1 Purpose of and Need for the Luce Bayou Interbasin Transfer Project




2012

US Army Corps of Engineers
Galveston District

Contents

List of Tables

List of Figures

1.0 PURPOSE OF AND NEED FOR THE LUCE BAYOU INTERBASIN TRANSFER PROJECT (LBITP)

1.1 Introduction

This Chapter describes the purpose of and need for the action, the U.S. Army Corps of Engineers (USACE) role in the Environmental Impact Statement (EIS) process, and the required regulatory actions for the proposed project.

1.1.1 Applicant's Stated Purpose

USACE has concluded its decision to issue, issue with conditions, or deny the Coastal Water Authority (Applicant) a Department of the Army (DA) individual permit, pursuant to the Clean Water Act, Section 404 and the 1899 Rivers and Harbors Act, Section 10. This is a major federal action having the potential to significantly affect the quality of the human environment. Therefore, the USACE is preparing this EIS to comprehensively assess the impacts from the Applicant's proposed action, and determine reasonable alternatives including identifying the least environmentally damaging alternative.

The Applicant intends for the Luce Bayou Interbasin Transfer Project to achieve the following.

- Comply with a regulatory mandate from the Harris-Galveston Subsidence District (HGSD) to control subsidence by significantly reducing and eventually eliminating the current heavy reliance on groundwater supplies to meet water demand. The Applicant sees the LBITP as a major part of the surface water development strategy which enables water use reduction according to the subsidence district timeline.

- Transfer enough surface water to the Northeast Water Purification Plant at Lake Houston to provide a long-term and reliable municipal water supply which will meet the future population growth forecast by the Texas Water Development Board's 2011 Region H Regional Water Plan and water contract commitments to major customers.

- Provide the required surface water supply by exercising previously secured long-term contracts for additional water rights in Lake Livingston, and construct water conveyance facilities using previously acquired property to convey water to Lake Houston, city of Houston's (Houston) primary water supply reservoir.

The USACE has determined the basic purpose for the proposed action is to provide municipal water supply for Houston and the surrounding area from surface water sources. The overall purpose is to provide this water using surface water rights currently available to Houston from Lake Livingston in the Trinity River basin.

1.1.2 Applicant's Stated Need

The Applicant has identified two distinct needs requiring their proposed project as follows.

- Houston must meet a statutory requirement by HGSD to significantly reduce groundwater use. Houston proposes to accomplish this regulatory requirement by using existing available surface water supplies for its source water supply. Long-term groundwater use is unsustainable, as it causes land subsidence (land loss) over significant areas in the Harris-Galveston area. Houston cannot replace the groundwater resource with surface water and continue to meet demand without drawing on a portion of its existing surface water rights for water outside the San Jacinto River basin.

- Houston's permitted water rights in the San Jacinto River basin total 258 million gallons per day (MGD) including water rights in Lake Houston and Lake Conroe. Groundwater supply and permitted rights to Trinity River water under contract from the Trinity River Authority (TRA) (Dayton Canal) make up the remaining supply Houston uses to meet current demand. To meet near-term forecast municipal growth within Houston and contract commitments to major customers outside Houston from multiple regional water authorities, Houston must exercise its contractual rights to water in Lake Livingston located in the Trinity River basin.

- Houston's average daily water demand is projected to increase from about 450 MGD in 2011 to 1,200 MGD by 2030. Between 2030 and 2050, demand is forecast to be between 1,300 and 1,400 MGD (Houston Water Master Plan; Jun Chang, Houston, Meeting Long-Term Water Demands for Houston and Surrounding Area, 2010). No existing surface water source in the San Jacinto River basin can meet these projected increased demands. Growth from surface water supplies must use Trinity River water as a major water source.

1.1.3 U.S. Army Corps of Engineers' (USACE) Determined Purpose and Need

The EIS's scope of analysis requires the USACE to consider and express the proposed activity's underlying purpose and need from a public interest perspective while generally focusing on the applicant's stated need and purpose. The USACE has defined the purpose and need for the project from the Applicant's and the public's perspective.

1.1.3.1 U.S. Army Corps of Engineers' (USACE) Basic Purpose and Water Dependency

The basic purpose for the proposed action is to provide municipal water supply for Houston and the surrounding area. This proposed action does not require access or proximity to or siting within a special aquatic site, such as a wetland, to fulfill its basic purpose.

1.1.3.2 U.S. Army Corps of Engineers' (USACE) Overall Project Purpose

The overall purpose of the proposed project is to provide municipal water supply from water rights currently held by the City of Houston.

1.2 Background

This section describes in detail how the two underlying needs for the proposed project and how these needs have developed over time, and why they have become consequential for how Houston identifies its surface water supply sources. This section also describes the Applicant's view about the purposes to be achieved if the needs were met by the proposed project.

1.2.1 Groundwater Supply Limits and Consequences of Subsidence

Groundwater supply is still a critical source for the Houston area's municipal water. At the same time, the Houston area land subsidence caused by fluid extraction, including water and to a somewhat lesser extent oil, has caused extensive damage to industrial and transportation infrastructure, motivated investments in levees, reservoirs, and surface water distribution systems, and caused substantial losses of wetland habitat (U.S. Geological Survey [USGS] 1999).

1.2.1.1 Advent of State-Enacted Districts to Manage Subsidence

Extensive and damaging land subsidence had occurred by the mid-1970s such that Houston area civic leaders were encouraged by the Texas legislature to create the HGSD to end subsidence which contributes to or precipitates flooding, inundation, and overflow in any area within HGSD (HGSD 2011).

This unique District was authorized by the state of Texas to issue or deny well permits, promote water conservation and education, and promote conversion from groundwater to surface water supplies (HGSD 2011). In the areas outside HGSD boundaries, subsidence continued as groundwater use expanded. By the late 1980s, a need was identified to create an additional subsidence district in Fort Bend County, adjacent to Harris County, Texas.

1.2.1.2 Subsidence Impacts on Urban and Natural Systems

Subsidence's physical consequences are readily apparent. In many low lying coastal areas near Houston, as much as 10 feet of subsidence has re-defined shorelines, turned wetlands into open water areas, and caused important cultural resources to be submerged. Near the San Jacinto Monument, approximately 100 acres of the San Jacinto battlefield park are under water due to subsidence. The remaining park land is protected from the bay by levees. Areas protected by levee systems also require rainfall to be pumped out. Subsidence has also caused surface fault movement leading to structure damages and ongoing maintenance issues for crossing roadways, pipelines and other infrastructure.

Subsidence increases flooding's frequency and intensity and the amount of land subject to tidal inundation. Hurricane evacuation routes are more vulnerable by being flooded far in advance of approaching storms. Coastal areas experience increased flooding incidences because land areas have lost elevation. In 1938, the Brownwood subdivision near Baytown, Texas was about 10 feet above sea level. By 1978, it was only 2 feet above sea level and vulnerable to storm tides and heavy rainfall flooding. Flooding related to Hurricane Alicia in 1982 caused the subdivision to be completely abandoned.

Subsidence also alters natural and engineered drainage ways by reducing or increasing pre-existing gradients. Reduced gradients decrease the flow rate within channels, and may thereby increase the chance for storm water runoff to flood. Increased gradients may locally increase runoff velocities while increasing flooding chances downstream. Changed gradients can also alter stream-flow characteristics leading to channel erosion and sediment deposition. **Figure 1-1** shows HGSD's regulatory Area 3's Historical and Predicted Subsidence, 1906 to 2030 (USGS 2011).

Wetland losses due to subsidence are varied and cause significant effects to area stream and bay fisheries. An estimated 26,000 acres of emergent wetlands in the Galveston Bay system have been lost to subsidence impacts along shorelines (USGS 1999). Once destabilized, shorelines may not rebuild completely due to a variety of other causes including:

- Wave actions,
- Natural and manmade sediment loss due to reservoir construction on the riverine systems flowing into Galveston Bay, and
- Relative sea level rise exacerbated by subsidence, which drowns shoreline marsh vegetation.

The combination of these man-induced changes and natural processes results in reduced wetland habitat, which is the foundation for commercial and recreational fisheries (USGS 1999).

Subsidence's extent continues to be monitored using increasingly precise technology such as radar interferometry (Buckley et. al. 2003). One effort to quantify the subsidence extent was accomplished by USGS scientists who provided the description of subsidence provided in the next section.

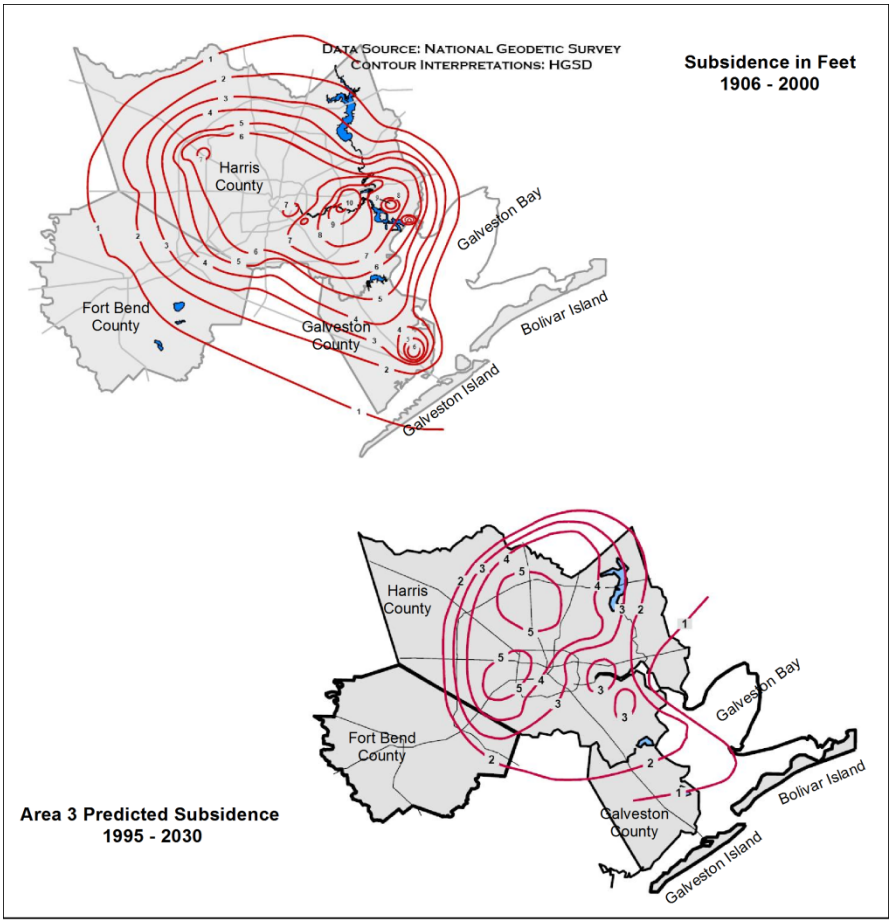
By 1943, subsidence had begun to affect a large part of the Houston area although the amounts were generally less than 1 foot. By the mid-1970s, six or more feet of subsidence had occurred throughout an area along the Ship Channel between Bayport and Houston, as a result of declining groundwater levels associated with rapid industrial expansion. During this time, subsidence problems took on crisis proportions, prompting the HGSD to be created. By 1979, up to 10 feet of subsidence had occurred and almost 3,200 square miles had subsided more than one foot (USGS Galloway et. al. 1999).

Earlier estimates indicated some 4,700 square miles had subsided by one-half foot between 1947 and 1973, mostly in the Houston-Galveston area's southeastern portions (Brown and Root Engineers 1979).

1.2.1.3 Subsidence's Cost

Subsidence's cost has been calculated in various ways. One estimate placed the annual cost to reclaim land, elevate structures including roadways, relocate other infrastructure, and construct levees for the 1969 to 1974 period at over $90 million annually in 1998 dollars. Restoring dock and wharf facilities along the Houston Ship channel, and repairing damages to refineries has been estimated at over $340 million (1998 dollars). Other infrastructure damage and structure damage estimates to residences and businesses across subsidence-affected areas are in the billions of dollars. The cost for wetland losses and resulting impacts to fisheries has not been estimated (USGS 1999).

Figure 1-1:
Historical and Predicted Subsidence

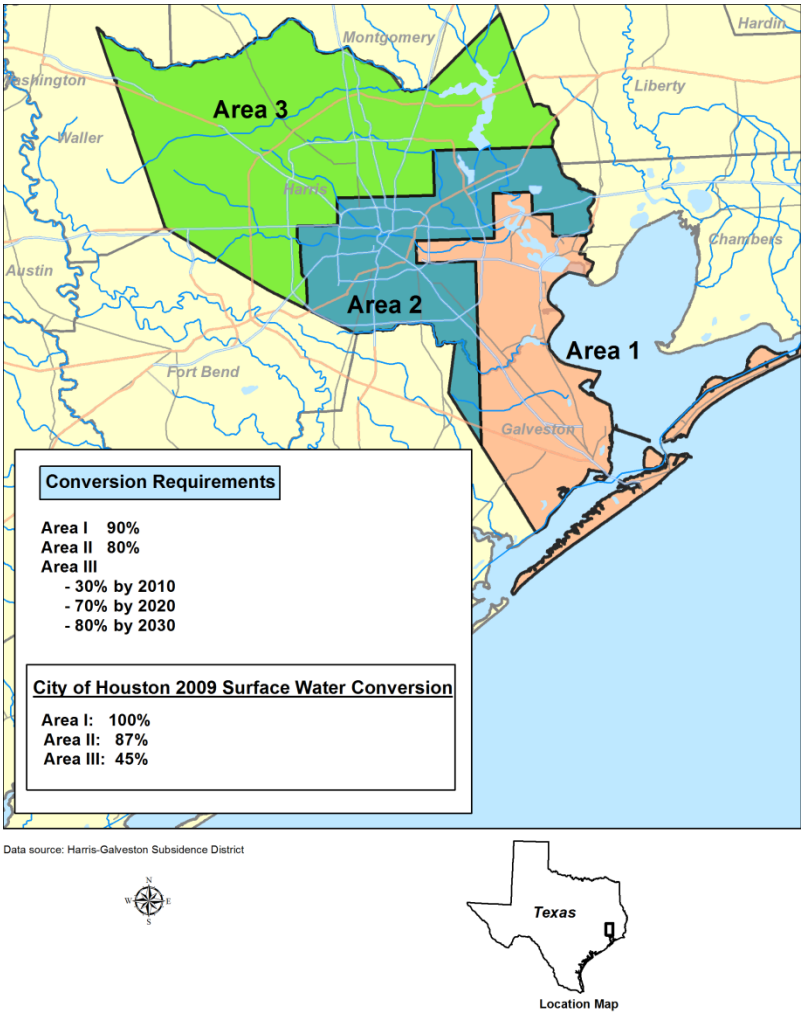


Data source: Fugro-McClelland CSD96
Contour Interpretations: HGCSD

Implementing the 1976 Subsidence District plan caused Galveston Bay industries to convert from using groundwater to surface water using supplies from Lake Livingston in the Trinity River basin. The conversion helped Baytown and Pasadena land areas recover from some problems caused by subsidence. Surface water supplied from Lake Houston in the San Jacinto River basin plus additional water from Lake Livingston led to slowed and halted water level declines, and raised water levels over a large area. Houston's eastern areas have seen less subsidence since the conversion, but areas in the western areas, primarily Area 3 (**Figure 1-2**), have experienced accelerated subsidence because groundwater has not been reduced to the same degree. The Fort Bend Subsidence District (created in 1989) has also developed a regulatory action plan which would reduce that county's groundwater pumpage by 80 percent by 2020.

Figure 1-2 shows Areas 1, 2, and 3 Conversion Requirements in the 2009 Surface Water Conversion Plan for HGSD. Generally, Houston's metropolitan areas and surrounding communities and industrial land uses are being regulated in their groundwater use. The goal is to significantly reduce groundwater use through conservation and by transitioning to surface water supplies. Various areas have different transition or conversion objectives, but stopping subsidence by significantly reducing or even eliminating groundwater use is the principal goal.

Figure 1-2:
Harris-Galveston Subsidence District (HGSD) Surface Water Conversion Plan



1.2.1.4 Sea Level Rise and Subsidence

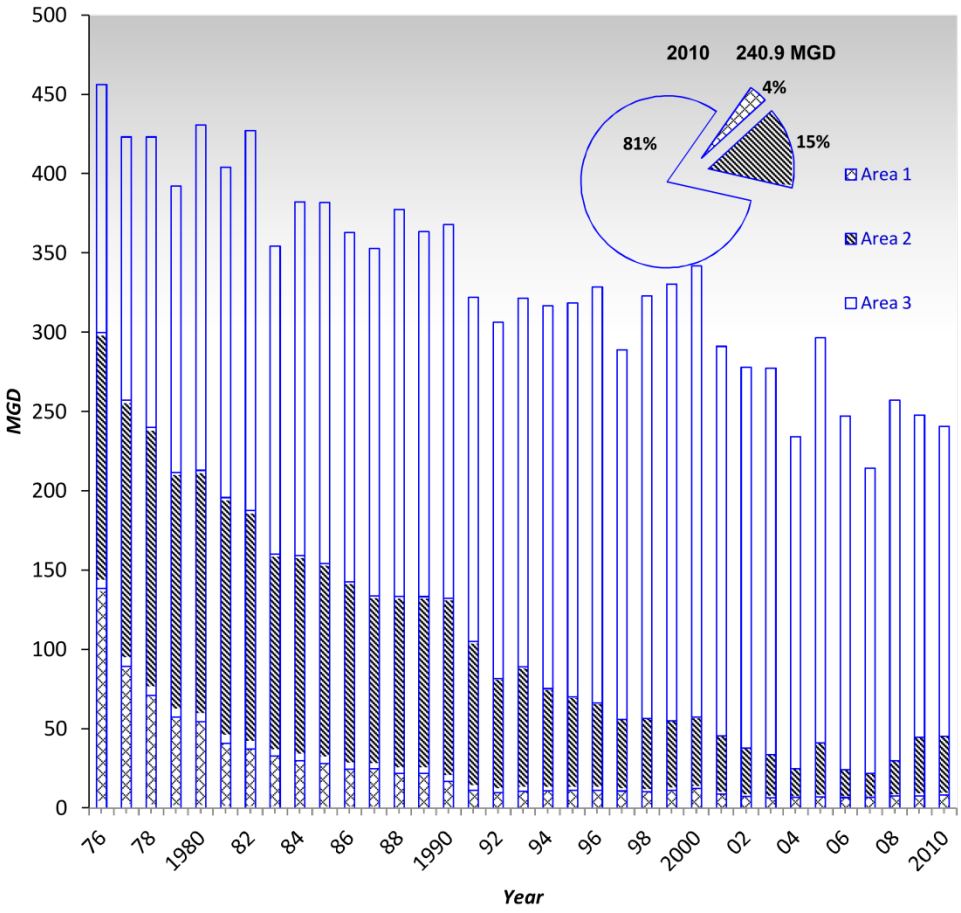
Near the coast, the net result from land subsidence is an apparent increase in sea-level or relative sea-level rise. This effect is also noted on a global basis as sea-level rise and regional land subsidence combine to significantly affect coastal zones. The combined effects from the actual sea-level rise and natural sediment consolidation along the Texas Gulf Coast yield a relative sea-level rise from natural causes that locally may exceed 0.08 inches per year (USGS 1999; Coplin; Galloway and Paine 1993).

During the 20th century, human-induced subsidence has been the dominant cause for relative sea-level rise along the Texas coast, exceeding one inch per year throughout much of the affected area. This subsidence has principally resulted from extracting groundwater, and to a lesser extent extracting oil and gas from subsurface reservoirs (USGS 1999).

1.2.1.5 Groundwater Reduction

Regulating Houston area's groundwater use is a scheduled process. Each numbered regulated regional area is carefully monitored in its ground and surface water use as shown in **Figure 1-3** (HGSD 2011).

Figure 1-3:
Groundwater Pumpage History by Area



Source: HGSD 2011

As of 2010, the conversion to surface water in Regulatory Area 1, which includes Galveston, Brazoria, and Harris County coastal areas, was almost complete. This area had pumped over 140 MGD in 1976, but by 2010 Area 1 had extracted less than 9 MGD. Area 2, which encompasses southeast, south central and parts of west and southwest Harris County, had pumped almost 40 MGD in 2010, which is a significant reduction from previous decades. In the 1970s through the early 1990s, Area 2 was pumping more than 120 MGD on the average, and major reductions were not realized until the early 2000s.

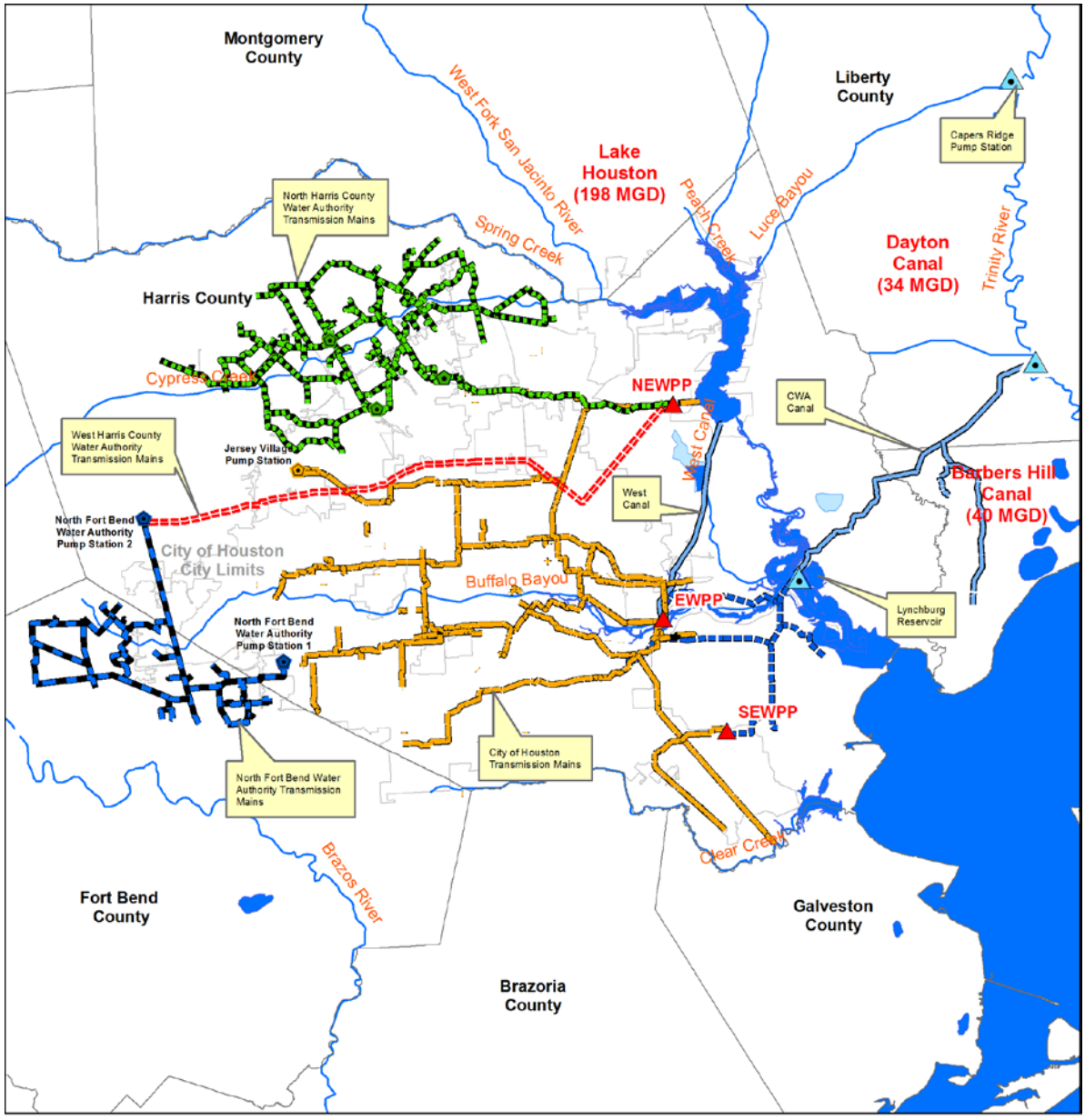
Area 3 pumped more than 195 MGD in 2010, which reflects this area's lack of surface water availability. The water contracts between Houston and the various water authorities which have organized in Area 3 would allow this area to significantly reduce groundwater use and thereby reduce subsidence's ongoing effects.

To meet the expected future water demands for Areas 2 and 3, Houston must supplement Lake Houston and Trinity supplies with additional supplies from the Trinity River. The supplies were permitted in Lake Livingston and already contracted to Houston. The additional water supply will also allow reduced groundwater use for Area 3 in 2020, when this water will be available to the water authorities. In 2010, the public water supply demand in Area 3, sourced by groundwater, was calculated to be 178 MGD (HGSD 2011). The group of Area 3 water authorities has contracted with Houston to provide 221 MDG in treated water by 2020. This would significantly reduce the need to use groundwater for public supply. This calculation does not consider other groundwater uses such as for industry or agriculture. It is clear the new surface water supplies by way of the LBITP will contribute substantially to Area 3's decrease in groundwater use (Houston 2011; HGSD 2011).

1.2.1.6 Water Demand and Conversion to Surface Water

The combined increased water demand for future growth, the need to significantly reduce groundwater usage, and because Houston is already using all its existing water supplies from the San Jacinto River, drives Houston to use its extensive available Lake Livingston water supplies. Because Houston and water authorities have developed the transmission lines and other infrastructure needed to distribute surface water to Area 3, a means to convey Lake Livingston water to the Northeast Water Purification Plant (NEWPP) in Lake Houston must be developed (**Figure 1-4**).

Figure 1-4:
Infrastructure Map



1.2.2 Surface Water Supply Availability

Houston's water system, begun in 1878, was initially focused on developing groundwater resources for its municipal supply. By the 1940s, concerns related to water quality and cost impacts caused the ground resources to be reviewed. During the 1950s, Houston began to develop surface water to add to the existing groundwater supplies. Houston's population essentially doubled approximately every 20 years, and the continuing demand for more and more water became a major issue (Los Angeles Times 2000; Rice Center 1978).

Planning for Houston's first water supply reservoir began in the late 1930s. In 1954, the Lake Houston reservoir was developed by damming the East Fork of the San Jacinto River. In 1969, a new dam in Polk County on the Trinity River created Lake Livingston, and a second dam in Montgomery County on the San Jacinto River north of Lake Houston created Lake Conroe. In 2002, land and water rights were acquired for an off-channel dam in Austin County to be built on Allen's Creek, which would take floodwaters from the nearby Brazos River. These four reservoirs create a substantial water supply asset for the region.

Houston's infrastructure investments in major water supply reservoirs, large groundwater pumping facilities, multiple water treatment plants (including various expansions between 1953 and 2006), along with distribution lines and related storage and pumping facilities, positioned Houston to become the major water provider for the entire metropolitan area. In 2009, the Houston water system averaged 347 MGD of water delivered with a 585 MGD maximum capability (Houston Department of Public Works 2011). This water was provided to almost three million residents and customers through 7,500 miles of waterlines (Houston 2011). Houston's evolving water system investments, its early water rights acquisitions, long-term supply contracts, and consistent policy to retain these rights have proven to be comprehensive. No other entity has developed a parallel or competing system. Houston has become the de facto principal water provider in Harris County and a significant water provider in surrounding counties.

1.2.2.1 Reasons for Surface Water Resource Development

Rapid population growth, industrial demand and water costs stimulated surface water resources development. The low cost for early groundwater water well systems and subsequent years providing minimal management and budgeting to maintain and expand that water system caused Houston to fall behind in its ability to provide for future water demands. By 1938, rapid population growth outstripped the water system's ability to meet current demands. Engineers told Houston the water system needed to be many times larger with a significantly larger budget and required a separate governing board to manage the system (Houston Chronicle, Alvord, Burdick, Howson 1938).

Economics and an aversion to continued groundwater well system use also stimulated the early surface water resource development. In the late 1930s, people thought surface water costs would decrease with increased use, while well water would increase in cost or remain constant (Houston Chronicle 1938). Further, well water was regarded as easily polluted by salt water encroachment leading to well abandonment. The San Jacinto River was judged to be a superior water source from a water quality standpoint, and may be the most easily treated or purified for municipal use. At the same time, the engineers recommended developing the San Jacinto River water resource. They also recommended evaluating a means to access Trinity River water and identified the area along Capers Ridge as a likely location for diverting Trinity River water to supplement Lake Houston (Houston Chronicle 1938).

Houston followed up on this recommendation in the 1950s, and acquired water rights in Lake Livingston and the Trinity River to impound, divert, or use state waters for municipal, agricultural, industrial, and recreational uses.

1.2.2.2 Using Water Rights and Previously Acquired Property

The state of Texas Permit in 1973 and the Certificate of Adjudication in 1986 allowed Houston to begin developing a location to move water from the Trinity River into the bed and banks of Luce Bayou for transport to Lake Houston. Houston applied for and received permits from many agencies to accomplish this work, including a DA permit to construct a pump station on the river and associated conveyance facilities needed to divert water into Luce Bayou and on through to Lake Houston.

Houston initiated engineering studies to verify the Capers Ridge location is a reasonable place to divert water from the river. Among the multiple alternative sites reviewed for the 'take point', Capers Ridge offered the following advantages.

- Provided a river bank site elevated so the site was not in the 100-year floodplain — an unusual circumstance, because the floodplains north and south of the site extended much farther west beyond the river's western bank.
- The site soils were suitable for construction in contrast to sites north and south, which would require extensive and costly foundation systems.
- The site was located at a point in the river where current velocities minimized siltation.
- The site was close to the upper reaches of Luce Bayou.

USACE plans (at the time) for a multi-purpose navigation channel in the Trinity River did not require realigning the river in the Capers Ridge area as was planned for reaches north and south of this location (Brown and Root Engineers 1979).

Houston applied for and received a DA permit allowing work to proceed on the river for the pumping station. Houston ultimately acquired the land areas needed on Capers Ridge to complete the various facilities required for pipelines, canals, sedimentation basins and other components needed to convey water to Luce Bayou. An extension to the USACE permit was acquired resulting in renewing this permit until 1987. The Luce Bayou project did not move forward until 2005.

The cost and requirements for converting Areas 1 and 2 to surface water were the primary reasons Luce Bayou in Area 3 was delayed. To meet the regulatory requirements for reducing groundwater usage in Areas 1 and 2, the water systems serving those areas needed major expansions and modifications to convert to surface water supplies. These efforts included significant improvements to Applicant's existing Trinity Pumping Station and conveyance canals and pipelines serving the southeast and east Water Purification Plants. Major expansions to those treatment plants and to the storage and conveyance facilities serving those plants were also required. These expansions involved a broad initiative for those areas needing to reduce or even cease groundwater use as soon as possible. They were very costly for Houston, so little effort was possible for Area 3.

When Areas 1 and 2 began to show subsidence control results, the continued population growth in the Harris and Fort Bend Counties' suburban areas created increased groundwater use. Inevitable subsidence issues in Area 3 resulted, which moved these metropolitan areas ahead of others, and the Luce Bayou project came to the front. A new water purification plant on Lake Houston was completed. During this same time, the new system of regional water authorities was created to facilitate groundwater reductions in Area 3 and in Fort Bend County. By 2005, the time had come to re-set the priorities for groundwater reduction in these areas and to provide for surface water supplies. Thus, the LBITP was reactivated.

1.2.2.3 Houston's Water Rights and Permitted Water Supply

Figure 1-5 provides a vicinity map of the affected areas. **Table 1-1** identifies the surface water rights, groundwater availability, and other contracts for permitted water rights Houston has available in 2011. The map shows 60 MGD of water supply in Lake Conroe as being available to Houston. However, this existing permitted water is only conditionally available to Houston during an interim period prior to LBITP's completion due to a 2009 agreement between Houston and the San Jacinto River Authority (SJRA). The SJRA plans to use this existing Lake Conroe water for its Groundwater Reduction Plan in Montgomery County, and has provided Houston with an equivalent amount of replacement water it owned within Lake Houston (San Jacinto River Authority 2011). As a consequence, Houston does not regard this water supply as a current water source (Jun Chang, Houston 2011). No other existing water rights are available within the San Jacinto River basin.

Table 1-1:
Houston Water Supply

Water Sources	MGD
Surface Water Rights	
San Jacinto River Basin	
Lake Conroe	60
Lake Houston	198
Trinity River Basin	
Lake Livingston	806
Dayton Canal	34
Wallisville	34
Barbers Hill Canal	40
Brazos River Basin	
Allen's Creek	62
Total Permitted Water Rights	1,234
Permit Pending: Bayou	143
Permit Pending: Reuse	519
AVAILABLE GROUNDWATER	235*
TOTAL WATER AVAILABLE	**2,131**

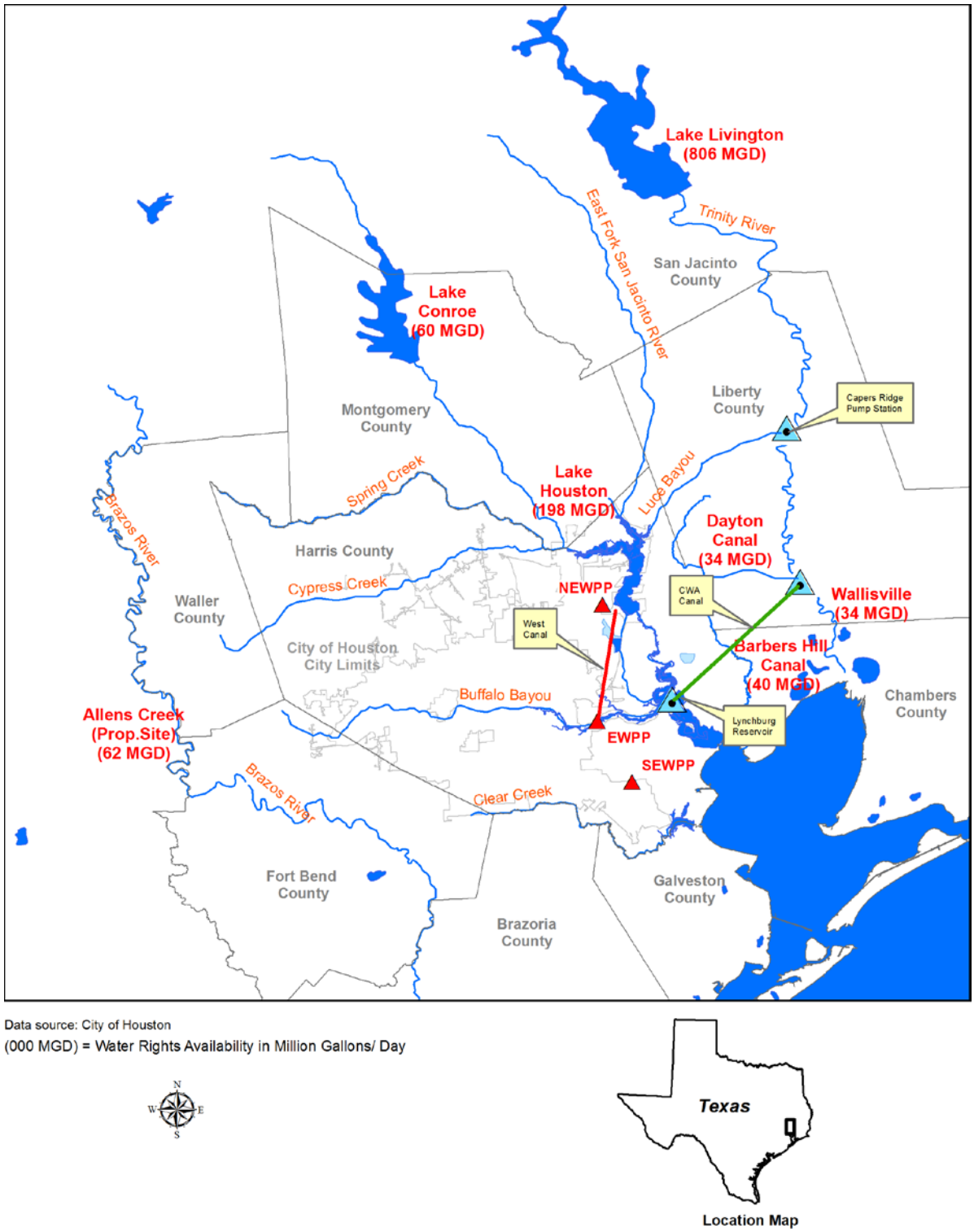
** Per Subsidence District Rules*

Source: Houston Department of Public Works 2011

Figure 1-6 depicts the total surface water demand forecast from 2010 to 2050. This graph demonstrates when the water contract commitments to multiple regional water authorities are combined with Houston's existing surface water demand, the total demand and total permitted surface water rights are essentially equal by 2045.

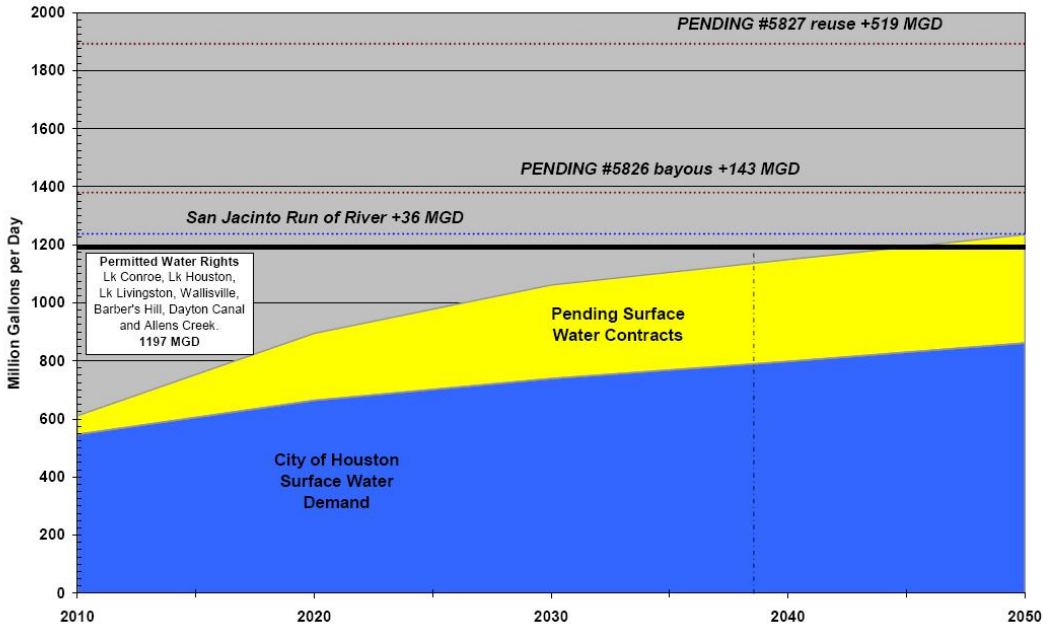
The Region H Regional Water Plan developed through the Texas Water Development Board forecasts Houston's metropolitan area population will have grown to over 8 million by 2040.

Figure 1-5:
Houston's Surface Water Supply Sources



Data source: City of Houston
(000 MGD) = Water Rights Availability in Million Gallons/ Day

Figure 1-6:
Total Surface Water Supply and Demand Forecast



Source: Houston

1.2.2.4 Long-Term, Stable (Reliable) Water Supply

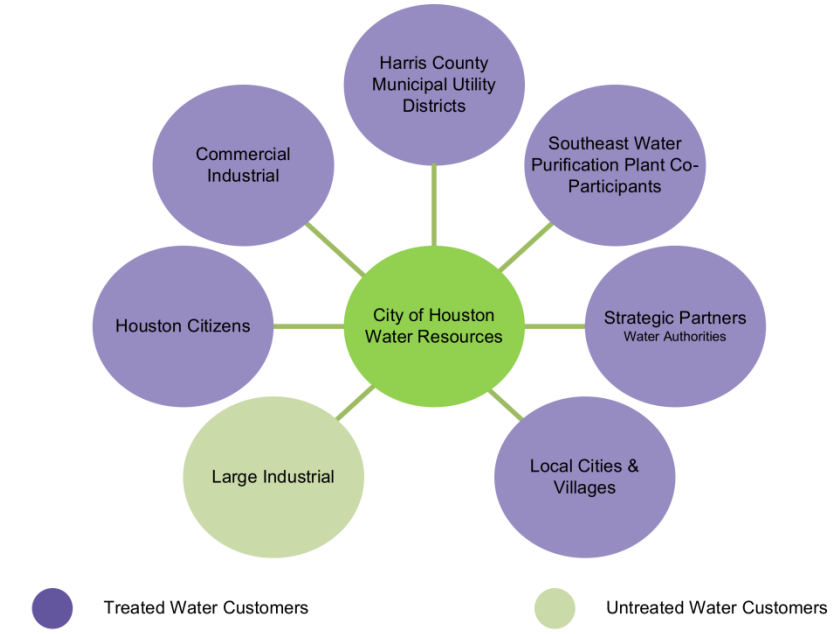
The Lake Livingston water supply is seen to be a long-term resource even during extreme drought conditions. Because Houston can rely on this water source, it represents security for its customers. *Note, a reliable water supply means the water is available even during record drought conditions.*

1.2.3 Water Authorities and Other Houston Water Customers

Houston provides treated and untreated water to a variety of consumers throughout the Houston region. Customers include commercial industry, heavy industry (such as refineries), utility districts, residential customers, incorporated municipalities and villages, and others (**Figure 1-7**). Various wholesale purchasing entities also exist within Houston's service area. They contract with Houston to purchase treated water supply for ultimate re-sale to individual customers or to other systems with additional retail customers. In early 2000, the state legislature began authorizing the formation of regional water authorities for multiple purposes including providing water delivery infrastructure, conserving groundwater and other purposes. These authorities include: North Harris County Regional Water Authority, Central Harris County Regional Water Authority, West Harris County Regional Water Authority, North Fort Bend County Water Authority, and one group which shares operating and maintenance costs for Houston's Southeast Water Purification Plant (Friendswood, Webster, Pasadena, and the Gulf Coast Water Authority). This group is referred to as the Southeast Co-Participants.

Figure 1-7:
Houston's Treated and Untreated Water Customers

Source: Houston

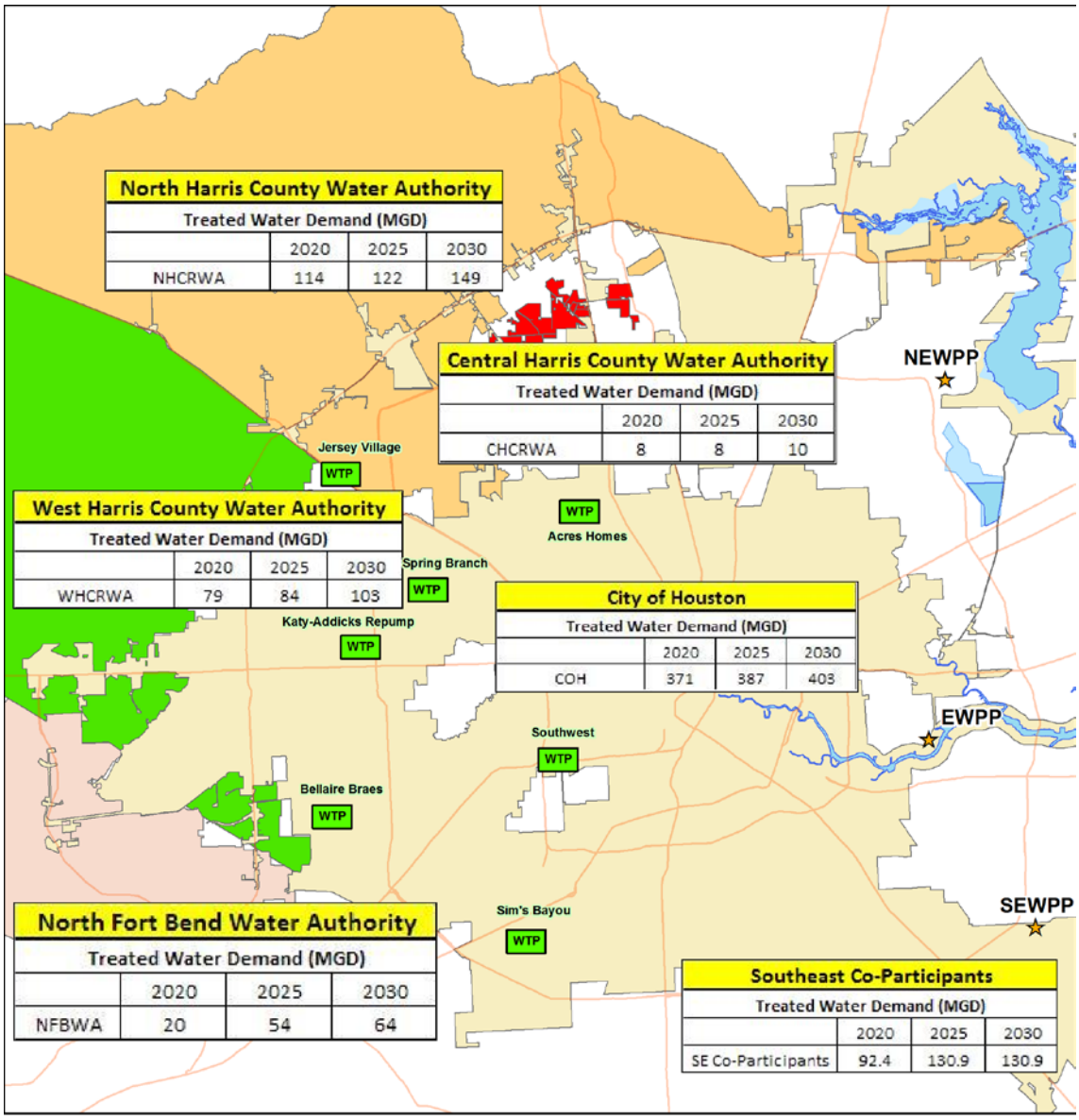


Water Authorities' Demand Projections

The water authorities have executed treated water contracts with Houston consistent with the specific geographic area population growth forecasts developed by the authorities for the areas under their jurisdiction. The contracts require Houston to provide specific water volumes to the authorities by 2020, 2025, and 2030 at a negotiated cost. **Figure 1-8** displays Houston's Demand Projections and the Water Authorities contracted demand (Houston 2011).

One of the primary reasons for creating the water authorities was to provide a regional entity to finance, construct, and operate surface water delivery infrastructure to rapidly growing unincorporated areas. Water service is exclusively provided by multiple utility districts (over 500 districts in the Harris and Fort Bend County metropolitan areas) using small self-contained groundwater supply systems. The utility districts, also authorized by the legislature, allow for development (primarily the providing streets, drainage, and water/wastewater infrastructure) in areas outside Houston by selling revenue bonds to finance the required infrastructure. All these districts originally developed exclusively groundwater-based systems due to the lower cost for such developments. Because providing municipal water supply using surface water is more complex and costly, a regional approach as provided by the water authorities, is required to keep the service cost at more reasonable rates and to maintain more local representation and control in the contracts with Houston.

Figure 1-8:
Houston and Water Authorities Demand Projections



Data source: City of Houston

Source: Houston

1.2.3.1 Population Growth

Population forecasts for water resource planning have been given a state framework through the regional water planning program mandated by Senate Bill 1. The Texas Water Development Board (TWDB) has been tasked with identifying water demand, supplies and future water management strategies for the entire state. They chose to accomplish this by creating 16 regional water planning groups representing diverse interests in specific regional geographic areas. As part of the state's planning process, the TWBD, works with the state demographer to develop population growth forecasts which are used by the regional water planning groups to develop their water management strategies. The Houston metropolitan area is a part of 15 counties within Region H. The state forecasts Harris County will grow from just over 4.0 million in 2010 to almost 6.0 million by 2040 (TWDB 2011) (**Table 1-2**), which accounts for 64 percent of the almost 9 million total forecasted population by 2040 in the 15 county region.

The Applicant and the state, by the state approving the Region H Plan, see Houston's use of its existing contracted water rights in Lake Livingston to be essential for meeting near term and 25-year population growth water demands. **Table 1-3** shows Region H's water demand projections in 10-year increments to 2060.

Table 1-2:
Region H Population Projections

County	2010	2020	2030	2040	2050	2060
Austin	27,173	30,574	32,946	34,355	35,031	35,958
Brazoria	305,649	354,708	401,684	444,981	490,875	538,795
Chambers	34,282	40,786	46,838	52,083	57,402	62,850
Fort Bend	550,121	719,737	893,875	1,090,710	1,348,851	1,643,825
Galveston	268,714	284,731	294,218	298,057	300,915	302,774
Harris	4,078,231	4,629,335	5,180,439	5,731,543	6,282,647	6,833,751
Leon	18,231	21,137	22,863	22,971	22,809	23,028
Liberty	81,930	94,898	107,335	119,519	132,875	147,845
Madison	13,905	14,873	15,644	16,364	17,002	17,560
Montgomery	453,369	588,351	751,702	931,732	1,169,199	1,444,999
Polk (part)	37,650	42,196	45,779	48,561	51,535	54,380
San Jacinto	27,443	32,541	36,617	39,159	40,630	41,299
Trinity (part)	11,571	12,485	12,786	12,631	12,131	11,673
Walker	70,672	77,915	81,402	80,547	80,737	80,737
Waller	41,137	51,175	62,352	74,789	89,598	106,608
Region H Total	**6,020,078**	**6,995,442**	**7,986,480**	**8,998,002**	**10,132,237**	**11,346,082**

Source: Texas Water Development Board 2011

Table 1-3:
Region H Water Demand Projections (in acre-feet/year)

Harris	2010	2020	2030	2040	2050	2060
Municipal	709,300	789,397	868,320	948,412	1,030,899	1,119,593
Manufacturing	395,997	424,761	449,218	470,881	487,094	478,957
Steam-Electric	7,728	23,962	28,015	32,955	38,977	46,317
Mining	1,282	1,434	1,529	1,624	1,720	1,805
Irrigation	15,300	15,300	15,300	15,300	15,300	15,300
Livestock	1,133	1,133	1,133	1,133	1,133	1,133
Total Water Use	**1,130,740**	**1,255,987**	**1,363,515**	**1,470,305**	**1,575,123**	**1,663,105**

Source: Texas Water Development Board

1.3 Authorizing Actions That May be Required

This permit application is being reviewed pursuant to Section 10 in the Rivers and Harbors Act of 1899, and Section 404 in the Clean Water Act. Proposed work in the Trinity River and the proposed fill material discharge into waters of the U.S., including wetlands require these permits. The USACE may issue, issue with modification, or deny either or both permits.

Other permits and certifications that may be required for the proposed project are as follows.

- Texas Commission on Environmental Quality (TCEQ)'s Section 401 State Water Quality Certification
- Certificate of Adjudication 09-4621 (TCEQ's water rights diversion permit)
- TCEQ's Texas Pollutant Discharge Elimination System (TPDES) General Permit for Construction Activities with Stormwater Management BMPs (and Plan)
- Harris County / Harris County Flood Control District (HCFCD) and Houston Storm Water Quality (SWQ) permit requirements (includes, SWQ permit application post-construction requirements)
- Texas Parks and Wildlife Department (TPWD) Revenue Sand Permit
- Texas General Land Office Miscellaneous Easement for the Trinity River
- Federal Emergency Management Agency (FEMA) floodplain Conditional Letter of Map Revision (CLOMR) or Letter of Map Revision (LOMR) with U.S. Fish and Wildlife Service (USFWS) authorization for Threatened and Endangered (T&E) species/habitat evaluation (if or as needed)
- Authorization from a variety of pipeline owners or operators with project crossings
- Railroad Commission of Texas (RRC) authorization for construction near oil and gas wells (if needed)
- Federal Energy Regulatory Commission (FERC) or ENSTOR permit for construction near the ENSTOR Houston HUB & Storage facility
- Local authorizations from Liberty County and Harris County near Lake Houston for construction activities
- Houston authorization for construction of discharge structure into Lake Houston
- TCEQ/TPWD Bed and Banks permit for Trinity River and Lake Houston
- TCEQ permits for Above Ground Storage Tanks (AST) for construction fueling and possibly an Spill Prevention, Control and Countermeasure (SPCC) plan
- Depending on size, possibly permits for emergency diesel generator at Capers Ridge pump station
- Texas Department of Transportation (TxDOT) permit and easements within and for roadway crossing construction
- Texas Public Utility Commission electrical power distribution system installation permit (responsibility of Sam Houston Electric Cooperative [SHECO])
- Utility routing permits as necessary (maintenance facility sanitary sewer, electrical, etc. for example)
- Natural Resources Conservation Service (NRCS) authorization for impact to prime farmland soils
- Deed recordation for property owned by Applicant

The proposed project is not located within the Texas Coastal Zone; therefore it does not require certification from the Texas Coastal Management Program.

1.4 EIS Organization

This EIS complies with the CEQ EIS requirements (40 Code of Federal Regulations [CFR] 1502.10) and the USACE' requirements (33 CFR 325, Appendix B).

- **Chapter 1.0** describes the purpose of and need for the action, the USACE role in the EIS process, and the required regulatory actions for the proposed project.
- **Chapter 2.0** includes the Proposed Action and the No Action alternatives plus the past, present, and reasonably foreseeable future actions considered in the cumulative effects analyses.
- **Chapter 3.0** discusses the affected environment and the potential direct, indirect, and cumulative impacts associated with the project alternatives; possible mitigation to minimize or compensate for impacts; and any residual adverse effects following the implementation of mitigation.
- **Chapter 4.0** explores the environmental consequences cumulative effects from implementing the alternatives including the No Action alternative.
- **Chapter 5.0** presents the cumulative effect analysis summary, and describes TxDOT's eight-step approach for evaluating cumulative effects.
- **Chapter 6.0** discusses in more detail measures or plans to be taken to mitigate environmental impacts.
- **Chapter 7.0** lists agencies, organizations and persons to whom copies of the statement are sent.
- **Chapter 8.0** lists the EIS preparers and reviewers.
- **Chapter 9.0** summarizes public participation and the scoping process, and the consultation and coordination undertaken to prepare the EIS.
- **Chapter 10.0** provides the list of references.
- **Chapter 11.0** contains the glossary defining terms.
- **Chapter 12.0** contains the index.

Copies of supporting documents are available for public review on the USACE, Galveston District (SWG) website at:
http://www.swg.usace.army.mil/BusinessWithUs/RegulatoryBranch/SpecialProjectsEnvironmentalImpactStatements.aspx

Technical documents will be available a minimum of 60 days past the date of the USACE Record of Decision for this project.