

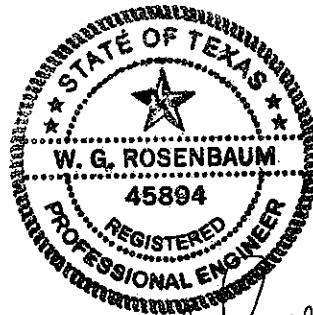
# Infrastructure Master Plan

and

# Impact Fee Determination

2007-2017

City of Tomball



*William J. Rosenbaum*  
10-22-08

Prepared by:



Lockwood, Andrews  
& Newnam, Inc.  
A LEO A DALY COMPANY

LAN Project No. 120-10520-300  
L:\119414\10520\Docs

## Table of Contents

<b>Section</b>	<b>Page</b>
1.0 PLAN OBJECTIVES	1
2.0 LAND USE PROJECTIONS	2
3.0 POPULATION PROJECTIONS	9
4.0 WATER SYSTEM	14
5.0 WASTEWATER SYSTEM	38
6.0 DRAINAGE SYSTEM	58
7.0 TRAFFIC AND TRANSPORTATION	66
8.0 PARKS	70
9.0 MAXIMUM IMPACT FEE DETERMINATION	74
<b>Tables</b>	<b>Page</b>
2-1 LAND USE CATEGORIES	3
2-2 LAND USE, 2007	4
2-3 PROJECTED LAND USE, 2017	6
2-4 PROJECTED LAND USE, CITY AND ETJ ULTIMATE BUILDOUT CONDITIONS	8
3-1 POPULATION PROJECTION COMPARISONS, 2000-2030	10
3-2 CENSUS DATA, 2000	11
3-3 POPULATION PROJECTIONS, 2007	12
3-4 POPULATION PROJECTIONS, 2017	13
4-1 WATER SUPPLY SYSTEM CAPACITIES, 2007	18
4-2 HISTORICAL WATER USE	19
4-3 WATER DEMAND FACTORS, PER ACRE BASIS	20
4-4 WATER DEMAND FACTORS, PER LAND USE TYPE	21
4-5 WATER DEMAND, 2007	22
4-6 PROJECTED WATER DEMAND, 2017	23
4-7 PROJECTED WATER DEMAND, ULTIMATE	24
4-8 WATER SUPPLY SYSTEM - PROJECTED DEMAND AND CAPITAL IMPROVEMENTS NEEDED TO SERVE THE CITY ONLY	25
4-9 WATER SUPPLY SYSTEM - PROJECTED DEMAND AND CAPITAL IMPROVEMENTS NEEDED TO SERVE THE CITY & ETJ	27
4-10 WATER SYSTEM UNIT COST DATA	29
4-11 WATER LINE PROJECTS, 2007 TO 2017	30
4-12 WATER SYSTEM SUMMARY REQUIREMENTS	32
5-1 HISTORICAL WASTEWATER TREATMENT PLANT FLOWS	41
5-2 EXISTING LIFT STATIONS	42
5-3 WASTEWATER DEMAND FACTORS, PER ACRE BASIS	43
5-4 WASTEWATER DEMAND BY SERVICE AREA, CITY ONLY, 2007	44
5-5 WASTEWATER DEMAND BY SERVICE AREA, CITY & ETJ, 2007	45
5-6 WASTEWATER DEMAND BY SERVICE AREA, CITY ONLY, 2017	46
5-7 WASTEWATER DEMAND BY SERVICE AREA, CITY & ETJ, 2017	47
5-8 WASTEWATER DEMAND BY SERVICE AREA, CITY & ETJ, ULT.	48

5-9	WASTEWATER TREATMENT PLANT - PROJECTED DEMAND VS. CAPACITY, CITY & ETJ	49
5-10	SANITARY SEWER UNIT COST DATA, 2007 DOLLARS	50
5-11	SANITARY SEWER LINE PROJECTS, 2007 TO 2017	52
5-12	WASTEWATER SYSTEM SUMMARY REQUIREMENTS	55
6-1	CITY OF TOMBALL CHANNELS	61
6-2	2007-2017 OUTFALL DRAINAGE CHANNEL IMPROVEMENTS	64
6-3	DETENTION FACILITIES	65
7-1	FUTURE ROADWAY PROJECTS	69
8-1	PARKS AND TRAILS ACREAGE	71
9-1	LUE EQUIVALENTS	80
9-2	WATER SYSTEM COST PER LUE	81
9-3	WASTEWATER SYSTEM COST PER LUE	82
9-4	DRAINAGE SYSTEM COST PER ACRE	83
9-5	DEBT SERVICE	84
9-6	DEBT SERVICE CREDITS	85
9-7	DERIVATION OF MAXIMUM WATER AND WASTEWATER IMPACT FEES	86
9-8	DERIVATION OF MAXIMUM DRAINAGE IMPACT FEES	87
9-9	DISPOSITION OF COLLECTED IMPACT FEES	88

## **Exhibits**

2-1	OVERALL LAND USE MAP
2-2	LAND USE MAP SUB AREA NO. 1
2-3	LAND USE MAP SUB AREA NO. 2
2-4	LAND USE MAP SUB AREA NO. 3
2-5	LAND USE MAP SUB AREA NO. 4
2-6	LAND USE MAP SUB AREA NO. 5
4-1	WATER SYSTEM WITH WATER PRESSURE CONTOURS
5-1	SANITARY SEWER SYSTEM WITH SERVICE AREAS
5-2	WATER AND SANITARY SEWER SYSTEM OVERALL
6-1	RELIEF MAP WITH FLOODPLAIN
6-2	FEMA FLOODPLAIN MAP
6-3	AERIAL PHOTO WITH 2007 FLOODPLAIN AND WATERSHED BOUNDARIES
6-3A	WATERSHED BOUNDARY MAP
7-1	EAST-WEST MAJOR THOROUGHFARE ALTERNATIVES
7-2	AGG ROAD BYPASS
8-1	PARK MAP

**INFRASTRUCTURE MASTER PLAN AND  
IMPACT FEE DETERMINATION 2007-2017  
CITY OF TOMBALL**

**1.0 PLAN OBJECTIVES**

The objectives of the 2007-2017 City of Tomball Infrastructure Master Plan and Impact Fee Determination are to estimate the growth within the City Limits and within the City's Extraterritorial Jurisdiction (ETJ) from 2007 to 2017 and at Ultimate Buildout, to determine the infrastructure needs to accommodate that growth, and to estimate the cost and impact fees related to those infrastructure improvements.

The City has used Infrastructure Master Plans for some time as a tool to guide the growth and sequencing of its water, wastewater, drainage, parks and roadway infrastructure systems. Previous Master Plans were published in 1969, 1982, 1986, 1996, 1999 and 2002.

Growth typically occurs both from a conversion of undeveloped properties to a developed state and from redevelopment of an existing land use. Current land use and redevelopment trends are important factors in the projected growth. The ETJ also plays a significant factor in the projected growth because this is the area that may one day be annexed into the City Limits and therefore may be eligible for City services. Thus this study presents the projected development of the land within the City Limits and ETJ and the corresponding demand on the infrastructure systems along with projected improvements to meet those demands.

The steps used to develop this Master Plan are summarized below:

- Estimate the land use by category in 2007 within the City and ETJ
- Estimate the 2007 population within the City and ETJ
- Estimate the future in land use within the City and ETJ during the study period
- Estimate the future population and service needs as a result of those land use changes
- Determine the Infrastructure improvements needed as a result of those changes
- Estimate the cost of the those Improvements
- Determine the Impact Fees related to those costs

## 2.0 LAND USE PROJECTIONS

Currently the City of Tomball comprises approximately 7,429 acres (11.6 square miles). Another 5,905 acres are contained within the City's Extraterritorial Jurisdiction which extends beyond the City limits and contains property that may one day be annexed into the City, as shown in **Exhibit 2-1**. The total area within the City and ETJ is 13,334 acres (20.8 square miles).

The land uses within the City limits and the ETJ are monitored by the City Planning and Public Works staff. City staff uses a Geographic Information System (GIS) to record and update changes to its land use base mapping system. The current GIS files delineate the City into five sub-areas and further identify each specific property into one of a multiple of land use categories. For the purposes of this study, some of the land use categories were combined as shown in **Table 2-1**, page 3. For the Exhibits, land use categories were aggregated into the following six categories:

- single-family
- multi-family
- commercial/retail/office
- industrial
- public
- drainage

The land uses within the City, the ETJ and within the five sub-areas are shown in **Exhibits 2-2 thru 2-6**. City staff has provided information on new and potential projects that are likely to be developed within the 2007-2017 timeframe. Those properties are shown as "Future" land uses in the Exhibits.

The area of each 2007 land use category within the City limits and ETJ is additionally summarized in **Table 2-2**, pages 4 and 5; **Table 2-3**, pages 6 and 7 summarizes the 2017 land uses; and **Table 2-4**, page 8 summarizes the land uses at Ultimate Buildout.

<b>Table 2-1</b>		
<b>Land Use Categories</b>		
<b>The City of Tomball Land Use Categories</b>	<b>- are shown in the Land Use Exhibits as</b>	<b>-and are listed in the Land Use Tables as</b>
Single Family	Single Family	Single Family, Average or Large Lots
Single Attached	Single Family	Single Family, Average Lots
Two Family	Single Family	Single Family, Average Lots
Multi-Family	Multi-Family	Multi-Family & Mobile Home
Commercial / Retail / Office	Commercial / Retail / Office	Commercial / Retail / Office
Industrial	Industrial	Industrial
Institutional	In Multi-Family, Commercial & Public	Institutional (Group Quarters - Nursing Homes, Assisted Living Homes)
Institutional	Public	Schools / Hospital
Parks / Open Space	Public	Parks / Open Space / Utilities
Utilities	Public	Parks / Open Space / Utilities
Drainage	Drainage	Drainage (HCFCD Right-of-Ways)
Vacant		Vacant Land (Developable Land, Undevelopable Land, Flood Zones, Street ROW)

<b>Table 2-2</b>							
<b>Land Use, 2007</b>							
<b>Within the City Limits</b>	<b>Sub Area 1</b>	<b>Sub Area 2</b>	<b>Sub Area 3</b>	<b>Sub Area 4</b>	<b>Sub Area 5</b>	<b>Total Area</b>	
	(Acres)	(Acres)	(Acres)	(Acres)	(Acres)	(Acres)	
Single Family, Average Lots	149	166	113	184	122	734	(2)
Single Family, Large Lots	334	273	95	121	0	823	(1)
Multi-Family & Mobile Home	42	9	0	39	0	90	(2)
Commercial / Retail / Office	107	74	56	204	162	603	(2)
Industrial	11	7	91	34	2	145	(2)
Institutional (Group Quarters - Nursing Homes, Assisted Living Homes)	5	9	0	24	0	38	(5)
Institutional (Schools / Hospital / Churches)	414	80	90	177	4	765	(2)
Parks / Open Space / Utilities	52	46	54	30	0	182	(2)
Drainage (HCFCD Right-of-Ways)	34	47	2	37	0	120	(2)
Vacant Land (Developable Land, Undevelopable Land, Flood Zones, Street ROW)	<u>718</u>	<u>1,076</u>	<u>673</u>	<u>990</u>	<u>472</u>	<u>3,929</u>	(4)
<b>Total City</b>	<b>1,866</b>	<b>1,787</b>	<b>1,174</b>	<b>1,840</b>	<b>762</b>	<b>7,429</b>	<b>(2)</b>
<b>Within the ETJ</b>	<b>Sub Area 1</b>	<b>Sub Area 2</b>	<b>Sub Area 3</b>	<b>Sub Area 4</b>	<b>Sub Area 5</b>	<b>Total Area</b>	
	(Acres)	(Acres)	(Acres)	(Acres)	(Acres)	(Acres)	
Single Family, Average Lots	0	16	239	0	45	300	(1)
Single Family, Large Lots	55	235	27	22	712	1,051	(1)
Multi-Family & Mobile Home	0	0	0	0	0	0	(2)
Commercial / Retail / Office	0	50	0	1	184	235	(2)
Industrial	0	27	12	0	0	39	(2)
Institutional (Group Quarters - Nursing Homes, Assisted Living Homes)	0	0	0	0	0	0	(5)
Institutional (Schools / Hospital)	0	0	0	0	0	0	(2)
Parks / Open Space / Utilities	8	0	7	0	5	20	(2)
Drainage (HCFCD Right-of-Ways)	0	0	0	78	19	97	(2)
Vacant Land (Developable Land, Undevelopable Land, Flood Zones, Street ROW)	<u>866</u>	<u>1,362</u>	<u>377</u>	<u>359</u>	<u>1,199</u>	<u>4,163</u>	(4)
<b>Total ETJ</b>	<b>929</b>	<b>1,690</b>	<b>662</b>	<b>460</b>	<b>2,164</b>	<b>5,905</b>	<b>(2)</b>
(1) The total area of single family large lot subdivisions has not increased since the 2002 Masterplan. The total area of all single family lots within the City Limits as shown in the GIS files is 1,583 acres.							
(2) From City of Tomball 2007 GIS shape files							
(3) From City of Tomball 2002 Masterplan							
(4) Balance of total							
(5) Assumed							

<b>Table 2-2</b>						
<b>Land Use, 2007</b>						
<b>Within Combined City and ETJ</b>	<b>Sub Area 1</b>	<b>Sub Area 2</b>	<b>Sub Area 3</b>	<b>Sub Area 4</b>	<b>Sub Area 5</b>	<b>Total Area</b>
	<b>(Acres)</b>	<b>(Acres)</b>	<b>(Acres)</b>	<b>(Acres)</b>	<b>(Acres)</b>	<b>(Acres)</b>
Single Family, Average Lots	149	182	352	184	167	1,034
Single Family, Large Lots	389	508	122	143	712	1,874
Multi-Family & Mobile Home	42	9	0	39	0	90
Commercial / Retail / Office	107	124	56	205	346	838
Industrial	11	34	103	34	2	184
Institutional (Group Quarters - Nursing Homes, Assisted Living Homes)	5	9	0	24	0	38
Institutional (Schools / Hospital / Churches)	414	80	90	177	4	765
Parks / Open Space / Utilities	60	46	61	30	5	202
Drainage (HCFCD Right-of-Ways)	34	47	2	115	19	217
<u>Vacant Land (Developable Land, Undevelopable Land, Flood Zones, Street ROW)</u>	<u>1,584</u>	<u>2,438</u>	<u>1,050</u>	<u>1,349</u>	<u>1,671</u>	<u>8,092</u>
<b>Total City and ETJ</b>	<b>2,795</b>	<b>3,477</b>	<b>1,836</b>	<b>2,300</b>	<b>2,926</b>	<b>13,334</b>



<b>Table 2-3</b>													
<b>Projected Land Use, 2017</b>													
<b>Within the City Limits</b>	<b>Sub Area</b>	<b>Sub Area</b>	<b>Sub Area</b>	<b>Sub Area</b>	<b>Sub Area</b>	<b>Total</b>							
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>Area</b>							
	<b>(Acres)</b>	<b>(Acres)</b>	<b>(Acres)</b>	<b>(Acres)</b>	<b>(Acres)</b>	<b>(Acres)</b>	<b>(Acres)</b>						
Single Family, Average Lots	400	858	223	355	192	2,028							
Single Family, Large Lots	334	273	95	121	0	823	(1)						
Multi-Family & Mobile Home	42	23	0	39	0	104	(2)						
Commercial / Retail / Office	152	82	83	397	411	1,125	(2)						
Industrial	11	11	363	58	2	445	(2)						
Institutional (Group Quarters - Nursing Homes, Assisted Living Homes)	5	9	0	38	0	52	(5)						
Institutional (Schools / Hospital / Churches)	450	80	90	218	4	842	(2)						
Parks / Open Space / Utilities	52	46	54	30	0	182	(2)						
Drainage (HCFCD Right-of-Ways)	34	47	2	37	14	134	(2)						
<u>Vacant Land (Developable Land, Undevelopable Land, Flood Zones, Street ROW)</u>	<u>386</u>	<u>358</u>	<u>264</u>	<u>547</u>	<u>139</u>	<u>1,694</u>	<u>(4)</u>						
<b>Total City</b>	<b>1,866</b>	<b>1,787</b>	<b>1,174</b>	<b>1,840</b>	<b>762</b>	<b>7,429</b>	<b>(2)</b>						
<b>Within the ETJ</b>	<b>Sub Area</b>	<b>Sub Area</b>	<b>Sub Area</b>	<b>Sub Area</b>	<b>Sub Area</b>	<b>Total</b>							
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>Area</b>							
<b>Land Use</b>	<b>(Acres)</b>	<b>(Acres)</b>	<b>(Acres)</b>	<b>(Acres)</b>	<b>(Acres)</b>	<b>(Acres)</b>	<b>(Acres)</b>						
Single Family, Average Lots	0	132	271	0	89	492							
Single Family, Large Lots	55	217	27	22	712	1,033	(1)						
Multi-Family & Mobile Home	0	0	0	0	0	0	(2)						
Commercial / Retail / Office	0	245	21	1	385	652	(2)						
Industrial	0	27	12	0	0	39	(2)						
Institutional (Group Quarters - Nursing Homes, Assisted Living Homes)	0	0	0	0	0	0	(5)						
Institutional (Schools / Hospital)	0	0	90	0	0	90	(2)						
Parks / Open Space / Utilities	8	0	7	0	5	20	(2)						
Drainage (HCFCD Right-of-Ways)	0	0	0	78	53	131	(2)						
<u>Vacant Land (Developable Land, Undevelopable Land, Flood Zones, Street ROW)</u>	<u>866</u>	<u>1,069</u>	<u>234</u>	<u>359</u>	<u>920</u>	<u>3,448</u>	<u>(4)</u>						
<b>Total ETJ</b>	<b>929</b>	<b>1,690</b>	<b>662</b>	<b>460</b>	<b>2,164</b>	<b>5,905</b>	<b>(2)</b>						
(1) The total area of single family large lot subdivisions has not increased since the 2002 Masterplan.													
(2) From City of Tomball 2007 GIS shape files													
(3) From City of Tomball 2002 Masterplan													
(4) Balance of total													
(5) Assumed													

<b>Table 2-3</b>						
<b>Projected Land Use, 2017</b>						
<b>City Limits &amp; ETJ Combined</b>	<b>Sub Area 1</b>	<b>Sub Area 2</b>	<b>Sub Area 3</b>	<b>Sub Area 4</b>	<b>Sub Area 5</b>	<b>Total Area</b>
	<b>(Acres)</b>	<b>(Acres)</b>	<b>(Acres)</b>	<b>(Acres)</b>	<b>(Acres)</b>	<b>(Acres)</b>
Single Family, Average Lots	400	990	494	355	281	2,520
Single Family, Large Lots	<u>389</u>	<u>490</u>	<u>122</u>	<u>143</u>	<u>712</u>	<u>1,856</u>
Single Family Total	789	1,480	616	498	993	4,376
Multi-Family & Mobile Home	42	23	0	39	0	104
Commercial / Retail / Office	152	327	104	398	796	1,777
Industrial	11	38	375	58	2	484
Institutional (Group Quarters - Nursing Homes, Assisted Living Homes)	5	9	0	38	0	52
Institutional (Schools / Hospital / Churches)	450	80	180	218	4	932
Parks / Open Space / Utilities	60	46	61	30	5	202
Drainage (HCFCD Right-of-Ways)	34	47	2	115	67	265
Vacant Land (Developable Land, Undevelopable Land, Flood Zones, Street ROW)	<u>1,252</u>	<u>1,427</u>	<u>498</u>	<u>906</u>	<u>1,059</u>	<u>5,142</u>
<b>Total City &amp; ETJ</b>	<b>2,795</b>	<b>3,477</b>	<b>1,836</b>	<b>2,300</b>	<b>2,926</b>	<b>13,334</b>

<b>From the 2002 Masterplan</b>	<b>Sub Area 1</b>	<b>Sub Area 2</b>	<b>Sub Area 3</b>	<b>Sub Area 4</b>	<b>Sub Area 5</b>	<b>Total Area</b>	<b>% of Total</b>
	(Acres)	(Acres)	(Acres)	(Acres)	(Acres)	(Acres)	
Single Family	1,295	1,275	300	441	335.0	3,646	29.1%
Multi Family	70	65	30	125	35.0	325	2.6%
Commercial	575	481	365	452	548.0	2,421	19.4%
Industrial	125	580	849	515	780.0	2,849	22.8%
Institutional	300	50	115	185	35.0	685	5.5%
Parks/Open Space	64	275	100	212	100.0	751	6.0%
Public Utility	5	65	7	35	25.0	137	1.1%
Floodplain	443	501	86	374	290.0	1,694	13.5%
<b>Total</b>	<b>2,877</b>	<b>3,292</b>	<b>1,852</b>	<b>2,339</b>	<b>2,148.0</b>	<b>12,508</b>	<b>100.0%</b>
<b>2002 Masterplan Figures adjusted for new areas and growth patterns</b>	<b>Projected Land Use City &amp; ETJ 2007</b>	<b>Projected Land Use City &amp; ETJ 2017</b>	<b>Projected Land Use Change 2007-2017</b>	<b>Proj Land Use Change as % of Vacant Land Area Change</b>	<b>Land Use Change, 2017- Ultimate (1)</b>	<b>Ultimate Land Use</b>	<b>% of Total</b>
	(Acres)	(Acres)	(Acres)		(Acres)	(Acres)	
Single Family Total	2,908	4,376	1,468	50.6%	1,878.4	6,254	46.9%
Multi-Family & Mobile Home	90	104	14	0.5%	17.9	122	0.9%
Commercial / Retail / Office	838	1,777	939	32.4%	1,201.4	2,978	22.3%
Industrial	184	484	300	10.3%	383.8	868	6.5%
Institutional (Group Quarters - Nursing Homes, Assisted Living Homes)	38	52	14	0.5%	17.9	70	0.5%
Institutional (Schools / Hospital)	765	932	167	5.8%	213.7	1,146	8.6%
Parks / Open Space / Public Utility	202	202	0	0.0%	0.0	202	1.5%
Undev. Vacant Land & Floodplain	8,309	5,407	-2,902	100.0%	-3,713.0	1,694	12.7%
<b>Total City &amp; ETJ, 2017</b>	<b>13,334</b>	<b>13,334</b>	<b>0</b>		<b>0.1</b>	<b>13,334</b>	<b>100.0%</b>

(1) Assuming the same % Distribution of Change for "2017 - Ultimate" as projected for "2007 - 2017"

### 3.0 POPULATION PROJECTIONS

The last official population census of the City was conducted by the U. S. Census Bureau in conjunction with the 2000 Census. The population within the city boundaries in the year 2000 was estimated at 9,089.

The Houston-Galveston Area Council (HGAC) and the Texas Water Development Board (TWDB) routinely prepare population projections for many communities within Texas. HGAC has prepared population projections for Census Tract 5554 (Tomball) for each year from 2007 to 2035. Additionally, the TWDB prepared a Regional Water Plan in 2006 which included population projections for the City of Tomball for each decade from 2010 thru 2060.

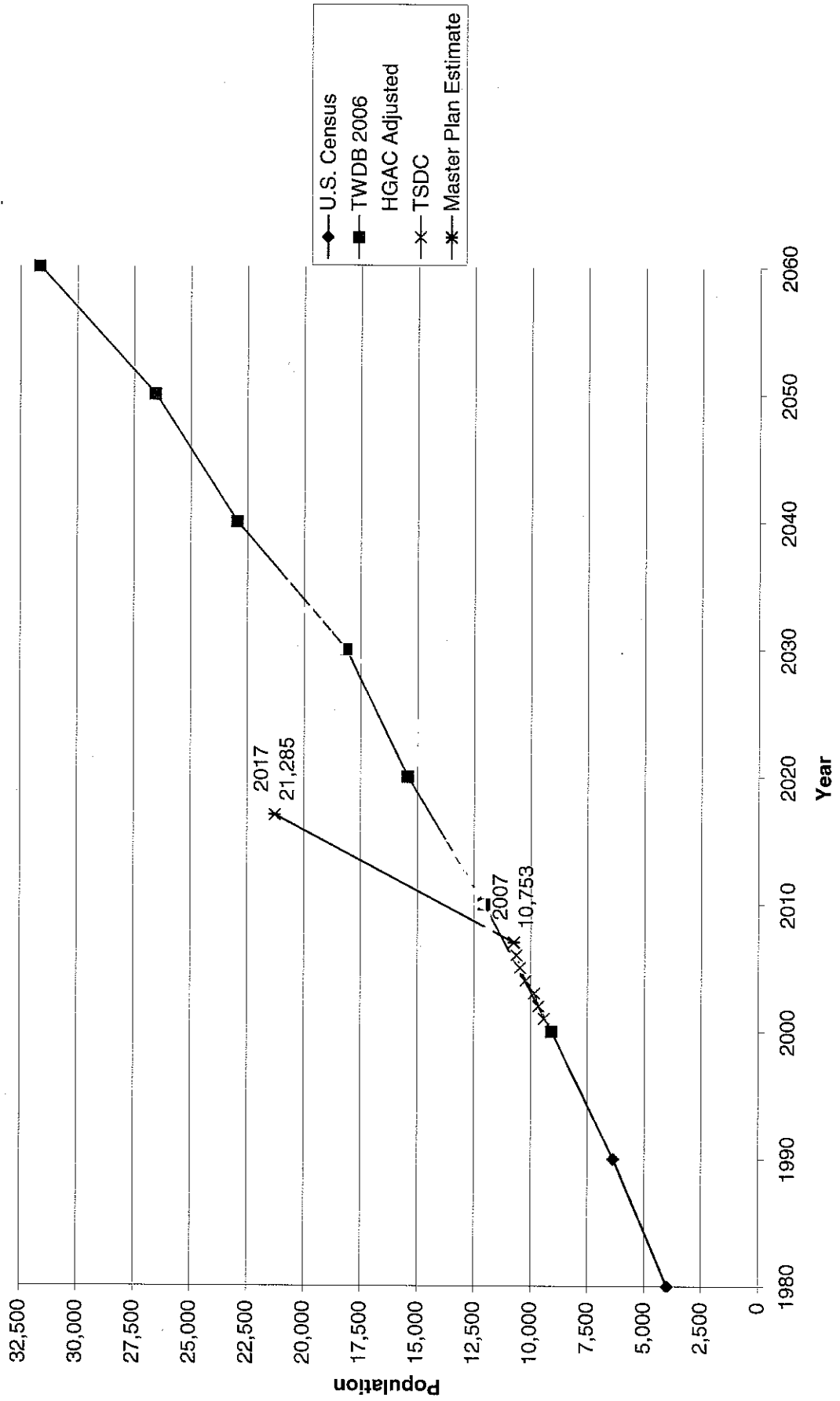
The population projections from these studies are graphed on **Exhibit 3-1**. The population for the years 2000, 2010, 2020 and 2030 with linear interpolations for years 2007 and 2017 are shown in **Table 3-1**, page 10. The 2007 population range is 11,168 to 11,765 and the 2017 population range is 13,783 to 14,418.

Independent population projections for the 2007 population within the City limits and the ETJ have been made using the area of each category of Land Use in 2007 as previously determined in **Table 2-1**, with the Land Use Densities assumptions from the 2002-2012 City of Tomball Masterplan and the Population Densities from the 2000 U.S. Census Bureau for Tomball shown in **Table 3-2**, page 11.

**Table 3-3**, page 12, shows the 2007 projection for the City population as 10,753, the ETJ as 3,633 and the combined total as 14,386.

As shown in **Table 3-4**, page 13, the projected population for the City in 2017 is 21,285, for the ETJ is 5,040 and for the combined total is 26,325.

**Exhibit 3-1  
City of Tomball Population Projections**



<b>Table 3-1</b>								
<b>Population Projection Comparisons, 2000-2030</b>								
<b>Within the Tomball City Limits</b>								
<b>Study / Year</b>	<b>2000</b>	<b>2007</b>	<b>2010</b>	<b>2012</b>	<b>2017</b>	<b>2020</b>	<b>2030</b>	
HGAC Projections for Tract 5554 (1)	9,089	11,765	12,256	12,819	13,783	14,690	18,563	
TWDB 2006 Regional Water Plan Population Projections for the City of Tomball	9,089	11,168	(2) 12,059	12,733	(2) 14,418	(2) 15,429	18,150	
(1) The boundary of Census Tract 5554 is slightly different than the City of Tomball boundary. An adjustment was made to the population in year 2000 to match the City Census population and the adjustment was carried forward								
(2) Linear interpolation								

**Table 3-2  
Census Data, 2000**

<u>2000 Census Data</u>	
Owner occupied housing units	1531
Renter occupied housing units	2029
<u>Vacant housing units</u>	<u>449</u>
Total housing units	4009
Average Household Size	2.43
Ave Household size Owner Occupied Unit	2.66
Ave Household size Renter Occupied Unit	2.26
Population	9089

% Vacancy of Total Housing Units =	11.2%
% of Total Housing Units Occupied =	88.8%

**Tomball Master Plan, 2002  
Land Use Density**

Single Family, Average Lots	2.8
Single Family, Large Lots	0.5
MultiFamily & Mobile Home	15

<b>Table 3-3</b>								
<b>Population Projections, 2007</b>								
<b>Within the City Limits</b>	<b>Total Area</b>		<b>Land Use Density</b>				<b>Population Density</b>	
	<b>(Acres)</b>		<b>(Units/ac)</b>			<b>Units</b>	<b>(People/Unit)</b>	<b>Population</b>
Single Family, Average Lots	734	(1)	2.8	(3)	2055	2.66	(3)	5,466
Single Family, Large Lots	823	(1)	0.5	(3)	412	2.66	(3)	1,096
Multi-Family & Mobile Home	90	(2)	15	(3)	1350	2.26	(3)	3,051
Commercial / Retail / Office	603	(2)						
Industrial	145	(2)						
Institutional (Group Quarters - Nursing Homes, Assisted Living Homes)	38	(5)	20.0	(5)	760	1.5	(3)	1,140
Schools / Hospital	765	(2)						
Public Parks / Open Space / Utilities	182	(2)						
Drainage (HCFCD Right-of-Ways)	120	(2)						
<u>Vacant Land (Developable Land, Undevelopable Land, Flood Zones, Street ROW)</u>	<u>3,929</u>	(4)	-					
<b>Total City</b>	<b>7,429</b>	(2)			<b>4577</b>			<b>10,753</b>
<b>Within the ETJ</b>	<b>Total Area</b>		<b>Land Use Density</b>				<b>Population Density</b>	
	<b>(Acres)</b>		<b>(Units/ac)</b>			<b>Units</b>	<b>(People/Unit)</b>	<b>Population</b>
Single Family, Average Lots	300	(1)	2.8	(3)	840	2.66	(3)	2,234
Single Family, Large Lots	1,051	(1)	0.5	(3)	526	2.66	(3)	1,399
Multi-Family & Mobile Home	0	(2)	15	(3)	0	2.26	(3)	0
Commercial / Retail / Office	235	(2)						
Industrial	39	(2)						
Institutional (Group Quarters - Nursing Homes, Assisted Living Homes)	0	(5)	20.0	(5)	0	1.5	(3)	0
Schools / Hospital	0	(2)						
Public Parks / Open Space / Utilities	20	(2)						
Drainage (HCFCD Right-of-Ways)	97	(2)						
<u>Vacant Land (Developable Land, Undevelopable Land, Flood Zones, Street ROW)</u>	<u>4,163</u>	(4)	-					
<b>Total ETJ</b>	<b>5,905</b>	(2)						<b>3,633</b>
<b>Total City and ETJ</b>	<b>13,334</b>							<b>14,386</b>
(1) From the City of Tomball 2007 GIS shape files and assuming no increase in the large lot subdivision acreage								
(2) From City of Tomball 2007 GIS shape files								
(3) From City of Tomball 2002 Masterplan								
(4) Balance of total								
(5) Assumed								
(6) From the 2000 Census Data for the City of Tomball								



<b>Table 3-4</b>								
<b>Population Projections, 2017</b>								
<b>Within the City Limits</b>		<b>Total Area</b>	<b>Land Use Density</b>			<b>Population Density</b>		
<b>Land Use Type</b>	<b>(Acres)</b>	<b>(Units/ac)</b>		<b>Units</b>	<b>(People/Unit)</b>		<b>Population</b>	
Single Family, Average Lots	2,028		2.8	(3)	5678	2.66	(6)	15,103
Single Family, Large Lots	823	(1)	0.5	(3)	412	2.66	(6)	1,096
Multi-Family & Mobile Home	104	(2)	15	(3)	1560	2.26	(6)	3,526
Commercial / Retail / Office	1,125	(2)						
Industrial	445	(2)						
Institutional (Group Quarters - Nursing Homes, Assisted Living Homes)	52	(2)	20.0	(5)	1040	1.5	(3)	1,560
Schools / Hospital	842	(2)						
Public Parks / Open Space / Utilities	182	(2)						
Drainage (HCFCD Right-of-Ways)	134	(2)						
Vacant Land (Developable Land, Undevelopable Land, Flood Zones, Street ROW)	1,694	(4)	-					
<b>Total City</b>	<b>7,429</b>	<b>(2)</b>						<b>21,285</b>
<b>Within the ETJ</b>		<b>Total Area</b>	<b>Land Use Density</b>			<b>Population Density</b>		
	<b>(Acres)</b>	<b>(Units/ac)</b>		<b>Units</b>	<b>(People/Unit)</b>		<b>Population</b>	
Single Family, Average Lots	492		2.8	(3)	1378	2.66	(6)	3,665
Single Family, Large Lots	1,033	(1)	0.5	(3)	517	2.66	(6)	1,375
Multi-Family & Mobile Home	0	(2)	15	(3)	0	2.26	(6)	0
Commercial / Retail / Office	652	(2)						
Industrial	39	(2)						
Institutional (Group Quarters - Nursing Homes, Assisted Living Homes)	0	(5)	20.0	(5)	0	1.5	(3)	0
Schools / Hospital	90	(2)						
Public Parks / Open Space / Utilities	20	(2)						
Drainage (HCFCD Right-of-Ways)	131	(2)						
Vacant Land (Developable Land, Undevelopable Land, Flood Zones, Street ROW)	3,448	(4)	-					
<b>Total ETJ</b>	<b>5,905</b>	<b>(2)</b>						<b>5,040</b>
<b>Total City and ETJ</b>	<b>13,334</b>							<b>26,325</b>
(1) From the City of Tomball 2007 GIS shape files and assuming no increase in the large lot subdivision acreage								
(2) From City of Tomball 2007 GIS shape files								
(3) From City of Tomball 2002 Masterplan								
(4) Balance of total								
(5) Assumed								
(6) From the 2000 Census Data for the City of Tomball								

## **4.0 WATER SYSTEM**

### **4.1 EXISTING WATER SYSTEM**

The City Water System consists of two Water Supply, Storage and Pumping facilities (Water Plants), two Elevated Storage Tanks and an extensive Water Distribution System. The two Water Plants, one located on Pine Street and other on Baker Drive, the two Elevated Storage Tanks and the network of Water Distribution lines are shown on **Exhibit 4-1**.

#### **4.1.1 Water Supply, Storage and Pumping Facility Details**

**The Pine Street Water Plant** has two on-site water wells and an off-site water well. Onsite Well #1 pumps from the Chicot Aquifer and currently has a capacity of **544 gallons per minute (gpm)**. Onsite Well #2, located a distance of approximately 200 feet from Well #1, pumps from the Evangeline Aquifer and currently has a capacity of **1,689 gpm**. Offsite Well #3, located on School Street, pumps from the Chicot Aquifer to the Pine Street Water Plant directly and currently has a capacity of **559 gpm**.

This water plant also has 400,000 gallons of ground storage, 750,000 gallons of elevated storage, three booster pumps rated at 1662 gpm, 1586 gpm and 1067 gpm and related disinfection and metering equipment.

**The Baker Street Water Plant** has an on-site well that pumps from the Evangeline Aquifer and currently has a capacity of **889 gpm**. This well originally had a capacity of 1,200 gpm but has been operated at a reduced rate in order to minimize the withdrawal of gas with the groundwater.

This facility also has 200,000 gallons of elevated storage, but because the tank bowl is below the operating pressure plane it essentially operates as a ground storage tank. This facility also has three booster pumps rated at 600 gpm, 500 gpm and 500 gpm and related disinfection and metering equipment.

**The Ulrich Road Elevated Storage Tank** is a 500,000 gallon storage facility is the primary "control" tower for the pressure pumping operations for both Water Plants. The existing capacities of the Water Plants are shown in **Table 4-1**, page 18.

#### **4.1.2 Water Distribution System Details**

The City's water distribution system consists of approximately 86 miles of 1.5 inch to 12-inch diameter water lines. Existing water line pipe materials consist of iron, steel and polyvinylchloride. The systems oldest lines were initially constructed in the late 1950's. The water distribution system is shown on **Exhibit 4-1**.

## 4.2 HISTORICAL WATER USE

The City has been tracking water usage each month by land use category - residential, commercial, public municipal and flushed/emergency. Beginning in 2002, the City separated the residential water use category into single family and multi family water usage.

The City also been tracking the number of meters by land use category i.e. residential (single family and multi family combined), commercial and public. The number of multi family master meters was known to be 95 in 2002 and is known today to be 96. By separating the meter counts into single family and multi family, an average water usage by meter (or gpd per unit) for single family and multi family can be calculated. Additionally, using the 2000 Census Data for Percent Occupancy and the Population per Housing Unit from **Table 3-2**, an estimation of the population can be made for each year.

The actual water use for the City of Tomball for years 2002 thru 2006 is shown in **Table 4-2**, page 19 along with the actual single family and multi family meter count (unit count) and the estimated population.

As shown in the table, the Average Daily Water Demand per Meter (or Unit) for single family usage ranges from 313-365 gpd. Thus the estimated average usage of 340 gpd increased by 10% to **374 gpd per single family meter** (living unit equivalent), as developed in the 2002 Master Plan, appears to be very representative and will be used throughout this report.

## 4.3 STATE DESIGN CRITERIA

The Texas Commission on Environmental Quality (TCEQ) criteria, which is specified in TAC, Title 30, Part I, Chapter 290, Subchapter D, Rules and Regulations for Public Water System, 9/13/00, provides minimum acceptable design and construction practices to ensure that facilities are properly sized to produce and distribute a safe potable water. The following criteria are used in this report:

Connection - A single residential unit or each commercial or industrial establishment to which drinking water is supplied from the system (§290.38).

Maximum Daily Demand - 2.4 times average daily demand (§290.38).

Peak Hourly Demand - 1.25 times maximum daily demand (prorated to an hourly rate) (§290.38).

Minimum Water System Capacity Requirements (§290.45)

### **Wells**

2 or more - total capacity of 0.6 gallons per minute (gpm) per connection.

**Storage**

Total capacity of 200 gallons per connection, including elevated storage of 100 gallons per connection

**Booster Pumps, the lesser of**

Two or more pumps with total capacity of 2 gpm per connection, or Minimum of 1,000 gpm with capacity to meet peak hourly demands with the largest pump out of service

**Nominal Operating Pressure**

35 psi throughout system  
20 psi minimum during firefighting

**4.4 ADEQUACY OF EXISTING SYSTEM**

The water supply, storage, and booster pumps are required to have minimum capacities based on the number of connections served and the delivery of water at minimum pressures. The existing water system capacities, shown on **Table 4-1**, page 18, were compared with minimum TCEQ criteria and the results are presented below:

	<u>Existing Capacity</u>	<u>Required Capacity</u>	<u>Adequacy</u>
Wells	3,681 gpm	3,582 gpm	OK
Firm Booster Pump Capacity	4,253 gpm	4,651 gpm	-511 gpm
Total Storage	1,850,000 gal	1,193,859 gal	OK
Elevated Storage	1,250,000 gal	596,929 gal	OK

All system elements, except booster pump capacity, currently meet the minimum TCEQ criteria.

**4.5 PROPOSED IMPROVEMENTS**

In order to determine the minimum TCEQ requirements thru 2017 and at Ultimate Buildout, a projection of the water demand must be made. **Table 4-3**, page 20, shows the Water Demand Factors on a Per Acre Basis from the 2002 Tomball Master Plan. **Table 4-4**, page 21, shows the Water Demand Factors per Land Use Type also from the 2002 Master Plan. These water demand factors will be used throughout this report.

The Land Use areas in 2007 from Table 2-2 were combined with the Water Demand Factors on a Per Acre Basis from Table 4-3 to produce an estimated Water Demand within the City Limits in 2007 of 815 million gallons (MG), as shown in **Table 4-5**, page 22.

Likewise, the projected Land Use areas in 2017 from Table 2-3 were combined with the Water Demand Factors from Table 4-3 to estimate the Water Demand for 2017 which resulted in a demand of 1,509 MG within the City and 1,905 MG within the City and ETJ combined, as shown in Table 4-6, page 23. Table 4-7, page 24, shows the projected Water Demand at Ultimate Buildout.

Table 4-8, pages 25 and 26, shows the projected Water Demand from 2007 to 2017 within the City Limits only, the Water System Capacities and the Improvements needed to meet that demand.

Table 4-9, pages 27 and 28, shows the projected Water Demand from 2007 to 2017 within the City Limits and ETJ combined, the Water System Capacities and the Improvements needed to meet that demand.

Below is a summary of TCEQ required capacities to serve the City and ETJ in 2017, the existing capacities in 2007 and the minimum additional capacity needed:

<u>Component</u>	<u>Min. Cap. Required Per TCEQ in 2017</u>	<u>Capacity in 2007</u>	<u>Min. Additional Capacity Needed</u>
Wells (gpm)	8,374	3,681	4,693
Firm Booster Capacity (gpm)	10,874	4,253	6,621
Total Storage (gallons)	2,791,200	1,850,000	941,200
Elevated Storage (gallons)	1,750,000	1,250,000	500,000

The additional capacities have been rounded to the next nominal capacity level and are listed below:

<u>Component</u>	<u>Additional Capacity Proposed</u>
Wells (gpm)	5,000
Firm Booster Capacity (gpm)	7,000
Total Storage (gallons)	1,300,000
Elevated Storage (gallons)	500,000
Ground Storage (gallons)	800,000

In addition to the water supply improvements, additional water mains will be needed to provide service in the future. Table 4-10, page 29 shows Unit Cost Data in 2007 Dollars, used to estimate the construction cost of the future Water Line projects. Table 4-11, pages 30 and 31, lists the Water Line Projects needed from 2007 to 2017 and using the Unit Cost Data from Table 4-10 shows the estimated project costs.

Table 4-12, pages 32 through 37, lists the combined Water Supply System and Water Line Projects needed from 2007 to 2017 and the estimated construction costs in 2007 dollars.

<b>Table 4-1</b>						
<b>Water Supply System Capacities, 2007</b>						
<b>Component</b>	<b>Water Wells (gpm)</b>	<b>Ground Storage Tanks (gallons)</b>	<b>Elevated Storage Tanks (gallons)</b>	<b>Total Storage (gallons)</b>	<b>Booster Pumps (gpm)</b>	<b>Booster Pumps w/largest pump out of service (gpm)</b>
<b>Pine Street Water Plant</b>						
Water Well #1 - Onsite	544					
Water Well #2 - Onsite	1,689					
Water Well #3 - Offsite	559					
Storage Tanks		400,000	750,000			
Booster Pump #1					1,662	
Booster Pump #2					1,586	1586
Booster Pump #3					1,067	1067
<b>Pine Street Water Plant Totals</b>	<b>2,792</b>	<b>400,000</b>	<b>750,000</b>	<b>1,150,000</b>	<b>4,315</b>	<b>2,653</b>
<b>Baker Drive Water Plant</b>						
Water Well #1 - Onsite	889					
Storage Tanks		200,000				
Booster Pump #1					600	600
Booster Pump #2					500	500
Booster Pump #3					500	500
<b>Baker Drive Water Plant Totals</b>	<b>889</b>	<b>200,000</b>	<b>0</b>	<b>200,000</b>	<b>1,600</b>	<b>1,600</b>
<b>Ulrich Road Facility</b>						
			500,000	500,000		
<b>Total Capacities</b>	<b>3,681</b>	<b>600,000</b>	<b>1,250,000</b>	<b>1,850,000</b>	<b>5,915</b>	<b>4,253</b>
<b>Total Capacities in LUE</b>	<b>6,135</b>		<b>12,500</b>	<b>9,250</b>		<b>5,458</b>

**Table 4-2, Historical Use**

Year	Component	No. of Meters	Number of Units	Annual Water Demand (MG)	Ave. Daily Water Demand (MG)	% of Units Occupied	Ave Daily Water Demand / Unit (gpd)	Ave House-hold (pop/unit)	Ave. Daily Demand per Person (gpcd)	Est. Pop.	Annual Rainfall (inches)
2002	Tomball Meter Count & Usage										
	single family all categories	1991 act	1991 act	210.16 act	0.576 act	88.8% act	326 act	2.66 (2)	123 (2)	4,703	
	multi-family all categories	95 act	2358 (1)	82.46 act	0.226 act	88.8% est	108 est	2.26 (2)	48 (2)	4,732	
	Total Residential	2086 act	4349	292.62 act	0.802 act					9,435	
2002	Other all categories	743 act		450.13 act	1.007 est		1356 est				
	Total	2829 Dec		660.29 act	1.809 act						52
2003	Tomball Meter Count & Usage										
	single family all categories	2060 act	2060 act	209.10 act	0.573 act	88.8% act	313 act	2.66 (2)	118 (2)	4,866	
	multi-family all categories	95 act	2358 (1)	89.00 act	0.244 act	88.8% est	116 est	2.26 (2)	51 (2)	4,732	
	Total Residential	2155 act	4418	298.10 act	0.817 act					9,598	
2003	Other all categories	802 act		446.06 act	0.978 est		1220 est				
	Total	2957 Dec		655.16 act	1.795 act						45
2004	Tomball Meter Count & Usage										
	single family all categories	2104 act	2104 act	249.03 act	0.682 act	88.8% act	365 act	2.66 (2)	137 (2)	4,970	
	multi-family all categories	96 act	2383 (3)	79.68 act	0.218 act	88.8% est	103 est	2.26 (2)	46 (2)	4,782	
	Total Residential	2200 act	4487	328.71 act	0.901 act					9,752	
2004	Other all categories	844 act		425.21 act	0.947 est		1122 est				
	Total	3044 Dec		674.24 act	1.847 act						58
2005	Tomball Meter Count & Usage										
	single family all categories	2125 act	2125 act	248.26 act	0.680 act	88.8% act	360 act	2.66 (2)	135 (2)	5,019	
	multi-family all categories	96 act	2383 (3)	77.52 act	0.212 act	88.8% est	100 est	2.26 (2)	44 (2)	4,782	
	Total Residential	2221 act	4508	325.78 act	0.893 act					9,802	
2005	Other all categories	811 act		501.26 act	1.161 est		1431 est				
	Total	3032 act		749.52 act	2.053 act						34
2006	Tomball Meter Count & Usage										
	single family all categories	2328 act	2328 act	249.77 act	0.684 act	88.8% act	331 act	2.66 (2)	124 (2)	5,499	
	multi-family all categories	96 act	2383 (3)	72.68 act	0.199 act	88.8% est	94 est	2.26 (2)	42 (2)	4,782	
	Total Residential	2424 act	4711	322.45 act	0.883 act					10,281	
2006	Other all categories	812 act		480.49 act	1.117 act		1376 act				
	Total	3236 act		730.26 act	2.001 act						59

(1) City utility records in 2000 of total number of multi-family units, page 2-3, 2002 City of Tomball Masterplan  
 (2) From the 2000 U.S. Bureau of Census Data for Tomball  
 (3) According to City staff, only 1 apartment project has been developed since 2000.

**Table 4-3****Water Demand Factors, Per Acre Basis**

<b>Land Use</b>	<b>Average Daily Demand Water Factors from 2002 Masterplan Table 6-4</b> (gal/ac)	<b>Land Use Density Table 3-3</b> (Units/ac)	<b>Average Daily Water Demand per Unit</b> (gpd)	<b>Max. Daily Water Demand = 2.4 x Average Daily Water Demand</b> (gal/ac)	<b>Peak Hourly Water Demand = 1.25 x Max. Daily Water Demand</b> (gal/ac)
Single Family, Average Lots	1045	2.8	374	2508	3135
Single Family, Large Lots	187	0.5	374	448.8	561
Multi-Family & Mobile Home	3960	15	264	9504	11880
Commercial / Retail / Office	440			1056	1320
Industrial	660			1584	1980
Institutional (Group Quarters - Nursing Homes, Assisted Living Homes)	715	20	36	1716	2145
Schools / Hospital	715			1716	2145
Public Parks / Open Space / Utilities	110			264	330
Drainage (HCFCD Right-of-Ways)					
Vacant Land (Developable Land, Undevelopable Land, Flood Zones, Street ROW)					



<b>Table 4-4</b>				
<b>Water Demand Factors per Land Use Type</b>				
<b>Land Use</b>	<b>Average Daily Water Use Factors from 2002 Masterplan Table 6-4</b> (gal/ac)	<b>Average Units per Acre</b> (units/ac)	<b>Average Daily Water Use per Unit of Land Use Type</b>	<b>Living Unit Equivalent (LUE) = 374 gpd</b>
Single Family, Average Lots	1045	2.8	374	1.0
Single Family, Large Lots	187	0.5	374	1.0
Multi-Family & Mobile Home	3960	15	264	0.7
Commercial / Retail / Office	440			
Industrial	660			
Institutional (Group Quarters - Nursing Homes, Assisted Living Homes)	715	20	36	0.1
Schools / Hospital	715			
Public Parks / Open Space / Utilities	110			
Drainage (HCFCO Right-of-Ways)				
Vacant Land (Developable Land, Undevelopable Land, Flood Zones, Street ROW)				

<b>Table 4-5</b>					
<b>Water Demand, 2007</b>					
<b>Within the City Limits</b>	<b>Total Area</b>	<b>Average Daily Water Use Factors from 2002 Masterplan Table 6-4</b>	<b>Ave. Daily Demand</b>	<b>Ave. Annual Demand</b>	<b>Living Unit Equivalent (LUE) Connections based on 374 gpd/conn</b>
	(Acres)	(gal/ac)	(gpd)	(MG)	(LUE)
Single Family, Average Lots	734	1045	767,030	279.97	
Single Family, Large Lots	823	187	153,901	56.17	
Single Family Total	1,557			336.14	
Multi-Family & Mobile Home	90	3960	356,400	130.09	
Commercial / Retail / Office	603	440	265,320	96.84	
Industrial	145	660	95,700	34.93	
Institutional (Group Quarters - Nursing Homes, Assisted Living Homes)	38	715	27,170	9.92	
Schools / Hospital	765	715	546,975	199.65	
Total Commercial	1,551			341.34	
Parks / Open Space / Utilities	182	110	20,020	7.31	
Flushing and System Losses					
Drainage (HCFCD Right-of-Ways)	120				
Vacant Land (Developable Land, Undevelopable Land, Flood Zones, Street ROW)	3,929				
<b>Total City</b>	<b>7,429</b>		<b>2,232,516</b>	<b>814.87</b>	<b>5,969</b>
<b>Within the ETJ</b>	<b>Total Area</b>	<b>Average Daily Water Use Factors from 2002 Masterplan Table 6-4</b>	<b>Ave. Daily Demand</b>	<b>Ave. Annual Demand</b>	<b>Living Unit Equivalent (LUE) Connections based on 374 gpd/conn</b>
	(Acres)	(gal/ac)	(gallons)	(MG)	(LUE)
Single Family, Average Lots	300	1045	313,500	114.43	
Single Family, Large Lots	1,051	187	196,537	71.74	
Multi-Family & Mobile Home	0	3960	0	0.00	
Commercial / Retail / Office	235	440	103,400	37.74	
Industrial	39	660	25,740	9.40	
Institutional (Group Quarters - Nursing Homes, Assisted Living Homes)	0	715	0	0.00	
Schools / Hospital	0	715	0	0.00	
Public Parks / Open Space / Utilities	20	110	2,200	0.80	
Drainage (HCFCD Right-of-Ways)	97		0	0.00	
Vacant Land (Developable Land, Flood Zones, ROW)	4,163		0	0.00	
<b>Total ETJ</b>	<b>5,905</b>		<b>641,377</b>	<b>234.10</b>	<b>1,715</b>
<b>Total City and ETJ</b>	<b>13,334</b>		<b>2,873,893</b>	<b>1,049</b>	<b>7,684</b>
<b>Peak Day Demand (gpm)</b>			<b>4,790</b>		
<b>Peak Hour Demand (gpm)</b>			<b>5,987</b>		

<b>Table 4-6</b>					
<b>Projected Water Demand, 2017</b>					
<b>Within the City Limits</b>	<b>Total Area</b>	<b>Average Daily Water Use Factors from 2002 Masterplan Table 6-4</b>	<b>Ave. Daily Demand</b>	<b>Ave. Annual Demand</b>	<b>Living Unit Equivalent (LUE) Connections based on 374 gpd/conn</b>
	(Acres)	(gal/ac)	(gpd)	(MG)	(LUE)
Single Family, Average Lots	2,028	1045	2,119,260	773.53	
Single Family, Large Lots	823	187	153,901	56.17	
Multi-Family & Mobile Home	104	3960	411,840	150.32	
Commercial / Retail / Office	1,125	440	495,000	180.68	
Industrial	445	660	293,700	107.20	
Institutional (Group Quarters - Nursing Homes, Assisted Living Homes)	52	715	37,180	13.57	
Schools / Hospital	842	715	602,030	219.74	
Public Parks / Open Space / Utilities	182	110	20,020	7.31	
Drainage (HCFCD Right-of-Ways)	134		0	0.00	
Vacant Land (Developable Land, Undevelopable Land, Flood Zones, Street ROW)	1,694		0	0.00	
<b>Total City</b>	<b>7,429</b>		<b>4,132,931</b>	<b>1,508.52</b>	<b>11,051</b>
<b>Within the ETJ</b>	<b>Total Area</b>	<b>Average Daily Water Use Factors from 2002 Masterplan Table 6-4</b>	<b>Ave. Daily Demand</b>	<b>Ave. Annual Demand</b>	<b>Living Unit Equivalent (LUE) Connections based on 374 gpd/conn</b>
	(Acres)	(gal/ac)	(gallons)	(MG)	
Single Family, Average Lots	492	1045	514,140	187.66	
Single Family, Large Lots	1,033	187	193,171	70.51	
Multi-Family & Mobile Home	0	3960	0	0.00	
Commercial / Retail / Office	652	440	286,880	104.71	
Industrial	39	660	25,740	9.40	
Institutional (Group Quarters - Nursing Homes, Assisted Living Homes)	0	715	0	0.00	
Schools / Hospital	90	715	64,350	23.49	
Public Parks / Open Space / Utilities	20	110	2,200	0.80	
Drainage (HCFCD Right-of-Ways)	131		0	0.00	
Vacant Land (Developable Land, Undevelopable Land, Flood Zones, Street ROW)	3,448		0	0.00	
<b>Total ETJ</b>	<b>5,905</b>		<b>1,086,481</b>	<b>396.57</b>	<b>2,905</b>
<b>Total City and ETJ</b>	<b>13,334</b>		<b>5,219,412</b>	<b>1,905.09</b>	<b>13,956</b>

**Table 4-7****Projected Water Demand, Ultimate Buildout**

<b>Within the City Limits &amp; ETJ</b>	<b>Total Area</b> (Acres)	<b>Average Daily Water Use Factors from 2002 Masterplan Table 6-4</b> (gal/ac)	<b>Ave. Daily Demand</b> (gpd)	<b>Ave. Annual Demand</b> (MG)	<b>Living Unit Equivalent (LUE) Connections based on 374 gpd/conn</b> (LUE)
Single Family, Average Lots	4,380	1045	4,577,518	1,670.79	
Single Family, Large Lots	1,874	187	350,438	127.91	
Single Family Total	6,254				
Multi-Family & Mobile Home	122	3960	482,724	176.19	
Commercial / Retail / Office	2,978	440	1,310,496	478.33	
Industrial	868	660	572,748	209.05	
Institutional (Group Quarters - Nursing Homes, Assisted Living Homes)	70	715	49,979	18.24	
Schools / Hospital	1,146	715	819,176	299.00	
Public Parks / Open Space / Utilities	202	110	22,220	8.11	
Drainage (HCFCD Right-of-Ways)	265				
Vacant Land (Developable Land, Undevelopable Land, Flood Zones, Street ROW)	1,429				
<b>Total City &amp; ETJ</b>	<b>13,334</b>		<b>8,185,298</b>	<b>2,987.63</b>	<b>21,886</b>

**Table 4-8**

**Water Supply System - Projected Demand and Capital Improvements Needed to serve the City only**

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
<b>WATER SYSTEM - PROJECTED DEMAND (1)</b>												
Within the current City Limits Only	LUE	5,969	6,477	6,986	7,494	8,002	8,510	9,018	9,526	10,035	10,543	11,051
<b>WATER SYSTEM - PROJECTED IMPROVEMENTS</b>												
<b>Water Well Capacity</b>												
<b>Existing Pine Street Water Plant</b>												
Water Well #1 - Onsite	gpm	544	544	544	544	544	544	544	544	544	544	544
Water Well #2 - Onsite	gpm	1,689	1,689	1,689	1,689	1,689	1,689	1,689	1,689	1,689	1,689	1,689
Water Well #3 - Offsite	gpm	559	559	559	559	559	559	559	559	559	559	559
<b>Existing Baker Drive Water Plant</b>												
Water Well #1 - Onsite	gpm	889	889	889	889	889	889	889	889	889	889	889
<b>Additional Water Well Capacity</b>												
Total Water Well Capacity	gpm	0	1,000	1,000	1,000	2,000	2,000	2,000	3,000	3,000	3,000	3,000
Total LUE's that can be served	LUE	6,135	7,802	7,802	7,802	9,468	9,468	11,135	11,135	11,135	11,135	11,135
LUE balance	LUE	166	1,324	816	308	1,466	450	1,609	1,100	592	84	84
Capacity needed for Demand only	gpm	3,582	3,886	4,191	4,496	4,801	5,411	5,716	6,021	6,326	6,631	6,631
<b>Booster Pump Capacity</b>												
Existing Pine Street Booster Pumps	gpm	4,315	4,315	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
Existing Baker Drive Booster Pumps	gpm	1,600	1,600	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Additional Booster Pump Capacity	gpm	0	1,000	2,000	2,000	2,000	3,000	4,000	4,000	4,000	4,000	5,000
Total Booster Pump Capacity	gpm	5,915	6,915	6,500	6,500	6,500	7,500	8,500	8,500	8,500	8,500	9,500
Total Booster Pump Capacity w/Largest Pump Out of Service	gpm	4,253	5,253	6,253	6,253	6,253	7,253	8,253	8,253	8,253	8,253	9,253
<b>Total LUE's that can be served</b>												
LUE balance	LUE	5,458	6,742	8,025	8,025	8,025	9,309	10,592	10,592	10,592	10,592	11,876
Capacity needed for Demand only	gpm	(511)	264	1,040	531	23	799	1,066	557	49	49	825
Capacity needed for Demand only	gpm	4,651	5,047	5,443	5,839	6,235	6,631	7,027	7,423	7,819	8,215	8,611

**Table 4-8**

**Water Supply System - Projected Demand and Capital Improvements Needed to serve the City only**

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
<b>WATER SYSTEM - PROJECTED DEMAND (1)</b>											
<b>Within the current City Limits Only</b>	LUE	5,969	6,477	6,986	7,494	8,002	8,510	9,018	9,526	10,035	11,051
<b>Total Water Tank Storage Capacity</b>											
Pine Street Ground Storage Tank	gal	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
Pine Street Elevated Storage Tanks	gal	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000
Baker Dr, Ground Storage Tank	gal	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Ulrich Drive Elevated Storage Tank	gal	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000
<b>Additional Ground Storage Tanks</b>	gal.										
<b>Additional Elevated Storage Tanks</b>	gal										
<b>Total Water Storage Tank Capacity</b>	gal	1,850,000	1,850,000	1,850,000	1,850,000	1,850,000	1,850,000	1,850,000	2,050,000	2,250,000	2,250,000
<b>Total LUE's that can be served</b>	LUE	9,250	9,250	9,250	9,250	9,250	9,250	9,250	10,250	11,250	11,250
<b>LUE balance</b>	LUE	3,281	2,773	2,264	1,756	1,248	740	232	724	215	199
<b>Capacity needed for Demand only</b>	gal	1,193,859	1,295,493	1,397,127	1,498,761	1,600,395	1,702,029	1,803,664	1,905,298	2,006,932	2,210,200
<b>Ground Tank Storage Capacity</b>											
Pine Street Ground Storage Tank	gal	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
Baker Dr, Ground Storage Tank	gal	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
<b>Additional Ground Storage Tanks</b>	gal										
<b>Total Water Storage Tank Capacity</b>	gal	600,000	600,000	600,000	600,000	600,000	600,000	600,000	800,000	1,000,000	1,000,000
<b>Total LUE's that can be served</b>	LUE	3,000	3,000	3,000	3,000	3,000	3,000	3,000	4,000	5,000	5,000
<b>LUE balance</b>	LUE	3,000	3,000	3,000	3,000	3,000	3,000	3,000	4,000	5,000	5,000
<b>Capacity needed for Demand only</b>	gal	0	0	0	0	0	0	0	0	0	0
<b>Elevated Storage Tank Capacity</b>											
Pine Street Elevated Storage Tanks	gal	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000
Ulrich Drive Elevated Storage Tank	gal	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000
<b>Additional EST Tanks</b>	gal										
<b>Total EST Capacity</b>	gal	1,250,000	1,250,000	1,250,000	1,250,000	1,250,000	1,250,000	1,250,000	1,250,000	1,250,000	1,250,000
<b>Total LUE's that can be served</b>	LUE	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500
<b>LUE balance</b>	LUE	6,531	6,023	5,514	5,006	4,498	3,990	2,974	2,465	1,957	1,449
<b>Capacity needed for Demand only</b>	gal	596,929	647,746	698,564	749,381	800,198	851,015	901,832	952,649	1,003,466	1,054,283

(1) Assumes straight line growth between 2007 and 2017

**Table 4-9**

**Water Supply System - Projected Demand and Capital Improvements Needed to serve the City & ETJ**

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Ultimate
<b>WATER SYSTEM - PROJECTED DEMAND</b>												
City Limits and ETJ Combined	LUE	7,684	8,311	8,939	9,566	10,193	10,820	11,447	12,074	13,329	13,956	21,886
<b>WATER SYSTEM - PROJECTED IMPROVEMENTS</b>												
<b>Water Well Capacity</b>												
<b>Pine Street Water Plant</b>												
Water Well #1 - Onsite	gpm	544	544	544	544	544	544	544	544	544	544	544
Water Well #2 - Onsite	gpm	1,689	1,689	1,689	1,689	1,689	1,689	1,689	1,689	1,689	1,689	1,689
Water Well #3 - Offsite	gpm	559	559	559	559	559	559	559	559	559	559	559
<b>Baker Drive Water Plant</b>												
Water Well #1 - Onsite	gpm	889	889	889	889	889	889	889	889	889	889	889
Additional Water Well Capacity	gpm	0	2,000	2,000	3,000	3,000	4,000	4,000	5,000	5,000	5,000	10,000
Total Water Well Capacity	gpm	3,681	5,681	5,681	6,681	6,681	7,681	7,681	8,681	8,681	8,681	13,681
Total LUEs that can be served	LUE	6,135	9,468	9,468	11,135	11,135	12,802	12,802	14,468	14,468	14,468	22,802
LUE balance	LUE	(1,549)	1,157	530	1,569	942	1,354	727	1,767	1,140	512	916
Capacity needed for Demand only	gpm	4,611	4,987	5,363	5,739	6,116	6,492	7,245	7,621	7,997	8,374	13,132
<b>Booster Pump Capacity</b>												
Pine Street Booster Pumps	gpm	4,315	4,315	4,315	4,315	4,315	4,315	4,315	4,315	4,315	4,315	4,315
Baker Drive Booster Pumps	gpm	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600
Additional Booster Pump Capacity	gpm	0	3,000	3,000	4,000	5,000	5,000	6,000	6,000	7,000	7,000	13,000
Total Booster Pump Capacity	gpm	5,915	8,915	8,915	9,915	10,915	10,915	11,915	11,915	12,915	12,915	18,915
Total Booster Pump Capacity w/Largest Pump Out of Service	gpm	4,253	7,253	7,253	8,253	9,253	9,253	10,253	10,253	11,253	11,253	17,253
Total LUEs that can be served	LUE	5,458	9,309	9,309	10,592	11,876	11,876	13,159	13,159	14,442	14,442	22,143
LUE balance	LUE	(2,226)	998	370	1,026	1,683	1,055	1,084	457	1,114	486	257
Capacity needed for Demand only	gal	5,987	6,476	6,965	7,453	7,942	8,431	8,919	9,397	9,885	10,374	17,053

**Table 4-9**

**Water Supply System - Projected Demand and Capital Improvements Needed to serve the City & ETJ**

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Ultimate	
<b>WATER SYSTEM - PROJECTED DEMAND</b>													
City Limits and ETJ Combined	LUE	7,684	8,311	8,939	9,566	10,193	10,820	11,447	12,074	12,702	13,329	13,956	21,886
<b>Total Water Tank Storage Capacity</b>													
Pine Street Ground Storage Tank	gal	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
Pine Street Elevated Storage Tank	gal	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000
Baker Dr, Ground Storage Tank	gal	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Ulrich Drive Elevated Storage Tank	gal	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000
Additional Ground Storage Tanks	gal		400,000	400,000	400,000	400,000	400,000	400,000	800,000	800,000	800,000	800,000	1,600,000
Additional Elevated Storage Tanks	gal							0	0	500,000	500,000	500,000	1,000,000
Total Water Storage Tank Capacity	gal	1,850,000	2,250,000	2,250,000	2,250,000	2,250,000	2,250,000	2,250,000	2,650,000	3,150,000	3,150,000	3,150,000	4,450,000
<b>Total LUEs that can be served</b>													
LUE balance	LUE	9,250	11,250	11,250	11,250	11,250	11,250	11,250	13,250	15,750	15,750	15,750	22,250
Capacity needed for Demand only	gal	1,536,841	1,662,200	1,787,713	1,913,149	2,038,585	2,164,021	2,289,456	2,414,892	2,540,328	2,665,764	2,791,200	4,377,200
<b>Ground Storage Tank Capacity</b>													
Pine Street Ground Storage Tank	gal	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
Baker Dr, Ground Storage Tank	gal	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Additional Ground Storage Tanks	gal		400,000	400,000	400,000	400,000	400,000	400,000	800,000	800,000	800,000	800,000	1,600,000
Total Water Storage Tank Capacity	gal	600,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,400,000	1,400,000	1,400,000	1,400,000	2,200,000
<b>Total LUEs that can be served</b>													
LUE balance	LUE	3,000	5,000	5,000	5,000	5,000	5,000	5,000	7,000	7,000	7,000	7,000	11,000
Capacity needed for Demand only	gal	0	0	0	0	0	0	0	0	0	0	0	0
<b>Elevated Storage Tank Capacity</b>													
Pine Street Elevated Storage Tanks	gal	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000
Ulrich Drive Elevated Storage Tank	gal	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000
Additional Elevated Storage Tanks	gal							0	500,000	500,000	500,000	500,000	1,000,000
Total Elevated Storage Tank Capacity	gal	1,250,000	1,250,000	1,250,000	1,250,000	1,250,000	1,250,000	1,250,000	1,750,000	1,750,000	1,750,000	1,750,000	2,250,000
<b>Total LUEs that can be served</b>													
LUE balance	LUE	12,500	12,500	12,500	12,500	12,500	12,500	12,500	17,500	17,500	17,500	17,500	22,500
Capacity needed for Demand only	gal	768,421	831,100	893,856	956,574	1,019,292	1,082,010	1,144,728	1,207,446	1,270,164	1,332,882	1,395,600	2,188,600



**Table 4-10  
Water System Unit Cost Data**

<b>8-inch Water Line</b>		<b>Unit</b>	<b>Unit Price</b>
8-inch Water Line		LF	\$ 40.00
Fire Hydrant(1)		LF	\$ 5.71
Trench Safety		LF	\$ 1.00
<b>Subtotal</b>			<b>\$ 47.00</b>
Augering & Roadway Repairs	15%	LF	\$ 7.05
Easement Acquisition	15%	LF	\$ 7.05
Pipeline Relocation	30%	LF	\$ 14.10
Contingencies	15%	LF	\$ 7.05
Engineering & Surveying	25%	LF	\$ 11.75
<b>Total 8-inch Water Line per LF</b>			<b>\$ 94.00</b>

<b>12-inch Water Line</b>		<b>Unit</b>	<b>Unit Price</b>
12-inch Water Line		LF	\$ 50.00
Fire Hydrant(1)		LF	\$ 5.71
Trench Safety		LF	\$ 1.00
<b>Subtotal</b>			<b>\$ 57.00</b>
Augering & Roadway Repairs	15%	LF	\$ 8.55
Easement Acquisition	15%	LF	\$ 8.55
Pipeline Relocation	30%	LF	\$ 17.10
Contingencies	15%	LF	\$ 8.55
Engineering & Surveying	25%	LF	\$ 14.25
<b>Total 12-inch Water Line per LF</b>	<b>100%</b>		<b>\$ 114.00</b>

**Miscellaneous Items Used in Water Lines above**

Fire Hydrant Assembly	EA	\$ 2,000.00
-----------------------	----	-------------

**Water Well**

A 1000 gpm water well	EA	\$ 1,000,000.00
Cost per gpm (including contingencies)	gpm	\$ 1,000.00
Cost per gpm (with Engineering)	gpm	\$ 1,250.00

**Elevated Storage Tanks**

A 500,000 gallon Elevated Storage Tank	EA	\$ 1,000,000.00
Cost per gallon (including contingencies)	gal	\$ 2.00
Cost per gallon (with Engineering)	gal	\$ 2.50

**Ground Storage Tanks**

An 800,000 gallon Ground Storage Tank	EA	\$ 550,000.00
Cost per gallon (including contingencies)	gal	\$ 0.69
Cost per gallon (with Engineering)	gal	\$ 0.86

**Booster Pump Capacity**

3000 gpm pump capacity with building	LS	\$ 240,000.00
In 1000 gpm increments (incl. contg.)	EA	\$ 80,000.00
In 1000 gpm increments w/ Engineering	EA	\$ 100,000.00

(1) Assumes Fire Hydrants are spaced every 350 feet

**Table 4-11****Water Line Projects, 2007 to 2017**

Proj. No.	Description	Priority (1)	Quantity	Units	Unit Cost	Total Cost
1	12-inch Water Line along Zion Road and E. Hufsmith Road from Neal Street to F.M. 2978	1	6,500	LF	\$ 114.00	\$741,000
2	12-inch Water Line along Future Brown-Hufsmith Road from SH 249 to Quinn Road	1	3,000	LF	\$ 114.00	\$342,000
3	12-inch Water Line along Tomball Cemetery Road North of 2920	1	2,300	LF	\$ 114.00	\$262,200
4	12-inch Water Line along F.M. 2978 from F.M. 2920 to E. Hufsmith Road	2	6,800	LF	\$ 114.00	\$775,200
5	12-inch Water Line along E. Hufsmith Road from Ulrich Road to Zion Road	2	7,900	LF	\$ 114.00	\$900,600
6	12-inch Water Line through new developments between Ulrich Road and Zion Road	2	7,000	LF	\$ 114.00	\$798,000
7	12-inch Water Line along S. Persimmon Street south of Agg Road to Holderrieth Road	3	5,100	LF	\$ 114.00	\$581,400
8	12-inch Water Line along S. Persimmon Street from Lizzie Lane to Agg Road	3	3,600	LF	\$ 114.00	\$410,400
9	8-inch Water Line along S. Pitchford Road	3	3,700	LF	\$ 94.00	\$347,800
10	8-inch Water Line between S. Pitchford Road and S. Persimmon Street just south of Lizzie Lane	3	1,100	LF	\$ 94.00	\$103,400
11	12-inch Water Line along Agg Road from S. Pitchford Road to S. Persimmon Street	3	1,100	LF	\$ 114.00	\$125,400
12	12-inch Water Line along Future Brown-Hufsmith Road from Quinn Road to Baker Drive	3	2,000	LF	\$ 114.00	\$228,000
13	12-inch Water Line along Calvert Road and Alice Road from F.M. 2920 to SH 249	3	7,300	LF	\$ 114.00	\$832,200
14	12-Inch Water Line along Agg Road from Mulberry Street to S. Pitchford Road (includes Railroad Crossing)	3	1,800	LF	\$ 114.00	\$205,200
15	12-Inch Water Line along the Future Medical Complex Drive from S. Holderrieth to S. Cherry Street	3	3,700	LF	\$ 114.00	\$421,800
16	12-Inch Water Line along the Future Bypass from S. Cherry Street to Agg Road	3	2,600	LF	\$ 114.00	\$296,400
17	12-Inch Water Line along the Future Bypass from S. Persimmon Street to Hufsmith-Kohrville Road	3	2,100	LF	\$ 114.00	\$239,400

**Table 4-11**  
**Water Line Projects, 2007 to 2017**

Proj. No.	Description	Priority (1)	Quantity	Units	Unit Cost	Total Cost
18	8-inch Water Line along the Future Michel Road extension from Commercial Park Drive to School Street	3	3,100	LF	\$ 47.00	\$145,700
19	12-Inch Water Line along the Future Bypass east of Hufsmith-Kohrville Road	4	2,500	LF	\$ 114.00	\$285,000
20	12-inch Water Line along Quinn Road from Baker Drive to Inwood Street	4	2,900	LF	\$ 114.00	\$330,600
21	8-inch Water Line between Quinn Road and Julia Street of Hunterwood	4	1,400	LF	\$ 94.00	\$131,600
22	8-inch Water Line between Medical Complex Drive and Commercial Park Drive	5	900	LF	\$ 94.00	\$84,600
23	12-Inch Water Line along Park Road from FM 2920 to Brown Road	5	4,200	LF	\$ 114.00	\$478,800
24	12-Inch Water Line along Ulrich Road north of Zion to replace existing 6-inch Water Line	5	4,500	LF	\$ 114.00	\$513,000
25	8-inch Water Line along Randolph Road	5	3,500	LF	\$ 94.00	\$329,000
26	12-Inch Water Line along Brown Road from Park Road to Orchard Grove Drive	5	4,000	LF	\$ 114.00	\$456,000
	<b>Totals</b>		<b>94,600</b>			<b>\$10,364,700</b>

(1) Priority Rating of 1 is highest priority and 5 is lowest priority

<b>Table 4-12</b>						
<b>Water System Summary Requirements</b>						
<b>Total Connections in City</b>				in 2007 =	5,969	LUE
<b>Total Connections in City &amp; ETJ</b>				in 2007 =	7,684	LUE
<b>New Connections during Period</b>						
<b>2007 Existing System serving City Only</b>						
<b>System Component</b>	<b>Size</b>	<b>Unit</b>	<b>Outstanding Bond Amount (1)</b>	<b>Capacity in LUE's</b>	<b>Demand in LUE's</b>	<b>LUE Excess or (Deficit)</b>
<b>Water Well Capacity</b>						
Pine Street Water Plant Well #1 - Onsite	544	gpm		907		
Pine Street Water Plant Well #2 - Onsite	1,689	gpm	\$600,000	2,815		
Pine Street Water Plant Well #3 - Offsite	559	gpm		932		
Baker Drive Water Plant Well #1- Onsite	889	gpm		1,482		
<b>Total Existing Water Well Capacity</b>	<b>3,681</b>	<b>gpm</b>		<b>6,135</b>	<b>5,969</b>	<b>166</b>
Add. Water Well Capacity (2007 - 2017)		gpm				
Add. Water Well Capacity (2007 - Ult)						
<b>Total Water Well Capacity</b>	<b>3,681</b>	<b>gpm</b>		<b>6,135</b>	<b>5,969</b>	<b>166</b>
<b>Booster Pump Capacity</b>						
Pine Street Booster Pumps	4,315	gpm				
Baker Drive Booster Pumps	1,600	gpm				
<b>Total Existing Booster Pump Capacity</b>	<b>5,915</b>	<b>gpm</b>	<b>\$0</b>			
<b>Existing Firm Booster Pump Capacity</b>	<b>4,253</b>	<b>gpm</b>	<b>\$0</b>	<b>5,458</b>	<b>5,969</b>	<b>(511)</b>
Additional Booster Pump Cap. (2007-2017)						
Additional Booster Pump Cap. (2017- Ult)						
<b>Total Firm Booster Pump Capacity</b>	<b>4,253</b>	<b>gpm</b>		<b>5,458</b>	<b>5,969</b>	<b>(511)</b>
<b>Total Water Tank Storage Capacity</b>						
Existing Pine Street Ground Storage Tank	400,000	gal		2,000		
Existing Baker Dr. Ground Storage Tank	200,000	gal		1,000		
<b>Total Existing GST Capacity</b>	<b>600,000</b>	<b>gal</b>		<b>3,000</b>		
Add. Ground Storage Tanks (2007-2017)		gal				
Add. Ground Storage Tanks (2017-Ult)		gal				
<b>Total Existing &amp; Future GST Capacity</b>	<b>600,000</b>	<b>gal</b>		<b>3,000</b>		
Existing Pine St. Elevated Storage Tank	750,000	gal				
Existing Ulrich Dr. Elevated Storage Tank	500,000	gal				
<b>Existing EST Capacity</b>	<b>1,250,000</b>	<b>gal</b>		<b>12,500</b>	<b>5,969</b>	<b>6,531</b>
Add. Elevated Storage Tank (2007-2017)		gal				
Add. Elevated Storage Tank (2017-Ult)						
<b>Total Existing &amp; Future EST Capacity</b>	<b>1,250,000</b>	<b>gal</b>	<b>\$1,200,000</b>	<b>12,500</b>	<b>5,969</b>	<b>6,531</b>
<b>Total Water Storage Tank Capacity</b>	<b>1,850,000</b>	<b>gal</b>	<b>\$1,200,000</b>	<b>9,250</b>	<b>5,969</b>	<b>3,281</b>

<b>Table 4-12</b>						
<b>Water System Summary Requirements</b>						
<b>Total Connections in City</b>				in 2007 =	5,969	LUE
<b>Total Connections in City &amp; ETJ</b>				in 2007 =	7,684	LUE
<b>New Connections during Period</b>						
	<b>2007 Existing System serving City Only</b>					
<b>System Component</b>	<b>Size</b>	<b>Unit</b>	<b>Outstanding Bond Amount (1)</b>	<b>Capacity in LUE's</b>	<b>Demand in LUE's</b>	<b>LUE Excess or (Deficit)</b>
<b><u>Distribution Lines</u></b>						
Misc Distribution Lines			\$732,090	21,648	5,969	15,679
<u>Additional Distribution Lines</u>						
<b>Distribution Line Total</b>			<b>\$732,090</b>	<b>21,648</b>	<b>5,969</b>	<b>15,679</b>
<b>TOTAL</b>						
<b>(1) From Table 9-13, 2002 Tomball Masterplan.</b>						

<b>Table 4-12</b>						
<b>Water System Summary Requirements</b>						
<b>Total Connections in City</b>				in 2007 =	5,969	LUE
<b>Total Connections in City &amp; ETJ</b>				in 2017 =	13,956	LUE
<b>New Connections during Period</b>					7,987	LUE
<b>2007 to 2017 Improvements serving the City &amp; ETJ</b>						
<b>System Component</b>	<b>Size</b>	<b>Unit</b>	<b>Cost</b>	<b>Capacity in LUE's</b>	<b>Demand in LUE's</b>	<b>LUE Excess or (Deficit)</b>
<b>Water Well Capacity</b>						
Pine Street Water Plant Well #1 - Onsite						
Pine Street Water Plant Well #2 - Onsite						
Pine Street Water Plant Well #3 - Offsite						
Baker Drive Water Plant Well #1- Onsite						
<b>Total Existing Water Well Capacity</b>	3,681	gpm		6,135	6,135	0
<b>Add. Water Well Capacity (2007 - 2017)</b>	5,000	gpm	\$6,250,000	8,333	7,821	512
<b>Add. Water Well Capacity (2007 - Ult)</b>						
<b>Total Water Well Capacity</b>	8,681	gpm	\$6,250,000	14,468	13,956	512
<b>Booster Pump Capacity</b>						
Pine Street Booster Pumps						
Baker Drive Booster Pumps						
<b>Total Existing Booster Pump Capacity</b>						
<b>Existing Firm Booster Pump Capacity</b>	4,253	gpm		5,458	5,458	0
<b>Additional Booster Pump Cap. (2007-2017)</b>	7,000	gpm	\$700,000	8,984	8,498	486
<b>Additional Booster Pump Cap. (2017- Ult)</b>						
<b>Total Firm Booster Pump Capacity</b>	11,253	gpm	\$700,000	14,442	13,956	486
<b>Total Water Tank Storage Capacity</b>						
Existing Pine Street Ground Storage Tank	400,000	gal				
Existing Baker Dr. Ground Storage Tank	200,000	gal				
<b>Total Existing GST Capacity</b>	600,000	gal		3,000	3,000	
<b>Add. Ground Storage Tanks (2007-2017)</b>	800,000	gal	\$687,500	4,000	4,000	
<b>Add. Ground Storage Tanks (2017-Ult)</b>		gal				
<b>Total Existing &amp; Future GST Capacity</b>	1,400,000	gal	\$687,500	7,000	7,000	0
Existing Pine St. Elevated Storage Tank	750,000	gal		7,500		
Existing Ulrich Dr. Elevated Storage Tank	500,000	gal		5,000		
<b>Existing EST Capacity</b>	1,250,000	gal		12,500	12,500	0
<b>Add. Elevated Storage Tank (2007-2017)</b>	500,000	gal	\$1,250,000	5,000	1,456	3,544
<b>Add. Elevated Storage Tank (2017-Ult)</b>		gal				
<b>Total Existing &amp; Future EST Capacity</b>	1,750,000	gal	\$1,250,000	17,500	13,956	3,544
<b>Total Water Storage Tank Capacity</b>	3,150,000	gal	\$1,937,500	15,750	13,956	1,794

<b>Table 4-12</b>						
<b>Water System Summary Requirements</b>						
<b>Total Connections in City</b>				in 2007 =	5,969	LUE
<b>Total Connections in City &amp; ETJ</b>				in 2017 =	13,956	LUE
<b>New Connections during Period</b>					<b>7,987</b>	LUE
<b>2007 to 2017 Improvements serving the City &amp; ETJ</b>						
<b>System Component</b>	<b>Size</b>	<b>Unit</b>	<b>Cost</b>	<b>Capacity in LUE's</b>	<b>Demand in LUE's</b>	<b>LUE Excess or (Deficit)</b>
<b>Distribution Lines</b>						
Misc Distribution Lines						
<u>Additional Distribution Lines</u>			<u>\$10,364,700</u>	<u>21,886</u>		
<b>Distribution Line Total</b>			<b>\$10,364,700</b>			
<b>TOTAL</b>			<b>\$19,252,200</b>			
<b>(1) From Table 9-13, 2002 Tomball Master</b>						

<b>Table 4-12</b>						
<b>Water System Summary Requirements</b>						
<b>Total Connections in City</b>	<b>and ETJ</b>			in 2017 =	13,956	LUE
<b>Total Connections in City &amp; ETJ</b>				at Ultimate Buildout =	21,886	LUE
<b>New Connections during Period</b>					<b>7,930</b>	LUE
<b>2017 to Ultimate Buildout serving the City &amp; ETJ</b>						
<b>System Component</b>	<b>Size</b>	<b>Unit</b>	<b>Cost</b>	<b>Capacity in LUE's</b>	<b>Demand in LUE's</b>	<b>LUE Excess or (Deficit)</b>
<b>Water Well Capacity</b>						
Pine Street Water Plant Well #1 - Onsite						
Pine Street Water Plant Well #2 - Onsite						
Pine Street Water Plant Well #3 - Offsite						
Baker Drive Water Plant Well #1- Onsite						
<b>Total Existing Water Well Capacity</b>	<b>3,681</b>	<b>gpm</b>		<b>6,135</b>	<b>6,135</b>	<b>0</b>
Add. Water Well Capacity (2007 - 2017)	5,000	gpm		8,333	8,333	0
Add. Water Well Capacity (2007 - Ult)	<b>5,000</b>	<b>gpm</b>	<b>\$6,250,000</b>	<b>8,333</b>	<b>7,418</b>	<b>916</b>
<b>Total Water Well Capacity</b>	<b>13,681</b>	<b>gpm</b>	<b>\$6,250,000</b>	<b>22,802</b>	<b>21,886</b>	<b>916</b>
<b>Booster Pump Capacity</b>						
Pine Street Booster Pumps						
Baker Drive Booster Pumps						
<b>Total Existing Booster Pump Capacity</b>						
<b>Existing Firm Booster Pump Capacity</b>	<b>4,253</b>	<b>gpm</b>		<b>5,458</b>	<b>5,458</b>	<b>0</b>
Additional Booster Pump Cap. (2007-2017)	7,000	gpm		8,984	8,984	0
Additional Booster Pump Cap. (2017- Ult)	<b>6,000</b>	<b>gpm</b>	<b>\$600,000</b>	<b>7,701</b>	<b>7,444</b>	<b>257</b>
<b>Total Firm Booster Pump Capacity</b>	<b>17,253</b>	<b>gpm</b>	<b>\$600,000</b>	<b>22,143</b>	<b>21,886</b>	<b>257</b>
<b>Total Water Tank Storage Capacity</b>						
Existing Pine Street Ground Storage Tank	400,000	gal				
Existing Baker Dr. Ground Storage Tank	<u>200,000</u>	<u>gal</u>				
<b>Total Existing GST Capacity</b>	<b>600,000</b>	<b>gal</b>		<b>6,000</b>	<b>6,000</b>	<b>0</b>
Add. Ground Storage Tanks (2007-2017)	800,000	gal		8,000	8,000	0
Add. Ground Storage Tanks (2017-Ult)	<b>800,000</b>	<b>gal</b>	<b>\$687,500</b>	<b>8,000</b>	<b>7,886</b>	<b>114</b>
<b>Total Existing &amp; Future GST Capacity</b>	<b>2,200,000</b>	<b>gal</b>	<b>\$687,500</b>	<b>22,000</b>	<b>21,886</b>	<b>114</b>
Existing Pine St. Elevated Storage Tank	750,000	gal		7,500		
Existing Ulrich Dr. Elevated Storage Tank	<u>500,000</u>	<u>gal</u>		<u>5,000</u>		
<b>Existing EST Capacity</b>	<b>1,250,000</b>	<b>gal</b>		<b>12,500</b>	<b>12,500</b>	<b>0</b>
Add. Elevated Storage Tank (2007-2017)	500,000	gal		5,000	2,500	2,500
Add. Elevated Storage Tank (2017-Ult)	<b>500,000</b>	<b>gal</b>	<b>\$1,250,000</b>	<b>5,000</b>	<b>6,886</b>	<b>0</b>
<b>Total Existing &amp; Future EST Capacity</b>	<b>2,250,000</b>	<b>gal</b>	<b>\$1,250,000</b>	<b>22,500</b>	<b>21,886</b>	<b>614</b>
<b>Total Water Storage Tank Capacity</b>	<b>4,450,000</b>	<b>gal</b>	<b>\$1,937,500</b>	<b>22,250</b>	<b>21,886</b>	<b>364</b>



<b>Table 4-12</b>						
<b>Water System Summary Requirements</b>						
<b>Total Connections in City</b>	<b>and ETJ</b>			in 2017 =	13,956	LUE
<b>Total Connections in City &amp; ETJ</b>				at Ultimate Buildout =	21,886	LUE
<b>New Connections during Period</b>					7,930	LUE
<b>2017 to Ultimate Buildout serving the City &amp; ETJ</b>						
<b>System Component</b>	<b>Size</b>	<b>Unit</b>	<b>Cost</b>	<b>Capacity in LUE's</b>	<b>Demand in LUE's</b>	<b>LUE Excess or (Deficit)</b>
<b>Distribution Lines</b>						
Misc Distribution Lines						
Additional Distribution Lines						
<b>Distribution Line Total</b>						
<b>TOTAL</b>			<b>\$8,787,500</b>			
<b>(1) From Table 9-13, 2002 Tomball Master</b>						

## **5.0 WASTEWATER SYSTEM**

### **5.1 EXISTING WASTEWATER SYSTEM**

The Tomball wastewater collection system is made up of a network of gravity lines and lift stations with force mains. Old lines in the central core were constructed in the late 1950's along with the north wastewater treatment plant. New lines and plant expansions have been added as the city grew. A relatively new trunk sewer system and treatment plant serves the south side of the city.

The city has some topographic relief being hilly in the northwest area and relatively flat in the south. The highest elevation in the city is 225 feet with low areas of 150 feet at Spring Creek and Willow Creek. For areas east of S.H. 249, the approximate north-south drainage divide in the city is F.M. 2920. West of S.H. 249, the divide is close to Brown Road.

#### **5.1.1 Wastewater Treatment Plants**

The City has two wastewater treatment plants – the north and south plant. The north plant is located in the north central part of the city and discharges into Spring Creek. The first phase of the plant (0.75 MGD) was completed in 1974. The plant was expanded to 1.5 MGD in the late 1980's. This facility operates as a complete mix plant with four mixing basins and two clarifiers. Future expansion of the plant is possible. The average daily flow in 2006 was 0.64 MGD as shown in **Table 5-1**, page 41.

The south wastewater treatment plant is a 1.5-MGD facility serving the south part of the city. The South Plant, placed into service in 1999, operates as an extended aeration, oxidation ditch facility with one aeration channel, two clarifiers, and associated units. This facility is currently permitted to treat 1.5 MGD. The average daily flow in 2006 was 0.86 MGD as shown in **Table 5-1**, page 41. **Exhibit 5-1** shows the locations of these plants.

#### **5.1.2 Lift Stations**

The City of Tomball presently has nine lift stations in operation, not including the plant lift stations. There are also numerous private lift stations serving individual tracts of land which do not yet have public sewer service. The public lift stations and their capacities are shown in **Table 5-2**, page 42.

#### **5.1.2 Collection System**

The City wastewater collection system consists of approximately 54.5 miles of gravity sewer lines ranging in diameter from 4 inches through 36 inches. The lines are shown on **Exhibit 5-1**.

## 5.2 HISTORICAL WASTEWATER FLOWS

The historical wastewater flows from the north and south plants from 2002 thru 2006 are shown on **Table 5-1**, page 41. Both plants are currently operating below their maximum capacities.

## 5.3 STATE DESIGN CRITERIA

The design criteria outlined in Chapter 217 of the Texas Commission on Environmental Quality regulations titled "Design Criteria for Sewerage Systems" have been used to evaluate the adequacy of the existing system and to size new system components. The criteria include the following items:

- Estimation of wet weather flows as 400 percent of average day flow rates.
- The layout of collection lines are placed to provide flexibility toward future land use changes and economical considerations.
- Maximum sewer capacities were calculated for pipes flowing full at not less than 2 feet per second using standard grades based on Manning's formula with an assumed "n" factor of 0.013.
- In order to avoid under-designs, which can occur without long-range planning, trunk line sizes were based upon consideration of the size of an area and an allowance for full development. The interim improvements for the study period consider future growth and provide a base system for ultimate improvements.

## 5.4 ADEQUACY OF THE EXISTING SYSTEM

The existing wastewater system adequately serves the current properties and population within the City limits.

## 5.5 PROPOSED IMPROVEMENTS

The previously presented Table 4-3 shows the water demand factors by land use type on a per acre basis as developed in the 2002 Master Plan. Using the factors in this table and assuming a 76.9% return of wastewater to be treated (100 gpd wastewater per capita/130 gpd water per capita), wastewater demand factors by land use type on a per acre basis can be derived as shown on **Table 5-3**, page 43.

Using the wastewater demand factors in Table 5-3 and the land use areas in Table 2-4, wastewater demand for the north and south service areas, within the City Limits only, are derived and shown in **Table 5-4**, page 44. The north wastewater treatment service area is comprised in subareas 1 and 2 with very little exception. The south wastewater treatment service area is comprised of subareas 3, 4 and 5.

Likewise, the wastewater demand for the City Limits and ETJ combined in 2007 are shown in **Table 5-5**, page 45. The demand for the City Limits Only in 2017 are shown in **Table 5-6**, page 46. And the wastewater demand for the City Limits and ETJ combined in 2017 are shown in **Table 5-7**, page 47. The wastewater demand for the City Limits and ETJ combined at ultimate buildout are shown in **Table 5-8**, page 48.

**Table 5-9**, page 49 shows the projected wastewater demand for the north and south service areas for the **City Limits and ETJ** from 2007 thru 2017. An additional 1.5 MGD of wastewater treatment capacity will be needed in each service area before 2017.

Per TCEQ rules, when the plant flow reaches 75% of its capacity the design of an expansion must commence. Likewise, when the plant flow reaches 90% of its capacity, the construction of an expansion must commence. In the North Service Area, it is projected that demand within the City will exceed 75% of the plant capacity by 2011 and 90% by 2013. In the South Service Area, these milestones are projected in 2012 and 2015.

In addition to the wastewater capacity, new sanitary sewer lines will be needed to provide service as shown on **Exhibit 5-1**. The estimated service areas used to size the proposed sanitary sewer lines are also shown on **Exhibit 5-1**. **Exhibit 5-2** shows the future Water and Wastewater Lines. **Table 5-10**, pages 50 and 51, shows Unit Cost Data in 2007 Dollars, used to estimate the construction cost of the future Sanitary Sewer projects.

**Table 5-11**, pages 52 through 54, lists the **Sanitary Sewer Line Projects needed from 2007 to 2017** and using the Unit Cost Data from **Table 5-10** shows the estimated project costs.

**Table 5-12**, pages 55 through 57, lists the combined **Wastewater System Improvements needed from 2007 to 2017**, thru Ultimate Buildout and the estimated construction costs in 2007 dollars.

<b>Table 5-1</b>						
<b>Historical Wastewater Treatment Plant Flows</b>						
	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>Projected</b>
						<b>2007</b>
<b>North Wastewater Treatment Plant</b>						
Annual Flow (MG)	244.0	227.8	275.0	247.6	235.0	
Average Daily Flow (MGD)	<b>0.668</b>	<b>0.624</b>	<b>0.753</b>	<b>0.678</b>	<b>0.644</b>	
Plant Capacity (MGD)	1.500	1.500	1.500	1.500	1.500	
% of Total Plant Capacity Used	44.6%	41.6%	50.2%	45.2%	42.9%	
<b>South Wastewater Treatment Plant</b>						
Annual Flow (MG)	301.4	259.74	307.8	286.7	315.6	
Average Daily Flow (MGD)	<b>0.826</b>	<b>0.712</b>	<b>0.843</b>	<b>0.785</b>	<b>0.865</b>	
Plant Capacity (MGD)	1.500	1.500	1.500	1.500	1.500	
% of Total Plant Capacity Used	55.1%	47.4%	56.2%	52.4%	57.6%	
<b>Total Average Daily Flow (MGD)</b>	<b>1.494</b>	<b>1.336</b>	<b>1.597</b>	<b>1.464</b>	<b>1.508</b>	<b>1.717</b>
<b>LUE</b>	5412					5983
<b>Average Daily Flow per LUE (gpd)</b>	276					287
<b>Total Water Demand</b>						
Annual Water Demand (MG)	660.29	655.16	674.24	749.52	730.26	
Average Daily Demand (MGD)	1.809	1.795	1.847	2.053	2.001	
<b>% of Wastewater Treated vs Water Pumped</b>	82.6%	74.4%	86.4%	71.3%	75.4%	

<b>Table 5-2</b>	
<b>Existing Lift Station Capacities</b>	
<b>Lift Station Name</b>	<b>Firm Capacity (1)</b> (gpm)
Northstar	250
Sherwood	380
Hunterwood	175
Hufsmith	350
Tomball Hills	225
Persimmon	108
Snook Lane	200
Jergens Park	36
Mattheson Park	125
North WWTP	4500
South WWTP	4475
FM 2920 & Park Rd	340
(1) Lift station capacity with largest pump out-of-service	



**Table 5-4**

**Wastewater Demand by WWTP Service Area, City Limits Only, 2007**

Land Use	Sub Area (Acres)		Sub Area (Acres)	Sub Area (Acres)	Total Area (Acres)	Average Daily Wastewater Factors from Table 5-3 (gal/ac)	Ave. Daily Flow (gpd)	LUE
	1	2						
<b>North WWTP Service Area</b>								
Single Family, Average Lots	149	166			315	804	253,260	
Single Family, Large Lots	334	273			607	144	87,408	
Multi-Family & Mobile Home	42	9			51	3046	155,346	
Commercial / Retail / Office	107	74			181	338	61,178	
Industrial	11	7			18	508	9,144	
Institutional (Group Quarters - Nursing Homes, Assisted Living Homes)	5	9			14	550	7,700	
Institutional (Schools / Hospital)	414	80			494	550	271,700	
Parks / Open Space / Utilities	52	46			98	85	8,330	
Drainage (HCFCD Right-of-Ways)	34	47			81			
Vacant Land (Developable Land, Undevelopable Land, Flood Zones, Street ROW)	718	1,076			1,794			
<b>North WWTP Service Area Total</b>	<b>1,866</b>	<b>1,787</b>			<b>3,653</b>		<b>854,066</b>	<b>2,968</b>
<b>South WWTP Service Area</b>								
Single Family, Average Lots	113	184	122	5	419	804	336,876	
Single Family, Large Lots	95	121	0	0	216	144	31,104	
Multi-Family & Mobile Home	0	39	0	0	39	3046	118,794	
Commercial / Retail / Office	56	204	162	2	422	338	142,636	
Industrial	91	34	2	0	127	508	64,516	
Institutional (Group Quarters - Nursing Homes, Assisted Living Homes)	0	24	0	0	24	550	13,200	
Schools / Hospital	90	177	4	0	271	550	149,050	
Parks / Open Space / Utilities	54	30	0	0	84	85	7,140	
Drainage (HCFCD Right-of-Ways)	2	37	0	0	39			
Vacant Land (Developable Land, Undevelopable Land, Flood Zones, Street ROW)	673	990	472	0	2,135			
<b>South WWTP Service Area Total</b>	<b>1,174</b>	<b>1,840</b>	<b>762</b>	<b>0</b>	<b>3,776</b>		<b>863,316</b>	<b>3,001</b>
<b>North &amp; South Service Area Totals</b>					<b>7,429</b>		<b>1,717,382</b>	<b>5,969</b>



**Table 5-5**

**Wastewater Demand by WWTP Service Area, City Limits & ETJ, 2007**

Land Use	Sub Area (Acres)		Sub Area (Acres)		Sub Area (Acres)		Sub Area (Acres)		Total Area (Acres)	Average Daily Wastewater Factors from Table 5-3 (gal/ac)	Ave. Daily Flow (gpd)	LUE
	City Limits Only	ETJ	City Limits Only	ETJ	City Limits Only	ETJ	City Limits Only	ETJ				
<b>North WWTP Service Area</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>2</b>								
Single Family, Average Lots	149	166	0	16					331	804	266,124	
Single Family, Large Lots	334	273	55	235					897	144	129,168	
Multi-Family & Mobile Home	42	9	0	0					51	3046	155,346	
Commercial / Retail / Office	107	74	0	50					231	338	78,078	
Industrial	11	7	0	27					45	508	22,860	
Institutional (Group Quarters - Nursing Homes, Assisted Living Homes)	5	9	0	0					14	550	7,700	
Institutional (Schools / Hospital)	414	80	0	0					494	550	271,700	
Parks / Open Space / Utilities	52	46	8	0					106	85	9,010	
Drainage (HCFCO Right-of-Ways)	34	47	0	0					81	0	0	
Vacant Land (Developable Land, Undevelopable Land, Flood Zones, Street ROW)	718	1,076	866	1,362					4,022	0	0	
<b>North WWTP Service Area Total</b>	<b>1,866</b>	<b>1,787</b>	<b>929</b>	<b>1,690</b>					<b>6,272</b>		<b>939,986</b>	<b>3,266</b>
<b>South WWTP Service Area</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>3</b>	<b>4</b>	<b>5</b>						
Single Family, Average Lots	113	184	122	239	0	45			703	804	565,212	
Single Family, Large Lots	95	121	0	27	22	712			977	144	140,688	
Multi-Family & Mobile Home	0	39	0	0	0	0			39	3046	118,794	
Commercial / Retail / Office	56	204	162	2	1	184			609	338	205,842	
Industrial	91	34	2	12	0	0			139	508	70,612	
Institutional (Group Quarters - Nursing Homes, Assisted Living Homes)	0	24	0	0	0	0			24	550	13,200	
Schools / Hospital	90	177	4	0	0	0			271	550	149,050	
Parks / Open Space / Utilities	54	30	0	7	0	5			96	85	8,160	
Drainage (HCFCO Right-of-Ways)	2	37	0	0	78	19			136	0	0	
Vacant Land (Developable Land, Undevelopable Land, Flood Zones, Street ROW)	673	990	472	377	359	1197			4,068	0	0	
<b>South WWTP Service Area Total</b>	<b>1,174</b>	<b>1,840</b>	<b>762</b>	<b>664</b>	<b>460</b>	<b>2,162</b>			<b>7,062</b>		<b>1,271,558</b>	<b>4,418</b>
<b>North &amp; South Service Area Totals</b>	<b>3,040</b>	<b>3,627</b>	<b>1,691</b>	<b>2,354</b>	<b>460</b>	<b>2,162</b>			<b>13,334</b>		<b>2,211,544</b>	<b>7,684</b>

**Table 5-6**

**Wastewater Demand by WWTP Service Area, City Limits Only, 2017**

Land Use	Sub Area (Acres)		Sub Area (Acres)		Sub Area (Acres)		Sub Area (Acres)		Total Area (Acres)	Average Daily Wastewater Factors from Table 5-3 (gal/ac)	Ave. Daily Flow (gpd)	LUE
	1	2	1	2	1	2	1	2				
<b>North WWTP Service Area</b>	<b>City Limits Only</b>		<b>ETJ</b>									
Single Family, Average Lots	400	858	0	0	0	0	0	0	1,258	804	1,011,432	
Single Family, Large Lots	334	273	0	0	0	0	0	0	607	144	87,408	
Multi-Family & Mobile Home	42	23	0	0	0	0	0	0	65	3046	197,990	
Commercial / Retail / Office	152	82	0	0	0	0	0	0	234	338	79,092	
Industrial	11	11	0	0	0	0	0	0	22	508	11,176	
Institutional (Group Quarters - Nursing Homes, Assisted Living Homes)	5	9	0	0	0	0	0	0	14	550	7,700	
Institutional (Schools / Hospital)	450	80	0	0	0	0	0	0	530	550	291,500	
Parks / Open Space / Utilities	52	46	0	0	0	0	0	0	98	85	8,330	
Drainage (HCFCD Right-of-Ways)	34	47	0	0	0	0	0	0	81	0	0	
Vacant Land (Developable Land, Undevelopable Land, Flood Zones, Street ROW)	386	358	0	0	0	0	0	0	744	0	0	
<b>North WWTP Service Area Total</b>	<b>1,866</b>	<b>1,787</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3,653</b>	<b>0</b>	<b>1,694,628</b>	
<b>South WWTP Service Area</b>	<b>City Limits Only</b>		<b>ETJ</b>									
Single Family, Average Lots	223	355	192	0	0	0	0	0	770	804	619,080	
Single Family, Large Lots	95	121	0	0	0	0	0	0	216	144	31,104	
Multi-Family & Mobile Home	0	39	0	0	0	0	0	0	39	3046	118,794	
Commercial / Retail / Office	83	397	411	0	0	0	0	0	891	338	301,158	
Industrial	363	58	2	0	0	0	0	0	423	508	214,884	
Institutional (Group Quarters - Nursing Homes, Assisted Living Homes)	0	38	0	0	0	0	0	0	38	550	20,900	
Schools / Hospital	90	218	4	0	0	0	0	0	312	550	171,600	
Parks / Open Space / Utilities	54	30	0	0	0	0	0	0	84	85	7,140	
Drainage (HCFCD Right-of-Ways)	2	37	14	0	0	0	0	0	53	0	0	
Vacant Land (Developable Land, Undevelopable Land, Flood Zones, Street ROW)	264	547	139	0	0	0	0	0	950	0	0	
<b>South WWTP Service Area Total</b>	<b>1,174</b>	<b>1,840</b>	<b>762</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3,776</b>	<b>0</b>	<b>1,484,660</b>	
<b>North &amp; South Service Area Totals</b>	<b>3,040</b>	<b>3,627</b>	<b>762</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>7,429</b>	<b>0</b>	<b>3,179,288</b>	<b>11,051</b>

**Table 5-7**

**Wastewater Demand by WWTP Service Area, City Limits & ETJ, 2017**

Land Use	Sub Area (Acres)		Sub Area (Acres)		Sub Area (Acres)		Sub Area (Acres)		Total Area (Acres)	Average Daily Wastewater Factors from Table 5-3 (gal/ac)	Ave. Daily Flow (gpd)	LUE
	1	2	1	2	1	2	1	2				
<b>North WWTP Service Area</b>												
Single Family, Average Lots	400	858	0	132	1,390	804	1,117,560					
Single Family, Large Lots	334	273	55	217	879	144	126,576					
Multi-Family & Mobile Home	42	23	0	0	65	3046	197,990					
Commercial / Retail / Office	152	82	0	245	479	338	161,902					
Industrial	11	11	0	27	49	508	24,892					
Institutional (Group Quarters - Nursing Homes, Assisted Living Homes)	5	9	0	0	14	550	7,700					
Institutional (Schools / Hospital)	450	80	0	0	530	550	291,500					
Parks / Open Space / Utilities	52	46	8	0	106	85	9,010					
Drainage (HCFCD Right-of-Ways)	34	47	0	0	81	0	0					
Vacant Land (Developable Land, Undevelopable Land, Flood Zones, Street ROW)	386	358	866	1,069	2,679	0	0					
<b>North WWTP Service Area Total</b>	<b>1,866</b>	<b>1,787</b>	<b>929</b>	<b>1,690</b>	<b>6,272</b>	<b>0</b>	<b>1,937,130</b>	<b>6,733</b>				
<b>South WWTP Service Area</b>												
Single Family, Average Lots	223	355	192	271	1,130	804	908,520					
Single Family, Large Lots	95	121	0	27	977	144	140,688					
Multi-Family & Mobile Home	0	39	0	0	39	3046	118,794					
Commercial / Retail / Office	83	397	411	21	1,298	338	438,724					
Industrial	363	58	2	12	435	508	220,980					
Institutional (Group Quarters - Nursing Homes, Assisted Living Homes)	0	38	0	0	38	550	20,900					
Schools / Hospital	90	218	4	90	402	550	221,100					
Parks / Open Space / Utilities	54	30	0	7	96	85	8,160					
Drainage (HCFCD Right-of-Ways)	2	37	14	0	184	0	0					
Vacant Land (Developable Land, Undevelopable Land, Flood Zones, Street ROW)	264	547	139	234	2,463	0	0					
<b>South WWTP Service Area Total</b>	<b>1,174</b>	<b>1,840</b>	<b>762</b>	<b>662</b>	<b>7,062</b>	<b>2,164</b>	<b>2,077,866</b>	<b>7,223</b>				
<b>North &amp; South Service Areas Total</b>	<b>3,040</b>	<b>3,627</b>	<b>1,691</b>	<b>2,352</b>	<b>13,334</b>	<b>2,164</b>	<b>4,014,996</b>	<b>13,956</b>				

<b>Table 5-8</b>			
<b>Wastewater Demand, City Limits &amp; ETJ, Ultimate Buildout</b>			
<b>Land Use</b>	<b>Total Area (Acres)</b>	<b>Average Daily Wastewater Factors from Table 5-3 (gal/ac)</b>	<b>Ave. Daily Flow (gpd)</b>
<b><u>North &amp; South WWTP Service Area</u></b>			
Single Family, Average Lots	4,380	804	3,521,520
Single Family, Large Lots	1,874	144	269,856
Multi-Family & Mobile Home	122	3046	371,612
Commercial / Retail / Office	2,978	338	1,006,564
Industrial	868	508	440,944
Institutional (Group Quarters - Nursing Homes, Assisted Living Homes)	70	550	38,500
Institutional (Schools / Hospital	1,146	550	630,300
Parks / Open Space / Utilities	202	85	17,170
Drainage (HCFCD Right-of-Ways)	265	0	0
<u>Vacant Land (Developable Land, Undevelopable Land, Flood Zones, Street ROW)</u>	<u>1,429</u>	<u>0</u>	<u>0</u>
<b>Total</b>	<b>13,334</b>		<b>6,296,466</b>
<b>North Service Area Only</b>			
			<b>2,996,260</b>
<b>South Service Area Only</b>			
			<b>3,300,206</b>
<b>Total</b>			<b>6,296,466</b>

**Table 5-9  
Wastewater Treatment Plant - Projected Demand vs Capacity, City Limits & ETJ**

	Units	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Ultimate
Total Connections in City Only	LUE	5,969											
Total Projected Connections in City & ETJ	LUE	7,684										13,956	21,886

<b>North WWTP Service Area</b>													
<b>Projected Demand</b>													
Within City Limits Only	MGD	0.85	0.94	1.02	1.11	1.19	1.27	1.36	1.44	1.53	1.61	1.69	2.66
Within ETJ	MGD	<u>0.09</u>	<u>0.10</u>	<u>0.12</u>	<u>0.13</u>	<u>0.15</u>	<u>0.16</u>	<u>0.18</u>	<u>0.20</u>	<u>0.21</u>	<u>0.23</u>	<u>0.24</u>	<u>0.38</u>
Total	MGD	0.94	1.04	1.14	1.24	1.34	1.44	1.54	1.64	1.74	1.84	1.94	3.04
<b>WWTP Capacity</b>													
Current Capacity	MGD	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Future Capacity	MGD	<u>0.00</u>	<u>0.00</u>	<u>0.00</u>	<u>0.00</u>	<u>0.00</u>	<u>0.00</u>	<u>1.50</u>	<u>1.50</u>	<u>1.50</u>	<u>1.50</u>	<u>1.50</u>	<u>1.50</u>
Total	MGD	1.50	1.50	1.50	1.50	1.50	1.50	3.00	3.00	3.00	3.00	3.00	3.00
City Only Demand as % of Current Cap.		57%	63%	68%	74%	79%	85%	91%	96%	102%	107%	113%	177%
Total Demand as % of Total Capacity		63%	69%	76%	83%	89%	96%	51%	55%	58%	61%	65%	101%

<b>South WWTP Service Area</b>													
<b>Projected Demand</b>													
Within City Limits Only	MGD	0.86	0.93	0.99	1.05	1.11	1.17	1.24	1.30	1.36	1.42	1.48	2.33
Within ETJ	MGD	<u>0.41</u>	<u>0.43</u>	<u>0.45</u>	<u>0.46</u>	<u>0.48</u>	<u>0.50</u>	<u>0.52</u>	<u>0.54</u>	<u>0.56</u>	<u>0.57</u>	<u>0.59</u>	<u>0.93</u>
Total	MGD	1.27	1.35	1.43	1.51	1.59	1.67	1.76	1.84	1.92	2.00	2.08	3.26
<b>WWTP Capacity</b>													
Current Capacity	MGD	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Future Capacity	MGD	<u>0.00</u>	<u>0.00</u>	<u>0.00</u>	<u>1.50</u>	<u>1.50</u>	<u>1.50</u>	<u>1.50</u>	<u>1.50</u>	<u>1.50</u>	<u>1.50</u>	<u>1.50</u>	<u>2.00</u>
Total	MGD	1.50	1.50	1.50	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.50
City Only Demand as % of Current Cap.		58%	62%	66%	70%	74%	78%	82%	87%	91%	95%	99%	155%
Total Demand as % of Total Capacity		85%	90%	96%	50%	53%	56%	59%	61%	64%	67%	69%	93%

**Table 5-10  
Sanitary Sewer Unit Cost Data, 2007 Dollars**

Item		Unit	Unit Price
<b>8-inch Gravity Sanitary Sewer</b>			
8-inch Gravity Sanitary Sewer (all depths)		LF	\$ 40.00
Sanitary Sewer Manhole(1)		LF	\$ 5.00
<u>Trench Safety</u>		LF	\$ 1.00
Subtotal			\$ 46.00
Augering & Roadway Repairs	15%	LF	\$ 6.90
Easement Acquisition	15%	LF	\$ 6.90
Pipeline Relocation	30%	LF	\$ 13.80
Contingencies	15%	LF	\$ 6.90
<u>Engineering &amp; Surveying</u>	<u>25%</u>	LF	\$ 11.50
Indirect Cost Subtotal	100%		\$ 46.00
<b>8-inch Gravity Sanitary Sewer Total</b>			<b>\$ 92.00</b>
<b>10-Inch Gravity Sanitary Sewer</b>			
10-inch Gravity Sanitary Sewer (all depths)		LF	\$ 45.00
Sanitary Sewer Manhole(1)		LF	\$ 5.00
<u>Trench Safety</u>		LF	\$ 1.00
Subtotal			\$ 51.00
<u>Indirect Cost Subtotal (2)</u>		LF	\$ 51.00
<b>10-Inch Gravity Sanitary Sewer Total</b>			<b>\$ 102.00</b>
<b>12-Inch Gravity Sanitary Sewer</b>			
12-inch Gravity Sanitary Sewer (all depths)		LF	\$ 55.00
Sanitary Sewer Manhole(1)		LF	\$ 5.00
<u>Trench Safety</u>		LF	\$ 1.00
Subtotal			\$ 61.00
<u>Indirect Cost Subtotal (2)</u>		LF	\$ 61.00
<b>12-Inch Gravity Sanitary Sewer Total</b>			<b>\$ 122.00</b>
<b>15-Inch Gravity Sanitary Sewer</b>			
15-inch Gravity Sanitary Sewer (all depths)		LF	\$ 60.00
Sanitary Sewer Manhole(1)		LF	\$ 5.00
<u>Trench Safety</u>		LF	\$ 1.00
Subtotal			\$ 66.00
<u>Indirect Cost Subtotal (2)</u>		LF	\$ 66.00
<b>15-Inch Gravity Sanitary Sewer Total</b>			<b>\$ 132.00</b>
<b>18-Inch Gravity Sanitary Sewer</b>			
18-inch Gravity Sanitary Sewer (all depths)		LF	\$ 75.00
Sanitary Sewer Manhole(1)		LF	\$ 5.00
<u>Trench Safety</u>		LF	\$ 1.00
Subtotal			\$ 81.00
<u>Indirect Cost Subtotal (2)</u>		LF	\$ 81.00
<b>18-Inch Gravity Sanitary Sewer Total</b>			<b>\$ 162.00</b>

**Table 5-10  
Sanitary Sewer Unit Cost Data, 2007 Dollars**

Item	Unit	Unit Price
<b>21-Inch Gravity Sanitary Sewer</b>		
21-inch Gravity Sanitary Sewer (all depths)	LF	\$ 100.00
Sanitary Sewer Manhole(1)	LF	\$ 5.00
<u>Trench Safety</u>	<u>LF</u>	<u>\$ 1.00</u>
Subtotal		\$ 106.00
Indirect Cost Subtotal (2)	LF	\$ 106.00
<b>21-Inch Gravity Sanitary Sewer Total</b>		<b>\$ 212.00</b>
<b>4-Inch Force Main</b>		
4-Inch Force Main	LF	\$ 25.00
<u>Trench Safety</u>	<u>LF</u>	<u>\$ 1.00</u>
Subtotal		\$ 26.00
Indirect Cost Subtotal (2)	LF	\$ 26.00
<b>4-Inch Force Main Total</b>		<b>\$ 52.00</b>
<b>6-Inch Force Main</b>		
6-Inch Force Main	LF	\$ 30.00
<u>Trench Safety</u>	<u>LF</u>	<u>\$ 1.00</u>
Subtotal		\$ 31.00
Indirect Cost Subtotal (2)	LF	\$ 31.00
<b>6-Inch Force Main Total</b>		<b>\$ 62.00</b>
<b>8-Inch Force Main</b>		
8-Inch Force Main	LF	\$ 35.00
<u>Trench Safety</u>	<u>LF</u>	<u>\$ 1.00</u>
Subtotal		\$ 36.00
Indirect Cost Subtotal (2)	LF	\$ 36.00
<b>8-Inch Force Main Total</b>		<b>\$ 72.00</b>
<b>Miscellaneous Items Used in Sanitary Sewer Lines Above</b>		
Sanitary Sewer Manhole	EA	\$ 2,000.00
<b>Lift Station (300-500 gpm)</b>		
Lift Station (300-500 gpm) including contingencies	EA	\$ 250,000.00
<u>Engineering &amp; Testing</u>	<u>EA</u>	<u>\$ 62,500.00</u>
<b>Total</b>		<b>\$ 312,500.00</b>
<b>Lift Station (1,000-1,500 gpm)</b>		
Lift Station (1,000-1,500 gpm) including contingencies	EA	\$ 325,000.00
<u>Engineering &amp; Testing</u>	<u>EA</u>	<u>\$ 81,250.00</u>
<b>Total</b>		<b>\$ 406,250.00</b>
<b>Lift Station (1,500-2,000 gpm)</b>		
Lift Station (1,500-2,000 gpm) including contingencies	EA	\$ 450,000.00
<u>Engineering &amp; Testing</u>	<u>EA</u>	<u>\$ 112,500.00</u>
<b>Total</b>		<b>\$ 562,500.00</b>
<b>Wastewater Treatment Plant Capacity</b>		
Wastewater Treatment Plant Capacity incl. contg.	gpd	\$ 6.00
<u>Engineering &amp; Testing</u>	<u>gpd</u>	<u>\$ 1.50</u>
<b>Total per gpd</b>		<b>\$ 7.50</b>

(1) Manhole spaced every 400 feet.

(2) Indirect cost percentages are the same for all sizes of sanitary sewer lines and force mains. The percentages are shown in the cost data for an 8-inch sanitary sewer line.

**Table 5-11****Sanitary Sewer Line Projects, 2007 to 2017**

Proj. No.	Description	Priority (1)	Quantity	Units	Unit Cost (2)	Total Cost
1	10-inch Gravity Sanitary Sewer along Future Brown-Hufsmith Road from SH 249 to Quinn Road	1	2,500	LF	\$ 102.00	\$ 255,000.00
2	18-inch Gravity Sanitary Sewer along Zion Road from Neal Street to Cabotway Road	1	2,600	LF	\$ 162.00	\$ 421,200.00
3	12-inch Gravity Sanitary Sewer along Tomball Cementery Road	1	2,200	LF	\$ 122.00	\$ 268,400.00
4	18-inch Gravity Sanitary Sewer along E. Hufsmith Road from existing 36-inch line to Zion Road	2	3,900	LF	\$ 162.00	\$ 631,800.00
5	18-inch Gravity Sanitary Sewer along F.M. 2978 from F.M. 2920 to Dement Road	2	2,500	LF	\$ 162.00	\$ 405,000.00
6	15-inch Gravity Sanitary Sewer along F.M. 2978 north of Dement Road	2	3,500	LF	\$ 132.00	\$ 462,000.00
7	Lift Station at the corner of F.M. 2978 and F.M. 2920 (Design Flow = 2,200 gpm)	2	1	LS	\$ 562,500.00	\$ 562,500.00
8	18-inch Gravity Sanitary Sewer along S. Persimmon Street from Agg Road to Holderrieth Road	3	5,100	LF	\$ 162.00	\$ 826,200.00
9	12-inch Gravity Sanitary Sewer along S. Persimmon Street north of Agg Road	3	3,600	LF	\$ 122.00	\$ 439,200.00
10	12-inch Gravity Sanitary Sewer along S. Pitchford Road and Agg Road to S. Persimmon Street	3	4,900	LF	\$ 122.00	\$ 597,800.00
11	18-inch Gravity Sanitary Sewer along Calvert Road and Alice Road from F.M. 2920 to SH 249	3	7,200	LF	\$ 162.00	\$ 1,166,400.00
12	8-inch Gravity Sanitary Sewer along Future Brown-Hufsmith Road from Quinn Road to Baker Drive	3	1,800	LF	\$ 92.00	\$ 165,600.00
13	15-inch Gravity Sanitary Sewer along Zion Road and E. Hufsmith Road from Cabotway Road to Stanolind Road	3	2,600	LF	\$ 132.00	\$ 343,200.00



**Table 5-11  
Sanitary Sewer Line Projects, 2007 to 2017**

Proj. No.	Description	Priority (1)	Quantity	Units	Unit Cost (2)	Total Cost
14	8-inch Gravity Sanitary Sewer along Ulrich Road	3	3,200	LF	\$ 92.00	\$ 294,400.00
15	6-inch Force Main along Ulrich Road	3	3,400	LF	\$ 62.00	\$ 210,800.00
16	Lift Station at the end of Ulrich Road (Design Flow = 375 gpm)	3	1	LS	\$ 312,500.00	\$ 312,500.00
17	8-inch Gravity Sanitary Sewer along Agg Road east of Mulberry Street	3	1,300	LF	\$ 92.00	\$ 119,600.00
18	12-inch Gravity Sanitary Sewer along E. Hufsmith Road from Stanolind Road across F.M. 2978	4	2,700	LF	\$ 122.00	\$ 329,400.00
19	10-inch Gravity Sanitary Sewer along Quinn Road	4	3,500	LF	\$ 102.00	\$ 357,000.00
20	6-inch Force Main along Quinn Road	4	3,700	LF	\$ 62.00	\$ 229,400.00
21	Lift Station at the end of Quinn Road (Design Flow = 430 gpm)	4	1	LS	\$ 312,500.00	\$ 312,500.00
22	10-inch Gravity Sanitary Sewer along the Future Medical Complex Drive west of Cherry Street	4	1,600	LF	\$ 102.00	\$ 163,200.00
23	8-inch Gravity Sanitary Sewer along the Future Medical Complex Drive west of School Street	4	1,100	LF	\$ 92.00	\$ 101,200.00
24	8-inch Gravity Sanitary Sewer along the Future Michel Road extension east of Commercial Park Drive	4	1,100	LF	\$ 92.00	\$ 101,200.00
25	18-inch Gravity Sanitary Sewer along Park Road from FM 2920 to Brown Road	4	4,300	LF	\$ 162.00	\$ 696,600.00
26	15-inch Gravity Sanitary Sewer along Brown Road from Park Road to Orchard Grove Drive	4	5,000	LF	\$ 132.00	\$ 660,000.00
27	8-inch Force Main along Brown Road from Orchard Drive to Park Road	4	4,800	LF	\$ 72.00	\$ 345,600.00

**Table 5-11****Sanitary Sewer Line Projects, 2007 to 2017**

<b>Proj. No.</b>	<b>Description</b>	<b>Priority (1)</b>	<b>Quantity</b>	<b>Units</b>	<b>Unit Cost (2)</b>	<b>Total Cost</b>
28	Lift Station at Brown Road and Orchard Grove Drive (Design Flow = 1,000 gpm)	4	1	LS	\$ 406,250.00	\$ 406,250.00
29	8-inch Gravity Sanitary Sewer along Rudolph Road north of E. Hufsmith Road	4	1,000	LF	\$ 92.00	\$ 92,000.00
30	8-inch Gravity Sanitary Sewer along Rudolph Road south of Zion Road	5	2,100	LF	\$ 92.00	\$ 193,200.00
31	10-inch Gravity Sanitary Sewer along the Future Bypass east of Hufsmith-Kohrville Road	5	2,300	LF	\$ 102.00	\$ 234,600.00
(1) Priority Rating of 1 is highest priority and 5 is lowest priority				<b>Construction Total</b>		<b>\$11,703,750</b>
(2) Unit Price for Gravity Sanitary Sewer Includes Manholes						

**Table 5-12  
Wastewater System Summary Requirements**

<b>Total Connections in City Only</b>							
North WWTP Service Area					in 2007 =	2,968	LUE
South WWTP Service Area					in 2007 =	3,001	LUE
Total Connections					in 2007 =	5,969	LUE
<b>Total Connections in City &amp; ETJ</b>							
North WWTP Service Area					in 2007 =	3,266	LUE
South WWTP Service Area					in 2007 =	4,418	LUE
Total Connections					in 2007 =	7,684	LUE
<b>2007 Existing System, City Only</b>							
<b>Component</b>	Size	Unit	Outstanding Bond Amount		Capacity in LUE's	Demand in LUE's	LUE Excess or (Deficit)
<b>North Wastewater Treatment Plant</b>							
Existing 1.5 MGD Plant	1.5	MGD	\$228,300	(1)	5,214	2,968	2,245
Proposed 1.5 MGD Expansion with 2007 CIP							
<b>North Wastewater Treatment Plant Total</b>	1.5		<b>\$228,300</b>		5,214	2,968	2,245
<b>South Wastewater Treatment Plant</b>							
Existing 1.5 MGD Plant	1.5	MGD	\$6,117,000	(1)	5,214	3,001	2,213
Proposed 1.5 MGD Expansion with 2007 CIP							
Future Expansion for Ultimate Buildout	-						
<b>South Wastewater Treatment Plant Total</b>			<b>\$6,117,000</b>		5,214	3,001	2,213
<b>Trunklines and Lift Stations</b>							
Trunklines from 1996 & 1999 CIP			\$1,330,451	(1)	21,648	5,969	15,679
Lift Station from 2002 CIP			\$107,933	(1)	6,685	6,685	0
Trunklines from 2002 CIP			\$4,454,771	(1)	21,648	5,969	15,679
Proposed Lift Stations with 2007 CIP							
Proposed Trunklines with 2007 CIP							
<b>Trunklines and Lift Station Total</b>			<b>\$5,893,155</b>				
<b>TOTAL</b>			<b>\$12,238,455</b>				
(1) From Table 9-13 2002 Tomball Masterplan							

**Table 5-12  
Wastewater System Summary Requirements**

<b>Total Connections in City Only</b>						
North WWTP Service Area						
South WWTP Service Area						
Total Connections						
<b>Total Connections in City &amp; ETJ</b>						
North WWTP Service Area				in 2017 =	6,733	LUE
South WWTP Service Area				in 2017 =	<u>7,223</u>	<u>LUE</u>
Total Connections				in 2017 =	13,956	LUE
2007 to 2017 Improvements, City & ETJ						
<u>Component</u>	Size	Unit	Construction Cost	Capacity in LUE's	Demand in LUE's	LUE Excess or (Deficit)
<b>North Wastewater Treatment Plant</b>						
Existing 1.5 MGD Plant	1.5	MGD		5,214	5,214	0
Proposed 1.5 MGD Expansion with 2007 CIP	1.5	MGD	\$11,250,000	5,214	1,519	3,694
<b>North Wastewater Treatment Plant Total</b>	<b>3.0</b>	<b>MGD</b>	<b>\$11,250,000</b>	10,427	6,733	3,694
<b>South Wastewater Treatment Plant</b>						
Existing 1.5 MGD Plant	1.5	MGD		5,214	5,214	0
Proposed 1.5 MGD Expansion with 2007 CIP	1.5	MGD	\$11,250,000	5,214	2,009	3,204
Future Expansion for Ultimate Buildout						
<b>South Wastewater Treatment Plant Total</b>	<b>3.0</b>	<b>MGD</b>	<b>\$11,250,000</b>			
<b>Trunklines and Lift Stations</b>						
Trunklines from 1996 & 1999 CIP						
Lift Station from 2002 CIP						
Trunklines from 2002 CIP						
Proposed Lift Stations with 2007 CIP			\$1,593,750	4,994	4,994	0
Proposed Trunklines with 2007 CIP			\$10,110,000	21,886	13,956	7,930
<b>Trunklines and Lift Station Total</b>			<b>\$11,703,750</b>			
<b>TOTAL</b>			<b>\$34,203,750</b>			
(1) From Table 9-13 2002 Tomball Masterplan						

**Table 5-12  
Wastewater System Summary Requirements**

<b>Total Connections in City Only</b>						
North WWTP Service Area						
<u>South WWTP Service Area</u>						
Total Connections						
<b>Total Connections in City &amp; ETJ</b>						
North WWTP Service Area						
<u>South WWTP Service Area</u>						
Total Connections						
2017 to Ultimate, City & ETJ						
<b>Component</b>	Item	Unit	Construction Cost	Capacity in LUE's	Demand in LUE's	LUE Excess or (Deficit)
<b>North Wastewater Treatment Plant</b>						
Existing 1.5 MGD Plant						
<u>Proposed 1.5 MGD Expansion with 2007 CIP</u>						
<b>North Wastewater Treatment Plant Total</b>						
<b>South Wastewater Treatment Plant</b>						
Existing 1.5 MGD Plant						
Proposed 1.5 MGD Expansion with 2007 CIP						
<u>Future Expansion for Ultimate Buildout</u>						
<b>South Wastewater Treatment Plant Total</b>						
<b>Trunklines and Lift Stations</b>						
Trunklines from 1996 & 1999 CIP						
Lift Station from 2002 CIP						
Trunklines from 2002 CIP						
Proposed Lift Stations with 2007 CIP						
<u>Proposed Trunklines with 2007 CIP</u>						
<b>Trunklines and Lift Station Total</b>						
<b>TOTAL</b>			<b>\$3,750,000</b>			
(1) From Table 9-13 2002 Tomball Masterplan						

## 6.0 DRAINAGE SYSTEM

### 6.1 INTRODUCTION

The City of Tomball is located in northwest Harris County in the Spring Creek (J100-00-00) and Willow Creek Watersheds. The key constraints on the City's drainage infrastructure remain unchanged since the 2002 Master Plan. Spring Creek and Willow Creek have not been improved and the City's drainage systems must limit the flow into these channels to the existing conditions to prevent an adverse impact downstream. Consequently, providing detention storage remains an essential component for mitigating impacts of future development and future drainage projects.

The City of Tomball contains 7 main outfall systems that drain to Spring Creek and Willow Creek as shown on **Exhibit 6-1**. The portion of the city north of F.M. 2920 primarily drains into Spring Creek through three main outfall systems:

- J131-00-00 or Boggs Gulley for the northeast portion of the city.
- J132-00-00 in the northern portion of the city.
- J133-00-00 in the northwest portion of the city, located just east of S.H. 249.

The portion of the city south of F.M. 2920 primarily drains into Willow Creek (M100-00-00) through four main outfall systems:

- M116-00-00 passes through the Tomball Country Club in the southeast portion of the city and outfalls into Willow Creek east of the city limits.
- M121-00-00 starts northeast of the intersection of South Cherry Street and Holderieth Road and continues south of Holderieth Road to Willow Creek in the southern portion of the city.
- M124-00-00 drains the portion of the city west of S.H. 249 and south of F.M. 2920.
- M125-00-00 is an open ditch system south of F.M. 2920 that conveys the portion of the city surrounding S.H. 249 south to Willow Creek. A 550 feet long portion of M125-00-00 consists of a double 8'x8' concrete box sewer underneath a shopping center parking lot east of S.H. 249. In addition, the portion of the ditch north of the box sewer east of S.H. 249 to Graham Drive has been enlarged to provide additional storage, with the provision of a small pump to empty the stored water below the flowline elevation of the S.H. 249 ditch system to prevent standing water.

### 6.2 NEW FEMA FLOODPLAIN INSURANCE RATE MAPS

The Federal Emergency Management Agency released new Flood Insurance Rate Maps (FIRM) that became effective June 18, 2007. **Exhibit 6-2** shows a map that compares the 2000 floodplain to the new 2007 floodplain. The most notable change in the floodplain is along Boggs Gully south of Zion Road. A large portion of the floodplain through this area has been eliminated on the new maps.

**Exhibits 6-1 and 6-3** show the floodplain for the City on a relief map and on an aerial photo. The relief map shows the range of elevations with a color scale. This makes it easy to visualize the high points and ridges within the City as well as the low lying areas that may have drainage problems. This data was generated using GIS tools and the Harris County LiDAR data that was collected in 2001. Using this data will greatly enhance the planning of future drainage projects.

### 6.3 EXISTING DRAINAGE SYSTEM

The existing drainage system for the City of Tomball consists of 7 main outfall systems with several lateral systems that drain to Spring Creek and Willow Creek, as presented in Section 6.1. A summary of the 7 main outfall systems and their lateral systems within the City of Tomball are presented in **Table 6-1** below. The lateral drainage systems consist primarily of roadside ditch facilities and storm sewer that are predominately located in the downtown portion of the city. This drainage plan focuses on the main outfall systems and the lateral drainage systems are not discussed further.

**Table 6-1 – City of Tomball Channels**

HCFCU Unit No.	Name	Receiving Channel Unit No.	Stream Length (feet)			Floodplain Studied (Yes/No)*	Type (Natural/ Engineered)
			Total	ETJ	City Limits		
J100-00-00	Spring Creek	G103-00-00	374,716	16,745	7,587	Yes	Natural
J131-00-00	Boggs Gully	J100-00-00	22,104	16,952	11,488	90/10	Natural
J131-01-00**	J131-01-00	J131-00-00	6,315	6,315	6,315	Yes	Natural
J131-03-00**	J131-03-00	J131-00-00	4,207	4,207	4,207	No	Engineered
J131-04-00**	J131-04-00	J131-00-00	1,383	1,383	1,383	No	Engineered
J132-00-00	J132-00-00	J100-00-00	2,351	2,351	2,351	No	Engineered
J132-01-00**	J132-01-00	J132-00-00	483	483	483	No	Engineered
J132-02-00**	J132-02-00	J132-00-00	460	460	460	No	Engineered
J132-03-00**	J132-03-00	J132-00-00	538	538	538	No	Engineered
J133-00-00	J133-00-00	J100-00-00	4,938	4,938	4,938	No	95/5
J231-00-00**	J231-00-00	J131-00-00	4,055	4,055	4,055	No	Engineered
M100-00-00	Willow Creek	J100-00-00	108,284	8,680	1,129	Yes	Natural
M116-00-00	M116-00-00	M100-00-00	14,254	11,566	2,201	50/50	Engineered
M121-00-00	M121-00-00	M100-00-00	4,612	4,612	1,988	No	Engineered
M123-00-00**	M123-00-00	M100-00-00	3,937	3,937	0	No	Engineered
M124-00-00	M124-00-00	M100-00-00	13,643	1,587	0	Yes	90/10
M125-00-00	M125-00-00	M100-00-00	12,115	12,115	5,912	No	Engineered
M225-00-00**	M225-00-00	M100-00-00	2,890	2,890	2,890	No	Engineered

\*Ratios based on total length of channel.

\*\*Lateral system.

## 6.4 FUTURE DETENTION REQUIREMENTS FOR DEVELOPMENT

The 7 main outfall systems and Spring Creek are not adequately sized to convey the 100-year design storm event. This limited capacity requires mitigation of increased impervious cover created by development. This mitigation generally comes in the form of detention basins.

The 2002 Master Plan summarized the requirements of Harris County Flood Control District (HCFCD) in regards to mitigation of peak flows as not to increase the flood levels in downstream channels. Without large scale improvements to Spring Creek and especially Willow Creek, this requirement mandates the provision of detention storage to maintain existing flows and flood levels. This scenario holds true for this Master Plan update and will likely hold true for some time.

There are three options for providing detention storage: (1) on-site detention, where each new development provides its own detention storage with controlled releases reducing the flow leaving the site in proposed conditions to that of existing conditions; (2) regional detention, where larger detention facilities serve large areas of proposed development with controlled releases to limit the flow to that of existing conditions; and (3) sub regional detention where several developments are served by detention facilities of a smaller scale than regional facilities with controlled releases.

The different detention options offer advantages and disadvantages associated with each option that must be weighed in determining the best alternative for detention storage. On-site detention is simple from the ownership perspective since the party responsible for each development must provide detention storage for the respective site. However, the use of multiple small detention facilities demands a higher cost per acre served, requires more land, and creates a more complicated hydraulic and hydrologic network. In addition, the on-site detention facilities demand on-going maintenance which adds more expenses and responsibilities to the land owner.

The maintenance of regional and sub regional detention basins would be provided for by the HCFCD and not the land owner. There are significant disadvantages, however, including a large initial cost for site acquisition and construction. An added inconvenience is the requirement of a watershed master plan study to size and locate the most cost-effective regional facilities. An "impact fee" would also need to be developed that developers will pay for use of the detention facilities. The master plan and impact fee would need to be agreed upon by each of the four counties that are served by Spring Creek as well as any drainage districts or other government agencies involved, including the City of Tomball. It is obvious that these requirements will require a significant amount of time in order to implement regional and sub regional detention methods.

The City should promote the use of regional and sub regional detention systems and use on-site detention only when other options are not available. The advantages of regional and sub regional detention facilities include:



- Reduces the overall cost of required detention facilities.
- Increases the effectiveness of provided storage.
- Simplifies the required maintenance of detention facilities.

Discussions with the Harris County Flood Control District (HCFCD) about future projects indicated that there are no plans to increase the capacity of Spring Creek and Willow Creek any time soon. HCFCD is coordinating projects such as the Grand Parkway that may realign portions of Willow Creek but will not increase its conveyance.

## **6.5 DRAINAGE STUDIES COMPETED SINCE 2002**

The Harris County Flood Control District is currently compiling a Watershed Master Plan that contains the 22 major watersheds in Harris County. This HCFCD Master Watershed study, when completed, will identify the channel capacity Level of Service for Spring Creek, Willow Creek and the 7 main outfall systems within the City of Tomball. The Level of Service of a channel is identified by which recurrence storm event is held within the channel banks. The Level of Service of each portion of the watershed will help identify the portions of the channel that are inadequate. Included in this study will be conceptual (planning level) channel sizes and right-of-way requirements for various levels of protection for Spring Creek, Willow Creek and the 7 main outfall systems. Based on the results of the Watershed Master Plan, revisions to the identified drainage projects may be necessary.

A preliminary engineering report was prepared for the City of Tomball (consultant – PBS&J) in May of 2003 for the proposed M121-00-00 west channel and detention facilities. This study identifies the location and size of the M121-00-00 west channel system and the associated detention facilities.

Currently, an in-depth study is being performed by the City of Tomball (consultant - Lockwood, Andrews, & Newnam, Inc.) for the M124-00-00 outfall system. The study identifies channel improvement and detention basin options for M124-00-00. This study is scheduled for completion by the end of 2008.

## **6.6 DESIGN CRITERIA**

The City of Tomball uses the HCFCD criteria for the design of channel and detention ponds and the City of Houston criteria for the design of storm sewer systems. In October of 2004, HCFCD adopted a new Policy Criteria & Procedure manual. Additionally, the City of Houston storm sewer design criteria has been revised since 2002. Pertinent outfall criteria are given below along with previous criteria that have changed in parenthesis.

- Design new channels to contain the 100-year frequency, 24-hour storm event.
- The starting water surface elevation for a storm sewer is the top of pipe elevation at the outfall (25 year storm level in outfall channel in 2002 Master Plan).

- The City of Houston storm sewer design criterion uses a 2 year storm event (5 year in 2002 Master Plan).
- The minimum side slope for a channel is 4:1 for grass lined channels and 2:1 for concrete lined channels (3:1 and 1:1-1/2 respectively in 2002 Master Plan).
- Roadside ditch side slopes no steeper than 3:1.
- Velocities in unlined channels should be no greater than 5 fps.
- Culverts and bridges should be designed to pass the 100 year frequency storm when crossing outfall channels.
- The detention design process has been modified by HCFCD and has defined a process for small, moderate, and large drainage areas. The City should consider adopting these methods.

## 6.7 CONSTRUCTION COST INCREASES

Based on the U.S. Department of Labor Bureau of Labor Statistics, there has been approximately a 20% increase in the project construction costs from 2002 to 2007 and a 30% increase in the project construction costs from 1998 or 1999 to 2007. The projects that are shown in **Table 5-1** of the 2002 Master Plan that have not been constructed will most likely cost between 20% and 30% more in 2007 dollars. **Exhibit 6-1** and **6-3** show the proposed drainage projects presented in the 2002 Master Plan. **Table 6-2** below estimates the projected 2007 cost for the 10-year channel improvements found in the 2002 Master Plan. **Table 6-3** estimates the projected 2007 cost of detention facilities for the main outfalls to Willow Creek found in the 2002 Master Plan. **Table 6-3** also includes the 2007 cost for the total drainage program presented in the 2002 Master Plan.

## 6.8 UNIT COSTS OF CONSTRUCTION

In order to estimate future construction costs, unit cost of construction for channels and detention basins have been calculated using construction cost estimates. Unit cost of channel construction per linear foot as well as detention basin cost per acre-foot of storage and cost per acre of surface area are detailed below.

- Channel Construction
  - Average width channel: \$561.00 per linear foot of channel
  - Average large-width channel: \$680.00 per linear foot of channel
- Detention Basin Construction
  - Cost per acre of surface area: \$182,000 per acre
  - Cost per acre-foot of detention: \$33,000 per acre-foot

The average channel is assumed to be a channel consisting of a 6-foot bottom width, 4:1 side slopes, and a depth of 8-feet. The channel will also include 60-feet of right-of-way for maintenance purposes for a total channel right-of-way width of 130-feet. The average large channel is assumed to be a 9-foot deep bench style channel with 60-feet of right-of-way for a maintenance purposes and a total right-of-way width of approximately 200-feet. In order to determine unit cost of construction, it was assumed that land required for channel right-of-way and detention pond construction was priced at \$100,000 per acre. Excavation, grading, outfall structures, and landscaping costs were assumed to be \$7.00 per cubic yard. Additionally, mobilization costs for construction of channels and detention ponds as well as miscellaneous costs were assumed to be \$0.45 per square foot of surface area.

**Table 6-2 – 10 Year Outfall Drainage Channel Improvements**

Number	10-Year Outfall Drainage Channel Improvements	2002 Master Plan Cost	2007 Costs
1.	Outfall Ditch I (J131-00-00) -- Improvement and extension of tributary to Ditch J, approximately 300 acres of new development.	\$676,000	\$811,000
2.	Outfall Ditch B (M116-00-00) – Extension of M116-00-00, approximately 150 acres of new development	942,000	1,130,000
3.	Outfall Ditch D and D-1 (M121-00-00) – Drainage channels from Graham Street, to Willow Creek (M121 East = \$1,900,000 and M121 West = \$3,000,000)	4,900,000 <sup>(1)</sup>	6,370,000
4.	Outfall Ditch G and G-1 (M124-00-00) – Tributary of Ditch M124 to serve 220 acres of commercial and west side of city.	3,600,000	4,320,000
5.	Outfall Ditch C (M118-00-00) – First improvement of Ditch C to drain 150-acre development	2,000,000 <sup>(2)</sup>	2,600,000
6.	Outfall Ditch E (M125-00-00) – Ditch M125 improvement across S.H. 259	0 <sup>(3)</sup>	0
7.	Lateral Ditch F – Tributary to Ditch E, extend to Mary Jane,	745,000	894,000
8.	Outfall Ditch N (J132-00-00) – Enlargement to serve area near Zion Road	825,000	990,000
9.	Lateral Ditch K – Tributary of J131-00-00, to serve new streets	175,000	210,000
10.	Lateral Ditch L – Tributary of J131-00-00, to serve Baker Drive	170,000	204,000
<b>Total Channels and Boxes</b>		<b>\$14,033,000</b>	<b>\$17,529,000</b>

All costs were taken from the 2002 Master Plan and adjusted to 2007 dollars by a 1.2 multiplier unless it was associated note otherwise based on superscript.

- (1) From Recommended Alternative Evaluation of M121-00-00 and M121 Lateral, dated September 1999 – Multiply by 1.30 for 2007 cost.
- (2) From M118-00-00 Drainage Study in the Willow Creek Watershed, dated December 1999 – Multiply by 1.30 for 2007 cost.
- (3) From PER Proposal M125-00-00 Channel and Detention Facility

**Table 6-3 – Detention Facilities for the Main Outfalls to Willow Creek**

Number	Detention Facilities on Outfalls to Willow Creek**	Unadjusted Cost	2007 Costs
1.	Detention for Ditch B (M116-00-00), 300 acre-feet/62 acres	\$3,630,000 <sup>(1)</sup>	\$4,719,000
2.	Detention for Ditch C (M118-00-00)***	3,700,000 <sup>(2)</sup>	4,810,000
3.	Detention for Ditch D (M121-00-00)***	4,500,000 <sup>(3)</sup>	5,850,000
4.	Detention for Ditch D (M121-00-00)***	3,300,000 <sup>(4)</sup>	4,290,000
5.	Detention for Ditch E (M125-00-00), ultimate detention only***	1,100,000 <sup>(5)</sup>	1,320,000
6.	Detention for Ditch G (M124-00-00), 675 acre-feet/133 acres	8,170,000 <sup>(1)</sup>	10,621,000
<b>Total Detention</b>		<b>\$24,400,000</b>	<b>\$31,610,000</b>
<b>Total Drainage Program</b>		<b>\$38,433,000</b>	<b>\$49,139,000</b>

\* Land Costs are not included in these figures

\* All detention facilities proposed are outside city limits, but in ETJ.

\*\*\* Per 2002 Master Plan these are subregional detention facilities to be partially funded by application of city impact fees

All costs were taken from the 2002 Master Plan and adjusted to 2007 dollars by a 1.2 multiplier unless it was associated note otherwise based on superscript.

- (1) From Willow Creek mid Reach Watershed Study Final Phase III Report dated June 1999, excavation only @ \$5/CY x \$1.50 – Multiply by 1.30 for 2007 cost.
- (2) From M118-00-00 Drainage Study in the Willow Creek Watershed, dated December 1999 – Multiply by 1.30 for 2007 cost.
- (3) From HCFCD M500-01-00 Detention Facility Final Report dated May 1998, 372 acre-feet excavation only @ \$5/CY x 1.5 for contingencies, pipelines, design, and land – Multiply by 1.30 for 2007 cost.
- (4) From Recommended Alternative Evaluation M121-00-00 and M121 Lateral, dated September 1999. This amount is for the City-funded pond expansion to serve new development – Multiply by 1.30 for 2007 cost.
- (5) From PER Proposed M125-00-00 Channel and Detention Facility (ultimate detention volume [90 acre-feet] excavation only @ \$5 CY x 1.5 for contingencies, design, and land – Multiply by 1.2 for 2007 cost.

## **7.0 TRAFFIC AND TRANSPORTATION**

### **7.1 INTRODUCTION**

The City of Tomball is located 28 miles northwest of downtown Houston in Harris County. The City and its ETJ are situated along two major highway corridors, SH 249 and FM 2920. SH 249 runs north and south on the western side of Tomball, connecting southward into Houston and northward into Montgomery County and eventually Navasota via other roadways. FM 2920 travels east and west through the center of the city, extending westward to US 290 at Waller and eastward to IH 45 at Spring.

Regional arterials in or near Tomball's city limits and ETJ include FM 2978 (Hufsmith-Kohrville Road), Telge Road, and Spring-Cypress Road.

The roadway system is the city's primary form of transportation. At this time, the City is not undergoing a pedestrian and bicycle plan nor is one currently in place. Tomball is not in the METRO service area; although the surrounding portion of unincorporated Harris County is in the service area. The nearest bus service is approximately five miles to the south, where the #86 bus terminates at Hewlett Packard's office campus at SH 249 and Spring-Cypress Road. The City has expressed interest in acquiring Hooks Airport for public use but no definite plans have been announced as of yet.

### **7.2 DESCRIPTION OF MAJOR EXISTING ROUTES**

SH 249, commonly referred to as Tomball Parkway, is a major north-south highway in Southeast Texas that traverses the City of Tomball. Its northernmost terminus is at the intersection of FM 1774 and FM 149 in Pinehurst. It extends approximately 27 miles south, crosses Beltway 8 and terminates in northern Houston at IH 45. SH 249 through Tomball is primarily a lightly wooded corridor with residential and commercial land uses in some places. Its major intersections are IH 45, FM 1960, Louetta Road and FM 2920.

Hufsmith-Kohrville (FM 2978) is a two-lane north-south facility that spurs off SH 249 in northern Harris County and extends northward into Montgomery County. FM 2978 will be widened from a two to five lane highway beginning at Spring Creek south to FM 2920. The project will also include an overpass at the railroad crossing to improve traffic flow and safety. Construction is set to begin fall 2007.

FM 2920 is a major east west arterial in northern Harris County between the communities of Waller on US 290-Northwest Freeway and Spring near IH 45-North Freeway. Portions of it become Main Street in the City of Tomball. The Houston-Galveston Area Council, along with TxDOT, the City of Tomball, the City of Waller and other stakeholders, have plans to conduct an Access Management Study of 2920 from IH-45 to US 290 to help alleviate traffic congestion and other access issues.

The Grand Parkway (SH 99) is a proposed 180+ mile scenic highway encircling the Greater Houston region. At completion, it will traverse seven counties and provide easier

access for suburban communities. Currently 20 miles of the highway, Segment D, from US 59 near Sugar Land to IH 10 near Katy, have been constructed as a toll free road. Segment D has been open to the public since August 31, 1994. Segments F-1 and F-2 have the potential to greatly affect Tomball, as this portion of the highway will travel east to west roughly in the vicinity of Boudreaux Road, just to the south of Tomball's ETJ. The opening of this facility, currently scheduled for late 2012 to early 2013, will greatly affect the traffic patterns in the region, and is discussed further in the selection process for an additional east-west arterial.

Holderrieth Road, a four-lane roadway traversing the southern most part of Tomball, currently serves as a southern connector to the eastern or western parts of the city. It currently extends from SH 249 to FM 2978 (Hufsmith-Kohrville Road).

Other area roadways are in various stages of project development and can be found in **Table 7-1** on page 69.

### **7.3 CONNECTIONS TO HOUSTON ETJ**

Texas state law allocates ETJ based on a city's population. Tomball, with a 2000 Census population of 9,089, falls in the "5,000 to 24,999" category, and is thus entitled to a 1-mile ETJ. The ETJ will increase to 2 miles when the population reaches 25,000, and 3 ½ miles at 50,000. Tomball's actual ETJ is smaller than the theoretical 1 mile in places, as it is surrounded on three sides by the ETJ of the City of Houston, who is entitled to a 5-mile ETJ, based on a population of 100,000 or more. Houston and Tomball have agreed to several ETJ exchanges to the east and west of Tomball. However, Houston has indicated they are not willing to release any ETJ south of Boudreaux Road.

Holderrieth Road, where it exits Tomball's ETJ and enters Houston's, is shown as a major thoroughfare (100 foot ROW) continuing westward, parallel to FM 2920, until it merges with FM 2920 between Bauer and Becker Roads, approximately 10 miles west of Tomball. East of Tomball, Holderrieth is proposed to turn southward and connect to the existing Champions Forest Drive.

Hufsmith-Kuykendahl Road is shown as a major collector (minimum 70 foot ROW) from where it exits Tomball's eastern edge, to the road's current terminus at Kuykendahl Road. Boudreaux Road, which is entirely in Houston's ETJ, is shown as a major thoroughfare. Other than the state facilities of FM 2920 and the Grand Parkway (SH 99), no other east-west roadways are shown in the vicinity of Tomball.

Trichel Road (extending eastward from FM 2920 near Telge Road) is shown as a major thoroughfare "to be widened." It ends at the Tomball city limits. This corridor was originally planned to connect to Tomball's Medical Complex Drive. It is located south of Medical Complex but north of Alice Road (the western extension of Theiss Road).

## 7.4 OPTIONS FOR NEW EAST-WEST ARTERIAL

The City can benefit greatly from an additional East-West route. Currently, Main Street (FM 2920) as their primary route when traveling east or west through the City. This through traffic on the corridor mixes with traffic trying to access shopping and other Main Street attractions. The original plans for this route followed Medical Complex Drive in the vicinity of SH 249. When TxDOT constructed the SH 249 bypass, however, no provision was made for a grade separation at Medical Complex Drive. Therefore, in order to use this roadway as an east-west arterial, the City of Tomball would have to construct an overpass at their own expense. Due to the high cost, City staff directed the project team to examine alternatives for an east-west arterial. There are three viable options for creating an east-west bypass within the city. From south to north, these are: Holderrieth Road, extensions of Theiss and Agg Roads, and Brown-Huffsmith Road. These three bypass options, and the original Medical Complex Drive route, are shown on **Exhibit 7-1**.

Holderrieth Road exists as a two-lane facility, and is continuous from SH 249 to FM 2978. Of the three options, it is the shortest distance from east to west and currently the most used. Current traffic is heavy, and the road needs widening to handle both its current load and any increased traffic. Several acres of vacant property exist along the Holderrieth corridor that may be developed for commercial or residential uses if this option is chosen, further increasing the need for roadway expansion. However, pending development of the Grand Parkway makes Holderrieth a less viable option due to its close proximity to the parkway, which will be constructed approximately one mile to the south. Furthermore, a drainage channel and sand pits west of SH 249 present significant obstacles to extending Holderrieth to the west. Right-of-way along Holderrieth varies from 60 to 90 feet with minor obstructions that restrict further widening. Much of the roadway is in the 100-year floodplain, which places environmental restrictions on potential development.

A corridor using Theiss and Agg Roads would serve major commercial and industrial developments in the southern area of the city. There is over 100 acres of mixed-use development pending for the area. A Theiss-Agg corridor will also serve the area around Medical Complex Drive, which does not cross the new SH 249 bypass. There are approximately 10 new buildings being developed in this area. Agg Road currently has 60 feet of right-of-way while Theiss Road's right-of-way varies from 60 feet to 100 feet. Connecting Theiss to Agg Road will require a new-location approximately one-half mile long, through wooded, currently undeveloped land. Connections to FM 2920 at either end of the Theiss-Agg corridor are possible, and travel through currently undeveloped land.

Brown-Hufsmith Road, a two-lane facility, is another viable option as an east-west thoroughfare through the city. It is the closest of the three corridors to Tomball downtown. The portion of Brown-Hufsmith Road between SH 249 and Quinn is currently being constructed, with completion expected in 2009. The next section to the east, a new-location roadway between Quinn and Baker, should be finished shortly



afterwards. The remainder of the corridor follows existing roadways which will require expansion.

Although the City of Houston does not designate major thoroughfares outside its own ETJ, its Major Thoroughfare and Freeway Plan (MTFP) shows proposed four-lane thoroughfares ending at the Houston/Tomball boundary, clearly connecting to both ends of existing Holderrieth Road, and one (Triechel Road) between Medical Complex and Alice Road, as previously discussed in Section 7-3. One extension of Holderrieth travels west approximately nine miles, parallel to FM 2920, before merging with FM 2920 near Bauer Road. This alignment does not take into account the aforementioned sand pits at SH 249 and Holderrieth. The other proposed thoroughfare travels east from Holderrieth at FM 2978, turns southeast almost immediately, and connects to Champions Forest Drive.

If the City of Tomball chooses to develop a corridor other than Holderrieth or Triechel as a major east-west connector, it is recommended that the City coordinate with the City of Houston on potential changes to Houston's MTFP, to ensure regional continuity of the planned roadway system.

**Table 7-1  
Other Future Roadway Projects—Tomball Vicinity**

<b>Sponsor</b>	<b>Street</b>	<b>Limits</b>	<b>Description</b>	<b>FY</b>
Harris County	Gosling Rd.	Kuykendahl – FM 2920	2 Lane Asphalt Road with Turn Lanes	2009
HCTRA	SH 249	@ BW 8	SB-WB Direct Connector	2009
TXDOT Houston	FM 2920	IH 45-Kuykendahl	Install Vids, Pan Tilt Cameras and Message Signs at Intersections	2009
TXDOT Houston	FM 2920	Kuykendahl- FM 2978	Install Aerial Fiber	2009
City of Tomball	Brown-Huffsmith Rd.	W Huffsmith/Baker Rd.- SH 249 in Tomball	2 Lanes on New Location	2008
Harris County	Kuykendahl	Augusta Pine- Willow Creek	Widen 2 to 4 Lanes	2008
Harris County	Kuykendahl	Willow Creek- FM 2920	Widen 2 to 5 Lanes	2008

## **8.0 PARKS**

In 1995, the City developed its first park master plan which included a list of existing parks and a plan for acquiring and developing new park land. Currently, the City owns approximately 43.5 acres of developed park land. There are also three Harris County facilities either within the City or nearby which are available for Tomball residents. These facilities include: Roy Campbell Burroughs Park, Spring Creek Park, and Samuel Matthews Park. There are no regulations for park space, but the National Recreation and Park Association promotes a goal of 10 acres of park land per 1,000 residents. The City exceeds this goal from 2007 to 2017 if the acreage from the local county parks is included. A summary of the city's park land is shown in **Table 8-1**, page 71.

### **8.1 EXISTING PARKS**

There are six developed parks within the City's ETJ including one Harris County park. There are also two additional Harris County parks within 4 miles of the city central business district. All of these parks are in very good condition.

#### **8.1.1 Parks within the ETJ**

Juergens Park is a 10 acre facility located on Ulrich Road. The park includes a large pavilion with picnic tables, a basketball court, barbeque and picnic facilities, restrooms, a playground, walking trails and a parking area. Overall, the park is in good condition but vandalism has been a recurring problem.

Jerry Mattheson Park is a 9.8 acre facility located across from Juergens Park on Ulrich Road. The park includes four tennis courts, a baseball field, a large playground, a municipal swimming pool and parking area. The park is in excellent condition.

Martin Luther King, Jr. Park is a 0.7 acre facility located at Timkin Road and South Chesnut Street. The park includes a covered, lighted basketball court, a playground and two picnic tables with barbeque grills. The park is in excellent condition.

The Stovall Memorial Sports Complex is located on a 19 acre tract on the corner of West Hufsmith and North Cherry Street. The facility is owned by the City and leased to Tomball Sport Association for operation and maintenance. The site includes seven baseball fields, two concession stands, a League office, a small playground and large parking areas. The park is in need of a new restroom facility.

Theiss Park is a 4 acre facility located on Theiss Lane between SH 249 and Commercial Park Drive. The park includes a small lake with a pier, walking trails, benches, tables and a parking area.

Samuel Matthews Park is a 5 acre Harris County Precinct 4 facility located within the City's ETJ on Kuykendahl Hufsmith Road at Stanolind Road. The park includes one covered basketball court, one open basketball court, volleyball court, playground,

**Table 8-1  
Parks and Trails Acreage**

<b>NRPA Recommended Park Space (10 acres per 1000 residents)</b>			
<u>Year</u>	<u>Population</u>	<u>Recommended Park Space</u>	
2007	10,753	108	acres
2017	21,285	213	acres

<b>Park Space - Existing, Currently Undeveloped and to be Acquired &amp; Developed</b>	
<u>Existing Parks</u>	<u>Park Area</u>
Juergens Park	10.0 acres
Jerry Mattheson Park	9.8 acres
Stovall Memorial Sports Complex	19.0 acres
Martin Luther King, Jr. Park	0.7 acres
Theiss Park	4.0 acres
Samuel Matthews Park-Harris County	5.0 acres
Spring Creek Park-Harris County	114.0 acres
<u>Roy Campbell Burroughs Park-Harris County</u>	<u>320.0 acres</u>
Subtotal	482.5 acres
<u>Additional Parks To Be Developed</u>	
Martin Park	1.0 acres
Tomball City Park	9.9 acres
City Landfill	19.0 acres
<u>Dentention Pond Sports Complex</u>	<u>35.0 acres</u>
Subtotal	64.9 acres
<u>Parks To Be Acquired and Developed</u>	
Library Park	1.0 acres
Tomball City Park (Cortez Tract)	5.0 acres
<u>Pedestrian Trails System</u>	<u>9.4 acres</u>
Subtotal	15.4 acres
<b>TOTAL</b>	<b>562.8 acres</b>

<u>City</u>	<u>Population (1)</u>	<u>Park Acreage (2)</u>	<u>Acres per 1,000 Residents</u>
Tomball	10,753	483	45
Katy	12,325	133	11
Pearland	37,640	106	3
Kingwood	65,000	500	8
Conroe	36,800	335	9
Sugarland	77,982	772	10

(1) Population is approximate  
(2) Park Acreages were determined from City websites

baseball field, picnic tables, restrooms, walking trail, a Precinct 4 office building, and parking area. The park is in very good condition.

### **8.1.2 Additional Harris County Parks outside the ETJ**

Spring Creek Park is a 114 acre facility located west of the City on Brown Road. The park includes a pavilion with picnic tables, volleyball court, covered basketball court, two tennis courts, baseball field, restroom facilities, camping/picnic areas, multiple playgrounds and walking trails.

Roy Campbell Burroughs Park is a 320 acre facility located northeast of the City on Hufsmith Road. The park includes seven soccer fields, four baseball fields, two volleyball courts, restroom facilities, walking trails, a small lake, picnic tables, multiple playground areas, and a pavilion.

## **8.2 EXISTING PARK LAND TO BE DEVELOPED**

The City currently owns four additional sites totaling 64.9 acres which may be used for park land.

Martin Park is a 3 acre wooded site located on East Hufsmith Road at Peach Street. The site is located next to an assisted living facility. The assisted living facility has an agreement with a regional non-profit group to develop a 1 acre park on the site in exchange for the use of the remainder of the property. The park development may include walking trails, benches, picnic tables, playground equipment, and native plantings and landscaping.

Tomball City Park is a 9.9 acre wooded site west of Rudolph Road. HCFCU Unit #J131-00-00 divides the tract into two sections, and the 5 acre Cortez Tract separates Tomball City Park from Jerry Mattheson Park. The City's 1995 park plan suggests the park include two large covered pavilions, picnic facilities, a softball field, restrooms, parking area and walking trails with a wooden foot bridge crossing the drainage channel.

City Landfill is a 19 acre site between Neal Street and Rudolph Street. There are numerous possibilities of development of this tract including skateboard, skating, or rollerblade facilities, baseball fields, soccer fields, walking trails, restrooms, picnic areas, playgrounds, and parking areas.

Harris County Flood Control District and the City jointly own a 75 acre site south of Holderrieth Road at Cherry Street for a stormwater detention pond. When the construction of the pond is completed, the site will have approximately 35 acres available for park development. The area will be ideal for baseball fields, soccer fields and walking trails.

### **8.3 PROPOSED PARKS**

The Cortez Tract is a 5 acre site located on Ulrich Road between Jerry Mattheson Park and the future Tomball City Park. The acquisition of this tract will connect the two parks and complete the master park plan for Jerry Mattheson Park.

Tomball Outlots are small parcels between Ulrich Road, East Hufsmith Road and the railroad. These tracts do not have any road frontage and the City owns most of the parcels. The City is currently negotiating to acquire the rest of the parcels in order to designate the land for public use.

### **8.4 PEDESTRIAN TRAILS**

The 1995 Park Plan proposed an interconnecting system of pedestrian trails that would connect existing parks as well as neighborhoods, schools, the community college, medical center and other parts of the City. The pedestrian trails are planned to be constructed in open areas and drainage easements where possible, and they will utilize approximately 1 mile of existing sidewalks along Baker Drive and Sandy Street. When complete, the project will consist of approximately 9.4 miles of trails throughout the City.

### **8.5 SUMMARY**

Including the nearby county parks, the City of Tomball currently has about 483 acres of park space available to its residents. This relates to approximately 45 acres per 1,000 residents based on an estimated 2007 population of 10,753. If the City of Tomball continues to acquire and develop the parks discussed in this section, the total amount of park land available to Tomball residents will increase to about 563 acres. This will equate to approximately 26 acres of park space per 1,000 residents based on an estimated 2017 population of 21,285. These numbers greatly exceed the National Recreation and Park Association's goal of 10 acres of park land per 1,000 residents. Other communities in the Houston Metropolitan Area average close to 10 acres of park area per 1,000 residents as shown on **Table 8-1**, page 71.

## **9.0 MAXIMUM IMPACT FEE DETERMINATION**

### **9.1 TECHNICAL BASIS FOR MAXIMUM IMPACT FEE CALCULATION**

This section contains a discussion of the technical basis which was used in the calculation of Tomball's maximum impact fee fees as set forth in Local Government Code, Title 12, Planning and Development, Chapter 395, et seq, Financing Capital Improvements Required by New Development in Municipalities, Counties, and Certain Other Local Governments, and Its Successors. Tomball Code, Part II, Chapter 82, Utilities, Article IV, Water and Wastewater Capital Recovery Fees, adopted by Ordinance No. 90-01 and amended by Ordinances 93-11, 96-20, and 99-21 implements Local Government Code §395.

This report also presents the drainage impact fee which will be imposed on the service areas of drainage channels M118, M121, M121 W, and M125.

#### **9.1.1 Land Use and Planning Assumptions**

Chapter 395 requires the following in land use and planning assumptions:

- Definition of service area
- Projections in changes in land uses, densities, and population within the service area for ultimate development and the next 10 years.
- Land use assumptions differentiated by at least residential, commercial, and industrial land uses.

Land use and planning assumptions for the impact fee calculations were derived from the City's infrastructure master plan for 2007 to 2017, which is presented in the first eight sections of this report. The following sections provide a discussion of these assumptions.

##### **9.1.1.1 Service Area Definitions**

The service area designation defines the area of growth for which the fee is developed, allows an estimate of service demand arising from the growth and permits the development of a capital improvements program to meet the service needs.

For water and wastewater facilities, the service area of the infrastructure master plan; i.e., the current corporate boundaries of the city and its ETJ is used for derivation of maximum impact fees.

For storm drainage facilities, the service area may include all or part of the land within the city or its ETJ, but will not exceed the area actually served by the facility

described in the plan and will not extend across watershed boundaries. The service areas for the four fee drainage basins are depicted graphically on **Exhibit 6-1**.

#### 9.1.1.2 Land Use Assumptions

Land Use projections for the years 2007 and 2017 have been previously presented in **Tables 2-2 and 2-3**, pages 4 through 7. Regarding projected ultimate buildout conditions, the City completed its Comprehensive (Land Use) Plan Update in 1986. This plan projected land uses at ultimate buildout conditions for the four service areas in place at that time. Later in the 2002 Masterplan, additional area was added to the City / ETJ and the four service areas were redistributed into five service areas. The revised Land Use projections for ultimate buildout prepared in 2002 are shown in the top half of **Table 2-4**, page 8.

Since 2002, the City has increased its City / ETJ area from 12,508 acres to 13,334 acres. Additionally, land use development patterns have changed since the 1986 study. Based on the land use patterns projected for 2007 to 2017, a redistribution of the remaining developable land was made and the revised Land Use at Ultimate Buildout is shown in the lower half of **Table 2-4**, page 8.

#### 9.1.2 Utility Usage

Usage for water and wastewater in the infrastructure master plan were also used in the fee development. The fee program is designed to mirror consumption patterns so that potential overcharges (and subsequent refunds) will be avoided.

#### 9.1.3 Capital Improvement Plan (CIP)

The capital improvement plan (Infrastructure Master Plan 2007-2017) which is used to calculate impact fees contains the following:

1. A description of the existing capital improvements within the service area and the costs to upgrade, update, improve, expand, or replace the improvements to meet existing needs and usage; and stricter safety, efficiency, environmental, or regulatory standards.
2. An analysis of the total capacity, the level of current usage, and commitments for usage of capacity of the existing capital improvements.
3. A description of all or the parts of the capital improvements or facility expansions and their costs necessitated by and attributable to new development in the service area based on the approved land use assumptions.
4. A definitive table establishing the specific level or quantity of use, consumption, generation, or discharge of a service unit for each category of capital improvements or facility expansions, and an equivalency or conversion

table establishing the ratio of a service unit to various types of land uses, including residential, commercial, and industrial.

5. The total number of projected service units necessitated by and attributable to new development within the service area based on the approved land use assumptions and calculated in accordance with generally accepted engineering or planning criteria.
6. The projected demand for capital improvements or facility expansions required by new service units projected over a reasonable period of time, not to exceed 10 years.

In addition, legislation provides that the CIP may include construction costs, survey and engineering fees, land acquisition costs, fees for preparation of the CIP and impact fee study, and projected interest and finance costs. These items are addressed later in this section.

#### **9.1.4 Conversion Table - Utilities**

City of Tomball Code, Article IV, Section 82-134, establishes living unit equivalents ("LUE") as a basis for establishing equivalency among and within various customer classes. These are based upon the relationship of the continuous-duty maximum flow rate in gallons-per-minute for a water meter of a given size and type compared to that of a five-eighths inch diameter simple water meter using American Water Works Association C700-C703 standards. **Table 9-1**, page 80, shows LUE equivalencies for various types and sizes of water meters. LUE is the basis for calculation of both water and wastewater fees.

Because the utility fee calculation was based on water meter size, the conversion table applies equally to all land uses. The only need to make further differentiation by land use type would occur if a particular development's wastewater flow was not represented by the size of its water meter, as might occur with consumptive commercial uses (car washes, restaurants) or industrial processes. Additionally, any land use might have a large meter for irrigation purposes, thus over-representing its wastewater flows. For these reasons, the city ordinance provides for exceptions based on professional engineering reports and staff recommendations.

#### **9.1.5 Projected Utility Demands to Satisfy New Development**

The water demand within the City and ETJ service areas are shown in **Table 4-9**, pages 27 and 28. **Table 4-12**, pages 32 through 37, shows the projected water system improvements for year 2007, 2007 thru 2017 and at Ultimate Buildout. Likewise, **Table 5-9**, page 49 shows the wastewater treatment demand within the City and ETJ and the projected wastewater system improvements for year 2007, 2007 thru 2017 and at Ultimate Buildout.



### **9.1.6 Projected Drainage Requirements to Satisfy New Development**

The demand for improved drainage facilities within the next 10 years and at ultimate buildout was projected for the four impact fee basins (M118, M121, M121W, M125) using the assumptions for development of the CIP and applying these to projected land use.

### **9.1.7 Capital Improvements for Existing and Future Utility Needs**

This item requires an inventory of existing facilities, verification of the 10-year CIP's applicability for recovery fees, and verification of the ultimate CIP listing from the 1986 Comprehensive Plan Update, as updated for the increased ETJ area. Utility capacities were allocated to the appropriate group's requirements (existing, 10-year, and ultimate). Costs for all facilities were adjusted for consistency using current-year prices.

Water service demand is expressed in Living Unit Equivalent (LUE), which is the basis for establishing equivalency among and within various customer classes as discussed previously. Each single-family home is served by a five-eighths meter and this connection is considered an LUE. Demands for other customer classes are determined by equating 374 gpd to each LUE. Water demands are expressed in LUE's and are shown in **Tables 4-5, 4-6, 4-7 and 4-9**, pages 22 through 28. Wastewater demands are shown in **Tables 5-4 thru 5-8**, pages 44 - 48.

**Table 4-12**, pages 32 through 37, and **Table 5-9**, page 49, show the required allocation of existing facilities and future capital improvements for existing development, development within the next 10 years, and development at ultimate buildout.

### **9.1.8 Capital Improvements for Existing and Future Drainage Needs**

Simpler in scope than the utility inventories, this effort involved determining ultimate needs in each of the four basins for primary outfall channel and detention storage as described previously. Current needs are served without these facilities, but the facilities will provide some service to existing properties. Therefore, the cost attributable to each developing acre is derived by allocating projected costs over the entire acreage in each basin.

## **9.2 FEE CALCULATION**

### **9.2.1 Applicable CIP Costs**

The calculation of construction cost per LUE for water and wastewater is shown in **Tables 9-2 and 9-3**, pages 81 and 82. The computation of construction cost per acre for drainage is shown in **Table 9-4**, page 83.

Existing costs are the city's currently outstanding bonds for CIP projects. The city considers the bond issues to be allocated equally between water, wastewater, and gas. No city bonds are outstanding on drainage facilities in the four target basins.

In addition to the major facility costs, minor miscellaneous costs were developed which included consultant expenses in developing the infrastructure master plan and impact fee calculations.

### **9.2.2 Cost of Indebtedness**

Chapter 395.012 provides that projected interest charges and other finance costs may be included in determining the amount of impact fees if the impact fees are used for the payment of principal and interest on bank notes and other obligations issued by or on behalf of the political subdivision to finance improvements identified in the CIP.

Total cost of indebtedness, bond cost, and interest is shown in **Table 9-5**, page 84.

### **9.2.3 Credits**

As noted earlier, the maximum fee amount may be the full capital cost per unit; however, rate contributions and bond avoidance must be considered in determining the maximum fee.

**Table 9-6**, page 85 shows the dollar amount of existing debt which is attributed to each LUE of existing service. Future utility customers will partially pay for their own cost of service through rate payments in an amount typically equal to debt service payback for existing customers. Thus, future customers will be permitted to pay a portion of their costs of service through rates, similar to existing customers. Credits for these rate payments are applied to the full capital cost.

Since the intent of Impact Fees is to avoid bonding, a portion of the CIP is assumed to be funded through fees and without bonds. Credits for the avoided costs of bonds are also applied to the full capital costs.

### **9.2.4 Maximum Impact Fee Calculation**

**Table 9-7**, page 86 shows the derivation of the maximum impact fees for water and wastewater. The capital costs for each utility are shown. After application of bonding costs and interest, the full capital cost (debt service) of each is obtained. Credits are applied for payback through rate payments and avoided bonding costs. The results are the maximum allowable impact fee per Local Government Code, Title 12, Chapter 395. The maximum water impact fee per LUE is **\$2,000.54** and the maximum wastewater impact fee is **\$4,523.54**, a total of **\$6,524.08**.

**Table 9-8**, page 87 shows the derivation of the four drainage service area fees, similar to the utility fees. The total impact fee per basin is:

M118	<b>\$6,023.90</b>
M121E	<b>\$6,828.71</b>
M121W	<b>\$4,985.14</b>
M125	<b>\$574.40</b>

### **9.2.5 Disposition of Previous Fees**

**Table 9-9**, page 82 lists the fees previously collected under the city's impact fee program and on hand as of 3/31/08. It also lists projects which were on the previous CIP project list to support the city's continuing growth and which have been completed prior to this computation of fee. These projects are not included in this CIP listing. The previously-collected fees could be used to reimburse those city funds which were used to pay for these growth-induced projects.

This document represents the first computation of impact fees for drainage facilities. Therefore, there are no previously collected drainage impact fees.

**Table 9-1**  
**LUE Equivalencies for Various Types and Sizes of Water Meters**

Meter Type	Meter Size	Continuous Duty Maximum Rate (gpm)	Ratio to 5/8" Meter	Living Unit Equivalent (LUE)
Simple	5/8" x 3/4"	10	1.0	1.0
Simple	3/4"	15	1.5	1.5
Simple	1"	25	2.5	2.5
Simple	1-1/2"	50	5.0	5.0
Simple	2"	80	8.0	8.0
Compound	2"	80	8.0	8.0
Turbine	2"	100	10.0	10.0
Compound	3"	160	16.0	16.0
Turbine	3"	240	24.0	24.0
Compound	4"	250	25.0	25.0
Turbine	4"	420	42.0	42.0
Compound	6"	500	50.0	50.0
Turbine	6"	920	92.0	92.0
Compound	8"	800	80.0	80.0
Turbine	8"	1600	160.0	160.0
Compound	10"	1150	115.0	115.0
Turbine	10"	2500	250.0	250.0
Turbine	12"	3300	330.0	330.0

<b>Table 9-2</b>							
<b>Water System Cost per LUE, 2007 to 2017</b>							
Component	Outstanding Bond Amount	Total Capital Cost	LUE Capacity	Cost Basis per LUE	New LUE's Served from 2007 to 2017	Cost Distribution 2007 to 2017	Total Capital Cost per LUE 2007 to 2017
<b>Total Connections in City Only, 2007 =</b>							
		5,969	LUE				
<b>Total Projected Connections in City &amp; ETJ, 2017 =</b>							
		13,956	LUE				
<b>Total Projected Additional Connections =</b>							
		7,987	LUE				
<b>Facilities constructed with 1996 &amp; 1999 CIP (1)</b>							
Water Wells	\$600,000		6,135	\$97.80	166	\$16,206	
Elevated Storage Tanks	\$1,200,000		12,500	\$96.00	6,531	\$626,948	
Distribution Lines	\$732,090		21,648	\$33.82	7,987	\$270,094	
<b>Facilities constructed with 2002 CIP</b>							
Baker St. Well Capacity Increase		\$270,000	2,000	\$135.00	2,000	\$270,000	
Distribution Lines		\$1,885,815	21,648	\$87.11	7,987	\$695,743	
<b>Proposed Facilities with 2007 CIP</b>							
Water Wells		\$6,250,000	8,333	\$750.00	7,821	\$5,865,750	
Booster Pumps		\$700,000	8,984	\$77.92	8,498	\$662,105	
Ground Storage Tanks		\$687,500	4,000	\$171.88	4,000	\$687,500	
Elevated Storage Tanks		\$1,250,000	5,000	\$250.00	1,456	\$364,000	
Distribution Lines		\$10,364,700	21,886	\$473.58	7,987	\$3,782,318	
Water CIP 2007-2017						\$45,000	
<b>Total</b>					<b>7,987</b>	<b>\$13,285,664</b>	<b>\$1,663.47</b>

(1) Existing facility costs and capacity figures are from Tomball staff and 2002 Masterplan Table 9-13.

<b>Table 9-3</b>							
<b>Wastewater System Cost per LUE</b>							
<b>Total Connections in City Only, 2007 =</b>							
				5,969	LUE		
<b>Total Projected Connections in City &amp; ETJ, 2017 =</b>							
				13,956	LUE		
<b>Total Projected Additional Connections =</b>							
				7,987	LUE		
Component	Outstanding Bond Amount	Total Capital Cost	LUE Capacity	Cost Basis per LUE	New LUE's Served from 2007 to 2017	Cost Distribution 2007 to 2017	Total Capital Cost per LUE 2007 to 2017
<b>Facilities constructed with 1996 &amp; 1999 CIP (1)</b>							
North Wastewater Treatment Plant	\$228,300		5,214	\$43.79	2,968	\$129,977	
South Wastewater Treatment Plant	\$6,117,000		5,214	\$1,173.25	3,001	\$3,520,928	
Trunk Lines		\$1,330,451	21,648	\$61.46	5,969	\$3,650,905	
<b>Facilities constructed with 2002 CIP</b>							
Trunklines		\$4,055,238	21,648	\$187.33	7,987	\$1,496,119	
<b>Proposed Facilities with 2007 CIP</b>							
North Wastewater Treatment Plant Expansion		\$11,250,000	5,214	\$2,157.77	1,519	\$3,278,267	
South Wastewater Treatment Plant Expansion		\$11,250,000	5,214	\$2,157.77	5,214	\$11,250,000	
<b>Trunkline and Lift Stations</b>							
Lift Stations 2007 CIP		\$1,593,750	4,994	\$319.10	4,994	\$1,593,750	
Trunk Lines 2007 CIP		\$10,110,000	21,886	\$461.94	7,987	\$3,689,372	
Wastewater CIP 2007-2017						\$45,000	
<b>Total</b>					<b>7,987</b>	<b>\$28,654,318</b>	<b>\$3,587.75</b>

(1) Existing Facility costs and capacity figures are from Tomball staff. Costs shown are outstanding bond amounts.

**Table 9-4****Drainage System Cost per Acre**

HCFC Channel No.	Type of Work	2007 Cost	Total Acres Served	Existing 2002 Development	Acreage to Bear Fee	Capital Cost Basis per Acre
M118	Outfall Ditch C	\$2,600,000	150	57	725	\$3,586.21
M118	Detention for Ditch C	\$4,810,000	725	57	725	<u>\$6,634.48</u>
						\$10,220.69
M121 East	East Ditch D	\$2,470,000	719	170	719	\$3,435.33
M121 East	Detention for E. Ditch D	\$5,850,000	719	170	719	<u>\$8,136.30</u>
						\$11,571.63
M121 West	West Ditch D	\$3,900,000	967	225	967	\$4,033.09
M121 West	Detention for W. Ditch D	\$4,290,000	967	225	967	<u>\$4,436.40</u>
						\$8,469.49
M125	Outfall Ditch E	\$0				
M125	Detention for Ditch E	\$1,320,000	1,318	373	1,318	<u>\$1,001.52</u>
						\$1,001.52

<b>Table 9-5</b>					
<b>Debt Service</b>					
<b>Component</b>	<b>Capital Cost per LUE 2007 to 2017</b>	<b>Source</b>	<b>Bond Amount per LUE (1)</b>	<b>Interest per LUE (2)</b>	<b>Total Debt Service per LUE</b>
Water	\$1,663.47	Table 9-2	\$1,771.60	\$818.89	\$2,590.48
Wastewater	\$3,587.75	Table 9-3	\$3,820.96	\$1,766.16	\$5,587.12
<b>Drainage Service Area</b>					
<b>Area</b>	<b>Cost per Acre</b>	<b>Source</b>	<b>Bond Amount (1)</b>	<b>Interest (2)</b>	<b>Annual Debt Service</b>
M118	\$10,220.69	Table 9-4	\$10,885.03	\$5,031.39	\$15,916.42
M121E	\$11,571.63	Table 9-4	\$12,323.78	\$5,696.42	\$18,020.20
M121W	\$8,469.49	Table 9-4	\$9,020.01	\$4,169.32	\$13,189.33
M125	\$1,001.52	Table 9-4	\$1,066.62	\$493.02	\$1,559.64
(1) Assumes a bond soft costs of 6.5%					
(2) Assumes an interest rate of 4% and 40 semi-annual payments					



<b>Table 9-6</b>										
<b>Debt Service Credits</b>										
Category	Bond Issue	Total Amount	% Allocation		Allocated Payback	% Existing Customers	Existing Customer Payback	Existing LUE	Capital Payback per Existing LUE	Debt Service Payback per Existing LUE
Water	1989	\$2,185,000	33.33%	(1)	\$728,261	68.92%	\$501,917			
<b>Total Water</b>					\$7,852		\$501,917	5,412	\$92.75	\$180.50
Wastewater	1989	\$2,185,000	33.33%	(1)	\$728,261	68.92%	\$501,917			
Wastewater	1999	\$7,500,000	100.00%	(2)	\$7,500,000	0.00%	\$0			
<b>Total Wastewater</b>							\$501,917	5412	\$92.75	\$180.50
Drainage										
M118	n/a									
M121E	n/a									
M121W	n/a									
M125	n/a									
(1) Unless otherwise noted, the City considers the bond issues to be equally allocated between water, wastewater and gas (33.33% each)										
(2) This bond issue was entirely for the south wastewater treatment plant										

<b>Table 9-7</b>						
<b>Derivation of Maximum Water and Wastewater Impact Fees</b>						
Component	Capital Cost per LUE 2007 to 2017	Debt Service per LUE 2007 to 2017	Credit for Debt Service Payback thru Rates	Eligible Recovery Costs	Credit for Avoided Bonding Costs (1)	Maximum Impact Fee per LUE
Water	\$1,663.47	\$2,590.48	(\$180.50)	\$2,409.98	(\$409.44)	\$2,000.54
Wastewater	\$3,587.75	\$5,587.12	(\$180.50)	\$5,406.62	(\$883.08)	\$4,523.54
Total						\$6,524.08
(1) Avoided cost of 50% of CIP during study period						

<b>Table 9-8</b>						
<b>Derivation of Maximum Drainage Impact Fees</b>						
<b>Component</b>	<b>Capital Cost per Acre</b>	<b>Debt Service</b>	<b>Credit for Debt Service Payback thru Rates</b>	<b>Eligible Recovery Costs</b>	<b>Credit for Avoided Bonding Costs (1)</b>	<b>Maximum Impact Fee per Acre</b>
M118	\$10,220.69	\$15,916.42	(\$7,958.21)	\$7,958.21	(\$1,934.31)	\$6,023.90
M121E	\$11,571.63	\$18,020.20	(\$9,010.10)	\$9,010.10	(\$2,181.39)	\$6,828.71
M121W	\$8,469.49	\$13,189.33	(\$6,594.66)	\$6,594.66	(\$1,609.52)	\$4,985.14
M125	\$1,001.52	\$1,559.64	(\$779.82)	\$779.82	(\$205.42)	\$574.40
<b>(1) Avoided cost of 50% of CIP during study period</b>						

**Table 9-9  
Disposition of Collected Impact Fees**

<u>Water Impact Fees Collected and Interest Earnings as of 5/2/08</u>	<u>Amount</u>
1996 to 1998	\$193,203
1999 to 2002	\$584,293
2003 to 2007	\$1,327,242
Balance as of 3/31/2008	\$230,564

**Water System Improvements, completed from 1996 CIP**

	<u>Amount</u>	<u>Wells</u>	<u>EST</u>	<u>Water lines</u>
1. 12" water main along Zion Road from Ulrich to Neal St.	\$97,200			\$97,200
2. 12" water main along SH 249 from Brown to Baker	\$50,000			\$50,000
3. 12" water main along S. Cherry from Agg to Theis	\$210,600			\$210,600
4. 12" water main along Theis from S. Cherry to SH 249	\$194,499			\$194,499
5. 2000 gpm water well	\$600,000	\$600,000		
<b>Total</b>	<b>\$1,152,299</b>	<b>\$600,000</b>	<b>\$0</b>	<b>\$552,299</b>

**Water System Improvements, completed from 1999 CIP**

1. 12" water main along FM 2920 from Lowes to Calvert	\$54,810			\$54,810
2. 750,000 gallon elevated storage tank	\$1,200,000		\$1,200,000	
3. 6" parallel water main on Graham and Holderreith	\$124,981			\$124,981
<b>Total</b>	<b>\$1,379,791</b>	<b>\$0</b>	<b>\$1,200,000</b>	<b>\$179,791</b>
<b>Total Water System Improvements from 1996 and 1999 CIP</b>	<b>\$2,532,090</b>	<b>\$600,000</b>	<b>\$1,200,000</b>	<b>\$732,090</b>

**Water System Improvements, completed from 2002 CIP**

	<u>Amount</u>	<u>Wells</u>	<u>EST</u>	<u>Water lines</u>
1. 12" Water main on SH 249 from Theis to Holderreith	\$172,800			\$172,800
2. 12" Water main on Holderreith from School St ext. to SH 249	\$86,400			\$86,400
3. 12" Water main on Holderreith from School St ext. to Cherry	\$103,680			\$103,680
4. 12" Water main on Holderreith from S. Cherry to Huffsmith-Korhville	\$311,040			\$311,040
5. 12" Water main along S. Cherry from Theis to Holderreith	\$164,160			\$164,160
6. 12" Water main along Brown Rd to E. Hurfsmith Extension	\$216,000			\$216,000
7. 8" Water main along Johnson Rd from Michel to shopping center	\$37,260			\$37,260
8. 12" Water main along Hufsmith-Kohrville from FM 2920 to Holderreith	\$492,480			\$492,480
9. Install 1200 gpm pump at Baker St. well	\$270,000	\$270,000		
10. 12" Water main along Alice Rd from SH 249 to SH 249 Bypass	\$86,400			\$86,400
11. 12" Water main along FM 2920 from Persimmon to ETJ	\$181,440			\$181,440
12. 8" Water main on Willow St from Carrell to Texas	\$34,155			\$34,155
<b>Total</b>	<b>\$2,155,815</b>	<b>\$270,000</b>	<b>\$0</b>	<b>\$1,885,815</b>

**Table 9-9  
Disposition of Collected Impact Fees**

<u>Wastewater Impact Fees Collected and Interest Earnings</u>	<u>Amount</u>		<u>N. WWTP</u>	<u>S. WWTP</u>	<u>Trunklines</u>
1996 to 1998	\$220,617				\$103,200
1999 to 2002	\$522,943				\$50,000
2003 to 2007	\$1,002,404				\$40,000
Balance as of 3/31/2008	\$83,046				\$193,200
<b><u>Wastewater System Improvements, completed from 1996 CIP</u></b>					
1. 10" gravity sewer along SH 249 from McCoy's to FM 2920	\$103,200				\$103,200
2. 10" gravity sewer along Hooper from Bypass to SH 249	\$50,000				\$50,000
3. 10" gravity sewer along Hirschfield from SH 249 to Bypass	\$40,000				\$40,000
4. 1.5 MGD Wastewater Treatment Plant	\$6,117,000			\$6,117,000	
<b>Total</b>	<b>\$6,310,200</b>		<b>\$0</b>	<b>\$6,117,000</b>	<b>\$193,200</b>
<b><u>Wastewater System Improvements, completed from 1999 CIP</u></b>					
1. 10" gravity line along FM 2920: Kroger to City Limit	\$14,144				\$14,144
2. 12" gravity line along FM 2920: City Limit to Calvert	\$151,948				\$151,948
3. 10" gravity line along Hirschfield: SH 249 and bypass	\$56,253				\$56,253
4. Temporary Lift Station at Calvert FM 2920	\$80,000				\$80,000
5. 6" force main along FM 2920 from temporary Lift Station to gravity sewer at Sh 249	\$39,387				\$39,387
6. 18" gravity trunk along Cherry from McPhail to Agg Road	\$127,374				\$127,374
7. 21" gravity trunk along Cherry from Agg to Theis	\$120,745				\$120,745
8. 24" gravity trunk along Cherry from Theis to Holderreith	\$305,597				\$305,597
9. 27" gravity trunk along Cherry from Holderreith to WWTP	\$158,165				\$158,165
10. 18" gravity line along Theis from LS to Cherry	\$83,278				\$83,278
11. Abandon Theis Lift Station	\$360				\$360
<b>Total</b>	<b>\$1,137,251</b>		<b>\$0</b>	<b>\$0</b>	<b>\$1,137,251</b>
<b>Total Wastewater System Imp from 1996 and 1999 CIP</b>	<b>\$7,447,451</b>		<b>\$0</b>	<b>\$6,117,000</b>	<b>\$1,330,451</b>

## Table 9-9

### Disposition of Collected Impact Fees

<u>Wastewater System Improvements, completed from 2002 CIP</u>	<u>Amount</u>	<u>N. WWTP</u>	<u>S. WWTP</u>	<u>Trunklines</u>
1. (8) 12" gravity line along W. Hufsmith from Quin Ext to SH 249	\$164,160			\$164,160
2. (10) 18" gravity line along FM 2920 from Calvert to Park St	\$228,960			\$228,960
3. (11) 6" force main from Temp Lift Station at Park/FM 2920 to Calvert	\$73,440			\$73,440
4. (12) 12" gravity line along FM 2920 from Park Rd to Tomball Cem. Rd	\$145,935			\$145,935
5. (14) Temp Lift Station at FM 2920 and Park Rd	\$107,933			\$107,933
6. (16) 10" gravity line on SH 249 from Hirschfield Rd to Alice Rd	\$64,800			\$64,800
7. (17) 21" gravity line on SH 249 from Alice Rd to Holderreith Rd	\$528,255			\$528,255
8. (18) 18" gravity line on Alice Rd from SH 249 Bypass to SH 249	\$128,790			\$128,790
9. (19) 30" gravity line on Holderreith Ext west of SH 249	\$79,488			\$79,488
10. (20) 30" gravity line on Holderreith from SH 249 and S. WWTP	\$864,000			\$864,000
11. (25) 8" gravity line along Johnson	\$40,500			\$40,500
12. (28) Abandon Cherry St Lift Station	\$13,500			\$13,500
13. (29) 27" gravity line on Holderreith from S. WWTP Trunk Line to BNRR	\$577,800			\$577,800
14. (30) 27" gravity line on Holderreith from BNRR to Hufsmith-Kohrville Rd	\$288,900			\$288,900
15. (31) 24" gravity line on Hufsmith-Kohrville Rd from Holderreith to Sutton Lr	\$790,560			\$790,560
16. (32) 18" gravity line on Hufsmith-Kohrville Rd from Sutton Ln to FM 2920	\$357,750			\$357,750
<b>Total</b>	<b>\$4,454,771</b>	<b>\$0</b>	<b>\$0</b>	<b>\$4,454,771</b>