

## Carters Creek Watershed Wastewater Work Group Recommendation Report

This document describes the management measures recommended for implementation by the Carters Creek Wastewater Work Group to address bacteria loading in the Carters Creek Watershed. The Wastewater Work Group is made up of representatives from the Brazos County Health Department and the cities of Bryan and College Station. Faculty from Texas A&M University faculty also participated in several meetings and provided their inputs to the group. Management measures are described in terms of the ten key elements required by TCEQ to describe how the implementation of each management measure will help in meeting TMDL requirements. The following measures are proposed for inclusion in the Carters Creek Watershed TMDL Implementation Plan by the Stormwater and Transportation Work Group:

1. Work to coordinate WWTF self-reporting data collection with the Brazos River Authority's quarterly Clean Rivers Program Monitoring as well as expand watershed monitoring
2. Continue to implement the Sanitary Sewer Overflow (SSO) Initiatives of the cities of Bryan and College Station
3. Identify on-site septic facilities (OSSFs) in the watershed and develop/amend ordinances to require inspections of all OSSFs inclusive of conventional systems
4. Evaluate need for modifying county designated septic system land requirements

These measures are seen as a good first step in managing potential *E. coli* loading from human derived wastewater sources. Adaptive management will be critical to the long-term success of this implementation plan and as such the above listed measures' effectiveness will be evaluated following implementation. As changes in water quality are seen, modifications to this plan can and will be made to improve its effectiveness. Utilizing adaptive management throughout the process of implementing the plan will enable stakeholders to modify and improve the plan as progress is made and a better understanding of the watershed is developed.

### Key Element #1

*This element identifies the causes of the impairment, in this case the sources of bacteria that need to be controlled by the TMDL and the Implementation Plan.*

Potential sources of bacteria pollution can be divided into two primary categories: *regulated* and *non-regulated*. Pollution sources that are regulated have permits under the Texas Pollutant Discharge Elimination System (TPDES) such as MS4s or wastewater treatment facility (WWTF). Non-regulated sources are typically nonpoint source in nature, meaning the pollution originates from multiple locations such as grazing livestock, pets and wildlife and are usually carried to surface waters by rainfall runoff.

For the purposes of this assessment, specific causes of the bacteria impairment were not identified. Rather, larger source categories were defined and collectively evaluated to define the overall bacterial loading to the Carters Creek watershed. Specific sources identified in the watershed and listed alphabetically include:

***Regulated Sources:***

- Municipal separate storm sewer system
  - Dry weather discharges/Illicit discharges
- Wastewater treatment facilities
  - Sanitary sewer overflows

***Non-Regulated Sources:***

- Failing on-site sewage facilities
- Agricultural activities and domesticated animals
- Wildlife and unmanaged animal contributions

Water quality sampling data utilized in developing the TMDL for Carters Creek watershed were collected between September 2001 and October 2007 at three key index sites within the watershed. Geometric means of data collected at each site exceeded the state's water quality standard of 126 colony forming units (CFUs) of bacteria per 100 mL water sample across all flow conditions with bacteria levels under 'very high flow' conditions exhibiting the highest bacteria geometric mean levels. This finding indicates that stormwater dominated flows do contribute a considerable amount of bacteria to the Carters Creek watershed.

This portion of the plan will focus efforts on targeting both permitted and non-permitted sources of bacterial contamination in the watershed. Stormwater management measures proposed will work to address bacteria contributions from a variety of aspects thus broadening the effective reductions in stormwater derived bacteria in the creeks.

## **Key Element #2**

*This element describes the management measures proposed for implementation to reduce wastewater derived bacteria contributions to the Carters Creek Watershed.*

### **Expand and Coordinate Watershed Monitoring**

To address the current lack of water quality monitoring being conducted in the watershed, a proposed expanded spatial and temporal scale monitoring project has been suggested. Water quality monitoring in the Carters Creek watershed currently exists at minimal levels. Monitoring conducted by the Brazos River Authority through the Clean Rivers Program has been reduced to one sampling station monitored

quarterly since 2007. A special set of monitoring data will be collected by TCEQ regional staff in the coming fiscal year on Country Club Branch, a very small intermittent stream between Finfeather Lake and Country Club Lake. This data collection will conclude at the end of the year.

Efforts will be undertaken to develop a project proposal with Texas A&M faculty that includes monthly sampling for a two year period at 20 to 25 sampling sites that target specific areas of the watershed. Data collected will be analyzed at a National Environmental Laboratory Accreditation Conference certified laboratory so that data can be submitted to the TCEQ for inclusion in SWQMIS.

The proposal will be developed and submitted to TCEQ for funding consideration in their next funding cycle (Fiscal Year 2011).

Coordination of existing and future monitoring will also be carried out such that self-reported WWTF data will be collected on the same date and similar time as CRP or special study data are collected. This will serve to illustrate the influences of the WWTFs on instream water quality.

#### **Continue to Implement the Cities' SSO Initiatives**

The City of Bryan currently has a SSO Initiative in place and the City of College Station is working to establish their SSO Initiative. These initiatives include numerous activities that each city is planning to carry out in efforts to reduce the occurrence of sanitary sewer overflows. The measures included in the SSO Initiative and identified as a means to mitigate *E. coli* loading to the Carters Creek watershed include:

- continuing routine sewer pipe inspections to identify pipe defects using inflow and infiltration studies (smoke tests) and television inspections; inspections will serve as a means to prioritize what areas of the cities are repaired or replaced first
- continue manhole inspections and rehabilitation efforts (visual inspections)
- track the miles and location of sewer pipe replaced annually
- track sewer overflows by location and document the cause of each overflow ; this will serve as a means to track progress in reducing the overall number of sewer spills

#### **Identify Watershed Septic Systems**

The Brazos County Health Department is in charge of overseeing septic systems in the county. Records of septic systems are on file for all systems, whether aerobic or conventional, installed later than 1980. Aerobic systems in the county are required to have inspections performed by licensed service providers three times annually; traditional systems do not currently have this same requirement. For traditional septic systems, maintenance issues become worse over time as these systems tend to degrade resulting in an increased risk of malfunctions. Additionally, when properties change hands, there is rarely any information transfer to the new owner on the proper care and maintenance that septic systems need.

To address these concerns, the following items are recommended:

- continue to ensure that those systems identified as aerobic systems are currently under a maintenance contract as required by the county
- work to amend county ordinances on OSSF inspections to include annual inspections by service providers for all identified underground (aerobic and non-aerobic) OSSFs
- work with homeowners to bring OSSFs found to be malfunctioning into compliance
- work to identify all septic systems in the county (all systems installed post-1980 should be documented) with the initial focus being applied in areas nearest the creek, areas nearest major tributaries second, and others third
- evaluate means to educate new homeowners about proper OSSF care and maintenance when a property changes hands; a mechanism to make this happen is needed
- evaluate ways and develop a mechanism to verify that OSSF inspections provided under maintenance contracts are being provided as indicated by maintenance providers

#### **Evaluate Brazos County Septic System Land Requirements**

Septic systems are a common form of wastewater treatment in unincorporated areas where a centralized wastewater collection system is not available. The Carters Creek watershed includes areas where septic systems are utilized and according to the draft Technical Support Document for the Carters Creek Watershed Bacteria TMDL, there are currently estimated to be 455 septic systems within the watershed. The Brazos County Health Department maintains jurisdiction over the permitting, installation, inspection and regulation of existing and new septic systems in the county.

Sizing requirements for new septic systems planned for installation in all portions of the county have also been established by the county. Current sizing requirements vary depending on the size of the house and the number of bedrooms it contains. The table below illustrates the specific sizing requirements. Before installing a new septic system, an application for an OSSF must be completed and submitted to the Brazos County Health Department along with the required fees.

**Brazos County Septic System Spray-field Size Requirements**

House Size	Number of Rooms	Required Spray-field Size
< 2,500 sq. ft.	3	5,333 sq. ft. minimum
> 2,500 sq. ft.	3	6,667 sq. ft. minimum

Potential exists to refine these sizing requirements to further protect water quality from potential fecal bacteria loading. Several options for improvements include a sliding scale for the required spray-field size based on the proximity to Carters Creek or one of its tributaries, a general increase in the required spray-field size or a sizing requirement based on site specific land use and soil characteristics. These and

other options will be evaluated to determine the feasibility of reducing the potential impacts of OSSFs on instream water quality.

### Key Element #3

*Key Element #3 describes the potential bacteria load reductions that could be achieved by implementing the management measure listed below in the Carters Creek Watershed.*

#### SSO Initiative Implementation

In the draft Technical Support Document for the Carters Creek Watershed Bacteria TMDL, sanitary sewer overflows (SSOs) were identified as one contributor of *E. coli* into the storm sewer system. Stormwater managers actively identifying these SSOs and subsequently working with wastewater collection system personnel to rectify these problems is one management measure that will produce a quantifiable *E. coli* load reduction. Using the SSO information presented in the draft Technical Support Document for the Carters Creek Watershed Bacteria TMDL and published literature values, the following equation was derived to estimate an estimated load reduction for reducing the average number of SSO events by half.

$$.065 \frac{SSOs}{day} * 8748 \frac{gallons}{SSO} * \frac{10^6 cfu}{100mL} * .8 * 3785.2 \frac{ml}{gallon} = 1.72 \times 10^{10} \frac{cfu}{day}$$

In this equation, the inputs are as follows:

- $.065 \frac{SSOs}{day} = 248 \text{ SSOs recorded over a 1,884 day period } * 50\%$
- $8748 \frac{gallons}{SSO} = 248 \text{ SSOs totaling 2,169,622 gallons of sewage}$
- $10^6 \frac{cfu}{100mL} = \text{fecal coliform concentration rate in onsite septic facility effluent as reported by Metcalf & Eddy, 1991; Canter & Knox, 1985; Cogger & Carlile, 1984}$
- $.8 = \text{conversion factor to convert between fecal coliforms and } E. coli$
- $3785.2 \frac{ml}{gallon} = \text{number of milliliters in a gallon}$

and the assumptions made include:

- Onsite septic facility effluent and wastewater spilled in an SSO event are treated as equal from an *E. coli* content perspective
- Reducing the number of SSO events by half is realistically achievable
- Colony Forming Units (CFUs) of *E. coli* and Most Probable Number (MPN) of *E. coli* are considered as equals and are used inter-changeably

Assuming that this level of load reduction can be achieved by reducing the average number of SSO occurrences by half and that the average SSO volume remains about the same, the average daily load in Carters Creek as measured at Station 11785 under very high flow conditions will be reduced from

$1.6895 \times 10^{13} \frac{MPN}{day}$  to  $1.6878 \times 10^{13} \frac{MPN}{day}$  for an overall load reduction of 0.1 percent. The very high flow condition was chosen because it was used in developing the TMDL for the watershed.

### OSSF Identification

As reported in the draft Carters Creek Watershed TMDL Technical Support document, the Brazos County Health Department indicated that 455 OSSFs were contained within the Carters Creek watershed. Of these 98 percent were thought to be aerobic and are required to be inspected three times annually under a service contract; the other 2 percent or 9 systems are conventional OSSFs. Soils in Brazos County are not conducive to conventional OSSFs and almost all new OSSFs are aerobic systems due to the elevated potential for failure in conventional systems. Using the equation presented below, an estimated load reduction can be developed for identifying and repairing failing septic systems in the watershed.

$$5 \text{ failing septic systems} * 10^6 \frac{\text{fecal coliforms}}{100 \text{ mL}} * .8 * \frac{70 \frac{\text{gallons}}{\text{person}}}{\text{day}} * 3785.2 \frac{\text{mL}}{\text{gallon}} * 2.52 \frac{\text{persons}}{\text{household}} = 2.67 \times 10^{10} \frac{\text{cfu}}{\text{day}}$$

In this equation, the inputs are as follows:

- 5 septic systems are considered failing in the watershed
- $10^6 \frac{\text{cfu}}{100\text{mL}}$  = fecal coliform concentration rate in onsite septic facility effluent as reported by Metcalf & Eddy, 1991; Canter & Knox, 1985; Cogger & Carlile, 1984
- .8 = conversion factor to convert between fecal coliforms and *E. coli*
- $3785.2 \frac{\text{mL}}{\text{gallon}}$  = number of milliliters in a gallon
- 70 gallons per person per day is estimated discharge in OSSFs as reported by Horsley & Witten, 1996
- 2.52 persons per household is the US Census Bureau's Brazos County estimate for 2009

and the assumptions made include:

- Identifying these failing septic systems and working with their owners to correct these problems is achievable
- Colony Forming Units (CFUs) of *E. coli* and Most Probably Number (MPN) of *E. coli* are considered as equals and are used inter-changeably

Using these assumptions, an average daily load reduction of  $2.67 \times 10^{10} \frac{\text{cfu}}{\text{day}}$  can be achieved by identifying and repairing these systems. As compared to the daily average *E. coli* load under very high flow conditions of  $1.6895 \times 10^{13} \frac{\text{cfu}}{\text{day}}$ , this would yield a 0.16 percent load reduction.

## Key Element #4

*This element identifies technical and financial assistance needed to implement the projects in this management measure.*

### **Technical Assistance**

Current staffs employed by the cities and county fulfill the current technical assistance needs of each respective entity implementing measures to mitigate wastewater related pollution contributions.

Technical assistance will be for the coordination and development of an expanded watershed monitoring proposal by the Texas Water Resources Institute.

### **Financial Assistance**

Expanded monitoring in the watershed will likely require significant resources. These resources will be sought through outside funding sources in the form of grant dollars.

Additional resources may be required by the Brazos County Health Department to conduct the OSSF identification. Additional personnel will be the likely requirement here as current employees are fully occupied.

## Key Element #5

*This element describes the education component to enhance the public understanding of the Carters Creek Watershed TMDL Implementation Plan and to encourage their participation.*

Education at multiple levels is considered to be a key aspect of decreasing bacteria contributions to Carters Creek watershed. Educating the public on proper practices to operate and maintain OSSFs and proper usage of WWTF conveyance systems will help alleviate some impacts from wastewater derived bacteria. The improper disposal of Fats, Oils and Grease into the sewer system is the cause of many wastewater conveyance system malfunctions. Providing this information to local residents through utility bill inserts, public service announcements and other means as deemed necessary will be utilized.

Efforts can also be taken to bring focused educational workshops or events that target a specific problem area such as OSSFs or Fats, Oils and Grease to the watershed to further get the word out about proper management of specific potential pollutant sources.

## Key Element #6

*This element provides a schedule with milestones for implementing these management measures.*

The table below illustrates the schedule and milestones of each management measure recommended by the Wastewater Work Group that will be implemented as described to the extent possible. Funding availability, utilizing adaptive management procedures and other unforeseen events can greatly impact the responsible entity's ability to adhere to this implementation schedule and meet designated milestones.

Wastewater Work Group Management Recommendations Implementation Schedule & Milestones

Type of Management Measure	Management Measure	Implementation Schedule	Milestones
Expand & Coordinate Watershed Monitoring	Coordinate all watershed bacteriological monitoring	annually	initial coordination complete within 3 months of TMDL IP approval
	Develop Expanded Watershed Monitoring Proposal	seek funding until secured	funding secured
	Conduct Expanded Watershed Monitoring	when funded	expanded monitoring complete
Implement SSO Initiatives	Continue sewer pipe inspections	continually	number of miles inspected annually
	Continue manhole inspections	continually	number of manholes inspected annually
	Track miles and location of sewer pipe replaced annually	continually	Updated tracking maps
	Track sewer overflows by location and document the cause of each overflow	continually	SSOs identified and cause determined
Identify Watershed Septic Systems	Continue to ensure OSSF inspections continue as required by county ordinances	continually	number of systems found in non-compliance reported annually
	Amend county ordinances to require annual inspections for all conventional OSSFs	as political will allows	documentation of ordinance development/amendment
	Work to identify all non-documented OSSFs in the watershed	as funding and personnel time allow	Number of OSSFs identified
	Evaluate ways to educate new homeowners on proper OSSF care and maintenance when a property changes hands	within first year of implementation	effective means of homeowner education identified for future implementation
	Evaluate & develop mechanism to verify that OSSF inspections occur as documented	evaluate alternatives within first year	effective mechanism identified for future implementation

## Key Element #7

*This element identifies interim, measureable milestones that will be used to document improvements in water quality due to implementation of these management measures.*

- Completion of a coordinated monitoring schedule that all monitoring parties have agreed to
- Completed watershed monitoring proposal
- Funding secured for expanded watershed monitoring
- Completion of expanded watershed monitoring
- Miles of sewer pipe inspected annually
- Number of manholes inspected annually
- Updated tracking of sewer line replacements and amount
- Number of SSOs identified, documented and causes determined



- Number of OSSFs inspected and found in non-compliance reported annually
- Ordinance developed or amended requiring inspections of OSSFs county-wide
- Number of non-documented OSSFs identified
- Effective means of educating new homeowners on proper OSSF care and maintenance
- Effective mechanism identified for ensuring that OSSF inspections occur as documented

## Key Element #8

*This element defines the indicators that will be used to document improvements in water quality due to implementation of these management measures.*

Monitored instream *E. coli* concentrations will be used to document improvements in water quality due to implementation of the above described management measures. Data reported to TCEQ for inclusion in their surface water quality monitoring information system (SWQMIS) and used in their bi-annual water quality assessments will be used as the primary indicator of water quality improvements. *E. coli* data included in the Draft 2010 Texas Integrated Report for Clean Water Act Sections 305(b) and 303(d) will be used as the benchmark for tracking improvements. *E. coli* are reported in units of most probable number (MPN) per 100 mL of water and the geometric mean of at least 10 samples collected over a 7-year monitoring period should not exceed 126 mpn/100 mL. TCEQ station 11785 located at Bird Pond Road (Figure 1) will be used as the index site for future water quality assessments. As reported in the Draft 2010 Texas Integrated Report for Clean Water Act Sections 305(b) and 303(d) (TCEQ 2010), bacteria levels reported at this site during the most recent water quality assessment were 753.1 mpn/100mL. During this same assessment, Burton Creek's *E. coli* levels were found to be 527.1 mpn/100mL (station 11783) and Country Club Branch was reported as 503.9 mpn/100mL (station 11795); both well above the imposed *E. coli* standard.

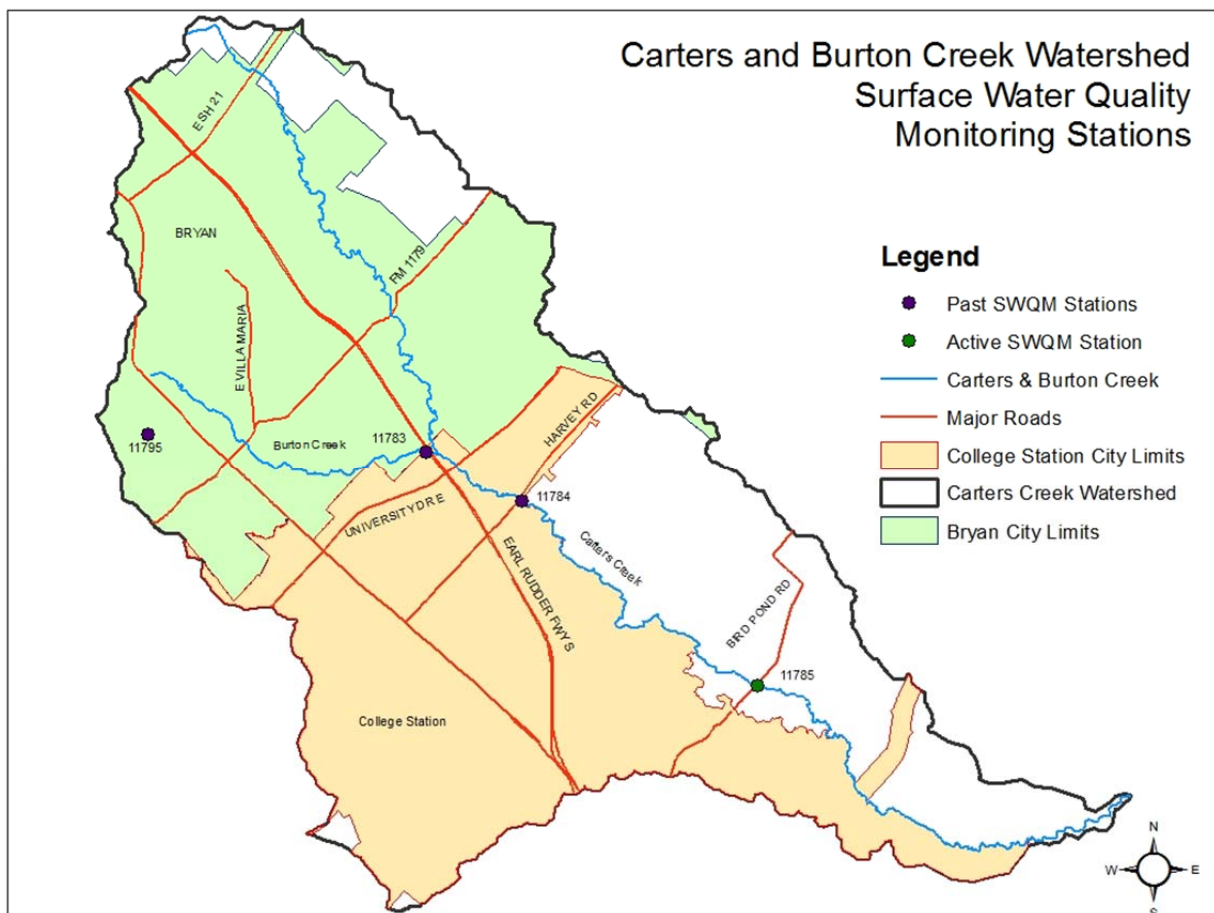
## Key Element #9

*This element describes the monitoring component of the Implementation Plan to determine the attainment of the water quality standards throughout the watershed.*

Water quality monitoring conducted and used to assess water quality in the Carters Creek watershed has been conducted in the past approximately quarterly by TCEQ and the Brazos River Authority at four monitoring stations (Figure 1) (Burton Creek: Station 11783, Carters Creek: Station 11784, Carters Creek: Station 11785, Country Club Branch: Station 11795). Beginning in August 2007, data collection in the watershed was reduced to monitoring Carters Creek station 11785 located on Bird Pond road. As a result, future monitoring conducted at station 11785 will be the benchmark dataset for determining water quality standard attainment.

Additionally, efforts to secure funding and conduct spatially and temporally intensive watershed monitoring to better characterize the breadth and distribution of *E. coli* loading in the watershed will be undertaken as part of this TMDL Implementation Plan effort. Should funding be secured, these data will also provide good information to not only document improvements in water quality, but to refine local knowledge of the watershed and hopefully hone in on 'E. coli hotspots' in the watershed. This proposed monitoring scheme will be planned in coordination with all involved in developing the TMDL IP and Texas A&M Soil and Crop Sciences Department faculty. Additionally, the proposed monitoring will build upon earlier watershed monitoring conducted in the watershed. If funded, these data will also be used in future water quality assessments. Two NELAC approved labs exist in close proximity to the watershed and could be contracted for sample analysis so that data can be used incorporated into SWQMIS for future water quality assessments.

Carters Creek Watershed with Active and Past SWQM stations



## Key Element #10

*This element provides the following list of entities responsible for implementing these management measures.*

**Brazos County Health Department** – Responsible for implementing measures related to the identification of OSSFs in the watershed and development/enforcement of amended OSSF ordinances

**City of Bryan** – Responsible for implementing measures outlined in their SSO Initiative and coordinating with other monitoring entities to coordinate watershed monitoring.

**City of College Station** – Responsible for completing their SSO Initiative and implementing measures outlined there in. Also responsible for coordinating with other monitoring entities to coordinate watershed monitoring.

**Texas AgriLife Research** – Provide monitoring support as funding allows

**Texas Water Resources Institute** – Responsible for developing expanded monitoring proposal, working to secure funding for monitoring, working with collaborating entities to further coordinate watershed monitoring, and exploring funding avenues for program management and expansion. Also provide coordination as needed and support for securing funds to implemented recommended management measures.

## References

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