

BIG

BACTERIA IMPLEMENTATION GROUP

MAY '14

ANNUAL REPORT



This annual report for the **Implementation Plan for Seventy-Two Total Maximum Daily Loads for Bacteria in the Houston-Galveston Region (I-Plan)** is prepared by the Houston-Galveston Area Council's Community and Environmental Planning Department in collaboration with the Bacteria Implementation Group (BIG), a stakeholder group appointed by H-GAC's Board of Directors and charged with the I-Plan's development and oversight.

The preparation of this report was financed in part through grants from the U.S. Environmental Protection Agency and the Texas Commission on Environmental Quality.



More information about the project, including a the full I-Plan, can be found at:
www.h-gac.com/BIG.

cover photo by Gene Fisseler



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IMPLEMENTING THE BIG I-PLAN

A group of government, business, and community leaders worked together with other stakeholders from across the region to develop an Implementation Plan (I-Plan) to help reduce bacteria in area waterways. Parenthetical indicates type of organization represented.

BIG Members

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Cathy McCoy, Harris County Soil and Water Conservation District #442 (Agriculture/Business)

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Linda Shead, Texas Coastal Partners (Conservation)

Brian Shmaefsky, Lone Star College, Kingwood (Public)

Vacant, City of League City (Municipal)



BIG Alternates

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Jessalyn Giacona, Buffalo Bayou Partnership
Frank Green, Montgomery County
Pamela Guillory, City of Webster
Denise Hall, Harris County
Gregory M. Hall, Jr., City of Conroe
Jonathan Holley, Harris County Flood Control District
Steve Hupp, Bayou Preservation Association, Inc.
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Michael Schaffer, Harris County
Richard "Dick" Smith, Cypress Creek Flood Control Coalition
Robert Snoza, Harris County Flood Control District
Michael Thornhill, Si Environmental, LLC
Jennifer Wheeler, Harris County
Mary Ellen Whitworth, EarthShare of Texas
Jim Williams, Sierra Club
Guyneth Williams, City of Houston
Vacant, US Geological Survey

Many stakeholders participated in the development of the I-Plan and this Annual Report (see Appendices A and B).

Be a Part of the Solution

The BIG project, the first of its kind in the state, is successful thanks in no small part to your support. We are eager to build on this success and seek the continued commitment of our partners and renewed interest and participation of our stakeholders.

Many of the implementation activities in the I-Plan are voluntary. MS4 operators, local governments, farmers and ranchers, OSSF owners, pet owners, and residents can help reduce the amount of bacteria entering our waterways with simple changes to daily routines.

Learn more by visiting
www.h-gac.com/BIG.





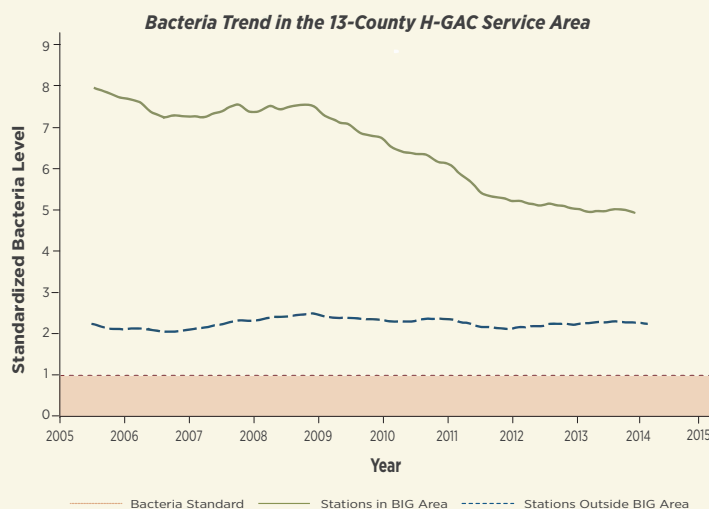
EXECUTIVE SUMMARY

Half of the streams and shoreline miles in the Houston-Galveston region have bacteria levels higher than state standards. High bacterial concentrations can cause swimmers or others who come into direct contact with the water to become ill or suffer from skin infections. In 2008, a group of government, business, and community leaders formed the Bacteria Implementation Group (BIG) with the common goal of developing a plan to reduce bacteria to improve water quality so that the region's waters support contact recreation where appropriate. The Texas Commission on Environmental Quality (TCEQ) approved this Implementation Plan (formally known as the **Implementation Plan for Seventy-Two Total Maximum Daily Loads for Bacteria in the Houston-Galveston Region**, or I-Plan) in January 2013.

Implementation Strategies

Many different sources contribute to the bacteria issue in the BIG project area; therefore, there is no one-size-fits-all solution for the problem. This I-Plan is a common-sense approach for reducing bacteria in our waterways. Municipalities, industries, landowners, and residents can consider a menu of water protection and implementation activities addressed by the following 11 strategies:

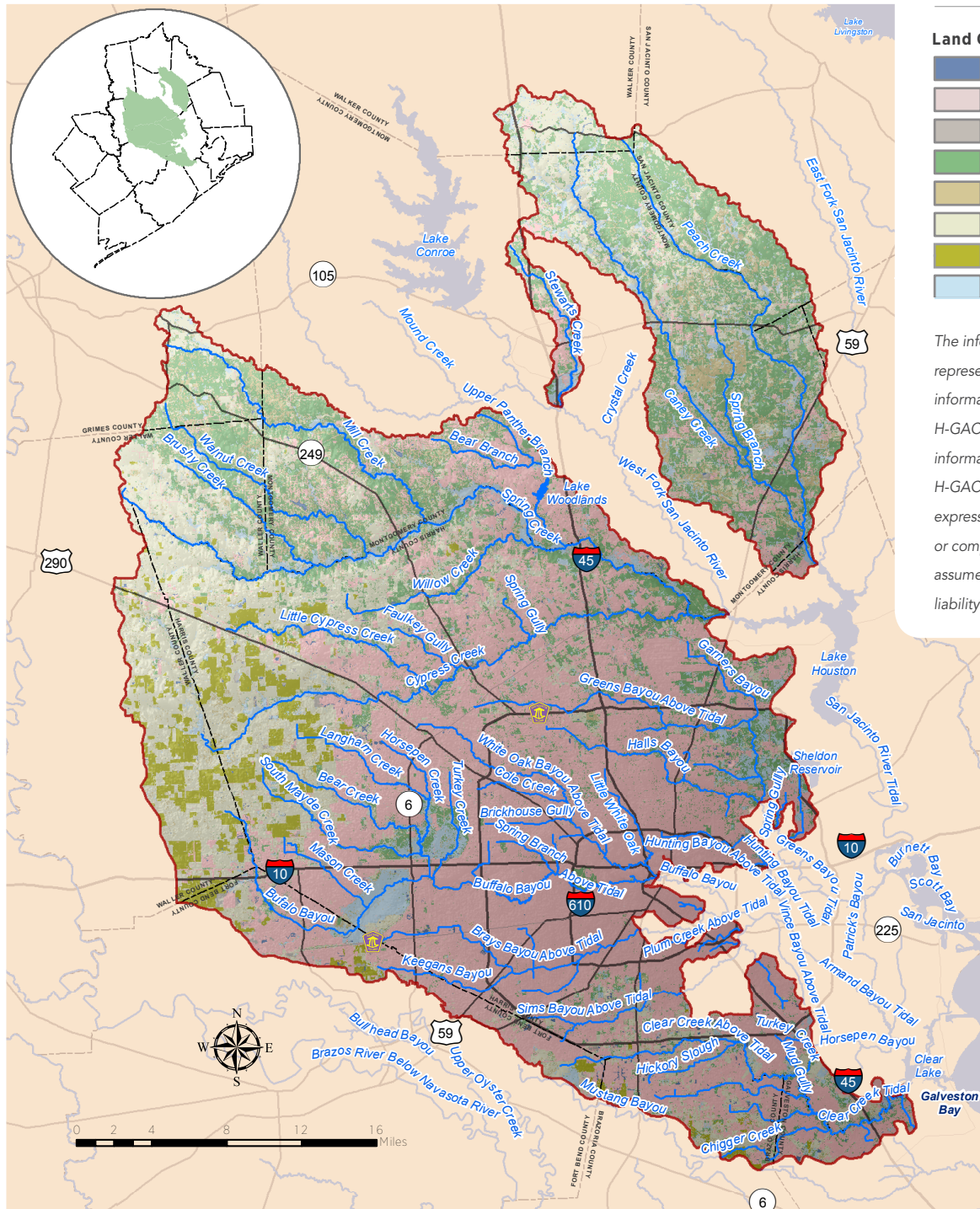
1. Wastewater Treatment Facilities
2. Sanitary Sewer Systems
3. On-Site Sewage Facilities
4. Stormwater and Land Development
5. Construction
6. Illicit Discharges and Dumping
7. Agriculture and Animals
8. Residential
9. Monitoring and I-Plan Revision
10. Research
11. Geographic Priority Framework



Making Progress

Overall, bacteria levels in the BIG project area are going down. Since 2005, bacteria levels in waterways have decreased from almost nine to just under five times the state standard (see Appendix C), making them safer for contact recreation. However, we still have a long way to go. The good news is we are making a difference. Many stakeholders are already actively implementing and tracking projects to examine the effectiveness of implementation activities in reducing bacteria, such as developing best management practices and tracking mechanisms, offering training for wastewater operators, providing up-to-date and interactive data for septic system "hot spots," and conducting public education campaigns. By working together, we can continue to identify what's working and what we still need to do.

BIG PROJECT AREA



- BIG Project Area
- Waterways
- County Boundary
- Major Highways
- State Highways
- Other Roads

Land Cover

- Open Water
- Developed Land
- Barren Land
- Forest
- Shrub/Scrub
- Grassland/Pasture
- Cultivated Crops
- Wetlands

The information on this map represents the most current information available to H-GAC and is for general informational purposes only. H-GAC does not implicitly or expressly warrant its accuracy or completeness and neither assumes nor will accept liability for its use.

The BIG project area is approximately 2,200 square miles and has a population of about four million people. The area encompasses much of the City of Houston and part or all of another 55 cities and 10 counties.



SPOTLIGHT ON SUCCESSES

Planning for Top 10 “Most Wanted” Streams

Last year, H-GAC released the Top 10 “Most Wanted” Streams – a list of the assessment units with the highest bacteria levels in the BIG project area. After a reassessment this year, almost all streams on the list have seen improvement. In some instances, the improvements appear to be directly tied to actions of BIG stakeholders. For example, the Bayou Preservation Association (BPA) worked with the City of Houston to remove three illicit storm sewer discharge sources of bacteria from Shramm Gully in the Hunting Bayou watershed. As a result, the water body was removed from the list. For more information about the Top 10 “Most Wanted” Streams, see Appendix G.

On-Site Sewage Facility SEP Funding

Recently, the TCEQ approved a Supplemental Environmental Project (SEP) which allows some funds generated from environmental compliance fines to be directed toward repairing or replacing failing septic systems in the 15 counties in the Houston-Galveston Area Council (H-GAC) Clean Rivers Program (CRP) region (see Appendix D) rather than having all of those funds go to the State General Fund. H-GAC plans to use its existing On-Site Sewage Facility (OSSF) database to prioritize use of these future SEP funds in impaired watersheds, including the BIG implementation area.

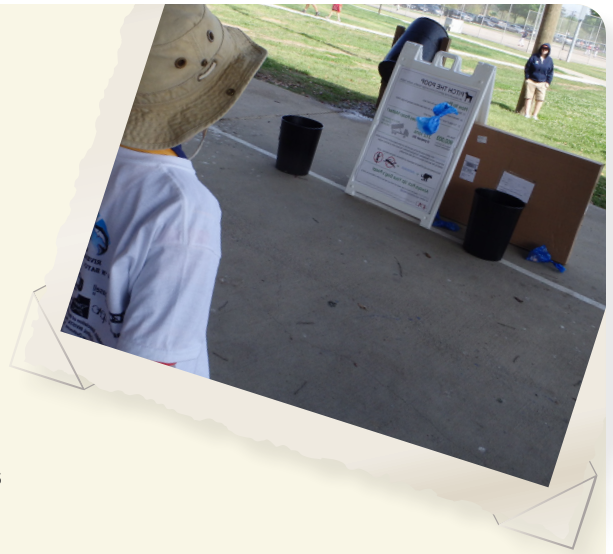
On-the-Ground Structural Best Management Practices

In 2013, multiple jurisdictions in Harris and Galveston counties initiated Best Management Practice (BMP) projects to gauge effectiveness. An example is the Ghirardi WaterSmart Park in League City. The City, TCEQ, and Texas Coastal Watershed Program (TCWP) completed the 3.75-acre park highlighting Low-Impact Development (LID) BMPs. The park features pervious pavement, a cistern, a green roof, rain gardens, and bio-swales, and serves as a demonstration for residents, city staff, and local developers as to how these BMPs can be implemented into landscapes and developments around the area. TCWP monitored the BMPs until August 31, 2014, measuring nitrogen, phosphorus, and bacteria.



Pet Waste

H-GAC's ongoing "Pet Waste Pollutes" campaign aims to reduce pet waste, which ultimately drains into area waterways and contributes to bacterial pollution. In 2013, H-GAC designed and distributed pet waste bag dispensers at the Reliant World Series of Dog Shows and Trash Bash®. This type of programming is supplemented by educational outreach efforts, such as online resources pertaining to other programs and model ordinances at www.petwastepollutes.org. The campaign is also useful for reporting data. For instance, the City of Houston demonstrated a progressive increase in the number of pet waste-related citations and convictions over the past seven years



Harris County Wastewater Treatment Plant Plan Set Reviews

In 2013, Harris County began reviewing wastewater treatment plant plan sets in unincorporated Harris County as they relate to the potential for excess discharge of bacteria into local waterways. Although TCEQ retains primacy for the wastewater treatment plant program, the extra set of eyes provided by Harris County reduces the risk of poor design being constructed, thereby resulting in better performing plants.

PROGRESS REPORT

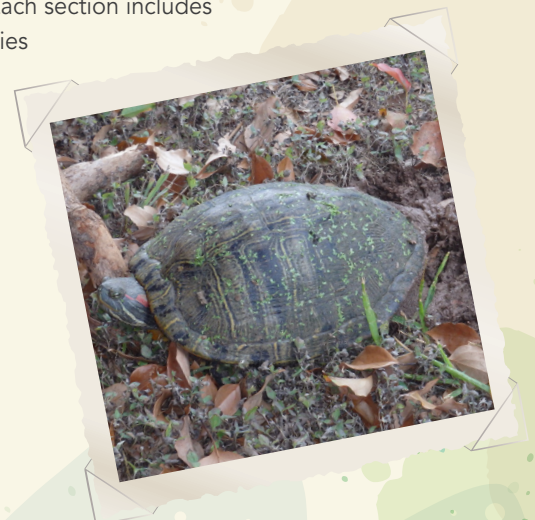
Success for the BIG will be achieved when the waters assessed by the state are no longer considered impaired, meaning they meet state water quality standards. Achieving that goal requires annually assessing progress to determine what is working and what is not working, looking critically at what each of the BIG partners is doing, and sharing information and coordinating future implementation activities. This Annual Report is meant to be that mechanism for annual assessment, encouraging efforts that appear to be working and redirecting implementation that seems to be falling short. It is also an opportunity to look at the I-Plan to see if expectations are being met or if some of the activities need further refinement.

Most of the information in this report is based on reports given to H-GAC through the workgroup process by stakeholders who are already involved in the BIG's planning effort. The BIG workgroups met in separate meetings between December 2013 and March 2014 to discuss implementation. This report includes activities through December 2013.

This report is divided into 11 implementation strategy sections and an appendix. Each section includes a summary of the issue, a focus for next year, and individual implementation activities in-line with the activities set out in the I-Plan. There are 38 implementation activities described in the I-Plan and laid out in this report. For each activity the reader will find goals for that activity, an assessment of the activity, and a summary of implementation efforts conducted throughout the year.

The assessment of each activity includes determining progress made toward achieving the activity's interim goal: Not Started, Initiated, In Progress, or Completed. Additionally, each activity is assessed based on the BIG partners efforts to advance the activity over the year: Behind Schedule, On Schedule, or Ahead of Schedule.

Overall in 2013, 34 activities are listed as In Progress with the remaining 4 listed as Initiated. For the year 2013 three activities are considered Ahead of Schedule, 29 are On Schedule, and 6 have been assessed as Behind Schedule





WASTEWATER TREATMENT FACILITIES

1

Summary

One potential source for bacteria in the BIG project area is from Wastewater Treatment Facility (WWTF) effluent. When operated properly and under most conditions, WWTFs meet state permit limits. However, until recently, compliance has been determined from the chlorine residual monitoring data collected and reported on each facility's discharge monitoring reports (DMRs). As Texas Pollutant Discharge Elimination System (TPDES) permits are being renewed, bacteriological testing requirements (except in specific circumstances) are being added to the permits to demonstrate adequate disinfection of effluent prior to being discharged to the receiving stream. Most of the region's waterways are effluent dominated and have minimal natural flows. The information learned through monitoring can assist WWTF operators in enhancing plant operation and direct resources, when needed, toward maintenance and planned upgrades. Bacteria results from DMRs* submitted in 2013 by 489 BIG project area WWTF operators suggest that over 95% of all 3,748 single grab/daily maximum bacteria samples reported (Table 1) met the WWTF required bacteria limits for *E. coli* or enterococcus.

The Wastewater Treatment Facilities Workgroup (11 BIG stakeholders, including five BIG members and one alternate) met January 16, 2014, and reported that over the past year the focus of implementation has been directed toward: 1) permitting, compliance and enforcement; 2) tracking revision of Title 30, Chapter 217 and reinstating Chapter 317 of the Texas Administrative Code; 3) facility design and upgrades; and 4) "regionalization" of WWTFs that chronically fail to meet their permit limits. "Regionalization" is the consolidation of multiple smaller plants, if they have the ability to do so, into larger facilities that serve broader areas. H-GAC continues to examine WWTF permit limits, effluent data, compliance, and enforcement. Stakeholders noted that for the first time there was bacteria data, though limited, that could be analyzed; presenting a baseline for future reports.

**H-GAC used data for the BIG project area from the TCEQ's DMR database, TCEQ's Central Registry, and H-GAC's permit database.*

2014 Focus

- H-GAC and BIG stakeholders aim to:
 - Continue to track and provide comments to the TCEQ on changes to the Texas Administrative Code Title 30, Chapter 217 and reinstatement of Chapter 317.
 - Focus on filling data gaps and conducting analysis (age of plant, ultraviolet [UV] vs. chlorine treatment, and bacteria sampling frequency).
 - Continue to provide training for operators (e.g. improve operation, maintenance, and bacteria sampling).
 - Continue to review WWTF design plan sets within unincorporated Harris County.

Implementation Strategies

1.1 Impose More Rigorous Bacteria Monitoring Requirements

- **Interim Measure:** Within five years, all of the WWTF permits should have had renewals initiated to include more rigorous monitoring requirements.

Project Status

- | | |
|--|--|
| ☐ Not Started | ☒ Behind Schedule |
| ☒ Initiated | ☐ On Schedule |
| ☐ In Progress | ☐ Ahead of Schedule |
| ☐ Completed | |

- With each WWTF permit renewal, the facilities are being required to initiate bacteria monitoring at the state specified frequency. The BIG I-Plan proposed more stringent monitoring frequencies than the state required. However, the TCEQ (source: TCEQ) does not plan to incorporate the BIG proposed monitoring frequencies at this time.

Implementation Effort

- **Increased Monitoring:** The BIG recommended to the TCEQ more stringent monitoring frequencies for WWTFs in the BIG project area. While the state does not currently have plans to increase the frequency, the BIG will continue to work with the TCEQ to request that renewed/new permits be issued with the BIG I-Plan recommended frequencies

**Table 1: 2013 Bacteria Permit Limit Exceedances
Taken From DMR Database***

Number of Geomean Results Reported from Permittees with Limits in Permit	3,632
Number of Samples Exceeding Daily Average Limit	32
Percentage of Samples Exceeding Daily Geomean Limit	0.9
Number of Highest Single Grab/Daily Max for WWTF DMR Monitoring Period	3,748
Number of Highest Single Grab/Daily Max for WWTF DMR Monitoring Period Exceeding Limit	165
Percentage of Highest Single Grab/Daily Max for WWTF DMR Monitoring Period Exceeding Limit	4.4

Table 1. Number and percentage of samples taken in 2013 that exceeded WWTF bacteria limits for facilities within the BIG project area.

Additional samples are potentially collected by WWTFs during the monitoring period depending on their permits with the state, but only the highest value reported during the monitoring period is used for this analysis.

What is a Geomean?

Bacteria data are often summarized using a geometric mean. Outliers and extreme values are common in such data, and the geometric mean (or geomean) is not as sensitive to them as an arithmetic mean. H-GAC calculates the mean of the natural logarithms of each bacteria value, and then converts the logarithm back into a number by exponentiation.

E. coli and enterococci data can be standardized for comparisons by dividing the geometric mean by the water quality standard to produce a relative geomean.

What is a Single Grab/Daily Max?

WWTFs' reporting typically requires a single grab bacteria sample or a daily maximum bacteria sample during the reporting period. A single grab sample is an individual sample collected in less than 15 minutes. A daily maximum sample is the maximum concentration measured on a single day, by the sample type specified in the permit, within a period of one calendar month.

1.2 Impose Stricter Bacteria Limits for WWTF Effluent

- **Interim Measure:** Within five years, all of the WWTF permits should have had renewals initiated to include more stringent limits for bacteria in effluent.

Project Status

- ☐ Not Started
- ☐ Initiated
- ☒ In Progress
- ☐ Completed

- ☐ Behind Schedule
- ☐ On Schedule
- ☒ Ahead of Schedule

- The majority of WWTFs in the BIG project area have undergone permit renewals that have included the more stringent bacterial limit and performance criteria dealing with the geometric mean and individual maximum results.

Implementation Effort

- **Permit and DMR Findings.** H-GAC analyzed WWTF permits from the H-GAC permits database, the TCEQ Central Registry, and TCEQ's DMR and made the following observations:
 - There are 489 permitted industrial, municipal and private WWTFs (Table 2) submitting data in the DMR database for the BIG Project Area (source: TCEQ DMR dataset). Of the 489 permitted facilities utilizing the TCEQ DMR database, 448 use *E.coli* as their reportable bacteria and three WWTF are using enterococci as their reportable bacteria.
 - Over 80%, or 395, of facilities in the BIG project area have more stringent bacteria limits (Table 2) than other parts of the state. It should be noted that not all plants using *E.coli* as their reportable bacteria in the BIG project area will be required by the state to have a 63 MPN/100mL limit. As an example, WWTFs in the Clear Creek watershed will have limits of 126 MPN/110mL since the TMDL study demonstrated that limit would allow the water body to meet state standards.
 - Since most WWTFs recently received their new permits and have just begun sampling there are few reported values for *E.coli* and enterococci.
- **Future Research.** BIG stakeholders asked H-GAC, as data and funding become available, to conduct further research on the following topics:
 - Age of WWTFs to identify any potential correlations with exceedances (or bacteria levels in general);
 - Correlation to rainfall events; and
 - Differences between UV and chlorination disinfection.

Table 2: Total Number of BIG WWTF By Type from 2013 DMR

Permit Type	Permittees Submitting DMRs in 2013 (TCEQ Data)	Number of Permittees Reporting with <i>E.coli</i> Geomean Limit of 63 MPN/100 mL (TCEQ DMR)	Number of Permittees Reporting with <i>E. Coli</i> Geomean Limit of 126 MPN/100 mL (TCEQ DMR)	Number of Permittees Reporting with Enterococci Geomean Limit of 35 MPN/100 mL (TCEQ DMR)	No Geomean Limit in H-GAC Permit Database
Industrial	36	8	4	NA	24
Municipal Domestic	363	311	37	3	12
Private Domestic	90	76	12	NA	2
Total	489	395	53	3	38

Table 2. BIG project area WWTFs reporting DMRs to the TCEQ in 2013. WWTFs are broken out into type of facility, reporting limits per the permit reviewed either through H-GAC's permit database or the TCEQ's Central Registry. For WWTFs with 'No Geomean' those plants submitted data to the TCEQ DMR but as of the date data was pulled for the Annual Report, no limit could be determined. Many plants still remain to have their permits renewed or are undergoing review at the time of printing.

1.3 Increase Compliance and Enforcement by the TCEQ

- **Interim Measures:** Each year, TCEQ can address low numbers of investigations and renewals by increasing:
 - The number of unannounced inspections conducted;
 - The number of focused sampling investigations;
 - The percent of plans and specifications reviewed;
 - The percent of DMRs reviewed;
 - The number of other investigations conducted; and
 - The ability of the TCEQ to conduct focused sampling investigations.

Project Status

- ☐ Not Started
- ☐ Initiated
- ☒ In Progress
- ☐ Completed

- ☒ Behind Schedule
- ☐ On Schedule
- ☐ Ahead of Schedule

- As of this publication's printing, H-GAC does not currently have TCEQ's information to address this activity's interim measures. BIG stakeholders will work with TCEQ to obtain data to evaluate the interim measure in the future. Local compliance data and DMR data will be used as a surrogate until that time.

Implementation Effort

☒ Compliance and Enforcement:

- Harris County inspectors (Harris County Pollution Control Services- HCPCS) found that 9% of samples they obtained at domestic WWTFs in Harris County during unannounced compliance inspections in 2013 exceeded the permitted bacteria limits. WWTFs in Harris County that submitted DMR reports (self reporting) for the same plants sampled by HCPCS indicated 3.7% of single grab/daily max samples in 2013 exceeded permitted bacteria levels (Table 3). This suggests that between 91% and 97% of the bacteria samples collected from WWTFs in Harris County are meeting permit limits.
- In Figures 1 and 2 DMR data is presented in the BIG project area WWTFs percent mean daily discharge and total estimated bacterial loading by relative facility size. Comparing mean daily discharge to percent bacterial loading suggests that WWTFs smaller than 0.5 MGD contribute a disproportionate amount of bacteria to the project area when compared to other size WWTFs. This is supported by the data presented in Table 4 that finds more WWTFs less than 0.5 MGD have 25% or more excursions above their single grab/daily max permit limit.

- ☒ **Focused Sampling.** The TCEQ has not approved focused sampling investigations but did report that they conduct focused investigations (targeted investigations rather than multi-day compliance investigations). Focused TCEQ investigations can potentially cut down on time and increase the number of WWTFs visited per year, increase the time available to spend at WWTFs that are having issues, and be used to identify plants that would benefit from additional owner/operator education.

- ☒ **Monitoring Study.** The TCEQ reported that they are conducting a study on 37 UV/Chlorination WWTFs to evaluate the proper location to collect bacteria samples for self reporting by the WWTF operator. According to TCEQ, there is not an explicitly designated location from which WWTFs are taking the bacteria samples, which has resulted in sample collection at locations that may not be representative of bacteria loading to the receiving stream.

☒ Education.

- Texas A&M Engineering Extension (TEEX) and Galveston Bay Foundation (GBF) hosted an Effluent Bacteria Loading Workshop on November 1, 2013, that covered issues causing bacteria violations, laboratory testing, and best practices for resolving bacteria violations.
- TCEQ worked with TEEX and Texas Water Utilities Association (TWA) to improve WWTF operator course curriculum and testing.

Table 3: WWTFs in the BIG Project Area Inspected by Harris County Pollution Control Services

Relative Plant Size / Permitted (MGD)	Data Source	Number of Highest Single Grab/Daily Max for WWTF DMR Monitoring Period	Number of Highest Single Grab/Daily Max for WWTF DMR Monitoring Period Exceeding Limit	Percentage of Highest Single Grab/Daily Max for WWTF DMR Monitoring Period Exceeding Limit	Data Source	Number of Random Samples Collected	Number of Samples Exceeding TCEQ Grab/Single Sample Limit	Percent HCPCS Samples Exceeding TCEQ Permit Limit
< 0.1	DMR	267	9	3.4	HCPCS	110	14	12.7
0.1-0.5	DMR	567	10	1.8	HCPCS	95	2	14.7
0.5-1	DMR	579	16	2.8	HCPCS	76	1	2.6
1-5	DMR	534	38	7.1	HCPCS	61	0	1.6
5-10	DMR	38	2	5.3	HCPCS	3	14	0
> 10	DMR	12	0	0	HCPCS	1	0	0
Totals	DMR	1,997	75	3.7		346	31	9.0

Table 3. Domestic WWTFs in Harris County found within the BIG project area reporting to the DMR database that underwent Harris County Pollution Control Services (HCPCS) inspections and that had permit limits at the time of inspection. Here the random grab sample collected by HCPCS is compared to single grab/daily max samples, number of samples exceeding permit limits, and percentage exceeding.

Table 4: Permittees with 25% or More Excursions Above Permit Limit

Plant Size/Permitted Flow	Daily Geomean	Single Grab/Daily Max
Variable or Unknown	NA	NA
< 0.1 MGD	10	10
0.1-0.5 MGD	2	3
0.5-1 MGD	NA	4
1-5 MGD	NA	5
5-10 MGD	NA	NA
> 10 MGD	NA	1

Table 4. WWTFs in the BIG project area in 2013 where 25% or greater samples taken exceeded the facility's permit limit.

1.4 Improved Design and Operation Criteria for New WWTFs

- **Interim Measure:** Every five years, at least 20% of local governments should consider whether to adopt stricter requirements. Note: The I-Plan indicates the revision process should start in year six of implementation.

Project Status

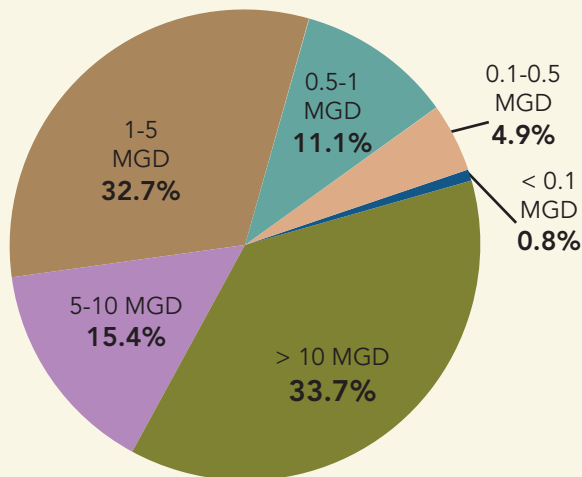
- ☐ Not Started
- ☐ Initiated
- ☒ In Progress
- ☐ Completed
- ☐ Behind Schedule
- ☒ On Schedule
- ☐ Ahead of Schedule

– This activity is on schedule. The revision process will begin in 2018.

Implementation Effort

- **WWTF Design Reviews.** Harris County implemented a new WWTF program that reviews plan sets for compliance with state standards for new and significantly modified WWTFs in unincorporated Harris County. The County reviewed eight plant designs in 2013. Of those eight plants, one plan set was identified as insufficient and required modification.
- **New State Design Criteria of Domestic WWTFs.** The TCEQ's proposed changes to Chapter 217 of the Texas Administrative Code is intended to update WWTF standards and criteria with current engineering practices and to reflect the current permitting practices. BIG stakeholders are tracking the progress of changes to Chapter 217. Stakeholders are encouraged to provide comment on this proposed change during the next phase of public comment which is scheduled for 2014.

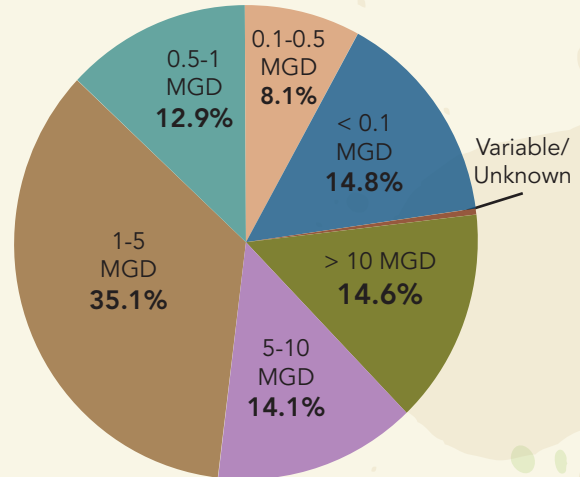
Figure 1: Percent of Mean Daily Discharge by Relative Facility Size



Percent from Plants with Variable Discharge Not Shown in Chart - 1.2%

Figure 1. 2013 mean daily discharge by relative facility size for WWTFs in BIG project area.

Figure 2: Percent of Total Estimated Bacteria Loading by Relative Facility Size



Load Estimated from Reported Bacteria Daily Average and Mean Reported Flow During Monitoring Period

Figure 2. 2013 percent total estimated bacteria loading by relative facility size for WWTF in BIG Project Area.

1.5 Upgrade Facilities

- **Interim Measure:** WWTFs not meeting effluent limits should upgrade or repair their facilities to comply with individual permits.

Project Status

- | | | |
|--|--|---|
| ☐ Not Started | ☒ Behind Schedule | – This activity is initiated, but additional work is needed to gather data on WWTFs efforts to upgrade or repair facilities to comply with permits. |
| ☒ Initiated | ☐ On Schedule | |
| ☐ In Progress | ☐ Ahead of Schedule | |
| ☐ Completed | | |

Implementation Effort

- **Monitoring Upgrades.** BIG stakeholders suggested consideration of using geographic information systems (GIS) to track changes to WWTF footprints. This technique might be used to validate coarse design measurements that were provided in the permit amendments.
- **Permit Amendments.** BIG stakeholders recommended that H-GAC staff track permit amendments. This process could be used to determine if WWTF upgrades were made to address bacteria. HCPCS enforcement may be able to provide assistance.

1.6 Consider Regionalization of WWTFs

– Interim Measures:

- Regulators should develop criteria for identifying chronically non-compliant WWTFs.
- Regulators should document the number of non-compliant WWTFs identified using said criteria.
- Regulators should document the number of chronically non-compliant WWTFs that have considered regionalization.

Project Status

- | | | |
|--|--|---------------------------------|
| ☐ Not Started | ☐ Behind Schedule | – This activity is on schedule. |
| ☐ Initiated | ☒ On Schedule | |
| ☒ In Progress | ☐ Ahead of Schedule | |
| ☐ Completed | | |

Implementation Effort

- **Regulatory.** EPA and TCEQ have developed criteria for chronically non-compliant WWTFs and documents those WWTFs. TCEQ will share documented WWTFs with the BIG to assist with tracking future regionalization.
- **Regionalization.** BIG stakeholders reported that two WWTFs were regionalized (source: Harris County Community Services Department) due to their regular non-compliance. West Mount Houston is included in this report as it had not been tracked in previous BIG implementation efforts. In 2011, two plants considered regionalization and are listed here to initiate future tracking:
 - Regionalized
 - » Atascocita - May 2013
 - » West Mount Houston - May 2012 (not previously tracked)
 - Future Tracking
 - » Esmarelda Sanjuin considered regionalization in 2011
 - » Aldine Community Care considered regionalization in 2011

1.7 Use Treated Effluent for Facility Irrigation

- **Interim Measure:** Every five years, one WWTF in the project area shall install a new irrigation system that uses treated effluent.

Project Status

☐ Not Started

☒ Initiated

☐ In Progress

☐ Completed

☐ Behind Schedule

☒ On Schedule

☐ Ahead of Schedule

– This activity is on schedule to meet the five-year target.

Implementation Effort

- **Type I and Type II.** The BIG stakeholders suggested that this activity be reviewed and that new language be evaluated by the BIG WWTF work group for distinguishing between Type I and Type II re-use. Any changes to the I-Plan will require approval of the BIG.





SANITARY SEWER SYSTEMS

2

Summary

Failure of sanitary sewer systems (SSSs) often results in sanitary sewer overflows (SSOs). SSOs discharge untreated sewage into area waterways before the sewage reaches a treatment facility. The microbial pathogens and other pollutants present in SSOs can cause or contribute to contamination of drinking water supplies, water quality impairments, beach closures, shellfish bed closures, and other environmental and human health problems. Based on estimates in total maximum daily load (TMDL) reports and/or draft technical documents, an average of 77 overflows were reported in the project area each month. These SSOs occurred in all but two of the project area's watersheds and reported a monthly average of over 700,000 gallons discharged without treatment.

To address these infrastructure deficiencies, the Sanitary Sewer Systems Workgroup (eight BIG stakeholders, including two BIG members and one alternate) met January 23, 2014, and reported that efforts over the past year focused on developing capacity to increase education, data collection, and source elimination activities that support implementation.

2014 Focus

- H-GAC and BIG stakeholders aim to:
 - Continue to host an annual conference on asset management for SSSs.
 - Work with the TCEQ to improve the SSO reporting system.
 - Identify appropriate contact information and begin tracking utility asset management programs (UAMPs) and identifying subscriber systems. BIG stakeholders request that H-GAC send out an email survey to WWTF operators concerning UAMP and interest in future UAMP-related workshops. The survey could be used to ascertain problem areas and suggest topics.
 - Facilitate coordination of "Cease the Grease" and "Corral the Grease" to develop a unified regional message on fats, oils, and grease (FOG) education for the project area and region.
-

Implementation Strategies

2.1 Develop Utility Asset Management Programs (UAMP) for Sanitary Sewer Systems

– Interim Measures:

- Within five years, H-GAC, the TCEQ, or another appropriate entity shall offer at least eight educational workshops for owners, operators, and engineers.
- After 10 years, all WWTF permits will have UAMPs.

Project Status

☐ Not Started

☐ Initiated

☒ In Progress

☐ Completed

☐ Behind Schedule

☒ On Schedule

☐ Ahead of Schedule

– This activity is on schedule to meet the five-year target.

Implementation Effort

- **Education.** H-GAC, through its Clean Waters Initiative (CWI), hosted Capacity Management Operations and Maintenance, a workshop on asset management for SSSs on March 8, 2013
- **TCEQ's Voluntary SSOI.** TCEQ's voluntary Sanitary Sewer Overflow Initiative (SSOI) allows eligible municipalities to direct resources toward corrective actions rather than paying enforcement penalties. There are 19 WWTF operators within the BIG project area involved in the program (source: TCEQ).

2.2 Address Fats, Oils, and Grease

– Interim Measures:

- Within five years, H-GAC and other local entities will:
 - » Compile and share all existing regulations within the project area;
 - » Examine each community's regulations and policies;
 - » Distribute flyers or other collateral material; and
 - » Develop and promote website.
- Within five years, one community shall adopt new regulations.

Project Status

☐ Not Started

☐ Initiated

☒ In Progress

☐ Completed

☐ Behind Schedule

☒ On Schedule

☐ Ahead of Schedule

– This activity is on schedule to meet the five-year target.

Implementation Effort

- **Model FOG Programs.** BIG suggested that a regional message be developed based on the following programs:
 - Galveston Bay Foundation has received funding to develop 'Cease the Grease,' a FOG program in the BIG region. The local effort is based on the successful program in the Dallas/Ft. Worth region.
 - The City of Houston's 'Corral the Grease' and 'Grease Busters' programs have been in operation for several years. The City participates in a large apartment complex management meeting each year to allow apartment managers to sign up to receive 'Corral the Grease' materials. Apartment complexes referred by the City's stoppage crews as having grease issues in the sewer main lines were targeted with educational materials.
- **Education.** The TCEQ developed a FOG poster, available on the TCEQ website (document listing GI-290).

2.3 Encourage Appropriate Mechanisms to Maintain Function at Lift Stations

– **Interim Measure:** Every five years, 10% of SSSs shall be compliant with recommendations.

Project Status

- ☐ Not Started
- ☐ Initiated
- ☒ In Progress
- ☐ Completed

- ☐ Behind Schedule
- ☒ On Schedule
- ☐ Ahead of Schedule

– This activity is on schedule to meet the five-year target.

Implementation Effort

- **Emergency Power Requirements.** The TCEQ is in the process of revising Title 30, Chapter 217 and reinstating Chapter 317 of the Texas Administrative Code. Of importance to SSSs are Subchapters B and C of Chapter 217, which address emergency power requirements. BIG members plan to provide comments in 2014 to the TCEQ regarding the changes to Chapter 217.

2.4 Improve Reporting Requirements for SSOs

– **Interim Measures:** Within five years, the U.S. Environmental Protection Agency (EPA) and TCEQ will develop appropriate database structure and technology for collecting and sharing information regarding SSOs.

Project Status

- ☐ Not Started
- ☐ Initiated
- ☒ In Progress
- ☐ Completed

- ☒ Behind Schedule
- ☐ On Schedule
- ☐ Ahead of Schedule

– This activity is behind schedule to meet the five-year target. Currently the TCEQ does not have a time-frame for electronic reporting.

Implementation Effort

- **Reporting.** The TCEQ stated that there is no timeframe for electronic reporting. TCEQ also stated that there were 169 comments to the EPA's Proposed National Pollution Discharge Elimination System (NPDES) Electronic Reporting Rule. Once addressed, there will be an additional supplemental notice sent out to the states. The BIG will continue to track this development and evaluate any impact to implementation.



2.5 Strengthen Controls on Subscriber Systems

– Interim Measures:

- By year three, H-GAC will work with attorneys for WWTFs, municipal utility districts, and stakeholders to develop model contract language.
- Within five years, H-GAC will develop a list of subscriber systems.
- As funds are available, H-GAC will initiate a circuit rider program.

Project Status

☐ Not Started

☒ Initiated

☐ In Progress

☐ Completed

☒ Behind Schedule

☐ On Schedule

☐ Ahead of Schedule

- This activity is behind schedule to meet the three- and five-year targets. Stakeholders are just beginning to look at tracking this issue.

Implementation Effort

- **Tracking.** Stakeholders suggested that this is a tracking issue to target when emailing WWTFs and begin to gauge interest in future workshops. Responses would be used to collect data on individual subscriber systems and subscriber system contracts and look for opportunities to share information and improve contract language between WWTFs and subscriber systems.

2.6 Penalties for Violations

- **Interim Measure:** Within five years, the TCEQ will have an appropriate penalty policy in place.

Project Status

☐ Not Started

☐ Initiated

☒ In Progress

☐ Completed

☐ Behind Schedule

☒ On Schedule

☐ Ahead of Schedule

- This activity is on schedule to meet the five-year target.

Implementation Effort

- **Penalty Policy.** The TCEQ is currently working on Enforcement Initiation Criteria revision 15. The last revision to the Penalty Policy for violations was made September 1, 2011. That revision was in response to House Bill 2694 that required an increase in statutorily authorized penalties from \$10,000/day to \$25,000/day and to cap the penalty enhancement attribute to compliance history down from 300% to 100% of the base penalty for any individual violation
- **SSO Investigations.** TCEQ inspectors conducted focused SSO investigations.
- **Future Tracking.** As funds are available, H-GAC and BIG stakeholders intend to track the occurrence of and penalties for SSS violations. Information will be derived from the TCEQ's annual enforcement reports and other information resources



ON-SITE SEWAGE FACILITIES

3

Summary

Properly functioning and maintained On-Site Sewage Facilities (OSSF) contribute negligible amounts of bacteria to waterways. Therefore, BIG stakeholders have primarily focused on unpermitted, failing, or poorly maintained OSSFs.

One of the biggest challenges to understanding OSSFs has been a lack of a regional inventory and monitoring practices. In 2009, H-GAC staff partnered with local governments to create the OSSF Information System, a GIS-based online mapping tool that displays OSSF data. The OSSF Information System also helped identify probable locations of older, unpermitted systems at higher risk of failing. Staff identified 31,517 permitted systems in the BIG project area.

The On-Site Sewage Facilities Workgroup (eight BIG stakeholders, including one BIG member and one alternate) met February 13, 2014. The stakeholders reported continued focus over the past year on education and regulatory action to prevent and remediate failing systems. Efforts are already underway to provide education programs to a variety of audiences. Examples of regulatory measures are also being collected and shared for potential enactment in the future. H-GAC coordinated with the TCEQ to develop an approved Supplemental Environmental Project (SEP) to address low-income residences with failing OSSFs.

2014 Focus

■ H-GAC and BIG stakeholders aim to:

- Continue to update maps with OSSF location data and establish priority areas.
 - Continue to allow only higher performing systems that are electronically monitored to be installed in unincorporated Harris County within bacteria impaired watersheds.
 - Begin applying SEP funds to maintain, repair, and replace failing systems in priority areas.
-

Implementation Strategies

3.1 Identify and Address Failing Systems

– Interim Measures:

- H-GAC will work with the TCEQ, authorized agents, and other interested parties to create an inventory of OSSFs with a focus on identifying known or suspected failing systems.
- Within one year, H-GAC and local authorized agents will create an initial map.
- Within two years, H-GAC and local authorized agents will identify target areas.
- Every five years, owners will repair or replace 500 failing OSSFs.
- Authorized agents will continue to collect and share OSSF data on an ongoing basis.

Project Status

- ☐ Not Started
- ☐ Initiated
- ☒ In Progress
- ☐ Completed

- ☐ Behind Schedule
- ☒ On Schedule
- ☐ Ahead of Schedule

- This activity is on schedule to meet the five-year target, having completed the initial map and started to prioritize areas for conducting educational workshops and repairing and replacing systems.

Implementation Effort

- **Mapping.** H-GAC staff, with the input from BIG stakeholders, continued to refine and update the OSSF permit database. The mapping system allows the public to view OSSF permit data and access basic analyses at www.h-gac.com/go/ossf. Highlights of the system include:
 - Layers that show permitted OSSFs by age, authorized agent, and residential properties with a high chance of having an old or otherwise unpermitted system.
 - Tools for future prioritizing system repair and replacement under a SEP project (see Appendix E).
- **Data.** Authorized agents continue to provide data. Additionally, agents have been working with H-GAC to collect data on OSSF locations when in the field using hand-held GPS units supplied by H-GAC. The new data is being used to refine the mapping system to identify other OSSFs.
- **Address Failing Systems.** Harris County and East Aldine Management District continue to install sewer service in the Aldine region with failing OSSFs utilizing Community Development Block Grant funding. OSSFs are abandoned as sewer tie-ins occur. Many of the abandoned OSSFs were failing as evidenced by violations.



3.2 Address Inadequate Maintenance of OSSFs

– Interim Measures:

- Each community will examine its regulations and policies.
- Existing regulations will be compiled and shared among BIG stakeholders.
- Flyers or collateral material will be distributed among BIG stakeholders.

Project Status

- | | | |
|---|---|--|
| ☐ Not Started | ☐ Behind Schedule | – This activity is on schedule. Regulations and educational information has been compiled and are available through the H-GAC website. |
| ☐ Initiated | ☒ On Schedule | |
| ☒ In Progress | ☐ Ahead of Schedule | |
| ☐ Completed | | |

Implementation Effort

- **Wastewater Professional Education.** Harris County hosted the 3rd Annual Harris County On-site Wastewater Seminar on April 29, 2013, which was attended by approximately 100 regional on-site wastewater professionals
- **Real Estate Industry Coordination.** H-GAC developed and maintains a curriculum for real estate inspection professionals to learn how to properly inspect an OSSF during a point-of-sale home inspection.
- **Online Regulations and Policies.** H-GAC continued to compile OSSF regulations and policies online at www.h-gac.com/go/septic. These serve as model regulations and policies.
- **Homeowner Education.** H-GAC maintains a website, www.h-gac.com/go/septic, to share educational material. In addition to providing general information, the site offers content specific to homeowners/homebuyers, local governments, and real estate professionals.
- **OSSF Compliance.** Managing OSSFs presents a challenge for rural counties to adequately track residential compliance with maintenance and repairs. Walker County contracted with 26 professional on-site wastewater companies to perform inspections, assist homeowners in determining repair issues, and completing and filing inspection reports. The county developed uniform inspection standards, requiring a processing fee for each report and implementing a late fee for overdue reports. The county maintains the list of approved wastewater companies by conducting random follow-up inspections to ensure reports are accurately completed.

3.3 Legislation and Other Regulatory Actions

– Interim Measures:

- The TCEQ should host biennial meetings to review OSSF regulations.
- Local authorized agents will meet annually.
- Every five years, one community shall revise or adopt new regulations.

Project Status

- | | | |
|---|---|--------------------------------------|
| ☐ Not Started | ☐ Behind Schedule | – Activity is currently on schedule. |
| ☐ Initiated | ☒ On Schedule | |
| ☒ In Progress | ☐ Ahead of Schedule | |
| ☐ Completed | | |

Implementation Effort

- **Education.**
 - Harris County hosted the 3rd Annual On-Site Wastewater Seminar on April 29, 2013.



STORMWATER AND LAND DEVELOPMENT

4

Summary

Regional growth and development have increased the importance of stormwater management. Bacteria sources, such as waste from pets, wildlife, and even humans, can be washed into storm drains and discharged into local waterways. Stormwater systems are designed to remove stormwater from developments quickly and efficiently. As a result, stormwater in urbanized areas often bypasses natural vegetative barriers. Without these filters, “sheet flow” (i.e., stormwater flowing across the landscape) tends to result in more concentrated bacteria loading to waterways.

In general, this strategy focuses on building upon existing programs by sharing knowledge and developing incentives to increase voluntary implementation. The Stormwater and Land Development Workgroup (10 BIG stakeholders, including three BIG members and two alternates) met on February 20, 2014, and reported progress in implementing demonstration LID and stormwater management projects with an emphasis on effectiveness monitoring; progress on providing education and training opportunities; progress on surveying Municipal Separate Storm Sewer System (MS4) operators; and some progress on developing a MS4 recognition program.

2014 Focus

- H-GAC and BIG stakeholders aim to:
 - Collect new small MS4 Notices of Intent (NOIs) and Stormwater Management Plans submitted to TCEQ by June 11, 2014 to track implementation of new MS4 permittees, with the goal of expanding stormwater management programs related to bacteria and special provisions for impaired water bodies.
 - Implement a web-based MS4 Phase II Tracking System with stakeholders to develop a more uniform MS4 Phase II annual report format that will facilitate improved tracking.
 - Examine local regulations and how they might inhibit LID projects.
 - Implement the recognition and awards program through coordination with local builder/developer trade organizations.
 - Highlight five local programs on H-GAC’s website.
-

Implementation Strategies

4.1 Continue Existing Programs

– Interim Measures:

- Eighty MS4 programs will be continued.
- As many as 200 additional MS4s will be added to TCEQ Region 12 during the new permit cycle; many will be in the BIG project area.

Project Status

- | | | |
|--|--|---------------------------------|
| ☐ Not Started | ☐ Behind Schedule | – This activity is on schedule. |
| ☐ Initiated | ☒ On Schedule | |
| ☒ In Progress | ☐ Ahead of Schedule | |
| ☐ Completed | | |

Implementation Effort

- **Continued Program Administration.** Eighty MS4 permit areas are located partially or fully within the BIG project area. These programs have been used to identify best practices and are supported by educational opportunities.
- **MS4 Operator Survey.** H-GAC conducted interviews with 107 of 142 Phase II MS4 operators within H-GAC's region, which includes the eighty BIG MS4 operators; reviewed annual reports; and provided general recommendations to the TCEQ for potential improvements to the program. The survey and annual report reviews suggest:
 - Most do not report implementation of structural BMPs.
 - Most do not report having significant BMP effectiveness evaluation methods.
 - Almost all provide some form of outreach and education.
 - Most have an interest in additional training and clarification of expectation for MS4 Annual Report format and requirements.



4.2 Model Best Practices

- **Interim Measure:** Each year, BIG stakeholders will hold four to six networking meetings and will highlight five local programs.

Project Status

- | | | |
|--|--|---------------------------------|
| ☐ Not Started | ☐ Behind Schedule | |
| ☐ Initiated | ☒ On Schedule | – This activity is on schedule. |
| ☒ In Progress | ☐ Ahead of Schedule | |
| ☐ Completed | | |

Implementation Effort

- **BMP Database.** Harris County Flood Control District (HCFCD) created an online Regional BMP Database (www.bmpbase.org) for stakeholders to access and evaluate the effectiveness of structural BMPs. The database provides access to BMP effectiveness data and is set to the International Stormwater BMP Database standards. HCFCD encourages other entities to submit qualified BMP effectiveness data from other projects in the region. In cases where other projects did not collect desired performance data, HCFCD remains interested in collecting the projects' geographic location and other metadata.
- **BMP Installation.** BIG partners installed or are constructing several BMPs to track progress. Other low impact development projects than the ones highlighted below are being designed and constructed in our region, including additional Harris County roadways, urban retrofits (such as Bagby Street within the City of Houston) and other land development projects.
 - Completed Projects:
 - » The City of League City and Texas Coastal Watershed Program (TCWP) completed a watersmart park highlighting LID practices. Ghirardi WaterSmart Park is a 3.75-acre park that features rain gardens, a cistern, pervious pavement, green roof, and bio-swales. TCWP is monitoring the BMPs until August 31, 2014, measuring nitrogen, phosphorus, and bacteria.
 - » The first low impact development roadway in Texas, Birnamwood Drive (Harris County) was completed. Harris County intends to begin stormwater quality performance monitoring in 2014. The project has won awards from both the American Society of Civil Engineers and the EPA Region 6 for its innovation in design.
 - Under Construction:
 - » The Springwoods low impact development project (located in Harris County) is underway, and monitoring is scheduled to begin in March 2014.
- **Education.** H-GAC, through its CWI, conducted seven workshops supporting BMPs during the year: Minimum Control Measures (February), Asset Management (March), Construction Permits (April), Industrial Permits (July), Electricity Use and Production through Waste Water (September), Water Quality Applications (October), and Feral Hogs and Water Quality (November).

4.3 Encourage Expansion of Stormwater Management Programs

– Interim Measure: *Within the next five years:*

- All permit holders shall expand or focus their existing programs.
- Thirty previously unpermitted entities shall develop new programs.

Project Status

- ☐ Not Started
- ☐ Initiated
- ☒ In Progress
- ☐ Completed

- ☐ Behind Schedule
- ☒ On Schedule
- ☐ Ahead of Schedule

- *This activity is on schedule to meet the five-year target. New TPDES permit requirements will encourage MS4 operators to address impaired waterbodies with appropriate management measures.*

Implementation Effort

- **MS4 Operator Survey.** H-GAC, through the MS4 analysis project, surveyed MS4 Phase II operators and asked how H-GAC could assist them in developing their programs. Most were interested in assistance through topical workshops.
- **New General Permit Eligibility.** In May 2012, the U.S. Census Bureau released new maps of urban areas based on the 2010 Census. A preliminary review indicated that 13 cities and 124 special purpose districts will be subjected to the MS4 Phase II General Permit for the first time. This permit required these entities to develop and submit Stormwater Management Programs to the TCEQ by June 11, 2014.

4.4 Promote Recognition Programs for Developments that Voluntarily Incorporate Bacteria Reduction Measures

– Interim Measures:

- *Within five years, BIG stakeholders should develop a recognition program and subsequently recognize communities and participants.*
- *Each year, two communities will analyze regulations and programs to accommodate participation in existing programs.*

Project Status

- ☐ Not Started
- ☐ Initiated
- ☒ In Progress
- ☐ Completed

- ☐ Behind Schedule
- ☒ On Schedule
- ☐ Ahead of Schedule

- *This activity is on schedule to meet the five-year target. Additional work must be made to identify communities which have analyzed regulations and other hurdles in an effort to meet the requirements of existing recognition programs.*

Implementation Effort

- **Recognition Program.** H-GAC developed a draft recognition program that was submitted to TCEQ. BIG stakeholders recommended that the program should be shared with trade organizations to seek their comments and support. Representatives from Harris County and the City of Houston volunteered to participate. BIG stakeholders recommended that the BPA, Association of Water Board Directors (AWBD), American Council of Engineering Companies – Houston (ACEC-Houston), Association of General Contractors (AGC), and Greater Houston Builders Association (GHBA) be encouraged to participate. Until the recognition program is established, analysis of regulations and programs is pending.

4.5 Provide a Circuit Rider Program

- **Interim Measure:** *Each year, H-GAC will contact 50 stakeholders and provide five in-depth community consultations.*

Project Status

- | | | |
|--|--|---|
| ☐ Not Started | ☐ Behind Schedule | – <i>This activity is on schedule to meet the yearly target</i> |
| ☐ Initiated | ☒ On Schedule | |
| ☒ In Progress | ☐ Ahead of Schedule | |
| ☐ Completed | | |

Implementation Effort

- **MS4 Phase II Operator Survey.** H-GAC reviewed its database of annual reports compiled in 2013. Using the database, H-GAC created a list of MS4 Phase II operators holding permits. Over three months, H-GAC staff surveyed 107 MS4 operators from the list. Most were interested in assistance through topical workshops and clarification of annual report requirements.
- **Education.** H-GAC, through its CWI, conducted five workshops related to MS4 operators during the year: Minimum Control Measures (February), Asset Management (March), Construction Permits (April), Water Quality Applications (October), and Feral Hogs and Water Quality (November).

4.6 Petition the TCEQ to Facilitate Reimbursement of Bacteria Reduction Measures

- **Interim Measure:** *Within three years, BIG stakeholders should receive letters of commitment or similar support from the TCEQ.*

Project Status

- | | | |
|--|--|---|
| ☐ Not Started | ☐ Behind Schedule | – <i>This activity is on schedule to meet the three year target</i> |
| ☐ Initiated | ☒ On Schedule | |
| ☒ In Progress | ☐ Ahead of Schedule | |
| ☐ Completed | | |

Implementation Effort

- **TCEQ Reimbursement.** TCEQ continues to work on the issue of developer reimbursement. For projects located in unincorporated Harris County, TCEQ agrees that projects following the local LID design manual, *Harris County Low Impact Development & Green Infrastructure Design Criteria for Storm Water Management* (Harris County & HCFCF, April, 2011), will be eligible for equitable bond calculation consideration for LID as compared to “standard” development. Currently there is a large-scale development in north Harris County that is being constructed using LID. It is the first development in Harris County to seek reimbursement following the Harris County design criteria.



CONSTRUCTION

5

Summary

Rapid population growth and increasing densification of the BIG project area have led to more widespread and intense development activity that contributes to bacterial loading. Although construction sites for typical building and transportation projects are not significant sources of bacteria, urbanization inevitably results in more stormwater runoff. This runoff conveys sediments, nutrients, fertilizers, on-site sanitary wastes, and other contaminants downstream.

The Construction Workgroup (eight BIG stakeholders, including two BIG members and one alternate) met on February 20, 2014, and reported on their ability to conduct compliance and enforcement at construction sites and offer beneficial construction site education. The group also recommended H-GAC directly contact MS4 operators to determine the number of BIG MS4 operators conducting compliance and enforcement inspections.

2014 Focus

- H-GAC and BIG stakeholders aim to:
 - Implement stakeholder tracking.
 - Solicit information and participation from new MS4 permittees.
 - Quantify and document inspections and enforcements in annual reports.
 - Provide educational materials and opportunities for contractors.
 - Work with professional organizations.
-

Implementation Strategies

5.1 Increase Compliance with and Enforcement of Stormwater Management Permits

– Interim Measures:

- *In year one, MS4 operators should evaluate needs or requirements for staffing an appropriate construction inspection program.*
- *In year two, BIG stakeholders should develop and begin offering educational material and training.*

Project Status

☐ Not Started

☐ Initiated

☒ In Progress

☐ Completed

☐ Behind Schedule

☒ On Schedule

☐ Ahead of Schedule

– *This activity is on schedule as construction education and training is being offered and improving compliance.*

Implementation Effort

■ **Compliance and Enforcement.** The City of Houston and Harris County reported meeting inspection requirements found in their MS4 permits. The City of Houston reported that they conduct multiple inspections of all NOIs and Construction Site Notices (CSN) for projects of an acre or more that are submitted to the City and some sites less than an acre. BIG stakeholders suggested emailing MS4 Phase II entities and tracking how many have begun inspections.

■ **Training.** Both Harris County and the City of Houston reported that informal on-site compliance education at construction sites is increasing compliance.

■ **Education.** H-GAC, through its CWI, provided a Construction Site Runoff workshop on April 11, 2013.





ILLICIT DISCHARGES AND DUMPING

6

Summary

Illicit discharge detection efforts have found illegal connections, discharges, and dumping activities that have resulted in increased bacterial loads in the project area's storm sewer and watershed systems. BIG stakeholders have widely cited mobile septic waste haulers as a potential source of contamination as they transport waste from OSSFs and grease and grit traps. While regulations dictate proper methods for disposing of waste at treatment facilities and recording information on manifests, anecdotal evidence indicates that illicit discharges do occur. Because these discharges can happen in so many locations, there are no flow-adjusted estimates for waste hauler contributions to bacteria levels in area waterways.

In response to these concerns, the BIG recommends that stakeholders focus on three activities: (1) detect and eliminate illicit discharges specific to bacteria; (2) improve local government mechanisms to regulate and enforce illicit discharges; and, (3) monitor and control waste hauler activities through regulations and fleet tracking programs. The Illicit Discharges and Dumping Workgroup (nine BIG stakeholders, including two BIG members and one alternate) met on February 13, 2014, and recorded direct efforts to track down illicit connections and to either fix or remove them. Additionally the group discussed illicit discharge compliance and enforcement regulations and public education.

2014 Focus

- H-GAC and BIG stakeholders aim to:
 - Continue to gather information about implementation.
 - Continue to identify regulatory resources related to liquid waste hauling, liquid waste generators, and trip tickets.
 - Survey MS4 operators to acquire implementation activity updates
-

Implementation Strategies

6.1 Detect and Eliminate Illicit Discharges

– Interim Measures:

- Within ten years, MS4 operators will complete initial surveys and maps.
- Each year, MS4 operators will identify the number of illicit discharges found and resolved each year.

Project Status

☐ Not Started

☐ Initiated

☒ In Progress

☐ Completed

☐ Behind Schedule

☒ On Schedule

☐ Ahead of Schedule

- This activity is on schedule to meet the ten-year target. Current TPDES MS4 permits require permittees complete surveys and develop maps. Additional effort is needed to routinely capture the number of illicit discharges identified by MS4 operators each year.

Implementation Effort

- **Illicit Discharge Implementation.** The Joint Task Force (Harris County, City of Houston, Texas Department of Transportation, and Harris County Flood Control District) reports current and ongoing illicit discharge detection and elimination (IDDE) programs to look for and track illicit discharges. Maintaining strong IDDE programs is likely one reason for the declining bacteria seen in the BIG project region (Appendix C).
- **MS4 Reporting.** MS4 Phase I and II operators map their storm sewer system, develop techniques for detecting illicit discharges, and establish enforcement procedures for removing sources of illicit discharges. Based on a review of MS4 operators within H-GAC's MS4 database, nearly all operators report having some form of regulatory mechanisms in place and/or procedures for detecting illicit discharges.
- **IDDE Reporting.** BPA has conducted a source identification and elimination project over the past three years. The BPA, in concert with the City of Houston, has improved Schramm Gully, in the Hunting Bayou watershed, by removing three sources which has helped to drop the water body off the "Most Wanted" list of streams with the highest bacteria geomeans. The project further studied three additional water bodies from the list and referred two sources to TCEQ. The City of Houston and will follow up on the third water body in the future.



6.2 Improve Regulation and Enforcement of Illicit Discharges

Interim Measures:

- Within five years, BIG stakeholders will compile and share all existing regulations in the project area.
- Within five years, all communities shall examine their regulations, and one shall adopt new or revised regulations.

Project Status

- | | | |
|---|---|--|
| ☐ Not Started | ☐ Behind Schedule | – This activity is on schedule to meet the five-year target. |
| ☐ Initiated | ☒ On Schedule | |
| ☒ In Progress | ☐ Ahead of Schedule | |
| ☐ Completed | | |

Implementation Effort

- **Compile MS4 Regulations.** Many MS4 Phase I and II operators have implemented new ordinances or regulations as a permit requirement. H-GAC along with the BIG will be working to compile a list of ordinances and add them to ordinances currently available on the BIG website at www.h-gac.com/community/water/tmdl/big/illicit-discharges.aspx
 - Representatives from the City of Houston, Harris County, and the City of Webster stated that they have ordinances and actively enforce the codes.
 - » Harris County has regulations prohibiting illicit discharges in unincorporated Harris County and they actively enforce those regulations. HCPCS also enforces state regulations prohibiting illicit discharges throughout Harris County outside of the City of Houston.
 - » The City of Houston reviews waste hauler receipts during inspections at WWTFs.

6.3 Monitor and Control Waste Hauler Activities

- **Interim Measure:** Within five years, one waste hauler fleet tracking pilot program shall be started by local stakeholders.

Project Status

- | | | |
|---|---|--|
| ☐ Not Started | ☒ Behind Schedule | – This activity is behind schedule to meet the five-year target. BIG partners have yet to identify a local program interested in starting a pilot program. |
| ☐ Initiated | ☐ On Schedule | |
| ☒ In Progress | ☐ Ahead of Schedule | |
| ☐ Completed | | |

Implementation Effort

- **Tracking.**
 - City of Houston maintains a successful waste hauler tracking program. The city was unable to enhance its program by developing an ordinance that would require local businesses to maintain receipts of waste hauler pick-ups.
 - BIG stakeholders noted that in addition to grease haulers that other potential waste haulers are required to dispose of properly, for example, carpet cleaners, landscapers, and commercial pressure washers.
- **Education.** As part of the Environmental Enforcement Roundtable, H-GAC held a seminar on January 8, 2013, that focused on illegal dumping in and along waterways. The roundtable provides a forum for local peace officers, county prosecutors, city officials, and personnel from TCEQ's Region 12 office to discuss illegal dumping issues.



ANIMALS AND AGRICULTURE

7

Summary

Animals and agricultural practices contribute to increased bacteria levels in sediment runoff and water bodies. Cattle and poultry operations are the most common agriculture animals of concern in the BIG project area. However, clusters of other animals – such as horses, swine, sheep, and goats – also may contribute to water quality impairments throughout the area. Of particular interest to BIG stakeholders are feral hogs, a state and national problem estimated to cause \$500 million in statewide damages each year. Feral hogs damage property due to their rooting and wallowing. They also defecate, often directly into waterways, large amounts of bacteria and nutrients into the environment.

Most agricultural management programs are either voluntary or only apply to confined animal feeding operations (CAFOs) designated by the EPA. These operations are not present in the BIG project area. On February 11, 2014, the Animals and Agriculture Workgroup (seven BIG stakeholders, including one BIG member) met and recommended that local initiatives continue to focus on promoting increased participation in existing voluntary- and incentive-based programs that target erosion control, nutrient reduction, and livestock management. The expansion of these programs will help lower bacteria levels in waterways, particularly in subwatersheds where substantial areas of land are devoted to crop, pasture, and range use.

2014 Focus

- H-GAC and BIG stakeholders aim to:
 - Encourage stakeholder involvement in existing Texas State Soil and Water Conservation Board (TSSWCB), Texas A&M AgriLife Extension Service (AgriLife Extension), and Texas Water Resources Institute (TWRI) programs.
 - Continue to provide technical support and education opportunities.
 - Track success of Harris County's feral hog management project.
-



Implementation Strategies

7.1 Promote Increased Participation in Existing Programs for Erosion, Control Nutrient Reduction and Livestock Management

- **Interim Measure:** Each year, participation by farmers and ranchers in financial and technical assistance programs should increase by 5% percent.

Project Status

- | | | |
|--|--|--|
| ☐ Not Started | ☐ Behind Schedule | – This activity is on schedule to the annual target. |
| ☐ Initiated | ☒ On Schedule | |
| ☒ In Progress | ☐ Ahead of Schedule | |
| ☐ Completed | | |

Implementation Effort

☒ **Implementation.**

- TSSWCB certified two water quality management programs in the BIG region's Little Cypress Creek watershed.
- TSSWCB is working with landowners to close a dairy lagoon in the Cypress Creek watershed which is no longer serving its original function. This action removes a potential bacterial source.

- ☒ **Education.** As part of the Lone Star Healthy Streams Program, TWRI offers a series of publications designed to educate Texas farmers, ranchers, and landowners about proper grazing, feral hog management, and riparian area protection to reduce the levels of bacterial contamination in streams and rivers. In June 2014, Lone Star Healthy Streams will host a workshop for Chambers County.

7.2 Promote the Management of Feral Hog Populations

- **Interim Measure:** During the next five years, AgriLife Extension will host two feral hog management workshops per year for landowners, local governments, and other interested people.

Project Status

- | | | |
|--|--|---|
| ☐ Not Started | ☐ Behind Schedule | – This activity is ahead of schedule to meet the five-year target |
| ☐ Initiated | ☐ On Schedule | |
| ☒ In Progress | ☒ Ahead of Schedule | |
| ☐ Completed | | |

Implementation Effort

☒ **Education.**

- AgriLife Extension hosted two feral hog workshops, one in the Dickinson Bayou watershed on September 28, 2013, and another in Wharton on November 9, 2013. AgriLife Extension also reported 23 feral hog programs providing some form of face-to-face interaction within 11 counties, including the BIG project area stakeholders, reaching 1,444 people.
- H-GAC hosted a CWI workshop on November 13, 2013, on feral hog reduction and education.

- ☒ **Implementation.** Harris County employees, the U.S. Army Corp of Engineers staff, and contractors remove approximately 250-300 hogs/year from the Barker and Addicks reservoirs. In 2013, Harris County Precinct 3 received a \$630,000 Coastal Impact Assistance Program grant to help build feral hog pen traps, cover follow up monitoring to determine water quality benefits, and to pay for processing feral hog meat to donate to a local food bank.



RESIDENTIAL

8

Summary

Communities can improve water quality by changing overall attitudes and individual behavior – one homeowner at a time. Enforcement, or the threat of enforcement, may be effective with stakeholders regulated by permits. Yet, it has less impact on individuals. Changing the attitudes and behaviors of individuals presents an opportunity for long term water quality improvement and support for existing permitted programs, like MS4s. For this strategy, the focus is on how to empower residents and neighborhoods through volunteer activities and educational outreach.

The Residential Workgroup (four BIG stakeholders, including two BIG members and one alternate) met on February 11, 2014, and reported on efforts to expand homeowner bacteria education in the project area. In particular, stakeholders identified pet waste education and FOG programs as prime achievements over the past year.

2014 Focus

- H-GAC and BIG stakeholders aim to:
 - Develop objectives and evaluation measures to better evaluate results of education efforts.
 - Continue identifying regional opportunities to address pet waste and FOG concerns utilizing education and/or regulatory action.
 - Encourage MS4 operators to focus on bacteria reduction public education and outreach.
-

Implementation Strategies

8.1 Expand Homeowner Education Efforts throughout the BIG Project Area

– Interim Measures:

- Local governments and appropriate agencies should begin or continue homeowner education programs. Each year, participation should increase by 2%.
- Every five years, H-GAC and BIG stakeholders will conduct at least one pilot study to evaluate the results of education efforts.

Project Status

- ☐ Not Started
- ☐ Initiated
- ☒ In Progress
- ☐ Completed

- ☐ Behind Schedule
- ☒ On Schedule
- ☐ Ahead of Schedule

- This activity is on schedule to meet yearly education targets. Local MS4 operators are focusing more on education efforts. Additional work is needed to evaluate and derive environmental results from education.



Implementation Effort

■ MS4 Reports.

- Nearly all of the 80 MS4 operators listed for the BIG in the H-GAC MS4 database report at least one activity in their annual MS4 report for Minimum Control Measure 1, Outreach and Education. The majority of operators report accomplishments including tax bill messages and brochures; a few reported pet waste stations, storm drain markings, and/or use Clean Water Clear Choice brochures.
- Nearly all of the 80 BIG MS4 operators in the H-GAC MS4 database report at least one activity in their annual MS4 report for Minimum Control Measure 2, Public Participation. The majority of operators report accomplishments including volunteer opportunities and public meetings; a few list answering a hotline and/or provide an active speakers bureau.

■ Outreach.

- During Trash Bash® in 2013, 2,847 people volunteered to collect 26.6 tons of garbage and 216 tires in the BIG project area. Education displays and/or activities were available during the event and included themes like picking up pet waste, FOG programs, water conservation, and watershed education.
- H-GAC's ongoing "Pet Waste Pollutes" campaign aims to reduce pet waste that ultimately drains into waterways and causes bacterial pollution. Pet waste bag dispensers were distributed at the 2013 Trash Bash®. This type of programming is supplemented by educational outreach efforts such as new online resources pertaining to other programs and model ordinances at www.petwastepollutes.org. The campaign is also useful for reporting data. For instance, the City of Houston demonstrated a progressive increase in pet waste-related citations and convictions over the past seven years.
- H-GAC and the City of Houston jointly hosted an educational booth at the Reliant Park World Series of Dog Shows, an event that attracts more than 40,000 spectators, participants, and vendors annually.
- H-GAC staff hosted an educational booth at the Sam Houston Area Council Boy Scout Fair, a two-day event open to area scouts and their families with roughly 35,000 individuals in attendance.
- H-GAC staff participated in Caring for Creation, a faith-based environmental stewardship event in Montgomery County.

■ Education.

- Local organizations and communities continued to offer many ongoing homeowner education programs that help reduce bacteria loading in the BIG project area. In addition to the listed programs, events, and website repositories, a number of other formal and informal resources are available to increase awareness and understanding. These examples include, but are not limited to:
 - » A CWI workshop on MS4s was held on February 14, 2013.
 - » Quarterly H-GAC Environmental Awareness Roundtable discussions designed to facilitate idea-sharing, including Social Media 101: Raising Stakeholder Awareness in an Information Age on May 23, 2013, and Measuring the Success of Your Outreach on October 22, 2013.
- In 2013, H-GAC conducted post-workshop surveys to evaluate CWI and EAR workshops, presenters, and information to assist with better programming in future workshops.



MONITORING AND I-PLAN REVISION

9

Summary

To assess I-Plan progress, the BIG is required to monitor ambient water quality data and the progress of all Implementation Activities. Using these data the BIG produces an annual report. This keeps BIG stakeholders apprised of progress, and helps to determine if the I-Plan or any of its individual elements require revisions to their implementation strategies or schedules. The monitoring data, in particular, will be an important indicator of whether I-Plan guidance results in the desired reduction of bacteria loading. A more in-depth evaluation will occur every five years, as resources are available and with stakeholder participation.

The review will address answers to the following questions:

- Do ambient water quality monitoring data indicate that bacteria levels are changing?
 - » If so, are the bacteria levels increasing or decreasing?
- Do non-ambient water quality monitoring data indicate that implementation activities are reducing the load of bacteria?
- Are implementation activities and controls being undertaken as described in the I-Plan?
 - » Which activities have been implemented and which have not?

The Monitoring and Plan Revision Workgroup met twice during the year, January 7, 2014, (ten stakeholders, including four BIG members and two alternates) and March 20, 2014 (six stakeholders, including two BIG members and one alternate), and reported success with removing sources of bacteria by conducting non-ambient sampling and tracking to source; the launch of HCFCDD's BMP database; and several organizations are completing BMPs that include effectiveness monitoring.

2014 Focus

- H-GAC and BIG stakeholders aim to:
 - Continue ambient water quality monitoring and analysis.
 - Strengthen implementation tracking and coordination of non-ambient efforts.
 - Develop a BIG regional implementation activity database.
-

Implementation Strategies

9.1 Continue to Utilize Ambient Water Quality Monitoring and Data Analysis

- **Interim Measure:** Each year, H-GAC and BIG stakeholders will monitor ambient water quality to help determine if water bodies are meeting state standards for bacteria.

Project Status

- | | | |
|--|--|---|
| ☐ Not Started | ☐ Behind Schedule | |
| ☐ Initiated | ☒ On Schedule | – This activity is on schedule to meet the annual target. |
| ☒ In Progress | ☐ Ahead of Schedule | |
| ☐ Completed | | |

Implementation Effort

- **H-GAC's CRP.** H-GAC's CRP continues to be the primary vehicle for water quality monitoring and data analysis in the project area (see Appendix F).
 - The 2014 *Basin Highlights Report How's the Water?* documents water quality impairments and trends based on data collected by seven organizations at 162 sites within the BIG project area.
 - Since September 2011, CRP monitors have been recording evidence of enterococci concurrent with *E.coli* samples in non tidal areas. Of 1836 dual samples collected, 236 results (13%) returned values with enterococci above 35 MPN/100mL while the sample never exceeded the standard for *E.coli* (126 MPN/100mL).
 - CRP gathered observations of contact recreation while out gathering ambient water quality data. Of the 162 sites monitored by CRP partners in 2013, 153 reported whether there was any observable evidence of contact recreation. At twenty-three of 153 sites, or 15%, CRP partners recorded 73 observations of contact recreation.

CRP Monitoring in the BIG Project Area

Organizations	Number of Stations
TCEQ	10
Environmental Institute of Houston	10
Harris County Pollution Control	1
Houston Health and Human Services	111
Houston Water Quality Control	7
San Jacinto River Authority	9
Houston - Galveston Area Council	14
Total	162

9.2 Conduct and Coordinate Non-Ambient Water Quality Monitoring

→ **Interim Measure:** H-GAC and BIG stakeholders will conduct non-ambient water quality monitoring activities including:

- » Developing a regional Quality Assurance Project Plan (QAPP); and
- » Developing a regional non-ambient monitoring database.

Project Status

- | | | |
|--|--|---------------------------------|
| ☐ Not Started | ☐ Behind Schedule | |
| ☐ Initiated | ☒ On Schedule | – This activity is on schedule. |
| ☒ In Progress | ☐ Ahead of Schedule | |
| ☐ Completed | | |

Implementation Effort

- **Non-Ambient Water Quality Monitoring QAPP.** In 2013, TCEQ determined that resources were not available to evaluate the QAPP. The BIG Monitoring Workgroup determined that the QAPP was important because it is a detailed plan written to ensure the quality and comparability of data from sample collection and processing through analysis and storage. BIG recommended that the QAPP be approved by H-GAC and reported back to the BIG workgroups.
- **Regional BMP Database.** The HCFCD developed a regional BMP database modeled on the International Stormwater BMP Database. Currently, the database includes monitoring information for stormwater BMP projects developed by the HCFCD, as well as other BMP projects in the region. More information is available at www.bmpbase.org/LandingPage.aspx.
- **Monitoring Data Implementation.**
 - The City of League City and TCWP completed the Gharardi Watersmart Park that contains monitored BMPs that will be evaluated through August 31, 2014.
 - BPA is commencing preconstruction of water quality sampling at a future LID project.
 - BPA continued to conduct non-ambient monitoring to track down sources of bacteria in the BIG project area. For more details, see section 11. *Geographic Priority Framework*.

9.3 Create and Maintain a Regional Implementation Activity Database

- **Interim Measure:** Each year, BIG stakeholders will provide a report on the activities they implemented during the year. H-GAC will compile and share this information in a database.

Project Status

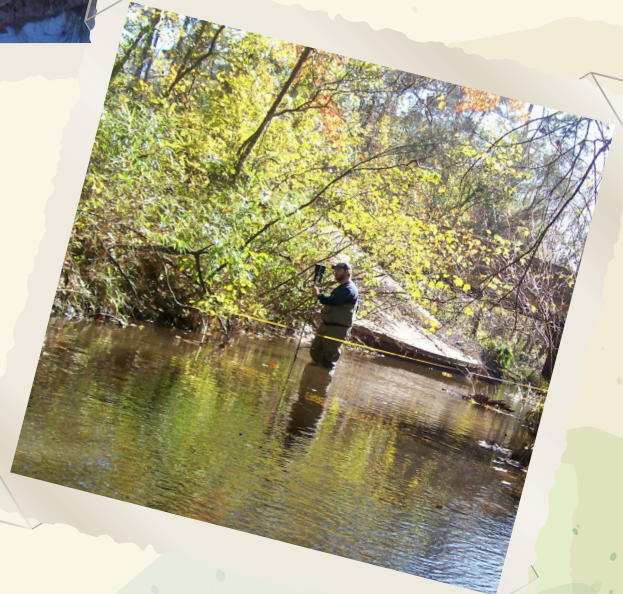
- ☐ Not Started
- ☐ Initiated
- ☒ In Progress
- ☐ Completed

- ☐ Behind Schedule
- ☒ On Schedule
- ☐ Ahead of Schedule

– This activity is on schedule and has met the annual target.

Implementation Effort

- **Regional Implementation Activity Database.** In 2012, H-GAC staff developed a preliminary regional implementation activity database for the purpose of tracking I-Plan progress. H-GAC will continue to improve with BIG partners, the implementation database and simplify local reporting efforts, including annual tracking surveys. The database will be compatible with HCFCF database.



9.4 Assess Monitoring Results and Modify I-Plan

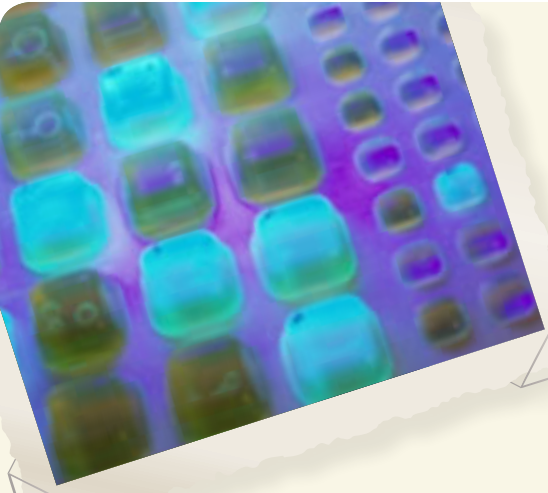
→ **Interim Measure:** Each year, H-GAC will assess monitoring in annual reports to identify whether progress is being made and communicate the results to the BIG. The BIG will determine if changes or updates to the I-Plan are needed.

Project Status

- | | | |
|--|--|---|
| ☐ Not Started | ☐ Behind Schedule | – This activity is on schedule and has met the annual target. |
| ☐ Initiated | ☒ On Schedule | |
| ☒ In Progress | ☐ Ahead of Schedule | |
| ☐ Completed | | |

Implementation Effort

- **BIG Bacteria Trend Line.** The BIG project area bacteria trend line continues to show improvements (see Appendix C). However, it seems that progress has slowed in the past year. H-GAC will continue to review available data to determine trends in bacteria levels.
- **Non-Ambient Water Quality Monitoring.** Data have not been provided to H-GAC at this time to understand the impact of specific implementation activities that have been undertaken in the BIG project area. However, there are projects underway that will be able to provide data for analysis soon, including:
 - The HCFCD BMP database;
 - Harris County PID Birnamwood Drive LID monitoring project;
 - The City of League City and TCWP BMP park; and
 - The BPA LID project.
- **Modifications to the I-Plan.** Workgroups reviewed current I-Plan language to determine if any modifications might be needed.
 - Some BIG WWTF workgroup members suggested the potential need to modify the I-Plan that would explain Type I and Type II re-use of reclaimed water under implementation activity 1.7. Any change will require the BIG to approve.
 - Coordination and Policy workgroup established new language to augment implementation activity 9.4.5 to incorporate adjacent watersheds outside of the BIG project area that are under a TMDL and request inclusion under the I-Plan.
 - 16 assessment units within the BIG project area will be added to the original 72 due to completion of TMDLs for those units once the BIG approves language changes to the I-Plan.



RESEARCH

10

Summary

BIG stakeholders support new research initiatives that could result in useful findings and recommendations. TMDL studies provide a general overview of the extent and source of the presence of bacteria. However, these studies are not sufficient to determine the most cost-effective courses of action to achieve water quality standards for contact recreation. The BIG has identified three top research priorities: (1) effectiveness of stormwater management activities, (2) bacteria persistence and regrowth, and (3) appropriate indicators to identify health risks presented by contact recreation in impaired waters.

These topics are pertinent to the entire project area. However, research is often driven by the availability of resources. While some research is being conducted within the region, BIG's active participation and advocacy at the state and national levels will help to ensure regional priorities are addressed. Local participation will also help to ensure findings and recommendations produced elsewhere are transferable to the project area.

On March 29, 2014, the Research Workgroup (nine BIG stakeholders, including three BIG members and one alternate) met and reported that the City of Houston will be conducting bacterial source tracking, evaluating the IDEXX methods, and studying alternative bacteria indicators; multiple organizations installed BMPs that are producing effectiveness data; and H-GAC and CRP continued to collect and analyze *E.coli* and enterococci samples.

2014 Focus

- H-GAC and BIG stakeholders aim to:
 - Continue researching existing programs and projects.
 - Secure funding for additional projects.
 - Conduct research to better understand the relationship between bacteria and sediment
-

Implementation Strategies

10.1 Evaluate the Effectiveness of Stormwater Implementation Activities

- **Interim Measure:** BIG stakeholders will monitor current and future stormwater projects and analyze their effectiveness.

Project Status

- | | | |
|--|--|--------------------------------|
| ☐ Not Started | ☐ Behind Schedule | – This activity is on schedule |
| ☐ Initiated | ☒ On Schedule | |
| ☒ In Progress | ☐ Ahead of Schedule | |
| ☐ Completed | | |

Implementation Effort

☒ **BMP Monitoring.**

- HCFCD is actively monitoring several stormwater sites within the region and developed a Regional BMP Database at www.bmpbase.org where stakeholders may access and evaluate effectiveness data.
- City of League City in cooperation with TCWP installed a BMP park that is currently being monitored.
- Harris County PID Birnamwood Drive LID monitoring project. BPA is developing a monitoring QAPP for a future stormwater project.

10.2 Further Evaluate Bacteria Persistence and Regrowth

- **Interim Measure:** BIG stakeholders will conduct special studies to better understand the extent of human contributions to bacterial loading. Data from these studies should be included in a monitoring databases.

Project Status

- | | | |
|--|--|---------------------------------|
| ☐ Not Started | ☐ Behind Schedule | – This activity is on schedule. |
| ☐ Initiated | ☒ On Schedule | |
| ☒ In Progress | ☐ Ahead of Schedule | |
| ☐ Completed | | |

Implementation Effort

☒ **Special Studies.**

- City of Houston is proceeding with a bacterial source tracking project to quantify host organism contributions.
- City of Houston will be evaluating the IDEXX method to determine test accuracy due to questions about false positive contributions by multiple bacteria species.
- City of Houston, Harris County, and HCFCD are continuing their Unified Ambient Water Quality Monitoring Program to quantify diurnal bacteria fluctuations in area waterways.

10.3 Determine Appropriate Indicators

- **Interim Measure:** H-GAC and BIG stakeholders should help determine the need for alternative, supplemental, or multiple bacteria indicators to refine the I-Plan.

Project Status

- | | | |
|--|--|---|
| ☐ Not Started | ☐ Behind Schedule | – Overall this activity is on schedule. |
| ☐ Initiated | ☒ On Schedule | |
| ☒ In Progress | ☐ Ahead of Schedule | |
| ☐ Completed | | |

Implementation Effort

- **Initial Research.** BIG will continue to track ongoing and future research by the following agencies and organizations which indicate promising indicators in the coming years.
 - The EPA completed analysis of recreational water quality standards based on new analytical techniques involving quantitative polymerase chain reactions (PCR), new statistical terminology, predictive modeling, sanitary surveys, epidemiological studies, and the development of quantitative microbial risk assessment. Currently, use of PCR based standards is not an available water quality assessment and is only in use on a case-by-case basis.
 - The H-GAC CRP continued collecting enterococci samples to supplement *E.coli* samples in freshwater.
 - City of Houston, during the bacteria source tracking project, will be evaluating potential bacteria indicators including bacteria from the order Bacteroidales.

10.4 Additional Research Topics

- **Interim Measure:** H-GAC and BIG stakeholders should conduct additional research on WWTFs, health risks, recreational use, land use modeling, unimpaired waterways, nutrients, and other constituents as funds are available.

Project Status

- | | | |
|--|--|------------------------------|
| ☐ Not Started | ☐ Behind Schedule | – Activities are on schedule |
| ☐ Initiated | ☒ On Schedule | |
| ☒ In Progress | ☐ Ahead of Schedule | |
| ☐ Completed | | |

Implementation Effort

- **Research Abstracts.** BIG stakeholders provided four research article abstracts for H-GAC's library relating to road bacteria contributions and implementation measures. The collection included articles about:
 - Bacteria contributions from roadways;
 - Bridge runoff characterization;
 - Water quality benefits from use of permeable friction course; and
 - Pollutant removal on vegetative shoulders.
- **Future Research Topics.** BIG members recommended new research initiatives that study the relationship between bacteria and biofilms, colloidal particles, total suspended solids, and turbidity, including:
 - Wet sieve analysis;
 - Sample dilution;
 - Use of filters smaller than 0.45 μm ; and
 - Testing sludge blankets from wastewater treatment facilities



GEOGRAPHIC PRIORITY FRAMEWORK

11

Summary

For the BIG project area to achieve state standards for contact recreation, a wide range of community stakeholders must be responsible for implementing the I-Plan. While some initiatives span the entire project area, others focus on targeted watersheds. During the project stage, public input via outreach meetings and/or surveys is essential to help set priorities and timing.

As regional organizations and local jurisdictions work to establish their priorities, they should consider five main categories of concern: (1) bacteria level, (2) accessibility of water body, (3) use level, (4) implementation opportunities, and (5) future land use changes.

On March 11, 2014, the Watershed Outreach Workgroup (seven BIG stakeholders, including two BIG members and two alternates) met and reported on efforts to use H-GAC's Top Ten "Most Wanted" Streams list to eliminate bacteria pollutant sources. In addition, Harris County developed their method for evaluating streams by a geographic prioritization framework.

2014 Focus

- H-GAC and BIG stakeholders aim to:
 - Host watershed meetings in regional watersheds to encourage local stakeholder feedback and participation.
 - Continue to address the Top 10 "Most Wanted" Streams by building on the momentum of stakeholders to address specific problem areas.
 - Evaluate the 2013 Top 10 "Most Wanted" Streams list.
 - Begin to address the 2013 Top 10 "Most Likely to Succeed" Streams list. Most saw increased bacteria levels (i.e., negative results).
-

Implementation Strategies

11.1 Consider Recommended Criteria When Selecting Geographic Locations for Projects

- **Interim Measure:** *Communities should consider bacteria, accessibility, opportunities, use, and future use when selecting locations for projects.*

Project Status

- | | | |
|---|---|--|
| ☐ Not Started | ☐ Behind Schedule | – <i>This activity is ahead of schedule. Stakeholders have begun prioritized watershed to address sources of bacteria.</i> |
| ☐ Initiated | ☐ On Schedule | |
| ☒ In Progress | ☒ Ahead of Schedule | |
| ☐ Completed | | |

Implementation Effort

- **BIG's Geographic Prioritization.** H-GAC staff cross compared the 2012 and 2013 Top 10 "Most Wanted" Streams and Top 10 "Most Likely to Succeed" Streams (see Appendices G and H).
 - Two new stream assessment units were added to the "Most Wanted" list. The two removed from the list showed improvement through a decrease in bacteria relative geomean. Of the remaining eight, two saw bacteria concentrations increase based on relative geomean, one remained the same and five saw bacteria concentrations decrease (green). Bintliff Ditch saw the largest decrease going from a relative geomean of 36 to 27 MPN/100 mL.
 - Seven assessment units were new to the Top 10 "Most Likely to Succeed" Streams list in 2013. Of the six assessment units that were removed from the list, three left the list due to relative geomeans that increased and three saw their geomeans decrease below the standard. For the remaining four assessment units, one continued on the list with the same relative geomean (blue), two improved with a lower relative geomean, and one saw its relative geomean increase (red).
- **Top 10 "Most Wanted" Streams List.** BPA and the City of Houston are working together to tackle the "Most Wanted" list. BPA conducts reconnaissance and additional wet and dry weather monitoring to track down bacteria source locations. When likely targets are identified, the information is passed on to the City of Houston to address the source.
 - Schramm Gully (1007R_01) dropped off the list and potentially could be attributed to the effort that identified and fixed three sources of bacteria.
 - Bintliff Ditch (1007T_01) decreased from a relative geomean of 36 to 27 MPN/100 mL, likely the result of removing a cross connected sewer line found during this project.
- **Harris County Geographic Priority Framework.** Harris County presented its method for evaluating streams by a geographic prioritization framework (see Appendix I). Points are given for each metric in the framework and tallied up to prioritize the stream segments to be given future implementation priority. Harris County's framework uses the following metrics:
 - Percent geometric mean above the water quality standard;
 - Monitoring station located in watershed draining to Lake Houston (drinking water source);
 - Monitoring station located in segment that crosses a bike path, trail, or greenway;
 - Monitoring station located in segment that is within 300 feet of a park; and
 - Average population density within segment in a 200 foot buffer.

APPENDIX A

ACKNOWLEDGMENTS

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Ryan Gerlich, Texas Agrilife Extension

Frank Green, Montgomery County

Wesley Adam Grier, Harris County

Andrew Isbell, Walker County

Larry Johnson, Harris County

Jeremiah Kilgore, Harris County

Robert Knight, Walker County

Alisa Max, Harris County

Rayfield May Sr., Harris County

Will Merrell, Houston-Galveston Area Council

Jack Northey, Texas Commission on Environmental Quality

Winford Roberts, Waller County

James Walls, Harris County

Tyrone West, Harris County

Residential and Outreach Work Group

Richard Chapin, City of Houston

Marilyn Christian, Harris County

Ronald Drachenberg, Fort Bend County

Steve Hupp, Bayou Preservation Association

Tom Ivy, Public

Adam Wright, Fort Bend County

Jasmin Zambrano, City of Houston

Wastewater Treatment Facility Work Group

Susie Blake, City of League City
Richard Chapin, City of Houston
Danielle Cioce, Harris County
Frank Green, Montgomery County
Jonathan Holley, Harris County Flood Control District
Steve Hupp, Bayou Preservation Association
Tom Ivy, Public
Carol LaBreche, City of Houston
Alisa Max, Harris County
Scott Nichols, Montgomery County
Ray Pavlovich, Nottingham Country MUD
Mary Purzer, AECOM
Kathy Richolson, Gulf Coast Waste Disposal Authority

Sanitary Sewer Systems Work Group

Charlene Bohanon, Galveston Bay Foundation
Richard Chapin, City of Houston
Marilyn Christian, Harris County
Daniel Christodoss, URS Corporation
Ralph Cox, Klotz and Associates
Roy Elizondo, Montgomery County
Bill Goloby, City of Houston
Floyd Green, Harris County MUD #26
Teague Harris, IDS Engineering
Tom Ivy, Public

Carol LaBreche, City of Houston
Karen Kottke, AECOM
Jason Maldonado, Lockwood, Andrews and Newnam
Michael Mooney, Woodlands Joint Power Agency
Raghavender Nednur, City of Houston
Ogadimma Oneybuchi, City of Houston
Mary Purzer, AECOM
Gary Syzek, Harris County MUD #86
Tim Vu, City of Houston
Patrick Walters, City of West University Place

Illicit Discharges and Dumping Work Group

Ted Aplace, HPARD
Charlene Bohanon, Galveston Bay Foundation
Richard Chapin, City of Houston
Danielle Cioce, Harris County
Frank Green, Montgomery County
Jesse Espinoza, City of Webster
Denise Hall, Harris County
Anita Hunt, Hunt & Hunt Engineering Corp.
Tom Ivy, Public
Katie McCann, Galveston Bay Foundation
Rasheedah Mujtabay, City of Houston
Mary Purzer, AECOM
Robert Snoza, Harris County Flood Control District

APPENDIX B

"WALL OF FAME"

Authorized agents for on-site sewage facilities (OSSFs) and operators of municipal separate storm sewer systems (MS4s) were asked via e-mail and/or phone to provide data and information for this annual report. The "Wall of Fame" acknowledges participating stakeholders for their contributions. Additional stakeholders, including wastewater treatment facility permit holders, will be asked to provide data and information in the coming year.

On-Site Sewage Facilities

RELIABLY SUBMITTED DATA AND SUBMITTED A COMPLETE PERMIT DATA SET

- City of Manvel
- Brazoria County*
- Fort Bend County
- Galveston County
- Harris County
- Liberty County
- San Jacinto River Authority
- Waller County
- Walker County
- Texas Commission on Environmental Quality

* Also submitted some violation data

Note: Austin, Chambers, Colorado, Matagorda and Wharton counties, while outside of the BIG project area, have provided information in support of the OSSF mapping program initiated by the BIG.

Municipal Separate Storm Sewer Systems

SHARED ANNUAL REPORTS

- Chelford City MUD
- City of Bunker Hill Village
- City Of Friendswood
- City of Houston
- City of Humble
- City of Jacinto City
- City of Jersey City
- City of Katy Public Works Department
- City of League City
- City of Oak Ridge North
- City of Pasadena

- City of Stafford
- City of Sugarland
- City of Webster
- Fort Bend County
- Fort Bend County MUD #119
- Fort Bend County Drainage District
- Grand Lakes MUD 1
- Grand Lakes MUD 2
- Grand Lakes MUD 4
- Grand Lakes WCID
- Harris County
- Harris County Flood Control District
- Harris Fort Bend Counties MUD 5
- Montgomery County
- Montgomery County Drainage District 6
- Montgomery County MUD 6
- Montgomery County MUD 19
- NASA Johnson Space Center
- North Mission Glen MUD
- Rayford Road MUD
- Renn Road MUD
- Southern Montgomery County MUD
- Southwest Harris County MUD #1
- Spring Creek Utility District
- The Woodlands Joint Powers Authority
- Texas Department of Transportation (with the Joint Task Force, but not in other areas)
- West Keegans Bayou Improvement District

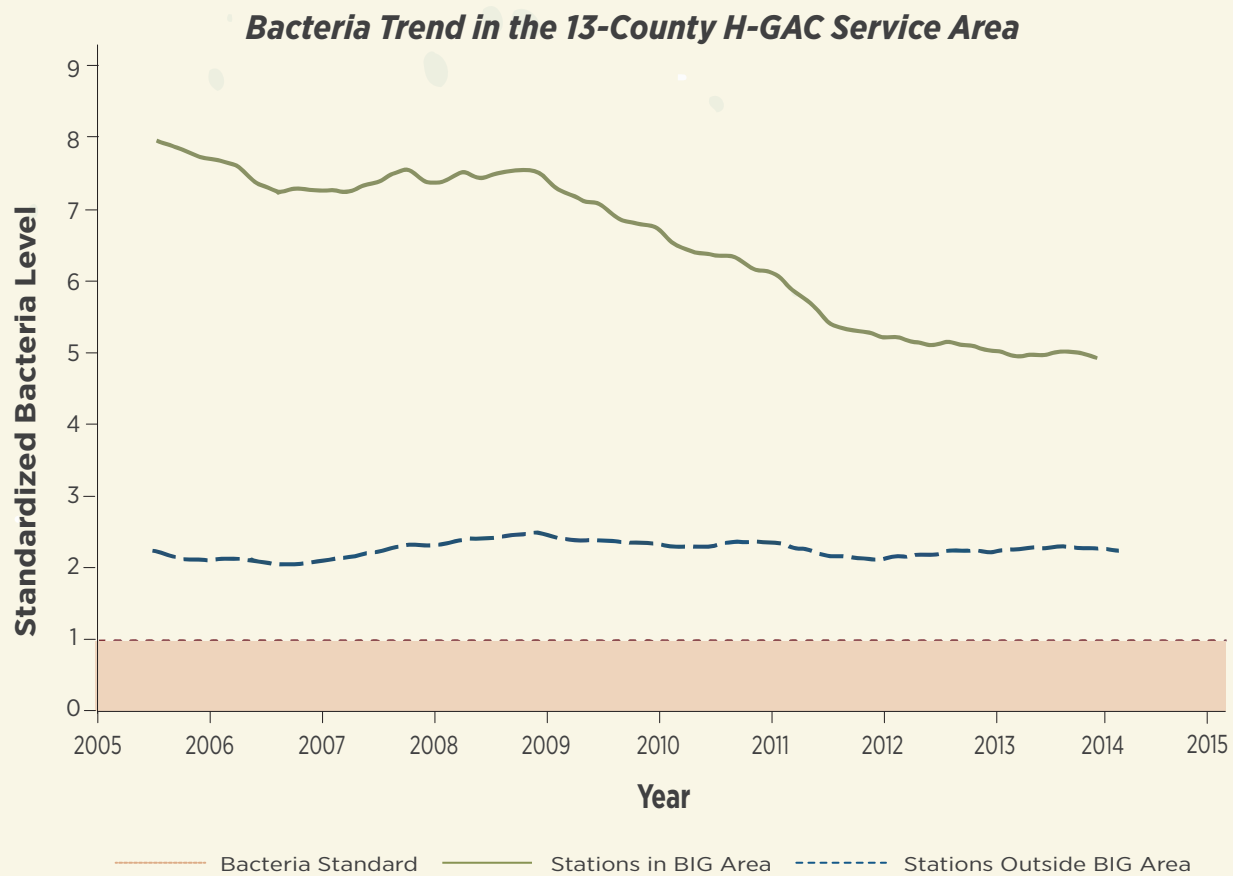
Note: Additional MS4s outside of the BIG project area have also submitted MS4 annual reports. A complete list can be found at: www.h-gac.com/go/MS4reports.

APPENDIX C

BACTERIA TRENDS

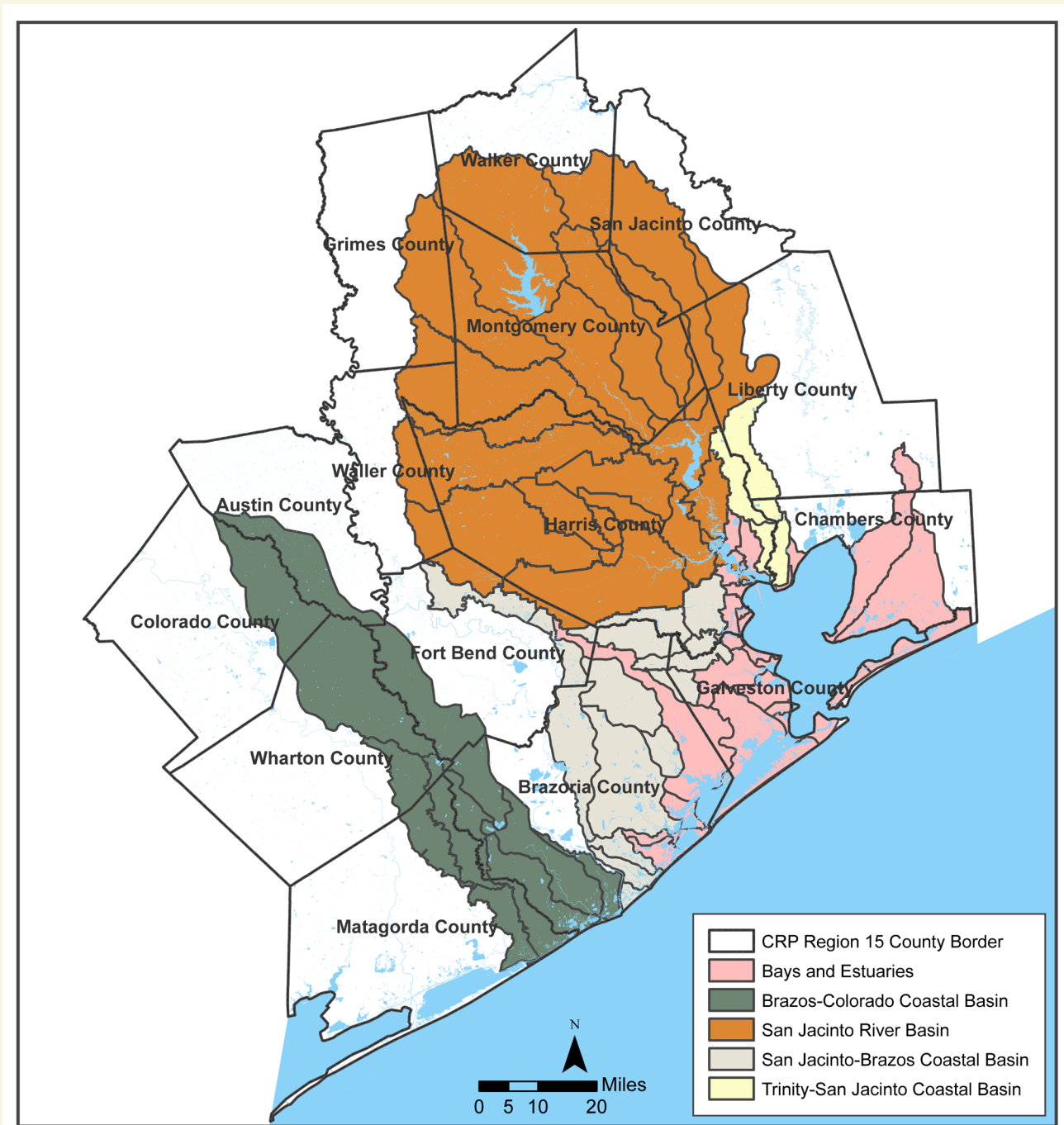
The following chart illustrates how the seven-year geometric mean for bacteria levels has changed over time. It is based on ambient water quality data from all Clean Rivers Program monitoring stations within the BIG project area through the calendar year 2013.

While the overall bacteria trend in the BIG project area continues to decline, the area's relative geometric mean is still roughly five times the state's water quality standard for bacteria



APPENDIX D

H-GAC CRP REGION



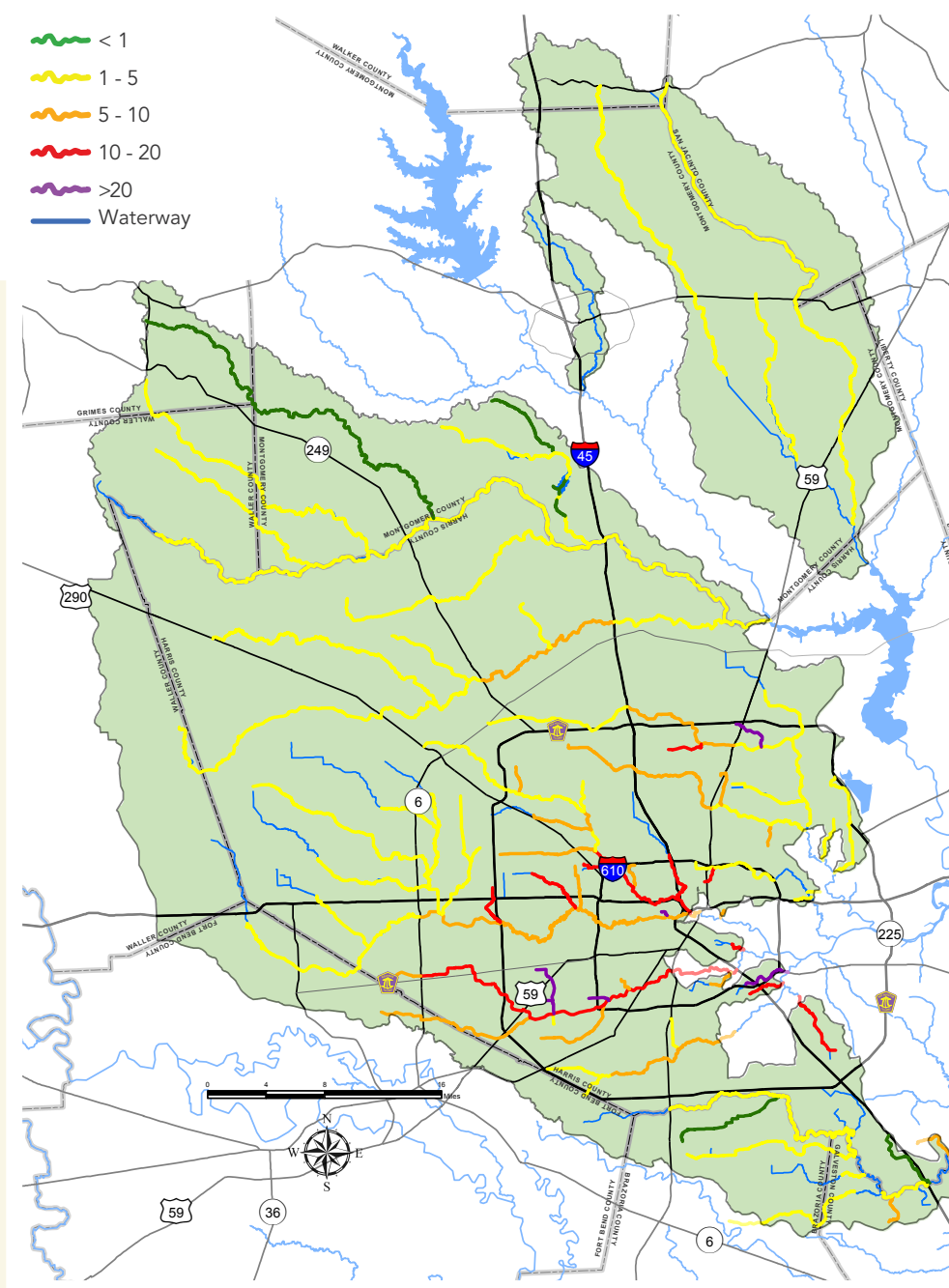
OSSF INFORMATION SYSTEM



APPENDIX F

BACTERIA GEOMEANS

Bacteria Relative Geomeans within the BIG Project Area



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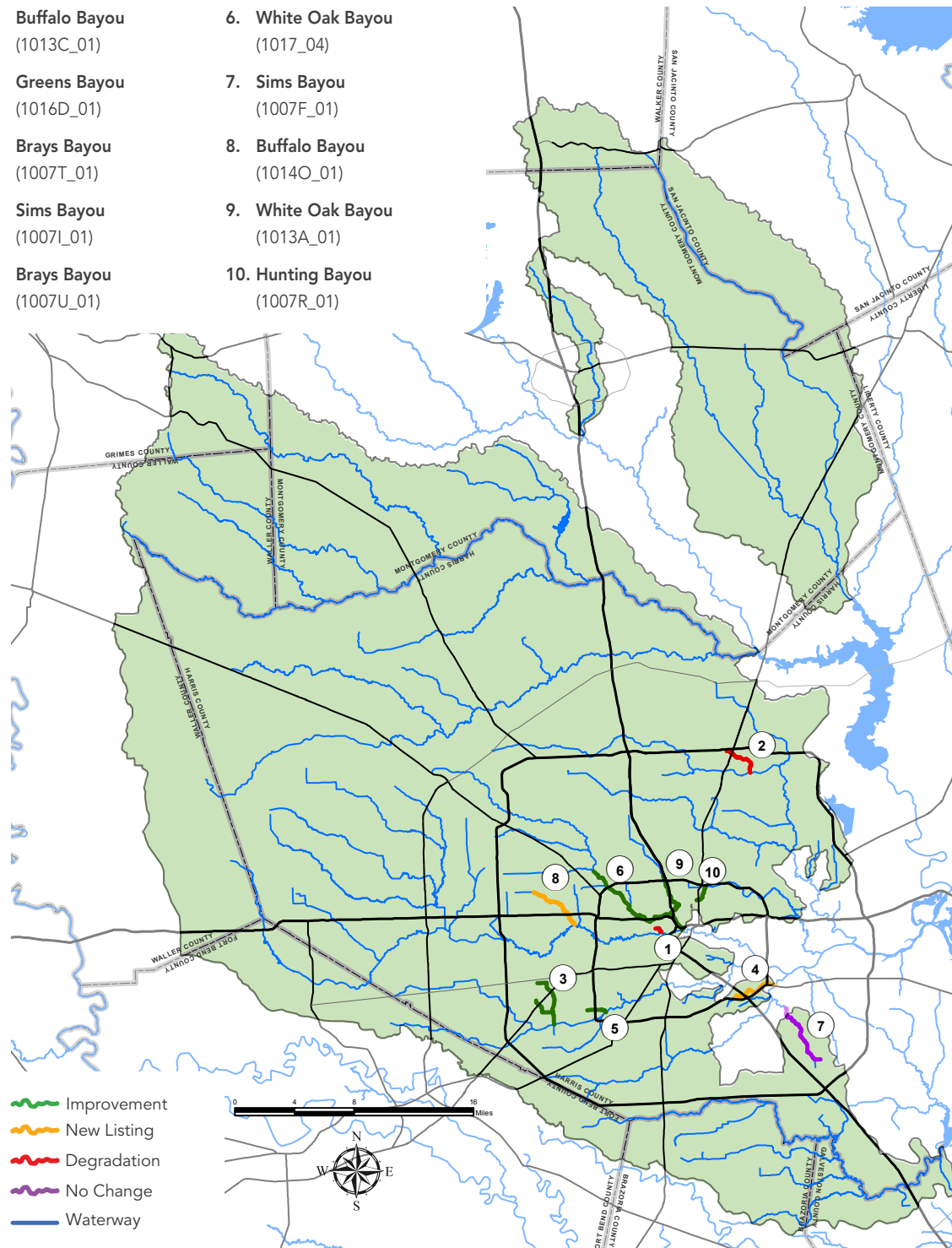
APPENDIX G

TOP 10 “MOST WANTED” STREAMS

Rank	Assessment Unit	Parameter	Relative Geomean (MPN/ 100 mL)	Geomean (MPN/ 100 mL)	Assessment Unit Description	Watershed
1	1013C_01	<i>E. coli</i>	46.04	5801.62	Unnamed tributary, located approximately 1.8 miles upstream of the Buffalo Bayou/White Oak Bayou confluence between IH-10 and Memorial Drive west of IH-45 in Harris County	Buffalo Bayou
2	1016D_01	<i>E. coli</i>	28.72	3618.89	Unnamed tributary of Greens Bayou, from the confluence with Greens Bayou, west of El Dorado Country Club to Lee Road, west of US Hwy 59 in Harris County	Greens Bayou
3	1007T_01	<i>E. coli</i>	26.58	3348.75	Bintliff Ditch, from the Brays Bayou confluence to 0.57 km (0.35 mi) upstream of the Fondren Road bridge crossing	Brays Bayou
4	1007I_01	<i>E. coli</i>	22.00	2771.79	Plum Creek, from the Sims Bayou confluence to Telephone Road in Harris County	Sims Bayou
5	1007U_01	<i>E. coli</i>	21.94	2764.18	Mimosa Ditch, from the Brays Bayou confluence upstream 2.9 km (1.8 mi) to the Chimney Rock bridge crossing	Brays Bayou
6	1017_04	<i>E. coli</i>	19.01	2394.83	Whiteoak Bayou, Brickhouse Gully confluence to a point immediately upstream of the confluence of Little Whiteoak Bayou in Harris County	White Oak Bayou
7	1007F_01	<i>E. coli</i>	18.42	2321.07	Berry Bayou, from a point 2.4 km (1.5 mi) upstream of the Sims Bayou confluence to SH 3	Sims Bayou
8	1014O_01	<i>E. coli</i>	16.62	2094.32	Spring Branch, from Buffalo Bayou Above Tidal confluence to 1.4 km (0.87 mi) upstream of Long Point Road in Harris County	Buffalo Bayou
9	1013A_01	<i>E. coli</i>	16.44	2072.07	Little Whiteoak Bayou, from the White Oak Bayou confluence to Yale Street in Harris County	White Oak Bayou
10	1007R_01	<i>E. coli</i>	15.90	2003.95	Hunting Bayou, From Bain Street to Sayers Street (South Fork)	Hunting Bayou

Top 10 “Most Wanted” Streams

- | | |
|--------------------------------|----------------------------------|
| 1. Buffalo Bayou
(1013C_01) | 6. White Oak Bayou
(1017_04) |
| 2. Greens Bayou
(1016D_01) | 7. Sims Bayou
(1007F_01) |
| 3. Brays Bayou
(1007T_01) | 8. Buffalo Bayou
(1014O_01) |
| 4. Sims Bayou
(1007I_01) | 9. White Oak Bayou
(1013A_01) |
| 5. Brays Bayou
(1007U_01) | 10. Hunting Bayou
(1007R_01) |



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APPENDIX H

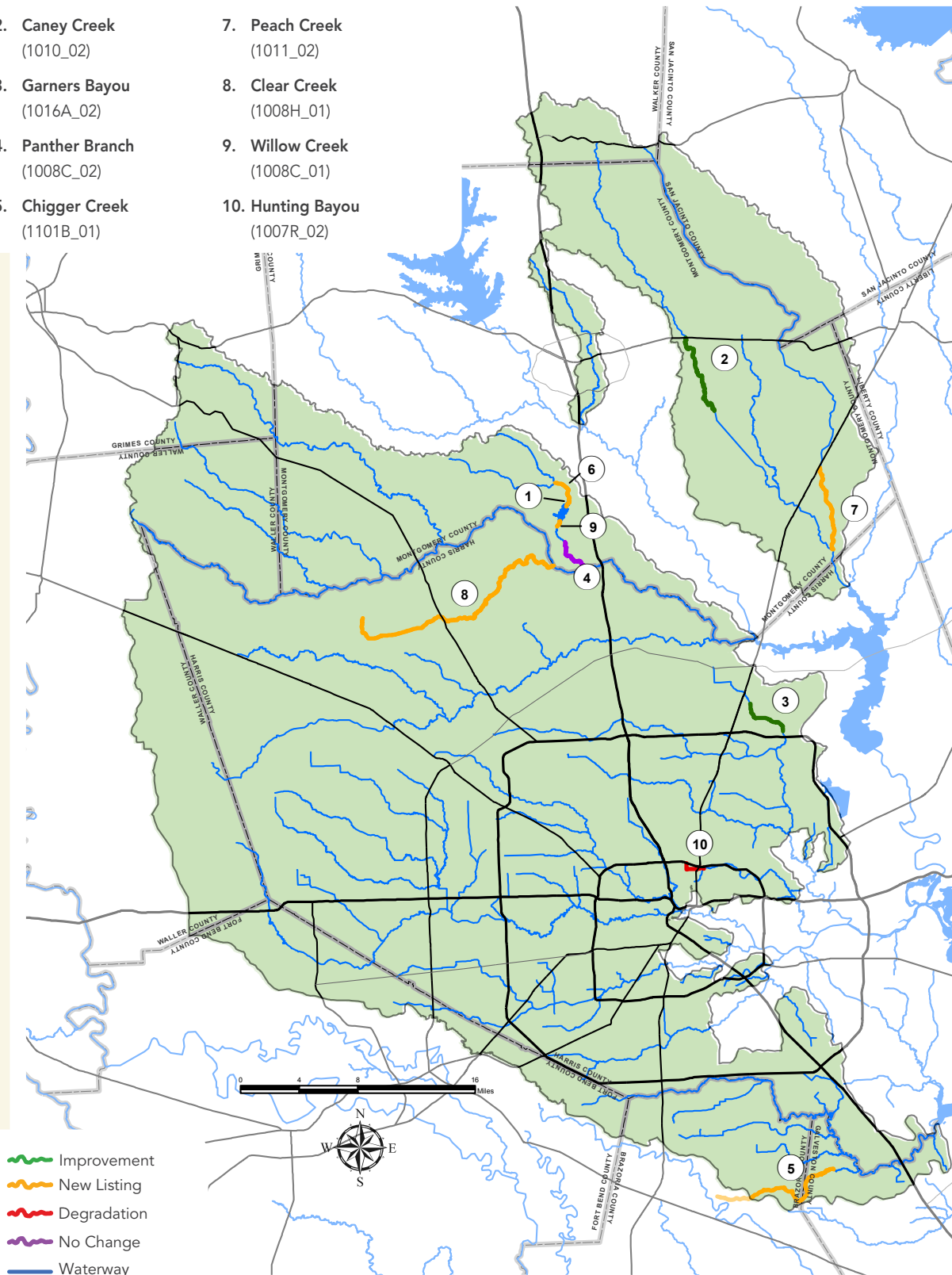
TOP 10 “MOST LIKELY TO SUCCEED” STREAMS

Rank	Assessment Unit	Parameter	Relative Geomean (MPN/100 mL)	Geomean (MPN/100 mL)	Assessment Unit Description	Watershed
1	1008F_01	<i>E. Coli</i>	1.04	130.66	Lake Woodlands, upper end of segment to Northshore Park/Woodlock Forest	Lake Woodlands
2	1010_02	<i>E. Coli</i>	1.09	136.75	Caney Creek, from FM 1097 to SH 105	Caney Creek
3	1016A_02	<i>E. Coli</i>	1.14	143.19	Garners Bayou, from the confluence with Williams Gully upstream to 1.5 km north of Atascocita Road	Garners Bayou
4	1008C_02	<i>E. Coli</i>	1.20	151.21	Lower Panther Branch, from Saw Dust Road to the Lake Woodlands Dam	Panther Branch
5	1101B_01	<i>E. Coli</i>	1.21	153.03	Chigger Creek, from the headwaters to FM 528	Chigger Creek
6	1008B_02	<i>E. Coli</i>	1.27	160.13	Upper Panther Branch, from a point a point 0.22 miles (0.35 km) upstream of the Bear Branch confluence to the confluence of Lake Woodlands	Panther Branch
7	1011_02	<i>E. Coli</i>	1.28	160.76	Peach Creek, US Hwy 59 to confluence with Caney Creek	Peach Creek
8	1008H_01	<i>E. Coli</i>	1.32	166.44	Clear Creek Above Tidal, Hickory Slough confluence to Turkey Creek confluence	Clear Creek
9	1008C_01	<i>E. Coli</i>	1.39	175.01	Willow Creek, from the Spring Creek confluence to a point 0.48 km (0.3 mi) north of Juergen Rd	Willow Creek
10	1007R_02	<i>E. Coli</i>	1.50	188.76	Hunting Bayou, from just east of Elysian Street to Falls Street (North Fork)	Hunting Bayou

Top 10 “Most Likely to Succeed” Streams

- | | |
|---------------------------------|---------------------------------|
| 1. Lake Woodlands
(1008F_01) | 6. Panther Branch
(1008B_02) |
| 2. Caney Creek
(1010_02) | 7. Peach Creek
(1011_02) |
| 3. Garners Bayou
(1016A_02) | 8. Clear Creek
(1008H_01) |
| 4. Panther Branch
(1008C_02) | 9. Willow Creek
(1008C_01) |
| 5. Chigger Creek
(1101B_01) | 10. Hunting Bayou
(1007R_02) |

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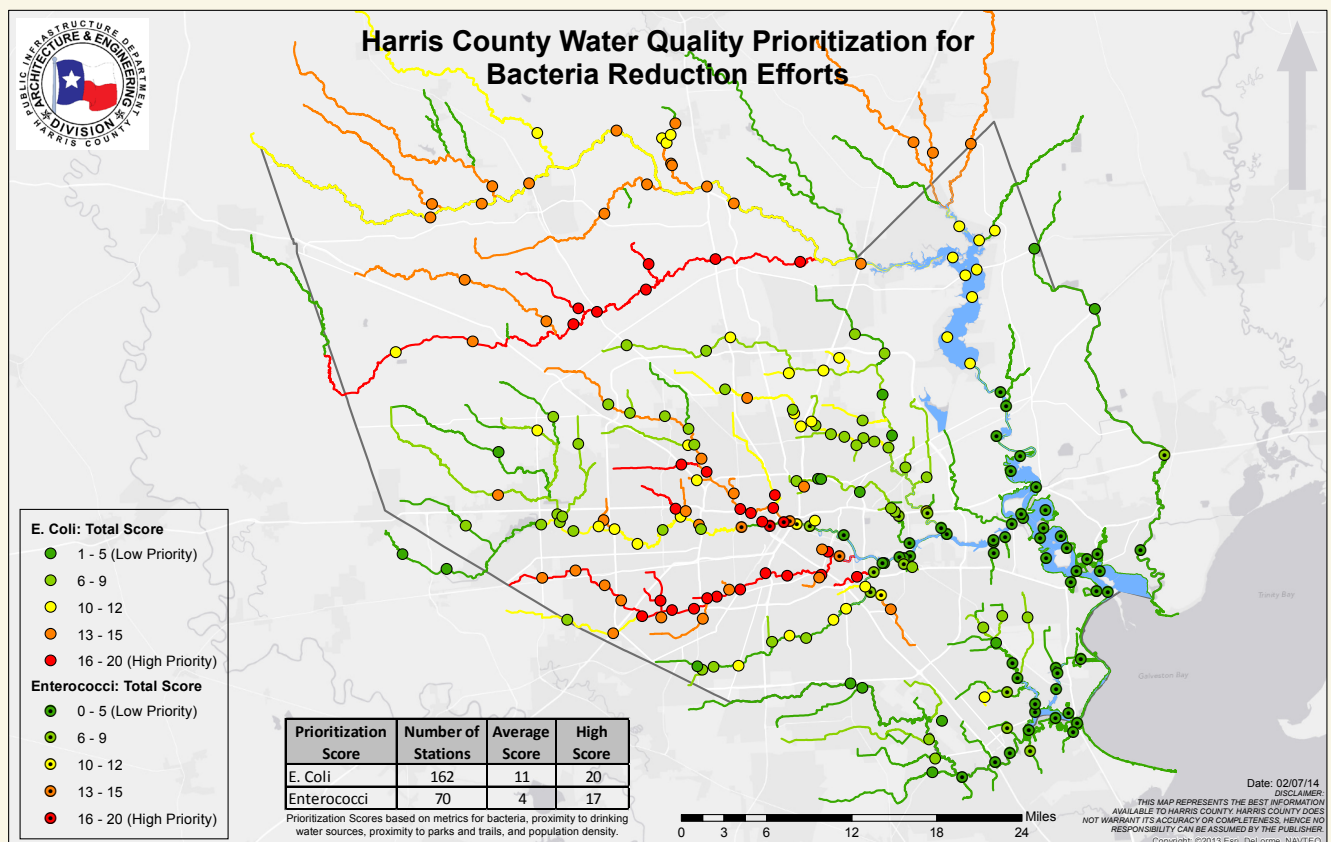


APPENDIX I

HARRIS COUNTY WATER QUALITY PRIORITIZATION

■ **Harris County Geographic Priority Framework.** Harris County presented its method for evaluating streams by a geographic prioritization framework. Points are given for each metric in the framework and tallied up to prioritize the stream segments to be given future implementation priority. Framework uses the following metrics:

- Percent geometric mean above the water quality standard;
- Monitoring station located in watershed draining to Lake Houston (drinking water source);
- Monitoring station located in segment that crosses a bike path, trail, or greenway;
- Monitoring station located in segment that is within 300 feet of a park; and
- Average population density within segment in a 200 foot buffer.





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