Upper San Antonio River: Bacteria in Waters Used for Contact Recreation

- **Three TMDLs Adopted July 25, 2007**
  Approved by EPA September 25, 2007
- **Seven TMDLs Added by Addendum April 2016**
  Approved by EPA August 9, 2016
- **One TMDL Added by Addendum October 2019**
  Approved by EPA March 11, 2020 (scroll to view or print this addendum)

Addendum Two to Three Total Maximum Daily Loads for Bacteria in the San Antonio Area

One Total Maximum Daily Load for Indicator Bacteria in Martinez Creek

For Segment 1911I

Assessment Unit 1911I_01

Introduction

The Texas Commission on Environmental Quality (TCEQ) adopted *Three Total Maximum Daily Loads for Bacteria in the San Antonio Area: Segments 1910, 1910A, and 1911* (TCEQ, 2007) on July 25, 2007. The total maximum daily loads (TMDLs) were approved by the United States Environmental Protection Agency (EPA) on September 25, 2007. Additionally, an addendum to the original TMDL was submitted to EPA through the April 2016 Water Quality Management Plan (WQMP) update (TCEQ, 2016). That addendum added seven additional assessment units (AUs) in five segments (1910D, 1911B, 1911C, 1911D, and 1911E). This document represents a second addendum to the original TMDL document.

This addendum includes information specific to one additional AU. The AU is in Segment 1911I located within the watershed of the approved TMDL project for bacteria in the San Antonio area. Concentrations of indicator bacteria in this additional AU exceed the geometric mean criterion used to evaluate attainment of the water quality standard for contact recreation. This addendum presents the new information associated with the additional AU. For background or other explanatory information, please refer to the *Technical Support Document for a Total Maximum Daily Load for Indicator Bacteria in Martinez Creek* (Brady et al., 2019). Refer to the original, approved TMDL document for details related to the Salado Creek, Walzem Creek, and Upper San Antonio River watersheds as well as the methods and assumptions used in developing the original TMDLs.

The watershed for Segment 1911I was included in the original TMDL project area. 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.

Problem Definition

The TCEQ first identified the bacteria impairment for Martinez Creek in the 2014 *Texas Integrated Report of Surface Water Quality for Clean Water Act*

Sections 305(b) and 303(d) (2014 Integrated Report; TCEQ, 2015). Martinez Creek was also included in the 2016 Integrated Report (TCEQ, 2018; the most recent EPA-approved version). Table 1 provides a synopsis of the 2014 and 2016 Integrated Reports. The impaired AU is 1911I_01, as shown in Figure 1. The segment has two AUs, with the impairment in the most downstream AU (Figure 2). The project watershed is located within Bexar County. Figure 1 also shows the Martinez Creek watershed in relation to the entire watershed of the original TMDLs as well as the watersheds addressed in the first addendum.

Table 1. Synopsis of the 2014 and 2016 Integrated Reports for Martinez Creek.

Integrated Report Year	Segment	AU	Parameter	Contact Recreation Use Level of Support	Category
2014	1911I	1911I_01	*E. coli*	Nonsupport	5c
2016	1911I	1911I_01	*E. coli*	Nonsupport	5c

The Texas Surface Water Quality Standards (TSWQS; TCEQ, 2010) 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 2010 TSWQS. *Escherichia coli* (*E. coli*) is the indicator bacteria for assessing primary contact recreation use in freshwater.

Table 2 summarizes the ambient water quality data for the TCEQ surface water quality monitoring (SWQM) stations on Martinez Creek, as reported in the 2014 and 2016 Integrated Reports. The data from these assessments indicate nonsupport of the primary contact recreation use for Martinez Creek, because the geometric mean concentration for *E. coli* exceeds the geometric mean criterion of 126 colony forming units (cfu)/100 milliliters (mL) of water. Surface water quality monitoring within the Martinez Creek watershed has occurred at TCEQ SWQM station 12751 (Figure 2).

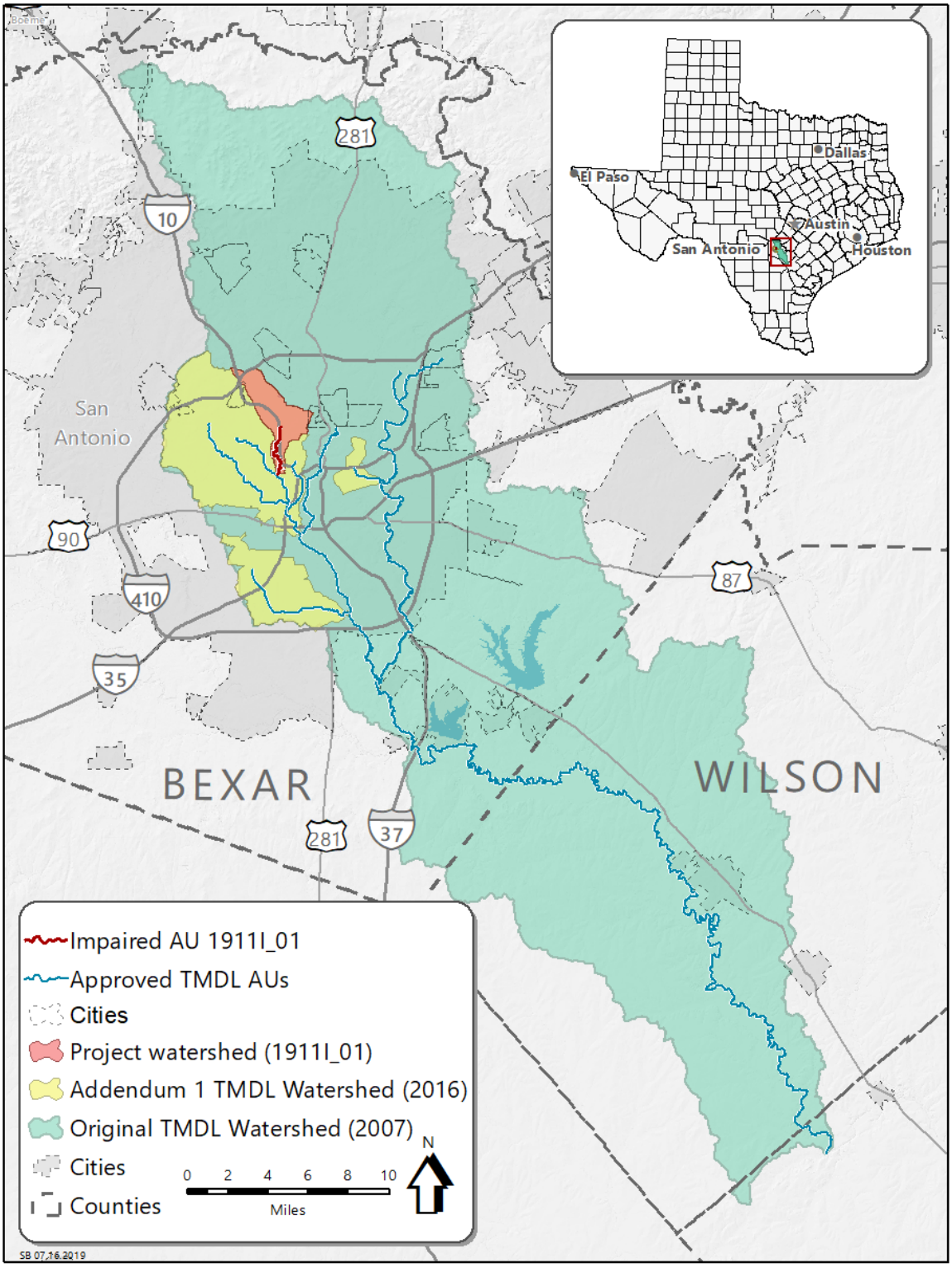

Figure 1. Approved TMDL and first addendum watersheds, and the Martinez Creek project watershed.

Table 2. 2014 and 2016 Integrated Report summary for the Martinez Creek watershed.

Integrated Report Year	AU	Parameter	Station	Number of Samples	Date Range	*E. coli* Geometric Mean (cfu/100 mL)
2014	1911I_01	*E. coli*	12751	41	2005-2012	268
2016	1911I_01	*E. coli*	12751	50	2007-2014	238

Description of the Study Area

Martinez Creek (Segment 1911I) is a tributary of the Upper San Antonio River (Segment 1911). Martinez Creek is an unclassified, freshwater stream composed of two AUs – the downstream AU (1911I_01) has a flow type of "Intermittent with pools"; the upstream AU (1911I_02) has a flow type of "Intermittent" (TCEQ, 2018). Martinez Creek (Segment 1911I) flows into Alazan Creek (1911C) in San Antonio and is approximately 6 miles in length. At its mouth, Martinez Creek drains an area of 7.29 square miles in Bexar County. Martinez Creek is located within the San Antonio city limits and is largely channelized within concrete banks.

The 2016 Texas Integrated Report (TCEQ, 2018) provides the following segment and AU descriptions for Martinez Creek:

- Segment 1911I (Martinez Creek) – Martinez Creek from the confluence of Alazan Creek in central San Antonio upstream to the terminus at Vance Jackson Rd in north San Antonio
    - 1911I_01 – Martinez Creek from the confluence of Alazan Creek in central San Antonio upstream to the concrete channel portion at San Francisco St in north San Antonio
    - 1911I_02 – Martinez Creek from the concrete channel portion at San Francisco St upstream to the terminus at Vance Jackson Rd in north San Antonio

Using a watershed-based approach and because the impaired AU 1911I_01 is downstream of the non-impaired AU 1911I_02, the entire watershed of Martinez Creek will be considered in this document.

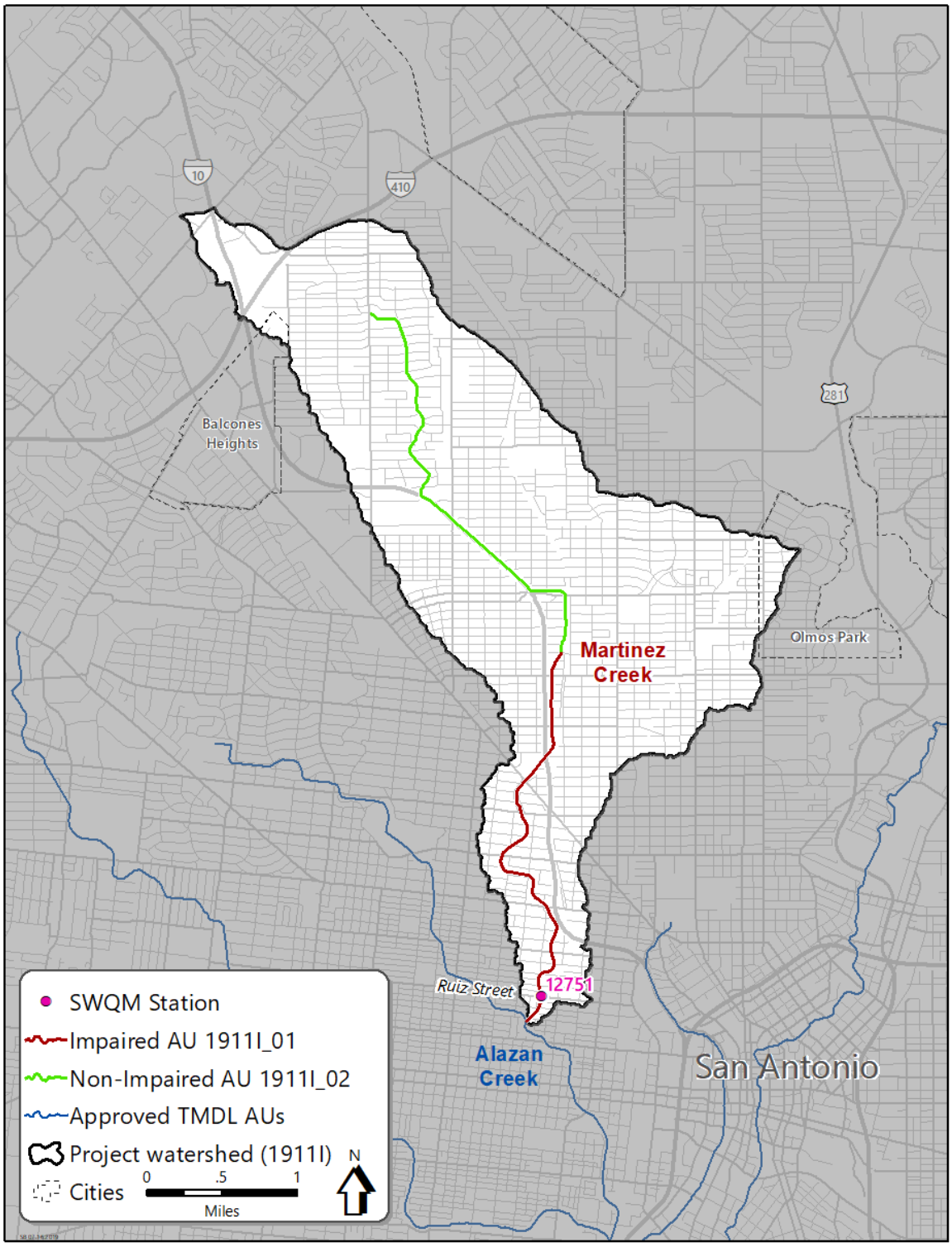

Figure 2. Martinez Creek watershed showing impairment status of AUs and TCEQ SWQM station.

Watershed Climate

The Martinez Creek watershed is located within the central portion of Texas, described as having a subtropical subhumid climate (Larkin and Bomar, 1983). As in much of the state, the region's subtropical climate is caused by the "predominant onshore flow of tropical maritime air from the Gulf of Mexico," while the increasing moisture content (from west to east) reflects variations in "intermittent seasonal intrusions of continental air" (Larkin and Bomar, 1983).

Climate data from 2004 through 2018 for the San Antonio International Airport weather station (USW00012921) indicate a bimodal precipitation pattern (NOAA, 2019a; Figure 3). Annual rainfall in the San Antonio area averages 32.4 inches. The wettest months are typically May and September (4.5 and 4.6 inches) while February and August (1.6 and 2.0 inches) are normally the driest months (NOAA, 2019b). Average high temperatures generally reach their peak of 96˚ F in August, while the average low temperature reaches a minimum of 41˚ F in January.

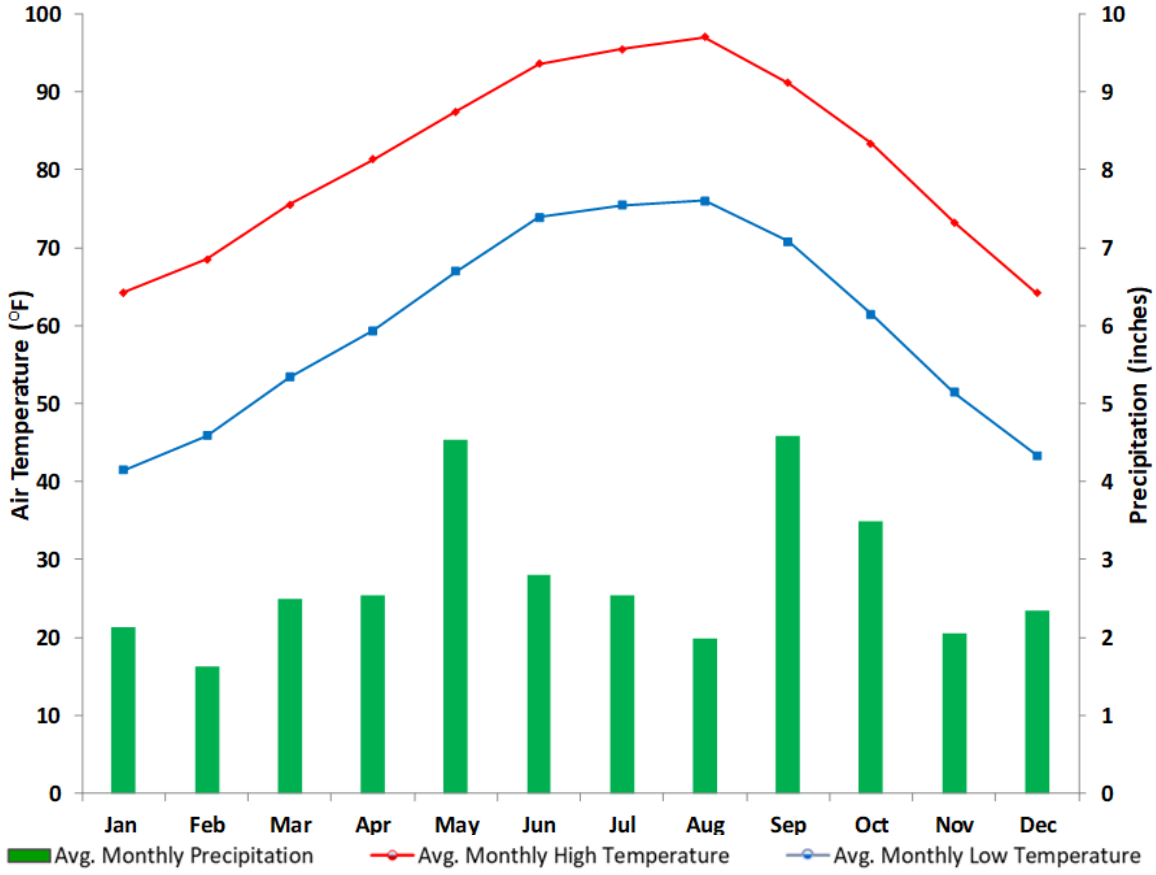

Figure 3. Average minimum and maximum air temperature and total precipitation by month from January 2004 through December 2018 for San Antonio International Airport weather station.

Land Use

The land use/land cover data for the Martinez Creek watershed was obtained from the 2016 National Land Cover Database (NLCD) (MRLC, 2019) and are displayed in Figure 4. A summary of the land use/land cover data is shown in Table 3 and indicates that the Martinez Creek watershed is almost completely developed (over 99 percent).

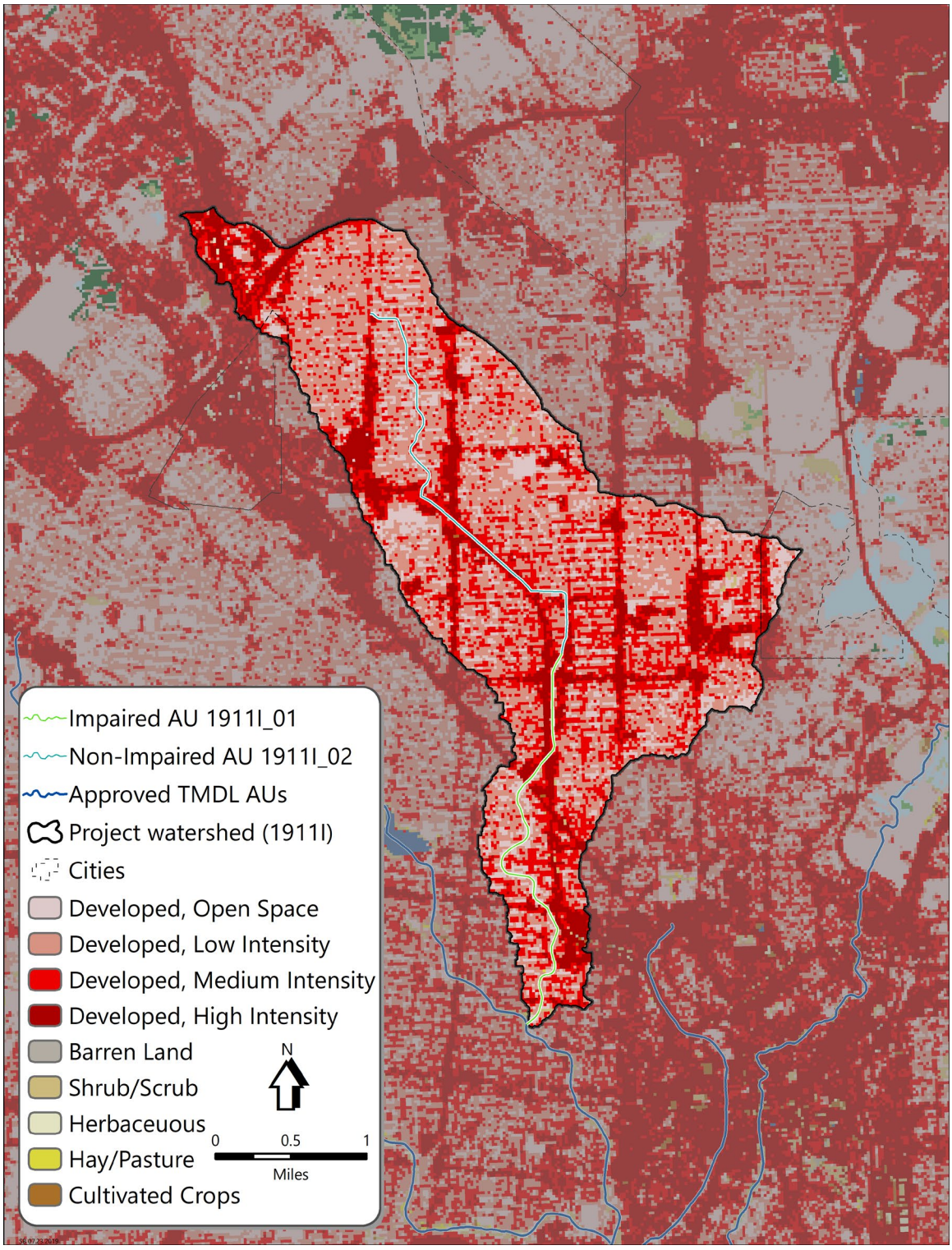

Figure 4. Land use/land cover map showing categories within the Martinez Creek watershed.

Table 3. Land use/land cover within the Martinez Creek watershed.

Classification	Area (Acres)	Percent of Total
Developed, Open Space	636.8	13.7%
Developed, Low Intensity	2065.2	44.3%
Developed, Medium Intensity	1307	28.0%
Developed High Intensity	643.6	13.8%
Barren Land	0.4	0.01%
Shrub/Scrub	8.7	0.19%
Grassland/Herbaceous	1.8	0.04%
Pasture/Hay	0.2	0.004%
Cultivated Crops	1.8	0.04%
Total	**4,665.5**	**100.0%**

Watershed Population and Population Projections

According to the United States Census Bureau (USCB) 2010 Census (USCB, 2011), there are an estimated 47,010 people in the Martinez Creek watershed, indicating a population density of 6,449 people/ square mile.

Geospatial analysis based on water user groups (WUGs), which allows a refinement of county and city-level projections developed by the Office of the State Demographer and the Texas Water Development Board (TWDB, 2019), reveals that the population is projected to increase by 82.6 percent in the Martinez Creek watershed between 2010 and 2070 (Table 4).

Table 4. 2010 Population and 2070 population projection for the Martinez Creek watershed.

Water Body	Segment	2010 U.S. Census Population	2070 Projected Population	Projected Population Increase	Percent Change (2010–2070)
Martinez Creek	1911I	47,010	85,858	38,848	82.64

Endpoint Identification

The endpoint for the TMDL is to maintain the concentration of *E. coli* below the geometric mean criterion of 126 cfu/100mL identified in the 2010 TSWQS.

Source Analysis

Regulated Sources

Permitted sources are regulated under the Texas Pollutant Discharge Elimination System (TPDES) program.

Domestic and Industrial Wastewater Treatment Facilities

There are no permitted domestic wastewater treatment facilities (WWTFs) or industrial dischargers within the Martinez Creek watershed. The entire watershed is included within the San Antonio Water System (SAWS) service area.

Sanitary Sewer Overflows

The TCEQ Region 13 Office maintains a database of sanitary sewer overflow (SSO) data reported by municipalities. These SSO data typically contain estimates of the total gallons spilled, responsible entity and a general location of the spill. A summary of the reports of SSO events that were determined to have occurred within the Martinez Creek watershed between January 2012 and December 2017 is shown in Table 5, as well as in Figure 5.

Table 5. Summary of SSO incidences reported within the Martinez Creek Watershed from 2012 through 2017.

No. of Incidents	Total Volume (gallons)	Average Volume (gallons)	Minimum Volume (gallons)	Maximum Volume (gallons)
69	196,037	2,841	5	75,600

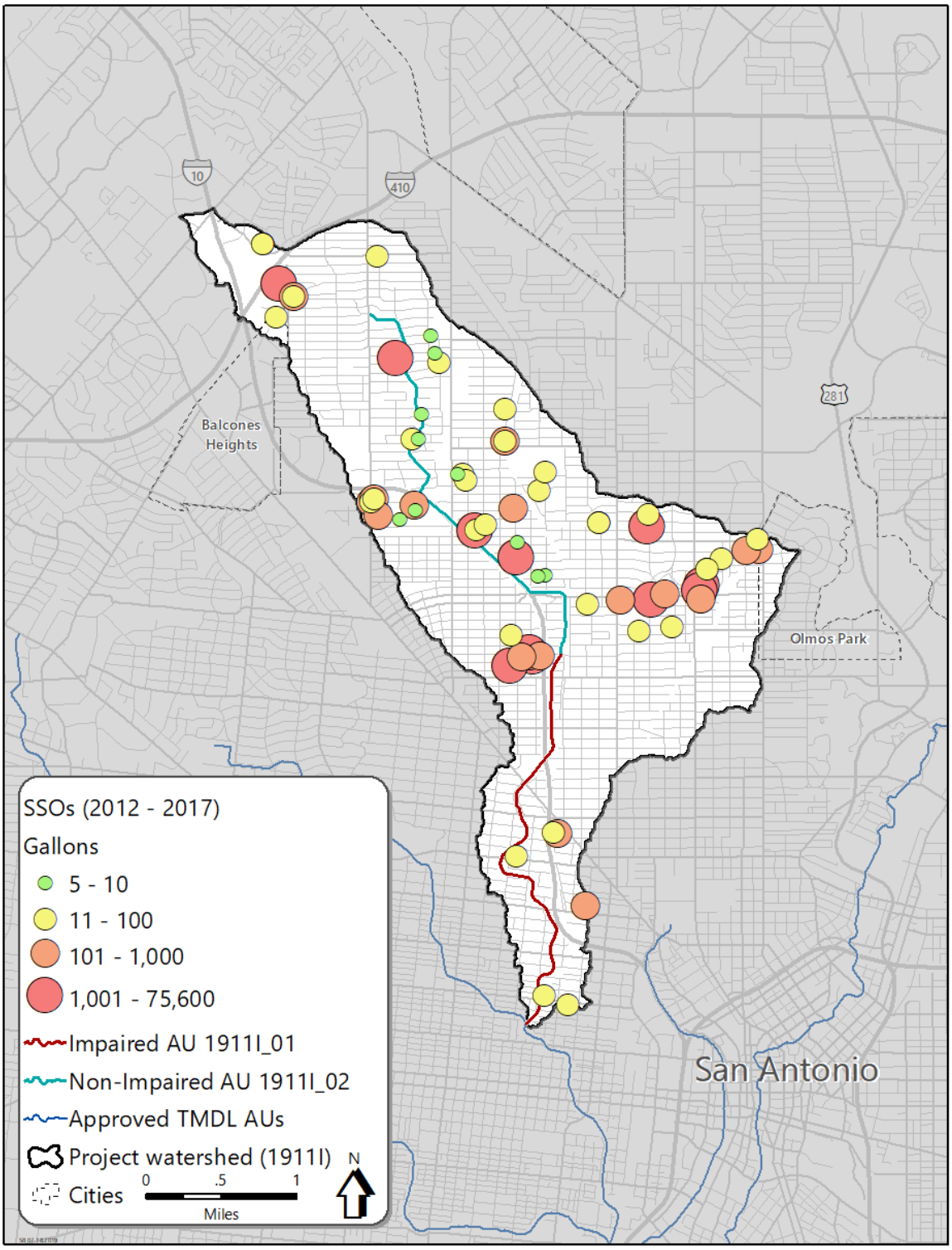

Figure 5. SSOs incidences reported from 2012 through 2017 within the Martinez Creek watershed.

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 municipal separate storm sewer system (MS4) entities, industrial facilities, and construction activities; and
2) stormwater runoff not subject to regulation.

The TPDES MS4 Phase I and II rules require municipalities and certain other entities in urban areas to obtain permit coverage for their stormwater systems. A regulated MS4 is a publicly owned system of conveyances that includes ditches, curbs, gutters, and storm sewers that do not connect to a wastewater collection system or treatment facility. Phase I permits are individual permits for large and medium-sized communities with populations of 100,000 or more based on the 1990 U.S. Census, whereas the Phase II general permit regulates smaller communities within a USCB-defined urbanized area. The purpose of an MS4 permit is to reduce discharges of pollutants in stormwater to the "maximum extent practicable" by developing and implementing a Stormwater Management Program (SWMP). The SWMP describes the stormwater control practices that will be implemented consistent with permit requirements to minimize the discharge of pollutants from the MS4. The permits require that the SWMPs specify the best management practices to meet several minimum control measures (MCMs) that, when implemented in concert, are expected to result in significant reductions of pollutants discharged into receiving waterbodies. Phase II MS4 MCMs include:

- Public education, outreach, and involvement;
- Illicit discharge detection and elimination;
- Construction site stormwater runoff control;
- Post-construction stormwater management in new development and redevelopment;
- Pollution prevention and good housekeeping for municipal operations; and
- Industrial stormwater sources.

Phase I MS4 individual permits have similar MCMs organized differently and are further required to perform water quality monitoring.

The geographic region of the TMDL watershed covered by Phase I and II MS4 permits is that portion of the area within the jurisdictional boundaries of the regulated entities. For Phase I permits the jurisdictional area is defined by the city limits and for Phase II permits the jurisdictional area is defined as the

intersection or overlapping areas of the city limits and the 2000 or 2010 USCB urbanized area.

The area under the jurisdiction of Phase II general permits and Phase I individual permits was used to estimate the regulated stormwater areas for construction, industrial, and MS4 permits. In this report, the regulated area for the Phase II permits was based on the 2010 urbanized area from the U.S. Census (Figure 6).

A review of active stormwater general permits coverage and a review of the central registry for Phase I MS4 permit coverage (TCEQ, 2019) in the study area revealed that existing Phase I and Phase II permits (Table 6) provide 100 percent MS4 coverage for the Martinez Creek watershed.

Table 6. TPDES MS4 permits associated with the Martinez Creek watershed.

Entity/ Permittee	Permitted Area	TPDES Permit	NPDES[a] Permit
City of San Antonio/ San Antonio Water System/Texas Department of Transportation	San Antonio	WQ0004284000	TXS001901
Texas Department of Transportation	Statewide	WQ0005011000	TXS002101
City of Balcones Heights	Balcones Heights	Phase II General Permit (TXR040000)	TXR040156
City of Olmos Park	Olmos Park	Phase II General Permit (TXR040000)	TXR040026

[a] National Pollutant Discharge Elimination System (NPDES)

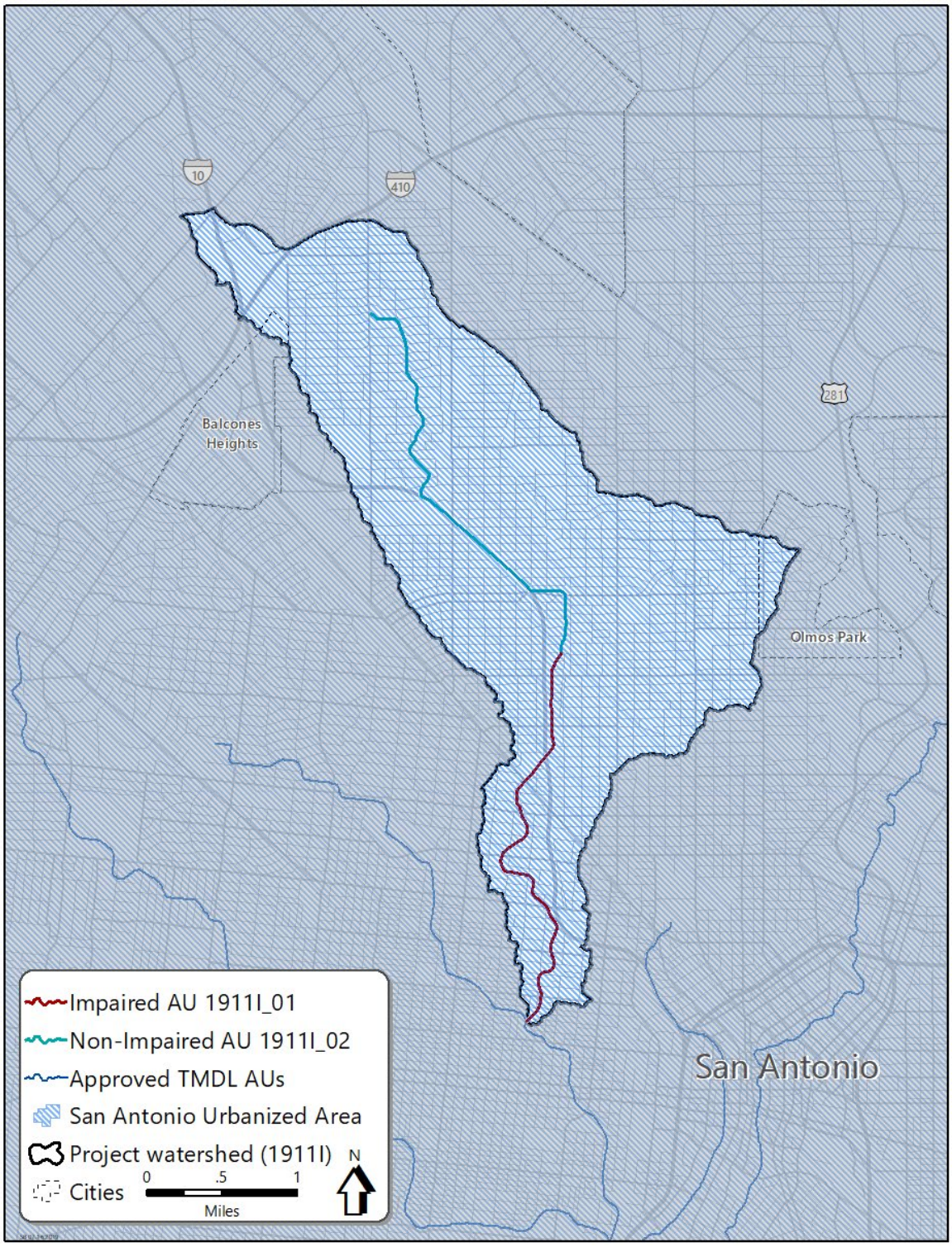

Figure 6. Regulated stormwater area based on Phase I and Phase II MS4 permits within the Martinez Creek watershed.

TPDES Water Quality General Permits

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

- TXG110000 – concrete production facilities
- TXG130000 – aquaculture production facilities
- TXG340000 – petroleum bulk stations and terminals
- TXG500000 – quarries in John Graves Scenic Riverway
- TXG670000 – hydrostatic test water
- TXG830000 – petroleum fuel or petroleum substances
- TXG870000 – pesticides
- TXG920000 – concentrated animal feeding operations
- TXG100000 – wastewater evaporation
- WQG20000 – livestock manure compost operations (irrigation only)

A review of active general permit coverage (TCEQ, 2019) in the Martinez Creek watershed as of June 14, 2019, found no operations or facilities of the types described above.

Unregulated Sources

Unregulated sources of indicator 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.

Wildlife and Unmanaged Animal Contributions

Fecal bacteria inhabit the intestines of all warm-blooded animals, including feral hogs and 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. Wildlife and feral hogs are naturally attracted to the riparian corridors of streams and rivers. With direct access to the stream channel, the direct deposition of wildlife and feral hog waste can be a concentrated source of bacteria loading to a water body. Fecal bacteria from wildlife and feral hogs are also deposited onto land surfaces, where they may be washed into nearby streams by rainfall runoff. The *E. coli* contribution from feral hogs and wildlife in Martinez Creek could not be determined based on existing information. However, due to the urbanized nature of the watershed, it is assumed that the contribution would be minimal.

Domesticated Animals

Due to the highly urbanized nature of the Martinez Creek watershed, livestock were not considered a significant source of bacteria loading. Fecal bacteria from dogs and cats are transported to streams by runoff in both urban and rural areas and can be a potential source of bacteria loading. Table 7 summarizes the

estimated number of dogs and cats within the Martinez Creek watershed. Pet population estimates were calculated as the estimated number of dogs (0.584) and cats (0.638) per household according to data from the American Veterinary Medical Association 2012 U.S Pet Statistics (AVMA, 2015). The number of households in the watershed was estimated using 2010 USCB data (USCB, 2010). The actual contribution and significance of bacteria loads from pets in the Martinez Creek watershed is unknown.

Table 7. Estimated households and pet populations for the Martinez Creek watershed.

Estimated Number of Households	Estimated Dog Population	Estimated Cat Population
17,620	10,290	11,242

On-site Sewage Facilities

Estimates of the number of OSSFs in the Martinez Creek watershed were determined using spatial data supplied by the Bexar County Public Works Department (BCPW). The BCPW data indicate that there are 14 OSSFs located within the project watershed (Table 8 and Figure 7).

Table 8. OSSF permits for the Martinez Creek watershed.

Watershed	Segment/AU Number	Permitted OSSFs
Martinez Creek	1911I	14

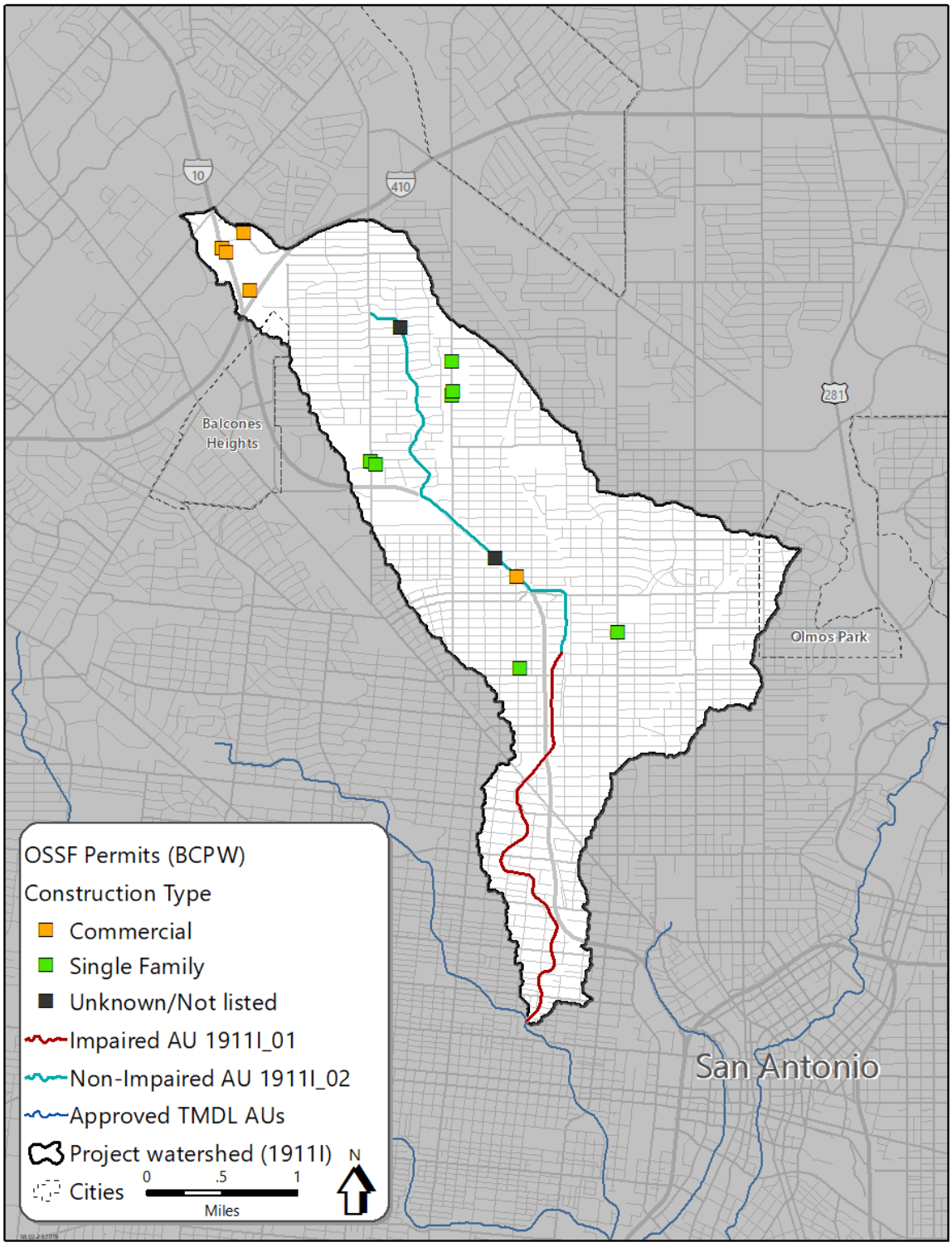

Figure 7. Map showing OSSFs located within the Martinez Creek watershed.

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 LDCs 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 (Brady et al., 2019) provides details about the linkage analysis and the LDC method and its application.

Margin of Safety

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 incorporates an explicit MOS of five percent of the total TMDL allocation.

Pollutant Load Allocation

The TMDL for Martinez Creek was derived using the median flow within the high flows regime (or 10 percent flow) of the LDC developed for SWQM Station 12751, the most downstream station in the watershed (Figure 8).

For the Martinez Creek LDC, the wet weather data points occurred predominately under the higher flow regimes and consistently exceeded the geometric mean criterion. Wet weather data points in the lowest flow regime typically represent bacteria data collected after a small rainfall-runoff event when conditions up to the event were very dry. Often the non-wet weather event data points also exceed the geometric mean criterion for Martinez Creek. The geometric means of existing data for all three flow regimes show that *E. coli* levels are consistently greater than the geometric mean criterion for the waterbody. 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.

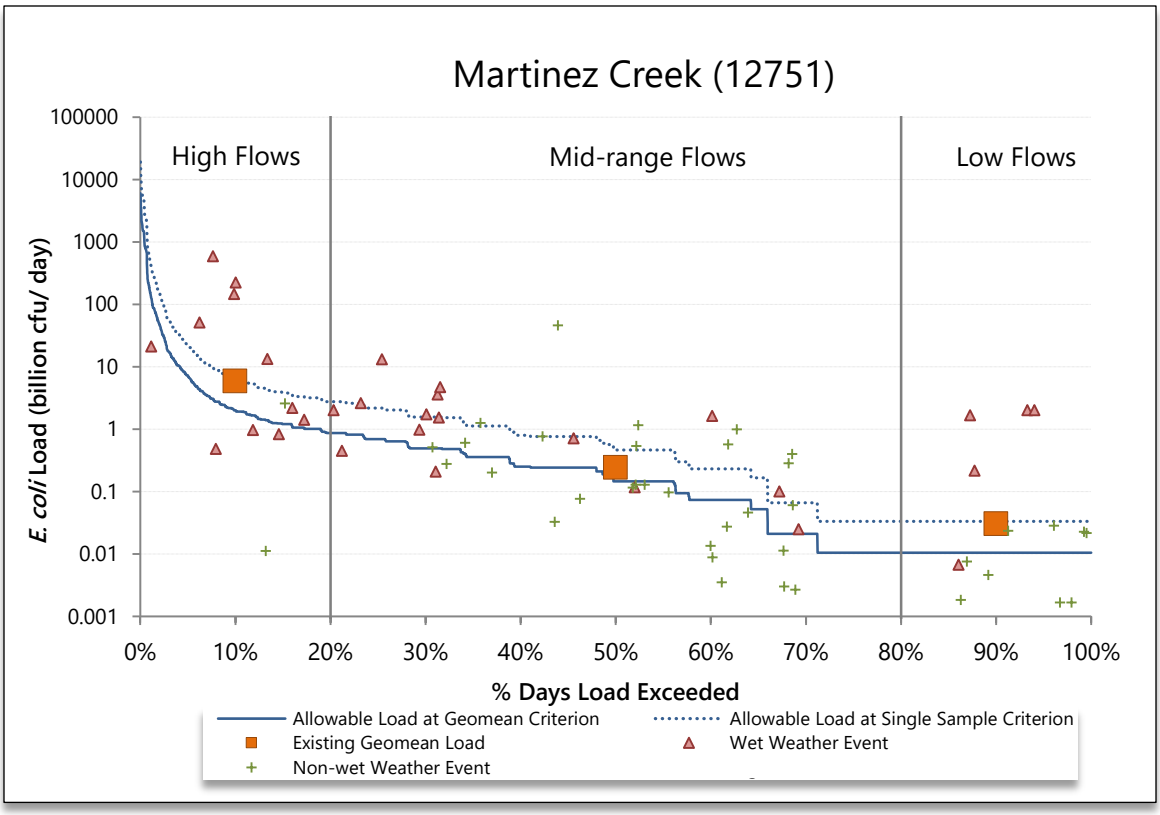

Figure 8. LDC for Martinez Creek (Station 12751).

Wasteload Allocation

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

Wastewater Treatment Facilities

TPDES-permitted WWTFs would be 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 developed TMDLs. Due to the absence of any permitted dischargers in the Martinez Creek watershed and to remain consistent with the previous TMDLs, 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 (defined as the area designated as urbanized area in the 2010 U.S. Census) 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. As noted earlier, Phase I and Phase II permits provide 100 percent MS4 coverage for the Martinez Creek watershed.

However, even in highly urbanized areas such as the Martinez Creek watershed, there remain small areas of streams within each watershed that are not strictly regulated, and which may receive bacteria loadings from unregulated sources such as wildlife. To account for these small unregulated areas, the stream length based on the TCEQ description of AU 1911I_01 was multiplied by the average channel width as calculated based on recent aerial imagery, and the results were used to compute an area of unregulated stormwater contribution, totaling 37.6 acres. Therefore, the percentage of land under the jurisdiction of stormwater permits in the Martinez Creek watershed was 99.19 percent.

Load Allocation

The load allocation (LA) component of the TMDL corresponds to runoff from unregulated sources. It is calculated by subtracting the sum of the WLA_{WWTF}, WLA_{SW}, MOS, and future growth (FG) allocations from the total TMDL allocation.

Future Growth

The 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. The assimilative capacity of streams increases as the amount of flow increases. Increases in flow allow for additional indicator bacteria loads if the concentrations are at or below the primary contact recreation standard (126 cfu/100 mL).

As noted previously, the Martinez Creek watershed is entirely within the collection system area of the SAWS. Additionally, there are no WWTFs within the Martinez Creek watershed and there are no plans to build a new WWTF within the watershed (SAWS, 2019). Due to 100 percent coverage of wastewater collection by the SAWS collection system and the absence of WWTFs in the Martinez Creek watershed, the FG component for impaired AU 1911I_01 is zero. This approach for FG also remains consistent with the previous TMDLs.

The three-tiered antidegradation policy in the TSWQS prohibits an increase in loading that would cause or contribute to degradation of an existing use. The antidegradation policy applies to both point and nonpoint source pollutant discharges. In general, antidegradation procedures establish a process for reviewing individual proposed actions to determine if the activity will degrade water quality. The TMDL in this document will result in protection of existing uses and conform to Texas' antidegradation policy.

TMDL Calculations

Table 9 summarizes the TMDL calculation for Martinez Creek AU 1911I_01. The TMDL was calculated based on the median flow in the 0-20 percentile range (10 percent exceedance, high flows regime) for flow exceedance from the LDC developed for the monitoring station 12751. Allocations are based on the current geometric mean criterion for *E. coli* of 126 cfu/100 mL for each component of the TMDL (although one-half the criterion would have been used to calculate the WLA_{WWTF} and FG terms, had these terms been non-zero).

Table 9. TMDL allocation summary for Martinez Creek.

Water Body	AU	TMDL	WLA_{WWTF}	WLA_{SW}	LA	FG	MOS
Martinez Creek	1911I_01	2.0031	0	1.8875	0.0154	0	0.1002

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

The final TMDL allocations (Table 10) 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 10. Final TMDL allocations for Martinez Creek.

Water Body	AU	TMDL	WLA_{WWTF}	WLA_{SW}	LA	MOS
Martinez Creek	1911I_01	2.0031	0	1.8875	0.0154	0.1002

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 11 years (2008 through 2018) of routine monitoring collected in the warmer months (May through September) against those collected during the cooler months (October through April). 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 Martinez Creek at station 12751. 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

The TCEQ maintains an inclusive public participation process. From the inception of the TMDL study, the TCEQ 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 for this TMDL addendum (Brady et al., 2019) was posted on the TMDL project webpage on July 30, 2019. A presentation on this addendum was given at an annual status meeting for the *Implementation Plan for Three Total Maximum Daily Loads for Bacteria in the Upper San Antonio Watersheds* in San Antonio on September 5, 2019. The public will have an opportunity to comment on this addendum during the official Water Quality Management Plan update public comment period (November 8 through December 12, 2019). 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, and the document will be posted on the WQMP Updates webpage. TCEQ accepted public comments on the original TMDL from March 23 through April 23, 2007. No comments were submitted related to Martinez Creek.

Implementation and Reasonable Assurance

The segment covered by this addendum is within the existing bacteria TMDL watersheds of Salado Creek, Walzem Creek, and Upper San Antonio River. Those TMDL watersheds including Martinez Creek are addressed by the implementation plan developed by the Upper San Antonio River Watershed Stakeholder Coordination Committee, which was approved by the commission on April 6, 2016. It outlines an adaptive management approach in which measures are periodically assessed 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.

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