) ALTERNATIVE 1 & TRAFFIC

JOB NO: XXXXXX

DATE: December 21, 2015

SHEET NO: EXHIBIT 4 OF 8

H:\2013-003\WO 03\3.Antoine Road\CAD\H-2013T-ANTOINE-ALT01(S)-traff.dwg Plotted: Dec 23, 2015 - 9:12am

EXISTNG R.O.W.
EXISTING EDGE OF PAVEMENT
PROPOSED R.O.W.
PROPOSED CONCRETE PAVEMENT
PROPOSED MEDIAN
POTENTIAL MEDIAN CLOSURE
PROPOSED EDGE OF PAVEMENT

0 50 100
SCALE: 1"=100'

CITY OF HOUSTON

DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

PRE-ENGINEERING FOR THOROUGHFARE IMPROVEMENTS

ANTOINE FROM US290 TO BRIDGE FOREST DR

WORK NO. N100-005-3

OMEGA ENGINEERS, INC.
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SHEET TITLE: ANTOINE DR. US 290 TO BRIDGE FOREST DR. (SOUTH) ALTERNATIVE 1 & TRAFFIC

JOB NO: XXXXXX

DATE: December 21, 2015

SHEET NO: EXHIBIT 5 OF 6

H:\2013-003\WO 03\Antoine Road\CADD\N-2013T-ANTOINE-ALT01(S)-traff.dwg Plotted: Dec 22, 2015 - 2:59pm

EXISTNG R.O.W.
EXISTING EDGE OF PAVEMENT
PROPOSED R.O.W.
PROPOSED CONCRETE PAVEMENT
PROPOSED MEDIAN

POTENTIAL MEDIAN CLOSURE
PROPOSED EDGE OF PAVEMENT

0 50 100
SCALE: 1"=100'

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
PRE-ENGINEERING FOR THOROUGHFARE IMPROVEMENTS
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WORK NO. N100-005-3

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JOB NO: XXXXXX
DATE: December 21, 2015
SHEET NO: EXHIBIT 6 OF 6

H:\2013-003\WO 03\Antoine Road\CAD\N-2013T-ANTOINE-ALT01(S)-traff.dwg Plotted: Dec 22, 2015 - 3:00pm

LEGEND

- PROP SAN SWR
- PROP WATER LINE
- PROP STORM SWR

0 50 100
SCALE: 1"=100'

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
PRE-ENGINEERING FOR THOROUGHFARE IMPROVEMENTS
ANTOINE FROM US290 TO BRIDGE FOREST DR
WORK NO. N100-005-3

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SHEET TITLE: ANTOINE DR. US290 TO BRIDGE FOREST DR.
PROPOSED STORM & UTILITY LAYOUT

JOB NO: XXXXXX
DATE: December 1, 2015
SHEET NO: EXHIBIT 1 OF 6

H:\2013-003\WO 03\3.Antoine Road\CADD\N-2013T-ANTOINE-ALT01(S)-util.dwg Plotted: Dec 02, 2015 - 1:43pm

LEGEND

- PROP SAN SWR
- PROP WATER LINE
- PROP STORM SWR

0 50 100
SCALE: 1"=100'

CITY OF HOUSTON

DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

PRE-ENGINEERING FOR THOROUGHFARE IMPROVEMENTS

ANTOINE FROM US290 TO BRIDGE FOREST DR

WORK NO. N100-005-3

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SHEET TITLE: ANTOINE DR. US290 TO BRIDGE FOREST DR.

PROPOSED STORM & UTILITY LAYOUT

JOB NO.: XXXXXX

DATE: December 1, 2015

SHEET NO.: EXHIBIT 2 OF 6

H:\2013-003\WO 03\3.Antoine Road\CAD\N-2013T-ANTONE-ALT01(S)-util.dwg Plotted: Dec 02, 2015 - 1:45pm

LEGEND

- PROP SAN SWR
- PROP WATER LINE
- PROP STORM SWR

0 50 100
SCALE: 1"=100'

CITY OF HOUSTON

DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

PRE-ENGINEERING FOR THOROUGHFARE IMPROVEMENTS

ANTOINE FROM US290 TO BRIDGE FOREST DR

WORK NO. N100-005-3

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"FOR EXHIBIT PURPOSES ONLY, NOT FOR BIDDING OR CONSTRUCTION"

SHEET TITLE: ANTOINE DR. US290 TO BRIDGE FOREST DR.

PROPOSED STORM & UTILITY LAYOUT

JOB NO: XXXXXX

DATE: December 1, 2015

SHEET NO: EXHIBIT 3 OF 6

H:\2013-003\WO 03\3.Antoine Road\CAD\H-2013T-ANTOINE-ALT01(S)-ut1.dwg Plotted: Dec 02, 2015 - 1:47pm

LEGEND

- PROP SAN SWR
- PROP WATER LINE
- PROP STORM SWR

0 50 100
SCALE: 1"=100'

CITY OF HOUSTON

DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

PRE-ENGINEERING FOR THOROUGHFARE IMPROVEMENTS

ANTOINE FROM US290 TO BRIDGE FOREST DR

WORK NO. N100-005-3

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"FOR EXHIBIT PURPOSES ONLY, NOT FOR BIDDING OR CONSTRUCTION"

SHEET TITLE: ANTOINE DR. US290 TO BRIDGE FOREST DR.

PROPOSED STORM & UTILITY LAYOUT

JOB NO: XXXXXX

DATE: December 1, 2015

SHEET NO: EXHIBIT 4 OF 6

H:\2013-003\WO 03\3.Antoine Road\CAD\H-2013T-ANTOINE-ALT01(S)-util.dwg Plotted: Dec 02, 2015 - 1:49pm

LEGEND

- PROP SAN SWR
- PROP WATER LINE
- PROP STORM SWR

0 50 100
SCALE: 1"=100'

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
PRE-ENGINEERING FOR THOROUGHFARE IMPROVEMENTS
ANTOINE FROM US290 TO BRIDGE FOREST DR
WORK NO. N100-005-3

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SHEET TITLE: ANTOINE DR. US290 TO BRIDGE FOREST DR.
PROPOSED STORM & UTILITY LAYOUT

JOB NO: XXXXXX
DATE: December 1, 2015
SHEET NO: EXHIBIT 5 OF 6

H:\2013-003\WO 03\Antoine Road\CADD\N-2013T-ANTOINE-ALT01(S)-util.dwg Plotted: Dec 02, 2015 - 1:54pm

LEGEND

- PROP SAN SWR
- PROP WATER LINE
- PROP STORM SWR

0 50 100
SCALE: 1"=100'

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
PRE-ENGINEERING FOR THOROUGHFARE IMPROVEMENTS
ANTOINE FROM US290 TO BRIDGE FOREST DR
WORK NO. N100-005-3

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SHEET TITLE: ANTOINE DR.
US290 TO BRIDGE FOREST DR.

PROPOSED STORM
& UTILITY LAYOUT

JOB NO: XXXXXX
DATE: December 1, 2015
SHEET NO: EXHIBIT 6 OF 6

H:\2013-003\WO 03\Antoine Road\CAD\N-2013T-ANTOINE-ALT01(S)-util.dwg Plotted: Dec 02, 2015 - 1:56pm

Appendix 4

Traffic Report

TECHNICAL MEMORANDUM

TO: Edelmiro Castillo, P.E., Omega Engineers, Inc.
FROM: Rene Arredondo, P.E., PTOE, AC Group, LLC
DATE: November 23, 2015

SUBJECT: Traffic Engineering Study
Final Pre-Engineering Report – Intersection Capacity Analysis
Work Order No. 13: WBS No. N-000100-0005-3
Pre-Engineering Services for:
Corridor 2, N-2013T-0013, Antoine Drive from Bridge Forest Dr to US Hwy 290

The purpose of this traffic engineering study technical memorandum is to document the capacity analysis performed for updating the Antoine Drive corridor improvements recommended by the Northwest Houston Mobility Study. Updates to the Antoine Drive corridor included reverting the original corridor typical section from 6 lanes to 4 lanes between Tidwell Road to Bridge Forest.

Antoine Drive is a north-south, four-lane divided roadway. The posted speed limit is 35 miles per hour for the commercial area and 30 miles per hour for the residential area of the corridor. The corridor also encourages cyclists to share the road with symbolic bicyclist signs with a descriptive plaque signs of "SHARE THE ROAD" on both sides of the roadway. The study corridor between Acorn Street and Bridge Forest Drive is predominantly commercial along both sides of the corridor including some residential apartment complexes. The study corridor between Acron Street and US Highway 290 is predominantly residential with Scarborough High School located between W 43rd Street and Saxon Drive.

Traffic Analysis:

In addition to the updated intersection capacity analysis for all major intersections along Antoine Drive, specifically analysis of the 4-lane typical section between Tidwell Road and Bridge Forest, this traffic analysis included the assessment of control delay (seconds per vehicle) associated with the existing at-grade rail road crossing located north of Tidwell Road. Traffic data collected at the rail road crossing revealed approximately 6 crossing events during each peak period with the maximum roadway blockage of three minutes. Tables 3 and 4 show the results of the Tidwell Road intersection average control delay with (assuming no overpass crossing) and without (assuming overpass crossing) vehicle delay associated with 6 hourly rail crossings north of Tidwell Road.

Table 1. Level-of-Service Criteria for Signalized and Unsignalized Intersections

Level-of-Service (LOS)	Control Delay (seconds/vehicle)		Description
	Signalized Intersections	Unsignalized Intersections	
A	≤10.0	≤10.0	Very low vehicle delay, free traffic flow, good signal progression
B	10.1 to 20.0	10.1 to 15.0	Good signal progression, more vehicle stops and higher delay than LOS A
C	20.1 to 35.0	15.1 to 25.0	Stable traffic flow, fair signal progression, significant number of vehicle stops
D	35.1 to 55.0	25.1 to 35.0	Noticeable traffic congestion, longer delays and unfavorable signal progression
E	55.1 to 80.0	35.1 to 50.0	Limit of acceptable vehicle delay, unstable traffic flow, poor signal progression
F	> 80.0	> 50.0	Unacceptable delay, extremely unstable flow, heavy congestion, traffic exceeds capacity

Source: Highway Capacity Manual, Transportation Research Board, 2000.

Table 1. Intersection Level-of-Service for the Antoine Drive Study Corridor - Morning (AM) Peak Hour

Antoine Drive Intersections	Existing (2013)		Projected (2035)		Projected (2035) Alternative 1		Projected (2035) Alternative 2		Projected (2035) Alternative 3	
	Delay (Sec/Veh)	LOS	Delay (Sec/Veh)	LOS	Delay (Sec/Veh)	LOS	Delay (Sec/Veh)	LOS	Delay (Sec/Veh)	LOS
Antoine Dr and Bridge Forest Dr	7.3	A	9.1	A	8.6	A	8.6	A	9.1	A
Antoine Dr and W Gulf Bank Rd	16.7	B	18.9	B	16.7	B	16.7	B	19.1	B
Antoine Dr and Long Creek Ln	6.3	A	5.4	A	5.0	A	5.0	A	5.3	A
Antoine Dr and Victory Dr	27.4	C	35.4	D	29.4	C	27.7	C	32.3	C
Antoine Dr and W Little York Rd	20.2	C	23.6	C	23.7	C	23.7	C	27.4	C
Antoine Dr and De Soto St	7.6	A	8.1	A	7.4	A	7.4	A	9.1	A
Antoine Dr and W Tidwell Rd	35.4	D	50.4	D	35.9	D	29.8	C	74.7	E
Antoine Dr and Pinemont Dr	40.3	D	58.8	E	46.4	D	33.5	C	33.5	C
Antoine Dr and Acorn St	2.8	A	5.4	A	3.6	A	3.6	A	7.5	A
Antoine Dr and W 43rd St	17.8	B	22.0	C	19.3	B	19.3	B	26.4	C
Antoine Dr and Saxon Dr	3.1	A	7.7	A	4.7	A	4.7	A	4.7	A
Antoine Dr and US Hwy 290 North	35.1	D	54.4	D	55.5	E	51.5	D	51.5	D
Antoine Dr and US Hwy 290 South	49.4	D	72.8	E	72.8	E	41.0	D	41.0	D

1 - Alternative 1 includes the widening of Antoine Drive from a 4-lane section to a 6-lane section
2 - Alternative 2 includes the widening of Antoine Drive from a 4-lane section to a 6-lane section and additional intersection improvements including cross street turn lanes
3 - Alternative 3 includes the maintaining a 4-lane section from Tidwell Road to Bridge Forest and additional intersection improvements including cross street turn lanes

Table 2. Intersection Level-of-Service for the Antoine Drive Study Corridor - Evening (PM) Peak Hour

Antoine Drive Intersections	Existing (2013)		Projected (2035)		Projected (2035) Alternative 1		Projected (2035) Alternative 2		Projected (2035) Alternative 3	
	Delay (Sec/Veh)	LOS	Delay (Sec/Veh)	LOS	Delay (Sec/Veh)	LOS	Delay (Sec/Veh)	LOS	Delay (Sec/Veh)	Delay (Sec/Veh)
Antoine Dr and Bridge Forest Dr	5.2	A	6.0	A	5.2	A	5.2	A	6.7	A
Antoine Dr and W Gulf Bank Rd	23.0	C	29.3	C	24.2	C	24.2	C	28.9	C
Antoine Dr and Long Creek Ln	6.5	A	7.0	A	6.0	A	6.0	A	7.2	A
Antoine Dr and Victory Dr	46.4	D	68.1	E	41.0	D	35.0	C	69.0	E
Antoine Dr and W Little York Rd	19.8	B	20.2	C	19.3	B	19.3	B	21.2	C
Antoine Dr and De Soto St	10.4	B	5.8	A	4.1	A	4.1	A	11.2	B
Antoine Dr and W Tidwell Rd	37.7	D	47.4	D	32.4	C	26.4	C	42.0	D
Antoine Dr and Pinemont Dr	27.9	C	40.0	D	32.9	C	24.3	C	24.7	C
Antoine Dr and Acorn St	3.4	A	7.7	A	4.7	A	4.7	A	6.8	A
Antoine Dr and W 43rd St	30.6	C	39.6	D	26.8	C	26.8	C	30.8	C
Antoine Dr and Saxon Dr	7.9	A	25.2	D	24.8	C	24.8	C	24.8	C
Antoine Dr and US Hwy 290 North	29.5	C	50.8	D	50.7	D	33.2	C	33.2	C
Antoine Dr and US Hwy 290 South	25.7	C	50.9	D	50.9	D	23.3	C	23.3	C

1 - Alternative 1 includes the widening of Antoine Drive from a 4-lane section to a 6-lane section
2 - Alternative 2 includes the widening of Antoine Drive from a 4-lane section to a 6-lane section and additional intersection improvements including cross street turn lanes
3 - Alternative 3 includes the maintaining a 4-lane section from Tidwell Road to Bridge Forest and additional intersection improvements including cross street turn lanes

Table 3. Intersection Level-of-Service for the Antoine Drive Study Corridor – Morning (AM) Peak Hour

Antoine Drive Intersections	Projected (2035) Alternative 3		Projected (2035) Alternative 4 AM							
	Delay (Sec/Veh)	Delay (Sec/Veh)	Delay (Sec/Veh)	LOS						
Antoine Dr and W Tidwell Rd	74.7	E	95.8	F						

3 - Alternative 3 includes the maintaining a 4-lane section from Tidwell Road to Bridge Forest and additional intersection improvements (including a Rail Road Overpass)
4 - Alternative 4 includes the additional delay that Tidwell will incur as a result of the railroad crossing north of Tidwell

Table 4. Intersection Level-of-Service for the Antoine Drive Study Corridor – Evening (PM) Peak Hour

Antoine Drive Intersections	Projected (2035) Alternative 3		Projected (2035) Alternative 4 PM							
	Delay (Sec/Veh)	LOS	Delay (Sec/Veh)	LOS						
Antoine Dr and W Tidwell Rd	42.0	D	72.0	E						

3 - Alternative 3 includes the maintaining a 4-lane section from Tidwell Road to Bridge Forest and additional intersection improvements (including a Rail Road Overpass)
4 - Alternative 4 includes the additional delay that Tidwell will incur as a result of the railroad crossing north of Tidwell

Access Management Assessment:

As described in the Texas Department of Transportation (TxDOT) Access Management Manual, proper access management assists in protecting the substantial public investment in transportation by persevering roadway efficiency and enhancing traffic safety, thus reducing the need for expensive improvements. Furthermore, access management can significantly reduce traffic accidents, personal injury, and property damage.

The City of Houston Infrastructure Design Manual does include access management design criteria under Chapter 15 "Traffic and Signal Design Requirements". The access management criteria include driveway widths (both residential and commercial), driveway spacing (both residential and commercial), corner clearance upstream and downstream of the intersections, and median lengths along principal streets. AC Group assessed each of the intersections within the study corridor for compliance with the City of Houston Infrastructure Design Manual. It was determined that a majority of the intersections do not comply with driveway spacing or corner clearance.

In addition to driveway spacing non-compliance, the existing median breaks also fall short of the 600' median break spacing at multiple locations and should be considered for closure. Several median breaks serve public streets on both sides of Antoine Drive and others serve large trip generators therefore a more thorough median break closure study is recommended that further evaluates utilization, need, and purpose.

Antoine Drive and Bridge Forest Drive

Access Management Measures	Min	Max	Met	Comments
Driveway Width (Residential)	**12’**	**24’**	**-**	
Driveway Width (Others)	**24’**	**35’**	**Yes**	
Driveway Spacing (Residential)	**20’**	**-**	**-**	
Driveway Spacing (Commercial)	**20’**	**-**	**Yes**	
Corner Clearance Spacing- Upstream *	**100’**	**-**	**No**	**NB & SB**
Corner Clearance Spacing- Downstream*	**60’**	**-**	**Yes**	
Median Length (Principal at Principal)	**500’**	**-**	**-**	
Median Length (Principal at Collector)	**500’**	**-**	**No**	**NB Only**

*** Upstream Approach and Downstream Departure of Intersection**

Antoine Drive and W Gulf Bank Road

Access Management Measures	Min	Max	Met	Comments
Driveway Width (Residential)	12’	24’	Yes	
Driveway Width (Others)	24’	35’	Yes	
Driveway Spacing (Residential)	20’	-	Yes	
Driveway Spacing (Commercial)	20’	-	Yes	
Corner Clearance Spacing- Upstream *	100’	-	No	EB & WB
Corner Clearance Spacing- Downstream*	60’	-	No	NB, SB & WB
Median Length (Principal at Principal)	500’	-	No	NB, SB, EB, & WB
Median Length (Principal at Collector)	500’	-	-	

*** Upstream Approach and Downstream Departure of Intersection**

Antoine Drive and Long Creek Lane

Access Management Measures	Min	Max	Met	Comments
Driveway Width (Residential)	**12’**	**24’**	**Yes**	
Driveway Width (Others)	**24’**	**35’**	**Yes**	
Driveway Spacing (Residential)	**20’**	**-**	**Yes**	
Driveway Spacing (Commercial)	**20’**	**-**	**Yes**	
Corner Clearance Spacing- Upstream *	**100’**	**-**	**No**	**WB**
Corner Clearance Spacing- Downstream*	**60’**	**-**	**No**	**NB**
Median Length (Principal at Principal)	**500’**	**-**	**-**	
Median Length (Principal at Collector)	**500’**	**-**	**No**	**NB, SB, EB, & WB**

*** Upstream Approach and Downstream Departure of Intersection**

Antoine Drive and Victory Drive

Access Management Measures	Min	Max	Met	Comments
Driveway Width (Residential)	12’	24’	-	
Driveway Width (Others)	24’	35’	Yes	
Driveway Spacing (Residential)	20’	-	-	
Driveway Spacing (Commercial)	20’	-	Yes	
Corner Clearance Spacing- Upstream *	100’	-	No	SB, EB, & WB
Corner Clearance Spacing- Downstream*	60’	-	No	WB
Median Length (Principal at Principal)	500’	-	No	NB, SB, & WB
Median Length (Principal at Collector)	500’	-	-	

*** Upstream Approach and Downstream Departure of Intersection**

Antoine Drive and W Little York Road

Access Management Measures	Min	Max	Met	Comments
Driveway Width (Residential)	**12’**	**24’**	**-**	
Driveway Width (Others)	**24’**	**35’**	**Yes**	
Driveway Spacing (Residential)	**20’**	**-**	**-**	
Driveway Spacing (Commercial)	**20’**	**-**	**No**	**WB**
Corner Clearance Spacing- Upstream *	**100’**	**-**	**No**	**NB, EB, & WB**
Corner Clearance Spacing- Downstream*	**60’**	**-**	**No**	**NB & SB**
Median Length (Principal at Principal)	**500’**	**-**	**No**	**NB & SB**
Median Length (Principal at Collector)	**500’**	**-**	**-**	

*** Upstream Approach and Downstream Departure of Intersection**

Antoine Drive and De Soto Street

Access Management Measures	Min	Max	Met	Comments
Driveway Width (Residential)	12’	24’	-	
Driveway Width (Others)	24’	35’	Yes	
Driveway Spacing (Residential)	20’	-	-	
Driveway Spacing (Commercial)	20’	-	Yes	
Corner Clearance Spacing- Upstream *	100’	-	No	NB & WB
Corner Clearance Spacing- Downstream*	60’	-	No	NB & EB
Median Length (Principal at Principal)	500’	-	-	
Median Length (Principal at Collector)	500’	-	No	NB, SB, & WB

*** Upstream Approach and Downstream Departure of Intersection**

Antoine Drive and W Tidwell Road

Access Management Measures	Min	Max	Met	Comments
Driveway Width (Residential)	12’	24’	-	
Driveway Width (Others)	24’	35’	Yes	
Driveway Spacing (Residential)	20’	-	-	
Driveway Spacing (Commercial)	20’	-	No	EB (Consolidation Needed)
Corner Clearance Spacing- Upstream *	100’	-	No	EB
Corner Clearance Spacing- Downstream*	60’	-	No	SB & EB
Median Length (Principal at Principal)	500’	-	No	NB, SB, EB &WB
Median Length (Principal at Collector)	500’	-	-	

*** Upstream Approach and Downstream Departure of Intersection**

Antoine Drive and Pinemont Drive

Access Management Measures	Min	Max	Met	Comments
Driveway Width (Residential)	12’	24’	-	
Driveway Width (Others)	24’	35’	Yes	
Driveway Spacing (Residential)	20’	-	-	
Driveway Spacing (Commercial)	20’	-	Yes	
Corner Clearance Spacing- Upstream *	100’	-	No	NB, SB & EB
Corner Clearance Spacing- Downstream*	60’	-	No	NB, SB & WB
Median Length (Principal at Principal)	500’	-	No	NB, SB, EB & WB
Median Length (Principal at Collector)	500’	-	-	

*** Upstream Approach and Downstream Departure of Intersection**

Antoine Drive and Acorn Street

Access Management Measures	Min	Max	Met	Comments
Driveway Width (Residential)	12’	24’	Yes	
Driveway Width (Others)	24’	35’	Yes	
Driveway Spacing (Residential)	20’	-	Yes	
Driveway Spacing (Commercial)	20’	-	Yes	
Corner Clearance Spacing- Upstream *	100’	-	No	NB & EB
Corner Clearance Spacing- Downstream*	60’	-	No	SB & WB
Median Length (Principal at Principal)	500’	-	-	
Median Length (Principal at Collector)	500’	-	No	NB & SB

*** Upstream Approach and Downstream Departure of Intersection**

Antoine Drive and W 43rd Street

Access Management Measures	Min	Max	Met	Comments
Driveway Width (Residential)	**12’**	**24’**	**Yes**	
Driveway Width (Others)	**24’**	**35’**	**-**	
Driveway Spacing (Residential)	**20’**	**-**	**Yes**	
Driveway Spacing (Commercial)	**20’**	**-**	**-**	
Corner Clearance Spacing- Upstream *	**100’**	**-**	**No**	**NB, SB & WB**
Corner Clearance Spacing- Downstream*	**60’**	**-**	**No**	**EB**
Median Length (Principal at Principal)	**500’**	**-**	**No**	**EB & WB**
Median Length (Principal at Collector)	**500’**	**-**	**-**	

*** Upstream Approach and Downstream Departure of Intersection**

Antoine Drive and Saxon Drive

Access Management Measures	Min	Max	Met	Comments
Driveway Width (Residential)	**12’**	**24’**	**Yes**	
Driveway Width (Others)	**24’**	**35’**	**-**	
Driveway Spacing (Residential)	**20’**	**-**	**Yes**	
Driveway Spacing (Commercial)	**20’**	**-**	**-**	
Corner Clearance Spacing- Upstream *	**100’**	**-**	**No**	**EB & WB**
Corner Clearance Spacing- Downstream*	**60’**	**-**	**No**	**EB**
Median Length (Principal at Principal)	**500’**	**-**	**-**	
Median Length (Principal at Collector)	**500’**	**-**	**No**	**NB**

*** Upstream Approach and Downstream Departure of Intersection**

Antoine Drive and US Highway 290 North

Access Management Measures	Min	Max	Met	Comments
Driveway Width (Residential)	12’	24’	Yes	
Driveway Width (Others)	24’	35’	-	
Driveway Spacing (Residential)	20’	-	Yes	
Driveway Spacing (Commercial)	20’	-	-	
Corner Clearance Spacing- Upstream *	100’	-	Yes	
Corner Clearance Spacing- Downstream*	60’	-	Yes	
Median Length (Principal at Principal)	500’	-	No	SB
Median Length (Principal at Collector)	500’	-	-	

*** Upstream Approach and Downstream Departure of Intersection**

Antoine Drive and US Highway 290 South

Access Management Measures	Min	Max	Met	Comments
Driveway Width (Residential)	12’	24’	Yes	
Driveway Width (Others)	24’	35’	-	
Driveway Spacing (Residential)	20’	-	Yes	
Driveway Spacing (Commercial)	20’	-	-	
Corner Clearance Spacing- Upstream *	100’	-	No	EB (Consolidation Needed)
Corner Clearance Spacing- Downstream*	60’	-	No	SB & EB
Median Length (Principal at Principal)	500’	-	No	NB
Median Length (Principal at Collector)	500’	-	-	

*** Upstream Approach and Downstream Departure of Intersection**

Conclusions:

Maintaining a four-lane typical section between Tidwell Road and Bridge Forest was shown to have a significant increase in delay at the Tidwell Road intersection and increasing intersection delay from 29.8 seconds per vehicle (LOS C) to 74.7 seconds per vehicle (LOS E) during the morning peak hour and from 26.4 seconds per vehicle (LOS C) to 42.0 seconds per vehicle (LOS D) during the evening peak hour. The intersection of Antoine Drive and Victory Drive also increased in delay from 35.0 seconds per vehicle (LOS C) to 69.0 seconds per vehicle (LOS E) during the evening peak hour.

Synchro traffic simulation models were also used to determine delay associated with the peak hour rail road crossing blockage. Although the Synchro traffic simulation application does not evaluate effects between intersections, the average control delay for Tidwell Road was determined by adding the additional delay associated with the rail road crossing given the close vicinity of the rail road crossing. The construction of a grade-separated railroad overpass along Antoine Drive, just north of Tidwell Road, would reduce average control delay at the Tidwell Road intersection from 95.8 seconds per vehicle (LOS F) to 74.7 seconds per vehicle (LOS E) during the morning peak hours and from 72.0 Seconds per vehicle (LOS E) to 42.0 seconds per vehicle (LOS D) during the evening peak hour. A benefit-to-cost analysis using project cost and savings in delay would determine the feasibility of such an improvement.

An access management assessment of the corridor intersections has determined that all of the intersections have one or more non-compliant access management measures as described in the City of Houston Infrastructure Design Manual. The majority of the intersections do not meet the minimum corner clearances or median lengths as recommended (or required) by the City of Houston Infrastructure Design Manual.

APPENDIX A
Traffic Data Sheets

Trains by time at Antoine north of Tidwell 11-12-2015

Put an "X" next to the minute a train or crossing arms blocks the track and mark each subsequent minute until the train and crossing arms are up and the train is gone; repeat each occurrence;

7:00			8:00			4:00			5:00	
7:01			8:01			4:01			5:01	
7:02			8:02			4:02			5:02	
7:03			8:03			4:03			5:03	
7:04			8:04			4:04			5:04	
7:05			8:05			4:05	X		5:05	
7:06			8:06			4:06	X		5:06	
7:07			8:07			4:07			5:07	
7:08			8:08			4:08			5:08	
7:09			8:09			4:09			5:09	
7:10			8:10			4:10			5:10	X
7:11			8:11			4:11			5:11	X
7:12			8:12			4:12			5:12	
7:13			8:13			4:13			5:13	
7:14			8:14			4:14			5:14	
7:15			8:15			4:15			5:15	
7:16			8:16			4:16			5:16	
7:17			8:17			4:17			5:17	
7:18			8:18	X		4:18			5:18	
7:19			8:19	X		4:19			5:19	
7:20			8:20			4:20			5:20	
7:21	X		8:21			4:21			5:21	
7:22	X		8:22			4:22			5:22	
7:23			8:23			4:23			5:23	
7:24			8:24			4:24			5:24	
7:25			8:25	X		4:25			5:25	
7:26			8:26	X		4:26			5:26	
7:27			8:27	X		4:27			5:27	
7:28			8:28			4:28			5:28	
7:29			8:29			4:29			5:29	
7:30			8:30			4:30			5:30	
7:31			8:31			4:31	X		5:31	
7:32	X		8:32			4:32	X		5:32	
7:33	X		8:33	X		4:33			5:33	
7:34	X		8:34	X		4:34			5:34	X
7:35			8:35			4:35			5:35	X
7:36			8:36			4:36			5:36	
7:37			8:37			4:37			5:37	
7:38			8:38			4:38			5:38	
7:39			8:39			4:39			5:39	
7:40			8:40			4:40			5:40	
7:41			8:41	X		4:41			5:41	
7:42			8:42			4:42			5:42	
7:43			8:43			4:43			5:43	
7:44			8:44			4:44			5:44	
7:45			8:45			4:45			5:45	X
7:46			8:46			4:46			5:46	X
7:47			8:47			4:47			5:47	
7:48			8:48			4:48			5:48	
7:49			8:49			4:49	X		5:49	
7:50			8:50			4:50	X		5:50	
7:51			8:51			4:51	X		5:51	
7:52			8:52			4:52			5:52	
7:53			8:53			4:53			5:53	
7:54			8:54			4:54			5:54	
7:55			8:55			4:55			5:55	
7:56			8:56			4:56			5:56	
7:57			8:57			4:57			5:57	
7:58			8:58			4:58			5:58	
7:59			8:59			4:59			5:59	

APPENDIX B
Intersection Improvements

Antoine Drive Corridor

Intersection improvements consisted of making the various changes to the intersections listed below.

Intersection: Antoine Drive and Bridge Forest Drive

1. No changes made

Intersection: Antoine Drive and W Gulf Bank Road

1. No changes made

Intersection: Antoine Drive and Long Creek Lane

1. No changes made

Intersection: Antoine Drive and Victory Drive

1. Add eastbound right-turn lane to 250'
2. Add westbound right-turn lane (150')

Intersection: Antoine Drive and W Little York Road

1. No changes made

Intersection: Antoine Drive and De Soto Street

1. No changes made

Intersection: Antoine Drive and W Tidwell Road

1. Extend SB, EB, and WB left-turn lanes to 200'
2. Operate traffic signal with protected-permissive left-turns

Intersection: Antoine Drive and Pinemont Drive

1. Extend NB, SB, EB, and WB left-turn lanes to 200'
2. Operate traffic signal with protected-permissive left-turns

Intersection: Antoine Drive and Acorn Street

1. No changes made

Intersection: Antoine Drive and W 43rd Street

1. No changes made

Intersection: Antoine Drive and Saxon Drive

1. No changes made

Intersection: Antoine Drive and US Highway 290 North

1. Add exclusive southbound right-turn lane (250')
2. Add one westbound through lane to match three lane departure
3. Add exclusive westbound right-turn lane (250')

Intersection: Antoine Drive and US Highway 290 South

1. Add exclusive southbound right-turn lane (250')
2. Add exclusive westbound right-turn lane (250')

APPENDIX C
City of Houston – Access Management Design Criteria

C. ACCESS MANAGEMENT DESIGN

1. Driveways

a. Driveways and their associated openings should be located and designed to provide reasonable access between private property and the street right of way. The driveway should not create an unmanaged traffic hazard for drivers entering the street or for drivers on the through street, nor negatively impact normal use of street right of way.

b. The proper location and design of a driveway should be consistent with the safety and convenience of the public and must take into account nature and volume of traffic on abutting streets, dimensions and construction of abutting streets, use of developed property, dimensions of the developed property, and type and locations of improvements to the developed property.

c. Driveway design considers the effect of vehicles to/from developed property on the movement of traffic and the safety of traveling public on abutting streets.

d. Driveways are based on two property classifications: single family residential and all others.

e. Driveways to/from a property should include no more than the minimum number to provide reasonable access between the property and abutting street.

d. Driveway width is measured at the beginning of the driveway radii tangents within the driveway (see Figure 15.08.01). Driveway Radius is the rounded edge of a driveway that permits easier entry and exit by turning vehicles. Design standards for minimum driveway width and radius can be found in Table 15.08.01.

Figure 15.08.01 Driveway Radius and Width

Table 15.08.01 Driveway Design Criteria

	Single Family Residential				All Others			
	Radius (ft)		Width (ft)		Radius (ft)		Width (ft)	
	Max	Min	Max	Min	Max	Min	Max	Min
Two-Way	15	4	24	12	25	10	35	24
Joint-Access	15	4	24	12	25	10	35	24
One-Way	15	4	20	12	25	10	20	15

e. Notes on Driveway Design Criteria

(1) One-way driveways must intersect city streets between 45 and 90 degrees.
(2) Skewed, one-way drives are permitted only on one-way streets and divided streets with no median opening.
(3) Two-way driveways must intersect city streets at approximately 90 degrees.
(4) Where situations permit, AASHTO design vehicles may be used to justify driveway radii.
(5) No driveway radius shall encroach on abutting property or corner radius.
(6) Driveways shall not be permitted within limits of any intersection. (Design exception shall be required for major thoroughfare locations with existing esplanades and streets used for residential access.)
(7) For one-way driveways, the entry driveway shall precede exit driveways (in direction of adjacent travel lane).
(8) Driveway must remain tangential for a minimum of 20 feet past the property line.
(9) Where present or projected traffic operations indicate needs for alternative driveway geometrics, additional consideration may be given.

2. Driveways and Loading Docks/Wells/Berths

a. Loading docks/wells/berths are not permitted for back-in loading from an adjacent Major Thoroughfare.

b. Loading docks/wells/berths must be located on site to provide for approach and maneuvering on-site with appropriate space to accommodate dimensions of vehicles accessing site.

c. Loading docks/wells/berths must be located on site such that sufficient area is available to store commercial motor vehicle, truck-tractor, trailer, or semi-trailer or combination of such vehicles within the developed property and no

part of vehicle shall protrude over the property line or obstruct any public street or sidewalk in whole or in part.

3. Driveway and Corner Clearance Spacing

The distance between connections (driveway-driveway and driveway-street) is measured along the edge of traveled way from the closest edge of pavement of the first connection to the closest edge of pavement of the second connection (see Figure 15.08.02 for residential and Fig 15.08.03 for non-residential). Driveway spacing criteria for residential areas can be found in Table 15.08.02. Non-residential driveway placement criteria for intersections is shown in Figure 15.08.03 and Table 15.08.03.

Figure 15.08.02 Driveway Spacing

Table 15.08.02 Residential Driveway Spacing Criteria				
	Between Adjacent Driveways	Between Adjacent Street ROW	Between Side Property Line	Maximum Number of Driveways
	Spacing (Minimum dimension in ft)			
Single Family Residential	20(1)	20	4	2
(1) 10 foot minimum between pair of one-way driveways (2) All proposed access connections must be placed to achieve adequate intersection sight distance for safe and efficient departure from the proposed location (comply with AASHTO standard). (3) Driveway radius cannot extend beyond property line. (4) Driveway radius cannot extend into public street on other driveway curb radius.				

FIGURE 15.08.03
DRIVEWAY PLACEMENT

Table 15.08.03 Non-Residential Driveway Placement Criteria (1)

A Frontage (2)	Number of Driveways	B Minimum Driveway Offset (Primary Street)	C Minimum Driveway Offset (Intersecting Street)	D Minimum Driveway Spacing
Up to 170 feet	1	100 feet	60 feet	20 feet
170 to 250 feet	2	100 feet	60 feet	20 feet
250 to 450 feet	3	100 feet	60 feet	20 feet
> 450 feet	1 additional / 250’ frontage	100 feet	60 feet	20 feet

(1) Applicable to driveways designed for commercial traffic (auto, truck, and bus access).
(2) Where the development frontage is equal to or greater than the distance to first median opening, at least one driveway will be aligned with the existing and/or future location of the median opening.
(3) For CBD or Locations unable to comply, approval of the City Engineer required.
(4) All proposed access connections must be placed to achieve adequate intersection sight distance for safe and efficient departure from the proposed access connection (comply with AASHTO standard).
(5) The minimum driveway offset for all major thoroughfare shall be 100 feet.
(6) Driveway radius cannot extend beyond property line.
(7) Driveway radius cannot extend into public street or other driveway curb radius.

b. Notes regarding connection spacing:

(1) A pair of one-way driveways (entry and exit) should be considered as a two-way driveway for driveway spacing purposes.
(2) Spacing between one-way driveways requires the entry precedes the exit in the direction off the adjacent travel lane and the one-way pair meets spacing requirements from adjacent driveways or streets.
(3) For the special situation of multiple entry driveways placed on one-way street and exit driveways placed on a different street, two same street driveways should be considered as a one-way pair.
(4) Driveways on a street without a median should align with driveways on the opposite side of the street.
(5) Driveways shall not be placed in the intersection limits (see 15.03.I for definition of intersection limits).
(6) Driveway should be placed of a minimum offset distance of 75 ft from the median nose.

4. Medians

a. Median design involves mainly median type, opening, and length. Installing medians provides the potential for safer street operation, increased capacity, and improved aesthetics.

b. Median Openings
Median openings allow vehicles to cross opposing traffic lanes at designated locations. Requirements for median openings can be found in Chapter 10.08 of this manual.

c. Minimum Median Lengths
The minimum lengths of medians between openings are determined by the functional classification of the street and the type of interruption (thoroughfare, collector, local street, private driveway, etc.) of the adjacent openings. Requirements can be found in Chapter 10.08 of this Manual.

5. Treatments for Turning Movements

a. Turn lanes provide a refuge area for left and right turning vehicles. Turn lanes may be placed at intersection approaches, driveway approaches, and median openings to remove turning vehicles from the through lanes, thus reducing congestion and improving traffic operations, capacity, and safety.

b. Dedicated Left-Turn Lanes

(1) Left-turn lanes shall be considered in the following situations:

(a) All signalized intersection approaches along planned or existing streets having a classification of collector or higher;
(b) All unsignalized intersections and driveways along divided streets having a classification of collector or higher;
(c) All unsignalized intersections and driveways along undivided streets having a classification of thoroughfare or higher;
(d) All developments in excess of five acres located within 500 feet of the intersection of two or more thoroughfare facilities;
(e) New public or private school construction;
(f) Shopping centers and other traffic generators with a lease space in excess of one hundred thousand square feet;
(g) Places of worship.

(2) The use of dedicated left-turn lanes should also always be guided by a traffic study. The use of a left-turn lane requires approval from the City Engineer.

c. Dedicated Right-Turn Lanes

The use of dedicated right-turn lanes should always be guided by a traffic study.

6. Minimum Turning Treatment Storage Length

a. Storage length, as shown in Figure 15.08.04, is an important design element that ensures the provision of sufficient turn lane storage capacity to reduce instances of spillback. Left- and right-turn lane storage lengths must not be less than the minimum requirements outlined in Chapter 10.06 of this Manual.

Figure 15.08.04 Turn Lane Details

b. Calculating Required Storage Length (Single Lane)

The required storage length for both left- and right-turn lanes can be obtained using traffic modeling software such as the latest version of the HCM Software (HCS) or Synchro/SimTraffic. The 95th percentile queue length is a widely accepted value for storage length. The following methods may be used to determine storage length.

Signalized Storage Length
For signalized intersections, the storage length should be determined based on results from computer analysis software.

Unsignalized Storage Length
Equation 1 is used to calculate unsignalized storage length.

$$L=(V/30)(2)(S) \qquad \text{(Equation 1)}$$

Where:
L = storage length in feet
V/30 = turning volume in a two-minute interval
2 = a factor that provides for storage of all left-turning vehicles on most cycles
S = queue storage length, in feet per vehicle

15.09 TRAFFIC SIGNS

15.09.01 GENERAL

A. This section of the Design Manual contains the criteria and formats to be used in designing and preparing plans for the installation and refurbishing of traffic signs in the City of Houston. The intent is to establish standard procedures and requirements that will be used by engineering designers and consultants when designing signing for City of Houston projects. All design shall also be in accordance with the Standard Highway Sign Designs (SHSD) for Texas and with the Texas Manual of Uniform Traffic Control Devices (TMUTCD).

B. This document provides Designers and Consultants with:

1. the design requirements and guidelines for ensuring uniformity in sign types, mounting, size, and placement; and

2. the required format of plan sheets to allow ease of review, minimization of construction errors, and facilitation of maintenance.

15.09.02 DESIGN REQUIREMENTS

A. Description of Design/Review Process

TYPICAL MEDIAN OPENING C

MEDIAN INTERRUPTION FOR	1 LTB (1)	2 LTB (1)
PRIVATE DRIVE	52.5'	60'
UNDIVIDED STREET <40 44'	52.5' (1) 55' (2)	60' 60'
DIVIDED STREET ALL	D+22'	D+22'

NOTE:

(1) LTB–LEFT TURN BAY.
(2) DISTANCE FROM CENTERLINE OF OPENING TO MEDIAN NOSE WITH LEFT TURN LANE IS 30' FOR RIGHT ANGLE INTERSECTIONS. FOR INTERSECTIONS OTHER THAN 90', APPLY DESIGN VEHICLE TURNING TEMPLATE TO DETERMINE DIMENSION TO MEDIAN NOSE CUT OFF.

MIMIMUM MEDIAN LENGTH A, B

IF DIVIDED STREET IS:	INTERSECTING STREET CLASSIFICATION			
	MAJOR STREET/ THOROUGHFARE (A)	COLLECTOR STREET (A)	LOCAL STREET (A)	PRIVATE STREET OR DRIVEWAY (B)
PRINCIPAL THOROUGHFARE/ THOROUGHFARE	660'	660'	660'	660'
COLLECTOR STREET	660'	500'	350'	350'
LOCAL STREET	300'	300'	300'	300'

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

MEDIAN DESIGN
MEDIAN LENGTH AND OPENING
(NOT TO SCALE)

APPROVED BY:	APPROVED BY:
CITY ENGINEER	DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: FEB-13-2015	DWG NO: 10.06-06

PREVIOUS NO: CH 10 FIG 3

Antoine from US290 to Saxon

EXISTING SECTION

FROM US290 TO SAXON

Antoine from Saxon to Acron

EXISTING SECTION
FROM SAXON TO ACORN

Antoine from Acron to Tidwell

EXISTING SECTION

FROM ACORN TO TIDWELL

Antoine from Tidwell to Victory

EXISTING SECTION
FROM TIDWELL TO VICTORY

Antoine, Victory to BridgeForest (CIP Project)

EXISTING SECTION
FROM VICTORY TO BRIDGEFOREST

Appendix 6

Public Meeting Exhibits

Antoine at Northwest Freeway
Proposed Intersection Improvements

REBUILD HOUSTON

Legend

- Trees
- Existing ROW
- Proposed ROW
- Medians
- Sidewalk
- Pavement

N

0 75 150 300 Feet

Antoine at Tidwell
Proposed Intersection Improvements

REBUILD HOUSTON

Legend

- Trees
- Existing ROW
- Proposed ROW
- Medians
- Sidewalk
- Pavement

N

0 75 150 300 Feet