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Draft Implementation Plan for Five Total Maximum Daily Loads for Indicator Bacteria in Hillebrandt Bayou and Neches River Tidal

Assessment Units 0601_01, 0601_02, 0601_03, 0601_04, 0704_02

By Stakeholders of the Hillebrandt Bayou and Neches River Tidal Watersheds and the Texas Water Resources Institute

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Big Thicket Association
City of Beaumont
City of Port Neches
Entergy Texas, Inc.
Jefferson County AgriLife Extension Service
LJA Engineering
Lower Neches Valley Authority
Lower Sabine-Neches Soil and Water Conservation District
Texas A&M Forest Service
Texas Sea Grant
Texas State Soil and Water Conservation Board

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Abbreviations

ANRA	Angelina and Neches River Authority
AU	assessment unit
BMP	best management practice
BTA	Big Thicket Association
cfu	colony forming units
CIG	Conservation Innovation Grants
CWSRF	Clean Water State Revolving Fund
CMS	Coordinated Monitoring Schedule
CRP	Clean Rivers Program
CSP	Conservation Stewardship Program
E. coli	*Escherichia coli*
EPA	Environmental Protection Agency (United States)
EQIP	Environmental Quality Incentives Program
FG	future growth
I-Plan	implementation plan
LA	load allocation
LNVA	Lower Neches Valley Authority
MCM	minimum control measures
mL	milliliter
MOS	margin of safety
MS4	municipal separate storm sewer system
NRCS	Natural Resources Conservation Service
O&M	Operation and Maintenance
OSSF	on-site sewage facility
QAPP	quality assurance protection plan
RCPP	Regional Conservation Partnership Program
SARE	Sustainable Agriculture Research and Education
SSO	sanitary sewer overflow
SSOI	Sanity Sewer Overflow Initiative
SWCD	Soil and Water Conservation District
SWMP	Stormwater Management Program
SWQM	surface water quality monitoring
SWQMIS	Surface Water Quality Monitoring Information System
TCEQ	Texas Commission on Environmental Quality
TFS	Texas A&M Forest Service
TMDL	total maximum daily load
TPDES	Texas Pollutant Discharge Elimination System
TPWD	Texas Parks and Wildlife Department
TSSWCB	Texas State Soil and Water Conservation Board
TST	Texas Stream Team
TWRI	Texas Water Resources Institute
TxDOT	Texas Department of Transportation
UA	Urbanized Area

U.S.	United States
USDA	U.S. Department of Agriculture
WLA	wasteload allocation
WQMP	Water Quality Management Plan
WWTF	wastewater treatment facility

Implementation Plan for Five TMDLs for Indicator Bacteria in Hillebrandt Bayou and Neches River Tidal

Executive Summary

On August 11, 2021, the Texas Commission on Environmental Quality (TCEQ) adopted *One Total Maximum Daily Load for Indicator Bacteria in Hillebrandt Bayou* (assessment unit [AU] 0704_02). In 2023, TCEQ will consider the adoption of *Four Total Maximum Daily Loads for Indicator Bacteria in Neches River Tidal* (Segment 0601).

This implementation plan, or I-Plan:

- Describes the steps that watershed stakeholders and TCEQ will take toward achieving the pollutant reductions identified in the total maximum daily load (TMDL) report.
- Outlines the schedule for implementation activities.

The goal of this I-Plan is to restore the primary contact recreation 1 uses in Segments 0601 and 0704 by reducing concentrations of indicator bacteria to levels established in the TMDLs. *Escherichia coli* (*E. coli*) and Enterococci are widely used as indicator bacteria to assess attainment of the contact recreation use—*E. coli* in freshwater and Enterococci in saltwater. The criteria for assessing attainment of the contact recreation use are expressed as the number of bacteria, typically given as colony forming units (cfu). The primary contact recreation 1 use is not attained when the geometric mean of indicator bacteria samples exceeds the geometric mean criterion of 126 cfu per 100 milliliters (mL) for *E. coli* in freshwater or 35 cfu/100 mL for Enterococci in saltwater, including tidal water bodies. Both AU 0704_02 and Segment 0601 are listed as not supporting primary contact recreation 1 uses, because the concentrations of indicator bacteria, *E. coli* for AU 0704_02 and Enterococci for Segment 0601, exceed the use criteria.

This I-Plan includes eight management measures and two control actions that stakeholders will use to reduce indicator bacteria in the Hillebrandt Bayou and Neches River Tidal watersheds. Management measures are related to managing nonpoint sources (mostly unregulated), such as working to identify on-site sewage facilities (OSSFs) in the TMDL watersheds. Control actions are related to point sources (regulated discharges), such as implementing industrial or domestic wastewater treatment facilities (WWTFs) permits and implementing municipal separate storm sewer systems (MS4s) permits with Stormwater Management Programs (SWMPs).

Management Measures and Control Actions

For each of the measures and actions chosen, this plan names the responsible parties, technical and financial needs, monitoring and outreach efforts, and a schedule of activities. Implementation of management measures will be dependent upon the availability of funding. The management measures and control actions in this plan are:

Management Measures

1. Promote and implement Natural Resources Conservation Service conservation plans and Texas State Soil and Water Conservation Board Water Quality Management Plans.
2. Promote effective feral hog management.
3. Promote OSSF management.
4. Reduce sanitary sewer overflows and unauthorized discharges.
5. Promote sustainable forest practices.
6. Promote volunteer water quality monitoring.
7. Implement water quality monitoring.
8. Promote adult and youth watershed education and awareness through education programs and public events.

Control Actions

1. Continue implementation of Phase I MS4 Stormwater Management Programs.
2. Continue implementation of Phase II MS4 Stormwater Management Programs.

The stakeholders and TCEQ will review progress under TCEQ's adaptive management approach. Stakeholders may adjust the plan periodically based on progress reviews.

Introduction

To keep Texas' commitment to restore and maintain water quality in impaired rivers, lakes, and bays, TCEQ works with stakeholders to develop an I-Plan for each adopted TMDL. A TMDL is a technical analysis that:

- Determines the amount of a particular pollutant that a waterbody can receive and still meet applicable water quality standards.
- Sets limits on categories of sources that will result in achieving standards.

This I-Plan is designed to guide activities that will achieve the water quality goals for the Hillebrandt Bayou and Neches River Tidal watersheds as defined in

their respective TMDL reports. It is a flexible tool that governmental and non-governmental organizations involved in implementation use to guide their activities to improve water quality. The participating partners may accomplish the activities described in the plan through rule, order, guidance, or other appropriate formal or informal action.

This I-Plan contains the following components:

- Description of control actions and management measures that will be implemented to achieve the water quality target.
- Schedule for implementing activities.
- The legal authority under which the participating agencies may require implementation of the control actions.
- A follow-up tracking and monitoring plan to determine the effectiveness of the control actions and management measures undertaken.
- Measurable outcomes and other considerations TCEQ and stakeholders will use to decide whether the I-plan has been properly executed, water quality standards are being achieved, or the plan needs to be modified.
- Communication strategies TCEQ will use to share information with stakeholders.
- Review strategy that stakeholders will use to periodically review and revise the plan to ensure progress in improving water quality.

Watershed Overview

Hillebrandt Bayou is in the Neches-Trinity Coastal Basin near the southeast Gulf Coast region. Hillebrandt Bayou begins in the City of Beaumont, approximately 100 meters upstream of State Highway 124 and flows approximately 14.6 miles southeasterly until converging with Taylor Bayou (Figure 1). Hillebrandt Bayou consists of a single classified Segment (0704) and two AUs (0704_01 and 0704_02), of which only AU 0704_02 is impaired for bacteria. The drainage area for the impaired AU 0704_02 is 36.02 square miles (23,053.76 acres) and is located entirely in Jefferson County.

The Neches River Tidal watershed is in the Neches River Basin along the East Texas Gulf Coast (Figure 2). The Neches River Tidal flows approximately 30 stream miles, along the boundary between Jefferson and Orange counties, from the Neches River Saltwater Barrier into Sabine Lake. Neches River Tidal consists of a single Segment (0601) and four AUs (0601_01, 0601_02, 0601_03, and 0601_04). The total watershed area for Neches River Tidal is 210.75 square miles (134,881 acres).

The 2020 Texas Integrated Report (TCEQ, 2020) provides the following segment and AU descriptions for the water bodies considered in this document:

- Segment 0704 (Hillebrandt Bayou) – From the confluence of Taylor Bayou in Jefferson County to a point 100 meters (110 yards) upstream of State Highway 124 in Jefferson County.
  - AU 0704_02 - From the confluence with Willow Marsh Bayou (0704A) upstream to a point 100 meters (110 yards) upstream of State Highway 124 in Jefferson County.
- Segment 0601 (Neches River Tidal) – From the confluence with Sabine Lake in Orange County to the Neches River Saltwater Barrier, which is at a point 0.8 kilometers (0.5 miles) downstream of the confluence of Pine Island Bayou, in Orange County.
  - AU 0601_04 – Top of last oxbow below Kansas City Southern Railroad bridge to saltwater barrier at National Hydrography Dataset reach code 12020003000017.
  - AU 0601_03 – Top of U.S. National Defense Reserve Fleet Basin to top of last oxbow below Kansas City Southern Railroad bridge 0.44 kilometers upstream of National Hydrography Dataset reach code 12020003000013.
  - AU 0601_02 – Top of first oxbow to top of United States (U.S.) National Defense Reserve Fleet Basin at top of National Hydrography Dataset reach code 12020003008459.
  - AU 0601_01 – Lower boundary to top of first oxbow, above Bird Island Bayou confluence at National Hydrography Dataset reach code 12020003000004.

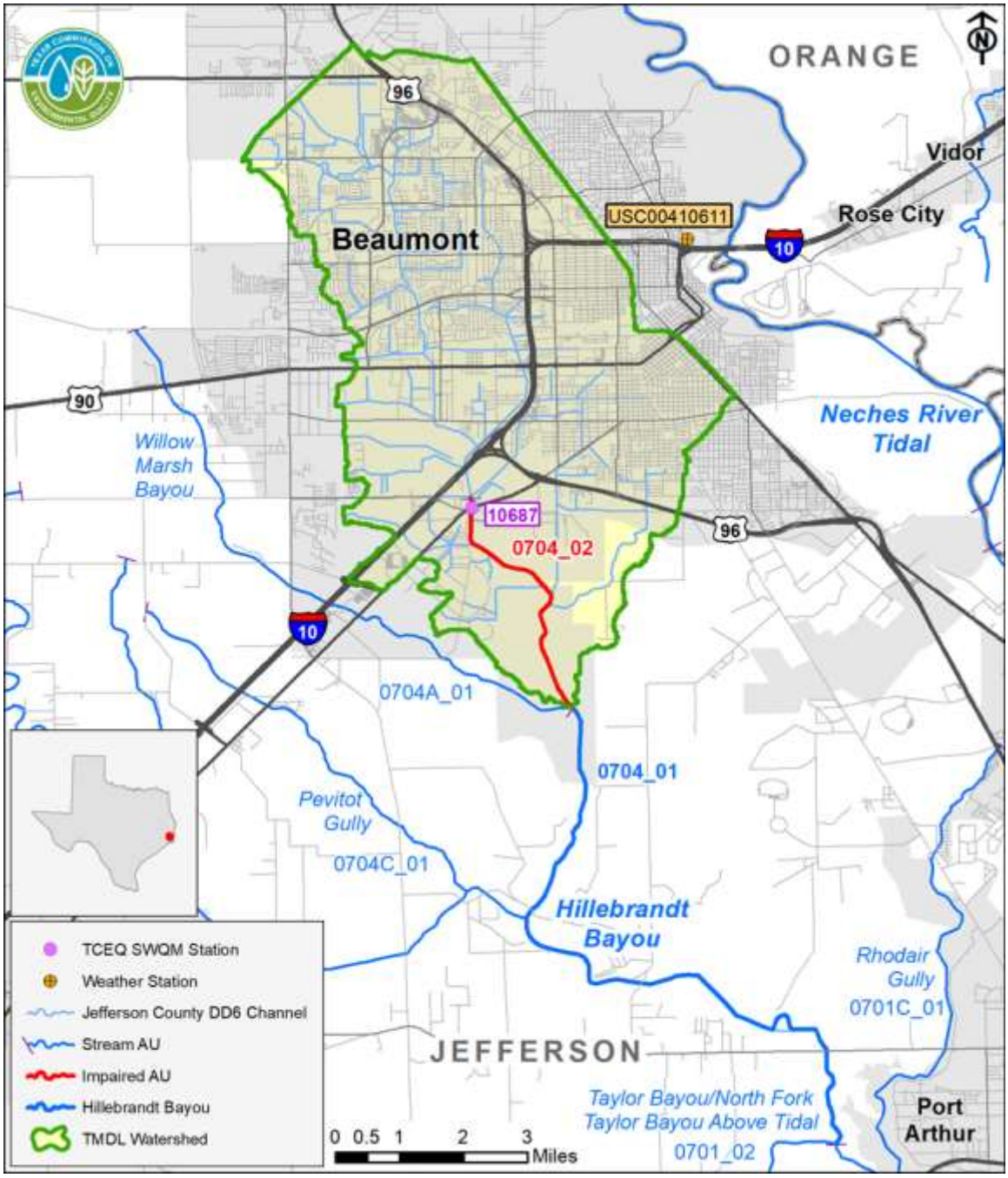

Figure 1. Map of the Hillebrandt Bayou TMDL watershed

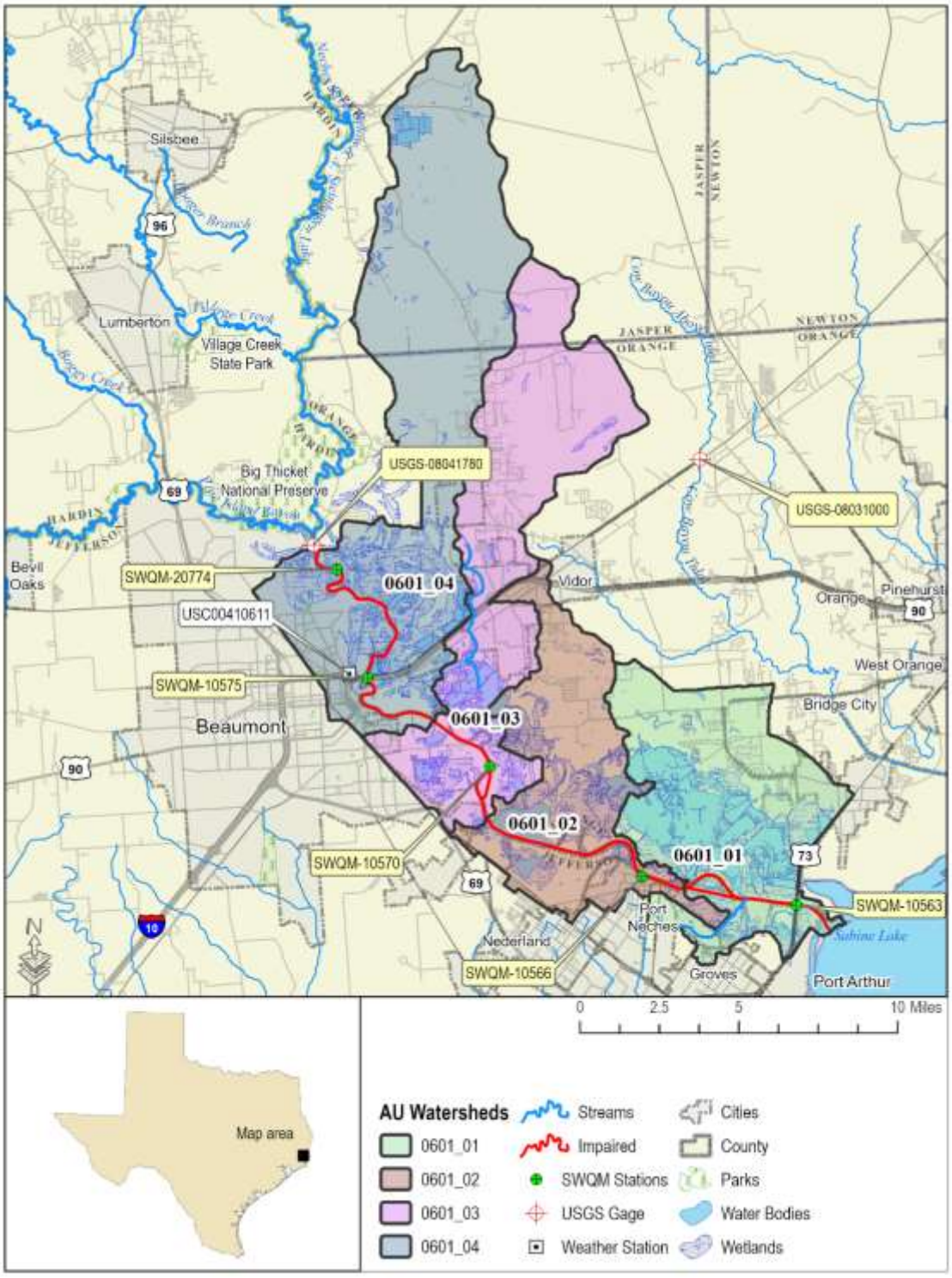

Figure 2. Map of the Neches River Tidal TMDL watersheds

Summary of TMDLs

Table 1 summarizes the allocations developed for *One Total Maximum Daily Loads for Indicator Bacteria in Hillebrandt Bayou* and *Four Total Maximum Daily Loads for Indicator Bacteria in Neches River Tidal*. See the TMDL reports for additional background information including the problem definition, endpoint identification, source analysis, linkages between sources and receiving waters, and pollutant load allocations.

Table 1. TMDL Allocation Summary

AU	Segment Name	TMDL	MOS[a]	WLA_{WWTF}[b]	WLA_{SW}[c]	LA[d]	FG[e]
0704_02	Hillebrandt Bayou	2,101.907	105.095	0	1,856.664	53.484	86.664
0601_04	Neches River Tidal	21,974.371	1,098.719	86.148	4,236.648	16,531.233	21.623
0601_03	Neches River Tidal	22,231.261	1,111.563	117.946	4,907.483	16,064.665	29.604
0601_02	Neches River Tidal	22,841.803	1,142.090	124.544	5,450.609	16,093.300	31.260
0601_01	Neches River Tidal	24,760.772	1,238.039	144.417	5,438.702	17,903.365	36.249

All loads for the Hillebrandt Bayou are expressed in billion cfu/day *E. coli* and billion cfu/day Enterococci for Neches River Tidal

[a]MOS: margin of safety

[b]WLA_{WWTF}: wasteload allocation for WWTFs

[c]WLA_{SW}: wasteload allocation for stormwater

[d]LA: load allocation

[e]FG: future growth

Implementation Strategy

This I-Plan documents eight management measures and two control actions to reduce bacteria loads. Stakeholders selected management measures based on feasibility, costs, support, and timing. Activities may be phased in based on the needs of the stakeholders, availability of funding, and the progress made in improving water quality.

Adaptive Implementation

All I-Plans use an adaptive management approach in which stakeholders periodically assess measures for efficiency and effectiveness. This adaptive management approach is one of the crucial elements of the I-Plan. The iterative process of evaluation and adjustment ensures continuing progress toward

achieving water quality goals and expresses stakeholder commitment to the process.

The stakeholders will periodically assess progress using the schedule of implementation, interim measurable milestones, water quality data, and the communication strategy included in this plan. If stakeholders find that there has been insufficient progress or that implementation activities have improved water quality, the implementation strategy can be adjusted.

Activities and Milestones

The Texas Water Resources Institute (TWRI), in coordination with the TCEQ, facilitated stakeholder participation in the development of this I-Plan. With guidance from TWRI and TCEQ, the Hillebrandt Bayou and Neches River Tidal stakeholders formed a Coordination Committee to determine management measures and control actions along with activities and schedules to accomplish them. Collectively, the Hillebrandt Bayou and Neches River Tidal Coordination Committee held nine meetings to develop this I-Plan.

The Coordination Committee developed detailed, consensus-based measures. The following sections describe the planned implementation activities.

Management Measures and Control Actions

This I-Plan includes eight management measures and two control actions.

Management Measures

1. Promote and implement Natural Resources Conservation Service conservation plans and Texas State Soil and Water Conservation Board Water Quality Management Plans.
2. Promote effective feral hog management.
3. Promote OSSF management.
4. Reduce sanitary sewer overflows and unauthorized discharges.
5. Promote sustainable forest practices.
6. Promote volunteer water quality monitoring.
7. Implement water quality monitoring.
8. Promote adult and youth watershed education and awareness through education programs and public events.

Control Actions

1. Continue implementation of Phase I MS4 Stormwater Management Programs.
2. Continue implementation of Phase II MS4 Stormwater Management Programs.

Management Measure 1

Promote and implement Natural Resources Conservation Service conservation plans and Texas State Soil and Water Conservation Board Water Quality Management Plans.

Grazed pastures and rangeland can contribute to bacteria loadings across the watersheds. Wagner (2013) found that *E. coli* concentrations in runoff from grazed lands were up to 70% higher compared to ungrazed sites. While the fate and transport of fecal bacteria deposited on upland surfaces is not always certain, practices that manage livestock behavior and time spent grazing, particularly in riparian pastures, can reduce potential bacteria loads reaching nearby water bodies.

Promoting and implementing Water Quality Management Plans (WQMPs) and conservation plans is anticipated to provide direct benefits to water quality and can provide benefits to producers. Several best management practices (BMPs) are available to achieve goals of improving forage quality, distributing livestock across a property, and making water available to livestock. Table 2 provides a list of common practices available to producers. Note that available BMPs are not limited to those in the table and the scope and type of BMPs implemented will vary by operation. In addition to reducing bacteria loads reaching waterways, these practices can reduce erosion, sediment loads, and nutrient loads.

The U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) and the Texas State Soil and Water Conservation Board (TSSWCB) give technical and financial assistance to producers for planning and implementing BMPs that protect and improve water quality. NRCS offers a variety of programs to implement operation-specific conservation plans that will meet producer goals and outline how BMPs will be implemented. TSSWCB, through local Soil and Water Conservation Districts (SWCDs), gives technical and financial assistance to develop and implement WQMPs through planning, implementation, and maintenance of each practice.

Table 2. NRCS conservation practices for producers that can improve water quality

Practice	NRCS code	Focus area or benefit
Brush management	314	Livestock, water quality, water quantity, wildlife
Fencing	382	Livestock, water quality
Filter strips	393	Livestock, water quality, wildlife
Grade stabilization structures	410	Water quality
Grazing land mechanical treatment	548	Livestock, water quality, wildlife
Heavy use area protection	562	Livestock, water quantity, water quality
Pond	378	Livestock, water quantity, water quality, wildlife
Prescribed burning	338	Livestock, water quality, wildlife
Prescribed grazing	528	Livestock, water quality, wildlife
Range/pasture planting	550/512	Livestock, water quality, wildlife
Shade structure	NA	Livestock, water quality, wildlife
Stream crossing	578	Livestock, water quality
Supplemental feed location	NA	Livestock, water quality
Water well	642	Livestock, water quality, wildlife
Watering facility	614	Livestock, water quality

The goal of this management measure is to promote BMP implementation in about 50% of the cattle farms in either TMDL watershed. Of all livestock, cattle were estimated to be the major contributors of bacteria loading in the two TMDL watersheds (Table 3). Based on USDA (2019) agricultural census data, there are approximately 14 and 168 cattle farms in the Hillebrandt Bayou and Neches River Tidal watersheds, respectively. Therefore, over the next ten years, the I-Plan targets implementing one conservation plan or WQMP in the Hillebrandt Bayou watershed per year and eight plans per year in the Neches River Tidal watershed.

Table 3. Estimates of *E. coli* and Enterococci loads from livestock

Livestock	Population estimates	Annual loading of indicator bacteria (billion cfu/year)	% of Total
Hillebrandt Bayou Watershed			
Cattle	661	1,300,000 *E. coli*	95%
Goats and Sheep	14	13,900 *E. coli*	1%
Hogs and Pigs	9	50,300 *E. coli*	4%
Horses	17	1,420 *E. coli*	0%
Total		**1,365,620 *E. coli***	
Neches River Tidal Watershed			
Cattle	3,010	1,640,000 Enterococci	86%
Goats and Sheep	263	72,500 Enterococci	4%
Hogs and Pigs	123	191,000 Enterococci	10%
Horses	228	5,300 Enterococci	0%
Total		**1,908,800 Enterococci**	

Education Component

Education is one of the most important components of this management measure. An intensive education and outreach program is needed to broadly promote the adoption of management practices through the appropriate programs. Awareness of the TSSWCB and NRCS programs, management practices, and their benefits is often one of the largest factors affecting the adoption of BMPs. Existing educational programs specific to landowner interests should also be used in the education and outreach campaign to further promote the adoption of BMPs. These educational resources include the Lone Star Healthy Streams Program and the Texas Riparian and Stream Ecosystem Education Program. Local AgriLife Extension offices and SWCDs work to locally promote and deliver these programs.

Priority Areas

The greatest impact of this measure will be limiting the direct deposition of fecal waste in or near water bodies. Most of the cattle farms are in the rural portions of the TMDL watersheds (Figure 3). Responsible parties for this measure will prioritize voluntary practices that limit livestock access to streams by supplying alternative watering systems and excluding livestock from streamside buffers.

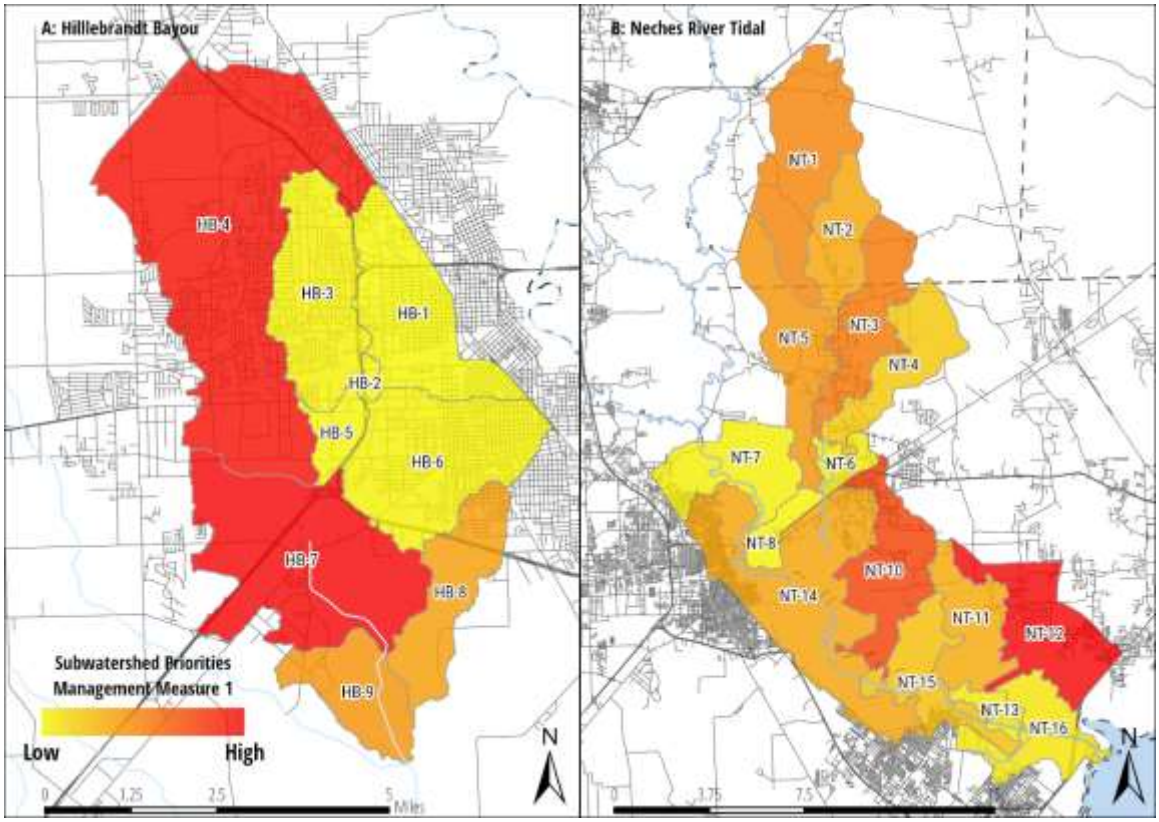

Figure 3. Subwatershed priorities based on *E. coli* and Enterococci loading potential from cattle

Responsible Parties and Funding

Each organization listed below will be responsible only for expenses associated with its efforts and as funds become available.

- **Landowners and producers:** Landowners and producers will work with NRCS and SWCDs as appropriate to develop conservation plans or WQMPs and obtain funding to implement BMPs according to the site-specific plans.
- **Texas A&M AgriLife Extension Service:** The Texas A&M AgriLife Extension Service (AgriLife Extension) will work with NRCS, SWCDs, and TSSWCB to deliver outreach, education, and extension materials, workshops, and field days.
- **TSSWCB:** TSSWCB will work with NRCS and SWCDs to fund and hire a field technician to facilitate the development and implementation of conservation plans and WQMPs. TSSWCB is also responsible for oversight of the WQMP program.
- **SWCDs:** A SWCD, like a county or school district, is a subdivision of state government. SWCDs are administered by boards of directors who are elected by their fellow landowners. There are 216 individual SWCDs organized in Texas. The TMDL watersheds are covered by the Coastal #432 and Lower Sabine Neches #446 SWCDs. The SWCDs will work with TSSWCB

and NRCS to develop and implement conservation plans or WQMPs. The districts will also work with other entities in the delivery of outreach and extension materials, workshops, and field days.

- **USDA NRCS:** NRCS will work with landowners/producers and SWCDs to develop and implement conservation plans or WQMPs. NRCS will also work with entities in the delivery of outreach and extension materials, workshops, and field days.

Technical Assistance

Developing and implementing practices to reduce runoff from agricultural lands requires substantial technical expertise. Producers can obtain technical assistance from local SWCDs, local NRCS offices, and local AgriLife Extension offices. Producers that request planning assistance will work with the local SWCD and NRCS offices to define operation-specific management goals and objectives and develop a management plan that prescribes effective practices that will achieve stated goals while also improving water quality.

Financial Assistance

This I-Plan targets the adoption and implementation of a total of 90 conservation plans and five education programs over ten years. Table 4 shows the funding requirements for implementing Management Measure 1. The funding needed for education or outreach programs was estimated using an average cost of $50,000 per program. The annual salary, benefits, and additional costs associated with a field technician are estimated at approximately $75,000 per year. The cost of on-farm practices can vary substantially, depending on the specific suite of practices adopted by the producer. For this plan, TWRI estimates the cost associated with each plan at $15,000. Several cost-share programs are available to producers that incentivize the planning and implementation of these practices.

Table 4. Estimated funding needed for implementing Management Measure 1

Description	Item	Unit	Rate	Amount
Field technician for developing WQMPs	10	Years	$ 75,000	$ 750,000
Educational programs	5	No.	$ 50,000	$ 250,000
WQMP implementation	90	No.	$ 15,000	$ 1,350,000
			Total	**$ 2,350,000**

Potential funding sources are detailed below:

- **WQMP Program:** WQMPs are property-specific plans that outline the BMPs most appropriate to improve the quality of land and water on the property. The TSSWCB may provide financial assistance to private property owners in implementing individual WQMPs, as funding allows.

- **Clean Water Act Section 319(h) Nonpoint Source Grant Program:** This U.S. Environmental Protection Agency (EPA) grant program, administered by TCEQ and TSSWCB, provides funding for implementation of nonpoint source management measures. The funds require a 40% match and may be used to support education programs, watershed implementation, and technicians.
- **Sustainable Agriculture Research and Education:** Sustainable Agriculture Research and Education (SARE) provides grants and educational programs to advance agricultural innovation which promotes profitability, stewardship of the land, air, and water, and quality of life for farmers, ranchers, and their communities. Southern SARE is the regional component that includes Texas and grants go towards land, crop, and livestock management.
- **USDA Conservation Innovation Grants:** The USDA Conservation Innovation Grants (CIG) is a voluntary program intended to stimulate the development and adoption of innovative conservation approaches and technologies while leveraging Federal investment in environmental enhancement and protection, in conjunction with agricultural production. Under CIG, Environmental Quality Incentives Program (EQIP) funds are used to award competitive grants to non-federal governmental or non-governmental organizations, tribes, or individuals.
- **NRCS Agricultural Management Assistance:** The Agriculture Management Assistance program of the NRCS helps agriculture producers use conservation to manage risk and solve natural resource issues through natural resources conservation.
- **NRCS Conservation Stewardship Program:** The Conservation Stewardship Program (CSP) helps agricultural producers maintain and improve their existing conservation systems and adopt additional conservation activities to address priority resource concerns. Participants earn CSP payments for conservation performance — the higher the performance, the higher the payment.
- **NRCS EQIP:** EQIP is a voluntary program that provides financial and technical assistance to agricultural producers through contracts up to a maximum term of ten years. These contracts provide financial assistance to help plan and implement conservation practices that address natural resource concerns and for opportunities to improve soil, water, plant, animal, air, and related resources on agricultural land and non-industrial private forestland. An additional purpose of EQIP is to help producers meet federal, state, tribal, and local environmental regulations.
- **NRCS Regional Conservation Partnership Program:** The Regional Conservation Partnership Program (RCPP) is a new, comprehensive, and flexible program that uses partnerships to stretch and multiply conservation investments and reach conservation goals on a regional or watershed scale. Through RCPP, the NRCS and state, local, and regional partners coordinate resources to help producers install and maintain

conservation activities in selected project areas. Partners leverage RCPP funding in project areas and report on the benefits achieved.

- **EPA Environmental Education Grants:** Under the Environmental Education Grant Program, EPA seeks grant proposals from eligible applicants to support environmental education projects that promote environmental stewardship and help develop knowledgeable and responsible students, teachers, and citizens. This grant program provides financial support for projects that design, demonstrate, and/or disseminate environmental education practices, methods, or techniques as described in their Requests for Proposals.

Measurable Milestones

Contingent upon the receipt of proposed project funding, the measurable milestones are as follows.

- Number of WQMPs and conservation plans developed.
- Number of acres in conservation plans developed.
- Number of AgriLife Extension, outreach, or education programs delivered.

Monitoring Component

AgriLife Extension, NRCS, SWCDs, and TSSCWB will work with local stakeholders to monitor and track the implementation of BMPs, workshops, field days, and extension programs delivered, and document the implementation status annually.

Implementation Schedule

The implementation schedule is as follows. Contingent upon the receipt of proposed project funding, the responsible parties as identified above will:

Year 1:

- Secure funding for a field technician to develop conservation plans and WQMPs.
- Deliver a Lone Star Healthy Streams workshop, or related workshop or field day event.
- Develop nine WQMPs or conservation plans in the TMDL watersheds.

Year 2:

- Maintain funding for the field technician developing conservation plans and WQMPs.
- Develop nine WQMPs or conservation plans in the TMDL watersheds.

Year 3:

- Maintain funding for the field technician developing conservation plans and WQMPs.

- Deliver a Lone Star Healthy Streams workshop, or related workshop or field day event.
- Develop nine WQMPs or conservation plans in the TMDL watersheds.

Year 4:

- Maintain funding for the field technician developing conservation plans and WQMPs.
- Develop nine WQMPs or conservation plans in the TMDL watersheds.

Year 5:

- Maintain funding for the field technician developing conservation plans and WQMPs.
- Deliver a Lone Star Healthy Streams workshop, or related workshop or field day event.
- Develop nine WQMPs or conservation plans in the TMDL watersheds.
- Assess overall progress and if necessary, modify existing efforts or develop a new strategy for implementation.

Year 6:

- Maintain funding for the field technician developing conservation plans and WQMPs.
- Develop nine WQMPs or conservation plans in the TMDL watersheds.

Year 7:

- Maintain funding for the field technician developing conservation plans and WQMPs.
- Deliver a Lone Star Healthy Streams workshop, or related workshop or field day event.
- Develop nine WQMPs or conservation plans in the TMDL watersheds.

Year 8:

- Maintain funding for the field technician developing conservation plans and WQMPs.
- Develop nine WQMPs or conservation plans in the TMDL watersheds.

Year 9:

- Maintain funding for the field technician developing conservation plans and WQMPs.
- Develop nine WQMPs or conservation plans in the TMDL watersheds.

Year 10:

- Maintain funding for the field technician developing conservation plans and WQMPs.

- Deliver a Lone Star Healthy Streams workshop, or related workshop or field day event.
- Develop nine WQMPs or conservation plans in the TMDL watersheds.
- Assess overall progress and if necessary, modify existing efforts or develop a new strategy for implementation.

Estimated Load Reductions

The following equation was used to estimate the potential annual load reduction of *E. coli* and Enterococci (billion cfu/year) from implementation of conservation plans and WQMPs:

$$Load_{cattle} = N_{plans} \times Head/Operation \times Animal\ Unit\ Conversion \times FC_{cattle} \times Conversion_{bac} \times Median\ Efficacy \times Prox \times 365\ days/year$$

Where:

$Load_{cattle}$ = Potential annual load reduction of *E. coli* attributed to cattle

N_{plans} = Number of conservation plans or WQMPs developed and implemented (1 per year in Hillebrandt Bayou and 8 per year in Neches River Tidal)

Head/Operation = Average number of head of cattle per operation in Jefferson, Orange, and Jasper counties (approximately 47 and 18 in Hillebrandt Bayou and Neches River Tidal watersheds, respectively)

Animal Unit Conversion = Cattle to animal unit conversion factor, assumed to be one (Wagner and Moench, 2009)

FC_{cattle} = Fecal coliform produced per animal unit per day; 8.55 billion cfu/day (Wagner and Moench, 2009)

$Conversion_{bac}$ = Conversion rate of .63 from fecal coliform to *E. coli* and .175 from fecal coliform to Enterococci (Borel et al. 2015)

Median Efficacy = Median efficacy of selected conservation practices at reducing bacteria loads (.58 used, see Table 5)

Prox = Approximate proximate factor to account for distance of management practices from riparian areas (.15 used, see below)

The effectiveness of WQMPs and conservation plans at reducing bacteria loads is highly dependent on the specific conservation practices installed by the rancher or farmer. To estimate expected *E. coli* and Enterococci reductions, efficacy values of likely BMPs were calculated from median literature reported values. Because the actual BMPs implemented per WQMP or conservation plan are unknown, an overall median efficacy value of 58% was used to calculate load

reductions (Table 5). The proximity of implemented BMPs to water bodies will influence the effectiveness of reducing loads. Typically, a proximity factor of 5% is used for BMPs in upland areas and 25% is used in riparian areas (Escamilla et al. 2019). Since there is uncertainty in both the selection of specific BMPs and the locations where plans are implemented, an average proximity factor of 15% was used.

Table 5. Summary of literature reported values for conservation practice effectiveness in reducing indicator bacteria loads

Management practice	Median *E. coli* removal efficacy
Exclusionary fencing	62% [1]
Prescribed grazing	54% [2]
Stream crossing	48% [3]
Watering facility	73% [4]
Overall median	**58%**

[1] Median of reported reductions in the following: Brenner et al. (1996); Cook (1998); Hagedorn et al. (1999); Line (2002); Line (2003); Lombardo et al. (2000); Meals (2001); Meals (2004); Peterson et al. (2011).

[2] Median of reported reductions in the following: Tate et al. (2004); EPA (2010).

[3] Median of reported reductions in the following: Inamdar et al. (2002); Meals (2001).

[4] Median of reported reductions in the following: Byers et al. (2005); Hagedorn et al. (1999); Sheffield et al. (1997).

Potential load reductions of about 8,039 billion cfu of *E. coli* and 6,842 billion cfu of Enterococci per year for Hillebrandt Bayou and Neches River Tidal watersheds, respectively, are estimated.

Table 6. Management Measure 1: Promote and Implement NRCS conservation plans and TSSWCB Water Quality Management Plans

Causes and Sources: Fecal deposition from livestock in pastures, rangeland, and in streams, and runoff from manure applied to cropland

Potential Load Reduction	Technical and Financial Assistance	Education Component	Schedule of Implementation	Interim, Measurable Milestones	Indicators of Progress	Monitoring Component	Responsible Parties
AU 0704_02 8,039 billion cfu/year of *E. coli* and Segment 0601 6,842 billion cfu/year of Enterococci	**Technical:** ▪ Assistance for producers and landowners is available through local SWCDs, NRCS, and county AgriLife Extension offices. **Financial:** ▪ Funding for the field technician at approximately $75,000 per year. ▪ About $50,000 per education or outreach program per year. ▪ Funding for each WQMP at approximately $15,000. ▪ Funding requirements for conservation plans vary substantially based on landowner production goals.	▪ An intensive education and outreach program is needed to broadly promote the adoption of BMPs through appropriate programs such as Lone Star Healthy Streams and Texas Riparian and Stream Ecosystem Education Program.	**Year 1:** ▪ Secure funding for a field technician to develop conservation plans and WQMPs. ▪ Deliver an education, outreach, or extension event. ▪ Develop nine WQMPs or conservation plans. **Years 2, 4, 6, 8, 9:** ▪ Maintain funding for the field technician developing conservation plans and WQMPs. ▪ Develop nine WQMPs or conservation plans annually. **Years 3, 7:** ▪ Maintain funding for the field technician developing conservation plans and WQMPs. ▪ Deliver an education, outreach, or extension event. ▪ Develop nine WQMPs or conservation plans annually. **Years 5, 10:** ▪ Maintain funding for the field technician developing conservation plans and WQMPs. ▪ Deliver an education, outreach, or extension event. ▪ Develop nine WQMPs or conservation plans annually. ▪ Assess progress, and if necessary, modify existing efforts or develop a new strategy for implementation.	▪ Number of WQMPs and conservation plans developed. ▪ Number of acres in conservation plans. developed. ▪ Number of AgriLife Extension outreach, or educational programs delivered.	**Years 1-10** ▪ Nine WQMPs or conservation plans developed annually. **Years 1, 3, 5, 7, 10** ▪ Five educational programs held.	▪ AgriLife Extension, NRCS, SWCDs and TSSCWB working with local stakeholders will monitor and track the implementation of BMPs, workshops, field days, and extension programs delivered and document the implementation status annually.	▪ Landowners and producers ▪ AgriLife Extension ▪ TSSWCB ▪ USDA NRCS ▪ SWCDs

Management Measure 2

Promote effective feral hog management.

Fecal matter deposited directly in streams by feral hogs contributes bacteria and nutrients to the state's water bodies. In addition, extensive rooting activities of feral hogs can cause erosion and soil loss.

While the complete eradication of feral hogs from the TMDL watersheds is not feasible, a variety of methods are available to manage populations. Stakeholders have recommended that governmental agencies and others undertake efforts to control feral hogs to reduce their population, limit their spread, and minimize the effects on water quality. AgriLife Extension (2012) estimated that 66% of feral hogs need to be managed annually to keep the population stable with no increase.

Currently, feral hog trapping is the responsibility of individual landowners. Given resource constraints, reliance on landowners to conduct the majority of feral hog trapping is likely to remain. As resources allow, professional trapping services and equipment programs can be provided to local stakeholders.

The promotion and implementation of BMPs focused on managing the feral hog populations within priority subwatersheds can lead to instream water quality improvements by minimizing fecal deposition.

The goal of this management measure is to manage 60% of the feral hog population in the TMDL watersheds.

Education Component

Education is one of the most important components of this management measure. An intensive education and outreach program is needed to broadly promote the adoption of management practices. A targeted education and outreach campaign will provide multiple educational opportunities to stakeholders. Educational materials will be developed and tailored to local conditions and broadcasted throughout the TMDL watersheds. Existing feral hog management workshops will also be used in the education and outreach campaign.

Priority Areas

Feral hogs occupy and exploit a wide variety of habitats, and as shown in Figure 4, their loading potential is widespread. However, hogs will often congregate in high concentrations in areas where food is readily available, such as crop fields or forested areas with mast-producing trees. Feral hogs also congregate in riparian areas and muddy wetland habitats where they like to wallow around to keep cool. The largest population of hogs is located in the Neches River Tidal

watershed (Table 7) which, compared to the predominantly urban Hillebrandt Bayou watershed, has large areas of habitats suitable for feral hogs.

Table 7. Estimates of indicator bacteria loads from feral hogs

Watershed	Hillebrandt Bayou	Neches River Tidal
Feral hog population estimate	170	2,334
Indicator bacteria	*E. coli*	Enterococci
Annual indicator bacteria load (billion cfu/year)	5,913	22,549

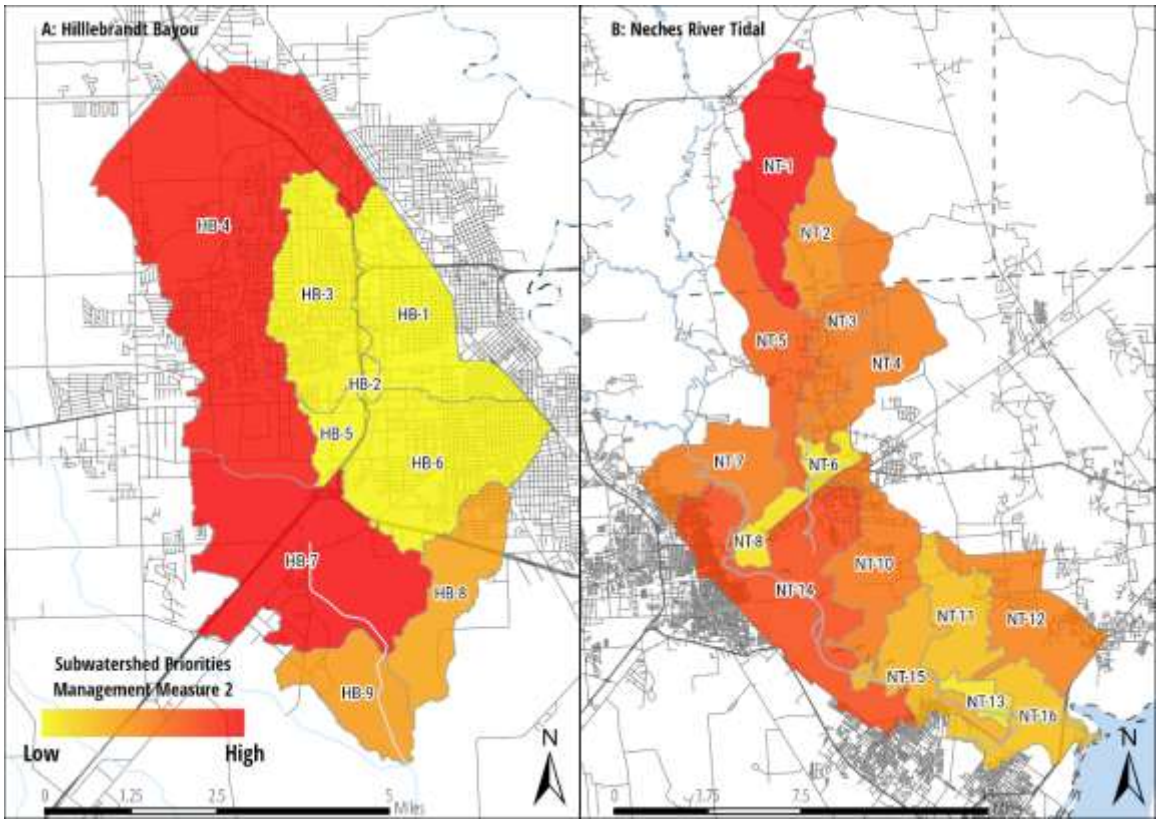

Figure 4. Subwatershed priorities based on *E. coli* and Enterococci loading potential from feral hogs

Responsible Parties and Funding

Each organization listed below will be responsible only for expenses associated with its efforts and as funds become available.

- **Local stakeholders:** Landowners are responsible for trapping feral hogs on private property. Stakeholders will take advantage of services provided by AgriLife Extension by requesting feral hog management workshops for landowners, local governments, and other interested individuals as appropriate. As resources allow, regional or county trapping services may

be made available for local landowners to trap feral hogs and track feral hogs removed more efficiently.

- **Jefferson County and Orange County Extension Offices:** The extension offices will work with other stakeholders or entities to deliver feral hog management education and outreach workshops.
- **AgriLife Extension:** AgriLife Extension will work with local stakeholders to deliver feral hog management workshops.

Technical Assistance

Numerous resources are available to assist landowners and managers to control feral hog populations. AgriLife Extension offers technical materials and workshops on feral hog identification, impacts, and control methods. Similar resources are available through the USDA Animal and Plant Health Inspection Services. Texas Parks and Wildlife Department (TPWD) offers general information about identification, trapping, hunting, and regulations regarding the removal of feral hogs.

Financial Assistance

Table 8 shows the estimated costs of activities to implement for managing feral hog populations in the TMDL watersheds. Feral hog management workshops are estimated to cost approximately $2,500 per workshop. The cost will vary depending on anticipated attendance, speaker and travel costs, and venue fees.

Annual costs associated with funding a feral hog trapper and associated equipment is estimated at $95,000 per year. These costs may vary depending on whether a full or part-time trapper is employed.

Currently, funding for feral hog management activities is limited primarily to non-federal and non-state funding sources. Therefore, funding for trapper activities will rely primarily on local funds.

Table 8. Estimated funding for implementing Management Measure 2

Description	Item	Unit	Rate	Amount
Funding for a feral hog trapper and associated equipment	10	Years	$ 95,000	$ 950,000
Feral hog workshops	5	No.	$ 2,500	$ 12,500
			Total	**$ 962,500**

Potential funding sources include:

- **Clean Water Act Section 319(h) Nonpoint Source Grant Program:** This EPA grant program, administered by TCEQ and TSSWCB, provides funding

for implementation of nonpoint source management measures. The funds require a 40% match and may be used to fund feral hog education workshops and outreach programs.

- **Local Funds:** Local funds include funds or eligible in-kind resources provided by local entities, such as county and municipal governments, local agencies, non-governmental organizations, volunteer groups, or individuals. While financial resources are typically considered, volunteer or staff time can be leveraged as eligible cost-share for many state and federal grant programs that require some type of cost-share. Local funds are anticipated to be the primary avenue of funding trappers.

Measurable Milestones

Contingent upon the receipt of proposed project funding, the measurable milestones are as follows.

- Estimated number of feral hogs managed from the TMDL watersheds on an annual basis.
- Number of education programs delivered.
- Estimated number of individuals reached.

Monitoring Component

Local stakeholders are primarily responsible for feral hog management. However, no mechanisms exist for tracking watershed-wide feral hog management at this time. Although some efforts in the past have attempted to track these numbers, they have failed to gain traction. As funds allow, trapping programs will be used to track feral hogs removed. AgriLife Extension will track delivery of feral hog programs.

Implementation Schedule

The implementation schedule is as follows. Contingent upon the receipt of proposed project funding, the responsible parties as identified above will:

Years 1-10:

- Deliver a minimum of five feral hog management workshops.
- Promote feral hog management by volunteer hunting or trapping.
- Explore funding for feral hog trappers and equipment as needed.

Years 5, 10:

- Assess overall progress and if necessary, change existing efforts or develop a new strategy for implementation.

Estimated Load Reductions

Load reductions resulting from feral hog management are highly uncertain. According to AgriLife Extension (2012), approximately 60% of the population must be managed to maintain current population levels. Therefore, the I-Plan target is to remove about 10 feral hogs from the Hillebrandt Bayou watershed and 140 from the Neches River Tidal watershed each year over a period of 10 years.

Populations are highly mobile and will travel in and out of watersheds, making it difficult to estimate changes in local populations. Therefore, overall load reductions resulting from feral hog management are not calculated in the plan. The plan estimates that a single feral hog has a loading potential of approximately 34.8 billion cfu/year of *E. coli* and 9.7 billion cfu/year of Enterococci in Hillebrandt Bayou watershed and Neches River Tidal watershed, respectively. Therefore, any efforts to maintain or reduce local feral hog populations will either reduce future increases in bacteria loadings or decrease existing loads by the loading potential indicated above.

The following equation was used to estimate the loading potential of a feral hog, and the assumed potential avoided load from removing a single feral hog:

$$Load_{fh} = N_{fh} \times Animal\ Unit\ Conversion \times FC_{fh} \times Conversion \times 365\ days/year$$

Where:

$Load_{fh}$ = Potential annual load reduction of *E. coli* attributed to removal of one feral hog (in units of billion cfu/year)

N_{fh} = Number of feral hogs removed

Animal Unit Conversion = Feral hog to animal unit conversion factor, assumed to be .125 (Wagner & Moench, 2009)

FC_{fh} = Fecal coliform produced per animal unit per day; 1.21 billion cfu/day (Wagner & Moench, 2009)

Conversion = Conversion rates of .63 from fecal coliform to *E. coli* and .173 from fecal coliform to Enterococci (Borel et al. 2015)

Table 9. Management Measure 2: Promote effective feral hog management

Causes and Sources: Fecal deposition from feral hogs directly into streams and in riparian habitats.

Potential Load Reduction	Technical and Financial Assistance	Education Component	Schedule of Implementation	Interim, Measurable Milestones	Indicators of Progress	Monitoring Component	Responsible Parties
AU 0704_02 34.8 billion cfu/year of *E. coli* per feral hog removed. and Segment 0601 9.7 billion cfu/year of Enterococci per feral hog removed.	**Technical:** ▪ Resources for landowners about feral hog management techniques are available through AgriLife Extension, USDA Animal and Plant Health Inspection Services, and TPWD. **Financial:** ▪ Salary and costs associated with a trapper are estimated at $95,000 per year. ▪ Feral hog workshops are estimated at $2,500 per program.	▪ Responsible parties will deliver five feral hog management educational events or extension programs.	**Years 1-10:** ▪ Deliver a minimum of five feral hog management workshops. ▪ Promote the feral hog management by volunteer hunting or trapping. ▪ Explore funding for feral hog trappers and equipment as needed. **Years 5, 10:** ▪ Assess overall progress and if necessary, modify existing efforts or develop a new strategy for implementation.	▪ Estimated number of feral hogs managed annually. ▪ Number of educational programs delivered. ▪ Estimated number of people reached.	▪ Number of education programs delivered. ▪ On average, an estimated 150 feral hogs managed annually. ▪ A stable or increased number of people reached by education programs annually.	▪ AgriLife Extension will track programs delivered. ▪ As funds allow, trapping programs will be used to track feral hogs removed.	▪ Local stakeholders ▪ Jefferson and Orange County Extension Offices ▪ AgriLife Extension

Management Measure 3

Promote OSSF management.

Failing private residential OSSFs, commonly referred to as septic systems, have been known to contribute to bacteria impairments in surface water. Several pathways of the liquid waste in OSSFs afford opportunities for bacteria to enter ground and surface waters if the OSSF is malfunctioning. Lack of routine maintenance, aging of OSSFs, improper use of OSSFs, and inappropriate designs are some of the reasons that lead OSSFs to fail. When properly designed and operated, OSSFs contribute virtually no fecal bacteria to surface waters (Weiskel et. al 1996).

The exact number of failing systems is unknown, but studies estimate that approximately 12% of systems in the TMDL watersheds are expected to be in failing condition (Reed, Stowe, and Yanke 2001). With an estimated four OSSFs in the Hillebrandt Bayou watershed and 4,059 OSSFs in the Neches River Tidal watershed (Schramm & Jha, 2020a, 2020b), an estimated 486 malfunctioning OSSFs need to be managed. While some systems can be treated and repaired, some may need to be redesigned and replaced. However, homeowners must have the awareness and resources to address OSSF problems when they arise.

The goal of this management measure is to promote OSSF management in the TMDL watersheds by delivering OSSF operation and maintenance (O&M) workshops and repair and replace 130 OSSFs to minimize potential water quality impacts.

Education Component

Education and outreach for OSSFs will be targeted to both homeowners and local officials. Local officials can set up mechanisms that will mitigate pollution problems from OSSFs at community, county, watershed, and regional scales. Responsible parties will aim to deliver educational materials on proper OSSF O&M to homeowners.

AgriLife Extension currently hosts education programs for homeowners about proper O&M requirements as well as providing an overview of general OSSFs, collection and storage, pretreatment (and advanced pretreatment) components, disinfection, final treatment and dispersal, selection, and permitting. See information about this program on AgriLife Extension's webpage On-Site Sewage Facilities[1]. As funding allows, this program will be delivered throughout the TMDL watersheds to help meet the educational requirements of this plan.

[1] https://ossf.tamu.edu

Priority Areas

The majority of OSSFs are in the Neches River Tidal watershed as it is more rural. The highest densities of OSSFs are concentrated in areas north of Pine Forest, draining into AUs 0601_04 and 0601_03, communities located in the eastern part of the City of Vidor, draining into AU 0601_02, and in communities west of the City of Bridge City, draining into AU 0601_01.

In the communities draining into AUs 0601_01 and 0601_02, OSSF densities are above 100 OSSFs per square mile (Figure 5). These areas should be prioritized for remediation of malfunctioning OSSFs. Additionally, these higher density areas are in the upstream parts of either TMDL watershed. Any OSSF discharges from these communities will enter and affect the entirety of the TMDL watersheds.

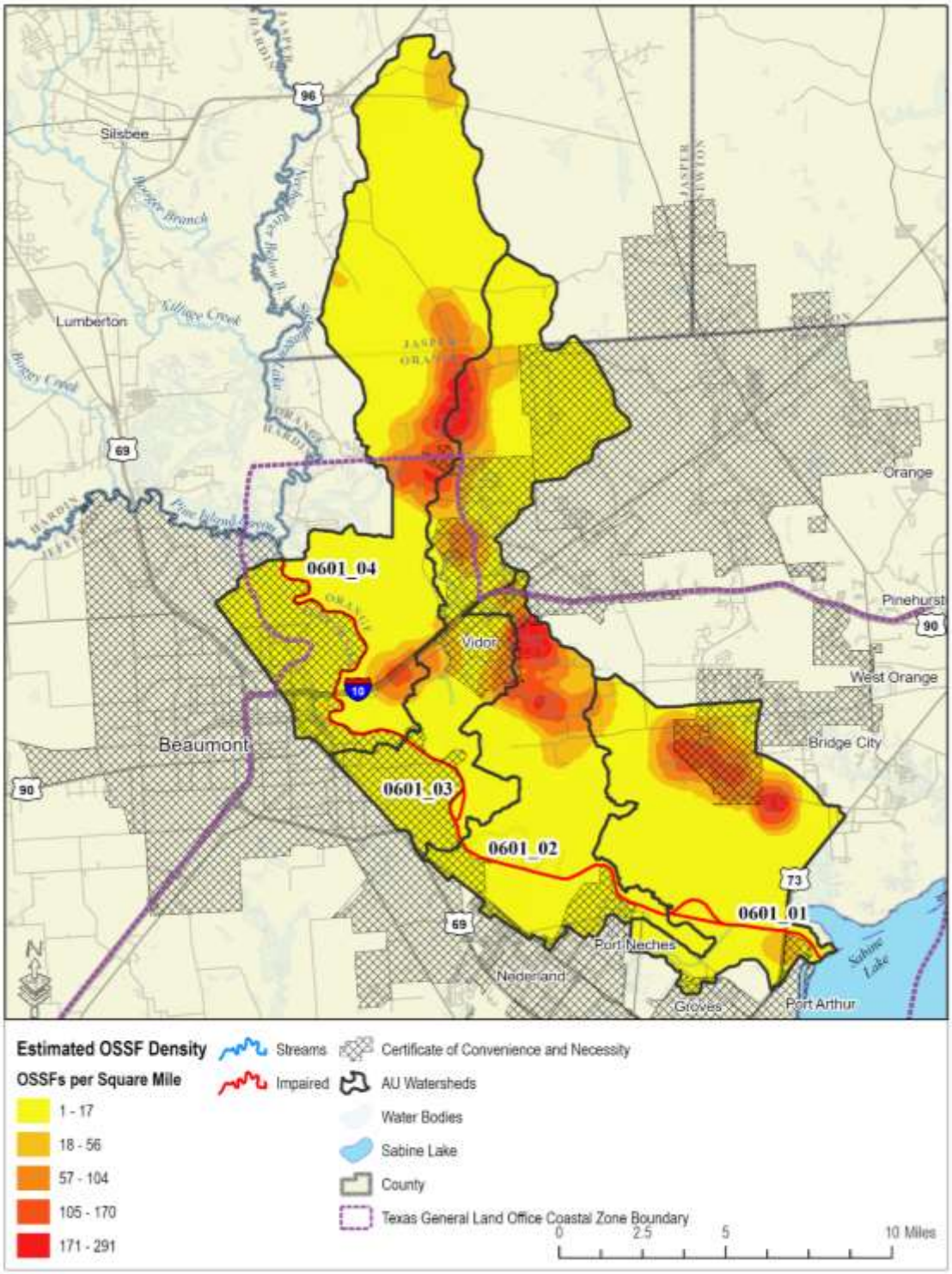

Figure 5. Estimated OSSF density in the Neches River Tidal watershed

Responsible Parties and Funding

Each organization listed below will be responsible only for expenses associated with its efforts and as funds become available.

- **OSSF owners**: OSSF owners will be responsible for coordinating repairs or replacements of malfunctioning OSSFs on their own property. Homeowners will be made aware of available resources or programs to assist with OSSF repair and replacement as funding becomes available.
- **AgriLife Extension**: AgriLife Extension will work with local stakeholders to develop the OSSF repair and replacement program and to provide OSSF O&M workshops.
- **County Staff or Designated Representatives**: Most of the OSSFs are concentrated in Orange County. Orange County Environmental Health and Code Compliance Department will work with OSSF owners for permitting new or replaced OSSFs in Orange County. Jefferson County Environmental Control will work with OSSF owners for permitting and replacing OSSFs in Jefferson County.
- **Lower Neches Valley Authority**: The Lower Neches Valley Authority (LNVA) can assist with coordination and delivery of AgriLife Extension based training programs.

Technical Assistance

The repair and replacement of OSSFs requires licensed personnel and permits through the appropriate offices. Jefferson County Environmental Control and Orange County Environmental Health and Code Compliance Department can assist with the permitting process within their respective jurisdictions and will work with stakeholders to identify specific educational needs and help identify the technical and financial assistance needed to deliver educational programs. The design, construction, installation, and maintenance of new systems should be coordinated with local licensed service providers that can provide technical assistance to homeowners as needed.

AgriLife Extension offers educational opportunities through the Texas Well Owner Network, Installer and Maintenance Provider Workshops, and OSSF O&M workshops.

Financial Assistance

The estimated cost for this management measure (Table 10) assumes that all of the malfunctioning OSSFs will be replaced, however, some may need minor repairs. For proper identification and documentation of failing OSSFs and follow-up after repairs or replacements, regional organizations are encouraged to hire a dedicated technician to oversee this process.

Table 10. Estimated funding for implementing Management Measure 3

Description	Item	Unit	Rate	Amount
Repair or replacement of OSSFs	130	No.	$ 7,500	$ 975,000
Employ technician to identify and document failing OSSFs	10	Years	$ 40,000	$ 400,000
OSSFs O&M workshops	5	No.	$ 7,500	$ 37,500
			Total	**$ 1,412,500**

As resources are available, TCEQ's Small Business and Local Government Assistance Program will provide technical support to local governments to find the best approach for addressing OSSF issues.

Funding sources are detailed below.

- **Clean Water Act Section 319(h) Nonpoint Source Grant Program:** This EPA grant program, administered by TCEQ and TSSWCB, provides funding for implementation of nonpoint source management measures. The funds require a 40% match and may be used to fund OSSF education, repairs, and replacements.
- **TCEQ Supplemental Environmental Projects:** The Supplemental Environmental Projects program, administered by TCEQ, directs fines, fees, and penalties for environmental violations toward environmentally beneficial uses. Through this program, a respondent in an enforcement matter can choose to invest penalty dollars in improving the environment, rather than paying into the Texas General Revenue Fund. Program dollars may be directed to OSSF repair, trash dump clean up, and wildlife habitat restoration or improvement, among other things. Program dollars may be directed to entities for single, one-time projects that require special approval from TCEQ or directed entities (such as Resource Conservation and Development Councils) with pre-approved "umbrella" projects.

Measurable Milestones

Contingent upon the receipt of proposed project funding, the measurable milestones are as follows.

- Number of OSSFs inspections completed.
- Number of OSSFs repaired or replaced.
- Number of educational programs delivered.

Monitoring Component

AgriLife Extension and LNVA will work with county staff and designated representatives to track the number of OSSFs repaired or replaced upon receipt of proposed project funding.

Implementation Schedule

The implementation schedule is as follows. Contingent upon the receipt of proposed project funding, the responsible parties as identified above will:

Years 1-10:

- Inspect and document the status of OSSFs in the TMDL watersheds during Year 1.
- Secure funding and administer an OSSF repair or replacement program to address malfunctioning OSSFs identified through inspections.
- Repair or replace approximately 130 OSSF systems within 10 years (contingent upon funding).
- Organize and deliver five OSSF O&M Workshops including any other related topics requested by local stakeholders.

Years 5, 10:

- Assess overall progress and if necessary, modify existing efforts or develop a new strategy for implementation.

Estimated Load Reductions

The following equation was used to estimate annual bacteria load reductions from the repair and replacement of failing OSSFs:

$$Load_{ossf} = N_{ossf} \times N_{hh} \times Production \times FC_s \times Conversion \times 365\ days/year$$

Where:

$Load_{ossf}$ = Potential annual load reduction of *E. coli* attributed to OSSF repair/replacement (in units of billion cfu per year)

N_{ossf} = Number of OSSFs repaired/replaced (13 in the Neches River Tidal watershed)

N_{hh} = Average number of people per household (2.63 derived from U.S. Census Bureau Population and Household Data [2019] using a weighted average of the owner occupied and renter occupied housing in Orange County)

Production = Assumed sewage discharge rate; 264,979 mL per person per day (Horsley & Witten, 1996)

FC_s = Fecal coliform concentration in sewage; 0.01 billion cfu/ mL (EPA, 2001)

Conversion = Conversion rate of .175 from fecal coliform to Enterococci (Borel et al. 2015)

Based on the annual installation, repair, or replacement of 13 OSSFs in the Neches River Tidal watershed, the estimated total annual bacteria reduction from OSSF repair and replacement is about 5,786,840 billion cfu for Neches River Tidal.

Table 11. Management Measure 3: Promote OSSF management

Causes and Sources: *E. coli* loading from untreated or insufficiently treated household sewage discharged from malfunctioning OSSFs.

Potential Load Reduction	Technical and Financial Assistance	Education Component	Schedule of Implementation	Interim, Measurable Milestones	Indicators of Progress	Monitoring Component	Responsible Parties
Segment 0601 5,786,840 billion cfu/year of Enterococci per OSSF	**Technical:** ▪ Resources and staff to identify and prioritize repair and replacement of failing OSSFs. **Financial:** ▪ Costs incurred for OSSF repair or replacement, estimated at $7,500 per system. ▪ Funds for hiring technical staff to undertake surveys and document status of OSSFS estimated at $40,000 per year. ▪ Workshop and training funds are estimated at $7,500 per program.	▪ Delivery of OSSF workshops for homeowners.	**Years 1-10:** ▪ Inspect and document the status of OSSFs in Year 1. ▪ Secure funding and administer an OSSF repair or replacement program to address malfunctioning OSSFs identified through inspections. ▪ Repair or replace approximately 130 OSSF systems within 10 years (contingent upon funding). ▪ Organize and deliver five OSSF O&M Workshops. **Year 5, 10:** ▪ Assess overall progress and if necessary, modify existing efforts or develop a new strategy for implementation.	▪ Number of OSSFs inspections completed. ▪ Number of OSSFs repaired or replaced. ▪ Number of educational programs delivered.	▪ Education and outreach programs held every other year, on average. ▪ On average, 13 failing OSSFs repaired or replaced annually.	▪ AgriLife Extension and LNVA will work with county staff and designated representatives to track number of OSSFs repaired or replaced upon receipt of proposed project funding.	▪ AgriLife Extension ▪ County Staff or Designated Representatives ▪ OSSF owners ▪ LNVA

Management Measure 4

Reduce sanitary sewer overflows and unauthorized discharges.

Sanitary Sewer Overflows (SSOs) have the potential to occur in almost every sewer system. The causes of SSOs can vary from community to community but many avoidable SSOs are caused by inadequate O&M, inadequate system capacity, and/or improper system design and construction. The costs of rehabilitation and other measures to correct SSOs can vary widely by community size and sewer system type.

The SSO Initiative (SSOI) is a voluntary program that aims at addressing increases in SSOs due to aging collection systems throughout the state and encourages corrective action before there is harm to human health and safety or the environment. Municipalities choose to take part in the voluntary SSOI Program by contacting TCEQ. Benefits of participation include (1) not being subject to formal enforcement by TCEQ for most continuing SSO violations, as long as the overflows are addressed by the SSO plan, and (2) participation allows the municipality to direct resources towards corrective actions rather than having to pay penalties associated with an enforcement order in addition to the corrective actions.

The goal of this management measure is to continue to carry out efforts to reduce the number of overflows that occur within the wastewater services areas through continued participation in TCEQ's SSOI Program. Currently, the City of Beaumont, the City of Port Neches, and the City of Nederland participate in the program and plan to continue participating. Municipalities and eligible entities that are not currently participating in SSOI will be encouraged to participate.

Education Component

Public education involves informing developers and the public of how sewer overflows happen and what they can do to prevent them. The community can help prevent overflows by conserving water and flushing only appropriate items. Therefore, as part of this measure, responsible parties will deliver targeted education materials as resources allow.

Priority Areas

Incidents of SSOs are widespread in the Hillebrandt Bayou watershed, particularly in the central part of the City of Beaumont (Figure 6). In the Neches River Tidal watershed, reported SSO incidents were concentrated in the City of Vidor and in the downstream areas draining into AU 0601_04 which are part of the City of Beaumont.

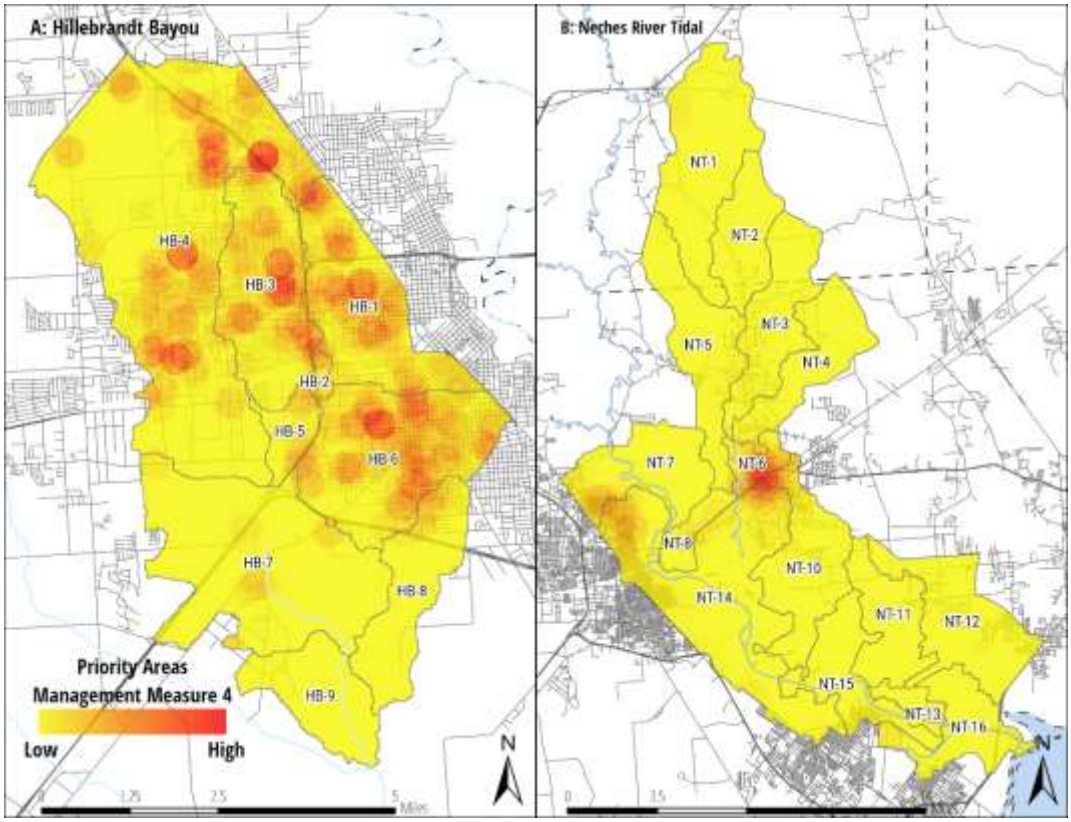

Figure 6. Priority areas for Management Measure 4 based on SSO event density from 2005 through 2018

Responsible Parties and Funding

Each organization listed below will be responsible only for expenses associated with its efforts and as funds become available.

- **Cities participating in SSOI:** The City of Beaumont, City of Port Neches, and City of Nederland will continue taking part in the SSOI, establishing funding for this initiative, and implementing SSO prevention overflow management strategies described in their respective SSO plans.
- **AgriLife Extension:** AgriLife Extension has worked with other small municipalities to develop and deliver stormwater and SSO education materials. AgriLife Extension will work with participating municipalities as needed to provide educational materials for the general public related to SSOs. Other cities and eligible entities in the TMDL watersheds will be encouraged to participate.

Technical Assistance

The TCEQ's Small Business and Local Government Assistance Program may provide technical support to identify the best approach for addressing SSO issues, as resources are available.

Financial Assistance

Expenses associated with this management are built into annual operating budgets (Table 12). Additional costs associated with educational material development and delivery can be minimized by leveraging existing resources and projects in other watersheds that provide educational materials for residents. Participation in the initiative also allows the municipality to direct resources toward corrective actions, as opposed to having to pay penalties associated with an enforcement order in addition to the corrective actions.

Table 12. Estimated funding needed for implementing Management Measure 4

Description	Item	Unit	Rate	Amount
SSOI participation	NA	NA	Varies based on local budgets	NA
Capital projects for sewer improvements	NA	NA	Varies based on local budgets	NA
Educational material development	NA	NA	$10,000	$10,000
			Total:	**$10,000**

Measurable Milestones

Contingent upon the receipt of proposed project funding, the measurable milestones are as follows.

- Approved SSO plan.
- Employee training on O&M.
- Annual community outreach events.

Monitoring Component

The City of Beaumont, the City of Port Neches, and the City of Nederland will continue to monitor and track the implementation of their respective SSO plans and the occurrence of SSOs to report to TCEQ as required.

Implementation Schedule

The implementation schedule is as follows. Contingent upon the receipt of proposed project funding, the responsible parties as identified above will:

Years 1-10:

- Participating municipalities will continue to implement the components of their SSOI and track SSO events, repairs, and replacements.
- Participating municipalities will deliver annual employee training on O&M and community outreach.

Estimated Load Reductions

Indicator bacteria loading from overflow events will vary based on the discharge amount and the level of treatment of sewage. In total, wastewater facilities documented about 838 overflow events from 2005 to 2018 in the Neches River Tidal watershed and about 404 in the Hillebrandt Bayou watershed.

The following equation was used to estimate bacteria load reductions from reductions in SSOs:

$$Load_{sso} = Average\ Volume \times FC \times Conversion$$

Where:

$Load_{sso}$ = Average potential *E. coli* load reduction per overflow incident (total cfu).

Average Volume = The average SSO volume (mL) for each watershed from 2005-2018 (435 gallons for Hillebrandt Bayou and 4,895 gallons for Neches River Tidal) (Schramm & Jha, 2020a and 2020b). These values were multiplied by 3,785.41 mL/gallon to convert to mL.

FC = Fecal coliform concentration in sewage; 0.01 billion cfu/mL (EPA, 2001)

Conversion = Conversion rate of .63 from fecal coliform to *E. coli* and .175 from fecal coliform to Enterococci (Borel et al. 2015)

Since reductions in SSO events are uncertain, total annual reductions were not estimated. However, reductions per incident are estimated to be 32,427 billion cfu in the Neches River Tidal watershed and 10,374 billion cfu in the Hillebrandt Bayou watershed.

Table 13. Management Measure 4: Reduce SSOs and unauthorized discharges

Causes and Sources: Bacteria loading from SSO incidents.

Potential Load Reduction	Technical and Financial Assistance Needed	Education Component	Schedule of Implementation	Interim, Measurable Milestones	Indicators of Progress	Monitoring Component	Responsible Parties
AU 0704_02 10,374 *E. coli* cfu per SSO incident avoided and Segment 0601 32,427 Enterococci cfu per SSO incident avoided	**Technical:** ▪ TCEQ's Small Business and Local Government Assistance Program may provide technical support to identify the best approach for addressing SSO issues, as resources are available. **Financial:** ▪ Financial support is currently set aside for these efforts through annually approved budgets by participating municipalities. ▪ Funds for educational development material estimated at $10,000. ▪ Extra funds for capital projects.	▪ Employee training ▪ Public outreach	**Years 1-10:** ▪ Participating municipalities and entities will continue to implement the components of their SSOIs and track SSO events, repairs, and replacements. ▪ Participating municipalities will deliver annual employee training on O&M and community outreach events.	▪ Approved SSO plan. ▪ Annual employee training on O&M. ▪ Annual community outreach events.	▪ Reduction in number of SSO incidents.	▪ The City of Beaumont, the City of Port Neches, and the City of Nederland will continue to monitor and track the implementation of their SSO plans and the occurrence of SSOs to report to TCEQ as required.	▪ City of Beaumont ▪ City of Port Neches ▪ City of Nederland ▪ Other municipalities and eligible entities as enrolled ▪ AgriLife Extension

Management Measure 5

Promote sustainable forest practices.

A large portion of the Neches River Tidal watershed is made up of mixed and evergreen forests, which accounts for a little over 25% of the watershed. Healthy forests are critical to providing clean water. Forests support a multitude of functions, such as water flow regulation and soil erosion control, which have direct impacts on the quality of surface waters. By regulating flow and reducing the amount of sediment reaching the water body, forests can reduce bacteria loading into water bodies. Activities that remove or disturb forest vegetation or hydro-pollutant flow paths affect the quality of water bodies, including enhancing bacteria concentration. Therefore, forest operations such as harvesting and road work, can potentially degrade water quality if done improperly. Forestry BMPs are the principal means of protecting water resources during forestry activities.

The Texas A&M Forest Service (TFS) promotes several BMPs that can directly affect instream water quality, especially the establishment and maintenance of appropriately sized streamside management zones, stream crossings, and harvesting techniques. These practices target a wide range of stakeholders including loggers, landowners, and contractors. The goal of this management measure is to promote the implementation of forestry BMPs chosen by local stakeholders.

Education Component

Because of the potential of forestry activities contributing to increased bacterial loading in the receiving water bodies, foresters, landowners with forestry interests, and other interested parties must be educated on the impact of forestry operations and the benefits of implementing BMPs on water quality. TFS will tailor training about these subjects to the entities above and, also, will provide education and outreach opportunities to local stakeholders about the proper installation and maintenance of forestry BMPs.

Priority Areas

Generally, priority areas will change based on the forestry operations ongoing. It is important, however, whether during harvesting, planting, or other forestry activities, that operators try to limit disturbances in streamside management zones. TFS guidelines stipulate that streamside management zones should be at least 50 feet wide on each side and above the head of perennial and intermittent streams, although streamside management zones can be wider depending on site conditions. More information on streamside management zones and how

they can be demarcated, mapped, and protected in Texas is available at TFS website.[2]

Management Measure 5 priority areas are based on water resource protection priority areas developed by TFS for the state's Forest Action Plan (TFS 2020a; TFS 2020b) (Figure 7).

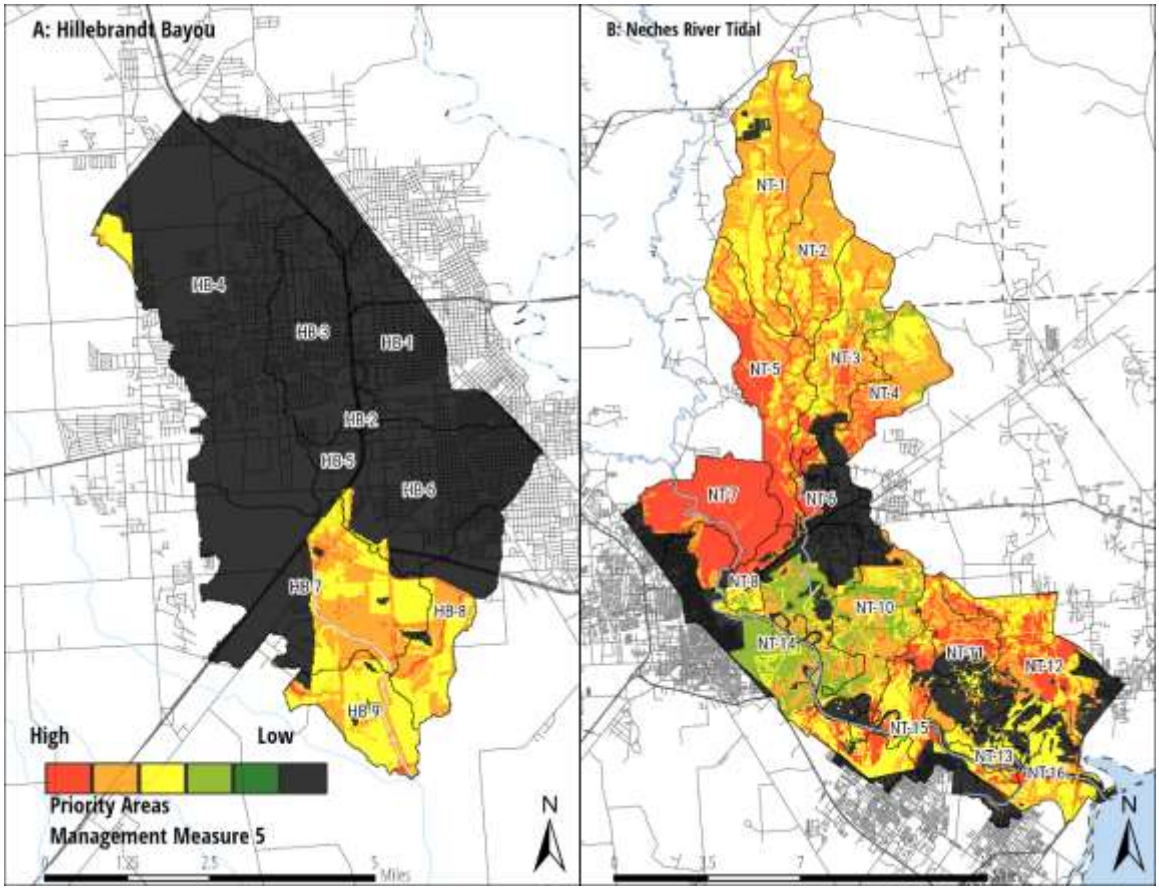

Figure 7. Priority areas for Management Measure 5 based TFS Forest Action Plan water resource priority areas

Responsible Parties and Funding

Each organization listed below will be responsible only for expenses associated with its efforts and as funds become available.

- **TFS**: TFS will be responsible for providing technical assistance and helping landowners identify sources of financial assistance. TFS also tracks progress of local education and outreach efforts and BMP implementation. Landowners, loggers, and logging contractors will be responsible for voluntarily implementing these practices.

[2] https://tfsweb.tamu.edu

- **Landowners and forest managers:** Responsible for taking part in educational opportunities and applying what they learned to their lands.

Technical Assistance

TFS, the Texas Forestry Association, TSSWCB, and organizations such as the Texas Sustainability Forestry Initiative Committee and the Big Thicket Association (BTA) administer training tailored to different stakeholders. TFS provides several resources for forest operational planning such as the "Plan My Land Operation," which is a free, publicly accessible, web-based forest operation planning tool. The application allows users to plan and layout a project based on the specific terrain, soil, and water resources found on an area of interest, locate and map their property, and identify and place custom buffers around sensitive areas, such as streams.

Financial Assistance

When available, TFS will promote the availability of financial aid to forestry interests in the TMDL watersheds. Voluntary reforestation efforts are eligible for existing Farm Bill program funds. Financial assistance required per landowner will vary greatly depending on practices implemented and were not estimated (Table 14). The staff time for a full-time forester to provide education and outreach and track implementation is estimated at $75,000 annually.

Table 14. Estimated funding needed for implementing Management Measure 5

Description	Item	Unit	Rate	Amount
Full-time regional forester	10	Years	$75,000	$750,000
BMP implementation	NA	NA	NA	NA
			Total:	**$750,000**

Funds may also be available through the following programs:

- **Clean Water Act Section 319(h) Nonpoint Source Grant Program:** This EPA grant program, administered by TCEQ and TSSWCB, provides funding for implementation of nonpoint source management measures. The funds require a 40% match and may be used to support education programs, watershed implementation, and technicians.
- **USDA CIG:** The USDA CIG is a voluntary program intended to stimulate the development and adoption of innovative conservation approaches and technologies while leveraging federal investment in environmental enhancement and protection, in conjunction with agricultural production. Under CIG, EQIP funds are used to award competitive grants to non-federal governmental or non-governmental organizations, tribes, or individuals.
- **NRCS CSP:** The CSP helps agricultural producers maintain and improve their existing conservation systems and adopt additional conservation

activities to address priority resource concerns. Participants earn CSP payments for conservation performance — the higher the performance, the higher the payment.

- **NRCS EQIP:** EQIP is a voluntary program that provides financial and technical assistance to agricultural producers through contracts up to a maximum term of ten years. These contracts provide financial assistance to help plan and implement conservation practices that address natural resource concerns and for opportunities to improve soil, water, plant, animal, air, and related resources on agricultural land and non-industrial private forestland. An additional purpose of EQIP is to help producers meet federal, state, tribal, and local environmental regulations.
- **NRCS RCPP:** The RCPP is a new, comprehensive, and flexible program that uses partnerships to stretch and multiply conservation investments and reach conservation goals on a regional or watershed scale. Through RCPP, the NRCS and state, local, and regional partners coordinate resources to help producers install and maintain conservation activities in selected project areas. Partners leverage RCPP funding in project areas and report on the benefits achieved.

Measurable Milestones

Contingent upon the receipt of proposed project funding, the measurable milestones are as follows.

- Delivery of education and outreach programs to local stakeholders by TFS.
- Documentation of landowner and forestry personnel participation.
- Documentation of BMP implementation through survey feedback.

Monitoring Component

Every three years, TFS conducts BMP implementation monitoring on forested tracts throughout East Texas, including the Neches Tidal and Hillebrandt Bayou watersheds.

Implementation Schedule

The implementation schedule is as follows. Contingent upon the receipt of proposed project funding, the responsible parties as identified above will:

Years 1-10:

- Deliver education programs to landowners, loggers, and others, or host outreach activities for them.
- Encourage landowners and forestry managers with no forestry management plans to develop such plans.
- Encourage landowners and forestry managers to voluntarily implement and maintain appropriate BMPs.

Estimated Load Reductions

Although timber harvesting itself is not a direct source of *E. coli* loading and typically have only short-term impacts on post-harvest stream water quality, the altered hydrology from harvesting activities have been shown to be correlated with elevated fecal coliform loading after harvest (Ensign & Mallin 2001). It should be noted that despite widespread research on the impacts of forestry BMPs on sediment, nutrients, and fauna, little research has been conducted on the impacts of forestry BMPs on fecal indicator bacteria (Cristan, et al. 2016). However, it is generally established that the transport of fecal indicator bacteria, when correlated with stream discharge, is greatly influenced by suspended sediments (Yang, Lin & Falconer 2008), and, therefore, it is assumed that there is a correlative reduction in *E. coli* loads with reduced stream discharges and suspended sediment loads that are associated with implementing forestry BMPs.

Forestry BMP adoption rates are assumed to be high across East Texas, with an overall area weighted BMP adoption rate of 94% reported for non-industrial forestlands in East Texas (Thomas, Hazel & Work, 2018). Given high rates of BMP implementation, it is unlikely that additional load reductions will be seen from forestry BMPs relative to sources such as wildlife and livestock calculated earlier. However, BMP implementation will continue to be important to avoid additional *E. coli* loading to the watershed. Therefore, an estimate was calculated to approximate the avoided additional loads per year as a result from forestry BMP implementation from each TMDL watershed. Avoided loads associated with the application of forestry BMPs will vary based on numerous site-specific factors for which data is currently unavailable.

The following equation was used to estimate bacteria loads avoided from implementing forestry BMPS:

> *Load = (Existing Median Load ÷ Watershed Acres) × Annually Treated Area × Percent of forestland with BMPs × Percent Increase without BMP implementation × 365 days/year*

Where:

> *Load* = Average potential *E. coli* or Enterococci load avoided per day (total cfu).
>
> *Existing Median Load* = The median daily *E. coli* or Enterococci load for the watershed (7,411.32 billion cfu/day Enterococci in Neches River Tidal and 182.49 billion cfu/day *E. coli* in Hillebrandt Bayou) (Schramm & Jha, 2020a; Schramm & Jha, 2020b).
>
> *Watershed Acres* = 134,881.00 acres in Neches River Tidal and 23,053.79 acres in Hillebrandt Bayou.

Annually Treated Area = 440.8194 acres in Neches River Tidal and 1.4214 acres in Hillebrandt Bayou.

Percent of forestland with BMPs = 94% (Thomas, Hazel & Work 2018)

Percent Increase Without BMPs = 108.92% (Sanders & McBroom 2012)

Avoided *E. coli* loading is uncertain considering the assumptions that are required to develop calculations. However, there is high certainty that forestry BMPs are widely adopted and beneficial to overall water quality. Based on current estimates of BMP adoption in East Texas and area of treated forests, loads avoided are estimated at 9,051.78 billion cfu Enterococci and 4.20 billion cfu *E. coli* annually in the Neches River Tidal and Hillebrandt Bayou watersheds, respectively.

Table 15. Management Measure 5: Promote sustainable forest practices

Causes and Sources: Indicator bacteria loading from runoff.

Potential Load Reduction	Technical and Financial Assistance	Education Component	Schedule of Implementation	Interim, Measurable Milestones	Indicators of Progress	Monitoring Component	Responsible Parties
AU 0704_02 4.20 billion cfu *E. coli* annually avoided based on current BMP estimates and Segment 0601 9,051.78 billion cfu Enterococci per year avoided based on current BMP estimates	**Technical:** ▪ TFS will supply technical aid to landowners, foresters, loggers, logging contractors, and others, promoting sound forestry management practices that protect water quality. ▪ Other entities including the Texas Forestry Association, TSSWCB, and the Texas Sustainability Forestry Initiative Committee all administer training tailored to different stakeholders. **Financial:** ▪ When they are available, TFS will inform forestry interests in the TMDL watersheds about financial assistance opportunities. ▪ Voluntary reforestation efforts are eligible for existing Farm Bill program funds. ▪ Funds for hiring a full-time regional forester estimated at $75,000 per year.	▪ TFS will tailor training for foresters, landowners with forestry interests, and other interested parties about the impact of forestry operations and the benefits of implementing BMPs. ▪ TFS will provide education and outreach opportunities to local stakeholders about the proper installation and maintenance of forestry BMPs.	**Years 1-10:** ▪ Deliver education programs to landowners, loggers, and others or host outreach activities for them. ▪ Encourage landowners and forestry managers with no forestry management plans to develop such plans. ▪ Encourage landowners and forestry managers voluntarily implement and maintain appropriate BMPs.	▪ Delivery of education and outreach programs to local stakeholders by TFS. ▪ Documentation of landowner and forestry personnel participation. ▪ Documentation of BMP implementation through survey feedback.	▪ Number and type of BMPs implemented in the TMDL watersheds. ▪ Number of landowners and managers taking part in voluntary BMP adoption. ▪ Number of education and outreach programs delivered in or near the TMDL watersheds.	▪ Every three years, TFS will track BMP implementation and education and outreach events.	▪ TFS ▪ Landowners ▪ Forest managers

Management Measure 6

Promote volunteer water quality monitoring.

To encourage environmental stewardship by empowering a statewide network of concerned volunteers, partners, and institutions, the Texas Stream Team (TST) program trains volunteers to monitor water and environmental quality across Texas. Along with training, the program offers a wide variety of engagement programs focused on taking volunteer monitoring to the next step through community involvement, awareness, and additional data collection.

The goal of this management measure is to promote water quality monitoring activities for volunteers. Stakeholders can use the collected data to evaluate water quality changes due to the implementation of the measures in the I-Plan. Data collected by volunteers are quality assured and the TST program maintains a database of the collected information.

Education Component

Under the TST program, volunteers participate in educational workshops, outreach events, and receive educational resources. Activities include educating the public on citizen science, water quality, environmental stewardship, water quality sampling, and more.

Priority Areas

Volunteers will be recruited from either or both TMDL watersheds. Recruitment of environmental stewards, schools, and other organizations near the TMDL watersheds will be prioritized.

Responsible Parties and Funding

Each organization listed below will be responsible only for expenses associated with its efforts and as funds become available.

- **Volunteers:** Local stakeholders will be encouraged to enroll and participate in the TST program. Before beginning voluntary data collection activities, volunteers will participate in the appropriate training provided by the Meadows Center for Water and the Environment or the local TST partner.
- **The Meadows Center for Water and the Environment**: The Meadows Center for Water and the Environment oversees the TST volunteer monitoring program and is responsible for providing supplies, training, and data management services associated with the program.
- **LNVA**: LNVA supports a dedicated group of volunteer monitors in the basin. As a TST partner, LNVA provides water quality testing kits, supplies, and reagents to trained volunteers.
- **Angelina Neches River Authority:** The Angelina Neches River Authority (ANRA) offers support to volunteer environmental monitoring in the basin.

ANRA provides TST monitoring kits, training, and replacement supplies and reagents to trained volunteers.

Technical Assistance

LNVA, ANRA, and The Meadows Center for Water and the Environment can train volunteers and implement "train the trainers" programs to help start and support a local chapter of citizen scientists. The Meadows Center for Water and the Environment also provides data storage and quality assurance services.

Financial Assistance

Water quality monitoring kits used by TST are about $580 each (Table 16). The number of kits bought will depend on the number of local volunteers who take part in the TST program. Costs associated with personnel and travel will vary based on the party that conducts the monitoring within the TMDL watersheds.

Table 16. Estimated funding needed for implementing Management Measure 6

Description	Item	Unit	Rate	Amount
Water quality kits	10	Number	$580	$5,800
Personnel and travel	NA	NA	NA	NA
			Total:	**$5,800**

Possible sources of funds include:

- **Clean Water Act Section 319(h) Nonpoint Source Grant Program:** This EPA grant program, administered by TCEQ and TSSWCB, provides funding for the implementation of nonpoint source management measures. The funds require a 40% match and may be used to support volunteer water quality monitoring.
- **Local Funds:** Local funds include funds or eligible in-kind resources provided by local entities, such as county and municipal governments, local agencies, river authorities, non-governmental organizations, volunteer groups, or individuals.

While financial resources are typically considered, volunteer or staff time may be eligible to meet cost-share requirements for many state and federal grant programs.

Measurable Milestones

Contingent upon the receipt of proposed project funding, the measurable milestones are as follows.

- Number of water quality sampling events conducted by volunteers.
- Number of water quality training events for volunteers.

- Number of volunteers enrolled as citizen scientists.

Monitoring Component

TST coordinates a network of citizen scientists who conduct water quality monitoring at assigned sites on their local water bodies. Citizen scientists may identify water quality issues, possible nonpoint pollution sources, monitor water quality, or collect and analyze data. Information collected by citizen scientists is submitted to a database containing data from sites across the state maintained by The Meadows Center for Water and the Environment.

Like other citizen scientists, volunteers from the TMDL watersheds, working with the LNVA and ANRA steering committees, will track the number of sampling events held, number of training events organized, and the number of volunteers enrolled in addition to undertaking water quality monitoring.

Implementation Schedule

The implementation schedule is as follows. Contingent upon the receipt of proposed project funding, the responsible parties as identified above will:

Years 1-10:

- Recruit local environmental stewards or citizen scientists.
- Provide an annual volunteer water quality training for volunteers covering both TMDL watersheds.
- Secure funding for buying volunteer water quality monitoring kits.

Estimated Load Reductions

No load reduction was calculated for this measure.

Table 17. Management Measure 6: Promote volunteer water quality monitoring

Potential Load Reduction	Technical and Financial Assistance	Education Component	Schedule of Implementation	Interim, Measurable Milestones	Indicators of Progress	Monitoring Component	Responsible Parties
Not estimated	**Technical:** ▪ Training opportunities are provided by LNVA, ANRA, and The Meadows Center for Water and the Environment. ▪ The Meadows Center for Water and the Environment supplies data storage and quality assurance services. **Financial:** ▪ Procurement of water quality monitoring kits. The retail price is about $580 each (in 2020). The number to be bought will depend on the number of volunteers who take part in the TST program. ▪ Training or workshop costs.	▪ Volunteers will participate in educational workshops and outreach activities about citizen science, water quality, environmental stewardship, water quality sampling, and more.	**Years 1-10:** ▪ Recruit local environmental stewards or citizen scientists. ▪ Provide an annual volunteer training event. ▪ Secure funding for buying water quality monitoring kits.	▪ Number of water quality sampling events conducted by volunteers. ▪ Number of water quality training events for volunteers. ▪ Number of volunteers enrolled as citizen scientists.	▪ One training event held annually. ▪ A stable or increasing number of citizen scientists enrolled in the TST program annually. ▪ A stable or increasing number of water quality monitoring events undertaken.	▪ Volunteers, working with the LNVA and ANRA steering committees, will track the number of sampling events held, the number of trainings organized, and volunteers enrolled in addition to undertaking water quality monitoring.	▪ Volunteers ▪ LNVA ▪ ANRA ▪ The Meadows Center for Water and the Environment

Management Measure 7

Implement water quality monitoring.

To track the progress and effectiveness of management measures proposed in this plan, routine monitoring at the existing stations should be maintained. Monitoring efforts could also include bacteria source tracking analysis to find the sources of *E. coli* and Enterococci in the water bodies so that future management measures can be tailored to the main source of contamination. Currently, five sites are actively monitored on the Neches River Tidal and one site is monitored in the impaired AU of the Hillebrandt Bayou watershed.

Through the Texas Clean Rivers Program (CRP), TCEQ partners with regional water authorities to coordinate and conduct water quality monitoring, assessment, and stakeholder participation across the entire state. LNVA is the CRP partner in the Neches River Tidal watershed and the Hillebrandt Bayou watershed. LNVA provides public participation on water quality issues through its basin steering committees which consist of stakeholders representing local industry and municipalities, state and federal agencies, tribal groups, environmental groups, and the public. Members of either TMDL watershed are encouraged to participate and highlight any local concerns, including additional monitoring needs.

The goal of this management measure is to continue routine monitoring at the existing six surface water quality monitoring (SWQM) stations and identify other monitoring projects (such as bacteria source tracking) to monitor changes in water quality and inform future water quality management decisions.

Education Component

LNVA's website provides an overview of the CRP statewide water quality program and includes basin reports, quality assurance documents, and links to other websites such as the TCEQ Surface Water Quality Data Viewer and Statewide Coordinated Monitoring Schedule (CMS). LNVA also holds an annual Steering Committee meeting in coordination with CRP to share updates on water quality monitoring and relevant watershed issues that include information on the TMDL watersheds, among others. Updates on I-Plan progress can be presented during this annual meeting. Local stakeholders are encouraged to engage with LNVA to publish information like water quality analysis reports and other resources specific to the TMDL watersheds on LNVA's website. LNVA carries out educational and informational events in areas under its jurisdiction. Stakeholders are encouraged to coordinate with LNVA to participate in such training.

Responsible Parties and Funding

Each organization listed below will be responsible only for expenses associated with its efforts and as funds become available.

- **Local Stakeholders:** Local stakeholders aid in determining and refining data and data quality objectives for future monitoring programs.
- **LNVA**: LNVA is the CRP partner in this area. LNVA conducts routine monitoring on Segments 0601 and 0704.

Technical Assistance

LNVA and TCEQ oversee several water quality projects. These organizations have considerable expertise to design and carry out monitoring programs. LNVA and TCEQ should continue providing monitoring services as funding allows. CRP can also supply further technical assistance in determining monitoring frequency and locations.

Financial Assistance

Costs associated with water quality monitoring can vary based on the suite of parameters monitored, personnel costs, vehicle and mileage costs, and lab costs. TWRI and LNVA estimate approximately $2,500 for lab analysis and supply costs per station per year for full routine water quality monitoring (Table 18). Costs associated with personnel and travel will vary substantially based on the party that conducts the monitoring

Table 18. Estimated funding needed for implementing Management Measure 7

Description	Item	Unit	Rate	Amount
Lab analysis and supply costs for 6 stations per year	10	Year	$15,000	$150,000
Personnel and travel	NA	NA	NA	NA
			Total:	**$150,000**

Possible sources of funds are detailed below:

3. **Texas CRP:** The Texas CRP is a state fee-funded, non-regulatory program. CRP funds can be used for routine monitoring as well as special projects. Responsible parties and local stakeholders can request water quality monitoring through the Texas CRP during the development of the CMS.
4. **Clean Water Act Section 319(h) Nonpoint Source Grant Program:** This EPA grant program, administered by TCEQ and TSSWCB, provides funding for implementation of nonpoint source management measures. The funds require a 40% match and may be used to support education programs, watershed implementation, and technicians.

5. **Local funds:** Local funds include funds or eligible in-kind resources provided by local entities, such as county and municipal governments, local agencies, non-governmental organizations, volunteer groups, or individuals. While financial resources are typically considered, volunteer or staff time can be leveraged as eligible cost-share for many state and federal grant programs that require some type of cost-share.

Measurable Milestones

Contingent upon the receipt of proposed project funding, the measurable milestones are as follows.

- Developing the CMS for the TMDL watersheds.
- Conducting a water quality monitoring in each of the TMDL watersheds according to the TCEQ-approved CRP quality assurance project plan (QAPP).
- Submitting routine water quality data to the TCEQ Surface Water Quality Monitoring Information System (SWQMIS).
- Developing additional water quality monitoring projects and funding sources as needed.

Monitoring Component

LNVA will report water quality monitoring and water quality analyses in the annual Basins Highlights Report delivered as part of CRP.

Water quality monitoring will continue at existing TCEQ SWQM stations. Additional monitoring projects may be developed under this management measure as needed.

Implementation Schedule

The implementation schedule is as follows. Contingent upon the receipt of proposed project funding, the responsible parties as identified above will:

Years 1-10:

- Conduct water quality monitoring and submit data according to the TCEQ-approved CRP QAPP.
- Develop QAPPs for additional projects as needed.
- Provide water quality monitoring and I-Plan implementation updates at annual CRP Steering Committee meetings.

Estimated Load Reductions

No load reduction was calculated for this measure.

Table 19. Management Measure 7: Implement water quality monitoring

Potential Load Reduction	Technical and Financial Assistance	Education Component	Schedule of Implementation	Interim, Measurable Milestones	Indicators of Progress	Monitoring Component	Responsible Parties
Not estimated	**Technical:** ▪ LNVA and TCEQ provide technical expertise associated with monitoring and data management activities for coordinated water quality monitoring. **Financial:** ▪ Local and state funds can be used for water quality monitoring activities. Costs per site are about $15,000 annually.	▪ LNVA will hold annual stakeholder meetings in conjunction with CRP Basin Steering Committee meetings.	**Years 1-10:** ▪ Conduct water quality monitoring and submit data according to established CRP QAPPs. ▪ Develop QAPPs for additional projects as needed. ▪ Provide water quality and I-Plan updates at annual CRP Steering Committee meetings.	▪ Updated CMS. ▪ Water quality monitoring programs implemented in each of the TMDL watersheds. ▪ Routine data submitted in SWQMIS. ▪ Develop additional water quality monitoring sites, projects, and funding sources as needed.	▪ Improvement in water quality.	▪ Monitoring will continue at existing TCEQ SWQM stations. ▪ Additional monitoring projects may be developed under this management measure as needed.	▪ LNVA ▪ Local stakeholders

Management Measure 8

Promote adult and youth watershed education and awareness through education programs and public events.

Public education plays a critical role in keeping water bodies healthy. Through targeted outreach, public education helps to bring awareness of water quality issues and empowers adults and youth to become stewards of their watersheds through their daily actions. Targeted education to adults provides opportunities for them to engage more fully with their local environment. In contrast, youth education and school-based programs help them to develop and deepen their academic skills by integrating classroom education with real-world experiences. There are various entities, local and statewide, that provide watershed education and outreach for communities.

Raising public awareness is critical to creating an enabling environment, promoting participatory and inclusive processes, and building program ownership. It increases enthusiasm and support amongst local stakeholders, stimulates self-mobilization and action, and encourages local knowledge and use of resources. Several methods and tools exist for enhancing program awareness. For example, one popular tool involves bringing communities together through themed community events. In addition to creating awareness, public community events have the potential to raise additional financial resources to help implement some of the management resources in this I-Plan.

Local stakeholders within the TMDL watersheds already host water quality-themed community activities and events throughout the year which bring together the community and local organizations. These events have included stream cleanups and the Annual Neches River Rally, both of which engage the residents to get involved in protecting their watersheds and become educated on water quality issues.

The goal of this measure is to (1) promote education programs that inform the public about watersheds, water quality, and their effects on bacteria loading; and (2) promote the use of community events to increase local awareness of water quality issues in local watersheds.

Education Component

Education is the primary objective of this management measure, and it seeks to create targeted adult and youth education and outreach programs throughout the TMDL communities. There are many existing educational programs that exist through AgriLife Extension and local county extension offices that can provide workshops and programs to further educate the public about watershed stewardship and water quality. In addition, Texas Sea Grant, in coordination

with BTA, is working with local school districts in the TMDL watersheds to provide students with watershed related education opportunities.

Public campaigns play a vital role in changing social norms and providing basic facts and education to members of the audience. They can provide a platform for holding impactful educational events, such as community forums and topical presentations, among others. More so, such events may attract partnerships with local or regional experts, and corporate organizations that bring expertise, in addition to technical and financial resources.

Responsible Parties and Funding

Each organization listed below will be responsible only for expenses associated with its own efforts and as funds become available.

- **County extension offices:** The Jefferson County and Orange County extension offices of AgriLife Extension educate local communities in all areas of agriculture including horticulture, marine sciences, environmental stewardship, youth, and adult life skills, human capital and leadership, and community economic development.
- **AgriLife Extension:** AgriLife Extension provides several statewide education programs, and will work with local entities to coordinate and deliver educational programs as needed.
- **Texas Sea Grant:** Texas Sea Grant promotes literacy by supporting students and the development of Science, Technology, Engineering, and Math educational programs, tools, and products. The local Texas Sea Grant agent will work with partners to develop and deliver education programs in the watershed.
- **LNVA:** LNVA will work with local partners to deliver education programs.
- **BTA:** Founded in 1964, BTA, through active and effective advocacy, provides leadership for the protection and conservation of natural, cultural, and historic resources of the Big Thicket region. In line with its objectives, among other programs, BTA operates several events (e.g., the Ivory Bill tours and the Neches River Rally) that provide platforms for carrying out public education and outreach on matters relating to this I-Plan.
- **Local stakeholders:** Other local stakeholders, including municipalities and corporations, typically provide in-kind services and sponsorships for events. These stakeholders will be relied upon as requested and needed.

Technical Assistance

Most local and statewide watershed education programs are ongoing and require little technical support, if any. If needed, technical assistance may be provided by the responsible parties implementing the education programs.

Financial Assistance

Statewide education programs use a combination of federal grants and state-funded match funds. Statewide education programs are estimated around $10,000 per event with salary, benefits, travel, and event costs factored in (Table 20).

Public events such as the Neches River Rally are organized and funded through registrations and sponsorships. Community clean-up events are mostly volunteer-driven. Local entities and corporations have previously provided financial resources.

Table 20. Estimated funding needed for implementing Management Measure 8

Description	Item	Unit	Rate	Amount
Educational programs	5	Years	$10,000	$50,000
Outreach events	10	No.	NA[a]	NA
			Total:	**$50,000**

[a] Costs per event vary substantially and are not estimated here. Costs are typically covered by a combination of in-kind services and event registration fees.

Possible sources of funds include the following:

- **Clean Water Act Section 319(h) Nonpoint Source Grant Program:** This EPA grant program, administered by TCEQ and TSSWCB, provides funding for the implementation of nonpoint source management measures. The funds require a 40% match and may be used to support education and outreach.
- **Local funds:** Local funds include funds or eligible in-kind resources provided by local entities, such as county and municipal governments, local agencies, river authorities, non-governmental organizations, volunteer groups, or individuals.

Measurable Milestones

Contingent upon the receipt of proposed project funding, the measurable milestones are as follows.

- Number of educational programs implemented.
- Estimated number of residents attending programs.
- Number of water quality-themed community events held.
- Estimated number of event attendees.

Monitoring Component

Education programs and public outreach events implemented in the TMDL watersheds will be reported in annual I-Plan status reports.

Implementation Schedule

The implementation schedule is as follows. Contingent upon the receipt of proposed project funding, the responsible parties as identified above will:

Years 1-10:

- Implement education and outreach programs within the TMDL watersheds that target residents and students.
- Organize and implement water quality themed public outreach events annually.

Estimated Load Reductions

A load reduction was not calculated for the measure.

Table 21. Management Measure 8: Promote adult and youth watershed education awareness through education programs and public events

Potential Load Reduction	Technical and Financial Assistance	Education Component	Schedule of Implementation	Interim, Measurable Milestones	Indicators of Progress	Monitoring Component	Responsible Parties
Not estimated	**Technical:** ▪ Most local and statewide watershed education programs are ongoing and require little technical support, if any. If needed, technical assistance may be provided by the responsible parties implementing the education programs. **Financial:** ▪ Statewide education programs use a combination of federal grants and state-funded match funds, estimated around $10,000 per event. ▪ Public events such as the Neches River Rally are organized and funded through registrations and sponsorships. ▪ Community clean-up events are mostly volunteer-driven. ▪ Local entities and organizations provide donations and in-kind support.	▪ The management measure is entirely focused on promoting education and outreach programs in the TMDL communities.	**Years 1-10:** ▪ Implement education programs in the TMDL watersheds that target residents and students. ▪ Organize and implement water quality themed public outreach events annually.	▪ Number of educational and outreach programs implemented. ▪ Number of people attending programs ▪ Number of water quality-themed community events held ▪ Number of people ▪ Number of people attending events.	▪ Number of educational programs implemented. ▪ Estimated number of people attending programs ▪ Number of water quality-themed community events held ▪ Estimated number of event attendees	▪ Education and outreach programs implemented in the TMDL watersheds will be reported in annual I-Plan status reports.	▪ Jefferson County AgriLife extension ▪ Orange County AgriLife extension ▪ Texas Sea Grant ▪ LNVA ▪ Texas A&M AgriLife Extension ▪ BTA ▪ Other local stakeholders

Control Action 1

Continue implementation of Phase I MS4 Stormwater Management Programs.

State and federal rules require cities and certain other entities to obtain permits for controlling stormwater pollution. These regulated MS4s are publicly owned systems of conveyances and includes ditches, curbs, gutters, and storm sewers that do not connect to a sanitary wastewater collection system or treatment facility. 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. Phase I permits were issued for MS4s that had a population of 100,000 or more as of the 1990 U.S. Census. Phase I regulations are implemented through individual permits.

The Texas Pollutant Discharge Elimination System (TPDES) MS4 Phase I rules require municipalities and certain other entities in urban areas to obtain permit coverage for their stormwater systems. According to EPA guidelines, stormwater regulated by an MS4 permit is considered a point source for TMDL allocation. More information about MS4s, classification, and regulatory requirements specific to Texas is available at TCEQ's Stormwater Permits[3] webpage.

The purpose of an MS4 permit is to reduce discharges of pollutants in stormwater to the "maximum extent practicable" by developing and implementing a SWMP. The SWMP describes the stormwater control practices that the regulated entity will implement, consistent with permit requirements, to minimize the discharge of pollutants. The MS4 permits require that SWMPs specify BMPs to meet several minimum control measures (MCMs) that, when implemented in concert, are expected to result in significant reductions of pollutants discharged into receiving water bodies. At a minimum, Phase I MCMs include all of the following:

- MS4 maintenance activities.
- Post-construction stormwater control measures.
- Detection and elimination of illicit discharges.
- Pollution prevention and good housekeeping for municipal operations.
- Limiting pollutants in industrial and high-risk stormwater runoff.
- Limiting pollutants in stormwater runoff from construction sites.
- Public education, outreach, involvement, and participation.
- Monitoring, evaluating, and reporting.

[3] https://www.tceq.texas.gov/permitting/stormwater

There are two Phase I MS4 permits in the TMDL watersheds, shown in Table 22 See the City of Beaumont's Stormwater Program[4] webpage and the Texas Department of Transportation's (TxDOT) Stormwater Management Program[5] webpage to learn more about their MS4 permit programs.

Table 22. MS4 Permits in Hillebrandt Bayou TMDL watershed

Entity	Authorization Type	TPDES Permit No./ EPA ID	Location
City of Beaumont and Jefferson County Drainage District No. 6	Phase I MS4	WQ0004637000/ TXS000501	Jurisdictional boundary of Beaumont, Texas
Texas Department of Transportation	Combined Phase I and Phase II MS4	WQ0005011000/ TXS002101	TXDOT rights-of-way located within Phase I MS4s and Phase II UAs

The goal of this management measure is to continue the implementation of BMPs by the permittees as outlined in their SWMPs and to ensure compliance to permit conditions.

Education Component

Phase I MS4 permits are required to implement strategies that promote public education, outreach, and involvement in their SWMPs. The City of Beaumont, Jefferson County Drainage District No. 6, and TxDOT will continue to promote public education and outreach as a part of their SWMPs through their existing programs and establish new programs, as needed. Additionally, SWMPs require that permittee employees be trained in stormwater management. The City of Beaumont, Jefferson County Drainage No. 6, and TxDOT will continue to provide training to their employees as part of their SWMP.

Priority Areas

The focus of this management measure will be on areas of the TMDL watersheds that discharge stormwater into or near the impaired AUs, however effort should not be limited to those areas. Permitted entities should identify and document priority areas within their stormwater networks and implement targeted O&M BMPs.

Responsible Parties and Funding

Each organization listed below will be responsible only for expenses associated with its own efforts and as funds become available.

- **City of Beaumont and Jefferson County Drainage District No. 6:** Will continue to implement their SWMP as part of their MS4 permit and should

[4] https://beaumonttexas.gov/departments/public-works/stormwater/
[5] https://www.txdot.gov/inside-txdot/division/environmental/swmp.html

be engaged to review the SWMP to ensure that it targets bacteria loading, including implementing BMPs targeted at bacteria loading reduction in priority areas.

- **TxDOT:** Will continue to implement their SWMP as part of their statewide combined Phase I and Phase II MS4 permit and will be engaged to develop and implement specific BMPs in the TMDL watersheds to specifically address bacteria loading.

Technical Assistance

TCEQ's Small Business and Local Government Assistance Program may provide technical support and information on MS4 permits. The program has developed a webpage with information on MS4s, Assistance Tools for Municipal Separate Storm Sewer Systems (MS4s)[6].

Financial Assistance

The implementation of measures in a SWMP are the responsibility of the permittee, and as such, financial resources for carrying out activities that reduce bacteria loading, within the permittee's area of authority should be included in annual budgets. Capital investments often include additional funds through municipal financing mechanisms or state and federal loan and grant programs. The amount of financial assistance required to implement this management measure will vary substantially as individual projects are identified and prioritized by city staff. The City of Beaumont budgeted approximately $6.8 million towards streets and drainage staff, operations, and equipment in fiscal year 2020 (Table 23). Funding requirements are expected to increase over time. The City of Beaumont has also identified over $15 million in capital improvement projects related to sewer infrastructure and $63 million in capital improvements for public works projects that include street and stormwater drainage projects.

Table 23. Estimated funding needed for implementing Control Action 1

Description	Item	Unit	Rate	Amount
O&M Costs	10	year	$6,800,000	$68,000,000
Capital investments	1	NA	$79,530,000	$79,530,000
			Total:	**$147,530,000**

Potential funding sources include:

- **Clean Water State Revolving Fund:** The Clean Water State Revolving Fund (CWSRF) program is a federal-state partnership that provides communities

[6] https://www.tceq.texas.gov/assistance/water/stormwater/sw-ms4.html.

low-cost financing for a range of water quality infrastructure projects. The program functions as an environmental infrastructure bank by providing low-interest loans to eligible recipients for water infrastructure projects. Assistance can be provided for construction of publicly owned treatment works, decentralized wastewater treatment systems, and measures to manage, reduce, treat, or recapture stormwater or subsurface drainage water, among others.

- **Sewer Overflow and Stormwater Reuse Municipal Grants Program:** Grants are awarded to states, which then provide awards to eligible entities for projects that address infrastructure needs for SSOs and stormwater management.

Measurable Milestones

Contingent upon the receipt of proposed project funding, the measurable milestones are as follows.

- Approved SWMPs for Phase I MS4s.
- Employee training on stormwater management.
- Public education and outreach programs implemented.

Monitoring Component

Phase I MS4 permit holders will continue to monitor MS4 outfalls, respond to spills that may discharge to the MS4, and implement good sampling measures as part of their approved SWMP.

Implementation Schedule

The implementation schedule is as follows. Contingent upon the receipt of proposed project funding, the responsible parties as identified above will:

Years 1-10:

- Identify priority areas and sources of bacteria in the MS4 areas.
- Update SWMPs to include BMPs and projects aimed at reducing bacteria loads in the impaired waterbodies.
- Implement measures described in the SWMPs.

Estimated Load Reductions

No load reduction was calculated for this measure.

Table 24. Control Action 1: Continue implementation of Phase I MS4 Stormwater Management Programs

Causes and Sources: Polluted stormwater runoff is transported through MS4s and then discharged into local water bodies.

Potential Load Reduction	Technical and Financial Assistance	Education Component	Schedule of Implementation	Interim, Measurable Milestones	Indicators of Progress	Monitoring Component	Responsible Parties
Not estimated	**Technical:** ▪ Online resources are available on both the EPA and TCEQ websites. ▪ TCEQ's Small Business and Local Government Assistance Section may offer technical assistance on MS4s. **Financial:** ▪ Financial support is currently set aside for these efforts through approved budgets by the MS4s. The annual cost of O&M is estimated at $6,800,000. ▪ Extra funds from capital projects.	▪ Employee training. ▪ Public education and outreach.	**Years 1-10:** ▪ Identification of priority areas and sources of bacteria in the MS4 areas. ▪ Update SWMPs to include BMPs aimed at reducing bacteria loads in the impaired waterbodies. ▪ Implement measures described in the SWMPs.	▪ Approved SWMPs for Phase I MS4s. ▪ Number of employees trained on stormwater management. ▪ Number of public education and outreach programs implemented.	▪ Updated and approved SWMPs that include activities aimed at reducing bacteria loads in the impaired waterbodies. ▪ Number of employees trained. ▪ Number of public education and outreach programs implemented.	▪ The permittees are required to monitor MS4 outfalls, respond to spills that may discharge to the MS4, and implement good sampling measures as part of their SWMPs.	▪ City of Beaumont ▪ Jefferson County Drainage District No. 6 ▪ TxDOT

Control Action 2

Continue implementation of Phase II MS4 Stormwater Management Programs.

State and federal rules require cities and certain other entities to obtain permits for controlling stormwater pollution. These regulated MS4s are publicly owned systems of conveyances and includes ditches, curbs, gutters, and storm sewers that do not connect to a wastewater collection system or treatment facility. 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 Phase II permits were first issued following EPA approval of the Phase II rules in 1999. More information about MS4s, classification, and regulatory requirements specific to Texas is available at TCEQ's Stormwater Permits[7] webpage.

Phase II MS4 regulations are implemented through a general permit under which MS4s in Urbanized Areas (UAs), as defined most recently in 2010 by the U.S. Census, are authorized to discharge stormwater. The TPDES MS4 Phase II rules require municipalities and certain other public entities in UAs to obtain permit coverage for their stormwater systems. Like a Phase I MS4, the Phase II MS4 general permit requires that SWMPs specify the BMPs to meet several MCMs that, when implemented in concert, are expected to result in significant reductions of pollutants discharged into receiving water bodies. Phase II MS4 MCMs include all of the following:

- 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.
- Industrial stormwater sources[8].
- Authorization for construction activities where the small MS4 is the site operator (*optional*).

The Neches River Tidal watershed includes 10 Phase II MS4 authorizations. Areas in the Hillebrandt Bayou watershed are covered in the Phase I MS4 permits discussed under Control Action 1. The Phase II MS4s authorizations are listed in Table 25.

[7] https://www.tceq.texas.gov/permitting/stormwater
[8] MCM only applies to Phase II MS4s which serve a population of 100,000 or more

Table 25. Phase II MS4 authorizations in the Neches River Tidal watershed

Permit holder	TPDES[a] ID	Location
City of Vidor[c]	TXR040028	The area within the City of Vidor limits that is located within the Beaumont UA
Orange County Drainage District[c]	TXR040029	The area within Orange County Drainage District limits that is located within the Beaumont and Port Arthur UAs
Orange County[c]	TXR040030	The area within the Orange County limits that is located within the Beaumont & Port Arthur UAs
Jefferson County[b]	TXR040129	The area within Jefferson County located outside city limits that is located within the Beaumont & Port Arthur UA
Jefferson County Drainage District No. 7[b]	TXR040130	The area within the Drainage District No. 7 limits that is located within Port Arthur UA
City of Port Neches[b]	TXR040131	The area within the City of Port Neches limits that is located within the Port Arthur UA
City of Bridge City[c]	TXR040429	The area within Bridge City limits that is located within the Port Arthur UA
City of Nederland[b]	TXR040133	The area within the City of Nederland limits that is located within the Port Arthur UA
City of Groves[b]	TXR040134	The area within the City of Groves limits that is located within the Port Arthur UA
City of Port Arthur[b]	TXR040143	The area within the City of Port Arthur limits that is located within the Port Arthur UA

[a]TPDES: Texas Pollutant Discharge Elimination System

[b]Jefferson County Stormwater Coalition Stormwater Program website[9]

[c]Orange County Stormwater Coalition Stormwater Program website[10]

Although the City of Port Arthur, the City of Groves, and the City of Nederland are authorized under the Phase II MS4 General Permit No. TXR040000, they encompass a relatively minor proportion of the total UA in the watershed. Stakeholders also indicate that due to the low relief and elevation of the City of Bridge City, inundation and sheetflow result in runoff being directly connected to Sabine Lake instead of towards the Neches River Tidal during high flow and storm events. Phase II MS4 implementation activities from these entities will likely not contribute substantially to load reductions given the size and characteristics of the MS4s. Therefore, efforts will focus on the remaining permitted entities.

The goal of this management measure is to continue the implementation of BMPs by the permittees as outlined in their SWMPs and to ensure compliance to permit conditions.

Education Component

Phase II MS4s are required to implement strategies that promote public education, outreach, and involvement in their SWMPs in addition to training permittee employees in stormwater management. The SWMPs prepared by the

[9] https://www.txms4.com/jefferson/index.html
[10] https://txms4.com/orange/

MS4s listed in Table 25 include BMPs aimed at educating various categories of stakeholders within their respective jurisdictional areas. Some of these educational BMPs include educating the public on stormwater impacts and ways they can minimize stormwater pollution, development of guidance materials for construction site personnel on the proper installation, and maintenance of erosion and sediment controls, among others.

Priority Areas

The focus of this management measure will be on areas of the TMDL watersheds that discharge stormwater into or near the impaired AUs, however, efforts should not be limited to those areas. The Phase II MS4s should identify and document priority areas within their sewer networks and implement targeted O&M BMPs.

Responsible Parties and Funding

Each organization listed below will be responsible only for expenses associated with its own efforts and as funds become available.

- **Phase II MS4s:** Will continue to implement their SWMPs according to their respective permit requirements.

Technical Assistance

TCEQ's Small Business and Local Government Assistance Program may provide technical support and information on MS4 permits. The program has developed a webpage with information on MS4s, Assistance Tools for Municipal Separate Storm Sewer Systems (MS4s)[11].

Financial Assistance

The implementation of measures in the SWMP are the responsibility of the permittee, and as such, financial resources for carrying out activities that reduce bacteria loading, within the permittee's area of authority should be included in annual budgets. The exact amount of funding required to carry out a SWMP within the watershed area is difficult to determine since fiscal priorities vary by MS4 entity, and most entities include multiple watersheds. However, based on fiscal year 2021 proposed budgets, authorized entities have devoted at least $5 million annually to operations of streets, drainage, and wastewater O&M (Table 26). Capital investments often include additional funds through municipal financing mechanisms or state and federal loan and grant programs. The amount of financial assistance required to implement this management measure will vary substantially as individual projects are identified and prioritized by MS4 entity's staff.

[11] https://www.tceq.texas.gov/assistance/water/stormwater/sw-ms4.html.

Table 26. Estimated funding needed for implementing Control Action 2

Description	Item	Unit	Rate	Amount
O&M Costs	10	Year	$5,000,000	$50,000,0000
Capital investments	NA	NA	NA	NA
			Total:	**$50,000,000**

Potential funding sources include:

- **CWSRF:** CWSRF is a federal-state partnership that provides communities low-cost financing for a range of water quality infrastructure projects. The program functions as an environmental infrastructure bank by providing low-interest loans to eligible recipients for water infrastructure projects. Assistance can be provided for construction of publicly owned treatment works, decentralized wastewater treatment systems, and measures to manage, reduce, treat, or recapture stormwater or subsurface drainage water, among others.
- **Sewer Overflow and Stormwater Reuse Municipal Grants Program:** Grants are awarded to states, which then provide awards to eligible entities for projects that address infrastructure needs for SSOs and stormwater management.

Measurable Milestones

Contingent upon the receipt of proposed project funding, the measurable milestones are as follows.

- Approved SWMPs for Phase II MS4s.
- Employee training on stormwater management.
- Public education and outreach programs implemented.

Monitoring Component

Individual MS4 entities will track progress consistent with their respective SWMP and Phase II MS4 requirements under TPDES General Permit No. TXR040000.

Implementation Schedule

The implementation schedule is as follows. Contingent upon the receipt of proposed project funding, the responsible parties as identified above will:

Years 1-10:

- Implement measures described in SWMPs.

Estimated Load Reductions

No load reduction was calculated for this measure.

Table 27. Control Action 2: Continue implementation of Phase II MS4 Stormwater Management Programs

Causes and Sources: Polluted stormwater runoff is transported through MS4s and then discharged into local water bodies.

Potential Load Reduction	Technical and Financial Assistance	Education Component	Schedule of Implementation	Interim, Measurable Milestones	Indicators of Progress	Monitoring Component	Responsible Parties
Not estimated	**Technical:** ▪ Online resources are available on both the EPA and TCEQ websites. ▪ TCEQ's Small Business and Local Government Assistance Section may offers technical assistance on MS4s. **Financial:** ▪ Financial support is currently set aside for these efforts through annually approved budgets by the MS4s. The annual O&M costs are estimated to be about $5,000,000 annually.	▪ Public education and outreach. ▪ Employee training.	**Years 1-10:** ▪ Implement measures described in SWMPs.	▪ Approved SWMPs for Phase II MS4s. ▪ Number of employees trained on stormwater management. ▪ Number of public education and outreach programs implemented.	▪ Updated and approved SWMPs that include activities aimed at reducing bacteria loads in the impaired waterbodies. ▪ Number of employees trained. ▪ Number of public education and outreach programs implemented.	▪ Individual entities will track progress consistent with their respective SWMP and Phase II MS4 requirements under TPDES General Permit No. TXR040000.	▪ City of Vidor ▪ Orange County Drainage District ▪ Orange County ▪ Jefferson County ▪ Jefferson County Drainage District No. 7 ▪ City of Port Neches ▪ City of Bridge City ▪ TxDOT

Sustainability

TCEQ, responsible parties, and other stakeholders in TMDL implementation projects periodically assess the results of the planned activities, along with other information, to evaluate the effectiveness of the I-Plan. Responsible parties and other stakeholders evaluate several factors, such as the pace of implementation, the effectiveness of BMPs, load reductions, and progress toward meeting water quality standards.

The responsible parties and other stakeholders will track progress using both implementation milestones and water quality indicators. 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 Milestones** – A measure of administrative actions undertaken to affect an improvement in water quality.

Water Quality Indicators

Water quality monitoring staff from LNVA and TCEQ will continue to monitor the status of water quality during implementation as funding and resources allow. Additional funding will be sought to conduct supplemental monitoring in the TMDL watersheds. The indicator that will be used to measure improvement in water quality is *E. coli* for the Hillebrandt Bayou watershed and Enterococci for the Neches River Tidal watershed.

Implementation Milestones

Implementation tracking provides information that can be used to determine if progress is being made toward meeting the goals of the TMDL. Tracking also allows stakeholders to evaluate actions taken, identify those that may not be working, and make any changes that may be necessary to get the plan back on target.

Communication Strategy

TCEQ will work with responsible parties and other stakeholders to hold meetings or obtain annual I-Plan updates for up to five years so stakeholders may evaluate their progress. Responsible parties and stakeholders will continue to provide annual updates and/or take part in any meetings over the ten-year period to evaluate implementation efforts. After the completion of the scheduled I-Plan activities, stakeholders will assemble and evaluate the actions, overall impacts, and results of their implementation efforts.

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