2026 BASIN HIGHLIGHTS REPORT

Characterization of the Brays Bayou and Sims Bayou Watersheds

Photo courtesy of Bayou Preservation Association staff

Houston-Galveston Area Council

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Characterization of the Brays Bayou and Sims Bayou Watersheds

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INTRODUCTION

H-GAC's CLEAN RIVERS PROGRAM

The Texas Clean Rivers Program (CRP) is a partnership between the Texas Commission on Environmental Quality (TCEQ) and regional water authorities to monitor water quality and engage stakeholders. The Houston-Galveston Area Council (H-GAC) coordinates the efforts of our region's local partners to monitor health of waterbodies throughout the region. In addition to analyzing monitoring data, H-GAC assesses factors and activities affecting water quality. Through their public education and outreach program, H-GAC provides information on regional water quality and recommendations on what individuals, industry, and local governments can do to conserve and make improvements to local waterways. Data acquired through the CRP provides support for all watershed-based activities in the region. The H-GAC's CRP uses a coordinated approach to water quality monitoring with activities occurring throughout four river basins and coastal waters (Figure 1).

BASINS AND COUNTIES

The four river basins included in H-GAC's CRP study area are:

- San Jacinto River Basin
- Brazos-Colorado Coastal Basin
- San Jacinto-Brazos Coastal Basin
- Trinity-San Jacinto Coastal Basin

A portion of the Bays and Estuaries (Basin 24) is also included.

The fifteen counties included in the H-GAC's CRP area are:

- Austin
- Brazoria
- Chambers
- Colorado
- Fort Bend
- Galveston
- Grimes
- Harris
- Liberty
- Matagorda
- Montgomery
- San Jacinto
- Walker
- Waller
- Wharton

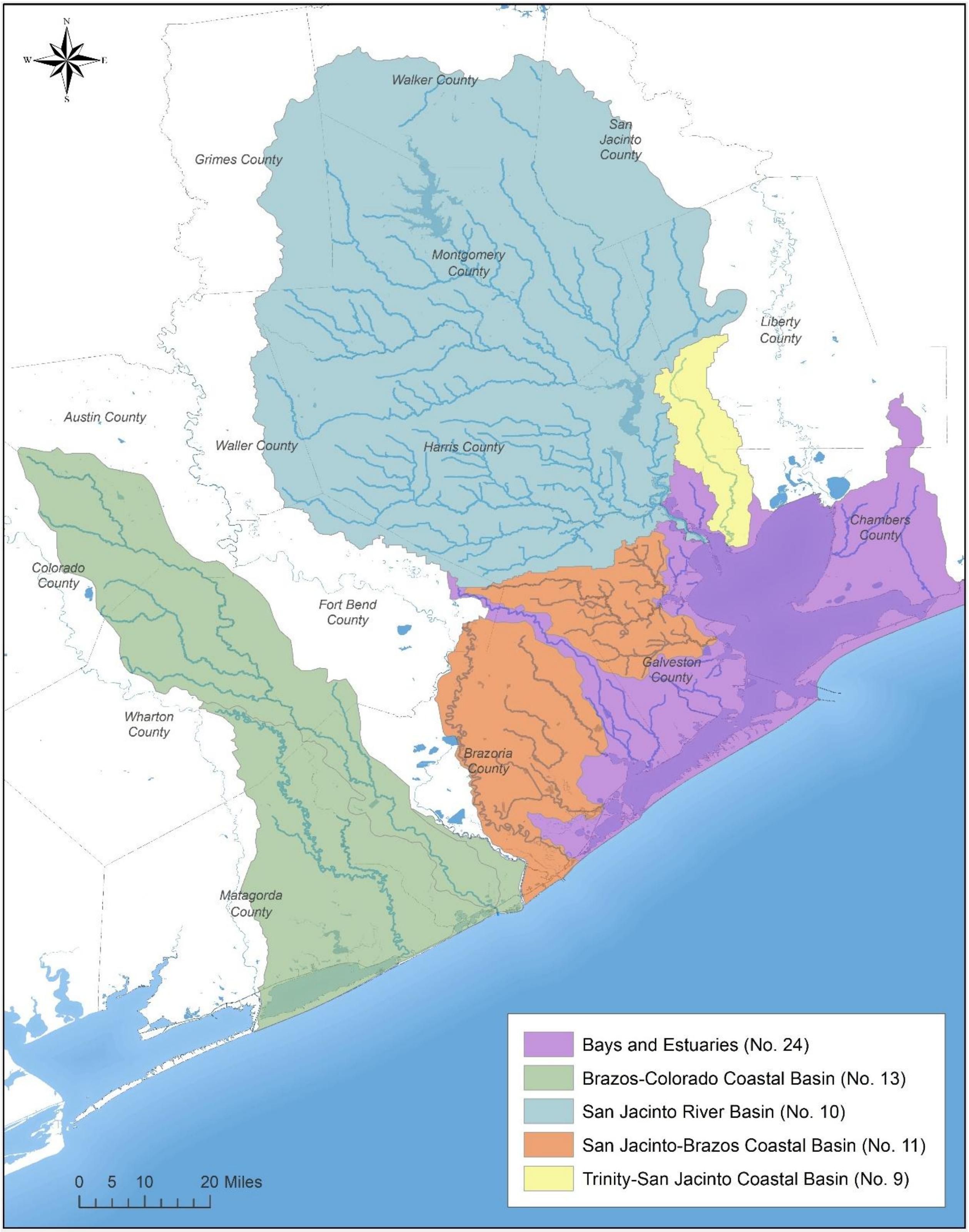

Figure 1. River and coastal basins in the Houston-Galveston Area Council's Clean Rivers Program area.

MONITORING PARTNERS AND CONTRACTORS

The H-GAC's CRP monitoring includes 320 coordinated sampling sites and six regional partners (Figure 2).

These partners are:

- City of Houston Health Department (HHD)
- City of Houston Regulatory Compliance Utility Development (RCUD) (previously the Drinking Water Operations)
- Environmental Institute of Houston (EIH) at the University of Houston-Clear Lake
- Harris County Pollution Control Services (HCPCS)
- San Jacinto River Authority (SJRA) – Lake Conroe Division & The Woodlands Division
- Texas Research Institute for Environmental Studies (TRIES) at Sam Houston State University

Other agencies contributing data used by the H-GAC CRP include:

- Texas Commission on Environmental Quality
- United States Geological Survey

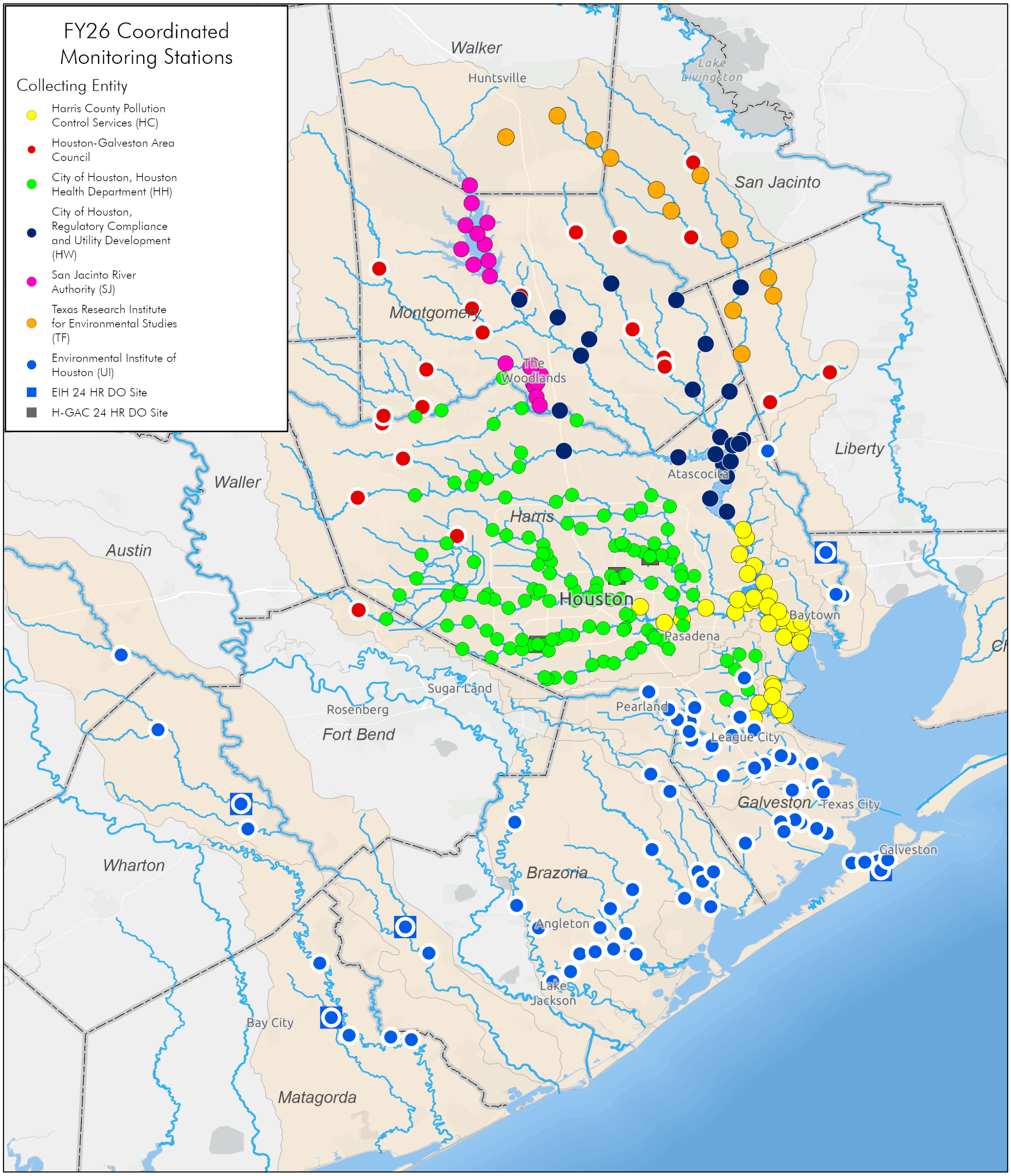

Figure 2. Map of fiscal year (FY) 2026 monitoring sites by collecting partner for the Clean Rivers Program in the H-GAC region.

REGIONAL IMPAIRMENTS AND CONCERNS

PATHOGEN INDICATOR BACTERIA

44% of the assessed stream miles in our region are impaired for recreational use due to elevated levels of pathogen indicator bacteria.

In the Houston-Galveston region, one of the most significant water quality issues faced is elevated levels of pathogen indicator bacteria in our local waterways. State pathogen indicator bacteria standards are set based on the level of recreational use assigned to the waterbody. The pathogen indicator bacteria collected in tidal waterways is enterococci, while *Escherichia coli* (*E. coli*) is collected in freshwater. Both are found in digestive tracts in people and animals and are used as indicators of the likely presence of fecal matter and associated pathogens. High bacterial concentrations may cause gastrointestinal illnesses or skin infections in swimmers or others who come into direct contact with the water. Even where the concentration of pathogen indicator bacteria is less than the standard, there can still be a risk of contracting waterborne diseases.

Sources of bacterial contamination include:

- Sanitary sewer overflows (SSOs);
- Failing on-site sewage facilities (OSSFs); and
- Fecal waste from livestock, pets, feral hogs, and other wildlife.

DISSOLVED OXYGEN

21% of the assessed stream miles in our region are impaired for aquatic life use due to low levels of dissolved oxygen.

Dissolved oxygen (DO) levels are measured to evaluate a waterbody's ability to support aquatic life. As a general rule, higher levels of DO can support more abundant and diverse aquatic species. DO levels fluctuate naturally based on season and time of day; however, human activities can further depress DO concentrations in waterbodies. Sudden or prolonged decreases in DO could result in fish kills.

DO levels can be negatively impacted by many factors, including:

- High concentrations of nutrients that cause algal blooms;
- Sediment from construction sites; and
- Stream channel modification and development that reduces riparian tree cover.

NUTRIENTS

33% of the assessed stream miles in our region exceed state screening levels for nutrients, such as nitrate, ammonia, or phosphorus.
24% of the assessed stream miles in our region exceed state screening levels for chlorophyll-a.

Nutrients, including phosphorus, nitrate, and ammonia, occur naturally in surface waters. They are an important part of a healthy aquatic ecosystem. However, human activities can contribute excessive nutrients to waterbodies. High concentrations of nutrients can result in algal blooms (monitored by chlorophyll-a), which can depress DO levels and produce toxins that are harmful to humans and aquatic species.

Sources of nutrient pollution include:

- Wastewater treatment plant discharges;
- Stormwater runoff with animal manure and fertilizer from lawns and agricultural fields; and
- Failing on-site sewage facilities, including septic systems.

PCBS AND DIOXINS

68% of the assessed tidal streams and bays in our region are impaired for PCBs and dioxins.

PCBs, or polychlorinated biphenyls, and dioxins are broad groups of synthetic organic compounds developed for industrial purposes or are by-products of industrial processes. PCBs and dioxins are toxic and carcinogenic and are legacy pollutants, meaning they can remain in the environment long after they are introduced. Both accumulate in the fatty tissue of marine life, and humans can be exposed through consumption of contaminated fish and shellfish.

FROG CHART REGIONAL WATER QUALITY SUMMARY

Finding a way to summarize water quality can be complicated because there are several different standards that can be used to evaluate the health of a waterbody. The H-GAC has created a "frog chart" to provide a summary of water quality using the percent of total segment lengths that are impaired or of concern for each of the water quality standards or screening levels that the TCEQ evaluates (Table 1). In addition to listing levels of impairments, H-GAC staff also interpreted these data and assigned one to five "frogs" to give a snapshot of water quality. The "frog" count is based on the percentage of each segment that is impaired, and the severity and type of the impairment.

Table 1. 2026 frog chart by segment. Numbers represent the percentage of total segment length that is impaired or of concern for each parameter. Cells without numbers (blanks) represent segments that are currently meeting state standards or screening levels but may be improving or degrading for each parameter. Orange cells indicate a trend analysis that is getting worse, blue cells indicate a trend analysis that is getting better, and grey cells indicate a trend analysis that is stable. 1 frog indicates severe, multiple water quality impairment(s) or concern(s) exist in a majority of the waterbody. 2 frogs indicate significant, multiple water quality impairment(s) or concern(s) exist in the waterbody. 3 frogs indicate water quality impairment(s) or concern(s) exist in a substantial portion of the waterbody. 4 frogs indicate water quality impairment(s) or concern(s) exist in the waterbody. 5 frogs indicate no significant water quality impairment(s) or concern(s) exist in the waterbody.

Basin	Watershed	Segment	DO	Bact	Chl-a	Nutr	PCB	Other*	Frogs
Trinity-San Jacinto Coastal	Cedar Bayou	0901	14.2	100.0	85.8		85.8		1
Trinity-San Jacinto Coastal	Cedar Bayou Above Tidal	0902	82.7	82.7		17.3		82.7	3
San Jacinto River	Buffalo Bayou Above Tidal	1014	3.1	77.9		69.0		0.7	3
San Jacinto River	Buffalo Bayou Tidal	1013	34.2	77.8		47.9		29.9	3
San Jacinto River	Caney Creek	1010		69.2					4
San Jacinto River	Cypress Creek	1009	18.8	80.3	9.3	80.3		10.3	3
San Jacinto River	East Fork San Jacinto River	1003		85.7					4
San Jacinto River	Greens Bayou Above Tidal	1016	17.4	95.8		85.3			3
San Jacinto River	Houston Ship Channel	1006	7.6	43.6	3.3	78.2	38.9	21.7	3
San Jacinto River	Houston Ship Channel/Buffalo Bayou Tidal	1007	16.7	70.2		83.4	28.7	0.9	3
San Jacinto River	Houston Ship Channel/San Jacinto River Tidal	1005				82.3	100.0		2
San Jacinto River	Lake Conroe	1012						4.3	5
San Jacinto River	Lake Creek	1015	40.1	52.2				30.7	3
San Jacinto River	Lake Houston	1002	9.8	9.8		9.8		10.6	4
San Jacinto River	Peach Creek	1011		100.0				15.4	3
San Jacinto River	San Jacinto River Tidal	1001			31.7		53.2		3
San Jacinto River	Spring Creek	1008	10.3	76.1		35.0		11.0	3
San Jacinto River	West Fork San Jacinto River	1004		60.8	16.6	3.2		16.6	4
San Jacinto River	Whiteoak Bayou Above Tidal	1017	11.7	87.0		83.2			3
San Jacinto-Brazos Coastal	Armand Bayou Tidal	1113	61.7	69.6	28.6	17.0	23.4	12.1	3
San Jacinto-Brazos Coastal	Bastrop Bayou Tidal	1105	31.4	81.7					3
San Jacinto-Brazos Coastal	Chocolate Bayou Above Tidal	1108		100.0					4
San Jacinto-Brazos Coastal	Chocolate Bayou Tidal	1107		100.0	100.0		100.0		1
San Jacinto-Brazos Coastal	Clear Creek Above Tidal	1102	11.9	78.8		76.1	48.4	13.1	3
San Jacinto-Brazos Coastal	Clear Creek Tidal	1101	29.1	78.0	4.7	31.8	29.2		3
San Jacinto-Brazos Coastal	Dickinson Bayou Above Tidal	1104		54.5					4
San Jacinto-Brazos Coastal	Dickinson Bayou Tidal	1103	86.9	85.2			43.6		2
San Jacinto-Brazos Coastal	Old Brazos River Channel Tidal	1111							5
San Jacinto-Brazos Coastal	Oyster Creek Above Tidal	1110	96.8	96.8		32.3		96.8	3
San Jacinto-Brazos Coastal	Oyster Creek Tidal	1109	100.0	100.0					3
Brazos-Colorado Coastal	Caney Creek Above Tidal	1305	44.6	57.7		57.7		13.9	3
Brazos-Colorado Coastal	Caney Creek Tidal	1304		61.0	46.8				4
Brazos-Colorado Coastal	San Bernard River Above Tidal	1302	61.5	68.2		20.9		7.3	3
Brazos-Colorado Coastal	San Bernard River Tidal	1301	100.0	100.0					3
Bays and Estuaries	Barbours Cut	2436				100.0	100.0		2
Bays and Estuaries	Bastrop Bay / Oyster Lake +, ++	2433							5
Bays and Estuaries	Bayport Ship Channel	2438	100.0		100.0	100.0	100.0	100.0	1
Bays and Estuaries	Black Duck Bay	2428			100.0	100.0	100.0		2
Bays and Estuaries	Burnett Bay	2430			69.2	100.0	100.0		2
Bays and Estuaries	Cedar Lakes +	2442							5
Bays and Estuaries	Chocolate Bay	2432	81.6	86.3	13.7		33.0		3
Bays and Estuaries	Christmas Bay	2434							5
Bays and Estuaries	Clear Lake	2425	2.4	4.3	58.4	69.6	73.9	45.3	3
Bays and Estuaries	Drum Bay +, ++	2435							5
Bays and Estuaries	East Bay	2423	33.9		75.6		100.0		2
Bays and Estuaries	East Matagorda Bay	2441							5
Bays and Estuaries	Lower Galveston Bay	2439			92.8	13.6	92.8		3
Bays and Estuaries	Moses Lake	2431	18.5	30.1	52.8		56.8		3
Bays and Estuaries	San Jacinto Bay	2427			100.0	100.0	100.0		2
Bays and Estuaries	Scott Bay	2429				100.0	100.0		2
Bays and Estuaries	Tabbs Bay	2426			48.3	48.3	69.5		3
Bays and Estuaries	Texas City Ship Channel	2437			100.0	100.0	100.0		2
Bays and Estuaries	Trinity Bay	2422	13.3	29.1	72.7	43.9	88.5		2
Bays and Estuaries	Upper Galveston Bay	2421		7.1	98.9	57.3	87.9		2
Bays and Estuaries	West Bay	2424	10.4	7.4	10.6	5.7	91.1		3
Bays and Estuaries	Gulf of Mexico	2501						100.0	4

* Other includes parameters such as high and low pH, water temperature, metals in water, metals in sediment, impaired habitat, impaired benthic macroinvertebrates, impaired fish communities, sediment toxicity, fecal coliform, mercury in fish tissues, and fish consumption.

+ This segment was not assessed due to insufficient data

++ This segment was not assessed for routine parameters, but was assessed for fecal coliform in Oyster Waters.

WATERSHED CHARACTERIZATIONS

The watershed characterization is a type of Basin Highlights Report that characterizes select waterbodies within the Houston-Galveston region (Table 2). For this 2026 report, H-GAC has chosen to characterize the Brays Bayou and Sims Bayou watersheds. Watershed characterizations may be used to help prioritize monitoring efforts and in the development of watershed-based plans (such as Total Maximum Daily Loads [TMDLs] or Watershed Protection Plans [WPPs]) to improve water quality.

Table 2. Descriptions of sections that are included in Watershed Characterizations.

Content	Description
Segment Description	A description of the segment, assessment unit (AU) boundaries, and monitoring sites within each segment.
Hydrologic Characteristics	Streamflow variability, reservoir dynamics, seasonality of flow and typical flow trends.
Land Cover and Natural Characteristics	A description of the land surrounding a segment, including developed lands, agricultural lands, forest/shrubs, barren land, open water, and wetlands.
Description of Water Quality Issues	Identification of the reason why the waterbody is listed as impaired and when it first appeared on the 303(d) List or why it is in an area of interest. This includes the number of samples, parameters of concern or impairment, assessment results, and the designated state water quality standard for comparison.
Potential Sources of Water Quality Issues	Possible sources of water quality issues identified through land use and land cover, watershed surveys, and communications with stakeholders and staff from local and state agencies.
Potential Stakeholders	Governmental agencies (Federal/State/Local), organizations, companies, or individuals that have a vested interest in the area and who may have a representative serve as a stakeholder.
Recommendations for Improving Water Quality	Proposed next steps based on the potential sources of impairment or concern.
Watershed Projects	Current or future projects within the segment (TMDLs, WPPs, special studies, etc.).
Major Watershed Events	Anticipated or known occurrences that have the potential to either positively or negatively affect water quality.
Community Engagement	Public engagement activities within the watershed.
Images of the Watershed	Photographic images of the watershed (monitoring stations, public access, and recreational activities, etc.).
Maps	Maps of stream segments, assessment units, monitoring stations, land use, soils, water quality impairments/concerns, wastewater treatment facility outfalls, sanitary sewer overflows, on-site sewage facilities, and other areas of interest.

ADDITIONAL INFORMATION

For more information, including a list of acronyms, a glossary of water quality terminology, a technical primer, and information regarding the statistical methodology used for H-GAC's water quality analyses presented in this report, please refer to the appendices. For more information on H-GAC's CRP, please visit: https://www.h-gac.com/clean-rivers-program.

THE BRAYS BAYOU AND SIMS BAYOU WATERSHED

WATERSHED OVERVIEW

The Brays Bayou and Sims Bayou watersheds are most likely named for Anglo settlers in the area that were part of the "Old Three Hundred" – the settlers who received land grants by Stephen F. Austin to colonize Texas and settled in proximity to these waterways (Jordan 2021). Brays Bayou flows east and south from its headwaters near the crossing of State Highway 6 and the Westpark Tollway. Sims Bayou is south of Brays Bayou, also flowing east from its headwaters near the border between Harris and Fort Bend counties (Figure 3). These watersheds span approximately 220 square miles of portions of Harris and Fort Bend counties. Major transportation corridors that intersect the watersheds include Interstate 10, Interstate 45, Interstate 69/US Highway 59, US Highway 90, the Sam Houston Tollway/Beltway 8, the Westpark Tollway, State Highway 6, State Highway 35, and State Highway 288. The watersheds overlap portions of Bellaire, Four Corners, Houston, Mission Bend, Meadows Place, South Houston, Southside Place, Stafford, University Place, and small portions of Missouri City, Pasadena, and Sugar Land.

The Brays Bayou and Sims Bayou watersheds are composed of the drainage area of the unclassified segments Brays Bayou Above Tidal (1007B) and Sims Bayou Above Tidal (1007D), as well as smaller unclassified segments, tributaries, and a network of natural and manmade drainage channels. This Watershed Characterization Report addresses the following segments that comprise the Brays Bayou and Sims Bayou watersheds:

- Brays Bayou
    - Houston Ship Channel/Buffalo Bayou Tidal (1007_04)
    - Brays Bayou Above Tidal (1007B_01, 1007B_02)
    - Keegans Bayou Above Tidal (1007C_01)
    - Willow Waterhole Bayou Above Tidal (1007E_01)
    - Kuhlman Gully Above Tidal (1007G_01)
    - Country Club Bayou Above Tidal (1007K_01)
    - Unnamed Non-Tidal Tributary of Brays Bayou (1007L_01)
    - Poor Farm Ditch (1007S_01)
    - Bintliff Ditch (1007T_01)
    - Mimosa Ditch (1007U_01)
    - Harris County Flood Control Ditch D 138 (1007W_01)

- Sims Bayou
    - Houston Ship Channel/Buffalo Bayou Tidal (1007_02, 1007_06)
    - Canal C-147 (1007A_01)
    - Sims Bayou Above Tidal (1007D_01, 1007D_02, 1007D_03)
    - Berry Bayou Above Tidal (1007F_01)
    - Pine Gully Above Tidal (1007H_01)
    - Plum Creek Above Tidal (1007I_01)
    - Unnamed Non-Tidal Tributary of Sims Bayou (1007N_01)

Brays Bayou begins just northeast of Clodine in northern Fort Bend County and runs southeast for approximately 22.5 kilometers (km) before it flows into Buffalo Bayou. Within its upper reaches, the waterbody is intermittent with pools, and it traverses variable terrain made up of soils with low infiltration rates, with mixed hardwoods and prairie grasses growing in the vicinity (TSHA, 1952a). The urbanized watershed covers approximately 127 square miles (mi^2), with approximately 195 km of open streams, including segments and tributaries (HCFCD, 2026a). The bayou and most major tributaries are maintained to enhance their flow-carrying capacity. Several multi-use facilities, including parks, either currently exist or are planned to be constructed by recreational sponsors in conjunction with the Harris County Flood Control District's (HCFCD) Project Brays. Severe flooding in the watershed has occurred at least once every decade (HCFCD, 2026a).

Sims Bayou begins just inside Houston's southern city limit between the Southern and Missouri Pacific rail lines in Harris County and flows east-northeast for approximately 45 km, through the Houston metropolitan area before finally draining into the Houston Ship Channel (TSHA, 1952b). The bayou is a major runoff drainage channel for Houston, one of several that suffer from flooding and pollution issues as a result of the metropolitan area's rapid growth over the years. The watershed spans approximately 94 mi^2 and, similar to Brays Bayou, has approximately 195 km of open streams, including segments and tributaries, with structural flooding occurring numerous times (HCFCD, 2026b). The recently completed Sims Bayou Federal Project has significantly reduced flooding risks (HCFCD, 2026b). It included environmental impact mitigation efforts such as inline ponds and flood benches, and the watershed now features a multitude of trails and other recreational facilities along the channel and throughout detention areas (HCFCD, 2026b).

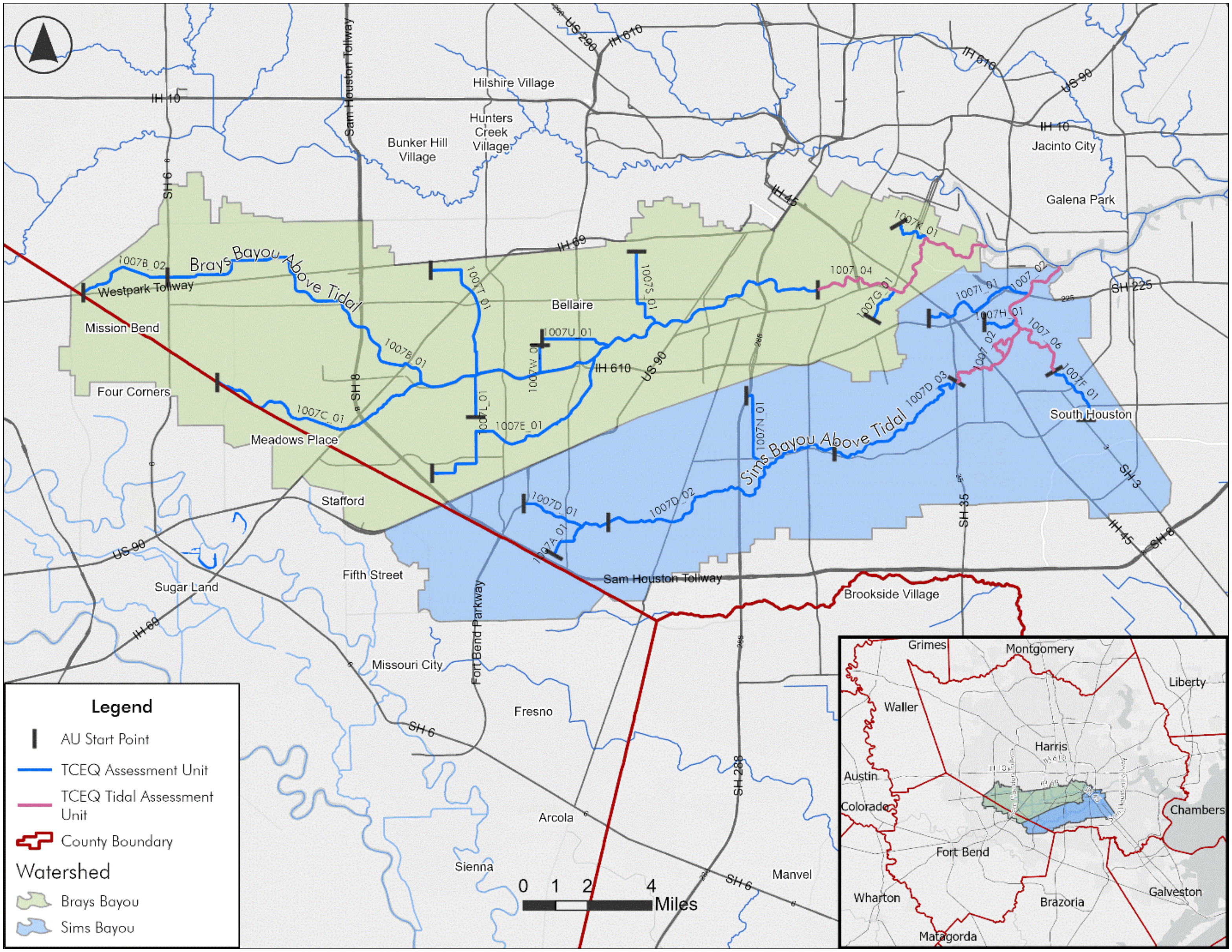

Figure 3. Brays Bayou and Sims Bayou watersheds boundaries and location.

HYDROLOGIC CHARACTERISTICS

In the Brays Bayou watershed, the unclassified segments are freshwater tributaries to the Houston Ship Channel, Segment 1007. All assessment units (AUs) in these segments have perennial flow except for 1007B_02, which serves as the segment's headwaters and primarily exists as an intermittent stream with pools. Segment 1007_04 is a tidal waterbody that flows into the Houston Ship Channel/Buffalo Bayou. Similarly in the Sims Bayou watershed, the unclassified segments are also freshwater tributaries to Segment 1007. All AUs in these segments have perennial flow. Segments 1007_02 and 1007_06 are both tidal waterbodies that flow into the Houston Ship Channel/Buffalo Bayou. Both waterways have been extensively modified and feature concrete-lined sections, widened banks, and numerous stormwater detention basins designed to reduce flood risk. The bayous are susceptible to flash flooding.

STREAM FLOW GAGES

There are seven United States Geological Survey (USGS) stream gages in the Brays Bayou and Sims Bayou watersheds (Table 3 and Figure 4). Hydrographs depicting the gage height, flood stages, and discharge for each of the USGS stations for the time period of 1/1/2006 – 12/31/2025 (20 years, or available data for entire period of record if less than 20 years) are displayed in Figure 5 through Figure 12. Site 08075000, which is the most downstream gage station in the Brays Bayou watershed, has exceeded flood stage once in the past 20 years, resulting from Hurricane Harvey (8/27/2017 – 44.65 ft) (Figure 6).

Table 3. USGS Gage Stations in the Brays Bayou and Sims Bayou watersheds.

Watershed	Gage Station ID	Site Description	Period of Record Gage Height (ft)	Period of Record Discharge (cfs)
Brays	08075110	Brays Bayou at MLK Jr. Blvd, Houston, TX	10/1/2007 - Present	10/15/2007 - Present
Brays	08075000	Brays Bayou at Main St, Houston, TX	6/8/1988 - Present	5/25/1936 - Present
Brays	08074810	Brays Bayou at Gessner Dr, Houston, TX	5/1/1997 - Present	12/3/1987 - Present
Brays	08074800	Keegans Bayou at Roark Rd nr Houston, TX	8/1/1996 - Present	8/13/1964 - 9/29/1981
Brays	08074760	Brays Bayou at Alief, TX	9/27/2006 - Present	10/1/2006 - Present
Sims	08075500	Sims Bayou at Telephone Rd, Houston, TX	10/1/1997 - Present	10/1/1952 – 9/29/1995
Sims	08075605	Berry Bayou at Nevada St, Houston, TX	10/1/2007 - Present	10/1/2006 - Present
Sims	08075400	Sims Bayou at Hiram Clarke St, Houston, TX	9/14/1996 - Present	8/18/1964 - Present

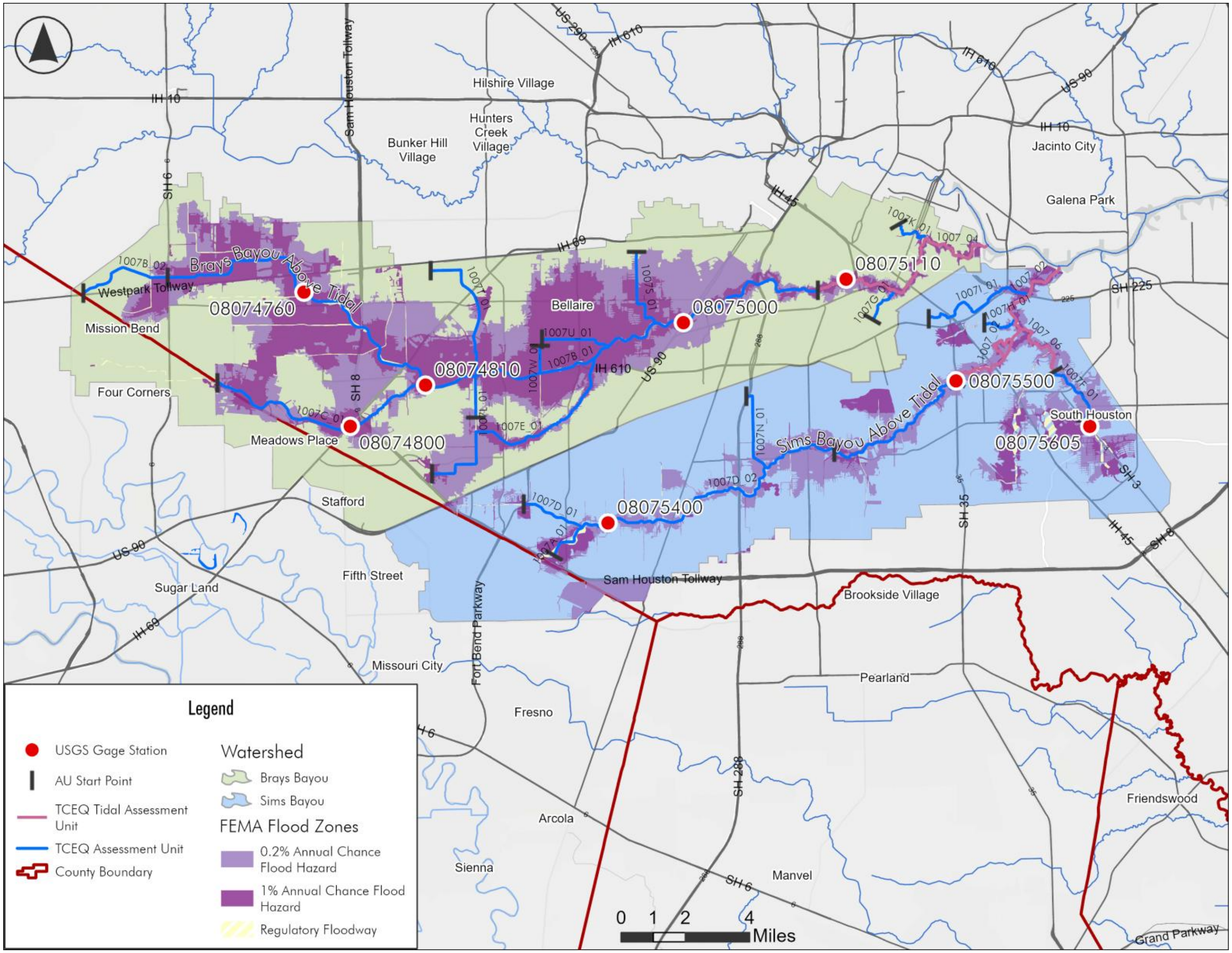

Figure 4. Hydrologic features of the Brays Bayou and Sims Bayou watersheds including floodplains and USGS gage stations. Source: FEMA flood plain maps. [*Flood Data Viewers and Geospatial Data | FEMA.gov*] (FEMA, 2025).

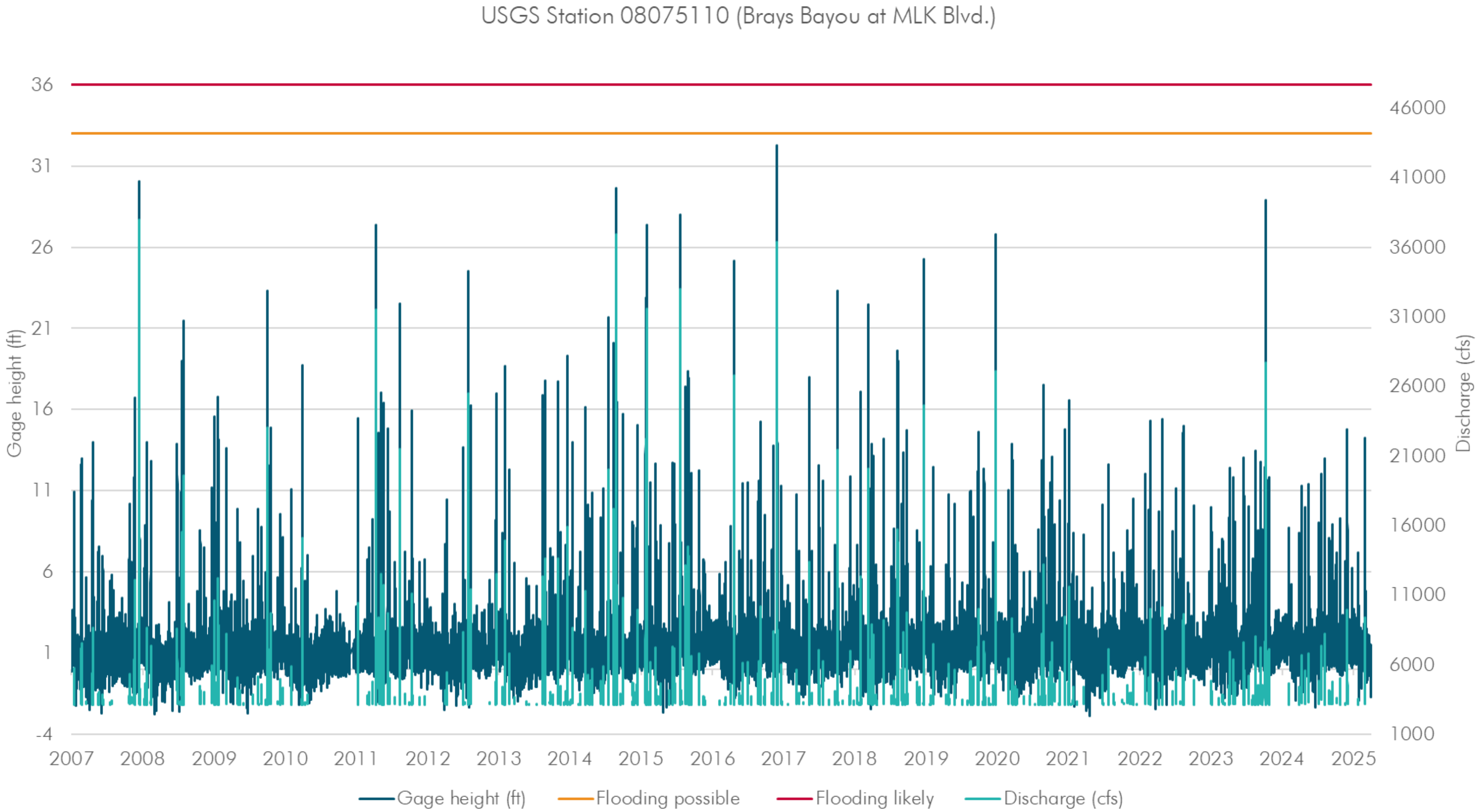

Figure 5. Gage height (ft) and discharge (cfs) for USGS site 08075110 located at Brays Bayou at MLK Jr. Blvd for the period of record (2007-2025). The orange line corresponds to the "flooding possible" elevation (33 ft) and the red line is the "flooding likely" elevation (36 ft) per the HCFCD site 405.

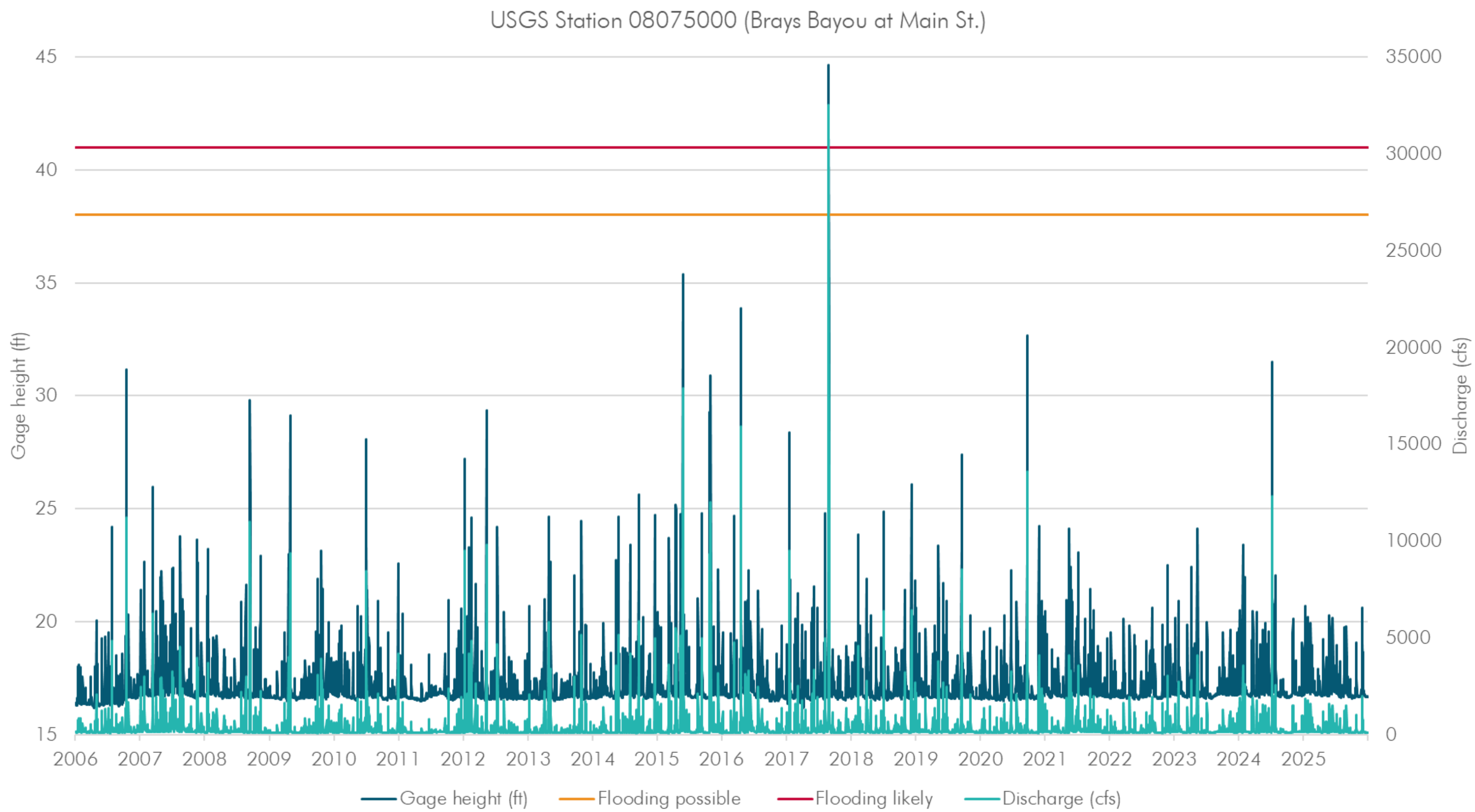

Figure 6. Gage height (ft) and discharge (cfs) for USGS site 08075000 located at Brays Bayou at Main St for the past 20 years (2006-2025). The orange line corresponds to the "flooding possible" elevation (38 ft) and the red line is the "flooding likely" elevation (41 ft) per the HCFCD site 420.

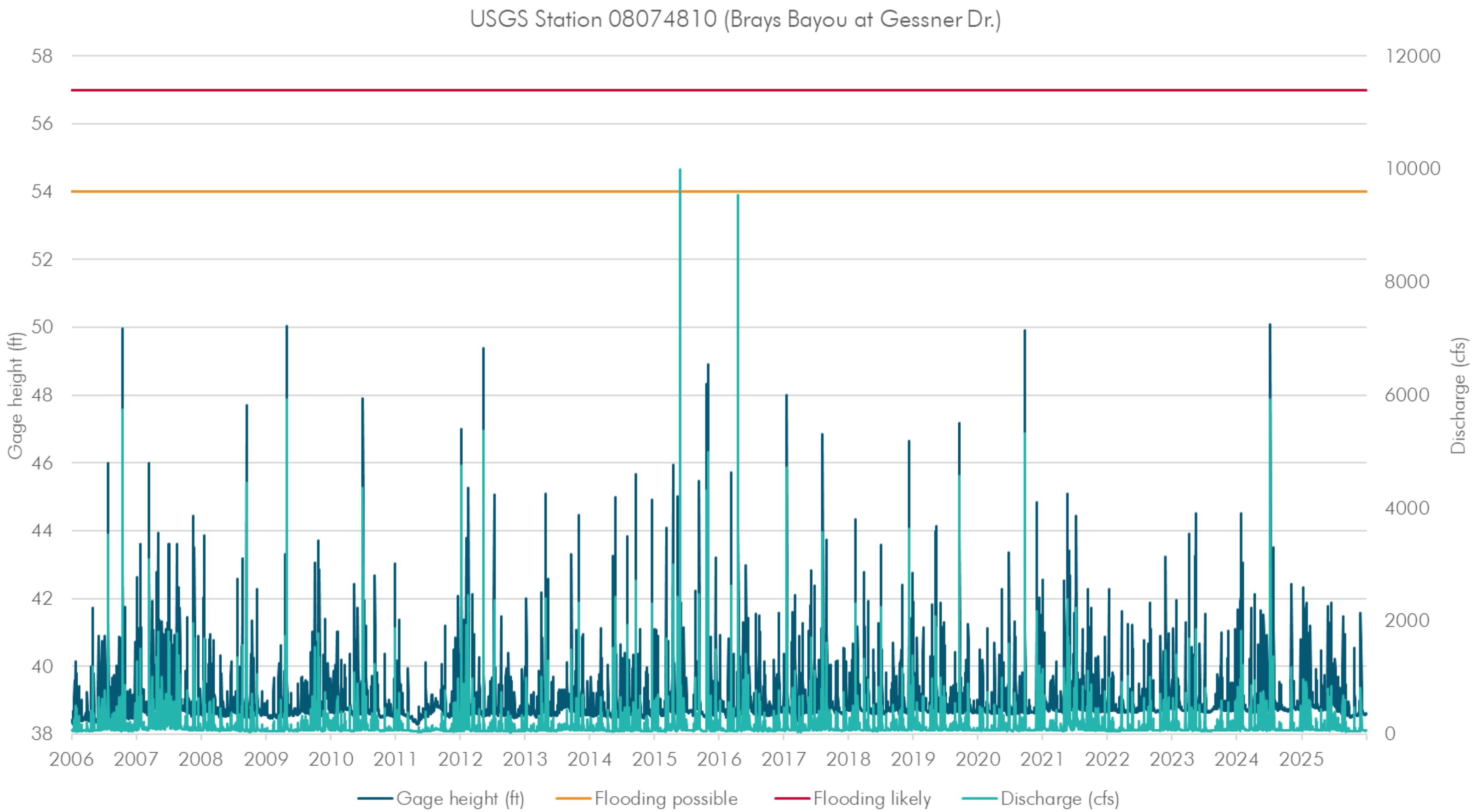

Figure 7. Gage height (ft) and discharge (cfs) for USGS site 08074810 located at Brays Bayou at Gessner Dr. for the past 20 years (2006-2025). The orange line corresponds to the "flooding possible" elevation (54 ft) and the red line is the "flooding likely" elevation (57 ft) per the HCFCD site 460.

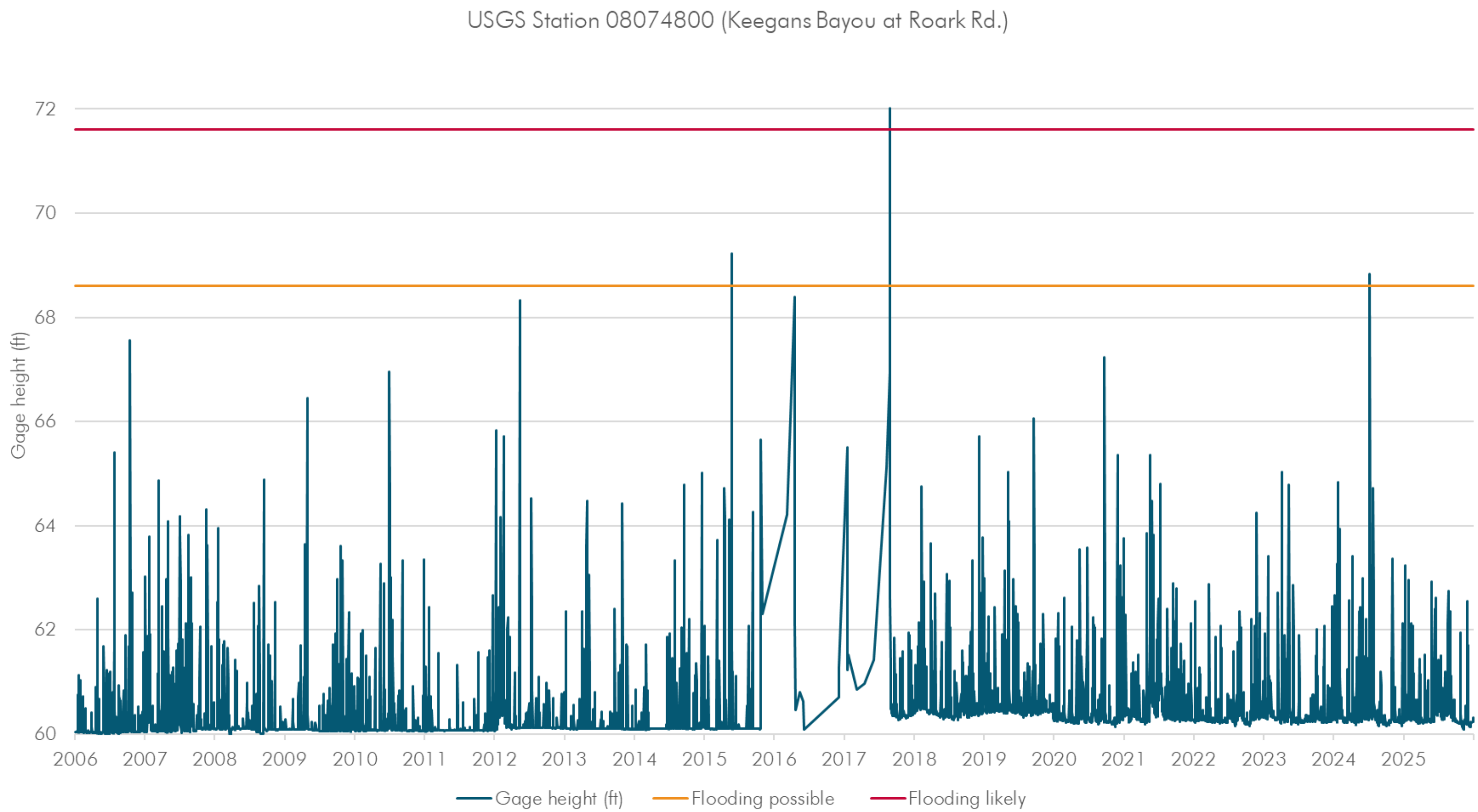

Figure 8. Gage height (ft) for USGS site 08074800 located at Keegans Bayou at Roark Rd. for the past 20 years (2006-2025). The orange line corresponds to the "flooding possible" elevation (68.6 ft) and the red line is the "flooding likely" elevation (71.6 ft) per the HCFCD site 480.

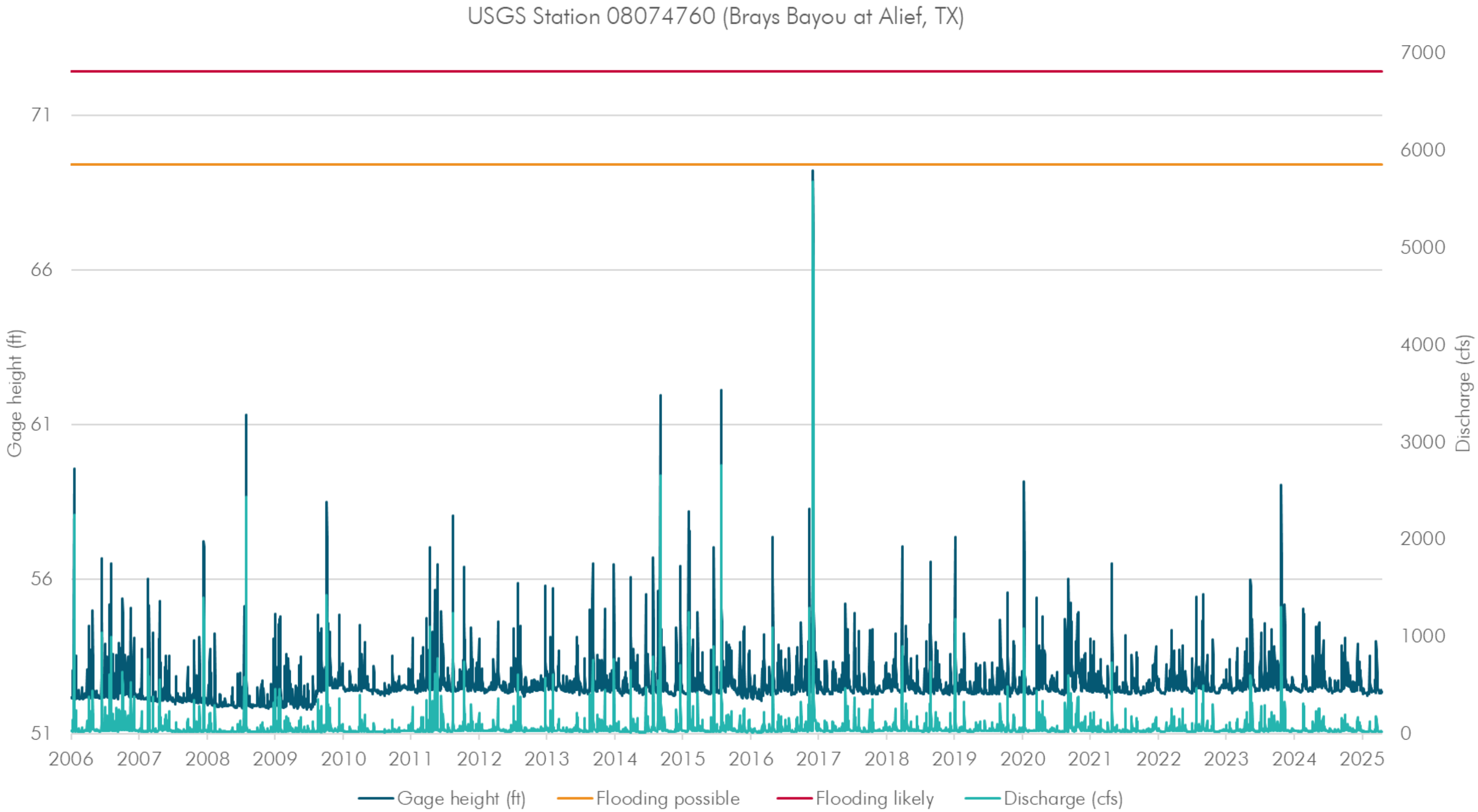

Figure 9. Gage height (ft) and discharge (cfs) for USGS site 08074760 located at Brays Bayou at Alief, TX for the past 20 years (2006-2025). The orange line corresponds to the "flooding possible" elevation (69.4 ft) and the red line is the "flooding likely" elevation (72.4 ft) per the HCFCD site 470.

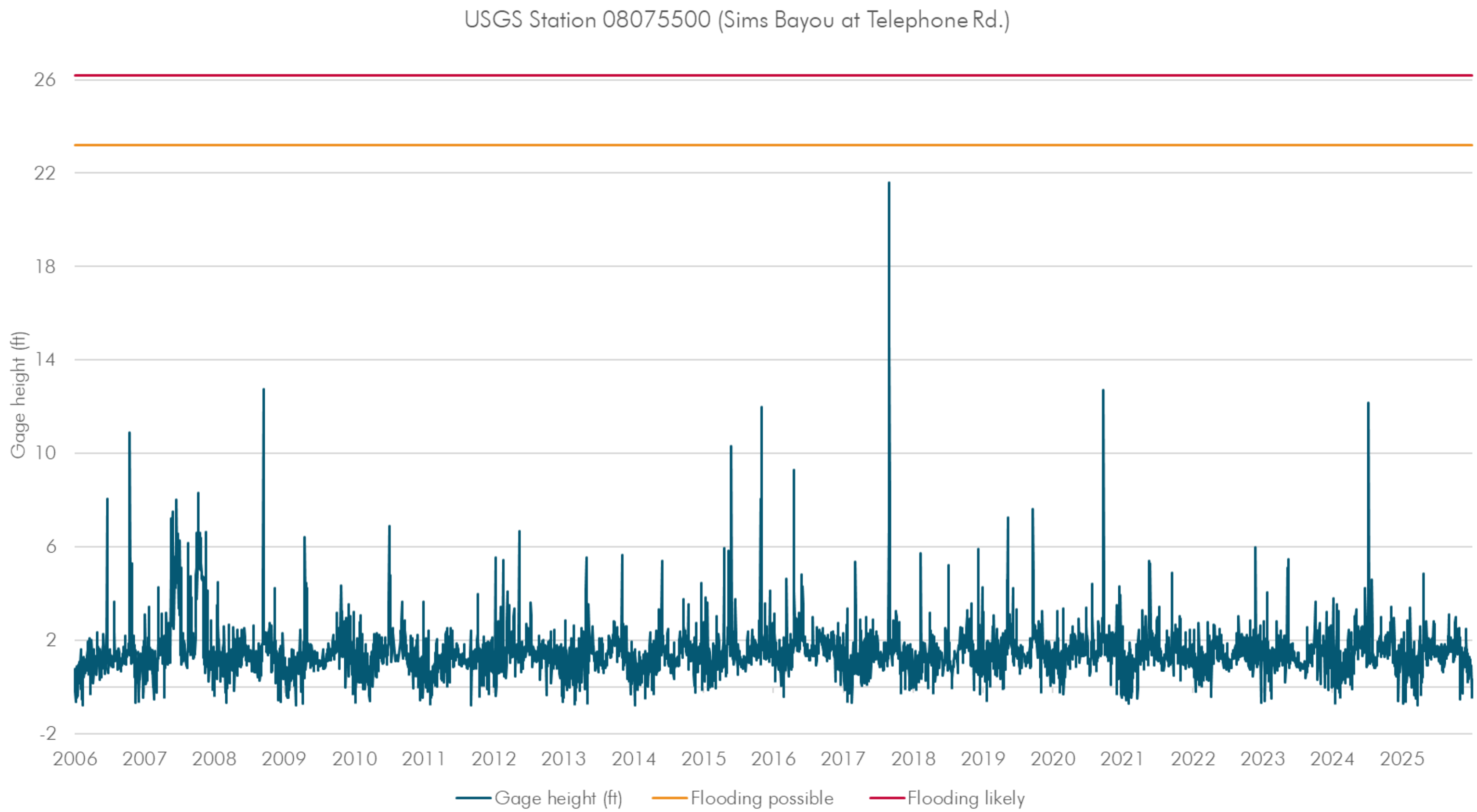

Figure 10. Gage height (ft) for USGS site 08075500 located at Sims Bayou at Telephone Rd. for the past 20 years (2006-2025). The orange line corresponds to the "flooding possible" elevation (23.2 ft) and the red line is the "flooding likely" elevation (26.2 ft) per the HCFCD site 340.

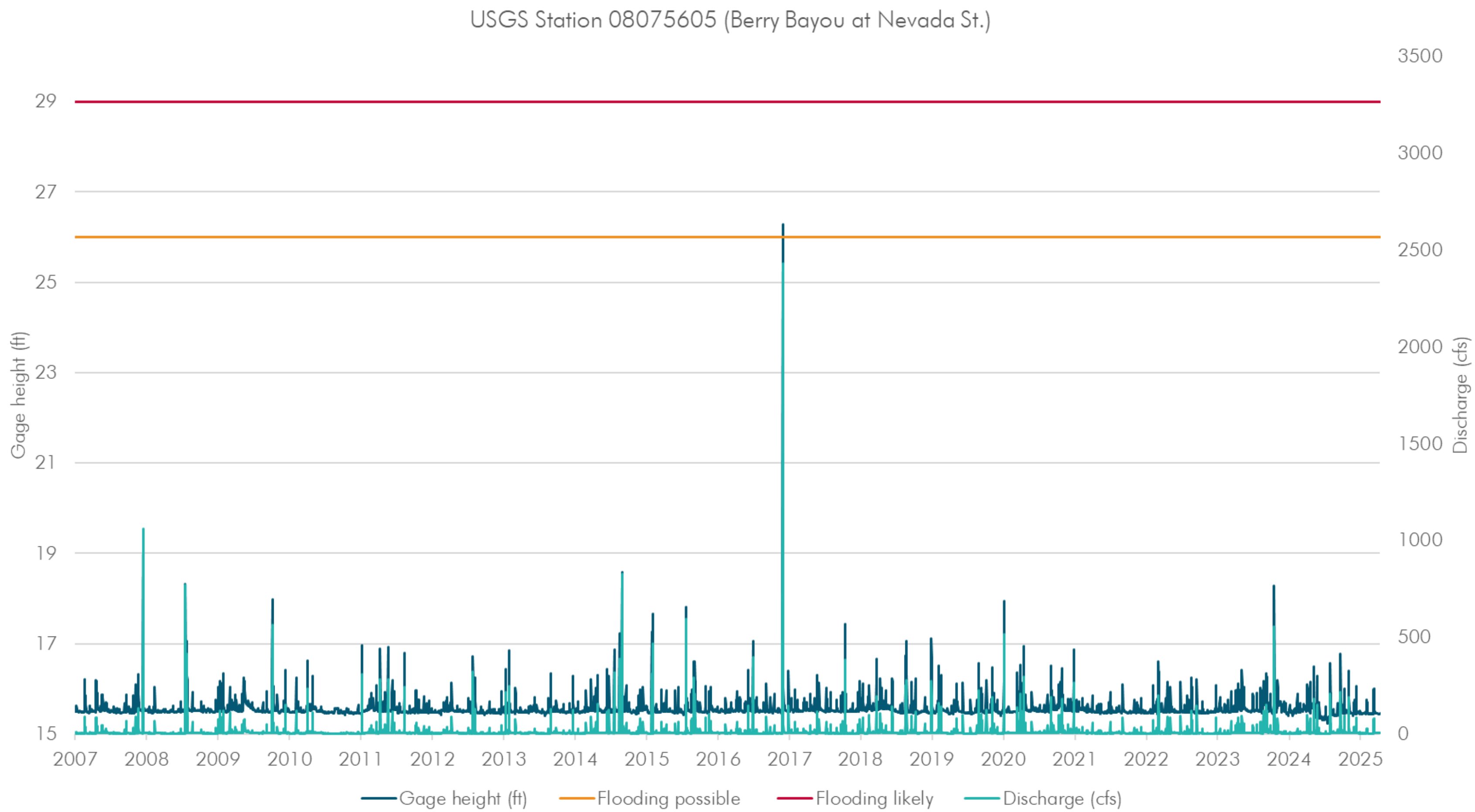

Figure 11. Gage height (ft) and discharge (cfs) for USGS site 08075605 located at Berry Bayou at Nevada St. for the period of record (10/1/2007-12/31/2025). The orange line corresponds to the "flooding possible" elevation (26 ft) and the red line is the "flooding likely" elevation (29 ft) per the HCFCD site 310.

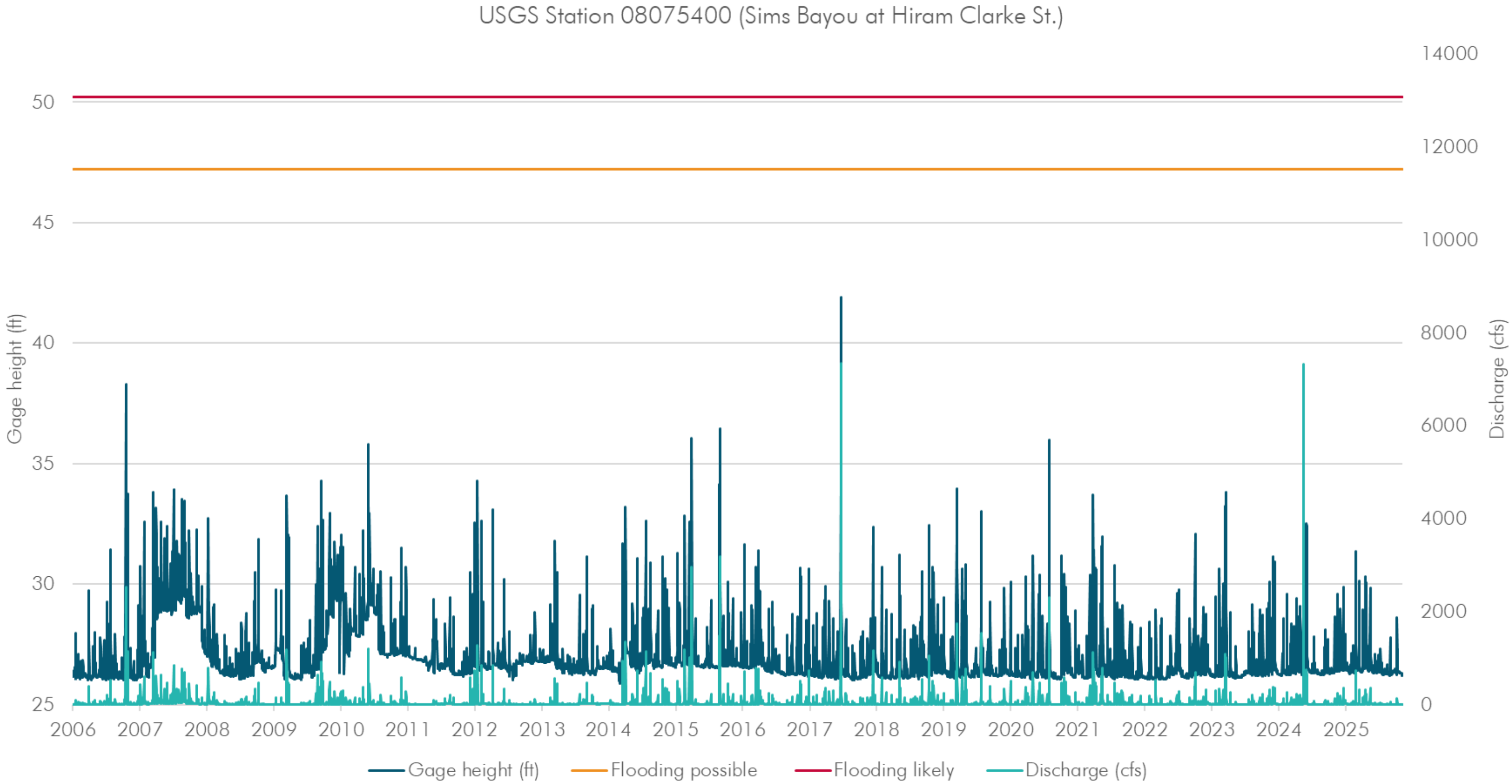

Figure 12. Gage height (ft) and discharge (cfs) for USGS site 08075400 located at Sims Bayou at Hiram Clarke St. for the past 20 years (2006-2025). The orange line corresponds to the "flooding possible" elevation (47.2 ft) and the red line is the "flooding likely" elevation (50.2 ft) per the HCFCD site 380.

PRECIPITATION

Precipitation is one of the primary factors affecting stream flow in the Brays Bayou and Sims Bayou watersheds. During rainfall events, water runoff from the surrounding land flows into the bayou. This runoff results in a rise in the water level and increased flow, which can lead to flooding in low-lying areas adjacent to the bayou. Seasonal changes and the movement of storm systems largely control the amount and timing of precipitation.

The Houston William P Hobby Airport, TX (HGX) National Weather Service weather station is located at latitude 29.63750, longitude -95.28250 within the Sims Bayou watershed. The average annual rainfall over the past 40 years (1986-2025) is 52.4 inches/year (Figure 13). The month of June has seen the highest average rainfall of 6.1 inches/month during this period of record.

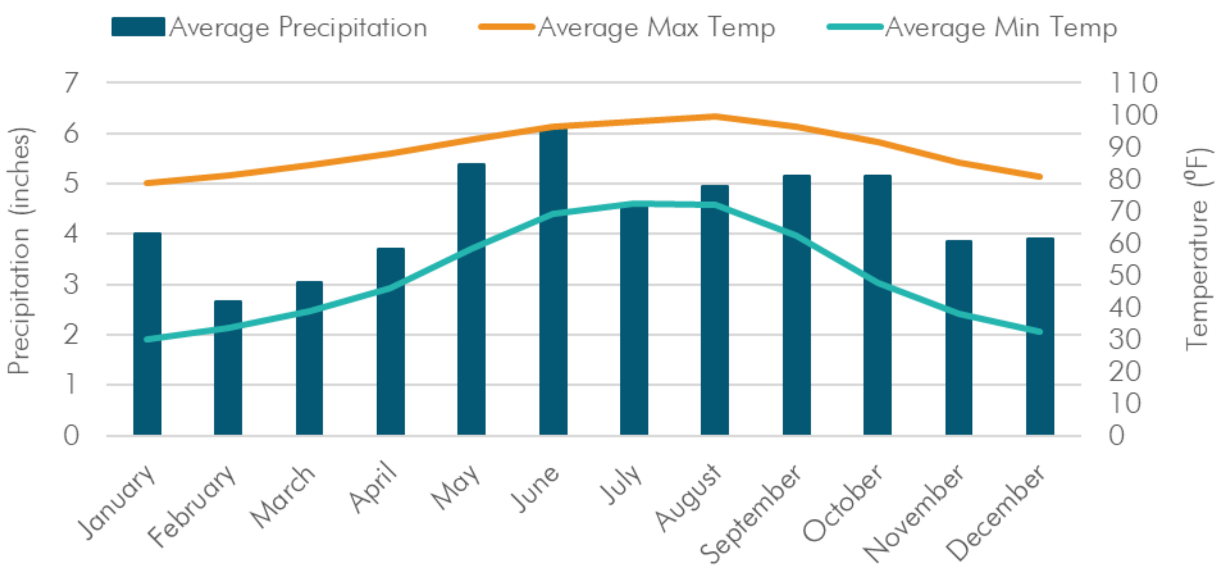

Figure 13. Average monthly precipitation in inches, and minimum and maximum air temperature from 1986 – 2025 at Houston William P Hobby Airport, TX (HGX) National Weather Service weather station. Source: https://www.ncdc.noaa.gov/cdo-web/datatools

HYDROLOGIC SOIL GROUPS

The most prevalent soil type in the Brays Bayou and Sims Bayou watersheds is clay (Table 4 and Figure 14). The predominant hydrologic soil group in both watersheds is D (96.19% for Brays and 98.17% for Sims). This soil group is characterized as having a very slow infiltration rate and high runoff potential. When there is a slow infiltration rate, stormwater, which often transports non-point source pollutants such as bacteria and nutrients, particularly in urbanized watersheds, flows into surface waters more quickly and at high rates. There are no hydrologic soil groups: A-sand, B-sandy loam, loamy sand, and A/D-sand in the Brays Bayou and Sims Bayou watersheds, therefore those soil groups were excluded from Table 4 and Figure 14.

Table 4. Hydrologic soil groups by area in the Brays Bayou and Sims Bayou watersheds. Corresponds with Figure 14. Hydrologic soil groups: A-sand, B-sandy loam, loamy sand, and A/D-sand are not found in these watersheds.

Watershed	Hydrologic Soil Group	Soil Texture Class	Typical Soil Composition	Infiltration Rate	Runoff Potential	Area Square Miles	Area %
Brays	C	Clay loam, Silty clay loam, Sandy clay loam, Loam, Silty loam, Silt	20 – 40% clay, <50% sand	Slow	Moderately High	1.00	0.78
Brays	D	Clay, Silty clay, Sandy clay	>40% clay, <50% sand	Very Slow	High	123.73	96.19
Brays	B/D	Sandy loam, Loamy sand	10 – 20% clay, 50 – 90% sand	Very Slow (Moderate if drained)	High (Moderate if drained)	1.65	1.28
Brays	C/D	Clay loam, Silty clay loam, Sandy clay loam, Loam, Silty loam, Silt	20 – 40% clay, <50% sand	Very Slow (Slow if drained)	High	2.25	1.75
Sims	C	Clay loam. Silty clay loam, Sandy clay loam, Loam, Silty loam, Silt	20 – 40% clay, <50% sand	Slow	Moderately High	0.33	0.35
Sims	D	Clay, Silty clay, Sandy clay	>40% clay, <50% sand	Very Slow	High	91.80	98.17
Sims	B/D	Sandy loam, Loamy sand	10 – 20% clay, 50 – 90% sand	Very Slow (Moderate if drained)	High (Moderate if drained)	0.25	0.27
Sims	C/D	Clay loam, Silty clay loam, Sandy clay loam, Loam, Silty loam, Silt	20 – 40% clay, <50% sand	Very Slow (Slow if drained)	High	1.13	1.21

Source: Natural Resources Conservation Service at https://www.nrcs.usda.gov/

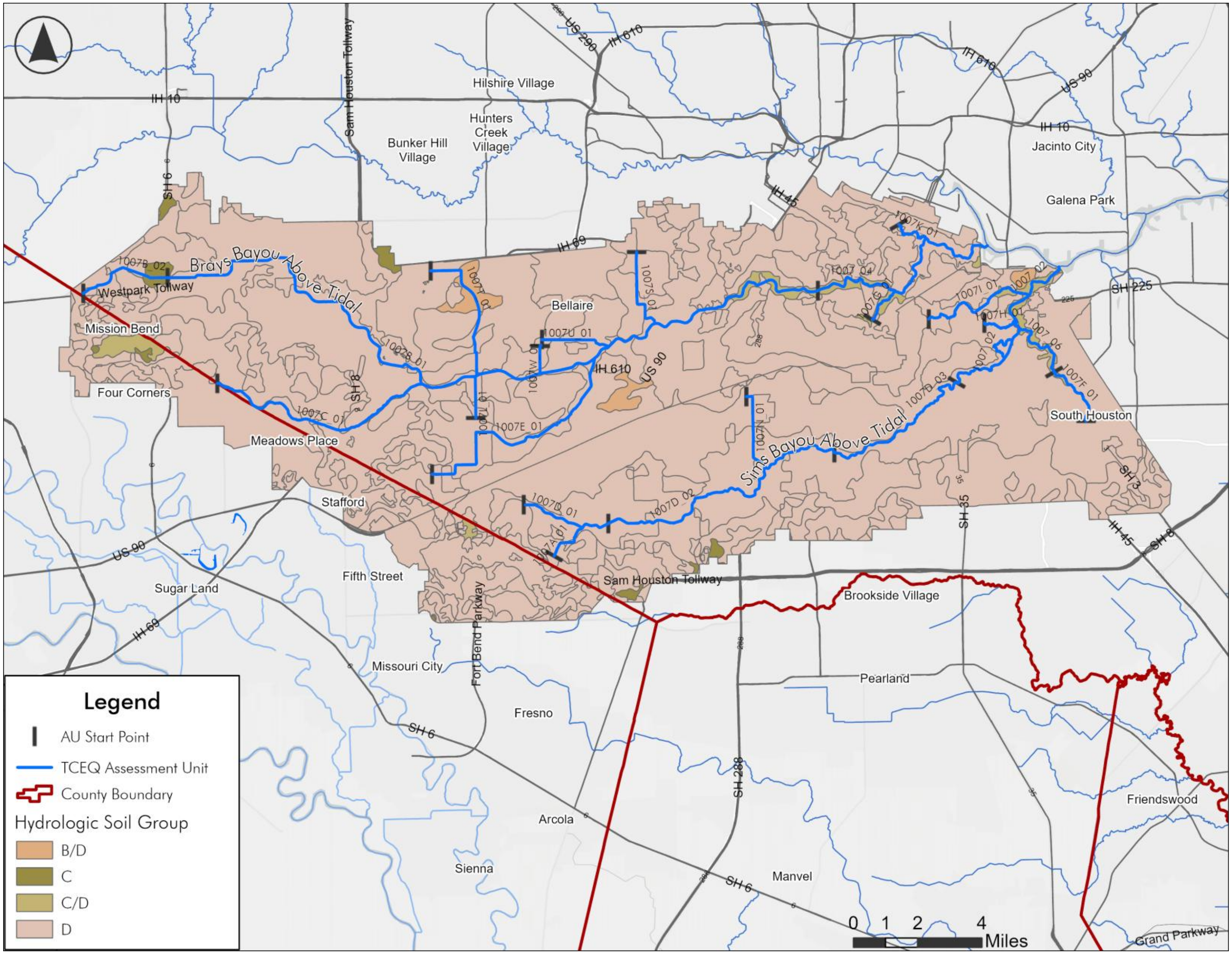

Figure 14. Hydrologic soil groups in the Brays Bayou and Sims Bayou watersheds. Corresponds with Table 4.

LAND COVER AND NATURAL CHARACTERISTICS

H-GAC prepares land cover assessments for the region, with the most recent completed in 2022 from 2022 aerial imagery (H-GAC, 2022). The Brays Bayou and Sims Bayou watersheds were classified into ten land cover classes. Both watersheds are mostly developed with only 1.06% and 5.68% of Brays Bayou and Sims Bayou classified as rural, respectively. (Table 5 and Figure 15). The developed areas can be described as mostly medium intensity (51.7 mi^2 or 40.2% for Brays Bayou and 30.5 mi^2 or 32.6% for Sims Bayou). The remaining developed areas in descending order of size for Brays Bayou are high intensity, low intensity, and open space at 30.9%, 18.6% and 9.3%, respectively. The remaining developed areas in descending order of size for Sims Bayou are low intensity, open space, and high intensity at 23.9%, 21.5% and 15.9%, respectively.

The dominant non-developed land use and largest land cover category for the Brays Bayou watershed is open water (0.72 mi^2 or 0.56%). This is indicated by small waterbodies concentrated in the western portion of the watershed. The second largest land cover category is wetlands at 0.38%. Forest/shrub is estimated to make up 0.08% of the watershed, and agricultural land area is estimated at 0.04% of the watershed between pasture/grasslands and croplands.

For the Sims Bayou watershed, the dominant non-developed land use and largest land cover category is wetlands (2.50 mi^2 or 2.68%), which are scattered throughout the central and eastern portions of the watershed. Agricultural land area, estimated at 1.80 mi^2 or 1.90% between pasture/grasslands and croplands, is spread across much of the watershed. Open water is estimated to be at 0.86%, with the smallest land category estimated to be forest/shrub at 0.69%.

Table 5. Land use and land cover for the Brays Bayou and Sims Bayou watersheds. Corresponds with Figure 15.

Watershed	Land Cover Class[1]	Land Cover Description	Area mi^2	Area %
Brays	Barren Land	Barren lands and unconsolidated shore land areas	0.00	0.00
Brays	Cropland	Areas intensely managed to produce annual crops. Crop vegetation accounts for greater than 20% of total vegetation or actively tilled.	0.01	0.01
Brays	Developed, High Intensity	Contains significant land area that is covered by concrete, asphalt, and other constructed materials. Vegetation, if present, occupies < 20% of the landscape.	39.69	30.85
Brays	Developed, Low Intensity	Contains areas with a mixture of constructed materials and substantial amounts of vegetation or other cover. Constructed materials account for 21% to 49% of total area.	23.90	18.58
Brays	Developed, Medium Intensity	Contains area with mixture of constructed materials and vegetation or other cover. Constructed materials account for 50% to 79% of the total area.	51.69	40.18
Brays	Developed, Open Space	Contains areas with a mixture of some constructed materials, but mostly managed grasses or low-lying vegetation planted in developed areas for recreation, erosion control, or aesthetic purposes.	11.99	9.32
Brays	Forest/Shrub	Composite class that contains all three forest land types (deciduous, evergreen, and mixed forest) and shrub lands.	0.10	0.08
Brays	Open Water	Composite class that contains open water and both palustrine and estuarine aquatic beds.	0.72	0.56
Brays	Pasture/ Grassland	Composite class that contains both Pasture/Hay lands and Grassland/Herbaceous	0.048	0.04
Brays	Wetlands	Composite class that contains all the palustrine and estuarine wetland land types.	0.49	0.38
Sims	Barren Land	Barren lands and unconsolidated shore land areas	<0.01	0.01
Sims	Cropland	Areas intensely managed to produce annual crops. Crop vegetation accounts for greater than 20% of total vegetation or actively tilled.	0.42	0.45
Sims	Developed, High Intensity	Contains significant land area that is covered by concrete, asphalt, and other constructed materials. Vegetation, if present, occupies < 20% of the landscape.	14.87	15.90
Sims	Developed, Low Intensity	Contains areas with a mixture of constructed materials and substantial amounts of vegetation or other cover. Constructed materials account for 21% to 49% of total area.	22.31	23.85
Sims	Developed, Medium Intensity	Contains area with mixture of constructed materials and vegetation or other cover. Constructed materials account for 50% to 79% of the total area.	30.49	32.61
Sims	Developed, Open Space	Contains areas with a mixture of some constructed materials, but mostly managed grasses or low-lying vegetation planted in developed areas for recreation, erosion control, or aesthetic purposes.	20.12	21.51
Sims	Forest/Shrub	Composite class that contains all three forest land types (deciduous, evergreen, and mixed forest) and shrub lands.	0.64	0.69
Sims	Open Water	Composite class that contains open water and both palustrine and estuarine aquatic beds.	0.81	0.86
Sims	Pasture/ Grassland	Composite class that contains both Pasture/Hay lands and Grassland/Herbaceous	1.36	1.45
Sims	Wetlands	Composite class that contains all the palustrine and estuarine wetland land types.	2.51	2.68

[1] Source: [2022 15 County 15 Class | H-GAC Regional GIS Data Hub]

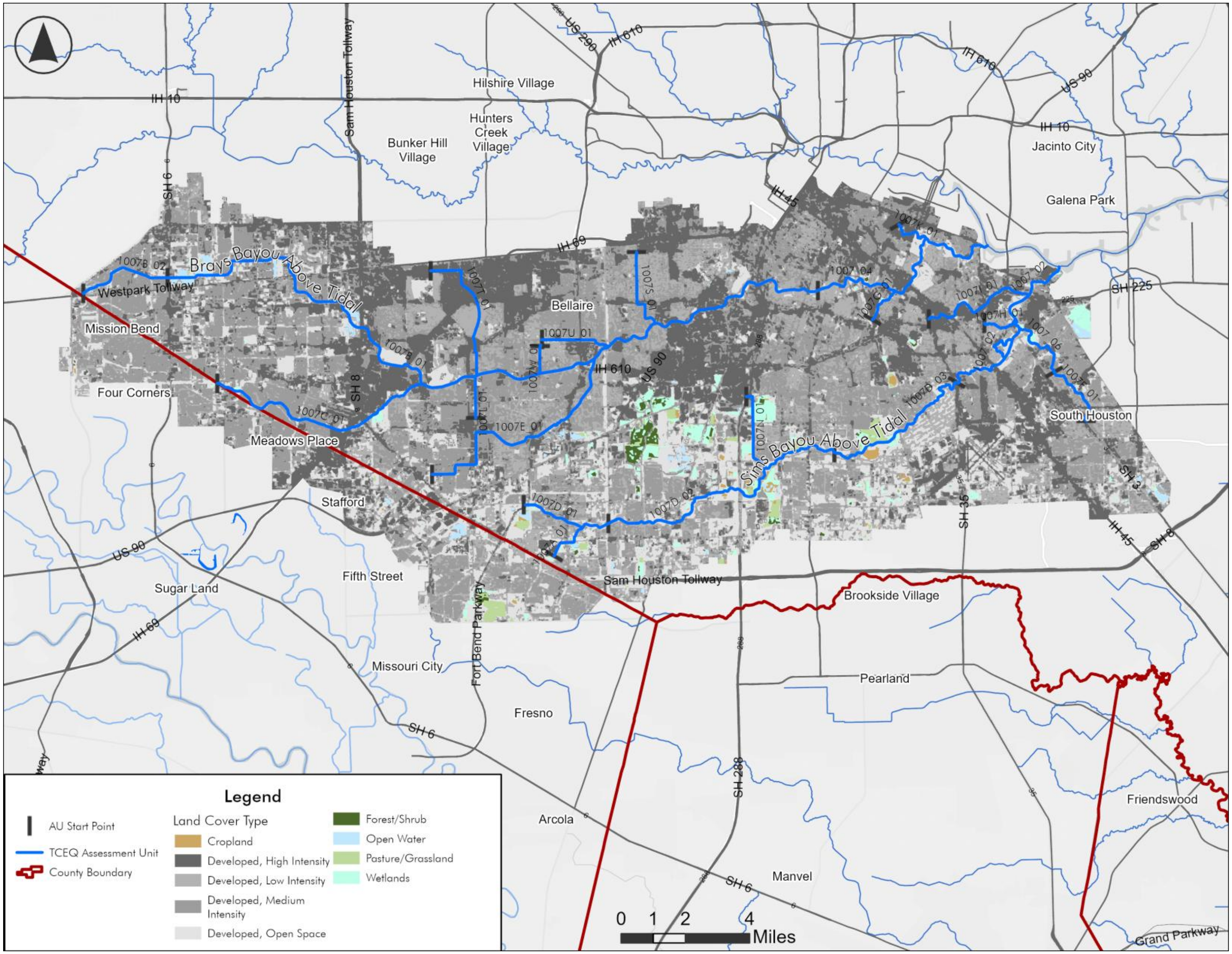

Figure 15. Land use and land cover for the Brays Bayou and Sims Bayou watersheds. Corresponds with Table 5.

POPULATION

H-GAC estimated the 2022 population for the Brays Bayou and Sims Bayou watersheds to be 831,899 and 342,489, respectively (Table 6) (H-GAC, 2024a). The respective number of households within the Brays Bayou and Sims Bayou watersheds was 313,329 and 110,695 in 2022. Both watersheds, like most watersheds in the H-GAC region, will likely experience continued growth over the next few decades. By 2050, H-GAC estimates the population in the Brays Bayou watershed will increase to 995,215 for a net growth rate of 19.63% between 2022 and 2050 (H-GAC, 2024a). For the Sims Bayou watershed, H-GAC estimates the population will increase to 458,644 for a net growth rate of 33.91% between 2022 and 2050 (H-GAC, 2024a).

Table 6. 2022 and projected[1] 2050 population for the Brays Bayou and Sims Bayou watersheds.

Watershed	2022 Population	2022 Household	2050 Population	2050 Household	% Projected Population Change (2022-2050)[1]
Brays	831,899	313,329	995,215	388,829	19.63%
Sims	342,489	110,695	458,644	173,093	33.91%

[1]Sources: H-GAC's Regional Growth Forecast (https://www.h-gac.com/regional-growth-forecast).

MAJOR WATERSHED EVENTS - FLOODING

HISTORY OF MAJOR FLOODING

Flooding is a persistent and significant hazard for the H-GAC region, impacting millions of residents, critical infrastructure, and economic vitality. The Brays Bayou and Sims Bayou watersheds have experienced a long history of floods that have shaped Houston-region flood disaster mitigation efforts. Harris County, where the Brays Bayou and Sims Bayou watersheds are located, is notably prone to flooding due to its dense population, rapid urbanization, and flat topography. Major flood events in recent decades have highlighted the urgent need for robust mitigation and planning to protect the area's people and assets from future flood risks. These watersheds exemplify both the challenges of flooding in a highly developed coastal city and the innovative solutions that have emerged to address these challenges. Understanding this history and the management practices implemented provide valuable context for ongoing watershed protection efforts.

Since the early settlement of Houston, residents have contended with flooding (HCFCD 2026c). Flooding along Brays Bayou has been documented as early as 1843. As agricultural and pasture lands in the floodplains were replaced by housing subdivisions throughout the mid-20th century, flooding became increasingly problematic.

Tropical Storm Allison (2001)

Tropical Storm Allison, which struck Houston in June 2001, became a watershed moment, both literally and figuratively, for flood control policy in the region. The storm dumped nearly 40 inches of rain over several days, making it the costliest tropical storm in U.S. history at the time (NWS 2011). In Harris County alone, Tropical Storm Allison caused 23 deaths, flooded 35,000 homes (FEMA 2021), and resulted in approximately $5 billion in damages nation-wide (NOAA 2001). This catastrophic flooding prompted an overhaul of Harris County's floodplain maps and catalyzed federal and local investment in flood mitigation infrastructure.

Memorial Day Flood (2015) and Tax Day Flood (2016)

The Memorial Day Flood in May 2015 resulted from a slow-moving thunderstorm that dropped up to 11 inches of rain in just three hours flooding more than 6,000 structures and causing seven fatalities (HCFCD 2026c). Less than a year later, in April 2016, another significant flood event (the Tax Day Flood) brought additional rainfall and flooding to the region. These back-to-back events underscored the vulnerability of Houston's urban watersheds to intense, localized rainfall events.

Hurricane Harvey (2017)

Hurricane Harvey, which struck in August 2017, produced unprecedented rainfall totals over a four-day period. Harvey became the costliest natural disaster in Texas history and tied with Hurricane Katrina as the most expensive tropical cyclone on record at $125 billion in damages (NHC 2018, HCFCD 2026c).

In the Brays Bayou watershed, there was widespread flooding, with water levels exceeding those of Tropical Storm Allison by 0.5 to one foot downstream, and by one to two feet upstream of the 610 Loop (Blackburn and Borski 2023). Despite ongoing flood mitigation work, the storm averaged between the 50-year and 500-year flood levels along most of the bayou (Blackburn and Borski 2023).

In contrast, Sims Bayou, which had undergone extensive channel improvements prior to Harvey, performed comparably well. The main channel did not overflow during Harvey. This success demonstrated the tangible benefits of comprehensive flood reduction projects and validated the investments in channel improvements and detention basins.

CHANNEL IMPROVEMENTS AND FLOOD DAMAGE REDUCTION PROJECTS

Project Brays: The Brays Bayou Federal Flood Damage Reduction Project

Project Brays is the HCFCD’s largest flood damage reduction program undertaken to date (HCFCD 2026d). This multi-year, cooperative effort between the HCFCD and the U.S. Army Corps of Engineers (USACE) includes the widening of Brays Bayou from the Houston Ship Channel to Fondren Road and from West Houston Center Boulevard to State Highway 6 (e.g. Figure 16), the replacement or modification of 32 bridges, and excavation of four stormwater detention basins (HCFCD 2015).

Project Brays was completed in late 2022 after over 40 years from initial studies in the 1970s through final completion (HCFCD 2026d). Comprehensive planning for flood protection in the watershed and construction of flood damage reduction projects on and along Brays Bayou has occurred in the past and continues today (USACE 2021). There are 19 projects highlighted on the HCFCD’s Brays Bayou webpage.

Figure 16. Photo showcasing modifications to a bridge on Brays Bayou to allow for increase in bayou flow. Photo courtesy of Harris County Flood Control District.

Sims Bayou Federal Flood Damage Reduction Project

The Sims Bayou Federal Flood Damage Reduction Project is a partnership project between the USACE and the HCFCD. The project included 19.3 miles of bayou enlargements and environmental enhancements along Sims Bayou from the Houston Ship Channel to Croquet Lane, just west of South Post Oak Road, and the replacement or modification of 22 bridges that cross Sims Bayou (e.g. Figure 17) (HCFCD, 2026e). The design included prioritization of earthen channels rather than concrete channelization, and in parts, trees were replanted within the floodway. The project's success during Hurricane Harvey demonstrated the tangible benefits of comprehensive flood reduction projects and the investment in channel improvements.

In addition to these projects, there are many capital improvement projects (CIP) occurring throughout the City of Houston. Half of the CIP are going towards improving the city's water and wastewater infrastructure, with the water utility system receiving $4.3 billion and wastewater treatment facilities receiving $3.8 billion. To learn more, visit the City of Houston's Capital Improvement Projects website: Capital Improvement Projects.

Funding flood-related projects in areas covered by these watersheds can originate from a variety of sources. The Hazard Mitigation Grant Program (HMGP) administered by the Federal Emergency Management Agency (FEMA), the Texas General Land Office (GLO), the Texas Water Development Board (TWDB), and other federal, state, and local agencies all support projects designed to increase community resilience to flooding. Funding can be used for planning, infrastructure improvements, and other solutions identified through regional and state flood planning efforts. It is important to note that funding eligibility for projects is determined by what has been included in previous planning efforts.

Figure 17. Photo of construction work under the Federal Flood Damage Reduction Project on Sims Bayou at W Orem Dr. Photo courtesy of U.S. Army Corps of Engineers - Galveston District U.S.

Texas' State Flood Plan and Future Updates

The 2024 State Flood Plan, produced by the TWDB, is Texas's first attempt to integrate regional flood planning efforts into a single, statewide policy framework. The Plan incorporates strategies, project lists, and policies developed by regional flood planning groups and is intended to guide flood risk reduction initiatives across Texas, including Houston and the H-GAC region. This living document is scheduled for its next update in 2028, which will build upon new data and findings, including results from GLO's 2020 Combined River Basin Flood Studies.

The Plan's continued evolution ensures that flood mitigation efforts are based on the best available science and reflect changing risk profiles and infrastructure needs. The incorporation of updated flood study data in each planning cycle is crucial for guiding investments, prioritizing projects, and determining eligibility for future funding opportunities.

GLO Combined River Basin Flood Studies

After Hurricane Harvey in 2017, the GLO launched the Combined River Basin Flood Studies covering 49 counties impacted by presidential disaster declarations, and several counties affected by earlier flooding. The studies focus on increasing regional resiliency, helping communities identify effective mitigation strategies, and supporting efforts to secure additional funding for flood reduction.

These studies deliver critical, high-resolution flood risk data that local governments and planning organizations can use to inform their decisions. Results from the Combined River Basin Flood Studies directly inform the next round of regional flood plans due in 2028. These plans will heavily influence which projects are considered eligible for state and federal grant funding. Integrating cutting-edge data from the GLO studies ensures that funding is allocated based on the most up-to-date understanding of hazards and priorities, supporting a smarter and more resilient approach to flood risk management.

Hazard Mitigation Plans

A Hazard Mitigation Plan (HMP), as defined by FEMA, is a strategic document developed by state, tribal, and local governments to identify natural hazards and disasters, assess their risks and vulnerabilities, and outline long-term strategies and specific actions to reduce or eliminate the impacts of these hazards on people and property. The plan serves as the essential blueprint for building community resilience, helping guide investments and decision-making before disasters strike. FEMA requires approved hazard mitigation plans for communities to be eligible for certain types of non-emergency disaster assistance, including mitigation grants. These plans are vital tools for identifying, prioritizing, and guiding funding for projects that reduce the impacts of disasters from *natural* hazards, including flooding.

For more information on H-GAC's ongoing and past hazard mitigation planning initiatives, visit the H-GAC Hazard Mitigation Planning webpage.

BEST MANAGEMENT PRACTICES FOR FLOOD MITIGATION

Modern flood mitigation in Houston increasingly relies on a combination of "gray" infrastructure (traditional engineered solutions like channels and detention basins) and "green" infrastructure (nature-based solutions). This integrated approach provides multiple benefits including flood reduction, water quality improvement, habitat creation, and enhanced community amenities. There are many different nature-based stormwater infrastructure options that are designed to slow the flow of stormwater, allowing for higher infiltration into the soil while providing co-benefits like water quality improvement. Where soils have low infiltration rates, these types of features can be designed with perforated underdrains that tie-into stormwater drainage systems allowing for reduction in peak flows while still providing water quality improvements. They vary by scale and scope, but some of the main types of nature-based stormwater infrastructure are introduced below. Please visit the U.S. Environmental Protection Agency (EPA) National Menu of Best Management Practices for Stormwater, the Texas Agrilife Green Infrastructure Toolkit, and H-GAC's Low Impact Development websites for more resources and additional information for homeowners, municipalities, and industry.

Detention basins are large, excavated areas connected to a bayou or channel, designed to store excess stormwater until the threat of flooding has passed and water can safely drain back into the waterway. These basins typically work passively through gravity and elevation differences.

The detention basins constructed as part of Project Brays have multiple benefits including flood control, recreational opportunities through integrated trail systems, water quality improvement, and wildlife habitat. An example of a nature-based stormwater detention basin in the Brays Bayou watershed is Willow Waterhole which was completed in 2019 (Figure 18). This system can hold up to 600 million gallons of stormwater and includes 279 acres of greenspace with trails and playgrounds.

Bioretention areas are shallow, landscaped depressions that capture rainwater from rooftops, sidewalks, streets, and parking lots. They are designed to allow water to temporarily pond when it rains and increase infiltration into the ground, reducing the immediate flow of the stormwater into the waterways.

Permeable pavements such as porous asphalt, and permeable interlocking concrete pavers, unlike impermeable surfaces such as asphalt or concrete, allow stormwater to infiltrate through porous surfaces into the soil or connect to stormwater drainage systems through underdrains.

Vegetated swales are grass-lined drainage paths or vegetated channels used to transport stormwater. They can be used in small drainage areas with low runoff instead of underground storm sewers or open concrete channels. As linear features, they are particularly well suited to being placed along streets and parking lots.

Rainwater harvesting systems, including cisterns and rain barrels, collect and store rainwater from rooftops and other structures to be reused for other purposes such as irrigation. By storing and diverting stormwater, these devices help reduce the flooding, erosion, and polluted runoff that intense rainfall can cause.

For properties located deep within floodplains where no feasible amount of infrastructure improvement can meaningfully reduce flood risk, voluntary and mandatory buyout programs offer an alternative solution. Along with many structural mitigation measures such as channelization and detention facilities, the HCFCD has also pursued acquisition and buyout as a non-structural mitigation measure (HCFCD 2026f).

The Harris County voluntary buyout program was initiated in 1985, although federal funds were not granted until the nineties (FEMA, 2026a). Following the catastrophic flood caused by Hurricane Harvey, Harris County quickly approved local funds to purchase and permanently remove some of the worst-flooded homes. These local funds along with federal funds from FEMA resulted in additional acquisition and removal of properties as a part of the Hazard Mitigation Grant Program (FEMA 2018a; FEMA 2018b). Once the structures are removed, the land is dedicated and maintained as open space to conserve natural floodplain functions. To learn more about the home buyout program visit the HCFCD website: https://www.hcfcd.org/Activity/Additional-Programs/Home-Buyout-Program.

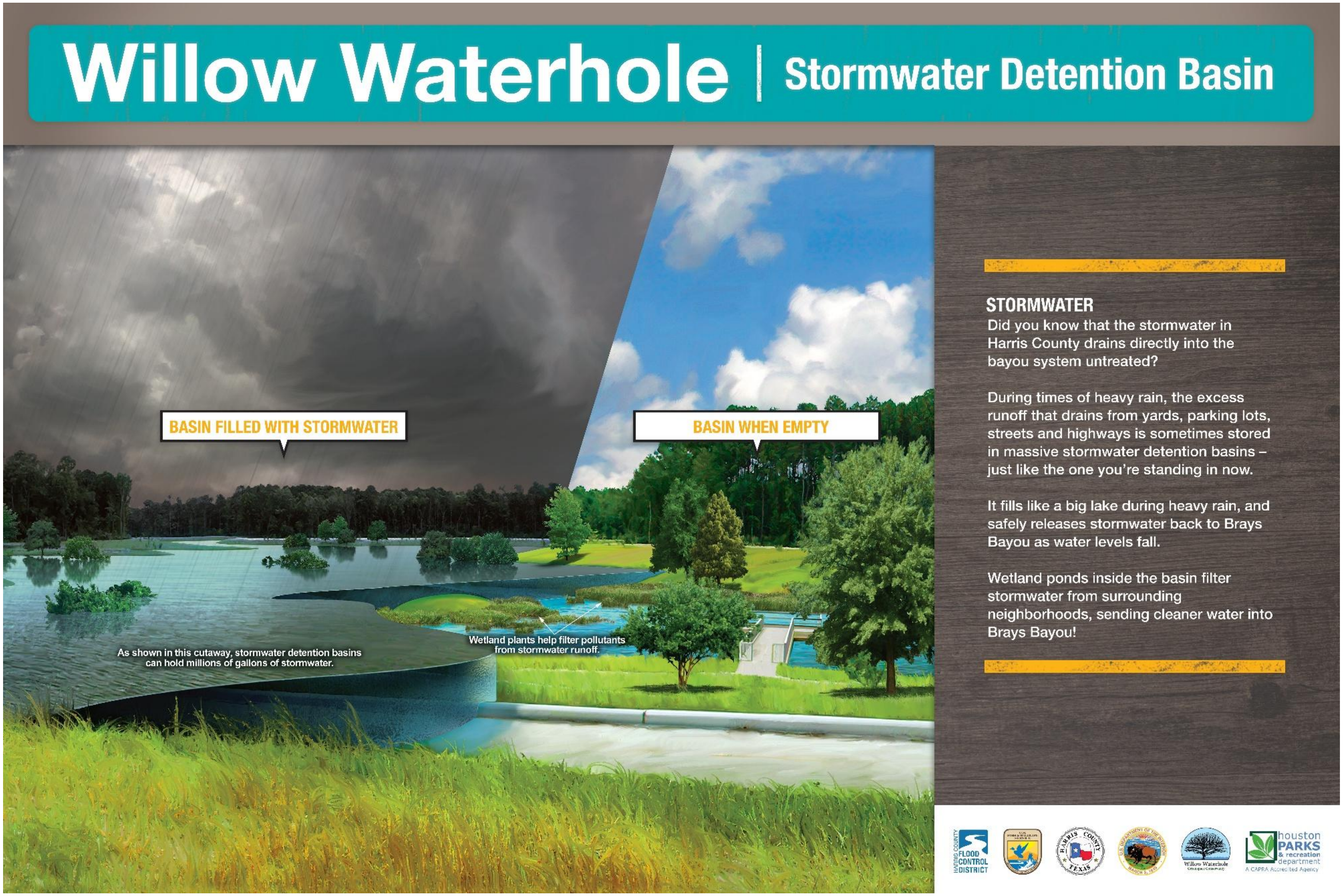

Figure 18. Willow Waterhole stormwater detention basin sign. Accessed from: https://www.hcfcd.org/Activity/Projects/Brays-Bayou/Willow-Waterhole-Prairie-Management-Area on February 13, 2026.

Looking forward, the region is embracing an integrated approach that combines traditional gray infrastructure with innovative nature-based infrastructure and low impact development practices. This combination addresses not only flooding but also water quality, habitat, heat island effects, and community amenity needs. By learning from past flooding events and implementing best management practices (BMPs) at multiple scales, the region can build greater resilience to future storms while improving water quality and quality of life for residents.

FLOOD MAPPING RESOURCES

Floodplain Maps

The FEMA floodplain maps identify areas at varying levels of flood risk and are widely used for insurance requirements, building regulations, and personal preparedness. Residents can access these maps through FEMA's Flood Map Service Center to search by address, view effective Flood Insurance Rate Maps (FIRMs), and compare them with recently released draft updated maps, which incorporate newer rainfall data and improved modeling (FEMA, 2026b). These draft updates may change which properties fall within the 100-year or 500-year floodplains, potentially affecting insurance costs, regulatory requirements, and understanding of personal flood exposure (FEMA, 2026b). Together, the effective and draft maps provide a valuable resource for understanding current and future flood risks and for making informed decisions about safety and property planning. To view the Harris County interactive floodplain map, visit the website: https://www.maapnext.org/Interactive-Map

Flood Warning System

The HCFCD's Flood Warning System provides real-time rainfall, stream level, and flood stage data from a network of gages across the county, helping residents monitor flood risk as storms develop (HCFCD, 2026g). Users can access the online dashboard to view color-coded maps, station status, and trend graphs, and can customize alerts for specific bayous or locations to receive timely notifications. The system can serve as a critical resource, offering up-to-the-minute information to support preparedness and decision-making during severe weather events. To visit the interactive Flood Warning System map, visit the website: https://www.harriscountyfws.org/

SEGMENT CHARACTERIZATION: BRAYS BAYOU AND SIMS BAYOU

SEGMENT DESCRIPTIONS

Brays Bayou and its tributaries are approximately 57.5 miles long and contain 11 total segments and 12 AUs (Table 7). Sims Bayou and its tributaries are approximately 34 miles long and contain 7 segments and 10 AUs. Both watersheds include non-tidal and tidal segments that flow into Buffalo Bayou/Houston Ship Channel (AU 1007_01).

There are a total of 24 active routine monitoring stations in the Brays Bayou watershed and 15 active routine monitoring stations in the Sims Bayou watershed for the FY 2026 Coordinated Monitoring Schedule (Table 8 and Figure 19). The submitting and collecting entities, monitoring type (i.e., routine, biased, etc.), number of monitoring events per year, and parameter groups collected are presented in Table 8. In addition, there are three historic monitoring stations (21750, 22438, and 22439) located in the Brays Bayou watershed, in AU 1007B_01, that are associated with biased flow monitoring and were not included in this report. To explore site-specific data and photos for all of the routine monitoring stations visit H-GAC's Water Resources Information Map (WRIM), an interactive application intended to help stakeholders explore, visualize, and understand water quality data to support regional water quality planning. There are representative photos of the lower and upper Brays Bayou and Sims Bayou segments provided in Figure 20 through Figure 23.

Table 7. Assessment unit descriptions for the segments in the Brays Bayou and Sims Bayou watersheds.

Watershed	Segment ID	Segment Name	AU ID	AU Description	AU Length (mi)
Brays	1007	Houston Ship Channel/Buffalo Bayou Tidal	1007_04	Brays Bayou Tidal - From the Houston Ship Channel confluence to downstream of IH-45	6.86
Brays	1007B	Brays Bayou Above Tidal	1007B_01	From a point 11.5 km (7.1 mi) upstream of confluence with Houston Ship Channel up to SH 6	22.00
Brays	1007B	Brays Bayou Above Tidal	1007B_02	From State Highway 6 upstream to Clodine Road	2.64
Brays	1007C	Keegans Bayou Above Tidal	1007C_01	From the Brays Bayou confluence to the Harris County Line	6.65
Brays	1007E	Willow Waterhole Bayou Above Tidal	1007E_01	From the Brays Bayou confluence upstream to South Garden Street	6.99
Brays	1007G	Kuhlman Gully Above Tidal	1007G_01	From Brays Bayou confluence to Atchison, Topeka and Santa Fe Railroad tracks	1.09
Brays	1007K	Country Club Bayou Above Tidal	1007K_01	From just downstream of South Lockwood Drive to the confluence with Brays Bayou	1.25
Brays	1007L	Unnamed Non-Tidal Tributary of Brays Bayou	1007L_01	From the Brays Bayou confluence near Fondren Road to a point 0.7 km (0.43 mi) upstream of Willowbend Blvd in Harris County	1.12
Brays	1007S	Poor Farm Ditch	1007S_01	From the Brays Bayou confluence upstream 3.6 km (2.3 mi) to the Bissonnet Road bridge crossing	2.33
Brays	1007T	Bintliff Ditch	1007T_01	From the Brays Bayou confluence to 0.57 km (0.35 mi) upstream of the Fondren Road bridge crossing	3.90
Brays	1007U	Mimosa Ditch	1007U_01	From the Brays Bayou confluence upstream 2.9 km (1.8 mi) to the Chimney Rock bridge crossing	1.90
Brays	1007W	Harris County Flood Control Ditch D 138	1007W_01	From the confluence with Brays Bayou to a point immediately south of Beechnut Street in Houston	0.77
Sims	1007	Houston Ship Channel/Buffalo Bayou Tidal	1007_02	Sims Bayou Tidal - From the Houston Ship Channel confluence to a point 11 km (6.8 mi) upstream	6.75
Sims	1007	Houston Ship Channel/Buffalo Bayou Tidal	1007_06	Berry Bayou - From the Houston Ship Channel confluence to a point 2.4 km (1.5 mi) upstream of the Sims Bayou confluence	2.05
Sims	1007A	Canal C-147	1007A_01	From the confluence with Sims Bayou upstream to a point 0.71 km east of Beltway 8	1.27
Sims	1007D	Sims Bayou Above Tidal	1007D_01	From Fort Bend Parkway to Hiram Clarke	2.52
Sims	1007D	Sims Bayou Above Tidal	1007D_02	From Hiram Clark to 11 miles upstream of the confluence with the Houston Ship Channel	7.87
Sims	1007D	Sims Bayou Above Tidal	1007D_03	From 11 miles upstream of the Houston Ship Channel confluence to SH 35	4.78
Sims	1007F	Berry Bayou Above Tidal	1007F_01	From a point 2.4 km (1.5 mi) upstream of the Sims Bayou confluence to SH 3	1.89
Sims	1007H	Pine Gully Above Tidal	1007H_01	From the Sims Bayou confluence to 0.11 km (0.07 mi) east of Broadway Street	1.06
Sims	1007I	Plum Creek Above Tidal	1007I_01	From the Sims Bayou confluence to Telephone Road in Harris County	3.55
Sims	1007N	Unnamed Non-Tidal Tributary of Sims Bayou	1007N_01	From the confluence with Sims Bayou, south of Airport Road, upstream to SH 288 in Harris County	2.26

Table 8. FY 2026 active monitoring stations in the Brays Bayou and Sims Bayou watersheds. Corresponds with Figure 19.

Watershed	Segment ID	Assessment Unit (AU)	Station ID	Station Description	SE[2]	CE[3]	MT[4]	Scheduled Monitoring Events Per Year			
								Field	Conv.	Bact.	Flow
Brays	1007	1007_04	11306	BRAYS BAYOU TIDAL AT 75TH ST	WC	FO	RT	3	3	3	
Brays	1007	1007_04	11309	BRAYS BAYOU AT SCOTT ST	HG	HH	RT	6	6	6	
Brays	1007	1007_04	16479	BRAYS BAYOU AT SOUTH WAYSIDE	HG	HH	RT	6	6	6	
Brays	1007B	1007B_01	11138	BRAYS BAYOU AT ALMEDA ROAD	HG	HH	RT	6	6	6	
Brays	1007B	1007B_01	11139	BRAYS BAYOU AT SOUTH MAIN ST	HG	HH	RT	6	6	6	6
Brays	1007B	1007B_01	11140	BRAYS BAYOU AT SOUTH GESSNER	HG	HH	RT	6	6	6	6
Brays	1007B	1007B_01	15850	BRAYS BAYOU AT DAIRY ASHFORD	HG	HH	RT	6	6	6	
Brays	1007B	1007B_01	15851	BRAYS BAYOU AT WILCREST DRIVE	HG	HH	RT	6	6	6	
Brays	1007B	1007B_01	15852	BRAYS BAYOU AT BEECHNUT STREET	HG	HH	RT	6	6	6	
Brays	1007B	1007B_01	15853	BRAYS BAYOU AT HILLCROFT ST	HG	HH	RT	6	6	6	
Brays	1007B	1007B_01	15854	BRAYS BAYOU AT S RICE AVENUE	HG	HH	RT	6	6	6	
Brays	1007B	1007B_01	15855	BRAYS BAYOU AT STELLA LINK RD	HG	HH	RT	6	6	6	
Brays	1007B	1007B_02	15848	BRAYS BAYOU AT SH 6	HG	HH	RT	6	6	6	
Brays	1007C	1007C_01	11169	BRAYS/KEEGAN BAYOU AT ROARK RD	HG	HH	RT	6	6	6	6
Brays	1007C	1007C_01	20211	KEEGAN'S BAYOU AT SYNOTT ROAD	HG	HH	RT	6	6	6	
Brays	1007E	1007E_01	16652	WILLOW WATERHOLE AT MCDERMED	HG	HH	RT	6		6	
Brays	1007G	1007G_01	16653	KUHLMAN GULLY AT BROCK ST	HG	HH	RT	6	6	6	
Brays	1007K	1007K_01	16650	COUNTRY CLUB BAYOU AT WAYSIDE	HG	HH	RT	6	6	6	
Brays	1007K	1007K_01	16651	COUNTRY CLUB BAYOU AT HUGHES	HG	HH	RT	6	6	6	
Brays	1007L	1007L_01	16654	TRIB BRAYS BAYOU AT DUMFRIES	HG	HH	RT	6	6	6	
Brays	1007S	1007S_01	18692	POOR FARM DITCH AT N BRAESWOOD	HG	HH	RT	6		6	
Brays	1007T	1007T_01	18690	BINTLIFF DITCH AT BISSONNET ST	HG	HH	RT	6		6	
Brays	1007U	1007U_01	18691	MIMOSA DITCH AT NEWCASTLE DR	HG	HH	RT	6		6	
Brays	1007W	1007W_01	21180	HCFCD D138 / AT CAVERSHAM DR	HG	HG	BS[5]				4
Brays	1007W	1007W_01	21180	HCFCD D138 / AT CAVERSHAM DR	HG	HH	RT	6	6	6	
Sims	1007	1007_02	11302	SIMS BAYOU TIDAL AT LAWNDALE	WC	FO	RT	3	3	3	
Sims	1007	1007_02	20736	SIMS BAYOU AT GALVESTON ROAD	HG	HH	RT	6	6	6	
Sims	1007	1007_06	16660	BERRY BAYOU AT HOWARD DRIVE	HG	HH	RT	6	6	6	
Sims	1007A	1007A_01	16656	SIMS BAYOU S BRANCH AT TIFFANY	HG	HH	RT	6		6	
Sims	1007D	1007D_01	11135	SIMS BAYOU AT HIRAM CLARKE RD	HG	HH	RT	6	6	6	6
Sims	1007D	1007D_01	17976	SIMS BAYOU AT S POST OAK RD	HG	HH	RT	6	6	6	
Sims	1007D	1007D_02	11133	SIMS BAYOU AT CULLEN BLVD	HG	HH	RT	6	6	6	
Sims	1007D	1007D_02	15876	SIMS BAYOU AT ALMEDA ROAD	HG	HH	RT	6	6	6	
Sims	1007D	1007D_03	11132	SIMS BAYOU AT TELEPHONE ROAD / SH35	HG	HH	RT	6	6	6	6
Sims	1007D	1007D_03	15877	SIMS BAYOU AT M L KING JR BLVD	HG	HH	RT	6	6	6	6
Sims	1007D	1007D_03	15878	SIMS BAYOU AT SWALLOW STREET	HG	HH	RT	6	6	6	
Sims	1007F	1007F_01	16661	BERRY BAYOU AT SOUTH RICHEY	HG	HH	RT	6	6	6	
Sims	1007H	1007H_01	16659	PINE GULLY AT OLD GALVESTON RD	HG	HH	RT	6	6	6	
Sims	1007I	1007I_01	16658	PLUM CREEK AT OLD GALVESTON RD	HG	HH	RT	6	6	6	
Sims	1007N	1007N_01	16655	TRIB OF SIMS BAYOU AT DULCIMER	HG	HH	RT	6	6	6	

[1] The Clean Rivers Program coordinated monitoring schedule for current and previous fiscal years can be located at cms.lcra.org

[2] Submitting Entity – The entity submitting monitoring data to TCEQ's Surface Water Quality Information System. HG = Houston-Galveston Area Council and WC=Texas Commission on Environmental Quality

[3] Collecting Entity – The entity collecting monitoring data. HG = Houston-Galveston Area Council, HH = Houston Health Department, FO=TCEQ Regional Office

[4]Monitoring Types – RT = Routine, BS = Biased to Season.

[5]In the case of the BS at station 21180, 24hr Dissolved Oxygen monitoring is being collected.

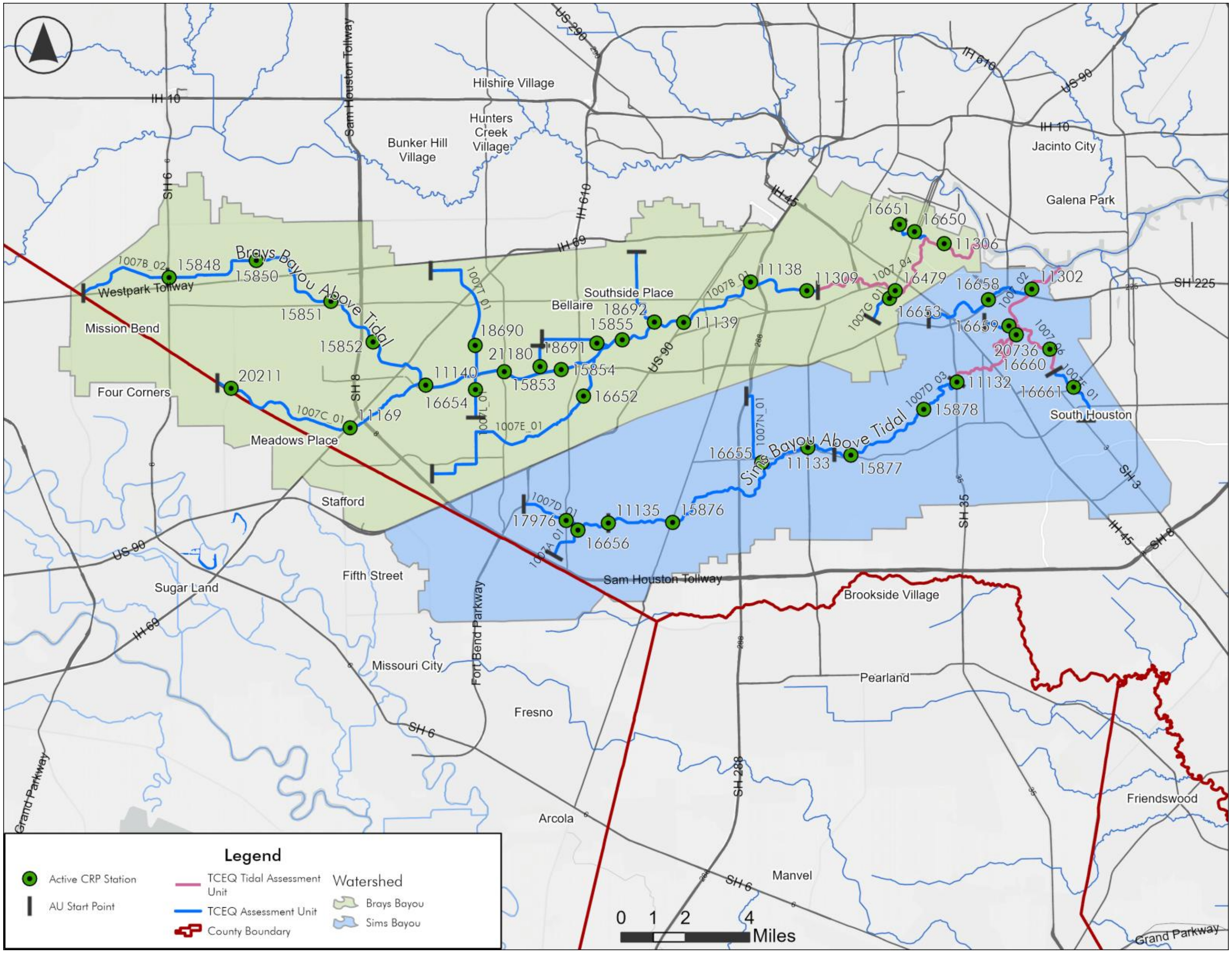

Figure 19. Map of Brays Bayou and Sims Bayou watersheds with TCEQ recognized segments and subsequent assessment units and all current routine monitoring stations. Corresponds with Table 8.

SEGMENT PHOTOS

Figure 20. Photo of Brays Bayou Tidal (1007_04) near site 11306 (Brays Bayou at 75th Street) facing upstream. Photo by C. Evans, Jr.

Figure 21. Photo of Brays Bayou Above Tidal (1007B_02) at site 15848 (Brays Bayou at SH6) facing upstream. Photo by the City of Houston Health Department.

Figure 22. Photo of Sims Bayou Tidal (1007_02) at Milby Park south of site 11302 (Sims Bayou at Lawndale Ave). Photo by Houston Parks and Recreation Department.

Figure 23. Photo of Sims Bayou Above Tidal (1007D_01) at site 17976 (Sims Bayou at S Post Oak Rd) facing downstream. Photo by the City of Houston Health Department.

DESCRIPTION OF WATER QUALITY ISSUES

WATER QUALITY STANDARDS AND CRITERIA

The tidal segments of Brays Bayou and Sims Bayou (1007) are classified and associated with the Houston Ship Channel. They are designated as navigation and industrial water supply (N/IS) and are assessed using the indicator bacteria enterococci. The remaining sixteen unclassified segments are assessed based on the statewide criteria of freshwater streams and designated as primary contact recreation (Table 9). The aquatic life designated use for the tidal segments is minimal (M), DO grab criteria for minimum and screening level at 1 milligram per liter (mg/L). The remaining aquatic life designated uses and DO screening levels vary by AU (Table 10).

Table 9. Designated uses for recreation and associated numeric criteria[1] and nutrient screening levels[2] for the Brays Bayou and Sims Bayou watersheds. N/IS = navigation and industrial water supply (other use), PCR1 = primary contract recreation 1.

Watershed	Segment ID	Recreational DESIGNATED USE	Indicator Bacteria[3] Geomean (MPN/100 mL)	Indicator Bacteria Grab Maximum[1] (MPN/100mL)	Total Phosphorus (mg/L)	Nitrate-Nitrogen (mg/L)	Ammonia-Nitrogen (mg/L)	Chlorophyll-a (µg/L)[5]
Brays	1007	N/IS[4]	168	N/A	0.66	1.10	0.46	21.0
Brays	1007B	PCR1	126	399	0.69	1.95	0.33	N/A
Brays	1007C	PCR1	126	399	0.69	1.95	0.33	N/A
Brays	1007E	PCR1	126	399	0.69	1.95	0.33	N/A
Brays	1007G	PCR1	126	399	0.69	1.95	0.33	N/A
Brays	1007K	PCR1	126	399	0.69	1.95	0.33	N/A
Brays	1007L	PCR1	126	399	0.69	1.95	0.33	N/A
Brays	1007S	PCR1	126	399	0.69	1.95	0.33	N/A
Brays	1007T	PCR1	126	399	0.69	1.95	0.33	N/A
Brays	1007U	PCR1	126	399	0.69	1.95	0.33	N/A
Brays	1007W	PCR1	126	399	0.69	1.95	0.33	N/A
Sims	1007	N/IS[4]	168	N/A	0.66	1.10	0.46	21.0
Sims	1007A	PCR1	126	399	0.69	1.95	0.33	N/A
Sims	1007D	PCR1	126	399	0.69	1.95	0.33	N/A
Sims	1007F	PCR1	126	399	0.69	1.95	0.33	N/A
Sims	1007H	PCR1	126	399	0.69	1.95	0.33	N/A
Sims	1007I	PCR1	126	399	0.69	1.95	0.33	N/A
Sims	1007N	PCR1	126	399	0.69	1.95	0.33	N/A

[1] Source: 2022 Texas Surface Water Quality Standards (https://www.tceq.texas.gov/waterquality/standards/2022-texas-surface-water-quality-standards) TCEQ, 2022)

[2] Source: 2024 Guidance for Assessing and Reporting Surface Water Quality in Texas (https://www.tceq.texas.gov/downloads/water-quality/assessment/integrated-report-2024/2024-guidance.pdf/view), Table 3.11.

[3] The indicator bacteria for freshwater is E. coli and for saltwater is enterococci.

[4]The tidal segments do not have a designated recreational use, instead they have an "other use" of navigational and industrial water supply (N/IS).

[5]The chlorophyll-a state-wide screening criteria for freshwater streams is 14.1µg/L, but because this parameter is not monitored or assessed for the non-tidal segments in the Brays Bayou and Sims Bayou watersheds, they are listed as N/A.

Table 10. Designated uses[1] for aquatic life use and associated numeric critera[2] for assessment units in the Brays Bayou and Sims Bayou watersheds. Aquatic life use categories = high (H), intermediate (I), limited (L), and minimal (M).

Watershed	Segment ID	Assessment Unit(s)	Aquatic Life Use[3]	Dissolved Oxygen Grab Minimum (mg/L)	Dissolved Oxygen Grab Screening Level (mg/L)
Brays	1007	1007_04	M	1	1
Brays	1007B	1007B_01, 1007B_02	L	2	3
Brays	1007C	1007C_01	L	2	3
Brays	1007E	1007E_01	L	2	3
Brays	1007G	1007G_01	H	3	5
Brays	1007K	1007K_01	I	3	4
Brays	1007L	1007L_01	L	2	3
Brays	1007S	1007S_01	I	3	4
Brays	1007T	1007T_01	I	3	4
Brays	1007U	1007U_01	I	3	4
Brays	1007W	1007W_01	L	2	3
Sims	1007	1007_02, 1007_06	M	1	1
Sims	1007A	1007A_01	L	2	3
Sims	1007D	1007D_01	I	3	4
Sims	1007D	1007D_02, 1007D_03	L	2	3
Sims	1007F	1007F_01	L	2	3
Sims	1007H	1007H_01	I	3	4
Sims	1007I	1007I_01	I	3	4
Sims	1007N	1007N_01	L	2	3

[1] *Source: 2022 Texas Surface Water Quality Standards (https://www.tceq.texas.gov/waterquality/standards/2022-texas-surface-water-quality-standards), Appendix D, Page 198 (TCEQ, 2022)*

[2] *Source: 2024 Guidance for Assessing and Reporting Surface Water Quality in Texas (https://www.tceq.texas.gov/downloads/water-quality/assessment/integrated-report-2024/2024-guidance.pdf/view), Chapter 3, Table 3.2.*

[3] *Aquatic Life Use is categorized as either E = Exceptional, H = High, I = Intermediate, L = Limited, or M = Minimal.*

The tidal segments in the Brays Bayou and Sims Bayou watersheds have defined criteria for general use parameters of pH range and water temperature (Table 11). In addition, these segments have assigned criteria for key bioaccumulative toxins in water for Nickel (dissolved), Mercury, and Lead (dissolved) (Table 11).

Table 11. Numeric criteria for general use and fish consumption use parameters by segment. HH = human health

Watershed	Segment ID	Assessment Unit(s)	pH Range (s.u.)	Temperature (°F)	Nickel (dissolved)	Mercury	Lead (dissolved)
Brays	1007	1007_04	6.5-9.0	95	1,140	0.03	3.83
Sims	1007	1007_02, 1007_06	6.5-9.0	95	1,140	0.03	3.83

SUMMARY OF 2024 ASSESSMENT RESULTS

The 2024 Texas Integrated Report (IR) (TCEQ, 2024) describes the integrated level of support of the waterbody based on historical data and the extent to which it attains the Texas Surface Water Quality Standards. The seven-year assessment period for the 2024 IR was 12/1/15 – 11/30/22. All non-tidal AUs in both Brays and Sims Bayous are non-supporting for Primary Contact Recreational Use (Table 12). There are several AUs that are not meeting the integrated level of support for aquatic life DO minimum and screening levels. Two AUs (1007K_01 and 1007I_01) have a carry-forward impairment from 24hr average DO which supersedes the grab data level of support in these cases. There are several AUs with nutrient screening level concerns for total phosphorus, nitrate-N, and ammonia-N in each of the watersheds. The tidal segments in both watersheds are non-supporting for fish consumption use due to a Department of State Health Service no consumption advisory for both PCBs and dioxins (Table 13).

Table 12. Integrated level of support by of Brays Bayou and Sims Bayou assessment units for recreational use, aquatic life use, and general use nutrient screening levels. Date of record included in the 2024 Integrated Report (12/01/15 – 11/30/22) FS = fully supporting, NS = non-supporting, NC = no concern, CN = use concern, CS = screening level concern.

Watershed	AU	Enterococci‡ or *E. coli*	Dissolved Oxygen Grab	Dissolved Oxygen Grab	Total Phosphorus	Nitrate-N	Ammonia-N
Brays	1007_04	FS[1]	FS	NC	CS	CS	CS
Brays	1007B_01	NS	FS	NC	CS	CS	CS
Brays	1007B_02	NS	FS	NC	CS	CS	NC
Brays	1007C_01	NS	FS	NC	CS	CS	NC
Brays	1007E_01	NS	FS	NC	NC	NC	NC
Brays	1007G_01	NS	FS	CS	NC	NC	NC
Brays	1007K_01	NS	NS	CN[2]	NC	NC	NC
Brays	1007L_01	NS	FS	NC	NC	CS	NC
Brays	1007S_01	NS	FS	NC	CS	CS	NC
Brays	1007T_01	NS	FS	NC	NC	NC	NC
Brays	1007U_01	NS	FS	NC	NC	NC	NC
Brays	1007W_01	NS	NS	CS	NC	NC	CS
Sims	1007_02	FS[1]	FS	NC	CS	CS	NC
Sims	1007_06	FS[1]	FS	NC	CS	CS	NC
Sims	1007A_01	NS	FS	NC	CS	CS	NC
Sims	1007D_01	NS	FS	NC	CS	CS	NC
Sims	1007D_02	NS	FS	NC	CS	CS	NC
Sims	1007D_03	NS	FS	NC	CS	CS	NC
Sims	1007F_01	NS	FS	NC	CS	CS	NC
Sims	1007H_01	NS	NS	CS	NC	NC	CS
Sims	1007I_01	NS	NS	NS[2]	NC	NC	CS
Sims	1007N_01	NS	FS	CS	NC	NC	CS

[1]The tidal segments do not have a designated recreational use, instead they have an "other use" of navigational and industrial water supply (N/IS).

[2] The carry-forward impairment for dissolved oxygen 24hr average is reported in place of the grab screening level assessment.

Table 13. Integrated level of support for tidal assessment units in the Brays Bayou and Sims Bayou watersheds for general use and fish consumption use. Date of record included in the 2024 Integrated Report (12/01/15 – 11/30/22) FS = fully supporting, NS = non-supporting, NC = no concern, NA = not assessed, and HH = human health.

Watershed	AU	Low pH	High pH	Chlorophyll-a	Water Temperature	DSHS No Consumption Advisory PCBs	DSHS No Consumption Advisory Dioxins	Nickel (dissolved)	Mercury	Lead (dissolved)
Brays	1007_04	FS	FS	NC	FS	NS	NS	FS	FS	FS
Sims	1007_02	FS	FS	NC	FS	NS	NS	FS	FS	FS
Sims	1007_06	FS	FS	NA	FS	NS	NS	FS	FS	FS

RECREATIONAL USE

Pathogen Indicator Bacteria (E. coli or Enterococci)

The tidal AUs are designated as navigational and industrial water supply (N/IS) for “Other Use”, which has a 7-year geomean standard of 168 MPN/100mL, and all are fully supporting according to the 2024 IR. Unfortunately, all non-tidal AUs are non-supporting for primary contact recreation due to elevated concentrations of pathogen indicator bacteria, *E. coli* (Table 14 and Figure 24). The primary contract recreation standard is a 7-year geomean of 126 MPN/100mL. The 2024 IR 7-year geomean for the non-tidal AUs ranged from 130.18 to 6690.36 MPN/100mL. The category for the integrated level of support for the impairments on the non-tidal AUs is 4a, meaning the waterbody does not meet applicable water quality standards for recreation, but a Total Maximum Daily Load (TMDL) has been completed and approved by the EPA. Once a waterbody is in Category 4a, the focus shifts from assessment to implementing the pollutant reduction strategies outlined in the approved TMDL. The Bacteria Implementation Group (BIG) oversees the implementation plan identified in the TMDL for the Brays and Sims Bayous.

H-GAC completed a preliminary review of the most recent 7-years of TCEQ data available, which included data collected since the end of the IR date range (which ended on 11/30/2022) (Table 14). Results from the last 10 years were plotted for visualization purposes (Figure 25 through Figure 28). Data from the most recent 7-years were analyzed using Kendall’s Tau-b in SAS 9.4 to determine if there were any statistically significant temporal trends in the results. Out of the three tidal AUs, one (1007_02) had a deteriorating trend, meaning the bacteria results appear to be getting higher over time. Three of the non-tidal AUs (1007B_01, 1007C_01, and 1007W_01) had deteriorating trends and two AUs (1007I_01 and 1007K_01) had improving trends for *E. coli* results (Appendix E). The rest of the AUs appear to have stable bacteria results. Of note, the AU 1007_06 geomean calculated with the most recent 7-years of data is 207.34 MPN/100mL, which is above the navigational and industrial water supply (N/IS) “other use” criterion for enterococci of 168 MPN/100mL L. Also, AU 1007A_01 geomean calculated with the most recent 7-years of data is 107.40 MPN/100mL, which is below the primary contract recreation standard of 126 MPN/100mL. The assessment for the 2026 integrated report will be conducted by TCEQ later this year.

Table 14. Bacteria results for Brays Bayou and Sims Bayou watersheds. Category: 4a = A state-developed TMDL has been approved by EPA or a TMDL has been established by EPA for any water-pollutant combination. Assessed level of support: FS = fully supporting, NS = non-supporting, and NA = not assessed. Mean exceedances = mean of the samples that exceeded criteria. 2024 Integrated Report (IR) period of record: 12/01/15 – 11/30/22.

Watershed	AU ID	2024 IR Assessed Level of Support	2024 IR Category	2024 IR Geometric Mean[1] (MPN/100mL)	H-GAC Data Review Date Start	H-GAC Data Review Date End	H-GAC Data Review n	H-GAC Data Review Geometric Mean[1] (MPN/100mL)	H-GAC Data Review Mean Exceedances (Samples Exceeding grab maximum/n)[2]
Brays	1007_04	FS	NA	82.89	6/5/2018	4/28/2025	107	114.60	2,686.67 (45/107)
Brays	1007B_01	NS	4a	1,913.13	6/4/2018	4/22/2025	420	2,216.78	7,832.85 (362/420)
Brays	1007B_02	NS	4a	831.26	6/14/2018	4/14/2025	47	743.29	3,777.43 (35/47)
Brays	1007C_01	NS	4a	826.67	6/14/2018	4/14/2025	94	956.72	5,118.70 (0/94)
Brays	1007E_01	NS	4a	1,145.67	6/4/2018	4/22/2025	47	1,560.11	1,4087.43 (35/47)
Brays	1007G_01	NS	4a	938.35	6/13/2018	4/28/2025	46	609.84	7,925.22 (23/46)
Brays	1007K_01	NS	4a	2,284.91	6/13/2018	4/28/2025	93	1,325.88	1,0515.29 (68/93)
Brays	1007L_01	NS	4a	693.07	6/4/2018	4/22/2025	47	1,256.39	1,3791.11 (36/47)
Brays	1007S_01	NS	4a	746.23	6/21/2018	4/16/2025	47	926.38	7,105.67 (30/47)
Brays	1007T_01	NS	4a	6,690.36	6/4/2018	4/22/2025	47	10,136.07	24,236.81 (47/47)
Brays	1007U_01	NS	4a	1,225.29	6/21/2018	4/16/2025	47	1,234.97	7,982.12 (33/47)
Brays	1007W_01	NS	4a	807.50	6/21/2018	4/16/2025	47	1,278.91	19,030.33 (30/47)
Sims	1007_02	FS	NA	76.37	6/5/2018	5/14/2025	108	114.94	2,948.91 (46/108)
Sims	1007_06	FS	NA	143.24	6/5/2018	5/14/2025	47	207.34	1,997.31 (26/47)
Sims	1007A_01	NS	4a	130.18	6/4/2018	5/14/2025	47	107.40	1,146.25 (8/47)
Sims	1007D_01	NS	4a	462.72	6/4/2018	5/12/2025	94	465.54	5,169.33 (45/94)
Sims	1007D_02	NS	4a	356.91	6/4/2018	5/12/2025	94	271.77	3,185.67 (30/94)
Sims	1007D_03	NS	4a	666.75	6/4/2018	5/14/2025	141	732.33	4,114.05 (84/141)
Sims	1007F_01	NS	4a	3,125.58	6/5/2018	5/14/2025	47	3,680.57	11,402.44 (41/47)
Sims	1007H_01	NS	4a	2,447.78	6/5/2018	5/14/2025	45	2,406.03	17,068.38 (37/45)
Sims	1007I_01	NS	4a	3,579.70	6/5/2018	5/14/2025	47	2,453.94	20,158.92 (37/47)
Sims	1007N_01	NS	4a	268.89	6/4/2018	5/12/2025	47	145.01	3,046.25 (8/47)

[1]The criteria for navigational and industrial water supply (N/IS) "other use" for segment 1007 is a geometric mean criterion for enterococci of 168 MPN/100mL and the Primary Contact Recreation criteria for non-tidal streams is a geometric mean criterion for E. coli of 126 MPN/100mL. (TCEQ, 2022)

[2]The single sample criterion for tidal streams for the purposes of recreational beaches is 130 MPN/100mL and for non-tidal streams with a PCR1 is 399 MPN/100mL. (TCEQ, 2022). The recreational beaches single sample criteria do not apply to the tidal AUs in these watersheds, this standard was used for H-GAC data review purposes only.

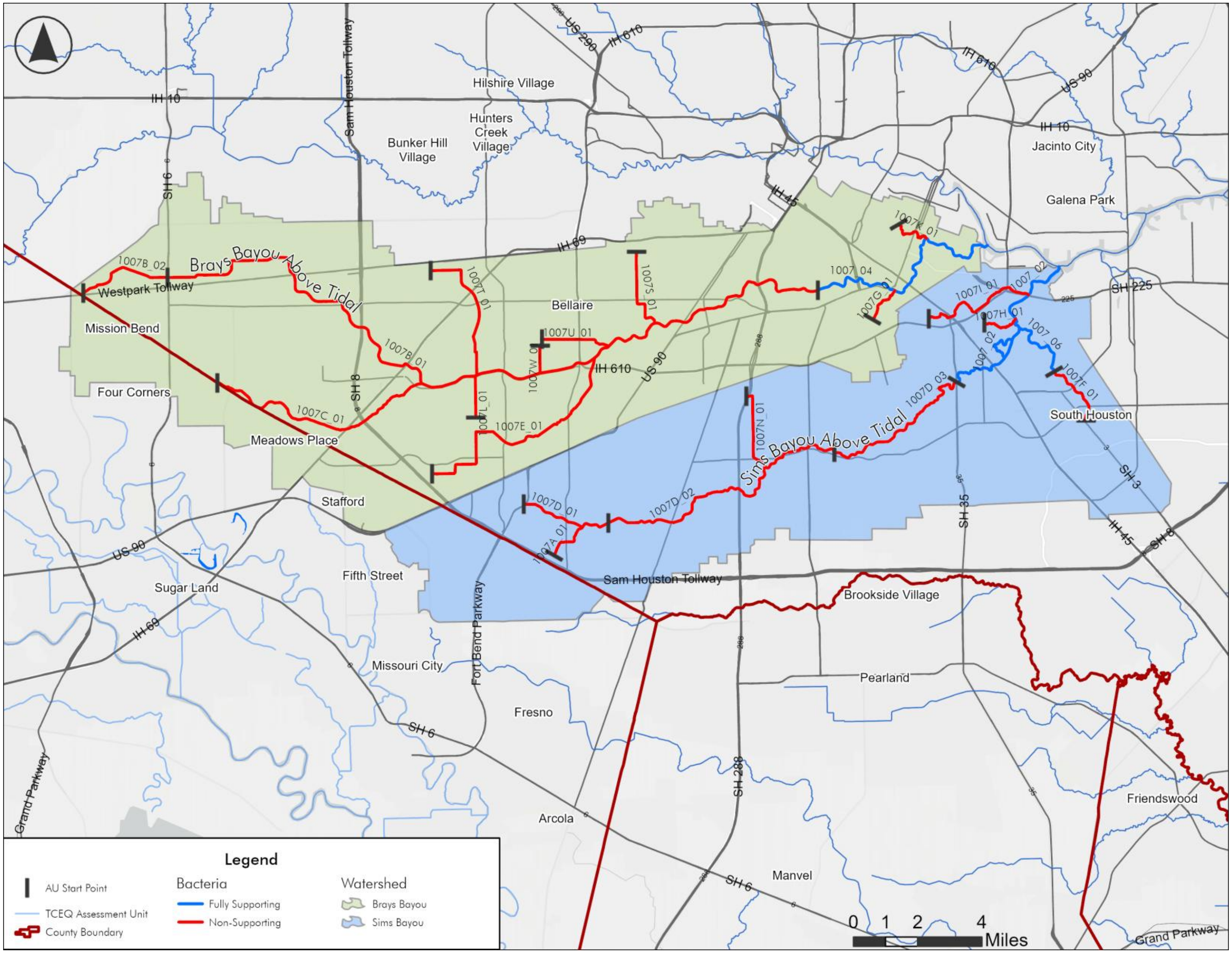

Figure 24. Map of Brays Bayou and Sims Bayou watershed's assessment for pathogen indicator bacteria (2024 IR).

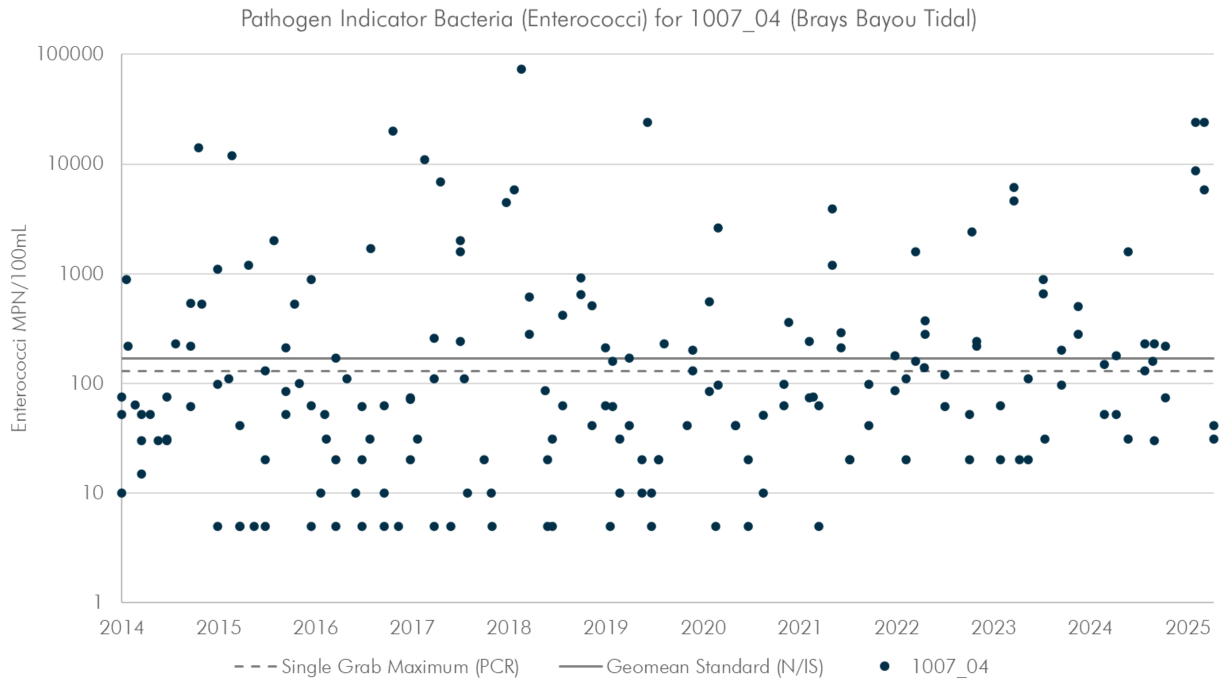

Figure 25. Pathogen indicator bacteria enterococci grab results through time for the Brays Bayou Tidal segment. The geometric mean standard of 168 for navigational and industrial water supply (N/IS) is plotted in the solid grey line and the single grab standard of 130 for primary contact recreation, used for H-GAC's data visualization only, is plotted in the dashed gray line. Note: y-axis as log scale.

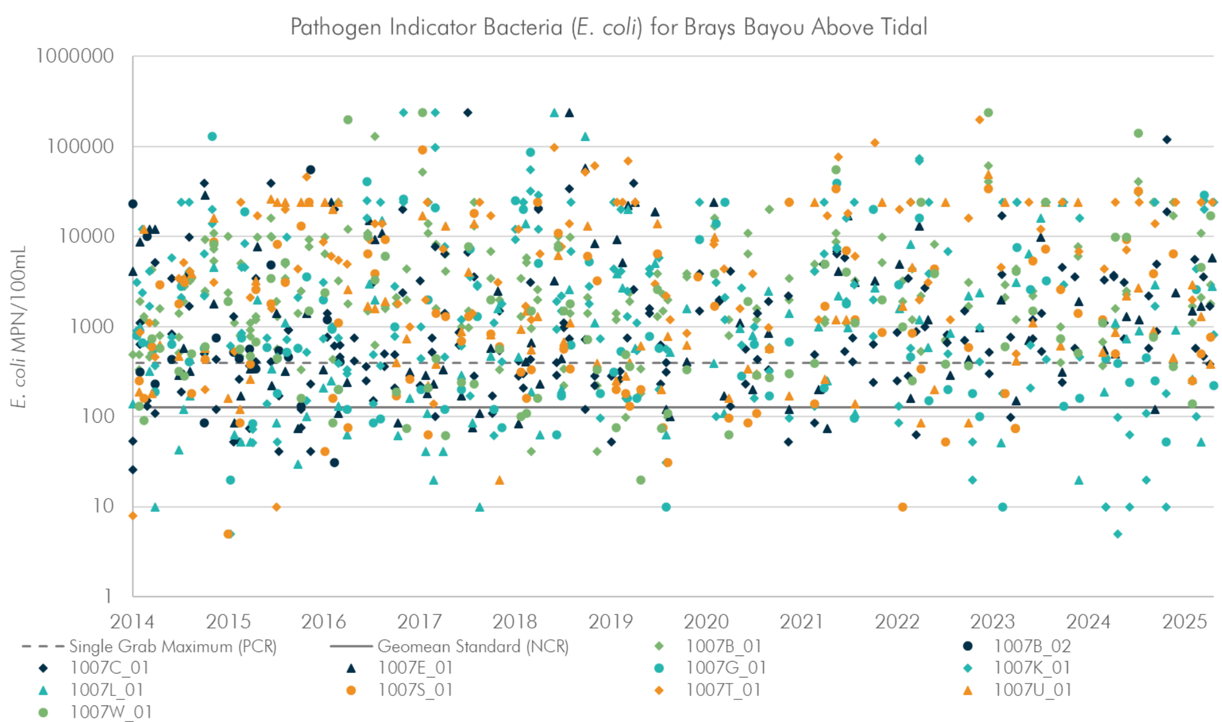

Figure 26. Pathogen indicator bacteria E. coli grab results by assessment unit (AU) through time for Brays Bayou Above Tidal segments. The geometric mean standard of 126 is plotted in grey line and the single grab standard of 399 is plotted in the dashed gray line. Note: y-axis as log scale.

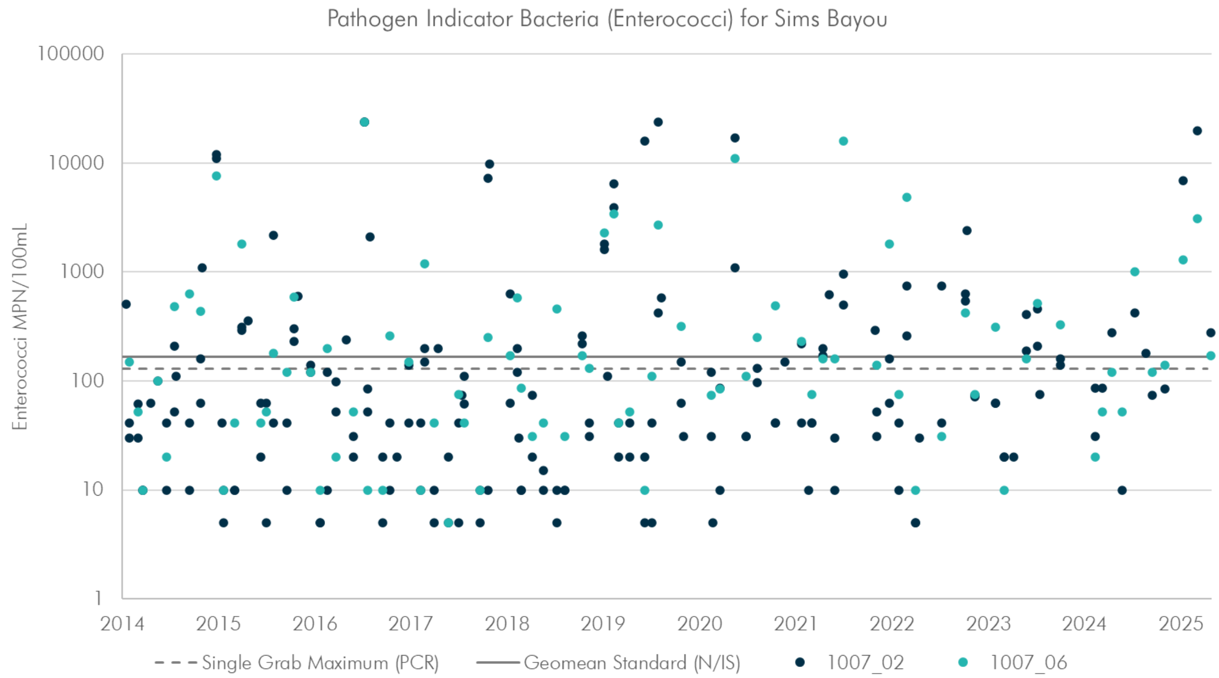

Figure 27. Pathogen indicator bacteria enterococci grab results by assessment unit (AU) through time for Sims Bayou Tidal segment. The geometric mean standard of 168 for navigational and industrial water supply (N/IS) is plotted in the solid grey line and the single grab standard of 130 for primary contact recreation, used for H-GAC's data visualization only, is plotted in the dashed gray line. Note: y-axis as log scale.

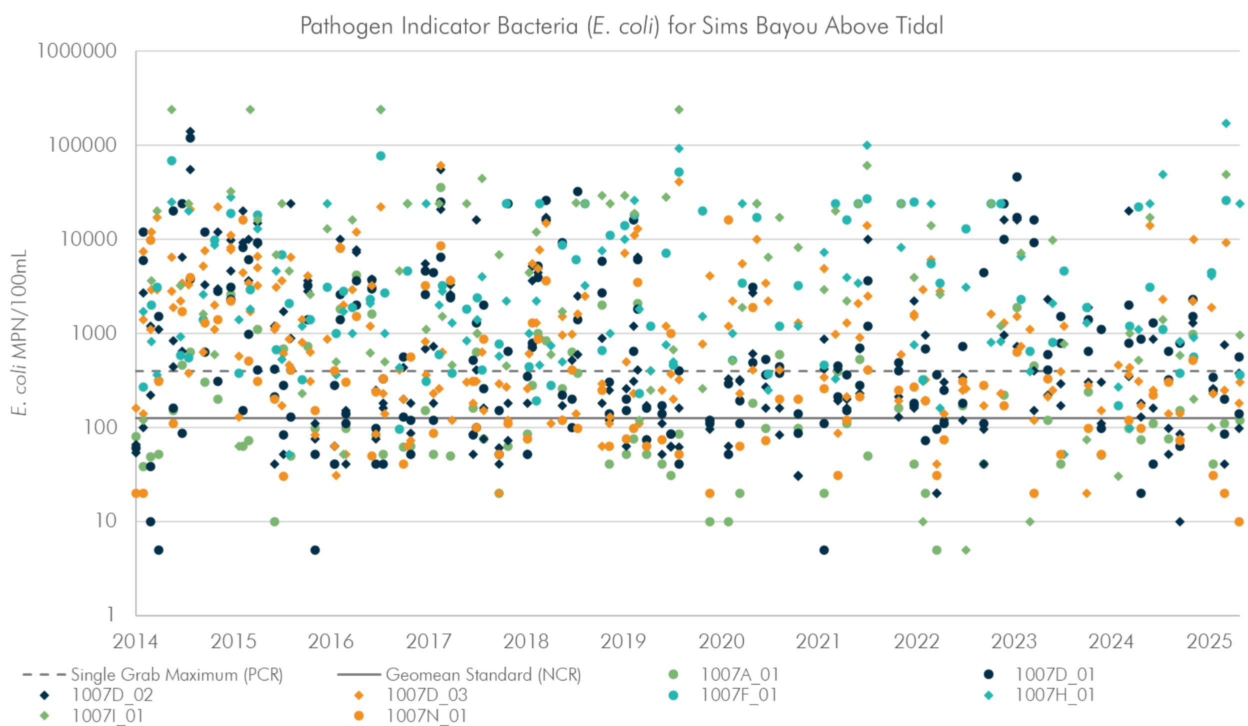

Figure 28. Pathogen indicator bacteria E. coli grab results by assessment unit (AU) through time for Brays Bayou Above Tidal segments. The geometric mean standard of 126 is plotted in grey line and the single grab standard of 399 is plotted in the dashed gray line. Note: y-axis as log scale.

AQUATIC LIFE USE

Dissolved Oxygen

The designated aquatic life uses, and the associated numeric criteria varies by AU (Table 10). According to the 2024 IR, two AUs (1007K_01 and 1007W_01) in the Brays Bayou watershed and two AUs (1007H_01 and 1007I_01) in the Sims Bayou watershed are non-supporting for their DO grab minimum criteria (Table 15). There are also three AUs in each watershed (Brays: 1007G_01, 1007K_01, and 1007W_01; Sims: 1007H_01, 1007I_01, and 1007N_01) that have a screening level concern, use concern, or impairment for their DO grab screening level, or DO 24hr average.

H-GAC completed a preliminary review of the most recent 7-years of TCEQ data available, which included data collected since the end of the IR date range (which ended on 11/30/2022) (Table 15, and Figure 29). Results from the last 10 years for AUs with impairments were plotted for visualization purposes (Figure 30 and Figure 31). Data from the most recent 7-years were further analyzed using Kendall's Tau-b in SAS 9.4 to determine if there were any statistically significant temporal trends in the results. Four AUs in each watershed (Brays: 1007B_01, 1007B_02, 1007U_01, and 1007W_0; Sims: 1007_02, 1007D_02, 1007D_03, and 1007N_01) had a deteriorating trend, meaning the DO results appear to be getting lower over time (Appendix E). The rest of the AUs appear to have stable DO results. The assessment for the 2026 integrated report will be conducted by TCEQ later this year.

*Table 15. Dissolved oxygen (DO) impairments and data summary for Brays Bayou and Sims Bayou watershed AUs. Assessed level of support (LOS): FS = fully supporting, NC = no concern, CS = screening level concern, CN = use concern, and NS = non-supporting. Mean exceedances = mean of the samples that exceeded criteria. Criteria by parameter and AU provided in Table 10. *When applicable, the 24hr DO integrated LOS is reported in place of DO screening LOS. 2024 Integrated Report (IR) period of record: 12/01/15 – 11/30/22.*

Parameter DO Grab (mg/L)	Watershed	AU ID	2024 IR Current Assessed Level of Support	2024 IR Mean Exceedances (Samples Exceeding Standard/n)	H-GAC Data Review Date Start	H-GAC Data Review Date End	H-GAC Data Review Mean Exceedances (Samples Exceeding Standard/n)
Minimum	Brays	1007_04	FS	0.21 (5/176)	6/5/2018	4/30/2025	0.26 (5/155)
Minimum	Brays	1007B_01	FS	0.70 (1/440)	6/4/2018	4/22/2025	1.15 (2/399)
Minimum	Brays	1007B_02	FS	- (0/48)	6/14/2018	4/14/2025	- (0/43)
Minimum	Brays	1007C_01	FS	- (0/97)	6/14/2018	4/14/2025	- (0/84)
Minimum	Brays	1007E_01	FS	- (0/51)	6/4/2018	4/22/2025	- (0/44)
Minimum	Brays	1007G_01	FS	- (0/51)	6/13/2018	4/28/2025	- (0/45)
Minimum	Brays	1007K_01	NS	1.60 (41/102)	6/13/2018	4/28/2025	1.60 (40/90)
Minimum	Brays	1007L_01	FS	0.90 (1/52)	6/4/2018	4/22/2025	0.90 (1/46)
Minimum	Brays	1007S_01	FS	- (0/48)	6/21/2018	4/16/2025	- (0/40)
Minimum	Brays	1007T_01	FS	- (0/52)	6/4/2018	4/22/2025	- (0/45)
Minimum	Brays	1007U_01	FS	- (0/51)	6/21/2018	4/16/2025	2.80 (1/45)
Minimum	Brays	1007W_01	NS	1.54 (9/51)	6/21/2018	4/16/2025	1.33 (12/45)
Minimum	Sims	1007_02	FS	0.50 (5/127)	6/5/2018	5/14/2025	0.57 (6/115)
Minimum	Sims	1007_06	FS	0.43 (3/52)	6/5/2018	5/14/2025	0.43 (3/47)
Minimum	Sims	1007A_01	FS	- (0/50)	6/4/2018	5/14/2025	- (0/44)
Minimum	Sims	1007D_01	FS	1.27 (3/90)	6/4/2018	5/12/2025	1.27 (3/90)
Minimum	Sims	1007D_02	FS	- (0/102)	6/4/2018	5/12/2025	- (0/90)
Minimum	Sims	1007D_03	FS	- (0/153)	6/4/2018	5/14/2025	0.70 (1/139)
Minimum	Sims	1007F_01	FS	- (0/52)	6/5/2018	5/14/2025	- (0/47)
Minimum	Sims	1007H_01	NS	1.63 (26/51)	6/5/2018	5/14/2025	1.73 (24/45)
Minimum	Sims	1007I_01	NS	1.15 (32/50)	6/5/2018	5/14/2025	1.35 (25/45)
Minimum	Sims	1007N_01	FS	0.40 (1/51)	6/4/2018	5/12/2025	- (0/45)
Screening Level	Brays	1007_04	NC	0.21 (5/176)	6/5/2018	4/30/2025	0.26 (5/155)
Screening Level	Brays	1007B_01	NC	1.60 (2/440)	6/4/2018	4/22/2025	1.15 (2/399)
Screening Level	Brays	1007B_02	NC	- (0/48)	6/14/2018	4/14/2025	- (0/43)
Screening Level	Brays	1007C_01	NC	2.80 (1/97)	6/14/2018	4/14/2025	- (0/84)
Screening Level	Brays	1007E_01	NC	- (0/51)	6/4/2018	4/22/2025	- (0/44)
Screening Level	Brays	1007G_01	CS	4.24 (14/51)	6/13/2018	4/28/2025	4.28 (12/45)
Screening Level	Brays	1007K_01	CN*	2.05 (53/102)	6/13/2018	4/28/2025	1.88 (47/90)
Screening Level	Brays	1007L_01	NC	0.90 (1/52)	6/4/2018	4/22/2025	0.90 (1/46)
Screening Level	Brays	1007S_01	NC	- (0/48)	6/21/2018	4/16/2025	- (0/40)
Screening Level	Brays	1007T_01	NC	- (0/52)	6/4/2018	4/22/2025	- (0/45)
Screening Level	Brays	1007U_01	NC	- (0/51)	6/21/2018	4/16/2025	2.80 (1/45)
Screening Level	Brays	1007W_01	CS	1.97 (20/51)	6/21/2018	4/16/2025	1.77 (20/45)
Screening Level	Sims	1007_02	NC	0.50 (5/127)	6/5/2018	5/14/2025	0.57 (6/115)
Screening Level	Sims	1007_06	NC	0.43 (3/52)	6/5/2018	5/14/2025	0.43 (3/47)
Screening Level	Sims	1007A_01	NC	- (0/50)	6/4/2018	5/14/2025	- (0/44)
Screening Level	Sims	1007D_01	NC	1.27 (3/90)	6/4/2018	5/12/2025	1.27 (3/90)
Screening Level	Sims	1007D_02	NC	- (0/102)	6/4/2018	5/12/2025	- (0/90)
Screening Level	Sims	1007D_03	NC	2.36 (5/153)	6/4/2018	5/14/2025	2.08 (5/139)
Screening Level	Sims	1007F_01	NC	2.70 (1/52)	6/5/2018	5/14/2025	2.70 (1/47)
Screening Level	Sims	1007H_01	CS	1.94 (31/51)	6/5/2018	5/14/2025	2.08 (30/45)
Screening Level	Sims	1007I_01	NS*	1.34 (35/50)	6/5/2018	5/14/2025	1.57 (28/45)
Screening Level	Sims	1007N_01	CS	2.21 (7/51)	6/4/2018	5/12/2025	2.26 (5/45)

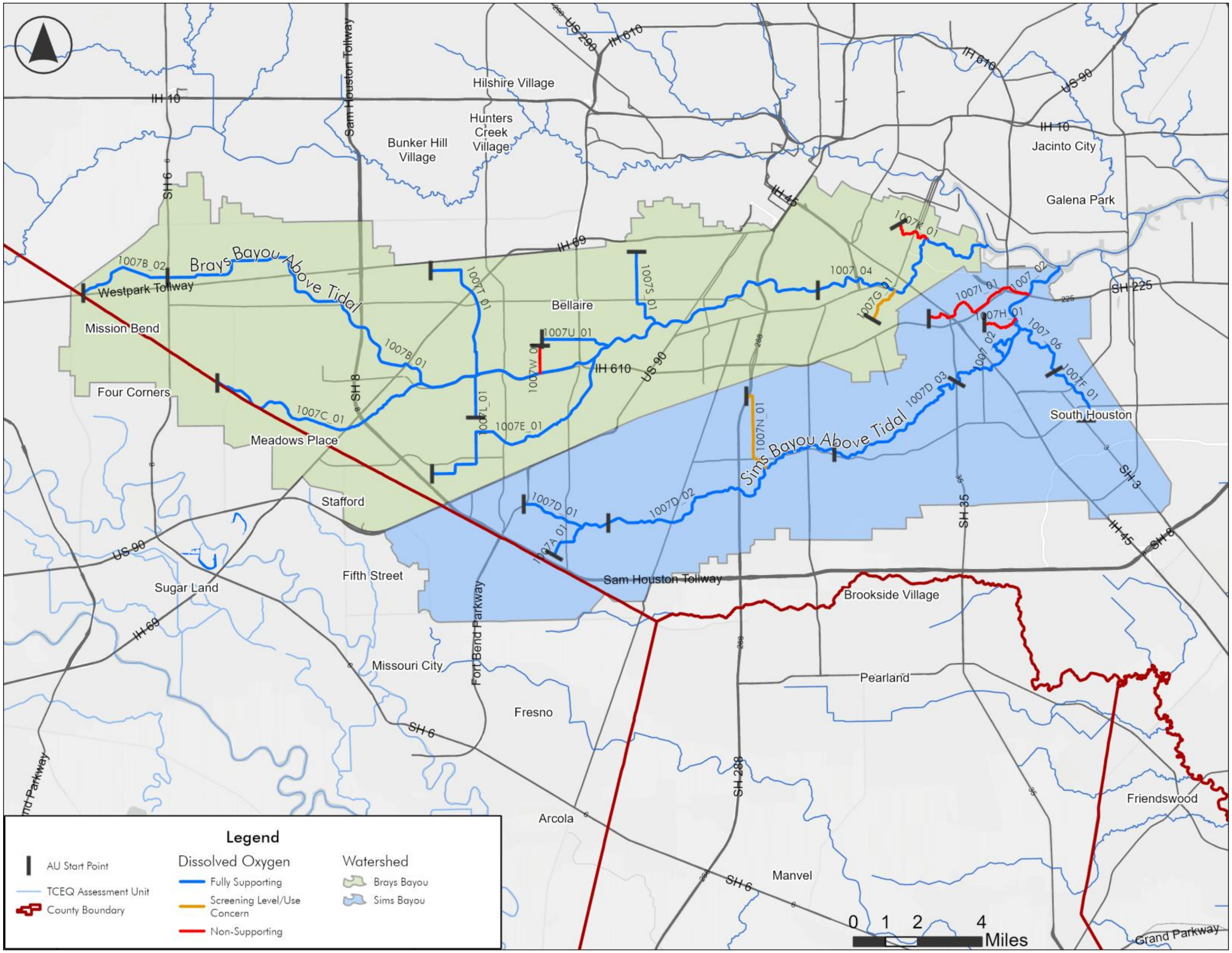

Figure 29: Map of Brays Bayou and Sims Bayou watershed's assessment for dissolved oxygen concerns and impairments (TCEQ, 2024).

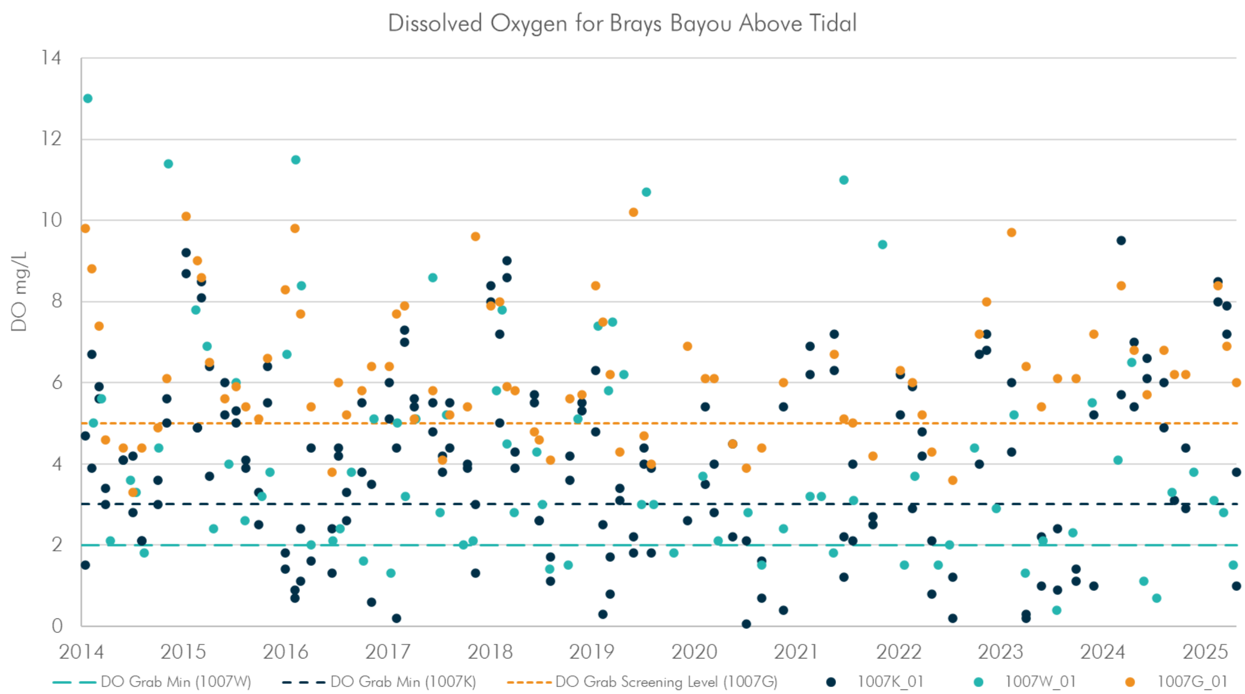

Figure 30. Dissolved oxygen (DO) grab results by assessment unit (AU) through time for the three Brays Bayou AUs with DO impairments or concerns.

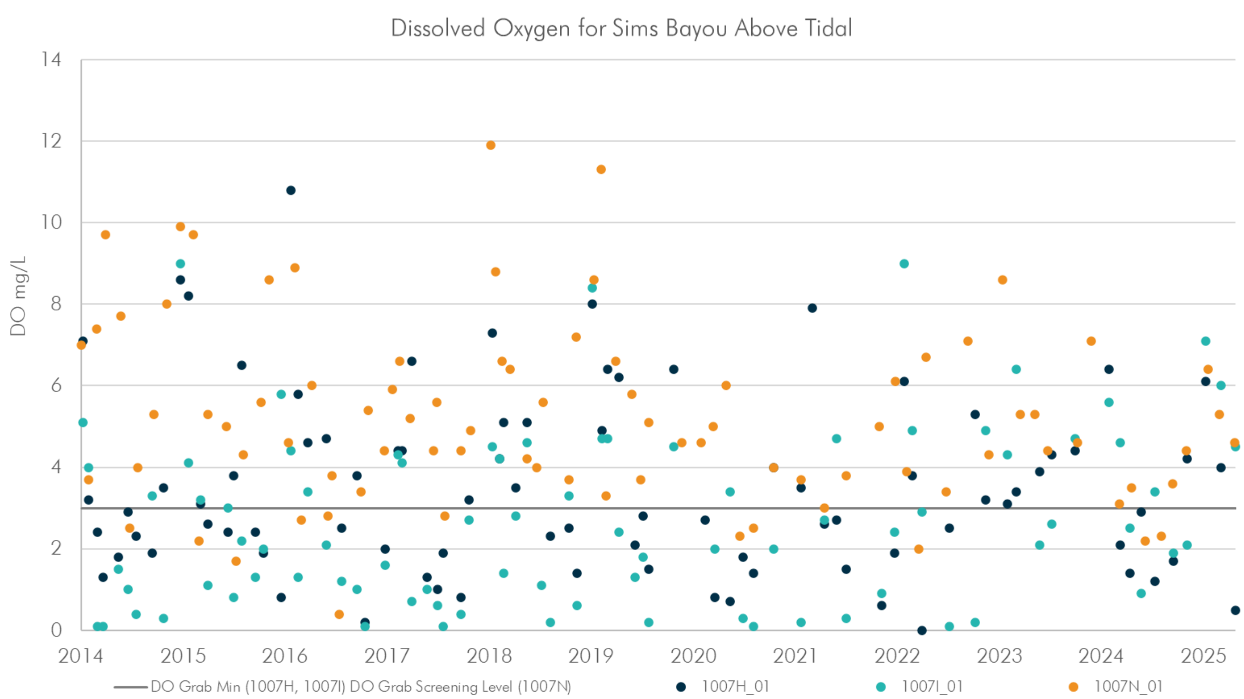

Figure 31. Dissolved oxygen (DO) grab results by assessment unit (AU) through time for the three Sims Bayou AUs with DO impairments or concerns.

GENERAL USE

Nutrient Concerns

A total of 31 general use nutrient screening level concerns within the Brays and Sims watersheds exist in the 2024 IR for total phosphorus, nitrate, and ammonia (Table 12 and Figure 32). There are only 5 AUs (Brays: 1007E_01, 1007G_01, 1007K_01, 1007T_01, and 1007U_01) that have no nutrient screening level concerns. Except for 1007L_01, all AUs with nitrate-N concerns also have total phosphorus concerns.

H-GAC completed a preliminary review of the most recent 7-years of TCEQ data available, which included data collected since the end of the IR date range (which ended on 11/30/2022) (Table 16 through Table 19). Results from the last 10 years for AUs with impairments were plotted for visualization purposes (Figure 33 through Figure 39). Data from the most recent 7-years were further analyzed using Kendall's Tau-b in SAS 9.4 to determine if there were any statistically significant temporal trends in the results. The assessment for the 2026 integrated report will be conducted by TCEQ later this year.

For the parameter total phosphorus, two AUs (Brays: 1007B_01; Sims: 1007D_01) had a deteriorating trend, meaning the results appear to be getting higher over time, and four AUs (Brays: 1007G_01 and 1007K_01; Sims: 1007I_01 and 1007N_01) had an improving trend, meaning the results appear to be getting lower over time. The rest of the AUs appear to have stable total phosphorus results.

For the parameter nitrate-N, three AUs (Brays: 1007G_01; Sims: 1007D_01 and 1007I_01) had a deteriorating trend, meaning the results appear to be getting higher over time (Appendix E). The rest of the AUs appear to have stable nitrate-N results.

For the parameter ammonia-N, six AUs (Brays: 1007_04, 1007B_01, 1007K_01, 1007L_01, and 1007W_01; Sims: 1007_06) had a deteriorating trend, meaning the results appear to be getting higher over time (Appendix E). The rest of the AUs appear to have stable ammonia-N results.

While there are no current screening level concerns for Chlorophyll-a on the two monitored and assessed AUs, one AU (Brays: 1007_04) had a deteriorating trend (Figure 39). The other AU (Sims: 1007_02) appears to have stable chlorophyll-a results. The remaining assessed general use parameters (pH and Temperature) for the two AUs (Brays: 1007_04; Sims: 1007_02) had no exceedances in the most recent 7-years analyzed by H-GAC.

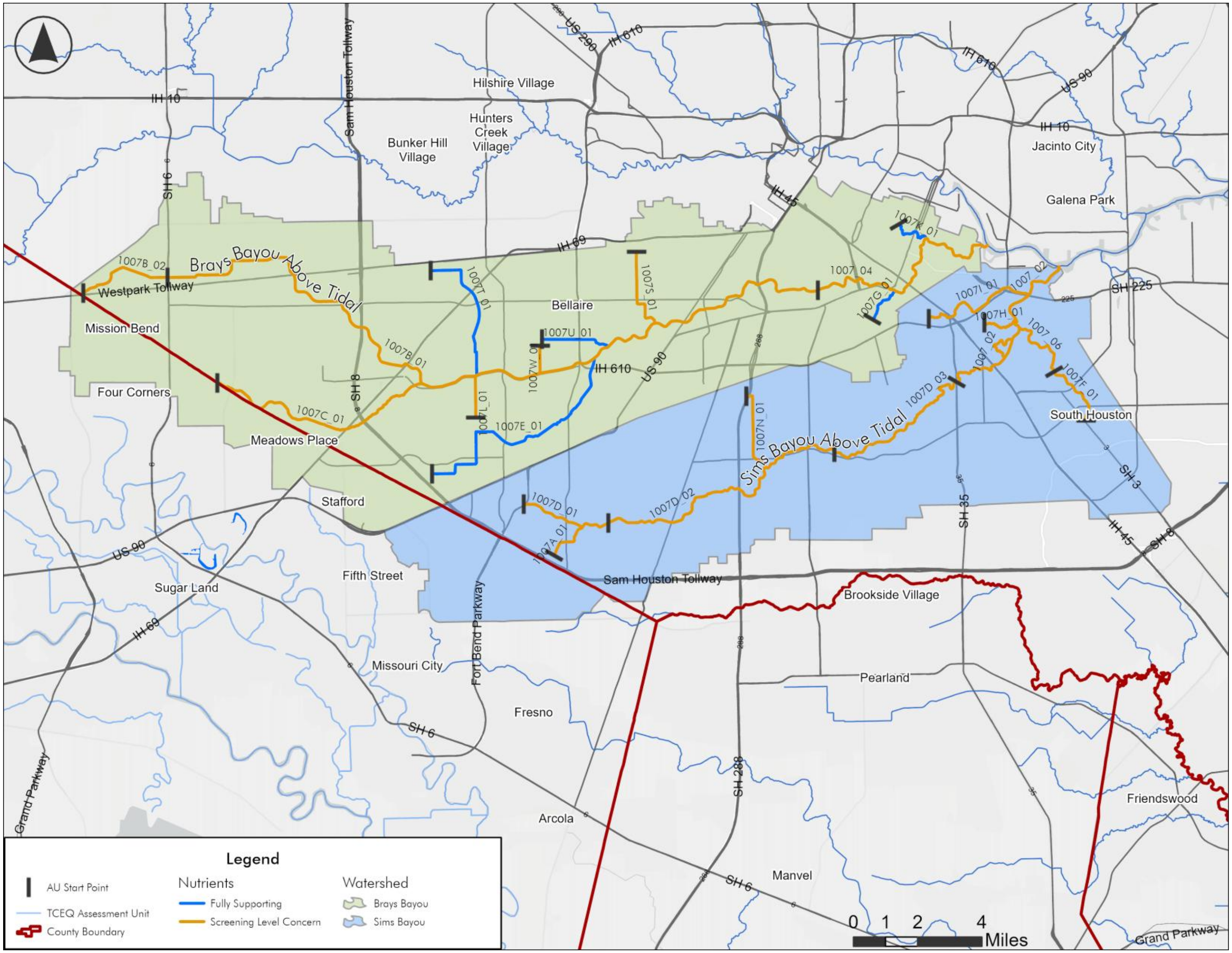

Figure 32. Map of Brays Bayou and Sims Bayou watershed's assessment for nutrient concerns (TCEQ, 2024).

Table 16. Total phosphorus (TP) - nutrient concerns and data summary for the Brays Bayou and Sims Bayou watersheds by assessment unit (AU). Integrated level of support: NC = no concern and CS = screening level concern. Mean exceedances = mean of the samples that exceeded criteria. Criteria by parameter and AU provided in Table 11. 2024 Integrated Report (IR) period of record: 12/01/15 – 11/30/22.

Parameter mg/L	Watershed	AU ID	2024 IR Current Assessed Level of Support	2024 IR Mean Exceedances (Samples Exceeding Standard/n)	H-GAC Data Review Date Start	H-GAC Data Review Date End	H-GAC Data Review Mean Exceedances (Samples Exceeding Standard/n)
TP	Brays	1007_04	CS	1.13 (146/179)	6/5/2018	4/30/2025	1.06 (134/158)
TP	Brays	1007B_01	CS	1.39 (422/475)	6/4/2018	4/22/2025	1.40 (382/421)
TP	Brays	1007B_02	CS	2.14 (52/52)	6/14/2018	4/14/2025	2.06 (47/47)
TP	Brays	1007C_01	CS	2.46 (96/105)	6/14/2018	4/14/2025	2.60 (91/94)
TP	Brays	1007E_01	NC	1.47 (1/34)	6/4/2018	4/22/2025	- (0/12)
TP	Brays	1007G_01	NC	- (0/52)	6/13/2018	4/28/2025	- (0/46)
TP	Brays	1007K_01	NC	0.88 (2/105)	6/13/2018	4/28/2025	0.83 (3/93)
TP	Brays	1007L_01	NC	0.85 (2/53)	6/4/2018	4/22/2025	0.85 (2/47)
TP	Brays	1007S_01	CS	1.22 (16/34)	6/21/2018	4/16/2025	1.08 (7/12)
TP	Brays	1007T_01	NC	- (0/34)	6/4/2018	4/22/2025	- (0/12)
TP	Brays	1007U_01	NC	- (0/34)	6/21/2018	4/16/2025	- (0/12)
TP	Brays	1007W_01	NC	1.37 (3/53)	6/21/2018	4/16/2025	1.18 (3/47)
TP	Sims	1007_02	CS	1.35 (105/129)	6/5/2018	5/14/2025	1.27 (85/115)
TP	Sims	1007_06	CS	1.53 (40/53)	6/5/2018	5/14/2025	1.52 (33/47)
TP	Sims	1007A_01	CS	1.98 (30/34)	6/4/2018	5/14/2025	1.93 (12/12)
TP	Sims	1007D_01	CS	2.06 (42/106)	6/4/2018	5/12/2025	1.91 (56/94)
TP	Sims	1007D_02	CS	2.13 (81/106)	6/4/2018	5/12/2025	2.11 (82/94)
TP	Sims	1007D_03	CS	2.24 (134/158)	6/4/2018	5/14/2025	2.39 (112/141)
TP	Sims	1007F_01	CS	2.27 (45/53)	6/5/2018	5/14/2025	2.30 (38/47)
TP	Sims	1007H_01	NC	1.13 (3/52)	6/5/2018	5/14/2025	1.79 (1/46)
TP	Sims	1007I_01	NC	1.61 (1/53)	6/5/2018	5/14/2025	1.61 (1/46)
TP	Sims	1007N_01	NC	- (0/53)	6/4/2018	5/12/2025	- (0/47)

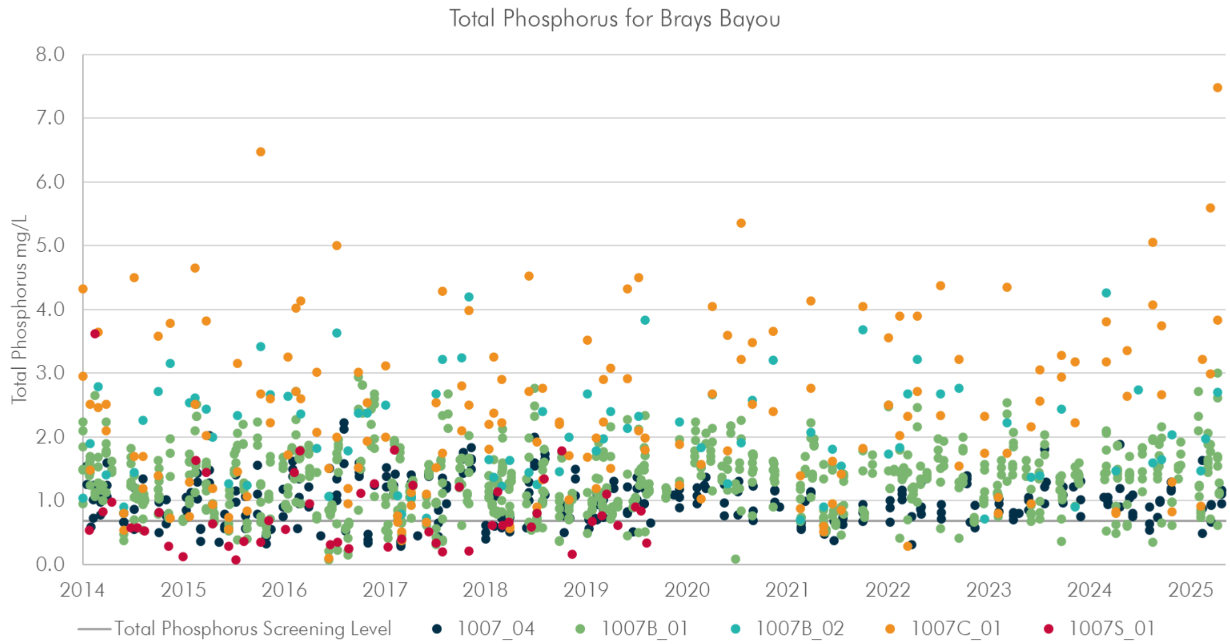

Figure 33. Total phosphorus (TP) grab results by assessment unit (AU) through time for the Brays Bayou AUs with TP concerns.

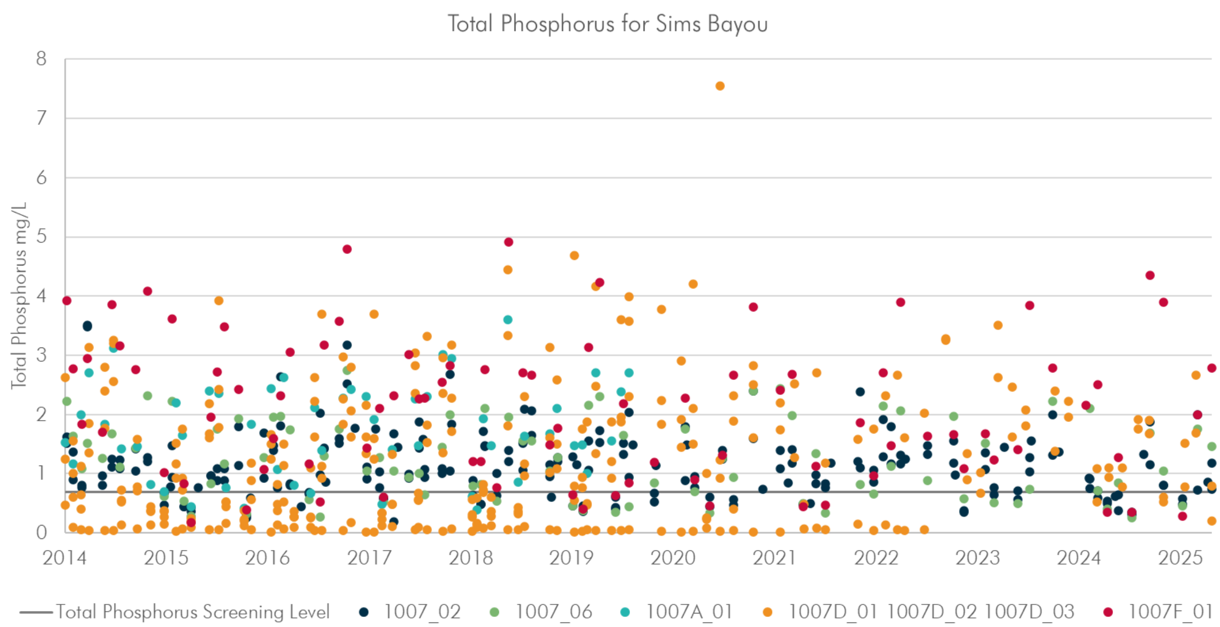

Figure 34. Total phosphorus (TP) grab results by assessment unit (AU) through time for the Sims Bayou AUs with TP concerns.

Table 17. Nitrate-nitrogen (NO_3) - nutrient concerns and data summary for the Brays Bayou and Sims Bayou watersheds by assessment unit (AU). Integrated level of support: NC = no concern and CS = screening level concern. Mean exceedances = mean of the samples that exceeded criteria. Criteria by parameter and AU provided in Table 11. 2024 Integrated Report (IR) period of record: 12/01/15 – 11/30/22.

Parameter mg/L	Watershed	AU ID	2024 IR Current Assessed Level of Support	2024 IR Mean Exceedances (Samples Exceeding Standard/n)	H-GAC Data Review Date Start	H-GAC Data Review Date End	H-GAC Data Review Mean Exceedances (Samples Exceeding Standard/n)
Nitrate	Brays	1007_04	CS	5.34 (172/178)	6/5/2018	4/30/2025	5.37 (152/156)
Nitrate	Brays	1007B_01	CS	6.80 (411/475)	6/4/2018	4/22/2025	6.85 (374/421)
Nitrate	Brays	1007B_02	CS	10.11 (50/52)	6/14/2018	4/14/2025	9.14 (46/47)
Nitrate	Brays	1007C_01	CS	10.05 (99/105)	6/14/2018	4/14/2025	10.76 (91/94)
Nitrate	Brays	1007E_01	NC	- (0/34)	6/4/2018	4/22/2025	- (0/12)
Nitrate	Brays	1007G_01	NC	- (0/52)	6/13/2018	4/28/2025	- (0/46)
Nitrate	Brays	1007K_01	NC	- (0/105)	6/13/2018	4/28/2025	- (0/93)
Nitrate	Brays	1007L_01	CS	3.04 (21/53)	6/4/2018	4/22/2025	2.93 (13/47)
Nitrate	Brays	1007S_01	CS	5.59 (23/34)	6/21/2018	4/16/2025	4.61 (8/12)
Nitrate	Brays	1007T_01	NC	- (0/34)	6/4/2018	4/22/2025	- (0/12)
Nitrate	Brays	1007U_01	NC	- (0/34)	6/21/2018	4/16/2025	- (0/12)
Nitrate	Brays	1007W_01	NC	5.41 (2/53)	6/21/2018	4/16/2025	5.41 (2/47)
Nitrate	Sims	1007_02	CS	4.46 (116/128)	6/5/2018	5/14/2025	4.25 (103/113)
Nitrate	Sims	1007_06	CS	5.98 (49/53)	6/5/2018	5/14/2025	5.75 (44/47)
Nitrate	Sims	1007A_01	CS	8.49 (32/34)	6/4/2018	5/14/2025	9.32 (12/12)
Nitrate	Sims	1007D_01	CS	7.05 (42/106)	6/4/2018	5/12/2025	6.15 (51/94)
Nitrate	Sims	1007D_02	CS	5.65 (73/106)	6/4/2018	5/12/2025	5.26 (76/94)
Nitrate	Sims	1007D_03	CS	5.48 (114/158)	6/4/2018	5/14/2025	4.96 (117/141)
Nitrate	Sims	1007F_01	CS	9.75 (47/53)	6/5/2018	5/14/2025	10.13 (41/47)
Nitrate	Sims	1007H_01	NC	- (0/52)	6/5/2018	5/14/2025	- (0/46)
Nitrate	Sims	1007I_01	NC	9.40 (1/53)	6/5/2018	5/14/2025	9.40 (1/46)
Nitrate	Sims	1007N_01	NC	2.41 (4/53)	6/4/2018	5/12/2025	2.69 (2/47)

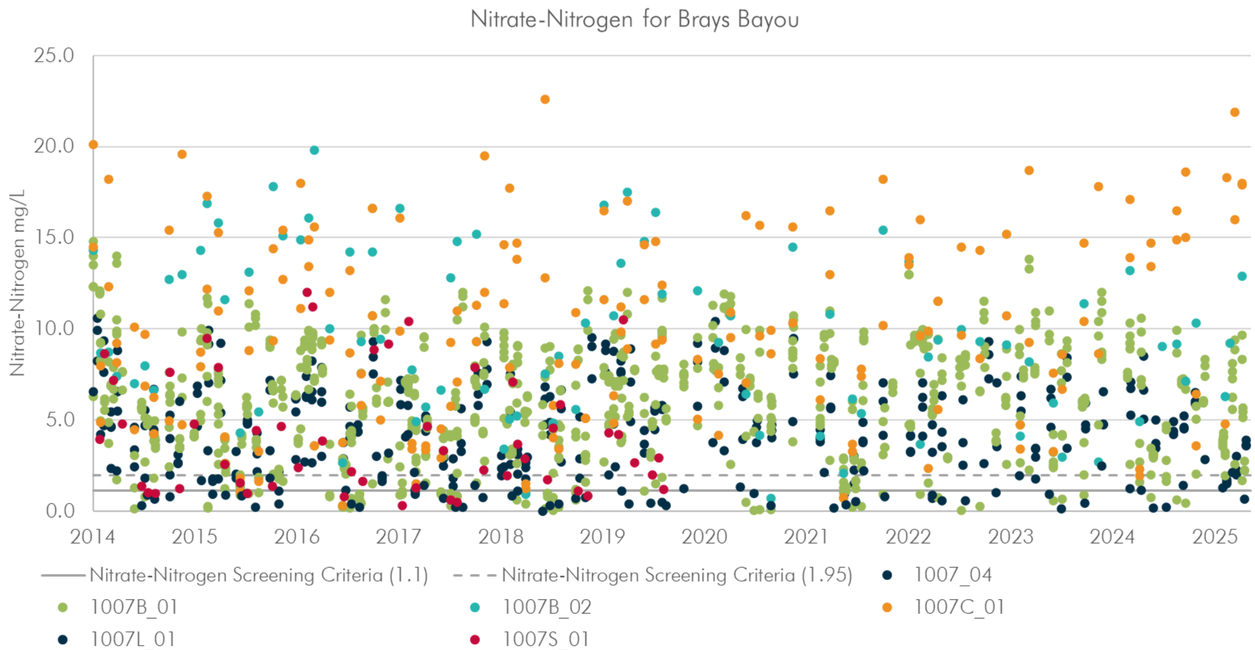

Figure 35. Nitrate-nitrogen grab results by assessment unit (AU) through time for the Brays Bayou AUs with nitrate-nitrogen concerns. Screening criteria may differ by AU and corresponds to Table 9.

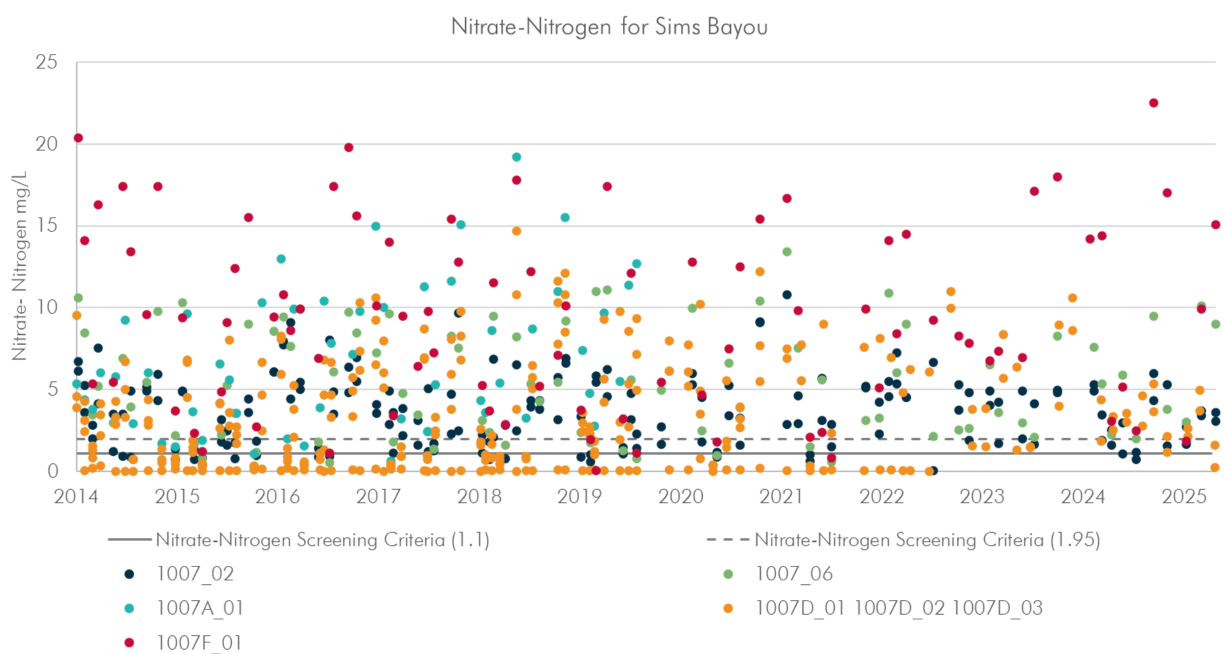

Figure 36. Nitrate-nitrogen grab results by assessment unit (AU) through time for the Sims Bayou AUs with nitrate-nitrogen concerns. Screening criteria may differ by AU and corresponds to Table 9.

Table 18. Ammonia-nitrogen (NH_3) - nutrient concerns and data summary for the Brays Bayou and Sims Bayou watersheds by assessment unit (AU). Integrated level of support: NC = no concern and CS = screening level concern. Mean exceedances = mean of the samples that exceeded criteria. Criteria by parameter and AU provided in Table 11. 2024 Integrated Report (IR) period of record: 12/01/15 – 11/30/22.

Parameter mg/L	Watershed	AU ID	2024 IR Current Assessed Level of Support	2024 IR Mean Exceedances (Samples Exceeding Standard/n)	H-GAC Data Review Date Start	H-GAC Data Review Date End	H-GAC Data Review Mean Exceedances (Samples Exceeding Standard/n)
Ammonia	Brays	1007_04	CS	1.05 (51/177)	6/5/2018	4/30/2025	0.80 (52/157)
Ammonia	Brays	1007B_01	CS	1.17 (138/474)	6/4/2018	4/22/2025	1.07 (118/420)
Ammonia	Brays	1007B_02	NC	1.59 (9/52)	6/14/2018	4/14/2025	1.56 (5/47)
Ammonia	Brays	1007C_01	NC	1.23 (16/105)	6/14/2018	4/14/2025	0.80 (12/94)
Ammonia	Brays	1007E_01	NC	0.76 (3/34)	6/4/2018	4/22/2025	1.19 (1/12)
Ammonia	Brays	1007G_01	NC	0.93 (6/52)	6/13/2018	4/28/2025	0.90 (5/46)
Ammonia	Brays	1007K_01	NC	0.65 (16/105)	6/13/2018	4/28/2025	0.83 (28/93)
Ammonia	Brays	1007L_01	NC	0.35 (1/52)	6/4/2018	4/22/2025	0.35 (1/46)
Ammonia	Brays	1007S_01	NC	1.41 (2/34)	6/21/2018	4/16/2025	1.63 (1/12)
Ammonia	Brays	1007T_01	NC	0.65 (8/34)	6/4/2018	4/22/2025	0.62 (3/12)
Ammonia	Brays	1007U_01	NC	0.40 (4/34)	6/21/2018	4/16/2025	- (0/12)
Ammonia	Brays	1007W_01	CS	2.02 (21/53)	6/21/2018	4/16/2025	1.68 (24/47)
Ammonia	Sims	1007_02	NC	0.73 (27/127)	6/5/2018	5/14/2025	0.86 (20/114)
Ammonia	Sims	1007_06	NC	0.59 (4/53)	6/5/2018	5/14/2025	1.39 (4/47)
Ammonia	Sims	1007A_01	NC	0.86 (3/34)	6/4/2018	5/14/2025	1.31 (1/12)
Ammonia	Sims	1007D_01	NC	0.77 (7/106)	6/4/2018	5/12/2025	0.95 (7/94)
Ammonia	Sims	1007D_02	NC	0.65 (21/106)	6/4/2018	5/12/2025	0.78 (17/94)
Ammonia	Sims	1007D_03	NC	0.64 (32/158)	6/4/2018	5/14/2025	0.65 (21/141)
Ammonia	Sims	1007F_01	NC	0.97 (12/53)	6/5/2018	5/14/2025	0.84 (12/47)
Ammonia	Sims	1007H_01	CS	2.46 (14/52)	6/5/2018	5/14/2025	1.52 (12/46)
Ammonia	Sims	1007I_01	CS	0.71 (27/53)	6/5/2018	5/14/2025	0.64 (19/46)
Ammonia	Sims	1007N_01	CS	2.48 (37/53)	6/4/2018	5/12/2025	2.23 (32/47)

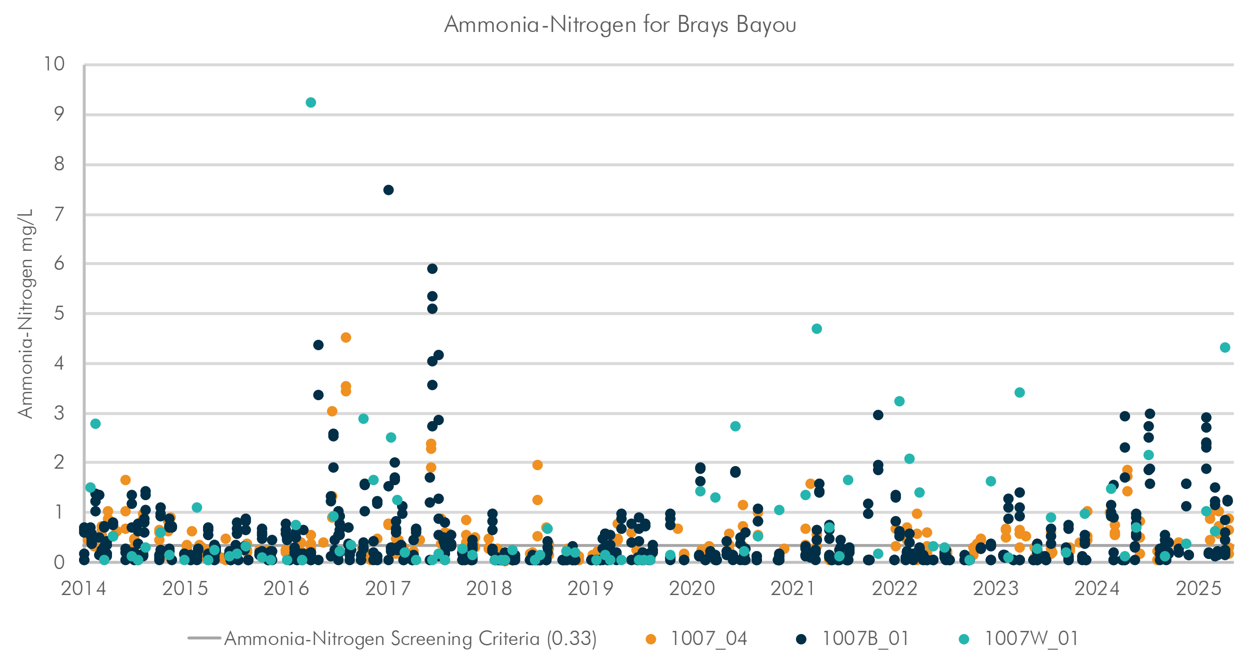

Figure 37. Ammonia-nitrogen grab results by assessment unit (AU) through time for the Brays Bayou AUs with ammonia-nitrogen concerns.

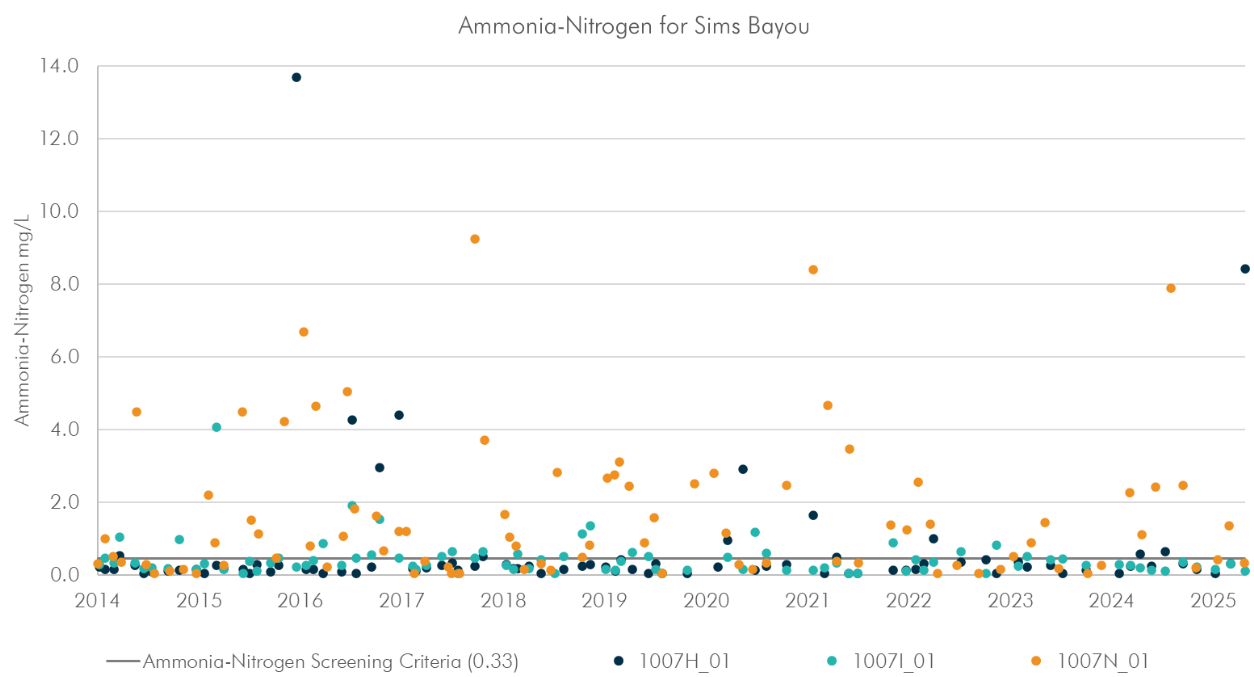

Figure 38. Ammonia-nitrogen grab results by assessment unit (AU) through time for the Sims Bayou AUs with ammonia-nitrogen concerns.

Table 19. Chlorophyll-a data summary for the Brays Bayou and Sims Bayou watersheds by assessment unit (AU). Integrated level of support: NC = no concern. Mean exceedances = mean of the samples that exceeded criteria. Criteria by parameter and AU provided in Table 11. 2024 Integrated Report (IR) period of record: 12/01/15 – 11/30/22.

Parameter mg/L	Watershed	AU ID	2024 IR Current Assessed Level of Support	2024 IR Mean Exceedances (Samples Exceeding Standard/n)	H-GAC Data Review Date Start	H-GAC Data Review Date End	H-GAC Data Review Mean Exceedances (Samples Exceeding Standard/n)
Chlorophyll-a	Brays	1007_04	NC	24.5 (1/20)	6/5/2018	4/30/2025	25.0 (1/17)
Chlorophyll-a	Sims	1007_02	NC	24.6 (1/23)	6/5/2018	5/14/2025	24.6 (1/20)

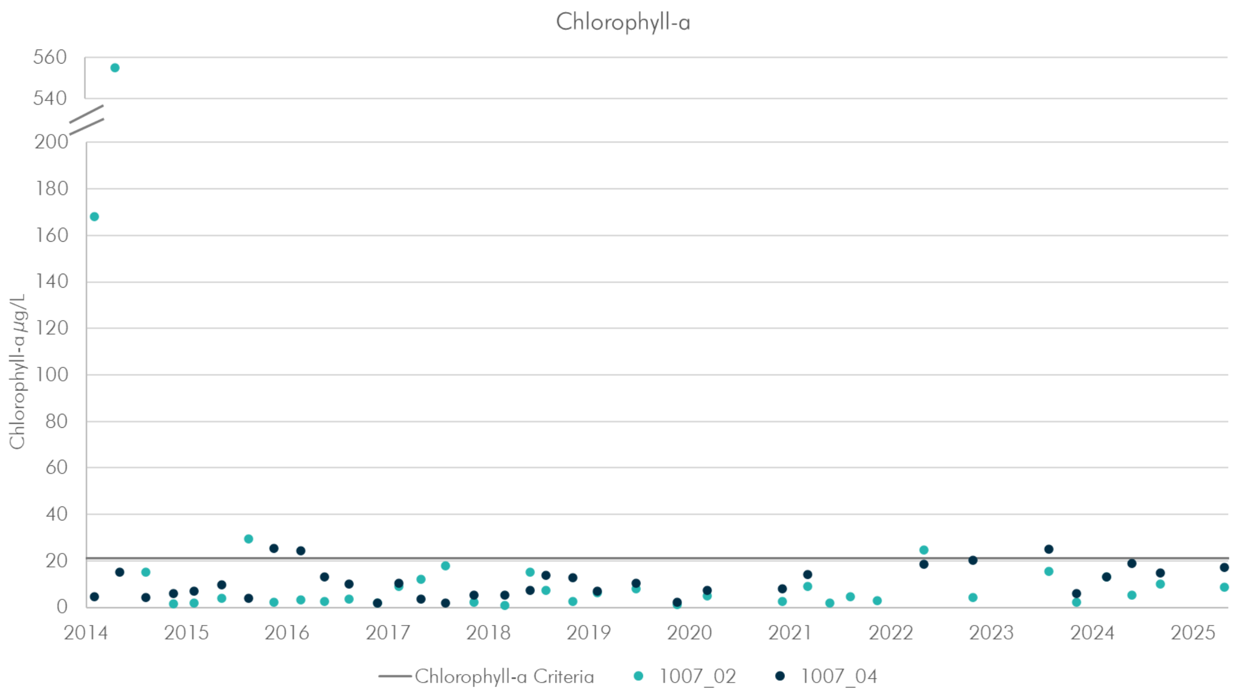

Figure 39. Chlorophyll-a grab results by assessment unit (AU) through time for the monitored AUs.

FISH CONSUMPTION USE

The TCEQ uses the Texas Department of State Health Services (DSHS) fish consumption advisories to assess fish consumption use for surface waters. The tidal AUs (Brays: 1007_04; Sims 1007_02 and 1007_06) have a "no consumption advisory" due to PCBs and dioxins in edible tissue (Figure 40). PCBs and dioxins are organic pollutants that persist for a long time, accumulate in sediments and organisms, and become increasingly concentrated as they move up the food chain, posing risks to wildlife and human health. A DSHS no consumption advisory means that fish or aquatic life from a specific Texas waterbody should not be eaten due to unsafe levels of contaminants. These advisories are issued to protect public health when testing reveals the presence of contaminants like mercury, PCBs, or dioxins at levels that could be harmful if consumed.

The 2024 IR also assessed the three tidal AUs for fish consumption use using three human health (HH) bioaccumulative toxics in water [nickel (dissolved), mercury, and lead (dissolved)], all of which were fully supporting with no exceedances.

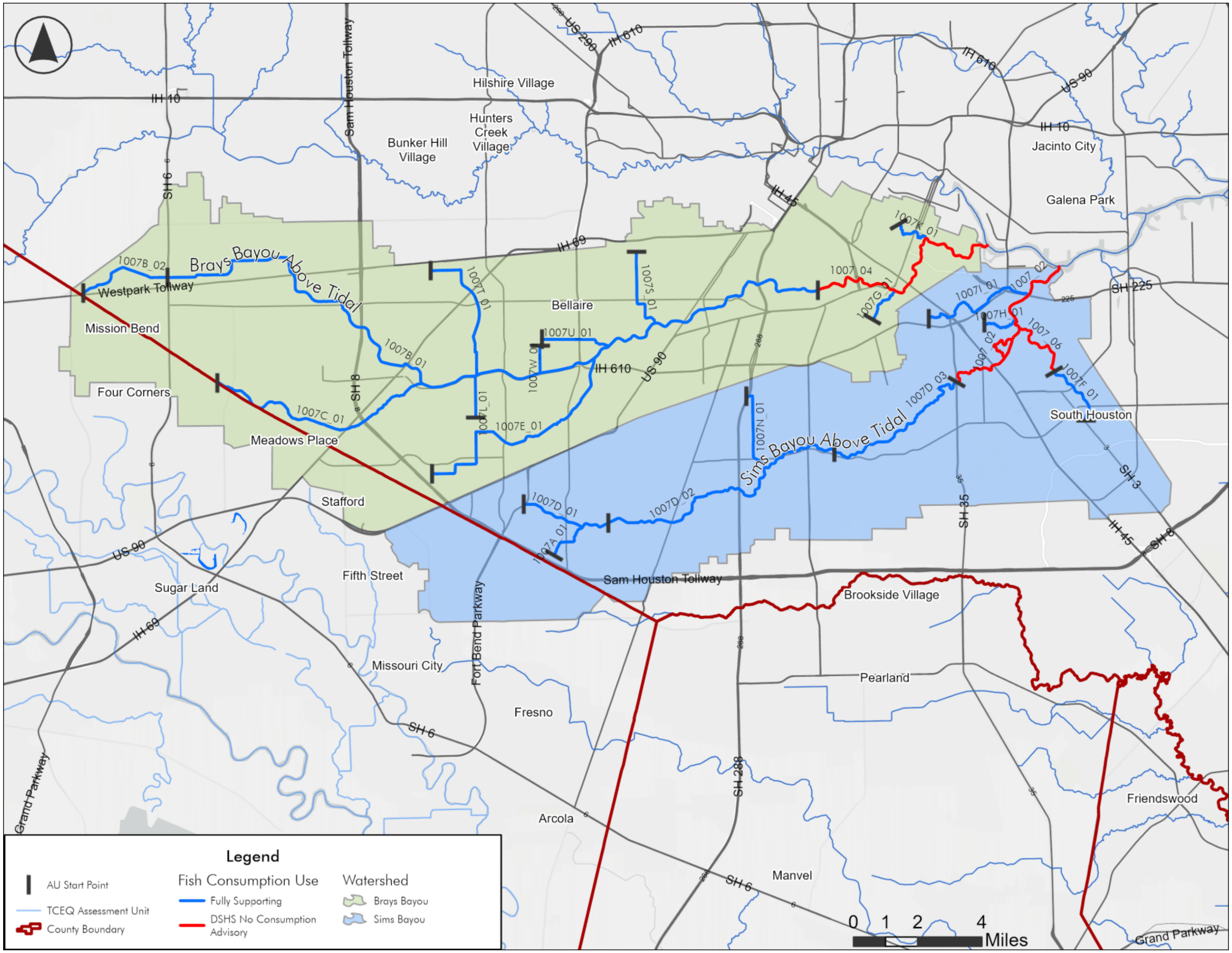

Figure 40. Map of Brays Bayou and Sims Bayou watershed's assessment for fish consumption use (TCEQ, 2024).

POTENTIAL SOURCES OF WATER QUALITY ISSUES

Potential sources of fecal indicator bacteria and nutrients in the Brays Bayou and Sims Bayou watersheds include both point and nonpoint sources. These sources include but are not limited to wastewater treatment facilities, SSOs, failing OSSFs, stormwater runoff, and animal waste.

PERMITTED WASTEWATER DISCHARGES

For Brays Bayou, centralized wastewater accounts for 128.63 square miles or 96.87% of the watershed. There are 22 permitted outfalls that discharge to the Brays Bayou watershed (Table 20 and Figure 41). Of these outfalls there is one permittee (Appendix F) that is located just outside the watershed, however their discharge leads to the Houston Ship Channel/Buffalo Bayou (segment 1007) within the watershed's boundary. The cumulative permitted discharge to the watershed is over 100 million gallons per day (MGD) (TCEQ, 2025a).

For Sims Bayou, centralized wastewater accounts for 93.51 square miles or 95.74% of the watershed. There are 16 permitted outfalls that discharge to the Sims Bayou watershed (Table 20 and Figure 41). Similar to Brays Bayou, there is one permittee (Appendix F) that is located outside of Sims Bayou but discharges into segment 1007 within the watershed's boundary. The cumulative permitted discharge to the watershed is over 100 MGD (TCEQ, 2025a). In general, well maintained wastewater treatment facilities have been found to meet state pollutant discharge permit requirements (H-GAC, 2025).

Table 20. Permitted wastewater discharges in the Brays Bayou and Sims Bayou watersheds. MGD = million gallons per day

Watershed	Segment	Number of Permitted Discharges	Total Permitted Average Flow (MGD)
Brays	1007	1	<0.01
Brays	1007B	13	116.98
Brays	1007C	6	35.50
Brays	1007S	1	0.30
Brays	1007L	1	0.40
Sims	1007	6	51.34
Sims	1007A	2	1.80
Sims	1007D	5	54.02
Sims	1007F	3	9.82

Wastewater collection systems that transport wastewater to the treatment plant can also be a source of bacteria. The following permittees are located within the Brays Bayou and Sims Bayou watersheds, however their respective discharge leads to segments outside of the watersheds' boundaries: TX0074896, TX0129518, TX0116009, and TX0027758. These plants' wastewater collection systems may still cross over with the watersheds' service area boundaries and should be considered as a possible source of pollution. All flow data and permit information in this section were obtained from available TCEQ Discharge Monitoring Reports (DMR) and the TCEQ's Central Registry.

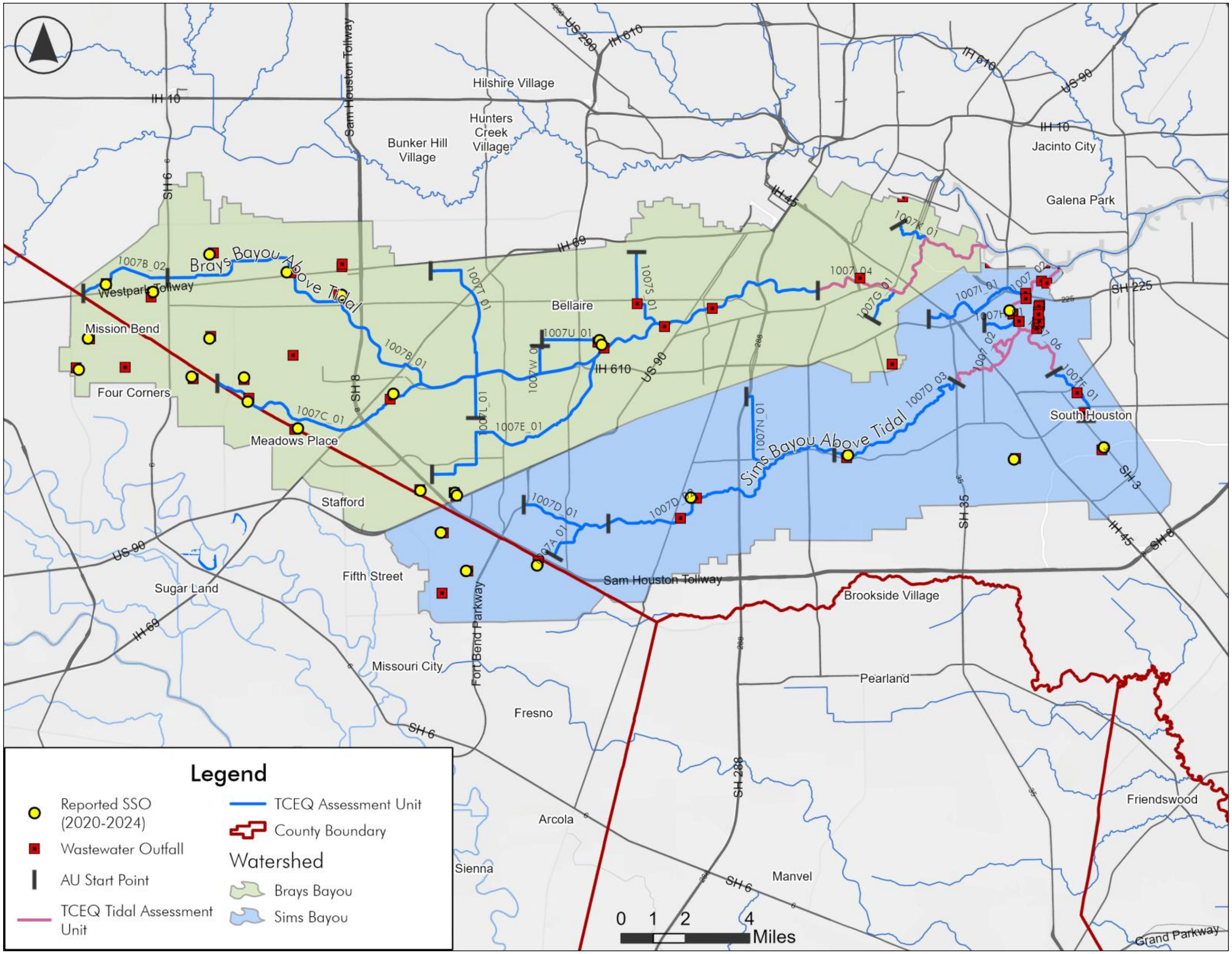

Figure 41. Map of permitted effluent discharges for the Brays Bayou and Sims Bayou watersheds (Data Source: H-GAC 2024b).

SANITARY SEWER OVERFLOWS

For the period of 2020 – 2024, 18 permittees reported SSOs to the TCEQ (TCEQ, 2025b) in the Brays Bayou watershed. The permittees reported a total of 906 SSOs for the same period. The total reported volume of these discharges was 723,021 gallons (Table 21).

In the Sims Bayou watershed, 9 permittees reported SSOs to the TCEQ between 2020 and 2024 (TCEQ, 2025b). The permittees reported a total of 1,502 SSOs, and the total reported volume of these discharges was 986,466 gallons (Table 21). While this number and volume of SSOs may not necessarily cause chronically high bacteria levels within this waterway, each discrete event may cause acute conditions that could affect public health.

Sources of SSOs often include aging wastewater infrastructure, mechanical failure, inflow and infiltration, and improper disposal of fats, oils, grease, and wipes. The major cause of SSOs reported in the Brays Bayou and Sims Bayou watersheds was due to blockages in the collection system due to fats/grease.

ON-SITE SEWAGE FACILITIES

For the Brays Bayou and Sims Bayou watersheds, 3.13% and 4.26% respectively, are not serviced by centralized wastewater. Some OSSFs in the watersheds operate under permit; however, some units precede permit regulations and are not subject to current reporting requirements. These will be referred to as 'non-registered' units. For the purpose of this report, all OSSFs are treated as potential sources of fecal waste due to vulnerability factors such as aging infrastructure, inconsistent maintenance histories, and cost challenges.

H-GAC, in coordination with authorized agents in H-GAC's service region, compiled the number of permitted and registered OSSFs in the project watersheds (H-GAC, 2024b). Fort Bend and Harris counties are local authorized agents who have accepted responsibility from TCEQ to permit OSSFs and enforce laws and rules governing OSSFs on behalf of the State. In the Brays Bayou and Sims Bayou watersheds, there are 266 and 337 registered OSSFs respectively (Figure 42).

Non-registered OSSF locations were estimated using H-GAC's geographic information database of potential OSSF locations (H-GAC, 2024c) in the Houston-Galveston area using known OSSF locations, 911 addresses, and WWTF service boundaries. Using H-GAC's estimate of non-registered OSSFs, there are likely another 959 and 1,205 non-registered OSSFs within the Brays Bayou and Sims Bayou watersheds respectively (Figure 42).

Table 21. Sanitary sewer overflows reported between January 1, 2020 and December 31, 2024 in the Brays Bayou and Sims Bayou watersheds.

Watershed	Cause Category	Cause Description	Number of overflows	Total gallons
Brays	Blockage in Collection System Due to Fats/Grease	Substances that are poured down drains solidify and build up layers that restrict wastewater flow	460	265,042
Brays	Infiltration and Inflow	High stormwater inflow overwhelming the collection system	180	134,262
Brays	WWTF Operation or Equipment Malfunction	A failing or malfunctioning component that causes the system to fail	108	129,621
Brays	Blockage in Collection System-Other Cause	Miscellaneous causes that lead to blockage of system	88	47,785
Brays	Collection System Structural Failure	Breakdown of pipes leading to collapse resulting in spills	40	48,699
Brays	Severe Weather/Natural Disaster	High rainfall causing overflow	14	79,660
Brays	Blockage Due to Rags/Wipes	These items, which may be labeled as flushable, do not disintegrate and in fact accumulate in pipes to cause sewage backups	7	2,272
Brays	Lift Station Failure	Pumps in the station stop moving wastewater, causing sewage backups	6	15,680
Brays	Unknown Cause	No cause given	3	-
Sims	Blockage in Collection System Due to Fats/Grease	Substances that are poured down drains solidify and build up layers that restrict wastewater flow	581	242,254
Sims	Infiltration and Inflow	High stormwater inflow overwhelming the collection system	434	262,464
Sims	WWTF Operation or Equipment Malfunction	A failing or malfunctioning component that causes the system to fail	173	120,974
Sims	Collection System Structural Failure	Breakdown of pipes leading to collapse resulting in spills	147	93,329
Sims	Blockage in Collection System-Other Cause	Miscellaneous causes that lead to blockage of system	141	64,288
Sims	Severe Weather/Natural Disaster	High rainfall causing overflow	15	202,143
Sims	Unknown Cause	No cause given	7	1,014
Sims	Blockage Due to Rags/Wipes	These items, which may be labeled as flushable, do not disintegrate and in fact accumulate in pipes to cause sewage backups	3	-
Sims	Lift Station Failure	Pumps in the station stop moving wastewater, causing sewage backups	1	-

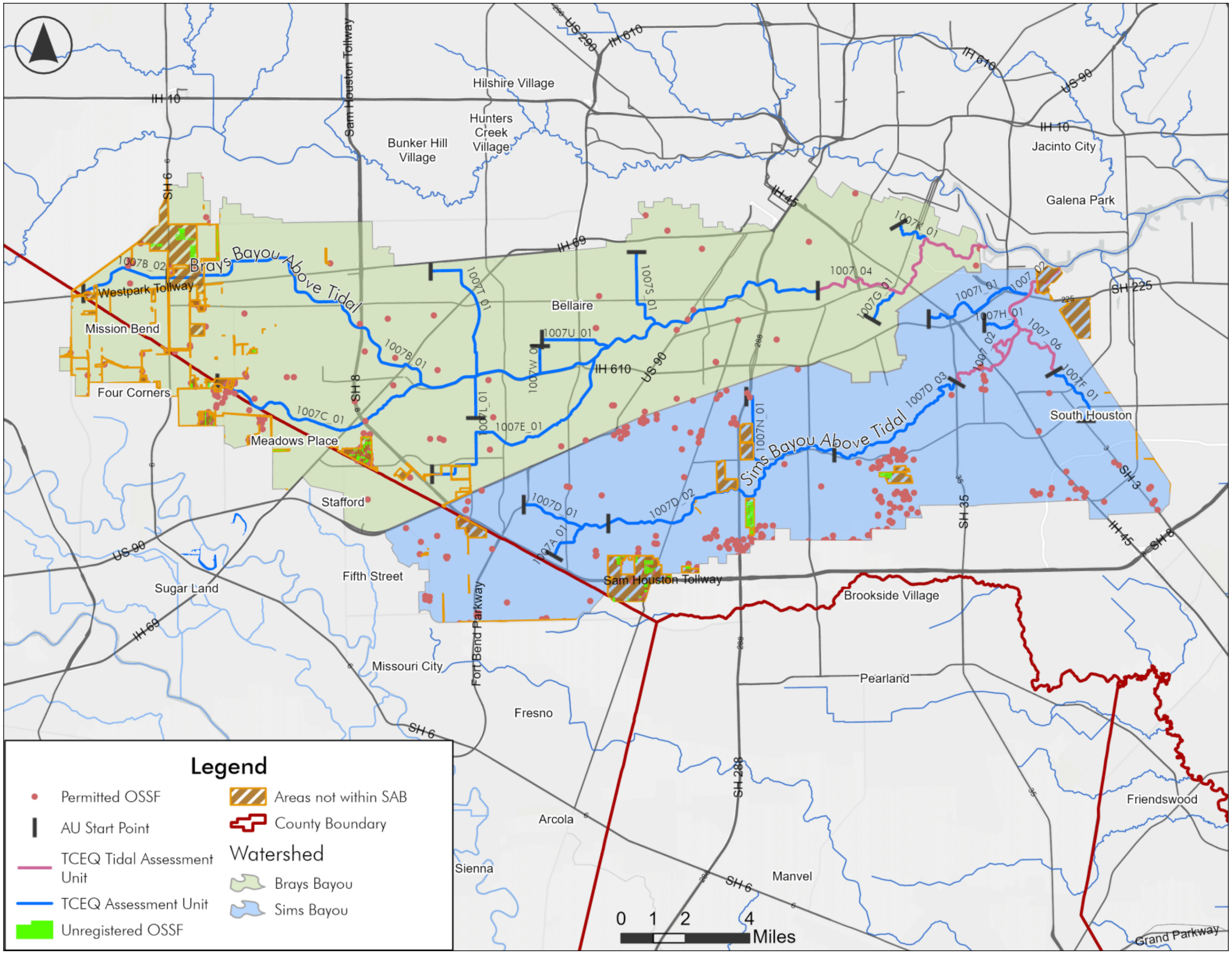

Figure 42. Map of Permitted on-site sewage facilities (OSSFs) and areas with assumed non-registered OSSFs (Areas not with the SAB = service area boundary) for the Brays Bayou and Sims Bayou watersheds.

NON-POINT SOURCES AND STORM SEWERS

Stormwater runoff can contribute to nutrient and bacteria contamination of waterways. Fecal contamination from all warm-blooded animals can increase these loadings within rural and urban settings.

RURAL STORMWATER

While the major land cover types are considered urban, both watersheds contain a small percentage of rural land cover types, including natural areas and agricultural producing lands (0.05% for Brays Bayou and 5.25% for Sims Bayou). Wildlife, feral hogs, and domesticated animals within these areas can contribute to nutrient and bacteria loadings (Table 22).

Table 22. Estimated populations for rural non-point sources of fecal waste by wildlife and livestock within the Brays Bayou and Sims Bayou watersheds.

Watershed	Deer	Feral Hogs	Cattle and Calves	Hogs and Pigs	Sheep and Goats	Equine	Poultry
Brays	302	46	12	0	1	1	3
Sims	372	80	179	1	16	20	50

Deer

Forests and open grasslands in the less developed areas of the watersheds provide habitat area for white-tailed deer. However, deer are adaptable to the encroachment of developed areas. Loss of natural areas may lead deer to explore suburban and light urban development as alternative habitat. Because of this, natural areas and open and low intensity developed areas were considered as possible deer habitat. Assessment and revision of the initial population estimates may be explored after further discussion with stakeholder groups. Resource Management Unit population density data accessed from the Texas Parks and Wildlife Department assuming one deer for every 40.2 acres of forest, shrubland and open developed areas was used to estimate deer populations in Table 22 (TPWD, 2020). In low intensity developed areas, deer density was assumed to be one deer for every 80.4 acres. With this approach, population dynamics are not well represented with respect to movements between land cover types and possible increases in density of natural areas after the built environment extends into previously undeveloped spaces.

Feral Hogs

Feral hogs are a non-native, invasive species, which likely impact the watershed with fecal waste contamination. Like deer, factors for estimating feral hog populations based on land area are available. These factors vary depending on land cover types and range between 8.9 and 16.4 hogs per square mile (Timmons et al. 2012). Feral hog population estimates may be weighed more heavily in riparian areas where animals are protected from the stresses associated with development and have more direct access to available food and water resources. The 8.9 hogs per square mile is applied to Barren, Cropland, and Developed Low Intensity land cover types. The 16.4 hogs per square mile is applied to Open Space Development, Forest/Shrub, Pasture/Grassland and Wetland land cover types. Feral hogs were estimated to have a total population of 46 and 80 within the Brays Bayou and Sims Bayou watersheds, respectively (Table 22).

Livestock

Several agricultural activities that do not require permits can be potential sources of fecal bacteria loading. Fecal waste from livestock such as cattle, pigs/hogs, sheep, goats, horses, and poultry can be introduced through direct deposition and as runoff from manure used in crop fertilization.
In Table 22, estimates of livestock in the Brays Bayou and Sims Bayou watersheds are shown. These estimates were calculated by applying a ratio of watershed's pasture/grassland land cover area compared to county land area times the livestock numbers from the 2022 Census of Agriculture for Harris and Fort Bend Counties performed by the USDA (USDA 2024). This calculation assumes equal distribution of livestock and farm operations throughout the two counties.

URBAN STORMWATER

As both watersheds are heavily urbanized, development is expected to continue to grow with the influx of population to the watershed. All land cover development types currently make up approximately 98.93% of the Brays Bayou watershed and 93.87% of the Sims Bayou watershed. Development with high and medium intensity make up 71.03% and 48.51% of Brays Bayou and Sims Bayou, respectively. This latter type of development brings increased impervious land cover that, along with slow-draining soils can increase the amount of runoff and presence of contaminants, and influence flooding events to the Brays Bayou and Sims Bayou watersheds.

Dogs and Cats

One common urban source of bacterial contamination is domesticated pets. Stray animals are of particular concern as they congregate in packs, and their waste can impact the watershed. Additionally, pet parks and walking trails can increase the impact if fecal waste is not picked up and packed out appropriately. Pet population estimates were calculated as the estimated number of dogs (1.60) and cats (1.80) per pet-owning household according to data from the 2025 American Veterinary Medical Association(AMVMA) Pet Ownership and Demographic Sourcebook (Table 23) (AVMA 2025). H-GAC estimated the number of households in the Brays Bayou and Sims Bayou watersheds in 2022 at 313,329 and 110,695, respectively. The actual contribution and significance of bacteria loading from pets reaching the waterbodies of the watersheds is unknown.

Table 23. Estimated populations for urban non-point sources of fecal waste by dogs and cats in the Brays Bayou and Sims Bayou watersheds.

Watershed	Dogs	Cats
Brays	501,326	563,992
Sims	177,112	199,251

Stormwater

A watershed can contain areas that are categorized as an "urbanized area," which can lead to a future stormwater permit. The Brays Bayou and Sims Bayou watersheds were considered by the U.S. Census as having designated urbanized areas (USCB, 2021). The TCEQ has often considered this designation for inclusion in the stormwater permit program. Currently, Brays Bayou is covered by 100% of the 2020 Census Urban Area, while Sims Bayou is covered by 99.2% of the 2020 Census

Urban Area. The state's stormwater permitting program describes the minimum requirements each entity must meet to ensure water quality protection and address identified impairments. Permit holders can be important to address urban pollution sources. To search for more information on a general permit (including stormwater), please visit TCEQ's Water Quality General Permits Search tool.

ONGOING PROJECTS

WATERSHED PROTECTION PLAN

In 2024, the H-GAC was awarded $281,800 through the United States Environmental Protection Agency's (EPA) Clean Water Act (CWA) 319(h) grant program administered locally by the TCEQ to facilitate stakeholders in the development of a voluntary, community-led WPP to address bacteria impairments and concerns for low DO and high nutrient concentrations in the Brays Bayou and Sims Bayou watersheds (Brays and Sims Bayou Watersheds | Houston-Galveston Area Council).

Work began in the fall of 2024 and is expected to continue for a duration of three years. The project will engage stakeholders to develop a WPP to address listed impairments, concerns, and stakeholder-identified water quality priorities in the waterways of the Brays Bayou and Sims Bayou watershed. The WPP will be developed to conform to the EPA's 9-element watershed-based plan standard and will utilize existing data for technical analysis. H-GAC is in the process of updating existing water quality analyses with additional ambient data acquired from 50 stations monitored by the CRP and sanitary sewer overflow and discharge monitoring reports data from the TCEQ. Further, H-GAC is developing modeling analyses using the Spatially Explicit Load Enrichment Calculation Tool (SELECT) and load duration curves (LDCs) to assess causes and sources of pollution and establish reduction targets for compliance. Refinement will utilize stakeholder review and update of data sources as needed. The modeling will inform stakeholder decisions by indicating the potential causes, extent, and required reductions associated with water quality issues.

TOTAL MAXIMUM DAILY LOAD

The TCEQ's Total Maximum Daily Load (TMDL) Program is a regulatory process triggered by impairments in a specific stream segment or segments that calculates the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards.

For Brays Bayou, the first five TMDLs for indicator bacteria (AUs: 1007B_01, 1007B_02, 1007C_01, 1007E_01, and 1007L_01) were adopted by the TCEQ on September 15, 2010 and approved by the EPA on September 27, 2010 (TCEQ, 2010a). Two addendums (adding AUs 1007S_01, 1007T_01, 1007U_01, and 1007W_01) have since been completed, the last being approved by the EPA on July 29, 2021 (TCEQ 2021).

For Sims Bayou, the commission adopted four TMDLs for indicator bacteria (AUs: 1007D_01, 1007D_02, 1007D_03, and 1007N_01) on August 24, 2016. The EPA approved them on October 7, 2016 (TCEQ, 2010b).

BACTERIA IMPLEMENTATION GROUP

The Bacteria Implementation Group (Bacteria Implementation Group | Houston-Galveston Area Council) project area covers an area of 3,200 square miles. The project area spans parts of 10 counties: Brazoria, Galveston, Harris, Fort Bend, Grimes, Liberty, Montgomery, San Jacinto, Walker, and Waller (Figure 43). Formed in 2008, the Bacteria Implementation Group is a 33-member stakeholder group that oversees an implementation plan to improve water quality in the greater Houston region and reduce bacteria levels. The implementation plan covers 11 management strategy areas with 38 activities.

In January 2013, the Bacteria Implementation Group's Implementation Plan for 72 total maximum daily loads (TMDLs) for Bacteria in the Houston-Galveston Region received approval from TCEQ. Since then, additional TMDLs have been added, including the addition of Armand Bayou and Jarbo Bayou, bringing the total today to 125. The plan is anticipated to be implemented over 25 years, with an annual review being conducted now to track success and make necessary course corrections. To track this success, the Bacteria Implementation Group is currently writing the next annual report using H-GAC CRP data to benchmark environmental progress toward implementation goals.

Figure 43. Map of the Bacteria Implementation Group (BIG) Project Area

TARGETED BACTERIA MONITORING

There are at least 144 impaired AUs within the BIG project area. The AUs are impaired for contact recreation due to elevated concentrations of fecal indicator bacteria, *E. coli* and enterococci. One specific strategy to address these impairments is to conduct geographically focused targeted bacteria monitoring to identify, report, and remediate sources of bacteria loading into the waterways. At the request of the BIG's stakeholders, H-GAC initiated the targeted monitoring program to implement these two strategies: 1) to conduct identification of illicit discharges and other bacteria sources, and 2) to geographically focus on a small, typically AU sized, area. This can be done either via volunteer work or professionally. The TCEQ's Total Maximum Daily Load (TMDL) Program is funding H-GAC to conduct targeted bacteria monitoring in the BIG project area. H-GAC is scheduled to continue targeted monitoring in December 2026 within the Sims Bayou watershed, with plans to conduct sampling on Berry Bayou Above Tidal (AU 1007F_01) and Sims Bayou Above Tidal (AU 1007D_03).

PARKS, NATURAL AREAS, AND BAYOU GREENWAYS

The Houston Parks Board is working to develop extensive greenways with public greenspaces, hike-and-bike trails, and pedestrian bridges connecting the bayous with existing parks and amenities (Figure 44 and Figure 45). At completion the Brays Bayou greenway will extend more than 30 miles and the Sims Bayou greenway will total nearly 20 miles of trails along the bayou. The Bayou Greenways interactive map allows users to explore the completed trails and view trail construction and closures.

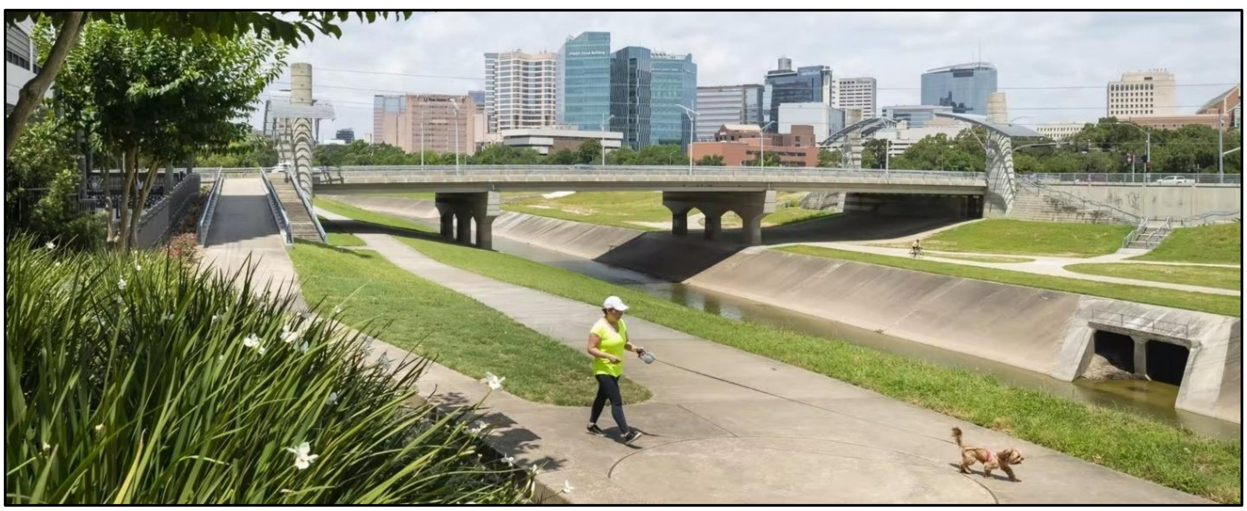

Figure 44. Brays Bayou Greenway. Photo by Houston Parks Board

Figure 45. Sims Bayou Greenway. Photo by Houston Parks Board/Anthony Rathbun.

The H-GAC hosts the annual Parks and Natural Area Awards which highlights best practices and innovative approaches to park planning and implementation. Since 2006 H-GAC has honored 65 parks and natural areas within the Brays Bayou and Sims Bayou watersheds in four categories including Projects Over $500,000, Projects Under $500,000, Planning Process and Policy Tools, and Programming. To learn more about these winning parks and natural areas in the Brays Bayou and Sims Bayou watersheds and throughout the entire H-GAC region visit the Parks and Natural Area Awards dashboard.

HOUSTON PARKS RIPARIAN RESTORATION INITIATIVE

The Houston Parks and Recreation Department's Natural Resources Management Division is implementing an initiative to restore forested riparian buffers in all parks adjacent to the city's bayous and tributaries. The restored riparian buffers will help to mitigate flooding, improve water quality, reduce erosion, and create wildlife habitat. Restoration efforts have either been completed or are in progress at many of the parks along Sims Bayou, spanning from Townwood Park downstream to Milby Park. Restoration efforts have also been undertaken along Brays bayou in both MacGregor Park and at Bayou Bend Court.

In a related project, Bayou Preservation Association staff work with Student Conservation Association interns to conduct monthly Texas Stream Team monitoring at some of the Sims Bayou park sites to collect data to help track site conditions over time.

LIVABLE CENTERS

ABOUT THE PROGRAM

Since the Livable Centers Program was established in 2008, H-GAC staff have worked with local communities and planning consultants to reimagine auto-focused infrastructure, policies, and programs to be more multi-modal with the development of 9- to10-month-long planning studies. The studies take a hybrid approach to transportation planning, evaluating improvements to the transportation network, and land use development practices that promote better access and connectivity between the roadway network and adjacent development. H-GAC published its first Livable Centers study in 2009, and as of January 2025, 46 studies have been completed in urban, suburban, and rural areas throughout the Metropolitan Planning Organization's (MPO) eight-county region. For fiscal years 2026–2028, 13 studies are planned.

At their core, Livable Centers are focused on land use and transportation. Each community has a unique set of challenges and desired outcomes, and as a result, each study is tailored to address those challenges and achieve those desired outcomes. The study aims to provide access to multi-modal transportation options, improve environmental quality, improve pedestrian safety, and promote economic development and housing diversity, all of which are strategies for achieving the program's primary goals of improving air quality and reducing vehicle miles traveled. Examples of recommendations include streetscape improvements, parking, signage and wayfinding, bicycle and pedestrian access, transit, and land use development.

At the completion of a study, local jurisdictions are equipped with a professionally developed, community-vetted plan that identifies implementable recommendations across short-, medium-, and long-term timeframes.

STUDIES IN AND AROUND THE BRAYS BAYOU AND SIMS BAYOU WATERSHEDS

Of the 46 completed Livable Centers studies, 19 are in and around the Brays Bayou and Sims Bayou watersheds (Figure 46). Highlighted below are four livable centers study examples from the Brays Bayou and Sims Bayou watershed.

East End

Published in 2009, the East End study was the first Livable Centers study to be completed in the region. It is also the study with the highest implementation rate of recommendations: 90% of the study's recommended projects, policies, and programs have been implemented to date. A total of $32.7M has been invested, with another $28M still planned for implementation (across the original study and several follow-on studies). Key recommendations and projects in the study include:

- Pedestrian and transit-friendly infrastructure improvements on Navigation Boulevard, Canal Street, Sampson Street, and York Street
- A strategy for mixed-use infill of vacant lands in the study area
- Improvements to the amenities in Guadalupe Park and the nearby intersection of Navigation Boulevard and Jensen Street

The Navigation Boulevard Esplanade is an implemented project that is particularly noteworthy. This three-block stretch has been transformed into a pedestrian-friendly, art-focused community space featuring solar-powered lighting, benches, bike racks, and wide sidewalks, making it a "gateway" to the East End. The project sponsor, the East End District, has become a strong proponent of the Livable Centers Program and actively supports partnerships with other sponsors.

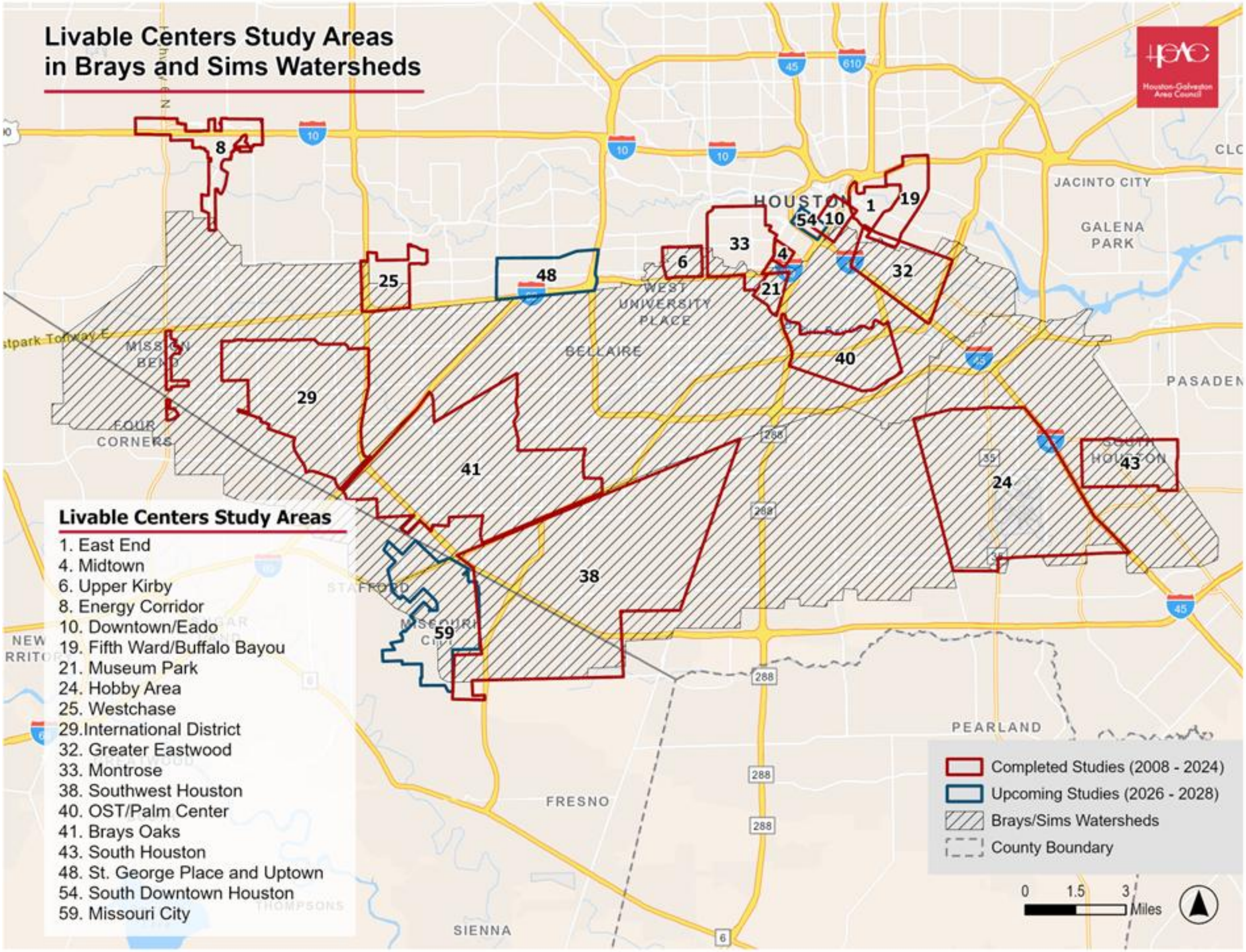

Figure 46. Map of the 17 completed and two upcoming livable centers studies that intersect with the Brays Bayou and Sims Bayou watersheds.

Southwest Houston

The Southwest Houston Livable Center study was completed in 2022. To date, implementation is at 26%, with $7.1million invested and an additional $4 million planned. Key recommendations and projects in the study include:

- Park enhancements
- Trail network improvements
- Identification of catalyst sites for infill development or re-development to promote mixed-use and transit-oriented development
- Roadway network/intersection improvements
- Pedestrian, bicycle, and transit connections and enhancements

Noteworthy implementation accomplishments from the Southwest Houston study include significant expansions to the bayou trail network (including the Sims Bayou trail system) and sidewalk enhancements. These projects support the study's recommendations to create a connected, multi-modal, and health-conscious environment that links neighborhoods to transit, parks, schools, community hubs, and commercial areas.

Old Spanish Trail (OST)/Palm Center

Also completed in 2022, the OST/Palm Center Livable Center study was sponsored by the Greater Southeast Management District. To date, 45% of the study projects and recommendations have been implemented through investments totaling $1.8 million. An additional $670 thousand in improvements are planned for future implementation. Central themes under which the study's recommendations are organized include:

- A vibrant and inclusive community with a distinct sense of place
- A community where everyone has access to economic opportunities
- A community where access to opportunities and experiences can be made safely, comfortably, and in dignity by a variety of transportation choices including walking, bicycling, and transit.

Key infrastructure improvements linked directly to recommendations in the study include intersection improvements on Martin Luther King, Jr. Boulevard and lane reconfigurations on Old Spanish Trail.

South Houston

The South Houston Livable Center study was completed in 2023 and received the 2024 Silver Planning Achievement award in Transportation Planning from the Houston, TX chapter of the American Planning Association. To date, 8% of the study's policies and programs have been implemented, with $2.25 million programmed for future project implementation.
The study's main recommendations include:

- Promote a health-conscious lifestyle through enhanced and expanded sidewalks, trails, streets, and transit links

- Strategize, finance, and execute a secure, accessible, and dependable multi-modal transportation system

As a result of the South Houston Livable Center recommendations, Harris County Precinct 2 has undertaken a study to begin the complete redesign of Spencer Highway.

PROGRAM IMPACT

The Livable Centers Program continues to make tangible impacts on the ground that improve the lives of residents of the eight-county MPO region every day. By generating activity centers, creating pedestrian, bicycle, and transit connections, and encouraging investment, the studies' recommendations contribute to improvement in the region's air quality and enhance residents' ability to live, work, and play without the need for a vehicle.

POTENTIAL STAKEHOLDERS

Potential stakeholders in the Brays Bayou and Sims Bayou watersheds include but are not limited to:

- Alief Independent School District
- Bacteria Implementation Group (BIG)
- Bayou Preservation Association
- City of Bellaire
- City of Houston
- City of Mission Bend
- City of Stafford
- Earth Economics
- Fort Bend County
- Galveston Bay Estuary Program
- Galveston Bay Foundation (GBF)
- Harris County
- Harris County Flood Control District (HCFCD)
- Harris County Precinct 1
- Harris County Precinct 2
- Harris County Precinct 4
- Harris County Soil and Water Conservation District
- Hermann Park Conservancy
- Houston Canoe Club
- Houston Methodist
- Houston Parks Board
- Houston Parks and Recreation Department
- Houston Public Works Department
- Keep Houston Beautiful
- Natural Resource Conservation Service, U.S. Department of Agriculture (USDA)
- National Parks Service
- Schlumberger
- Texas A&M Forest Service
- Texas Commission for Environmental Quality (TCEQ)
- Texas General Land Office
- Texas Parks and Wildlife (TPWD)
- Texas State Soil and Water Conservation Service (TSSWCB)
- Texas Stream Team
- The Student Conservation Association
- U.S. Army Corps of Engineers (USACE) Galveston District
- United States Geological Survey (USGS)
- Utility Districts
- Willow Waterhole Greenspace Conservancy

RECOMMENDATIONS FOR IMPROVING WATER QUALITY

Ways that potential stakeholders can take action to improve water quality in the Brays Bayou and Sims Bayou watersheds include but are not limited to:

1) Participate in the development and implementation of Watershed-based Plans.
   - A Watershed Protection Plan (WPPs) is in development for the Brays Bayou and Sims Bayou watersheds. Assessments of surface water indicate elevated levels of pathogen indicator bacteria and nutrients, which threaten the water quality of Brays Bayou and Sims Bayou as well as their tributaries. This pollution can potentially endanger public health, recreation, local economies, and the environment. Addressing this issue is a priority, and community involvement is vital to the planning process. To that end, the WPP will be a voluntary effort to identify pollution sources and measures to reduce them.
   - A Total Maximum Daily Load (TMDL) focuses on bacteria levels in the waterways and culminates in an Implementation Plan (I-Plan) that identifies potential ways to address bacteria levels and sources. The participation of local governments, organizations, and residents in the process is critical to the success of the effort. TCEQ has adopted TMDLs for the Brays Bayou and Sims Bayou watersheds, and implementation efforts have been incorporated in the BIG's I-Plan.

2) Gather more information on water quality and potential pollution sources.
   - Continue collecting water quality data and expand monitoring efforts either through the Clean Rivers Program or in support of actions associated with the development of watershed-based plans.
   - Implement or expand volunteer monitoring with the Texas Stream Team. Community Scientists with the Texas Stream Team can provide water quality data in areas without professional monitoring or provide more frequent monitoring where professional monitoring is present.
   - Conduct a use attainability analysis for the waterway.

3) Identify and address point sources of pollution. Point sources of pollution can be tracked back to a specific source such as sanitary sewer overflows, wastewater treatment facility discharges, or discharges from illicit connections. These sources may be regulated or permitted.

   - Analyze Discharge Monitoring Report data and present results to TCEQ, wastewater permittees, local governments/utility districts, and stakeholders through updates to the Regional Water Quality Management Plan.
   - Analyze sanitary sewer overflow data from regulated dischargers and present results to TCEQ, wastewater permittees, local governments/utility districts, and stakeholders through updates to the Regional Water Quality Management Plan.
   - Improve compliance and enforcement of existing stormwater quality permits and improve stormwater controls in new developments.
   - Conduct targeted bacteria monitoring to identify potential infrastructure issues or illicit discharges.

4) Identify and address nonpoint sources of pollution. Nonpoint sources of pollution can stem from the actions of individuals across the watersheds and combine to create issues for our waterways. Many nonpoint source pollutants can be carried into waterways by runoff from rain events but may not be traceable back to an origin point. However, because individual actions add to pollution, individual actions can also help reduce the sources of pollution.
   - Support general education and outreach efforts to inform residents about watersheds, stormwater runoff, pollution, and their connection to local waterways.
   - Support programs and resources to educate residents on the importance of proper pet waste disposal. Pet waste is identified in most watershed-based plans as a key source of bacteria in local waterways. Pet waste should always be picked up and disposed of in a waste receptacle. Specific pet waste stations can also be installed in apartment complexes or public areas like parks or trails.
   - Support public education programs to inform businesses, residents, and apartment complexes on appropriate disposal of fats, oils, grease, and wipes. Fats, oils, and grease from cooking, as well as wipes that are flushed down toilets, create clogs in residential and city pipes that can lead to residential sewer backups or sanitary sewer overflows. This can bring bacteria into contact with our waterways, but more importantly into contact with residents, which is a public health concern. Fats, oils, and grease should be poured into a container, cooled, and then disposed of in the trash, and wipes should be thrown away in the trash not flushed in the toilet. Individuals and businesses alike can participate in programs like Cease the Grease and Protect our Pipes.
   - Support homeowner education regarding proper maintenance of on-site sewage facilities, as well as programs that assist with repairing or replacing failing systems or connect homeowners with centralized sewer collection systems where practical.
   - Expand the use of low impact development and green infrastructure practices. These practices can help reduce stormwater runoff.
   - Improve or restore riparian habitats to enhance ecosystem services such as helping to slow runoff, absorbing nutrients, and reducing water temperatures.
   - Identify illegal dumping sites and improve signage and enforcement to reduce the instances of illegal dumping. When illegal dumping or floatable debris has accumulated in areas, work to clean up the site(s) utilizing existing programs such as Rivers Lakes Bays 'N Bayous Trash Bash, Stopping Plastics and Litter Along Shorelines (SPLASh), or by creating new local cleanup programs
   - Support or participate in programs such as the Texas State Soil and Water Conservation Districts (SWCDs) that educate landowners on best management practices for livestock or provide resources to assist with implementing these practices.

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APPENDICES

APPENDIX A: Acronyms and Abbreviations

APPENDIX B: Glossary of Water Quality Terms

APPENDIX C: Water Quality Technical Primer

APPENDIX D: Statistical Methodology

APPENDIX E: Trend Data Visualizations

APPENDIX F: Wastewater Discharge Permits in the Brays Bayou and Sims Bayou Watersheds

APPENDIX A: ACRONYMS AND ABBREVIATIONS

ALU	aquatic life use
AU	assessment unit
AVMA	American Veterinary Medical Association
BIG	Bacteria Implementation Group
BMP	best management practices
BS	biased to season
CE	collecting entity
CFS	cubic feet per second
CIP	capital improvement projects
CMS	coordinated monitoring schedule
CN	use concern
CRP	Clean Rivers Program
CS	screening level concern
CWA	Clean Water Act
DMR	discharge monitoring report
DMU	deer management units
DO	dissolved oxygen
DSHS	Texas Department of State Health Services
E. coli	*Escherichia coli*
EIH	Environmental Institute of Houston, University of Houston-Clear Lake
EPA	United States Environmental Protection Agency
F	fahrenheit
FEMA	Federal Emergency Management Agency
FIRM	flood insurance rate maps
FO	field operations
FS	fully supporting
ft	feet
GIS	geographic information system
GLO	Texas General Land Office
H	high
HCFCD	Harris County Flood Control District
HCPCS	Harris County Pollution Control Services
H-GAC	Houston-Galveston Area Council
HH	human health
HHD	City of Houston Health Department
HMGP	Hazard Mitigation Grant Program
HMP	hazard mitigation plan
I	intermediate
I-Plan	implementation plan
IR	Texas Integrated Report for Clean Water Act Sections 305(b) & 303(d)
km	kilometer
L	limited

LDC	load duration curve
LOQ	limit of quantitation
LOS	level of support
M	minimal
mg/L	milligram per liter
MGD	millions of gallons per day
mi	mile
mL	milliliter
MPN	most probable number
MPO	metropolitan planning organization
MS4	municipal separate storm sewer system
MT	monitoring type
N	nitrogen
N/A	not applicable
N/IS	navigation and industrial water supply
NA	not assessed
NC	no concern
NCR	noncontact recreation
NHC	National Hurricane Center
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPS	nonpoint source pollution
NRCS	Natural Resources Conservation Service
NS	non-supporting
NWS	National Weather Service
OSSF	on-site sewage facility
PCB	polychlorinated biphenyl
PCR1	primary contact recreation 1
PCR2	primary contact recreation 2
QAPP	quality assurance project plan
RCUD	City of Houston Regulatory Compliance Utility Development
RT	routine
RUAA	recreational use attainment analysis
s.u.	standard units
SAB	service area boundary
SAS	Statistical Analysis System
SCR1	secondary contact recreation 1
SCR2	secondary contact recreation 2
SE	submitting entity
SELECT	Spatially Explicit Load Enrichment Calculation Tool
SJRA	San Jacinto River Authority
SSO	sanitary sewer overflow
SWQM	Surface Water Quality Monitoring Program

SWQMIS	Surface Water Quality Monitoring Information System
TCEQ	Texas Commission on Environmental Quality
TDS	total dissolved solids
TMDL	total maximum daily load
TP	total phosphorus
TPWD	Texas Parks and Wildlife Department
TRIES	Texas Research Institute for Environmental Studies
TSHA	Texas State Historical Association
TSS	total suspended solids
TSSWCB	Texas State Soil and Water Conservation Board
TSWQS	Texas Surface Water Quality Standards
TWDB	Texas Water Development Board
UAA	use attainability analysis
USACE	United States Army Corps of Engineers
USCB	United States Census Bureau
USDA	United States Department of Agriculture
USGS	United States Geological Survey
WPP	watershed protection plan
WRIM	water resources information map
WWTF	wastewater treatment facility

APPENDIX B: GLOSSARY OF WATER QUALITY TERMS

A

Algae - Plants that lack true roots, stems and leaves. These non-vascular plants attach to rocks and debris or can float freely in the water. They may be green, blue-green, or olive-green and slimy to the touch. They usually have a coarse filamentous structure.

Ambient - The existing water quality in a particular water body (beyond the immediate influence of a discharge pipe).

Ammonia-Nitrogen (NH3) - Ammonia, naturally occurring in surface and wastewaters, is produced by the breakdown of compounds containing organic nitrogen.

Aquatic Community - An association of interacting populations of aquatic organisms in a given water body or habitat.

Aquatic Life Use (ALU) - A designation assigned to an individual water body segment based upon the potential to support aquatic life.

Assessment Unit (AU) - The smallest geographic areas of a water body that can support a designated or site-specific use.

Attainable Use - A use that can be reasonably achieved by a water body in accordance with its physical, biological, and chemical characteristics whether it is currently meeting that use or not. The designated use, existing use, or presumed use of a water body may not necessarily be the attainable use.

Assessed Waters - Water bodies for which the State can make use-support decisions based on actual information.

B

Basin - Large geographic areas generally containing one or more watersheds.

Benthos - Aquatic organisms that live on, in, or near the bottom of a waterbody. Examples include worms, leeches, snails, flatworms, burrowing mayflies and clams.

Best Management Practices (BMPs) - Schedules of activities, maintenance procedures, and other management practices to prevent or reduce the pollution of water to the maximum extent practicable. Best management practices include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

Bloom - The accelerated growth of algae and/or higher aquatic plants in a body of water. Bloom is often related to pollutants that increase the rate of growth.

C

Channelization - Straightening and deepening
streams so water will move faster. A method of flood control that disturbs fish and wildlife habitats and can interfere with a waterbody's ability to assimilate waste.

Chloride (Cl^-) - One of the major inorganic ions in water and wastewater. Concentrations can be increased by industrial processes. High chloride concentrations can affect metallic objects and growing plants.

Chlorophyll-*a* - A photosynthetic pigment found in all green plants. The concentration of chlorophyll a is used to estimate phytoplankton biomass (all of the phytoplankton in a given area) in surface water.

Classified - Refers to a waterbody that is listed and described in Appendix A or Appendix C of the Texas Surface Water Quality Standards.

Coastal Basin - A collection of watersheds adjacent to the coastline that water flows through on its way to the ocean. Typically, coastal basins are between and bound by major river basins and a bay or other outlet to the ocean.

Concentration - The amount or mass of a substance present in a given volume or mass of samples.

Conductivity - A measure of the carrying capacity for electrical current, in mhos/cm, of 1 cm^3 of water at 25°C. Dissolved substances in water dissociate into ions with the ability to conduct electrical current. Conductivity is a measure of how salty the water is. Salty water has high conductivity.

Confluence - The flowing together of two or more streams, including where a tributary joins another, usually larger, stream segment.

Contact Recreation - Recreational activities involving a significant risk of ingestion of water; including wading by children, swimming, water skiing, diving, and surfing. See also noncontact recreation.

Contamination - Degradation of water quality due to human activity (as compared to the original or natural conditions).

Conventional Parameters - A list of basic parameters that require laboratory analyses. The parameters frequently include, but are not limited to, solids (TSS and TDS), nutrients (nitrogen and phosphorus compounds), chlorides, and sulfates.

Criteria - Water-quality conditions that are to be met in order to support and protect desired uses.

D

Designated Use - A use that is assigned to specific waterbodies in Appendix A or in Appendix D of the Texas Surface Water Quality Standards. Typical uses that may be designated for specific waterbodies include domestic water supply, categories of aquatic- life use, kinds of recreation, and aquifer protection.

Dioxin - A family of polychlorinated chemicals found in waste from the paper bleaching processes and the combustion of chlorinated compounds. It is considered carcinogenic and can disrupt the reproductive and immune systems in humans.

Discharge - The rate of fluid flowing past a given point at a given time.

Dissolved Oxygen (DO) - The oxygen freely available in water. Dissolved oxygen is vital to fish and other aquatic life and for the prevention of odors. Traditionally, the level of dissolved oxygen has been accepted as the single most important indicator of a waterbody's ability to support desirable aquatic life.

Dissolved Oxygen (DO) Measurements, 24- hour - The measurement of dissolved oxygen over a 24-hour period using deployed, unattended, automated equipment preset to record and store field measurements over one 24-hour period. These measurements are used to assess Aquatic Life Use.

Drought - A time of less-than-normal or less-than-expected rainfall.

E

E. coli - *Escherichia coli*, a bacteria found in the intestinal tracts and feces of warm-blooded animals. Its presence in non-tidal waters indicates potential fecal contamination and the possible presence of enteric pathogens (viral, protozoan, and bacterial pathogens of the gastrointestinal route).

Effluent - Wastewater (treated or untreated) that flows out of a treatment plant or industrial outfall (point source) prior to entering a waterbody.

Enterococci - A subgroup of fecal bacteria found in the intestinal tracts and feces of warm-blooded animals. Its presence in tidal waters indicates potential fecal contamination and the possible presence of enteric pathogens (viral, protozoan, and bacterial pathogens of the gastrointestinal route).

Estuary - Regions of interaction between rivers and near shore ocean waters, where tidal action and river flow create a mixing of fresh and salt water.

Eutrophication - The process by which water becomes enriched with nutrients (particularly phosphorus and nitrogen).

F

Fecal Coliform - A subset of the coliform bacteria
group that is found in the intestinal tracts and feces of warm-blooded animals. Heat-tolerant bacteria from other sources can sometimes be included. It is used as an indicator of the potential presence of pathogens.

Field Parameters - A list of basic tests generally collected in the field using equipment and meters. The list also includes visual observations.

Flood - A relatively high streamflow that overtops the banks of a stream.

Flood Stage - The gage height (or stage) at which overflow of the natural banks of a stream begins to cause damage in the local area from flooding.

Flood Plain - The relatively level area of land bordering a stream channel that is inundated during a flood event.

Fully Supporting (FS) - The waterbody meets TSWQS or supports its designated uses.

G

Gage Station - A particular site on a stream segment where systematic observations or hydrologic data are obtained.

Gage Datum - A uniquely selected reference point for each gage site.

Gage Height - The distance (or height) of the stream (or lake) water surface above the gage datum (reference point). Gage height is also called stage, river height, river level, river stage, stream height, stream stage, and water height.

Geographic Information Systems (GIS) - A computerized system for combining, displaying, and analyzing geographic data.

H

Habitat - The area in which an organism lives.

Headwaters - The source and upper part of a stream.

Hydrograph - A graph of the water level or rate of flow of a body of water over time, showing the temporal or seasonal change.

I

Impaired - A designation for an associated use (aquatic life, contact recreation, etc.) where a water quality standard is not attained.

Impairment - A detrimental effect on the integrity of a waterbody caused by a change in the chemical, physical, or biological quality or condition of a waterbody that prevents attainment of the designated use.

Implementation Plan (I-Plan) - A formalized written plan developed by stakeholders to address specific concerns (e.g., bacteria) and contain policy recommendations to bring waterbodies back into compliance.

Impoundment - A body of water confined by a dam, dike, floodgate, or other barrier.

Indicator Organism - An organism, species or community that indicates the presence of a certain environmental condition or conditions.

Intermittent Stream - A stream that has a period of zero flow for at least one week during most years.

L

Limit of Quantitation (LOQ) - The lowest concentration of a substance that can be accurately measured under specific conditions.

LOESS Plot - a graph that shows the relationship of two variables (measurements or parameter values) made using a technique that calculates the slope of the plotted line at different time periods (locally weighted least-squares regression), producing a line that usually shows inflections (change points) rather than a straight line that best fits all points. LOESS is not really an acronym but can be thought of as "Local regression."

M

Macrobenthic Invertebrate - Aquatic bottom- dwelling fauna. Common types are flat worms, leeches, snails, and various insect species.

Monitoring - The process of sampling and analyzing water quality parameters over time.

Municipal Separate Storm Sewer System (MS4)
- A conveyance (or system of conveyances) that is owned by a state, city, town, village, or other public entity that discharges to waters of the U.S., is designed to collect or convey stormwater (e.g., storm drains, pipes, ditches), is not a combined sewer, and is not part of a sewage treatment plant or publicly owned treatment works.

N

National Pollutant Discharge Elimination System (NPDES) - A permit program under Clean Water Act Section 402 that imposes discharge limitations on point sources based upon the effluent limitation capabilities of a control technology or on local water quality standards.

Nekton - The aggregate of actively-swimming aquatic organisms in a body of water able to move independently of water currents.

Nitrate-Nitrogen (NO_3-N) - A compound containing nitrogen that can exist as a dissolved solid in water. Excessive amounts can have harmful effects on humans and animals (>10 mg/L).

Nitrite-Nitrogen (NO_2-N) - An intermediate oxidation state in the nitrification process (ammonia, nitrite, and nitrate).

Noncontact Recreation - Aquatic recreational pursuits not involving a significant risk of water ingestion and limited body contact incidental to shoreline activity; including fishing, and commercial and recreational boating. See also contact recreation.

Nonpoint Source (NPS) Pollution - A pollution source that is not subject to regulation, that is diffuse and does not have a single point of origin or is not introduced into a receiving stream from a specific outfall. NPS pollution typically results from land runoff, precipitation, atmospheric deposition, drainage, seepage, or hydrologic modification.

Nutrient - Any substance used by living things to promote growth. The term is generally applied to nitrogen and phosphorus in water and wastewater but is also applied to other essential and trace elements.

O

Outfall - A designated point of effluent discharge.

Oyster Waters - Waters producing edible species of clams, oysters, or mussels.

P

Perennial Stream - A stream that has a continuous flow of surface water throughout the year in at least parts of its catchment area during seasons of normal flow.

Permit - A legally binding document issued by a State or Federal permitting authority to the owner or manager of a point source discharge. The permit document contains a schedule of compliance and specifies monitoring and reporting requirements.

pH - The hydrogen-ion activity of water caused by the breakdown of water molecules and presence of dissolved acids and bases.

Phosphorus - A nutrient that is essential to the growth of organisms. It can be the nutrient that limits the primary productivity of water. In excessive amounts from wastewater, agricultural drainage, and certain industrial waste it also contributes to the eutrophication (the natural aging progression) of lakes and other waterbodies.

Pollution - The alteration of the physical, thermal, chemical, or biological quality of, or the contamination of, any water that renders it harmful, detrimental, or injurious to humans, animal life, vegetation, property, or the public health, safety, or welfare. Pollution may impair the usefulness or the public enjoyment of the water for any lawful or reasonable purpose.

Point Source Pollution - Any source of pollution that is subject to regulation and is permitted. An example of a point source is a permitted wastewater treatment facility effluent discharge.

Polychlorinated Biphenyls (PCBs) - A class of organic compounds used in dielectric fluids in transformers, capacitors, and coolants. PCBs are highly toxic and are associated with endocrine disruption and neural toxicity in humans.

Pool - A small part of a stream reach with little-to-no velocity. Pools commonly contain water deeper than surrounding areas.

Precipitation - Any or all forms of water particles that fall from the atmosphere (such as rain, snow, hail, etc.).

Public Water Supply (PWS) Use - A waterbody designated to provide water to a public water system.

Q

Quality Assurance Project Plan (QAPP) - A written document outlining the procedures a monitoring project will use to ensure the data it collects and analyzes meets project requirements.

R

Reach - A continuous part of a stream between two specified points.

Receiving Waters - Waters that receive treated or untreated wastewaters.

Recreational Use Attainment Analysis (RUAA) - A Use Attainment Analysis that is designed to determine if contact recreation is an appropriate use of a waterbody.

Reservoir - Any natural or artificial holding area used to store, regulate, or control water.

Riparian - Areas adjacent to streams or rivers with a high density, diversity, and productivity of plant and animal species relative to nearby uplands.

River Basin - A collection of watersheds drained by a major river and its tributaries.

Routine Monitoring - Monitoring that is scheduled in advance without intentionally trying to target a certain environmental condition. Routine monitoring typically consists of field measurements, conventional chemical parameters, bacteria, and flow measurements.

Runoff - The part of precipitation or irrigation water that runs off land into streams and other surface water.

S

Screening Level - Established targets (instream concentrations) for parameters that establish targets that can be directly compared to monitoring data. Screening levels are derived from long-term monitoring data or published levels of concern.

Sediment - Particles and/or clumps of particles of sand, clay, silt, and plant or animal matter carried in water and deposited in reservoirs and slow-moving areas of streams and rivers.

Segment - A waterbody or portion of a waterbody that is individually defined and classified in the Texas Surface Water Quality Standards. A segment is intended to have relatively homogeneous chemical, physical, and hydrological characteristics. A segment provides a basic unit for assigning site-specific standards and for applying water quality management programs. Classified segments may include streams, rivers, bays, estuaries, wetlands, lakes, and reservoirs.

Sonde - A multi-parameter water quality monitoring device that calculates and records field parameters.

Specific Conductance - A measure of the ability of a liquid to conduct an electrical current.

Standards - The designation of waterbodies for desirable uses and the narrative and numerical criteria deemed necessary to protect those uses.

Stormwater - Rainfall runoff, snow-melt runoff, surface runoff, and drainage.

Stream Mile - A distance of one mile along a line connecting the midpoints of the channel of a stream.

Stream Order - A ranking of the relative sizes of streams within a watershed based on the nature of their tributaries. The smallest unbranched tributary is called first order, the stream receiving the tributary is second order, and so on.

Subwatershed - Any of several drainage areas that flow to a specific location and collectively form a watershed.

Sulfate (SO_4^{2-}) - An ion derived from rocks and soils containing gypsum, iron sulfides, and other sulfur compounds. Sulfates are widely distributed in nature.

Surface Water - An open body of water, such as a lake, river, or stream.

Surface Water Quality Monitoring Information System (SWQMIS) - A database that serves as a repository for surface water quality monitoring data for the state of Texas. SWQMIS also provides data validation and reporting tools, a mapping interface, and modules for tracking information about projects and quality assurance documents.

T

Texas Surface Water Quality Standards (TSWQS) - Standards that establish explicit goals for the water quality of streams, rivers, lakes, and bays throughout the state. The Standards are developed to maintain the quality of surface waters in Texas so that it supports public health and enjoyment and protects aquatic life, consistent with the sustainable economic development of the state. Water quality standards identify appropriate uses for the state's surface waters, including aquatic life, recreation, and sources of public water supply. The TSWQS are codified in Title 30, Chapter 307 of the Texas Administrative Code.

Tidal - Descriptive of coastal waters subject to the ebb and flow of tides. For purposes of standards applicability, tidal waters are saltwater. Classified tidal waters include all bays and estuaries with a segment number that begins with 24xx, all streams with the word tidal in the segment name, and the Gulf of America (Gulf of Mexico in the 2024 IR).

Total Dissolved Solids (TDS) - The amount of material (inorganic salts and small amounts of organic material) dissolved in water and commonly expressed as a concentration in terms of milligrams per liter.

Total Maximum Daily Load (TMDL) - The total amount of a substance that a waterbody can assimilate and still meet the Texas Surface Water Quality Standards.

Total Suspended Solids (TSS) - The amount of organic and inorganic suspended particles in water.

Toxic Pollutants - Materials contaminating the environment that cause death, disease, and/or birth defects in organisms that ingest or absorb them.

Tributary - A stream or river that flows into a larger one.

U

Use Attainability Analysis (UAA) - A structured scientific assessment of the factors affecting a waterbody's attainment of specified uses.

W

Waterbody - Refers to any mass of water (lake, bay, river, creek, bayou, etc.).

Water Quality - The chemical, physical, and biological characteristics of water.

Watershed - The area of land from which precipitation drains to a single point. Watersheds are sometimes referred to as drainage basins or drainage areas.

Watershed Protection Plan (WPP) - A voluntary, locally led approach to address state water quality standard impairments along with other water-related concerns.

APPENDIX C: WATER QUALITY TECHNICAL PRIMER

TEXAS SURFACE WATER QUALITY STANDARDS

The Texas Surface Water Quality Standards (TSWQS) establish numerical and narrative goals to maintain the quality of streams, rivers, lakes, and bays throughout the state. Appendix A and Appendix D of the TSWQS establish the geographic boundaries and the appropriate standards for each body of water. The standards are developed to maintain the quality of surface waters. Standards ensure public health and enjoyment, protect aquatic life, and remain consistent with the sustainable economic development of the state. The Texas Commission on Environmental Quality (TCEQ) develops the TSWQS under the authorization of the U.S. Clean Water Act and Texas Water Code. The TSWQS are codified in Title 30, Chapter 307 of the Texas Administrative Code. The standards are approved by the EPA.

The TSWQS are designed to:

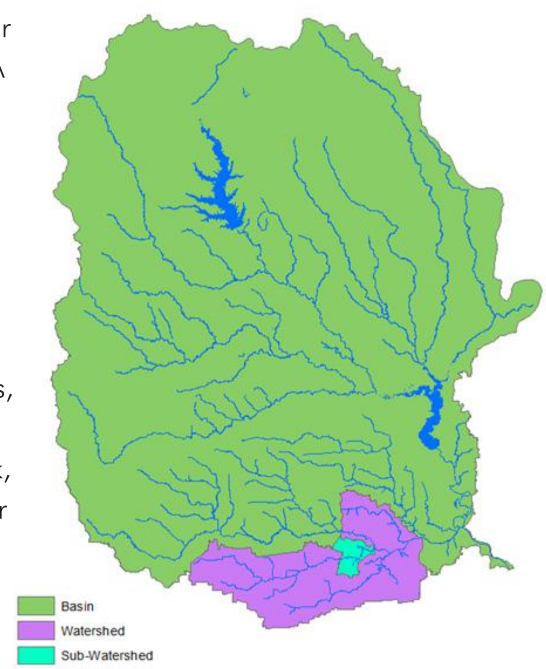
- Designate the uses, or purposes, for which the state's waterbodies should be suitable;
- Establish numerical and narrative goals for water quality throughout the state; and
- Provide a basis on which TCEQ regulatory programs can establish reasonable methods to implement and attain the state's goals for water quality.

The criteria adopted and incorporated into the standards are the allowable concentrations of pollutants in State, Territory, and authorized Tribal waters and are developed for the protection of aquatic life and human health. Impairments occur when water quality conditions do not meet the assigned uses or criteria as defined in the TSWQS.

DRAINAGE AREAS — BASINS, WATERSHEDS, AND SUB-WATERSHEDS

A watershed is a defined geographic area that waterways flow through on the way to a common body of water. Basins are larger geographic areas generally containing one or more watersheds. A river basin is a collection of watersheds drained by a major river and tributaries. A coastal basin is a collection of watersheds adjacent to the coastline that water flows through on its way to the ocean. Typically, coastal basins are between and bound by two major river basins and a bay or other outlet to the ocean.

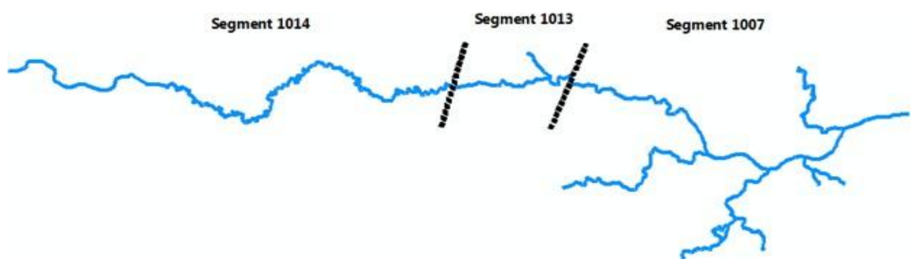
Watersheds can be broken down into even smaller drainage areas, which are referred to as sub-watersheds For example, a sub-watershed could be defined as the drainage area of a small creek, stream, or portion of a stream that is part of the drainage area for a tributary, which is part of a major river drainage basin.



WATERBODIES, SEGMENTS, AND ASSESSMENT UNITS

The term waterbody is used to refer to any mass of water. A waterbody can be contained in a lake or a bay, or flow, such as a river, creek, or bayou. The TCEQ divides waterbodies in the state into distinct segments that generally represent natural watersheds and are intended to have similar chemical, physical, and hydrological characteristics. Each segment is assigned a four-digit code. The first two digits identify the river basin, and the last two digits identify the segment. Segments can be either classified or unclassified.

Classified Segments

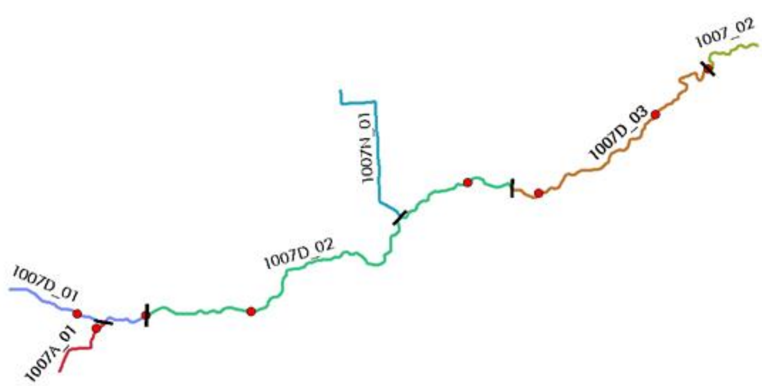


A classified segment is a waterbody (or portion of a waterbody) that is individually defined in the TSWQS. Typically, classified segments are major waterways. Site specific numerical criteria are developed to evaluate the uses and overall water quality of a classified segment. The parameters evaluated include bacteria, nutrients, and dissolved oxygen. Site-specific numerical criteria are developed to evaluate the uses and water quality of classified segments. These uses include aquatic life use and recreational use (discussed later in the primer).

Unclassified Segments

Unclassified segments are often tributaries of classified segments. These segments are usually assessed based on the criteria of the classified segment into which they flow. However, some unclassified segments have been assigned specific water quality standards in the TSWQS. Unclassified segments are assigned the same four-digit code as the classified segment and a letter that is specific to that waterway.

Assessment Units (AUs)



For assessment purposes, each segment is subdivided into hydrologically distinct units, or assessment units (AUs). AUs are the smallest geographic areas of a waterbody that can support a designated or site-specific use. A segment may have one or multiple AUs, depending on water quality conditions or flow in different sections of the waterbody. Each AU has the same four or five-digit code as the segment followed by an AU identifier (e.g., _01, _02, etc.). If there are multiple AUs, they will generally be in sequential order (e.g., 1007D_01, 1007D_02, etc.). Each AU is evaluated separately as part of the assessment.

For example, Sims Bayou Above Tidal (1007D) is divided into three AUs. The red dots represent monitoring stations. Monitoring stations have been placed on the downstream and upstream ends of each AU in 1007D. Tributary 1007A has one monitoring station close to the confluence with the parent stream 1007D.

WATER QUALITY AND DESIGNATED USES

As defined in the TSWQS, a waterbody can be assigned specific uses including aquatic life, public water supply, and contact recreation use. Designated uses typically have corresponding numeric criteria listed in the TSWQS. General criteria apply across the entire state, but if sufficient information is available for a specific waterbody, the site-specific standards may be developed.

Aquatic Life Use

Aquatic life use (ALU) is determined by the amount of dissolved oxygen and the abundance and diversity of species. Aquatic life use consists of five categories: minimal, limited, intermediate, high, and exceptional. In Texas, waterbodies not specifically listed in Appendix A or D of the TSWQS are presumed to have a high aquatic life use and corresponding dissolved oxygen criteria. This use is assessed using 24-hour dissolved oxygen data along with nekton and macrobenthic invertebrate community evaluations.

Public Water Supply Use

Public water supply (PWS) use includes an evaluation of chloride, sulfates, and total dissolved solids in the waterbody. Criteria for these parameters are set so that public water supplies are capable of treating and delivering water of acceptable quality.

Recreational Use

Recreational use refers to how safely a waterbody can support activities that involve the possibility of ingesting or coming into contact with water. If activities are likely to result in ingestion of water (swimming, diving, tubing, surfing, wading by children), bacteria concentrations need to be lower. The TSWQS protects human health by setting numeric criteria in a waterbody relative to the types of recreational activity occurring on that waterbody. Fecal indicator bacteria levels are measured to determine risk. Criteria are expressed as the number of bacteria per 100 milliliters (mL) of water [in terms of colony-forming units, most probable number (MPN), or other applicable reporting measures]. The presence of fecal indicator bacteria in waters suggests that human and animal wastes may be reaching the assessed waters. In freshwater, the indicator organism is *Escherichia coli* (*E. coli*). Enterococci bacteria are the indicator for tidal waterbodies.

There are five categories of recreational use, which are based on the type and frequency of recreation.

- Primary Contact Recreation 1 (PCR1) – Activities that are presumed to involve a significant risk of ingestion of water (e.g., wading by children, swimming, water skiing, diving, tubing, surfing, hand fishing, and the following whitewater activities: kayaking, canoeing, and rafting).
- Primary Contact Recreation 2 (PCR2) – Water recreation activities, such as wading by children, swimming, water skiing, diving, tubing, surfing, hand fishing, and whitewater kayaking, canoeing, and rafting, that involve a significant risk of ingestion of water but that occur less frequently than for PCR1 due to physical characteristics of the waterbody or limited public access.
- Secondary Contact Recreation 1 (SCR1) – Activities that commonly occur but have limited body contact incidental to shoreline activity (e.g. fishing, canoeing, kayaking, rafting, and motor boating). These activities are presumed to pose a less significant risk of water ingestion than PCR1 or PCR2 but more than secondary contact recreation 2.
- Secondary Contact Recreation 2 (SCR2) – Activities with limited body contact incidental to shoreline activity (e.g. fishing, canoeing, kayaking, rafting, and motor boating) that are presumed to pose a less significant risk of water ingestion than SCR1. These activities occur less frequently than SCR1 due to physical characteristics of the waterbody or limited public access.
- Noncontact Recreation (NCR) – Activities that do not involve a significant risk of water ingestion, such as those with limited body contact incidental to shoreline activity, including birding, hiking, and biking. NCR use may also be assigned where primary and secondary contact recreation activities should not occur because of unsafe conditions, such as ship and barge traffic.

Primary contact recreation is the presumed recreational use in Texas waterbodies unless there is evidence to show that the waterbody is not used for primary contact recreation. A Recreational Use Attainability Analysis (RUAA) is necessary to change the presumed use of a waterbody.

WATER QUALITY MONITORING

Surface Water Quality Monitoring (SWQM) Program

TCEQ's Surface Water Quality Monitoring Program evaluates the physical, chemical, and biological characteristics to ensure that it is suitable for general or designated uses. Water quality is monitored and evaluated in relation to human health concerns, ecological conditions, and designated uses. Data collected under the SWQM program is utilized by the TCEQ to provide a basis for effective policies that promote the protection, restoration, and wise use of the state's surface water.

Surface water samples are collected for assessment purposes following the methodologies outlined in TCEQ's *Surface Water Quality Monitoring Procedures Volume 1: Physical and Chemical Monitoring Methods* (TCEQ Publication RG-415) (colloquially referred to as "SWQM Procedures"). The guidelines outlined in the SWQM Procedures manual document the methods and the quality assurance procedures that must be used to demonstrate that data collected by monitoring personnel across the state are of a known and adequate quality. All data collected by H-GAC and its partners are collected following SWQM procedures.

Water quality data, including data collected under SWQM and the Clean Rivers Program, are stored in the Surface Water Quality Monitoring Information System (SWQMIS). This database is used to enter, manage, track, and report on water quality-related data.

Coordinated Monitoring Schedule (CMS)

The Coordinated Monitoring Schedule (CMS) is the combined schedule for all surface water quality monitoring in Texas. Monitoring entities within a basin or region meet annually to establish and coordinate monitoring schedules to ensure appropriate coverage, reduce duplication of effort, and better utilize available resources.

The CMS lists:

- Monitoring stations
- Collecting Entities (CE)
- Submitting Entities (SE)
- Monitoring Type (MT)
- Parameters
- Monitoring frequency

The Coordinated Monitoring Schedule is available online at cms.lcra.org

Quality Assurance Project Plan (QAPP)

H-GAC's Clean Rivers Program Quality Assurance Project Plan (QAPP) describes H-GAC's quality assurance policies, management structure, and procedures used to implement the quality assurance requirements for the Clean Rivers Program. These policies and procedures are necessary to verify and validate data collected for the Clean Rivers Program. The QAPP is reviewed and approved by TCEQ to help ensure that all data generated are of known and documented quality, deemed acceptable for their intended use and that the data have been collected and managed in such a way as to guarantee its reliability. Only quality-assured data may be used for water quality assessments or other regulatory purposes. H-GAC's current and previous QAPP documents are available on H-GAC's website at h-gac.com.

Monitoring Types

Monitoring activities may be divided into the following categories:

- Routine Monitoring
- Special-Study Monitoring
- Permit-Support Monitoring
- Systematic Monitoring

The type of monitoring conducted by the Clean Rivers Program is usually routine, meaning it is monitoring that is scheduled in advance without intentionally trying to target any certain environmental condition, with samples being collected regardless of the conditions encountered. Routine monitoring, at a minimum, includes field measurements [DO, pH, specific conductance, temperature], conventional chemical parameters (nutrients, chloride, sulfate), bacterial measurements (*E. coli* or enterococci), and flow measurements (if applicable for that waterbody). Please see Appendix C: Water Quality Parameters for a detailed description of each parameter.

Another monitoring type conducted by the Clean Rivers Program is biased monitoring (monitoring targeted to a season, time, or condition) measurements, such as 24- hour DO. In this procedure a data sonde (a water quality monitoring device that calculates and records field parameters) is deployed to measure DO every 15 minutes for 24 hours. After the deployment period, the data is analyzed, and the 24-hour average and absolute minimum are calculated. The DO average and absolute minimum are used to assign an ALU category to a waterbody. For example, exceptional aquatic life use has a 24-hour average of 6.0 mg/L and an absolute minimum of 4.0 mg/L.

ASSESSMENT OF WATER QUALITY DATA

The provisions of Sections 305(b) and 303(d) of the Clean Waters Act require the TCEQ to provide the *Texas Integrated Report for Clean Water Act Sections 305(b) and 303(d)* (Integrated Report) to the EPA every two years. The report contains a list of waterbodies evaluated, waterbodies assessed by basin, impaired waterbodies (303(d) List), waterbodies of concern, waterbodies either newly listed or removed from the 303(d) List, and other supporting information.

For the assessment, TCEQ evaluates data collected during a seven-year period. The time frame is extended to 10 years (if needed) to attain the minimum number of data points needed for the assessment. Each assessed waterbody is identified as:

- Fully Supporting – At least 10 data points (20 for bacteria) are available for an assessment, and the waterbody meets TSWQS or supports designated uses
- Of Concern – There are two levels of concern, CN and CS. CN means there is concern for near nonattainment of the TSWQS based on numeric criteria. A concern status of CN indicates that standards are not being met, but there is insufficient data to fully assess the waterbody. CS means that there is a concern for water quality based on screening levels. Screening levels are used when there is not a defined standard (as with nutrients) and are derived from statistical distributions of statewide water quality monitoring data, with the 85th percentile for each applicable parameter is used as the screening level criteria.
- Impaired – Data indicates that the waterbody does not meet standards. Impaired waterbodies are placed on the 303(d) List.

When a waterbody is determined to be impaired, several things must happen:

- The waterbody must be listed on the 303(d) List;
- An evaluation must be undertaken to determine what is preventing the waterbody from supporting its designated use(s) or if the use(s) are appropriate.
- Steps must be taken to either remedy the problem, collect additional data, or evaluate which uses are appropriate for the waterbody. These steps may include additional monitoring,

development of a Total Maximum Daily Load (TMDL) or Watershed Protection Plan (WPP), or a review of the water quality standards.

After assessment, waterbodies are placed into one of five categories (with subcategories). These categories indicate the water quality status of the waterbody. These categories (as well as subcategories), and their descriptions, are:

1. Attaining all water quality standards and no use is threatened.
2. Attaining some water quality standards and no use is threatened; and insufficient data and information are available to determine if the remaining uses are attained or threatened.
3. Insufficient data and information are available to determine if any water quality standard is attained.
4. Water quality standard is not supported or is threatened for one or more designated uses but does not require the development of a TMDL.
   - 4a TMDL has been completed and approved by EPA.
   - 4b Other pollution control requirements are reasonably expected to result in the attainment of the water quality standard in the near future.
   - 4c Nonsupport of the water quality standard is not caused by a pollutant.
5. The waterbody does not meet applicable water quality standards or is threatened for one or more designated uses by one or more pollutants.
   - 5a A TMDL is underway, scheduled, or will be scheduled.
   - 5b A review of the water quality standards for the waterbody will be conducted before a TMDL is scheduled.
   - 5c Additional data and information will be collected before a TMDL is scheduled.
   - 5n Waterbody does not meet its applicable chlorophyll-*a* criterion, but additional study is needed to verify whether exceedance is associated with causal nutrient parameters or impacts to response variables.
   - 5r A WPP is under development or accepted by EPA for this parameter.

If a previously assessed AU has insufficient data available during the assessment period for the most recent Integrated Report, this results in a carry-forward of the impairment listing from the previous report.

MANAGEMENT MEASURES FOR IMPAIRED WATERBODIES

If sufficient data is available to determine that a waterbody is impaired and does not meet standards, a management measure can be utilized to address the impairment.

- A Total Maximum Daily Load (TMDL) is a method used to determine the amount (load) of a pollutant an impaired waterbody can receive daily and still meet water quality standards and designated uses. After a load is calculated for the pollutant sources, an implementation plan (I-Plan) is drafted by the waterbody's stakeholders outlining management measures to be used to return the target pollutant to the calculated load. An I-Plan's management measures are usually voluntary actions but can, if recommended by stakeholders, include regulatory actions.

- A Watershed Protection Plan (WPP) is a community and stakeholder driven framework that uses a holistic/watershed approach to address potential sources of impaired waterways. The plan is developed with community involvement, and the measures to reduce pollutants are voluntary.

- A Use Attainability Analysis (UAA) determines if the natural characteristics of a waterbody cannot attain the currently designated uses and/or criteria. Natural characteristics include temperature, pH, DO, diversity of aquatic organisms, amount of streamflow, and physical conditions such as depth. If there is a consensus among stakeholders and resource agencies that a presumed or designated use may not be appropriate for a waterbody, a UAA may be conducted to determine the most appropriate use(s).

- A Recreational Use Attainment Analysis (RUAA) is used to determine if contact recreation use occurs in a waterbody. A waterway may have physical characteristics or limited public access that would not warrant a contact recreation use designation.

APPENDIX D: STATISTICAL METHODOLOGY

The identification of long- and short-term trends is important to many stakeholders, and these trends are important components of H-GAC's work, particularly in relation to the evaluation and revision of regional monitoring efforts and priorities. H-GAC staff used several methods of analyses to characterize surface water quality in the H-GAC region. Trend analysis can identify cases where the value of a water quality parameter is changing over time. Statistical tests are performed to distinguish statistically significant trends from random and seasonal variation. While it might seem reasonable to use all the data available for these analyses, as the amount of data increases the likelihood of finding a statistically significant but unimportant trend also increases. To minimize this, H-GAC performed trend analysis on the most recent 7 years (January 1, 2018 – Aug 31, 2025) of TCEQ-validated data to highlight recent trends in water quality in the region. Trends for the Appendix E analyses were considered statistically significant if the p-value was below 0.054.

All data management and statistical analysis were performed using Statistical Analysis System (SAS). Complete details of data selection, preparation, and analysis can be found in the SAS code, which is available upon request.

Data Selection and Processing

For analyses in this report, H-GAC staff selected water quality data collected between 06/04/2018 and 05/14/2025 from data downloaded from SWQMIS. All data used for these analyses were collected under a TCEQ-approved QAPP. Qualified data (data added to SWQMIS with qualifier codes that identify quality, sampling, or other problems that may render the data unsuitable) were excluded from the download.

Variables in each dataset were transformed as appropriate, and new variables were created to facilitate analysis and graphical display of results. In some cases, data from two or more STORET (method) codes (Table 24) were combined because the results obtained from each method can be considered equivalent. Any data collected at a depth greater than 0.3 meters, or not collected under a routine ambient monitoring program, were excluded.

Censored data (data reported as < [parameter limit of quantitation (LOQ)]) were transformed to a value of one-half the parameter LOQ associated with the data, with some important exceptions. Because nutrient LOQs have been lowered over time, the presence of data censored at many different LOQs in the same dataset poses several problems. If the data for a given parameter are censored at values well above a later, lower LOQ value, trend analysis could suggest a trend where no real water quality trend is present. There is no ideal solution to this problem. Editing the censored data alone would limit, but not eliminate, false trends. In cases where some of the data reflected use of a lower LOQ than the current H-GAC Clean Rivers Program LOQ, values were transformed to one-half of the H-GAC Clean Rivers Program's LOQ to minimize the identification of trends caused by changing analytical methods. H-GAC does not believe the impact from this transformation is significant. The impact of this analysis would be most pronounced for parameter trends typically found at concentrations at or near the LOQ in that specific waterbody.

Table 24. STORET Codes and Parameters for Trend Analysis

STORET Code	Parameter	Units
00010	Temperature	°C
00300	Dissolved Oxygen	mg/L
00400	pH	S.U.
31699	*E. coli*	MPN/100mL
31701	Enterococci	MPN/100mL
32211	Chlorophyll-*a* (Spectrophotometric)	µg/L
70953	Chlorophyll-*a* (Fluorometric)	µg/L
00665	Total Phosphorus	mg/L as P
00610	Ammonia-Nitrogen Total	mg/L as N
00630	Nitrite+Nitrate*	mg/L as N
00620	Nitrate Nitrogen, Total	mg/L as N
00530	Total Suspended Solids	mg/L

*Nitrate nitrogen, total was selected when available, but some labs have reported nitrite+nitrate instead. These two parameters were considered equivalent for the purpose of analysis.

Trend Analysis for the Regional Water Quality Summary ("Frog Chart")

The "Frog Chart" is an index constructed by H-GAC to capture the degree of impairment/concerns for selected parameters (dissolved oxygen, bacteria, chlorophyll-a, nutrients, PCBs/dioxins, and a category for other impairments) in each segment. H-GAC's assessment of the health of these waterbodies is a stream length-weighted summary of the impairments/concerns in each segment and is weighted based upon the percentage of the segment exhibiting the impairment or concern. This index is the basis for assigning a frog count to each segment. Segments are assigned from zero to five frogs, with the higher frog count indicating fewer impairments and concerns and better overall water quality.

In 2015, H-GAC staff compiled a subset of stations in classified segments believed to be most representative of segment water quality by selecting one to three stations that were statistically representative of a given parameter in a given segment. Means and standard deviations of parameter values are calculated for each station, and those stations with means and standard deviations closest to the overall mean and standard deviation for the segment and parameter combination were selected. Preference was given to stations where stream flow was measured, and final selections were reviewed for reasonableness. In most cases, the station, or stations at the most downstream location of the segment was the most statistically representative. Selection relied on SAS procedures PROC MEANS and PROC RANK. The same subset of stations has been used since 2015 to allow consistent comparisons across regional water quality summaries created for different years.

A conservative trend analysis was performed using seven years of recent data (01/01/2018 – 08/31/2025) at the selected representative monitoring stations in the classified portion of each watershed to detect trends at the watershed level for the H-GAC Regional Water Quality Summary ("Frog Chart"). Trends were identified by nonparametric correlation analysis and simple linear regression. Because nonparametric methods are less sensitive to extreme values in the data than parametric techniques like linear regression, trends that were suggested by linear regression analysis alone were not included in the chart.

Trends for the “Frog Chart” analysis were considered statistically significant if the p-value was below 0.05.

Some adjustments to the final frog count were made by H-GAC staff based on best professional judgment, to capture attributes not fully revealed by the SAS data analysis. Waterbodies where no monitoring data were collected, except for assessment based on oyster waters, trend and frog analyses were omitted.

APPENDIX E: TREND DATA VISUALIZATIONS

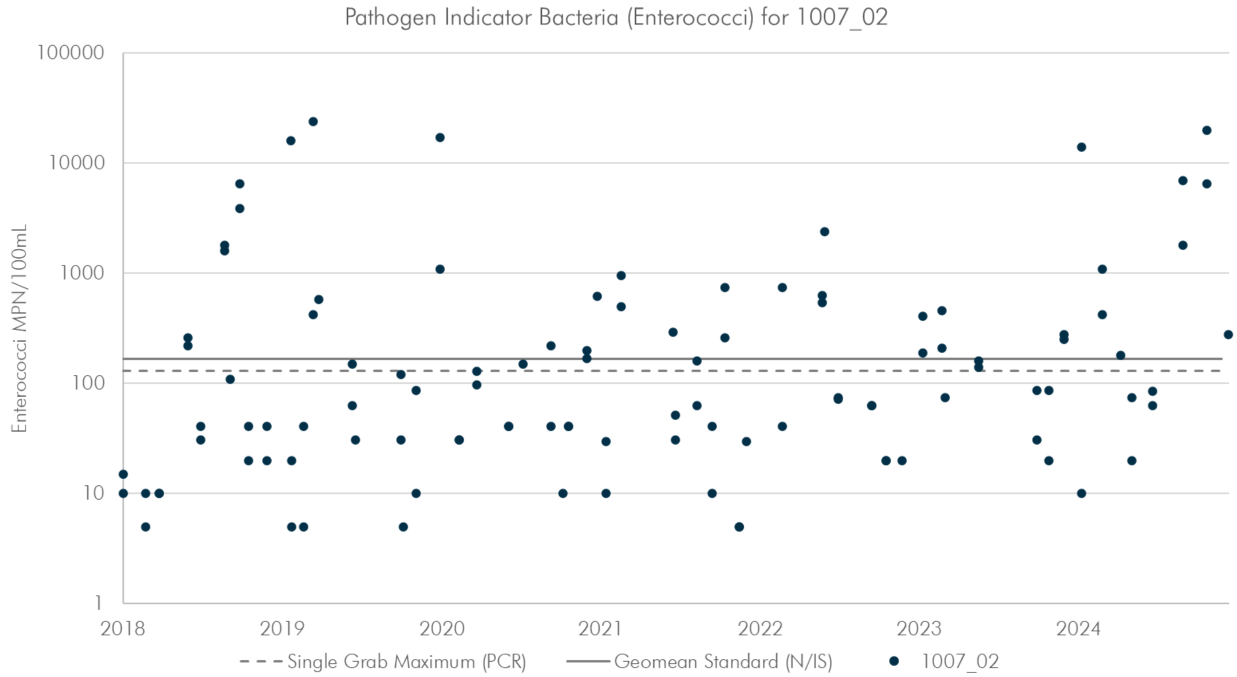


Figure 47. The most recent 7-years of enterococci grab results through time for Sims Bayou assessment unit (AU) 1007_02. This is the only AU with a statistically significant increasing trend for enterococci (p-value =0.0039). The single grab maximum for primary contact recreation (PCR) of 130 MPN/100mL, provided for H-GAC visualization purposes only, is represented by the dashed grey line. The navigational and industrial water supply (N/IS) for "Other Use" of 168 MPN/100mL is represented by the solid grey line. Note: y-axis as log scale.

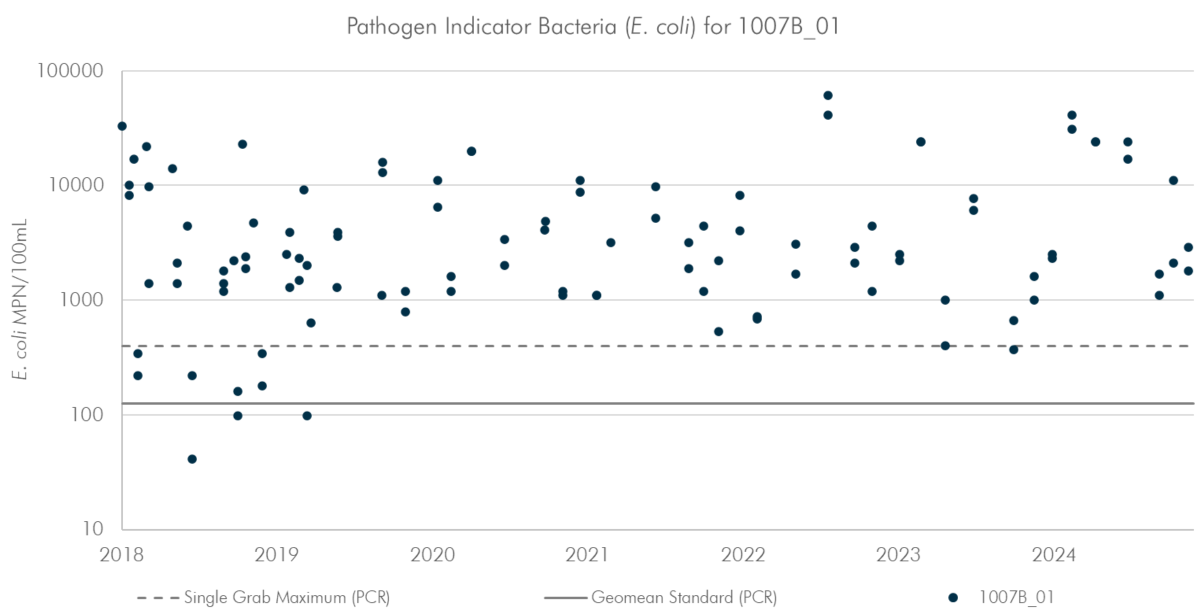


Figure 48. *The most recent 7-years of E. coli grab results through time for Brays Bayou assessment unit (AU) 1007B_01. This is one of three non-tidal AUs with a statistically significant increasing trend for E. coli (p-value =0.0353). The single grab maximum for primary contact recreation 1 (PCR1) of 399 MPN/100mL is represented by the dashed grey line. The 7-year geomean for PCR1 of 126 MPN/100mL is represented by the solid grey line. Note: y-axis as log scale.*

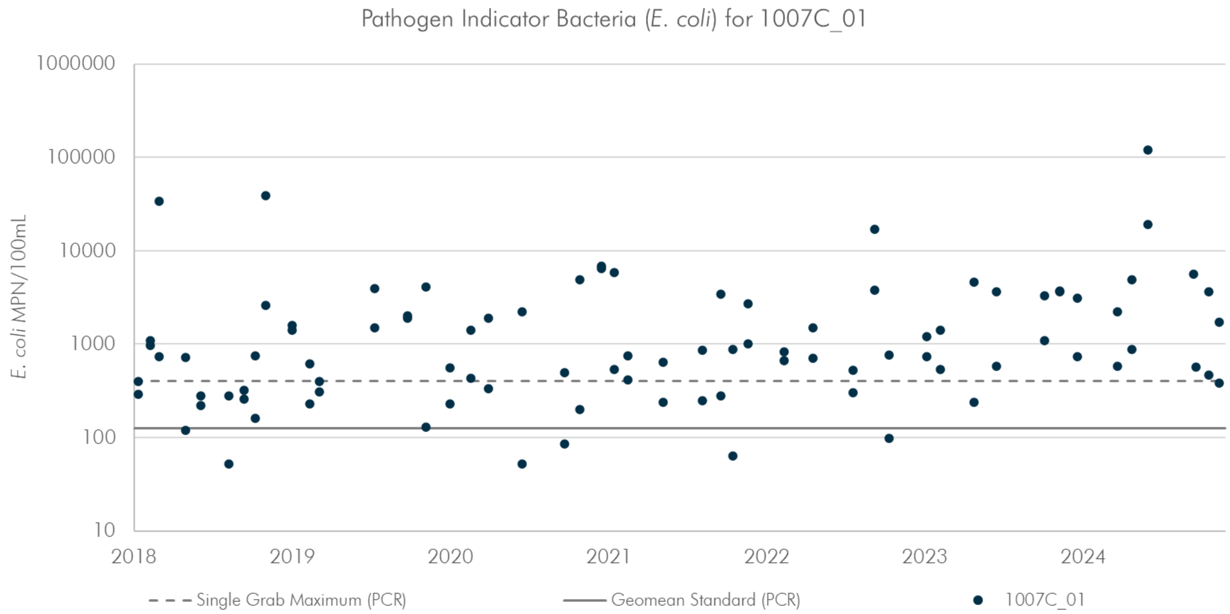


Figure 49. The most recent 7-years of E. coli grab results through time for Keegans Bayou assessment unit (AU) 1007C_01. This is one of three non-tidal AUs with a statistically significant increasing trend for E. coli (p-value =0.0071). The single grab maximum for primary contact recreation 1 (PCR1) of 399 MPN/100mL is represented by the dashed grey line. The 7-year geomean for PCR1 of 126 MPN/100mL is represented by the solid grey line. Note: y-axis as log scale.

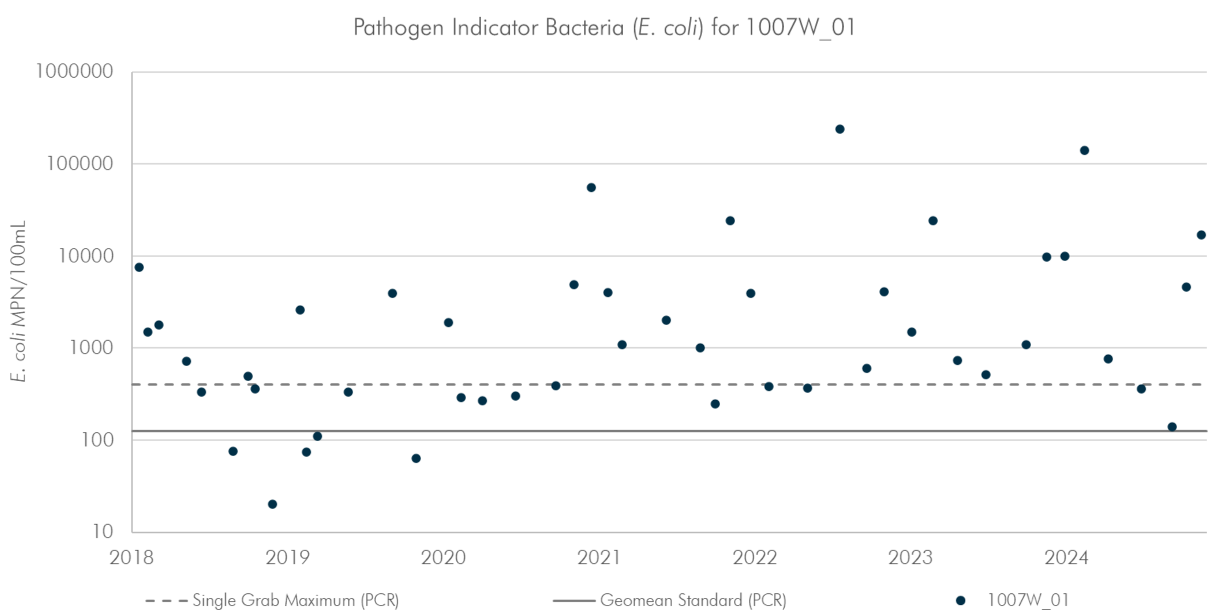


Figure 50. The most recent 7-years of E. coli grab results through time for Harris County Flood Control Ditch D 138 assessment unit (AU) 1007W_01. This is one of three non-tidal AUs with a statistically significant increasing trend for E. coli (p-value =0.0036). The single grab maximum for primary contact recreation 1 (PCR1) of 399 MPN/100mL is represented by the dashed grey line. The 7-year geomean for PCR1 of 126 MPN/100mL is represented by the solid grey line. Note: y-axis as log scale.

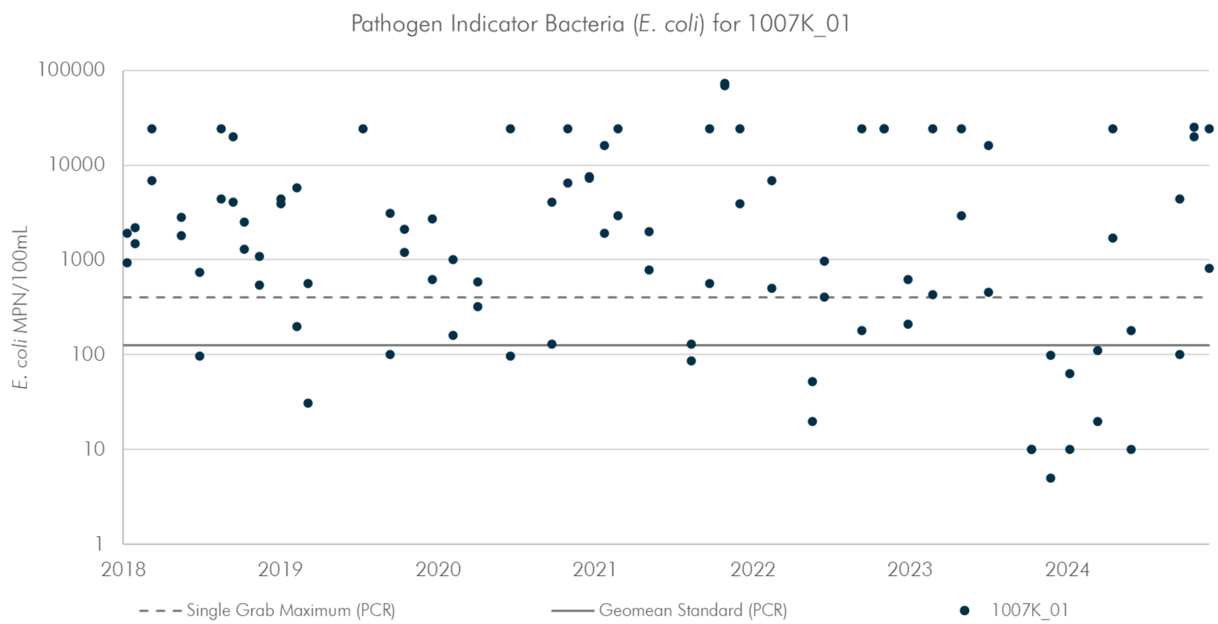


Figure 51. The most recent 7-years of E. coli grab results through time for Country Club Bayou Above Tidal assessment unit (AU) 1007K_01. This is one of two non-tidal AUs with a statistically significant decreasing trend for E. coli (p-value = 0.0062). The single grab maximum for primary contact recreation 1 (PCR1) of 399 MPN/100mL is represented by the dashed grey line. The 7-year geomean for PCR1 of 126 MPN/100mL is represented by the solid grey line. Note: y-axis as log scale.

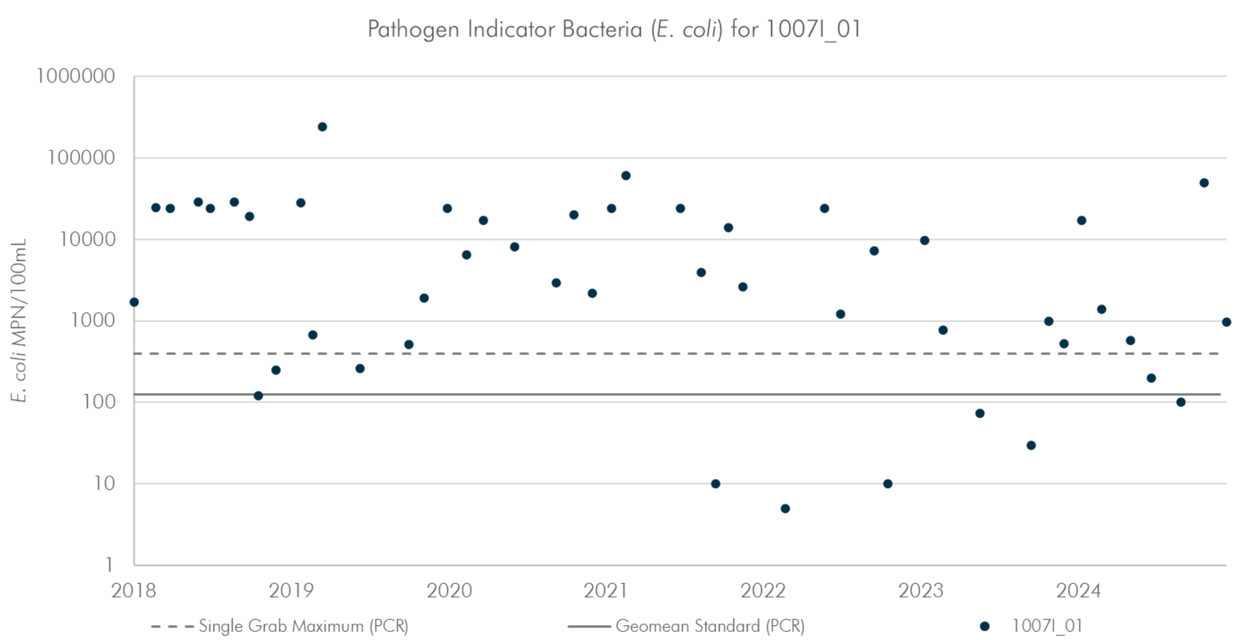


Figure 52. The most recent 7-years of E. coli grab results through time for Plum Creek Above Tidal assessment unit (AU) 1007I_01. This is one of two non-tidal AUs with a statistically significant decreasing trend for E. coli (p-value = 0.0300). The single grab maximum for primary contact recreation 1 (PCR1) of 399 MPN/100mL is represented by the dashed grey line. The 7-year geomean for PCR1 of 126 MPN/100mL is represented by the solid grey line. Note: y-axis as log scale.

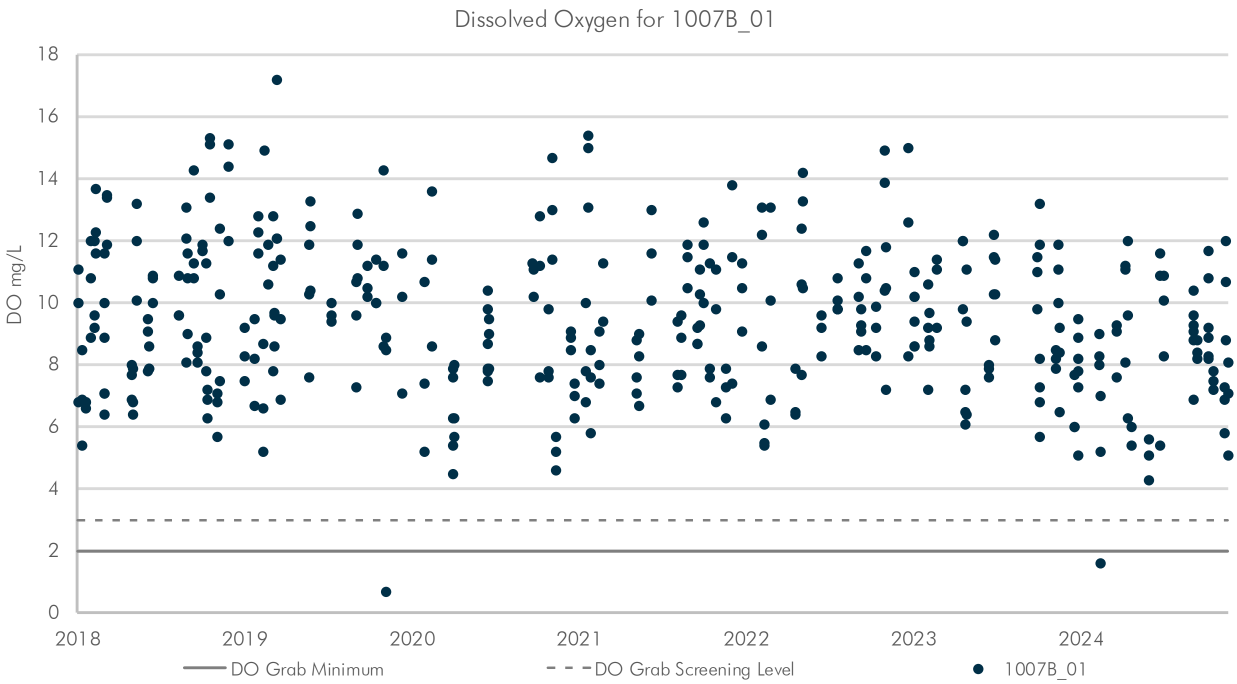


Figure 53. The most recent 7-years of dissolved oxygen (DO) grab results through time for Brays Bayou Above Tidal assessment unit (AU) 1007B_01. This is one of eight AUs with a statistically significant decreasing trend for DO (p-value <0.0001). The DO grab screening level of 3 mg/L is represented by the dashed grey line. The DO grab minimum of 2 mg/L is represented by the solid grey line.

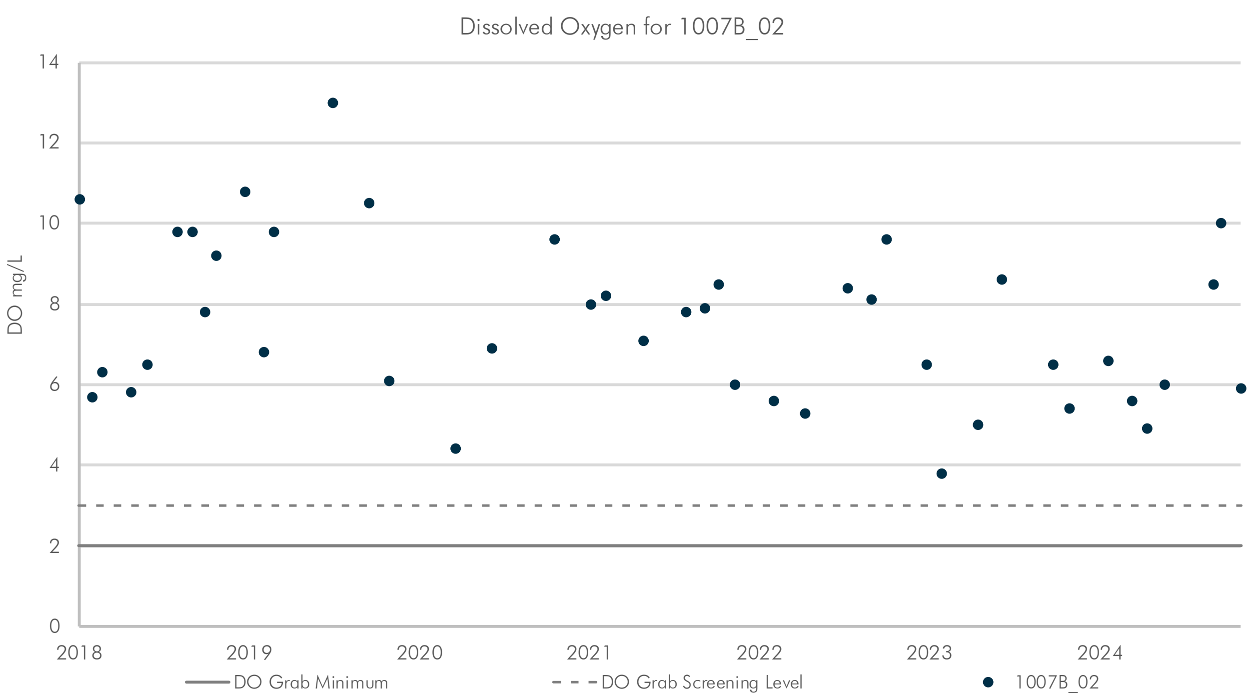


Figure 54. The most recent 7-years of dissolved oxygen (DO) grab results through time for Brays Bayou Above Tidal assessment unit (AU) 1007B_02. This is one of eight AUs with a statistically significant decreasing trend for DO (p-value = 0.0162). The DO grab screening level of 3 mg/L is represented by the dashed grey line. The DO grab minimum of 2 mg/L is represented by the solid grey line.

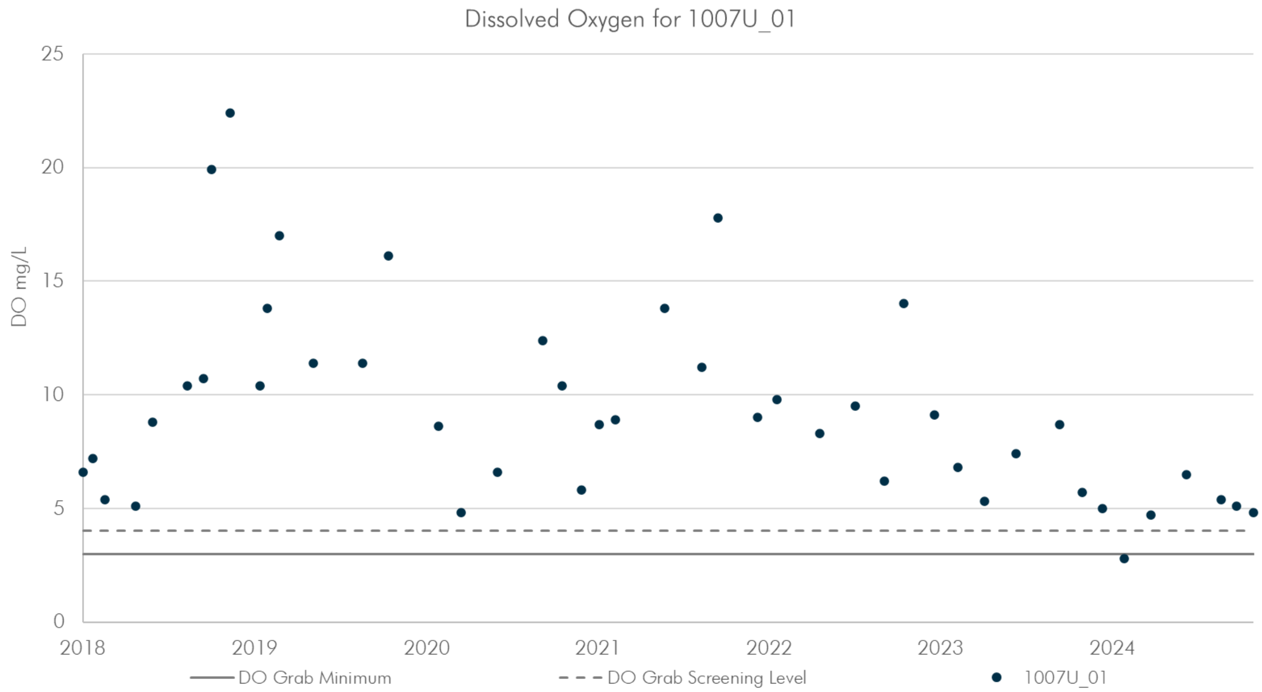


Figure 55. The most recent 7-years of dissolved oxygen (DO) grab results through time for Mimosa Ditch assessment unit (AU) 1007U_01. This is one of eight AUs with a statistically significant decreasing trend for DO (p-value = 0.0008). The DO grab screening level of 4 mg/L is represented by the dashed grey line. The DO grab minimum of 3 mg/L is represented by the solid grey line.

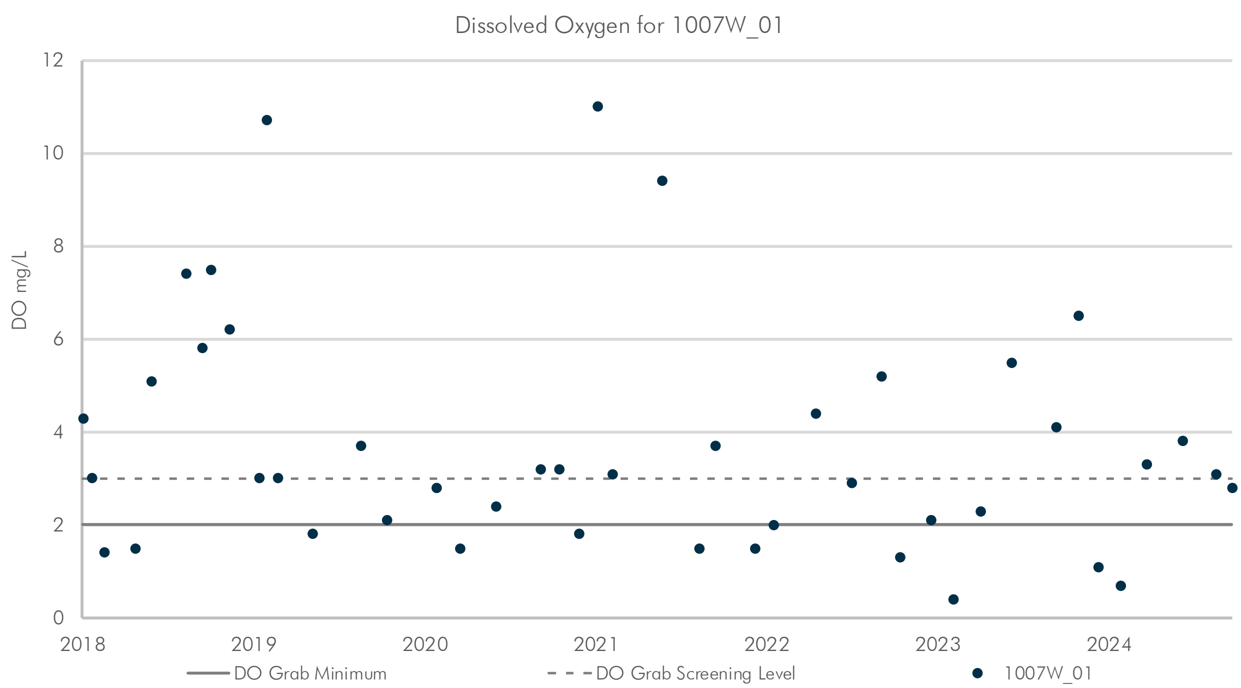


Figure 56. The most recent 7-years of dissolved oxygen (DO) grab results through time for Harris County Flood Control Ditch D 138 assessment unit (AU) 1007W_01. This is one of eight AUs with a statistically significant decreasing trend for DO (p-value = 0.0532). The DO grab screening level of 3 mg/L is represented by the dashed grey line. The DO grab minimum of 2 mg/L is represented by the solid grey line.

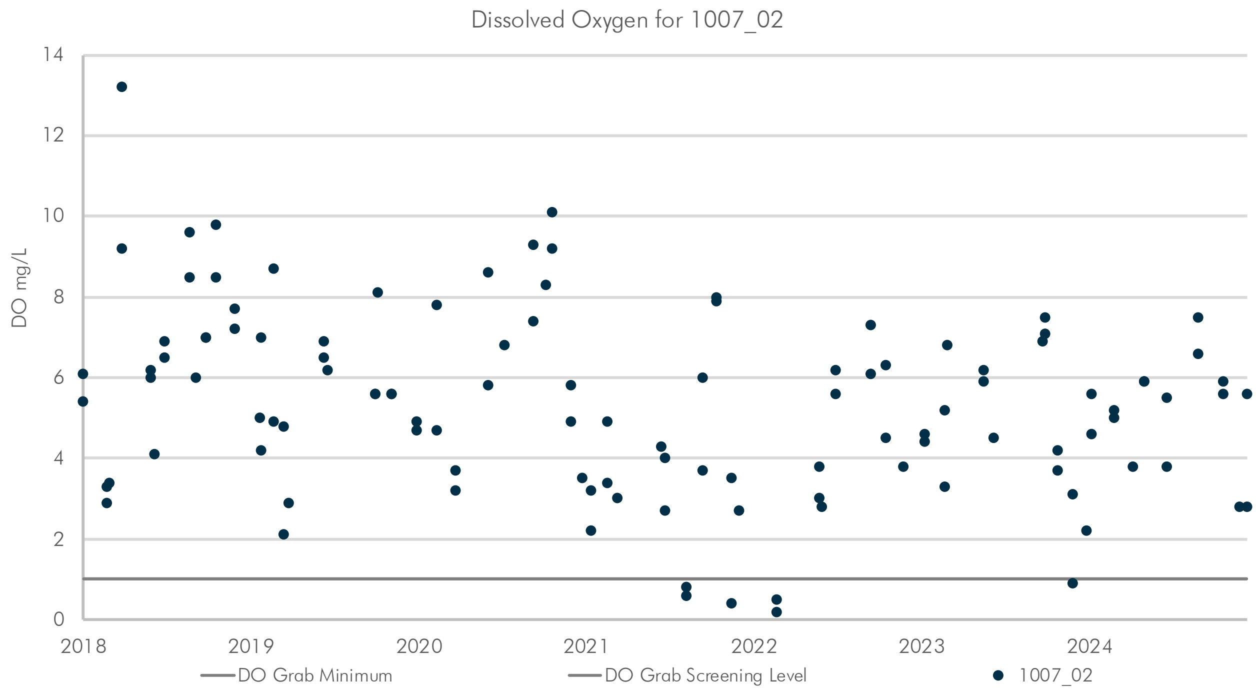


Figure 57. The most recent 7-years of dissolved oxygen (DO) grab results through time for Sims Bayou Tidal assessment unit (AU) 1007_02. This is one of eight AUs with a statistically significant decreasing trend for DO (p-value = 0.0023). The DO grab screening level of 1 mg/L is represented by the dashed grey line. The DO grab minimum of 1 mg/L is represented by the solid grey line.

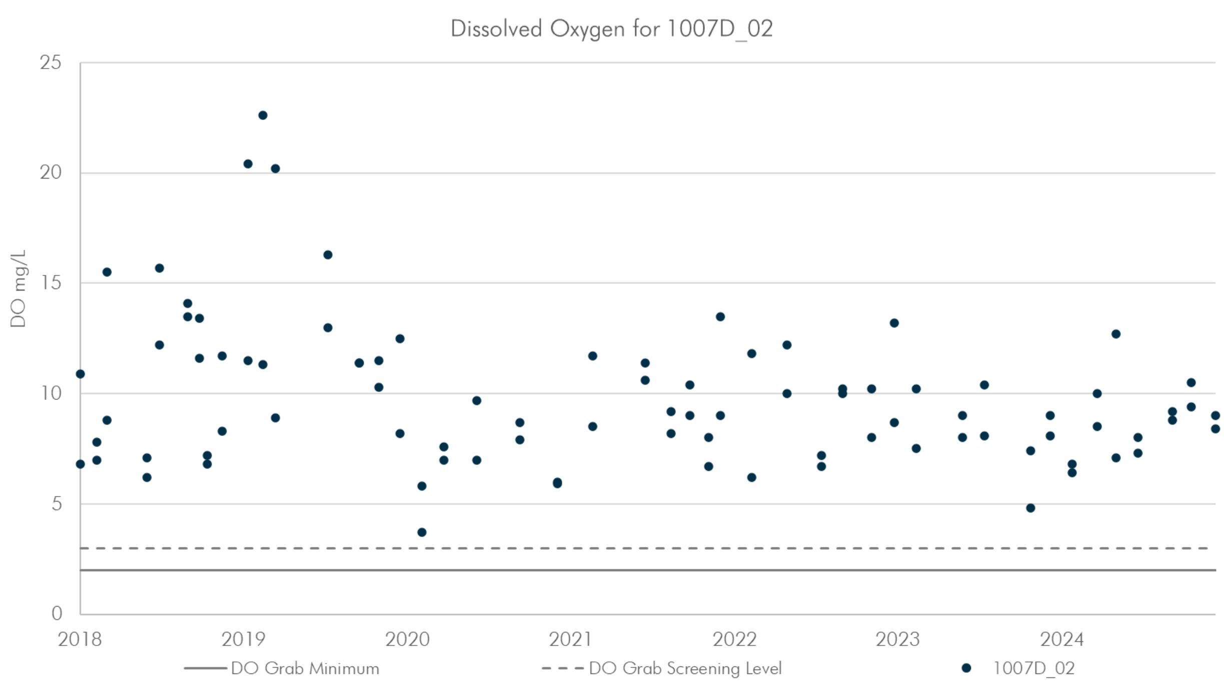


Figure 58. The most recent 7-years of dissolved oxygen (DO) grab results through time for Sims Bayou Above Tidal assessment unit (AU) 1007D_02. This is one of eight AUs with a statistically significant decreasing trend for DO (p-value = 0.0173). The DO grab screening level of 3 mg/L is represented by the dashed grey line. The DO grab minimum of 2 mg/L is represented by the solid grey line.

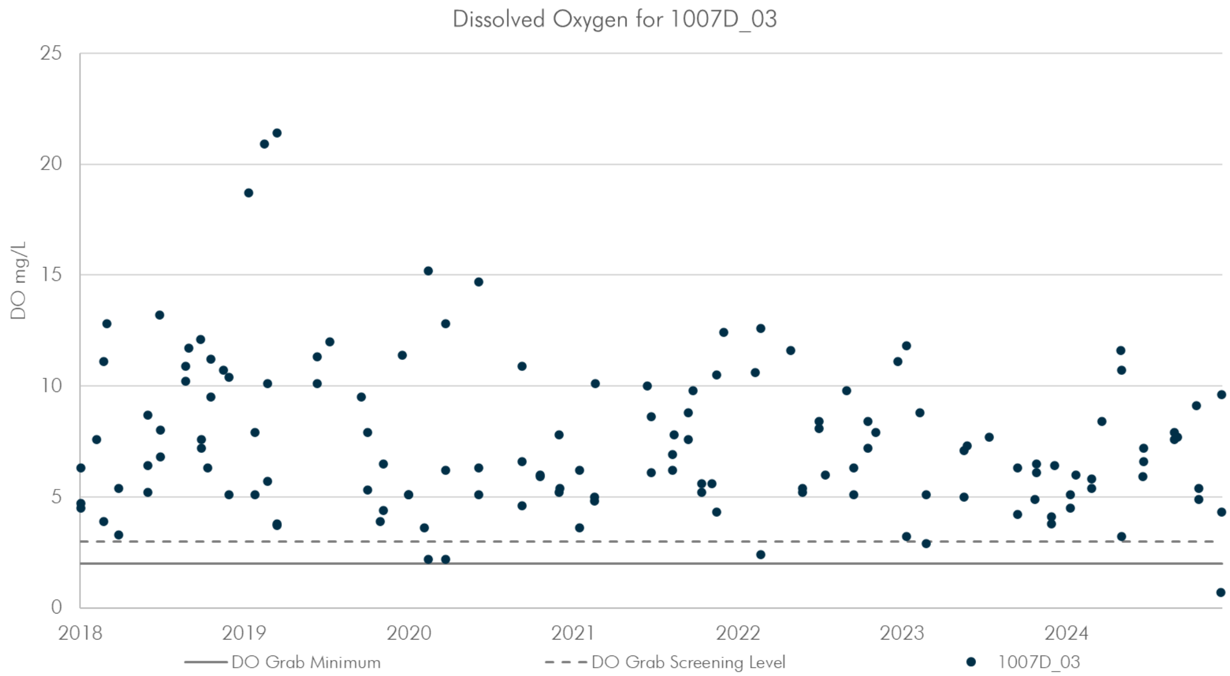


Figure 59. The most recent 7-years of dissolved oxygen (DO) grab results through time for Sims Bayou Above Tidal assessment unit (AU) 1007D_03. This is one of eight AUs with a statistically significant decreasing trend for DO (p-value = 0.0047). The DO grab screening level of 3 mg/L is represented by the dashed grey line. The DO grab minimum of 2 mg/L is represented by the solid grey line.

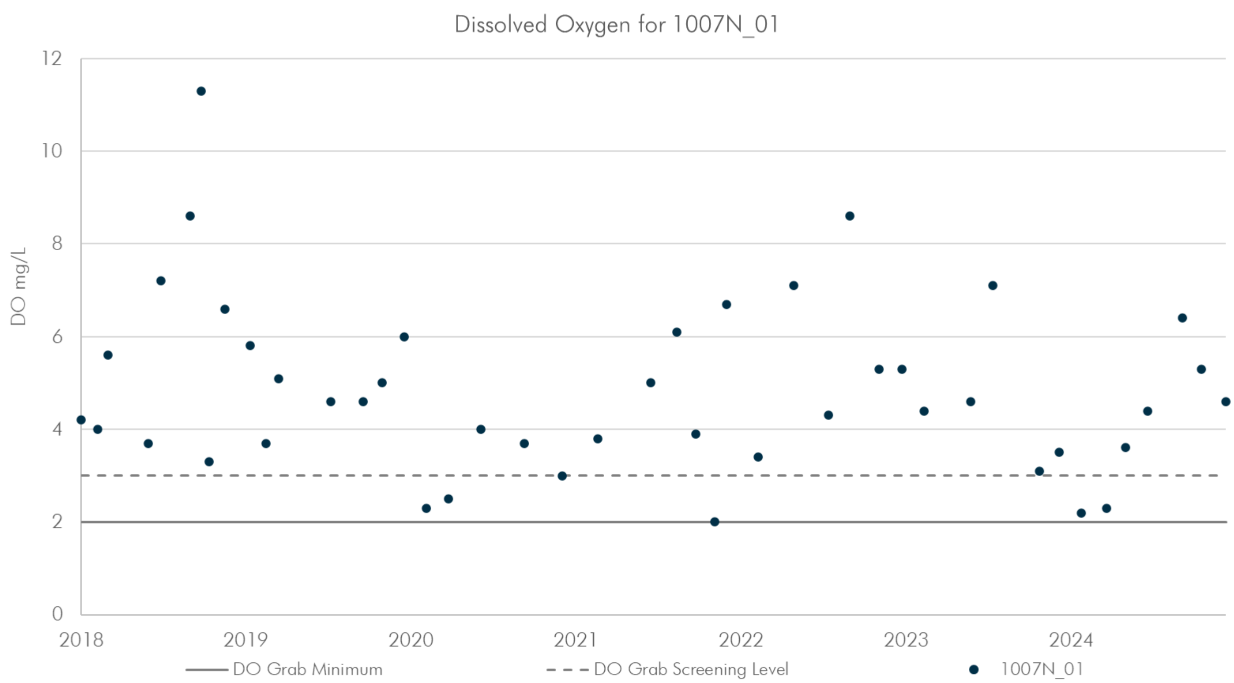


Figure 60. The most recent 7-years of dissolved oxygen (DO) grab results through time for Unnamed Non-Tidal Tributary of Sims Bayou assessment unit (AU) 1007N_01. This is one of eight AUs with a statistically significant decreasing trend for DO (p-value = 0.0400). The DO grab screening level of 3 mg/L is represented by the dashed grey line. The DO grab minimum of 2 mg/L is represented by the solid grey line.

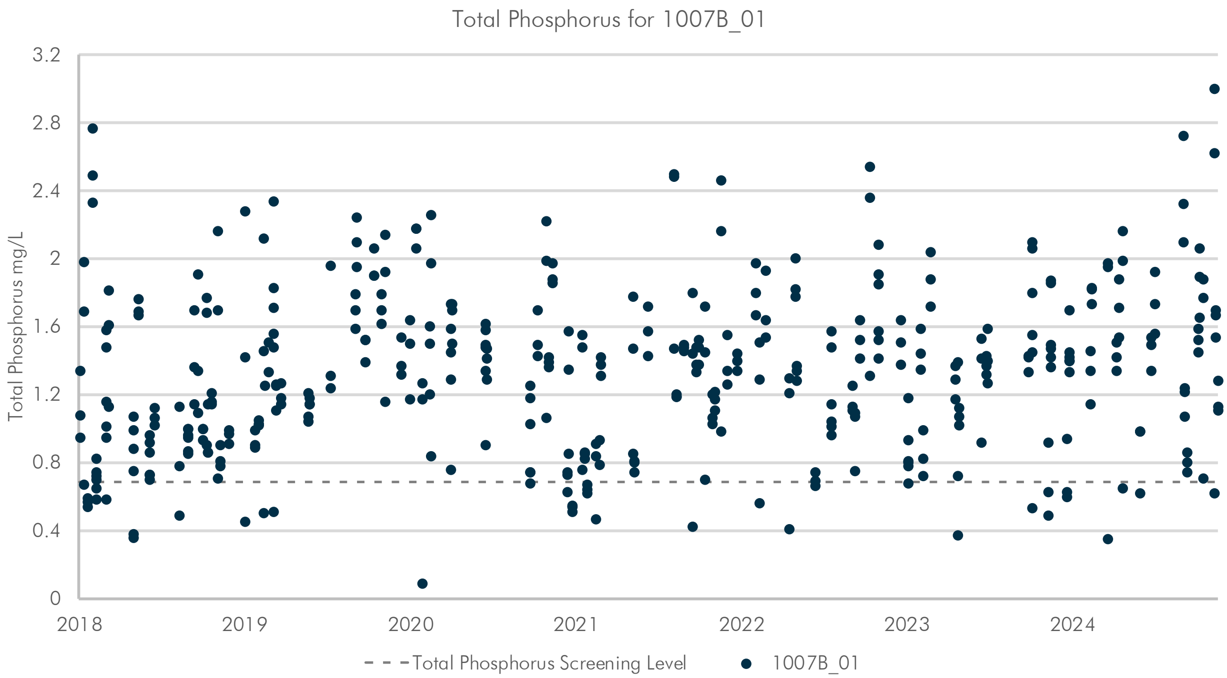


Figure 61. The most recent 7-years of total phosphorus (TP) grab results through time for Brays Bayou Above Tidal assessment unit (AU) 1007B_01. This is one of two AUs with a statistically significant increasing trend for TP (p-value = 0.0014). The TP screening level criteria of 0.69 mg/L is represented by the dashed grey line.

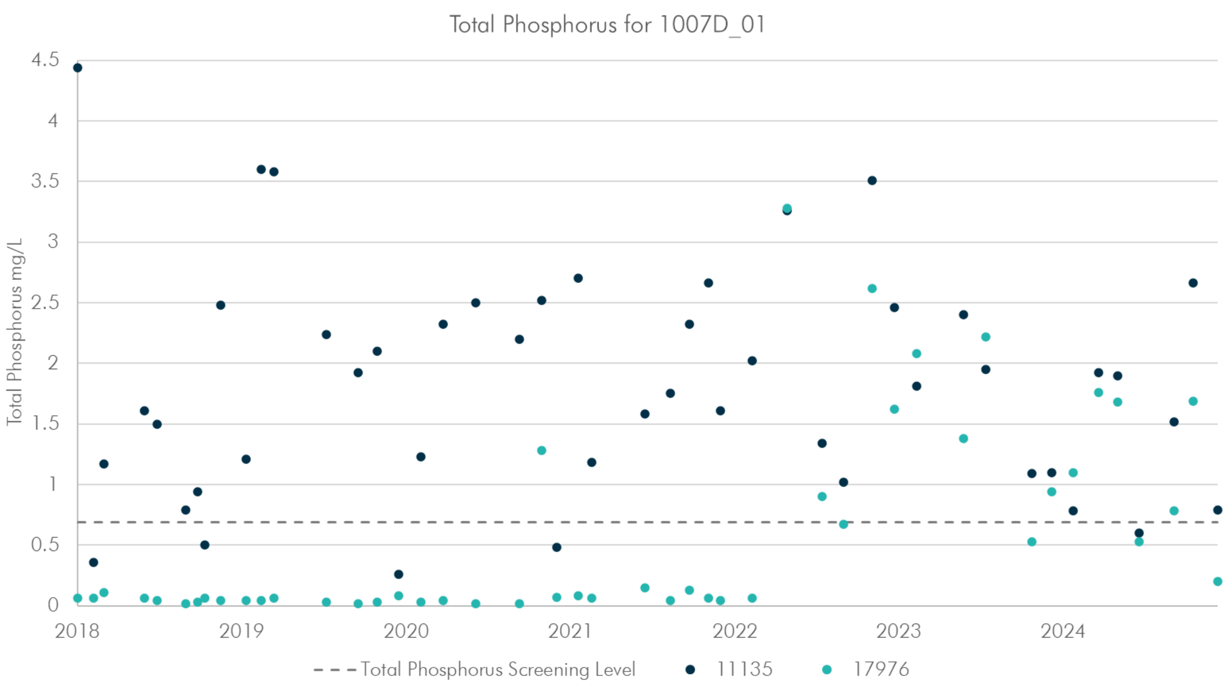


Figure 62. The most recent 7-years of total phosphorus (TP) grab results through time for Sims Bayou Above Tidal assessment unit (AU) 1007D_01 by monitoring station. This is one of two AUs with a statistically significant increasing trend for TP (p-value = 0.0013). The TP screening level criteria of 0.69 mg/L is represented by the dashed grey line. There appears to be a shift between July and September of 2022 at site 17976 from very low results to consistent levels above the screening level criteria.

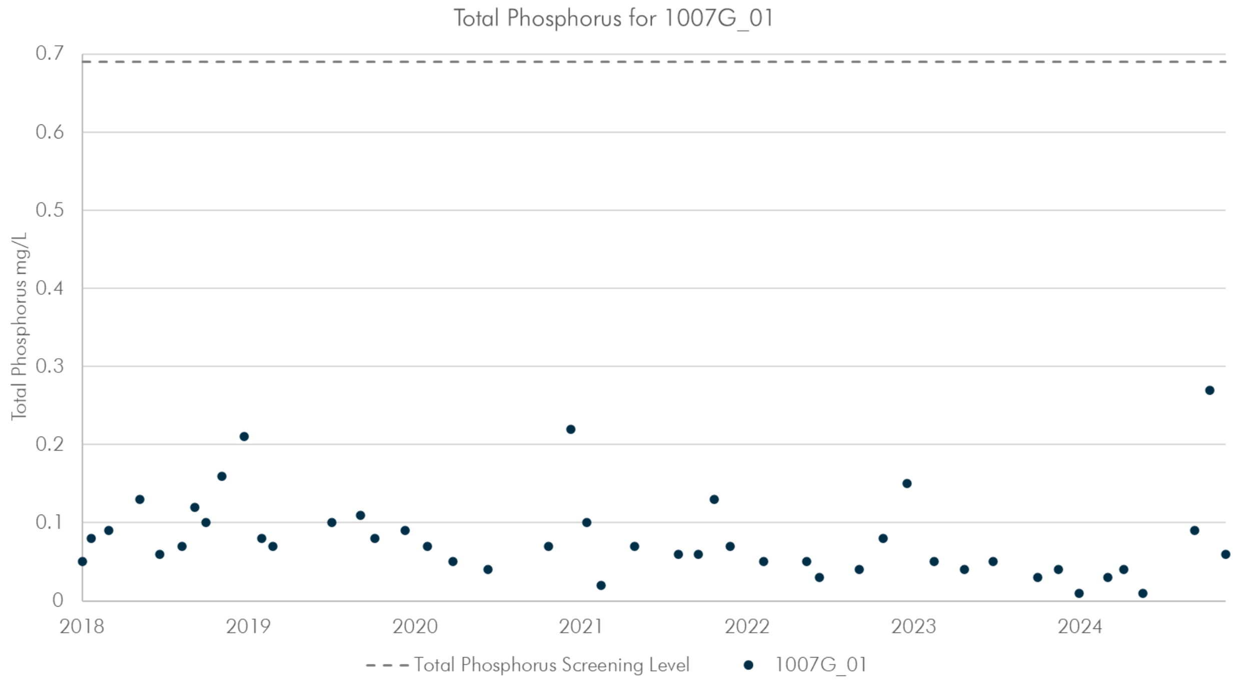


Figure 63. The most recent 7-years of total phosphorus (TP) grab results through time for Kuhlman Gully Above Tidal assessment unit (AU) 1007G_01. This is one of four AUs with a statistically significant decreasing trend for TP (p-value < 0.0001). The TP screening level criteria of 0.69 mg/L is represented by the dashed grey line.

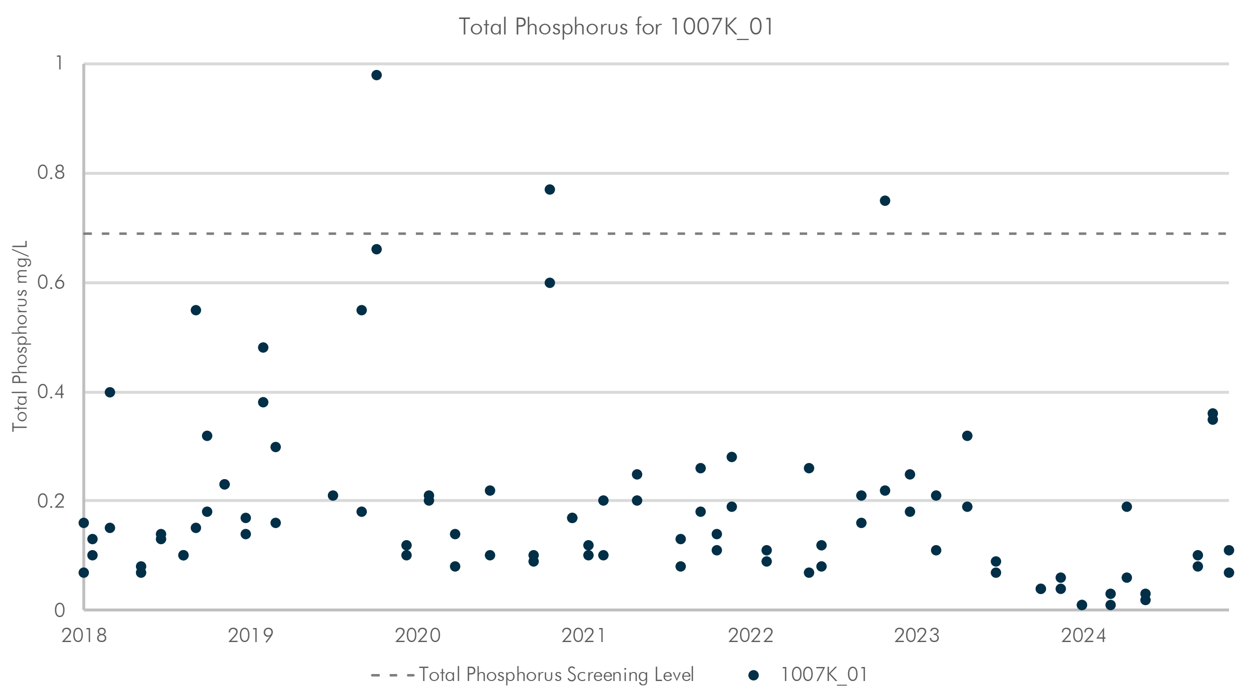


Figure 64. The most recent 7-years of total phosphorus (TP) grab results through time for Country Club Bayou Above Tidal assessment unit (AU) 1007K_01. This is one of four AUs with a statistically significant decreasing trend for TP (p-value = 0.0036). The TP screening level criteria of 0.69 mg/L is represented by the dashed grey line.

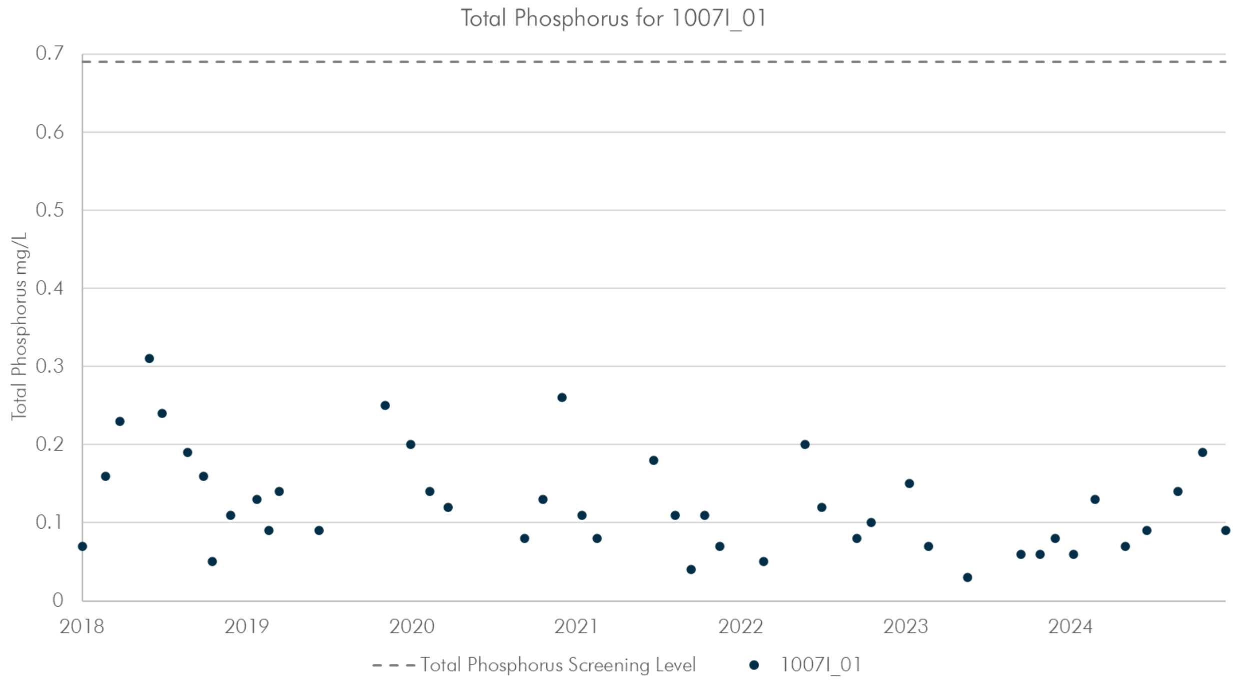


Figure 65. The most recent 7-years of total phosphorus (TP) grab results through time for Plum Creek Above Tidal assessment unit (AU) 1007I_01. This is one of four AUs with a statistically significant decreasing trend for TP (p-value = 0.0025). The TP screening level criteria of 0.69 mg/L is represented by the dashed grey line.

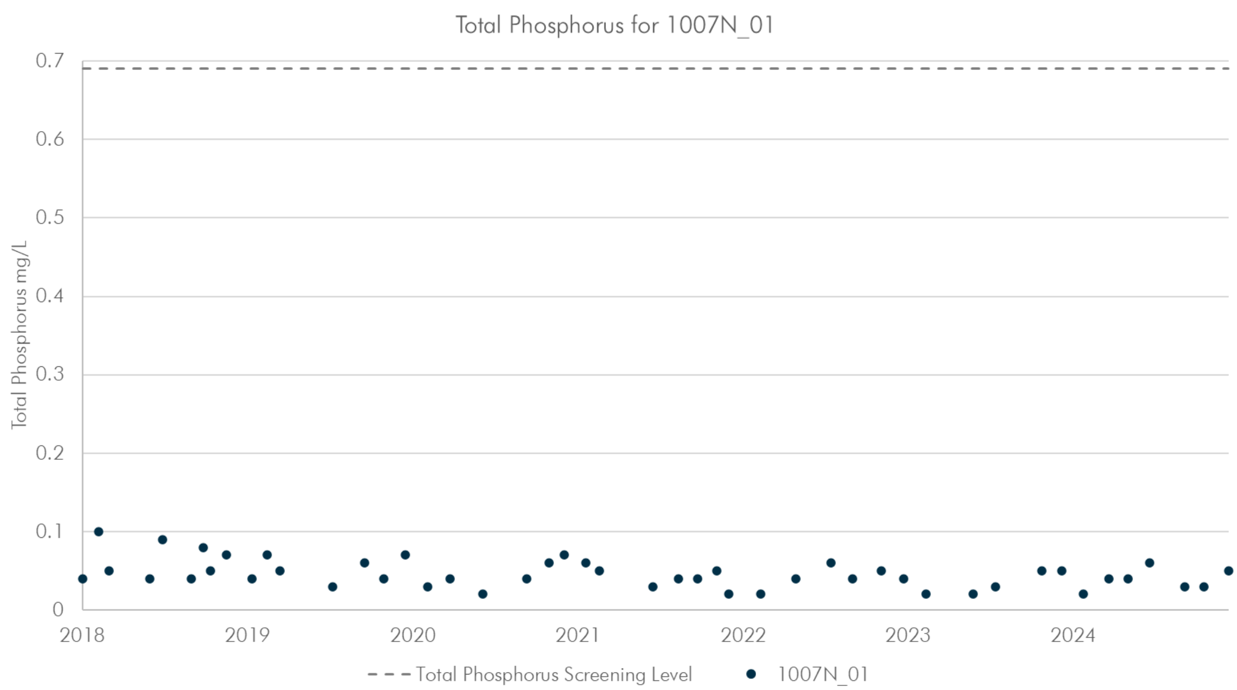


Figure 66. The most recent 7-years of total phosphorus (TP) grab results through time for Unnamed Non-Tidal Tributary of Sims Bayou assessment unit (AU) 1007N_01. This is one of four AUs with a statistically significant decreasing trend for TP (p-value = 0.0047). The TP screening level criteria of 0.69 mg/L is represented by the dashed grey line.

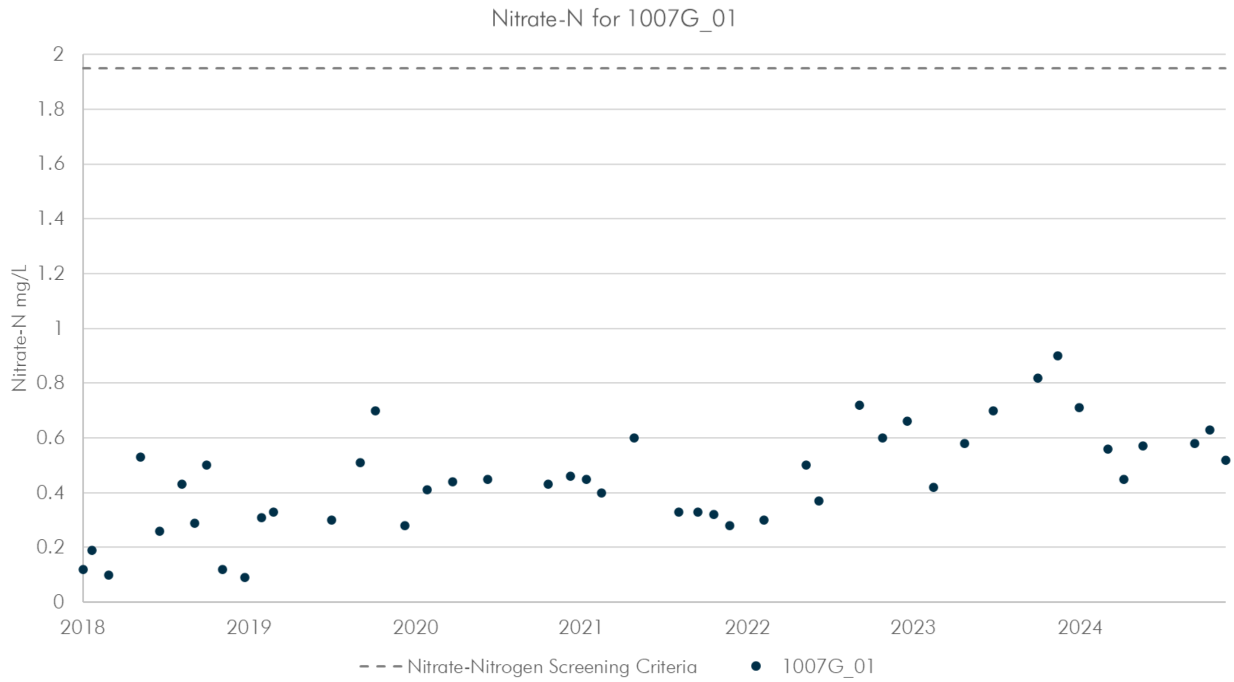


Figure 67. The most recent 7-years of nitrate-nitrogen (nitrate-N) grab results through time for Kuhlman Gully Above Tidal assessment unit (AU) 1007G_01. This is one of three AUs with a statistically significant increasing trend for nitrate-N (p-value < 0.0001). The nitrate-N screening level criteria of 1.95 mg/L is represented by the dashed grey line.

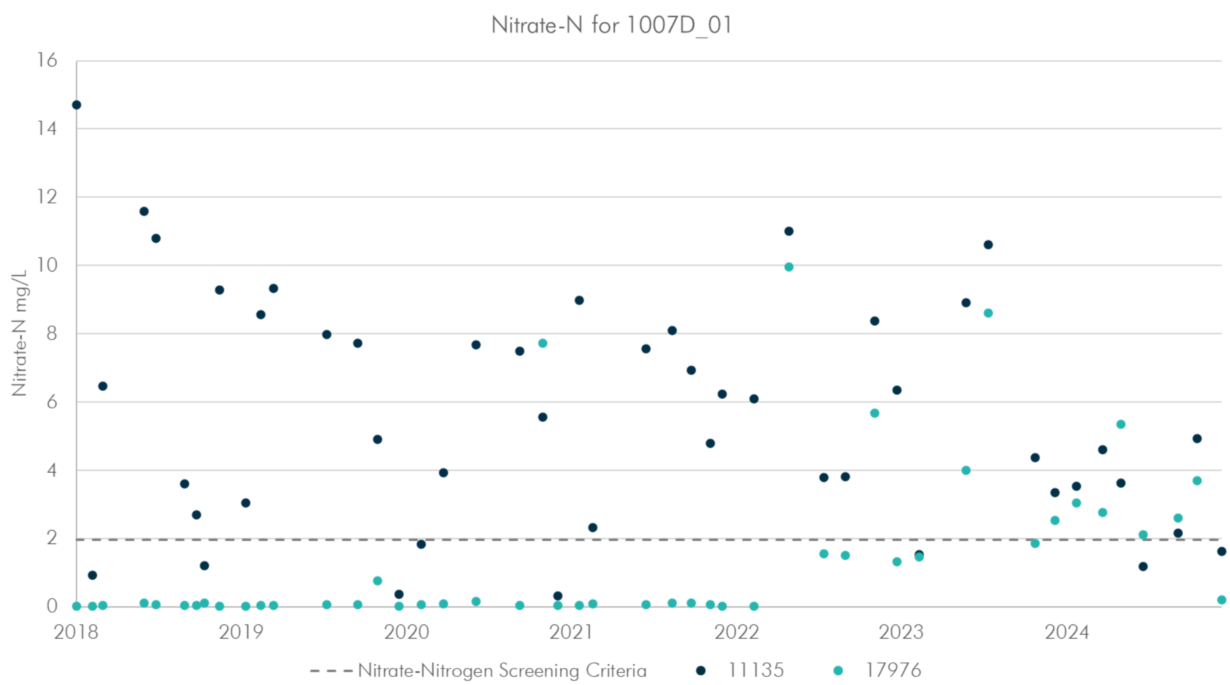


Figure 68. The most recent 7-years of nitrate-nitrogen (nitrate-N) grab results through time for Sims Bayou Above Tidal assessment unit (AU) 1007D_01 by monitoring station. This is one of three AUs with a statistically significant increasing trend for nitrate-N (p-value = 0.0120). The nitrate-N screening level criteria of 1.95 mg/L is represented by the dashed grey line. There appears to be a shift between July and September of 2022 at site 17976 from very low results to consistent levels above the screening level criteria.

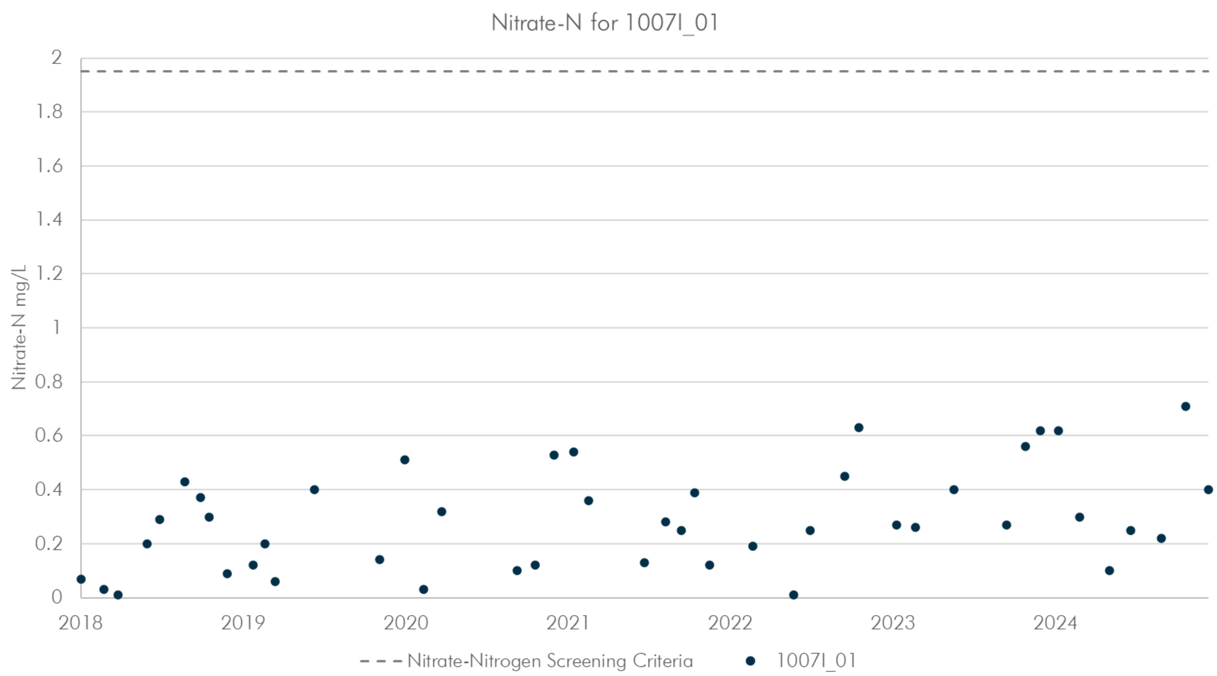


Figure 69. The most recent 7-years of nitrate-nitrogen (nitrate-N) grab results through time for Plum Creek Above Tidal assessment unit (AU) 1007I_01. This is one of three AUs with a statistically significant increasing trend for nitrate-N (p-value = 0.0145). The nitrate-N screening level criteria of 1.95 mg/L is represented by the dashed grey line.

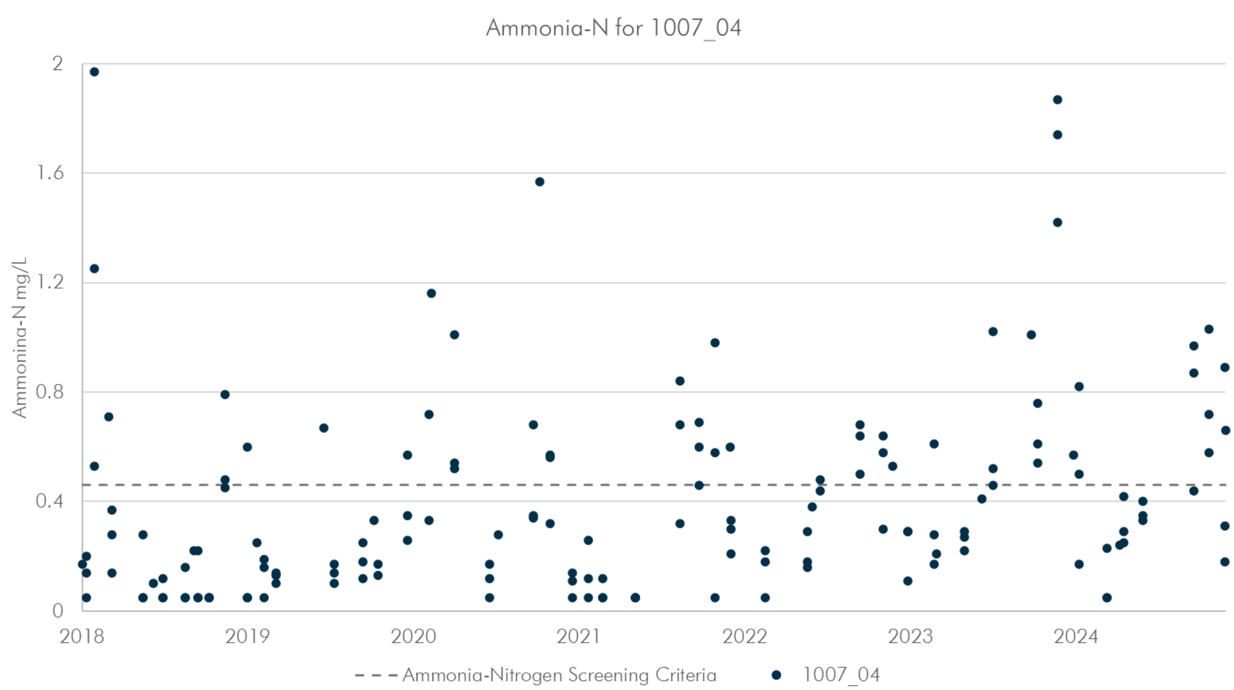


Figure 70. The most recent 7-years of ammonia-nitrogen (ammonia-N) grab results through time for Brays Bayou Tidal assessment unit (AU) 1007_04. This is one of six AUs with a statistically significant increasing trend for ammonia-N (p-value < 0.0001). The ammonia-N screening level criteria of 0.46 mg/L is represented by the dashed grey line.

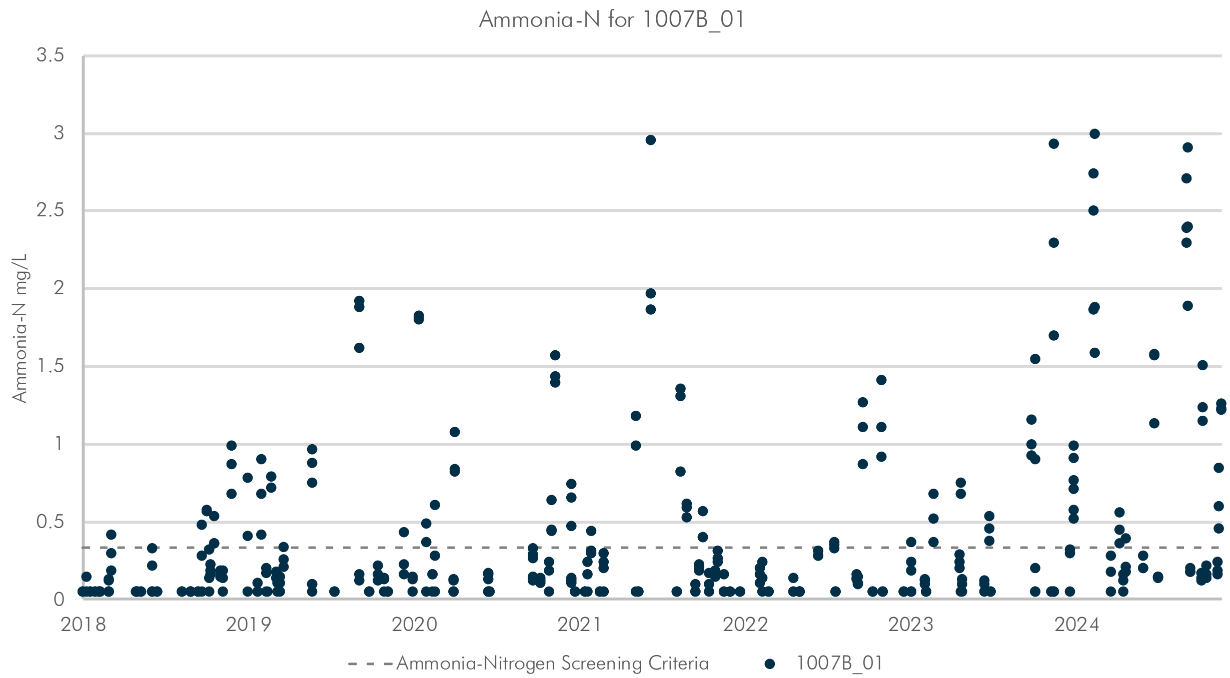


Figure 71. The most recent 7-years of ammonia-nitrogen (ammonia-N) grab results through time for Brays Bayou Above Tidal assessment unit (AU) 1007B_01. This is one of six AUs with a statistically significant increasing trend for ammonia-N (p-value < 0.0001). The ammonia-N screening level criteria of 0.33 mg/L is represented by the dashed grey line.

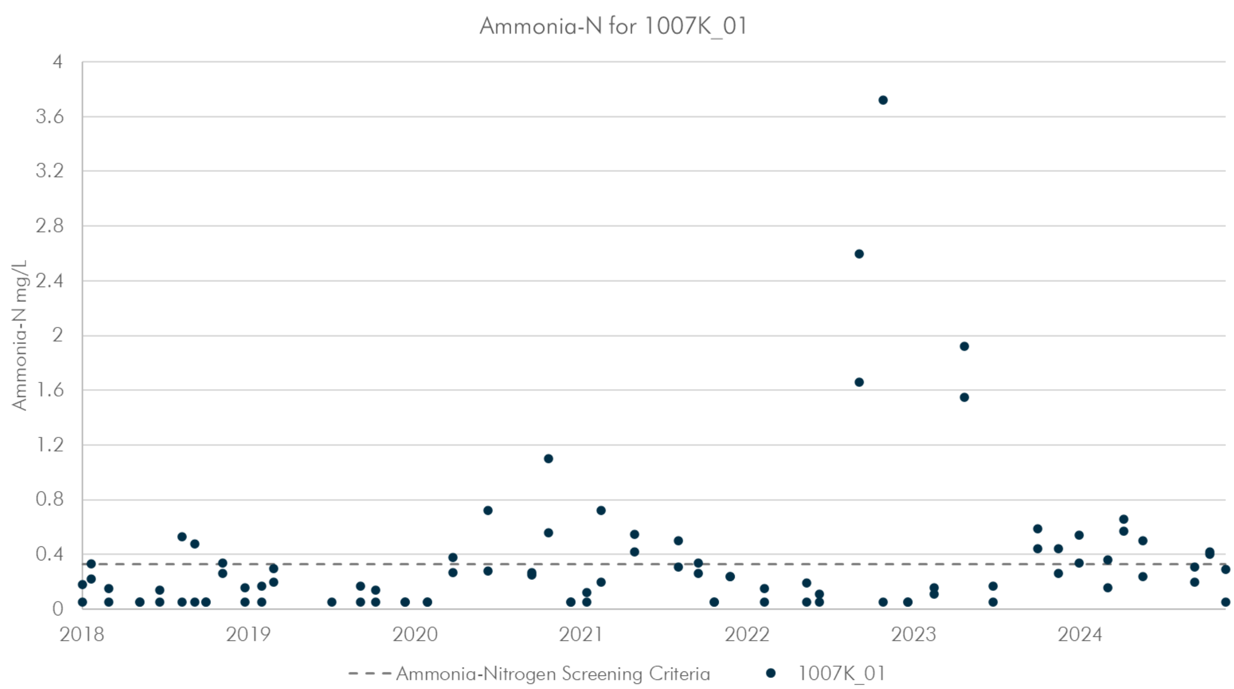


Figure 72. The most recent 7-years of ammonia-nitrogen (ammonia-N) grab results through time for Country Club Bayou Above Tidal assessment unit (AU) 1007K_01. This is one of six AUs with a statistically significant increasing trend for ammonia-N (p-value = 0.0009). The ammonia-N screening level criteria of 0.33 mg/L is represented by the dashed grey line.

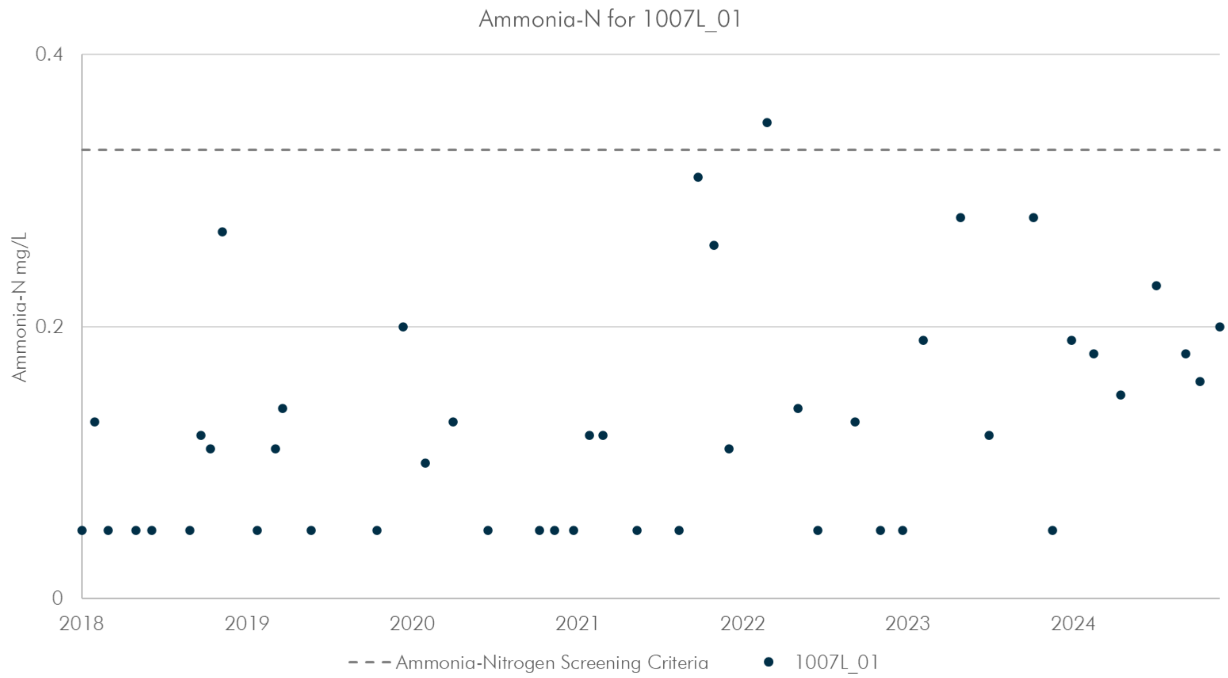


Figure 73. The most recent 7-years of ammonia-nitrogen (ammonia-N) grab results through time for Unnamed Non-Tidal Tributary of Brays Bayou assessment unit (AU) 1007L_01. This is one of six AUs with a statistically significant increasing trend for ammonia-N (p-value = 0.0029). The ammonia-N screening level criteria of 0.33 mg/L is represented by the dashed grey line.

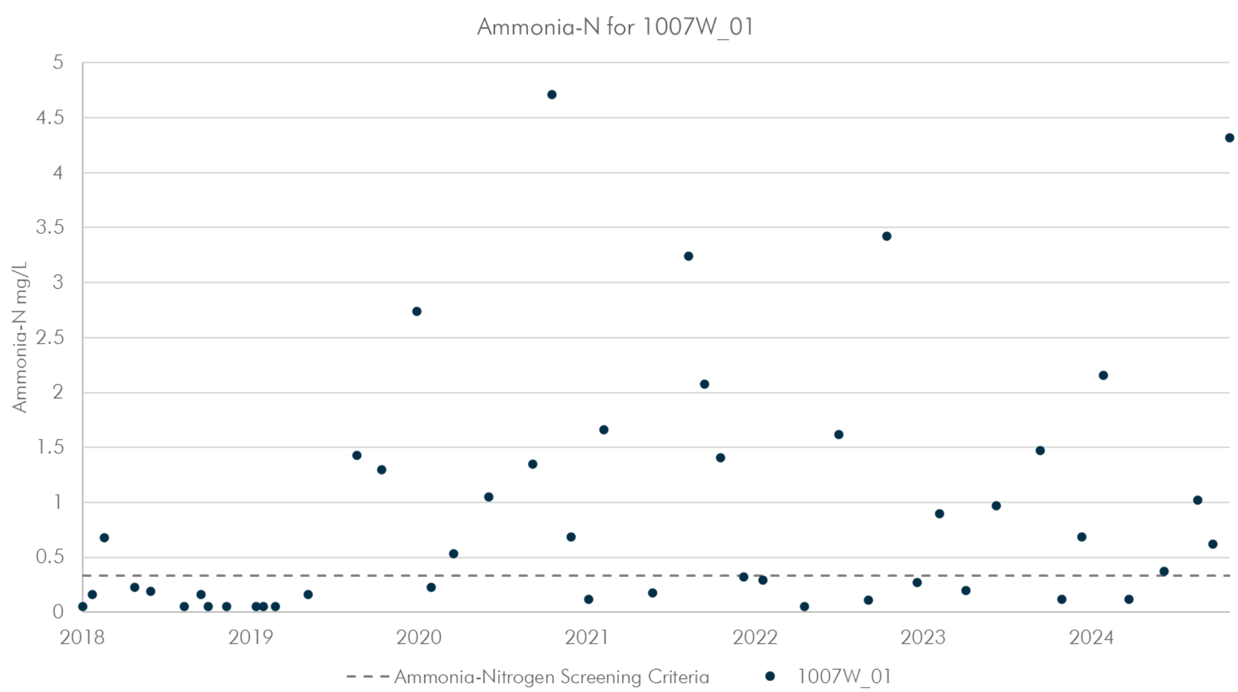


Figure 74. *The most recent 7-years of ammonia-nitrogen (ammonia-N) grab results through time for Harris County Flood Control Ditch D 138 assessment unit (AU) 1007W_01. This is one of six AUs with a statistically significant increasing trend for ammonia-N (p-value = 0.0008). The ammonia-N screening level criteria of 0.33 mg/L is represented by the dashed grey line.*

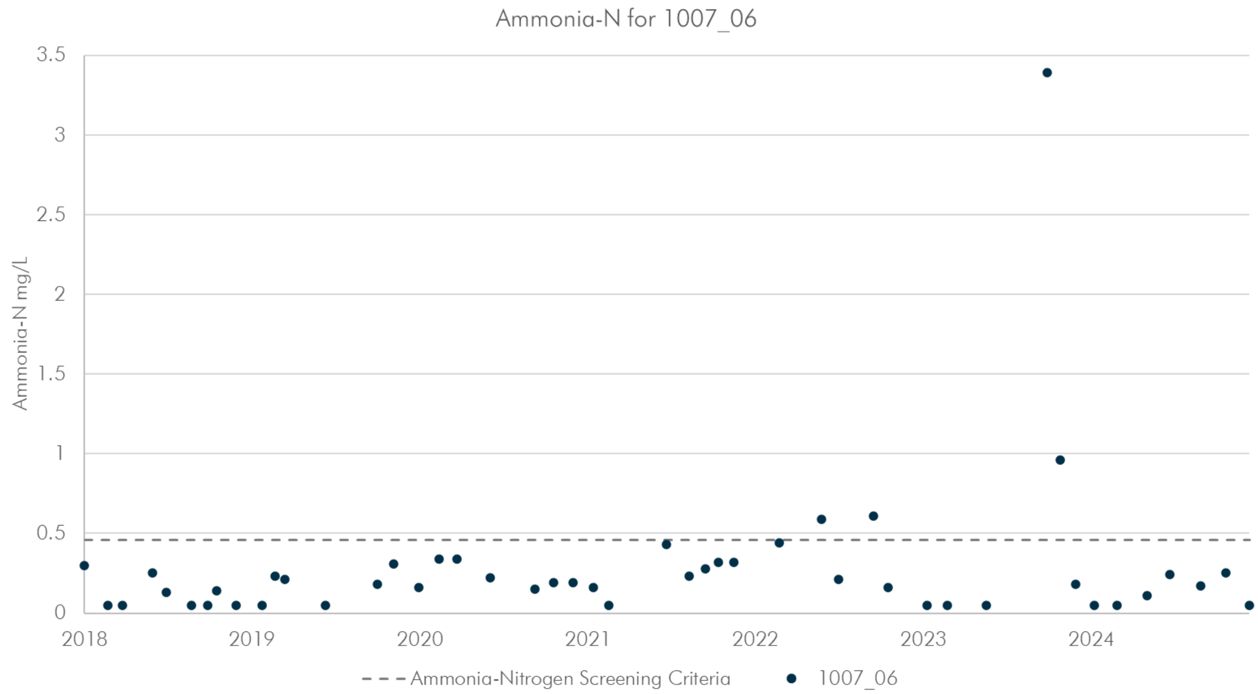


Figure 75. The most recent 7-years of ammonia-nitrogen (ammonia-N) grab results through time for Sims Bayou Tidal assessment unit (AU) 1007_06. This is one of six AUs with a statistically significant increasing trend for ammonia-N (p-value = 0.0532). The ammonia-N screening level criteria of 0.46 mg/L is represented by the dashed grey line.

APPENDIX F: WASTEWATER DISCHARGE PERMITS IN THE BRAYS BAYOU AND SIMS BAYOU WATERSHEDS

Watershed	Segment	NPDES ID	Facility Name	Total Permitted Average Flow (MGD)
Brays	1007B	TX0078751	FORT BEND COUNTY MUD 30 WWTP	1.50
Brays	1007B	TX0065307	BELTWAY WWTP	13.34
Brays	1007B	TX0084425	BEECHNUT MUD	1.38
Brays	1007C	TX0098191	KEEGANS BAYOU WWTP	23.10
Brays	1007B	TX0132438	LATERNA VILLA MHP WWTP	0.03
Brays	1007B	TX0056481	CHELFORD CITY REGIONAL WWTP	14.00
Brays	1007B	TX0088153	CITY OF HOUSTON UPPER BRAYS WWTP	18.00
Brays	1007C	TX0133779	FORT BEND COUNTY MUD NO.206 WWTF	0.60
Brays	1007C	TX0078964	RENN ROAD MUD WWTP	2.50
Brays	1007C	TX0053872	MEADOWS PLACE WWTP	1.50
Brays	1007C	TX0056952	BISSONNET WWTP	0.60
Brays	1007B	TX0089621	WEST HARRIS COUNTY MUD 6	0.50
Brays	1007B	TX0020613	CITY OF BELLAIRE	4.50
Brays	1007S	TX0026972	CITY OF SOUTHSIDE PLACE WWTP	0.30
Brays	1007B	TX0023841	WEST UNIVERSITY PLACE WWTP	2.00
Brays	1007B	TX0008851	THERMAL ENERGY TECO	0.95
Brays	1007[1]	TX0070530	MILBY STREET YARD	<0.01
Brays	1007B	TX0020052	FONDREN ROAD WWTF	0.60
Brays	1007L	TX0091979	SOUTHWEST HARRIS CO MUD 1	0.40
Brays	1007B	TX0062995	SOUTHWEST WWTP	60.00
Brays	1007B	TX0084484	HARRIS COUNTY MUD 122 WWTP	0.18
Brays	1007C	TX0027201	HARRIS COUNTY WCID 111 WWTP	7.20
Sims	1007D	TX0034924	ALMEDA SIMS WWTP	28.00
Sims	1007D	TX0079561	RAVAGO MANUFACTURING AMERICAS	0.02
Sims	1007A	TX0078891	FORT BEND MUD 26 WWTP	0.50
Sims	1007D	TX0099511	FT BEND COUNTY WCID 2	4.00
Sims	1007A	TX0053643	BLUE RIDGE WEST MUD WWTP	1.30
Sims	1007D	TX0063061	CHOCOLATE BAYOU WWTF	7.00
Sims	1007D	TX0062201	CITY OF HOUSTON	25.00
Sims	1007	TX0105058	CITY OF HOUSTON SIMS BAYOU SOUTH	36.00
Sims	1007	TX0003689	HOUSTON CHEMICAL PLANT	2.90
Sims	1007[1]	TX0007072	ECO SERVICES OPERATIONS HOUSTON	1.44
Sims	1007	TX0004961	BAYER HOUSTON PLANT	6.50
Sims	1007	TX0006068	INVISTA HOUSTON	1.50
Sims	1007	TX0034886	EASTHAVEN WWTP	3.00
Sims	1007F	TX0063045	HARRIS COUNTY WCID 47 WWTP	5.76
Sims	1007F	TX0057304	CITY OF SOUTH HOUSTON	4.00
Sims	1007F	TX0005479	MARTIN ASPHALT-SOUTH HOUSTON	0.06

[1]*Outfall not in the watershed, however discharge flows into the segment within the watershed.*