Brays Bayou Above Tidal and Tributaries: A Community Project to Protect Recreational Uses

Five Total Maximum Daily Loads for Indicator Bacteria in Brays Bayou Above Tidal and Tributaries

Adopted September 15, 2010.
Approved by EPA September 27, 2010.

Three TMDLs for Poor Farm Ditch, Bintliff Ditch, and Mimosa Ditch Added by Addendum I, April 2013

Via the April 2013 Update to the Texas Water Quality Management Plan.
Approved by EPA August 28, 2013.

One TMDL for Harris County Flood Control Ditch D 138Added by this Addendum II, January 2021

Via the January 2021 Update to the Texas Water Quality Management Plan (SFR-121/2021-02).
Approved by EPA July 29, 2021 (scroll to view or print this addendum).

Addendum Two to Five TMDLs for Indicator Bacteria in Brays Bayou Above Tidal and Tributaries

Adding One TMDL for AU 1007W_01

One TMDL for Indicator Bacteria in Harris County Flood Control Ditch D 138

Introduction

The Texas Commission on Environmental Quality (TCEQ) adopted *Five Total Maximum Daily Loads for Indicator Bacteria in Brays Bayou Above Tidal and Tributaries* (TCEQ, 2010) on September 15, 2010. The total maximum daily loads (TMDLs) were approved by the United States Environmental Protection Agency (EPA) on September 27, 2010. An addendum to the original TMDL was submitted to EPA through the April 2013 Water Quality Management Plan (WQMP) update (TCEQ, 2013). That addendum added three additional assessment units (AUs). This document represents a second addendum to the original TMDL document.

This addendum includes information specific to one additional AU (Harris County Flood Control (HCFC) Ditch D 138; 1007W_01) located within the watershed of the approved TMDL project for Brays Bayou Above Tidal. The concentration of indicator bacteria in this additional AU exceeds the criterion used to evaluate attainment of the primary contact recreation 1 use. This addendum provides the details related to developing the TMDL allocation for this additional AU, which was not specifically addressed in the original TMDL document. For background or other explanatory information, please refer to the *Technical Support Document for One Total Maximum Daily Load for Indicator Bacteria for Harris County Flood Control Ditch D 138*[1] (Adams and Millican, 2020). Refer to the original, approved TMDL document for details related to the overall project watershed as well as the methods and assumptions used in developing the original TMDLs.

Problem Definition

TCEQ first identified the bacteria impairment for HCFC Ditch D 138 in the *2016 Texas Integrated Report of Surface Water Quality for Clean Water Act Sections 305(b) and 303(d)* (2016 Texas Integrated Report; TCEQ, 2019) and then in each subsequent

[1] https://www.tceq.texas.gov/assets/public/waterquality/tmdl/72houmetbact/72-tsd-hcfd-d138-2020august.pdf

edition through 2020, the latest EPA-approved edition. The impaired AU is 1007W_01. HCFC Ditch D 138 is composed of only one AU that encompasses the entire water body. The HCFC Ditch D 138 watershed is located entirely within Harris County. Figure 1 shows the HCFC Ditch D 138 watershed in relation to the entire watershed of the original TMDLs, which also includes the watershed from the first addendum.

The Texas Surface Water Quality Standards (TSWQS; TCEQ, 2018) identify uses for surface waters and numeric and narrative criteria to evaluate attainment of those uses. The basis for the water quality target for the TMDL developed in this report is the numeric criterion for indicator bacteria from the 2018 TSWQS. *Escherichia coli* (*E. coli*) is the indicator bacteria for assessing primary contact recreation 1 use in freshwater.

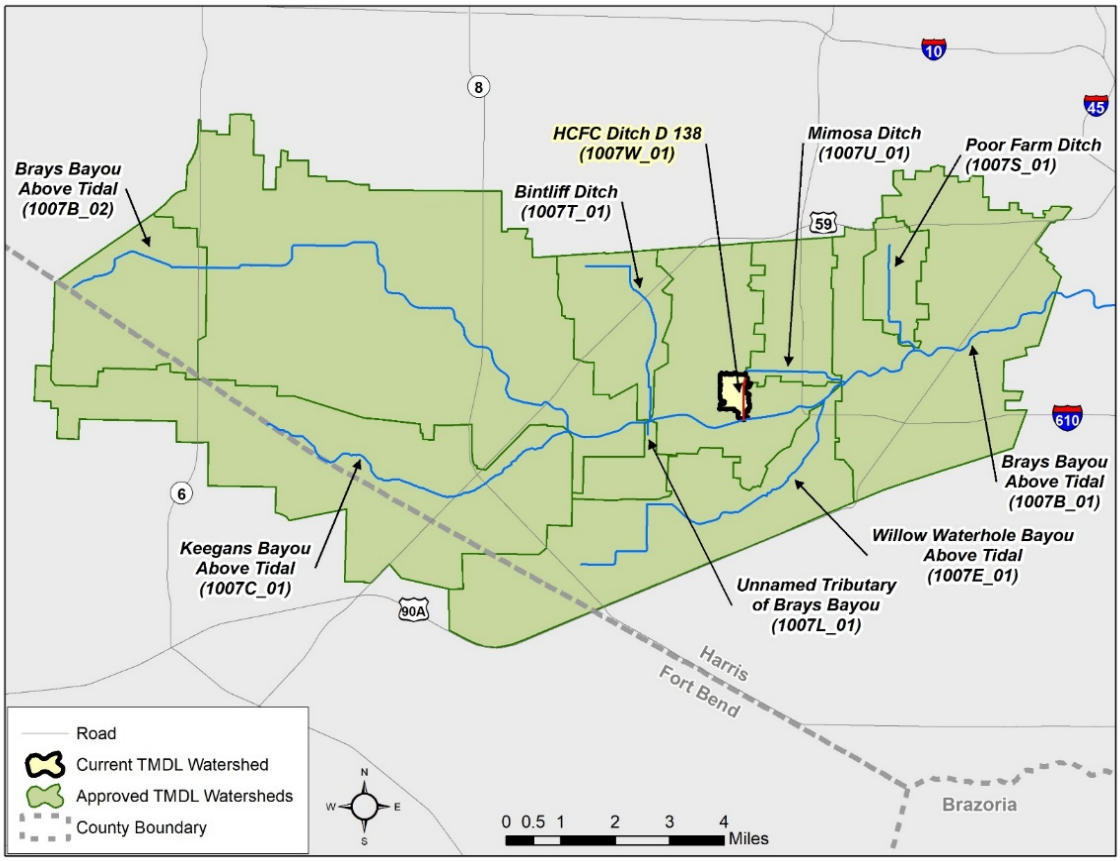

Figure 1. Map showing the previous TMDL watersheds and the current HCFC Ditch D 138 TMDL watershed considered in this addendum

Table 1 summarizes the ambient water quality data for the TCEQ surface water quality monitoring (SWQM) station on HCFC Ditch D 138, as reported in the 2020 Texas Integrated Report (TCEQ, 2020a). The data from the assessment indicate nonsupport of the primary contact recreation 1 use for the AU, because the geometric mean

concentration for *E. coli* exceeds the freshwater geometric mean criterion of 126 colony forming units (cfu)/100 milliliters (mL) of water. Monitoring within the HCFC Ditch D 138 watershed has occurred at TCEQ SWQM station 21180 (Figure 2).

Table 1. 2020 Texas Integrated Report summary for the HCFC Ditch D 138 TMDL watershed

AU	Station	Parameter	Number of Samples	Date Range	*E. coli* Geometric Mean (cfu/100 mL)
1007W_01	21180	*E. coli*	56	12/01/11 – 11/30/18	632.9

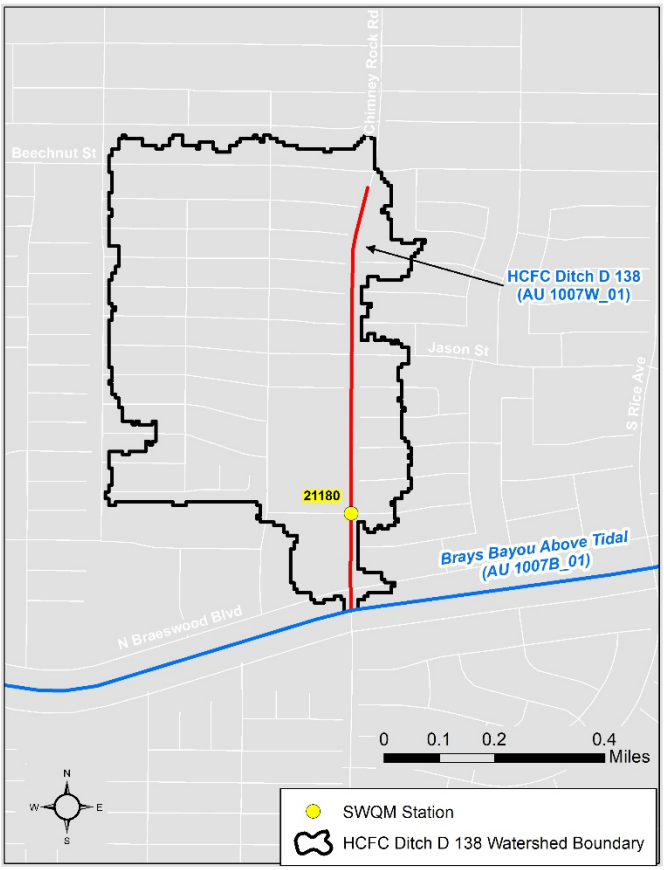

Figure 2. HCFC Ditch D 138 TMDL watershed showing the TCEQ SWQM station

Watershed Overview

HCFC Ditch D 138 (1007W) is a tributary to Brays Bayou (1007B) and is approximately 0.77 miles in length, entirely within Harris County. The HCFC Ditch D 138 watershed drains an area of approximately 228 acres. HCFC Ditch D 138 is an intermittent freshwater stream with perennial pools.

The 2020 Texas Integrated Report (TCEQ, 2020a) provides the following water body (and AU) description:

- HCFC Ditch D 138; AU 1007W_01 – From the confluence with Brays Bayou to a point immediately south of Beechnut Street in Houston.

Watershed Climate

The HCFC Ditch D 138 watershed is within the Upper Coast climatic division categorized as subtropical humid (Larkin and Bomar, 1983). The Gulf of Mexico is the principal source of moisture that drives precipitation in the region. Weather data were obtained for the 15-year period from January 2005 through December 2019 from the National Climatic Data Center for the William P. Hobby Airport in Houston (NOAA, 2020). Data from this 15-year period indicate that the average monthly high temperature typically reaches a maximum of 94.2 °F in August, and the average monthly low temperature generally reaches a minimum of 45.2 °F in January (Figure 3). Annual rainfall averages 53.6 inches. The wettest month is August (6.6 inches) while February (2.6 inches) is the driest month, with rainfall occurring throughout the year.

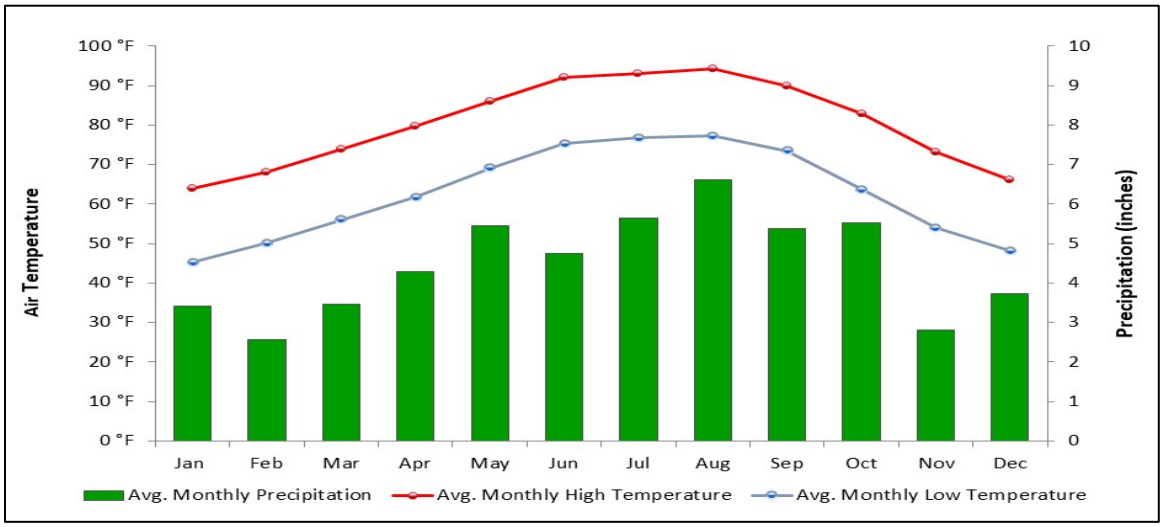

Figure 3. Average minimum and maximum air temperature and total precipitation by month from 2005 through 2019 for the William P. Hobby Airport weather station

Watershed Population and Population Projections

The HCFC Ditch D 138 watershed is geographically located within the municipal boundary of the City of Houston. Indicative of a developed urban watershed, current predominant population densities for this watershed are seven to 10 people per acre. According to the 2018 Houston-Galveston Area Council (H-GAC) regional growth forecast (H-GAC, 2017), the HCFC Ditch D 138 watershed had an estimated population of 3,913 people in 2020.

A population projection through 2045 was developed using data from the H-GAC regional growth forecast (H-GAC, 2017) to be consistent with previously completed TMDLs in the Brays Bayou watershed. Table 2 provides a summary of the population projection for the HCFC Ditch D 138 watershed. The procedure used to determine the values shown in Table 2 is detailed in Appendix A.

Table 2. 2020 Population and 2045 population projection for the HCFC Ditch D 138 TMDL watershed

Area	2020 Estimated Population	2045 Projected Population	Projected Population Increase	Percent Change
HCFC Ditch D 138 Watershed	3,913	4,045	132	3.4%

Land Cover

The land cover data for the HCFC Ditch D 138 watershed were obtained from the H-GAC 2018 10 Class Land Cover Data Set (H-GAC, 2017). The land cover for the HCFC Ditch D 138 watershed is shown in Figure 4. A summary of the land cover data is provided in Table 3 and indicates that the entire HCFC Ditch D 138 watershed is considered to be developed, with the Developed, Medium Intensity and Developed, Low Intensity categories comprising approximately 88.6% of the total land cover.

Endpoint Identification

The endpoint for the TMDL is to maintain the concentration of *E. coli* below the geometric mean criterion of 126 cfu/100 mL, which is protective of the primary contact recreation 1 use in freshwater.

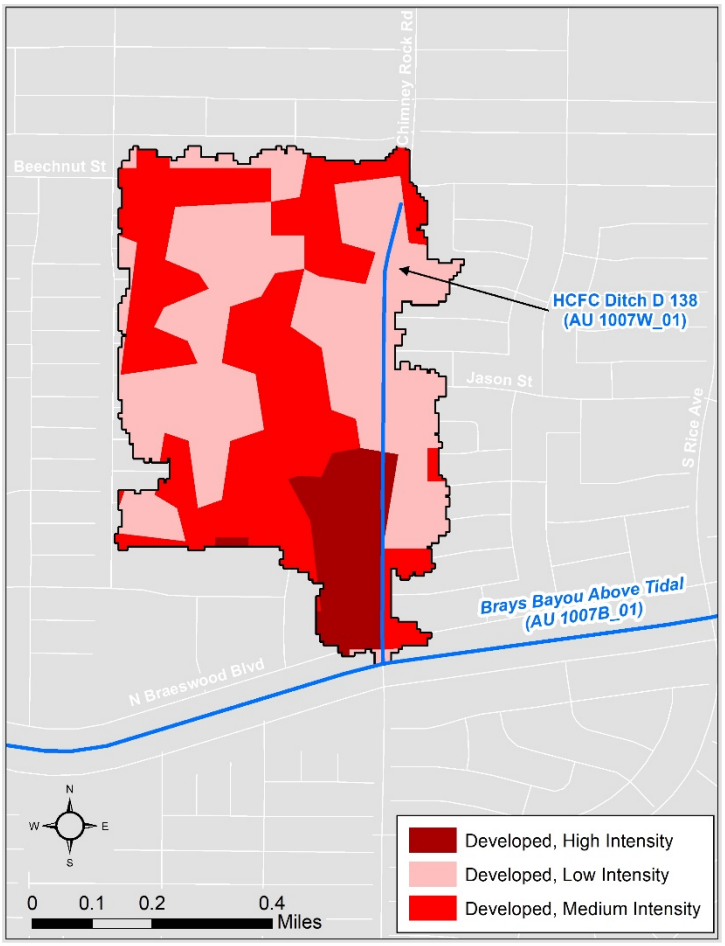

Figure 4. Land cover within the HCFC Ditch D 138 TMDL watershed

Table 3. Land cover within the HCFC Ditch D 138 TMDL watershed

2018 H-GAC Land Cover Classification	Area (Acres)	% of Total
Developed, High Intensity	25.9	11.4%
Developed, Low Intensity	93.7	41.1%
Developed, Medium Intensity	108.4	47.5%
Total	**228.0**	**100%**

Source Analysis

Pollutants may come from several sources, both regulated and unregulated. Regulated pollutants, referred to as "point sources," come from a single definable point, such as a pipe, and are regulated by permit under the Texas Pollutant Discharge Elimination System (TPDES) program. Wastewater treatment facilities (WWTFs) and stormwater

discharges from industries, construction, and the separate storm sewer systems of cities are considered point sources of pollution.

Unregulated sources are typically nonpoint source in origin, meaning the pollutants originate from multiple locations and rainfall runoff washes them into surface waters. Nonpoint sources are not regulated by permit.

Except for WWTFs, which receive individual wasteload allocations (WLAs; see the "WLA" section), the regulated and unregulated sources in this section are presented to give a general account of the different sources of bacteria expected in the watershed. These are not meant to be used for allocating bacteria loads or interpreted as precise inventories and loadings.

Regulated Sources

Regulated sources are controlled by permit under the TPDES program. The regulated sources in the TMDL watershed include WWTF outfalls and stormwater discharges from municipal separate storm sewer systems (MS4s), industries, and construction activities.

Domestic and Industrial WWTFs

As of August 20, 2020, there were no WWTFs with TPDES permits within the HCFC Ditch D 138 watershed.

TCEQ/TPDES Water Quality General Permits

Certain types of activities are required to be covered by one of several TCEQ/TPDES general permits:

- TXG110000 – concrete production facilities
- TXG130000 – aquaculture production
- TXG340000 – petroleum bulk stations and terminals
- TXG670000 – hydrostatic test water discharges
- TXG830000 – water contaminated by petroleum fuel or petroleum substances
- TXG870000 – pesticides (application only)
- TXG920000 – concentrated animal feeding operations
- WQG100000 – wastewater evaporation
- WQG200000 – livestock manure compost operations (irrigation only)

A review of active general permit coverage (TCEQ, 2020b) in the HCFC Ditch D 138 watershed as of June 15, 2020, found three pesticide permittees were covered by the general permit. The pesticide management areas do not have bacteria reporting or limits in their permits. These management areas were assumed to contain inconsequential

amounts of bacteria; therefore, it was unnecessary to allocate bacteria loads based on these activities. No other active general wastewater permit facilities or operations were found.

SSOs

A summary of sanitary sewer overflow (SSO) incidents that occurred during a four-year period from 2016 through 2019 in Harris County was obtained from TCEQ Central Office in Austin. The summary data indicated eight SSO incidents had been reported within the HCFC Ditch D 138 watershed. All SSO incidents were due to a temporary blockage of the collection system. Four of the SSO incidents had no corresponding estimate of the amount of overflow that had occurred. The remaining four SSO incidents reported an estimated overflow that ranged from 313 to 2,020 gallons per incident.

TPDES-Regulated Stormwater

When evaluating stormwater for a TMDL allocation, a distinction must be made between stormwater originating from an area under a TPDES-regulated discharge permit and stormwater originating from areas not under a TPDES-regulated discharge permit. Stormwater discharges fall into two categories:

1. Stormwater subject to regulation, which is any stormwater originating from TPDES regulated MS4 entities, industrial facilities, and construction activities.
2. Stormwater runoff not subject to regulation.

Discharges of stormwater from a Phase II MS4, industrial facility, or construction site must be covered under one of the following TCEQ/TPDES general permits:

- TXR040000 – Phase II MS4 General Permit for small MS4s located in urbanized areas
- TXR050000 – Multi-sector General Permit (MSGP) for industrial facilities
- TXR150000 – Construction General Permit (CGP) for construction activities disturbing more than one acre

A review of active stormwater general permit coverage (TCEQ, 2020b) in the HCFC Ditch D 138 watershed as of June 14, 2020, found no active MSGPs or CGPs within the HCFC Ditch D 138 watershed. There is currently one Phase I MS4 permit and one combined Phase I and Phase II MS4 permit within the HCFC Ditch D 138 watershed (Table 4). Figure 5 shows the USCB urbanized area (which accounts for MS4 coverage) within the HCFC Ditch D 138 watershed.

Table 4. TPDES MS4 permits associated with the HCFC Ditch D 138 TMDL watershed

Entity	TPDES Permit	NPDES Permit	Authorization Type
City of Houston and Harris County and Harris County Flood Control District	WQ0004685000	TXS001201	Phase I MS4
Texas Department of Transportation	WQ0005011000	TXS002101	Combined Phase I/II MS4

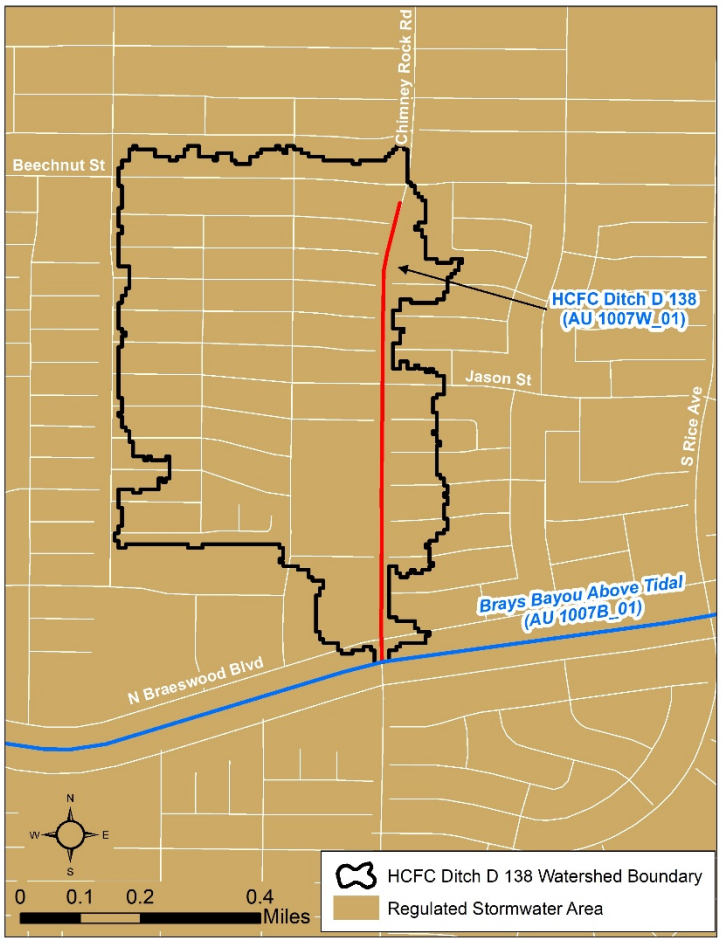

Figure 5. Regulated stormwater area based on urbanized area within the HCFC Ditch D 138 watershed

Illicit Discharges

Pollutant loads can enter water bodies from MS4 outfalls that carry authorized sources as well as illicit discharges under both dry- and wet-weather conditions. The term "illicit discharge" is defined in TPDES General Permit TXR040000 for Phase II MS4s as "Any

discharge to a municipal separate storm sewer that is not entirely composed of stormwater, except discharges pursuant to this general permit or a separate authorization and discharges resulting from emergency firefighting activities." Illicit discharges can be categorized as either direct or indirect contributions.

Unregulated Sources

Unregulated sources of bacteria are generally nonpoint and can originate from wildlife and feral hogs, various agricultural activities, agricultural animals, land application fields, urban runoff not covered by a permit, failing on-site sewage facilities (OSSFs), and domestic pets.

Unregulated Agricultural Activities and Domesticated Animals

A number of agricultural activities that do not require permits can be potential sources of fecal bacteria loading. However, due to the highly urbanized nature of the HCFC Ditch D 138 watershed, livestock were not considered a major source of bacteria loading.

Fecal bacteria from dogs and cats is transported to streams by runoff in both urban and rural areas and can be a potential source of bacteria loading. Table 5 summarizes the estimated number of dogs and cats within the HCFC Ditch D 138 watershed. Pet population estimates were calculated as the estimated number of dogs (0.614) and cats (0.457) per household (AVMA, 2018). The number of households in the TMDL watershed was estimated using 2010 Census data (USCB, 2010). The actual contribution and significance of bacteria loads from pets reaching HCFC Ditch D 138 is unknown.

Table 5. Estimated households and pet population for the HCFC Ditch D 138 TMDL watershed

Estimated Households	Estimated Dog Population	Estimated Cat Population
1,241	762	567

Wildlife and Unmanaged Animals

Fecal bacteria are common inhabitants of the intestines of all warm-blooded animals, including wildlife such as mammals and birds. In developing bacteria TMDLs, it is important to identify by watershed the potential for bacteria contributions from wildlife and feral hogs. The *E. coli* contribution from feral hogs and wildlife in the HCFC Ditch D 138 watershed cannot be determined based on existing information. However, due to the urbanized nature of the watershed it is assumed that the contribution is minimal.

OSSFs

Failing OSSFs were not considered a major source of bacteria loading in the HCFC Ditch D 138 watershed, because the entire watershed area is served by a wastewater collection and treatment system. A review of OSSF information received from H-GAC indicates that no OSSFs are known to exist in the TMDL watershed.

Linkage Analysis

The load duration curve (LDC) method was used to examine the relationship between instream water quality and the source of indicator bacteria loads. Inherent to the use of LDCs as the mechanism of linkage analysis is the assumption of a one-to-one relationship between instream loadings and loadings originating from point sources and the landscape as regulated and non-regulated sources. Further, this one-to-one relationship was also inherently assumed when using the LDC to define the TMDL pollutant load allocation. The LDC method allows for estimation of TMDL loads by utilizing the cumulative frequency distribution of streamflow and measured pollutant concentration data (Cleland, 2003). In addition to estimating stream loads, this method allows for the determination of the hydrologic conditions under which impairments are typically occurring, can give indications of the broad origins of the bacteria (i.e., point source and stormwater), and provides a means to allocate allowable loadings. The technical support document (Adams and Millican, 2020) provides details about the linkage analysis and the LDC method and its application.

The *E. coli* event data plotted on the LDC for station 21180 in Figure 6 show exceedances of the geomean criterion have commonly occurred regardless of streamflow conditions. The allowable load at the single sample criterion (399 cfu/100 mL) is included on the LDC for comparison with individual *E. coli* samples, although it is not used for assessment or allocation purposes.

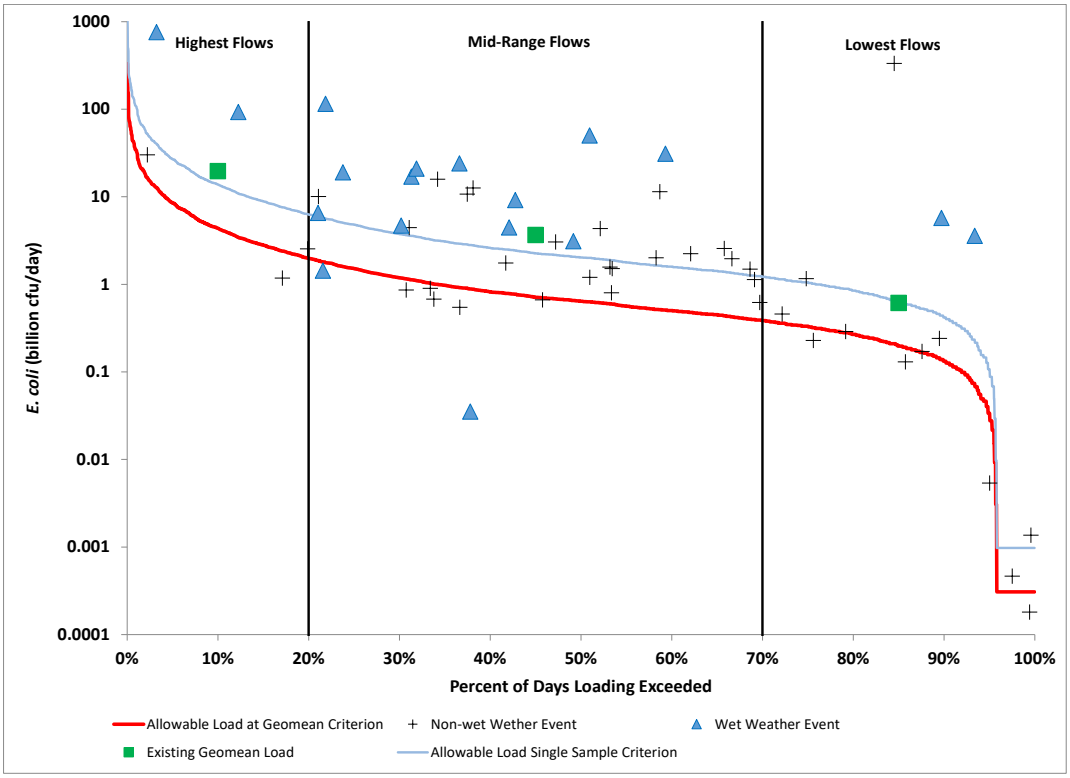

Figure 6. LDC for HCFC Ditch D 138 TMDL watershed at TCEQ SWQM Station 21180

MOS

The margin of safety (MOS) is designed to account for any uncertainty that may arise in specifying water quality control strategies for the complex environmental processes that affect water quality. Quantification of this uncertainty, to the extent possible, is the basis for assigning an MOS. The TMDL in this report incorporates an explicit MOS of 5% of the total TMDL allocation.

Pollutant Load Allocation

The TMDL represents the maximum amount of a pollutant that the stream can receive in a single day without exceeding water quality standards. The pollutant load allocations for the selected scenarios were calculated using the following equation:

TMDL = WLA + LA + FG + MOS

Where:

WLA = wasteload allocations, the amount of pollutant allowed by regulated dischargers

LA = load allocations, the amount of pollutant allowed by unregulated sources

FG = loadings associated with future growth from potential regulated facilities

MOS = margin of safety load

AU Level TMDL Computation

To be consistent with previously completed TMDLs in the Brays Bayou watershed, the TMDL for HCFC Ditch D 138 was derived using the median flow within the Highest Flows flow regime (or 10% flow) of the LDC developed for SWQM station 21180. This station represents the location within HCFC Ditch D 138 where an adequate number of *E. coli* samples has been collected.

MOS

The TMDL in this report incorporates an explicit MOS of 5%.

WLA

The WLA is the sum of loads from regulated sources, which are WWTFs and regulated stormwater.

WWTFs

TPDES-permitted WWTFs are allocated a daily wasteload (WLA_{WWTF}) calculated as their full permitted discharge flow rate multiplied by one-half the instream geometric mean criterion. One-half of the water quality criterion (63 cfu/100 mL *E. coli*) is used as the WWTF target to provide instream and downstream load capacity and to be consistent with previously completed TMDLs in the Brays Bayou watershed. Due to the absence of any permitted dischargers in the HCFC Ditch D 138 watershed, the WLA_{WWTF} component is zero.

Regulated Stormwater

Stormwater discharges from MS4, industrial, and construction sites are also considered regulated point sources. Therefore, the WLA calculations must also include an allocation for regulated stormwater discharges (WLA_{SW}). The percentage of the land area included in the project watershed that is under the jurisdiction of stormwater permits is used to estimate the amount of the overall runoff load that should be allocated as the permitted stormwater contribution in the WLA_{SW} component of the TMDL.

The HCFC Ditch D 138 watershed is covered 100% by MS4 permits. However, even in highly urbanized areas such as the HCFC Ditch D 138 watershed, there remain small

areas of potential direct deposition of bacteria loadings from unregulated sources such as wildlife. To account for these small unregulated areas, the stream length based on the TCEQ definition of AU 1007W_01 and average channel width as calculated based on aerial imagery was used to compute an area of unregulated stormwater contribution. The percentage of land under the jurisdiction of stormwater permits in the HCFC Ditch D 138 watershed is 99.18%.

LA

The load allocation (LA) component of the TMDL corresponds to runoff (or direct deposition) from unregulated sources.

Allowance for FG

The future growth (FG) component of the TMDL equation addresses the requirement of TMDLs to account for future loadings that might occur as a result of population growth, changes in community infrastructure, and development. Specifically, this TMDL component takes into account the probability that new flows from WWTF discharges may occur in the future. The assimilative capacity of water bodies increases as the amount of flow increases.

The allowance for FG will result in protection of existing uses and conform to Texas' antidegradation policy.

The FG component of the TMDL watershed was based on the population projections for the entire TMDL watershed. New WWTFs are to be designed for a daily wastewater flow of 75-100 gallons per capita per day (gpcd; TAC, 2008). Conservatively taking the higher daily wastewater flow capacity (100 gpcd) and multiplying it by a potential population change gives an FG flow. Based on the information in Table 2, the projected population change within the HCFC Ditch D 138 watershed for the time period 2020-2045 is 132. Multiplying the projected population growth by the higher daily wastewater flow capacity, yields a value of 0.013 MGD. This value would be considered the full permitted discharge of a potential future WWTF.

FG of existing or new point sources is not limited by this TMDL as long as the sources do not cause bacteria to exceed the limits. The assimilative capacity of water bodies increases as the amount of flow increases. Consequently, increases in flow allow for increased loadings. The LDC and tables in this TMDL will guide determination of the assimilative capacity of the water body under changing conditions, including FG.

Summary of TMDL Calculations

Table 7 summarizes the TMDL calculations for the HCFC Ditch D 138 watershed. The TMDL was calculated based on the median flow in the 0-20 percentile range (10% exceedance, Highest Flows flow regime) from the LDC developed for the SWQM station 21180. Allocations are based on the current geometric mean criterion for *E. coli* of 126 cfu/100 mL for each component of the TMDL (with the exception of the WLA_{WWTF} and FG terms, which used one-half the criterion).

Table 7. TMDL allocation summary for HCFC Ditch D 138 AU 1007W_01 watershed

Water Body	AU	TMDL	WLA_{WWTF}	WLA_{SW}	LA	FG	MOS
HCFC Ditch D 138	1007W_01	4.374	0	4.090	0.034	0.031	0.219

All loads expressed as billion cfu/day *E. coli*

The final TMDL allocations (Table 8) needed to comply with the requirements of 40 Code of Federal Regulations (CFR) Section 103.7 include the FG component within the WLA_{WWTF}.

Table 8. Final TMDL allocations for HCFC Ditch D 138 AU 1007W_01 watershed

Water Body	AU	TMDL	WLA_{WWTF}	WLA_{SW}	LA	MOS
HCFC Ditch D 138	1007W_01	4.374	0.031	4.090	0.034	0.219

All loads expressed as billion cfu/day *E. coli*

Seasonal Variation

Federal regulations in 40 CFR Section 130.7(c)(1) require that TMDLs account for seasonal variation in watershed conditions and pollutant loading. Analysis of the seasonal differences in indicator bacteria concentrations were assessed by comparing *E. coli* concentrations obtained from eight years (2012 through 2019) of routine monitoring collected in the warmer months (April through September) against those collected during the cooler months (October through March). Differences in *E. coli* concentrations obtained in warmer versus cooler months were then evaluated by performing a t-test on the natural log transformed dataset. This analysis of *E. coli* data indicated that there was no significant difference (α=0.05) in indicator bacteria between cool and warm weather seasons for HCFC Ditch D 138 (p=0.271). Seasonal variation was also addressed by using all available flow and bacteria records (covering all seasons) from the period of record used in LDC development for this project.

Public Participation

TCEQ maintains an inclusive public participation process. From the inception of the TMDL study, the project team sought to ensure that stakeholders were informed and involved. Communication and comments from the stakeholders in the watershed strengthen TMDL projects and their implementation.

The technical support document[2] for this TMDL addendum (Adams and Millican, 2020) was posted on the TCEQ website on August 20, 2020. A presentation on this addendum was given at the annual spring meeting of the Bacteria Implementation Group (BIG) in Houston on June 2, 2020. The public will have an opportunity to comment on this addendum during the official WQMP update public comment period (February 5 through March 9, 2021). This is an ongoing process, so notice of the public comment period for this addendum will be sent to the stakeholders and posted on the TCEQ's TMDL Program News webpage[3] and the document will be posted on the WQMP Updates webpage. TCEQ accepted public comments on the original TMDL from June 18 through July 19, 2010. No comments were submitted.

Implementation and Reasonable Assurance

The water body covered by this addendum is within the existing bacteria TMDL watershed for Brays Bayou Above Tidal. That TMDL watershed including HCFC Ditch D 138 is within the area covered by the implementation plan developed by the BIG for bacteria TMDLs throughout the greater Houston area, which was approved by the commission on January 30, 2013. It outlines an adaptive management approach in which measures are assessed annually by the BIG for efficiency and effectiveness. The iterative process of evaluation and adjustment ensures continuing progress toward achieving water quality goals and expresses stakeholder commitment to the process. Please refer to the original TMDL document for additional information regarding implementation and reasonable assurance.

[2] https://www.tceq.texas.gov/assets/public/waterquality/tmdl/72houmetbact/72-tsd-hcfd-d138-2020august.pdf

[3] https://www.tceq.texas.gov/waterquality/tmdl/tmdlnews.html

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Appendix A.

Method Used to Determine Population Projections in the HCFC Ditch D 138 Watershed

The following steps detail the method used to estimate the 2020 and projected 2045 populations in the HCFC Ditch D 138 watershed.

1. Obtained the H-GAC 2018 Regional Growth Forecast data for years 2020, 2030, 2040, and 2045 to develop the population projections.
2. Developed watershed population projections using the traffic zone area-level data for the HCFC Ditch D 138 watershed.
3. For zones not entirely within the watershed, a simple fraction of area within the watershed was proportioned.
4. The proportioned values were summed to arrive at the population projections for years 2020 and 2045 (as well as interim years 2030 and 2040).