

Texas Clean Rivers Program 2011 Basin Highlights Report



Beals Creek in the Upper Colorado River basin

A Characterization of Impaired Water Bodies in the Colorado River Basin

June, 2011

Introduction

The Basin Highlights Report is produced annually to provide an overview of water quality conditions in streams, rivers and reservoirs in the Colorado River basin. This 2011 report focuses on waters that do not currently meet *Texas Surface Water Quality Standards*. Below is a brief explanation of those Standards, the data collection and assessment processes, and the state and federal programs that restore impaired water bodies.

Texas Water Quality Standards

The Texas Commission on Environmental Quality (TCEQ) protects water quality by establishing surface water quality standards for all water bodies in the state. The standards are made up of two components: designated uses and criteria. Designated uses are purposes for water; they include general use, aquatic life use, contact recreation and public water supply. Criteria are usually numeric (sometimes narrative) limits used to compare water quality data or conditions. The designated uses and their associated criteria are described as follows:

General Use – this category was created to protect overall water quality. Temperature, pH, chloride, sulfate and total dissolved solids criteria are used to gauge support for this use. Numeric criteria for these parameters vary among water bodies in the Colorado River basin.

Aquatic Life Use – TCEQ has established several standards (Table 1) to determine support for aquatic life in fresh water. For each standard, there are four levels; exceptional, high, intermediate and limited. As a general rule, all perennial streams are assumed to have a high aquatic life use designation.

Table 1. Aquatic life use criteria

Level of Aquatic Life Use Attainment	Dissolved Oxygen (Grab sample or 24-hour average)	Dissolved Oxygen (24-hour minimum)	Fish Community Index Score	Benthic Community Index Score	Habitat Index Score
Exceptional	6.0	4.0	58-60	>36	26-31
High	5.0	3.0	48-52	29-36	20-25
Intermediate	4.0	2.0	40-44	22-28	14-19
Limited	3.0	2.0	<34	<22	<14

Contact Recreation - This use refers to a water body's ability to safely support physical contact such as swimming. The standard (Table 2) for contact recreation is a measure of bacteria levels. In freshwater, the indicator is *Escherichia coli* bacteria, though fecal coliform bacteria were used as indicators until the early 2000s. In saltwater and coastal areas, *Enterococci* bacteria are used as the indicator. Units of measure for bacteria test results may be reported in most probable number (MPN) or colony forming units (CFU) depending on the method of analysis, both are essentially identical.

Table 2. Criteria for bacteria based on Texas Surface Water Quality Standards

Bacteria	Geometric Mean Criteria	Single Sample Criteria
Fecal Coliform	200	400
<i>E.coli</i>	126	394
Enterococcus	35	89

Public Water Supply - This use is evaluated by assessing finished drinking water and/or surface water conditions. Finished drinking water is assessed for toxic contaminants at the point of entry to distribution systems. Finished drinking water is also assessed for elevated levels of dissolved minerals: chloride, sulfate and total dissolved solids, which have criteria of 300, 300 and 1000 mg/L, respectively. These criteria for dissolved solids are applied statewide and were developed to ensure that water supply utilities could treat and deliver water that is free of taste and odor.

Data Collection and the Assessment Process

Several entities collect water quality data in the Colorado River basin. TCEQ, Lower Colorado River Authority (LCRA), Upper Colorado River Authority (UCRA), Colorado River Municipal Water District (CRMWD), City of Austin (COA) and the United States Geological Survey (USGS) submit water quality data to TCEQ for assessment. Each agency collects and analyzes samples according to a Quality Assurance Protection Plan (QAPP), which ensures comparability among data sets.

Every two years, TCEQ compares all available quality assured-data to the *Texas Surface Water Quality Standards* and publishes the results in the *Texas Integrated Report for Clean Water Act Sections 305(b) and 303(d)*. The Integrated Report defines each water body as one of the following:

1. Meets or Supports status – At least ten data points are available to assess and the water body meets Texas Surface Water Quality Standards or supports the water body’s designated use(s).
2. Concern status – a) Sufficient data are not available to perform a full assessment, but the limited data indicate standards are not met, or b) standards have not yet been established, as is the case with nutrients. In this event, screening levels are applied.
3. Impaired status – Sufficient amount of data are available and the water body does not meet state standards. TCEQ publishes impaired water bodies in the 303(d) List, part of the integrated report.

Restoring Impaired Water Bodies

To restore an impaired water body, it is necessary to determine the sources of pollution. One way to do this is to develop a scientific model called a total maximum daily load (TMDL). A TMDL study involves a historical water quality data review, targeted monitoring, detailed water quality analysis, and finally a determination about the amount or “load” of a pollutant that a water body can receive and still support its designated uses. Once the load is allocated among all potential sources of pollution, an implementation plan outlines strategies to reduce pollutant loads. Another way to restore an impaired water body is through a Watershed Protection Plan (WPP). Unlike the TMDL, a WPP is non-regulatory. It is driven by stakeholders who holistically address causes of the identified impairments. Similar to a TMDL, a WPP outlines strategies to reduce pollutant loads.

Another option for addressing impaired water bodies is a Use Attainability Analysis (UAA). Where a TMDL and WPP are designed to improve water quality by limiting pollutants, a UAA is designed to set more appropriate standards. UAAs help determine whether the level of use originally assigned to the water body was appropriate. For example, in the late 1980s most rivers and streams were assigned a high aquatic life use. Since then, routinely collected data have shown that some did not meet a high aquatic life use; not because of pollution, but natural conditions prevented high aquatic life use from being attained. TCEQ has performed UAAs to establish a more appropriate level of aquatic life use in the *Texas Surface Water Quality Standards*. Similarly, a recreational use attainability analysis (RUAA) is a study that confirms the level of recreational use that takes place in a stream.

In 2010, TCEQ developed a process they called watershed action planning (WAP) to help identify watershed restoration projects for impaired water bodies. On its simplest level,

input is gathered from local stakeholders, monitors and community leaders. The information, which may be about potential sources of pollution, geographic factors in the watershed, community interest in a project etc is placed in a database. TCEQ uses the database to prioritize their water quality protection efforts across the state. The WAP process is mentioned throughout this document as a source of information and as a basis of recommendations.

Basis and Format of the Report

The TCEQ assessment process relies on data to interpret the condition of water and includes very little “ground-truthing” to determine potential causes of impairments. This Basin Highlights Report characterizes the impaired water bodies listed in the Draft 2010 303(d) List by reviewing data, mapping land use, and recording information from site visits and communication with monitoring personnel and local residents. It is intended to provide supplemental information for future assessments and water quality protection efforts. LCRA and the Colorado River basin Clean Rivers Program partners will use the following watershed characterizations to prioritize monitoring efforts and seek funding to restore impaired water bodies.

Much of the information in this report was derived from data collected between December 2001 and November, 2008 and published in the Draft 2010 Texas Integrated Report. The Integrated Report provides information on the states’ surface waters, including concerns for public health, fitness for use by aquatic species, and specific pollutants and their sources. It is composed of several documents including the 303(d) list of impaired water bodies, a list of water bodies evaluated, a list of water bodies removed from previous 303(d) lists and other reports.

The Draft 2010 303(d) List of impaired water bodies identified 24 impaired segments in the Colorado River basin (Table 3). These 24 segments have a total of 35 specific impairments; some segments are impaired for more than one parameter. Eighteen segments (75%) are listed due to elevated bacteria and not supporting the contact recreation use. Seven segments (29%) do not fully support the aquatic life use due to depressed dissolved oxygen. A list of water bodies removed from the 303(d) List in 2010 is included in the Appendix.

Segment	Water Body	Watershed	County	Parameter(s)	Potential Source(s)	Year Listed	Category	Action Taken
1304	Caney Creek Tidal	Matagorda Bay	Matagorda	bacteria	unknown	2006	5c	Increased the number of sites monitored
1304A	Linneville Bayou	Matagorda Bay	Matagorda	bacteria	unknown	2010	5b	New listing - no action taken
1305	Caney Creek above Tidal	Matagorda Bay	Matagorda and Wharton	bacteria	unknown	2002	5b	Increased the number of sites monitored
				dissolved oxygen	natural causes	1999	5b	TCEQ performed a special study (UAA) to determine if standards were appropriate. The upper portion of the creek was determined to be intermittent with a limited aquatic life use. Unless conditions change, Caney Creek should meet standards during the 2012 assessment.
1401	Colorado River Tidal	Matagorda Bay	Matagorda	bacteria	unknown	2006	5c	Maintain monitoring
1402C	Buckners Creek	Matagorda Bay	Colorado	dissolved oxygen	unknown	2010	5c	New listing - no action taken
1402H	Skull Creek	Matagorda Bay	Colorado	dissolved oxygen	unknown	2008	5b	maintain monitoring
				bacteria	unknown	2010	5b	New listing - no action taken
1403A	Bull Creek	Austin	Travis	dissolved oxygen	unknown	2010	5c	New listing - no action taken
1403J	Spicewood tributary to Shoal Creek	Austin	Travis	bacteria	urban development	2002	5b	Monitoring frequency increased
1403K	Taylor Slough South	Austin	Travis	bacteria	urban development	2002	5b	Monitoring frequency increased
1403R	Westlake-Davenport tributary to Lake Austin	Austin	Travis	bacteria	urban development	2006	5b	Monitoring frequency increased
1407A	Clear Creek	Lake LBJ	Burnet	Aluminum in water	graphite mine	2010	5c	Monitoring and remediation of source pollutant ongoing
				Sulfate	graphite mine	2010	5c	Monitoring and remediation of source pollutant ongoing
				TDS	graphite mine	2010	5c	Monitoring and remediation of source pollutant ongoing
				pH	graphite mine	2010	5c	Monitoring and remediation of source pollutant ongoing
1412	Colorado River below Lake J.B. Thomas	Upper Colorado	Mitchell and Howard	bacteria	unknown	2008	5c	Maintain monitoring
1412B	Beals Creek	Upper Colorado	Howard	bacteria	unknown	2010	5b	Monitoring frequency increased
				selenium in water	unknown	2010	5c	Monitoring frequency increased
1413	Lake J.B. Thomas	Upper Colorado	Borden and Scurry	chloride	naturally occurring	2008	5c	Maintain monitoring
				TDS	naturally occurring	2010	5c	Monitoring frequency increased
1416	San Saba River	Lake Buchanan	San Saba and Mills	bacteria	unknown	2008	5c	Maintain monitoring. Trends show decreasing bacteria levels at the site. Standards attainment should be reached in the future
1416A	Brady Creek (unclassified)	Lake Buchanan	McCullough	dissolved oxygen	urban nonpoint sources	2004	5c	Watershed protection plan - development phase
1421	Concho River	Concho River	Tom Green and Concho	dissolved oxygen	urban nonpoint sources	2008	5c	Watershed protection plan - implementation phase
				bacteria	urban nonpoint sources	2008	5c	Watershed protection plan - implementation phase
				impaired benthics	urban nonpoint sources	2002	5c	Watershed protection plan and US Geological Survey special study

Segment	Water Body	Watershed	County	Parameter(s)	Potential Source(s)	Year Listed	Category	Action Taken
1427A	Slaughter Creek	Austin	Travis	impaired benthics	unknown	2002	5b	TCEQ plans a special study (UAA) in 2011.
1428	Colorado River below Town Lake	Austin	Travis and Bastrop	bacteria	unknown	2006	5c	Maintain monitoring
1428B	Walnut Creek (unclassified)	Austin	Travis	bacteria	urban sources	2006	5b	Maintain monitoring
1429B	Eanes Creek (unclassified)	Austin	Travis	bacteria	urban sources	1999	5b	Monitoring frequency increased
1429C	Waller Creek (unclassified)	Austin	Travis	impaired benthics	urban sources	2002	5c	Monitoring postponed until construction of Waller Tunnel is complete
				bacteria	urban sources	2004	5b	Monitoring frequency increased
1431	Mid Pecan Bayou	Pecan Bayou	Brown	bacteria	unknown	2006	5b	TCEQ plans a special study (UAA) in 2010
1501	Tres Palacios Creek Tidal	Matagorda Bay	Matagorda	dissolved oxygen	natural causes and nonpoint sources	1999	5b	Texas Parks and Wildlife performed a UAA and determined that DO may not be a suitable measure of aquatic life in tidally influenced systems. TCEQ Standards Team currently reviewing data to address.
				bacteria	nonpoint sources	2006	5a	Increased the number of sites monitored

Category 5a - A TMDL is underway, scheduled, or will be scheduled.

Category 5b - A review of the water quality standards for this water body will be conducted before a TMDL is scheduled.

Category 5c - Additional data and information will be collected before a TMDL is scheduled.

Each impaired segment discussed in this document is organized numerically by segment number and labeled with tab dividers. The following headings are included in each section:

- Segment description – Describes the segment (geographic unit for assigning water quality standards and for applying water quality management programs), assessment unit (AU) boundaries in each segment, currently monitored sites and the site(s) that yielded the impairment.
- Land use – A description of the land surrounding the impaired segment based on aerial imagery and knowledge of the area. It includes cities, agricultural lands, permitted discharges and animal feeding operations
- Impairment description – Identifies why the water body is listed and when it first appeared on the 303(d) List. It includes number of samples, parameter(s) of concern or impairment, assessment results and the appropriate state standard for comparison.
- Potential causes of impairment – Identifies possible causes of the impairment based on land use, communication with monitors, agency staff and CRP steering committee members.
- Potential stakeholders – Companies, agencies or organizations who have a vested interest in the impairment and that may serve as a stakeholder.
- Actions taken – Identifies actions taken by TCEQ or CRP partners since the water body was first listed on the 303(d) List.
- Recommendations – Proposed next step based on potential causes of impairment, number of years on the 303(d) List, quality and amount of water quality data and knowledge of the site.
- Maps – Include Google Earth aerial images beginning at the watershed level and drilling down to the monitoring site level. Maps define segments and other boundaries, monitoring sites, permitted discharges and animal feeding operations.
- Images – Photographic images of the monitoring site where the impairment was identified.

Acronyms

ALU – Aquatic Life Use

AU - Assessment Unit

BMP - Best Management Practices

CAFO - Concentrated Animal Feeding Operation

CFU - Colony Forming Units

COA – City of Austin

CRMWD - Colorado River Municipal Water District

CRP - Clean Rivers Program

CRWN - Colorado River Watch Network

DO – Dissolved Oxygen

EPA - Environmental Protection Agency

GIS - Geographic Information System

LCRA - Lower Colorado River Authority

mg/L - milligrams per liter (parts per million)

MGD - Million Gallons per Day

MPN - Most Probable Number

NPS - Nonpoint-Source Pollution

ppm - parts per million

QAPP - Quality Assurance Project Plan

RRC - Railroad Commission of Texas

RUAA – Recreational Use Attainability Analysis

RWA - Receiving Water Assessments

SWCD - Soil and Water Conservation District

SWQM – Surface Water Quality Monitoring

TCEQ - Texas Commission on Environmental Quality

TDA - Texas Department of Agriculture

TDS - Total Dissolved Solids

TMDL - Total Maximum Daily Load

TPWD - Texas Parks and Wildlife Department

TSWQS – Texas Surface Water Quality Standards

UAA - Use Attainability Analysis

UCRA - Upper Colorado River Authority

USDA - United States Department of Agriculture

USGS - U.S. Geological Survey

WAP – Watershed Action Planning

WPP - Watershed Protection Plan

WWTP - Wastewater Treatment Plant

Segment Description

The Caney Creek watershed is typical of Texas' coastal prairies; flat with dark, loamy clay soils. The watershed is approximately 476 square miles and consists of tidally-influenced and freshwater streams.

Segment 1304 – the tidally influenced portion - begins at the creek's confluence with the Intracoastal Waterway and ends just upstream of its confluence with Linnville Bayou (Fig 1). The segment is 32 miles long. It is a slow flowing, meandering stream with oxbow scars and sloughs along its riparian corridor.

Segment 1304 was monitored at the following sites during the assessment period:

12148 (AU 01) – Caney Creek at Chambliss Road

12149 (AU 01) – Caney Creek on unnamed road south of Hawkinsville

12151 (AU 02) – Caney Creek 200 Yard downstream of its confluence with Linnville Bayou at FM 521

Segment 1304 is divided into two assessment units. AU 01 was redefined prior to the 2010 assessment to “the downstream end of the segment to the confluence with Dead Slough”; about 23 miles long. AU 02 extends from Dead Slough to the upstream end of the segment.

Land Use

The majority of land in segment 1304 is undeveloped. Some is used for row crop agriculture and ranching. Much of it lays fallow based on aerial imagery. A gravel pit with hydrologic connection to the creek is located just upstream of site 12149. In the lower end of the segment, subdivisions line the banks of the creek near East Matagorda Bay below the community of Sargent.

The Conoco-Phillips Refinery is located on Linnville Bayou near Sweeney. Linnville Bayou (and Caney Creek below Linnville Bayou) historically received up to five MGD of treated wastewater effluent from the plant. In 2005 the facility relocated its WWTP discharge to the Brazos River basin.

Impairment Description

Based on data from Site 12148, Segment 1304 was first listed for not supporting contact recreation in 2006. The trend continued as the Draft 2010 303(d) List showed 67 sampling events yielded a geometric mean of 54 MPN *Enterococcus* colonies, well over the criteria of 35 MPN and similar to historical values. The single sample criterion was

also exceeded as 21 of the 67 data points (31%) assessed were over 89 MPN. Segment 1304 is a category 5c, meaning more information will be collected before a TMDL or other water quality measures are implemented.

In addition to the bacteria impairment, the Draft 2010 Integrated Report showed a concern for depressed dissolved oxygen at Site 12148 in AU 01 and a concern for *Enterococcus* at Site 12151 in AU 02.

Potential Causes of Impairment

Nonpoint Sources

On-site Sewage Facilities

Houses line both sides of the creek at the lower end of the segment, near Site 12148. The town of Sargent, which has historically consisted of vacation homes, has experienced an increase in permanent residents in recent years. According to local residents, many homes located in the floodplain use septic systems.

Agriculture

Direct influence of agriculture on water quality is unknown, but worth further investigation. With average annual precipitation in the area being 54 inches, runoff from agricultural land potentially contributes to high bacteria levels.

Criterion

Prior to 2006, fecal coliform was the primary indicator of bacteria in tidal water bodies. The 2006 Integrated Report was the first time TCEQ performed a full assessment using *Enterococcus* as the indicator for contact recreation standards attainment. Of the 23 tidally-influenced water bodies listed for bacteria since 1996, 39% occurred in 2006, with another 22% occurring in 2010 (2008 was a targeted assessment in which data for unlisted water bodies was not considered). This includes three tidally influenced segments (1304, 1401 and 1501) monitored by LCRA. This sudden increase in coastal water impairment may be due to the use of *Enterococcus* or the method of analysis; either way, it is worth investigating.

Potential Stakeholders:

- Caney Creek Conservation Foundation
- Home owners associations located along the creek
- Landowners
- Matagorda County
- Natural Resource Conservation Service
- Sargent Chamber of Commerce

Texas AgriLife Extension
Texas State Soil and Water Conservation Board
Texas Department of Agriculture
Texas Parks and Wildlife Department
US Fish and Wildlife Service

Actions taken

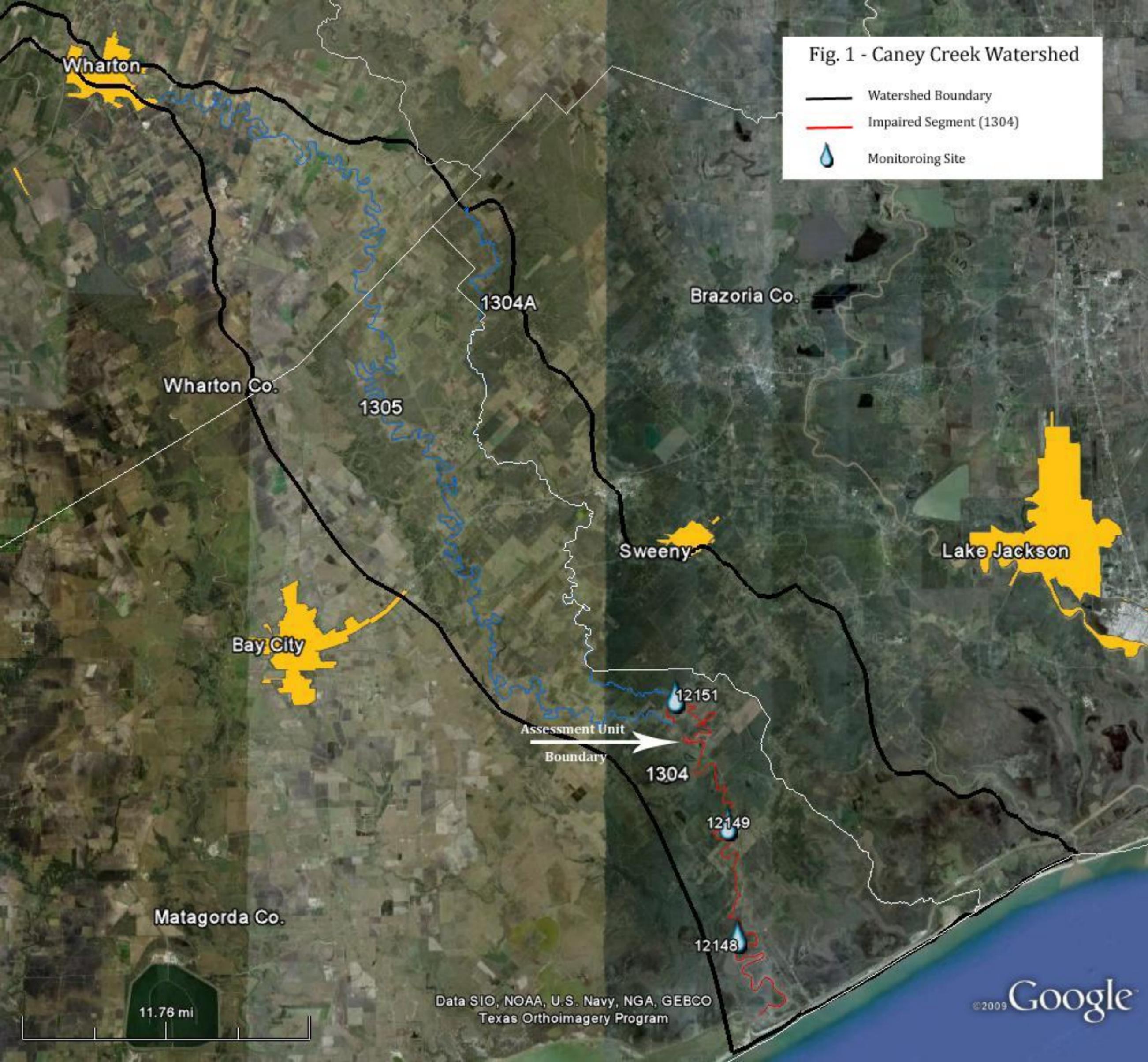
To help isolate potential sources of bacteria, LCRA began monitoring at Site 12149 in 2009. Initial monitoring of the new site, which is eight miles upstream of Site 12128, yielded bacteria values within state criteria.

Recommendations:

Continue monitoring at sites 12148 and 12149.
Determine if there is local interest in a WPP and communicate results to TCEQ and Texas State Soil and Water Conservation Board.
Continue communication with TCEQ and suggest a special study to evaluate current EPA-approved *Enterococcus* methods and 35 MPN criteria.

Fig. 1 - Caney Creek Watershed

- Watershed Boundary
- Impaired Segment (1304)
- 💧 Monitoring Site



Wharton Co.

Brazoria Co.

Matagorda Co.

Wharton

Bay City

Sweeny

Lake Jackson

1304A

1305

1304

12151

12149

12148

Assessment Unit
Boundary

11.76 mi

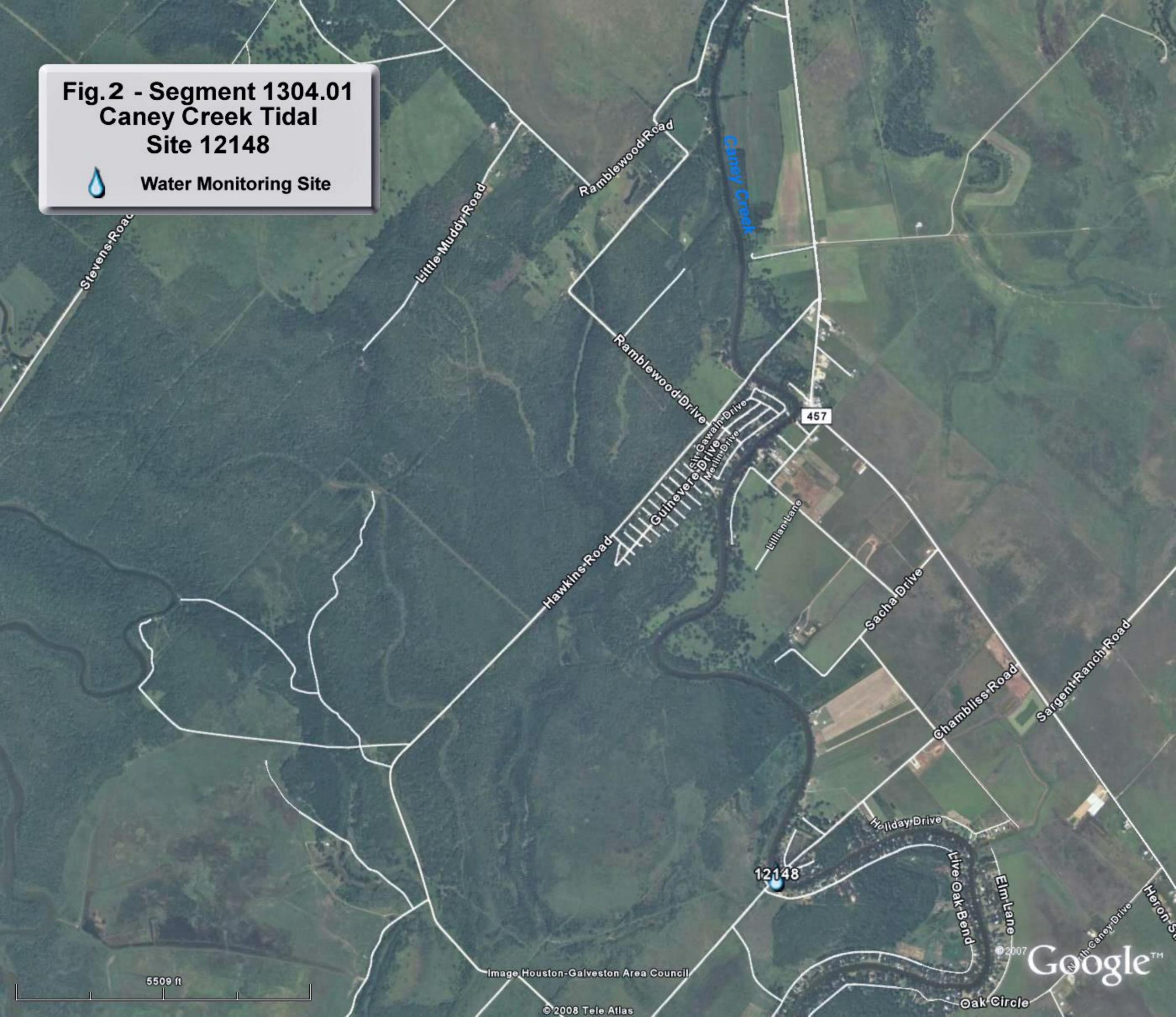
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Texas Orthoimagery Program

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**Fig.2 - Segment 1304.01
Caney Creek Tidal
Site 12148**



Water Monitoring Site



5509 ft

Image Houston-Galveston Area Council

© 2008 Tele Atlas

© 2007

Google™

**Fig. 3 - Segment 1304
Caney Creek Tidal**

Site 12148



Segment 1304A: Linnville Bayou

Impairment: Bacteria

Segment Description

Linnville Bayou is a freshwater tributary of Caney Creek. The Linnville Bayou watershed is approximately 111 square miles and is typical of Texas' coastal prairies; flat with dark loamy clay soils. It begins just above the confluence with Caney Creek in Matagorda County up to a point 1.1 km above SH 35 (Fig 3). TSWQS Appendix D defines the stream as intermittent with perennial pools.

During the period of record, TCEQ Region 12 monitored Segment 1304A at Site 12141 (Linnville Bayou at FM 324)

Land Use

Aerial imagery shows that much of the riparian vegetation has been cleared. The land is primarily used for row crop agriculture and ranching.

There is very little development in the watershed and houses near the stream are sparse. The City of Wharton is in the headwaters, far upstream of the monitoring site. Conoco-Phillips operates a refinery near Sweeney, Texas on the edge of the watershed. Linnville Bayou historically received up to five MGD of treated industrial wastewater effluent per day. Flow in Linnville Bayou decreased in 2005 when the refinery's wastewater primary outfall was removed from the stream. Water samples collected since the removal of the discharge (2005-2007) do not indicate a significant change in bacteria levels with the decreased flow.

According to TCEQ permit documents, Little Linnville Bayou receives storm water from the refinery. But there's no hydrologic connection between Little Linnville Bayou and Site 12141 where the bacteria impairment was found.

Impairment Description

Linnville Bayou was first listed in 2010 for not supporting contact recreation. The Draft 2010 303(d) List showed 23 sampling events yielded a geometric mean of 154 MPN of *E.coli*, over the criteria of 126. The 2010 Integrated Report places it in Category 5b, meaning a review of water quality standards will take place before a TMDL or other water quality improvement project is implemented.

Potential Causes of Impairment

Nonpoint Sources

Direct influence of agriculture on water quality is unknown, but worth further investigation. With average annual precipitation in the area being 54 inches, runoff from agricultural land potentially contributes to high bacteria levels.

Wildlife should also be considered a potential source of bacteria as well.

Point Sources

None. Conoco Phillips Refinery discharged treated industrial wastewater until 2005, for the first four years of the assessment period.

Actions Taken:

- TCEQ Region 12 collected the listing data from Site 12141 between 2001 and 2007. The Region plans to resume monitoring the site in 2011.

Potential Stakeholders:

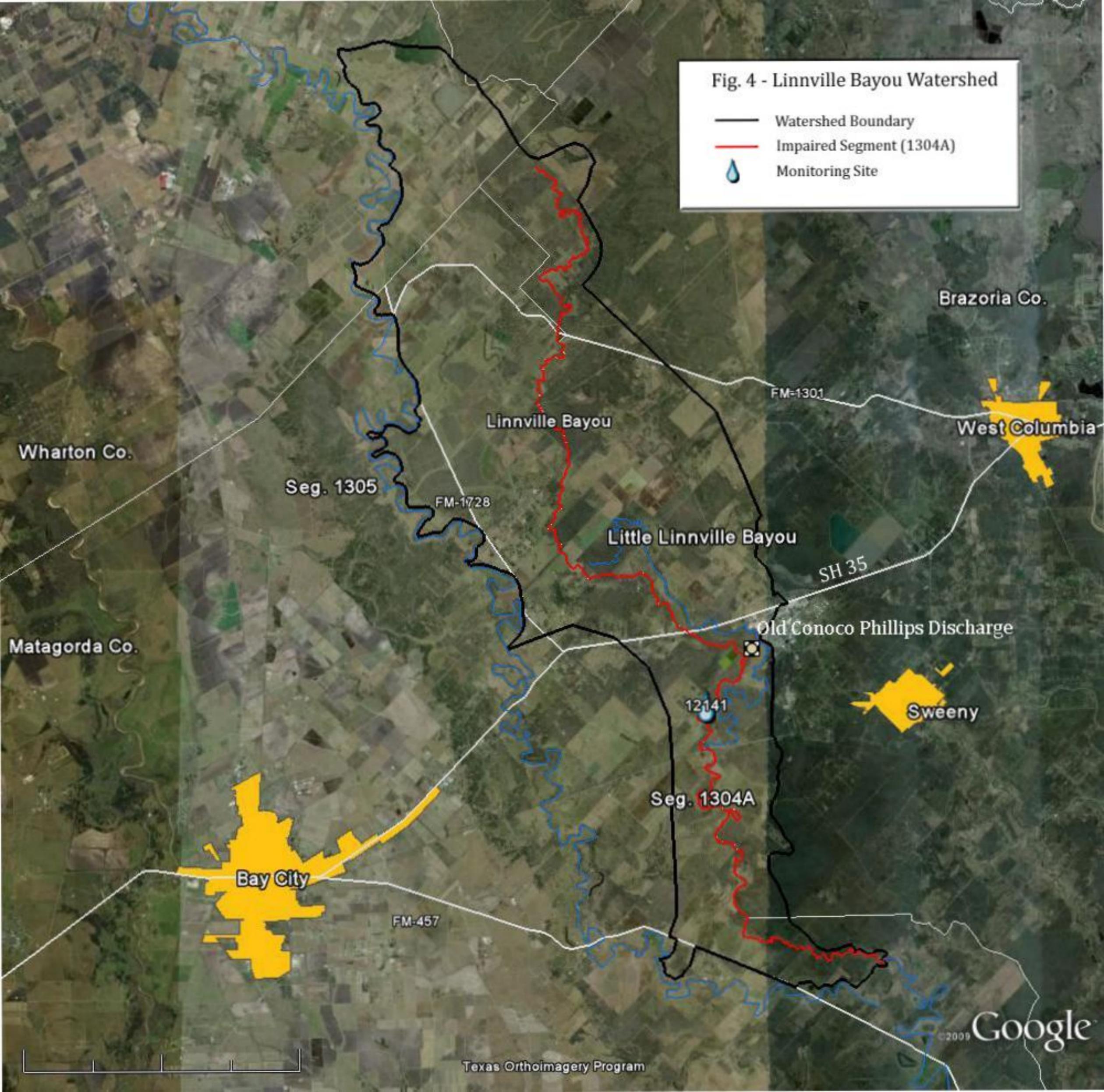
Texas AgriLife Extension
Conoco Phillips
Landowners
Matagorda County
Natural Resource Conservation Service
Sargent Chamber of Commerce
Texas State Soil and Water Conservation Board
Texas Department of Agriculture
Texas Parks and Wildlife Department
US Fish and Wildlife Service

Recommendations:

Continue to monitor at Site 12141
Work with TCEQ to determine if an RUAA is appropriate
Communicate the issue with CRP steering committee members to seek local input on project potential.

Fig. 4 - Linnville Bayou Watershed

- Watershed Boundary
- Impaired Segment (1304A)
- Monitoring Site



Brazoria Co.

West Columbia

Wharton Co.

Seg. 1305

FM-1728

Linnville Bayou

FM-1301

Little Linnville Bayou

SH 35

Old Conoco Phillips Discharge

12141

Sweeny

Seg. 1304A

Bay City

FM-457

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Texas Orthoimagery Program

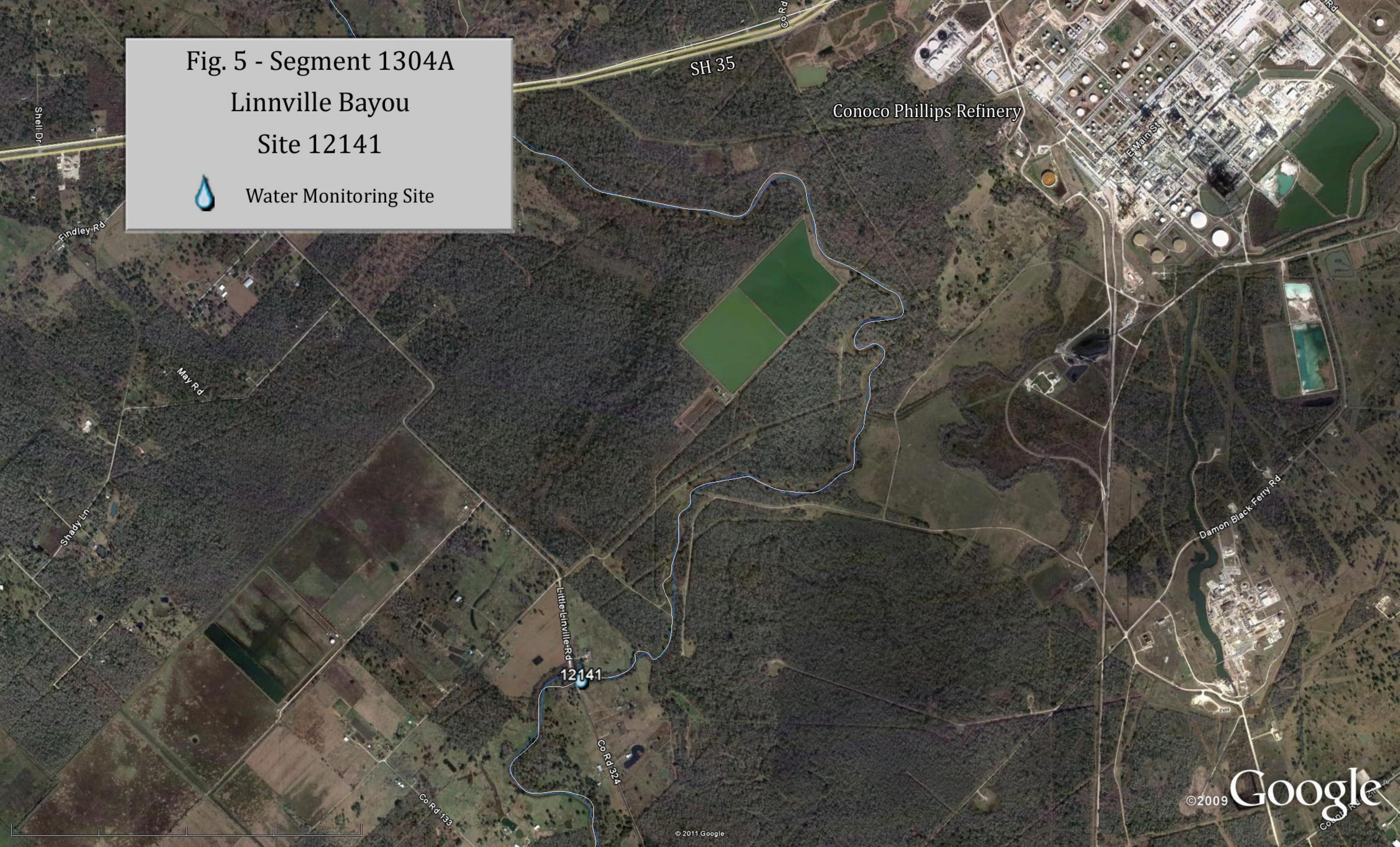
Fig. 5 - Segment 1304A

Linnville Bayou

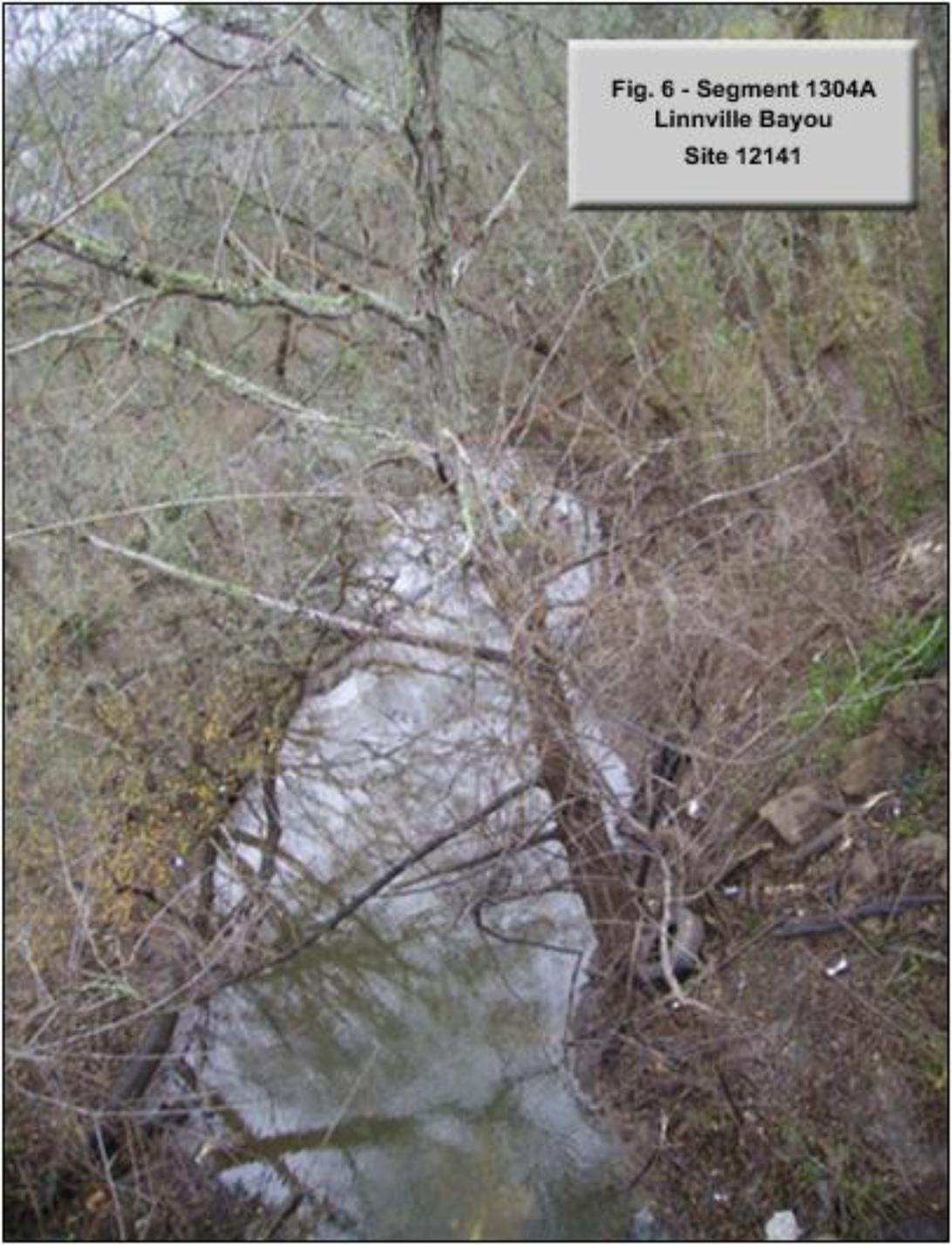
Site 12141



Water Monitoring Site



**Fig. 6 - Segment 1304A
Linnville Bayou
Site 12141**



Segment 1305: Caney Creek above Tidal

**Impairment: Bacteria
and Dissolved oxygen**

Segment Description

Segment 1305 begins from a point just upstream of the confluence with Linnville Bayou up to its headwaters near Old Caney Road in Wharton County (Fig 5). The segment is approximately 98 miles long. It is defined as perennial in Appendix A of the TSWQS. For the 2010 Assessment, the three AUs were redefined to include more specific geographic descriptions. They are

1305_1 - From the downstream end of the segment to the confluence with Hardeman Slough

1305_2 - From the confluence with Hardeman Slough to the confluence with Snead Slough

1305_3 - From the confluence with Snead Slough to the upper end of segment

During the period of record TCEQ Region 12 and LCRA monitored the segment at three sites. Site 20488 was added in 2010:

12151 – Caney Creek at FM 521 (AU 01)

12154 – Caney Creek at SH 35 (AU 02)

17498 – Caney Creek on Runnels Pierce Ranch (AU 03)

20468 – Caney Creek at Hill Road south of Pledger, Texas (AU 03)

Land Use

Based on aerial imagery, the majority of the land in the segment is farmed or ranched. There are two permitted dischargers at the upper end of AU 1305_03; Boling Municipal Water District, and Wharton County Power. Maxim Egg Farm is a permitted facility that does not discharge into a stream, but applies chicken manure to land in the area.

Impairment Description

Segment 1305 is on the Draft 2010 303(d) List for not supporting its designated aquatic life use and contact recreation. The segment was first listed for not meeting a high aquatic life use in 1999 based on dissolved oxygen grab samples and for not meeting contact recreation in 2002. Table 4 describes impairments and concerns by AU.

Table 4. Water quality impairments and concerns in Segment 1305

AU	Concern	Impairment
1305.02	Dissolved oxygen and orthophosphorus	Dissolved oxygen and bacteria
1305.03	Dissolved oxygen, orthophosphorus and total phosphorus	Dissolved oxygen

Dissolved Oxygen

The limited amount of 24-hour dissolved oxygen data collected from both AUs since the initial listing continues to show impairment. Based on the 24-hour average, dissolved oxygen levels did not meet screening levels for 4 of 9 samples (44%) assessed, and 13 out of 30 grab samples (43%) were below screening levels triggering a concern for aquatic life use.

Based on the results of a Use Attainability Analysis performed by TCEQ, site specific criteria (TSWQS, Appendix D) were assigned to the upper end of the segment (including AUs 02 and 03) during the 2010 TCEQ Standards Review. The new standards were not approved by EPA at the time of the 2010 assessment, however. If the 2010 standards are approved by EPA, seasonally lower DO criteria will be allowed (see actions taken) and it is likely the segment will meet its aquatic life use when assessed in 2012.

Bacteria

According to the 2010 303(d) List, bacteria data in Segment 1305_02 revealed a geometric mean of 156 MPN for 28 samples of *E.coli*, exceeding the criterion of 126 MPN. The bacteria impairment is currently classified as 5b, meaning TCEQ plans a review of contact recreation standards. A report on a Recreational Use Attainability Analysis is pending (see Actions Taken).

Potential Causes of Impairment

Nonpoint Sources

Caney Creek has a low gradient. It is a meandering creek with oxbow lakes and natural dams that decrease flow and create pools of stagnant water. The lack of aeration coupled with the breakdown of naturally occurring organics in the water may cause dissolved oxygen levels in the creek to frequently fall below the state standard of 5.0 mg/L.

Deer, feral hog and bird populations likely contribute to bacteria levels in the creek. Further study would need to occur before determining the extent of bacteria from wildlife sources. Agricultural practices such as plowing to the creek bank or watering cattle in-stream contribute to low dissolved oxygen and elevated bacteria levels.

Actions Taken:

- Caney Creek UAA performed by TCEQ – From 2003 to 2005, TCEQ performed a Use Attainability Analysis (UAA) on Segment 1305 to assess the aquatic life use and determine if the dissolved oxygen standard of 5.0 mg/L was appropriate. TCEQ found that a high aquatic life use criteria was met when measured by fish and bug collections. Analysis of the dissolved oxygen data did not show such clear results. Appendix D of the Draft 2010 TSWQS recommended site specific DO criteria for portions of the creek.
In 2008 TCEQ Region 12 began monitoring 24 hour DO from Site 12154
In 2010, TCEQ Region 12 began monitoring at site 20468 upstream of the listed site
- TCEQ contracted with University of Houston at Clear Lake to perform a RUAA on Segment 1305. Results of the study were not available at print time.

Potential Stakeholders:

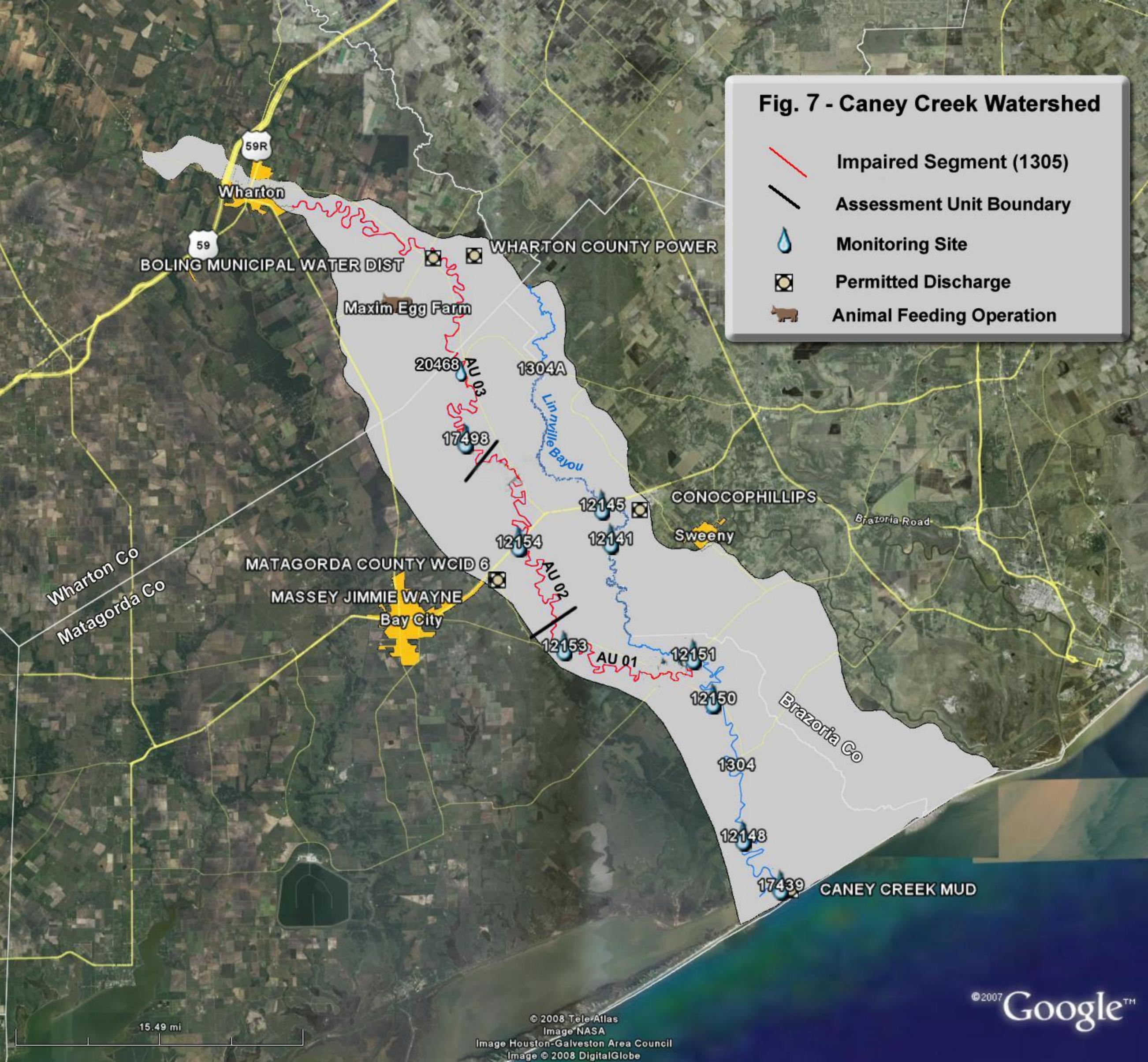
Texas AgriLife Extension
Landowners
Natural Resource Conservation Service
Texas Department of Agriculture
Texas State Soil and Water Conservation Board
Texas Parks and Wildlife Department
US Fish and Wildlife Service

Recommendations:

New seasonally-based standards aquatic life use are pending. Continue to collect data to determine if new standards are met.

Fig. 7 - Caney Creek Watershed

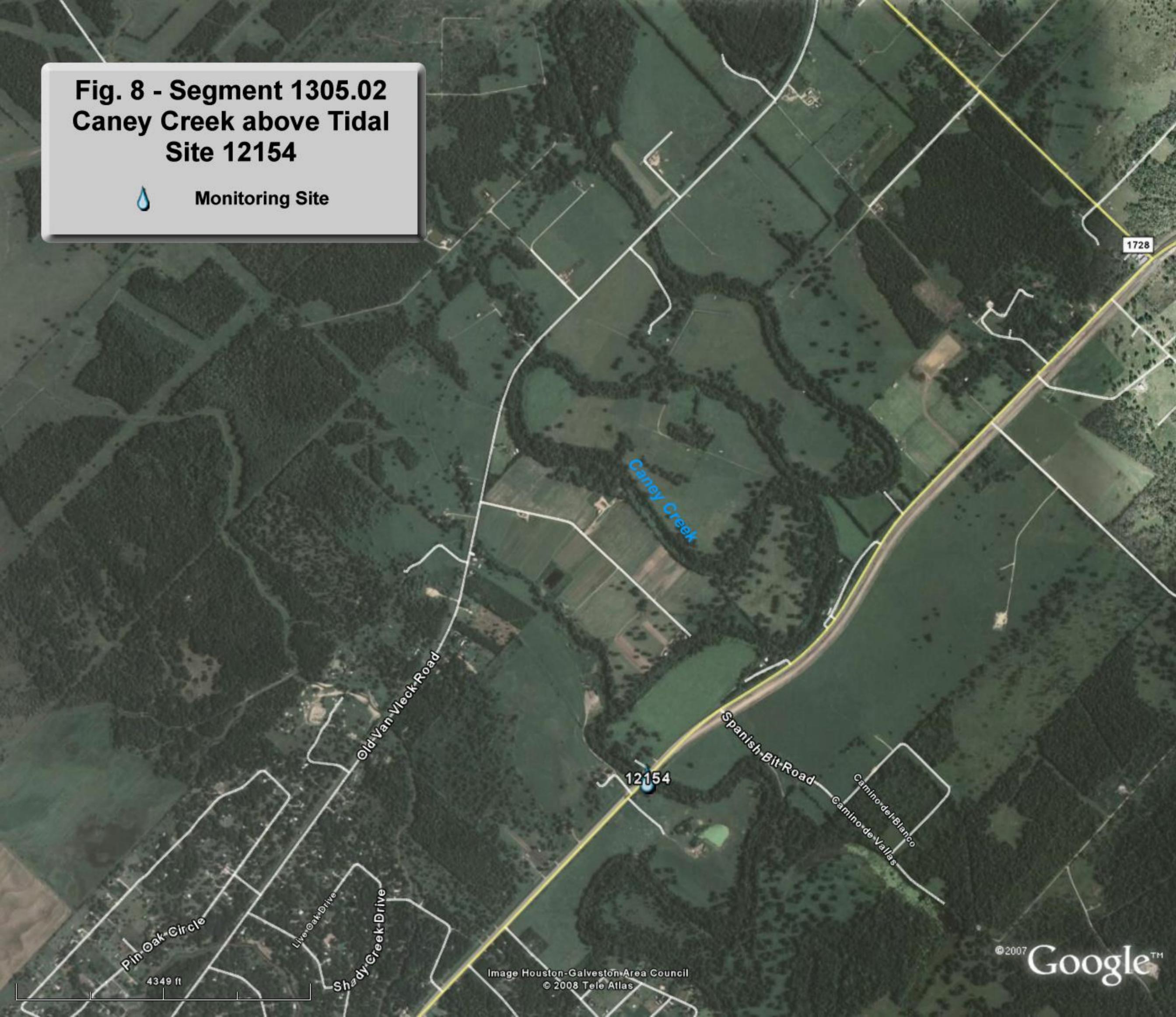
-  Impaired Segment (1305)
-  Assessment Unit Boundary
-  Monitoring Site
-  Permitted Discharge
-  Animal Feeding Operation



**Fig. 8 - Segment 1305.02
Caney Creek above Tidal
Site 12154**



Monitoring Site



**Fig. 9 - Segment 1305.02
Caney Creek Site 12154**



**Fig. 10 Segment 1305.03
Caney Creek above Tidal
Site 17498**



Monitoring Site

Caney Creek

17498



2755 ft

**Fig. 11 - Segment 1305.03
Caney Creek above Tidal
Site 17498**



Segment 1401: Colorado River Tidal

Impairment: Bacteria

Segment Description

Segment 1401 begins from the confluence with the Gulf of Mexico up to a point just downstream of the Missouri-Pacific Railroad in Matagorda County (Fig. 8). The segment is approximately 27 miles long and is monitored at one site:

12281 – Colorado River at Selkirk Island

The segment is composed of one AU, 1401_01. Data responsible for the listing are from Site 12281 and have been collected from the site since 1982.

Land Use

Based on aerial imagery, Segment 1401 watershed is rural. Much of the land along the river is farmed. Immediately upstream of the monitoring site, vegetated buffers are maintained along the east bank of the river, but much of the west bank above the monitoring site does not contain a riparian buffer strip.

There are no urban developments in Segment 1401. A small subdivision is located along the river at the monitoring site. The houses appear to have been built in the 1960s and 1970's and presumably use septic systems.

Two permitted discharges are located upstream of the monitoring site. Oxea Corporation, a maker of solvents, has a permit to discharge 2.28 MGD of treated domestic wastewater and process water. The discharge is located eight miles upstream of the monitoring site. The other permit belongs to Equistar Chemical plant, a producer of polymers and plastics. Equistar has a permit to discharge 0.65 MGD of treated domestic wastewater and process water and is located two miles upstream of the monitoring site.

The South Texas Nuclear Power Plant discharges storm water and water from a reservoir embankment protection system from a point just upstream of Site 12281. The facility does not discharge treated wastewater effluent into the Colorado River.

Impairment Description

Segment 1401 was first placed on the 2006 303(d) List as not supporting contact recreation based on elevated levels of *Enterococcus* bacteria. It remained on the Draft 2010 List with 15 out of 40 (38%) grab samples exceeding the single sample criterion of

89. The geometric mean of 40 samples was 55 MPN, exceeding the criteria of 35. All samples were collected between December 31, 2001 and November 30, 2008

In 2008, Segment 1401 was assigned Category 5c, meaning more data should be collected before a water quality project is implemented.

The Draft 2010 Integrated Report also identified a concern for nitrates based on data from Site 12281. Seventeen of 42 (40%) samples exceeded the screening level of 1.1 mg/L.

Potential Causes of Impairment at Site 12281

Point Sources

Equistar Chemicals, Oxea Corporation and South Texas Nuclear Power Plant (stormwater) discharge into the river upstream of the sampling point.

Nonpoint Sources

On-site sewage facilities – Septic systems located just upstream of the monitoring site may leech into the river.

Agriculture - Based on aerial imagery, there is little agricultural activity along the river for two miles upstream of Site 12281, but it is difficult to rule out the influence of agriculture on this impairment based on limited available data.

Wildlife –Deer, feral hog and domestic livestock may contribute bacteria in the segment (Fig. 7).

Influences of Flow

Since Segment 1401 is influenced by tides, flow is not measured at Site 12281. The influence of the tide and pulsed releases from upstream dams play a role in how bacteria are transported, but further study is necessary to determine how flow influences bacteria at this site.

Criterion

Prior to 2006, fecal coliform was the primary indicator of bacteria in tidal water bodies. The 2006 Integrated Report was the first time TCEQ performed a full assessment using *Enterococcus* as the indicator for contact recreation standards attainment. Of the 23

tidally-influenced water bodies listed for bacteria since 1996, 39% occurred in 2006, with another 22% occurring in 2010 (2008 was a targeted assessment in which data for unlisted water bodies was not considered). This includes three tidally influenced segments (1304, 1401 and 1501) monitored by LCRA. This sudden increase in coastal water impairment may be due to the use of *Enterococcus* or the method of analysis; either way, it is worth investigating.

Actions Taken:

Continued monitoring
Discussed by Clean Rivers Steering Committee with no decisive recommendations

Potential Stakeholders:

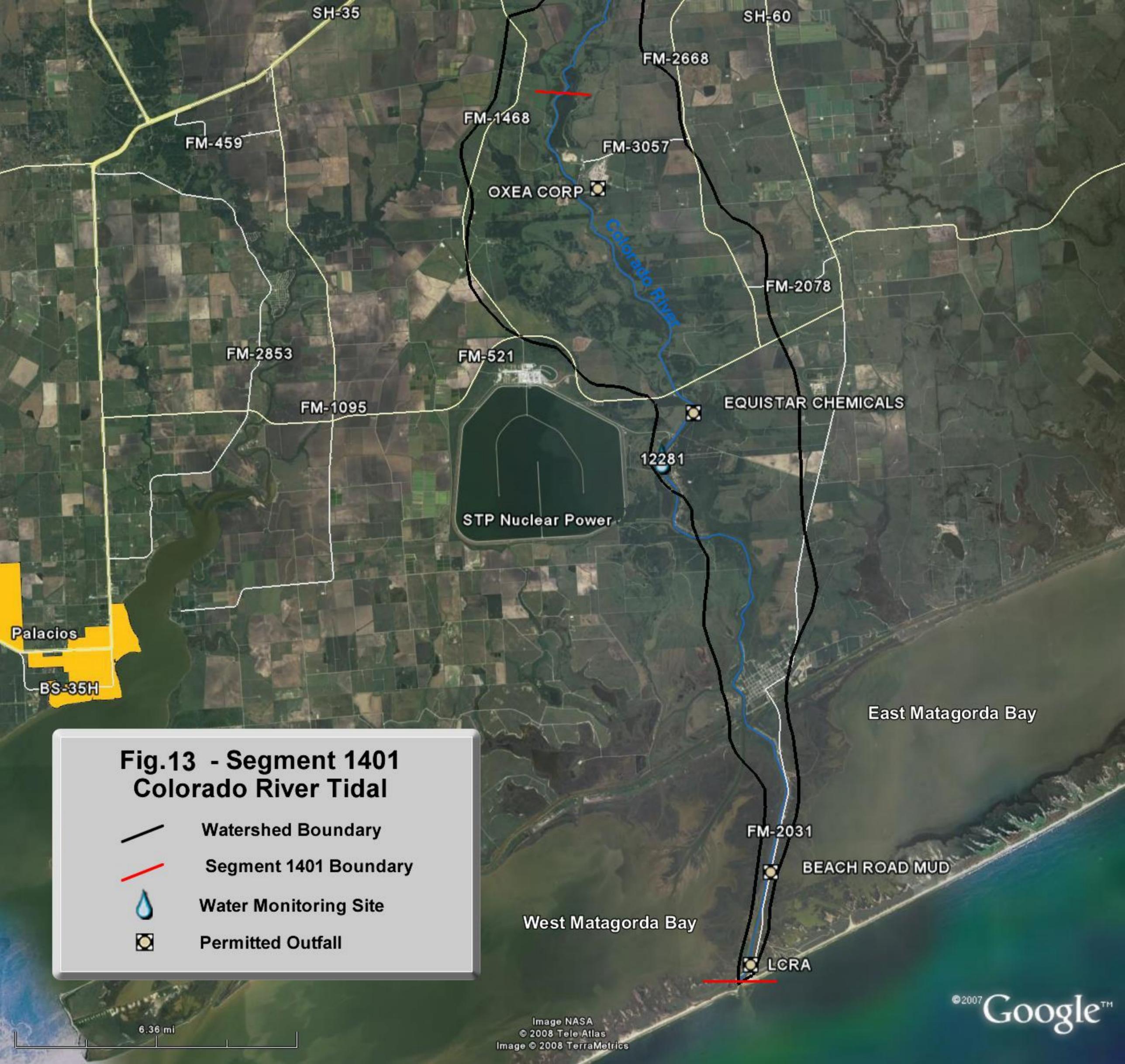
Equistar Chemicals
Matagorda County
Oxea Corporation
Property owners and homeowners associations
South Texas Nuclear Power Plant

Recommendation:

Continue communication with TCEQ to evaluate current EPA-approved *Enterococcus* methods and 35 MPN criteria.
Communicate with TCEQ and Texas State Soil and Water Conservation Board about potential for a WPP.



Fig. 12 - Feral Hogs on segment 1401 near Matagorda, Texas (Photo: Brian Koch)



**Fig.13 - Segment 1401
Colorado River Tidal**

-  Watershed Boundary
-  Segment 1401 Boundary
-  Water Monitoring Site
-  Permitted Outfall

6.36 mi

**Fig. 14 - Segment 1401
Colorado River Tidal**

-  Watershed Boundary
-  Water Monitoring Site
-  Permitted Outfall



FM-1468

OXEA CORP

Colorado River

FM-521

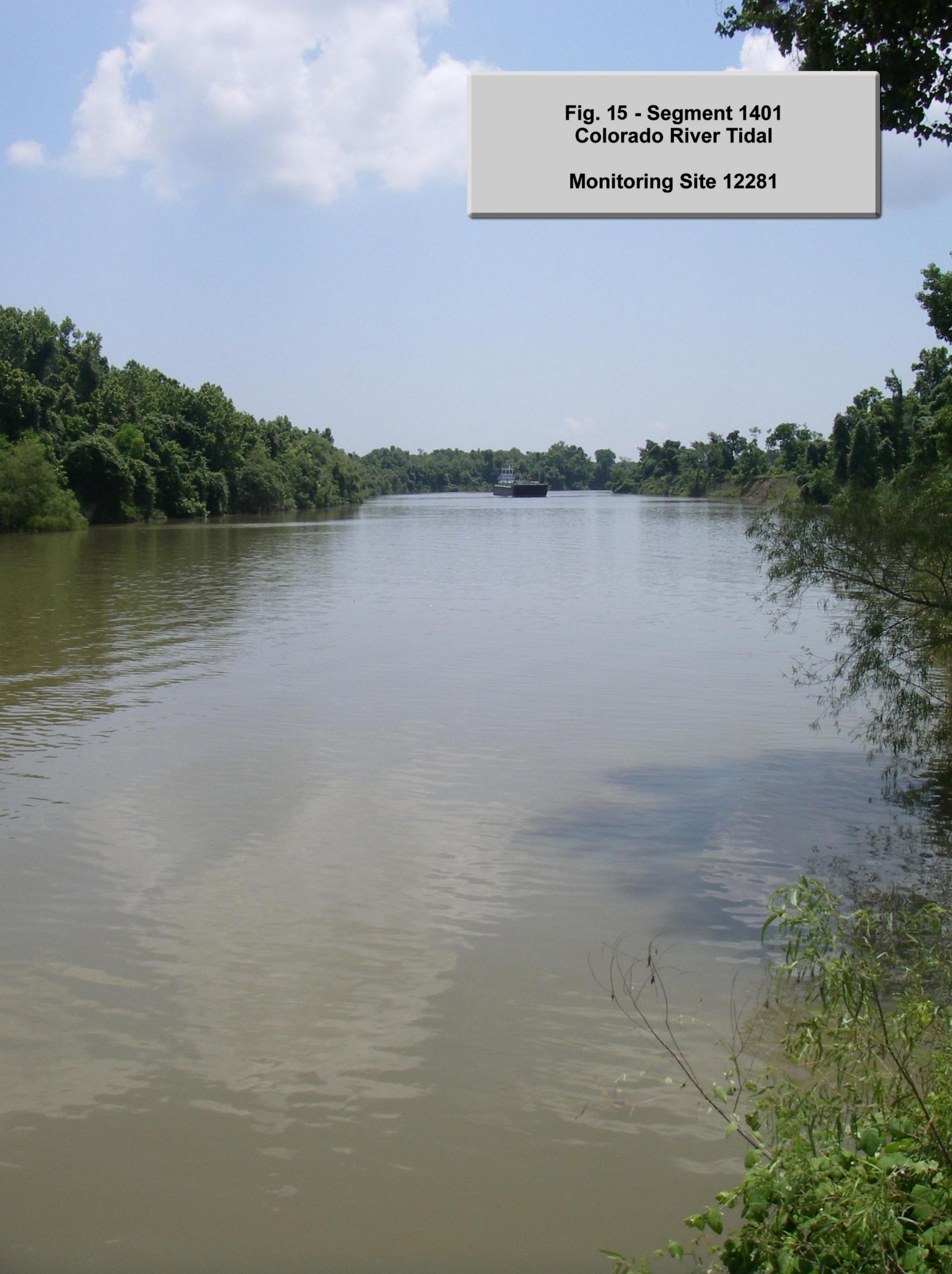
South Texas Nuclear Power Plant

EQUSTAR CHEMICALS

12281

2.81 mi

**Fig. 15 - Segment 1401
Colorado River Tidal
Monitoring Site 12281**



Segment Description

The Buckners Creek watershed is approximately 176 square miles located on the south side of the Colorado River near La Grange, Texas (Fig 16). Segment 1402C begins at the confluence with the Colorado River and ends at the headwaters near Rosanky in Bastrop County. The stream is approximately 26 miles long with many tributaries that contribute flow. It is a perennial stream according to TSWQS Appendix D. It consists of one assessment unit. During the period of record it was monitored at one site by TCEQ Region 11 in Austin:

16160 – Buckners Creek approximately 200 feet upstream of Fayette County Road 154

Land Use

The Buckners Creek watershed is rural. Based on aerial imagery, the majority of the watershed has been cleared, but land along the riparian area surrounding the creek remains intermittently intact; particularly in the upper end of the watershed.

There are two land application permits in the watershed; neither is upstream nor would have any influence on water quality at the sampling point.

Impairment Description

Buckners Creek is designated as high aquatic life in TSWQS Appendix D. It was first placed on the 2010 303(d) List for not supporting its designated aquatic life use based on 24-hour DO average and minimum. Of the seven monitoring events performed by TCEQ between December 2001 and November 2008, four exceeded the minimum criteria of 3 mg/L and three exceeded the average criterion of 5 mg/L DO.

Buckners Creek is in category 5c, meaning more information is needed before a TMDL or other water quality project is implemented.

Potential Causes of Impairment

Nonpoint Sources

Decomposition of organic matter is a likely cause of low DO in the stream. However further study is necessary to isolate potential sources.

Actions Taken:

No action to date

Potential Stakeholders:

- Texas AgriLife Extension
- Landowners
- Natural Resource Conservation Service
Texas Department of Agriculture
Texas State Soil and Water Conservation Board

Recommendation:

Collect 24-hour data from site 16160

Perform reconnaissance on the creek to help determine potential causes of low dissolved oxygen

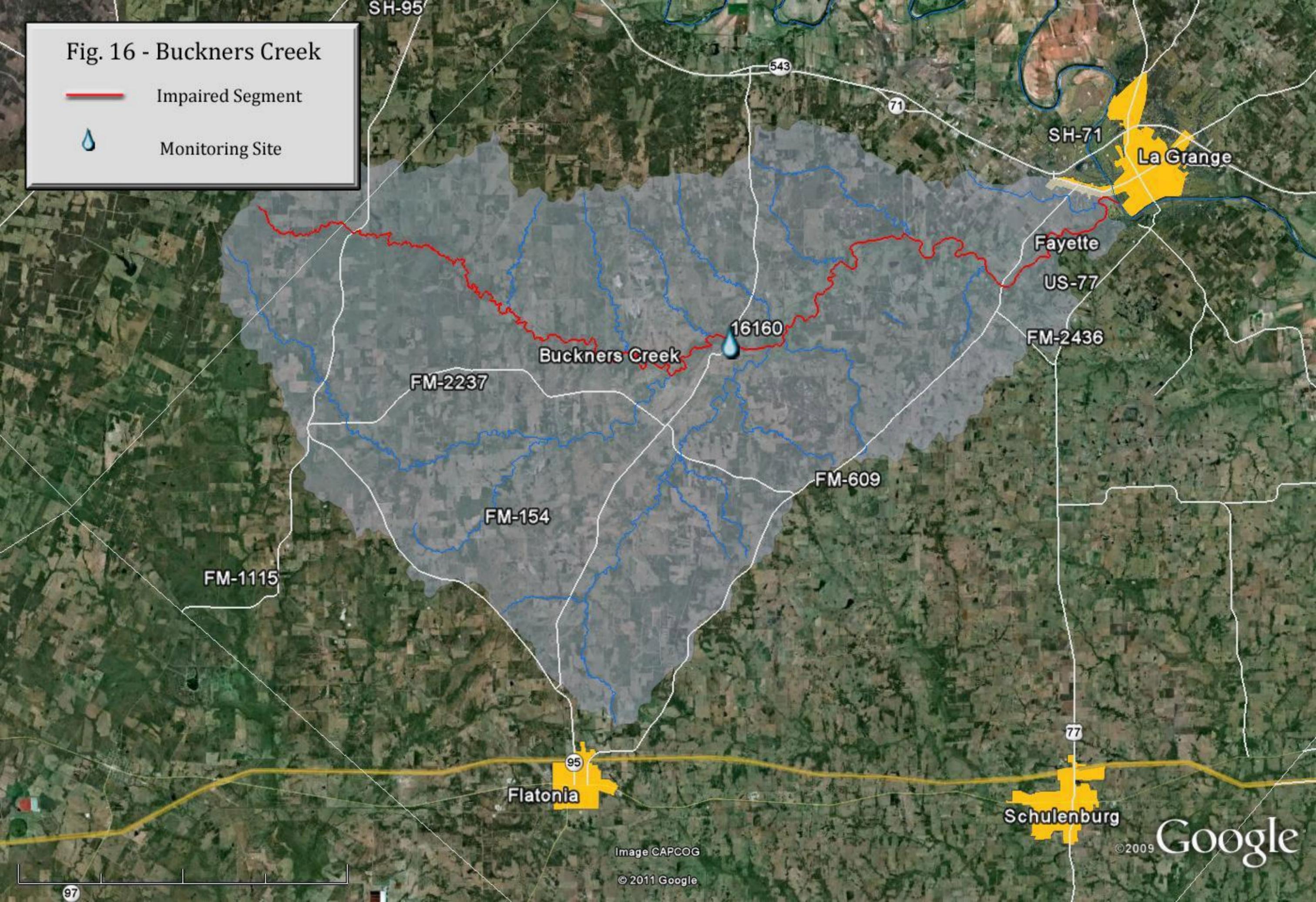
Communicate with TCEQ and Texas Soil and Water Conservation Board to determine the potential for a WPP.

Fig. 16 - Buckners Creek

Impaired Segment



Monitoring Site



Davis Rd

Fig. 17 - Segment 1402C
Buckners Creek
Site 16160

16160

N Farm to Market Rd 154





**Fig. 18 - Segment 1402C
Buckners Creek
Site 16160**

Segment 1402H: Skull Creek

**Impairment: Low Dissolved
Oxygen and Bacteria**

Segment Description

The Skull Creek watershed is approximately 112 square miles located on the south side of the Colorado River near Columbus, Texas (Fig 19). Segment 1402H begins at its confluence with the Colorado River to the upstream perennial portion southwest of Columbus. The stream is approximately 30 miles long and consists of one assessment unit. It has been routinely monitored at one site by TCEQ Region 12 since 2003:

16805 – Skull Creek at Colorado County Road 16 South of Altair

Land Use

The Skull Creek watershed is rural. Based on aerial imagery, much of the riparian area in the upper part of the watershed has been cleared. Pastures dot the landscape. Some appear to be used for grazing and some for growing row crops. The riparian area in the lower watershed remains intact with the exception of gravel operations located east of the creek's intersection with US 90 and along Dry Branch, a tributary. The mines compose about 7.5 square miles of the watershed just above monitoring Site 16805.

There is one permitted WWTP discharge in the watershed approximately 6 miles upstream of the sampling site. The Rice CISD was recently permitted to discharge 60,000 gallons of treated effluent per day by TCEQ. However, the permit was not issued until 2008, the tail end of the assessment period. So it is unlikely that the small amount of flow is a cause of low DO or elevated bacteria.

Impairment Description

DO

Skull Creek was first placed on the 2008 303(d) List – with limited data - for not supporting its designated aquatic life use based on 24-hour DO average. With the addition of more data, the Draft 2010 Integrated Report showed the stream not meeting its presumed high ALU for 24-hour DO average and minimum. Of the 12 monitoring events performed by TCEQ between December 2001 and November 2008, eight did not meet the average criterion of 5 mg/L DO and three exceeded the minimum criterion of 3 mg/L.

Bacteria

Skull Creek first appeared on the Draft 2010 303(d) List for not supporting contact recreation. The 2010 Integrated Report showed a geometric mean of 140 MPN for 22 samples of *E.coli*, exceeding the criterion of 126 MPN. The bacteria impairment is currently classified as 5b, meaning TCEQ plans a review of standards.

Potential Causes of Impairment

Nonpoint Sources

Decomposition of organic matter coupled with sluggish flow regimes is a likely cause of low DO in the stream. Cattle, deer, feral hog and other wildlife likely contribute bacteria to the creek. Further study is needed to determine sources of pollutants.

Stormwater runoff from gravel operations may influence the stream. According to TCEQ Region 12 staff who monitor at Site 16805, the stream is usually cloudy and may be influenced by gravel mines. Further study is necessary to isolate potential sources and to determine if runoff from gravel mines is a factor in low dissolved oxygen or bacteria levels.

Actions Taken:

TCEQ Region 12 completed ALM that found that the creek supports a diverse aquatic community despite chronic low dissolved oxygen levels and upstream gravel mines affect water clarity. Fish, macroinvertebrate and habitat samples indicate a high aquatic life use.

Potential Stakeholders:

Texas AgriLife Extension
Gravel Operators
Landowners
Natural Resource Conservation Service
Texas Department of Agriculture
Texas State Soil and Water Conservation Board

Recommendation:

Continue to collect data from site 16160.
Add another monitoring site upstream of the gravel mines.
Communicate with TCEQ and Texas Soil and Water Conservation Board to determine the potential for a WPP and RUAA.

Fig. 19 - Skull Creek Watershed

- Watershed Boundary
- Impaired Segment (1402H)
- Monitoring Site

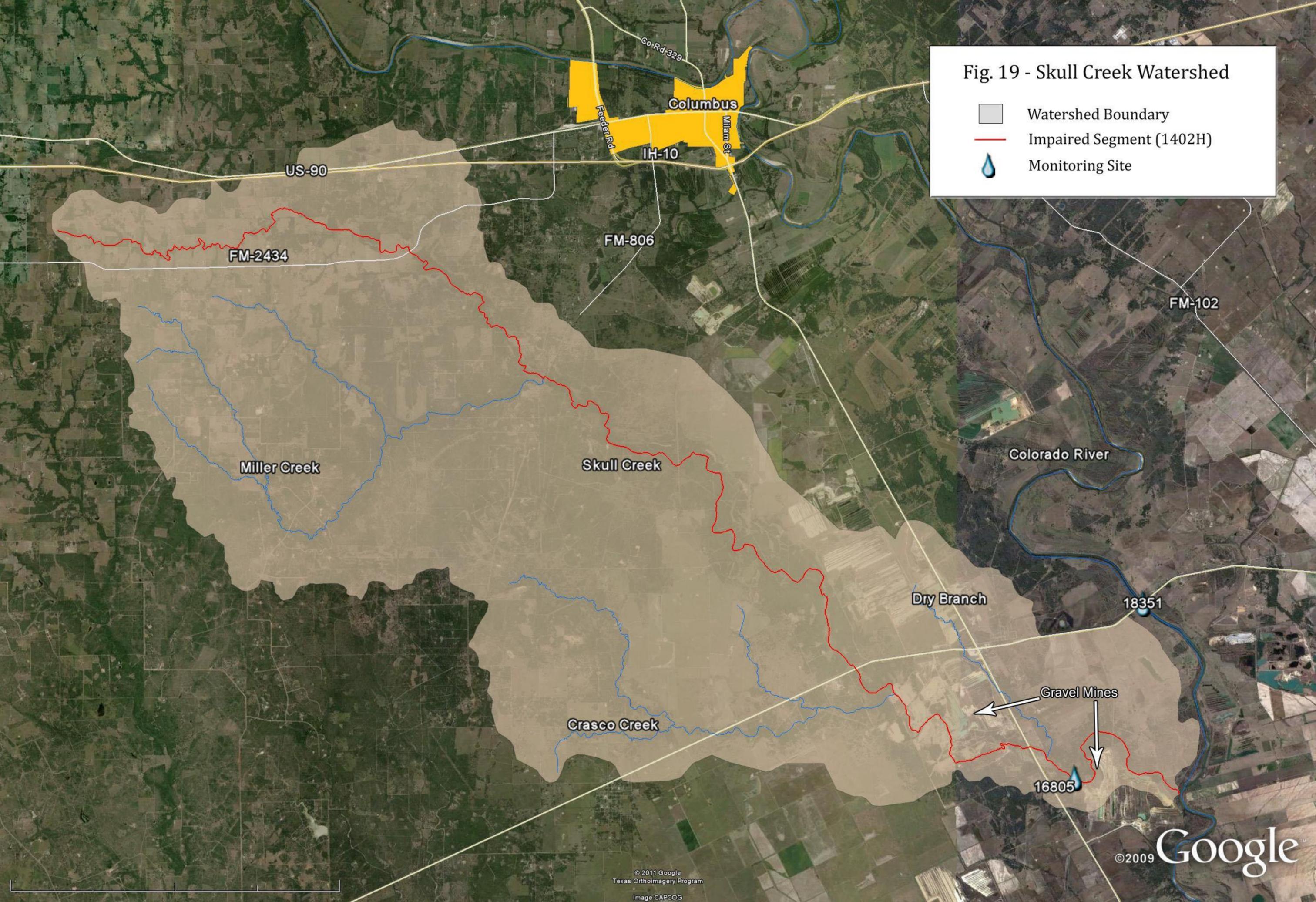


Fig. 20 - Segment 1402H

**Skull Creek
Site 16805**

Dry Branch

16805



**Fig. 21 - Segment 1402H
Skull Creek
Site 16805**



Segment 1403A: Bull Creek
Segment Description

Impairment: Dissolved Oxygen

The Bull Creek watershed is located on the north side of Lake Austin in Austin, Texas (Fig 19). Segment 1403A begins at its confluence with Lake Austin and ends upstream of the perennial portion of the stream near the intersection of RR 2222 and RR 620 (Fig 22). Segment 1403A is approximately 10 miles long and has 5 assessment units. During the period of record, it was monitored by the COA, USGS and LCRA at the following sites

- 12215 – Bull Creek at FM 2222 west of Lakewood Drive in west Austin
- 12216 – Bull Creek at Loop 360 one mile north of FM 2222 intersection
- 12218 – Bull Creek at Spicewood Springs Road fifth crossing
- 16308 – Stillhouse Hollow at Stillhouse Hollow Spring Upstream of Rimrock Drive
- 16309 – Spring in at the Head of an unnamed trib to Bull Creek 300FT west of the intersection of Longpoint Drive and Valley Drive
- 16320 – Unnamed tributary to Bull Creek, 0.26 mile west of Southern Pickfair Drive and Brightling Lane intersection (COA Tributary 6)
- 16321 – Unnamed tributary to Bull Creek, 0.33 mile west of Southern Pickfair Drive and Brightling Lane intersection (COA Tributary 5)
- 16322 – Bull Creek, south of the intersection of Syndham Drive and Corley Drive
- 17468 – West Bull Creek 70 meters west of the intersection of Jester Blvd and RR 2222

The impaired AU, 1403A_05, begins from the Spicewood Springs Rd. crossing near the Oak Grove cemetery upstream to the end of segment. Data responsible for the listing are from Site 16322 (Fig 23), referred to by COA monitoring staff as Bull Creek Tributary 7 at the Franklin Tract. The monitoring site is located with COA Water Quality Protection Lands; preserve lands permanently protected from future development. The stream maintains a population of the threatened Jollyville Plateau salamander (*Eurycea nana*).

Land Use

About 40 percent of the Bull Creek watershed has been developed for residential and commercial uses. The remaining 60 percent, including the area immediately upstream of Segment 1403A_05, remains in a natural state (Fig. 20).

Impairment Description

There was a prior listing on Bull Creek, in AU 04 at (Site 12218) for aquatic life use based on benthic macroinvertebrate data acquired from COA. In 2010, at the request of LCRA and COA, the listing was removed from the 303(d) List based on additional data that indicated support for the ALU. However, 1403A_05 was placed on the 2010 303(d) List for low dissolved oxygen levels. Four of 6 DO collections did not meet the 24-hour average criteria of 5 mg/L. The six events were collected by COA from Site 16322 between June 2005 and September 2008.

Site 16322 is strongly influenced by low DO groundwater spring discharges. Although not submitted for assessment thru the CRP, COA has independently monitored benthic macroinvertebrates at site 16322, collecting 28 samples since 1997. The average qualitative aquatic life use score of those samples is 28, at the upper range of intermediate aquatic life use designation.

Potential Causes of Impairment at Site 16322

Nonpoint Sources

According to COA Water Quality Protection Staff, Site 16322 is strongly influenced by low DO groundwater spring discharges. Nonpoint source impacts from development to groundwater recharge may be a factor, but given that Site 16322 is in the preserve, surface water runoff likely not directly responsible for low dissolved oxygen levels.

Actions Taken:

No actions to date.

Potential Stakeholders:

Bull Creek Foundation
COA
Colorado River Watch Network
Neighborhood Associations
TCEQ SWQM staff
LCRA

Recommendations:

24-hour diel monitoring should resume at Site 16322 in an effort to characterize DO levels in the system.

COA should evaluate submitting benthic macroinvertebrate data to TCEQ as an in support of a UAA or ALM.

**Fig. 22 - Segment 1403A
Bull Creek**

-  Watershed Boundary
-  Assessment Unit 05
-  Monitoring Site

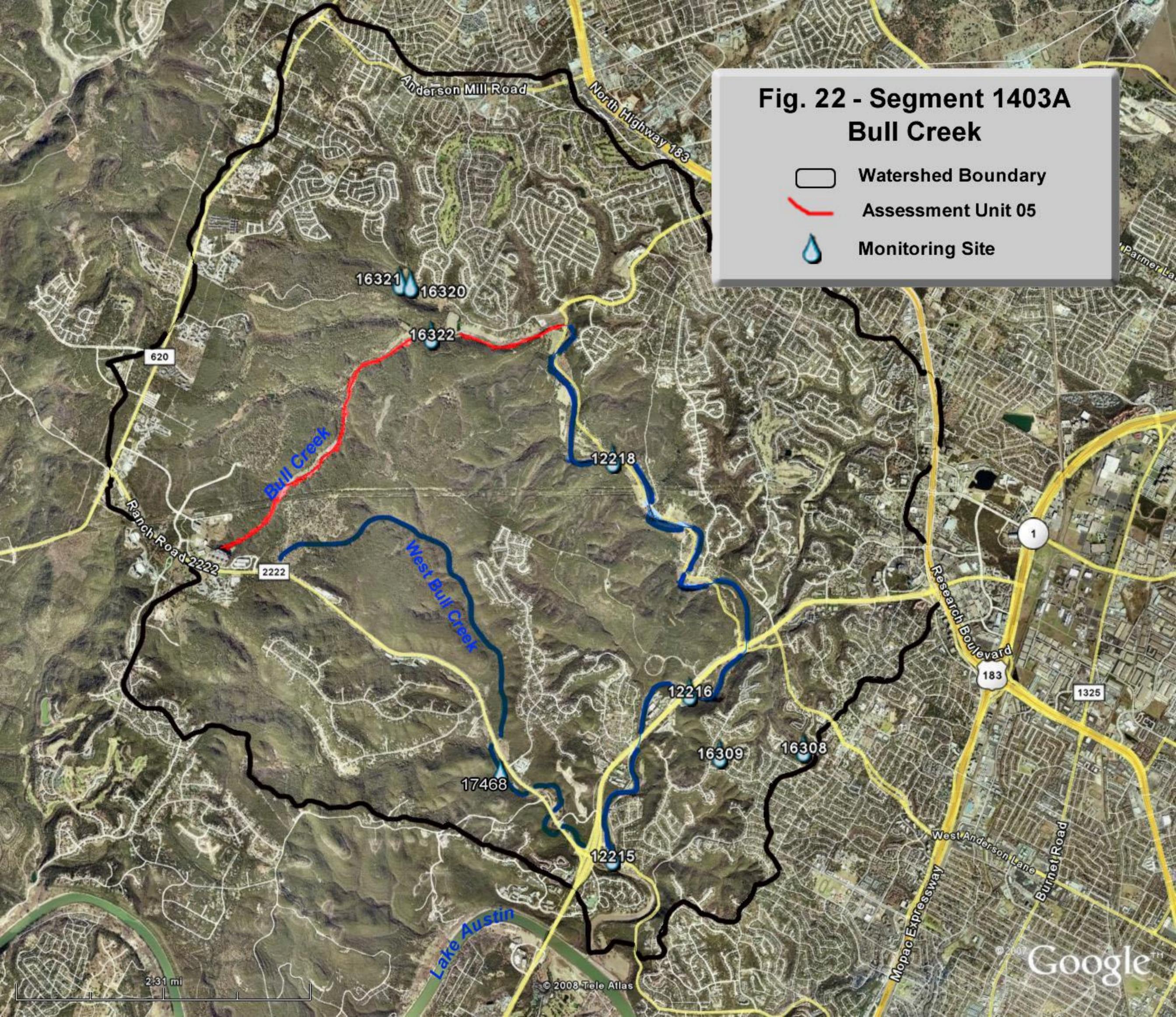


Fig. 23 - Segment 1403A

**Bull Creek
Site 16322**



Fig.24 - Segment 1403A
Bull Creek
Site 16322



Segment 1403J: Spicewood tributary to Shoal Creek

Impairment: Bacteria

Segment Description

This small tributary to Shoal Creek is incorrectly labeled in the Draft 2010 Integrated Report. It should be an unclassified water body under Segment 1429 because Shoal Creek is a tributary of segment 1429, Lady Bird Lake (Fig. 25). However, this document will use 1403J to describe the segment to remain consistent with TCEQ documents.

Segment 1403J is in the upper portion of the Shoal Creek watershed (Fig. 25) which lies on the north side of Lady Bird Lake in Austin, Texas. It begins near the west side of the MoPac Expressway in north Austin, where Spicewood Springs discharge from an old well house into Spicewood Tributary near Ceberry Drive. The tributary ends upstream at a point west of Hart Lane. The shallow, spring fed stream is a half mile long and is monitored by the COA at the following site:

16316 – Spicewood tributary to Shoal Creek, at the intersection of Spicewood Springs Road and Ceberry Drive. The impaired AU, 1403J_01, comprises the entire length of the water body (Fig. 25).

The spring discharge maintains a very small population of threatened Jollyville Plateau salamanders (*Eurycea nana*).

Land Use

The watershed is made up of dense residential/commercial land use.

Impairment Description

Segment 1403J was first placed on the 2002 303(d) List for not supporting contact recreation due to elevated levels of fecal coliform bacteria. The geometric mean for 21 samples collected from Site 16316 was 294, exceeding the criterion of 200. On the 2008 303(d) List, it is classified as a carry forward, meaning that there were not sufficient data to reevaluate the impairment.

In 2003, recognizing that *E.coli* is a better indicator for determining if a water body is contaminated with disease-causing pathogens, TCEQ began using *E.coli* to determine if contact recreation criteria were met. *E.Coli* samples collected by City of Austin beginning in January 2008 indicate that bacteria levels remain high in the stream. With only eight samples collected during the period of record, TCEQ could not perform a full assessment. With additional samples collected between 2008 and 2010, a full

assessment will be performed in 2012. A preliminary review of the data indicate the stream will remain on the 303(d) List.

Potential Causes of Impairment at Site 16316

Nonpoint Sources

Wastewater lines cross and run longitudinally in the small tributary. COA staff has reported high bacteria counts, algae and sewage from leaking lines at the site during some monitoring events. There are domestic pets in the yards of some residences that border the stream which could also be a source of fecal contamination in the creek. Elevated stream nutrient concentrations suggest that wastewater is a likely source of fecal contamination at this site.

Actions Taken:

In 2008, with assistance from TCEQ, COA began sampling monthly for *E.coli* at Site 16316. Ten data points were not obtained for the 2010 assessment. However, continued sampling through 2010 ensured enough *E.coli* data for the 2012 assessment. A preliminary look at those data indicates that the stream will remain on the 303(d) List due to elevated bacteria levels.

Potential Stakeholders:

COA
TCEQ
LCRA
Neighborhood Associations

Recommendations:

Evaluate wastewater collection infrastructure
Survey the watershed to verify potential sources of bacteria.
Recommend TCEQ rename the tributary under Segment 1429.
Communicate with TCEQ about the potential to perform a contact recreation use attainability analysis to determine the appropriate contact recreation use of the water body.

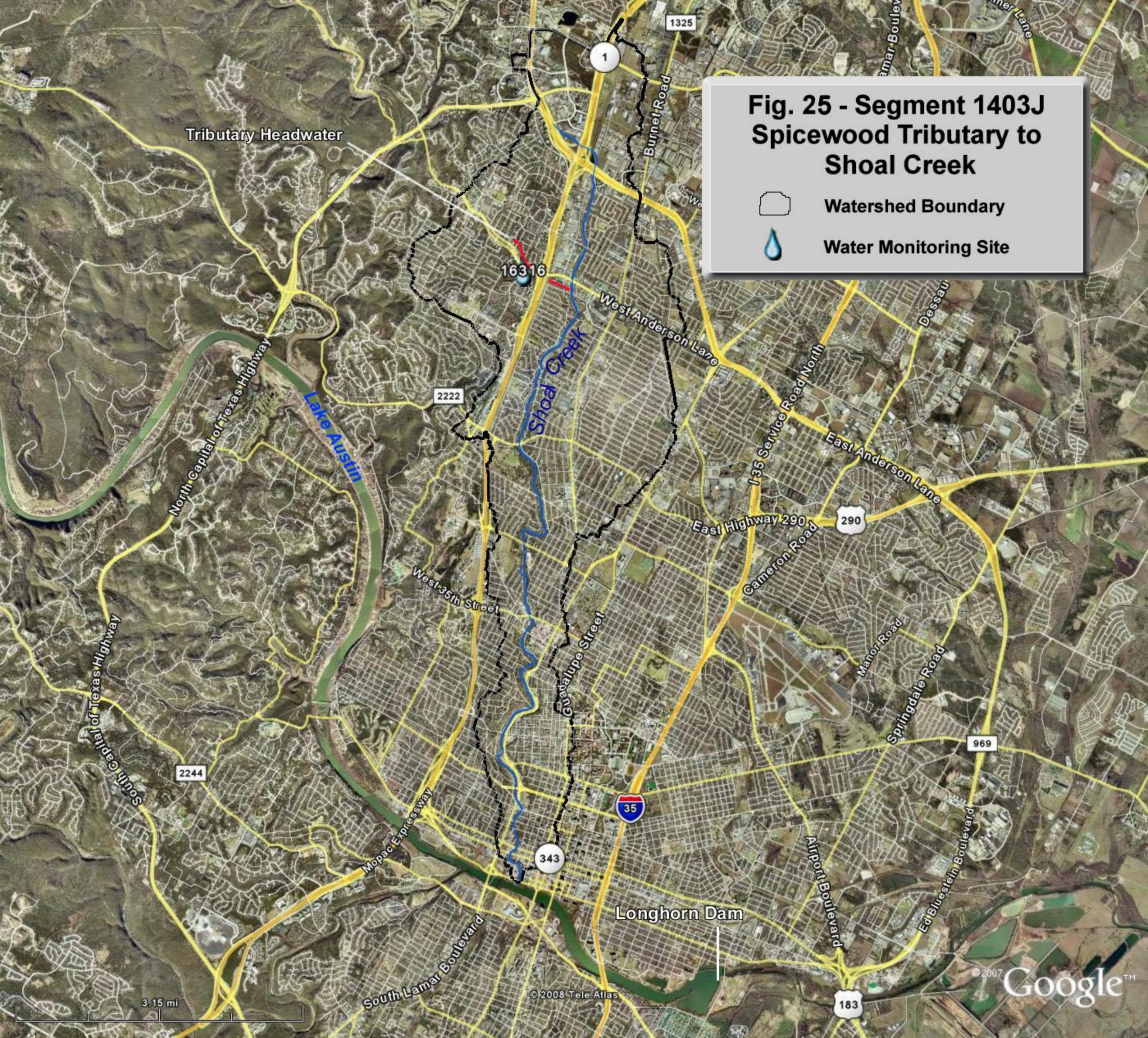
**Fig. 25 - Segment 1403J
Spicewood Tributary to
Shoal Creek**



Watershed Boundary



Water Monitoring Site



Tributary Headwater

16316

2222

2244

343

35

290

969

183

3.15 mi

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**Fig. 26 - Segment 1403J
Spicewood Tributary to
Shoal Creek**

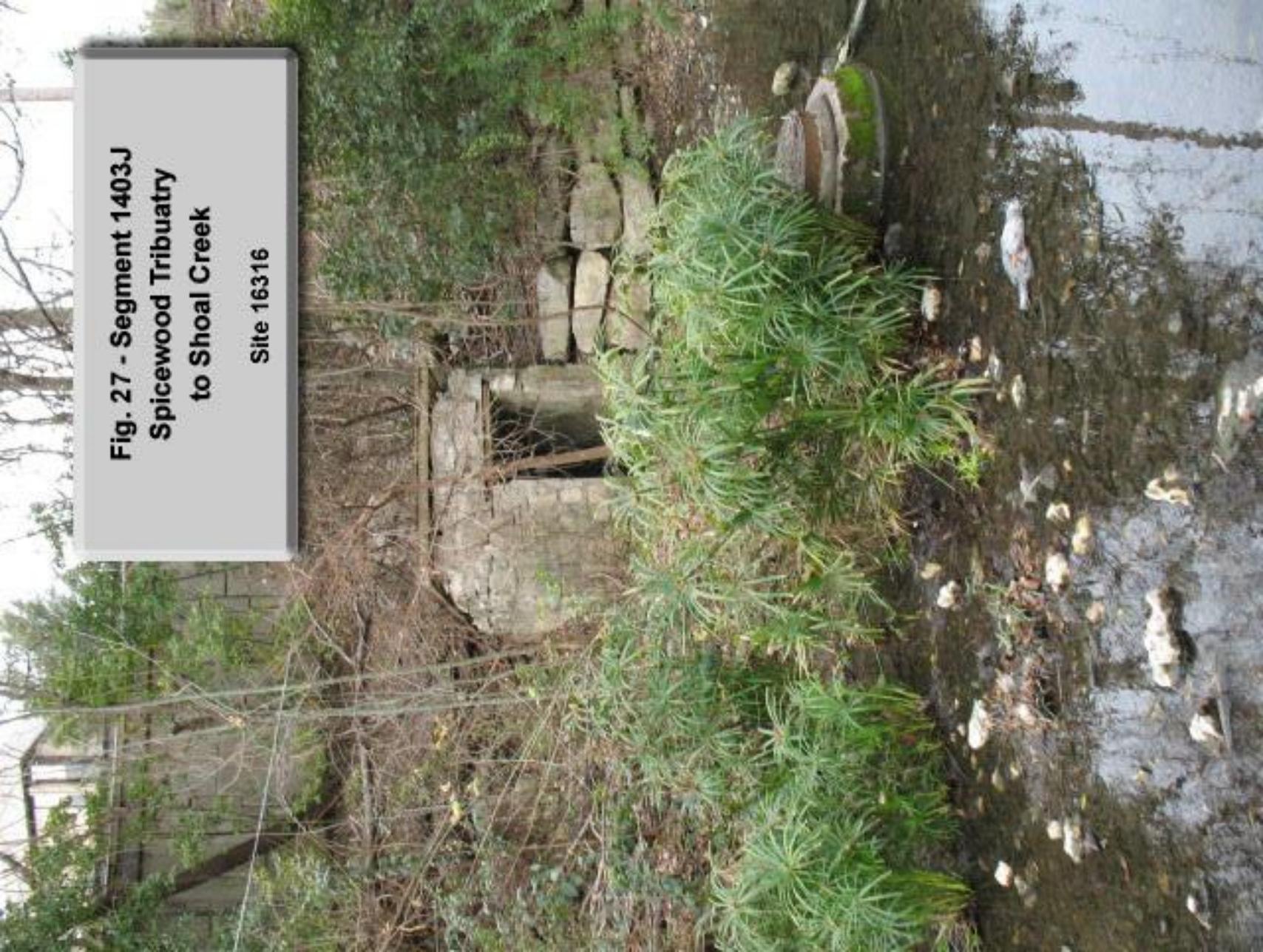


Water Monitoring Site



**Fig. 27 - Segment 1403J
Spicewood Tributary
to Shoal Creek**

Site 16316



Segment 1403K: Taylor Slough South

Impairment: Bacteria

Segment Description

The Taylor Slough watershed is located on the north side of Lake Austin in Austin, Texas (Fig 28). Segment 1403K begins at the confluence with Lake Austin and ends at a point upstream of Exposition Drive near South Meadow Circle. The stream is approximately one mile long and consists of one AU. It was monitored at one site during the period of record.

17294 – Taylor Slough downstream of Pecos Street in Reed Park

Land Use

The watershed is a dense urban landscape composed mostly of single-family residences (Fig. 28). Sample site 17294 is located in Reed Park, a small municipal park frequented by dog walkers. Sewer mains cross the creek at several locations in the watershed. Contact recreation (wading) occurs at Reed Park near Pecos Street.

Impairment Description

Segment 1403K was first placed on the 2002 303(d) List for not supporting contact recreation. Out of 12 fecal coliform samples collected from Site 17294, six exceeded the single sample criteria of 400. The geometric mean was 414 MPN exceeding the criteria of 200 for fecal coliform. Because of the COA rotating monitoring schedule, no bacteria samples were collected after the initial listing in 2002. The stream has remained on subsequent 303(d) Lists as a carryover.

In 2008, the City resumed monitoring for *E.coli* monthly; *E.coli* was selected by TCEQ as the new freshwater indicator species for determining contact recreation in 2003. Three out of five of the *E.coli* samples reviewed for the 2010 Integrated Report exceeded the grab sample criteria of 394 MPN. The geometric mean for the five samples was 375, three times the contact recreation standard of 126.

A review of more recent COA data shows a continuation of the same trend. Seven of nine bacteria samples collected since the Draft 2010 Integrated Report was published exceeded grab sample criteria and had a geometric mean of 671 MPN for *E.coli*.

A concern for nitrates in Segment 1403K was also identified in the Draft 2010 Integrated Report.

Potential Causes of Impairment at Site 17294

Nonpoint Sources

The watershed is urbanized. The stream receives storm water runoff from roads, roof tops and parking lots. Uncollected pet waste from back yards and from Reed Park may contribute to bacteria levels in the creek. According to City of Austin Watershed Protection staff, approximately 56,000 feet of wastewater lines are located within the watershed. Given the elevated nutrient concentrations found during monitoring, wastewater lines located near the creek likely contribute to the impairment.

Actions Taken:

In 2008, with assistance from TCEQ, COA began sampling monthly for *E.coli* in an effort to obtain enough data for a full assessment in 2010. Ten data points were not obtained before the November 30, 2008 submittal deadline for the 2010 assessment, but sampling continued through 2011 in an effort to obtain more *E.coli* data for the 2012 assessment.

Potential Stakeholders:

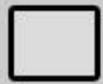
COA
TCEQ
LCRA
Neighborhood Associations

Recommendations:

Survey the watershed to verify potential sources of bacteria.
Evaluate wastewater collection infrastructure.

Fig. 28 - Segment 1403K

Taylor Slough South Watershed



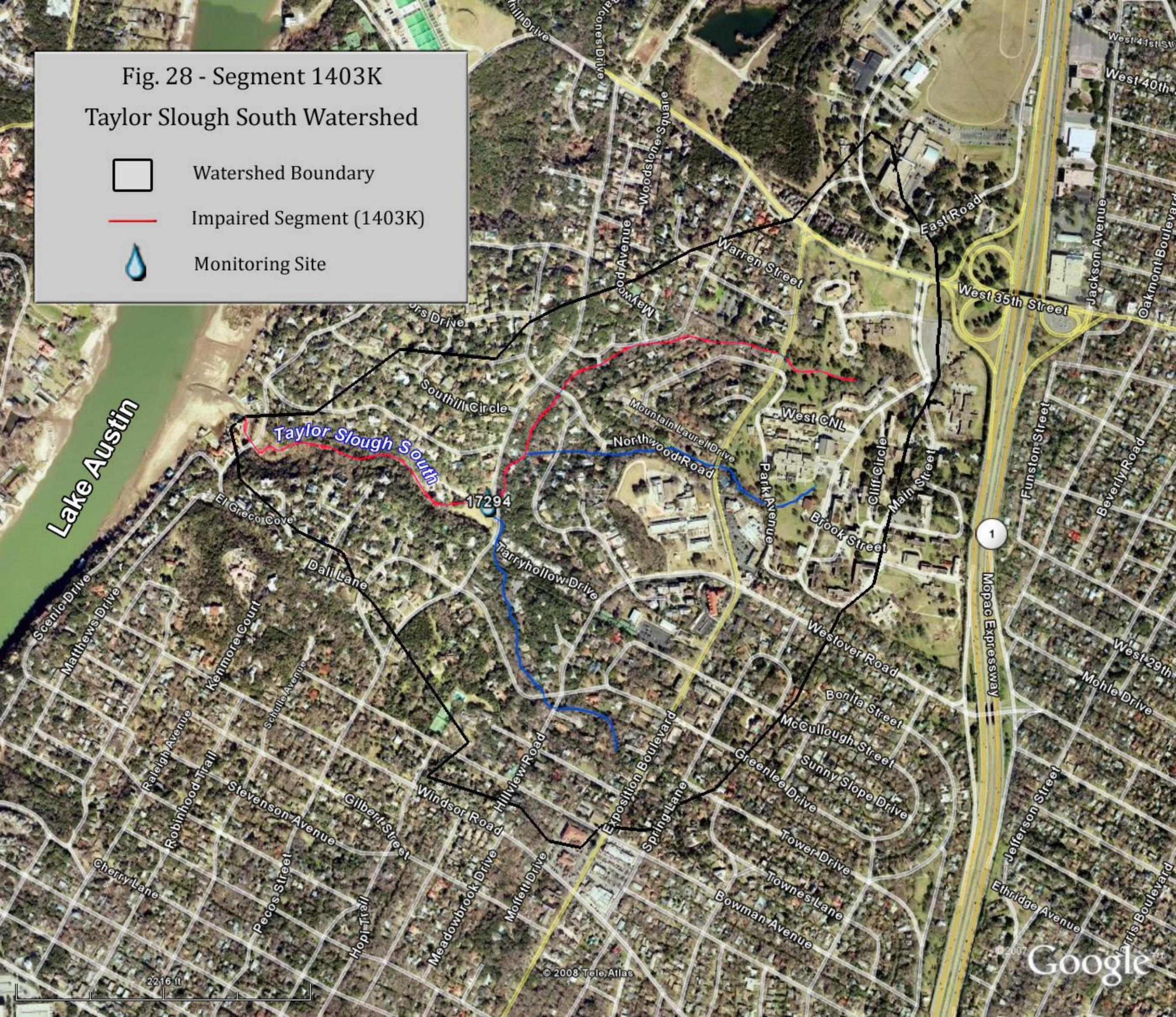
Watershed Boundary



Impaired Segment (1403K)



Monitoring Site



**Fig. 29 - Segment 1403K
Taylor Slough South**



Water Monitoring Site

17294

Pecoot
Street

146 ft

**Fig. 30 - Segment 1403K
Taylor Slough South
Site 17294**



Segment 1403R: Westlake-Davenport tributary to Lake Austin Impairment: Bacteria

Segment Description

Located on the south side of Lake Austin just west of Austin, Texas (Fig. 31), the watershed is approximately three quarters of a square mile. The stream is approximately two miles long. It begins at confluence with Lake Austin and ends upstream at a point east of Loop 360, 150 ft. southeast of the intersection of Waymaker Way and Round Table road.

The stream is composed of only one AU, 1403R_01, which is monitored by COA at Site 16310.

Land Use

The watershed is an urban landscape composed of clustered residential housing. The creek flows through a greenbelt that provides riparian cover on either side. A golf course is located along the lower one third of the stream. The monitoring site is upstream of the golf course and downstream of a densely populated subdivision.

Impairment Description

Segment 1403R was first placed on the 2006 303(d) List for not supporting its contact recreation use due to elevated levels of fecal coliform bacteria. Sixteen samples were collected from Site 16310 between December 1999 and October 2001. Seven out of the 16 (44 percent) samples exceeded the single sample criteria of 400. The geometric mean of the 16 samples was 317, exceeding the criteria of 200. Because of the City of Austin rotating monitoring schedule, no bacteria samples were collected after the initial listing in 2002. The stream has remained on subsequent 303(d) Lists as a carryover.

In 2008, COA committed to monitor for E.coli, which, in 2003, was selected by TCEQ as a more effective indicator for determining contact recreation attainment. The stream did not flow in 2008 and 2009. because of drought and no data were available in time for the 2010 assessment. Data collected since the 2010 Integrated Report was published indicate that the stream will meet contact recreation standards when assessed for the 2012 Integrated Report.

The stream has been assigned a Category 5b by TCEQ, which means TWQS will be reviewed before a TMDL is scheduled.

Potential Causes of impairment at Site 16310

Point Sources

A wastewater line is located parallel to the channel for the majority of stream reach and a lift station is located at Westlake Drive and Carry Back Lane.

Nonpoint Sources

Wildlife that lives in the greenbelt adjacent to the creek is a likely source of fecal material and bacteria.

Actions Taken:

In 2008, with assistance from TCEQ, the City of Austin began sampling monthly for *E.coli* in an effort to obtain enough data for a full assessment in 2010. Drought and low flows prevented the collection of data for the 2010 assessment.

Potential Stakeholders:

- COA
- Neighborhood Associations
- Austin Country Club golf course
- TCEQ
- LCRA

Recommendations:

Continue to collect *E.coli* data when flows return.

**Fig. 31 - Segment 1403R
Westlake-Davenport
Tributary to Lake Austin**



Watershed Boundary



Water Monitoring Site



4139 ft

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Google

**Fig. 32 - Segment 1403R
Westlake-Davenport
Tributary to Lake Austin**



Water Monitoring Site

16310

Westlake Drive

Fawn Creek Path

Fawn Trail

Day Star Cove

447 ft

© 2008 Tele Atlas

© 2007 Google™

**Fig. 33 - Segment 1403R
Westlake-Davenport Tributary
to Lake Austin
Site 16310**



Segment 1407A: Clear Creek

Impairment: pH, total dissolved solids, Sulfate and aluminum in water

Segment Description

The Clear Creek watershed is located on the northeast side of Inks Lake in Burnet County (Fig. 34), the watershed is approximately thirteen square miles. The creek is about 4.5 miles long, beginning at the confluence with Inks Lake upstream to a point west of FM 2341.

The stream is composed of one AU, 1407A_01. It is monitored by LCRA at Site 18710.

Land Use

The watershed is rural. Comprised of undeveloped ranch land, there are few residences. A tailings pile from an abandoned graphite mine is located about 1.5 miles upstream of the monitoring site and is the source of impairments. Southwestern Graphite began mining operations at the current Greensmiths site in 1915. The facility produced and refined graphite ore intermittently between 1915 and 1978. From 1978 and throughout the 80's, the site ceased ore extraction but continued to process graphite ore imported from other locations. This process required the use of water taken directly from the Colorado River, and later from Inks Lake. After using the water to float graphite from the ore, water was treated and discharged into Clear Creek and thence back to Inks Lake. The parent material that the graphite was extracted from now sits in a large tailings pile that covers over 23 acres on the bank of Clear Creek. In 2000, Greensmiths, Inc. purchased the facility and began using reclaimed tailings materials to landscape golf courses.

Impairment Description

Clear Creek was first placed on the 2010 303(d) List for not supporting general and aquatic life uses. Data collected from Site 18710 exceeded criteria for pH, total dissolved solids, sulfate and aluminum in water.

Table 5. Parameters causing the impairment in Clear Creek.

Parameter	Number of times sampled	Number of times criteria was exceeded	Criteria	Mean Results
pH (SU)	16	11	6.5	NA
Total dissolved solids (mg/L)	16	NA*	600	1321
Sulfate (mg/L)	15	NA*	100	1280
Aluminum in water (mg/L)	3	2	991	19,200

* Individual data points are not compared to criteria for sulfate, chloride, and TDS.

The stream has been assigned a Category 5c by TCEQ, which means more information should be collected before a TMDL or other water protection effort is implemented.

Cause of impairment at Site 16310

The tailings pile described above contains iron pyrite, which creates acid mine drainage and is the source of the impairment.

Actions Taken:

Greensmiths operated under an expired permit since 2000. Efforts to obtain a new permit were complicated by enforcement actions, ownership changes, and insurance issues. In 2004, LCRA worked with TCEQ and Greensmiths owner to find a solution and help secure a permit that would treat leachate on site and eliminate discharges to the stream.

- In 2007 LCRA established a water quality monitoring site on Clear Creek. Site 18710 is about 1.5 miles downstream of Greensmiths.

In 2010, Greensmiths engineered an industrial disposal plan to allow onsite treatment and eliminate discharges to the stream. LCRA reviewed and commented on a proposed application for an industrial disposal permit from TCEQ.

- A no discharge permit was issued by TCEQ in December, 2010. As described in the permit, Greensmiths will reduce stormwater onto the pile and reduce runoff from the pile by maintaining vegetation to increase evapotranspiration.

Potential Stakeholders:

Greensmiths
LCRA
TCEQ

Recommendations:

Continue site visits after construction of treatment units at Greensmith's
Continue monitoring at Site 18710

Fig. 34 - Segment 1407A
Clear Creek Watershed

- Watershed Boundary
- 💧 Water Monitoring Site

Lake Buchanan

Ranch Rd 2341
RM-2341

Little Midland-Dorbandt Rd

Greensmith's
Graphite Tailings

RM-690

RS-690

18710

SH-29

Ranch Rd 690

Inks Lake

FM-3509

Hoovers Valley Rd

Fig. 35 - Segment 1407A

Clear Creek

Site 18710



Water Monitoring Site

Greensmith's
Graphite Tailings



18710

RR690

SH 29

Inks Lake

**Fig. 36 - Segment 1407A
Clear Creek
Site 18710**



Segment 1412: Colorado River below Lake J.B. Thomas

Impairment: Bacteria

Segment Description

Segment 1412 is located in the upper Colorado River watershed (Fig. 37). It begins from a point immediately upstream of the confluence with Little Silver Creek in Coke County and continues upstream to J. B. Thomas Dam. It is approximately 99 miles long. It was monitored at the following sites during the period of record:

12362 – Colorado River at Pan American Oil Company Bridge 4.7 miles west of Silverado

12363 – Colorado River at SH 163

12365 – Colorado River at FM 1808

12366 – Colorado at SH 350

17002 – Colorado River at Mitchell CR 343

17003 – Colorado River at FM 2835

Land Use

The watershed for 12363 consists mainly of agricultural land. Colorado City and a prison farm are located just upstream of the site.

Impairment Description

Segment 1412 was initially placed on the 2008 303(d) List for not supporting contact recreation due to elevated *E. coli* bacteria levels. The Draft 2010 303(d) List extends the listing.

The impaired AU, 1412_02 begins at the Colorado River's confluence with Beals Creek and continues upstream to the dam below the Barber Reservoir pump station. Data responsible for the listing are from Site 12363. Twenty samples, collected from this site between December 01, 2001 and November 30, 2008, were assessed for the Draft 2010 303(d) List. Nine of the 20 samples (45%) exceeded the grab sample criterion of 394 MPN. The geometric mean of the 20 samples was 165.6 MPN, exceeding the criteria of 126 MPN.

Data collected since the Draft 2010 Integrated Report was published indicate that the stream will remain on the 2012 303(d) List due to elevated levels of *E. coli*. TCEQ assigned Segment 1412 as a category 5c waterbody, which means more data needs to be collected before a TMDL or other water quality project is implemented.

In addition to the bacteria impairment, low dissolved oxygen levels and high chlorophyll-*a* levels were identified as a concern in the Draft 2010 Integrated Report. Data indicate depressed dissolved oxygen concentrations are possibly associated with low flow conditions, which are common in the watershed.

TCEQ has also recognized frequent fish kills in Lake Colorado City as a concern. These kills are believed to be associated with harmful blooms of golden algae (*Prymnesium parvum*) and are a concern in Segment 1411, E. V. Spence Reservoir and Segment 1426, Colorado River below E. V. Spence Reservoir.

Potential Causes of Impairment

Point Sources

There are no known point sources. Colorado City, which is just upstream of the monitoring site, uses wastewater effluent for irrigation and does not discharge treated wastewater effluent into the stream.

Nonpoint Sources

Much of the contributing watershed for this segment consists of rangeland used for cattle grazing and may be a source of bacteria.

- In Colorado City, homes and businesses are located along the Colorado River. It is not known if they are connected to city wastewater infrastructure or to septic systems. Failing wastewater lines or inadequate septic systems may be a source of bacteria.
- The western portion of Colorado City drains towards Site 12363. Runoff from precipitation events may be a source of bacteria. However, these events should not cause the consistently high levels of bacteria collected at the monitoring site.
- A superfund site, the former Col-Tex Refinery, is located approximately one mile upstream of the monitoring site. Remediation of organic chemicals at the refinery is ongoing, but it is not a likely source of bacteria.

Prison Farm

CRMWD, as a means of maintaining downstream water quality, operates a pump station on the Colorado River that diverts water into an off-channel reservoir. The pump station is 4.3 miles upstream of monitoring site 12363. It is located upstream of the superfund site and Colorado City, consequently, bacteria found at the monitoring site, is from local sources.

Actions Taken:

Monitoring frequency increased in 2010 when CRMWD began sampling bacteria twice per year in addition to TCEQ Region 3 monitoring quarterly. Monitoring in 2012 is scheduled to be reduced because CRMWD is no longer monitoring as a Clean Rivers Partner.

Potential Stakeholders:

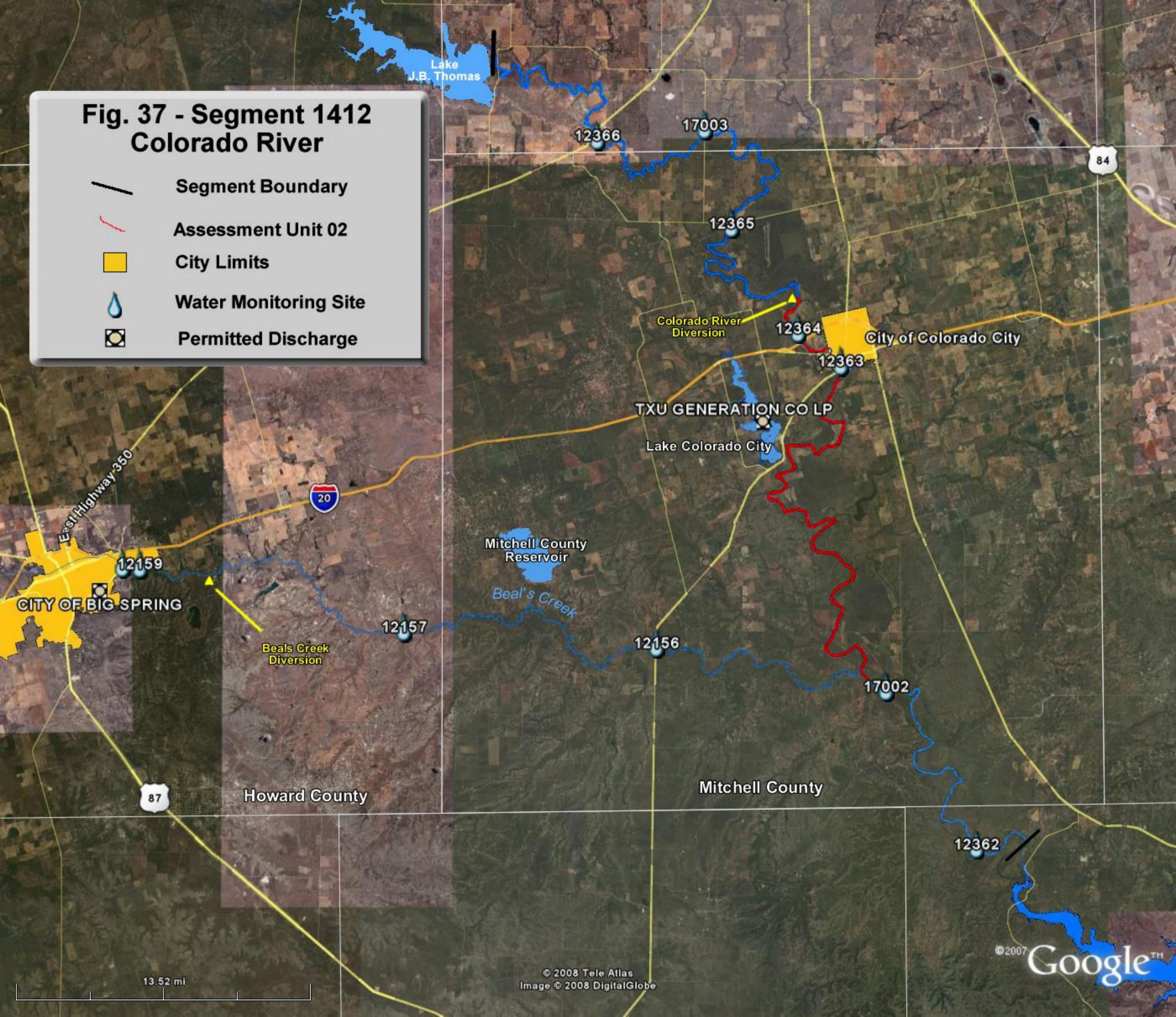
- CRMWD
- City of Colorado City
- Agriculture
- Industrial interests
- TCEQ
- Texas State Soil and Water Conservation Board
Texas AgriLife Extension

Recommendations:

- Survey upstream of Site 12363 to identify potential sources of bacteria.
- Communicate with TCEQ to determine if the stream is a candidate for an RUAA.

**Fig. 37 - Segment 1412
Colorado River**

-  Segment Boundary
-  Assessment Unit 02
-  City Limits
-  Water Monitoring Site
-  Permitted Discharge



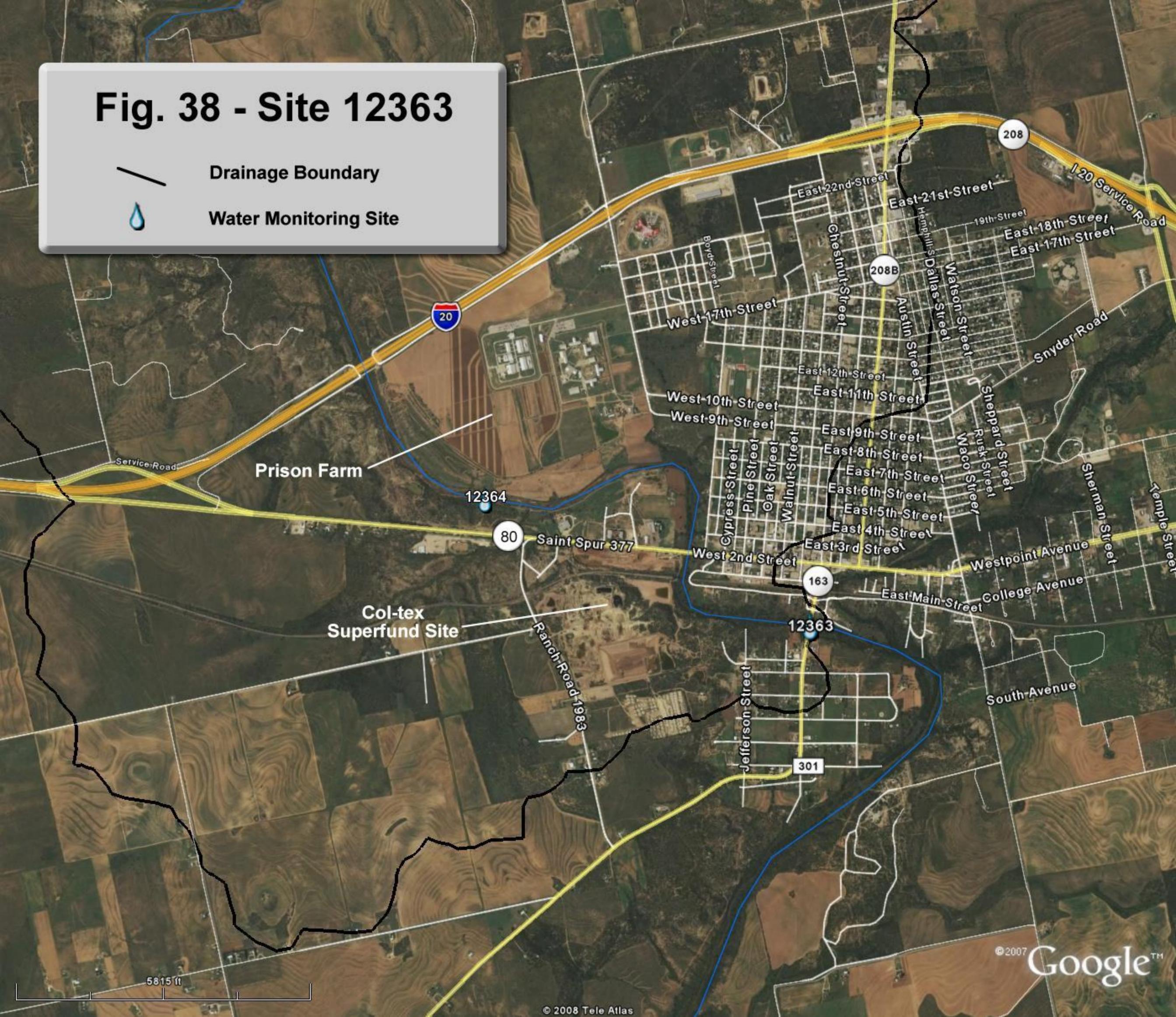
13.52 mi

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Fig. 38 - Site 12363

-  Drainage Boundary
-  Water Monitoring Site





**Fig. 39 - Segment 1412
Colorado River**

Site 12363

Segment 1412B: Beals Creek

Impairment: Bacteria and Total Selenium

Segment Description

Segment 1412B begins from the confluence with the Colorado River in Mitchell County and continues upstream to the confluence of Mustang Draw and Sulphur Springs Draw in Howard County (Fig. 40). The following sites were monitored during the period of record:

12156 – Beals Creek at SH 163

12157 – Beals Creek at FM 821

12158 – Beals Creek at Val Verde Road

12159 – Beals Creek at East Midway Road approx one mile east of FM 700 in Big Spring

12160 – Beals Creek at FM 700

Land Use

The watershed consists mainly of agricultural land with the exception of Big Spring and several small communities. Oil and gas production activities also occur in the watershed.

Impairment Description

Segment 1412B is placed on the Draft 2010 303(d) List for not supporting contact recreation due to elevated numbers of *E. coli* bacteria and for not supporting a general use due to elevated concentrations of total selenium in water.

The impaired AU, 1412B_03, begins at the confluence with Guthrie Draw and continues upstream to the confluence of Mustang Draw and Sulphur Springs Draw (Fig. 40). Data responsible for the listing are from Sites 12158, 12159 and 12160. Nineteen *E. coli* samples, collected from these sites between December 01, 2001 and November 30, 2008, were assessed. Six of the 19 samples (31.6 %) exceeded the single grab sample criteria of 394 MPN. The geometric mean of the 19 samples was 183.3 MPN, exceeding the criteria of 126 MPN.

Eight total selenium samples, collected from these sites between December 01, 2001 and November 30, 2008, were assessed. Two of the samples had values of 28.0 and 61.4 µg/L. They exceeded the single grab criteria of 20.0 µg/L. More recent data not yet reviewed by TCEQ indicate no exceedance of *E. coli* or total selenium criteria in this impaired AU.

The Draft 2010 Integrated Report identified concerns for elevated levels of chlorophyll-*a* in the segment (1412B_01 and 1412B_03). AU 03 has other concerns identified in the Draft 2010 Integrated Report. They are based on elevated concentrations of ammonia, nitrate, ortho-phosphate and total phosphorous. These concerns, except for chlorophyll-*a*, are not identified downstream of this AU.

The lack of these concerns downstream may be due to CRMWD operations. As a means of maintaining downstream water quality, water is diverted from Beals Creek into an off-channel reservoir. This pump station (Fig 40) is located 2.2 miles downstream of Site 12158.

Potential Causes of Impairment

Point Sources

The Big Spring WWTP discharges treated effluent into Beals Creek (1412B_03). Sites 12158 and 12159 are located downstream of this discharge.

Nonpoint Sources

In Big Spring, homes and businesses are located along Beals Creek. It is not known if they are connected to city wastewater infrastructure or to septic systems. Failing wastewater lines or inadequate septic systems may be a source of bacteria.

Beals Creek is a major drainage system for Big Spring. The majority of Big Spring is upstream of the monitoring sites (Fig. 41). Runoff from precipitation events may be a source of bacteria and total selenium. The industrial section and the municipal landfill of Big Spring, a major railway switch yard and a petroleum refinery are located in the impaired AU.

Another potential source of selenium is the local geology. Based on USGS and Texas Water Development Board data, moderate concentrations of selenium have been found in groundwater and soils in the area.

Action Taken

CRMWD and TCEQ Region 7 began monitoring for total selenium in 2011.

Potential Stakeholders:

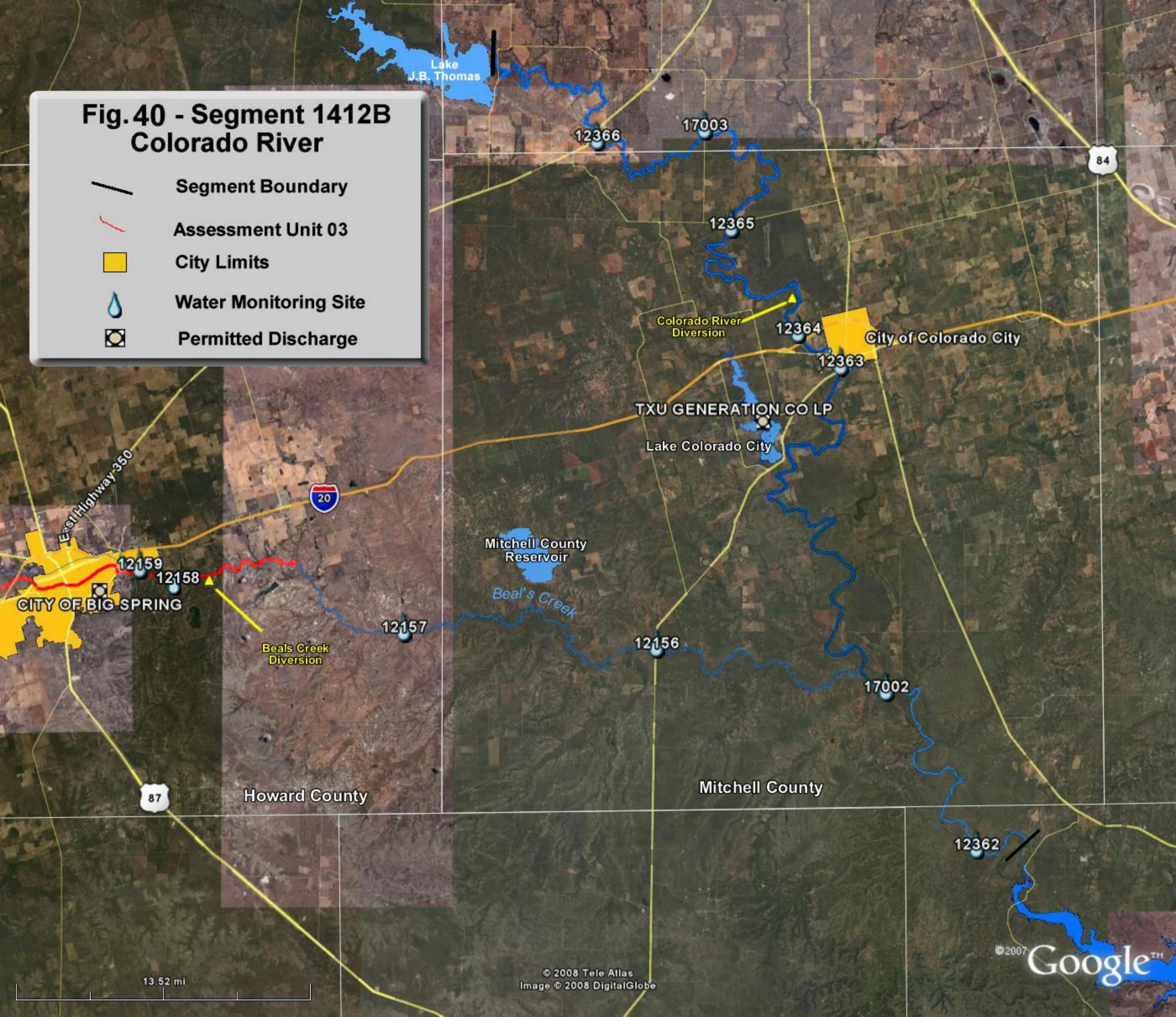
- TCEQ
- CRMWD
- City of Big Spring
- Agriculture interests
- Industrial interests

Recommendations:

- Continue water quality monitoring.
- Communicate with TCEQ to determine if the stream is a candidate for an RUAA.

Fig.40 - Segment 1412B Colorado River

-  Segment Boundary
-  Assessment Unit 03
-  City Limits
-  Water Monitoring Site
-  Permitted Discharge



13.52 mi

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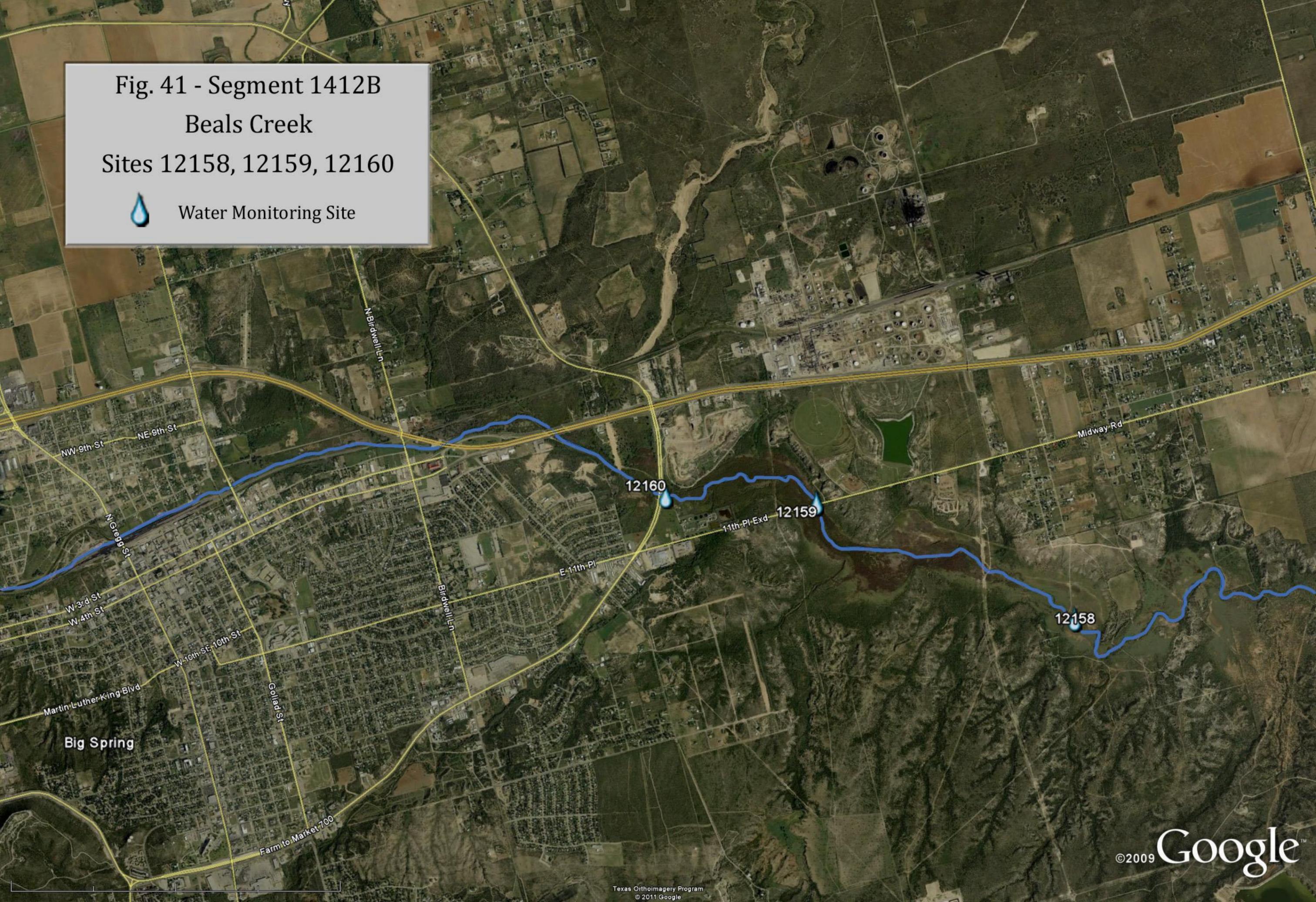
Fig. 41 - Segment 1412B

Beals Creek

Sites 12158, 12159, 12160



Water Monitoring Site



Big Spring

Fig. 42 - Segment 1412B
Beals Creek
Site 12158



Segment Description

Lake J. B. Thomas (Fig. 43) is the westernmost impoundment on the Colorado River. The reservoir impounds the Colorado River from the Colorado River Dam in Scurry County up to a normal pool elevation of 2,258 feet above mean sea level. The reservoir has a surface area of approximately 7,808 acres at conservation pool.

Land Use

The watershed has historically been used for ranching and for oil and gas production activities. Ice Melt Products, a mining facility located in the Colorado River watershed approximately ten miles upstream of above Lake J. B. (Fig. 43) Thomas pumps and extracts groundwater to processes magnesium chloride (MgCl) and sodium chloride (NaCl). The production system consists of impoundments that store and extract materials. According to CRMWD staff, the impoundments and grounds contain concentrated brine (260,000 mg/L NaCl) and an estimated 600,000 tons of NaCl solids.

Monitoring has not shown the facility to impact surface water. However, because of its close proximity to Lake J. B. Thomas, there is a concern that a catastrophic rain event could cause a release of the concentrated brine water into the reservoir. Ice Melts Products has entered into TCEQ Agreed Order which requires elimination of surface water discharges, implementation of closure activities, and procurement of financial resources to cover the estimated cost of remediation, closure, and post-closure.

Impairment Description

Segment 1413 was initially placed on the 2008 303(d) List for not meeting a general use due to elevated concentrations of chloride. The chloride listing carries over to the Draft 2010 303(d) List. Additionally, the Draft 2010 Integrated Report identified elevated concentrations of total dissolved solids leading to a second impairment.

The impaired AU, 1413_01, is defined as the entire reservoir. Data responsible for the listing are from Site 12367 (Fig. 44). Thirteen samples, collected from the site between December 01, 2001 and November 30, 2008, were assessed during the Draft 1010 Integrated Report. The mean value for chloride and TDS concentrations from the 13 samples was 100 mg/L and 509 mg/L, respectively. The criteria for chloride and TDS are 80 mg/L and 500 mg/L, respectively.

Data collected since the Draft 2010 Integrated Report was published indicate elevated concentrations of chloride and TDS remain.

Potential Causes of Impairment

Nonpoint Sources

Elevated concentrations of chloride and TDS in the lake are due to regional geology, prolonged drought and historical oil and gas production activities. Soils in the watershed are highly mineralized and dissolution of these minerals into surface water readily occurs. Annual precipitation in the area between December 01, 2001 and November 30, 2008 ranged from 14.6 to 35.3 inches with a mean of 22.7 inches. The reservoir capacity during this time ranged from 7.8 to 34.6 % with an average of 15.6 %. Evaporation coupled with low precipitation has concentrated minerals in the water.

The watershed contains oil and gas deposits that have been in production since the 1930s. Seeps that have resulted from oil and gas production activities, including abandoned or inadequately plugged wells, have been identified in the watershed. These seeps typically produce high saline water and are known to contaminate surface water.

Point Sources – CRMWD has expressed concern that a catastrophic rain event could cause a release of the concentrated brine water into the reservoir.

Actions Taken:

- CRMWD routinely monitors for flow at two seeps near the banks of Lake J.B. Thomas and notifies the Railroad Commission (RRC) when seeps are active.
- CRMWD monitors for surface runoff from Ice Melts facility.
CRMWD performed an oil and gas well mapping survey in the upper watershed. The survey, titled Tobacco Creek Water Quality Issues, included sulfate and chloride monitoring. The results were provided to the RRC to help prioritize regulatory activities.

Potential Stakeholders:

CRMWD
RRC
Lakeside Landowners
TCEQ
Texas State Soil and Water Conservation Board

Recommendations:

Continue monitoring efforts to verify the impairment.
Work with RRC on identifying well plugging candidates.

**Fig. 43 - Segment 1413
Lake J.B. Thomas**



Water Monitoring Site



Ice Melt Products

Grape Creek

Hullem Creek

Colorado River

Plum Creek

12367

Borden County

Scurry County

Howard County

East Highway 350

6.85 mi

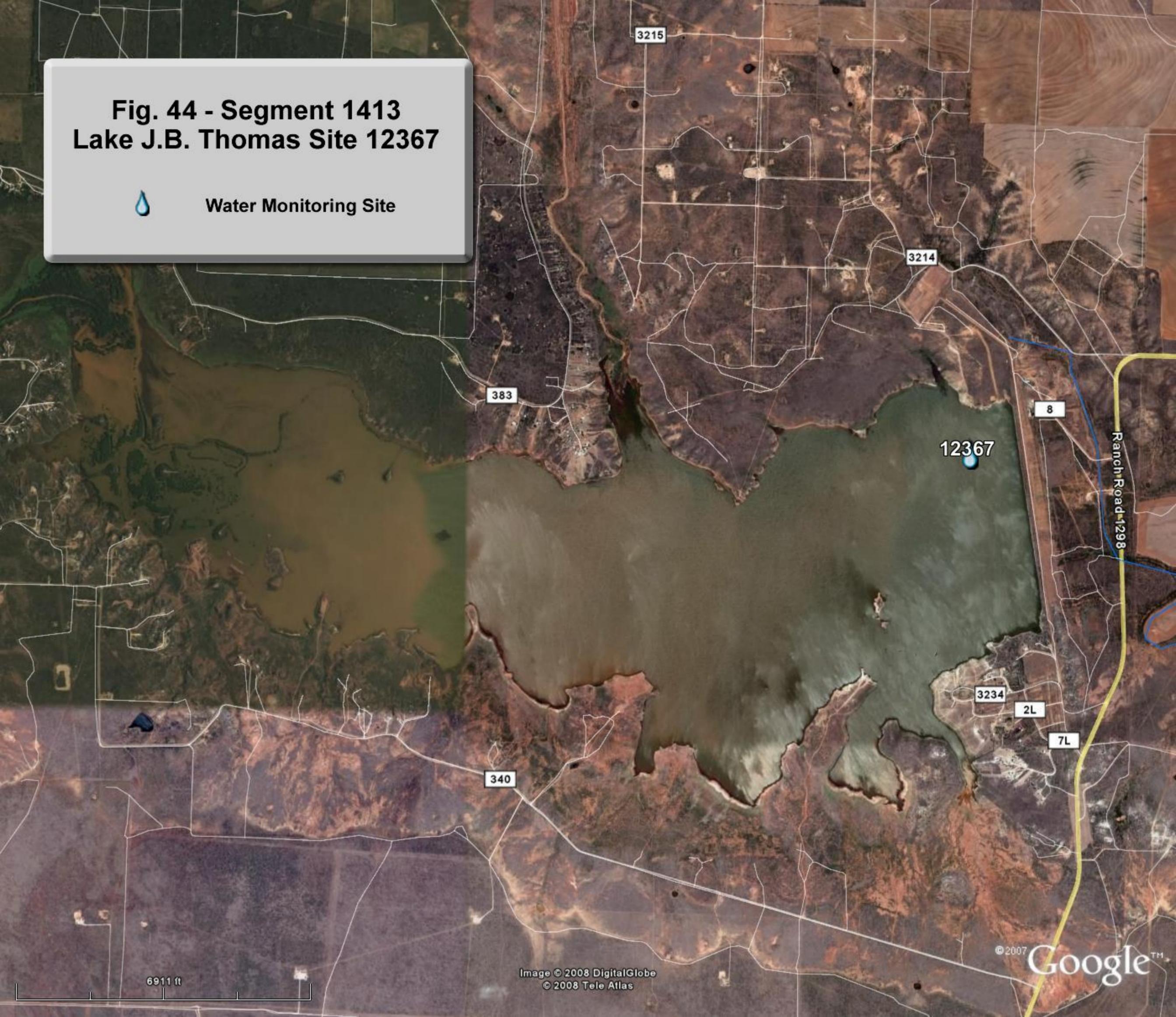
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**Fig. 44 - Segment 1413
Lake J.B. Thomas Site 12367**



Water Monitoring Site



**Fig. 45 - Segment 1413
Lake J.B. Thomas**



Segment 1416: San Saba River

Impairment: Bacteria

Segment Description

Segment 1416 begins from the San Saba River's confluence with the Colorado River, and continues upstream to the confluence of the North and Middle forks of the San Saba River near the Menard County line (Fig. 46). The river is approximately 168 miles long and was monitored at the following sites during the period of record:

12392 – San Saba River at SH 16

17004 – San Saba River immediately downstream of US 87

20662 – San Saba River at County Road 340

The impaired AU, 1416_01 (Fig. 47), begins at the confluence with the Colorado River upstream to the river's crossing with US Hwy 190. Data responsible for the listing are from Site 12392 (Fig. 48).

Land Use

Most of the area surrounding site 12392 is used for agriculture. Jordan Cattle Auction Barn is located four miles upstream of Site 12392 on State Hwy 190, about half a mile from the river (Fig. 47).

The City of San Saba is half a mile south of Site 12392. Fifty percent of the city's storm water drains to the site (Fig. 48). There are no TCEQ permitted discharges immediately upstream of the monitoring site.

Impairment Description

Segment 1416 was placed on the 2008 303(d) List for not supporting contact recreation due to elevated levels of *E.coli*. Forty-four samples collected from Site 12392 between 1999 and 2006 were assessed by TCEQ. The resulting geometric mean for *E.coli* was 197 MPN, exceeding the criteria of 126. Grab sample criteria were not exceeded.

The trend continued in the 2010 assessment. According to the Draft 2010 Integrated Report, the geometric mean for forty samples collected between 2001 and 2008 was 196 MPN. Again, the grab sample criteria were not exceeded. TCEQ assigned the segment category 5c, meaning more information should be gathered before a TMDL or other water improvement project is implemented.

A review of the 12 data points collected since the 2010 Integrated Report shows a geometric mean of 148, indicating that the water body will remain on the 2012 303(d) List.

Potential Causes of Impairment at Site 12392

Nonpoint Sources

Agriculture - The land immediately upstream of and surrounding the monitoring site is used for hay production and grazing livestock. Three pecan orchards are located immediately upstream of the site. There is very little riparian area. Upstream of the monitoring site cattle have access to the river and use it as a water source.

Wildlife - Deer live in the area upstream of the sampling site. According to a rancher, who has lived near the sampling site since 1960, feral hog populations have increased. Wildlife probably contributes to bacteria levels at the site, but the extent can't be determined.

- Urban Runoff - The City of San Saba is less than a mile south of the site. GIS analysis shows that the western portion of the city drains storm water into the river upstream of the site (Fig. 48).

Actions Taken:

- No actions taken to date

Potential Stakeholders:

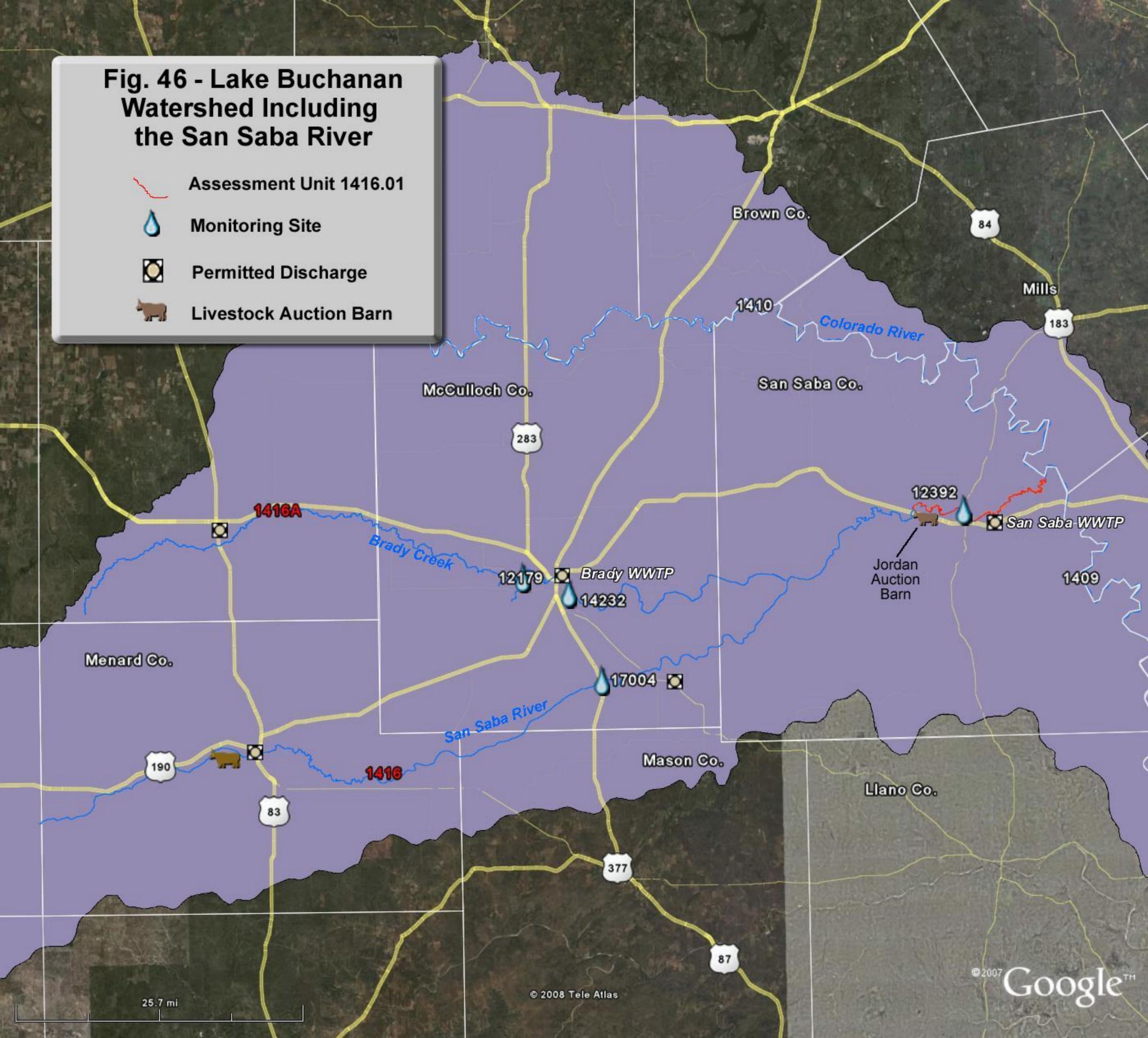
- City of San Saba
- Local Landowners
- Texas State Soil and Water Conservation Board
Texas Department of Agriculture
Texas AgriLife Extension
Natural Resource Conservation Service
Texas Parks and Wildlife
Pecan Growers
Auction Barn Owners

Recommendations:

Communicate with TCEQ and Texas State Soil and Water Conservation Board to determine the rivers' suitability as a candidate for a WPP.

Fig. 46 - Lake Buchanan Watershed Including the San Saba River

-  Assessment Unit 1416.01
-  Monitoring Site
-  Permitted Discharge
-  Livestock Auction Barn



**Fig. 47 - Segment 1416.01
San Saba River**

-  Assessment Unit 01
-  Water Monitoring Site
-  Permitted Discharge

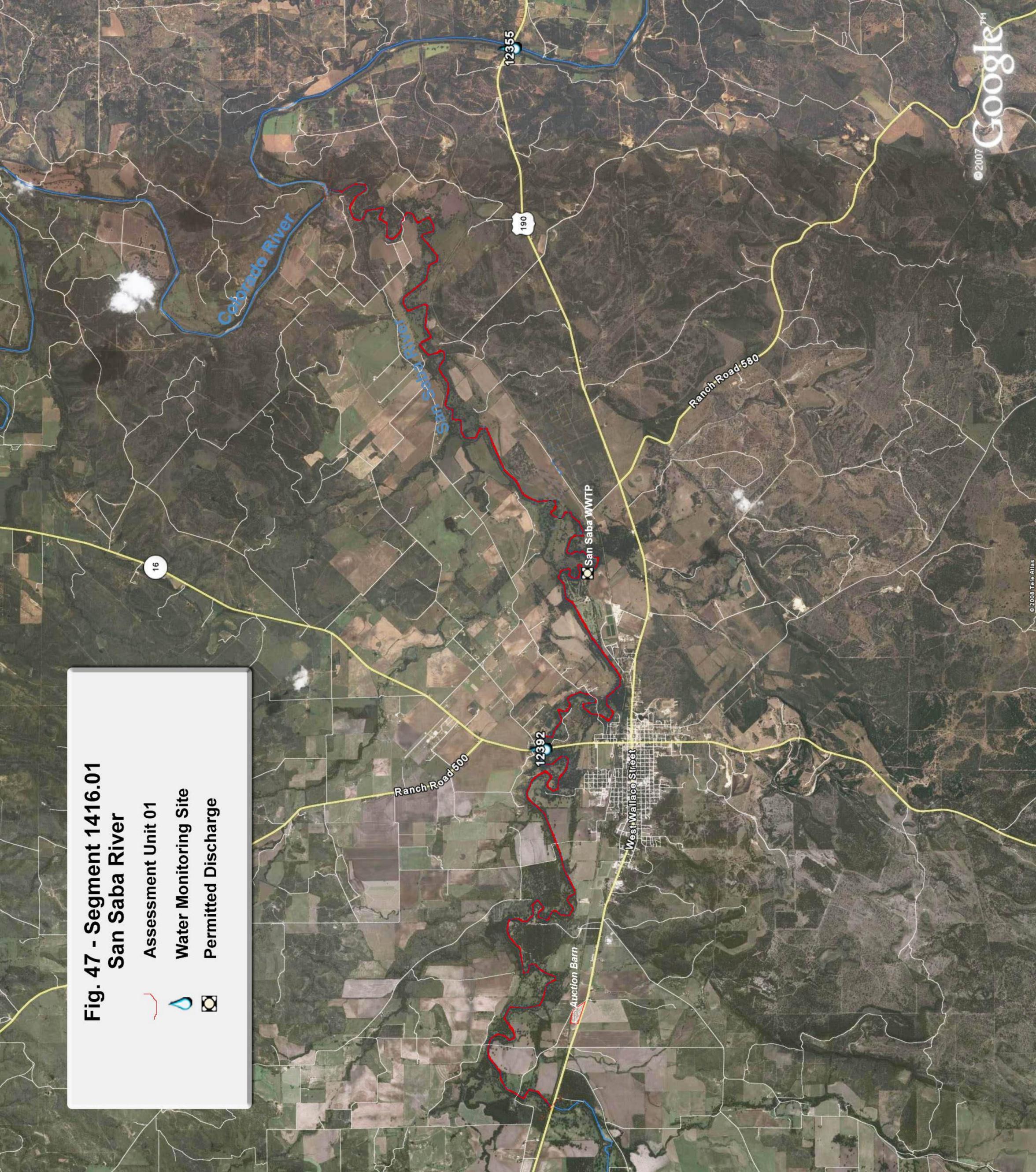


Fig. 48 - Drainage from San Saba into Site 12392

-  Drainage Boundary
-  Water Monitoring Site



**Fig. 49 - Segment 1416
San Saba River at
Site 12392**



Segment Description

The Brady Creek watershed is located in Concho and McCullough counties. The watershed is about 784 square miles. It is primarily rural, used for agriculture. The cities of Brady, Melvin and Eden are located in the middle and upper regions of the watershed.

TCEQ defines Segment 1416A as beginning at the confluence of the San Saba River southwest of San Saba upstream to Brady Lake Dam (Fig 50). The entire length of the creek is approximately 90 miles. Because water quality data were recently collected from the portion of the creek above the Brady Lake Dam, TCEQ created a new unclassified water body for the 2010 assessment; Brady Creek above Brady Creek Reservoir (Segment 1416C). The segment was monitored at the following sites during the period of record as part of routine monitoring and the Brady Creek WPP:

12179 – Brady Creek Reservoir midlake near dam

14232 – Brady Creek on private road two miles downstream of FM 714

17005 – Brady Creek at Elm Street in Brady immediately downstream of low water crossing

17347 – Brady Creek Immediately upstream of McCulloch County Rd 128

20411 – Brady Creek at San Saba County Road 261 (Segment 1416C)

20661 – Brady Creek immediately downstream of County Road 3034 (Segment 1416C)

The impaired AU, 1416A_03, begins at FM 714 and ends upstream at Brady Lake Dam (Fig. 51). Data responsible for the listing are from Site 17005 (Fig. 51). The site is no longer monitored because it goes dry frequently. Site 14232, which is currently monitored by TCEQ Region 8, is a representative sample location. Site 14232 is about three miles downstream of Site 17005, in AU 02. AU 03 and the upper end of AU 02 are designated as supporting an intermediate aquatic life use with a DO criterion of 4.0 mg/L in Appendix D of the TSWQS because of flow regimes.

Land Use

Below Brady Lake Dam, at the headwaters of 1416A_03, the creek flows through farmland and pastureland. However, Site 17005 is in Brady, a community of about

5,200 people. The city's wastewater treatment plant is on the outskirts of town downstream of Site 17005 (Fig. 51).

Impairment Description

Segment 1416A was first placed on the 2004 303(d) List for not supporting its designated aquatic life use based on low levels of dissolved oxygen. The 2004 listing, which was based on single grab samples was confirmed through limited 24-hour monitoring; four of six 24-hour events failed to meet the criteria of 4 mg/L and five of six events also failed to meet the 24-hour minimum dissolved oxygen criteria of 3mg/L according to the 2008 303(d) List.

The Draft 2010 Integrated Report identified concerns for elevated levels of chlorophyll-*a*, total phosphorous, orthophosphorus and nitrate based on data collected from 14232, just 2 miles downstream of Site 17005.

In town, the creek receives storm water runoff from commercial, residential and industrial property. Flow in this section of the creek is restricted by Brady Lake Dam just upstream and by several low water dams in the city.

Potential Causes of Impairment at Site 17005

Nonpoint Sources

Agricultural Influences -Farmland two miles upstream of Site 17005 is planted in row crops providing the potential for nutrient contributions from tilled soil and fertilizer. Further monitoring and investigation is needed to determine how much, if any, of the excessive nutrient levels found in town come from the upstream farms.

Urban Influences - All storm water runoff from the city flows into AU 03 of Brady Creek. Urban runoff contributes nutrients which may stimulate algal blooms and periodic fish kills in the creek.

Brady Lake Dam, which is located just upstream of 1416A.03, restricts flow to the creek. In-stream flows are further reduced by several low water dams in the city. During the summer, the dams create stagnant pools, where elevated nutrients contribute to algal blooms which results in extreme fluctuations of dissolved oxygen levels. Site 17005 is in such a pool (Fig. 52).

Actions Taken:

- The Brady Creek Master Plan, produced in 2004 by UCRA identified and implemented BMPs to decrease the impact of storm water on the creek.

UCRA received Clean Water Act 319(h) grant funding from TCEQ to develop the Brady Creek Watershed Protection Plan. To date, the following have been completed:

- Stakeholder meetings held in Brady and Melvin
- Draft Public Participation Plan submitted to TCEQ
- Water quality monitoring began and is ongoing
- A draft copy of the plan is expected in 2013.

Stakeholders from the Brady Creek WPP

City of Brady
City of Eden
City of Melvin
Concho County
Concho County Soil and Water Conservation District
LCRA
McCullough County
McCullough County Soil and Water Conservation District
TCEQ
Texas Parks and Wildlife Department
Texas State Soil and Water Conservation Board
UCRA

Recommendations:

Because monitoring resources were moved from Site 17005 to Site 14232 (Fig. 51) in 2007, reestablish Site 17005 or another site in AU 02 to determine if dissolved oxygen conditions have improved in the assessment unit as a result of the WPP implementation. Or work with TCEQ staff to determine if data from Site 14232 can be used to delist.

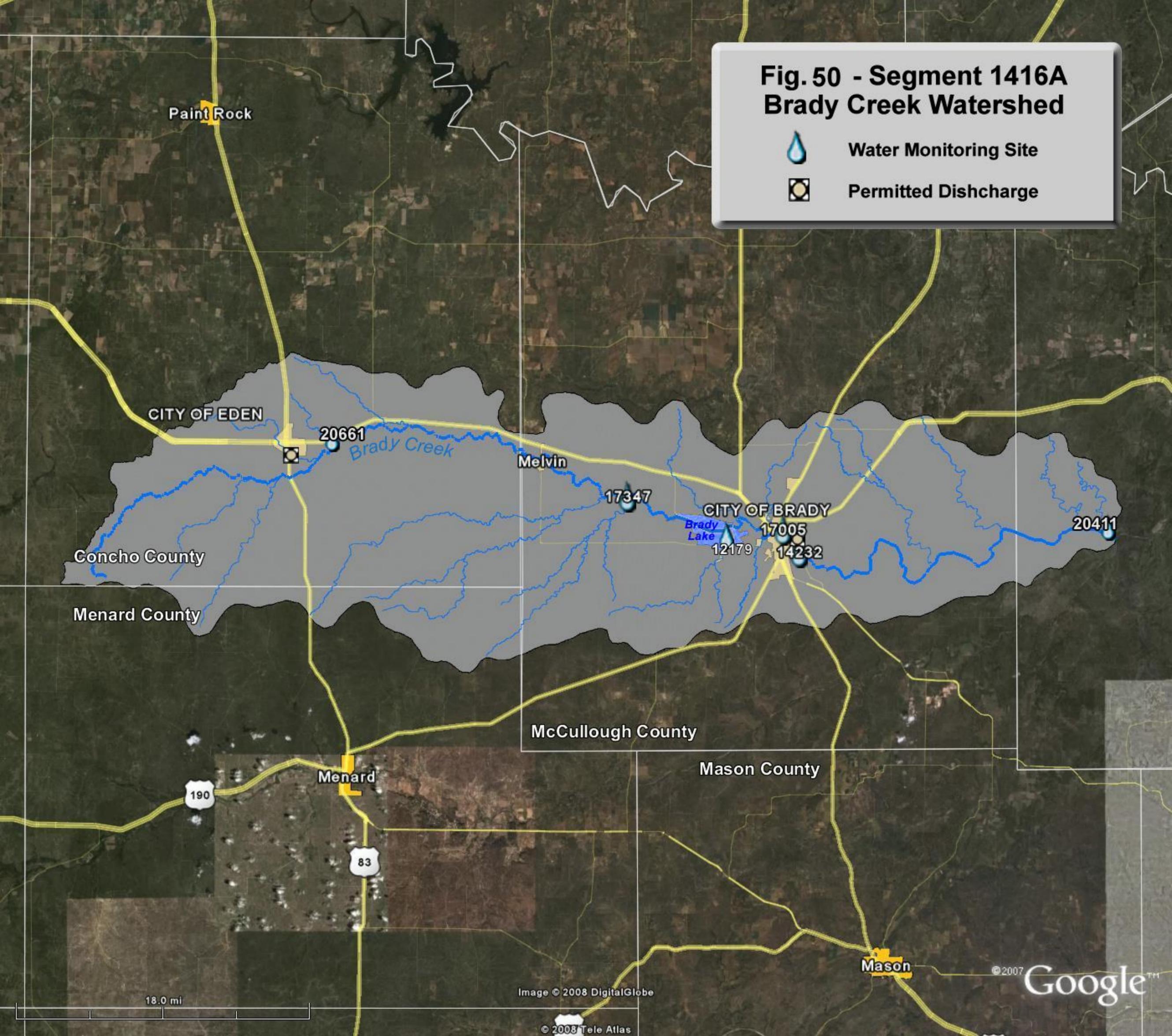
**Fig. 50 - Segment 1416A
Brady Creek Watershed**



Water Monitoring Site

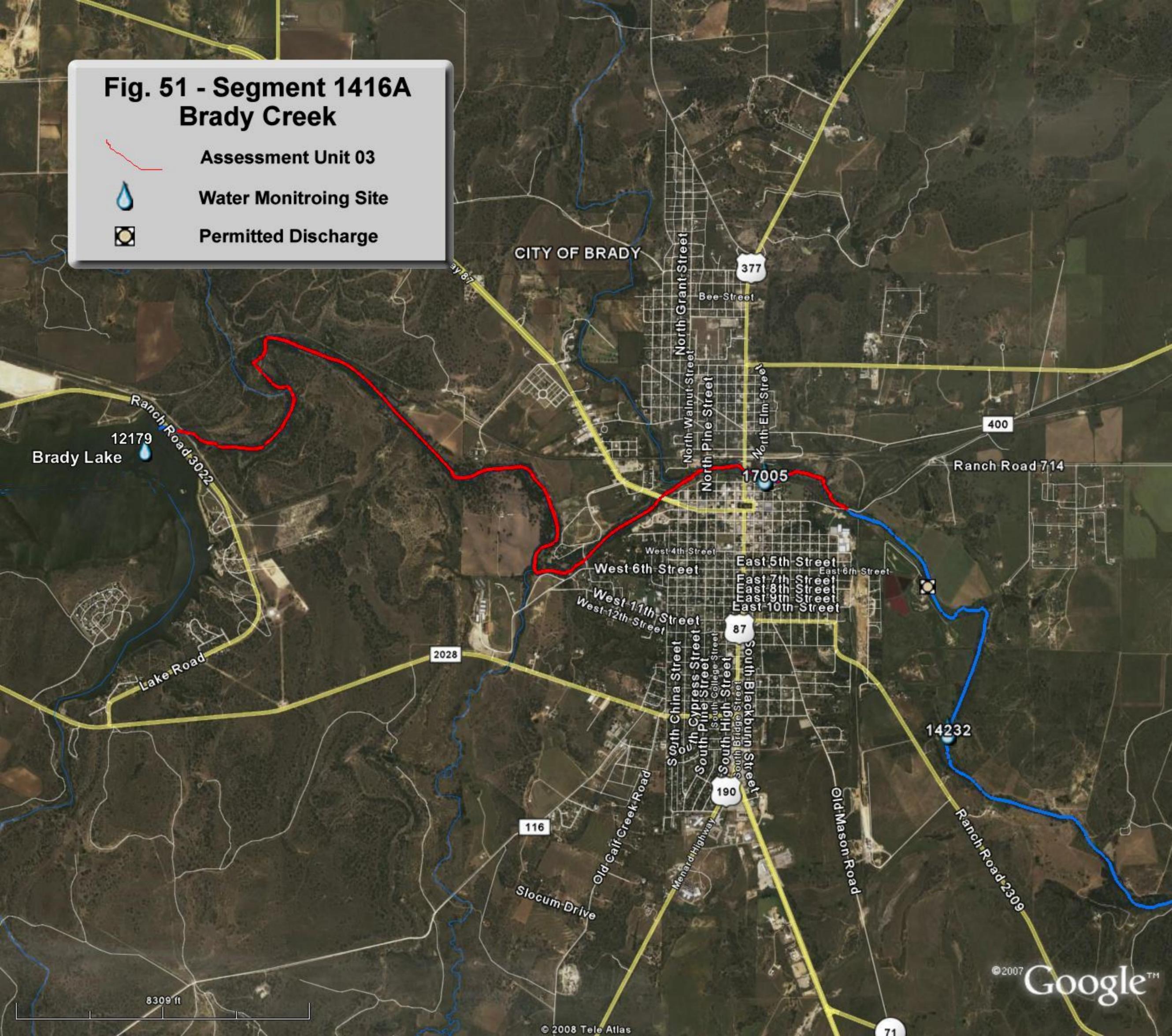


Permitted Discharge



**Fig. 51 - Segment 1416A
Brady Creek**

-  Assessment Unit 03
-  Water Monitoring Site
-  Permitted Discharge



8309 ft

**Fig. 52 - Segment 1416A
Brady Creek Site 17005**



Segment 1421: Concho River

**Impairment: Bacteria,
macroinvertebrate community
and dissolved oxygen**

Segment Description

The Concho River watershed is about 6,700 square miles. A series of dams near San Angelo capture water from the river's three forks for municipal water supply for the city. Segment 1421 begins upstream of the confluence of the Concho River and Fuzzy Creek in Concho County and extends upstream to the O.C. Fisher Reservoir outlet works on the North Concho River and to the Lake Nasworthy outlet works on the South Concho River in San Angelo (Fig. 53). The segment is approximately 64 miles long.

It has historically been monitored by CRMWD, TCEQ and UCRA. The following sites were monitored during the period of record:

12254 – Lipan Creek approx. 984 yard upstream of the confluence of the Concho River

12255 – Kickapoo Creek at FM 380

12257 – Dry Hollow Creek at headwaters of Chandler Lake

12401 – Concho River Bridge on U.S. 83 at Paint Rock

12402 – Concho River at FM 381

12403 – Concho River at FM 1692 South of the town of Miles

12404 – Concho River at County Road 4.5 miles Northeast of Veribest

12407- Concho River at FM 380 near Veribest

12408 – Concho River Downstream from Loop 306 East of San Angelo

12409 – Concho River 0.4 miles downstream of North and South Concho Confluence

12412 – North Concho River 22 yard above Irving Street Bridge

12416 – South Concho River at U.S. 87 in San Angelo

15886 – North Concho River at Caddo Street Bridge in San Angelo

There are two impaired AUs: 1421_07 and 1421_08 (Fig. 53). AU 1421_07 begins at the low water dam near Vine Road and ends at the confluence of the North and South Concho Rivers (Fig. 54). AU 1421_08, the North Concho River, begins at the confluence of the North and South Concho rivers upstream to O.C. Fisher Reservoir Dam (Fig. 57).

Land Use

Industrial, commercial and residential developments are located on either side of the river as it flows through San Angelo (Population 88,000). Dams at the headwaters of each AU restrict flow and decrease oxygenation. Below San Angelo, the segment is

predominantly agriculture, including confined animal feed operations, dairies, farming and pasture.

Impairment Description

AU 1421_07 was first placed on the 2002 303(d) List for not supporting its designated aquatic life use based on an impaired benthic macroinvertebrate community. Four monitoring events performed by UCRA from Site 12409 (Fig. 56) between March 1, 1996, and February 28, 2001, were assessed by TCEQ. The average Index of Biological Integrity (IBI) score was 18. A score of 29 is required to meet a high aquatic life use. Without additional data collection, the segment has remained on subsequent 303(d) lists as a carry forward.

1421_08 was first placed on the 2008 303(d) List for not supporting contact recreation or its designated aquatic life use. The Draft 2010 303(d) List confirms the impairment. The aquatic life impairment was based on low levels of dissolved oxygen. Data collected from sites 12412 and 15886 (Fig. 59) between December, 2001 and November, 2008 showed 15 of 28 24-hour events failed to meet the average criteria of five mg/L. Thirteen of 28 events also failed the 24-hour minimum criteria of three mg/L. A review of data collected since the Draft 2010 Integrated Report was published indicates that the sites continue to have low dissolved oxygen levels.

The contact recreation impairment was based on high *E.coli* levels. During the same period, the geometric mean of 34 *E.coli* samples was 224 MPN, exceeding the criteria of 126. A review of data collected since the Draft 2010 Integrated Report was published shows that the geometric mean for *E. coli* from samples collected from sites 15886 and 12412 also exceeded the criteria.

The Draft 2010 Integrated Report identified concerns for high levels of orthophosphorus, nitrate and chlorophyll-*a* have also been identified throughout Segment 1421.

Potential Causes of Impairment at Sites 12409, 12412 and 15886

Nonpoint Sources

Urban storm water runoff into the Concho River from San Angelo has been a serious problem for many years. Fish kills commonly occurred after rain events until storm water filters were installed as part of UCRA's nonpoint source pollution abatement program which began in the mid 1990s. Fish kills due to runoff are rare now. But, based on routine monitoring in AUs 07 and 08, low dissolved oxygen levels in the river are still a problem in portions of the river.

Actions Taken:**Watershed Protection Plan**

- The Concho River WPP implementation plan resulted in three BMPs to address urban storm water runoff:
 - Municipal stormwater ordinance development for the City of San Angelo.
 - Anoxic sludge was dredged from portions of AU 1421_08 in March, 2010.
 - A bank stabilization project in AU 1421_08 began March 2011.

To determine if limited data is responsible for the continued listing, the TCEQ retained the USGS in 2008 to perform biological and other monitoring within the assessment unit. Preliminary data from two sample events indicate a mean benthic IBI score of 25.5 which does not meet the standard for high aquatic life use.

Stakeholders from the Concho River Watershed Protection Plan

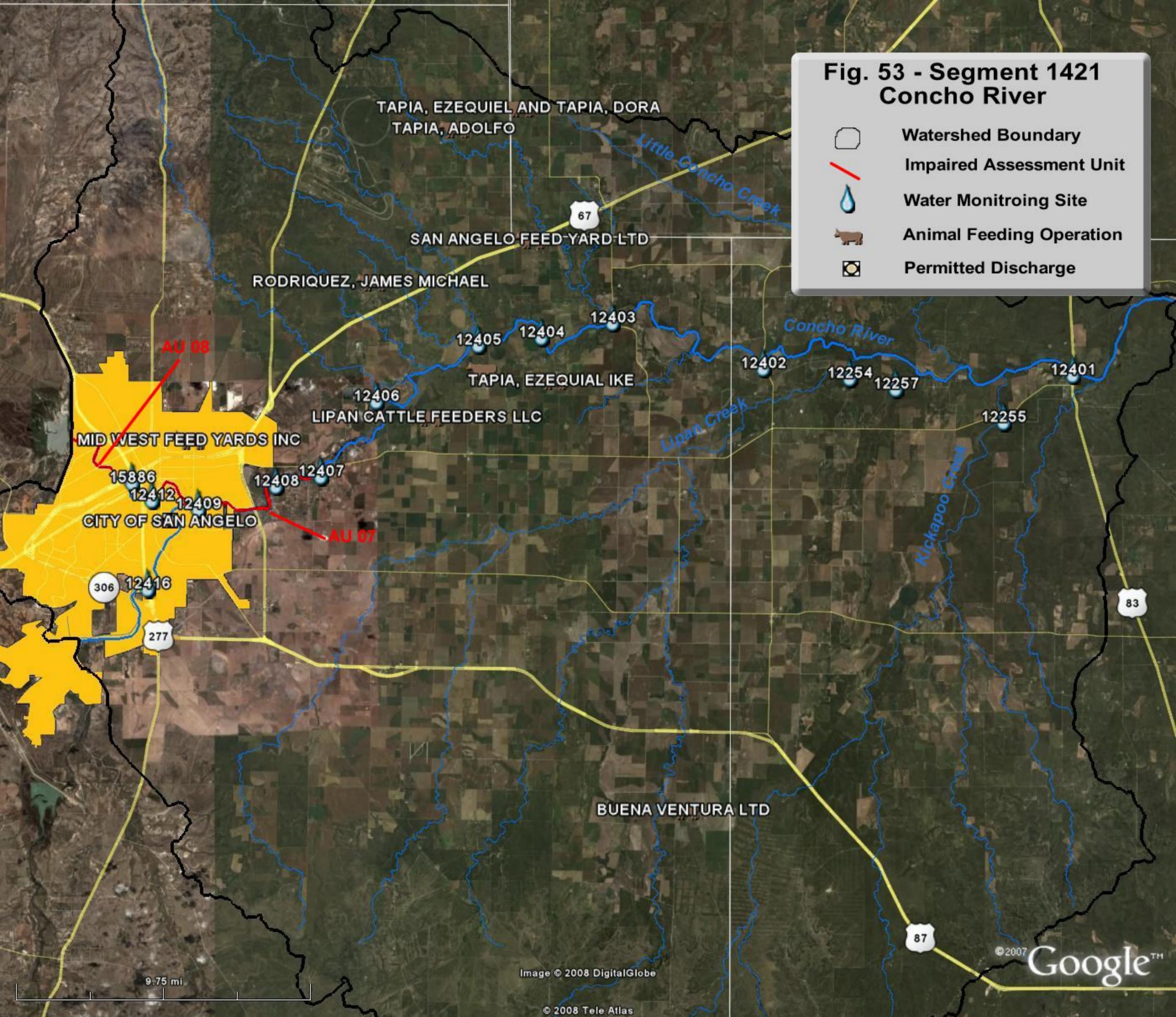
- City of San Angelo
- Upper Colorado River Authority
- Downtown Merchants
- North Concho River Property Owners
- Texas Parks and Wildlife Department
- Texas Commission on Environmental Quality
- Texas Institute for Applied Environmental Research
- City of Paint Rock
- Landowners downstream of San Angelo
- Texas Soil and Water Conservation Board
- Soil and Water Conservation Districts

Recommendations:

Continue to collect bacteria to verify the contact recreation listing in 2010.
Use USGS biological data to reassess aquatic life use attainment.
Continue to implement BMP's outlined in the Concho River WPP.

**Fig. 53 - Segment 1421
Concho River**

-  Watershed Boundary
-  Impaired Assessment Unit
-  Water Monitoring Site
-  Animal Feeding Operation
-  Permitted Discharge



9.75 mi

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**Fig. 54 - Segment 1421
Concho River
Assessment Unit 07**

-  Assessment Unit 07 Boundary
-  Water Monitoring Site



**Fig. 55 Segment 1421.07
Site 12409**



Water Monitoring Site

Bell Street Dam

12409

876 ft

**Fig. 56 - Segment 1421.07
Concho River Site 12409**



**Fig. 57 - Segment 1421
Concho River
Assessment Unit 08**

-  Assessment Unit 08 Boundary
-  Water Monitoring Site
-  Permitted Discharge

O.C.
Fisher
Reservoir

15886

12412

12409

CITY OF SAN ANGELO

7379 ft

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**Fig. 58 - Segment 1421.08
Concho River Sites
15886 and 12412**



Water Monitoring Site

15886

12412

1788 ft

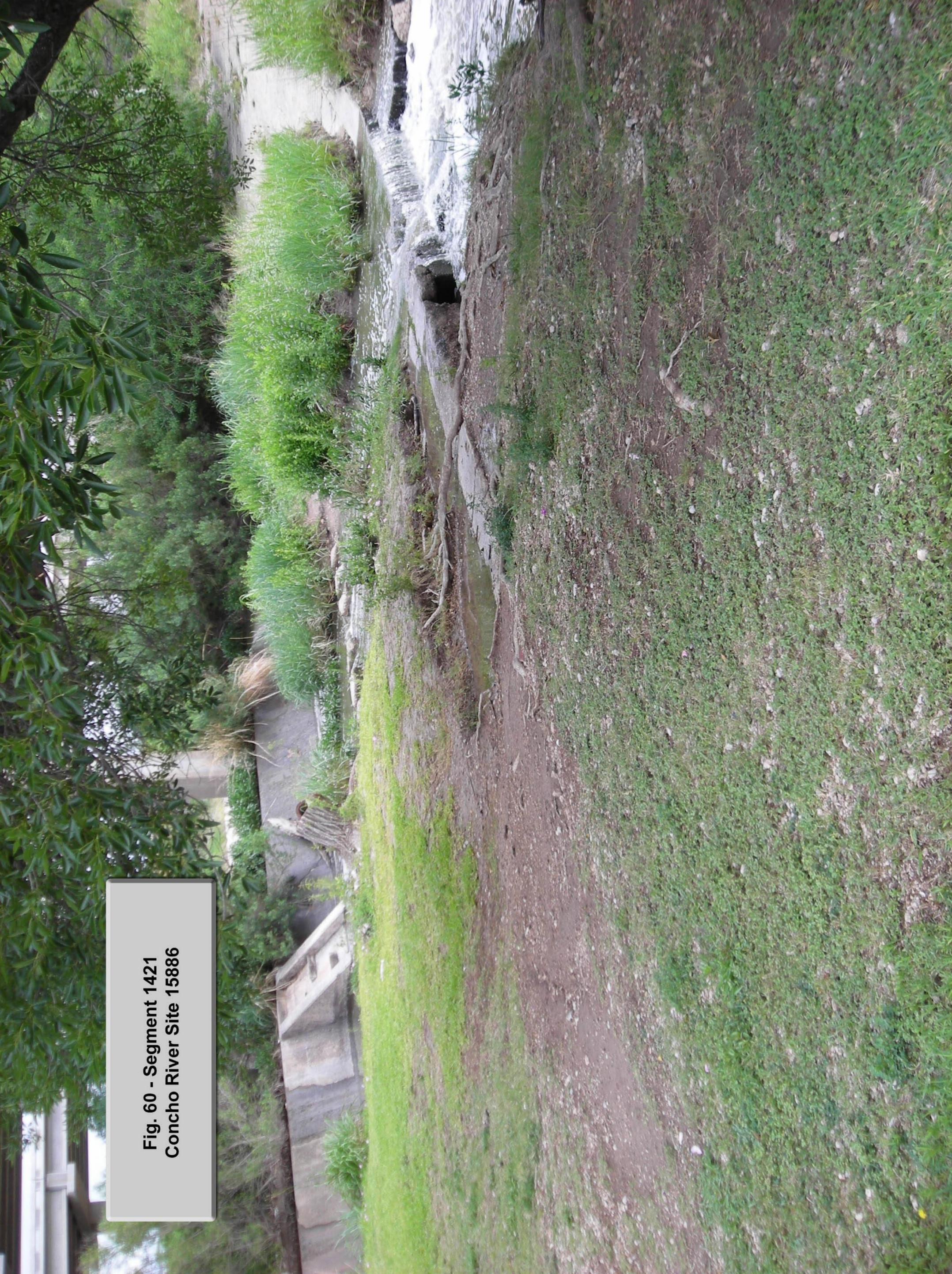
Image © 2008 DigitalGlobe

© 2007 Google™

**Fig. 59 - Segment 1421
Concho River Site 12412**



**Fig. 60 - Segment 1421
Concho River Site 15886**



Segment 1427A: Slaughter Creek

Impairment: Macrobenthic Community

Segment Description

Located in southern Travis County, the Slaughter Creek watershed is approximately 31 square miles (Fig 61). Slaughter Creek begins at its confluence with Onion Creek in east Austin and ends about 17 miles upstream near SH 290. A six-mile section of the creek near Loop 1 (MoPac) lies over the Edwards Aquifer recharge zone and this mid-reach portion of the creek does not maintain baseflow under normal conditions.

Slaughter Creek is composed of one AU, 1427A_01. It was monitored by TCEQ and USGS at the following sites during the period of record:

12186 – Slaughter Creek at FM 1826

17964 – Slaughter Creek downstream of FM 2304

Land Use

While the Slaughter Creek watershed is urban, the riparian area surrounding the creek remains largely intact. The lower watershed consists primarily of densely clustered housing subdivisions. The upper watershed is less developed.

Impairment Description

Segment 1427A was placed on the 303(d) List in 2002 for not supporting a high aquatic life use due to an impaired invertebrate community. The impairment was based on two data points collected in 2001 from Site 12184, Slaughter Creek at IH 35 (Fig. 62). The resulting average IBI score was 20. Slaughter Creek is assigned a high ALU in Appendix D of the TSWQS, which assumes a score of 29. The site has not been monitored since 2001. There are no data to reevaluate the impairment and the segment has remained on subsequent 303(d) lists.

Potential Causes of Impairment

Point Sources

Wastewater lines and septic systems are located throughout the watershed. There are no permitted discharges.

Nonpoint Sources

The watershed is urbanized. The stream receives storm water runoff from roads, roof tops and parking lots.

Inadequate data

In 2002, TCEQ acquired data collected on Slaughter Creek from the City of Austin. The impairment is based on two sampling events, not typically enough to list a water body. Another complicating factor is that the City used its own biological monitoring protocols. The limited amount of data and use of non TCEQ-approved sampling protocols make comparison to Texas Surface Water Quality Standards difficult and the impairment designation questionable.

Actions Taken:

A UAA was conducted by TCEQ in 2004. The findings were inconclusive due to drought conditions and accurate ALU designations were not determined. TCEQ Water Quality Standards Team is slated to begin biological monitoring in FY 2011 in an effort to collect enough data to determine an ALU.

Potential Stakeholders:

- COA
- Colorado River Watch Network
- Neighborhood Associations
- TCEQ SWQM staff
- LCRA

Recommendations:

Complete scheduled UAA

Fig. 61 - Slaughter Creek Watershed

— Watershed Boundary

— Impaired Segment (1427A)



Monitoring Site

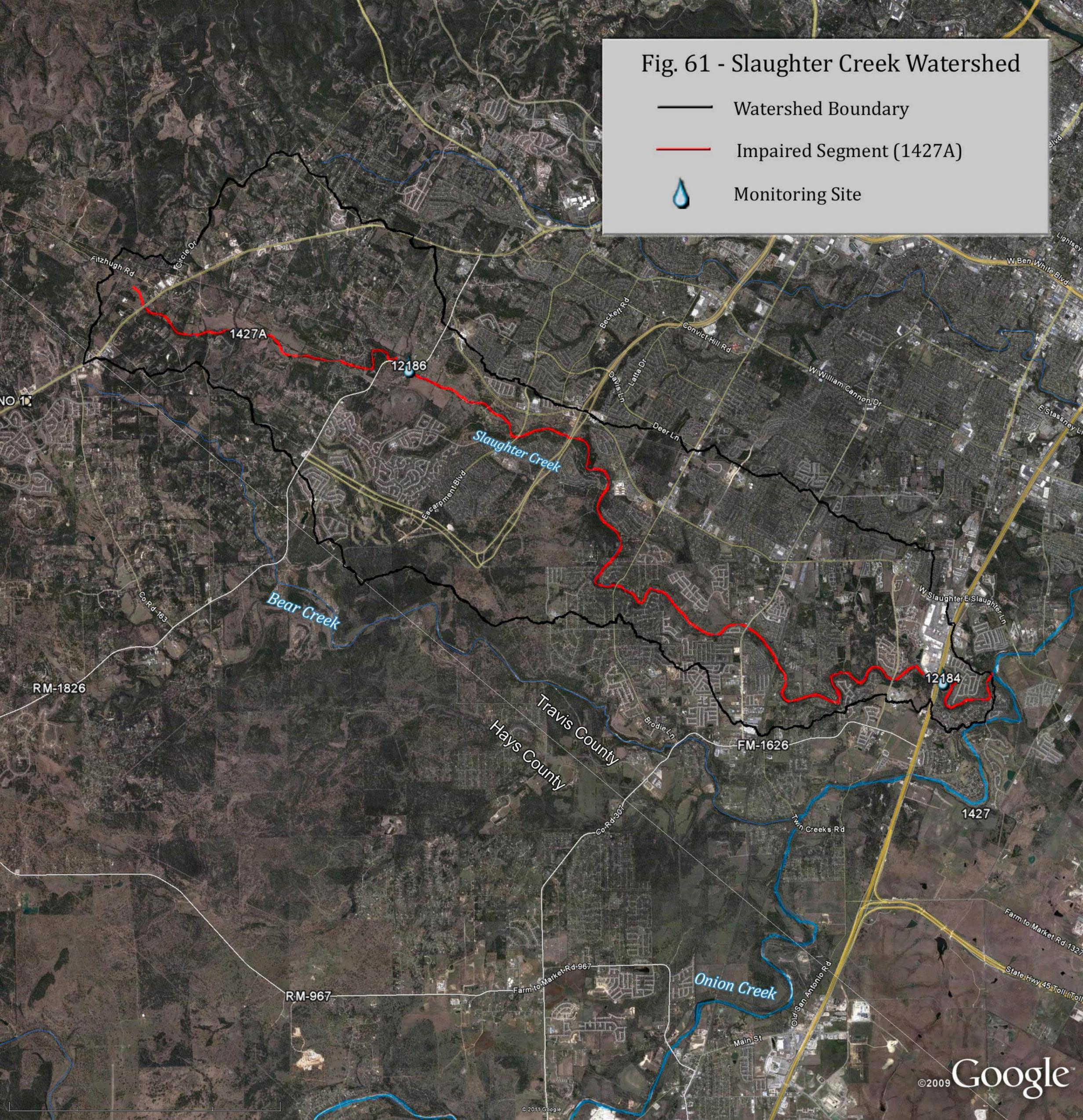


Fig. 62- Segment 1427A
Slaughter Creek
Site 12184



Water Monitoring Site

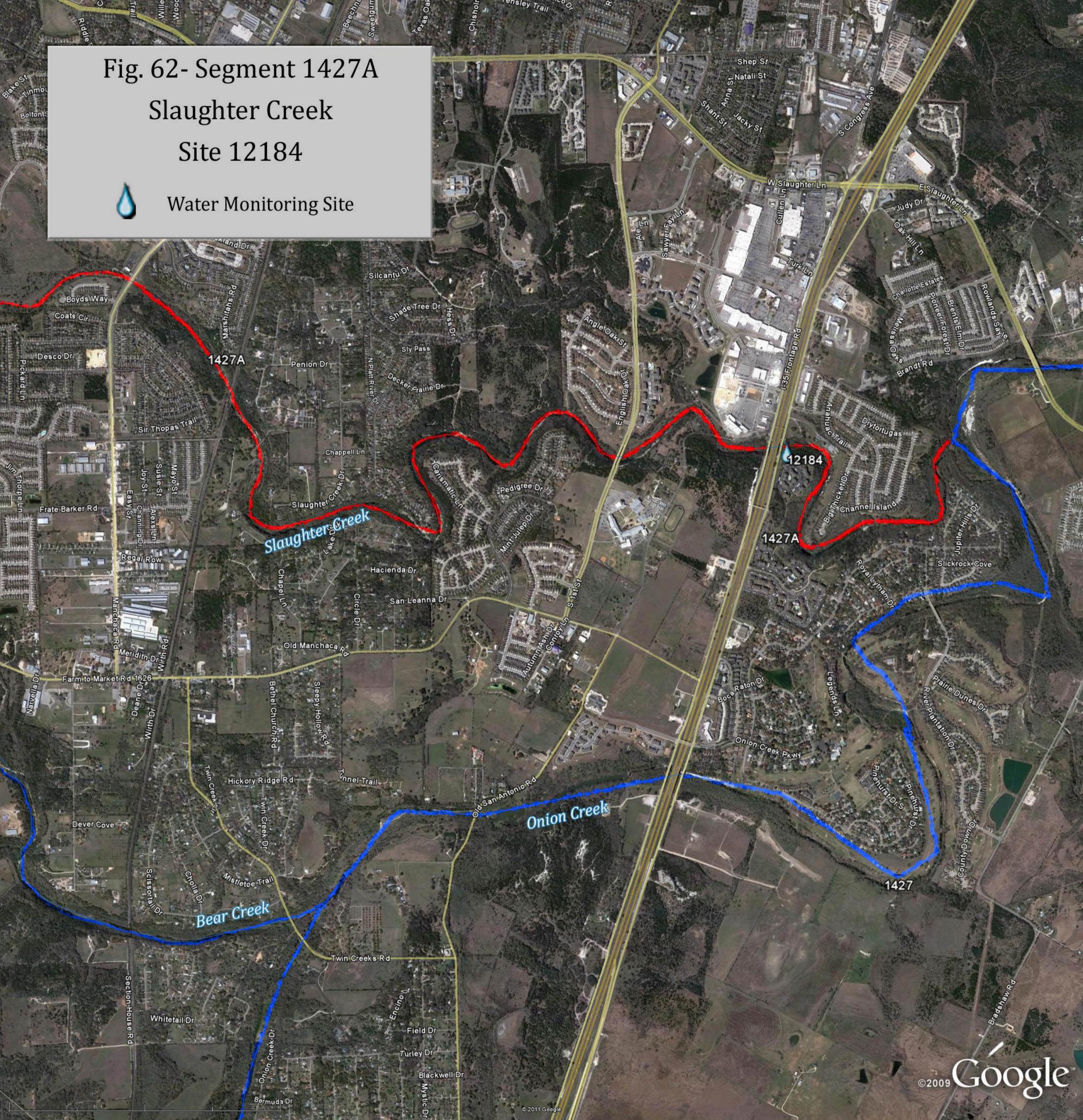


Fig. 63 - Segment 1427A
Slaughter Creek
Site 12184



Segment Description

Segment 1428 begins near FM 969 northwest of Bastrop and ends 41 miles upstream at Longhorn Dam, east of IH-35 in Austin. In 2010, three sites were monitored on-segment.

12466 – Colorado River at Little Webberville Park west of Water Road

12469 – Colorado River at Del Valley

12474 – Colorado River at US 183 southeast of Austin

The impaired AU, 1428_03, is the uppermost stretch of the segment. It begins at the confluence of the Colorado River and Walnut Creek and ends upstream at Longhorn Dam (Fig. 64). It is approximately five miles long. Data responsible for the listing are from Site 12475, Colorado River below Longhorn Dam (Fig. 65). Monitoring at Site 12475 was discontinued in September 2007 and moved one mile downstream to Site 12474, where a flow gage is located. The new site is also in AU 03.

Land Use

AU 1428_03 is downstream of the most densely urbanized watershed in the Colorado River basin. The immediate watershed consists of downtown and eastern Austin. Consequently, Lady Bird Lake provides all of the flow with the exception of some amounts of storm water runoff from a park on the south side of the river and a parking lot on the north side.

There are no wastewater treatment plants immediately upstream of AU 03. Until it was closed in September 2007, the COA operated Holly Power Plant, a power generating facility located on the lake near Longhorn Dam. The facility was permitted to discharge industrial cooling water; not a likely source of bacteria.

Wastewater lines are located near the monitoring site. In the past, line failure was determined to be a source of fecal contamination. Also, there is a homeless population in the area around the site which may be a source of bacteria.

Impairment Description

Segment 1428 was listed in 2006 for not meeting its contact recreation use due to elevated levels of *E. coli*. Site 12475 continued to show an impairment as the geometric

mean of data assessed for the 2008 Integrated Report was 143 MPN, exceeding the criteria of 126.

During the 2010 assessment, TCEQ reviewed 39 samples collected between December 1, 2001, and November 30, 2008. The resulting geometric mean was 136; again, greater than the criterion. TCEQ designated the segment as a category 5c waterbody, meaning more information will be gathered before a TMDL or other water quality project is implemented.

The Draft 2010 Integrated Report identified concerns for screening levels of nitrate, total phosphorus and orthophosphorus in the lower end of the segment. Nutrients are not a concern in AU 03 based on data from sites 12474 and 12475.

The Draft 2010 Integrated Report identified concerns for aquatic life use in the lower portion of the segment based on an insufficient data set of biological parameters. LCRA collected biological data at Site 12466 from 1999 to 2002, but the minimum number of data points necessary for a full assessment were not obtained. Because of the variable flow regime caused by upstream dam releases, a representative sample cannot be collected in the time frame outlined by TCEQ guidance. There are no plans for further biological monitoring.

Potential Causes of impairment at Site 12475

Nonpoint Sources

The effects of runoff on bacteria at the site are difficult to determine because flow is not a function of rainfall, but of water releases from Longhorn Dam. Quantity and frequency of releases from Longhorn Dam are determined by the needs of downstream water rights holders. Calls for water are greatest from mid-March through October during the rice growing season.

Data collected from Lady Bird Lake just upstream of Site 12475 do not indicate problematic bacteria levels in the lake. It is unlikely that the elevated bacteria levels at Site 12475 are from upstream sources.

The most likely cause of elevated bacteria at Site 12475 is leaking wastewater lines. An eight-inch sewer line located on the south side of the river was discovered to be failing in 1988 and again in 1994. A 1995 LCRA report titled *Longhorn Dam Fecal Coliform Study* attributed high levels of bacteria in the river to the leaking wastewater lines.

Large numbers of waterfowl have been observed on Lady Bird Lake at the dam and in the river below the dam. They may be a source of *E.coli*.

Actions Taken:

No actions taken to date.

Potential Stakeholders:

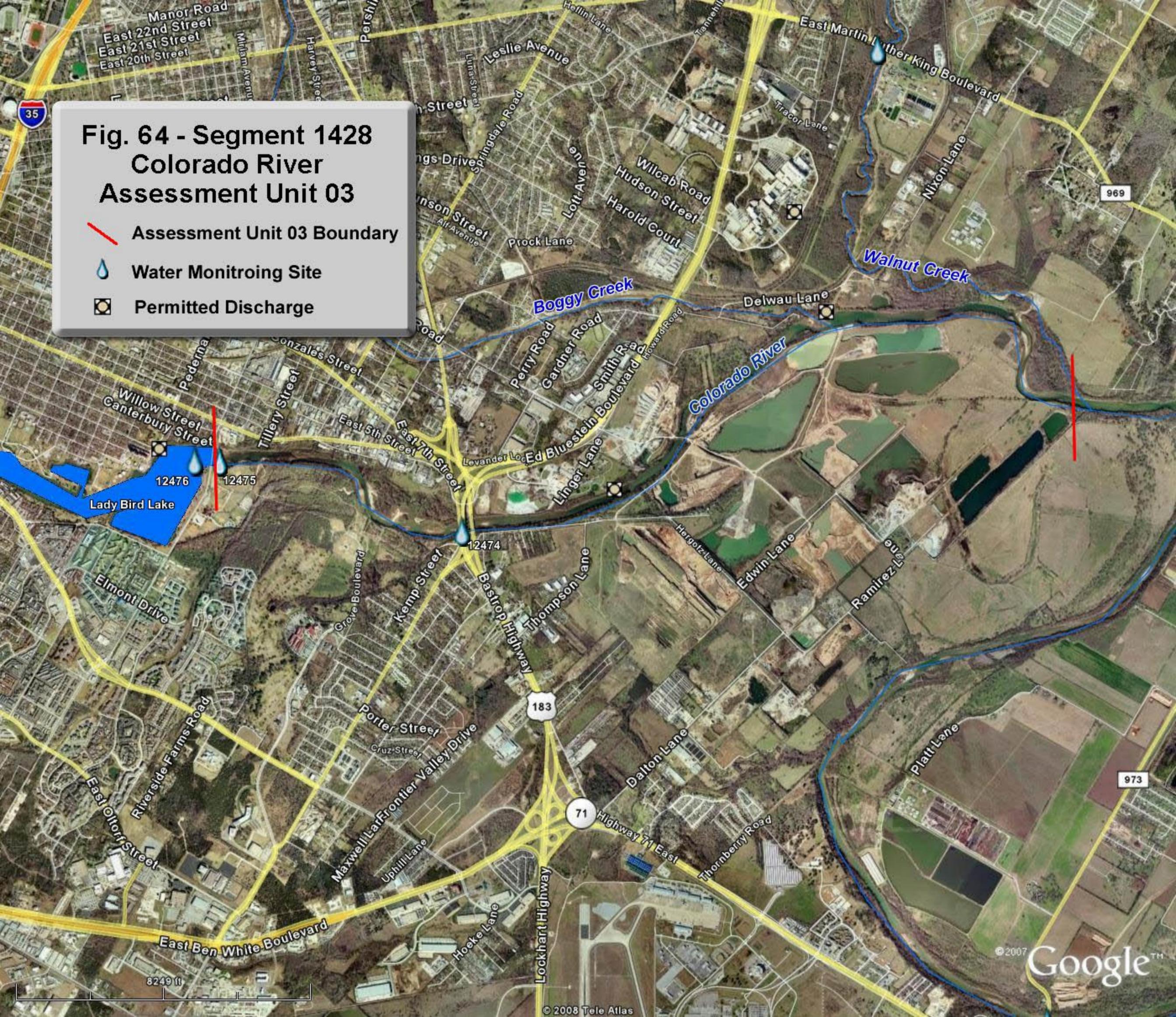
Austin-Bastrop River Corridor Partnership
COA
Environmental Stewardship
LCRA

Recommendations:

Bacteria values collected from Site 12474 are routinely less than the criteria of 126 MPN. Continue to monitor and reassess the segment in 2012

**Fig. 64 - Segment 1428
Colorado River
Assessment Unit 03**

-  Assessment Unit 03 Boundary
-  Water Monitoring Site
-  Permitted Discharge



35

969

973

183

71

8249 ft

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**Fig. 65 - Segment 1428
Colorado River
below Austin**



Water Monitoring Site



Permitted Discharge



Lady Bird Lake

Austin Energy

12476

12475

1176 ft

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**Fig. 66 - Segment 1428
Colorado River Site 12475**



Segment 1428B: Walnut Creek
Segment Description

Impairment: Bacteria

The Walnut Creek Watershed is located on the north side of the Colorado River in Austin. Segment 1428B begins at its confluence with the Colorado River in east Austin upstream to the perennial portion of the stream in north Austin (Fig. 67). The segment is approximately 20 miles long. It was monitored by the COA and USGS at the following sites during the period of record:

- 12231 – Walnut Creek at Southern Pacific RR, 1.2 miles south of FM 969
- 12232 – Walnut Creek at Webberville Road (FM 969) in east Austin
- 15743 – Walnut Creek at I-35 West Frontage Road
- 16187 – Walnut Creek adjacent to NE District Park near Crystal Brook Drive
- 17469 – Walnut Creek just downstream of Old Manor Road, east of Ferguson cutoff
- 17251 – Walnut Creek immediately downstream of Loop 1/MOPAC

Land Use

The Walnut Creek watershed is urban, comprised mostly of residential housing and commercial uses.

Impairment Description

First listed in 2006, three of five AUs in this segment continued to be impaired based on the 2008 303(d) List; 1428B.01, 1428B.03 and 1428B.05. Additional data collected by COA showed support for contact recreation in AUs 1428B_01 (confluence with the Colorado River upstream to FM 969) and 1428B_03 (from Old Manor Road moving upstream to Dessau Road) according to the Draft 2010 Integrated Report.

AU 1428B.05 (from Mopac/Loop 1 going upstream to railroad tracks west of Loop 1) remained on the draft 2010 303(d) List for exceeding grab sample and geometric mean criteria for *E.coli*. Eleven of thirteen samples were over the grab criterion of 394 and the geometric mean of samples collected from AU 05 was 902 MPN. Data responsible for the listing are from Site 17251.

TCEQ has designated Walnut Creek a category 5b waterbody, meaning TSWQS will be reviewed before a TMDL or other water improvement project is scheduled.

Potential Causes of impairment

Point Sources

None

Nonpoint Sources

- Throughout the watershed, wastewater collection infrastructure is located near the creek. Leaking pipes may be a cause for elevated bacteria.
- Storm water runoff from urban sources may also contribute bacteria to the stream.
Pet waste from the Walnut Creek Metro Park and greenbelt may be another source.

Actions Taken:

COA conducted additional longitudinal bacteria sampling in Walnut Creek around site 17251 not submitted to TCEQ for assessment. The source of fecal contamination has been bracketed spatially to a small pipe outfall upstream of the monitoring location.

COA is currently investigating the wastewater infrastructure near site 17251 to identify and repair any leaking infrastructure.

An old uncapped well has been identified that is most likely connected hydrologically to the 17251 monitoring site and may be influenced by domestic pets from the nearby apartment complex. COA is pursuing the capping of this well thru the Texas Water Development Board.

On-site sewage facilities (OSSF) near 17251 have been mapped.

Potential Stakeholders:

COA
Neighborhood associations
Land owners
TCEQ

Recommendations:

Evaluate the condition of OSSF near Site 17251.

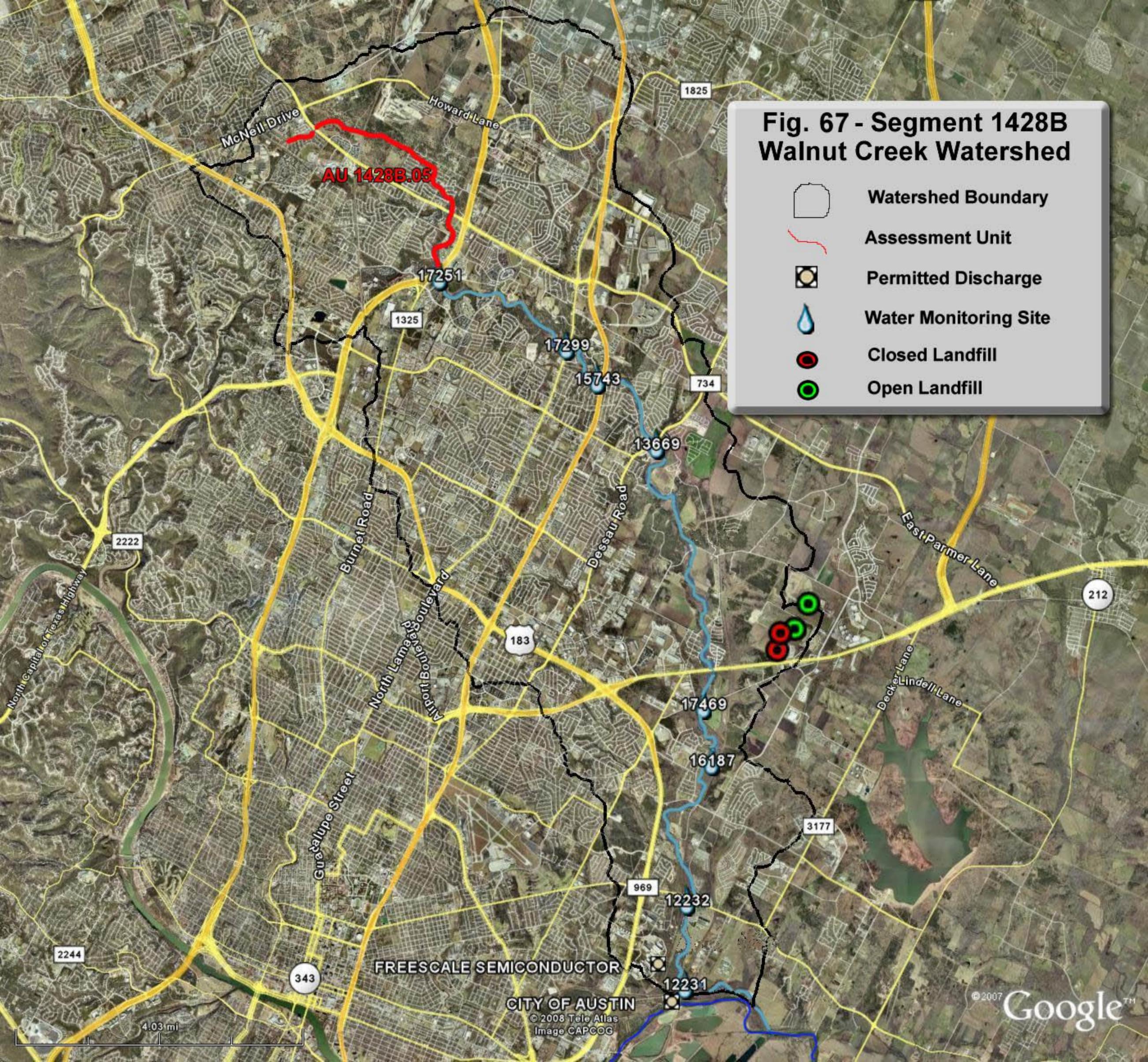
Evaluate wastewater collection infrastructure.

Identify the source of water from the pipe above Site 17251

Survey the creek to verify potential sources of bacteria.

**Fig. 67 - Segment 1428B
Walnut Creek Watershed**

-  Watershed Boundary
-  Assessment Unit
-  Permitted Discharge
-  Water Monitoring Site
-  Closed Landfill
-  Open Landfill



4.03 mi

FREESCALE SEMICONDUCTOR
CITY OF AUSTIN
© 2008 Teo Atlas
Image CAPCOG

© 2007 Google™

Fig. 68 - Segment 1428B Walnut Creek Assessment Unit 05

-  Watershed Boundary
-  Assessment Unit 05
-  Water Monitoring Site



**Fig. 69 - Segment 1428B
Walnut Creek Site 17251**



Segment Description

The Eanes Creek watershed is located on the south side of Lady Bird Lake between Loop 360 and MOPAC (Fig. 70). The uppermost portion of the watershed is within the cities of Rollingwood and West Lake Hills. Segment 1429B begins at its confluence with Lady Bird Lake and ends six miles upstream in west Austin.

The portion of the watershed below the creek crossing with Camp Craft Road (Fig. 70) lies over the southern Edwards Aquifer recharge zone. Eanes Creek is intermittent upstream of the recharge zone and ephemeral over the recharge zone.

During the period of record the creek was monitored at Site 15964, immediately upstream of the confluence with Lady Bird Lake. Data responsible for the listing were collected from Site 15963, Eanes Creek at Westlake High School on Camp Craft Road.

The impaired AU, 1429B_01, is defined as the entire length of the segment.

Land Use

The Eanes Creek Watershed is urban. It consists primarily of dense residential development. The upper portion of the watershed - near the intersection of Capital of Texas Highway and Bee Caves Road - has some commercial development. The upper part of the stream is intermittent.

Impairment Description

Segment 1429B was first placed on the 1999 303(d) List for not supporting contact recreation due to elevated levels of fecal coliform bacteria. The data were collected by Colorado River Watch Network volunteers and acquired by TCEQ. Discussions with TCEQ staff revealed that seven out of 12 samples (58 percent) collected from Site 15963 exceeded the single sample limit of 400 CFU. The impairment has been carried forward on subsequent 303(d) Lists.

While COA committed to collect *E.coli* monthly from the creek, no samples were collected because the creek remained dry during the 2008 drought. The Draft 2010 303(d) List identifies the creek as impaired as a carry forward.

Potential Causes of impairment

Inadequate Data

The Eanes Creek impairment is an eleven-year-old listing based on fecal coliform data submitted through the Colorado River Watch volunteer monitor program. No data were collected to confirm or refute the original listing until 2008.

Nonpoint Sources

Urban runoff and leaking wastewater pipes are a potential cause for elevated bacteria in the stream.

Actions Taken:

In 2008 TCEQ and the COA began monthly *E.coli* sampling under LCRA's CRP QAPP in an effort to obtain enough quality assured data to fully assess the creek. Unfortunately, the drought of 2008 prevented monthly data collection, and only two data points were available for review during the 2010 assessment.

Potential Stakeholders:

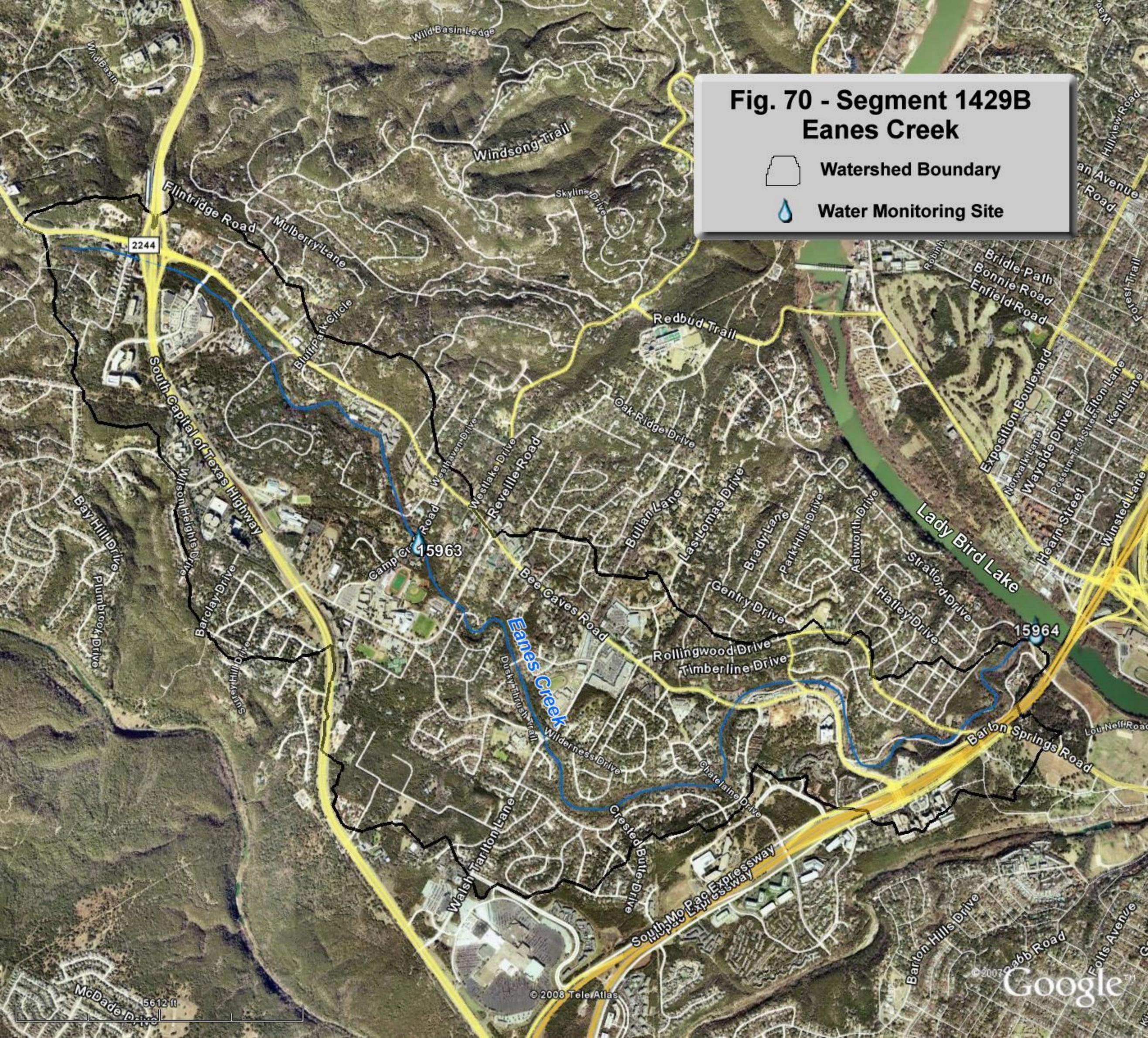
- COA
- City of Rollingwood
- City of Westlake Hills
- CRWN
- Neighborhood Associations
- TCEQ

Recommendations:

- Collect bacteria data when flow allows from Site 15964 to verify the impairment. Monitoring should continue to provide enough data for a full assessment in 2012.
Communicate with TCEQ to determine if an RUAA is appropriate because of the creeks ephemeral nature downstream of the recharge zone, flowing only in response to runoff generating storm events

**Fig. 70 - Segment 1429B
Eanes Creek**

-  Watershed Boundary
-  Water Monitoring Site



**Fig. 71 - Segment 1429B
Eanes Creek Site 15964**



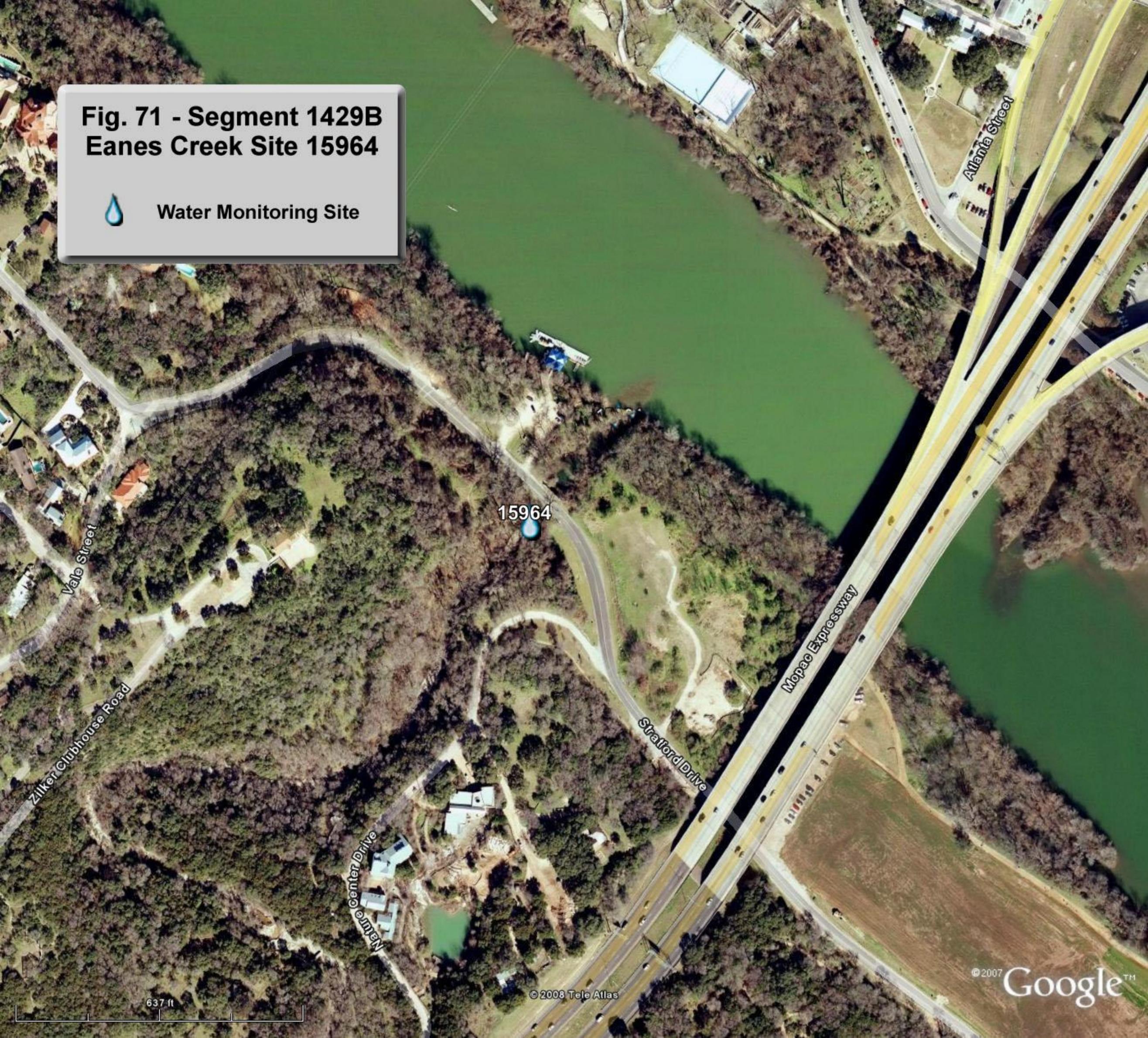
Water Monitoring Site

15964

637 ft

© 2008 Tele Atlas

© 2007 Google™



**Fig 72 - Segment 1429B
Eanes Creek Site 15964**



**Fig. 73 - Segment 1429B
Eanes Creek Site 15963**



Water Monitoring Site

15963

Camp Craft Road

401 ft

© 2008 Tele Atlas

© 2007 Google

**Fig. 74 - Segment 1429B
Eanes Creek Site 15963**



Segment 1429C: Waller Creek

**Impairment: Bacteria and
macrobenthic community**

Segment Description

The Waller Creek watershed is located on the north side of Lady Bird Lake in downtown Austin (Fig. 75). Segment 1429C begins at its confluence with Lady Bird Lake in central Austin and ends in north Austin. The segment is approximately five miles long and is delineated into three assessment units.

The following sites were monitored in Waller Creek during the period of record:

12222 – Waller Creek at 2nd Street

12228 – Waller Creek at Denson Avenue in Austin

15962 – Waller Creek at 24th Street on UT Campus

16331 – Waller Creek at Avenue H at the Elisabet Ney Museum

Each of the sites represents the three assessment units in Waller Creek; 1429C.01, 1429C.02 and 1429C.03.

AU 1429C_01 begins at the confluence with Lady Bird Lake and ends at East MLK Boulevard. 1429C_02 begins at MLK Blvd and ends upstream at East 41st Street. 1429C_03, is the portion of the creek upstream of 41st Street in north Austin (Fig. 84).

Land Use

Waller Creek is arguably the most densely urbanized watershed in the Colorado River basin. It flows through concrete-lined channels. Greenbelt and natural filters are non-existent. Sewer lines cross the creek at many locations and storm water outlets drain runoff from downtown Austin into the creek.

Signs of transient populations in the creek are evident during monitoring events.

Impairment Description

Segment 1429C was first placed on the 2002 303(d) List for not supporting a high aquatic life use due to an impaired invertebrate community. The impairment was based on four monitoring events performed by the COA at Site 12222 between March 1996 and February 2001. The mean score of the four samples was 21.3, which indicates a

limited aquatic life use. No biological data have been collected under an approved QAPP since the original listing. The segment has remained on subsequent 303(d) lists and is on the Draft 2010 303(d) List as a carry forward.

Assessment units 01 and 03 were first identified for not supporting contact recreation on the 2004 303(d) List due to elevated levels of fecal coliform bacteria. Assessment unit 02 was first identified for not supporting contact recreation on the 2006 303(d) List due to elevated levels of *E.coli*.

COA has collected *E.coli* samples from each of the monitoring sites since 2007. The Draft 2010 Integrated Report showed a continued impairment based on *E.coli* levels. Geometric means ranged from 268 to 797 MPN and grab sample criterion were exceeded at each site.

The Draft 2010 Integrated Report identified concerns for organics in sediment based on data collected from Site 15962 between 2003 and 2005. There is a concern for DO in AU 01 based on grab samples collected between 2001 and 2008.

Potential Causes of Impairment

Biological data

In 2002, TCEQ acquired the biological data from Waller Creek at COA's request. The resulting impairment was based on four sampling events. More biological data would help verify the 2002 listing. However, the Waller Creek Tunnel is under construction and will alter flow and habitat of the creek. This issue should be revisited once the project is complete.

Nonpoint Sources

The elevated bacteria levels in Waller Creek may be attributed to pet and human waste, leaking wastewater infrastructure and storm water runoff. These sources contribute pollutants from multiple locations and in variable amounts making it difficult to track sources and loading.

Actions Taken:

In an effort to obtain a sufficient amount of *E.coli* data for assessment, the COA, under contract with TCEQ, increased bacteria monitoring in Waller Creek to 12 times per year in 2008.

In 2010, bacteria monitoring ceased in anticipation of the Waller Creek Tunnel Project (see Recommendations).

Potential Stakeholders:

COA
CRWN
Downtown merchants
Neighborhood associations
TCEQ
University of Texas

Recommendations:

Evaluate wastewater collection infrastructure in the area, particularly in the upper portion of the watershed that will not be affected by the Waller Creek Tunnel project.

- The Waller Creek Tunnel Project is a large storm water bypass tunnel being built by COA that will additionally pump and recirculate water from Lady Bird Lake down Waller Creek during non-storm conditions. The project is being designed to alter floodplain boundaries to allow for additional urban development and may improve water quality of the creek. Completion is scheduled for July 2014. Given the level of alteration of the stream, monitoring for assessment purposes should be postponed until the project is complete. More information is available at http://www.ci.austin.tx.us/wallercreek/wctp_home.htm
- Once the Waller Creek Tunnel Project is complete, perform a UAA or ALA that includes fish, invertebrates, habitat and 24-hour Dissolved oxygen.

**Fig.75 - Segment 1429C
Waller Creek**



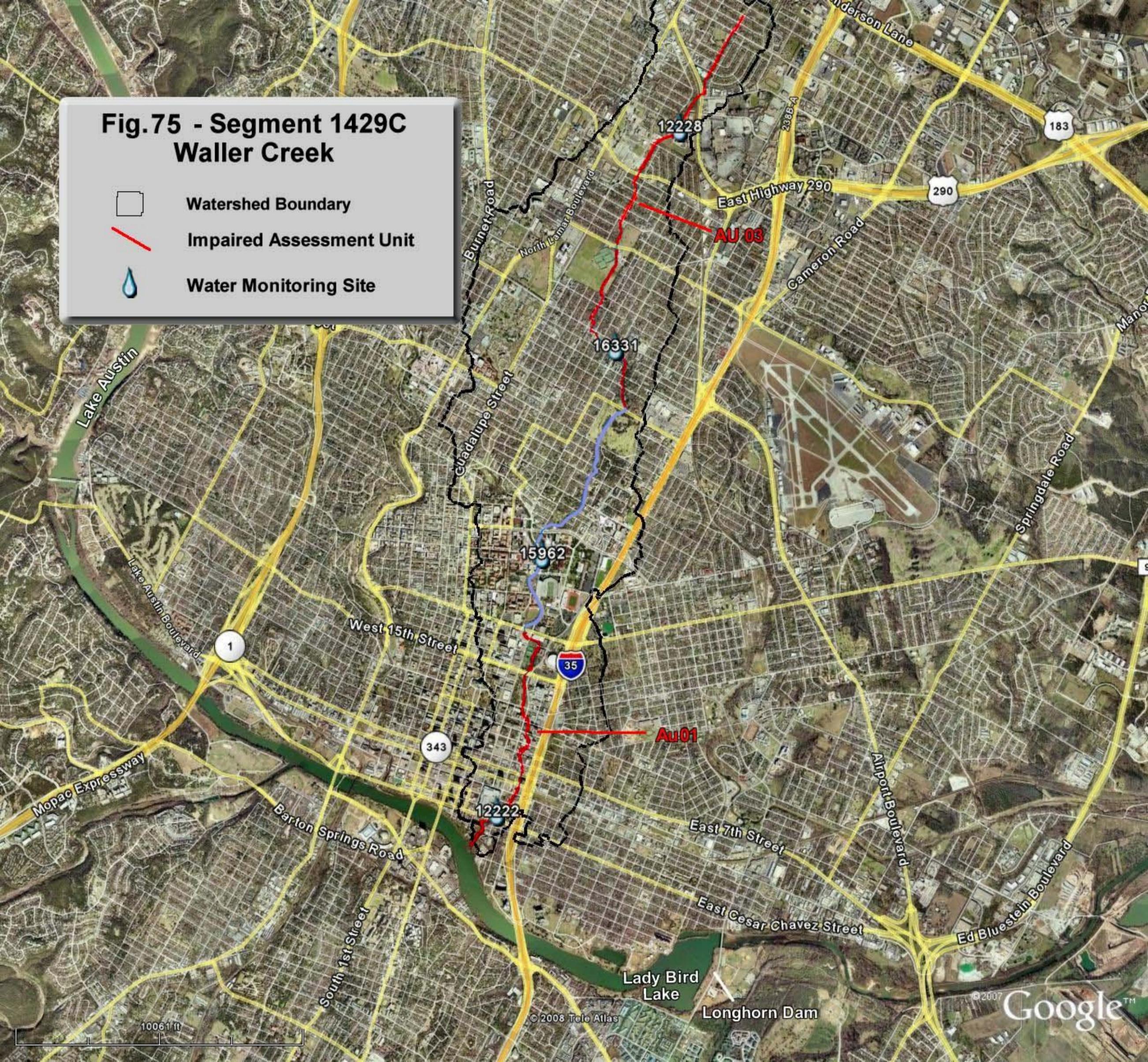
Watershed Boundary



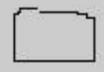
Impaired Assessment Unit



Water Monitoring Site



**Fig. 76 - Segment 1429C
Waller Creek Site 12222**



Waterhed Boundary



Water Monitoring Site



Lady Bird Lake

613 ft

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**Fig. 77 - Segment 1429C
Waller Creek Site 12222**



**Fig. 78 - Segment 1429C
Waller Creek Site 16331**



Water Monitoring Site



16331

East 44th Street

Avenue H

211 ft

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**Fig. 79 - Segment 1429C
Waller Creek Site 16331**



**Fig. 80 - Segment 1429C
Waller Creek Site 12228**



Watershed Boundary



Water Monitoring Site



**Fig. 81 - Segment 1429C
Waller Creek Site 12228**



Segment Description

A tributary of the Colorado River above Lake Buchanan, Pecan Bayou begins at its confluence with the Colorado River and ends upstream in Callahan County.

Segment 1431 begins immediately upstream of the confluence with Mackinally Creek in Brown County to a point just upstream of Willis Creek (Fig 81). The segment, which is approximately 13 miles long, is composed of one assessment unit. It is monitored by TCEQ at site 12504 (Pecan Bayou at FM 2126, downstream of the City of Brownwood)

Land Use

The City of Brownwood is located at the headwaters of the segment. Immediately downstream of the city, the surrounding watershed is primarily used for hay production and row crops. There is a concentrated animal feeding operation (CAFO) in the upper end of the segment near the monitoring site. The City of Brownwood Wastewater Treatment Plant (WWTP) discharges into Willis Creek about 1.5 miles upstream of the monitoring site 12504 (Fig. 82).

Impairment Description

Segment 1431 was first placed on the 2006 303(d) List for not supporting contact recreation due to elevated levels of *E.coli*. High bacteria counts were found in subsequent assessments. Based on the 2010 Draft Integrated Report, the geometric mean for *E.coli* data collected between 2001 and 2008 was 257 MPN, exceeding the criterion of 126.

The Draft 2010 Integrated Report identified concerns for high levels of nitrate, total phosphorus and orthophosphorus.

Potential Causes of impairment at Site 12504

Nonpoint Sources

Animal feedlot - The site of the former Gore's Dairy may contribute bacteria at the site. The site was recently used as a calving feedlot. TCEQ records showed violations found during an investigation performed in November 2000. More

recently, TCEQ cited the facility with a notice of violation. Drainage from the site and current waste disposal/land application practices are unknown. Current permit status of the operation is unknown.

Livestock - Cattle graze in pastures upstream of the monitoring site. The cattle have access to the stream and contribute fecal material to the water, but the amount and its relation to bacteria at Site 12504 are unknown.

Wildlife - Deer and feral hogs may be a source of fecal contamination, but the extent of their influence were not determined during this investigation.

Urban runoff - Site 12504 receives all of the storm water from the City of Brownwood (Fig. 83). This likely contributes to bacteria levels in the stream during rain events.

Point Sources

The City of Brownwood WWTP is permitted to discharge 4.5 MGD of treated effluent into a tributary upstream of the monitoring site.

Actions Taken:

The level of aquatic life use support has not been established for the segment. TCEQ and LCRA began collecting biological data for a UAA in 2010.

TCEQ Region 3 (Abilene) has pursued enforcement actions against the owners of the CAFO located near Site 12504.

A Recreational Use Attainability Analysis for Segment 1431 began in August, 2010. Texas AgriLife Extension and Texas Institute for Applied Environmental Research are working under a grant from the Texas Soil and Water Conservation Board to complete the project by January, 2012.

Potential Stakeholders:

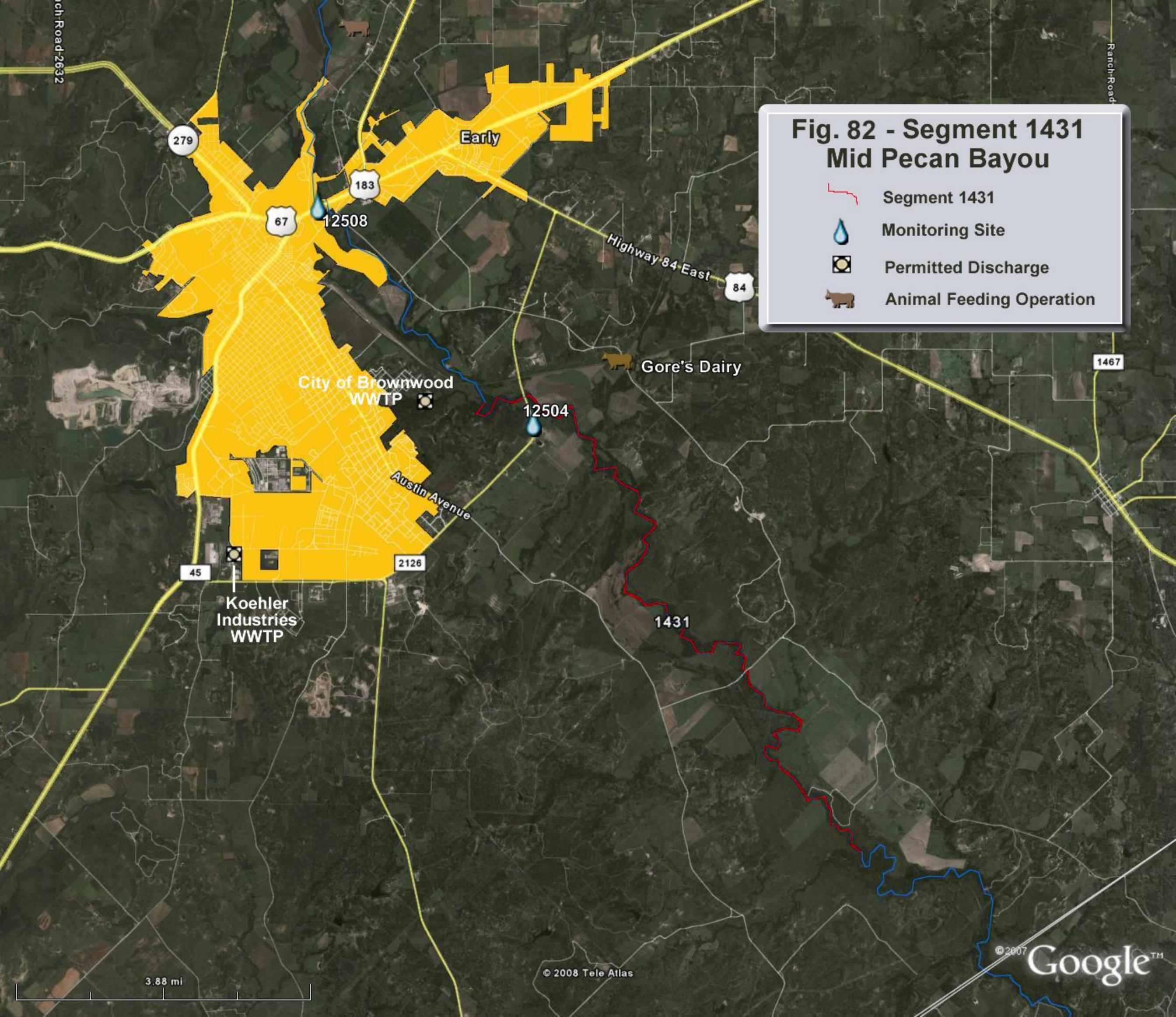
Brown County Soil and Water Conservation District
CAFO operator
City of Brownwood
LCRA
Local landowners
Natural Resource Conservation District
Texas Department of Agriculture

Texas AgriLife Extension
Texas Parks and Wildlife Department

Recommendations:

Complete data collection for development of an appropriate aquatic life use designation.

Complete the RUAA.



**Fig. 82 - Segment 1431
Mid Pecan Bayou**

-  Segment 1431
-  Monitoring Site
-  Permitted Discharge
-  Animal Feeding Operation

3.88 mi

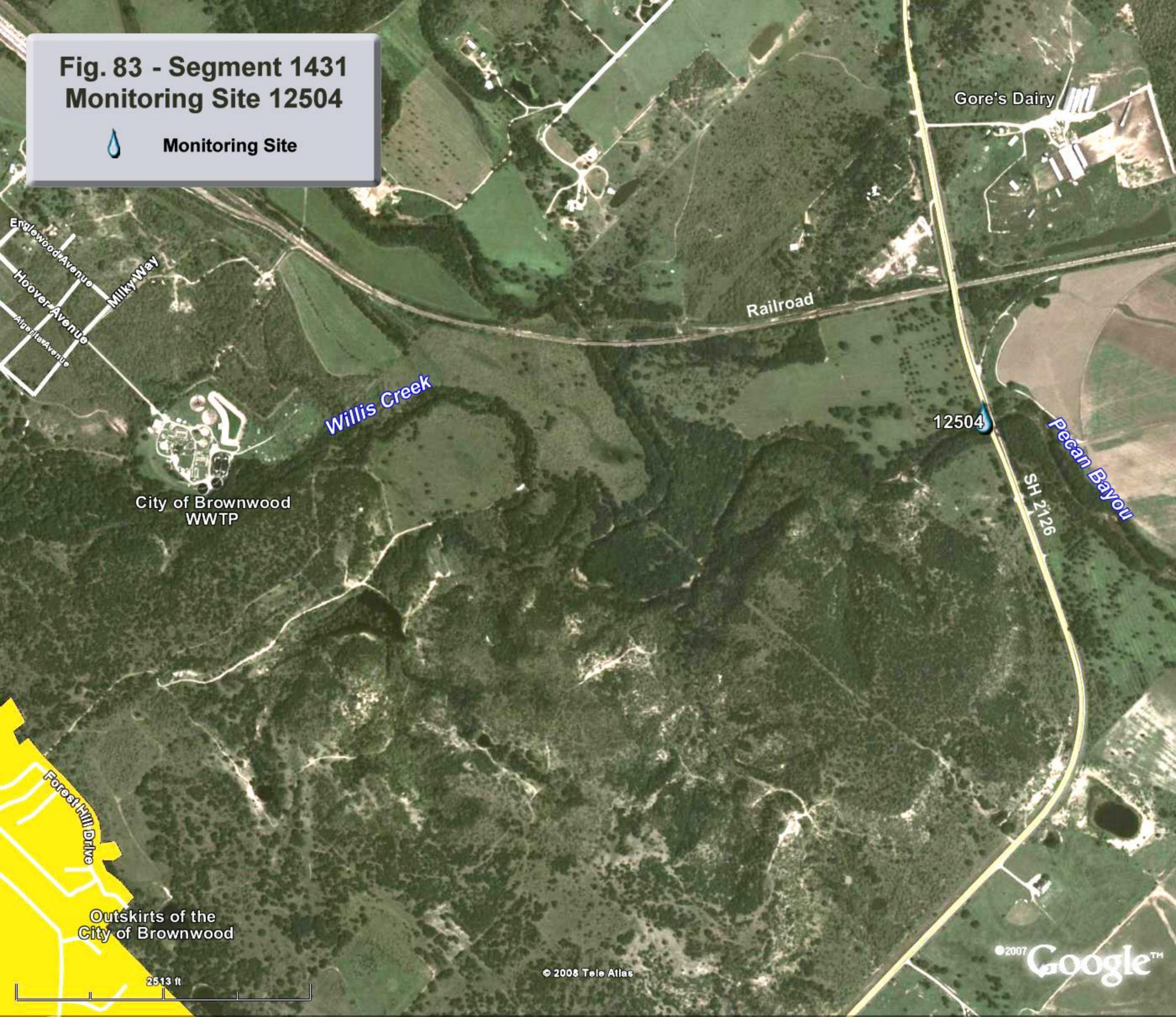
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**Fig. 83 - Segment 1431
Monitoring Site 12504**



Monitoring Site



Gore's Dairy

Railroad

Willis Creek

City of Brownwood
WWTP

12504

Pecan Bayou

SH 2126

Forest Hill Drive

Outskirts of the
City of Brownwood

2513 ft

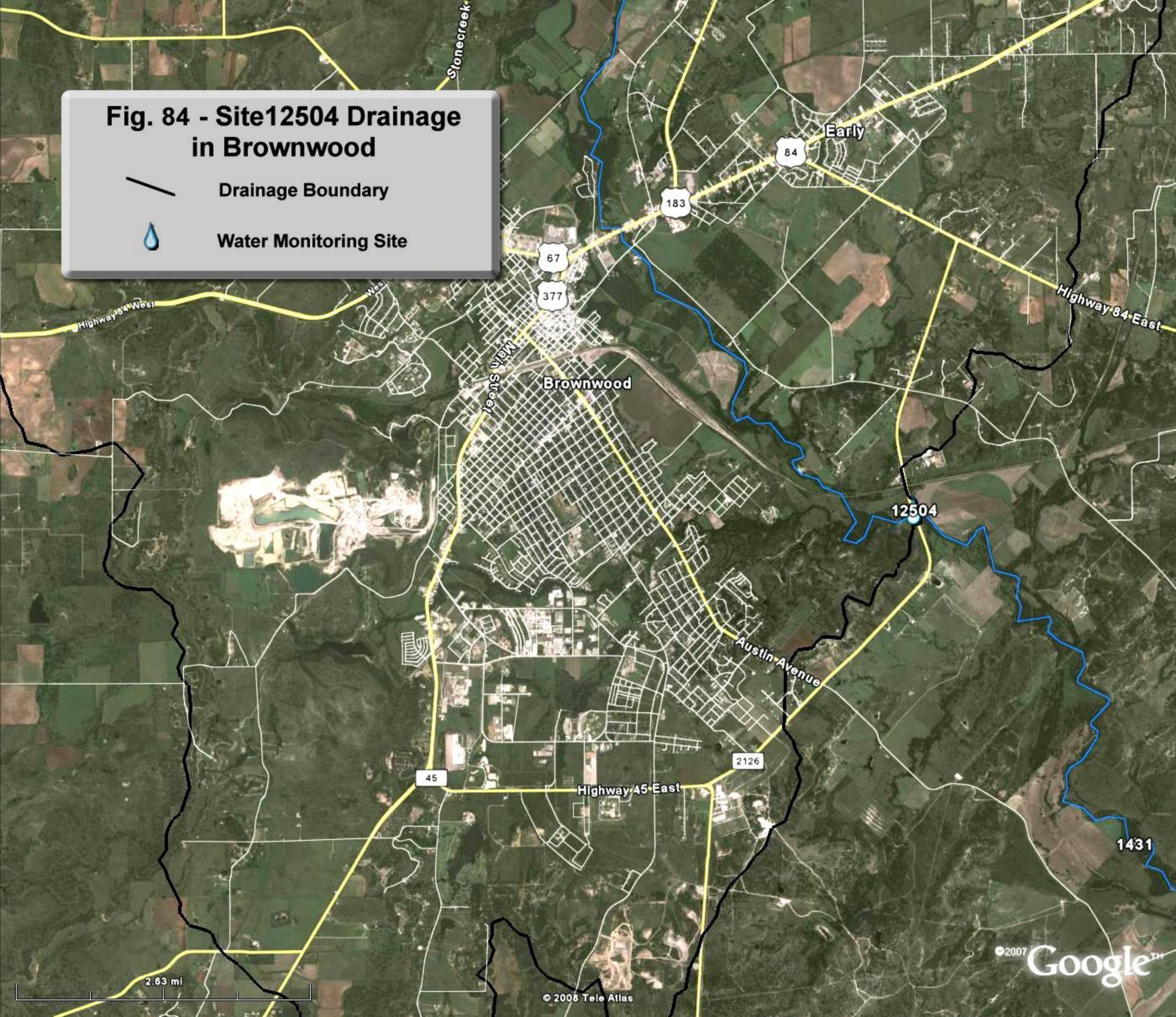
**Fig. 84 - Site12504 Drainage
in Brownwood**



Drainage Boundary



Water Monitoring Site



2.63 mi

Fig. 85 - Segment 1431
Mid Pecan Bayou
Site 12504

Photo taken during rain event



Segment 1501: Tres Palacios River Tidal

Impairment: Bacteria and Dissolved Oxygen

Segment Description

The tidally-influenced portion of the Tres Palacios River watershed begins at the mouth of Tres Palacios Bay and ends upstream at a point just upstream of its confluence with Wilson Creek (Fig. 85). The segment is approximately eight miles long and was monitored at the following sites during the period of record:

12515 – Tres Palacios River Tidal at FM 521

15321 – Tres Palacios Creek tidal 3.9 miles upstream of FM 521

The impaired AU, 1501_01, is defined as the entire length of the segment. Data responsible for the listing are from Site 12515 (Fig. 86). Data have been collected from the site since 1993. Site 20636 (near Riverside Drive) was added in 2010.

Land Use

The Segment 1501 watershed is rural. Much of the land along the river is farmed. Agricultural practices such as crop type and fertilizer rates are unknown. There is a subdivision approximately three miles upstream of Site 12515. Illegal dumping is a documented problem in the area.

Impairment Description

Segment 1501 was first placed on the 2006 303(d) List for not supporting contact recreation due to elevated levels of *Enterococcus* bacteria. It has remained on subsequent 303(d) Lists, including the Draft 2010 303(d) List for elevated bacteria levels.

In 2010, TCEQ assessed 63 samples collected between 2001 and 2008. Thirty-two of those samples (51 percent) exceeded the single sample criteria of 89. The geometric mean of the 63 samples was 106 MPN, exceeding criteria of 35. The bacteria impairment is classified as 5a, meaning a TMDL will be scheduled.

Tres Palacios River Tidal was first identified for not supporting its designated aquatic life use on the 1996 303(d) List. The original listing was based on low levels of dissolved oxygen obtained from grab samples. 24-hour DO data collected since the original listing confirmed the impairment. According to the 2008 303(d) List, five out of 11 samples (44 percent) assessed for 24-hour averages failed to meet DO criteria of five mg/L, and seven out of 11 (64 percent) did not meet the 24-hour minimum of 3 mg/L. No 24-hour

DO data has been collected since 2008. The segment remains on the Draft 2010 303(d) List. It is a Category 5b for dissolved oxygen, which means that a review of the water quality standards will be conducted by TCEQ prior to a TMDL or other water quality improvement project.

The Draft 2010 Integrated Report also showed a concern for elevated chlorophyll-*a* levels based on data collected from 12515.

Potential Causes of Impairment

Nonpoint Sources

Crop lands in the immediate watershed, livestock and wildlife may be a source of bacteria. But more study is necessary to determine the extent of their influence on water quality.

Houses in the subdivision upstream of the site use septic systems, which may be a source of bacteria.

Influences of Flow

Flow is not measured in Segment 1501 since it is tidally influenced. The influence of the tide play a role in how bacteria are transported, but further study is necessary to determine the extent of flow on bacteria at this site.

Actions Taken:

Texas Parks and Wildlife Department completed a UAA of Segment 1501 in 2007 to help determine the appropriate aquatic life use for the stream. Study results indicate that dissolved oxygen concentrations were not a major factor in determining the biological structure and components of ecosystem health. TPWD did not recommend a change in the exceptional aquatic life use for Segment 1501. Additional studies are needed to determine if the exceptional designation is appropriate.

In 1999, LCRA produced a report titled *Bacteria Study on the Tres Palacios River*. The study, done in response to elevated bacteria levels in Segment 1502 found that bacteria levels in the river correlated strongly with in-stream flow.

Site 20636 was added upstream of the listing site in 2010 to help determine if the bacteria is a localized problem.

Potential Stakeholders:

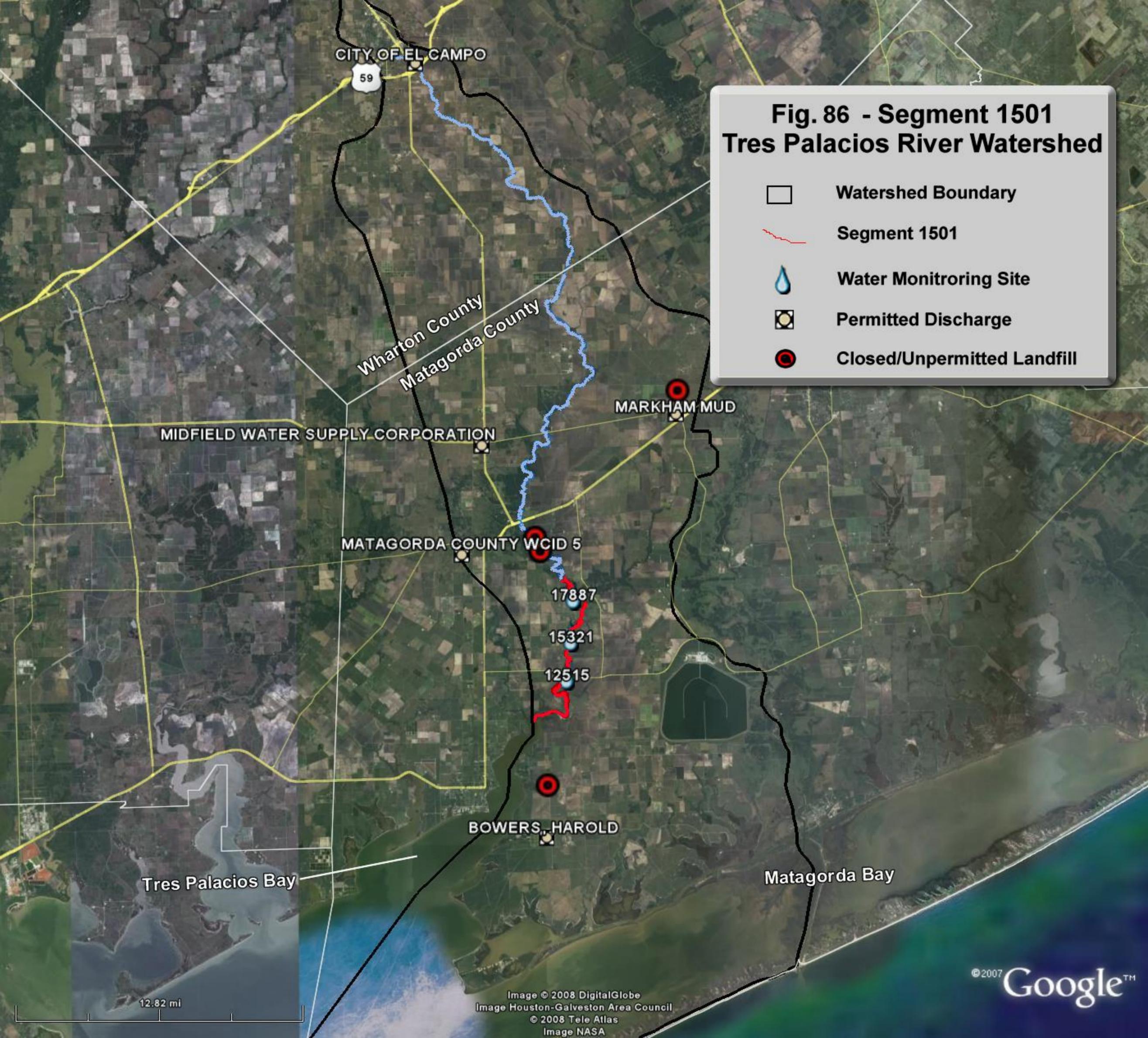
- LCRA
 - Local landowners
 - Matagorda County
 - Mad Island Marsh Wildlife Refuge
 - Natural Resource Conservation Service
- TCEQ
Texas A&M Marine Advisory Service
Texas AgriLife Extension
Texas Department of Agriculture
Texas Parks and Wildlife Department
Texas State Soil and Water Conservation Board

Recommendations:

Continue to monitor and compare data from sites 20636 and 12515
Communicate with TCEQ to determine if standards are appropriate for aquatic life.

**Fig. 86 - Segment 1501
Tres Palacios River Watershed**

-  Watershed Boundary
-  Segment 1501
-  Water Monitoring Site
-  Permitted Discharge
-  Closed/Unpermitted Landfill



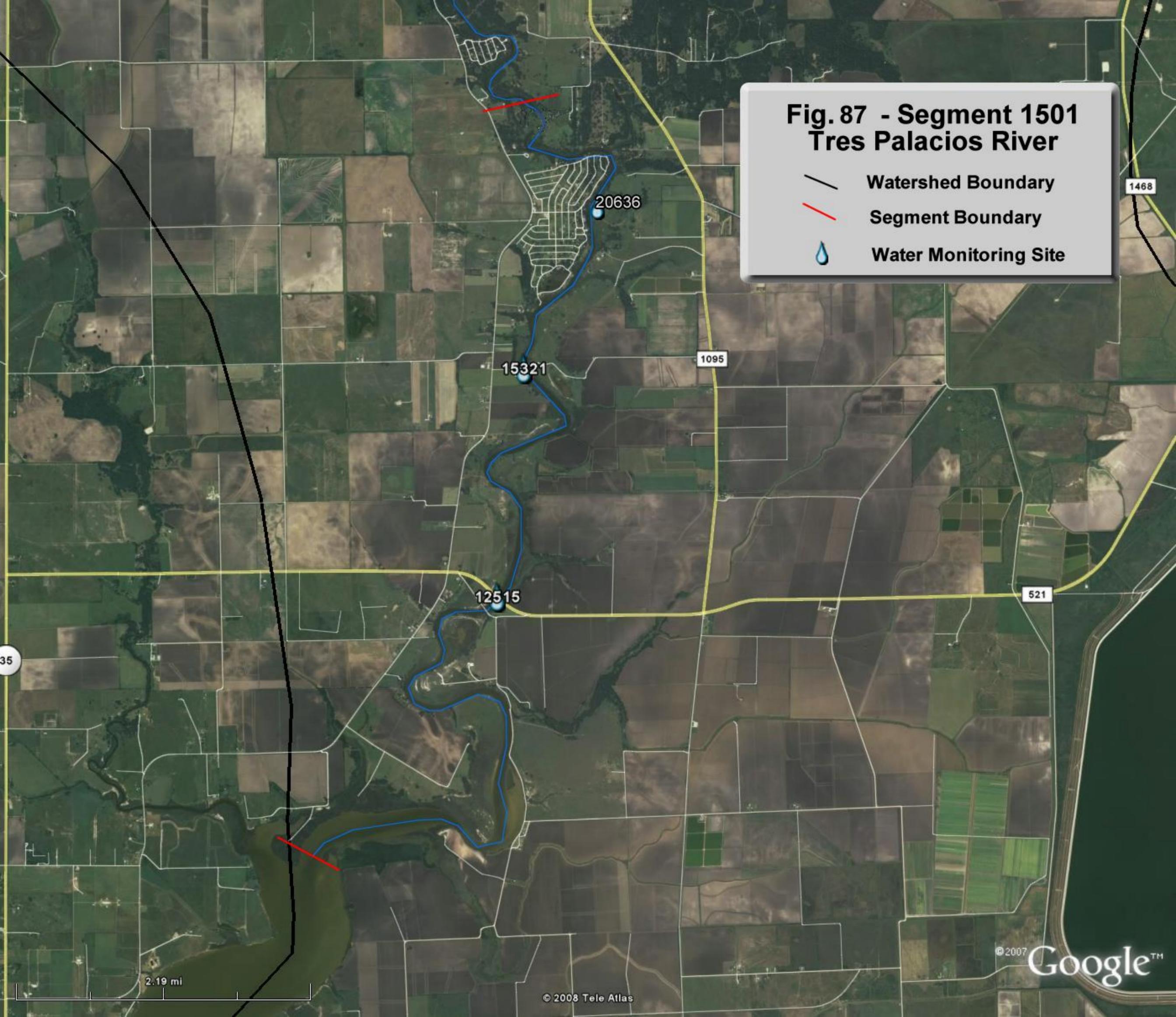
12.82 mi

Image © 2008 DigitalGlobe
Image Houston-Galveston Area Council
© 2008 Tele Atlas
Image NASA

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**Fig. 87 - Segment 1501
Tres Palacios River**

-  Watershed Boundary
-  Segment Boundary
-  Water Monitoring Site



**Fig. 88 - Segment 1501
Tres Palacios River Site 12515**



Appendix Segments Delisted in 2010

Segment	Description	Use Impaired	Parameter	Reason for Delisting
1403A	Bull Creek	Aquatic life	invertebrates	Recent data meets standard
1425	O.C. Fisher Lake	General	chloride	Recent data meets standard
1428B	Walnut Creek	Contact recreation	bacteria	Recent data meets standard
1428C	Gilleland Creek	Contact recreation	bacteria	TMDL completed/approved
1502	Tres Palacios Creek above tidal	Contact recreation	bacteria	Recent data meets standard

Segment 1403A – Bull Creek

Bull Creek is a tributary of Lake Austin, in Austin. The stream is approximately 10 miles long and divided into five assessment units.

Segment 1403A_04 was first placed on the 303(d) List in 2002 for not supporting aquatic life use based on an impaired invertebrate community. The listing was made based on limited data (3 events) acquired from COA. The data were collected without an approved QAPP and placed on the 2002 303(d) List based on professional judgment of TCEQ Staff.

In 2009, at the request of LCRA and COA, TCEQ reviewed the original listing and new data provided by COA. TCEQ staff concluded that 1403A_04 meets its designated aquatic life use and recommended that it be delisted in 2010.

Segment 1403A_05 was placed on the 2010 303(d) List for low dissolved oxygen levels. Four of six DO collections did not meet the 24-hour average criteria of 5 mg/L.

Segment 1425 – O.C. Fisher Lake

Located near San Angelo in the Concho River basin, O.C. Fisher Reservoir was first placed on the 2002 303(d) List for not meeting its general use due to elevated levels of chlorides. Mean chloride values remained above the 150 mg/L state standard when assessed in 2006 and 2008.

Twenty-eight sample events collected between December, 2001 and November, 2008 resulted in a mean chloride value of 130 mg/l. As a result, the segment was removed from the Draft 2010 303(d) List. In 2008, the Texas Institute for Environmental Research published a study titled *Review of Water Quality and Watershed Characterizations for*

Segment 1240 (White River Lake), Segment 1425 (O.C. Fisher Lake) and Segment 2307 (Rio Grande below Riverside Diversion Dam). The study, which was funded by TCEQ, attributed the impairment to drought conditions and low reservoir levels (referring to lack of dilution of solids) during the assessment period, and to geologic features in the watershed. The study goes on to state that recent decreases in concentrations of dissolved solids most likely are explained by dilution with relatively small increases in reservoir volume and increased flow of fresher waters associated with brush control efforts within the watershed.

Segment 1428B – Walnut Creek

Walnut Creek is a densely urbanized creek that flows into the Colorado River just below Austin. Three of five AUs in Walnut Creek were placed on the 303(d) List for high bacteria levels in 2006. The AUs were 1428B.01, 1428B.03 and 1428B.05. Routine data collected by COA during the 2010 assessment period showed support for contact recreation in 1428B.01 and 1428B.03. The uppermost AU, 1428B_05, remained on the Draft 303(d) List in 2010 for exceeding grab sample and geometric mean criteria for *E.coli*.

Segment 1428C – Gilleland Creek

Gilleland Creek begins in Pflugerville and ends approximately 31 miles downstream where it flows into the Colorado River just below Austin. The creek was originally listed in the 1999 303(d) List for not meeting its contact recreation use. Through a contract with TCEQ, LCRA developed a TMDL for the creek. The TMDL was adopted by TCEQ Commissioners in August, 2007 and by EPA in April, 2009. An implementation plan was approved by TCEQ Commissioners in February, 2011. Implementation is ongoing.

Segment 1502 – Tres Palacios River (freshwater portion)

The headwaters of the Tres Palacios River began in Matagorda County near El Campo. The end point of the segment is at the tidal boundary about 45 miles downstream, in Wharton County. The segment was first placed on the 303(d) List in 1996 for not supporting contact recreation due to elevated fecal coliform bacteria. The impairment was verified in the 2006 303(d) List when the geometric mean of *E.coli* samples exceeded the criteria of 126. However, data collected by TCEQ Region 12 that were assessed in 2010 indicate that the water body met state standards for contact recreation.