



Alternative Water Supply in Northeastern Harris County Feasibility Study



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September 2026 / FINAL



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Date: 2026.09.24 16:05:05-0500



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Abbreviations

AFY	acre-feet per year
AWS	alternative water supply
BAWA	Baytown Area Water Authority
BRACS	Brackish Resources Aquifer Characterization System
CHCRWA	Central Harris County Regional Water Authority
COH	City of Houston
DOR	drought-of-record
DPR	direct potable reuse
EHSA	East Harris Study Area
GCWA	Gulf Coast Water Authority
GLO	general land office
GPCD	gallons per capita day
GPD	gallons per day
GRP	Groundwater Reduction Plan
HGSD	Harris-Galveston Subsidence District
IPR	indirect potable reuse
JRPR	Joint Regulatory Plan Review
MGD	million gallons per day
MGY	million gallons per year
NEWPP	Northeast Water Purification Plant
NHCRWA	North Harris County Regional Water Authority
PDA	population density per acre
PWS	public water system
RO	reverse osmosis
RWA	regional water authority
RWP	regional water plan
SDWS	Safe Drinking Water Standards
SJRA	San Jacinto River Authority
TCEQ	Texas Commission on Environmental Quality
TPWD	Texas Parks and Wildlife Department
TWDB	Texas Water Development Board
UH	University of Houston
WHCRWA	West Harris County Regional Water Authority
WRF	water reclamation facility
WTP	water treatment plant
WWTP	wastewater treatment plant

SECTION 1 INTRODUCTION

The Harris-Galveston Subsidence District (HGSD) was created by the Texas Legislature in 1975 to prevent further subsidence in Harris and Galveston counties. Subsidence in this region is due to substantial, long-term withdrawal of groundwater from the Gulf Coast Aquifer System. When large volumes of groundwater are removed, layers of clay within this aquifer compact, causing the land surface to gradually sink. Although a slow process, it is irreversible and has significant impacts, such as damage to infrastructure and increased flood risks.

To address subsidence, HGSD implements science-driven groundwater regulations through a [Regulatory Plan](#) and award-winning water conservation programs to reduce reliance on groundwater. This plan utilizes a well-permitting process that specifies a percentage of permittees' total water demand to be met with groundwater, with designated conversion goals to supply the majority of water demand through alternative water sources that do not cause subsidence.

The plan is regularly reviewed in collaboration with the Fort Bend Subsidence District (FBSD), in a process called the Joint Regulatory Plan Review (JRPR), to account for projected population growth and water demand, the availability of alternative water supplies (AWS), subsidence modeling, and regulatory scenarios, ensuring the plan's effectiveness in preventing further subsidence. The results of the latest JRPR are documented in the [2025 JRPR Comprehensive Report](#), which provides a summary of the study's purpose, approach, tasks, and findings (HGSD and FBSD, 2025).

1.1 Goals

An AWS Availability Assessment was completed as part of the JRPR, and a portion of northeast Harris County, which lies outside the service areas of the City of Houston (COH) and the regional water authorities, was identified as lacking access to reliable AWS. This area, shown in Figure 1, is referred to as the East Harris Study Area (EHSA) in this report. The report recommended a focused assessment on regional and local AWS for the EHSA because no unappropriated water rights on the San Jacinto River and Lake Houston are available, and entities in this area will need to obtain surface water from other rights holders or seek out other AWS options.

This study includes:

- An assessment of population projections and water demands within the EHSA.
- Assessment of current water supplies.
- A review of previously identified AWS.
- An assessment of new AWS and regional facilities to facilitate water supply distribution to rural communities within the EHSA.

The primary goals of this study are to understand the demands within the study area, evaluate future AWS solutions, and propose a potential implementation guide for a more sustainable water future that reduces the risk of further subsidence.

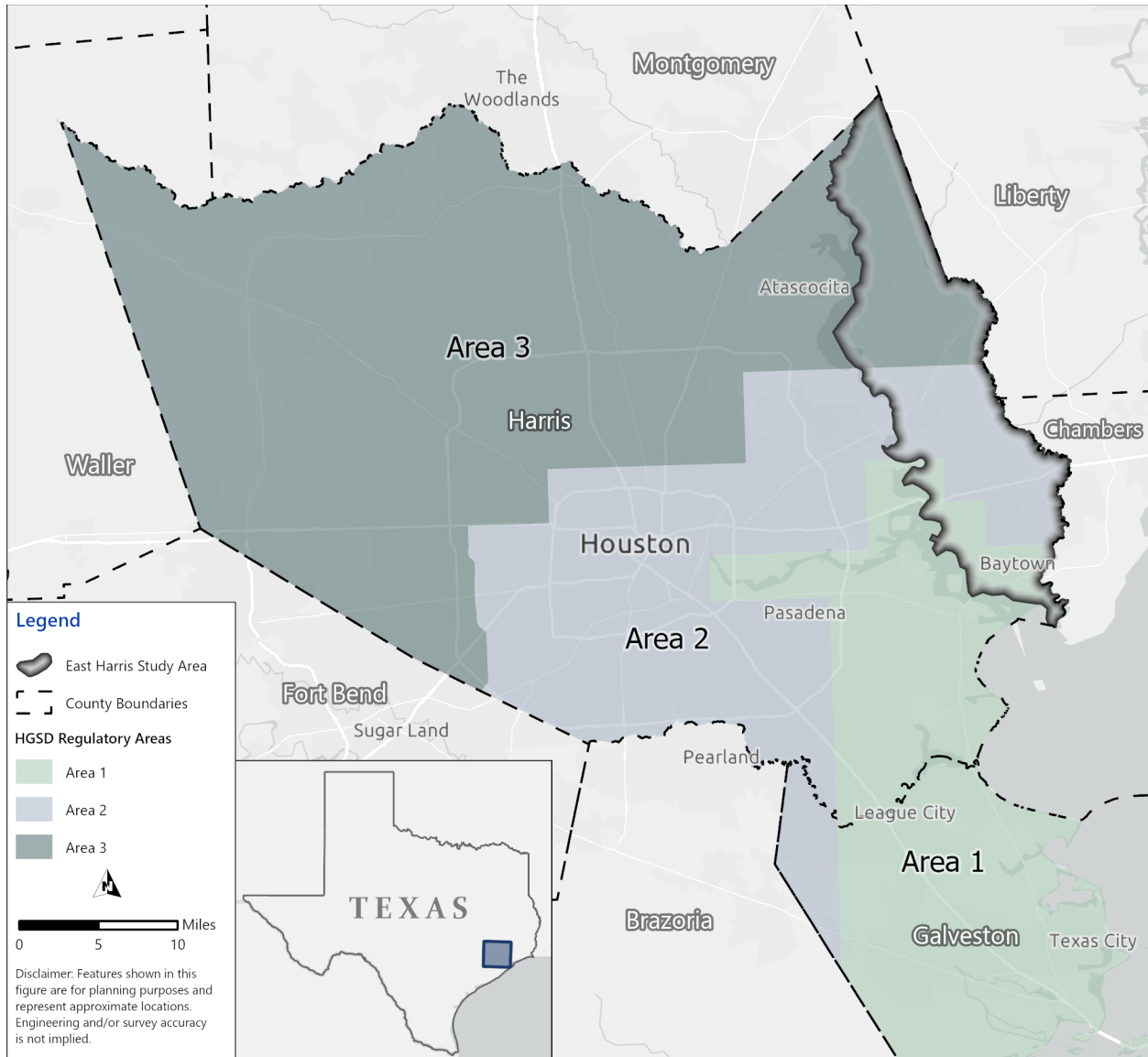


Figure 1 Location of the East Harris Study Area in Harris County

1.2 Project Background

The JRPR comprised several distinct technical evaluations, including developing population and water demand projections and conducting an AWS assessment. AWS is defined as metered water from any source that meets regulatory requirements, including but not limited to surface water, reuse water, treated effluent, desalinated seawater, or water from a retail public utility (HGSD Rules 1.1(b)). Water obtained from a supplier in compliance with a Groundwater Reduction Plan (GRP), or groundwater provided as part of a GRP, is considered an AWS (HGSD, 2023). Groundwater withdrawn from any county outside the HGSD does not qualify as an AWS unless the permittee can demonstrate that the groundwater withdrawals will not cause groundwater level declines or subsidence within the HGSD.

The AWS availability study considered surface water development, reuse water, treated effluent, and desalinated seawater, as well as water demand management, aquifer storage recovery (ASR), and other water supply options that may not yet be recognized as an AWS under the HGSD rules. The AWS study also investigated the availability of AWS; an available AWS, as defined in HGSD Rules 1.1(c), is an AWS “that can be utilized with the exercise of reasonable diligence within a reasonable time” (HGSD, 2023).

Many of the recommendations within this study require stakeholder investment, sponsorship, and community engagement to move forward. Community engagement enables a better understanding of needs, goals, and outcomes.

Please note that the water development approaches discussed in this study are only recommendations; water providers and water users are under no obligation to adhere to the suggested AWS options.

1.3 Regulatory Area Groundwater Use Reduction Goals

The Gulf Coast Aquifer System, the major aquifer located within the study area, parallels the Texas coastline from the Louisiana border to the border of Mexico. It consists of several aquifers, including the Jasper, Evangeline, and Chicot, which are composed of discontinuous sand, silt, clay, and gravel beds. In the greater Houston-Galveston region, freshwater is sourced from groundwater pumped primarily from the Chicot and Evangeline aquifers. The extraction of large volumes of groundwater from these aquifers causes clay deposits within the aquifer to depressurize and compact. Aquifer compaction affects overlying stratigraphic units all the way to the land surface and is observed as subsidence.

Since 1975, HGSD has been successfully mitigating subsidence, earning international recognition for effective groundwater regulations by implementing a regulatory plan that is based on the best available groundwater and subsidence data, population and water demand projections, and coordination with regional alternative water providers. This plan divides HGSD's jurisdiction into three regulatory areas that follow a schedule to reduce overall groundwater withdrawals from the Gulf Coast Aquifer to prevent subsidence. Each regulatory area's groundwater withdrawals must be reduced to a specific percentage of total water demand by a designated date. Presented below are the groundwater use reduction requirements by regulatory area.

Regulatory Area 1 – Groundwater withdrawals for each permittee must comprise no more than 10 percent of the permittee's annual total water demand.

Regulatory Area 2 – Groundwater withdrawals for each permittee must comprise no more than 20 percent of the permittee's annual total water demand unless the permittee is operating under a certified Groundwater Reduction Plan (GRP).

Regulatory Area 3 – Groundwater withdrawals for each permittee must comprise no more than 20 percent of the permittee's annual total water demand, unless the permittee is operating under a certified GRP. As of 2025, a permittee operating under a certified GRP must maintain their groundwater withdrawals to comprise no more than 40 percent of their annual total water demand with additional conversions to no more than 20 percent beginning in 2035.

1.4 Study Area Description

The EHSA includes all of Harris County east of Lake Houston, the San Jacinto River, and Luce Bayou as shown in Figure 2. The area encompasses approximately 128,770 acres and includes the communities of Lake Houston, Huffman, Crosby, Newport, and Barrett to the east and southeast of Lake Houston, and Highlands, McNair, Coady, Lynchburg, and Baytown in the southern portion of the study area.

The southern portion of the study area falls within the jurisdiction of the Baytown Area Water Authority (BAWA), a regional provider of wholesale water services for the City of Baytown along with several public water systems (PWS) in the area. BAWA purchases surface water from the COH and also uses some groundwater in accordance with their GRP. In the central portion of the study area, a small number of municipal utility districts (MUDs) purchase surface water from the San Jacinto River Authority (SJRA); these include Newport MUD and Crosby MUD, among others. The remaining PWS within the study area obtain their water supplies exclusively from groundwater along with rural domestic water users.

Land subsidence in the Baytown, Texas area began in the early 20th century with localized sinking at the Goose Creek Oil Field caused by oil and gas extraction, which produced several feet of elevation loss and surface fissuring. Over time, as industrialization expanded along the Houston Ship Channel, the primary driver of subsidence shifted to large-scale groundwater withdrawal, leading to widespread and rapid subsidence from the 1940s through the 1970s, with some areas near Baytown experiencing more than eight feet of total land loss and increased vulnerability to tidal flooding. One of the most notable examples was the Brownwood subdivision in the Baytown area, where subsidence ultimately lowered ground elevations below sea level, leading to abandonment of the subdivision (HGSD, 2026).

Recognition of the connection between subsidence, flooding, and economic risk led to the creation of the HGSD in 1975, a turning point in subsidence history for Baytown and the broader region. HGSD's implementation of a science-based regulatory plan focused on reducing groundwater dependence resulted in significant reductions in groundwater pumping, replaced by surface water from regional river basins, and substantial decline in subsidence rates, especially in coastal areas like Baytown where conversion to surface water was strongest (Turco, et al., 2024).

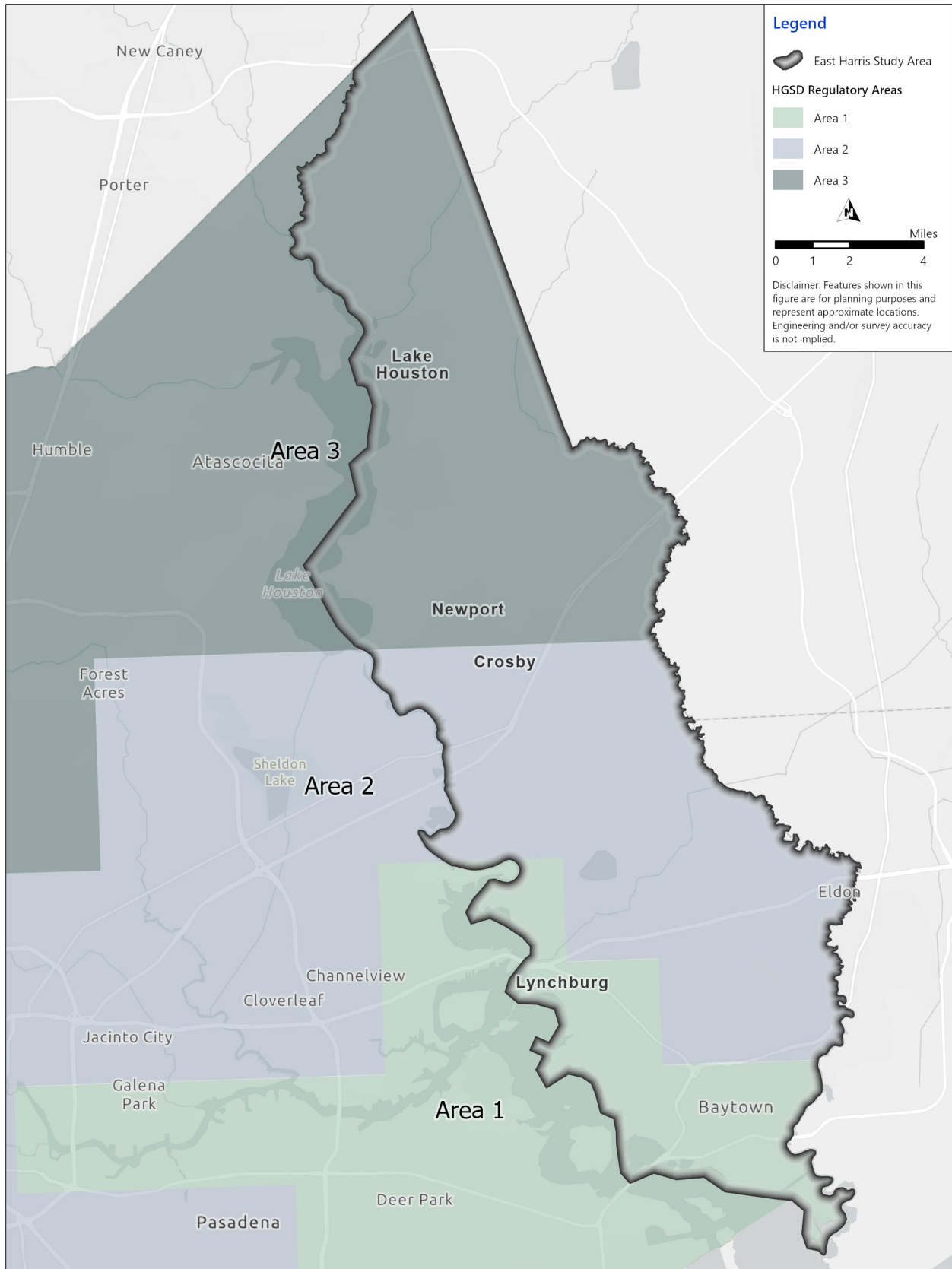


Figure 2 Detail Map of the East Harris Study Area

SECTION 2 POPULATION PROJECTIONS

Water demand projections for the EHSA are based on population projections developed as part of the JRPR process for use in modeling water level changes and land surface subsidence resulting from projected groundwater pumping in Harris and surrounding counties. The goal was to support groundwater management within HGSD and to allow the regional water planning process to reflect local conditions and region-specific planning efforts. The following paragraphs were taken from the JRPR Comprehensive Report to describe the process used to develop population projections for the study area.

2.1 Population Projection Methodology

Decadal population projections were developed for each PWS and for non-PWS areas. Population estimates from the 2020 Census were used as the baseline for the period of 2030 to 2100. Long-term decadal projections (spanning from 2030 to 2100) were developed by the University of Houston (UH) using the Small Area Model-Houston model. Near-term projections of growth between 2020 and 2030 were developed by Zonda for portions of the study area, including the EHSA, within HGSD Area 2 and Area 3. The results for 2030 projections developed by both methodologies were then compared and aligned to a single near-term projection.

The population and water demand projections produced for the JRPR were highly detailed at a fine spatial resolution (census block level rather than tract level). This enhanced approach provided several key benefits:

1. Availability of detailed municipal projection information at the census block level.
2. Closer alignment of projections and processes for local and regional planning.
3. More accurate reflection of the regulatory availability of groundwater within HGSD's counties.
4. More accurate representation of planned future infrastructure projects for the regulated community.
5. Facilitation of more advanced analyses of potential future strategies, including supplies such as reuse, which are influenced by population density and proximity to other infrastructure (Region H, 2026).

Tract-level projections from Zonda and UH were disaggregated to smaller census blocks to provide a higher resolution of the study area. The process of disaggregation considered factors such as land use, proximity to transportation corridors, floodplains, wetlands, and other developments. Service area boundaries for PWS were obtained from the Texas Water Development Board (TWDB) and modified based on stakeholder feedback. Boundaries were also adjusted to include areas that are anticipated to develop new PWS in the future. These PWS boundaries were then used to reaggregate population projections from the census block level.

2.2 Projected Population Density

To provide a better understanding of projected development of the EHSA and where growth is projected to occur, the disaggregated population projections at the combined census-block/PWS level were converted to population density per acre (PDA) using the land area of each individual polygon in the population dataset. For 2020, PDA within the EHSA ranged from zero for polygons covering undevelopable land to greater than 90 persons/acre within the City of Baytown. The 2020 PDA for non-urban PWS within the EHSA was used to determine an approximate threshold population density to indicate the point at which a rural area becomes sufficiently populated to support development of a PWS. A review of the PDA for established PWS in the EHSA indicates that a PDA threshold of 1.1 persons/acre may be a suitable indicator of development density. Using this PDA threshold, population polygons with PDA less than 1.1 persons/acre are considered as rural or undeveloped (and would continue to be served by individual domestic wells) while polygons with PDA greater than or equal to 1.1 persons/acre would be considered as developed and served by a PWS.

Figure 3 shows the PDA based on the 2020 Census population estimates. This map shows that in 2020, most of the population was primarily located in the southern portion of the EHSA including the communities of Baytown, Highlands, Lynchburg, and Eastpoint. In the central portion, the population is clustered in the communities of Newport, Crosby, and Barrett. Population density was much lower in the northern portion, primarily in scattered developments along the east shore of Lake Houston and some communities northeast of the lake.

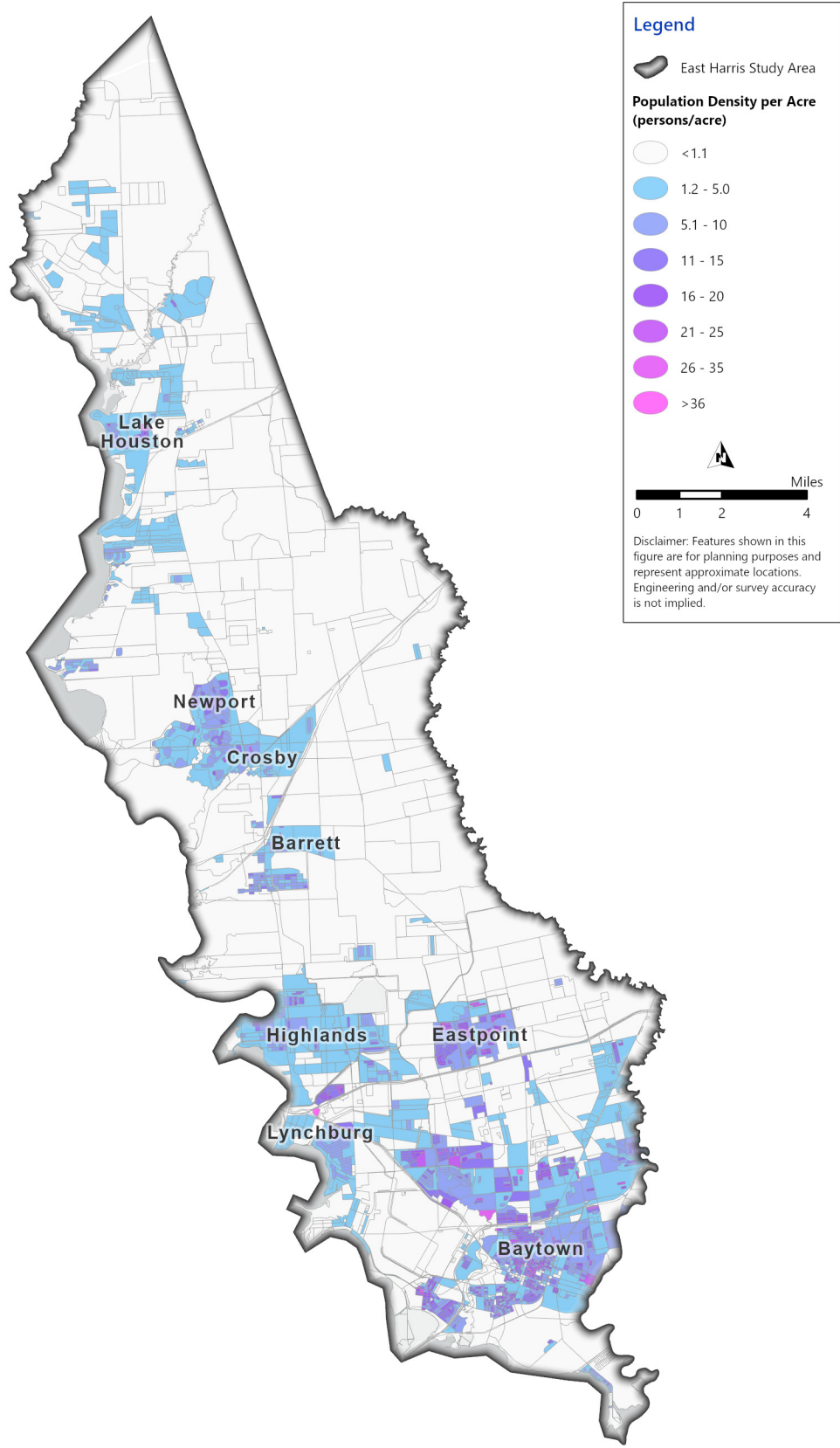


Figure 3 Population Density of the EHSA in 2020

The projected population and developed acreage based on the PDA threshold of the EHSA by decade is shown in Figure 4. As indicated by the slope of the developed acreage line on this chart, areal expansion of development based on projected population growth in the EHSA exceeds 900 acres per year through 2040, then slows to less than 150 acres per year through 2060; the projected rate of development increases to more than 300 acres per year in the final decade of the analysis period. After 2050, most of the projected development occurs in the central part of the EHSA around the communities of Newport, Crosby, and Barrett. Of the 128,770 acres in the EHSA, a total of 54,960 acres are projected to be developed by 2070. Approximately 20,400 acres are not suitable for development, as indicated by zero projected population in 2070. Thus, about 51 percent (54,960 acres divided by 108,370 acres) of the total developable acreage is projected to be developed by 2070.

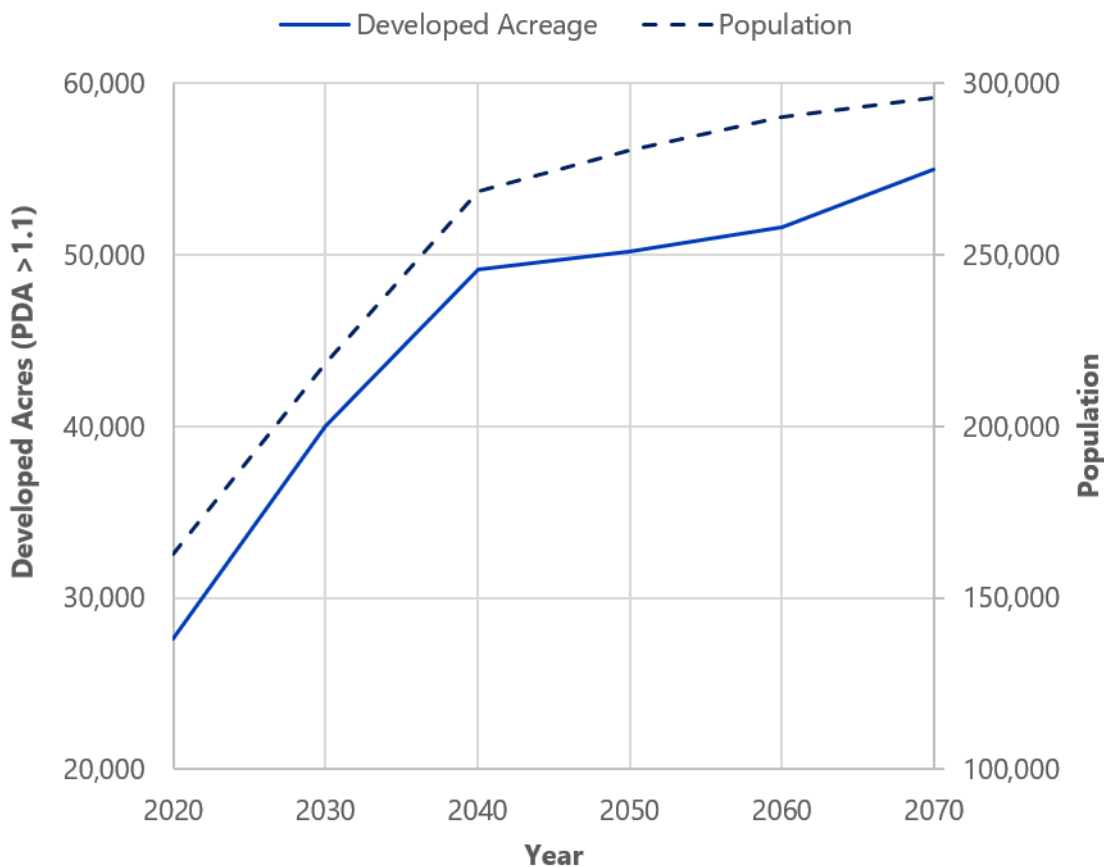


Figure 4 [Projected Developed Acreage and Population by Decade in the EHSA](#)

Similar to Figure 3, Figure 5 shows the projected areal population density of the EHSA by decade through 2070. These maps reflect the chart in Figure 4, indicating that areal expansion of development is mostly complete by 2040. Looking at the maps for 2020, 2030, and 2040, most of the areal expansion is expected to occur east of Lake Houston and near the communities of Newport, Crosby, and Barrett. Expansion is also expected in the southern portion of the study area, primarily near the communities of Highlands and Lynchburg and east of Eastpoint.

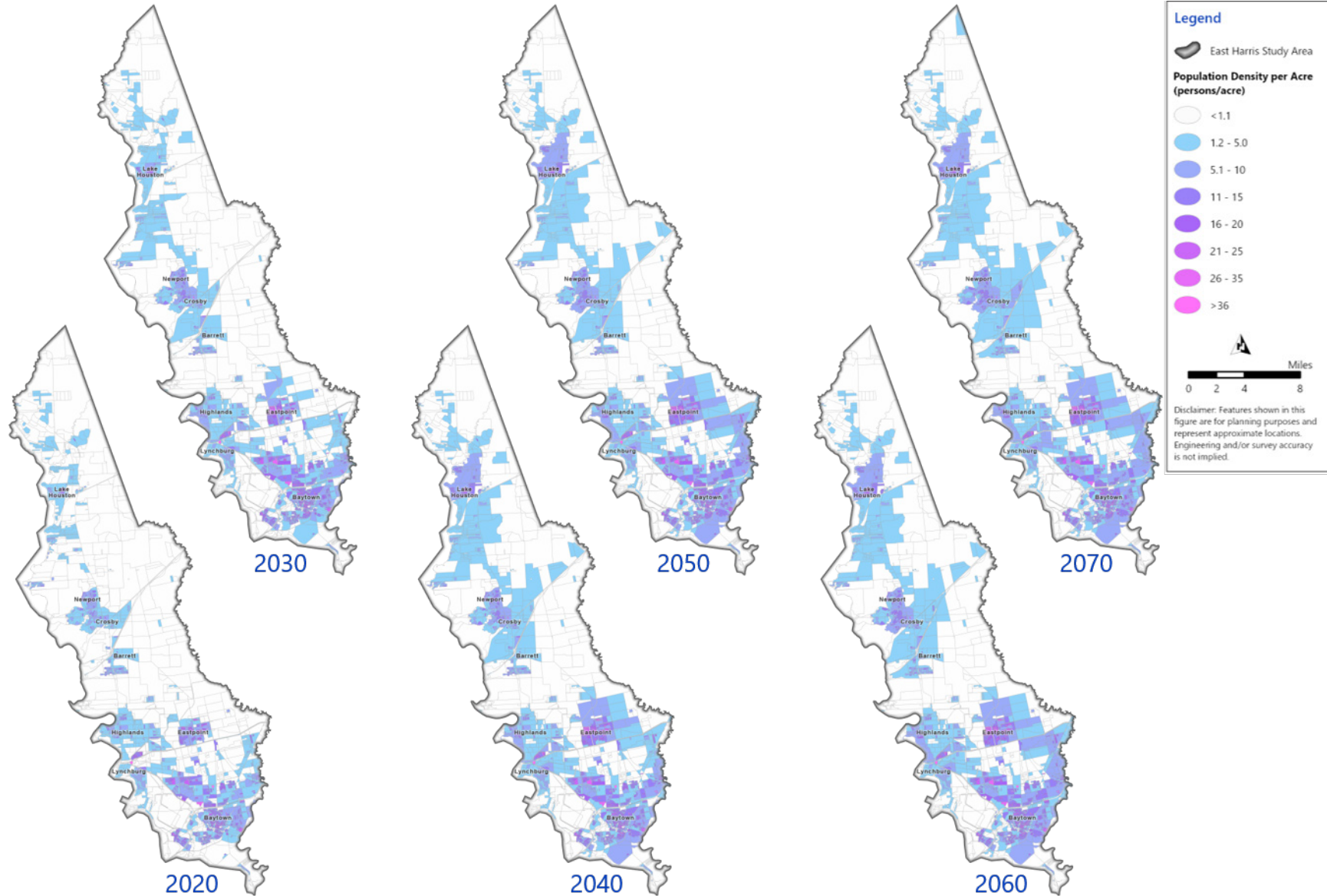


Figure 5 Projected Areal Population Density by Decade in the EHSA

2.3 Alternative Water Supply Planning Areas

Based on these projections, the EHSA was further divided into three AWS planning areas as shown in Figure 6. This figure shows the projected PDA for 2040. A clear gap of undeveloped area is apparent between Barrett and the southern developments near Highlands and Eastpoint; based on this gap, Barbers Hill Road and FM 1942 were used to delineate the southern Baytown AWS Planning Area. The Baytown AWS Planning Area includes the entirety of the BAWA within Harris County along with areas north of Interstate 10 and south of Barbers Hill Road and FM 1942; many of the existing PWS in this area beyond the northern administrative boundary of the BAWA are currently receiving treated water from BAWA.

A development gap is also apparent between Newport and the developments on the east side of Lake Houston, although some development is expected in this area along FM 2100 (Crosby Huffman Road). Because of the existing surface water supplies available to Newport and Crosby MUDs, this gap was used to delineate the remainder of the EHSA into two separate AWS planning areas, referred to herein as the Lake Houston-North AWS Planning Area and the Newport-Crosby AWS Planning Area.

The delineation of the EHSA into these three AWS planning areas is justified on the basis of existing surface water supplies available to each area. Although larger than the current BAWA administrative area in Harris County, historical records indicate that BAWA has contemplated an expansion of the BAWA administrative area to include all areas south of Barbers Hill Road and FM 1942 since at least 1994. As stated previously, BAWA already provides wholesale water to most of the PWS within this planning area.

Within the central Newport-Crosby AWS Planning Area, both Newport and Crosby MUDs are currently providing treated surface water sourced from SJRA to retail customers; two other MUDs within this planning area also have contracts with SJRA for untreated surface water but are not yet providing this water to customers. In the northern Lake Houston-North AWS Planning Area, all existing PWS are providing water to their customers sourced from groundwater.

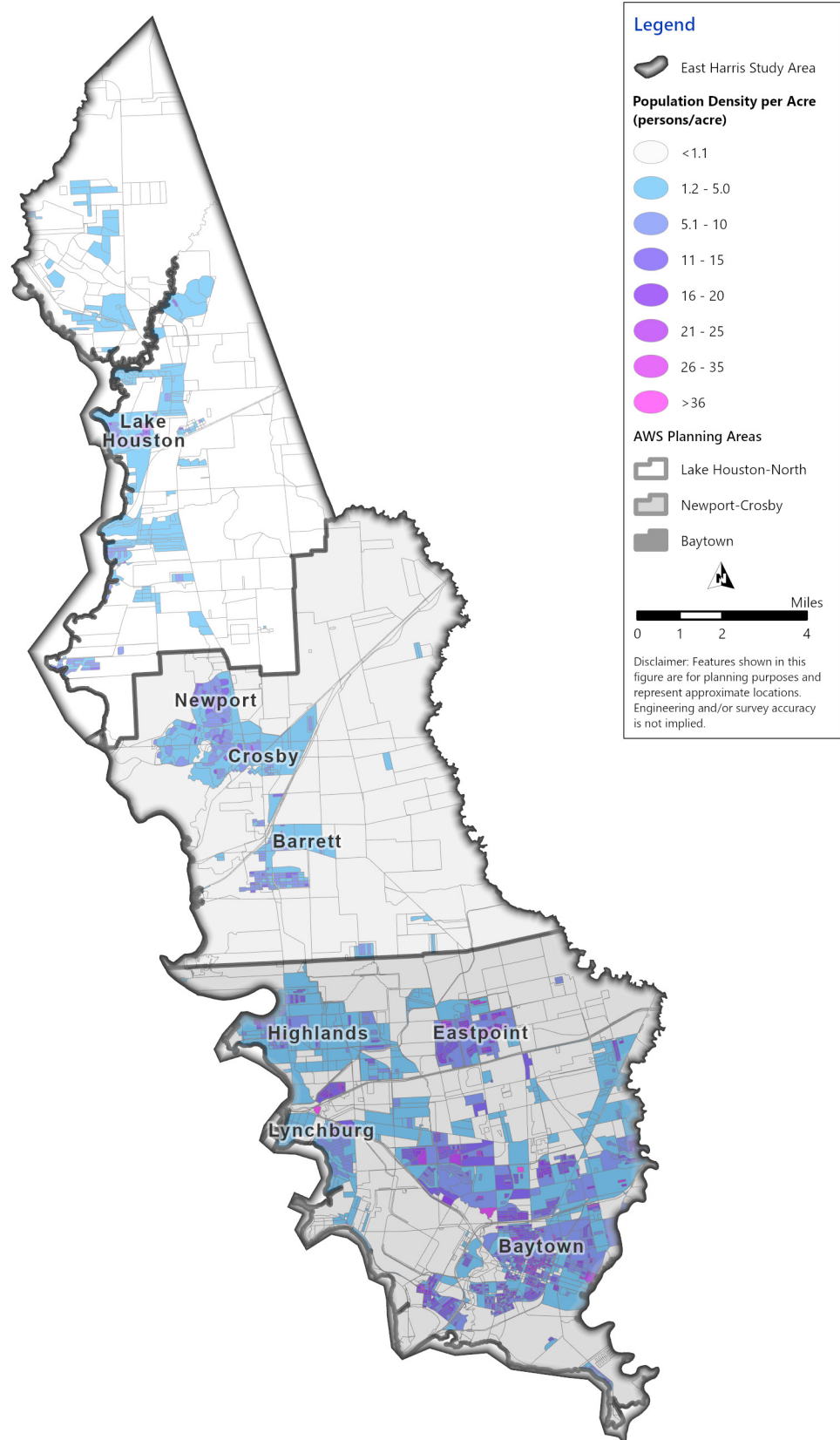


Figure 6 Projected Population Density in the EHSA in 2040 with AWS Planning Areas

2.4 Population Projection Results

The total population of the EHSA in 2020 was 162,833 and is projected to increase to 295,955 by 2070. These estimates include the Baytown area which accounted for almost 70 percent of the total EHSA population in 2020. Decadal projections for each AWS planning area are provided in Table 1.

Table 1 Projected Total Population of the EHSA by Decade

AWS Planning Area	Year					
	2020	2030	2040	2050	2060	2070
Lake Houston-North	21,668	36,070	51,237	51,724	52,062	53,303
Newport-Crosby	28,804	40,310	46,084	47,739	52,873	58,786
Baytown	112,361	142,021	171,382	181,127	185,217	183,866
EHSA	162,833	218,401	268,703	280,590	290,151	295,955

Table 2 provides decadal projections of urbanized population, i.e., for areas with PDA greater than 1.1 persons/acre, for each AWS planning area. In 2020, about 86 percent of the EHSA population was located in developed areas, primarily in the southern Baytown area. By AWS planning area in 2040, 80 percent of the population in the Lake Houston-North area is expected to be in urbanized areas, 82 percent of the population in the Newport-Crosby area is expected to be in urbanized areas, and 97 percent of the population in the Baytown area is expected to be in urbanized areas. The urbanized population of the EHSA is projected to increase to 91 percent by 2040 and 93 percent by 2070, as shown in Figure 7. Based on these projections, greater than 90 percent of residential water use is expected to be associated with municipal use in developed areas by 2030; rural domestic water use is expected to account for less than 10 percent of residential water use in the EHSA after 2030.

Table 2 Projected Urbanized Population of the EHSA by Decade

AWS Planning	Year					
	2020	2030	2040	2050	2060	2070
Lake Houston-North	12,513	25,569	41,219	41,450	41,680	43,515
Newport-Crosby	20,100	30,272	36,968	38,370	43,847	51,288
Baytown	107,552	137,219	166,467	176,385	180,535	179,461
EHSA	140,165	193,060	244,654	256,205	266,062	274,264

Population projections for the JRPR were developed in 2021 and 2022, using the 2020 Census as the basis for future changes in population (Freese and Nichols, Inc., 2024). As of early 2026, when this AWS evaluation for the EHSA was being conducted, real-world development is already showing significant differences from the projections and supporting assumptions. Several housing developments currently under construction in the EHSA are located in areas where development was not projected to occur prior to 2070. Where identified through aerial imagery, formation of a MUD, granting of a Certificate of Convenience and Necessity (CCN) for water service, or application for a GRP, these developments have been added to the map of projected development by 2040, as shown by the hatched areas in Figure 8.

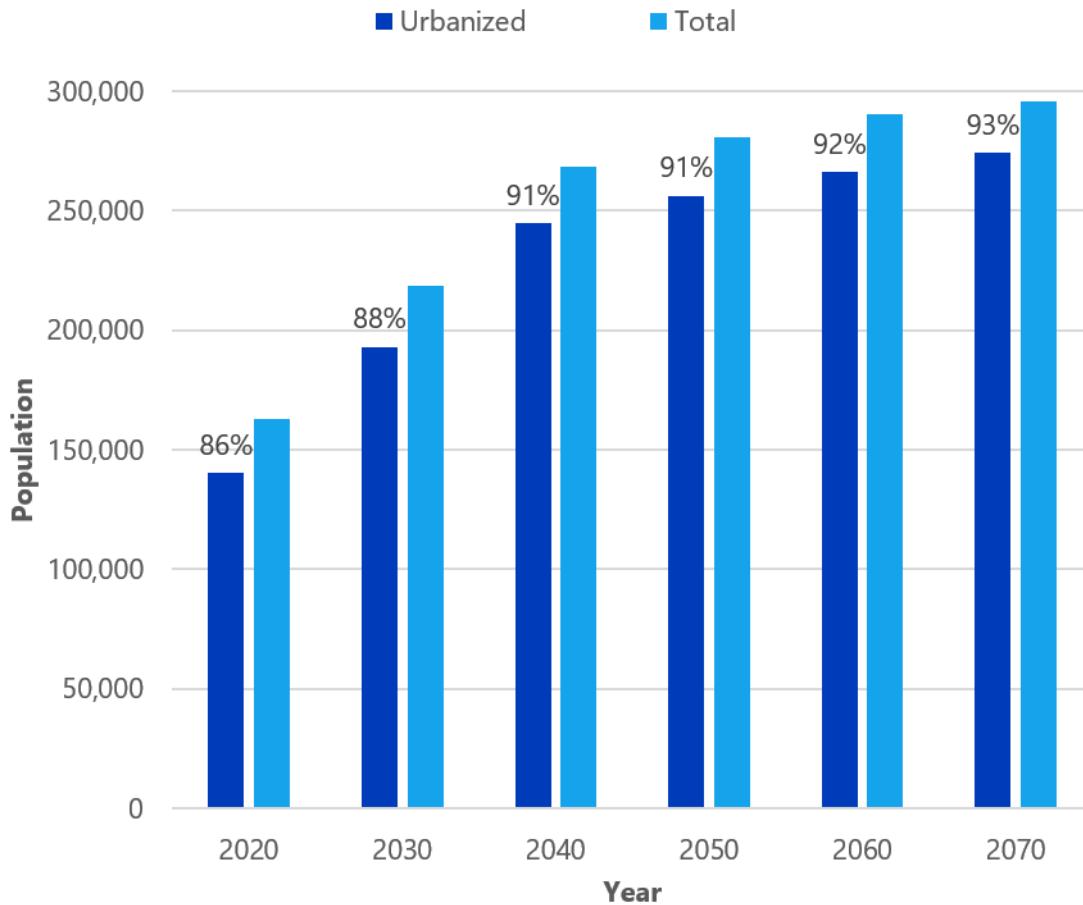


Figure 7 Projected Total and Urbanized Population of the EHSA by Decade

In the population projections presented in Tables 1 and 2 and Figure 7, it is assumed that these recent developments represent a relocation of projected population growth rather than additional growth. However, it is possible that population growth in the EHSA is occurring more rapidly than projected; the results of the 2030 Census will be needed to determine the amount of growth actually occurring. Review of population density for similar developments in central and western Harris County north of Houston provides an indication of expected population density for neighborhood developments in the EHSA. For example, several areas on the west side of Lake Houston had PDA of 8 to 10 persons/acre in 2020. PDA in these areas is projected to increase to 10 to 12 persons/acre by 2050 and to be greater than 11 persons/acre by 2070. Using these PDA ranges as a template for new developments in the EHSA, population in the Lake Houston-North and Newport-Crosby AWS Planning Areas may be 20 percent greater than previously projected.

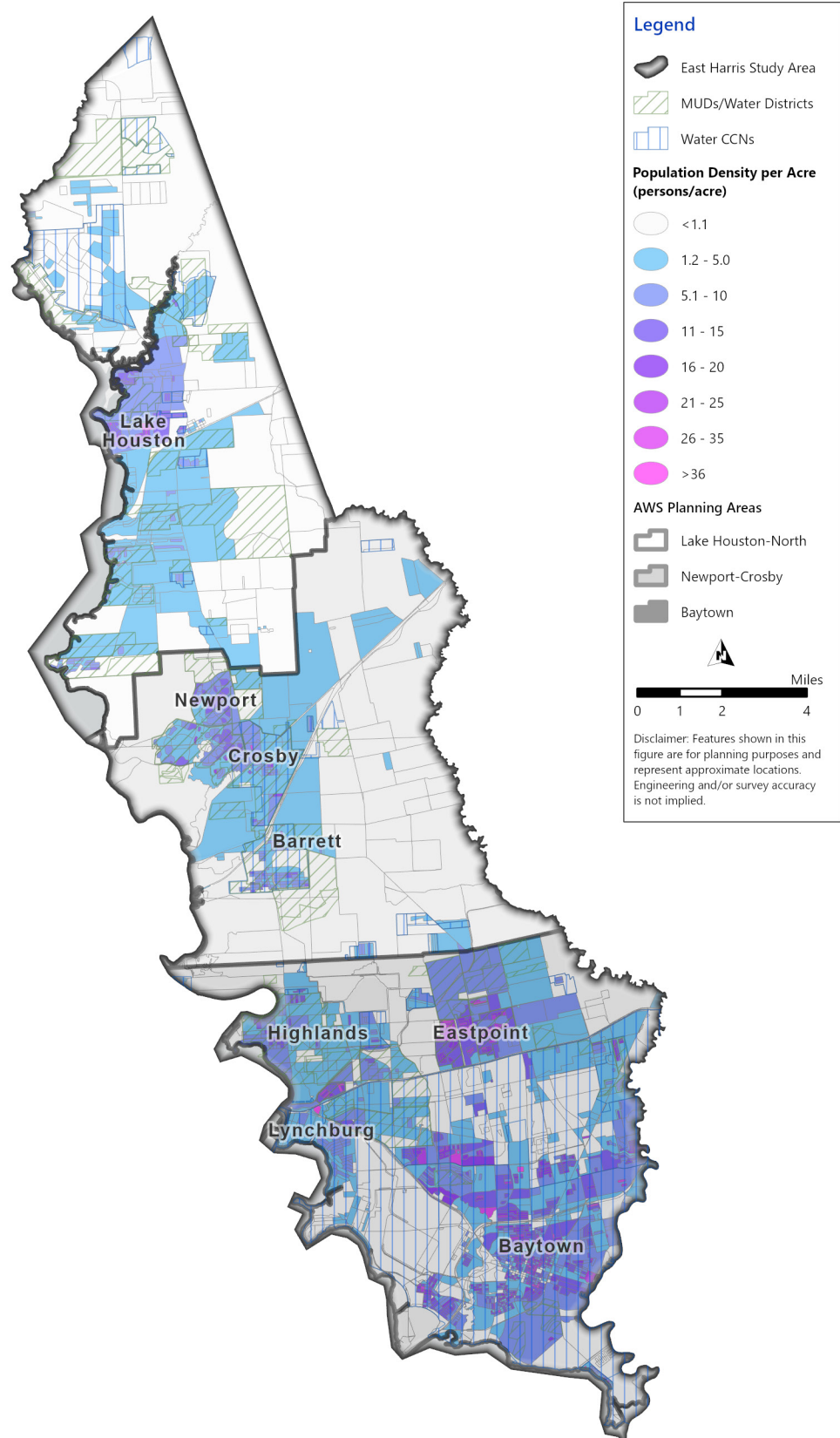


Figure 8 AWS Planning Areas with Water Districts, CCNs, and Projected 2040 Population Density

SECTION 3 WATER SUPPLY ASSESSMENT AND EVALUATION OF WATER DEMANDS

Water supplies within much of the EHSA have originated from groundwater sources. As development has occurred in the area, communities developed their own groundwater wells, making them self-contained in meeting their needs from a water resources perspective. However, this perspective has changed over time as the greater Houston area has faced subsidence due to reliance on groundwater and began regulating groundwater withdrawals to prevent further subsidence. In many areas, water providers outside the study area have developed regional infrastructure to use surface and other water supplies in lieu of groundwater to offset this threat. Northeast Harris County is unique in that the majority of this area lies outside the service areas of the COH and other regional water authorities and faces challenges not only from the organic growth of demand over time but also from the regulatory requirement to convert from groundwater to AWS.

Assessment of options for AWS that considers the responsible management of a sustainable water supply to meet future demands is difficult. For example, regional infrastructure projects are usually layered in their development. Water users rarely rely on a single project to develop and deliver their water supplies. Rather, users typically rely upon projects that provide for development of raw water, one or more raw water transmission projects, a treatment project, and one or more treated water transmission projects to finally deliver water to the demand center.

Review of the current status of water users within the EHSA is critical to provide a comprehensive water supply solution. This section will briefly describe how the HGSD regulatory areas affect the study area and present the projected total municipal water demands (2020-2070) and AWS demands (2020-2070). Identifying the amounts of AWS needed to meet the growing demands is a critical step in developing specific AWS, intended to provide the appropriate volume of water for future generations.

3.1 Harris-Galveston Subsidence District Regulatory Areas

As described in Section 1.3, the HGSD Regulatory Plan divides HGSD's jurisdiction into three regulatory areas and provides a schedule for regulating groundwater withdrawal from the Gulf Coast aquifer for each area. Each regulatory area's groundwater withdrawals must be reduced to a specific percentage of total water demand by a designated date.

As shown in Figure 9, most of the EHSA lies within HGSD Regulatory Areas 2 and 3. The Lake Houston-North AWS Planning Area lies completely within HGSD Regulatory Area 3. The northern portion of the Newport-Crosby AWS Planning Area lies within HGSD Regulatory Area 3, while the southern portion is in Area 2. Portions of Newport MUD and Crosby MUD are within both Regulatory Areas, and both MUDs have GRPs for water use in Area 3. The Baytown AWS Planning Area lies within Areas 1 and 2. The southern portion of the EHSA within Area 1 is primarily served by the BAWA and is already in compliance with HGSD's groundwater reduction goals. Of the 56 PWS in the EHSA with available data, 43 source water solely from groundwater, maintaining compliance by participating in larger GRPs or utilizing other allowances within HGSD's Regulatory Plan. However, no AWS options are currently available to most of these entities.

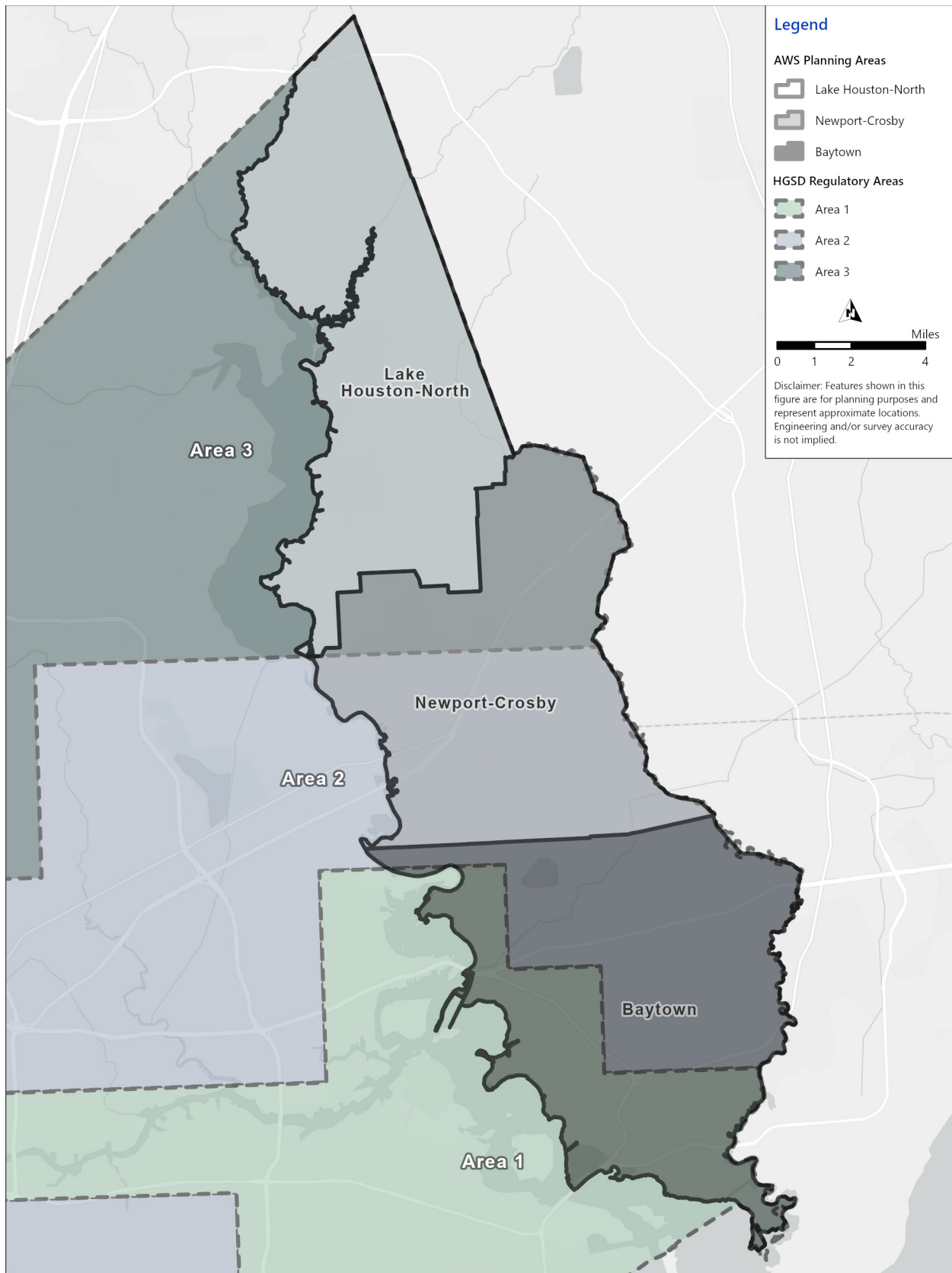


Figure 9 HGSD Regulatory Areas and AWS Planning Areas for the EHSA

3.2 Municipal Water Demand Projections

Municipal water demands include retail municipal demand associated with PWS and domestic well demand. Retail municipal demand refers to water supplied by PWS directly to end users, including commercial, institutional, and residential users; this demand is expected to increase over time with population growth. Domestic demand refers to residential water use supplied by a resident-owned private groundwater well, which is typically of a size and capacity to be exempt from permitting requirements.

Municipal water demands are calculated as the product of baseline per-capita demand (gallons per capita day [GPCD]) and population for each census-block/PWS polygon. The GPCD values were developed as part of the JRPR process as described in the following sections.

3.2.1 Baseline Gallons per Capita Day

3.2.1.1 Public Water Systems

As part of the JRPR, baseline per capita demand was developed for each water system that is representative of demand in a typical year based on historical per-capita use and drought index data. In the EHSA, baseline GPCD for PWS ranged from 71 to 242 with an overall population-weighted average of 116.

For this evaluation, baseline GPCD for individual PWS were aggregated to the AWS Planning Area using the 2020 Census population for each PWS to calculate a population-weighted average for the Planning Area. As shown in Table 3, aggregated baseline GPCD is lowest for the Baytown AWS Planning Area at 113 and higher in the two northern AWS Planning Areas at 125 and 126 for the Newport-Crosby and Lake Houston-North AWS Planning Areas, respectively.

3.2.1.2 Exempt Domestic Water Use

Exempt wells are those that are registered with the HGSD but are not required to have a permit. Wells with less than a 5-inch casing diameter that serve single-family dwellings and do not have alternative water available are exempt from groundwater reduction requirements in the HGSD Regulatory Plan. Projected population at the census block level that is outside of a PWS service area was assigned a baseline per-capita demand value of 100 GPCD based on the per-capita use rate assigned to rural domestic usage in the historical pumping estimates for the GULF 2023 subsidence model.

Table 3 Estimated Per Capita Water Use (GPCD) by AWS Planning Area

AWS Planning Area	GPCD
Lake Houston-North	126.0
Newport-Crosby	125.0
Baytown	113.4
Rural Domestic	100.0

3.2.2 Municipal Water Demands

Municipal water demands by decade for each AWS Planning Area were estimated as the product of projected population and baseline per-capita demand from Table 3. Municipal water demands were calculated separately for urbanized areas (i.e., served by PWS) and rural areas served by individual domestic water wells. Aggregating the baseline GPCD for individual PWS into a single value for each AWS Planning Area provides a more realistic estimate of future water demands as rural areas are developed because baseline GPCD for urbanized areas are higher than for rural areas.

For estimation of municipal water demands, the population for housing developments currently under construction in the Lake Houston-North AWS Planning Area located in areas where development was not projected to occur, as discussed in Section 2.4, were added to the projections starting in 2030. Population for these developments was estimated using a PDA of 8 persons/acre in 2030, increasing by 1 person/acre by decade through 2070. This process added 10,880 persons to the population of the Lake Houston-North AWS Planning Area in 2030, increasing to an additional 16,320 persons in 2070.

Estimated total municipal water demands (urbanized plus rural domestic) for the EHSA by AWS Planning Area are provided in Tables 4 and 5 in units of million gallons per year (MGY) and acre-feet per year (AFY), respectively. As illustrated in Figure 10, the largest decadal increases in demand are projected to occur from 2020 to 2030, particularly in the Lake Houston-North AWS Planning Area where 2030 demands are expected to be almost three times higher than 2020 demands. For the EHSA overall, 2030 demand is expected to be about 50 percent higher than in 2020. From 2030 to 2040, municipal demands are expected to increase by about 30 percent overall, with a 50 percent increase in the Lake Houston-North AWS Planning Area over this decade. Overall, the decadal increase in demand is expected to be about five percent or less for 2050 through 2070 for the EHSA.

Table 4 Total Projected Municipal Water Demand by AWS Planning Area (MGY)

AWS Planning Area	Year					
	2020	2030	2040	2050	2060	2070
Lake Houston-North	910	2,060	2,820	2,910	2,980	3,110
Newport-Crosby	1,230	1,750	2,020	2,090	2,330	2,610
Baytown Area	4,630	5,850	7,070	7,470	7,640	7,590
EHSA Total	6,770	9,660	11,910	12,470	12,950	13,310

Table 5 Total Projected Municipal Water Demand by AWS Planning Area (AFY)

AWS Planning Area	Year					
	2020	2030	2040	2050	2060	2070
Lake Houston-North	2,790	6,320	8,670	8,920	9,150	9,540
Newport-Crosby	3,790	5,360	6,190	6,420	7,140	8,010
Baytown Area	14,200	17,960	21,690	22,930	23,450	23,280
EHSA Total	20,770	29,640	36,550	38,260	39,750	40,840

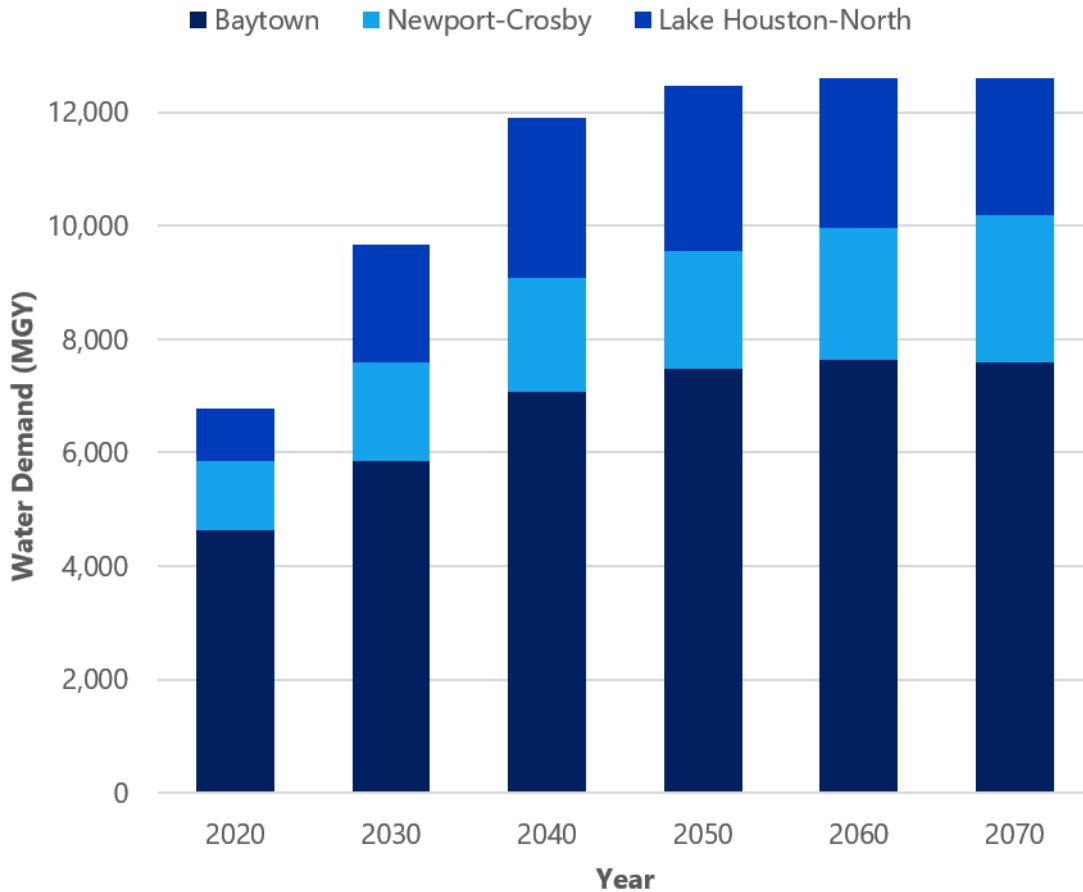


Figure 10 Projected Total Municipal Water Demand of the EHSA by Decade

Estimated municipal water demands for urbanized areas of the EHSA by AWS Planning Area are provided in Tables 6 and 7 in units of MGY and AFY, respectively. Estimated rural domestic demands are provided in Tables 8 and 9 in units of MGY and AFY, respectively. Rural domestic demands are relatively constant over time; therefore, almost all increase in water demands is associated with population growth in urbanized areas.

Table 6 Projected Urbanized Municipal Water Demand by Decade by AWS Planning Area (MGY)

AWS Planning Area	Year					
	2020	2030	2040	2050	2060	2070
Lake Houston-North	580	1,680	2,460	2,530	2,600	2,750
Newport-Crosby	920	1,380	1,690	1,750	2,000	2,340
Baytown Area	4,450	5,680	6,890	7,300	7,470	7,430
EHSA Total	5,940	8,730	11,030	11,580	12,070	12,510

Table 7 Projected Urbanized Municipal Water Demand by Decade by AWS Planning Area (AFY)

AWS Planning Area	Year					
	2020	2030	2040	2050	2060	2070
Lake Houston-North	1,770	5,140	7,540	7,770	7,990	8,440
Newport-Crosby	2,810	4,230	5,170	5,370	6,130	7,170
Baytown Area	13,660	17,420	21,140	22,400	22,920	22,790
EHSA Total	18,230	26,800	33,850	35,530	37,050	38,410

Table 8 Projected Rural Domestic Water Demand by Decade by AWS Planning Area (MGY)

AWS Planning Area	Year					
	2020	2030	2040	2050	2060	2070
Lake Houston-North	330	380	370	380	380	360
Newport-Crosby	320	370	330	340	330	270
Baytown Area	180	180	180	170	170	160
EHSA Total	830	920	880	890	880	790

Table 9 Projected Rural Domestic Water Demand by Decade by AWS Planning Area (AFY)

AWS Planning Area	Year					
	2020	2030	2040	2050	2060	2070
Lake Houston-North	1,030	1,180	1,120	1,150	1,160	1,100
Newport-Crosby	970	1,120	1,020	1,050	1,010	840
Baytown Area	540	540	550	530	520	490
EHSA Total	2,540	2,840	2,690	2,730	2,700	2,430

3.2.3 AWS Water Demands

The needed amount of AWS for each Planning Area is calculated as the municipal water demand for urbanized areas (Tables 6 and 7) less the amount of surface water supply already available. For current demands, the amount of AWS is equal to the amount of groundwater currently used by PWS. Although this AWS amount can be reduced by up to 20 percent or more based on the HGSD Regulatory Area and groundwater reduction goals or specific GRP requirements, the full amount has been used in this study as the target for AWS.

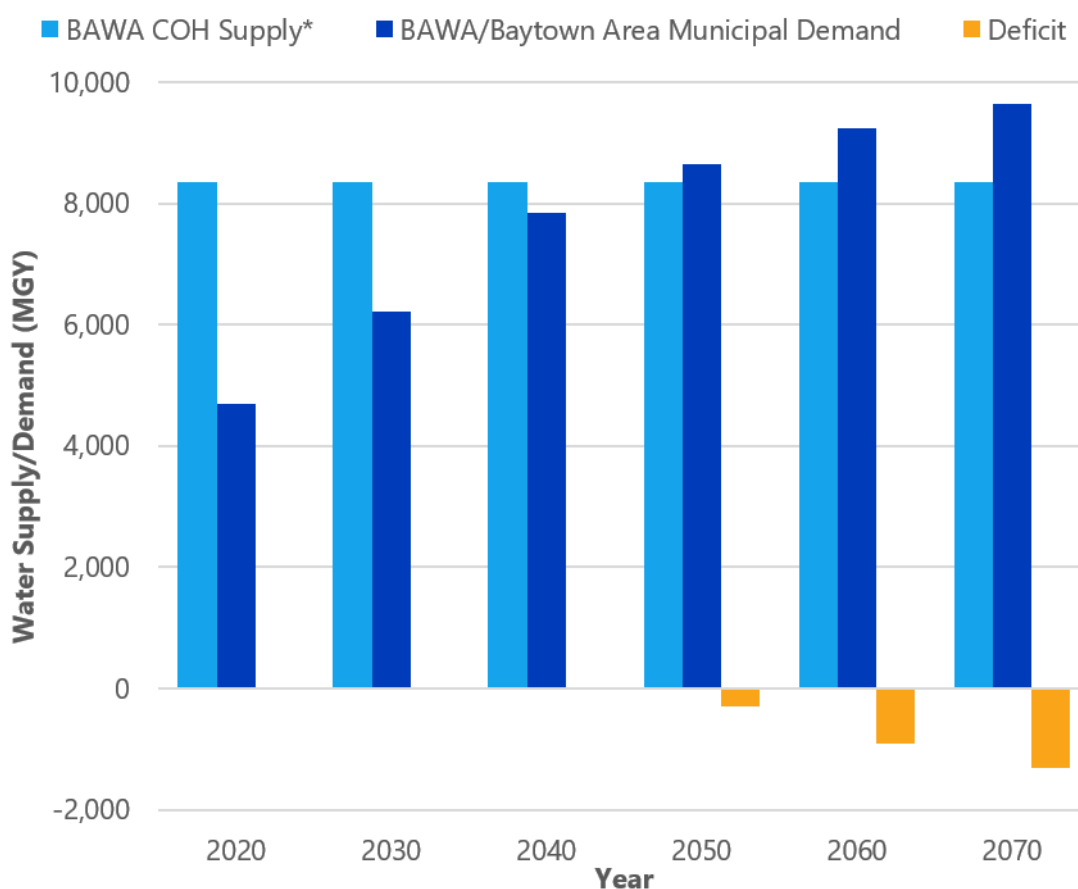
For the Lake Houston-North AWS Planning Area, all existing PWS are providing water sourced from groundwater to their customers; no surface water supplies are currently used in this area. Therefore, the AWS amount is equal to the estimated municipal water demand for urbanized areas.

Within the central Newport-Crosby AWS Planning Area, both Newport and Crosby MUDs are currently providing treated surface water sourced from SJRA to retail customers. The JRPR estimated that surface water accounts for 73 percent of demand for Newport MUD and 86 percent of demand for Crosby MUD; the remaining demand for both MUDs is met from groundwater (Freese and Nichols, Inc., 2024). The JRPR also assumed surface water supplies would increase in proportion to demands, maintaining the ratio of surface water to groundwater supplies. For these two MUDs, the amount of AWS needed is therefore equal to the assumed groundwater portion of the demand. Two other MUDs within this planning area

also have contracts with SJRA for untreated surface water but are not yet providing this water to customers. Therefore, these contracts were not included in the surface water amount for the Newport-Crosby AWS Planning Area.

For the Baytown AWS Planning Area, BAWA provides treated surface water to retail customers including the City of Baytown and nine other PWS in the EHSA. BAWA also provides treated water to other customers in Chambers County outside the EHSA. BAWA purchases raw surface water from the COH; under the current contract, BAWA can obtain up to 32 million gallons per day (MGD) through 2055. On an annual basis, this contract provides approximately 8,340 MGY (25,610 AFY) to BAWA using a peaking factor of 1.4 to calculate average day demand from the 32 MGD peak amount available.

To estimate the AWS needed by BAWA, total municipal water demand for BAWA, including demands in Chambers County, and other PWS in the Baytown AWS Planning Area was estimated as described previously. These demands, shown in Figure 11, increase from 4,700 MGY (14,30 AFY) in 2020 to 9,640 MGY (29,600 AFY) in 2070. Figure 11 shows that contracted supply from the COH is sufficient to meet demands through 2040 with supply deficits beginning in 2050 at 300 MGY (910 AFY) and increasing through 2070 to 1,300 MGY (3,990 AFY). These estimated deficits are the amount of AWS needed for the Baytown AWS Planning Area.



*Assumes Max Day/Average Day Peaking Factor = 1.4

Figure 11 Estimated Municipal Water Demand and Supply for the Baytown Area by Decade

Estimated AWS demands for the urbanized portions of the EHSA by AWS Planning Area are provided in Tables 10 and 11 in units of MGY and AFY, respectively. Because no surface water supplies are currently available in the Lake Houston-North AWS Planning Area, AWS demands are highest for this area.

Table 10 Projected AWS Demand by Decade by AWS Planning Area (MGY)

AWS Planning Area	Year					
	2020	2030	2040	2050	2060	2070
Lake Houston-North	580	1,680	2,460	2,530	2,600	2,750
Newport-Crosby	340	640	940	960	1,220	1,550
Baytown Area	0	0	0	300	900	1,300
EHSA Total	910	2,320	3,390	3,780	4,730	5,600

Table 11 Projected AWS Demand by Decade by AWS Planning Area (AFY)

AWS Planning Area	Year					
	2020	2030	2040	2050	2060	2070
Lake Houston-North	1,770	5,140	7,540	7,770	7,990	8,440
Newport-Crosby	1,030	1,970	2,870	2,940	3,750	4,760
Baytown Area	0	0	0	910	2,780	3,990
EHSA Total	2,800	7,120	10,420	11,610	14,520	17,200

As growth continues in the EHSA, moving away from groundwater as the primary water supply source to other alternative options is crucial. Currently, it is estimated that the EHSA requires a total AWS demand of 2,800 acre-feet in 2020, increasing to approximately 17,200 acre-feet by 2070 (Table 11). To meet these growing demands, one or several layered alternative supply options must be developed.

The following section will discuss in more detail six potentially feasible AWS options, evaluated and ranked for consideration as future water supply sources. Although discussed below, rainwater harvesting is not considered a feasible AWS option, as it does not increase the overall AWS yield, but rather reduces future water demands gradually (KIT and INTERA, 2022).

SECTION 4 ALTERNATIVE WATER SUPPLY OPTIONS

The importance of AWS cannot be understated for PWS within the HGSD which have been tasked with developing a water supply portfolio that not only meets future water needs, but also meets the regulatory requirements outlined in the HGSD's Regulatory Plan.

Much of the EHSA presented in Figure 1 lies outside of the service areas of the COH and regional water authorities. As more people move into homes and developments that rely on groundwater supplies, groundwater withdrawals in this area will increase, thereby increasing the risk of subsidence and likely violating the groundwater reduction targets defined in the Regulatory Plan. Groundwater withdrawals can only be reduced when an alternative source of water is available.

Several AWS options may be feasible for the EHSA that preserve the quality of life for residents, while also safeguarding all water resources in a sustainable way for future generations. Six potentially feasible AWS options have been evaluated, including surface water, reclaimed water, brackish groundwater desalination, aquifer storage and recovery, rainwater harvesting, and seawater desalination.

This section contains a summary of each AWS evaluated, along with a detailed explanation pertaining to its availability and practicality, consideration to seasonal variations in supply, infrastructure requirements, capacity to meet 2070 projected water demands, and economic feasibility. AWS options were characterized with respect to quantity, quality, reliability, and potential environmental impacts utilizing the TWDB's regional water planning process described in more detail below.

4.1 Evaluation Quantification Matrix

The practicality of each of the AWS options was measured in terms of quantity, quality and reliability of water produced and the varying degree of environmental impact (positive or negative) on preexisting local conditions. This procedure classifies the water supply options using the TWDB's following standard categories developed for regional water planning and is consistent with the 2026 Region H Regional Water Plan (RWP).

4.1.1 Quantity, Quality, and Reliability

Quantity, quality, and reliability are quantitatively assessed and assigned a ranking of 1 to 3, which shows the correlation between the category and the ranking (Table 12). "Reliability" is an assessment of the availability of the specified water quantity to the user over time. Quantifiably, the water volumes presented in the report for recommended alternatives are firm supplies that are 100 percent reliable during drought-of-record (DOR) conditions, according to the TWDB planning guidelines.

Table 12 Quantity, Quality, and Reliability Category Ranking Matrix

Rank	Quantity	Quality	Reliability
1	Meets 100% of the AWS water demand	Meets safe drinking water standards	High
2	Meets 50-99% of the AWS water demand	Must be treated or mixed to meet safe drinking water standards	Moderate
3	Meets < 50% of the AWS water demand	Usable for intended non-drinking use only	Low (variable, reliant on acceptance)

Quantity adequacy is measured as a percent of the volume of water needed to meet the specified shortage.

Quality adequacy is measured in terms of meeting Texas Commission on Environmental Quality (TCEQ) Safe Drinking Water Standards (SDWS). However, not all AWS options are intended for use requiring SDWS.

Reliability is evaluated based on the expected or potential for the water to be available during drought. Strategies that use water from a source that would not exceed permits even during droughts are rated as sustainable. Strategies that use water from a source that is available during normal meteorological conditions but may not be 100 percent available during drought are rated as interruptible. Strategies for which 100 percent of the supply cannot be maintained even during normal meteorological conditions are rated as unsustainable.

Environmental Impacts are quantitatively assessed and assigned a ranking from 1 to 5, which shows the correlation between the category and the ranking (Table 13). The environmental matrix takes into consideration the following categories:

- Environmental water needs.
- Wildlife habitat.
- Cultural resources.
- Environmental water quality.
- Bays and estuaries.
- Subsidence.

Table 13 Environmental Impact Category Rating Matrix

Rank	Environmental Water Needs	Wildlife Habitat	Cultural Resources	Environmental Water Quality	Bays & Estuaries
1	Positive	Positive	Positive	Positive	Not applicable
2	No new	No new	No new	No new	Not applicable
3	Minimal negative	Minimal negative	Minimal negative	Minimal negative	Not applicable
4	Moderate negative	Moderate negative	Moderate negative	Moderate negative	Not applicable
5	Significant negative	Significant negative	Significant negative	Significant negative	Not applicable

Environmental Water Needs impacts refer to how the strategy will impact the area's overall environmental water needs. Water is vital to the environmental health of a region, and so it is important to take into account how strategies will impact the amount of water that will be available to the environment.

1. Positive – additional water will be introduced for environmental use.
2. No new – no additional water will be introduced for environmental use.
3. Minimal negative – environmental water needs will be reduced by < 10 percent.
4. Moderate negative – environmental water needs will be reduced by 10 to 30 percent.
5. Significant negative – environmental water needs will be reduced by > 30 percent.

Wildlife Habitat impacts refer to how the strategy will impact the wildlife habitat of the local area. The more area that is impacted due to the implementation of the strategy, the more the area's habitat will be disrupted.

1. Positive – additional habitat area for wildlife use will be created.
2. No new – no additional habitat area for wildlife use will be created or destroyed.
3. Minimal negative – wildlife habitat will be reduced by < 100 acres.
4. Moderate negative – wildlife habitat will be reduced by 100 to 1,000 acres.
5. Significant negative – wildlife habitat will be reduced by > 1,000 acres.

Cultural Resources impacts refer to how the strategy will impact cultural resources located within the area. Cultural resources are defined as the collective evidence of the past activities and accomplishments of people. Locations, buildings and features with scientific, cultural or historic value are considered to be cultural resources.

1. Positive – cultural resources will be identified and protected.
2. No new – no impact will occur to local cultural resources.
3. Minimal negative – disturbance to cultural resources will be < 10 percent.
4. Moderate negative – disturbance to cultural resources will be 10 to 20 percent.
5. Significant negative – disturbance to cultural resources will be > 20 percent.

Environmental Water Quality impacts refer to the impact that the implementation of the strategy will have on the local area's natural water quality. Negative impacts could include the introduction of poorer quality water, the reduction of the natural flow of water of native quality source water, or the introduction of detrimental chemical elements into the natural water ways.

1. Positive – water quality of area streams will be enhanced for existing environmental use.
2. No new – water quality characteristics of existing environmental habitat will not be changed.
3. Minimal negative – water quality characteristics of existing environmental habitat will be negatively altered by < 10 percent.
4. Moderate negative – water quality characteristics of existing environmental habitat will be negatively altered by < 10 to 30 percent.
5. Significant negative – water quality characteristics of existing environmental habitat will be negatively altered by > 30 percent.

Bays and Estuaries impacts refer to the impact that the implementation of the strategy will have on the environmental flow to bays and estuaries. This evaluation is independent of the application of adopted environmental flow standards that are required to be enforced upon new water right appropriations. Projects that are found to reduce flows are not necessarily in violation of these standards, just as compliance with the adopted standards does not mean a project will not reduce instream flows.

1. Significantly increases instream or bay and estuary flows.
2. Increases stream or bay and estuary flows.
3. No impact.
4. Reduces instream or bay and estuary flows.

5. Significantly reduces instream or bay and estuary flows.

Subsidence impacts refer to the impact that the implementation of the strategy will have on causing subsidence.

1. No known subsidence risk.
2. Minimal subsidence risk.
3. Moderate subsidence risk
4. Severe subsidence risk
5. Extreme subsidence risk

Table 14 presents the ranking assessment for all evaluated AWS options. The following sections present discussions of each AWS option evaluated for the EHSA.

Table 14 AWS Option Characterization and Ranking Assessment

AWS	Quantity	Quality	Reliability	Environmental Impacts					
				Environmental Water Needs	Wildlife Habitat	Cultural Resources	Environmental Water Quality	Bays & Estuaries	Subsidence
	(1-3)	(1-3)	(1-3)	(1-5)	(1-5)	(1-5)	(1-5)	(1-5)	(1-5)
Surface Water									
<i>Purchase Treated Surface Water from COH</i>	1	1	1	2	2	2	2	N/A	1
<i>Construction of New WTP</i>	1	1	1	2	2	2	2	N/A	1
<i>Crosby MUD Waterline</i>	1	1	1	2	2	2	2	N/A	1
<i>BAWA East SWTP Expansion</i>	1	1	1	2	2	2	2	N/A	1
Reclaimed Water									
<i>Cedar Bayou WWTP DPR</i>	3	1	1	2	2	2	2	N/A	1
Brackish Groundwater Desalination	1	2	3	2	3	2	2	N/A	3
ASR									
<i>Industrial DOR ASR Project</i>	3	3	1	2	3	1	2	N/A	3
<i>Summer Peaking Municipal Project</i>	3	2	1	2	3	1	2	N/A	3
Rainwater Harvesting	3	3	3	1	1	2	1	N/A	1
Seawater Desalination	2	2	1	1	3	2	1	1	1

Notes:

DPR – direct potable reuse; WWTP – wastewater treatment plant

4.2 Surface Water

This AWS option includes receipt of contract supply from another provider (e.g., water purchase contracts), development of new supply (e.g., new run-of-the-river diversions, new reservoirs, enhanced yields of existing sources), and voluntary redistribution of available unused supply. The use of surface water is the primary source of AWS for permittees in HGSD and continues to be the preferred AWS within the HGSD regulatory areas (KIT and INTERA, 2022).

It is anticipated that future AWS availability will likely consist predominately of surface water development. Coordination at a regional level plays a key role in moving both surface water and reuse water supplies to the numerous end-users within the EHSA. Regional cooperation with other public utilities and authorities and partnerships with private entities ensures that:

1. Solutions are not only practical but also culturally and socially appropriate.
2. Uniqueness of each community's resources and challenges are embraced, advocating for water solutions tailored to specific needs.
3. Active community participation instills a sense of ownership and responsibility towards water resources.
4. Knowledge transfer is emphasized and helps to empower local communities in becoming good stewards of the water resources.

Within the EHSA, urbanized population increases from 86 percent in 2020 to 91 percent by 2070, with the largest increases in growth occurring prior to 2040 (Section 2). The projected 2040 urban population for the three AWS planning areas are as follows: Lake Houston-North 80 percent, Newport-Crosby 80 percent and Baytown Area 97 percent (Figure 9). Water is a valuable resource that must be developed and managed with great care to ensure the area's long-term viability. Supporting these rapidly growing areas requires sustainably planning for future water supply solutions.

Currently, rural land use within the Lake Houston-North AWS Planning Area is solely dependent on groundwater. As growth continues, developers will be required to look for an AWS to remain compliant with the groundwater regulatory area reduction goals. Both the Newport-Crosby and Baytown AWS Planning Areas have similar goals. PWS in all planning areas recognize the need to shift away from groundwater and move towards surface water supplies to meet the increasing water demands.

The sections below describe surface water supply options specific to each of the three AWS planning areas found in Figure 8.

4.2.1 Surface Water Supply Options for Lake Houston-North Planning Area

The projected AWS demand of 575 MGY (1,770 AFY) in 2020, increasing to 2,750 MGY (8,440 AFY) by 2070 within the Lake Houston-North AWS Planning Area, needs to be met primarily by alternative surface water supply option(s). Because this area lies completely within HGSD Regulatory Area 3, some groundwater use is allowed and even encouraged to maintain a diverse water supply portfolio. Although specific groundwater use goals are specified in each PWS's GRP, groundwater withdrawals must generally be limited to no more than 20 percent of the annual total water demand of each PWS by 2035.

Rapid growth is occurring on the east side of Lake Houston, driven by major residential projects. The broader Lake Houston area population grew by more than 12 percent from 2019 to 2024, reaching approximately 320,106 residents. This area offers suburban, lakeside living with increasing access to amenities, as it is a residential hub within the greater Houston metro area.

As the COH anticipates continued growth, a significant challenge for the east side is the lack of surface water infrastructure for new homes, leading to a reliance on groundwater pumping, which contributes to the risks of land subsidence. The development of rural land for urban use can no longer be sustained by groundwater alone.

The two AWS options discussed below outline water strategies aimed at converting future groundwater pumping to surface water sources, which will require developing robust infrastructure, such as pipelines and treatment plants, and implementing legal frameworks for water rights management. Both AWS options assume that rural domestic use is exempt from surface water conversion.

4.2.1.1 Purchase Treated Surface Water from City of Houston

The Northeast Water Purification Plant (NEWPP), owned by the COH, is a 400 MGD treatment facility located in northeast Harris County. The plant diverts water from nearby Lake Houston and treats it for use by the COH, North Harris County Regional Water Authority (NHCRWA), Central Harris County Regional Water Authority (CHCRWA), West Harris County Regional Water Authority (WHCRWA), and North Fort Bend Water Authority. The facility serves as the sole source of treated surface water for NHCRWA and CHCRWA, enabling them to meet the groundwater reduction requirements of the HGSD (Region H, 2026). The NEWPP will continue to serve these users with treated surface water as their demands and conversion requirements increase over time.

This strategy provides for the purchase of water supplies from COH to the Lake Houston-North AWS Planning Area to meet the projected future supply needs. The total volume of treated water available for purchase from the COH is contingent on the supply remaining after fulfilling existing purchase agreements with the other regional water authorities. COH is also investigating a potential third expansion phase of up to 100 MGD capacity for development by 2035, bringing the total capacity of the NEWPP to as much as 500 MGD (Region H, 2026).

Partnering with local MUDs on the east side of Lake Houston is another key component in the development of an efficient water supply plan that is economically viable and sustainable for future residents. As an example, Harris County MUD 599 has shown interest in supporting regional water solutions. They are willing to negotiate the trade of their water right of 479 MGY (1,471 AFY) from Lake Houston in exchange for treated surface water purchased from the COH. This water right could provide more than 40 percent of the 2030 AWS demand for the Lake Houston-North AWS Planning Area.

This strategy would require construction of a 30-inch, 10.9-mile transmission pipeline connecting the NEWPP to the Lake Houston-North AWS Planning Area via an aerial crossing of Lake Houston on the FM 1960 bridge as shown in Figure 12. This pipeline must originate from the NEWPP because the COH water distribution infrastructure on the west side of Lake Houston does not provide sufficient capacity to directly support demands on the east side of the lake. Pipelines were sized using a peaking factor of 2 and an ultimate demand of 7.5 MGD based on the 2070 projected AWS demand of 2,750 MGY (8,440 AFY) for the Lake Houston-North AWS Planning Area (Table 10).

Treated water would be distributed to communities in the Lake Houston-North AWS Planning Area through a combination of 24-inch, 16-inch, 12-inch, and 6-inch distribution lines totaling more than 32 miles to deliver treated water to existing and future developments. The primary transmission line would run north and south along FM 2100 with lateral distribution lines providing service to individual PWS as shown in Figure 12. The lateral distribution line would terminate at the PWS's ground storage tank, similar to service infrastructure currently being constructed to serve PWS in West and Central Harris County Regional Water Authorities.

Project components include construction of the 10.9-mile 30-inch transmission pipeline, aerial bridge crossing, 32-mile network of distribution pipelines to transport water to individual PWS, and land acquisition costs for the pipeline easements. The project is anticipated to come online by 2035, and the capital cost is estimated at \$165,126,000 as detailed in Table 15. The cost for the purchase of treated water is not included.

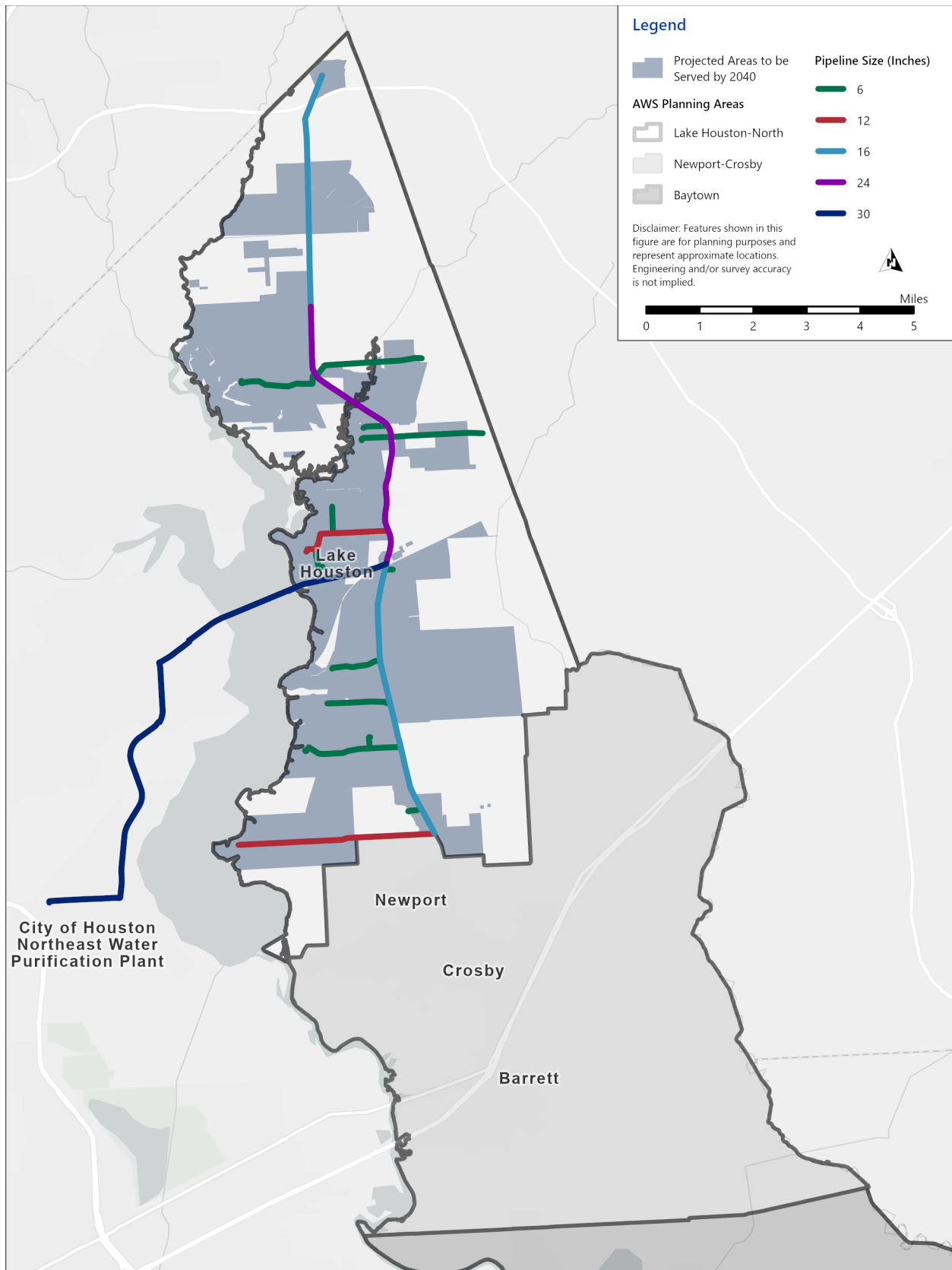


Figure 12 Lake Houston-North Area Alternative 1: Purchase Treated Surface Water from City of Houston

Table 15 Lake Houston-North Area Alternative 1: Treated Surface Water from City of Houston Cost Estimate

Client: HGSD		Alternative: Alternative 1 - Treated Water from NEWPP				
Project: Alternative Water Supply Feasibility Study		Date: 4/10/2026				
Estimate Class: AACE Class 5		Version: Draft				
ITEM NO	ITEM DESCRIPTION	ASSUMPTION	UNIT	QUANTITY	UNIT PRICE	ESTIMATED COST
1	6" Waterline	A	LF	63,308	\$ 214	\$ 13,548,000
2	12" Waterline	A	LF	28,896	\$ 325	\$ 9,392,000
3	16" Waterline	A	LF	50,756	\$ 398	\$ 20,202,000
4	24" Waterline	A	LF	29,470	\$ 545	\$ 16,062,000
5	30" Waterline	A	LF	49,223	\$ 654	\$ 32,192,000
6	30" Waterline - Aerial Crossing	B	LF	8,084	\$ 800	\$ 6,468,000
7	Pipeline Easement Land Acquisition	C	LS	1	\$ 12,069,234	\$ 12,070,000
				Subtotal		\$ 109,934,000
				Planning (3%)		\$ 3,299,000
				Design (7%)		\$ 7,696,000
				Construction Engineering (1%)		\$ 1,100,000
				Contractor Overhead & Profit (5%)		\$ 5,497,000
				Mobilization and Demobilization (3%)		\$ 3,299,000
				Permits, Bonds & Insurance (1%)		\$ 1,100,000
				Geotech (0.2%)		\$ 220,000
				Contingency (30%)		\$ 32,981,000
				Total Capital Cost ¹		\$ 165,126,000

Assumptions:

- A Pipeline unit costs are from the TWDB Unified Costing Model, Version 3.0.1, CPI February 2024.
- B Aerial pipeline unit costs reflect industry market values for similar project scopes, assuming steel pipe with pipe hangers.
- C Land acquisition costs assume easement widths of 15 ft for small-diameter pipelines and 20 ft for large-diameter water lines. Rural land values are based on Texas A&M Real Estate Research Center nominal prices (Q4 2025), while urban land values are derived from an average of selected HCAD parcels.
- 1 Operations and Maintenance (O&M) costs vary by alternative and are not included.

4.2.1.2 Construction of New Water Treatment Plant

This project aims to address the growing water demand on the east side of Lake Houston by constructing a new 15-MGD surface water treatment plant (SWTP). The exact location of the facility is presently undetermined; engineering preliminary studies are recommended to determine the best location for the facility. The new SWTP will utilize surface water from Lake Houston, purchased from the COH or SJRA, and potentially supplemented by diversions under Certificate of Adjudication No. 10-3980B owned by Riceland Landvest, LLC (MUD 599), which allows for the diversion of up to 480 MGy (1,471.2 AFY, annual equivalent of 1.3 MGD) at a priority date of December 7, 1942. As noted in Section 4.2.1.1, this water right could provide more than 40 percent of the 2030 AWS demand for the Lake Houston-North AWS Planning Area.

Assuming the SWTP is located near the point of diversion for water right 10-3980B, this strategy would require construction of a 1.9-mile, 30-inch transmission pipeline connecting the treatment plant to the primary north-south transmission line along FM 2100 as shown in Figure 13. Similar to the treated water purchase alternative, treated water would be distributed to communities in the Lake Houston-North AWS Planning Area through a combination of 24-inch, 16-inch, 12-inch, and 6-inch distribution lines. The primary transmission line would run north and south along FM 2100 with lateral distribution lines providing service to individual PWS as shown in Figure 13. The first 2.3-mile segment to the north on FM 2100 would be increased from 16 to 24 inches to accommodate the increased flows to meet demands north of FM 1960.

Project components include construction of the new 15-MGD treatment plant with lake intake and pump station, 1.9-mile 30-inch transmission pipeline, 32-mile network of distribution pipelines to transport water from the treatment plant to individual PWS, and land acquisition costs for the treatment plant site and pipeline easements. It is anticipated that the new SWTP will be designed similarly to the NEWPP, which uses a comprehensive, multi-barrier treatment strategy that combines conventional processes with advanced oxidation to ensure finished water quality that exceeds the TCEQ standards. The project is anticipated to come online by 2035, and the capital cost is estimated at \$305,326,000 as detailed in Table 16. The cost for the purchase of untreated water is not included.

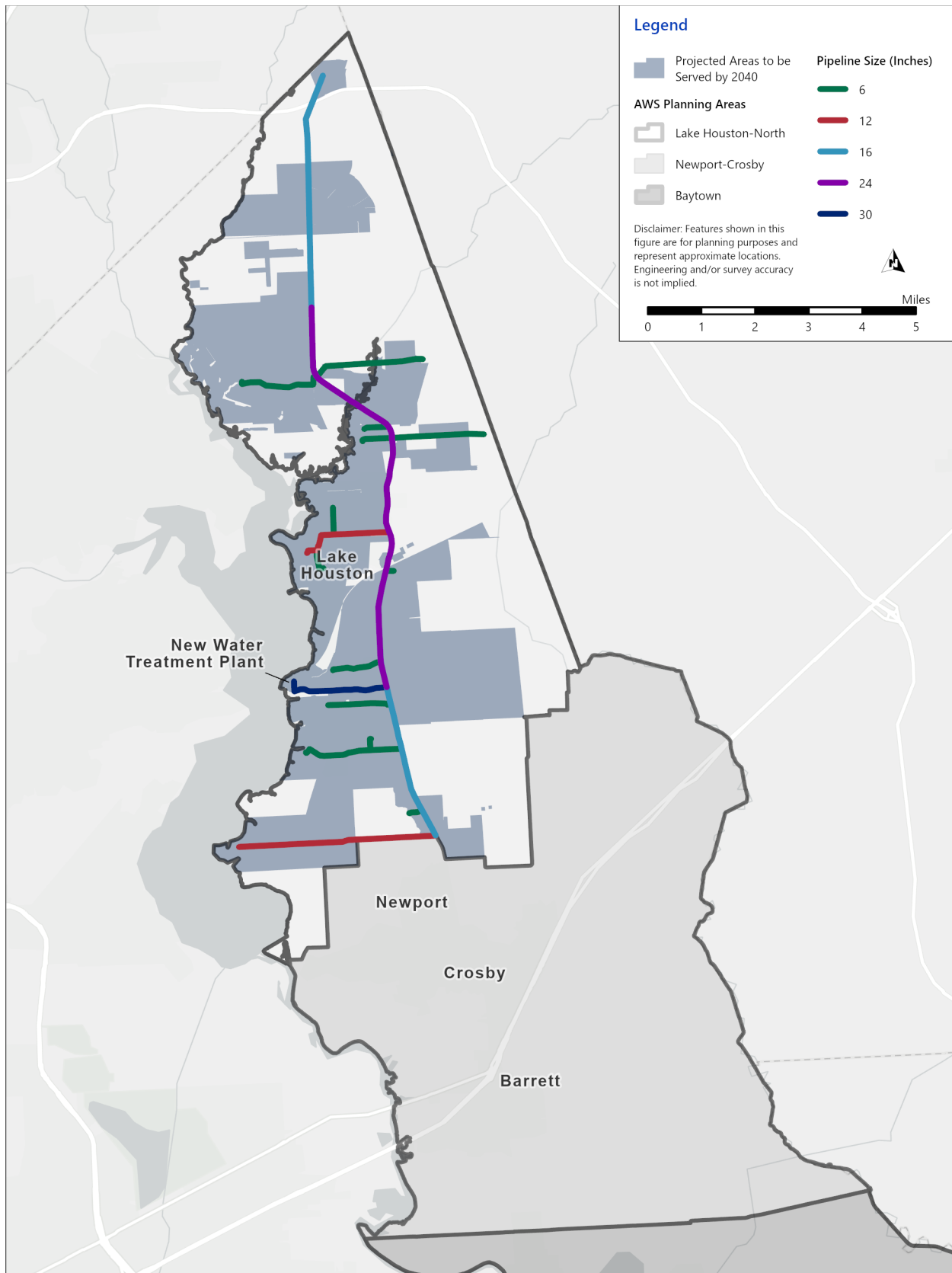


Figure 13 Lake Houston-North Area Alternative 2: New Surface Water Treatment Plant

Table 16 Lake Houston-North Area Alternative 2: New Surface Water Treatment Plant Cost Estimate

Client: HGSD				Alternative: Alternative 2 - New SWTP		
Project: Alternative Water Supply Feasibility Study				Date: 4/10/2026		
Estimate Class: AACE Class 5				Version: Draft		
ITEM NO	ITEM DESCRIPTION	ASSUMPTION	UNIT	QUANTITY	UNIT PRICE	ESTIMATED COST
1	6" Waterline	A	LF	63,308	\$ 214	\$ 13,548,000
2	12" Waterline	A	LF	28,896	\$ 325	\$ 9,392,000
3	16" Waterline	A	LF	38,572	\$ 398	\$ 15,352,000
4	24" Waterline	A	LF	41,660	\$ 545	\$ 22,705,000
5	30" Waterline	A	LF	10,206	\$ 654	\$ 6,675,000
6	15 MGD Surface Water Development	B	LS	1	\$ 126,742,800	\$ 126,743,000
7	SWTP Land Acquisition	C	LS	1	\$ 559,893	\$ 560,000
8	Pipeline Easement Land Acquisition	D	LS	1	\$ 8,301,307	\$ 8,302,000
				Subtotal		\$ 203,277,000
				Planning (3%)		\$ 6,099,000
				Design (7%)		\$ 14,230,000
				Construction Engineering (1%)		\$ 2,033,000
				Contractor Overhead & Profit (5%)		\$ 10,164,000
				Mobilization and Demobilization (3%)		\$ 6,099,000
				Permits, Bonds & Insurance (1%)		\$ 2,033,000
				Geotech (0.2%)		\$ 407,000
				Contingency (30%)		\$ 60,984,000
				Total Capital Cost ¹		\$ 305,326,000

Assumptions:

- A Pipeline Unit Costs are from the TWDB Unified Costing Model, Version 3.0.1, CPI February 2024.
- B Subtotal for the 15 MGD SWTP reflect industry market values for similar project scope.
- C Land acquisition costs based on 2026 HCAD appraisal costs for the necessary parcel.
- D Land acquisition costs assume easement widths of 15 ft for small-diameter pipelines and 20 ft for large-diameter water lines. Rural land values are based on Texas A&M Real Estate Research Center nominal prices (Q4 2025), while urban land values are derived from an average of selected HCAD parcels.
- 1 Operations and Maintenance (O&M) costs vary by alternative and are not included.

4.2.2 Water Supply Options for the Newport-Crosby Planning Area

The Newport-Crosby AWS Planning Area has experienced significant population growth and is expected to increase by 50 percent from 2020 to 2030. The primary population centers are the unincorporated areas served by Newport MUD along with the towns of Crosby and Barrett. The Newport-Crosby area is located approximately 22 miles northeast of Houston, offering a suburban-rural mix with close access to city amenities. The area is undergoing rapid residential expansion, with projections suggesting the addition of thousands of new homes. Projected AWS demand increases from 940 MGY (2,870 AFY) in 2040 to 1,550 MGY (4,760 AFY) by 2070. Currently, two PWS, Newport MUD and Crosby MUD, receive untreated surface water from SJRA through purchase agreements that provide water for the expanding area, and two additional PWS have contracts with SJRA but are not yet providing water service. To remain aligned with HGSD's groundwater reduction goals, other PWS within the Newport-Crosby Planning Area need access to surface water to permit conversion from groundwater.

Newport MUD began a project in 2023 to expand the existing SWTP from 2.4 MGD to 4 MGD. Newport MUD currently supplies water to some outside district customers, and the MUD has expressed interest in becoming a regional water supplier so long as the costs required to expand service to outside customers do not impact existing customers.

Crosby MUD also operates a SWTP and has considered downsizing the plant in recent years. Rather than downsizing the plant, a 6-mile, 12-inch transmission pipeline from the Crosby MUD WTP could be constructed along U.S. Highway 90 to the northeast providing AWS to multiple PWS located in the eastern part of the planning area as shown in Figure 14. Alternatively, this pipeline could be connected to the Newport MUD WTP, rather than the Crosby MUD WTP, if sufficient capacity is available after the current expansion project is completed. The project is anticipated to come online by 2035, and the capital cost is estimated at \$16,868,000 as detailed in Table 17. The cost for the purchase of untreated water is not included.

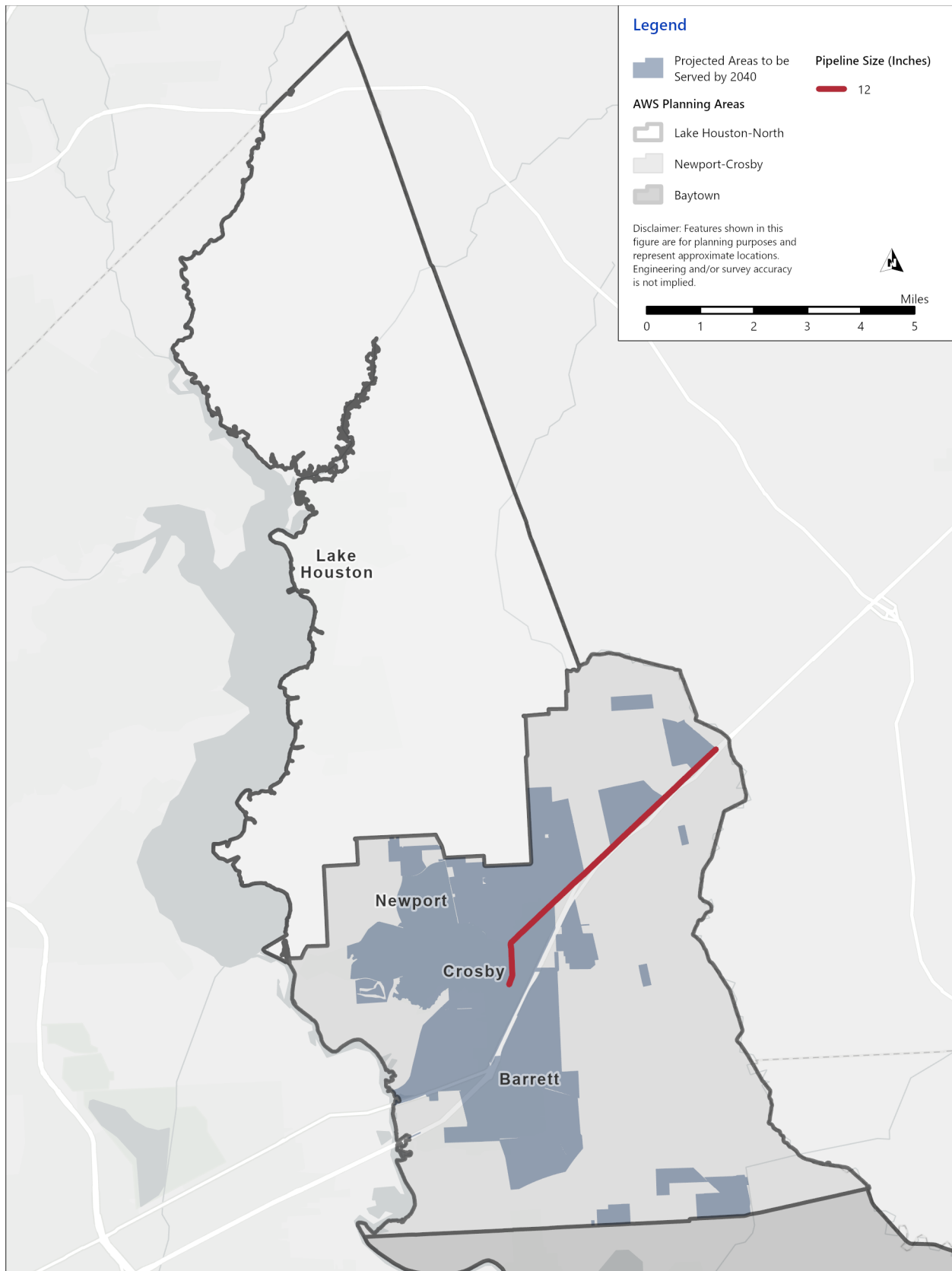


Figure 14 Newport-Crosby Area: Transmission Line from Crosby MUD Water Treatment Plant

Table 17 Newport-Crosby Area: Transmission Line from Crosby MUD Water Treatment Plant Cost Estimate

Client: HGSD				Alternative: Crosby MUD WL		
Project: Alternative Water Supply Feasibility Study				Date: 4/10/2026		
Estimate Class: AACE Class 5				Version: Draft		
ITEM NO	ITEM DESCRIPTION	ASSUMPTION	UNIT	QUANTITY	UNIT PRICE	ESTIMATED COST
1	12" Waterline	A	LF	31,951	\$ 325	\$ 10,385,000
2	Pipeline Easement Land Acquisition	B	LS	1	\$ 842,735	\$ 843,000
				Subtotal		\$ 11,228,000
				Planning (3%)		\$ 337,000
				Design (7%)		\$ 786,000
				Construction Engineering (1%)		\$ 113,000
				Contractor Overhead & Profit (5%)		\$ 562,000
				Mobilization and Demobilization (3%)		\$ 337,000
				Permits, Bonds & Insurance (1%)		\$ 113,000
				Geotech (0.2%)		\$ 23,000
				Contingency (30%)		\$ 3,369,000
				Total Capital Cost¹		\$ 16,868,000

Assumptions:

- A Pipeline Unit Costs are from the TWDB Unified Costing Model, Version 3.0.1, CPI February 2024.
- B Land acquisition costs assume easement width of 15 ft for small-diameter pipelines. Rural land values are based on Texas A&M Real Estate Research Center nominal prices (Q4 2025), while urban land values are derived from an average of selected HCAD parcels.
- 1 Operations and Maintenance (O&M) costs are not included.

4.2.3 Water Supply Options for the Baytown Planning Area

As mentioned in Section 1.4, land subsidence in the Baytown area began in the early 20th century associated with oil and gas extraction, followed by additional groundwater pumping-induced subsidence of more than eight feet by the 1970s. Through the conversion to surface water supplies, subsidence has now largely been stabilized in Baytown, though legacy elevation loss continues to affect flooding and coastal processes (HGSD, 2026).

Baytown and the surrounding area are experiencing a period of significant, multifaceted growth, transitioning from a solely industrial hub into a more diverse destination to live, work, and play. With population over 110,000 in 2020 and projected to increase to above 140,000 by 2030, residential growth is rapidly rising, particularly north of I-10. The area is benefiting from billions of dollars in investment, especially in industrial expansion and the massive, rail-and-barge-served TGS Cedar Port Industrial Park.

To support this rapid expansion and rising demand, enhanced water infrastructure, additional water supplies, storage, and pipeline extensions will be necessary to keep pace with existing and future water needs. The AWS option discussed below outlines a potentially feasible water strategy aimed at providing additional supplies for expected growth.

4.2.3.1 BAWA East Surface WTP Expansion

The following information is taken from the 2026 Region H RWP.

BAWA is a wholesale provider of treated water to municipal water systems in eastern Harris and western Chambers Counties, including the City of Baytown and multiple PWS. BAWA utilizes surface water obtained under contract from the COH diverted from two take points on the Coastal Water Authority canal system. This raw water is treated at BAWA's Fritz Langham SWTP and the newer East SWTP before being distributed through the BAWA and City of Baytown transmission and distribution systems. To meet the needs of current and future customers, BAWA has identified the need to expand the treatment capacity of the BAWA East SWTP. The new treatment infrastructure will be developed on the existing East

SWTP site, limiting the required permitting and the need for development of additional conveyance. This project does not require a new water right appropriation because it is associated with the infrastructure related to the use of existing rights (Region H, 2026).

This project assumes that additional supplies will be purchased from the COH through existing contractual agreements with existing water rights. The proposed infrastructure will increase treatment capacity to allow an increased volume of contracted surface water supply to be used by BAWA's customers. Major project components include development of additional treatment units and storage to increase treatment capacity, with an initial phase increasing the facility's capacity from 6 to 12 MGD by 2030, resulting in an additional 6 MGD (6,720 AFY) of treated water capacity. A subsequent expansion phase is anticipated to expand the facility by another 6 MGD by 2040.

Planning level cost estimates for this strategy are included in Table 18 and total approximately \$124,515,500. Costs and components presented for the project are associated with new infrastructure which will allow increased use of water sources and do not include any elements for replacement or maintenance of existing capacity (Region H, 2026). An estimated capital cost for the expansion of the SWTP was provided by BAWA and was scaled to a September 2023 equivalent cost in accordance with TWDB guidance.

Table 18 BAWA East SWTP Expansion Cost Estimate (Region H, 2026)

OPINION OF PROBABLE CONSTRUCTION COST					September 2023
ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
PROJECT CAPITAL COST SUMMARY					
1	CONSTRUCTION COST	1	LS	\$80,272,638	\$80,272,638
2	ENGINEERING, FINANCIAL, LEGAL SERVICES, AND CONTINGENCIES	1	LS	\$36,040,776	\$36,040,776
3	LAND AND EASEMENTS	1	LS	\$43,560	\$43,560
4	ENVIRONMENTAL - STUDIES AND MITIGATION	1	LS	\$435,600	\$435,600
5	INTEREST DURING CONSTRUCTION	1	LS	\$7,722,884	\$7,722,884
PROJECT CAPITAL COST					\$124,515,458

ITEM	DESCRIPTION	ANNUAL TOTAL					
ANNUAL COST SUMMARY		2030	2040	2050	2060	2070	2080
1	DEBT SERVICE (2030 PHASE)	\$4,380,521	\$4,380,521	\$0	\$0	\$0	\$0
2	DEBT SERVICE (2040 PHASE)	\$0	\$4,380,521	\$4,380,521	\$0	\$0	\$0
3	OPERATION AND MAINTENANCE (2030 PHASE)	\$1,454,906	\$1,454,906	\$1,454,906	\$1,454,906	\$1,454,906	\$1,454,906
4	OPERATION AND MAINTENANCE (2040 PHASE)	\$0	\$1,454,906	\$1,454,906	\$1,454,906	\$1,454,906	\$1,454,906
5	PUMPING ENERGY COSTS	\$0	\$0	\$0	\$0	\$0	\$0
6	PURCHASE COST OF WATER	\$0	\$0	\$0	\$0	\$0	\$0
TOTAL ANNUAL COST		\$5,835,426	\$11,670,853	\$7,290,332	\$2,909,811	\$2,909,811	\$2,909,811

ITEM	DESCRIPTION	ANNUAL TOTAL					
ANNUAL COST SUMMARY		2030	2040	2050	2060	2070	2080
1	ANNUAL COST	\$5,835,426	\$11,670,853	\$7,290,332	\$2,909,811	\$2,909,811	\$2,909,811
2	YIELD	6,720	13,440	13,440	13,440	13,440	13,440
3	UNIT COST	\$868	\$868	\$542	\$217	\$217	\$217
TOTAL UNIT COST		\$454					

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
CONSTRUCTION COST SUMMARY					
1	WATER TREATMENT PLANTS (2030 PHASE)	1	LS	\$40,136,319	\$40,136,319
2	WATER TREATMENT PLANTS (2040 PHASE)	1	LS	\$40,136,319	\$40,136,319
PROJECT COST					\$80,272,638

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
OPERATION AND MAINTENANCE (O&M) COST SUMMARY					
1	WATER TREATMENT PLANTS (2030 PHASE)	1.0	LS	\$1,454,906	\$1,454,906
2	WATER TREATMENT PLANTS (2040 PHASE)	1.0	LS	\$1,454,906	\$1,454,906
ANNUAL OPERATION AND MAINTENANCE COST					\$2,909,811

4.2.4 Creation of a Regional Water Authority for East Harris County

It is understood that the most optimum water solutions are driven by invested local stakeholders whose focus is on leveraging community, municipal, and private-sector collaboration to build resilient, sustainable, and tailored water infrastructure. These approaches prioritize local knowledge, direct engagement in decision-making, and long-term stewardship to address challenges such as the cost of infrastructure, asset management and collaborative governance.

Similar to the WHCRWA and the NHCRWA, which were created to secure a long-term supply of quality surface water and to facilitate the transition to surface water in compliance with HGSD requirements, this study recommends the creation of a new regional water authority (RWA) for east Harris County. The new RWA will be created with the purpose of providing surface water and groundwater for various uses for the

multiple independent PWS in the northern EHSA, constructing infrastructure to deliver water to PWS, securing financing for needed projects, and setting rates for wholesale water sales and customer classes. Figure 15 shows the location of the proposed RWA along with other regional water authorities serving the greater Houston area in Harris, Fort Bend, and Chambers counties.

Currently, 46 PWS are providing water service to residents in the Lake Houston-North and Newport-Crosby AWS Planning Areas; only five of those have secured surface water supplies and only two (i.e., Newport MUD and Crosby MUD) are currently providing treated surface water to customers. Because these 46 entities are independent, making the conversion to surface water on their own will be very difficult or nearly impossible. Therefore, creating a RWA to assume responsibility for developing a surface water supply and the necessary infrastructure to provide AWS, as has been done in other areas of Harris County, offers the best opportunity for individual PWS to meet the HGSD groundwater reduction requirements.

The service area of the proposed RWA should include the entirety of the EHSA in the northern part of the county as shown in Figure 16, including both Lake Houston-North and Newport-Crosby AWS Planning Areas. The southern boundary of the proposed RWA has been drawn about 0.9 miles north of FM 1942 at the eastern county line to a point about 2.5 miles west, where the boundary transitions to about 0.4 miles north of Barbers Hill Road and continues to the western county line. This boundary was drawn so that existing PWS in the far southern part of the Newport-Crosby AWS Planning Area are excluded from the proposed RWA. These PWS are closer to other PWS currently receiving water from BAWA than the developments south of Barrett, so it is assumed that these PWS would be served by BAWA. Discussion with BAWA is needed to determine if these PWS should be included in the service area of the proposed RWA.

The proposed RWA would have the responsibility of making AWS available to all current and future PWS within the Authority's service area. The proposed RWA would charge for wholesale water sales to PWSs with different customer classes established so that fees and rates can be charged according to the services provided. For example, because Newport MUD has already developed its own surface water supply infrastructure to meet the terms of its GRP with HGSD, Newport MUD ratepayers should not be expected to pay for the costs to develop infrastructure to supply developments in far northeast Harris County.

An RWA may only be created by an act of the Texas Legislature, signed into law by the governor, and approved by voters (if required as part of the enabling legislation). Residents, civic leaders, and PWS managers in the EHSA should begin working with their elected officials to include this in the next legislative session.

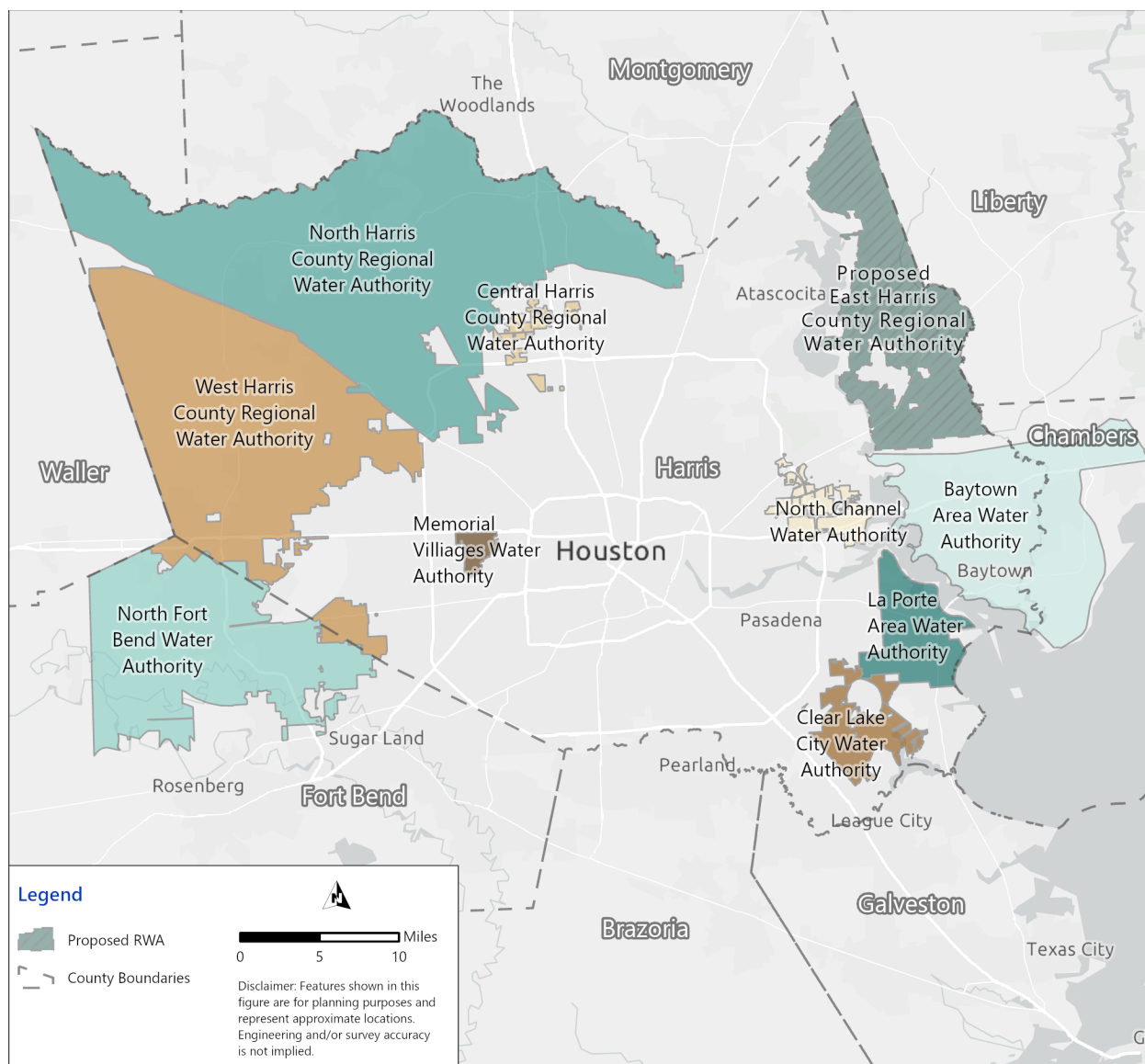


Figure 15 Locations of Regional Water Authorities in the Greater Houston Area

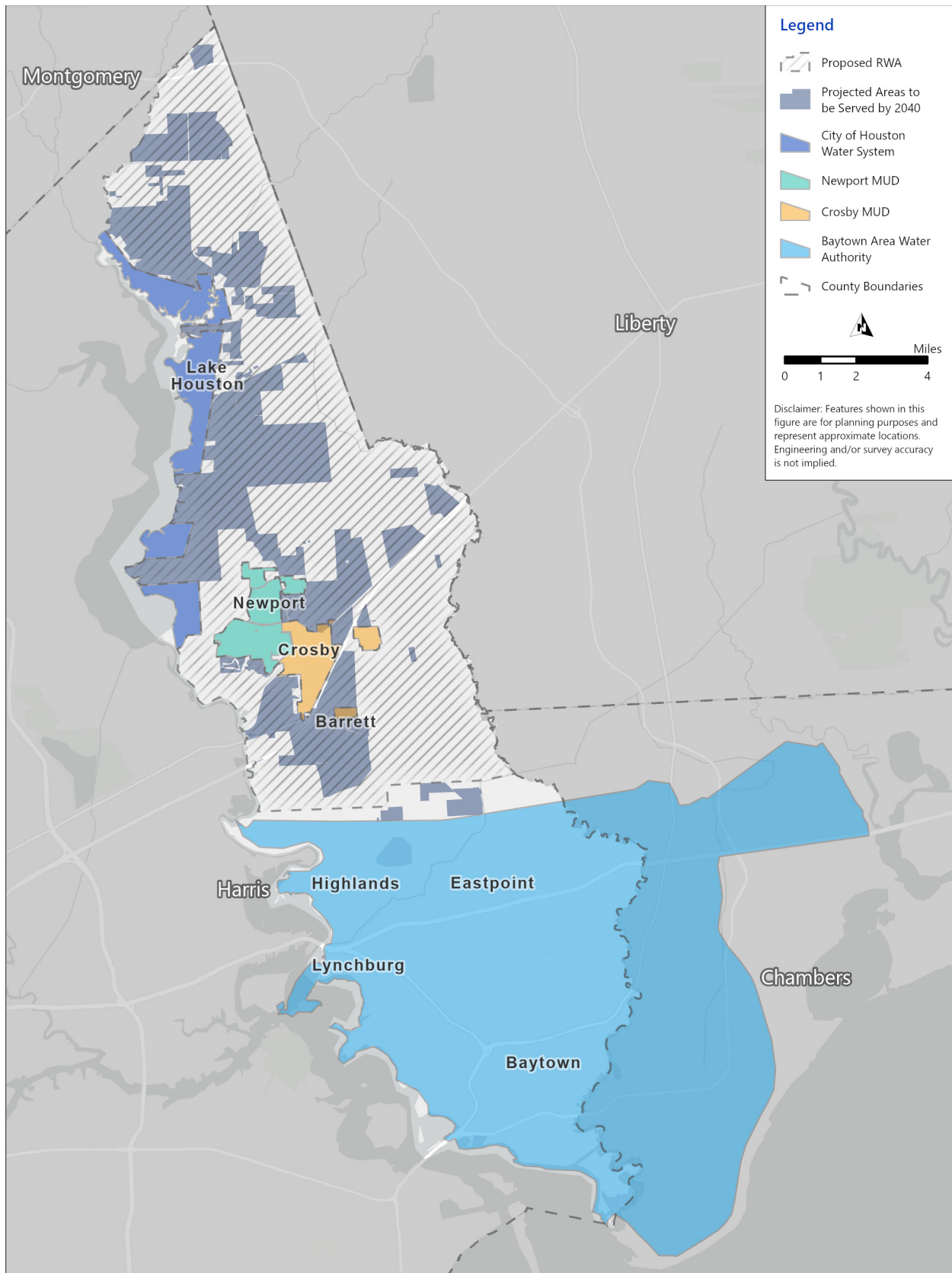


Figure 16 Proposed Service Area for the New Regional Water Authority for East Harris County

4.3 Reclaimed Water

Wastewater reuse is the practice of using treated wastewater for a beneficial purpose (30 TAC §210.3). There are two major categories of water reuse, both of which can be used for potable purposes.

Direct Reuse refers to reclaimed water that is piped directly from a wastewater treatment facility to a distribution system for beneficial use. Examples of direct reuse for non-potable uses include piping treated wastewater to an industrial center for manufacturing, to a golf course for irrigation, or a power plant for cooling.

Indirect Reuse refers to the discharge of reclaimed water back to an environmental buffer, such as a lake, river, or aquifer, and retrieving it to be utilized again. Indirect reuse projects that involve a watercourse require a bed and banks permit from the State, which authorizes the permit holder to convey and subsequently divert water.

DPR refers to advanced treated reclaimed water that is piped directly into the distribution system or blended with the raw water supply of the water treatment plant.

Indirect Potable Reuse (IPR) refers to treated reclaimed water that is discharged into a water body, such as groundwater or surface water and is subsequently treated for potable consumption to augment drinking water supplies.

Water reuse projects are key to addressing growing demand and securing water for future generations. In fact, in the 2022 State Water Plan, water reuse recommended water management strategies accounted for more than 14 percent of all new water supplies. If implemented, DPR will produce 20,200 MGY (62,000 AFY) by 2070. Indirect reuse will produce 240,800 MGY (739,000 AFY), and direct reuse will produce approximately 99,400 MGY (305,000 AFY). To help communities assess DPR, the TWDB published the first [Direct Potable Reuse Resource Document](#) in 2015 (TWDB, 2015).

This AWS option assesses reclaimed water treatment for both non-potable and potable uses. Historically, reclaimed water has been reserved for non-potable uses. However, as population and water demand continue to grow, especially in the EHSA, a diverse water portfolio is crucial for resilience, reliability, and sustainability, ensuring that communities are not dependent on a single source that is vulnerable to drought, contamination, or climate-related risks. Thus, reclaimed water is an excellent AWS option although it is most successful in areas where communities have many potential customers who are near one another.

4.3.1 Evaluated Alternative Water Supply Option

Reclaimed, or recycled, water is provided through the reuse of treated WWTP effluent for non-potable or potable use. Major non-potable end uses for reclaimed water can include the watering of golf courses, green spaces, lake filling, irrigation and industrial uses.

A non-potable reclaimed water system treating WWTP effluent is typically set up by using a network of purple pipeline, which designates it from being different than the network of pipes for drinking water, and is expected to include additional filtration or similar polishing treatment, additional storage and pumping facilities at the WWTPs, and additional reclaimed water piping to connect new customers to the system (CDM Smith, 2019; WRF, 2019). Treating WWTP effluent for non-potable uses, is a current source of water supply by several water providers within the regulatory areas.

Potable reuse is comprised of a centralized collection point, a transport system, and treatment of wastewater effluent for drinking water supplies. There are two different types of potable reuse: DPR and IPR. For the purposes of this study, DPR was evaluated as a recommended and viable AWS option. In DPR, treated wastewater will be sent directly to a WTP to be blended with other water sources for treatment and distribution. This AWS is intended for augmenting groundwater and surface water and has the added benefit of being a local and reliable water supply.

Reclaimed water is highly drought-resistant, given that wastewater collection system flows are typically consistent over time. In addition, through the augmentation of groundwater with a renewable water supply, reclaimed water addresses the environmental concern of groundwater subsidence (KIT and INTERA, 2022).

4.3.1.1 Direct Potable Reuse from Cedar Bayou WWTP for Lake Houston-North AWS Planning Area

The Cedar Bayou Wastewater Treatment Plant, located northeast of the COH, was evaluated as a potential source in providing a new DPR water supply. According to the current Texas Pollutant Discharge Elimination System permit for the facility, Permit No. WQ0010495112, the annual average flow of effluent shall not exceed 1.5 MGD. Assuming that by the time this project is implemented Cedar Bayou WWTP would be discharging the total currently permitted amount of 1.5 MGD (1,681 AFY), the available supply is estimated at 1.3 MGD (1,429 AFY) for an estimated recovery of 85 percent of effluent discharge.

This strategy is assumed to treat wastewater effluent to potable safe drinking water standards. The purified water would be pumped directly into the regional public supply distribution system along FM 2100 as shown in Figure 16. Although this additional water supply does not meet the total AWS demand of 2,750 MGY (8,440 AFY) for the Lake Houston-North AWS Planning Area by 2070, if implemented by 2040, DPR could sustainably supply almost 20 percent of the projected AWS demand at that time and reduce reliance on water from external sources. Therefore, DPR should be considered a critical component of a regional supply solution.

Project components include construction of a 1.5 MGD advanced treatment facility at the Cedar Bayou WWTP, a 1.2-mile 10-inch pipeline connecting to the main potable transmission line at FM 2100, and land acquisition costs for the advanced treatment plant site adjacent to the existing WWTP and pipeline easements. The project is anticipated to come online by 2035, and the capital cost is estimated at \$59,174,000 as detailed in Table 19.

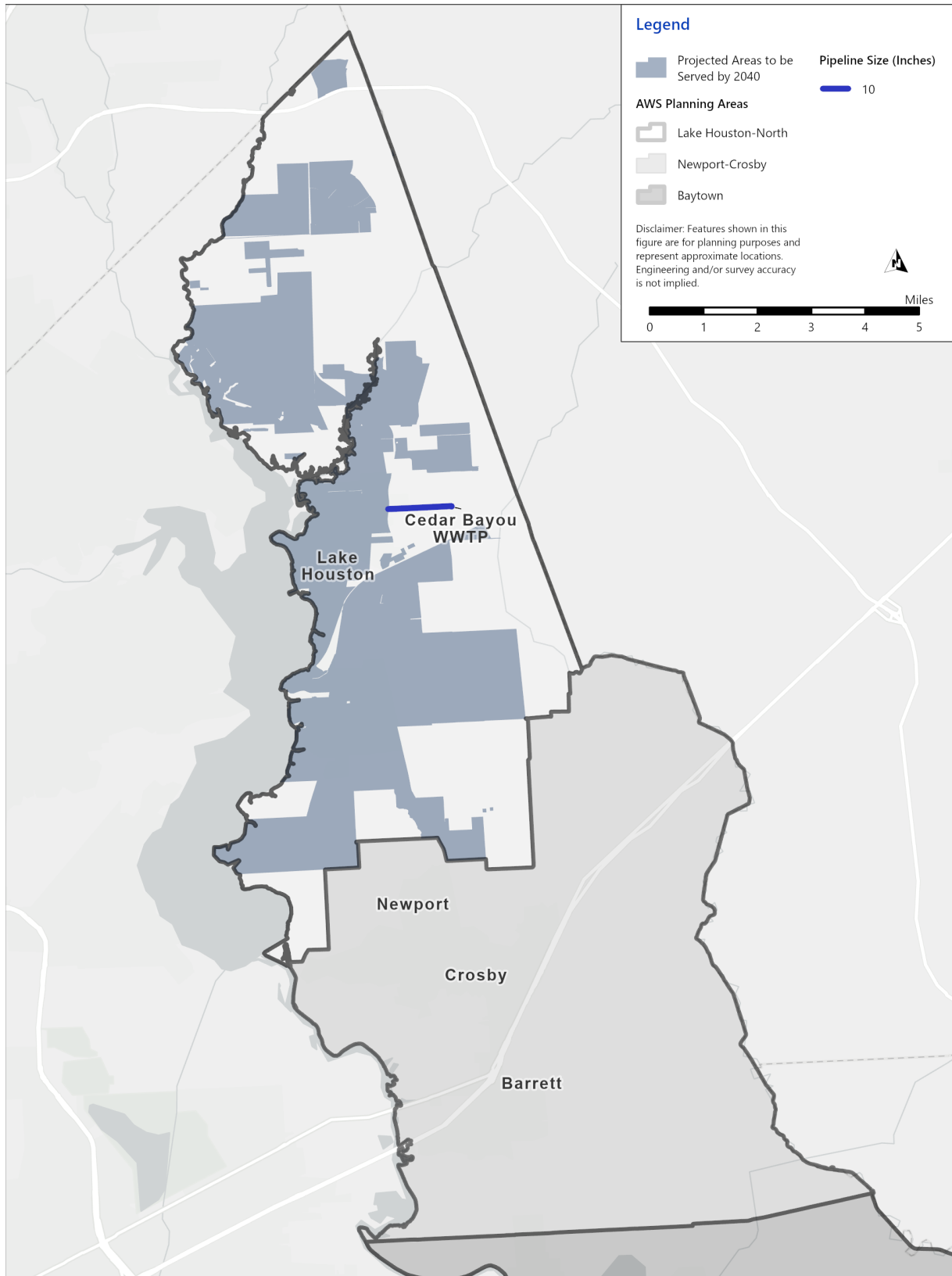


Figure 17 Lake Houston-North Area Alternative 3: Direct Potable Reuse from Cedar Bayou Wastewater Treatment Plant

Table 19 Cost Estimate for Lake Houston-North Area: Direct Potable Reuse from Cedar Bayou Wastewater Treatment Plant

Client: HGSD		Alternative: Alternative 3 - Cedar Bayou WWTP Upgrade				
Project: Alternative Water Supply Feasibility Study		Date: 4/10/2026				
Estimate Class: AACE Class 5		Version: Draft				
ITEM NO	ITEM DESCRIPTION	ASSUMPTION	UNIT	QUANTITY	UNIT PRICE	ESTIMATED COST
1	10" Waterline	A	LF	6,289	\$ 287	\$ 1,805,000
2	1.5 MGD DPR at Cedar Bayou WWTP	B	LS	1	\$ 36,770,100	\$ 36,771,000
3	DPR Land Acquisition	C	LS	1	\$ 653,400	\$ 654,000
4	Pipeline Easement Land Acquisition	D	LS	1	\$ 165,874	\$ 166,000
				Subtotal		\$ 39,396,000
				Planning (3%)		\$ 1,182,000
				Design (7%)		\$ 2,758,000
				Construction Engineering (1%)		\$ 394,000
				Contractor Overhead & Profit (5%)		\$ 1,970,000
				Mobilization and Demobilization (3%)		\$ 1,182,000
				Permits, Bonds & Insurance (1%)		\$ 394,000
				Geotech (0.2%)		\$ 79,000
				Contingency (30%)		\$ 11,819,000
				Total Capital Cost¹		\$ 59,174,000

Assumptions:

- A Pipeline Unit Costs are from the TWDB Unified Costing Model, Version 3.0.1, CPI February 2024.
- B Subtotal for the 1.5 MGD DPR is derived from the Civitas 2025 HGSD Joint Regulatory Plan Review Alternative Water Supply Cost Update Addendum.
- C Land acquisition costs based on 2026 HCAD appraisal costs for the necessary parcel, assuming acquisition of parcel directly south of City-owned parcel containing Cedar Bayou WWTP.
- D Land acquisition costs assume easement widths of 15 ft for small-diameter pipelines and 20 ft for large-diameter water lines. Rural land values are based on Texas A&M Real Estate Research Center nominal prices (Q4 2025), while urban land values are derived from an average of selected HCAD parcels.
- 1 Operations and Maintenance (O&M) costs vary by alternative and are not included

4.3.2 Characterization and Ranking Assessment

DPR from the Cedar Bayou Wastewater Treatment Plant is a preferred AWS option, to be utilized in conjunction with one of the surface water supply options, for additional supply to the Lake Houston-North AWS planning area. More details pertaining to the recommended surface water options for the Lake Houston-North planning area are discussed in Section 4.2.1.

According to Permit No. WQ0010495, the Cedar Bayou WWTP is authorized to discharge up to 1.5 MGD of annual average effluent flow. With an assumed estimated rate of recovery at 85 percent, the current available supply is approximately 479 MGY (1,430 AFY). This additional supply of water meets 19 percent of the 2040 groundwater demand volume of 2,460 MGY (7,540 AFY), accounting for less than 50 percent of the demand (Quantity = 3). The new water supply will need to be treated to meet safe drinking water standards prior to distribution (Quality = 2). The reliability of the new water supply is ranked high, (Reliability = 1) as it can provide a drought-resistant water supply when surface water supplies are limited.

Table 14 presents the ranking assessment for utilizing reuse as an AWS option. There are no new positive or negative impacts associated with this supply option because the treatment plant already exists.

4.4 Brackish Groundwater Desalination

Desalination is the process of removing dissolved solids and other minerals from saline water sources, which can include seawater and brackish groundwater. Texas now has 60 municipal desalination plants that treat brackish groundwater, surface water, or reclaimed water and have a combined design capacity of approximately 172 MGD (192,700 AFY) (The Future of Desalination in Texas, 2024). Brackish groundwater is an important water source that can provide new water supplies and help reduce the demand for freshwater supplies. For this report, brackish groundwater is considered groundwater with a total dissolved solid concentration ranging from 1,000 to 10,000 milligrams per liter.

To date, the TWDB has designated a total of 31 brackish groundwater production zones with moderate to high availability and productivity of brackish groundwater that meet statutory requirements and exclusion criteria. To support the development of water supplies from TWDB-designated brackish groundwater production zones, Senate Bill 1041 and House Bill 722 established a permitting framework. More information on the Brackish Resources Aquifer Characterization System (BRACS) studies and identified production zones can be found on the [TWDB's BRACS website](#).

Brackish groundwater has already been evaluated within the HGSD and is gaining increased interest, particularly in areas where surface water supplies may be unavailable (KIT and INTERA, 2022). HGSD has studied the occurrence of brackish groundwater within the Gulf Coast Aquifer. Significant volumes of brackish groundwater exist throughout the Chicot, Evangeline and Jasper Aquifers that comprise the Gulf Coast Aquifer system.

This option was considered an effective water strategy for future supplies because it has been previously evaluated, abundant supply is available, the treatment technologies (reverse osmosis [RO] membranes) are well understood, and this alternative is relatively drought-resistant.

4.4.1 Evaluated Alternative Water Supply Option

Many communities within the State are considering diversifying their water supply sources and exploring desalinating brackish groundwater for drinking water. Put simply, desalination is a process that removes dissolved mineral salts and other impurities from saline and brackish water, making it suitable for human consumption. The two most common methods are thermal desalination and membrane-based desalination.

Membrane technologies, such as RO and electrodialysis reversal, use semi-permeable membranes to separate salts from water. RO uses high-pressure pumps to push saline water through membranes that allow smaller water molecules to pass while rejecting larger salt minerals, resulting in desalinated water and brine. Electrodialysis reversal uses alternating ion-exchange membranes and electrodes to separate water from dissolved salts.

Treatment requires several different processes, including pretreatment to filter out solids and condition the water, removal of salts and other minerals, and post-treatment to prepare the desalinated water for distribution. The brine is disposed of through various methods, such as surface water discharge, deep well injection, or release into municipal sewer systems. The most common method for desalination is RO.

In 2018, HGSD completed a study to assess the hydrogeologic characteristics and potential subsidence risk associated with the development of brackish groundwater in the Jasper Aquifer portion of the Gulf Coast Aquifer system (INTERA, 2018). The study revealed the potential for land subsidence generally increases to the northeast (updip) as the Jasper Aquifer becomes shallower, with the greatest compaction occurring near the pumping zone.

The primary objective of the HGSD's Regulatory Plan is to reduce reliance on groundwater pumping to mitigate subsidence and, in turn, shift to other AWS options. The District recognizes the potential for brackish groundwater development but also that future development will require additional modeling and monitoring of hydrogeological conditions to avoid potential subsidence risks. Under the current Regulatory Plan, brackish groundwater is not formally recognized as an AWS because applications within the regulated areas of the HGSD have not been demonstrated to avoid compaction and subsidence (HGSD and FBSD, 2025).

4.4.2 Characterization and Ranking Assessment

According to the 2025 JRPR Comprehensive Report, it is assumed that by 2070 this AWS will provide approximately 8,760 MGY (26,900 AFY) to the greater Houston area, potentially meeting up to 100 percent of the total estimated AWS demand of 5,600 MGY (17,200 AFY) for the EHSA presented in Table 11. The quality of the new water supply will need to be treated to drinking water standards, prior to distribution (Quality = 2). The reliability of the new source is ranked low (Reliability = 3) due to the risk of subsidence (INTERA, 2018). The environmental impacts assessed are generally minimal (Table 14). However, it is expected that there will be temporary land disturbance during construction of facilities.

4.5 Aquifer Storage and Recovery

ASR is a water management technique that involves injecting excess water, such as treated drinking water, stormwater, or reclaimed water, into underground aquifers during wet periods for extraction and use during dry periods. It acts as an underground "water bank".

The HGSD sponsored a study performed by INTERA to research the potential occurrence of subsidence from using ASR as a water supply strategy in the Gulf Coast Aquifer system (INTERA, 2019). Because ASR includes a period of pumping during recovery of the stored water, it can potentially cause compaction and potential subsidence. Two types of ASR projects were considered to estimate the potential for subsidence associated with the application of ASR in HGSD:

1. A project to provide industrial water supply during a DOR.
2. A project to provide for an annual municipal summer peaking water supply (INTERA, 2019).

The modeling performed by INTERA confirmed that there is potential for subsidence associated with the application of ASR in the Gulf Coast Aquifer system within HGSD. It was determined that the greatest subsidence occurs within 1,000 feet of the ASR well(s).

The mission of HGSD is to prevent subsidence by providing reasonable groundwater regulation. Through science-based water planning, HGSD strives to meet future water demands with minimal risks of subsidence. Although this option was originally considered an effective way to increase water supply, due to the modeled results (discussed below in more detail), for the purposes of this study, ASR was ruled out as a preferred AWS option.

4.5.1 Evaluated Alternative Water Supply Option

Within HGSD, ASR has been considered by both industrial and municipal water supply users. This interest led HGSD to study the potential for ASR as a viable AWS option. Historically, the Gulf Coast Aquifer system has been the primary water source for HGSD's municipal, industrial, and agricultural water supply. The three primary water-bearing units of the Aquifer system are as follows: the Chicot, Evangeline, and Jasper Aquifers.

In 2019, INTERA published a study titled "[Assessment of Subsidence and Regulatory Considerations for Aquifer Storage and Recovery in the Evangeline and Chicot Aquifers](#)," which evaluates the potential risk of subsidence for two specific ASR project types and provides insight that can support future management and potential regulation of ASR wells in the District. A summary of the key findings of that report is provided in the paragraphs below.

The study targets those areas where water users have shown interest in ASR as a conjunctive water supply strategy. Specifically, the evaluation was for both a DOR water supply strategy for industrial water users in the Texas City Industrial Complex (Regulatory Area 1) and for the consideration of a municipal water supply strategy (Regulatory Areas 2 or 3) based upon meeting an annual summer peak demand with ASR.

For the DOR industrial user ASR case, INTERA performed an analysis of both water demand and surface water availability based upon the information provided by the Gulf Coast Water Authority (GCWA) and through use of the Brazos WAM, respectively (INTERA, 2019). The DOR ASR wellfield was located in the Texas City Industrial Complex. In addition, two other project locations were modeled, one on Galveston Island, and one southeast of Loop 610 in the area that comprises the Galena Park PRESS Site. These additionally modeled projects allowed for the assessment of variability from that of the industrial user case.

For the municipal summer peaking case, the water demand and timing of that water demand for the ASR simulation were based upon general characteristics of a project being considered by a municipality in the vicinity. The needs were derived from a typical municipal water user undergoing groundwater reduction in response to HGSD's Regulatory Plan, and growth in demand resulted from projected population increases. Site conditions representative of Texas City and modeling packages that simulate hydraulic response and compaction associated with ASR projects were used to model compaction due to pressure change in the aquifer (INTERA, 2019).

A critical finding of the study is that ASR is predicted to result in less compaction and potential subsidence as compared to an equal amount of groundwater pumping without a recharge cycle. Of the two simulated cases mentioned above, the DOR case showed a three percent less compaction at the end of a 5-year recovery period than straight groundwater pumping. In the case of the summer peaking scenario, the benefit of ASR is greater than 30 percent after 20 years of operation versus groundwater pumping only.

The study provides evidence that an ASR project can be designed and operated to serve as a valuable water management strategy while minimizing potential compaction/subsidence. However, the risk of subsidence does still exist so other AWS options that do not have the potential to induce subsidence should be considered.

4.5.2 Characterization and Ranking Assessment

According to the 2019 INTERA report, the ASR project for the industrial DOR users set a goal of achieving a firm supplemental supply with a recovery capacity of 5 MGD (5,600 AFY). When compared to the total estimated groundwater demand of 5,600 MGY (17,200 AFY) by 2070 (Table 11), the new ASR supply accounts for less than one-third of the demand (Quantity = 3). The new water supply will not need to be treated to meet safe drinking water standards, as it is intended for industrial use (Quality = 3). The reliability of the new water supply is ranked high (Reliability = 1), as it can provide a drought-resistant water supply when surface water supplies are limited. ASR also reduces water loss due to evaporation that can result from storing water in traditional surface reservoirs. It is anticipated that some land disturbance will occur with the drilling of an ASR groundwater well(s). However, the environmental impacts can be mitigated and have limited concern (Environmental Impacts = 3).

For the summer peaking municipal user project, it was assumed that water is available in excess of demand from November through February, with a project storage volume of 650 MG (2,000 acre-feet). This storage volume will be recovered from July through September (INTERA, 2019). The quantity of water generated by this water management strategy is less than 50 percent of the demand (Quantity = 3) found on Table 11. This new water supply will need to be treated to meet safe drinking water standards (Quality = 2). Scoring for all other criteria is similar to the industrial DOR users project, as detailed above.

The scoring and ranking assessments for each of the potential ASR projects are presented in Table 14, which align with the 2026 Region H RWP.

4.6 Rainwater Harvesting

The following discussion on Rainwater Harvesting is taken from [The Texas Manual on Rainwater Harvesting, 3rd Edition](#) (TWDB, 2005).

Rainwater is valued for its purity and softness. It has a nearly neutral pH and is free from disinfection byproducts, salts, minerals, and other natural man-made contaminants. Plants thrive under irrigation with stored rainwater. Appliances last longer when free from the corrosive or scale effects of hard water. Users with potable systems prefer the superior taste and cleansing properties of rainwater. Rainwater harvesting, in its essence, is the collection, conveyance, and storage of rainwater.

Rainwater harvesting systems can be as simple as a rain barrel for garden irrigation at the end of a downspout, or as complex as a domestic potable system or a multiple end-use system at a large corporate campus. Advantages and benefits of rainwater harvesting are numerous (Krishna, 2003):

- The water is free; the only cost is for collection and use.
- The end use of harvested water is located close to the source, eliminating the need for complex and costly distribution systems.
- Rainwater provides a water source when groundwater is unacceptable or unavailable, or it can augment limited groundwater supplies.
- The zero hardness of rainwater helps prevent scale on appliances, extending their use; rainwater eliminates the need for a water softener and the salts added during the softening process.
- Rainwater is superior for landscape irrigation.
- Rainwater harvesting reduces flow to stormwater drains and reduces non-point source pollution.

- Rainwater harvesting helps utilities reduce the summer demand peak and delay expansion of existing WTPs.
- Rainwater harvesting reduces consumers' utility bills.

There is a State-wide renewed interest in this time-honored approach of collecting water because of escalating environmental economic costs of providing water by centralized water systems or by well drilling. For more details on rainwater projects, training, and an in-depth description of rules in Texas, please visit the TWDB webpage on [rainwater harvesting](#).

4.6.1 Evaluated Alternative Water Supply Option

Water conservation is one of the most important components of water-supply management and is a potentially feasible water savings strategy that can be used to preserve the supplies of existing water resources. Recognizing its impact, setting realistic goals, and enforcing implementation may significantly extend the time when new supplies and associated infrastructure are needed.

According to the HGSD Rules, amended October 11, 2023, water conservation is defined as "a measure that seeks to make a water supply available for alternative or future use, to include best management practices, improved efficiency or accountability, recycling, reuse, pollution prevention, and reduction in consumption, loss, or waste" (HGSD Rules, 2023).

The magnitude of the savings associated with rainwater harvesting varies based on rainfall amount and intensity, the catchment area's size and material, the system's efficiency (evaporation and leaks), and site-specific factors like slope, soil, land use and elevation. The general formula to calculate the savings is rainfall (in inches) x catchment area (in square feet) x runoff coefficient = total rainwater volume (in gallons). Different surfaces have different runoff coefficients. For example, metal roofs (95 percent runoff), shingles (85 percent runoff), and tile roofs (80 percent runoff). These various roof types will impact how efficiently water is collected.

According to the TWDB's municipal water conservation planning tool, released in 2018 to support water utilities to more easily develop long-range conservation plans and compare alternative conservation measures in terms of water savings or implementation cost, rainwater harvesting has unit savings of 55.2 gallons per day (GPD).

This AWS option is considered cost-effective (not requiring any infrastructure investment), does not require any permits to implement, is not vulnerable to climate change, and can help to slow or reduce subsidence. However, the AWS option is not a supply option, as it does not increase the overall AWS yield, but rather reduces future water demands gradually (KIT and INTERA, 2022).

Although it is an important measure to consider, rainwater harvesting may not significantly reduce the projected water demand volumes presented in Table 11.

4.6.2 Characterization and Ranking Assessment

According to the TWDB, rainwater harvesting has a unit savings of 55.2 GPD. Compared to the Baseline GPCD values presented in Table 3, rainwater harvesting would meet less than 50 percent of projected water demands based on these amounts (Quantity = 3). Rainwater harvesting is intended for non-potable use (Quality = 3) and has a low reliability since it is dependent on rainfall (Reliability = 3). However, this AWS has a positive impact on the environmental water needs, the surrounding wildlife habitat, and local area's natural water quality. No change to cultural resources is expected. The ranking assessment for rainwater harvesting is presented in Table 14.

4.7 Seawater Desalination

As of 2023, desalination plants worldwide (seawater and brackish water) had a cumulative water production capacity of 25.1 billion gallons per day, which is 28 million AFY (Global Water Intelligence, 2024). In the past decade, seawater desalination has become more prevalent in the United States. Although Texas does not have an operational seawater desalination facility, the City of Corpus Christi and Port of Corpus Christi Authority have applied for permits from the TCEQ. In the 2022 State Water Plan, there are seven recommended water management strategy projects for seawater desalination located along the Gulf Coast. Desalination is an important AWS option that can provide a reliable source of freshwater, support economic growth, and increase resilience to drought.

The Gulf of America is an effectively unlimited supply, making this option extremely resistant to drought and climate variability. Seawater desalination will require a partnership between stakeholders to share costs and benefits of this newly developed, reliable water supply.

4.7.1 Evaluated Alternative Water Supply Option

Seawater desalination is the process in which salt and other constituents are removed to produce pure water. There are two common approaches:

1. Thermal process – uses heat to evaporate the water, leaving behind the dissolved salts, or waste stream, and separating it from pure water.
2. Membrane process – use RO and high pressure to force saltwater through very fine, porous filters that retain the salts, leaving pure water on one side of the membrane and the waste stream on the other side.

Several technical challenges accompany this AWS option, which include, but are not limited to, permitting, intake location, brine disposal, product water quality, and post-treatment. According to a recent Texas Parks and Wildlife Department (TPWD) and Texas General Land Office (GLO) study, it is critical to evaluate the total salt content, ratio of salt-type, adequate circulation for brine disposal and other factors that need to be considered in brine disposal (TPWD and GLO, 2018). Brine disposal options will require thorough evaluation to protect the marine life from high saline concentrations.

In addition, integrating desalinated seawater into potable water systems poses a threat to compatibility with existing supplies and will require blending. Additional water quality stabilization will be required to reduce the highly corrosive nature of the desalinated seawater. Lastly, post-treatment would be needed to safeguard human health and the integrity of the distribution system (KIT and INTERA, 2022).

Seawater desalination was evaluated as part of the 2023 JRPR despite the many implementation and financial challenges. In fact, HGSD and the Brazos River Authority are actively collaborating with the GCWA on a feasibility study to assess alternatives for regional seawater desalination projects. The feasibility study is anticipated to be completed in summer 2026. The concept for the project assumes a new seawater desalination facility located in or adjacent to GCWA's existing service area. This enables GCWA to augment their existing water supplies with a reliable, high-quality water supply from an alternative, drought-proof water source. The water treated from a seawater desalination facility could offset the current supplies that GCWA provides to industrial, agricultural, and municipal customers, including diversion rights from the Brazos River.

The strategy concept assumes an initial 20 MGD (22,400 AFY) RO treatment facility to treat raw seawater. An additional 20 MGD (22,400 AFY) treatment module could be added in the future, increasing the treatment facility's total capacity to 40 MGD (44,800 AFY). Conservatively, it was assumed that the intake would be sized to feed a seawater desalination facility operating at 50 percent recovery (Region H, 2026).

Additional conceptual project components assumed include a 43.5-MGD (48,700-AFY) seawater intake pump station, a 54-inch diameter raw water pipeline, saline water storage, and a pipeline and diffuser system to dispose of the brine created from the desalination process (Region H, 2026).

However, as a viable option for the near-term needs of the EHSA, seawater desalination remains too costly of an option, lacking coordination between the proper stakeholders.

4.7.2 Characterization and Ranking Assessment

According to the 2026 Region H RWP, the GCWA Coastal Desalination project assumes an initial 20 MGD (22,400 AFY) RO treatment facility, with the potential to add a 20 MGD (22,400 AFY) treatment module in the future, increasing the total capacity to 40 MGD (44,800 AFY). However, conservatively, it is assumed that the intake would be sized to feed a seawater desalination facility operating at 50 percent recovery. Under these assumptions, it is anticipated that this new water supply might range from 10 MGD (11,200 AFY) to roughly 20 MGD (22,400 AFY).

The total estimated groundwater demand by 2070 is approximately 5,600 MGY (17,200 AFY) (Table 11). The new desalination project could potentially supply 70 percent of the demand, ranking it with a Quantity score of two (Table 12). This new water supply will need to be treated to meet safe drinking water standards, prior to distribution (Quality = 2). The reliability of the new water supply is ranked high, (Reliability = 1) based on the assumption that the Gulf of America is an effectively unlimited water supply, making this option extremely resistant to climate variability. The degree of environmental impact varies depending on the site of the facility. However, if the facility is located on or near a site that is already developed, environmental impacts could be mitigated. In addition, this project could potentially result in increases in streamflow via return flows from points of use (Environmental Water Needs = 1). Discharge of brine affects salinity levels, which modify water chemistry and impact habitat in the vicinity of the discharge locations. Based on permit requirements, it is assumed that the discharge water will be blended with and diluted by other water before discharge (Bays & Estuaries = 1).

The ranking assessment for the evaluated seawater desalination project as an AWS option is presented in Table 14. This scoring is consistent with the 2026 Region H RWP.

SECTION 5 CONCLUSIONS

This study focuses on the EHSA, a region in northeast Harris County that currently lacks reliable access to AWS and must rely on purchasing surface water or developing new supply options because no unallocated water rights remain locally. The EHSA includes communities east of Lake Houston such as Baytown, Crosby, and Huffman, where water supply conditions vary, as some areas have access to surface water through regional providers while much of the region still relies almost entirely on groundwater, creating challenges for meeting regulatory requirements.

Land subsidence in the Baytown, Texas area began in the early 20th century with localized sinking at the Goose Creek Oil Field caused by oil and gas extraction, which produced several feet of elevation loss and surface fissuring. Over time, as industrialization expanded along the Houston Ship Channel, the primary driver of subsidence shifted to large-scale groundwater withdrawal, leading to widespread and rapid subsidence from the 1940s through the 1970s, with some areas near Baytown experiencing more than eight feet of total land loss and increased vulnerability to tidal flooding (HGSD, 2026).

Recognition of the connection between subsidence, flooding, and economic risk led to the creation of the HGSD in 1975, a turning point in subsidence history for the region. HGSD's implementation of a science-based regulatory plan focused on reducing groundwater dependence resulted in significant reductions in groundwater pumping, replaced by surface water from regional river basins, and substantial decline in subsidence rates, especially in coastal areas like Baytown where conversion to surface water was strongest (Turco, et al., 2024).

Although some portions of the EHSA have greatly reduced reliance on groundwater, including Baytown and surrounding communities through the Baytown Area Water Authority, along with Newport MUD and Crosby MUD, most water supply in other portions of the EHSA has been sourced from groundwater. Ongoing population growth and regulatory limitations on groundwater pumping have created significant challenges, particularly because the area lacks access to the regional surface water infrastructure available in other parts of the Houston region. The HGSD requires substantial reductions in groundwater use across three regulatory areas, with most of the EHSA subject to limits requiring groundwater to account for no more than 20 percent of total demand over time, resulting in many existing PWS in need of AWS.

The purpose of the study is to assess future population and water demand, evaluate existing water supplies, identify feasible AWS options, and recommend strategies for delivering sustainable water supplies that reduce reliance on groundwater and minimize subsidence risk.

The total population of the EHSA is projected to grow from approximately 162,800 in 2020 to nearly 296,000 by 2070, with most growth occurring before 2040. The Baytown area comprises the majority of the population currently, but significant growth is also expected in the northern portion of the study area. Urbanization is expected to increase significantly, with more than 90 percent of the population living in developed areas by 2040, indicating that most future water demand will be associated with municipal systems rather than rural domestic use.

Based on projected development patterns and existing water supply conditions, the EHSA was divided into three AWS Planning Areas—Lake Houston-North, Newport-Crosby, and Baytown—each with different levels of access to surface water and infrastructure. Recent development trends suggest that growth may

be occurring faster and in different locations than originally projected, particularly in the northern and central portions of the study area, and actual population levels could exceed projections by as much as 20 percent, highlighting the need for adaptive planning as conditions evolve.

Municipal water demand projections indicate substantial growth driven primarily by population increases in urbanized areas, with total demand projected to increase from approximately 6,770 MGY (20,800 AFY) in 2020 to over 13,300 MGY (40,800 AFY) by 2070, with most of the growth occurring before 2040.

Water demand is calculated based on population and per-capita use, with higher consumption rates in urbanized areas than in rural areas, and projections incorporate recent development trends that are expected to increase future demand, particularly in the Lake Houston-North AWS Planning Area. Demand associated with rural domestic wells is expected to remain relatively constant, with nearly all increases in water use attributable to growth in municipal systems serving developed areas.

The need for AWS is determined by comparing projected municipal water demand to existing surface water availability, with areas relying entirely on groundwater, such as Lake Houston-North, having the highest unmet needs, while areas with partial surface water access, such as Newport-Crosby, have lower but still significant deficits. In the Baytown area, existing contracts for surface water supply are sufficient to meet demand through approximately 2040, after which supply deficits begin to emerge and grow over time. AWS demand for the EHSA as a whole is projected to increase from approximately 910 MGY (2,800 AFY) in 2020 to 5,600 MGY (17,200 AFY) by 2070.

Several AWS options were considered and evaluated for feasibility for the EHSA, including surface water, reclaimed water, brackish groundwater desalination, ASR, rainwater harvesting, and seawater desalination. AWS options were characterized with respect to quantity, quality, reliability, and potential environmental impacts, utilizing the TWDB's regional water planning process to be consistent with the 2026 Region H RWP.

Surface water is the primary AWS strategy for the EHSA because it provides the most feasible available supply to meet the objectives of reducing groundwater use and achieving compliance with HGSD's Regulatory Plan. Regional coordination among utilities, authorities, and stakeholders is essential to successfully deliver these supplies and ensure solutions are practical, locally appropriate, and sustainable.

For the Lake Houston-North AWS Planning Area, which currently relies entirely on groundwater, two primary surface-water strategies are identified. The first is purchasing treated water from the COH's NEWPP and delivering it via a major transmission pipeline. The second is constructing a new surface WTP using water from Lake Houston. Both options require extensive infrastructure, such as pipelines and distribution systems, and are intended to meet growing demand while complying with groundwater reduction limits.

For the Newport-Crosby AWS Planning Area, surface water is partially available through existing agreements with the SJRA. The recommended approach focuses on expanding and regionalizing this supply, including transmission pipelines from existing treatment plants (such as Crosby MUD or Newport MUD) to serve additional PWS.

For the Baytown AWS Planning Area, which already receives significant surface water through the BAWA, the primary strategy is to expand the capacity of the East Surface WTP. This expansion would increase treated water supply to meet future growth, leveraging existing water rights and infrastructure rather than developing entirely new supply sources.

A summary of the identified AWS options is presented in Table 20. This table shows the projected water demand for each AWS Planning Area, the most viable AWS option(s), the amount of supply provided, and estimated cost for each project.

This study recommends the creation of a new RWA for eastern Harris County as a coordinated, regional approach to addressing water supply challenges in the northern portion of the EHSA. The new water authority will be created to provide surface water and groundwater for various uses to multiple independent PWS in the northern EHSA, construct infrastructure to deliver water to PWS, secure financing for needed projects, and establish rate structures for water sales and customer classes.

The need for a regional authority arises from the fragmented nature of existing water service, where 46 independent PWS operate with limited access to surface water and insufficient capacity to transition away from groundwater on their own. The proposed RWA would consolidate planning and infrastructure development across the Lake Houston–North and Newport–Crosby areas, while coordinating with existing providers such as the City of Houston, Newport MUD, Crosby MUD, San Jacinto River Authority, and Baytown Area Water Authority where appropriate. The proposed RWA would have the responsibility of making AWS available to all current and future PWS within the Authority’s service area. An RWA may only be created by an act of the Texas Legislature, signed into law by the governor, and approved by voters (if required as part of the enabling legislation).

Table 20 Summary of Projected Water Demand, Alternative Water Supply (AWS) Options, AWS Magnitude, and Estimated Cost for each AWS Planning Area.

AWS Planning Area	2040 AWS Demand ⁽¹⁾ (MGY/AFY)	2070 AWS Demand ⁽¹⁾ (MGY/AFY)	Proposed AWS Option(s)	AWS Source	Magnitude of AWS	Estimated Cost
Lake Houston-North	2,460 / 7,540	2,750 / 8,440	Purchase Treated Surface Water	City of Houston	ADD: 7.5 MGD MDD: 15 MGD	\$165,126,000
			New Surface Water Treatment Plant	Purchased Supply: City of Houston, San Jacinto River Authority (SJRA); Local Supply ⁽²⁾ (479 MGY / 1,471 AFY)	ADD: 7.5 MGD MDD: 15 MGD	\$305,326,000
			Direct Potable Reuse	Reclaimed Water from Cedar Bayou WWTP (City of Houston)	1.3 MGD	\$59,174,000
Newport-Crosby	960 / 2,870	1,550 / 4,760	Treated Surface Water	SJRA via transmission line from Crosby MUD or Newport MUD	ADD: 1.5 MGD MDD: 3.0 MGD	\$16,868,000
Baytown	0	1,300 / 3,990	BAWA East Surface WTP Expansion	City of Houston	12 MGD	\$124,515,500

ADD: average day demand; MDD: maximum day demand

- (1) AWS demand for each Planning Area is calculated as the municipal water demand for urbanized areas (Tables 6 and 7) less the amount of surface water supply already available. Although this AWS amount can be reduced by up to 20 percent or more based on the HGSD Regulatory Area and groundwater reduction goals or specific GRP requirements, the full amount has been used in this study as the target for AWS.
- (2) Diversions under Certificate of Adjudication No. 10-3980B, owned by Riceland Landvest, LLC (Harris County MUD 599), which allows for the diversion of up to 479 MGY (1,471.2 AFY, annual equivalent of 1.3 MGD) at a priority date of December 7, 1942.

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