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Updated Implementation Plan for Nine Total Maximum Daily Loads for Indicator Fecal Bacteria in Four Austin Streams

Assessment Units: 1403J_01, 1403K_01, 1428B_01,
1428B_02, 1428B_03, AU 1428B_04, 1428B_05,
1429C_02, and 1429C_03



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City of Austin Watershed Protection Division
Austin Water
Travis County
Lower Colorado River Authority
Texas Department of Transportation
Austin Association of Home Builders, Represented by the Atwell Group
Austin Parks Foundation
Austin Neighborhoods Council
Colorado River Alliance
Environment Texas
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Abbreviations

AU	assessment unit
AISD	Austin Independent School District
ANC	Austin Neighborhoods Council
APF	Austin Parks Foundation
BMP	best management practice
COA	City of Austin
COA WPD	City of Austin Watershed Protection Department
CRWN	Colorado River Watch Network
cfu	colony-forming units
<i>E. coli</i>	<i>Escherichia coli</i>
EPA	Environmental Protection Agency, United States
HABLA	Hispanic Advocates Business Leaders of Austin
IAS	Improving Austin Streams (stakeholder group)
I-Plan	implementation plan
LA	load allocation
LA _{AU}	load allocation for the TMDL
LA _{USL}	load allocation from upstream assessment units
LCRA	Lower Colorado River Authority
MCM	minimum control measure
MEP	maximum extent practicable
mL	milliliter
MOS	margin of safety
MPN	maximum probably number
MS4	municipal separate storm sewer system
NELAP	National Environmental Laboratory Accreditation Program
OSSF	on-site sewage facility
COA PARD	City of Austin Parks and Recreation Department
PODER	People in Defense of the Earth and her Resources
QAPP	quality assurance project plan
SSO	sanitary sewer overflow
SWMP	stormwater management program
SWQMIS	Surface Water Quality Monitoring Information System
TCEQ	Texas Commission on Environmental Quality
TMDL	total maximum daily load
TPDES	Texas Pollutant Discharge Elimination System
TPZ	Tree Protection Zones
TxDOT	Texas Department of Transportation
UTA	University of Texas at Austin
UTA-CPC	UTA Capital Planning and Construction Department
UTA-EHS	UTA Environmental Health and Safety Department
UTA-FS	UTA Facilities Services Department
UTA-PMCS	UTA Project Management and Construction Services Department
UTA-UEM	UTA Utilities and Energy Management Department

WLA	wasteload allocation
WLA _{SW}	wasteload allocation for regulated stormwater
WLA _{WWTF}	wasteload allocation for regulated wastewater discharges
WWTF	wastewater treatment facility

Executive Summary

The Texas Commission on Environmental Quality (TCEQ) identified elevated concentrations of indicator bacteria in 2002 and 2006 in four Austin streams, which indicate the presence of fecal bacteria, a potential health risk for people who swim or wade in the impacted water bodies. The impairments were first noted in the Spicewood Tributary to Shoal Creek (Segment 1403J) and Taylor Slough South (1403K) in the *2002 Texas Water Quality Inventory and 303(d) List* (TCEQ 2002). Waller Creek (1429C) and Walnut Creek (1428B) were added in the *2006 Texas Water Quality Inventory and 303(d) List* (TCEQ 2006). An assessment unit (AU) is the smallest geographic area for which TCEQ reports use attainment. The impaired segments and the five affected AUs within them in the Austin area are:

- Spicewood Tributary to Shoal Creek, AU 1403J_01
- Taylor Slough South, AU 1403K_01
- Walnut Creek, AU 1428B_05
- Waller Creek, AUs 1429C_02 and 1429C_03

TCEQ identified concerns for continued attainment of the primary contact recreation use in four AUs of Walnut Creek in the *2012 Texas Integrated Report of Surface Water Quality for Clean Water Act Sections 305(b) and 303(d)* (TCEQ 2012a). Those AUs are:

- Walnut Creek, AU 1428B_01
- Walnut Creek, AU 1428B_02
- Walnut Creek, AU 1428B_03
- Walnut Creek, AU 1428B_04

On January 21, 2015, TCEQ adopted *Five Total Maximum Daily Loads for Indicator Bacteria in Four Austin Streams* (TMDLs) to address the impairments (TCEQ 2015a). The U.S. Environmental Protection Agency (EPA) approved the TMDLs on March 18, 2015. After EPA guidelines were revised early in 2015 to allow TMDLs for concerns as well as for impairments, at the request of the Improving Austin Streams (IAS) stakeholder group, TCEQ added four TMDLs for the AUs of concern via the *April 2015 Update to the Texas Water Quality Management Plan* (TCEQ 2015c).

The January 2015 TMDL report and the April 2015 TMDL update established the maximum amounts of indicator bacteria the water bodies could assimilate and still meet the state's primary contact recreation use standards. *Escherichia coli* (*E. coli*) are widely used as indicator bacteria to assess attainment of the primary contact recreation use in freshwater streams. TCEQ measures geometric mean concentrations of *E. coli* bacteria to determine if that use is attained.

In addition to advising TCEQ on developing the TMDLs, the IAS stakeholder group developed their *Implementation Plan for Five Total Maximum Daily Loads for Bacteria in Four Austin Streams* (I-Plan) (TCEQ 2015b) to reduce indicator bacteria in the affected water bodies, which TCEQ also approved on January 21, 2015. TCEQ and the stakeholders considered the I-Plan to be adequate, without revision, to implement the four AUs added via the Texas Water Quality Management Plan. The TMDLs, the 2015 I-Plan, and this Updated I-Plan are available on TCEQ's [Austin Area Streams TMDL project webpage](#).¹

The goal of this Updated I-Plan is to continue reducing indicator bacteria concentrations and attain the primary contact recreation use for the nine affected AUs, stakeholders will implement this Updated I-Plan using regulatory control actions and voluntary management measures including:

- resident outreach
- water quality monitoring
- domestic pet waste management
- stormwater management
- riparian restoration

Stakeholders will use an adaptive management approach to carry out the Updated I-Plan, to assess the efficiency and effectiveness of the measures implemented and adjust for changing conditions.

This Updated I-Plan summarizes the nine adopted TMDLs and the progress achieved under the 2015 I-Plan. Data show that in all but one AU, trends indicate improvement (decreasing concentration over time). The Updated I-Plan also identifies the specific management measures and control actions the stakeholders will use to reduce bacteria concentrations over the next five years, the parties responsible for each measure or action, and a schedule for completing them.

The 2015 TMDL report identified the probable sources of *E. coli* in Austin streams as stormwater runoff from municipal separate storm sewer systems (MS4s), malfunctioning on-site sewage facilities (OSSFs), urban development, and pet and wildlife waste.

Organizations that have MS4 permits or authorizations in the four Austin streams watersheds (TMDL watersheds) are the City of Austin (COA), University of Texas at Austin (UTA), Texas Department of Transportation (TxDOT), and Travis County. No domestic wastewater treatment facilities (WWTFs) discharge within the TMDL watersheds.

Responsible parties will report their progress to the TCEQ TMDL Team every April for up to five years. Stakeholders may choose to meet each year after

¹ www.tceq.texas.gov/waterquality/tmdl/101-austinbacteria

submitting their reports to assess progress and adjust strategies as needed. TCEQ will post the annual status reports and notice of any meetings about them on the [Austin Area Streams TMDL project webpage](#).²

Introduction

The Austin area is located inside Travis County where the Edwards Plateau meets the Blackland Prairie at the Balcones Fault (commonly called the Texas Hill Country) according to the 2013 Texas Almanac (TSHA 2013). The four TMDL watersheds are found in the central and western areas of Austin and are located on the Balcones Escarpment, at the eastern edge of the Edwards Plateau. Land use in these TMDL watersheds is primarily urban (TCEQ 2015a).

In June 2021, six years after implementing their original I-Plan, the stakeholders decided to update their I-Plan based on currently available data and science and what they learned about the effectiveness of their chosen best management practices (BMPs). The stakeholder group was open to all individuals or representatives of organizations who fall into these categories:

- 1) Live or work in the affected watersheds.
- 2) Are affected by or may affect water quality in the watersheds.
- 3) Are able to develop and or implement measures or actions to reduce water quality problems.

Stakeholders formed a Coordination Committee to guide development of the updated I-plan and serve as a decision-making group, with the goal of making all decisions by consensus. Assignments related to writing the report were distributed to members based on interests and abilities. Table 1 lists the representatives who served as Coordination Committee members and alternates during development and approval of the Updated I-Plan.

Table 1. Coordination Committee membership

Organization	Representative	Alternate
City of Austin Watershed Protection	Julie White	Andrew Clamann
Austin Water	Tammy West	Rebekah Pepper
Austin Parks and Recreation	D'Anne Williams	Julia Hill
Travis County Transportation and Natural Resources	David Peyton	Robert Quinlan
University of Texas at Austin Environmental Health Services	Nena Anderson	Brent McLothin

² www.tceq.texas.gov/waterquality/tmdl/101-austinbacteria

Organization	Representative	Alternate
Texas Department of Transportation	Tracey Janus	Zach Lanfear
Austin Parks Foundation	Kathleen Barron	N/A
Austin Neighborhoods Council	Joyce Basciano	N/A
Home Builders Association of Greater Austin	Hank Smith	N/A
Lower Colorado River Authority	Lisa Benton	Aaron Richter
Environment Texas	Luke Metzger	N/A
Colorado River Alliance	Adrienne Longenecker	N/A
Waterloo Greenway Conservancy	Chris Perkes	Melissa Ayala
People Organized in Defense of Earth and Her Resources	Susana Almanza	N/A

Stakeholders' goals for the Updated I-Plan are to:

- Manage the affected watersheds through cooperation among jurisdictions and residents, and by tailoring solutions to each responsible party's unique needs.
- Improve water quality to meet the criterion used to measure the attainment of the primary contact recreation use.

This Updated I-Plan reflects the management measures and control actions that responsible parties will implement to meet those goals for the affected watersheds. One important point for holders of TCEQ MS4 permits was to ensure that the Updated I-Plan was flexible enough to reflect changes in the actions required under their MS4 permits so as not to impose additional voluntary actions that might then become mandatory under said permits. Throughout the process of developing the update, stakeholders considered the issue of how best to involve the public, both in developing the Updated I-Plan as well as in actions to improve water quality.

The group agreed to provide annual reporting about the plan's implementation each April followed by an optional annual meeting in May to assess progress and make any needed changes in implementation or management measures and control actions.

TMDL Summary

A TMDL represents the maximum amount of a pollutant that a water body can receive in a single day without exceeding water quality standards. TCEQ, with advice from the stakeholders, developed TMDLs for the five impaired AUs identified on the *Texas 303(d) List*, and as requested by the IAS stakeholder

group, developed TMDLs for the four AUs with concerns for continued attainment of the primary contact recreation use. Bacteria TMDLs for freshwaters are typically expressed in billion colony-forming units per day (cfu/day) of *E. coli*.

Figures 1 through 4 are maps developed by TCEQ showing the approximate locations and areas of the affected watersheds. Tables 2 and 3 summarize the allocations developed for the *Five Total Maximum Daily Loads for Bacteria in Four Austin Streams* (TCEQ 2015a) and the four TMDLs added in the *April 2015 Update to the Texas Water Quality Management Plan* (TCEQ 2015c). The TMDL report and update, available on TCEQ's [Austin Area Streams TMDL project webpage](#),³ provide additional background information, including the problem definition, endpoint identification, source analysis, linkages between sources and receiving waters, and pollutant load allocations.

³ www.tceq.texas.gov/waterquality/tmdl/101-austinbacteria

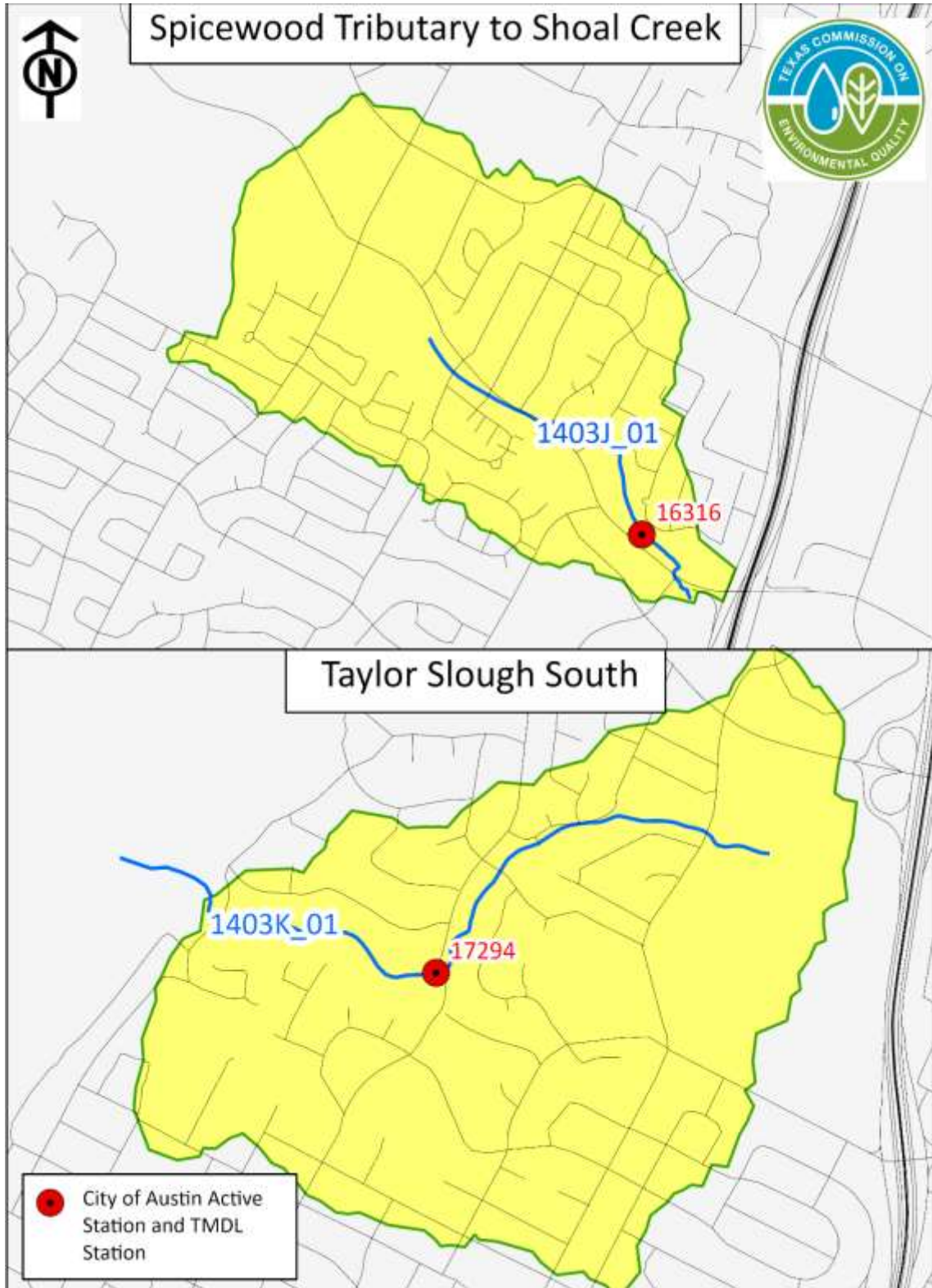


Figure 1. Spicewood Tributary to Shoal Creek and Taylor Slough South TMDL watersheds

City of Austin sites shown were active from September 2001 and are currently active at the time of the I-Plan update. The stream layer is from the National Hydrography Database.

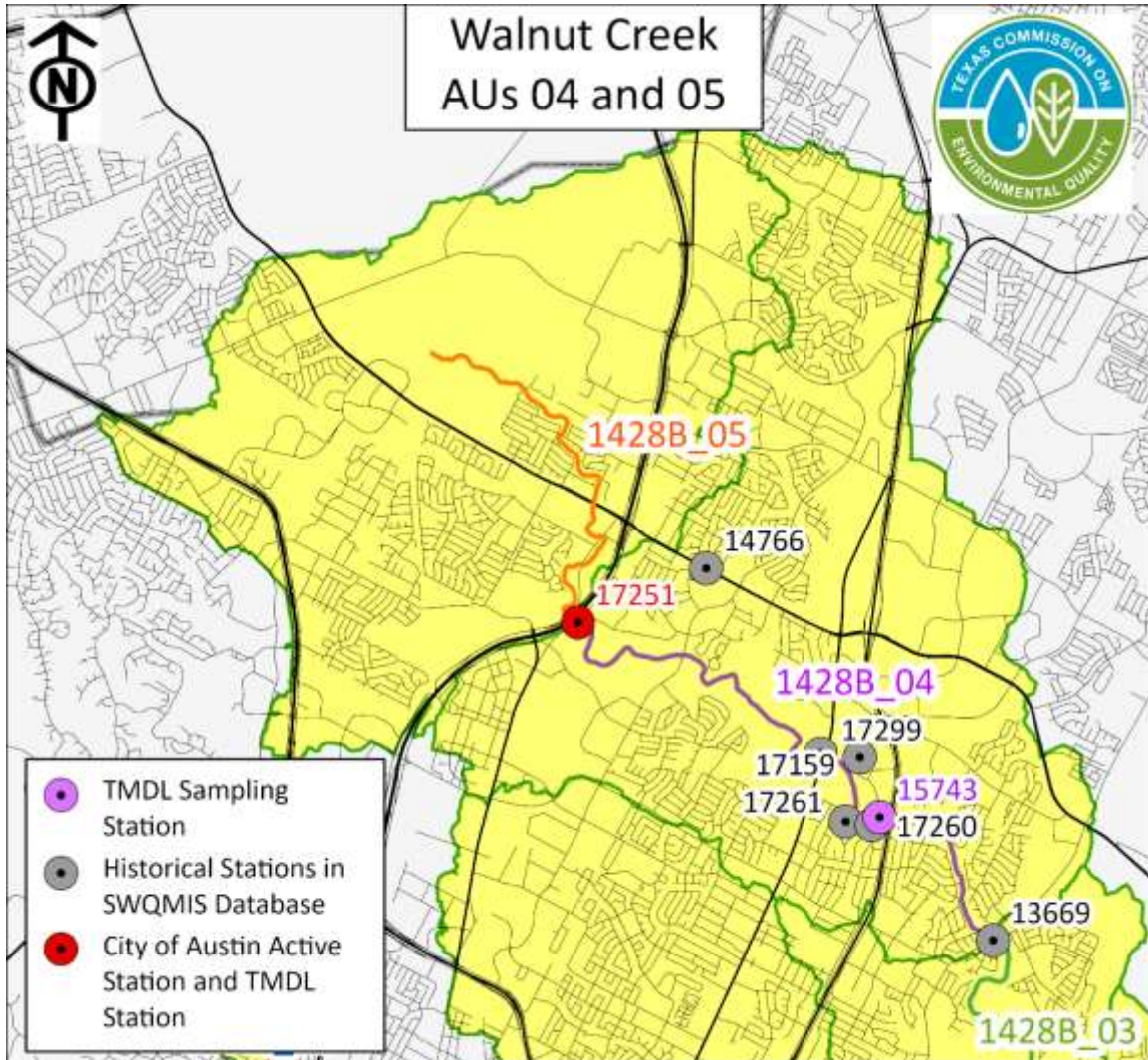


Figure 2. Upper Walnut Creek TMDL watersheds

City of Austin site shown was active from September 2001 and is currently active at the time of the I-Plan update. The stream layer is from the National Hydrography Database.

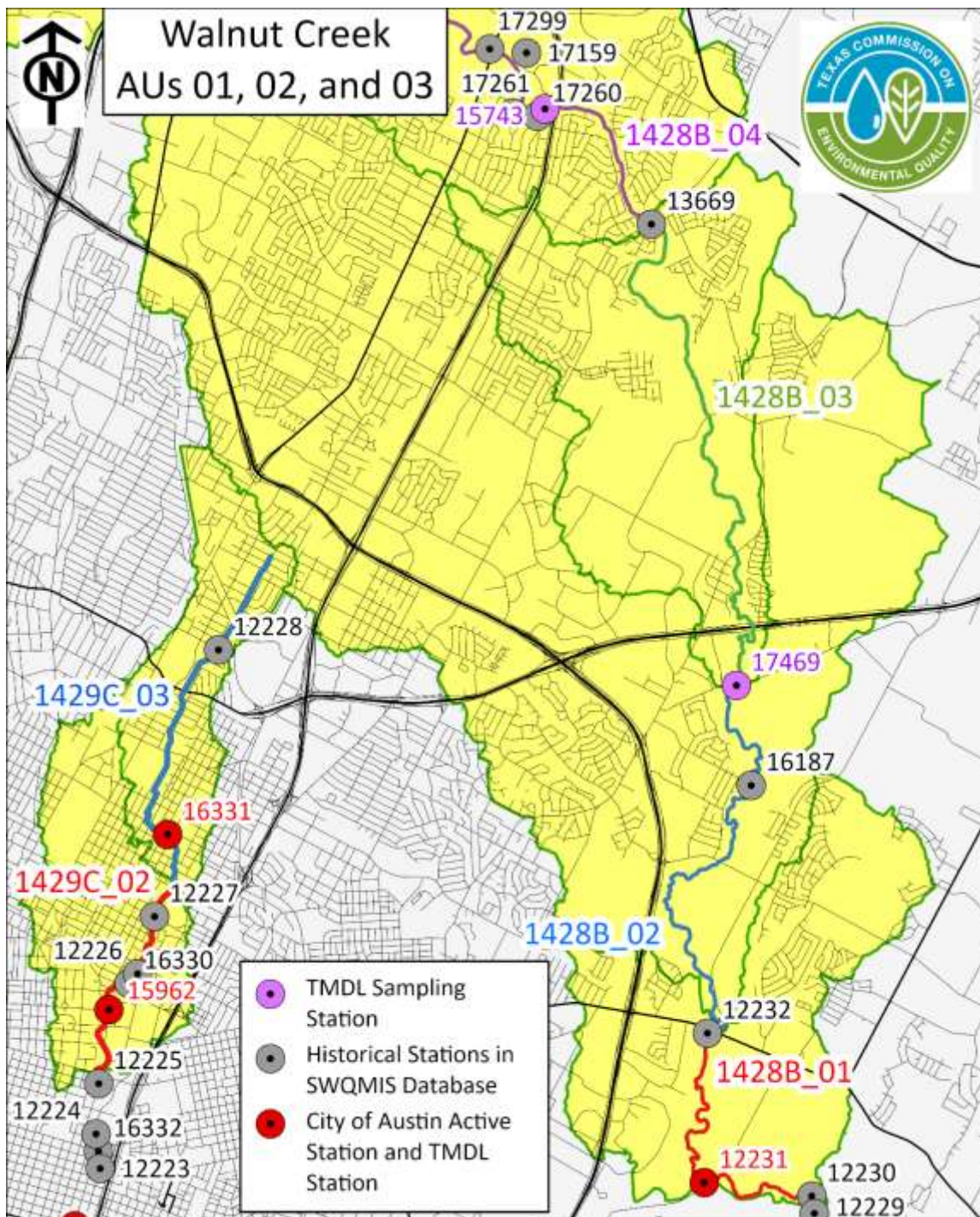


Figure 3. Lower Walnut Creek TMDL watersheds

City of Austin sites shown were active from September 2001 and are currently active at the time of the I-Plan update. The stream layer is from the National Hydrography Database.

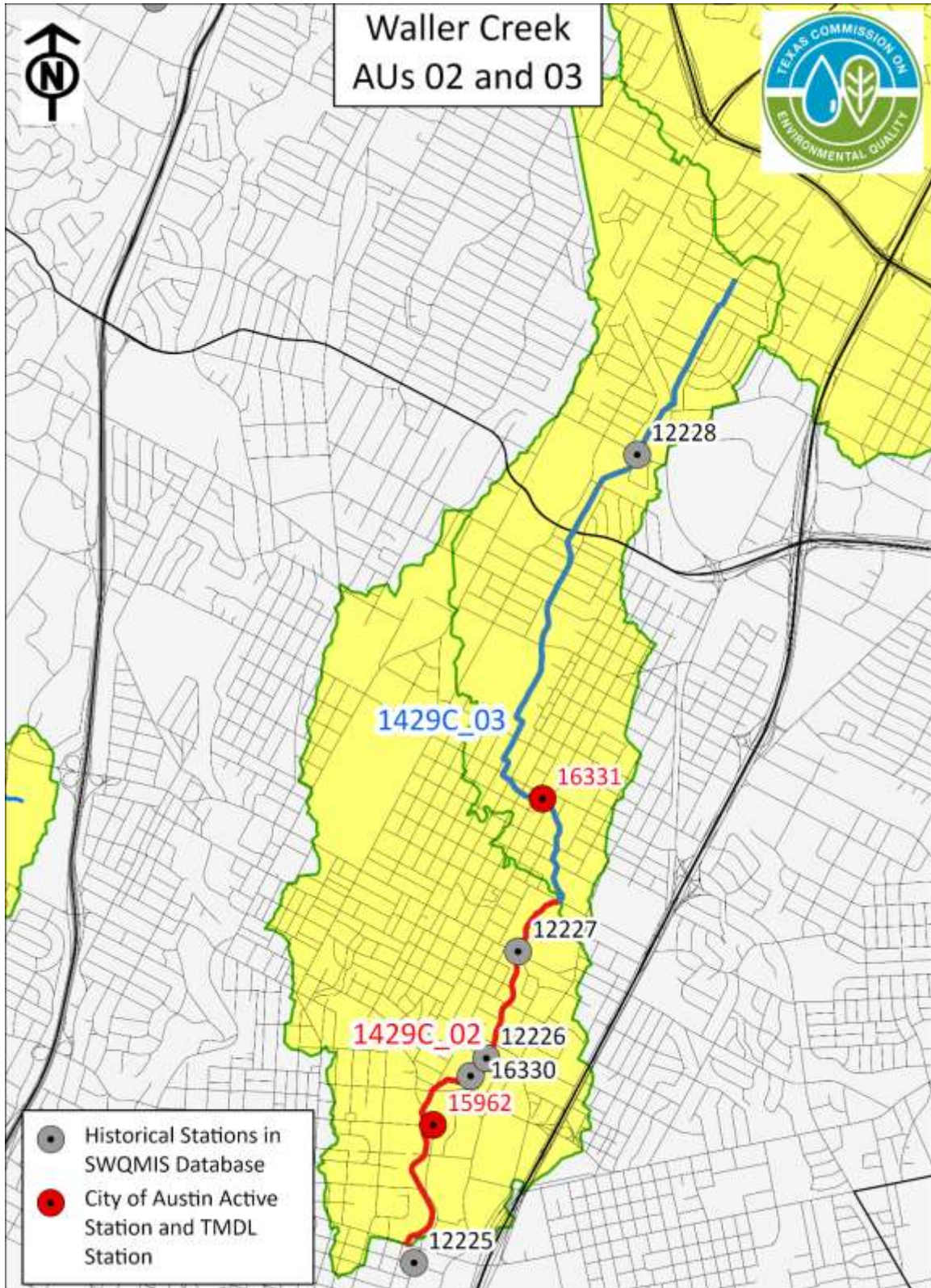


Figure 4. Waller Creek TMDL watersheds

City of Austin sites shown were active from September 2001 and are currently active at the time of the I-Plan update. The stream layer is from the National Hydrography Database.

Table 2. TMDL allocation summary for impaired AUs

Stream	AU	TMDL	WLA _{WWTF}	WLA _{SW}	MOS	LA _{USL}	LA _{AU}	LA _{Total}
Spicewood Tributary to Shoal Creek	1403J_01	11.93	0.00	11.33	0.60	0.00	0.00	0.00
Taylor Slough South	1403K_01	9.93	0.00	9.43	0.50	0.00	0.00	0.00
Walnut Creek	1428B_05	74.91	0.00	71.16	3.75	0.00	0.00	0.00
Waller Creek	1429C_02	90.29	0.00	50.72	2.67	36.90	0.00	36.90
Waller Creek	1429C_03	36.90	0.00	35.05	1.85	0.00	0.00	0.00

Loads are provided in billion cfu/day.

Table 3. TMDL allocation summary for AUs of concern

Stream	AU	TMDL	WLA _{WWTF}	WLA _{SW}	MOS	LA _{USL}	LA _{AU}	LA _{Total}
Walnut Creek	1428B_01	283.36	0.00	17.89	0.94	264.53	0.00	264.53
Walnut Creek	1428B_02	264.53	0.00	87.89	4.63	172.01	0.00	172.01
Walnut Creek	1428B_03	172.01	0.00	10.16	0.53	161.32	0.00	161.32
Walnut Creek	1428B_04	161.32	0.00	82.09	4.32	74.91	0.00	74.91

Loads are provided in billion cfu/day.

Detailed information about the TMDLs and the original I-Plan is available in Five Total Maximum Daily Loads for Indicator Bacteria in Four Austin Streams (TCEQ 2015a) and the Implementation Plan for Five Total Maximum Daily Loads for Bacteria in Four Austin Streams (TCEQ 2015b), both available on TCEQ's [Austin Area Streams TMDL project webpage](#).⁴

⁴ <https://www.tceq.texas.gov/waterquality/tmdl/101-austinbacteria>

Implementation Progress through 2020

TCEQ worked with stakeholders and interested governmental agencies to track the progress of the 2015 I-Plan throughout the 2015-2020 implementation period. To ensure accountability for reducing potential bacterial sources and meeting targets for progress under the TMDL, the responsible parties among the IAS stakeholder group provided annual updates on the agreed upon commitments to TCEQ. As part of this accountability framework, stakeholders agreed to develop short term goals, called milestones, to ensure progress. The yearly milestones represented key check-in points on the way to pollutant reduction in the identified Austin area streams. These milestones provide specific load reductions, rigorous assurances that load reductions will be achieved, and transparent reporting to the public. A summary of key milestones throughout the implementation period is provided below for each of the five management measures.

Summary of Progress for Each Management Measure

The status reports submitted by the IAS stakeholders during implementation of the 2015 I-Plan were a useful tool in tracking progress towards the environmental targets and ensuring transparency with the public. For a more detailed breakdown of individual stakeholder achievements, see the implementation status tables on the TCEQ's [Austin Area Streams TMDL project webpage](#).⁵

Grow Zones

As of 2020, additional riparian zone restoration has been achieved throughout the watersheds of the identified streams. Grow Zones were evaluated and expanded by three acres, and Grow Zones in all eligible parks in Taylor Slough, Walnut, and Waller Creek watersheds were adopted. Volunteers from the adopting organizations assisted in restoring riparian zones. Volunteers also helped educate the public about Grow Zones and Restoration Plans. COA provided them with information about creek-side restoration work and Land Stewardship Plans. The riparian buffer zone width for new development was increased, adding protection for 20 miles of riparian buffer in the TMDL watersheds.

OSSFs and Wastewater Infrastructure

Within the COA, owners of OSSFs were encouraged to connect to a centralized wastewater collection system. Travis County approved a fee waiver to encourage owners to choose to connect rather than defer action on OSSF repairs. COA rehabilitated a total of 42,000 linear feet of sewer lines, responded to 66

⁵ www.tceq.texas.gov/waterquality/tmdl/101-austinbacteria

sanitary sewer overflows and remediated them, and installed three additional public toilets.

Pet Waste Reduction

To address pet waste, COA updated signage in all watersheds and conducted an extensive Scoop-the-Poop public education campaign. The campaign assigned PARD staff park rangers to spread awareness by patrolling parks, providing information about pet waste regulations in person and over social media, and attending events. COA provided city-maintained parks with 140 mounted trash cans and routinely stocked pet waste bags. Educational kiosks were also installed at the Walnut Creek Park off-leash area.

The UTA-Environmental Health and Safety (UTA-EHS) department coordinated with the UTA-Facilities Services (UTA-FS) department and the UTA-Project Management and Construction Services (UTA-PMCS) department to install nine pet waste collection stations along the Waller Creek corridor on UTA's main campus. The stations were installed adjacent to trash cans at locations observed to have higher incidences of pet waste and near open lawns. Making disposable bags available to those walking through campus at no charge is intended to be an incentive for the proper collection and disposal of dog waste on campus.

Resident Education

Responsible parties conducted several types of activities to reach out to residents throughout the implementation period. COA provided briefings on proposed fecal contamination reduction strategies to the Austin Environmental Board. In cooperation with the Austin Neighborhoods Council (ANC), COA carried out education programs to reduce fecal contamination at Council meetings. COA also gave educational materials about the water quality impacts from outdoor defecation to the homeless through the nonprofit organization House for Homeless, and also began working on a more robust campaign focused on homelessness issues.

COA incorporated Scoop-the-Poop messaging into Earth Camp, a water-quality field science program for fifth-grade students attending Title I schools in the Austin Independent School District (AISD) and made two other presentations to AISD classes. The Austin Park Foundation and Keep Austin Beautiful incorporated the messaging in volunteer training and at several volunteer engagement events.

Stormwater Management Strategies

COA executed numerous structural stormwater management strategies between 2015 and 2020. Two water-quality retrofits were installed at the headwaters of Waller Creek, and 65 additional acres were modified to remove pollutants from

runoff. In addition, COA conducted inspections to ensure proper operations and maintenance of 2,900 water-quality control structures. All storm-drain outfalls greater than 36 inches were screened for dry-weather flows and investigated as needed to identify and resolve illicit discharges. COA enforced erosion and sedimentation control plans on all exterior construction projects, and conducted over 200 inspections to ensure compliance and address deficiencies. Inspections of industrial facilities for evidence of illicit discharges were conducted and violations were issued when necessary.

Implementation Strategy

This Updated I-Plan documents management measures and control actions to reduce bacteria loads. Management measures are voluntary activities, such as restoring and improving riparian buffer zones. Control actions are regulatory activities, such as compliance with WWTF or MS4 permits. The revised strategy described in this plan will both build on previous stakeholder commitments and continue those practices that have been shown to be effective goals and shows a commitment to improving water quality.

The participating partners may accomplish the activities described in the plan through rule, order, guidance, or other formal or informal actions. They will implement the plan using adaptive management, wherein measures are periodically assessed for efficiency and effectiveness and revised as needed. This iterative process for evaluating and adjusting the management measures and control actions will ensure continuing progress toward achieving water quality goals.

Management measures may be adjusted or eliminated by agreement of the stakeholders during each annual assessment of progress or when the period for this plan has been completed. Control actions can be adjusted based on changes in the regulations and permits that form their basis, including adding or removing actions needed to comply with applicable permits.

Management Measures Summary

This plan contains five categories of management measures, organized by approach to reduction of the pollutant, as follows:

- Resident Outreach (Management Measure 1)
- Water Quality Monitoring (Management Measure 2)
- Domestic Pet Waste (Management Measure 3)
- Stormwater Management Strategies (Management Measure 4)
- Riparian Restoration (Management Measure 5)

Each management measure is comprised of the sub-measures that will be implemented. Sub-measures contain a narrative description and are further organized around a table summarizing each measure to describe the:

- best management practice
- responsible party
- area of emphasis
- educational activities
- schedule of implementation
- interim, measurable milestones (list of things that will be tracked)
- progress indicators (how progress will be measured)
- monitoring component (what will be reported to TCEQ annually for the status report; may be administrative or water quality or both)

Control Action Summary

The control actions in this plan are drawn from the activities of responsible parties that hold MS4 Phase I individual permits or Phase II general permit authorizations issued under TCEQ's Texas Pollutant Discharge Elimination System (TPDES) program. The purpose of MS4 permits is to reduce discharges of pollutants in stormwater to the "maximum extent practicable."

Permit holders must develop and implement Stormwater Management Programs (SWMPs) that implement minimum control measures (MCMs) with BMPs that minimize the discharge of pollutants in stormwater. MCMs are established by TCEQ and EPA and are described in individual and general MS4 permits.

SWMPs will be included by reference in this Updated I-Plan since the schedules for revising the I-Plan and the SWMPs do not usually coincide. The Updated I-Plan provides webpage links to the SWMPs in Table 19, so that stakeholders are always able to read the latest approved program.

The Updated I-Plan also describes the general types of BMPs that the MS4 permit holders are implementing, shown in tables for each MS4. The BMPs are organized around the following sources of pollution or activities, depending on the MS4 permittee:

- sanitary sewer systems
- OSSFs
- wastewater infrastructure
- illicit discharges and dumping
- animal sources
- resident education
- monitoring, evaluation, and reporting
- riparian zone restoration

- stormwater management

Data Used in the Update

In December 2021, the Data Work Group gathered and reviewed existing available data that may indicate progress or otherwise inform the selection of management measures and control actions. Members of the Data Work Group included Austin Water, COA Watershed Protection Department (COA WPD), UTA, and TxDOT. Data for consideration included that which was available at the time of the development of this report in TCEQ's Surface Water Quality Monitoring Information System (SWQMIS), in the COA database, and collected by UTA and the volunteer Colorado River Watch Network (CRWN).

E. coli criterion for evaluating attainment of the primary contact recreation use is expressed in the Texas Surface Water Quality Standards as cfu/100 mL. *E. coli* are routinely measured in units of cfu/100 mL or as the most probable number (MPN) per 100 mL. The units cfu/100 mL and MPN/100 mL are considered equivalent for assessment purposes.

Data Evaluated in TCEQ SWQMIS

Data in SWQMIS are the only data that can be included in assessments to determine attainment of the primary contact recreation use standard. They are collected and submitted by participating organizations under an approved Quality Assurance Project Plan (QAPP). *E. coli* concentrations submitted in SWQMIS are typically accompanied by instantaneous discharge (flow) measurements or TCEQ flow severity codes. All *E. coli* samples in SWQMIS were collected pursuant to the applicable Surface Water Quality Monitoring Procedures (TCEQ 2012b) and analyzed in a laboratory accredited through the National Environmental Laboratory Accreditation Program (NELAP) using the IDEXX method.

Sample concentrations evaluated during the development of the 2015 I-Plan, as well as samples collected during the 2015-2020 I-Plan implementation period, are presented in Figures 5-10. Note that the values on the Y axis are not the same in every figure. Most samples are analyzed with a maximum value of 2,419 MPN due to analysis limitations. However, some samples were analyzed as dilutions to enable greater resolution; therefore, some values are greater than 2,419 MPN.

It should be noted that concentrations of 2,419 MPN shown in the graphs may in fact be greater. TCEQ SWQM Station 16331 (Waller Creek at Avenue H) was the only site with concentrations that included dilutions (and therefore some concentrations exceeding 2,419 MPN) and represented the only AU in which the linear average trend line did not show a decrease in *E. coli* concentration.

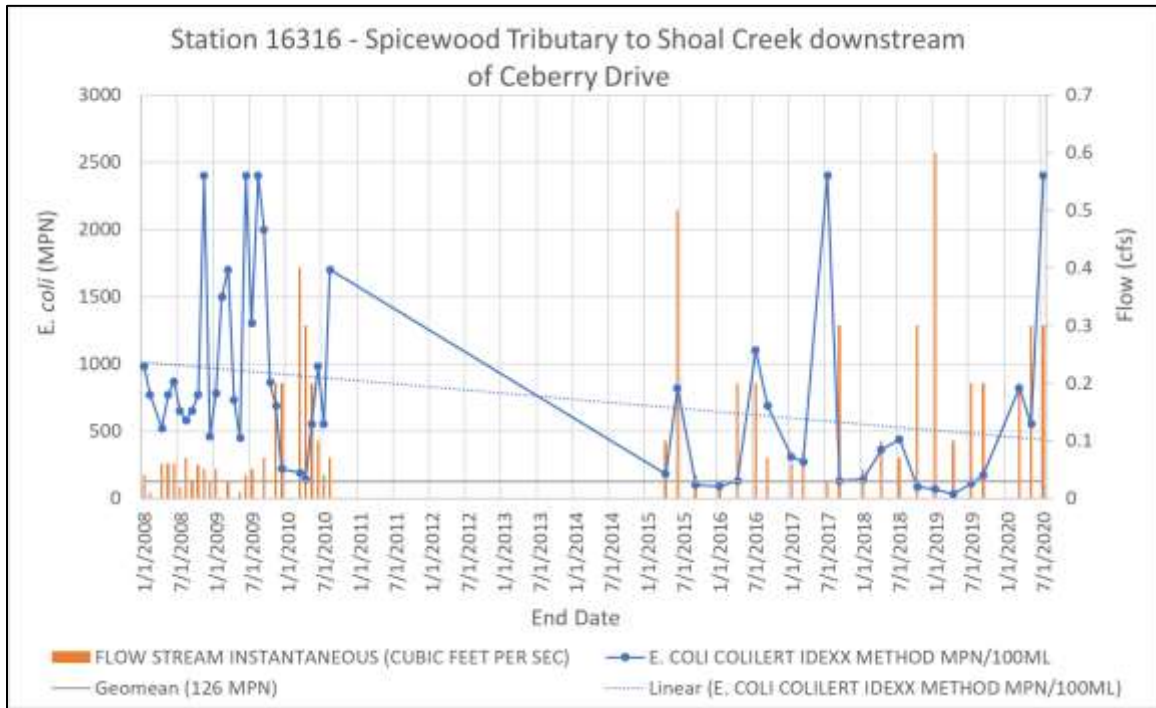


Figure 5. SWQMIS data before and during the 2015-2020 I-Plan implementation period for AU1403J_01

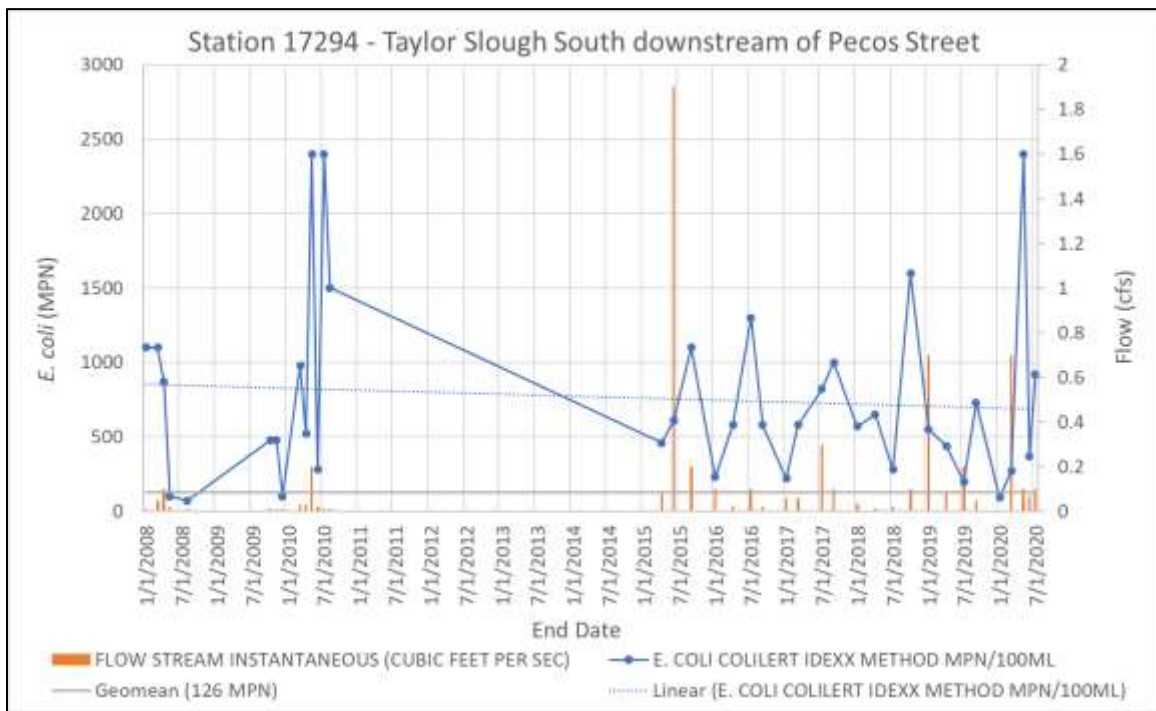


Figure 6. SWQMIS data before and during the 2015-2020 I-Plan implementation period for AU 1403K_01

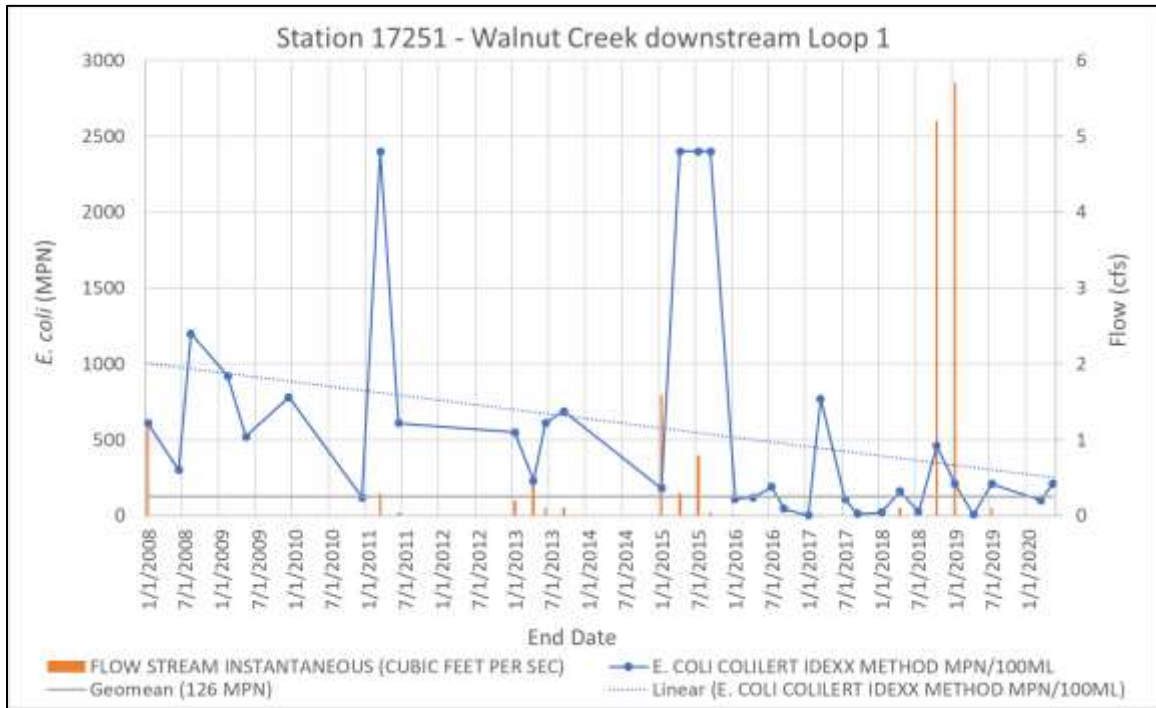


Figure 7. SWQMIS data before and during the 2015-2020 I-Plan implementation period for AU 1428B_05

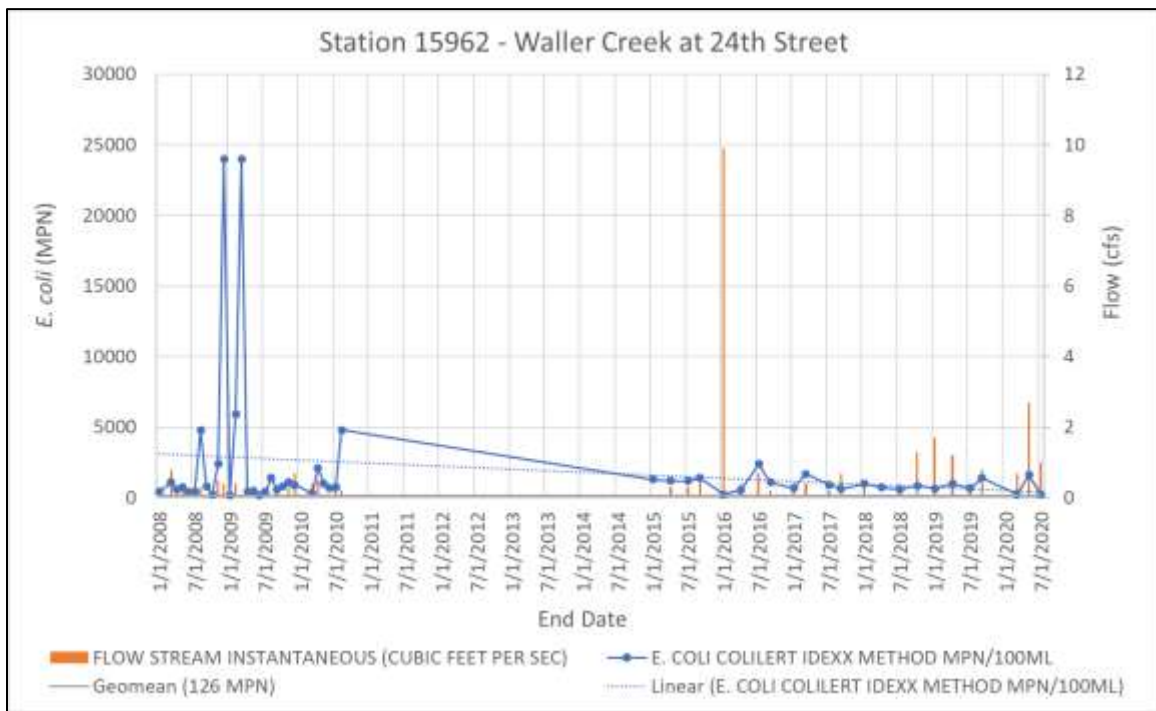


Figure 8. SWQMIS data before and during the 2015-2020 I-Plan implementation period for AU 1429C_02

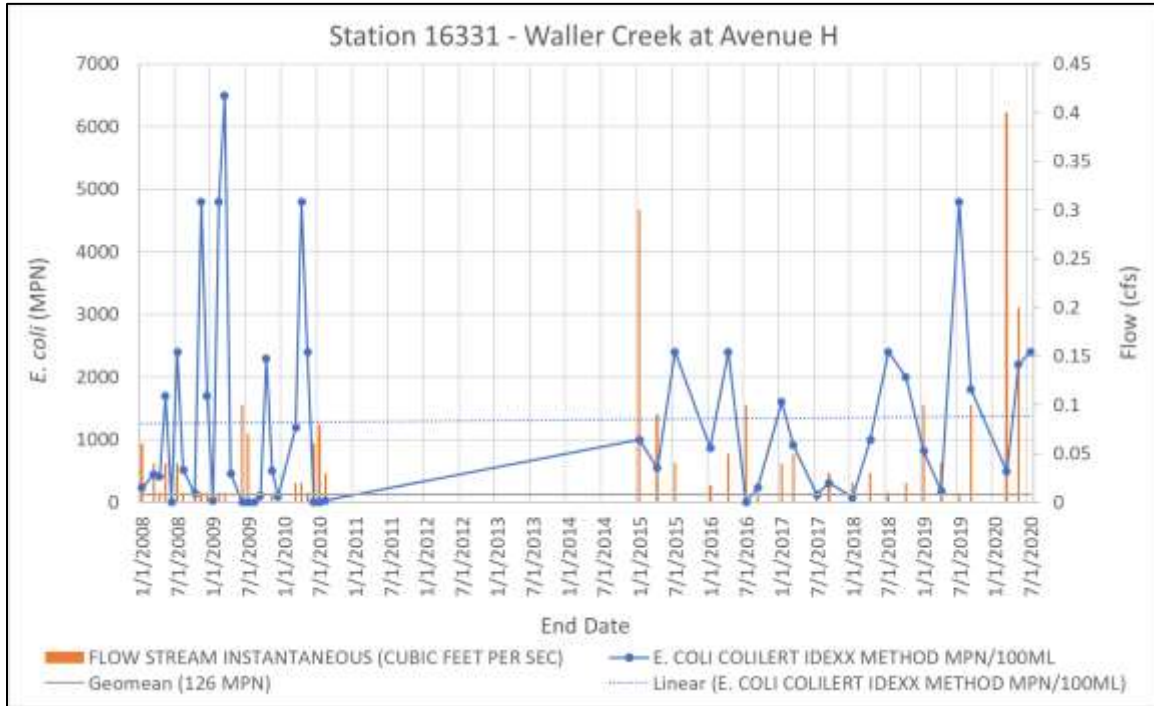


Figure 9. SWQMIS data before and during the 2015-2020 I-Plan implementation period for AU 1429C_03

Data Evaluated from City of Austin

The COA database includes the quality-assured *E. coli* data, collected under an approved Texas Clean Rivers Program QAPP, that have been submitted in SWQMIS through the Lower Colorado River Authority (LCRA). In addition, the COA database contains data that was not submitted for inclusion in SWQMIS because samples were collected prior to having an approved QAPP in place, samples were collected for other projects (not covered under a Texas Clean Rivers Program QAPP) or samples were processed at COA WPD laboratory and lacked NELAP accreditation. Some of these data fill in the gaps from December 2010–December 2014 seen in Figures 5-9. Data are not used in the assessment to determine water quality standards attainment if they were not collected under an approved QAPP. However, the Data Work Group did review this “extra” *E. coli* data (Table 4).

Table 4. COA data available to the public, but not included in SWQMIS, for the period of December 2010–December 2014

TCEQ Station	COA Site ID	Date	<i>E. coli</i> MPN, Individual Samples
17294 Taylor Slough Pecos	318 Taylor Slough @ Reed	10/6/2010	>2,419.6

Adopted Updated Implementation Plan for Nine TMDLs for Indicator Bacteria in Four Austin Streams

TCEQ Station	COA Site ID	Date	<i>E. coli</i> MPN, Individual Samples
17294 Taylor Slough Pecos	318 Taylor Slough @ Reed	12/8/2011	133.3
17294 Taylor Slough Pecos	318 Taylor Slough @ Reed	3/7/2012	365.4
17294 Taylor Slough Pecos	318 Taylor Slough @ Reed	7/5/2012	517.2
17294 Taylor Slough Pecos	318 Taylor Slough @ Reed	9/12/2012	387.3
17294 Taylor Slough Pecos	318 Taylor Slough @ Reed	1/15/2014	313
17294 Taylor Slough Pecos	318 Taylor Slough @ Reed	4/17/2014	235.9
17294 Taylor Slough Pecos	318 Taylor Slough @ Reed	7/2/2014	1,203.3
15962 Waller at 24th St	624 Waller at 23rd Street	12/1/2010	727
15962 Waller at 24th St	624 Waller at 23rd Street	3/23/2011	290.9
15962 Waller at 24th St	624 Waller at 23rd Street	6/7/2011	547.5
15962 Waller at 24th St	624 Waller at 23rd Street	9/21/2011	365.4
15962 Waller at 24th St	624 Waller at 23rd Street	1/22/2013	>2,419.6
15962 Waller at 24th St	624 Waller at 23rd Street	4/24/2013	920.8
15962 Waller at 24th St	624 Waller at 23rd Street	6/26/2013	1,119.9
15962 Waller at 24th St	624 Waller at 23rd Street	9/26/2013	1,553.1

In addition to data that partially inform the gap prior to implementation of the 2015 I-Plan, the COA database includes more recent *E. coli* samples collected following the five-year implementation (after 7/22/2020). Table 5 presents *E. coli* results from samples collected from fall 2020 through January 2022.

Table 5. 2020-2022 City of Austin data following implementation of the 2015 I-Plan

TCEQ STATION	COA Site ID	Date	<i>E. coli</i> MPN, Individual Samples
17294 Taylor Slough Pecos	318 Taylor Slough at Reed	09/14/2020	980.0
		09/13/2021	579.0
		01/27/2022	98.5
15962 Waller at 24th St	624 Waller at 23rd Street	09/14/2020	48.08
		01/27/2022	548.0
16331 Waller at Avenue H	781 Waller Creek at Shipe Park	09/14/2020	140.0
		09/13/2021	727.0
		01/27/2022	>2,420.0
16316 Spicewood Tributary to Shoal Creek	930 Spicewood Trib downstream of Spicewood	09/14/2020	179.0
		09/13/2021	308.0
		01/27/2022	238.0
17251 Walnut downstream of Loop 1	497 Walnut Creek at MoPac/Loop 1	09/14/2020	144.0

Data Evaluated from the University of Texas

UTA provided quarterly *E. coli* data from 2/18/2020 through 7/16/2021 at three sites on Waller Creek within campus boundaries. All three sites were near TCEQ SWQM Station 15962 within AU 1429C_02: Waller Creek near the Service Building (SER) upstream of 24th St, 21st Street (mid-campus near the stadium), and 15th Street. Although this is a relatively short time frame, the trendlines for all three sites over the study period indicated decreasing *E. coli* concentrations (Figure 10).

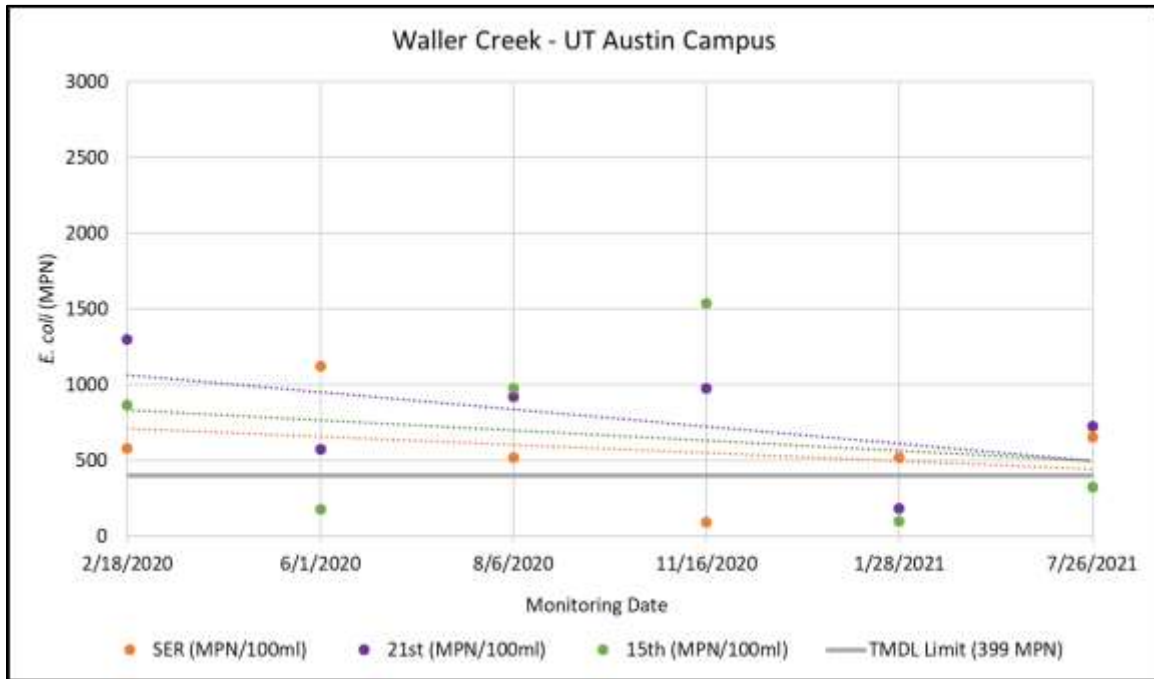


Figure 10. UTA *E. coli* data at three sites on campus in AU 1429C_02

Data Evaluated from the Colorado River Watch Network

Data available through the CRWN were not included in the Updated I-Plan. The reasons cited by the Data Work Group included: the method of sample processing was not IDEXX and therefore less comparable to other data; antecedent weather conditions for sample events were unclear; quality control and assurance methods were not verifiable. In addition, only two applicable sites were available.

Summary of Data Used

Based on the available *E. coli* data evaluated at the time of Data Work Group review, the stakeholders determined that no additional data were necessary on which to base their evaluation of progress or otherwise inform the selection of management measures and control actions. Stakeholders were encouraged that the majority of trends indicate improvement (decreasing concentration over time). In fact, only AU 1429C_03 (based on data from TCEQ SWQM Station 16331, Waller Creek at Avenue H) had a trend that was of increasing concentration. However, the trend was virtually flat and may also indicate no change rather than an increase. The Data Work Group did not determine during their review whether the measures in the I-Plan were responsible for the improvements in most AUs, but the trends imply that staying the course may result in attainment of the standard in the near future.

Management Measure 1: Resident Outreach

IAS stakeholders recognize the importance of reaching out to the community and letting people know how their actions affect water quality. Stakeholder constituent groups that volunteered management measures for this important activity include the Austin Neighborhoods Council (ANC), People Organized in Defense of Earth and Her Resources (PODER), Waterloo Greenway Conservancy, and the Austin Parks Foundation (APF).

1.1 and 1.2. ANC Educational Outreach

The ANC acts as a coordinating body for the efforts of Austin-area neighborhood groups, as a clearinghouse for information and to give guidance in all matters of concern and wellbeing to individual neighborhoods or the COA. The ANC is comprised of volunteer representatives of member neighborhood associations. Member neighborhood associations are organized into 10 geographic sectors, each sector being represented on the ANC Executive Committee.

Meetings of the ANC are open to the public when held in a public physical location. Meeting notices and agendas are emailed to representatives of member neighborhood associations in advance of the ANC meetings. Meeting agendas and PowerPoint presentations are available on the [ANC website](#)⁶

The ANC researches plans, resolutions, ordinances, and legislation that affect neighborhoods in the Austin area and makes specific recommendations. ANC strives to make a positive contribution to Austin through the betterment of neighborhoods by promoting civic awareness and education through forums, seminars, workshops, etc., on those subjects relating to neighborhood concerns. The ANC encourages individuals who are responsive to the needs of the neighborhoods.

Sub-Measure 1.1. ANC Educational Outreach Meetings

The ANC generally employs two ways to distribute educational material and program information about water quality issues:

- Passively by:
 - Inviting COA staff members to set up information tables at monthly general membership meetings to engage interested members before the meeting.

⁶ www.atxanc.org

- Broadcasting to member neighborhood associations via internet communication.
- Actively by:
 - Inviting COA staff to present information, distribute material, and answer questions during general membership or sector meetings.

ANC envisions at least one annual visit by COA staff to actively address water quality issues.

As part of the Updated I-Plan, the ANC will request annual briefings from COA staff on specific topics relevant to the fecal bacteria TMDLs, including riparian zone restoration, pet waste collection, water quality structural BMP retrofits, public education about fecal contamination reduction, wastewater infrastructure maintenance, addition of public toilets, and in-stream fecal bacteria monitoring results. These topics address a wide range of potential sources of fecal contamination.

TMDL implementation briefings will occur at regular monthly general membership meetings of the ANC at least once per year for five years. For those sectors that meet, COA staff will also be invited to give briefings at their meetings at least once per year for five years. It is within the existing purview of the ANC to request briefings from city staff.

While the ANC does not make city policy, it may enhance fecal load reduction from other COA-initiated implementation strategies by providing an additional means of public education and outreach and offering a public venue for adaptive management discussions should the IAS stakeholders decide that strategies need modification during implementation. The ANC may, as a result of briefings, offer guidance to COA.

Table 6. Management Measure 1.1. ANC educational outreach meetings

Item	Description
Best Management Practice	The ANC will invite COA WPD staff to attend one citywide general meeting and one meeting for each sector (or group of sectors) per year to provide information on COA programs that may reduce fecal contamination and ways in which citizens or neighborhood associations may voluntarily participate.
Responsible Party	ANC
Area of Emphasis	Community education
Educational Activities	Presentations about the status of COA programs included in the Updated I-Plan will serve to inform and update the public and provide a means for citizens to voluntarily implement fecal reduction measures through COA volunteer programs. COA may provide content for neighborhood association newsletters or links to COA web-based content for email notifications.

Item	Description
Schedule of Implementation	Years 1 through 5: Invite COA WPD staff to brief the citywide general meeting and each sector (or group of sectors) once per year.
Interim, Measurable Milestones	The number of briefings to ANC citywide general meetings and individual sector meetings held per year.
Progress Indicators	Completing one briefing at a citywide general meeting the number of ANC sectors receiving briefings.
Monitoring Component	ANC will track and report the number of COA briefings to ANC sectors in its annual status report to TCEQ.

Sub-Measure 1.2. ANC Newsletter Educational Outreach

As part of the Updated I-Plan, the ANC will request informational articles from the COA staff on topics relevant to the fecal bacteria TMDLs, including riparian zone restoration, pet waste collection, structural water-quality BMP retrofits, fecal contamination reduction public education, wastewater infrastructure maintenance, addition of public toilets, and in-stream fecal bacteria monitoring results. These strategies address a wide range of potential sources of fecal contamination.

ANC will distribute these articles to member neighborhood associations and invite them to publish the articles in their neighborhood newsletters or otherwise distribute them to the associations' members. ANC will request articles at least annually. It is within the existing purview of the ANC to request articles from city staff. ANC does not mandate the content of the newsletters.

While the ANC does not make city policy, it may enhance the fecal load reduction from other COA-initiated implementation strategies by providing an additional means of public education and outreach and offering a public venue for adaptive management discussions should the IAS stakeholders determine that strategies need modification during implementation. The ANC may, as a result of briefings, offer guidance to COA.

Table 7. Management Measure 1.2. ANC newsletter educational outreach

Item	Description
Best Management Practice	The ANC will request informational articles from the COA staff at least annually on topics relevant to the fecal bacteria TMDLs. ANC will distribute these articles to member neighborhood associations and invite them to publish the articles in their neighborhood newsletters or otherwise distribute them to the associations' members.

Item	Description
Responsible Party	ANC
Area of Emphasis	Community education
Educational Activities	Articles distributed to member neighborhoods will serve as a means to inform and update the public and a means for citizens to voluntarily implement fecal reduction measures through COA volunteer programs. COA may provide content for neighborhood association newsletters or links to COA web-based content for email notifications.
Schedule of Implementation	Years 1-5: Request COA staff to provide articles once per year.
Interim, Measurable Milestones	The number of articles ANC distributes to its member associations per year.
Progress Indicators	Providing a stable or increased number of articles per year.
Monitoring Component	ANC will track and report the number of articles requested and distributed in its annual status report to TCEQ.

Sub-Measure 1.3. PODER Educational Outreach

PODER is a grassroots environmental justice organization in East Austin, led by women of color, that defines the environment as the place where we live, work, learn, play, and pray. For that reason, PODER addresses multiple social and environmental issues affecting the communities as basic human rights.

PODER is a member of the Hispanic Advocates Business Leaders of Austin (HABLA), which is a think-tank group and forum made up of local Hispanic and Latino community and business leaders. HABLA members are committed to discussing and developing sustainable solutions on current affairs, public policies, and quality of life issues impacting the local Austin Hispanic and Latino community. At the time of this report, HABLA members meet monthly.

PODER is also a member of La Raza Roundtable, which brings together community organizations, community leaders, elected officials, and private and public sector representatives in leadership capacities that create positive change for La Raza. At the time of this report, La Raza Roundtable meets every Saturday.

As part of the Updated I-Plan, PODER will request annual briefings from the COA staff on specific topics relevant to the fecal bacteria TMDLs, including riparian zone restoration, pet waste collection, water quality structural BMP retrofits, public education on fecal contamination reduction, wastewater infrastructure maintenance, addition of public toilets, and in-stream fecal

bacteria monitoring results. These strategies address a wide range of potential sources of fecal contamination.

PODER will distribute updates at the HABLA and La Raza Roundtable meetings and provide links on the [PODER website](http://www.poderaustin.org)⁷ about the Austin bacteria TMDL I-Plan and other available resources.

Table 8. Management Measure 1.3. PODER educational outreach

Item	Description
Best Management Practice	PODER will request annual briefings from the COA staff on specific topics relevant to the fecal bacteria TMDLs. PODER will distribute updates at the HABLA and La Raza Roundtable meetings and provide links on the PODER website regarding the Austin bacteria TMDL I-Plan and other available resources.
Responsible Party	PODER
Area of Emphasis	Community education
Educational Activities	Presentations on the status of COA programs included in the I-Plan measures will serve as a means to inform and update the public and a means for citizens to voluntarily implement fecal reduction measures through COA volunteer programs. COA may provide content for PODER, HABLA, and La Raza meetings and links to COA web-based content.
Schedule of Implementation	Years 1-5: <ul style="list-style-type: none"> • Request annual briefings by COA WPD staff on COA environmental programs and ways citizens may help to reduce fecal contamination. • Distribute updates at the HABLA and La Raza Roundtable meetings annually. • Provide links on the PODER website regarding the Austin bacteria TMDL I-Plan and other available resources.
Interim, Measurable Milestones	<ul style="list-style-type: none"> • The number of briefings to PODER per year. • The number of updates by PODER to HABLA, La Raza, and others per year.
Progress Indicators	A stable number of annual briefings to PODER and a stable or increasing number of briefings to La Raza and HABLA.
Monitoring Component	PODER will track and report the number of briefings by COA staff and updates distributed to other organizations in its annual status report to TCEQ.

Sub-Measure 1.4. Waterloo Greenway Conservancy Educational Outreach and Programming

Waterloo Greenway Conservancy creates and maintains an extraordinary urban park system and a restored Waller Creek, in partnership with the COA, for the benefit of all. The Conservancy renews the natural environment, promotes play,

⁷ www.poderaustin.org

health and wellness, economic vitality, and mobility, and engages the community through outreach, education, cultural events, and the arts. Waterloo Greenway Conservancy will develop communications to educate users and neighbors about the watershed, ongoing creek restoration work, and water quality updates in collaboration with COA WPD and COA Parks and Recreation Department (COA PARD), via newsletter, website, and social media.

Table 9. Management Measure 1.4. Waterloo Greenway Conservancy educational outreach and programming

Item	Description
Best Management Practice	Waterloo Greenway Conservancy will develop communications to educate users and neighbors about the watershed, ongoing creek restoration work, and water quality updates in collaboration with COA WPD and PARD, via newsletter, website, and social media.
Responsible Party	Waterloo Greenway Conservancy
Area of Emphasis	Community education and outreach
Educational Activities	Educate users and neighbors of Waterloo Greenway Conservancy about the watershed, ongoing creek restoration work, and water quality updates through forums such as Waterloo Greenway Conservancy newsletters, blog posts, and park events.
Schedule of Implementation	Year 1: <ul style="list-style-type: none"> • Develop outreach strategy and materials/content. Years 2-5: <ul style="list-style-type: none"> • Distribute digital content twice a year and host one environmentally focused event per year.
Interim, Measurable Milestones	The number of digital content distributions and environmentally focused events per year.
Progress Indicators	Stable or increased attendance at environmentally focused events and stable or increased number of times materials or educational materials are distributed.
Monitoring Component	Waterloo Greenway Conservancy will track and report the number of times per year materials or educational messages are distributed or events are held in its annual status report to TCEQ.

Sub-Measure 1.5. APF Riparian and Scoop-the-Poop Education

Founded in 1992, APF is dedicated to partnering with our community to enhance people’s lives by making our public parks, trails, and green spaces better through volunteerism, innovative programming, advocacy, and financial support.

With a focus on creating equitable access to great parks for all Austinites, APF is helping fill the City's parks funding and resource gap. Funding initiatives like APF's community-initiated grants have distributed over \$3 million since 2006, and the annual flagship volunteer event, It's My Park Day, results in an average of \$650,000 in volunteer labor each year.

APF is committed to educating community volunteers on practices that support fecal load reduction such as riparian zone restoration efforts and pet waste collection. APF will incorporate curriculum provided by the COA WPD into volunteer workdays and meetings. APF will track and report the number of volunteer workdays and annual meetings at which riparian zone restoration or domestic pet waste education is discussed.

With a large, active volunteer base, APF is in an advantageous position to effectively distribute educational information to the community, particularly those residents frequenting park and creek areas. Increasing communication with the Adopt-A-Park and neighborhood leaders can efficiently and successfully disseminate the I-Plan's goals and benefits to the community. APF will incorporate riparian and Scoop-the-Poop educational messaging into volunteer workdays and annual meetings.

Table 10. Management Measure 1.5. APF riparian and Scoop-the-Poop education

Item	Description
Best Management Practice	Incorporating riparian and Scoop-the-Poop educational messaging into volunteer workdays and annual meetings
Responsible Party	APF
Area of Emphasis	Community education
Educational Activities	Use COA public education materials focused on the impact of certain activities on bacteria levels of waterways and geared towards volunteer service groups. Conduct outreach to volunteer service organizations regarding the region's bacteria TMDL and its causes.
Schedule of Implementation	Years 1-5: Provide educational materials incorporating riparian and Scoop-the-Poop messaging into volunteer workdays and annual meetings.
Interim, Measurable Milestones	Number of volunteer workdays or annual meetings associated with affected watersheds where riparian zone restoration and Scoop-the-Poop education programs are distributed or discussed.
Progress Indicators	Stable or increasing number of volunteer workdays or meetings at which educational materials are distributed and discussed.
Monitoring Component	APF will track and report the number of volunteer workdays and annual meetings at which riparian zone restoration or domestic pet waste education is distributed or discussed in its annual status report to TCEQ.

Management Measure 2: LCRA Volunteer Water Quality Monitoring

LCRA provides public power, manages the lower Colorado River, builds and operates transmission lines across the state, and more. LCRA’s mission is to enhance the quality of life for the Texans it serves through water stewardship, energy, and community service.

CRWN is a program of the Water Quality Protection department at LCRA. CRWN is the first and largest regional volunteer network of water quality monitors in Texas. Trained volunteers submit water quality data that is reviewed and analyzed by CRWN staff, creating an early warning system that alerts LCRA to potential water quality threats. CRWN requires a two-year commitment to the monthly monitoring, and many volunteers have been participating for five to 10 years. All testing equipment is loaned to a monitoring group or individual, and supplies are restocked regularly.

LCRA will work to recruit, train, and educate citizen volunteers to conduct water quality monitoring on the four affected waterways to provide further insights into bacteria loading into the creeks and guide and inform professional monitoring data collected and reported to TCEQ.

Table 11. Management Measure 2. LCRA volunteer water quality monitoring

Item	Description
Best Management Practice	Volunteer water quality monitoring
Responsible Party	LCRA
Area of Emphasis	Water quality monitoring
Educational Activities	Recruit and train citizen volunteers through LCRA’s CRWN to conduct water quality monitoring on Spicewood Tributary to Shoal Creek, Taylor Slough South, Walnut Creek, and Waller Creek. Educate and provide information to these volunteers on water quality protection BMPs and encourage them to find opportunities to share this knowledge within their community.
Schedule of Implementation	Years 1-5: Recruit, train, and support volunteers to conduct water quality monitoring in the four TMDL waterways.
Interim, Measurable Milestones	The number of volunteers conducting water quality monitoring and the data that they collect.
Progress Indicators	Starting from a baseline of volunteer effort in 2022, increasing trend in number of volunteers who conduct water quality monitoring in the TMDL watersheds, including unimpaired segments.

Item	Description
Monitoring Component	<ul style="list-style-type: none"> • LCRA will track and report the number of volunteers conducting water quality monitoring in its annual status report to TCEQ. • LCRA will compile all volunteer water quality monitoring data from these waterways and analyze the data each year.

Management Measure 3: UTA: Domestic Pet Waste

UTA-FS will maintain its nine pet waste collection stations weekly. UT-EHS will provide the pet waste bags. In addition, UTA-EHS will educate new and existing pet owners within the university community about the importance of taking responsibility for cleaning up after their pets. This includes publishing at least one article or other advertising material to campus social media accounts, newsletters, or newspapers annually.

Table 12. Management Measure 3. UTA domestic pet waste stations

Item	Description
Best Management Practice	Maintain all the installed pet waste collection stations on UTA's main campus.
Responsible Parties	UTA-EHS, UTA-FS
Area of Emphasis	Domestic pet waste
Educational Activities	Educate the campus community about water quality impacts of pet waste.
Schedule of Implementation	Years 1-5: Continue ongoing weekly maintenance of the pet waste stations by restocking waste bag supply.
Interim, Measurable Milestones	The number of bags restocked and number of times checked.
Progress Indicators	Reduction in <i>E. coli</i> concentrations in the Waller Creek watershed after five years of implementation.
Monitoring Component	UTA-FS will track and report the number of bags restocked and times checked.

Management Measure 4: Stormwater Management Strategies

Sub-Measure 4.1. UTA Flood Control Projects

UTA has implemented a stormwater management design standard requiring all construction projects including outdoor disturbance to manage a certain percentage of precipitation on site and reduce runoff velocity. Appropriate flood control measures are evaluated on a project-by-project basis in order to reduce erosion and the discharge of pollutants into the storm sewer system. The UTA-EHS department, UTA Capital Planning and Construction department (UTA-CPC), and UTA Project Management and Construction Services Department (UTA-PMCS) review new construction and redevelopment projects for opportunities to improve post-construction stormwater management in accordance with [UTA’s Standard for Storm Water Management Design Parameters](#).⁸

The UTA Utilities and Energy Management (UTA-UEM) department inspects university-owned flood control structures annually and performs maintenance as needed. UTA-EHS will educate the campus community about the benefits of permanent stormwater management features by publishing at least one article or other advertising material to campus social media accounts, newsletters, or newspapers annually.

Table 13. Management Measure 4.1. UTA: flood control projects

Item	Description
Best Management Practice	Maintain existing flood control structures according to designed specifications. Evaluate and require designers to incorporate flood control structures into applicable capital improvement projects.
Responsible Parties	<p><u>Maintenance</u> UTA-UEM</p> <p><u>Design</u> UTA-EHS, UTA-PMCS, UTA-CPC</p>
Area of Emphasis	Flood control and reduction of high-velocity runoff into Waller Creek.
Educational Activities	Educate campus community about the benefits of permanent stormwater management features on the main campus.

⁸ <https://ehs.utexas.edu/environment-waste/stormwater>

Item	Description
Schedule of Implementation	Years 1-5: <ul style="list-style-type: none"> Maintain 100% of existing structures to engineered specifications. Incorporate available flood control structures in 100% of applicable capital improvement projects.
Interim, Measurable Milestones	The number of flood control structures maintained and new flood control structures installed.
Progress Indicators	Reduction in <i>E. coli</i> concentrations in the UTA MS4.
Monitoring Component	<ul style="list-style-type: none"> UTA will track and report the number of existing flood control structures maintained and new flood control structures installed in its annual status report to TCEQ. UTA will conduct bacteria monitoring as described in UTA's MS4 permit (Sub-Measure 4.4).

Sub-Measure 4.2. UTA Water Quality Control Projects

UTA has implemented a stormwater management design standard requiring all construction projects including outdoor disturbance to manage a certain percentage of precipitation on site and reduce runoff velocity. Appropriate water quality control measures are evaluated on a project-by-project basis in order to reduce erosion and the discharge of pollutants into the storm sewer system. UTA-EHS, UTA-CPC, and UTA-PMCS review new construction and redevelopment projects for opportunities to improve post-construction stormwater management in accordance with [UTA's Standard for Storm Water Management Design Parameters](#).⁹

Table 14. Management Measure 4.2. UTA: water quality control projects

Item	Description
Best Management Practice	Require all applicable construction projects that include outdoor disturbance to follow UTA's stormwater design standard. Implement appropriate water quality and flood control measures in order to reduce erosion and the discharge of pollutants into the storm sewer system.
Responsible Parties	UTA-EHS, UTA-CPC, UTA-PMCS
Area of Emphasis	Water quality
Educational Activities	Educate the campus community about benefits of permanent stormwater management features on the main campus.

⁹ <https://ehs.utexas.edu/environment-waste/stormwater>

Item	Description
Schedule of Implementation	Years 1-5: Review projects for compliance with design standard to minimize stormwater pollution.
Interim, Measurable Milestones	The number of new water quality control structures installed.
Progress Indicators	Reduction in <i>E. coli</i> concentrations in the UTA MS4.
Monitoring Component	<ul style="list-style-type: none"> • UTA will track and report the number of new water quality control structures installed in its annual status report to TCEQ. • Bacteria monitoring in UTA's MS4 (Sub-Measure 4.4).

Sub-Measure 4.3. UTA: Tree Protection Zones

Similar to a recommendation by the Sustainable Sites Initiative to ensure soil vegetation and soil protection before and during construction, Tree Protection Zones (TPZ) will be designated and communicated by the UTA-FS department, with involvement from UTA-EHS as needed, to the UTA project team and contractors. These established zones also protect the critical root zone of trees, preserve native soils, and prevent soil compaction. By increasing stormwater infiltration, these TPZs are expected to reduce the volume and pollutant load in runoff, reducing the transport of *E. coli* into Waller Creek during rain events.

Table 15. Management Measure 4.3. UTA: tree protection zones

Item	Description
Best Management Practice	Require the designation of tree protection zones.
Responsible Party	UTA-FS
Area of Emphasis	Water quality
Educational Activities	UTA-FS provides guidance to project managers during construction planning.
Schedule of Implementation	Years 1-5: Analyze projects with outdoor disturbance for feasibility of implementation.
Interim, Measurable Milestones	The square footage of protected soils/vegetated areas where TPZ were implemented.
Progress Indicators	Reduction in <i>E. coli</i> concentrations in the UTA MS4.

Item	Description
Monitoring Component	<ul style="list-style-type: none"> The square footage of protected soils/vegetated areas where TPZ were implemented will be tracked and reported annually. Bacteria monitoring in UTA's MS4 (Sub-Measure 4.4).

Sub-Measure 4.4. UTA: Bacteria Monitoring

On a quarterly basis, UTA-EHS monitors indicator bacteria (*E. coli*) levels at three locations within Waller Creek. These locations were chosen to represent the water quality entering the campus MS4, in the center of campus, and exiting the campus. This program began in February of 2020 as a way for UTA-EHS to monitor the effectiveness of BMPs implemented throughout the watershed to achieve bacterial load reductions.

Table 16. Management Measure 4.4. UTA: bacterial level monitoring

Item	Description
Best Management Practice	Monitor bacterial levels at three identified locations along Waller Creek.
Responsible Party	UTA-EHS
Area of Emphasis	Water quality
Educational Activities	Educate campus community about sources of and strategies for minimizing fecal bacteria in streams.
Schedule of Implementation	Quarterly surface water samples at three locations along Waller Creek through the UT Austin main campus.
Interim, Measurable Milestones	Continuation of quarterly water samples.
Progress Indicators	Reduction in <i>E. coli</i> concentrations in the UTA MS4 watershed.
Monitoring Component	UTA will track and report the water quality monitoring results in its annual status report to TCEQ.

Management Measure 5: Riparian Restoration

Founded in 1992, APF is dedicated to partnering with our community to enhance people's lives by making our public parks, trails and green spaces better through volunteerism, innovative programming, advocacy, and financial support.

With a focus on creating equitable access to great parks for all Austinites, APF is helping fill the City's parks funding and resource gap. Funding initiatives like APF's community-initiated grants have distributed over \$3 million since 2006, and the annual flagship volunteer event, It's My Park Day, results in an average of \$650,000 in volunteer labor each year.

Sub-Measure 5.1. APF: Recruit Adopters for All Parks in the Watersheds

APF is committed to educating community volunteers on practices which support fecal load reduction such as riparian zone restoration efforts and pet waste collection. Watersheds in the affected areas will be targeted as high priority areas for recruitment and participation for the Adopt-A-Park program. All volunteer groups who have adopted parks or are otherwise working within the affected areas will be encouraged to support the creation and expansion of Grow Zones, as well as the continued maintenance of existing Grow Zones. APF will track and report the number of new adoptions, as well as volunteer workdays and annual meetings at which riparian zone restoration or domestic pet waste education is discussed.

With a large active volunteer base, APF is in an advantageous position to effectively distribute educational information to the community, particularly those residents frequenting park and creek areas. Increasing communication with the Adopt-A-Park and neighborhood leaders can efficiently and successfully disseminate the plan's goals and benefits to the community. APF will incorporate riparian and "scoop the poop" educational messaging into volunteer workdays and annual meetings.

Table 17. Management Measure 5.1. APF: Recruit adopters for all parks in the watersheds

Item	Description
Best Management Practice	Maintain adopters for all parks in the affected watersheds.
Responsible Party	APF
Area of Emphasis	Riparian restoration via volunteer activities.
Educational Activities	Utilize COA public education materials focused on the impact of certain activities on bacteria levels of waterways and geared towards volunteer service groups. Conduct outreach to volunteer service organizations regarding the region's bacteria TMDL and its causes.
Schedule of Implementation	Years 1-5: <ul style="list-style-type: none"> Evaluate parks within the affected watersheds for Adopt-a-Park sponsorship.

Item	Description
	<ul style="list-style-type: none"> Recruit sponsors as needed. Provide training including riparian zone restoration and maintenance.
Interim, Measurable Milestones	Adoption rate for parks within the affected watersheds.
Progress Indicators	Maintain adopters for all parks in affected watersheds.
Monitoring Component	APF will track and report the number of park adopters in affected watersheds in its annual status report to TCEQ.

Sub-Measure 5.2. APF: Use Volunteers to Help Expand and Maintain Grow Zone Riparian Initiative

As described in the management measure narrative for 5.1, APF will also support expansion of the City of Austin Grow Zone program to parks within the affected watersheds.

Table 18. Management Measure 5.2. APF: Use volunteers to help expand and maintain Grow Zone riparian initiative

Item	Description
Best Management Practice	Support expansion of Grow Zones to all applicable parks in the affected watersheds currently without Grow Zones and help maintain the integrity of Grow Zones through volunteer efforts.
Responsible Party	APF
Area of Emphasis	Riparian restoration via volunteer activities.
Educational Activities	Utilize COA Public Education materials focused on the impact of certain activities on bacteria levels of waterways and geared towards volunteer service groups. Conduct outreach to volunteer service organizations regarding the region's bacteria TMDL and its causes.
Schedule of Implementation	Years 1-5: <ul style="list-style-type: none"> Reach 100% of un-adopted parks within the affected watersheds to either or both programs. Continue efforts to encourage expansion.
Interim, Measurable Milestones	<ul style="list-style-type: none"> Number of service groups contacted and engaged in Grow Zone initiative. Number of new Grow Zones initiated or Grow Zones enhanced.
Progress Indicators	Stable or increasing numbers of service groups and Grow Zones.

Item	Description
Monitoring Component	APF will track and report the number of service groups contacted and engaged in Grow Zone initiatives and number of Grow Zones initiated or enhanced through volunteer efforts in its annual status report to TCEQ.

Control Action 1: Comply with MS4 Stormwater Management Programs

State and federal rules require cities and certain other entities to obtain permits for controlling stormwater pollution in urban areas. These regulated municipal separate storm sewer systems (MS4s) are publicly owned systems of conveyances and include ditches, curbs, gutters, and storm sewers that do not connect to a sanitary wastewater collection systems or treatment facilities.

There are two types of MS4 permits—Phase I and Phase II. Both types of permits regulate discharges of stormwater into surface water in the state. The first MS4 permits were issued during Phase I of urban stormwater regulation, with approval of EPA’s 1990 Phase I rule. The Phase II permits were first issued following EPA approval of the Phase II rules in 1999.

Phase I permits were issued for urban areas that had a population of 100,000 or more as of the 1990 United States Census (USCB 1990). Phase I regulations are implemented through individual permits.

Phase II permits are MS4s located in urbanized areas, as defined most recently in 2010 by the United States Census Bureau (USCB 2010), that were not permitted under Phase I. Phase II regulations are implemented through a general permit under which MS4s in urbanized areas are authorized to discharge stormwater. There is also the option for an individual permit for Phase II MS4s.

In watersheds for which TMDLs have been adopted, TCEQ requires MS4s that hold TPDES Phase I or Phase II stormwater permits or authorizations to include *either* all the measures in an approved I-Plan—*or* alternative, equivalent measures—in the SWMPs required under their MS4 permits. Specifically, SWMPs must:

- List targeted controls
- Provide measurable goals
- Identify benchmarks
- Monitor or assess progress in achieving benchmarks
- Determine the effectiveness of BMPs

SWMPs are renewed or updated at regular intervals and must be approved by TCEQ or EPA prior to implementation. MS4 operators should review their SWMPs

at least annually to determine their effectiveness and make any necessary changes. In addition, MS4 permit holders must prepare a comprehensive, system-wide annual report to describe the status of their SWMP implementation and submit the report to TCEQ each year.

To the extent that the MS4 permit holders are carrying out their approved SWMPs, their permits are consistent with the Austin Streams Bacteria TMDLs and this Updated I-Plan. Each permittee will implement its SWMP to target reductions of bacteria from those portions of the nine TMDL watersheds that fall within their jurisdictions.

Because schedules for revising the I-Plan, TPDES permits, and SWMPs do not coincide, this Updated I-Plan includes the SWMPs of the responsible parties by reference. SWMPs for parties operating in the Austin Streams TMDL watersheds are available on public webpages so that stakeholders may review them. MS4 permit holders will always post their most recent TCEQ-approved SWMPs. Table 19 lists the MS4s permits and authorizations in the TMDL watersheds.

Table 19. MS4s permits and authorization in the Austin Streams TMDL watersheds

MS4 Permit Holders	Permit Type	TPDES Permit or Authorization	Webpage Address
University of Texas at Austin	Phase I Individual	WQ0004704000	https://ehs.utexas.edu/environment-waste/stormwater
City of Austin	Phase I Individual	WQ0004705000	https://www.austintexas.gov/department/ms4-stormwater-permit-program
County of Travis	Phase II General (TXR040000)	TXR040327	https://www.traviscountytexas.gov/tnr/environmental-quality/stormwater
Texas Department of Transportation	Combined Phase I and Phase II Individual	WQ0005011000	https://www.txdot.gov/institute-txdot/division/environmental/swmp.html

Measures in SWMPs to Reduce Bacteria Loading

The purpose of MS4 permits is to reduce discharges of pollutants in stormwater to the maximum extent practicable (MEP). Permit holders must develop and implement SWMPs that implement MCMs with BMPs to minimize the discharge of pollutants in stormwater. MCMs are established by TCEQ and EPA and are described in individual and general MS4 permits.

Like TMDL I-Plans, stormwater permits use adaptive management in the process by which SWMPs are reviewed, updated, and renewed. The MS4 permit holders in the Austin Streams TMDL watersheds will carry out various BMPs under each of the MCMs to reduce bacteria entering streams from stormwater runoff. Although no WWTFs discharge into the nine TMDL AUs, the WWTF operators and OSSF designated authorities in the watersheds will also carry out practices under the SWMPs that prevent bacteria loading from WWTF service lines and OSSFs within the TMDL watersheds.

The following tables summarize, for each MS4 permittee, the sources or activity of possible pollutants, and types of BMPs being used to eliminate or reduce such pollutants.

Table 20. UTA: Types of bacteria reduction BMPs implemented through SWMPs

Source or Activity	Typical BMPs
Sanitary Sewer Systems	<ul style="list-style-type: none"> Inspect wastewater infrastructure in the Waller Creek watershed (main campus) and make repairs as problems are encountered. Sanitary sewer overflow response
On-Site Sewage Facilities	N/A
Illicit Discharges and Dumping	<ul style="list-style-type: none"> Dry-weather inspection of storm drain outfalls to identify illicit connections Construction site inspection and monitoring Street sweeping on UT Austin campus
Animal Sources	<ul style="list-style-type: none"> See Management Measure 3, Domestic Pet Waste, and Table 12
Resident Education	<ul style="list-style-type: none"> Educate campus community about water quality impacts of pet waste, benefits of permanent stormwater management features on the main campus.
Phase I MS4s only: Monitoring, Evaluation and Reporting	<ul style="list-style-type: none"> Evaluate water quality data against benchmark goals Conduct bacteria source isolation investigations <p>See Management Measure 4, Sub-Measure 4.4 and Table 16.</p>

Table 21. COA: Types of bacteria reduction BMPs implemented through SWMPs

Source or Activity	Typical BMPs
Sanitary Sewer Systems	<ul style="list-style-type: none"> Inspect lift stations Inspect pipes for leaks Respond promptly to sanitary sewer overflows
On-Site Sewage Facilities	<ul style="list-style-type: none"> Investigate on-site septic facilities complaints promptly

Source or Activity	Typical BMPs
Illicit Discharges and Dumping	<ul style="list-style-type: none"> • Conduct screening at outfalls for non-stormwater discharges during dry weather
Animal Sources	<ul style="list-style-type: none"> • Provide pet waste bags in parks • Provide educational material to the public at events • Provide educational material to pet friendly businesses and apartments
Resident Education	<ul style="list-style-type: none"> • Educate students at various school programs • Educate citizens about preventing grease clogs in sewer lines
Phase I MS4s only: Monitoring, Evaluation and Reporting	<ul style="list-style-type: none"> • Evaluate water quality data against benchmark goals • Conduct bacteria source isolation investigations

Table 22. Travis County: Types of bacteria reduction BMPs implemented through SWMPs

Source or Activity	Typical BMPs
Riparian Zone Restoration	<ul style="list-style-type: none"> • Require and enforce waterway setbacks in Walnut Creek Watershed.
Wastewater Infrastructure	<ul style="list-style-type: none"> • Provide incentives in Walnut Creek area for OSSF repair and improvements.
Stormwater Management	<ul style="list-style-type: none"> • Inspect and ensure proper operation of private water quality treatment and flood detention structures in Travis County jurisdiction.
Illicit Discharges and Dumping	<ul style="list-style-type: none"> • Annually inspect all industrial facilities within the Walnut Creek watershed to determine if inappropriate sanitary waste management results in illicit discharges to its MS4.

Table 23. TxDOT: Types of bacteria reduction BMPs implemented through SWMPs

Source or Activity	Typical BMPs
Illicit Discharges and Dumping	<p>The Illicit Discharge and Detection Elimination (IDDE) Program includes:</p> <ul style="list-style-type: none"> • Maintaining up-to-date map of outfalls operated by TxDOT. • Procedures for tracing the source of an illicit discharge. • Procedures for removing the source of an illicit discharge. • Procedures for conducting inspections.
Animal Sources	<ul style="list-style-type: none"> • TxDOT prohibits the discharge of animal wastes to the MS4.
Resident Education	<p>Implement litter clean up campaigns such as:</p> <ul style="list-style-type: none"> • “Don’t Mess With Texas” campaign • “Adopt-a-Highway” program

Source or Activity	Typical BMPs
Phase I MS4s only: Monitoring, Evaluation and Reporting	<ul style="list-style-type: none"> Evaluate the watersheds using existing stormwater characterization data once per permit term.

Implementation Tracking, Sustainability, and Milestones

Implementation tracking provides information that stakeholders can use to determine if progress is being made toward meeting the goals of the TMDL and Updated I-Plan. Tracking also allows stakeholders to identify whether specific actions are working or are not working and make any changes that may be necessary to get the Updated I-Plan back on target. Implementation milestones track the completion of activities associated with control actions or management measures. Schedules and milestones for this Updated I-Plan are included in the descriptions of each management measure. Schedules and milestones for SWMPs are included in the SWMPs noted in Table 19.

The responsible parties and other stakeholders will track progress using both water quality indicators and implementation milestones. These terms are defined as:

- **Water Quality Indicator** – A measure of water quality conditions for comparison to pre-existing conditions, constituent loadings, and water quality standards.
- **Implementation Milestone** – A measure of administrative actions undertaken to cause an improvement in water quality.

Water Quality Indicators

The goal for the Updated I-Plan is attainment of the geometric mean criterion (126 cfu/100 mL) for the primary contact recreation 1 use in each of the affected water bodies. The measure of success for each water body is a declining trend of *E. coli* concentration. Stakeholders will monitor trends in *E. coli* concentration and calculate the most current geometric mean for *E. coli* in each TMDL water body over the period of record to evaluate progress.

Routine *E. coli* monitoring will occur within each of the TMDL water body assessment units included in the Updated I-Plan to track the success of management measures over time. The COA WPD will implement a good faith effort to collect *E. coli* samples from within each of the assessment units four times per year. *E. coli* samples will be collected under an approved Texas Clean Rivers Program QAPP following [TCEQ Surface Water Quality Monitoring](#)

[Procedures Manual](#)¹⁰ guidelines. *E. coli* samples will be analyzed by an approved laboratory accredited by the [National Environmental Laboratory Accreditation Program](#)¹¹, as specified in the approved Texas Clean Rivers Program QAPP. Data will be submitted to TCEQ through the Texas Clean Rivers Program for inclusion in future water quality assessments.

Communications Strategy

Communication is necessary to ensure that stakeholders understand the Updated I-Plan and its progress in improving water quality. A central tenet of the Updated I-Plan is communication and education. Most management measures focus on or incorporate education.

Responsible parties and stakeholders will report their progress to the TCEQ TMDL Team annually in April for up to five years. Stakeholders may choose to meet following the submission of their progress reports to assess their progress and adjust implementation strategies as needed. TCEQ will post the stakeholders' annual status reports and notice of any meetings on the status reports on the [Austin Area Streams TMDL project webpage](#).¹² Following the completion of the scheduled activities, stakeholders will assemble to evaluate the actions, overall impacts, results of their implementation efforts, and the need for a second updated I-Plan.

¹⁰ www.tceq.texas.gov/waterquality/monitoring/swqm_procedures.html

¹¹ nelac-institute.org/index.php

¹² www.tceq.texas.gov/waterquality/tmdl/101-austinbacteria

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