

Element H- Criteria for Reduction Achievements/Monitoring and Measuring Progress

This watershed protection plan identifies strategies for achieving both the measurable milestones of the Highland Bayou Watershed stakeholders as well as a closer approximation to the current state water quality standards for the watershed. Milestones (Element G) are used to evaluate progress in implementing specific action areas recommended in the Plan. It is likely that some milestones will be accomplished sooner than anticipated while others will be completed slower than expected. Interim measurable milestones are identified in the implementation schedule presented in Element G. As these action areas are implemented within the watershed, water quality benchmarks and environmental indicators will need to be assessed to measure nutrient and bacteria reductions at the sub-watershed level. WPP implementation success will also be gauged by evaluating improvements in water quality. Table H-1 below illustrates bacteria reduction goals from levels reported in the 2010 Texas Integrated Report (TCEQ, 2010a). Measuring progress is an important component of adaptive management, which will be used to guide decisions throughout the implementation of this WPP. If the WPP is not meeting interim targets or making progress towards attaining State water quality standards, the WPP will be revised to update management practices.

Table H- 1. *Enterococcus* Reduction Milestones

Implementation Year	Reduction Goals in percent
Year 3 (2019)	Reduce by <u>5%</u>
Year 5 (2021)	Reduce by <u>15%</u>
Year 10 (2025)	Reduce by <u>42.1%</u>

The Highland Bayou Watershed is located in TCEQ Basin 24, ‘Bays and Estuaries.’ Furthermore, Highland Bayou is classified by TCEQ into ‘segments’ for water quality management purposes. The assignment of a designated use to a specific segment is contingent upon a range of factors relating to historical uses, actual uses, and desired uses of that segment. Uses are designated by TCEQ through agency study and review of specific segments. Of the five use categories, there are two use categories that are relevant to the Highland Bayou’s 303(d) listing: Recreational Use and ALU.

Recreational Uses refer to human recreational use of water, and are divided into four levels of activity. Water quality criteria become more stringent when there is an increased likelihood of ingestion of water from recreational use. Unless a specified recreational use is designated in for a specified segment, the assumed use is Contact Recreation. ALU standards for waterbodies depend on the desired human use for aquatic life and the environmental conditions of the waterway. ALU standards for unclassified waterbodies are presumed to be high.

Bacteria standards are linked to Recreational Uses and DO standards are linked to ALU. The standard increases with increasing quality of the ALU designation. Low levels of DO may be the result of excessive algae growth which uses pollutants like nitrates and phosphorous to grow.

Table H-2 below outlines environmental strategies and progress indicators that will determine if load reductions are being achieved. Water bodies not specified in the TSWQS for specific chlorophyll-a

criteria are protected from excessive nutrient levels in order to support the general uses through the use of screening levels. The screening levels listed for nutrients and chlorophyll are statistically derived from SWQ monitoring data and are to be used when site specific criteria have not been developed in the TSWQS (TCEQ, 2012).

Table H- 2. Criteria for Load Reduction Goals

Strategies	Description of Activities	Progress Indicators	Monitoring Component
Criteria 303(d) Listing Pollutant Reduction Goals			
Reduce the number of dissolved oxygen minimum standards exceedances	Between 2001 and 2011 there were 18 exceedances for DO minimum standards over 77 sampling events.	Reduce the number of measured exceedances in routine ambient sampling to fewer than two events per year	Monitored by Texas Stream Team Volunteers or other 3 rd party with monitoring and reporting duties
Reduce the number of bacteria (enterococcus) exceedances in routine ambient water quality monitoring	Between 2001 and 2011 there were 436 sampling events in the SWQM database and a total of 188 exceedances for the criteria of 89 CFUs/100mL. The rate of observed values exceeding these limits is 43% of all sampling events and a count of approximately 19 sampling events out of 43 events. The median value across all sampling stations in the basin is 79, while the average is 1,049, indicating the influence of extreme counts on values overall.	Reduce the number of measured exceedances in routine ambient water quality monitoring to fewer than 12 per year in the near term phase (5 years), and to fewer than 8 per year in the long term phase (beyond 5 years)	See ambient water quality monitoring program
Criteria NPS Pollutants of Concern Related to 303(d) Criteria Goals			
Sustain Total Phosphate screening limits and exceedances	Between 2001 and 2011 there were 47 sampling events for Total Phosphate and no observed exceedances for the screening limit	Sustain the number of screening limit exceedances in routine ambient sampling to zero on a rolling 7 year basis	See ambient water quality monitoring program
Sustain Nitrate screening limits and exceedances	Between 2001 and 2011 there were 207 sampling events in the SWQM database for the study area. No exceedances were observed in measured values	Sustain the number of screening limit exceedance in routine ambient monitoring to zero on a rolling 7 year basis	See ambient water quality monitoring program
Sustain average Chlorophyll-a screening limits; Reduce exceedances occurring in warm season sampling	Chlorophyll-a can be an indicator of excessive nutrients. Between 2001 and 2011 there were 96 sampling events in the basin and 27 exceedances of screening limits (21 micrograms/L). 26 exceedances were measured in the warm season	Keep median and average values on a rolling 7 year basis to be below the screening limit. Reduce the number of measured exceedances to fewer than 1 in 5 warm season sampling events	See ambient water quality monitoring program
Criteria for TCEQ Water Quality and Aesthetic Standard Goals			
Meet TCEQ water quality standards for primary contact recreational uses	Refers to activities where there is a significant likelihood of ingestion of water. This includes activities such as wading, swimming, water skiing, diving, tubing, surfing, and whitewater paddling or rafting.	Bacteria levels under 35/89 for <i>Enterococcus</i> CFU's	See ambient water quality monitoring program

Strategies	Description of Activities	Progress Indicators	Monitoring Component
Meet TCEQ water quality standards for High ALU	Refers to water quality conditions that support levels of aquatic life activity. High ALU waters have high diversity and the usual assemblage of species expected for that waterbody. Also, species diversity and richness will be high, although not exceptional. The trophic structure or food chain may be slightly imbalanced.	High measured diversity in macro- and microbenthic biotic assemblages and trophic orders from primary producers to apex species.	Monitoring activity is outside of specific recommendation in this WPP. Results will rely on 3 rd party with monitoring and reporting duties
Meet TCEQ Aesthetic Standards: Water free of debris	Debris and litter removal improves the perceived quality by the public of the waterway.	Noticeable changes in amount of debris found near banks of the bayou or free floating within the Highland Bayou Watershed	
Meet TCEQ Aesthetic Standards: Water has no odor	Increased organic matter can cause reductions in DO, alter taste and create odors in drinking water, and it can cause destruction of fish and aquatic plant habitat.	Chlorophyll <i>a</i> limits from 0.005 to 0.15 mg/L	
Meet TCEQ Aesthetic Standards: No foam, oil, or other residues on water surface	Boating activities and illicit dumping through storm drains or on land can result in sheens and residues on the waterway, fouling its use for recreational and other aquatic uses.	Fewer observed or reported oil or fuel sheens, whether from boating activities or the illegal disposal of materials in storm drains	Monitored by Texas Stream Team Volunteers or other 3 rd party with monitoring and reporting duties
Meet TCEQ Aesthetic Standards: No suspended solids	Suspended solids consists of fine particulates of organic and non-organic residue that stay suspended in the water column, either from NPS runoff or through effluent from wastewater treatment plants or other commercial and industrial activities.	Fewer observed exceedances of screening limits for TSS	See ambient water quality monitoring program; else, monitored by Texas Stream Team Volunteers or other 3 rd party with monitoring and reporting duties
Criteria for General Goals			
Reduction in algal blooms per year	Algal blooms may occur when concentrations of nitrate are greater than 0.1 mg/L. Excessive nitrogen can promote plant growth that interferes with ambient levels of DO, clogs channels, and lowers the aesthetic quality of waterways.	Nitrate concentrations below 0.1 mg/L Reduction in nuisance algal blooms per year	See ambient water quality monitoring program
Reduction in fish kills per year	Algal blooms interfere DO and can cause DO to drastically decrease. Algal blooms may occur when nitrate levels are over 0.1 mg/L.	Nitrate concentrations below 0.1 mg/L to avoid nuisance algal blooms leading to fish kills. Fewer than two reported fish kills per year for segments 2424A and 2424C_01, combined.	Monitoring activity is outside of specific recommendation in this WPP. Results will rely on 3 rd party with monitoring and reporting duties