Nonpoint Source Water Quality Planning and Implementation Efforts in the Westfield Estates, Bastrop Bayou, and San Bernard River Watersheds

Final Report
Contract 582-9-77098

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Acronyms

ARRA	American Reinvestment and Recovery Act
BIG	Bacteria Implementation Group
BMP	Best Management Practice
CRP	Clean Rivers Program
EAMD	East Aldine Management District
EPA	United States Environmental Protection Agency
GIS	Geographic Information System(s)
GBEP	Galveston Bay Estuary Program
HCFCD	Harris County Flood Control District
HCSWCD	Harris County Soil and Water Conservation District
H-GAC	Houston-Galveston Area Council
NPS	Nonpoint Source
OSSF	On-Site Sewage Facility
PID	(Harris County) Public Infrastructure Department
QAPP	Quality Assurance Project Plan
SEP	Supplemental Environmental Project(s)
SSO	Sanitary Sewer Overflow
TCEQ	Texas Commission on Environmental Quality
TxDOT	Texas Department of Transportation
TSSWCB	Texas State Soil and Water Conservation Board
USF&WS	United States Fish and Wildlife Service
WPP	Watershed Protection Plan
WWTF	Wastewater Treatment Facility

Executive Summary

This report summarizes work conducted under Contract 582-9-77098 (Contract), a Clean Water Act 319(h) nonpoint source water quality planning and implementation project administered by the Texas Commission on Environmental Quality (TCEQ). The project involved a series of planning and implementation tasks for the Westfield Estates, Bastrop Bayou, and San Bernard River watersheds. The primary focus for these efforts was planning for, and implementing, strategies to reduce and maintain indicator bacteria concentrations in these waterways below the contact recreation water quality standard. This document is a summary of the results of these efforts, and a discussion of future needs.

Westfield Estates – The Westfield Estates watershed is a small urbanized drainage area within the Westfield Estates community in northern Harris County. The watershed is comprised of several urban blocks that drain to linear ditches, and thence to Halls Bayou. Water in the linear ditches is significantly above the contact recreation standard, primarily due to malfunctioning on-site sewage facilities (OSSFs) and pet wastes. This Contract entailed the development of a watershed protection plan (WPP) for the community and implementation of stakeholder-identified best management practices (BMP). Efforts for Westfield Estates are covered under Contract tasks 1-9, and 12.

The following activities were conducted in the Westfield Estates project area during the term of this contract:

- H-GAC held an ongoing series of **meetings and discussions with stakeholders** and key partners in the watershed to develop appropriate strategies for mitigating bacteria sources.
- A **draft WPP was developed** for this area focused on mass remediation of failing septic systems. After several rounds of review by the TCEQ and EPA, the decision was made to not pursue the WPP for this watershed, and begin implementation efforts.
- A **pilot project to remediate OSSFs** was conducted. Supplemental Environmental Project (SEP) funds were used, in conjunction with partner efforts, to identify and remediate four OSSFs in the watershed. Due the high costs of drip aerobic systems necessitated by the restricted lot sizes of the neighborhood, remediation of additional OSSFs was deemed unfeasible.
- **Public outreach on residential OSSF maintenance** was conducted through a public meeting and direct mailings.
- An **OSSF pump-out program** was conducted to alleviate built up loads in existing OSSFs to help reduce overflows into the drainage ditches.
- A **low flow device program** was conducted in conjunction with the OSSF pump-out to provide low flow devices to residents to reduce loading to OSSFs.

- **Public outreach on pet waste management** was conducted through direct mailings to residents, including educational literature, a website with information, and a refillable dog waste bag dispenser.
- **Pre- and post-implementation outreach impact assessments** were disseminated to evaluate whether behavior and knowledge had been impacted by the efforts of the project.
- **Pre- and post-implementation sampling** was conducted to evaluate the impact of management measures on water quality in the drainage ditches.
- H-GAC **promoted the project** through interaction and coordination with a host of regional groups; including the Harris County Flood Control District's Halls Ahead group focusing on drainage and related improvements in the Halls Bayou Watershed.
- H-GAC helped **facilitate discussions between partners regarding sanitary sewer**. The ultimate solution to human bacteria sources in the watershed is installation of sanitary sewer. Previous projections had indicated that couldn't happen for 10 years or more. H-GAC facilitated conversations with watershed partners who have now expanded capacity to handle flow from Westfield and are working to fund a collection system on a shorter time scale.

Bastrop Bayou – The Bastrop Bayou Watershed is located in coastal Brazoria County, and includes the City of Angleton, portions of Lake Jackson and other communities, and a portion of the Brazoria National Wildlife Refuge. Impacts of projected growth, malfunctioning OSSFs, pet waste, cattle operations, and wildlife (including non-domestic animals like feral hogs) have lead to indicator bacteria concentrations in excess of the contact recreation standard. A draft WPP was developed under a previous nonpoint source grant project. Based on comments from TCEQ, additional revision was necessary and funding from the Westfield Estates project was applied to these efforts. This Contract entailed the development of revised modeling for Bastrop Bayou, outreach and education activities, facilitation of a stakeholder group, and revision and re-submittal of the Bastrop Bayou WPP. Efforts for Bastrop Bayou are covered under Contract tasks 1, 10, and 12.

The following activities were conducted in the Bastrop Bayou project area during the term of this contract:

- H-GAC held a series of **meetings and ongoing conversations with the established stakeholder advisory group**.
- **Watershed signage** was installed throughout the watershed as a cooperative effort between H-GAC, TxDOT and Brazoria County.
- **Informational kiosks** were obtained to display watershed information at various urban or highly-trafficked areas in the watershed.

- **Updated watershed modeling** was conducted to evaluate changing land use patterns in the watershed and provide more precise estimates of load reduction targets.
- H-GAC **coordinated, or provided assistance for, a series of partner BMP implementation efforts,** including installation of a dog park, initiating transition of a community from malfunctioning OSSFs to sanitary sewer, and GLO removal of an abandoned boat.
- H-GAC continued to provide **education and outreach** through the signage, kiosks, and program promotion with regional groups (GBEP, et al.) and public events (Migration Celebration, Clean Rivers Program, Texas Stream Team seminars.). H-GAC also coordinated with the Clean Rivers Program (CRP) Texas Stream Team volunteers as an outreach and monitoring activity in the watershed.
- The **draft WPP was updated** and submitted to TCEQ and EPA for review.

San Bernard River – A watershed protection plan for the San Bernard River was developed under a previous federal American Reinvestment and Recovery Act (ARRA) grant. After the culmination of that grant period, funds under this Contract were allocated to conduct additional modeling and monitoring work and continue facilitation of the stakeholder group to produce a revised WPP. Efforts for Westfield Estates are covered under Contract tasks 1, and 11-13.

The following activities were conducted in the San Bernard project area during the term of this contract:

- H-GAC held a series of **meetings and ongoing conversations with the established stakeholder group**
- H-GAC conducted a **modeling effort** to determine the impact of additional BMPs
- **Automated storm flow samplers** were installed and operated to collect data on baseline conditions at future BMP installation locations.
- A **revised WPP** was developed and approved by the stakeholders for submission to TCEQ and EPA.
- **Public outreach and education** was conducted, involving stakeholder meetings, installation of watershed signage, acquiring an educational kiosk for a watershed area park, installing an interactive computer kiosk in the Brazoria Library, and Texas Well Owner Network meetings, appearance at public events, and representing the project with regional groups and organization meetings.

While the Contract initially focused solely on Westfield Estates, changes in sanitary sewer timelines made wide scale OSSF remediation unfeasible, allowing work to be completed for the Bastrop and San Bernard projects using funds previously allocated to structural components of

the Westfield project. The final result of this Contract was the submission of three WPPs for review, and a series of initial outreach and education implementation activities for the project areas.

Introduction

This document is the culminating report for the nonpoint source water quality planning and implementation efforts conducted by the Houston-Galveston Area Council (H-GAC) under Contract 582-9-77098 (Contract), a Clean Water Act 319(h) nonpoint source project funded through the United States Environmental Protection Agency (EPA) and administered by the Texas Commission on Environmental Quality (TCEQ). The Contract efforts comprised the development of watershed protections plans (WPPs), related monitoring and modeling, public outreach and education, and implementation projects in the Westfield Estates, Bastrop Bayou, and San Bernard River watersheds project areas.

The ultimate goal of these efforts was to address sources of indicator bacteria in these impaired waterways in order to reduce and maintain bacteria concentrations that meet the State of Texas' Water Quality Standard for contact recreation. This goal is pursued through a series of planning and assessment tasks, and implementation of voluntary best management practices (BMPs).

This report will focus on the progress achieved in the 13 primary Objectives set forth in the Contract:

1. Project Administration and Management
2. Westfield Estates Stakeholder Advisory Group
3. Water Quality Monitoring, Bacteria Source Identification, Data Collection, Validation, and Determination of Effectiveness of Corrective Measures in Westfield Estates
4. Determination of Management Measures for Westfield Estates WPP
5. Implementation of Structural Measures (for Westfield Estates)
6. Implementation of Behavioral Measures for Westfield Estates
7. Education and Outreach for Westfield Estates WPP
8. Westfield Estates WPP Update
9. Measure Progress and Effectiveness of Implementation Efforts (for Westfield Estates)
10. Bastrop Bayou WPP (facilitation, water quality assessment and modeling, public outreach, implementation coordination, WPP update)
11. San Bernard Water Quality Assessment
12. Final Report
13. San Bernard Watershed Education, Outreach, and Stakeholder Coordination

Each objective is explained in greater depth later in the **Project Objectives** section. A description of the methodologies employed to generate outcomes is provided in the **Methods** section. Project outcomes are discussed in the **Results and Observations** section. The outcomes in the context of project goals for the tasks implemented under this Project are discussed in the **Discussion** and **Summary** sections. Additional information is provided in the **Appendices.**

Project Significance and Background

Background

Original Aims

Prior to this Contract, an initial survey[1] of on-site sewage facilities was conducted on the Westfield Estates community in northern Harris County. The survey found a high failure rate of OSSFs in the Westfield Estates community and bacterial source tracking confirmed that human waste was an appreciable source of bacteria, along with domestic animal waste, found in the linear ditches of the community. The Westfield Estates Community is an economically disadvantaged community in which OSSFs are the sole wastewater treatment strategy. While the OSSFs in the community were sufficient when it was developed in the mid-20th century, subdivision of lots, natural deterioration with age, addition of structures over drain fields, and lack of appropriate maintenance and enforcement capacity have greatly reduced the efficacy of the systems. Lack of available funds at the outset of the project to install wastewater effluent capacity at local treatment plants and a sanitary collection system meant that OSSFs were likely to continue to be the sole treatment option for the foreseeable future. The linear ditches that drain the Westfield Estates community have differing degrees of siltation, and have been site of frequent illegal dumping of large debris, leading to pooling of drainage water even in dry conditions. Water in the ditches, which drain to Halls Bayou, was contaminated with severely high levels of indicator bacteria[2]. The proximity of these contaminated pools to the residents of the neighborhood and the potential human health risk they represented were an impetus for H-GAC and local partners to seek grant funding to remediate the failing septic systems and address other sources of bacteria in the watershed. H-GAC pursued and was awarded a Clean Water Act 319(h) grant from the EPA, administered through the Texas Commission on Environmental Quality as Contract 582-9-77098. The primary focus of the FY09 grant at that time was the development of a Watershed Protection Plan that would include the remediation or replacement of a large number of OSSFs. The development of the WPP and the implementation activities were included in the same grant project.

Shift to Intermediate Focus

During the development of the WPP, stakeholders began to discuss alternative funding available to bring sanitary sewer to the neighborhood in a decreased timeframe. Based on this regional strategy, driven by the East Aldine (Management) District (EAMD), Harris County, and the Sunbelt Freshwater Supply District (Sunbelt), the stakeholders reconsidered the initial plans to focus primarily on OSSF replacement. It was determined that if sanitary collection was available on a shorter time frame, wide-scale OSSF replacement was not the most cost effective

[1] The Failing Septic System Initiative, completed in 2007 by H-GAC in conjunction with the Galveston Bay Estuary Program (GBEP) and Harris County Precinct 2, located at http://videos.h-gac.com/ce/water/publications/ss-ossf_failing_septic_system_initiative_westfield_estates.pdf.
[2] Measuring in the millions in some samples collected under pre-implementation monitoring under this project.

interim option. Economic conditions also required some partners to reconsider previous match commitments by significant amounts. Towards that end, the stakeholders revised their implementation plans and shifted the project focus to intermediate measures; fixing a small number of OSSFs as a pilot project, providing OSSF pump-outs and low-flow devices to neighborhood residents to reduce built up OSSF contents and future loading, providing outreach and education on OSSF maintenance and pet waste management, and improving drainage in the ditches and outfalls to Halls Bayou[3]. The ultimate solution identified in the WPP continued to be installation of sanitary sewer collection system in the neighborhood. This greatly reduced structural corrections that could be implemented, which in turn left unallocated funds in the Contract. TCEQ and H-GAC agreed to allocate these resources to unfunded needs in the Bastrop Bayou and San Bernard River Watersheds.

Expansion of Project Area

Previous projects[4] in the Bastrop Bayou and San Bernard River watershed project areas had both developed initial WPPs. Additional monitoring, modeling, outreach, and facilitation tasks identified during these projects were elected to be funded under this Contract. The Bastrop Bayou project area, a coastal watershed in rural Brazoria County with rising bacterial contamination issues, included tasks under this contract related to continuing the facilitation of a stakeholder group and additional water quality assessment and projection to complete a revised WPP. H-GAC was also to serve a coordination role between area stakeholders in their implementation of BMPs. The San Bernard River project area had identified several representative land parcels for pre-implementation monitoring prior to BMP installation. Additionally, continued facilitation of their stakeholder group and revision of previous modeling and the WPP draft was needed. These tasks were added to this Contract to bridge between the previous projects and future implementation funding upon approval of their respective WPPs by TCEQ and the EPA. Maps of the three project areas are included in **Appendix A**.

Significance

Elevated levels of indicator bacteria are the most common impairment in the 13-County H-GAC Region (Region). Fecal bacteria and pathogens can have pronounced impact on human health and economic resources derived from tourism and recreational pursuits in these waterways. With projected growth in the Region adding another 3.5 to 4 million people by 2035, sources of bacteria arising from development of natural areas are projected to increase appreciably.

With a strong regional emphasis on local control, WPPs are an important tool in addressing bacteria sources in a comprehensive manner that reflects the priorities and commitments of the local stakeholders. The development of WPPs and related implementation efforts in these

[3] This latter task is not in the scope of this Contract's objectives; rather, it was conducted as part of a larger effort by watershed partners Harris County and the Harris County Flood Control District.
[4] A Clean Water Act 319(h) grant project with additional funding from GBEP,

communities is generally significant in its reduction of human health risk and reduction of impact on the recreational economy in the coastal project areas.

The overarching purpose of this project is to develop roadmaps for local communities to address the sources of contamination in their watershed, and plan for the acquisition of assistance to aid them in doing so. The watersheds addressed under this Contract were identified because of strong local support for action, acute public health risk, or likelihood of being able to meet the standard.

The significance of the efforts undertaken in this Project is demonstrated by the variety of the outcomes they produced. For **Westfield Estates**, an acute human health risk has begun to be addressed in the short term through Contract implementation efforts, and a long term solution has solidified among the watershed partners due in part to participation in the WPP development process and aided by the information generated therein. The process has established ongoing commitments among the partners for continued efforts after the culmination of this Contract.

For **Bastrop Bayou** the significance of the project efforts are in the completion of a revised draft WPP, which moves the effort closer to full scale implementation. Equally as important are the coordination efforts which have resulted in a wide array of BMPs beginning to be implemented by watershed stakeholders and agency partners. Even prior to WPP approval, significant structural and outreach efforts are underway in the communities of the watershed. Additionally, modeling conducted under this Contract greatly enhanced the ability to predict bacteria source change in the watershed and allow stakeholders to more precisely target solutions. Continued facilitation of the stakeholder group has allowed for the establishments of commitments among watershed partners toward efforts after the culmination of this Contract.

For the **San Bernard River** the efforts conducted under this Contract allowed an established stakeholder group to remain focused on the revision and approval of the WPP. Additionally, this Contract allowed H-GAC to refine modeling results and conduct biased water quality sampling that will allow partners greater precision in future implementation choices and a baseline against which to measure the efficiency of their BMP installations.

Additional information about the outcomes of the Contract objectives is found in the **Results and Observations** Section.

Project Objectives

This section details the purpose for each of the 13 Contract objectives. For ease of reference, the Objectives are grouped by project area (excluding *Objectives 1 and 12 of the Project, which are Administrative tasks and Final Report requirements, and therefore are not reported on this document. For further information on these Tasks please refer to Quarterly Progress Reports).* The final scope of work for this Contract is attached as **Appendix B**. The results and outcomes of work conducted on the Contract objectives are presented in the **Results and Observations** Section.

Westfield Estates Project Area Objectives

Objective 2 – Westfield Estates Stakeholder Advisory Group

The purpose of Objective 2 was to facilitate and foster an active and engaged stakeholder group. The Objective was to be met by:

- holding stakeholder meetings on a regular basis;
- actively seeking stakeholder feedback; and
- disseminating information to partner agencies and groups through the stakeholder group representatives.

The overall goal of this Objective was to involve local partners in the efforts, ensure coordinated efforts across all implementation, and ensure local commitment to the project goals.

Objective 3 – Water Quality Monitoring, Bacteria Source Identification, Data Collection, Validation, and Determination of Effectiveness of Corrective Measures for Westfield Estates

The purpose of Objective 3 was to:

- develop and seek approval for a QAPP to conduct and assess pre-and post-implementation monitoring;
- develop a monitoring plan for pre- and post-implementation BMP effectiveness monitoring;
- amend and update the QAPP as necessary;
- collect data per the dictates of the QAPP; and
- submit the data in a proper format to TCEQ for inclusion in SWQMIS.

The overall goal of this Objective was to devise and implement a monitoring plan and quality plan that ensured data collected during the pre- and post-implementation efforts would meet

quality objectives for the project and be relevant to the intended purpose of evaluating BMP effectiveness.

Objective 4 – Determination of Management Measures for Westfield Estates WPP

Objective 4 was completed early in the Contract period, but continually revised as the Contract and the aims of the stakeholders evolved. The purpose of this Objective was to:

- prioritize the management measures to be implemented in the Westfield Estates watershed; and
- reflect this prioritization process and decisions in the revised WPP.

The overall goal of this objective was to seek the most cost-effective and feasible solutions based on local stakeholder knowledge, project aims, and likely success in achieving project goals.

Objective 5 – Implementation of Structural Measures

Objective 5 was originally targeted at wide-scale replacement or remediation of OSSFs. When the stakeholders shifted priorities to interim OSSF management and pet waste management, the Objective tasks were modified to require that H-GAC:

- facilitate the installation of low flow devices in up to 250 homes in the watershed;
- investigate and install pet waste management structural devices; and
- remediate a select number of OSSFs.

The overall goal of this objective was to implement a series of interim structural measures to reduce contribution from bacteria sources while funding is sought for the sanitary collection system.

Objective 6 – Implementation of Behavioral Measures for Westfield Estates WPP

The purpose of Objective 6 was to promote behavioral change in activities that lead to bacteria contribution, including maintenance of OSSFs, pet waste disposal, and illegal dumping. The Objective tasks were to be met by:

- developing a targeted program and materials for education and outreach on behavioral measures; and
- implementing this program through targeted education and public meetings.

The overall goal of this objective was to reduce bacteria from improperly discarded pet waste and improperly maintained OSSFs. Trash reduction is included in this objective in order to reduce pooling and potential contact with contaminated water in the pools.

Objective 7 – Education and Public Outreach for Westfield Estates WPP

The purpose of Objective 7 was to promote news and events of the project, with an emphasis on bilingual materials. The Objective tasks were to be met by:

- publicizing important meetings and events related to the WPP/project in bilingual materials when appropriate; and
- updating the WPP website with new information as appropriate.

The overall goal of this objective was to ensure that local stakeholders received adequate notification of WPP progress, events, and meetings in an appropriate format.

Objective 8 – Westfield Estates WPP Update

The purpose of Objective 8 was to update the WPP as new input and information was received. The Objective tasks were to be met by:

- updating the WPP as the need arose.

The overall goal of this Objective was to ensure that the WPP reflected the current feedback, priorities, and information provided by the stakeholders and partner agencies.

Objective 9 – Measure Progress and Effectiveness of Implementation Efforts

The purpose of Objective 9 was to measure the efficiency of the preliminary implementation efforts through community outreach impact assessment and water quality monitoring. The Objective tasks were to be met by:

- conducting pre- and post-implementation monitoring in conjunction with Objective 3; and
- conducting a community outreach impact assessment prior to, and subsequent to, implementation efforts.

The overall goal of this Objective was to measure the impact of selected implementation measures by establishing a baseline, and comparing results.

Bastrop Bayou Project Area Objectives

Objective 10 – Bastrop Bayou WPP

The purpose of Objective 10 was to coordinate efforts in the Bastrop Bayou watershed aimed at revising the WPP, coordinating stakeholder implementation, facilitating the stakeholder group, and conducting public outreach and education. The Objective was to be met by:

- facilitating the existing stakeholder advisory group in a series of public meetings in which additional feedback on changes and activities would be sought;
- completing any additional water quality or modeling analysis that was necessary to complete the WPP revision;
- coordinating stakeholder efforts and supporting implementation activities they pursued prior to the WPP approval;

- conducting public outreach and education through web presence, attending related events, and sponsoring a trash reduction event; and
- revising and resubmitting the WPP.

The overall goal of this Objective was to continue the efforts of the Bastrop Bayou Watershed Protection Plan development process as it transitioned from WPP development towards implementation.

San Bernard River Project Area Objectives

Objective 11 – San Bernard River Water Quality Assessment

The purpose of Objective 11 was to conduct additional water quality modeling and monitoring necessary to support the revision of the San Bernard River WPP. This Objective's tasks included:

- conducting water quality modeling to refine and revise BMP impact and load reduction projections for a series of example BMPs; and
- installing, configuring, and operating a series of automated stormwater sampling stations to provide pre-implementation monitoring at sites of future BMP installations.

The overall goal of this Objective was to support work being conducted under an ARRA grant for the development of the San Bernard River WPP.

Objective 13 – San Bernard Watershed Education, Outreach, and Stakeholder Coordination

The purpose of Objective 13 was to facilitate ongoing revision of the San Bernard River WPP, maintain facilitation of its stakeholder advisory group, conduct a community clean up event, and conduct additional water quality modeling and monitoring necessary to support the revision of the San Bernard River WPP. This Objective's tasks included:

- disseminating information about the project through public events, related meetings, and other appropriate venues;
- sponsoring a community clean-up event;
- facilitating the work of the stakeholder advisory group through a series of public meetings and solicitation of input on modeling information and WPP revisions; and
- coordinating H-GAC stream team sampling in the watershed.

The overall goal of this Objective was to provide additional support for the continuance or WPP revision and public outreach opportunities in the San Bernard River watershed.

Methods

The following is a brief summary of the methods employed by Project staff, and their strategy and approach to each of the primary Objectives. The goals and results for each Objective are described in more detail in their respective sections in the **Project Objectives** and **Results and Observations** section. The Objectives are grouped by project area for reference.

Westfield Estates Project Area

Objective 2 – Westfield Estates Stakeholder Advisory Group

The methodology and approach of facilitating this stakeholder group focused on maintaining a balance between Contract objectives and stakeholder feedback. Drastic changes to match availability from some of the partners (several hundreds of thousands of dollars) due to economic conditions, and an unexpected shortening of expected timeframes for installation of sanitary sewer necessitated guiding the stakeholder group, based on their feedback, to an acceptable middle ground in which OSSF remediation was not completely abandoned, but under which the focus shifted to interim sustaining measures. The frequency of called meetings, and increase in informal meetings with individual stakeholders was altered to meet the change from a WPP development project to an implementation project, and due to stakeholder preference.

Objective 3 – Water Quality Monitoring, Bacteria Source Identification, Data Collection, Validation, and Determination of Effectiveness of Corrective Measures for Westfield Estates

Development of the QAPP and siting choices for water quality monitoring were based on a review of standards utilized in by the CRP, knowledge of the watershed hydrology, knowledge of past location of pooled areas, and local knowledge. Because of the small size of the area and variability of available flow, it was expected that measurable impacts may be hard to produce Outlets at the ends of the watershed were chosen to represent the last points before introduction to Halls Bayou. Development of the QAPP was based on prior experience and knowledge of TCEQ QAPP requirements.

Objective 4 – Determination of Management Measures for Westfield Estates WPP

The initial management measures were derived from efforts in the watershed conducted prior to the initiation of the Contract. However, changing economic conditions, changing projections for sanitary sewer installation, and changing stakeholder preference necessitated a shift away

from large scale structural measures. H-GAC approached a revision of management measures by reviewing potential BMPs that would work in this urban setting, and taking feedback from stakeholders. The selected management measures were chosen for cost effectiveness, potential impact, likelihood of acceptance by the community, and interim time frame compatibility. Pet waste structural elements proved the most difficult aspect of measure selection due to logistical issues. Composting devices available were not designed to work with area soils, and there were no suitable locations identified by the stakeholders for pet waste stations. The stakeholders felt strongly that education was a more potent tool for the specific community, given their experience with pet waste disposal patterns in the area. Based on this feedback and lack of suitable location for stations, signage or other structural solutions, H-GAC focused implementation measures on educational efforts.

Objective 5 – Implementation of Structural Measures

As indicated in Objective 6, structural measure focus shifted during this Contract toward interim measures designed to support existing OSSF infrastructure until sanitary could be established. To evaluate the efficacy of additional OSSF replacement, a pilot project using SEP funds was conducted. The unfeasibility of the costs involved per system led H-GAC and the stakeholders to focus on a combination of low flow devices, OSSF pump-outs, and education on maintenance. Because EAMD was a strong community presence, had better bilingual capacity, and had established relationships with vendors in the area, H-GAC worked closely with them on the OSSF pump-out program. A continuing concern in this community was ensuring that proper bilingual support was in place for efforts. EAMD's capacity was identified as the proper vehicle for this and other efforts.

Objective 6 – Implementation of Behavioral Measures for Westfield Estates WPP

H-GAC approached implementation of behavioral measures in much the same way as those of structural measures. General programs and available materials needed to be modified to reflect the circumstances and needs of the community, especially in terms of bilingual support. H-GAC sought out existing community centers as a venue for education meeting, brought translation personnel to an OSSF education event, and paid for professional translation of all mailed materials. Based on low community organization response to a potential event surrounding dog waste, H-GAC shifted to direct contact with residents through mailings and dissemination of dog waste bag dispensers with bilingual materials.

Objective 7 – Education and Public Outreach for Westfield Estates WPP

Because the watershed was small in nature, and the project was unconventional in terms of other WPP development projects (not a named segment, etc.), H-GAC pursued a targeted focus on education and public outreach. Much of the direct community education and outreach was

in coordination with Objective 6. Additionally, H-GAC targeted existing meetings and other opportunities in which to share the project story with decision-makers, including outreach to elected officials in Pct. 2, directly to the residents in Pct. 2 and EAMD town hall meetings, and with representation on the North Houston Association (a group of local decision makers involved in the north Houston/Harris County are that included Westfield Estates). In building relationships with key partners (Harris County, EAMD, Sunbelt, et al.), H-GAC was able to obtain stringer commitments for future efforts and better coordination of ongoing efforts.

Objective 8 – Westfield Estates WPP Update

H-GAC pursued WPP update and approval over an extended period of time until TCEQ and EPA decided that they would not pursue it further. H-GAC's methods in this process were to incorporate EPA and TCEQ comments in a way that met the priorities and feedback of the stakeholders.

Objective 9 – Measure Progress and Effectiveness of Implementation Efforts

As per Objective 3, H-GAC implemented the monitoring plan/QAPP based on previous siting and methods decisions. Assessment was based on a comparison of before and after data. Issues with sufficient rainfall/dry periods in the post-implementation monitoring hampered H-GAC's ability to make a full comparison.

Bastrop Bayou Project Area

Objective 10 – Bastrop Bayou WPP

The bulk of the WPP development for Bastrop was completed prior to its inclusion in this Contract. Therefore, H-GAC focus was on continued facilitation of the existing stakeholder group. Specific emphasis was put on establishing and maintaining relationships with key partners in the watershed, including Brazoria County, Brazoria County Freshwater Supply District #2, several engaged local residents, the Texas State Soil and Water Conservation Board (TSSWCB), the USF&WS, and the County Extension Agent. The additional modeling was approached with the purpose of supporting WPP revision and enabling more precise load reduction estimates. The methods employed centered on development of innovative modeling approaches to evaluate loads on a more granular level, and incorporate SELECT modeling relationships into EPDRiv1 watershed modeling. H-GAC integrated updated assumptions into previous SELECT modeling to better estimate watershed conditions, and used flow-weighted values in EPDRiv1 modeling to better approximate rainfall conditions in the watershed.

San Bernard River Project Area

Objective 11 – San Bernard River Water Quality Assessment

To support previous modeling efforts and stakeholder demands, H-GAC worked with consultant CDM to model impacts of various BMPs. The intent of this effort was to refine projections in the WPP and incorporate stakeholder feedback about priorities. The automated storm flow sampling required a methodical approach and was new technology for some project staff. H-GAC worked closely with the sampling equipment vendor to carefully program and evaluate results from the samplers to ensure that monitoring results were as accurate as possible. Due to logistical issues with drive times to and from the watershed, and the inability to process bacteria samples when the receiving lab was closed, H-GAC had to change its methods in sampling programming to ignore triggering events that would happen outside of a timeframe conducive to a usable bacteria sample. Insufficient rainfall events hampered H-GAC's ability to complete this sampling project.

Objective 13 – San Bernard Watershed Education, Outreach, and Stakeholder Coordination

H-GAC adopted the same methods and practices utilized during the successful ARRA grant project in which the initial draft WPP was developed. A mix of stakeholder meetings and relationship building with general public engagement were successful in building a successful and sustainable coalition of stakeholders. Key partners were utilized to multiply H-GAC's outreach ability, including the Friends of the River San Bernard. H-GAC sought out public meetings in the area, including the San Bernard National Wildlife Refuge's Migration Celebration, Friends of the River San Bernard cleanup and community events, and other local Houston area events to target outreach to prospective stakeholders.

Methods Summary

In general, the methodical approach of the project team was to build and utilize key partnerships in the watershed, while also maintaining a strong public presence. Adaptability was a key, especially in the Westfield Estates project area, where dramatically changing fiscal and logistical issues required a refocusing and reevaluation of previous methods and decisions. In general, H-GAC sought to maintain a productive balance between local knowledge and feedback and sound science in decision making processes.

Results and Observations

This section discusses the results and outcomes of work on the Contract objectives detailed in **Appendix B** and the **Project Objectives** and **Methods** sections. As with the previous sections, the Objectives are grouped by project area. The focus of this section will be on discussion of work effort and definable outcomes.

Westfield Estates Project Area Results and Observations

Objective 2 Results – Westfield Estates Stakeholder Advisory Group

H-GAC facilitated an ongoing set of stakeholder meetings starting in 2009. Prior to the initiation of this project, H-GAC had held a series of public meetings with watershed residents and established a stakeholder group primarily composed of key watershed partners to guide the draft WPP to submission and begin implementation activities. Meeting frequency was greatest during development and revision of the WPP through late 2011, at which point TCEQ and EPA decided not to pursue approval of a WPP for Westfield Estates. After that point, the stakeholder indicated a preference for less frequent meetings and a reliance on need-specific individual communication as the project moved to an implementation footing. **Table 1** indicates the stakeholder advisory group or general stakeholder meetings held during this contract period. This table only includes formal meetings or teleconferences, and does not include informal calls and meetings with individual stakeholders.

Table 1 – Westfield Estates Stakeholder Meetings

Stakeholder Meetings/Participants	Date
Stakeholder Advisory Group Meeting (introductory with key partners)	9/28/2009
Stakeholder Advisory Group Meeting	10/12/2009
Meeting with Harris County Precinct 2	10/15/2009
Meeting with GBEP	10/23/2009
Meeting with Talento Bilingue de Houston (TBH)	11/17/2009
Stakeholder Advisory Group Meeting	1/22/2010
Meeting with Talento Bilingue de Houston (TBH)/Martin Jimenez (community leader)	1/31/2010
Meeting with Harris County Precinct 2	2/4/2010
Stakeholders meeting	2/9/2010
Westfield area Town Hall meeting	3/4/2010
Westfield area EAMD meeting	6/30/2010
Stakeholders meeting	1/6/2011
Stakeholder meeting (regarding SEP project)	5/11/2011
Stakeholders meeting (regarding SEP project)	7/26/2011
Stakeholders meeting	1/17/2012

The sustaining stakeholder advisory group members are those partners who will continue efforts subsequent to the end of this contract period. These organizations and their primary representative(s) are:

- **Harris County Public Infrastructure Division** – Susan Santos, Alisa Max – *Harris County PID is responsible for OSSFs in Harris County, as well as housing the watershed group dealing with addressing sources of contamination. Additionally, PID coordinates maintenance of drainage ditches and outlets in conjunction with the Harris County Flood Control District.*

- **Sunbelt Freshwater Supply District** – Jim Ainsworth – *Sunbelt is the water provider to the area, and will likely be the sanitary sewer provider, as they are for surrounding areas.*
- **East Aldine Management District** – Scott Bean, Richard Cantu - *EAMD is the improvement district for the community, and is leading the way regionally in finding funds for sanitary sewer and other community improvements, and are actively involved with community outreach and education projects.*
- **Harris County Precinct 2** – multiple - *Precinct 2 is involved in resident issues and outreach and education efforts in the watershed area.*
- **Houston-Galveston Area Council –** Justin Bower – *H-GAC will remain the repository of project information, will maintain informal coordination and updates between organizations, and will continue to provide data gathered under the Clean Rivers Program regarding Halls Bayou, and data from our 604(b)/Water Quality Management Plan grants concerning wastewater infrastructure (including our OSSF database). H-GAC will continue to publically and formally support the other partners in pursuit of funding and implementation efforts in this neighborhood.*

Additional information about the continuing commitments of these organizations can be found in **Appendix C.**

In general summary, the stakeholder group guided the project in transition from the original aims of wide-scale OSSF remediation to an interim outreach and targeted structural improvement approach. The phases of the project affected the frequency and type of meetings held, but the core stakeholder group has remained in constant contact regarding efforts in the watershed. Because the group works closely on a host of non-related issues, lines of communication should remain open in the future. The stakeholders remain committed to the goals of the project.

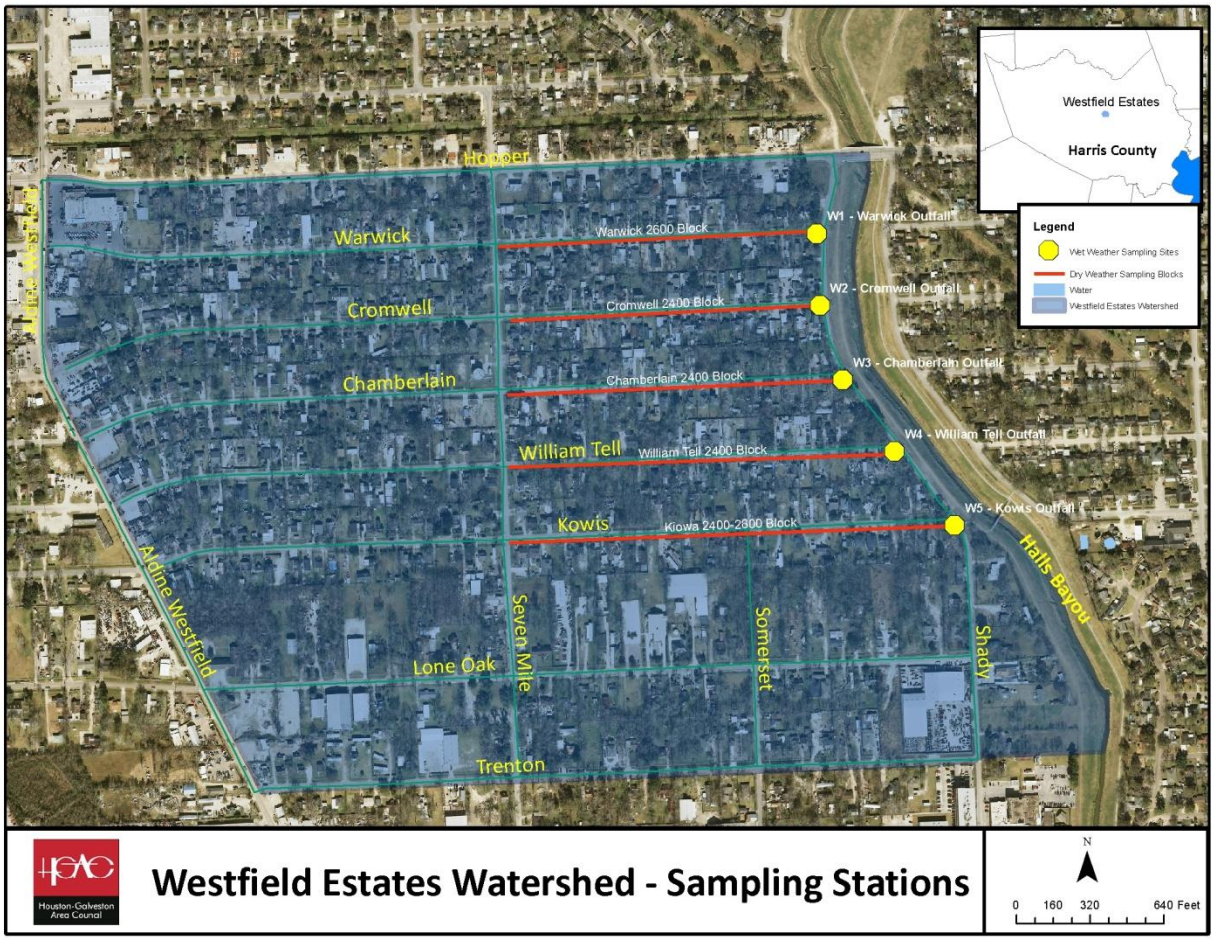
Objective 3: Water Quality Monitoring, Bacteria Source Identification, Data Collection, Validation, and Determination of Effectiveness of Corrective Measures for Westfield Estates Results

The purpose of this objective was to define and implement a monitoring plan and QAPP for sampling designed to measure the impact of implemented BMPs on bacteria concentrations in the ditches of Westfield Estates.

The QAPP and monitoring plan details were developed in conjunction with guidance from TCEQ and the H-GAC CRP staff. Sites were selected at the terminal outfalls of the watershed prior to introduction to Halls Bayou. While ditch condition varied from street to street, rain conditions were sufficient to produce at least pools at the terminal locations. The plan was designed to specify the wet weather location, but allow for the designation of dry weather sites within the same block west of the wet weather site to allow for sampling pools in dry weather. However,

H-GAC was able to find pools in dry weather at most sites that were within acceptable distance from the designated site such that no additional site designations were necessary.

Figure 1 – Westfield Estates Sampling Locations



H-GAC developed and was granted approval for a QAPP (The Westfield Estates Watershed Protection Plan Effectiveness Monitoring Quality Assurance Project Plan) and a subsequent amendment.

In conjunction with Objective 9, data was collected for two rounds of sampling, and submitted to TCEQ for inclusion in SWQMIS. The official data reports are available in SWQMIS. An informal summary of the results is includes as **Appendix D**. Additional information about collection is contained in the discussion of Objective 9 results.

Objective 4: Results of Determination of Management Measures for Westfield Estates WPP

The determination of preliminary management measures was developed prior to this Contract. During this Contract term, H-GAC worked to refine management measures with stakeholders, especially after the dramatic change in scope and funding necessitated by economic conditions

and sanitary sewer installation projections. A description of H-GAC's approach to shifting to an interim management measures focus is detailed in the Objective 4 subsection of the **Project Objectives** and **Methods** sections.

The final selection of management measures for the Contract is reflected in the Scope of Work, attached as **Appendix B**.

Objective 5: Results of Implementation of Structural Measures (for Westfield Estates WPP)

H-GAC pursued structural measures for human and animal sources of waste. The specific measures and their outcomes are detailed in **Table 2.**

Human Waste

H-GAC and watershed partners instituted a series of three structural measure programs to curb human waste.

- OSSF Replacement – H-GAC worked with stakeholders and the Harris County Soil and Water Conservation District (HCSWCD) to prioritize the use of SEP funds for the Westfield Estates watershed. Documentation for this effort is contained as Appendix E. H-GAC worked with the other stakeholders (EAMD, HCPID, HCSWCD, Sunbelt, Harris County Pct. 2) to define a set of criteria for selecting stakeholders, and to promote the program to area residents (through EAMD). Four sites meeting the criteria were selected for replacement. Due to the restrictive lot sizes of the neighborhood and the treatment technologies they necessitated, the replacement costs ranged in excess of $14,000 per system. No Contract funds other than staff time were expended by H-GAC; the remainder of the funding was wholly SEP funds. Given the costs involved, the potentially short life of new systems if sanitary sewer is installed in the near term, and the general unsuitability of lots (due to size, excess structures, etc.) the stakeholders thought further investment in replacement was unfeasible.
- OSSF Pump-outs – H-GAC worked with EAMD to secure vendor recommendations and selected a vendor based on a series of quotes and EAMD's recommendation. H-GAC made several announcements to the general public through public meetings (including an OSSF training event), bilingual mailings, and mailed reminders. Cooper Sanitation, the vendor, also worked with EAMD to distribute flyers to watershed residents to increase participation. The final outcome of the program was 188 houses addressed, representing 95,000 gallons of wastewater removed from the project area. Additionally, H-GAC used local funds to provide this service to an additional 75 systems in the Westfield Estates Community outside the project area, representing an additional 37,200 gallons of wastewater pumped. EAMD provided direct assistance in managing the vendor and taking resident inquiries and registrations.

- Low-flow devices – In conjunction with the OSSF pump-out program, H-GAC's vendor, with assistance from EAMD, disseminated low-flow devices to residences whose OSSF was pumped. The intent was to reduce flow to overloaded or malfunctioning systems. Initially, the stakeholders had investigated the option of installing devices for the residents. However, prohibitive costs for these services and the ease of installation of the chosen product caused them to rely on the vendor to explain and disseminate the product. The low-flow kits included personalized instruction sheets with partner and agency logos on them, and bilingual instructions. The kits were less expensive than projected, but were still of high quality and contained a shower head, faucet aerators, a toilet tank bladder, and leak test dye. H-GAC also disseminated the kits at a public meeting. The vendor disseminated a total of 188 kits, and H-GAC disseminated a total of 35 kits at their public meeting. The kits were well received by the residents. EAMD will continue to hand out remaining kits to the Community in cooperation with H-GAC.

Pet Waste

H-GAC and the stakeholders investigated a series of Pet waste structural measures but were unable to identify any measures that were feasible for the watershed. The measures reviewed included:

- Pet waste composters – Individual pet waste composting units were recommended and reviewed by the stakeholders. However, the unit descriptions indicated they would expect to work poorly in high clay soils. Stakeholders also feel that this would not be well received by the stakeholders.
- Pet waste stations - A typical BMP for pet waste management are pet waste stations with bags and a receptacle for disposal. The stakeholders reviewed the concept but were unable to identify locations within the watershed that would be feasible for installation. The watershed does not have public park area or greenbelt access that drains to its system. Additionally, stakeholder knowledge of behaviors concerning pets among the watershed residents was not conducive to this structural measure without a more pervasive education process. The decision was made to address pet waste directly with the residents through an event and/or direct mailings and individual pet waste bags. H-GAC, through its involvement in the Halls Ahead planning group for the Halls Bayou watershed, has recommended that HCFCD consider water quality improvements with its flood and recreation improvements. This would potentially include pet waste stations along recreational trails adjacent to the Westfield Estates watershed.
- Pet Waste Signage – As with waste stations, signage was deemed unfeasible by the stakeholders due to lack of suitable locations in the watershed. The potential sites identified were not in areas of dog-walking traffic or highly visible (WWTF ground, etc). Lack of public land in the watershed hampered implementation potential. As with waste stations, H-GAC has included signage as an example of water quality BMPs in

recommendations to the Halls Ahead planning group for areas adjacent to the waterway.

Additional Structural Measures

In addition to the measures implemented or considered under this Contract, partner organizations have implemented or planned for the following measures during this Contract period, in coordination with these watershed efforts.

- Drainage Ditch Improvements – Harris County performed maintenance on drainage ditches near the terminal end of the system on the eastern border. A noticeable difference in pooling was seen by project staff before and after the changes.
- Outfall improvements – HCFCD renovated the outfall structures and surrounding channel slope adjacent to the watershed, allowing for better drainage from the watershed, among other benefits.
- WWTF capacity expansion – Sunbelt's nearby WWTF conducted a capacity expansion project, part of which is designated for the community containing the project area when funding for sanitary collection is available.
- Trash facility – EAMD and Sunbelt are investigating the potential to install a large trash facility on the ground of the nearby WWTF to accept trash from the neighborhood, including illegal dumping and drainage ditch debris materials. This measure was in the planning stages during this Contract

Table 2 – Structural Management Measure Outcomes

Structural Management Measure	Direct Partners	Outcomes
OSSF Replacement	HCSWCD, EAMD, Sunbelt, Harris County Pct. 2, Harris County PID, H-GAC.	4 systems completely replaced. Costs/logistics ruled unfeasible for additional replacements.
OSSF Pump-outs	H-GAC, EAMD	263 systems (188 by the project, 75 by project partners) serviced for a total of 132,200 gallons (95,000 in the project area, 37,200 in the rest of the Community) of wastewater. H-GAC recommended to partners that future pump-outs may be necessary to incentivize depending on eventual sanitary schedule.
Low-flow devices	H-GAC, EAMD	223 devices were disseminated to residents directly.
Pet Waste Composters	All stakeholders, in discussion	Not implemented
Pet Waste Stations	All stakeholders, in discussion	Not implemented, recommended for trail areas adjacent to watershed
Pet Waste Signage	All stakeholders, in discussion	Not implemented, recommended for trail areas adjacent to watershed
Drainage Ditch Improvements	Harris County	Implemented at terminal ends of some watershed streets; improved drainage.
Outfall Renovations	Harris County Flood Control District	Implemented at outfalls/slope adjacent to terminal end of watershed; expected to improve drainage functionality to Halls Bayou.
WWTF Capacity Expansion	Sunbelt, EAMD	Capacity at a nearby WWTF expanded to include future flows from surrounding areas currently on OSSF.

The ultimate structural solution for human waste will be installation of a sanitary collection system and removal or remediation of abandoned OSSFs. The ultimate solution for pet waste is likely an ongoing education program rather than structural measures.

Objective 6: Implementation of Behavioral Measures for Westfield Estates WPP

In addition to structural solutions, the stakeholders and H-GAC identified and implemented a series of behavior-oriented measures to reduce pet waste and human waste in the watershed. As part of this process, H-GAC worked with the stakeholder group to develop community-appropriate outreach materials and programs. The specific measures and their outcomes are summarized in **Table 3.**

Human Waste

H-GAC and the stakeholders developed and implemented one human waste-oriented outreach measure, specifically aimed at OSSF management.

- OSSF training event – H-GAC and the partner organizations worked with Texas AgriLife to put on a program for community residents at the Northeast Community Center near the watershed. EAMD helped publicize the event and provided a meal for attendees. H-GAC, Harris County, and AgriLife worked with existing presentation materials to refine the message for the specific project community. Spanish language interpretation was active in the presentation and available for booths promoting the OSSF pump out program and low-flow devices. Over 40 residents attended the event, and it was well received based on comments from the crowd to project staff members. The educational program focused on how to maintain a residential OSSF system, and included demonstration parts and system components. H-GAC staff managed the event and used it as an opportunity to promote the structural measures programs. H-GAC promoted the event with flyers and posters, direct mailings, and through its partner agencies.

Figure 2 – OSSF Training Event

Pet Waste

H-GAC considered several different pet waste outreach strategies. In discussions with stakeholders, H-GAC attempted to establish a picture of how, where and when dog owners in the watershed walked their dogs, congregated, etc. Based on stakeholder feedback, strategies employed in other urban areas (regarding outreach at dog parks, door to door messages, etc.) were not likely to be well targeted for this community, or venues were not present (no dog park adjacent to watershed. An event at which pet waste would be a central message was identified as a possible measure, but response was poor from the stakeholders for the idea. To target the attitudes and behaviors of the community, H-GAC implemented two direct mail measures. A pet waste message was also included during general H-GAC water quality outreach events in the Houston area.

- Pet Waste Mailers – H-GAC developed a packet of bilingual and engaging pet waste outreach materials and devices, and mailed them directly to all residents. The mailer consisted of English and Spanish language pamphlets adopted from the Harris County Clean Choice/Clean Waterways program, a refillable dog waste disposal bag container that clips to dog leashes, a reminder about the OSSF program, and a bilingual letter from H-GAC speaking to the pet waste issue, and providing contact information. The mailers are branded with the website address for H-GAC's pet waste website[5]

[5] The website was not developed under this Contract. It is the product of related efforts in the Houston area, including the Bacteria Implementation Group (BIG).

(www.petwastepollutes.org). This website link will remain static while H-GAC continues to add additional content.

- Pet Waste Information on the Community Outreach Impact Assessments – The community assessments (pre- and post-implementation) included questions regarding OSSFs and dogs. While the assessments were an attempt to gauge resident knowledge and attitudes, they also served as an outreach tool to introduce ideas and provide contact information for follow-up questions to the partner agencies. Outreach impact assessment documents were disseminated to all addressed in the watershed (452). The outreach impact assessment documents and results are attached as **Appendix F.**

In addition to measures directly funded under this contract, several watershed partners have standing pet programs that include the watershed area.

- East Aldine Responsible Pet Ownership and Pet focus – EAMD maintains responsible pet ownership materials on its website and provides outreach to residents. Along with their promotion of spay/neuter programs in the area (http://aldinedistrict.org/?cat=21), EAMD also maintains a responsible pet ownership site with materials for local residents (http://aldinedistrict.org/?page_id=773).
- Harris County's Clean Waterways site (http://www.cleanwaterways.org/) contains stormwater quality information that includes a focus on pets.

Figure 3 – Pet Waste Educational Materials

Table 3 – Behavioral Management Measure Outcomes

Behavioral Management Measure	Direct Partners	Outcomes
OSSF Training Event	EAMD, Harris County, H-GAC	40+ attendees, 35 low flow kits disseminated, 12 attendees signed up for OSSF pump-outs.
Pet Waste Mailers	H-GAC, Harris County	Disseminated to 452 households.
Pet Waste Questions on Outreach Impact Assessment	H-GAC, with stakeholder review.	~5% return rate.
Pet Waste Event	H-GAC, partners in review	Not held due to low interest.
Pet Waste Website	H-GAC, BIG	Not funded by this Contract, used as resource in mailings.
Partner Pet Website Information	EAMD, Harris County	Not funded by this Contract, existing outreach resource.

Additional education and focus on structural measures in adjacent areas will be of benefit to this community. All education efforts must tailor their approach to fit the specific needs and patterns of behavior of this community rather than using a stock approach.

Objective 7: Education and Public Outreach for Westfield Estates

In addition to structural solutions, the stakeholders and H-GAC identified and implemented a series of behavior-oriented measures to reduce pet waste and human waste in the watershed. As part of this process, H-GAC worked with the stakeholder group to develop community-appropriate outreach effort. Stakeholders emphasized the need for bilingual materials, and H-GAC utilized translation services for all public printed materials and events.

Examples of public outreach materials regarding OSSF pump-outs and pet waste are included with **Appendix G.**

H-GAC maintained a project website for the project at www.h-gac.com/westfield.

The bulk of public outreach and education was split between efforts aimed at informing the residents (See Objective 6) and efforts to inform partner agencies and decision-makers. H-GAC maintained regular contact with our partner agencies throughout the project, and made regular updates to regional groups like the Clean Rivers Program, Galveston Bay Estuary Program, North Houston Association, and Natural Resources Advisory Committee of the H-GAC Board.

Objective 8: Westfield Estates WPP Update

H-GAC conducted a series of revisions during the course of 2009-2011, in conjunction with stakeholder feedback and circumstances, TCEQ comment, and EPA feedback. In late 2011, TCEQ and EPA made the decision not to continue to pursue WPP approval. Subsequent to this

decision, H-GAC pursued implementation efforts in the Contract, which reflected the stakeholder input.

Objective 9: Measure Progress and Effectiveness of Implementation Efforts

H-GAC conducted water quality monitoring and analysis, and community outreach impact assessment projects during FY 2012 to ascertain the impact of implemented management measures. Further information regarding development of quality assurance for water quality sampling efforts and development of a monitoring plan is described in the discussion of **Objective 3** in this section.

Water Quality Monitoring and Assessment

One round each of pre- and post-implementation monitoring was conducted at five (5) representative sites in the watershed. **Figure 1** (see Objective 3) details the location of the monitoring locations/reaches. In each round the project schedule called for two wet and two dry samples. Wet conditions were defined as those within 24 hours of at least 1 inch of rainfall at the nearest weather stations, and dry conditions were those in which no rainfall had been recorded within a preceding 72 hour period.

- The **pre-implementation sampling** round was conducted successfully in the spring to early summer of 2012 prior to initiation of full implementation activities. All four sampling events were successfully completed, although not all sites were successful in each run. An additional sampling run was made to get additional samples from some sites. While the sampling efforts were successful, rainfall conditions were sporadic in the watershed, hampering efforts. Rain events were fairly frequent, but not often sufficient to generate 1 inch of rainfall. Additionally, outfall improvement and ditch maintenance in the watershed improved the drainage for the system, reducing the existence of pools for sampling. Underscoring the need to address issues in this watershed, some results were several orders of magnitude above the standard. Results as high as several million organisms per 100mL were obtained. As per Objective 3, the results were submitted to TCEQ/SWQMIS. A summary of the results of this sampling effort are contained in **Appendix D**.
- The **post-sampling effort** round was less successful due to lack of rainfall. Rainfall during fall/winter 2012 was sporadic. Events were often enough to negate an antecedent dry period, but not enough to qualify for a wet event. Two dry events and one wet event were collected prior to the end of the Contract period. Ditches were fairly dry, with staff reconnaissance indicating anecdotal evidence of a decrease in overall pooling between current efforts and the formal assessment of dry event pool locations from efforts in the Watershed previous to this Contract. As per Objective 3, the results were submitted to TCEQ/SWQMIS. A summary of the results of this sampling effort are contained in **Appendix D**.

The results of the sampling effort indicate a wide variety of conditions between sampling locations, and during different flow events at the same station. Overall, however, bacteria

concentrations remained very high. The small size of the watershed was a challenge to producing meaningful sampling results. Samples varied widely at the same location under similar circumstances. Shifting piles of debris creating impounded pools changed the character of the ditches between sampling events. On more than one sampling run, H-GAC staff noted discharge from OSSFs in close vicinity of the sampling location, resulting in bacteria concentrations reaching into the millions of units per 100mL. Additionally, the majority of OSSFs serviced were not performed until late December, concurrent with post-implementation sampling. It is expected the full impact of that effort is not reflected in these numbers. Given the intensely variable nature of flow at the sites, even samples taken during similar weather events on different dates at the same site varied widely.

As the results indicate, there are still significant bacteria concentrations at most sampling locations. It is likely that a large shift in observable concentrations will require additional action from the watershed partners to replace the existing OSSFs with sanitary sewer, and for greater reduction of feral domestic animals in the watershed. The condition of the ditch system on some streets, with heavy siltation in some locations, leads to uneven flow. Additional ditch maintenance would likely improve drainage and ability to adequately assess conditions for the entire watershed at its terminal end. The results of this summary will be shared, as appropriate, with watershed partners and organizations operating in the Halls Bayou watershed (HCFCD Halls Ahead, et al.)

Community Outreach Impact Assessments

Pre- and post-implementation outreach impact assessments were disseminated to all addresses in the community. The assessment program design, copies of the assessmentss, and the summarized results are contained in **Appendix F**.

The assesments were disseminated as bilingual return postage paid postcards. Further detail on the

An average return rate of 5% for both rounds was achieved, with 19 responses for the pre-implementation round, and 29 responses for the post-implementation round. The assesments generally indicated that the implementation activities were popular among the respondents, and that attitudes toward contributing behaviors were primarily positive.

Bastrop Bayou Project Area Results and Observations

Objective 10: Bastrop Bayou WPP

H-GAC developed a draft WPP for the Bastrop Bayou watershed under a previous grant project that concluded in FY 2010. TCEQ began its review process in early FY11 and provided H-GAC with comments in March, 2011. H-GAC and TCEQ discussed potential options for facilitating further review and revision of the WPP to address TCEQ's substantive comments. In the amendment of the current Contract approved on 8/15/11, this Objective was added to provide resources to continue facilitation of the stakeholder group, update and improve existing modeling efforts, revise and resubmit the WPP, and coordinate implementation of stakeholder activities while conducting outreach and education efforts.

Stakeholder Group Facilitation

H-GAC maintained and expanded the existing stakeholder network established in the previous grant effort. During the period between the end of the previous grant and the addition of this Objective to the Contract, H-GAC maintained communication with several key partners in the watershed. During the remainder of the time frame in this Contract, H-GAC held a series of stakeholder meetings, as reflected in **Table 4.** The primary purposes of the meetings were to review new modeling data and assess partner organizations' activities in the watershed. Stakeholders reviewed materials regarding the topic at hand, and the attendance was regular. Attendees represented a mix of residents and partner organizations (Brazoria County, Brazoria County Freshwater Supply District #2, Demi-John, USF&WS, TSSWCB, and TCEQ). Feedback from stakeholders was incorporated into WPP revision efforts.

Table 4 – Bastrop Bayou Stakeholder Meetings

Meeting Date	Topic(s)
3/16/12	Project progress, upcoming modeling efforts
6/4/12	City Managers meeting; discussed project and requested feedback from City Managers/staff.
8/13/12	Stakeholders Meeting; discussed SELECT outputs, EPDRiv1 modeling.
12/19/12	EPDRiv1 modeling, Project progress, WPP resubmission

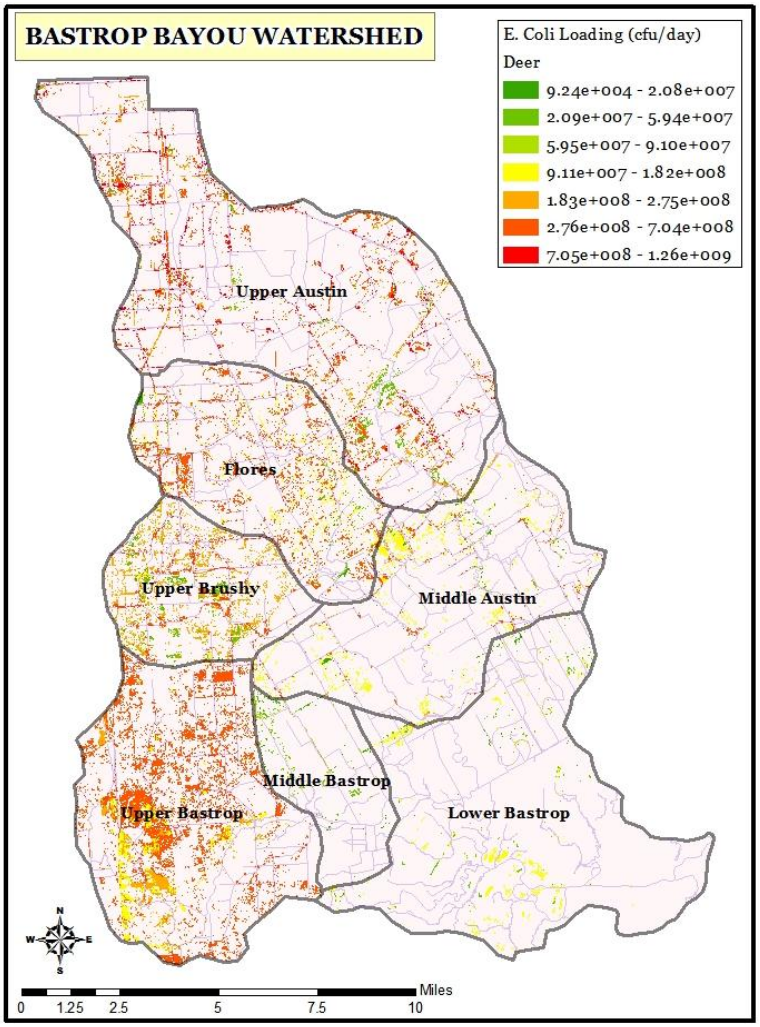
Water Quality Assessment

As part of the feedback regarding the Bastrop Bayou WPP, TCEQ asked that H-GAC produce more granular analysis of loading estimates and resulting load reductions. To accomplish this task, H-GAC undertook two modeling efforts; a revision of the SELECT loading model to

incorporate new land use data and related data, and a revision of the EPDRiv1 watershed model to incorporate new SELECT results and generate updated load reduction targets for BMP scaling. Prior to beginning modeling work, H-GAC developed an updated QAPP and received approval from TCEQ/EPA.

- SELECT – H-GAC had used the Spatially Explicit Load Enrichment Calculation Tool (SELECT) to generate potential bacteria loading based on land use, and known populations of livestock, WWTF inputs, and wildlife concentrations during the development of the WPP. During this Contract, H-GAC revisited the SELECT modeling and updated the methodology used to mirror improvements made during the development of the San Bernard River WPP, including development of differential loading based on proximity to the waterway, differing assumptions of wildlife estimates and livestock census numbers, and updated land use. The updated land use was produced by the Clean Rivers Program for the San Bernard River and Bastrop Bayou modeling efforts completed under this Contract. The Clean Rivers Program funded the development of new data through NOAA in order to correct issues identified with previous land use data. The production of the 2011 revised land use data product delayed the revision of the SELECT modeling effort, but staff felt it was important that the most current and correct land use be used. Future conditions in SELECT were modeled using H-GAC's Regional Forecast data, and 2040 was set as a planning horizon. The outcomes of the efforts were revised loading estimates for each of the subwatersheds for current conditions and future conditions (in five year periods through 2040). Based on TCEQ requests, a second round of analysis was done using a granular level focus. Instead of breaking down the watershed into the established subwatersheds, H-GAC developed loading based on parcel or smaller land use units. This approach allowed for a clearer view of "hotspots" within a watershed; local area of high loading potential. These hot spots are priority areas for implementation, all other factors being equal. **Figure 4** below shows an example of the SELECT outputs that were completed for both subwatershed and granular level analyses. The SELECT analyses were used for three primary purposes: 1) to generate loadings for input to a revised EPDRiv1 modeling run, 2) to establish the relative contributions between sources in the watershed, and 3) to establish the relative change between current and future conditions by subwatersheds and sources within subwatersheds. Because there was appreciable change between previous SELECT loading data and the revised runs, H-GAC and TCEQ determined that a revised run of the EPDRiv1 subwatershed modeling was appropriate. The results of the revised SELECT runs were presented to and approved by the stakeholders at the August stakeholders meeting.

Figure 4 – SELECT Output Example



- <u>EPDRiv1 –</u> The EPDRiv1 model was utilized during the original WPP development grant for Bastrop Bayou. At that time, SELECT was evaluated as an input, but XPSWMM/EPDRiv1 loading was determined to be more accurate to the model's calibration to observed water quality data. During the EPDRiv1 revisions under this Contract, H-GAC worked with consultant Atkins to devise an innovative accommodation to the EPDRiv1 loading that would integrate the two models. A scaling factor was developed between the current conditions loadings of the SELECT revised run output and the existing EPDRiv1 calibrated model. For future conditions, the EPDRiv1 loadings were derived from the scaled down SELECT loadings. Using this approach, projected concentrations for 2040 were established for each of the subwatersheds. To adopt a conservative approach, H-GAC used flow-weighted geomeans rather that straight geomeans of the data. The flow-weighted approach places greater importance on the high-flow, high-concentration rain events which are most demonstrative of NPS

contributions. After future conditions were established, Atkins systematically reduced input loads until the model indicated the subwatersheds would meet the contact recreation standard. The difference between the projected loadings and the reduced, standard-equivalent loadings were designated as the load reduction targets for scaling BMPs. The results of the EPDRiv1 loading analysis and BMP scaling methodologies were presented to, and approved by, the stakeholders on the 12/19/12 stakeholders meeting. Future condition outputs are shown in **Figure 5**.

Figure 5 – EPDRiv1 Output Example

SUBWATERSHED	SW1-BB/Lower Bastrop	SW2-BB/Upper Austin	SW3-BB/Flores	SW4-BB/Upper Brushy	SW5-BB/Middle Austin	SW6-BB/Upper Bastrop	SW7-BB/Middle Bastrop	Total
Load Reduction								
EC NPS Loads (#/day)	1.5201E+11	3.3727E+11	2.5457E+11	1.6407E+11	4.9627E+11	7.4596E+11	6.5769E+10	2.2159E+12
EC WWTP Loads (#/day)	0.0000E+00	2.2346E+09	1.9247E+09	1.4998E+09	0.0000E+00	2.3692E+08	0.0000E+00	5.8960E+09
Total EC Loads (#/day)	1.5201E+11	3.3951E+11	2.5650E+11	1.6557E+11	4.9627E+11	7.4619E+11	6.5769E+10	2.2218E+12
EC Geometric Mean Conc (#/dL)	16	32	22	33	20	50	45	
EC Flow-Weighted Geo Mean Conc (#/dL)	64	126	126	125	121	124	123	
EC Load Reductions (#/day)	**-**	**-1.7403E+12**	**-2.1209E+12**	**-8.2066E+11**	**-3.2902E+12**	**-3.8747E+12**	**-6.2412E+11**	**-1.2471E+13**
EC Load Reductions (%)	**-**	**-83.7%**	**-89.2%**	**-83.2%**	**-86.9%**	**-83.9%**	**-90.5%**	

- BMP Scaling - With load reduction targets developed using SELECT/EPDRiv1, H-GAC allocated the load to be reduced in each subwatershed based on the relative proportion of source contribution. For example, in a given subwatershed, if cattle accounted for 50% of the 2040 load, 50% of the load reduction would be drawn from cattle. This approach was confirmed by the stakeholders at the 12/19/12 meeting. With total load reduction per source, per subwatershed established, the scaling of BMPs was developed by finding a representative load for a management unit (one head of cattle, one acre, one dog, etc.) respective to the BMP being scaled. The loading per management unit was divided into the load reduction target for that source, to find the BMP scale. For example, if the load reduction target for cattle in subwatershed 7 was 1,000 organisms per day, and each head of cattle contributed 100 organisms per day, BMPs would need to address waste from 10 head of cattle (10 cattle X 100 units = 1000 units total).

Implementation Coordination

Concurrent with its revision efforts for the modeling runs, H-GAC met periodically with stakeholders and maintained open communication to assess and support progress with stakeholder implementation of BMPs, including those conducted in-house by H-GAC under different grant programs. The following implementation efforts were initiated in the watershed during the Contract period.

- Watershed Signage – Watershed signage was developed under the previous grant contract. After discussions with TxDOT and Brazoria County, H-GAC developed a siting plan for the existing signage working with Brazoria County and TxDOT, who installed the 30 signs at various key points on state and local roads throughout the watershed. Prior to installation, H-GAC sought stakeholder input on potential sign locations.

- Trash Reduction – A trash reduction event was held in the watershed in conjunction with the regional Trash Bash event. 123 attendees collected 6,240 pounds of trash from an 18 mile stretch of shoreline in the lower reaches of Bastrop Bayou. This total included 47 tires and 53 pounds of recycled material. Trash reduction continues to be a point of specific interest for stakeholders. This event was coordinated between project staff and the H-GAC CRP, who coordinates this event on a regional basis.
- Demi-John Sanitary Sewer Conversion and OSSF remediation – The community of Demi-John, which has been actively represented among the stakeholder group members, has a high rate of sanitary sewer failure. It was designated as a priority area for OSSF remediation due to acute human health risk. Partner agencies Brazoria County and the Brazoria County Freshwater Supply District 2 began a process for the remediation and conversion of the community to sanitary sewer. Brazoria County received approximately $101,000 in Coastal Impact Assistance Program grant funds to address failing septic systems on the inland portion of the Demi-John community. The Freshwater Supply District secured funding for installation of a sanitary sewer collection system and completed sign-up among its residents. All necessary agreements from residents were finalized prior to the end of the Contract. Based on current projections, work on installation will begin during FY13.
- Angleton Dog Park - The City of Angleton, an active stakeholder participant, installed a new dog park in the watershed. The dog park includes (and requires use of) pet waste stations for dog owners. H-GAC provided outreach materials and activities for the grand opening event, including dog waste bag dispensers. The City maintains the pet stations and regularly cleans the park to remove any dog waste that does not make it into the waste stations.
- Dow Woods – During and after the development of the WPP project partner USF&WS worked on a public-private partnership with the DOW Corporation to establish and maintain a new unit of the San Bernard National Wildlife Refuge. The new unit opened to the public and included signage and interpretive trails during this Contract period. One of the educational kiosks purchased under the Contract was disseminated to the USF&WS for this property. This land acquisition was developed as a strategy in the WPP.
- GLO Conservation Easements – The GLO, through their Ranch and Farm Lands Conservation Program established three development rights purchase projects within the watershed during a time period that includes this Contract term. The three projects aim to protect both the historical, agricultural and open space values of these properties. These projects are in line with open space conservation acquisition developed as a strategy under the WPP. GLO has been an agency partner during other efforts relevant to the WPP.
- GLO Boat Removal – As part of the stakeholder focus on trash removal, abandoned boats were selected as a priority. The GLO was able to remove a large abandoned boat from the watershed in coordination with other watershed partner agencies.

Figure 6 – Bastrop Bayou Stream Team Volunteer with Signage

Public Outreach and Education

In addition to facilitating public meetings and relationships with watershed partners, H-GAC pursued a series of education and outreach measures to promote public involvement.

- Bastrop Bayou Website – H-GAC maintained the project website with relevant updates. The website can be viewed at www.h-gac.com/bastropbayou.
- Regional Meetings and Public Outreach – H-GAC provided information and promoted the project at various regional meetings, including GBEP Water and Sediment Quality subcommittee meetings, the Regional Watershed Coordinator Steering Committee, the Regional Watershed Coordinator Roundtable, and at the Texas Water 2012 conference. H-GAC and Atkins presented a paper at the conference regarding the Bastrop Bayou modeling efforts. H-GAC also promoted the project to the public on several occasions, including regional events like Migration Celebration.
- Texas Stream Team Coordination – Project staff worked with H-GAC CRP staff to provide training for an additional Stream Team volunteer in the Bastrop Bayou watershed.

WPP Update

H-GAC combined the results of the modeling update, stakeholder feedback, and revisions based on TCEQ comments into a new WPP draft or TCEQ and EPA review. The new update addresses issues regarding granularity of load projections, BMP scaling, updated land use, revised load reduction projections, and other issues related to modeling outcomes and stakeholder decisions. The update is currently under review by TCEQ.

San Bernard River Project Area Results and Observations

Objective 11: San Bernard Watershed Water Quality Assessment

H-GAC conducted a water quality modeling effort and a storm flow water quality sampling effort to support the development and refining of a WPP for the San Bernard River. Work conducted under this Objective was done in concert with outreach and education efforts conducted under Objective 13.

- Water Quality Modeling – H-GAC retained the services of consultant CDM Smith to conduct additional watershed modeling efforts. The effort focused on the reviewing the impact of three additional BMPs: feral hog management, OSSF repair and replacement, and prescribed grazing. CDM Smith used the SWAT model to determine the impact of each of the BMPs in coordination with SWAT modeling runs conducted during the previous San Bernard ARRA grant. The results of the modeling outcomes were shared with the San Bernard WPP stakeholders on 10/25/12, and included in an update of the WPP submitted prior to the conclusion of this report. All work was conducted subsequent to approval of an updated QAPP. To support these efforts, H-GAC also addressed EPA comments to its Curve Number tool, and reviewed and updated its SELECT model mapping products. Additional information about this effort is contained in the San Bernard River WPP, and a summary of the effort is attached as **Appendix H**.
- Water Quality Monitoring – H-GAC developed an automated stormwater sampling program to evaluate baseline conditions at future BMP installation sites. This effort was carried over from the previous ARRA grant. H-GAC worked with consultant CC Lynch to install four ISCO samplers on three properties in the watershed. Subsequent to approval of a Pre-BMP Monitoring QAPP, H-GAC worked with CC Lynch to train project staff on sampler operation, install necessary software, and refine sampler programming to match site conditions. The samplers are designed to trigger in storm events to evaluate contaminant concentrations from the sites. H-GAC operated the samplers starting in the summer of 2012, but insufficient rain conditions during the intervening months hampered the collection of successful samples. **Table 5** includes a summary of sampler "triggering" events to which H-GAC responded, and the outcome of those events. **Appendix H** contains the result of the 9/13/12 sample event at which samples were collected for the Boettcher property.

H-GAC is working with TCEQ to continue this sampling program in FY13 under a different grant funding source. The overall intent of this Objective is to provide data on efficiency of various BMPs, and additional monitoring will need to occur to provide baseline conditions prior to implementation.

Table 5 – Autosampler Events

Event Date	Outcome
August 5th	Weekend event, bacteria hold times could not be met.
August 18th	Weekend event, bacteria hold times could not be met.
August 22nd	False trigger, no samples collected.
September 13th	Samples collected.
October 14th	Weekend event, bacteria hold times could not be met.
November 1st	Samplers triggered, but rainfall insufficient to produce viable samples.
December 4th	Samplers triggered, but runoff insufficient to produce viable samples.

Objective 13: San Bernard Watershed Education, Outreach, and Stakeholder Coordination

In coordination with efforts conducted under Objective 11, H-GAC continued to facilitate public involvement in the San Bernard River WPP through providing general public outreach regarding the project, coordinating a community cleanup event, facilitating a series of public stakeholder meetings, and coordinating Texas Stream Team efforts in the watershed.

Public Outreach Coordination

H-GAC and stakeholder partner organizations in the watershed conducted a series of outreach activities aimed at the general public, including:

- Providing updates on the project status were given at various regional meetings, including the NRAC, GBEP WSQ, Watershed Coordinators Roundtable, Regional Watershed Coordination Steering Committee, H-GAC CRP, and the regional meeting of Texas Stream Team volunteers;
- Promoting the project or project goals at a variety of public events including Migration Celebration, the Houston area Boy Scout Fair, meetings of the Friends of the River San Bernard, and others.
- Maintaining an updated project website;
- Installing watershed signage throughout Fort Bend and Brazoria County in conjunction with the H-GAC CRP;

- Coordinating of three Texas Well Owner Network meetings in Austin, Brazoria, and Colorado Counties;
- Installing an interactive, educational watershed kiosk in the Brazoria Library (kiosk provided by the TSSWCB through the Guadalupe Blanco River Authority); and
- Providing an outdoor message board for Hanson Park, to be maintained by the Friends of the River San Bernard.

Community Cleanup Event

H-GAC coordinated with the Friends of the River San Bernard to conduct a trash cleanup event in October, during which 8 volunteers spent two hours collecting trash from, and adjacent to, the Bayou.

Stakeholder Meeting Facilitation

H-GAC held a series of meetings for the stakeholder group established under the previous ARRA contract. During the meetings, stakeholders were informed on project progress and asked for feedback on revised modeling outputs, outreach activities, and WPP revisions. Stakeholder meetings were held on:

- February 16
- April 26
- June 21
- August 16
- October 25

H-GAC coordinated with TCEQ project staff to approve meeting materials prior to meeting dates. Greater detail on individual meetings is included in minutes found on the project website. In general, stakeholders have been in concurrence with decisions regarding modeling revisions and WPP revision choices. H-GAC project staff held conversations with individual stakeholders on a regular basis as necessary to coordinate outreach activities.

H-GAC project staff reviewed the draft WPP with the stakeholders and with stakeholder organizations, including the Friends of the River San Bernard and the Coastal Prairie chapter of the Texas Master Naturalists. Project staff also worked with stakeholders on an Executive Summary document for the watershed.

Texas Stream Team Volunteer Coordination

H-GAC project staff, in coordination with H-GAC CRP project staff, coordinated the efforts of nine (9) active Texas Stream Team volunteers in the San Bernard Watershed. The voluntary sampling program provided informal water quality sampling data, observational data, and an outreach venue.

Discussion

This section contains additional detail about select elements of the project area efforts, with an emphasis of placing work conducted under this Contract in context with subsequent efforts in these watersheds. Discussion in this section is broken out by project area.

Westfield Estates Project Area

The shift in approach for Westfield Estates during this Contract is reflected in the priorities and efforts of the watershed partners. While community response to implementation efforts was not universal, the products developed under this Contract will continue to be available to the watershed partners. More importantly, the efforts under this Contract played a part in coordinating stakeholder efforts and prompting partners to seek funding for a more permanent solution. During the final stages of implementation during this Contract, H-GAC worked with key stakeholders to outline and agree to continuing responsibilities (**Appendix C**). The aims and goals established under the draft WPP have been converted to ongoing efforts of the stakeholders involved in the project. With the advent of larger scale efforts for the Halls Bayou area (including the HCFCD's Halls Ahead project and the BIG), it is expected that local efforts will continue to be complimented with a more regional focus on water quality improvement. H-GAC will continue to be involved formally with these efforts, and informally with key partners in promoting project goals. The implementation of sanitary sewer will likely provide great relief for human source contributions of bacteria. However, prior to sewer installation, continued emphasis should be put on preventative maintenance of OSSFs and long term pet waste management education. Given that OSSFs and pet waste are an issue for many of the communities adjacent to Westfield Estates, a less localized approach may be more feasible than focusing on a single community, especially in terms of effectively targeting and utilizing media and other outreach venues.

Bastrop Bayou Project Area

The efforts conducted under this Contract were a bridge between the initial draft WPP development and the initiation of full implementation. The WPP revision refined earlier stakeholder efforts, and public outreach activities served as an initial phase of implementation. Additionally, coordination with stakeholders helped foster a series of stakeholder implementation activities. H-GAC is working with TCEQ to pursue grant funding for additional implementation activities in FY14. H-GAC will remain actively involved with the stakeholder groups from this watershed as part of our regional water quality efforts.

San Bernard River Project Area

The modeling efforts under the San Bernard River Objectives were successful, and a revised WPP has been submitted to TCEQ for review. Additional funding for related tasks in the San Bernard for FY13 has been secured through the TSSWCB. The monitoring efforts were not wholly successful due in large part to insufficient rain conditions during the monitoring period.

H-GAC will continue to work with TCEQ to address the need to fund a continuance of this effort using the autosamplers already deployed in the field. Efforts to facilitate the stakeholder group have resulted in a strong and active group, and a commitment to coordination and ongoing effort among some of the key partners (the Counties, Friends of the River San Bernard, TSSWCB, et al.) H-GAC will continue to foster these relationships as the project moves toward WPP approval and initiation of implementation efforts.

Summary

While this Contract has been altered significantly from its original Objectives, the changes have served to meet the evolving needs of the Westfield Estates community, and provide valuable supplemental support to two ongoing TCEQ WPPs in the Bastrop Bayou and San Bernard River project areas. In all three project areas, a strong core of key partners has evolved and will continue to work with H-GAC in the future to advance project goals in these areas.

Additional funding for implementation of projects in the Bastrop and San Bernard project areas will be vital to moving these projects from planning to implementation, pending the approval of their respective WPPs. In the mean time, progress will focus on efforts of partner stakeholders. The progress toward sanitary sewer service in the Westfield Estates project area and the decision against further pursuit of a WPP means that future efforts will be focused on ongoing projects of local stakeholder agencies. Additional funding for this project area is therefore best channeled through these agencies.

Additional documentation for these efforts is available on request. The revised San Bernard River and Bastrop Bayou WPPs have been sent under separate cover.

Appendices

Appendix A – Project Area Maps

Project Area 1 – Westfield Estates Watershed

Figure A1 – Westfield Estates Watershed Aerial Map

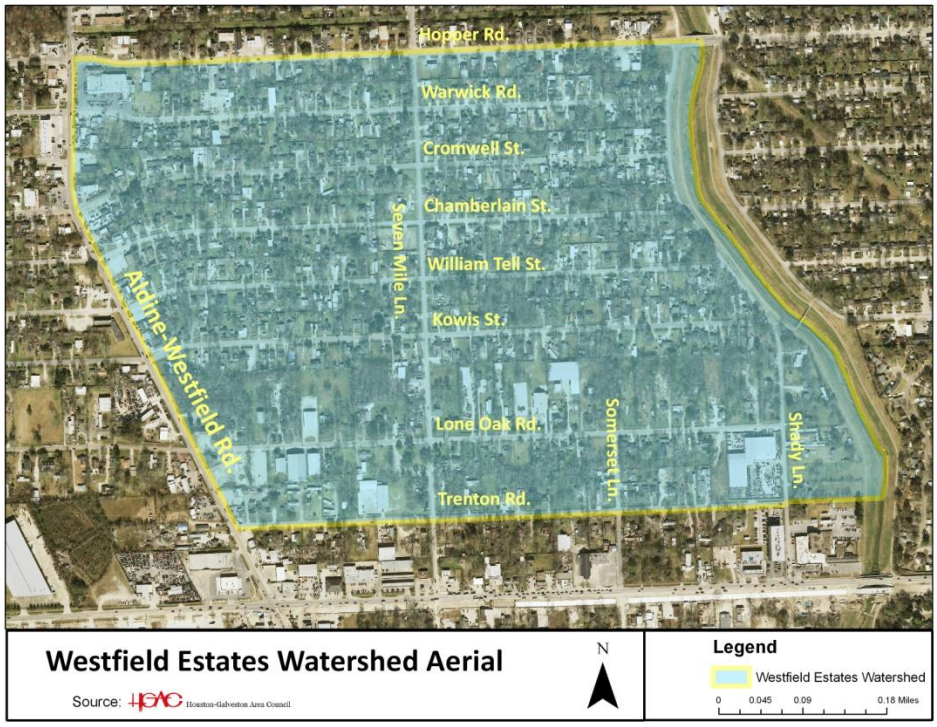
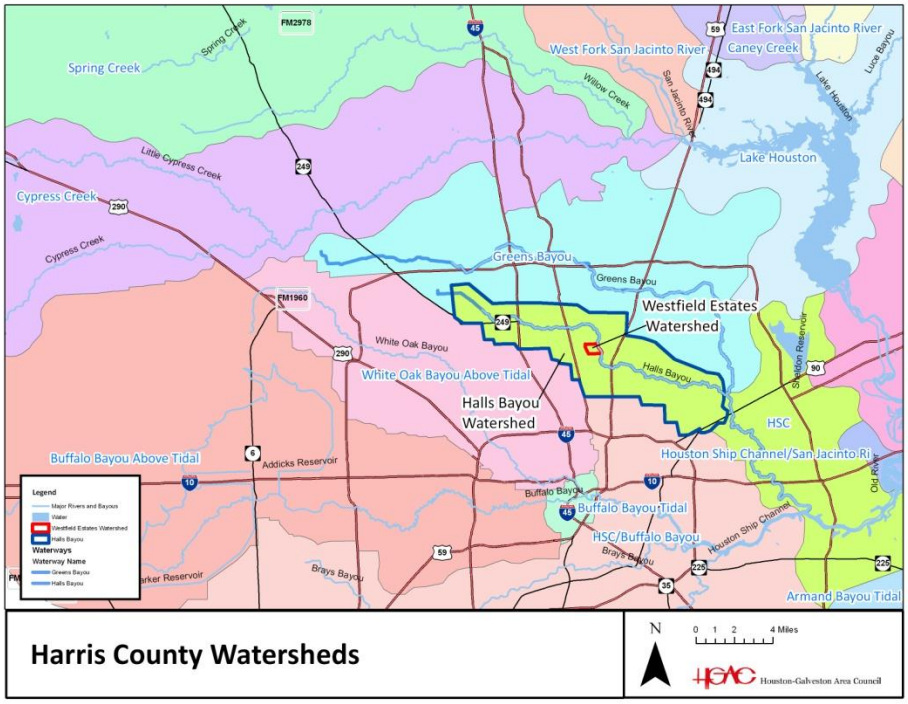
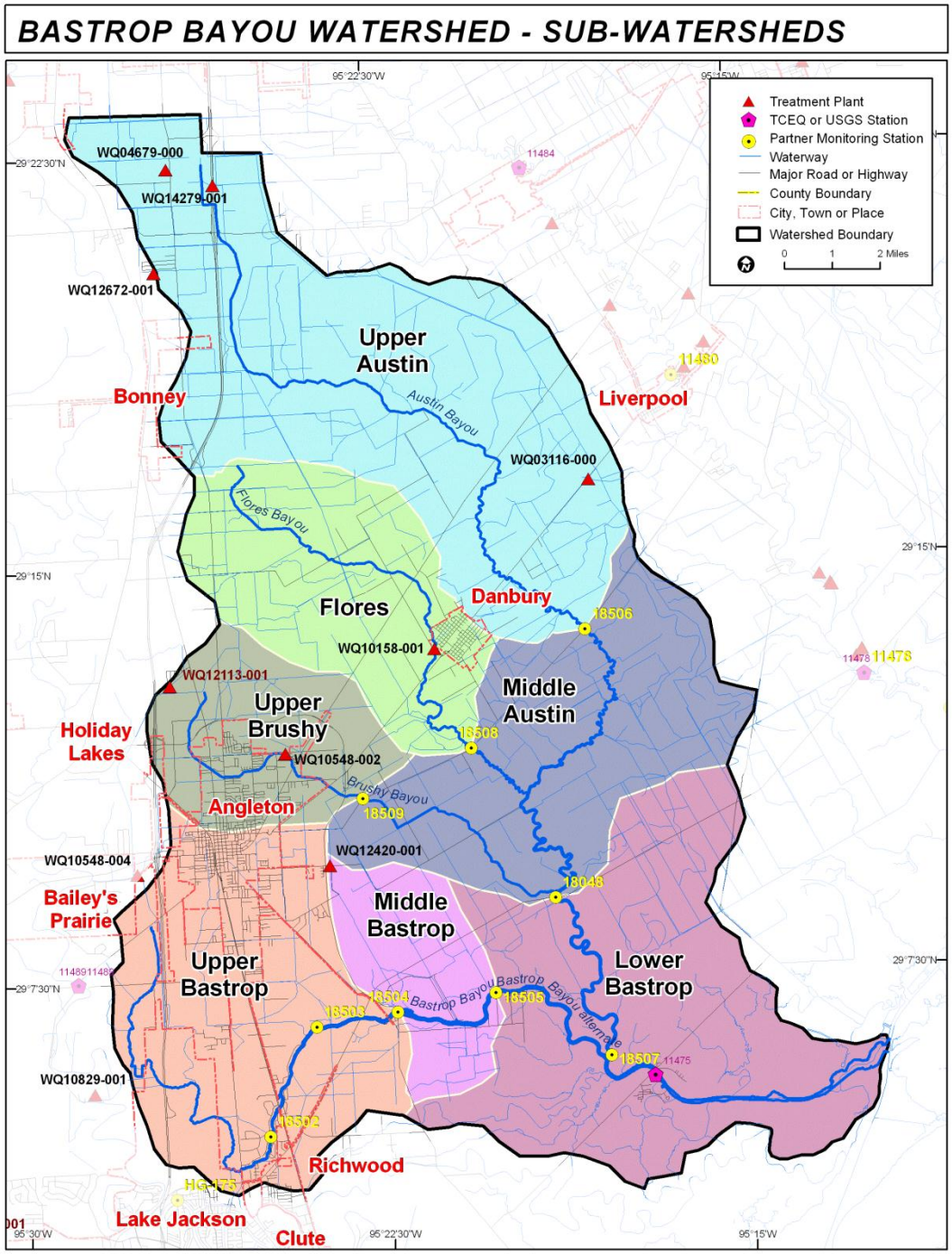


Figure A2 – Westfield Estates Watershed Location



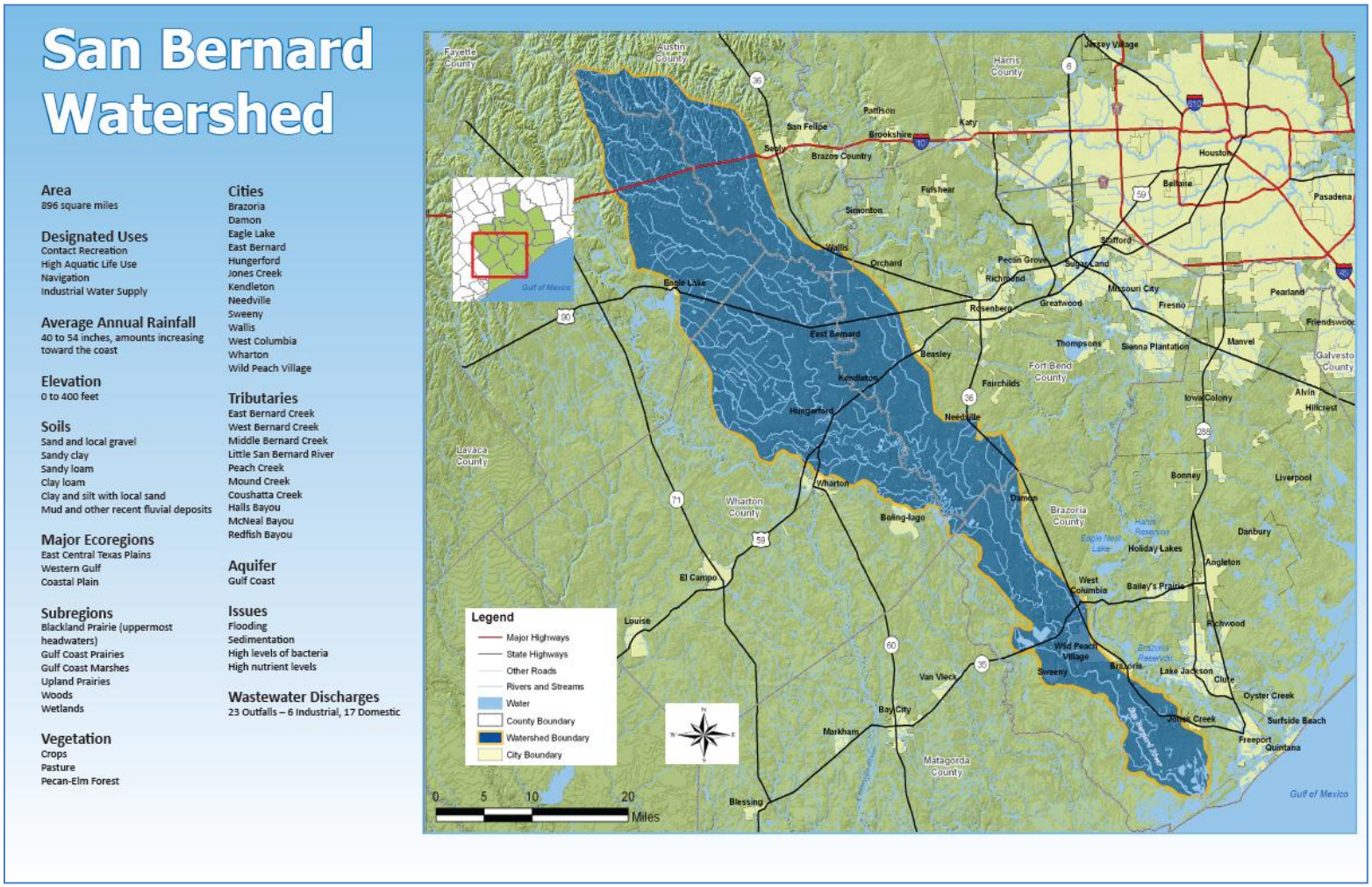
Project Area 2 – Bastrop Bayou Watershed

Figure A3 – Bastrop Bayou Watershed Map



Project Area 3 – San Bernard River Watershed

Figure A4 – San Bernard River Watershed Map



Appendix B – Scope of Work

Scope of Work

Problem/Need Statement:

The Westfield Estates Watershed (Watershed) is located in northeast Harris County, Texas adjacent to Halls Bayou. It is entirely within the East Aldine Management District and Harris County Precinct 2.The community of Westfield Estates, which covers the majority of the watershed, is served solely by OSSFs and has an open ditch stormwater drainage system. Water quality monitoring in the ditches has indicated levels of bacteria orders of magnitude greater than the applicable contact recreational water quality standard, and represent a potential acute public health issue. Public concern led to the impetus for the development of a Watershed Protection Plan (WPP).

High numbers of septic system operation violations have occurred in the Watershed. Westfield Estates was identified as having the highest need for public sewer services in Harris County (Harris County Precinct 2 Study, 2007). Stagnant black-colored water is found in ditches during dry weather from which a strong "sewer" odor emanates. Elevated levels of bacteria (>100,000 MPN/100 ml) were found at most of the 20 sites examined in Westfield Estates in the first phase of this work, Failing Septic System Initiative Phase I, concluded in 2007; (Phase I). Bacteria in ditch water flows through street ditches in the watershed, especially during rain events (in which concentrations ranged from 11,800 to 141,000 MPN/100 ml). An appreciable amount (approximately 16% based on bacterial source tracking efforts) of the contamination comes from failing septic systems. However, Phase I indicates that a significant amount of bacterial contamination comes from non-human sources (84%), primarily chickens and dogs (50%), and other unknown sources (34%). Bacteria levels 6 to 600 times the Water Quality Standard both in the Westfield Estates Watershed and adjacent Halls Bayou may pose a potential for human illness.

Implementation of the permanent solution to the human bacterial source problem (municipal sewer service) is currently underway. However, this process is likely to take several years, and be subject to funding availability. Interim solutions, which emphasize use of best management practices for decreasing bacterial contamination from both human and non-human sources, described an implemented under a WPP represent a viable option to reducing the bacteria load in the watershed.

Resident's participation in the Phase I Town Meeting and ongoing efforts was excellent and interest was high. A stakeholder's group, which includes elected officials with jurisdiction over the community and other interested parties has been established and is involved in developing a WPP for the area. Residents will continue to be actively engaged in project process and progress.

In addition to work within the Westfield Estates Watershed, monitoring and modeling will be conducted in the San Bernard Watershed and the Bastrop Bayou Watershed. The San Bernard River Watershed is located in several counties on the western edge of the Houston-Galveston Area Region, and has a mix of urban and rural land uses. A separate WPP is being developed for this area. The Bastrop Bayou

Watershed is located in southern Brazoria County, and also has a mix of urban and agricultural land uses. A WPP has been developed for this area. These efforts will generate crucial data for addressing impairments in these watersheds, but will also help garner data on general effectiveness of BMPs used across WPPs. This scope also provides for facilitation of public participation for the Bastrop Bayou WPP.

General Project Description:

The Westfield Estates Watershed Protection Plan (Westfield Estates WPP) proposes to identify, prioritize and implement suitable solutions to the human and nonhuman bacterial sources in the Watershed. These management measures will include structural (low flow devices, pet waste devices) and nonstructural (education and outreach campaigns) elements.

The Best Management Practices (BMPs) and efforts to be implemented under this Scope of work include:

- Widespread installation of low-flow devices in residential homes to reduce flow to failing OSSFs
- Installation or sponsorship of pet waste composting or disposal facilities/equipment
- Educational meetings on OSSF maintenance, pet waste disposal, watershed health, large trash disposal and/or other topics related to bacterial contamination.
- Community outreach impact assessments to assess knowledge of issues in the Watershed
- Multimedia outreach efforts to promote program awareness and generate participation.

In the Westfield Estates WPP, the primary benefit from utilizing low flow devices is a reduction of human source bacteria introduced into the watershed via overflows from failing OSSFs. This is complemented by a reduction of nonhuman source bacteria through pet waste reduction, education, and outreach. To monitor progress, bacteria levels will be determined by targeted pre- and post implementation monitoring in the Watershed and ambient monitoring at locations on Halls Bayou above and below the watershed outfall(s) through the Clean Rivers Program (CRP). Additional success will be measured by a decrease in standing water in ditches and generally observable evidence of direct overflows (color, odor of water, etc.) A Community outreach impact assessment will be used to measure general growth in knowledge based on educational programs and outreach efforts. The ultimate solution for human bacteria in the Watershed will be the installation of sanitary sewer service and/or curb and gutter stormwater systems in the future, and the ultimate solution for nonhuman sources will be continued education and community outreach efforts.

Project outcomes include:

- Install low flow devices in up to 250 homes in the Watershed
- Development and implementation of outreach programs for OSSF care and maintenance, pet waste maintenance, and domestic animal waste maintenance
- Gathered data on BMP effectiveness as measured by pre-and post-implementation monitoring and community outreach impact assessments

- Town Meetings two times per year initially, and as needed thereafter to share progress of project with watershed residents and project partners
- Final Town Meeting "Wrap-Up" of project. The Stakeholder's group will continue after the implementation project completion
- Formation of a permanent stakeholder group to facilitate efforts after the end of the project.

For the Bastrop Bayou WPP, H-GAC will provide ongoing facilitation of WPP development/updating, submittal and approval, and continued monitoring and modeling in support of implementation efforts. The Project outcomes will include additional monitoring/modeling results, continued maintenance of a stakeholder group, facilitation of partner installation of watershed signage, and general education and outreach efforts through meetings, trash reduction events, and other means.

For the San Bernard WPP, H-GAC will conduct targeted monitoring and modeling to demonstrate BMP effectiveness, in conjunction with the concurrent WPP development project. The project outcome of this task will be a dataset for local BMP effectiveness that can be applied to other current and future WPPs.

OBJECTIVE 1: PROJECT ADMINISTRATION AND MANAGEMENT

Goal: To effectively coordinate and monitor all technical and financial activities performed under this contract, preparing regular progress reports, and managing project files and data.

Task 1.1 **Project Oversight** - H-GAC's Project Manager will provide technical and fiscal oversight of H-GAC project staff and/or sub grantee(s)/subcontractor(s) to ensure Tasks and Deliverables are acceptable and completed as scheduled and within budget. With the TCEQ Project Manager's authorization, H-GAC may secure the services of sub grantee(s)/subcontractor(s) as necessary for technical support, repairs and training. Project oversight status will be provided to the TCEQ with the Quarterly Progress Reports.

In addition to the overall project oversight, H-GAC will provide the estimate of the value of third party in-kind contributions that was used for the San Bernard modeling study. The estimate will show what the value placed on the contribution would have cost if H-GAC paid for the creation of the relevant data. The estimate will provide sufficient detail to indicate the portion of cost going to salaries, supplies, and other relevant budget categories.

H-GAC will utilize up to $4,000 (federal) for the estimate. H-GAC will match this funding with local match. H –GAC will not utilize 319 (h) grant funds if any additional costs are needed to satisfy grantee after the contract ends on 12/31/2012. The estimate will be produced prior to 1/31/13 in order to be included with the final project invoice.

Task 1.2 **Quarterly Progress Reports** - H-GAC will submit Quarterly Progress Reports (QPR) to TCEQ by the 15th of the month following each state fiscal quarter for incorporation into the Grant Reporting and Tracking System (GRTS). Progress reports will contain a level of detail sufficient to document the activities that occurred under each task during the quarter, and contain a comprehensive tracking of deliverable status under each task. Progress reports will be distributed to all project partners.

Task 1.3 **Reimbursement Forms** - Reimbursement forms will be submitted to the TCEQ by the last day of the month following each state fiscal quarter.

Task 1.4 **Communication Plan** - H-GAC will participate in a post-award orientation meeting with TCEQ within 60 days of contract execution. H-GAC Project Manager will maintain regular telephone and/or email communication with the TCEQ Project Manager regarding the status and progress of the project in regard to any matters that require attention between Quarterly Progress Reports. This will include a call or meeting each January, April, July, and October. Minutes recording the important items discussed and decisions made in each call will be attached to each Quarterly Progress Report. Matters that must be communicated to the TCEQ Project Manager in the interim between QPRs include:

- Requests for approval of activities or expenditures those are not specifically included in the scope of work
- Notification in advance when GRANTEE has scheduled public meetings or events, initiation of construction, or other major task activities under this contract
- Information regarding events or circumstances that may require changes to the budget, scope of work, or schedule of deliverables. Such information must be reported within 48 hours of discovering these events or circumstances

Task 1.5 **Contractor Evaluation** - GRANTEE will participate in an annual Contractor Evaluation.

Task 1.6 **Project Fact Sheet** - The Project Manager will develop a one page fact sheet of the project using the TCEQ NPS Projects Template. The fact sheet will briefly describe what the project is going to accomplish, gives background information on why the project is being conducted, the current status of the project and lists who is involved in the project. The project fact sheet will be submitted to the TCEQ within 60 days after receipt of fact sheet template from TCEQ. The fact sheet will be updated annually and submitted with the fourth QPR. The fact sheet may be updated more often, as the project status changes. The fact sheet will be published on H-GAC's website after approval from the TCEQ Project Manager.

Task 1.7 **Annual Report Article** - Grantee will provide an article for Nonpoint Source Annual Report upon request by TCEQ. This report is produced annually in accordance with Section 319(h) of the Clean Water Act (CWA) and is used to report Texas' progress toward meeting the CWA § 319 goals and objectives and toward implementing its

strategies as defined in the Texas Nonpoint Source Management Program. The article will include a brief summary of the project and describe the activities of the past fiscal year.

Measures of Success: Adherence to the TCEQ administrative requirements; timely completion and submittal of progress reports and deliverables.

Deliverables:

- Minutes of Post-Award Orientation Meeting
- Quarterly Progress Reports
- Reimbursement
- Communication Plan
- Contractor Evaluation
- Project Fact Sheet
- Annual Report Article
- Estimate for In-kind contribution

OBJECTIVE 2: WESTFIELD ESTATES STAKEHOLDER ADVISORY GROUP

Goal: To lead the community-based component of the Watershed Protection Plan and Project.

Task 2.1 **Stakeholder Advisory Group (SAG) Interface** - Utilizing the existing partner network, which includes local officials, county government, state and federal government, special interest groups, environmental groups, developers, and citizens, SAG will provide advice on WPP plan updates, QAPP amendments, scope of work, implementation phase, and community education. This group will work toward Community acceptance of project, promoting continuing education, support maintenance programs, best and management practices. Meetings will be held on a regular basis. Additional stakeholders may be added to the group as the need and opportunity arises.

Task 2.2 **Stakeholder Advisory Group Meetings** - Hold meetings with the Stakeholder Advisory Group to establish priorities and focus of work effort. Meetings will be held on a regular basis to provide status of work progress to the group and obtain input on next steps. Stakeholders will review and approve the plan prior to finalization.

Task 2.3 **Dissemination of Information on Status of Project** - Use Stakeholder Advisory

Group meetings to disseminate project information held on a quarterly basis the first year and thereafter as warranted by developments in the project (at least twice a year), and at project conclusion. Town Meetings in English and Spanish will be held as needed to disseminate information on significant phases of the project.

Task 2.4 **Stakeholder Advisory Group Report** - Regular updates and a summary will be submitted documenting the status of Stakeholder Advisory Group meetings, outreach and educational activities and other SAG activities, and will be included in the Final Report (Task 12).

Measures of Success: Stakeholder Advisory Group meetings held where information is disseminated, and dialogue and discussion of issues occurs. Town meetings held to communicate information to and obtain feedback from the community.

Deliverables: The following will be submitted with quarterly reports if listed activity occurs within a particular quarter:

- SAG activities (e.g. announcements, agendas, minutes, or press releases)
- Changes to SAG operating structure
- Changes in SAG membership
- Official acceptance letter(s) from the Stakeholder Group approving the Watershed Protection Plan upon transfer of responsibility to a permanent SAG.
- Education and outreach materials developed or utilized
- Attendance at local and regional meetings to communicate and obtain input on the project - describe activities in progress reports
- Stakeholder Advisory Group efforts summary in the Final Report

OBJECTIVE 3: WATER QUALITY MONITORING, BACTERIA SOURCE IDENTIFICATION, DATA COLLECTION, VALIDATION, AND DETERMINATION OF EFFECTIVENESS OF CORRECTIVE MEASURES FOR WESTFIELD ESTATES WPP

Goal: To (1) further characterize indicator bacteria levels and possible sources pre-implementation and (2) to assess effectiveness of implementation practices.

Task 3.1 **QAPP** - This pre-and post-implementation monitoring for the Westfield Estates WPP will be conducted under an approved QAPP as approved by TCEQ. Ambient monitoring in Halls Bayou will be conducted under the general QAPP for the Clean Rivers Program.

Task 3.2 **QAPP Amendments and Updates** - QAPP will be revised as necessary. GRANTEE Project Manager will develop amendments as needed and submit to the TCEQ an updated Quality Assurance Project Plan (QAPP) with project specific data quality objectives consistent with the *EPA Quality Assurance Project Plans (QA/R5)* format and the TCEQ Surface Water Quality Monitoring Procedures, Volume 1 and 2, 45 days prior to the initiation of any data collection. TCEQ will provide comment and approval on the QAPP within 30 days of receipt of the amended QAPP. Updates will be on an annual basis if needed according to procedures in the QAPP.

Task 3.3 **Water Quality Monitoring Plan** - Water Quality Monitoring plan was previously approved by the stakeholders. It will provide pre- and post-implementation data for ascertaining the effectiveness of BMP measures. The data will be used to determine the impact of best management practices (BMPs) over time at the watershed scale for the Westfield Estates Watershed Protection Plan.

H-GAC monitors two CRP sites immediately upstream and downstream of the watershed inflows into Halls Bayou. Since improvements to water quality post-project may take several years to be fully apparent because of naturalization of bacteria and soil deposition, monitoring through the CRP program after the conclusion of the project is essential. A summary of the CRP results will be provided with annual reports throughout the course of the study and in the Final Report.

Task 3.4 **Data Collection** - Sampling sites in the watershed and sampling times will correspond to the greatest degree practicable to those used in the Phase I study. Additional sites may be added if necessary. Specific types of monitoring are described in the QAPP.

Task 3.5 **Data Submittal** - H-GAC will review, verify, and validate water quality monitoring data and submit the data to TCEQ at the conclusion of each sampling phase in report form. This report will be included in the quarterly report following receipt of data from the laboratory and completion of QAPP audit of the data. TCEQ submission will be before presenting data at Town Meetings.

Ambient data collected quarterly under the CRP program will be submitted pursuant to TCEQ via CRP data reporting requirements. An annual summary will be provided to the TCEQ NPS group.

Measures of Success: Annual updates to the TCEQ and continuing conformance to QAPP provisions.

Deliverables: The following will be submitted with quarterly reports if listed activity occurs within a particular quarter:

- QAPP update and input (annually)
- Water quality data submittal (CRP)
- Water quality monitoring non-conformances

OBJECTIVE 4: DETERMININATION OF MANAGEMENT MEASURES FOR WESTFIELD ESTATES WPP

Goal: Identify and quantify need for correction of specific failing septic systems and non-human bacteria impairment sources through home surveys, characterization and prioritization of needs, qualification of homes for assistance, and further analysis to identify additional non-human bacteria impairment sources.

Task 4.1 **Prioritization** – H-GAC will facilitate final prioritization of potential BMPs with the stakeholders advisory group.

Task 4.2 **Management Measures Summary** - H-GAC will prepare a description of community surveys and selected BMPs as part of the WPP, along with an implementation plan, to be included in an updated WPP.

Measures of Success: Selection of BMPs, inclusion in WPP, description under implementation plan.

Deliverables: The following will be submitted with quarterly reports if listed activity occurs within a particular quarter:

- Final BMP selection (as part of WPP/WPP updates)
- Management Measures Summary/Implementation Plan included in updated WPP

OBJECTIVE 5: IMPLEMENTATION OF STRUCTURAL MEASURES

Goal: Implement corrective measures to reduce bacterial contamination from OSSFs and pet/domestic animal waste.

Task 5.1 **Installation of Low-Flow Devices in Residences -** generate participants, procure supplies, and facilitate the installation of low flow devices in up to 250 homes in the Watershed.

Task 5.2 **Installation of Pet Waste Reduction Program Elements –** generate participants, procure supplies, and facilitate installation of pet waste reduction program structural elements, to potentially include pet waste composting devices and/or community waste collection stations.

Task 5.3 **Remediation of Select OSSFs** – coordinate with the East Aldine Management District (EAMD) and Harris County in a pilot program by which EAMD will select a few failed OSSFs to remediate, based on existing violations data and supported by inspections and other services from the County. H-GAC will help facilitate this element, to be funded by contributions from the EAMD and in-kind services from the County.

Task 5.4 **Structural Corrective Measures Summary**– H-GAC will prepare a summary of efforts undertaken to implement structural measures as part of the Final Report (Task 12).

Measures of Success: Substantial participation in pet waste reduction program and low flow device program.

Deliverables: Updates on the implementation of structural measures will be included in quarterly reports. The following will be submitted with quarterly reports if listed activity occurs within a particular quarter:

- Structural measures implemented

OBJECTIVE 6: IMPLEMENTATION OF BEHAVIORAL MEASURES FOR WESTFIELD ESTATES WPP

Goal: To reduce or affect behaviors that contribute to bacterial contamination through development and implementation of behavioral best management practices, including education and outreach programs and materials.

Task 6.1 **Develop Behavioral Program and Materials** – Create educational programs and materials on care and maintenance of OSSFs, proper pet waste and domestic animal waste disposal and/or composting, illegal dumping in ditches, and other educational topics related to the WPP.

Task 6.2 **Implementation of Behavioral Measures** - Hold public educational meetings based on these programs, and disseminate materials. Attend related community meetings to disseminate materials and speak to these topics where applicable. Provide materials for dissemination at other venues as appropriate.

Task 6.3 **Behavioral Measures Summary**– H-GAC will prepare a summary on the development and implementation of behavioral measures as part of the Final Report (Task 12).

Measures of Success: Development of behavioral measure programs and implementation through public education and outreach meetings, dissemination of materials, and appearance at related community events.

Deliverables: Activities on the Implementation of Behavioral Measure will be included in the quarterly report. The following will be submitted with quarterly reports if listed activity occurs within a particular quarter:

- Program(s) Developed
- Education and outreach materials and activities implemented
- Draft and Final Behavioral Measures Summary as part of Final Report (Task 12)

OBJECTIVE 7: EDUCATION AND PUBLIC OUTREACH FOR WESTFIELD ESTATES WPP

Goal: Develop an information/education component that will be used to enhance public understanding of the project and encourage early and continued participation in selecting, designing, and implementing the NPS management measures proposed in the Westfield Estates WPP.

Task 7.1 **Project Education and Publicity** – H-GAC will implement Project promotion and education programs that are bilingual in nature where possible, and utilize multiple media resources. Notices for meetings and other events will be posted more than two weeks in advance. H-GAC will attempt to reach the broadest, most diverse, audience possible.

Task 7.3 **Watershed Protection Plan Website** - Updates of Westfield Estates WPP on H-GAC's Watershed Protection Plan web page. To include maps; Phase I report; meeting information, notes and agenda; survey; and regular status updates on the implementation phase and WWP itself. (http://www.h-gac.com/westfield)

Task 7.4 **Education and Public Outreach Summary** – H-GAC will prepare an education and public outreach summary describing the activities included in this task, as part of the Final Report (Task 12).

Measures of Success: Awareness of project in Community surveys, public participation in meetings and events, regular updates WPP update on H-GAC's webpage.

Deliverables: Education and public outreach activities will be included in the quarterly report. The following will be submitted with quarterly reports if listed activity occurs within a particular quarter:

- Education and publicity materials
- Webpage Updates

OBJECTIVE 8: WESTFIELD ESTATES WATERSHED PROTECTION PLAN UPDATE

Goal: Update the Westfield Estates WPP as needed.

Task 8.1 **Update Plan** - Updates based on information collected under this project, including stakeholder-based input, will be provided as the need arises.

Measures of Success: Plan updated as needed.

Deliverables: Activities for the quarter on the watershed protection plan updates will be included in the quarterly report. The following will be submitted with quarterly reports if listed activity occurs within a particular quarter:

- Westfield Estates WPP updated as needed

OBJECTIVE 9: MEASURE PROGRESS AND EFFECTIVENESS OF IMPLEMENTATION EFFORTS

Goal: To determine the effectiveness of the management measures implemented in the Watershed.

Task 9.1 **Pre- and Post-Implementation Monitoring** - Monitor selected sites in the watershed in accordance with protocols in the QAPP, before and after implementation of management measures.

Task 9.2 **Conduct Community Survey** – Survey general community attitudes and knowledge of the project and issues in the Watershed before and after implementation/outreach.

Task 9.3 **Quantify Water Quality Improvement** - Determine decrease of bacteria in watershed by indicator bacterial level reduction. Include qualitative factors as supplemental information.

Task 9.4 **Effectiveness Monitoring Summary** – H-GAC will prepare a summary on pre-and post-implementation monitoring results, Halls Bayou ambient monitoring data, community surveys, and related indicators as part of the Final Report (Task 12).

Measures of Success: Collection and review of monitoring data to assess success of management measures on reducing bacterial water quality issues. Inclusion of data in the Final Report.

Deliverables: The following will be submitted with quarterly reports if listed activity occurs within a particular quarter:

- Monitoring, data collection, and analysis pre- and post- implementation
- Community Survey results

OBJECTIVE 10: BASTROP BAYOU WATERSHED PROTECTION PLAN

Goal: To facilitate the public involvement and outreach, ongoing monitoring and modeling assessment, and Plan review and update of the Bastrop Bayou Watershed Protection Plan in Fiscal Year 2011. This task builds on work completed as part of the Bastrop Bayou Watershed Protection Plan, as funded by TCEQ under FY 05/06 319 (h) Grant #99614611, Project # 1.22, and the Galveston Bay Estuary Program.

Task 10.1 **Stakeholder Group Facilitation** – H-GAC will facilitate an ongoing stakeholder group for the Bastrop Bayou Watershed Protection Plan by holding regular stakeholder meetings in the Watershed, maintaining a stakeholder communication network, disseminating new information and updates, and receiving public input.

Task 10.2 **Water Quality Assessment –** H-GAC will conduct additional monitoring and modeling as necessary to support continued assessment of the Bastrop Bayou Watershed. This will include ambient monitoring and targeted monitoring as deemed necessary, and as referenced in a QAPP developed by H-GAC and approved by TCEQ prior to monitoring efforts.

Task 10.3 **Implementation Coordination –** H-GAC will assist project partners in coordinating specific management measures they will implement in the Watershed. This will include coordinating implementation of watershed signage, green infrastructure pilot projects, trash cleanup events, and any other of the management measures identified in the Bastrop Bayou Watershed Protection Plan, as initiated by partners. Grant funding will support H-GAC staff time and documentation costs related to land acquisition, as specified in the Bastrop Bayou Watershed Protection Plan. These costs include time in preparing grant applications, documentation costs related to preparing conservation easements, and staff time spent in pursuing these objectives through meetings with local partners and interested parties.

Task 10.4 **Public Outreach and Education –** H-GAC will continue to support the Bastrop Bayou WPP through outreach and education efforts including maintaining a project website, attending related meetings and events in the watershed, sponsoring trash cleanup events in the watershed, and disseminating information regarding the project to the public.

Task 10.5 **WPP Update –** H-GAC will update the Bastrop Bayou Watershed Protection Plan as needed based on TCEQ/EPA comment or approval, stakeholder input, or changes in local conditions. The WPP will be updated at the end of FY 11 to reflect data collected and efforts conducted under this task.

Task 10.6 **Bastrop Bayou Watershed Report –** H-GAC will prepare a Bastrop Bayou Watershed Report detailing the efforts completed under this Task.

Measures of Success: Engaged and active stakeholder group, provision of water quality data sufficient to support Plan objectives and assessment goals, well-coordinated efforts between watershed partners, and strong participation in WPP-related events.

Deliverables: The following will be submitted with quarterly reports if listed activity occurs within a particular quarter:

- Stakeholder meeting materials and meeting summaries
- Monitoring and Modeling results received in that time period
- Summary of watershed partner activities related to the WPP
- Public meeting and event materials and summaries
- Bastrop Bayou Watershed Report

OBJECTIVE 11: SAN BERNARD WATERSHED WATER QUALITY ASSESSMENT

Goal: To support concurrent Watershed Protection Plan efforts in the San Bernard River Watershed through ambient and targeted water quality assessment efforts in Fiscal Year 2011. This task builds on work being conducted by H-GAC for the TCEQ, under FY 09 ARRA Grant # 96690301 , Project # 5B.

Task 11.1 **Water Quality Modeling** – H-GAC will conduct modeling based on existing ambient water quality monitoring to support Watershed Protection Plan (WPP) development and implementation efforts in the San Bernard River Watershed. Modeling efforts will be preceded by the development and TCEQ approval of a QAPP(s) under the aforementioned ARRA Grant and will focus on setting up a hydrologic model of the watershed, incorporating flow information, and conducting and evaluating tidal prism modeling. These modeling efforts will complement the modeling, including SELECT (or similar) source loadings quantification and projections of in-stream concentrations, which will occur under the existing ARRA contract under which the WPP is being developed. Results will be disseminated to groups and partners involved in efforts in the San Bernard Watershed.

Task 11.2 **Water Quality Monitoring –** Subsequent to the development of an approved monitoring QAPP and approved San Bernard WPP, and prior to WPP implementation, H-GAC will conduct targeted monitoring of three prospective BMP sites. The monitoring will include at least 4 storm events per site, and will be submitted in a form acceptable to the Surface Water Quality Monitoring Information System (SWQMIS). This data will provide a baseline assessment of water quality conditions at these sites by which a comparison may be made to post-implementation monitoring. The targeted BMP monitoring, when compared against post-implementation data will also provide generally applicable information on BMP effectiveness for guiding future BMP/site selection in a range of projects.

Task 11.2 **Water Quality Assessment Report –** H-GAC will evaluate and summarize data collected and model results under this task in a San Bernard Water Quality Assessment Report.

Measures of Success: Water quality monitoring and modeling sufficient to support watershed protection efforts in the San Bernard River Watershed completed, outcomes evaluated and summarized in the Final Report (Task 12).

Deliverables: The following will be submitted with quarterly reports if listed activity occurs within a particular quarter:

- Water quality monitoring results for three prospective BMP sites providing baseline data on bacteria and dissolved oxygen in at least 4 storm events per site, submitted in a form acceptable to the Surface Water Quality Monitoring Information System (SWQMIS)
- Water quality modeling design and predictive load reduction results for the proposed set of 3 high-priority BMPs in the WPP.
- San Bernard Water Quality Assessment Report.

OBJECTIVE 12: FINAL REPORT

Goal: To provide the TCEQ and the EPA with a comprehensive report on the activities and success of the pilot project conducted by H-GAC during the course of this project.

Task 12.1 **Draft Final Report** - Provide a comprehensive, technical report summarizing all project activities, findings, and the contents of all previous deliverables, referencing and/or attaching them as web links or appendices. This comprehensive, technical report will provide analysis of all activities and deliverables under this scope of work. The report may include the following information in acceptable format:

Title

Table of Contents

Executive Summary

Introduction

Project Significance and Background

Methods

Results and Observations

Discussion

Summary

References

Appendices

TCEQ Project Manager will review this report within 30 days of receipt and provide comment.

Task 12.2 **Final Report** - Revise the Draft report to address comments provided by the TCEQ Project Manager.

Measures of Success: Acceptance of the report by the TCEQ.

Deliverables:

- Final Draft Report
- Final Report

OBJECTIVE 13: SAN BERNARD WATERSHED EDUCATION, OUTREACH , AND STAKEHOLDER COORDINATION

Goal: To promote WPP education and outreach goals through dissemination of outreach materials through local venues and presentations, a community clean-up event, and maintenance of a project website.

Task 13.1 Public Outreach coordination – Attendance at local related events, public meetings, and other potential venues for the dissemination of project outreach materials.

- Public Participation Plan monthly reports
- Stakeholder meeting agendas, notes, and attendance reports

Task 13.2 Community Clean-Up Event – Sponsor a site in the watershed for a community clean up opportunity to improve water quality. To be included in the Education and Outreach report.

Task 13.3 Stakeholder Group Facilitation – attendance at stakeholder group meetings every other month in accordance with the Public Participation Plan created for the Watershed Protection Plan

- Solicit input from Stakeholders

Task 13.4 Texas Stream Team – Monthly collection of ambient data

- Monthly collection of data from monitors
- Continuation of education events and Phase III trainings

Measures of Success: Promotion and dissemination of educational materials and Implementation of Public Participation Plan**.**

Deliverables:

- Education and Outreach Report
- Monthly status reports
- Stakeholder meeting materials

Appendix C – Ongoing Commitments in Westfield Estates

The following list describes ongoing efforts related to the goals of the Westfield Estates project area work completed under this Contract. These efforts represent the commitments of stakeholders in continuing to work to improve public health in the Westfield Estates Community., and include routine related work and special projects specific to Westfield Estates.

Harris County/Harris County Flood Control District

- **OSSF enforcement** – Harris County will continue to enforce, as appropriate, regulations regarding OSSFs.
- **Drainage maintenance** – Harris County will continue to maintain the ditches and outfalls in the Westfield Estates community within their jurisdiction (in conjunction with Harris County Flood Control's maintenance of the outfalls and drainage conveyances related to Halls Bayou)
- **Pet Waste materials –** Harris County will utilize the Spanish language translation of their pet waste brochure provided by H-GAC
- **Sanitary Sewer –** Harris County will continue to support and participate with EAMD and Sunbelt FWSD, as appropriate, in the effort to extend sanitary sewer service to the Westfield Estates neighborhood.
- **Feral Animals –** Harris County will continue to provide animal control services to the Westfield Estates neighborhood through Harris County Public Health and Environmental Services, Veterinary Public Health program.
- **Illegal dumping** – Harris County, through Harris County Pollution Control Services Department and the Harris County Environmental Enforcement Division, will continue to field calls and investigate issues related to illegal dumping in the drainage ditches of the neighborhood.
- **Community Outreach** – Harris County will continue to provide outreach through a variety of means including, but not limited to, the Clean Water, Clear Choice branded website at www.cleanwaterways.org, and periodic meetings with residents (Precinct 2 town hall meetings, etc.)
- **Regional Flood Management –** Harris County and the Harris County Flood Control District will continue to manage regional drainage infrastructure to reduce pooling and flooding in areas including Westfield. Harris County will continue to participate in/support the HCFCD's "Halls Ahead" project to improve drainage in the Hall Bayou watershed, including the Westfield neighborhood.

East Aldine Management District

- **Sanitary Sewer –** EAMD will support and participate with Harris County and Sunbelt FWSD, as appropriate, in the effort to extend sanitary sewer service to the Westfield Estates neighborhood.
- **Low Flow Devices –** EAMD will continue to disseminate the stock of low-flow devices obtained during this project to residents of the Westfield project area.
- **Community Outreach –** EAMD will continue to work with the neighborhood as part of their larger identified goals for Neighborhood Cleanup (including heavy trash reduction) and in relation to pets (spay/neuter efforts, etc.).

Sunbelt Freshwater Supply District

- **Sanitary Sewer –** Sunbelt FWSD will support and participate with Harris County and EAMD, as appropriate, in the effort to extend sanitary sewer service to the Westfield Estates neighborhood. Sunbelt will maintain expanded treatment capacity sufficient to serve the Westfield Estates neighborhood, among others.
- **Trash Reduction –** Sunbelt, in cooperation with EAMD, will pursue the possibility of developing a solid waste facility at the Sunbelt WWTF site, which would alleviate pooling related to accumulation of heavy trash in ditches.

Houston-Galveston Area Council

- **OSSF Data –** H-GAC will continue to update and expand its spatial database of OSSF locations in Westfield and throughout the region and make this data available to the public.
- **Sanitary Sewer –** H-GAC will continue to formally support EAMD, Harris County, and Sunbelt FWSD in pursuing funding and implementation of sanitary sewer through promotion, letters of support, or other appropriate mechanism.
- **Community Events –** H-GAC will provide outreach materials or non-project staff time in support of related Harris County, EAMD, or Sunbelt FWSD community events as appropriate.
- **File Repository –** H-GAC will maintain project files and data for partner access in the future.
- **CRP Sampling –** H-GAC will continue to sample Halls Bayou as part of its CRP sampling program, and continue to assess Halls Bayou for annual Basin Highlights or Basin Summary Reports.
- **Halls Ahead –** H-GAC will continue to participate as a committee member of the Halls Ahead workgroup for the HCFCD. H-GAC will emphasize water quality needs for Westfield and similar areas in the watershed.
- **Wastewater Infrastructure Data Analysis –** H-GAC will continue to compile and make public a variety of wastewater infrastructure data, including permit information, spatial distribution of outfalls, service area boundaries, etc.

Appendix D – Water Quality Data Summary

Nonpoint Source Water Quality Implementation Project - Westfield Estates

Pre-implementation Biased Flow Bacteria Effort - Data Summary

Monitoring Period: 4/10/12-6/20/12

Station Information

SWQMIS Station ID	Station Location	Number of successful monitoring events
21135	UNNAMED DRAINAGE DITCH ON WARWICK ROAD	4
21136	UNNAMED DRAINAGE DITCH ON CROMWELL STREET	4
21137	UNNAMED DRAINAGE DITCH ON CHAMBERLAIN STREET	4
21138	UNNAMED DRAINAGE DITCH ON WILLIAM TELL STREET	4
21139	UNNAMED DRAINAGE DITCH ON KOWIS STREET	4

Wet Event Data

SWQMIS Station ID	Maximum value	Minimum value	Geomean
21135	46000	400	31,080.54
21136	160000	30000	69,282.03
21137	36000	31000	33,406.59
21138	170000	16000	52,153.62
21139	26000	10000	16,124.52

Dry Event Data

SWQMIS Station ID	Maximum value	Minimum value	Geomean
21135	840	400	579.66
21136	11000000	92000	1,005,982.11
21137	3400	2600	2,973.21
21138	2100000	150	17,748.24
21139	240000	24000	75,894.66

All Data, by site

SWQMIS Station ID	Maximum value	Minimum value	Geomean
21135	46000	400	4,244.53
21136	11000000	30000	264,000.92
21137	36000	2600	9,966.19
21138	2100000	150	30,424.25
21139	240000	10000	34,982.35

All Data

SWQMIS Station ID	Maximum value	Minimum value	Geomean
21135	11000000	150	26,001.98

Nonpoint Source Water Quality Implementation Project - Westfield Estates

Post-implementation Biased Flow Bacteria Effort - Data Summary

Monitoring Period: 11/30/12-12/28/12

Station Information

SWQMIS Station ID	Station Location	Number of successful monitoring events
21135	UNNAMED DRAINAGE DITCH ON WARWICK ROAD	3
21136	UNNAMED DRAINAGE DITCH ON CROMWELL STREET	3
21137	UNNAMED DRAINAGE DITCH ON CHAMBERLAIN STREET	3
21138	UNNAMED DRAINAGE DITCH ON WILLIAM TELL STREET	3
21139	UNNAMED DRAINAGE DITCH ON KOWIS STREET	3

Wet Event Data (1 Wet event, 12/17/12)

SWQMIS Station ID	Maximum value	Minimum value	Geomean
21135	24,810	24,810	24,810
21136	6,488	6,488	6,488
21137	48,840	48,840	48,840
21138	34,410	34,410	34,410
21139	98,040	98,040	98,040

Dry Event Data (2 dry events, 11/30/12 and 12/28/12)

SWQMIS Station ID	Maximum value	Minimum value	Geomean
21135	38,730	794	5,545.41
21136	>241,960	46,110	46,110.00
21137	32,550	12,997	20,568.24
21138	>241,960	17,820	17,820.00
21139	>241,960	198,630	198,630.00

All Data, by site

SWQMIS Station ID	Maximum value	Minimum value	Geomean
21135	38,730	794	9,137.59
21136	>241,960	6,488	41,675.73
21137	48,840	12,997	27,440.37
21138	>241,960	17,820	52,939.36
21139	>241,960	98,040	167,647.56

All Data

SWQMIS Station ID	Maximum value	Minimum value	Geomean
21135	>241,960	794	39215.35185

Appendix E – SEP Pilot OSSF Project Documentation

COMMUNITY AND ENVIRONMENTAL DEPT.
2012 APR 18 PM 1:07

Harris County
Soil and Water
Conservation
District # 442

Jim Meley
Chairman
Zone 3

Clarence Helfrich
Vice Chairman
Zone 2

Greg Dietrich
Secretary
Zone 5

Brenda Weiser
Member
Zone 4

R. D. Burnside
Member
Zone 1

March, 2012

In 2010, the Harris County Soil & Water Conservation District accepted a number of Supplemental Environmental Program grants through our partnership with the NRCS/Sam Houston Resource, Conservation & Development agency. That year, we were charged with finding partners through our agency, to accept these funds for Clean Burning School Buses, Wastewater Projects, Tire Clean-up and Household Hazardous Waste Events. We were very fortunate to team up with a number of wonderful people and organizations to help us in this endeavor.

At this time we would like to express our deepest appreciation for all your help and counsel – thanks to you, we co-sponsored a Household Hazardous Waste Event, helped purchase 3 school buses for two school districts, installed 4 septic systems in failing areas, and funded county abandoned tire pick-up efforts.

We continue to work towards making sure funds come to and stay in Harris County for the greater good, and look forward to future endeavors with you. With your help and guidance, this was a most successful undertaking, and we thank you!

Jim Meley

Jim Meley, Chairman
Harris Co SWCD

10808 Huffmeister Road • Houston, TX 77065
Voice: (713) 397-6996 • Fax: (281) 469-7005
Email: cath2453@earthlink.net

Invoice

MEINERS construction
P.O. Box 2778
Spring, TX 77383

COMMUNITY AND ENVIRONMENTAL DEPT.
2012 APR 18 PM 1:07

Date	Invoice #
2/27/2012	47151

Bill To
Harris Co SWCD Attention: Cathy Rogers McCoy 22566 FM 149 Montgomery TX 77356

Job Site
Elipido Castillo 2152 Warwick Houston, TX 77093

P.O. No.	Terms	Due Date	Contract Expires
		2/27/2012	

Item	Quantity	Description	Rate	Amount
Construction		Construction of Aerobic System & Materials	10,600.00	10,600.00
Operations		Two-Year Service Agreement:	640.00	640.00
Sludge haul		Pumping of existing tanks	420.00	420.00
			Total	$11,660.00

Phone #	Fax #	Email:
(281) 355-1420	(281) 419-9139	michelle@meinersconstruction.com

www.meinersconstruction.com

Invoice

MEINERS construction
P.O. Box 279
Spring, TX 77383

COMMUNITY AND ENVIRONMENTAL DEPT.
2012 APR 18 PM 1:07

Date	Invoice #
2/17/2012	47074

Bill To	Job Site
Harris Co SWCD Attention: Cathy Rogers McCoy 22566 FM 149 Montgomery TX 77356	Patricia Hernandez 2402 William Tell Houston, TX 77093

P.O. No.	Terms	Due Date	Contract Expires
		2/17/2012	2/1/2014

Item	Quantity	Description	Rate	Amount
Construction		Site Evaluation, Design, Permits, Construction of Aerobic System & Materials	9,750.00	9,750.00
Operations		Two-Year Service Agreement:	640.00	640.00
Sludge haul		Pumping of existing tanks	420.00	420.00
Construction		Mats	1,015.11	1,015.11
			Total	$11,825.11

Phone #	Fax #	Email:
(281) 355-1420	(281) 419-9139	michelle@meinersconstruction.com

www.meinersconstruction.com

Invoice

MEINERS construction
P.O. Box 2778
Spring, TX 77383

COMMUNITY AND ENVIRONMENTAL DEPT.

2012 APR 18 PM 1:08

Date	Invoice #
2/13/2012	47039

Bill To	Job Site
Harris Co SWCD Attention: Cathy Rogers McCoy 22566 FM 149 Montgomery TX 77356	Sonia Marines 2704 Kowis Houston, TX 77093

P.O. No.	Terms	Due Date	Contract Expires
	Due on receipt	2/13/2012	02/01/14

Item	Quantity	Description	Rate	Amount
Construction		Site Evaluation, Design, Permits, Construction of Aerobic System & Materials	9,750.00	9,750.00
Operations		Two-Year Service Agreement:	640.00	640.00
Sludge haul		Pumping of existing tanks	420.00	420.00
			Total	$10,810.00

Phone #	Fax #	Email:
(281) 355-1420	(281) 419-9139	michelle@meinersconstruction.com

www.meinersconstruction.com

Invoice

MEINERS construction
P.O. Box 2778
Spring, TX 77383

COMMUNITY AND ENVIRONMENTAL DEPT.
2012 APR 18 PM 1:08

Date	Invoice #
2/13/2012	47038

Bill To
Harris Co SWCD Attention: Cathy Rogers McCoy 22566 FM 149 Montgomery TX 77356

Job Site
VIRGINIA CONTRERAS 2229 Kowis Houston, TX 77093

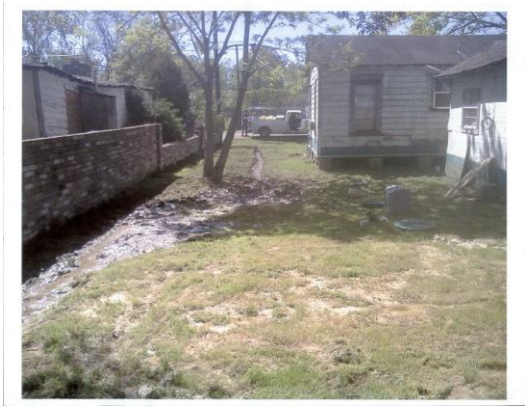
P.O. No.	Terms	Due Date	Contract Expires
	Due on receipt	2/13/2012	

Item	Quantity	Description	Rate	Amount
Construction		Site Evaluation, Design, Permits, Construction of Aerobic System & Materials	10,500.00	10,500.00
Operations		Two-Year Service Agreement:	640.00	640.00
Sludge haul		Pumping of existing tanks	420.00	420.00
			Total	$11,560.00

Phone #	Fax #	Email:
(281) 355-1420	(281) 419-9139	michelle@meinersconstruction.com

www.meinersconstruction.com

Figure E1 – SEP Pilot Project Site Pictures



Appendix F – Community Outreach Impact Assessmentss and Results

As part of the Project in the Westfield Estates Project Area, H-GAC conducted a series of community outreach impact assesments. A pre-implementation assessment was conducted prior to initiation of most implementation efforts, and a post-implementation assessment was concurrent with the final stage of implementation. The purposes of the assessments were to:

- evaluate pre-existing attitudes and knowledge regarding bacteria sources and contributing activities (pre-implementation assessment);
- evaluate potential willingness to participate in implementation activities(pre-implementation assessment);
- introduce project concepts regarding bacteria sources and contributing behaviors (pre-implementation assessment);
- determine the reach of project outreach efforts (post-implementation assessment);
- evaluate change in attitude toward contributing behaviors (post-implementation assessment);
- evaluate ; and
- evaluate potential willingness to participate in future partner programs

The assessments were bilingual, and included pre-paid postage to encourage return. The combined return rate for the assessments sent was approximately 5% of the total population. The assessments and the tabulated results are included with this Appendix.

The results of the assessment indicated that outreach efforts were fairly effective, the implementation activities were well received and that attitudes regarding contributing behaviors were positive. They also indicated a strong interest in potential future programs through project partners.

Pre-Implementation Outreach Impact Assessment

***Choose the best answer choice for each question**

**Elige la mejor opción para cada pregunta.*

1) Do you know that your house has a septic system?
¿Sabe usted que su casa tiene un sistema séptico?
☐ Yes / *Si* ☐ No / *No*

2) Have you serviced your septic system in the last 3 years?
¿Es su sistema séptico mantenimiento en los últimos 3 años ?
☐ Yes / *Si* ☐ No / *No*
☐ Don't Know / *No sé*

3) Would you hook up to a public sewer system if it were available?
¿Le conectar a un sistema de alcantarillado público, si estuviera disponible?
☐ Yes / *Si* ☐ No / *No*
☐ Depends on cost / *Depende del costo*

4) Have you ever noticed a bad smell coming from the ditch in front of your house or in your yard?
¿Alguna vez ha notado un mal olor proveniente de la zanja en el frente de su casa o en su patio*?*
☐ Often / *A menudo* ☐ Sometimes / *A veces*
☐ No / *No*

5) Do you see water in the ditches or in your yard during dry weather?
¿Ves el agua en las zanjas o en su patio durante el tiempo seco*?*
☐ Often / *A menudo* ☐ Sometimes / *A veces*
☐ No / *No*

6) Do you have any pets or other animals?
¿Tienes alguna mascota?
☐ No / No ☐ 1
☐ 2 or more / 2 o mas
Type / Tipo _____

7) Do you pick up and dispose of your animals' droppings?
¿Se limpia la caca de los animales?
☐ Yes / *Si* ☐ No / *No*
☐ I don't have animals / *No tengo animals*

8) Would you like more information on free programs for septic systems and pet waste?
¿Desea más información sobre los programas libres acerca de los sistemas sépticos y desechos de mascotas?
☐ Yes / *Si* ☐ No / *No*

Please fill out the survey on the back and drop it in your mailbox.

Also, please sign up for your FREE SEPTIC PUMPOUT

Además, no olvide firmar para arriba para *su gratis de limpieza de sistemas sépticos.*

Call East Aldine District (713-595-1220) to schedule

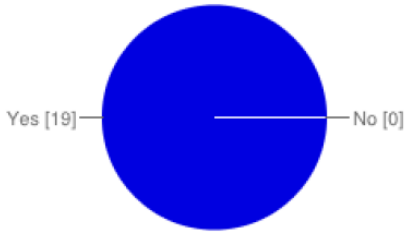
Llame a East Aldine District para programar

Attention: Justin Bower
Houston-Galveston Area Council
P.O Box 22777
Houston, TX 77227

Pre-Implementation Response Summary (19 Reponses)

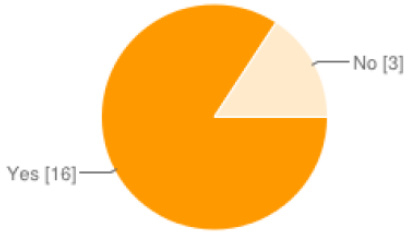
Summary See complete responses

Do you know that your house has a septic sytem?



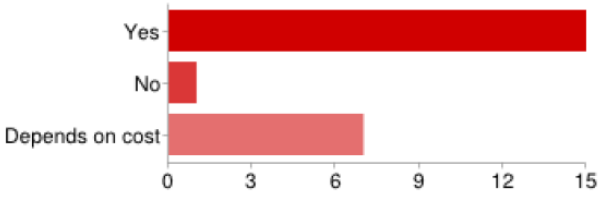
Yes	**19**	100%
No	**0**	0%

Have you serviced your septic system in the last 3 years?



Yes	**16**	84%
No	**3**	16%

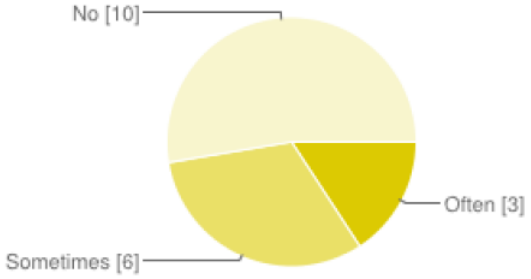
Would you hook up to a public sewer system if it were available?



Yes	**15**	79%
No	**1**	5%
Depends on cost	**7**	37%

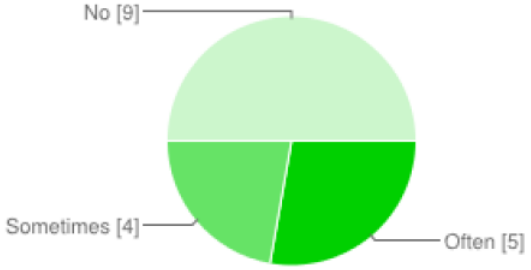
People may select more than one checkbox, so percentages may add up to more than 100%.

Have you ever noticed a bad smell coming from the ditch in front of your house or in your yard?



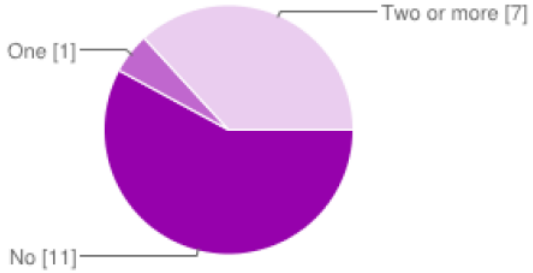
Often	3	16%
Sometimes	6	32%
No	10	53%

Do you see water in the ditches or in your yard during dry weather?



Often	5	26%
Sometimes	4	21%
No	9	47%

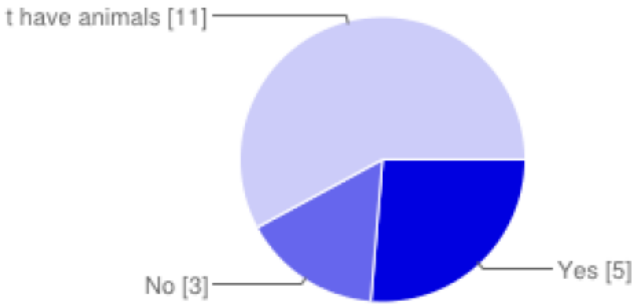
Do you have any pets or other animals?



No	11	58%
One	1	5%
Two or more	7	37%

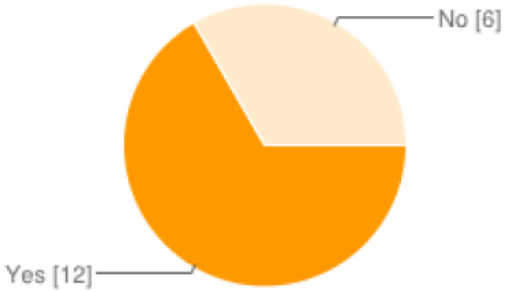
Do you pick up and dispose of your animals' droppings?

Yes	**5**	26%
No	**3**	16%
I don't have animals	**11**	58%



Would you like more information on free programs for septic systems and pet waste?

Yes	**12**	63%
No	**6**	32%



Post-Implementation Outreach Impact Assessment

*Choose the best answer choice for each question

Elige la mejor opción para cada pregunta.

1) Were you offered a free septic system pump out through our program?
¿Le ofrecieron una limpieza de sistemas sépticos gratis de nuestro programa?
☐ Yes / Si
☐ No / *No* ☐ Don't Know / *No sé*

2) If so, did you have your system pumped out?
Si es asi, ¿ha tenido su sistema de limpiado?
☐ Yes / Si ☐ No / *No* ☐ Don't Know / *No sé*

3) If so, have you noticed an improvement in your system or less water in your yard/ditch?
Si es asi, ¿ha notado una mejora en su sistema o menos agua en el césped / zanjas?
☐ Yes / Si ☐ No / *No* ☐ Don't Know / *No sé*

4) Would you participate in a program to pump out your septic system if one is available in the future?
¿Participaría en un programa para limpiar su sistema séptico si hay alguno disponible en el futuro?
☐ Yes / Si ☐ No / *No*

5) Did you receive information about proper disposal of pet waste?
¿Ha recibido información sobre la eliminación correcta de los excrementos de mascotas?
☐ Yes / Si ☐ No / *No* ☐ Don't Know / *No sé*

6) If so, was the information helpful?
¿Si es asi, fue la informacion util?
☐ Yes / Si ☐ No / *No* ☐ Don't Know / *No sé*

7) Will you pick up the waste from your pets to help keep your community healthy?
¿Va a recoger los excrementos de sus mascotas para mantener su comunidad saludable?
☐ Yes / Si ☐ No / *No* ☐ I don't have animals / *No tengo animales*

Please fill out the survey on the back and drop it in your mailbox.

Por favor, rellene la encuesta en la parte posterior y colóquelo en su buzón de correo.

We are conducting a brief survey to help us implement public health solutions in your community.

Estamos llevando a cabo una breve encuesta para ayudarnos a poner en práctica soluciones de salud pública en su comunidad.

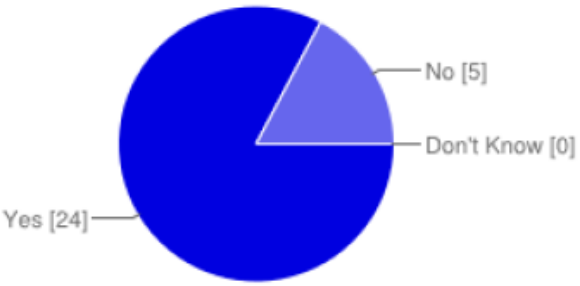
For more information, please call 713-499-6653.

Para obtener más información, por favor llame al 713-595-1220.

Attention: Justin Bower
Houston-Galveston Area Council
P.O Box 22777
Houston, TX 77227

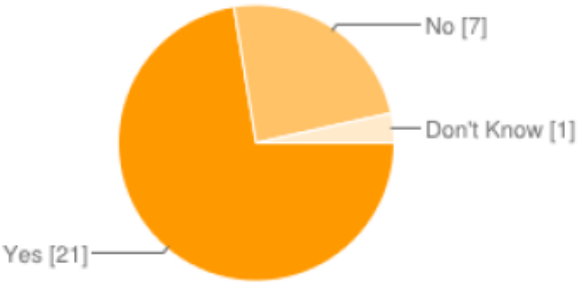
Pre-Implementation Response Summary (29 Responses)

Were you offered a free septic system pumpout through our program?



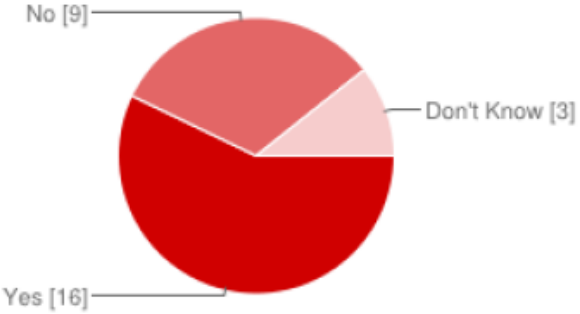
Yes	**24**	83%
No	**5**	17%
Don't Know	**0**	0%

If so, did you have your system pumped out?



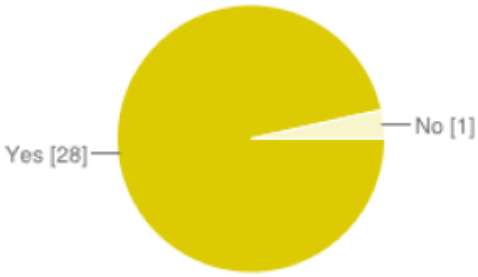
Yes	**21**	72%
No	**7**	24%
Don't Know	**1**	3%

If so, have you noticed an improvement in your system or less water in your yard/ditch?



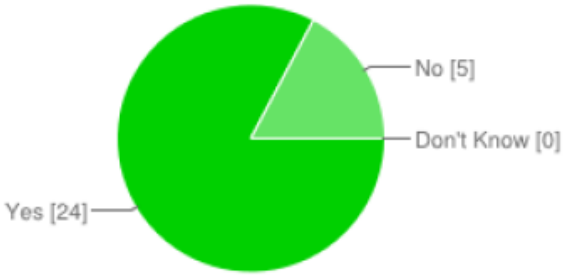
Yes	**16**	55%
No	**9**	31%
Don't Know	**3**	10%

Would you participate in a program to pump out your septic system if one is available in the future?



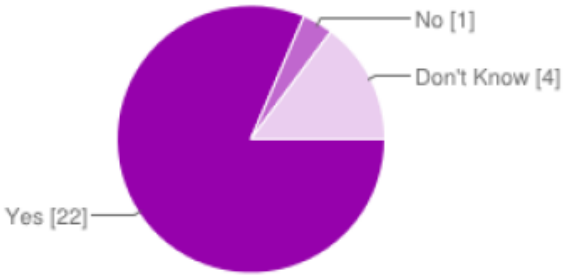
Yes	**28**	97%
No	**1**	3%

Did you receive information about proper disposal of pet waste?



Yes	**24**	83%
No	**5**	17%
Don't Know	**0**	0%

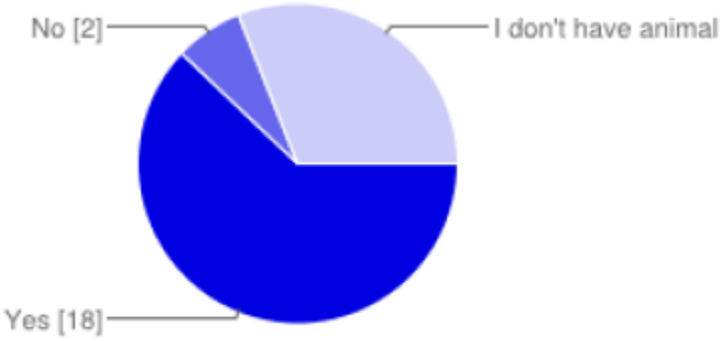
If so, was the information helpful?



Yes	**22**	76%
No	**1**	3%
Don't Know	**4**	14%

Will you pick up the waste from your pets to help keep your community healthy?

Yes	**18**	62%
No	**2**	7%
I don't have animals	**9**	31%



Appendix G – Examples of Westfield Outreach Materials

The following are a selection of outreach materials provided to residents of the Westfield Estates Community in regard to OSSF maintenance and proper pet waste disposal. The pet waste mailer in **Figure G1** was sent out to all residents, and contains bilingual materials from H-GAC and Harris County, as well as a dog-leash dog waste bag dispenser branded with a link to H-GAC's pet waste website.

Figure G1 – Pet Waste Educational Mailer

Residential OSSF maintenance education was conducted in various formats, including direct mailing to the residents and an educational event. Examples of materials used in mailings and the educational meeting are shown in **Figure G2**.

As part of the outreach efforts to reduce OSSF contributions, H-GAC, EAMD, and the OSSF service vendor disseminated Low Flow Device Kits (**Figure G3**). These kits were handed out at the educational meeting, and included with the OSSF pump-out service for each home served.

Figure G2 – Sample of OSSF Outreach Materials

Figure G3 – Low Flow Device Kit

Appendix H – San Bernard Sampling Data Summary

As detailed in the Results and Observations Section, the monitoring effort on the San Bernard was hampered by insufficient rainfall during the monitoring period. Of the seven triggering events after the initial period of installation and adjusting, only one produced viable samples.

Figure H1 – Sampling Dates and Outcomes

Event Date	Outcome
August 5th	Weekend event, bacteria hold times could not be met.
August 18th	Weekend event, bacteria hold times could not be met.
August 22nd	False trigger, no samples collected.
September 13th	Samples collected.
October 14th	Weekend event, bacteria hold times could not be met.
November 1st	Samplers triggered, but rainfall insufficient to produce viable samples.
December 4th	Samplers triggered, but runoff insufficient to produce viable samples.

The results from the 9/13/12 sampling run were viable and are recorded in Table H1.

Table H1 – Sampling Data Summary

	Test	Date	Result	Units
Boettcher 1	E coli	9/13/12	4884	mpn/100ml
	Nitrate+Nitrite	9/13/12	<0.02	mg/L
	TDS	9/13/12	304	mg/L
	TSS	9/13/12	4.7	mg/L
Boettcher 2	E coli	9/13/12	9804	mpn/100ml
	Nitrate+Nitrite	9/13/12	0.13	mg/L
	TDS	9/13/12	348	mg/L
	TSS	9/13/12	3.3	mg/L