Texas State Soil and Water Conservation Board
Clean Water Act §319(h) Nonpoint Source Grant Program
FY 2013 Workplan 13-07

SUMMARY PAGE						
Title of Project	Investigation into Contributions of Nitrate-Nitrogen to Plum Creek, Geronimo Creek and the Underlying Leona Aquifer					
Project Goals	• Analyze groundwater from the Leona Aquifer, surface water from Plum Creek and Geronimo Creek, precipitation and wastewater effluent for nitrate-nitrogen and its isotopes of nitrogen and oxygen to determine possible sources of nitrate-nitrogen, i.e. human, animal or fertilizer • Increase the understanding of the interaction between surface water and underlying groundwater • Evaluate strategies and practices for reducing nitrate levels in the surface water and groundwater • Provide results and recommendations to agricultural and water resource managers in two watersheds					
Project Tasks	(1) Project Administration; (2) Quality Assurance; (3) Surface Water Quality Monitoring; (4) Groundwater Quality Monitoring; (5) Spring Flow Monitoring; (6) Additional Monitoring; (7) Data Management and Technical Report					
Measures of Success	• Data of known and acceptable quality are generated for surface water quality monitoring of Plum Creek and Geronimo Creek • Data of known and acceptable quality are generated for groundwater monitoring in the Leona Aquifer associated with the Plum and Geronimo Creeks watersheds • Water quality data is used to develop isotopic signatures to indicate most likely sources of elevated nitrate-nitrogen in Plum and Geronimo Creeks and the Leona Aquifer • Increased knowledge of citizens, landowners, agricultural producers, water resource managers, and regulatory agencies regarding sources of elevated nitrate-nitrogen identified by isotopic ratios in groundwater and surface water					
Project Type	Implementation ( ); Education ( ); Planning ( ); Assessment (X); Groundwater (X)					
Status of Waterbody on *2010 Texas Integrated Report*	Segment ID 1810 1804A	Parameter Bacteria Nitrate-Nitrogen Bacteria Nitrate-Nitrogen	Category 4b CN 5c CN			
Project Location (Statewide or Watershed and County)	Plum Creek in Travis, Hays and Caldwell Counties, Geronimo Creek in Guadalupe and Comal Counties, and Leona Aquifer in Guadalupe and Caldwell Counties					
Key Project Activities	Hire Staff ( ); Surface Water Quality Monitoring (X); Technical Assistance (); Education ( ); Implementation ( ); BMP Effectiveness Monitoring ( ); Demonstration ( ); Planning ( ); Modeling ( ); Bacterial Source Tracking ( ); Other ( )					
2012 Texas NPS Management Program Reference	• Component 1 LTGs 1A, 1F, 3, 6 • Component 1 STGs 1B, 1C, 3D, 3F • Component 5					
Project Costs	Federal	$162,000	Non-Federal	$54,113	Total	$216,113
Project Management	Guadalupe-Blanco River Authority					

Project Period	October 1, 2013 – September 30, 2016

Part I – Applicant Information

Applicant							
Project Lead	Debbie Magin						
Title	Director of Water Quality Services						
Organization	Guadalupe-Blanco River Authority						
E-mail Address	dmagin@gbra.org						
Street Address	933 E. Court St.						
City	Seguin	County	Guadalupe	State	TX	Zip Code	78155
Telephone Number	(830) 379-5822			Fax Number	(830) 372-2757		

Project Partners	
Names	Roles & Responsibilities
Texas State Soil and Water Conservation Board (TSSWCB)	Provide state oversight and management of all project activities and ensure coordination of activities with related projects and TCEQ.
Guadalupe-Blanco River Authority (GBRA)	Provide project administration, coordination, water quality monitoring, data and analysis review, and USGS technical report review.
US Geological Survey (USGS)	Water quality monitoring, isotope analyses, data interpretation and preparation of technical report.
Geronimo and Alligator Creeks Watershed Partnership	Collaborate as critical local stakeholders and play a lead role in communicating with other local stakeholders.
Plum Creek Watershed Partnership (PCWP)	Collaborate as critical local stakeholders and play a lead role in communicating with other local stakeholders.

Part II – Project Information

Project Type							
Surface Water	X	Groundwater	X				
Does the project implement recommendations made in (a) a completed WPP, (b) an adopted TMDL, (c) an approved I-Plan, or (d) a Comprehensive Conservation and Management Plan developed under CWA §320, (e) the *Texas Coastal NPS Pollution Control Program*, or (f) the *Texas Groundwater Protection Strategy*?				Yes	X	No	
If yes, identify the document.	Plum Creek Watershed Protection Plan; Geronimo and Alligator Creeks Watershed Protection Plan						
If yes, identify the agency/group that developed and/or approved the document.	Plum Creek Watershed Partnership facilitated by Texas AgriLife Extension Service and TSSWCB; Geronimo and Alligator Creeks Watershed Partnership facilitated by GBRA and Texas AgriLife Extension Service			Year Developed	2008; 2012		

Watershed Information				
Watershed Name(s)	Hydrologic Unit Code (12 Digit)	Segment ID	Category on 2010 IR	Size (Acres)
Plum Creek Watershed	121002030401	1810	4b	288,240
Geronimo Creek Watershed	121002020110, 121002020111	1804A	5c	44,152

Water Quality Impairment

Describe all known causes (i.e., pollutants of concern) and sources (e.g., agricultural, silvicutltural) of water quality impairments or concerns from any of the following sources: *2010 Texas Integrated Report*, Clean Rivers Program Basin Summary/Highlights Reports or other documented sources.

Plum Creek Watershed:

2012 GBRA CRP Basin Highlights Report – Nitrate-nitrogen and total phosphorus concentrations at these stations continue to be some of the highest in the river basin.

2010 Integrated Report – Impaired due to bacteria with concerns for nitrate, orthophosphorus, and total phosphorus. Data collected from December 2001 through November 2008, reports the mean concentration of nitrate nitrogen for Assessment Unit (AU) 1810_01 as 3.07 milligrams per liter (mg/L) with 25 out of 82 samples exceeding the screening concentration; the mean concentration for AU 1810_02 as 8.89 mg/L with 24 out of 27 samples exceeding the screening concentration; and, the mean concentration for AU 1810_03 as 9.5 mg/L with 50 out of 82 samples exceeding the screening concentration. Moved to Category 4b with rationale based on WPP.

Geronimo Creek Watershed:

2012 GBRA CRP Basin Highlights Reports - The CRP Basin Highlights Reports for the Guadalupe River Basin since 2007 comment on the elevated nitrate-nitrogen concentrations, suggesting that the source appears to be groundwater seepage. The private wells that have been monitored in the area are shallow and have concentrations in excess of 20 mg/L.

2008 GBRA CRP Basin Summary Report – Report states that springs that come from the Leona formation, which is high in nitrate-nitrogen, are thought to be, in part, the source of the nutrient concern in Geronimo Creek. It goes on to describe the watershed as primarily agricultural, with no point source discharges above the historical monitoring locations. GBRA has monitored the Geronimo Creek as part of the Clean Rivers Program (CRP) since 1996. The report also states that there is a significant amount of groundwater influence on Geronimo Creek and many drinking water wells in the watershed are known to share nitrate values similar or higher than the creek itself. In the report, GBRA states its concern about potential effects of the nitrate levels on water supply for the region. The radical deviation of the nitrate concentrations in Geronimo Creek from similar streams in the Guadalupe River Basin present "an interesting question about the source of this contamination."

2010 Integrated Report –Geronimo Creek is listed as impaired on the 2010 303(d) List due to bacterial contamination, with a concern for nitrate-nitrogen. The data from the period of record December 2001 through November 2008 showed that the concentration of nitrate-nitrogen exceeded the screening concentration of 1.95 mg/L in 82 out of 82 samples, with an average nitrate-nitrogen concentration of 12.46 mg/L. The report states the sources of the impairment and concern are unknown.

Groundwater (Leona Aquifer):

2012 Nonpoint Source Management Program - NPS contamination is widespread in many Texas aquifers. The most widespread contaminant is nitrate, with a variety of potential sources. Potential nitrate sources may include leaking septic systems, storm water runoff, over application of fertilizer on cropland, and naturally occurring nitrate derived from the aquifer matrix. Nitrate is readily soluble and mobile in water, and is considered one of the major human health concerns in drinking water. Coincidentally, nitrate concentration may be an indicator of NPS pollution in groundwater, because it can move readily through the soil, entering aquifers by means of percolation. Nitrate in surface water indicates the potential for groundwater contamination. Other ambient groundwater quality constituents of concern are likely naturally occurring, and not necessarily good indicators of NPS influence on the aquifers.

Project Narrative

Problem/Need Statement

Plum Creek rises in Hays County north of Kyle and runs south through Caldwell County, passing Lockhart and Luling, and eventually joins the San Marcos River at their confluence north of Gonzales County. Plum Creek is 52 miles in length and has a drainage area of 389 mi^2. According to the 2010 Texas Integrated Report and 303(d) List, all three assessment units of Plum Creek that make up the classified stream segment exhibit nutrient enrichment concerns for ammonia, nitrate+nitrite nitrogen and total phosphorus. Data collected from December 2001 through November 2008, reports the mean concentration of nitrate nitrogen for Assessment Unit (AU) 1810_01 as 3.07 milligrams per liter (mg/L) with 25 out of 82 samples exceeding the screening concentration; the mean concentration for AU 1810_02 as 8.89 mg/L with 24 out of 27 samples exceeding the screening concentration; and, the mean concentration for AU 1810_03 as 9.5 mg/L with 50 out of 82 samples exceeding the screening concentration.

Geronimo Creek and its tributary Alligator Creek are located in Comal and Guadalupe Counties. The almost 70-square-mile watershed lies within the larger Guadalupe River Basin. The headwaters of Alligator Creek begin in southeastern Comal County, just above Interstate 35. The majority of the Alligator Creek watershed lies within the extra-territorial jurisdiction (ETJ) of New Braunfels, while the majority of the Geronimo Creek watershed is almost entirely within the extra-territorial jurisdiction of Seguin. The majority of Alligator Creek is intermittent with pools during much of the year, until just above its confluence with Geronimo Creek, where it receives spring flow. Geronimo Creek rises approximately one mile east of Clear Springs in northwestern Guadalupe County and runs southeast for 17 miles to its confluence with the Guadalupe River, three miles southeast of Seguin. Geronimo Creek is perennial, receiving flows from Alligator Creek, Baer Creek, an unnamed tributary, and numerous springs along its length. The GBRA has been sampling Geronimo Creek since 1996. The mean concentration for nitrate-nitrogen during that period is 11.0 milligrams per liter, well over the assessment screening concentration of 1.95 milligrams per liter and over the drinking water standard of 10.0 milligrams per liter. The only point source to the creek is within three-quarter mile of the confluence with the Guadalupe River, downstream of the historical monitoring locations. Hence, excess contributions of the nutrient loads are most likely from nonpoint sources. The land use in the area is primarily agricultural. The 44,152-acre watershed is made up of 45.5% cropland, including managed pasture, 31.6% rangeland, 9.8% forest and 11.5% developed land.

TSSWCB and Texas AgriLife Extension Service (Extension) established the Plum Creek Watershed Partnership (PCWP) in April 2006. The PCWP Steering Committee completed the Plum Creek WPP in February 2008 and was accepted by EPA in July 2009. Information about the PCWP, including the WPP, WPP Update, and implementation activities, is available at http://plumcreek.tamu.edu/. Sources of pollutants identified in the Plum Creek WPP include urban storm water runoff, pet waste, failing or inadequate on-site sewage facilities (septic systems), wastewater treatment facilities, livestock, wildlife, invasive species (feral hogs), and oil and gas production. The WPP Update notes that since the completion of the plan and implementation has begun, the watershed has seen significant changes, including severe drought, construction of State Highway 130 and subsequent commercial and residential growth, all of which have altered the land use and management of many areas in the watershed, affecting the implementation of some strategies (Extension, 2012).

TSSWCB, GBRA and Extension established the Geronimo and Alligator Creeks Watershed Partnership in 2008. The Geronimo Creek Partnership completed the WPP in August 2012 and was accepted by EPA in September 2012. The report states that the chemical quality of the water from wells in the area varies greatly. It goes on to say:

> *"Water from the alluvium and the Leona formation contains elevated nitrates. Nitrate concentrations vary by location within the watershed and by depth of the well. It is not uncommon to have nitrate-nitrogen concentrations at or above the primary drinking water standard of 10 mg/L. Further exploration of the hydraulic connection between these groundwater sources and the water in the creeks may help explain the elevated nitrate-nitrogen levels in the creeks. The draft report goes on to say that while LDC [Load Duration Curve] analysis indicated that*

nitrate-nitrogen levels exceed the screening criterion across all flow ranges, a review of area water well data in the Texas Water Development Board Groundwater Database revealed evidence of historically elevated nitrate-nitrogen concentrations (2 mg/L to over 40 mg/L) which pre-date the first use of inorganic fertilizers in the late 1940s. For example, one well drilled in the Alligator Creek watershed in 1943 yielded a nitrate concentration of 21.6 mg/L. Water testing data from the same time period for several other wells located in the Leona Formation and in immediately adjacent watersheds showed nitrate-nitrogen concentrations ranging from 10.8 to 21.7 mg/L. These data suggest that "natural", non-anthropogenic sources of nitrate-nitrogen are impacting in-stream levels of this pollutant. More intensive sampling and study would be required to accurately allocate the contribution of nitrates from groundwater. Another important observation is that the loading which might be expected from fertilizer and waste products during runoff conditions is not demonstrated by a noticeable increase in nitrate-nitrogen concentrations in the stream when compared to levels measured during ambient flows. The Steering Committee determined that together, these factors suggest that activities in the watershed are having little impact on in-stream nitrate-nitrogen concentrations."

Water quality monitoring is being conducted by GBRA at three sites on Plum Creek through resources dedicated by TCEQ CRP. Through TSSWCB project 10-07, *Surface Water Quality Monitoring and Additional Data Collection Activities to Support the Implementation of the Plum Creek Watershed Protection Plan*, GBRA is conducting intensive targeted monitoring on tributaries, springs, wastewater effluent, urban storm water runoff, and other main stem in-stream sites. GBRA is conducting water quality monitoring of one site on Geronimo Creek through resources provided by TCEQ CRP. In addition to the CRP monitoring, in 2012 GBRA resumed comprehensive water quality monitoring in the Geronimo and Alligator Creeks watersheds under TSSWCB project 11-06, *Water Quality Monitoring in the Geronimo Creek Watershed and Facilitation of the Geronimo Creek and Alligator Creeks Watershed Partnership* , and will be used to assess projects identified in the WPP as they are implemented.

Project Narrative

General Project Description (Include Project Location Map)

Since monitoring of Plum Creek and Geronimo Creek began in the late 1990's, these creeks have shown elevated concentrations of nitrate-nitrogen. Currently, because the state stream water quality standards are not numeric for nutrients, exceedences of a screening concentration of 1.95 mg/L nitrate-nitrogen have been used to designate a stream as having a concern for nitrate-nitrogen. The possible sources of the nutrient concern are numerous. Plum Creek is effluent-dominated and is also fed by springs that come from the Leona Aquifer, known to have elevated concentrations of nitrate-nitrogen. Geronimo Creek is also fed by springs from that same aquifer. Stakeholders in both watersheds have long suspected fertilizer use as the source of the nitrates in the Leona, but oddly enough, elevated concentrations of nitrates had been seen in well testing long before commercial inorganic fertilizers came into use. Septic systems, organic fertilizers, nitrifying plants and atmospheric deposition round out the list of possible sources.

The TCEQ has begun to develop numeric water quality standards for nitrate-nitrogen. At the end of that process, the standards established by TCEQ and the EPA could move Plum Creek and Geronimo Creek from a designation of "concern for nutrients" to the 303(d) List of impaired waterbodies. The Plum Creek and Geronimo Creek Watershed Partnerships have not waited for "impaired waterbody" status to start working on best management practices that could reduce sources of nitrates. In order to help direct efforts and funding toward the most likely or most influential source(s) of nitrate, this project will look to isotopic signatures of nitrogen and oxygen in the nitrates. The ratios of the isotopes of nitrogen and oxygen in nitrate often are useful for determining sources of nitrates in groundwater and surface water. Isotopic ratios are expressed as the ratio of the heavier isotope to the lighter isotope relative to a standard in parts per thousand (USGS, 2011). Figure 1 describes graphically the relationship of nitrogen and oxygen isotopes, and the nitrogen cycle.

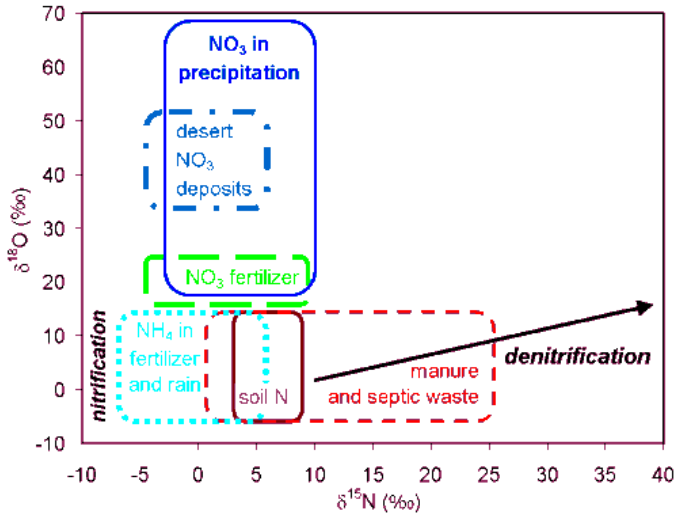

Figure 1. Relationships of nitrogen and oxygen isotopes and the nitrogen cycle.

A total of 11 sites in the Plum Creek (7) and the Geronimo Creek (4) watersheds will be sampled for major ions, selected nutrient species including nitrate-nitrogen, and ($^{15}N/^{14}N$) and oxygen ($^{18}O/^{16}O$) isotopes four times during the project period. Up to four wastewater effluents and one site for precipitation will be sampled for major ions, selected nutrient species including nitrate-nitrogen, and ($^{15}N/^{14}N$) and oxygen ($^{18}O/^{16}O$) isotopes four times during the project period. Figures 2 and 3 are maps of the proposed monitoring locations in each watershed. GBRA and USGS will conduct quarterly targeted surface water quality monitoring at 5 sites in the Plum Creek watershed and at 2 sites in the Geronimo Creek watershed over a range in hydrologic conditions (wet and dry conditions), collecting field, flow and conventional parameter groups. GBRA and USGS will conduct quarterly targeted groundwater quality monitoring at 1 well site in the Plum Creek watershed and one well site in the Geronimo Creek watershed, collecting field and conventional parameter groups. GBRA and USGS will conduct quarterly targeted spring quality monitoring at 1 site in the Plum Creek watershed and one site in the Geronimo Creek watershed, collecting field, flow and conventional parameter groups. USGS will conduct targeted precipitation monitoring at 1 site in the Plum Creek watershed, collecting field and conventional parameter groups. GBRA and USGS will conduct wastewater quality monitoring at up to 4 wastewater facilities located in the Plum Creek watershed, collecting field, flow and conventional parameter groups. A total of 52 environmental samples and six (6) quality-assurance samples will be collected. The quality-assurance samples will consist of 2 field blanks and 4 replicate samples. Sample collection will occur approximately every quarter and if possible, sampling will occur over a range in hydrologic conditions. Field parameters and flow will be collected at the same time as the water-quality samples.

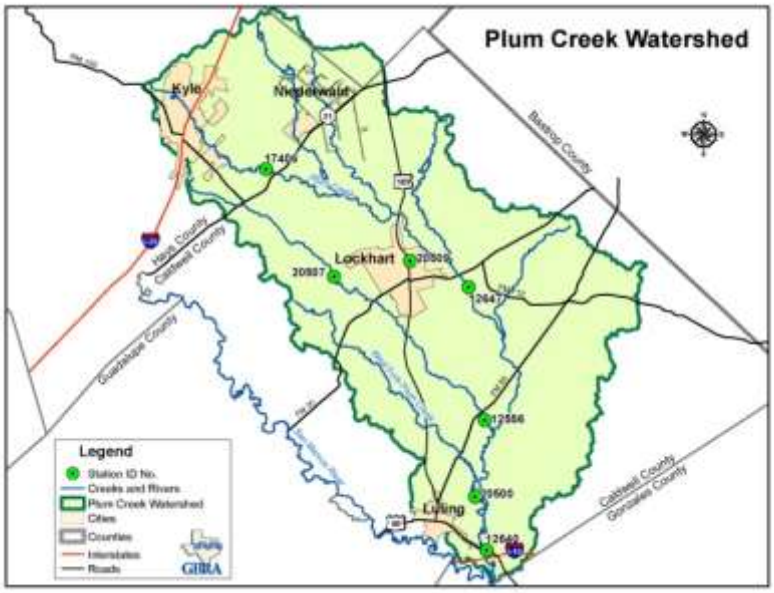

Figure 2. Map of Plum Creek monitoring locations.

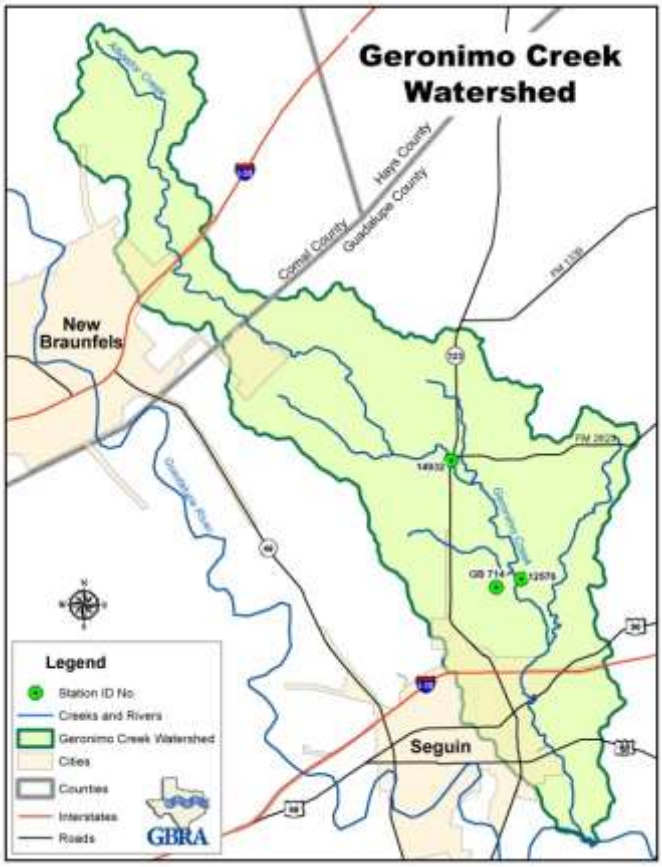

Figure 3. Map of Geronimo Creek monitoring locations.

Tasks, Objectives and Schedules						
Task 1	Project Administration					
Costs	Federal	$0	Non-Federal	$14,032	Total	$14,032
Objective	To effectively administer, coordinate and monitor all work performed under this project including technical and financial supervision and preparation of status reports.					
Subtask 1.1	GBRA will prepare electronic quarterly progress reports (QPRs) for submission to the TSSWCB. QPRs shall document all activities performed within a quarter and shall be submitted by the 15th of January, April, July and October. QPRs shall be distributed to all Project Partners.					
	Start Date	Month 1	Completion Date	Month 36		
Subtask 1.2	GBRA will perform accounting functions for project funds and will submit appropriate Reimbursement Forms to TSSWCB at least quarterly.					
	Start Date	Month 1	Completion Date	Month 36		
Subtask 1.3	GBRA will host coordination meetings or conference calls, at least quarterly, with Project Partners to discuss project activities, project schedule, communication needs, deliverables, and other requirements. GBRA will develop lists of action items needed following each project coordination meeting and distribute to project personnel.					
	Start Date	Month 1	Completion Date	Month 36		
Subtask 1.4	GBRA will include project related content to the existing Plum Creek Watershed Partnership (http://plumcreek.tamu.edu) and Geronimo and Alligator Creeks Watershed Partnership (http://www.geronimocreek.org) websites.					
	Start Date	Month 1	Completion Date	Month 36		
Deliverables	• Quarterly progress reports in electronic format • Reimbursement Forms and necessary documentation in hard copy format • Project related content on existing websites					

<table>
<tr><th colspan="8">Tasks, Objectives and Schedules</th></tr>
<tr><td>Task 2</td><td colspan="7">Quality Assurance</td></tr>
<tr><td>Costs</td><td>Federal</td><td>$0</td><td>Non-Federal</td><td>$14,423</td><td>Total</td><td colspan="2">$14,423</td></tr>
<tr><td>Objective</td><td colspan="7">To develop data quality objectives (DQOs) and quality assurance/control (QA/QC) activities to ensure data of known and acceptable quality are generated through this project.</td></tr>
<tr><td rowspan="2">Subtask 2.1</td><td colspan="7">GBRA will develop a QAPP for activities in Tasks 3, 4, and 5 consistent with the most recent versions of EPA Requirements for Quality Assurance Project Plans (QA/R-5) and the TSSWCB Environmental Data Quality Management Plan. All monitoring procedures and methods prescribed in the QAPP shall be consistent with the guidelines detailed in the TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue (RG-415) and Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data (RG-416). [Consistency with Title 30, Chapter 25 of the Texas Administrative Code, Environmental Testing Laboratory Accreditation and Certification, which describes Texas’ approach to implementing the National Environmental Laboratory Accreditation Conference (NELAC) standards, shall be required where applicable.]</td></tr>
<tr><td>Start Date</td><td colspan="2">Month 1</td><td>Completion Date</td><td colspan="3">Month 6</td></tr>
<tr><td rowspan="2">Subtask 2.2</td><td colspan="7">GBRA will implement the approved QAPP. GBRA will submit revisions and necessary amendments to the QAPP as needed.</td></tr>
<tr><td>Start Date</td><td colspan="2">Month 6</td><td>Completion Date</td><td colspan="3">Month 36</td></tr>
<tr><td>Deliverables</td><td colspan="7">• QAPP approved by TSSWCB and EPA in both electronic and hard copy formats
• Approved revisions and amendments to QAPP, as needed
• Data of known and acceptable quality as reported through Tasks 3, 4, and 5</td></tr>
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Tasks, Objectives and Schedules						
Task 3	Surface Water Quality Monitoring					
Costs	Federal	$40,250	Non-Federal	$10,404	Total	$50,654
Objective	To provide nutrient and isotope ratios to identify possible sources of nitrate-nitrogen and to assess the proportion of those sources in the surface water.					
Subtask 3.1	GBRA and USGS will conduct quarterly targeted surface water quality monitoring at 5 sites in the Plum Creek watershed over a range in hydrologic conditions (wet and dry conditions), collecting field, flow and conventional parameter groups. Sampling will extend over 12 months. Four (4) synoptic samplings will be conducted during the study – two during base flow (dry) conditions and two at higher flow (wetter) conditions; the sequence alternating between base flow and wet conditions. Four samples will be collected from each site for a total of 20 samples. The sites include the three routine sampling locations in the Clean Rivers Program (17406, 12640, and 12647). The other two sites are routine sites in the TSSWCB CWA Section 319(h) project 10-07, "*Surface Water Quality Monitoring and Additional Data Collection Activities to Support the Implementation of the Plum Creek Watershed Protection Plan*" (12556, 20500). Flow and field parameters will be collected by GBRA. The USGS will collect water-quality samples that will be analyzed for select nutrient species, nitrogen isotopes, and major ions. The nutrient and major ion samples will be analyzed at the USGS's National Water Quality Laboratory (NWQL) in Denver, CO, and the nitrogen isotope samples will be analyzed at the USGS's Reston Stable Isotope Laboratory (RSIL) in Reston, VA. Field parameters will include pH, temperature, specific conductance, and dissolved oxygen. Conventional parameters will include nutrient species, major ions, and nitrate-nitrogen isotopes ($^{15}N/^{14}N$ -nitrogen and $^{18}O/^{16}O$-oxygen isotopes). Flow parameters are flow collected by gage, electric, mechanical or Doppler, including severity.					
	Start Date	Month 6	Completion Date	Month 24		
Subtask 3.2	GBRA and USGS will conduct quarterly targeted surface water quality monitoring at 2 sites in the Geronimo Creek watershed over a range in hydrologic conditions (wet and dry conditions), collecting field, flow and conventional parameter groups; specific parameters are defined in Subtask 3.1. Sampling will extend over 12 months. Four (4) synoptic samplings will be conducted during the study – two during base flow (dry) conditions and two at higher flow (wetter) conditions; the sequence alternating between base flow and wet conditions. Four samples will be collected from each site for a total of 8 samples. The sites include the two historical sampling locations in the Clean Rivers Program (14932 and 12576). Flow and field parameters will be collected by GBRA. The USGS will collect major ions, selected nutrient species, and nitrogen and oxygen isotope samples. The major ions and nutrients will be analyzed at the USGS's National Water Quality Laboratory (NWQL) in Denver, CO and the isotopes will be analyzed at the USGS's Reston Stable Isotope Laboratory (RSIL) in Reston, VA.					
	Start Date	Month 6	Completion Date	Month 24		
Deliverables	• Water quality data on targeted monitoring • Information to be included in USGS technical report (Task 7) that includes isotopic data and data interpretation of surface water quality					

Tasks, Objectives and Schedules
Task 4	Groundwater Quality Monitoring

Costs	Federal	$11,500	Non-Federal	$6,324	Total	$17,824
Objective	To provide nutrient and isotope ratios to identify possible sources of nitrate-nitrogen and to assess the proportion of those sources in the groundwater.					
Subtask 4.1	GBRA and USGS will conduct quarterly targeted groundwater quality monitoring at 1 well site in the Plum Creek watershed collecting field and conventional parameter groups; specific parameters are defined in Subtask 3.1. Sampling will extend over 12 months. Four samples will be collected for a total of 4 samples. The site will be identified in the QAPP. Water level and field parameters will be collected by GBRA. The USGS will collect water-quality samples that will be analyzed for select nutrient species, nitrogen isotopes, and major ions. The nutrient and major ion samples will be analyzed at the USGS's National Water Quality Laboratory (NWQL) in Denver, CO, and the nitrogen isotope samples will be analyzed at the USGS's Reston Stable Isotope Laboratory (RSIL) in Reston, VA.					
	Start Date	Month 6	Completion Date	Month 24		
Subtask 4.2	GBRA and USGS will conduct quarterly targeted groundwater quality monitoring at 1 well site in the Geronimo Creek watershed, collecting field and conventional parameter groups; specific parameters are defined in Subtask 3.1. Sampling will extend over 12 months. Four samples will be collected for a total of 4 samples. The groundwater site (GB714) was identified in TSSWCB CWA Section 319(h) project 08-06, "*Development of a Watershed Protection Plan for Geronimo Creek*". Water level and field parameters will be collected by GBRA. The USGS will collect water-quality samples that will be analyzed for select nutrient species, nitrogen isotopes, and major ions. The nutrient and major ion samples will be analyzed at the USGS's National Water Quality Laboratory (NWQL) in Denver, CO, and the nitrogen isotope samples will be analyzed at the USGS's Reston Stable Isotope Laboratory (RSIL) in Reston, VA.					
	Start Date	Month 6	Completion Date	Month 24		
Deliverables	• Water quality data on groundwater monitoring • Information to be included in USGS technical report (Task 7) that includes isotopic data and data interpretation of groundwater quality					

Tasks, Objectives and Schedules						
Task 5	Spring Flow Monitoring					
Costs	Federal	$5,750	Non-Federal	$1,241	Total	$6,991
Objective	To provide nutrient and isotope ratios to identify possible sources of nitrate-nitrogen and to assess the proportion of those sources in the spring.					

Subtask 5.1	GBRA and USGS will conduct quarterly targeted spring quality monitoring at 1 site in the Plum Creek watershed over a range in hydrologic conditions (wet and dry conditions), collecting field, flow and conventional parameter groups; specific parameters are defined in Subtask 3.1. Sampling will extend over 12 months. Four samples will be collected for a total of 4 samples. The one spring site (20507) was identified in TSSWCB CWA Section 319(h) project 10-07, "*Surface Water Quality Monitoring and Additional Data Collection Activities to Support the Implementation of the Plum Creek Watershed Protection Plan*". Flow and field parameters will be collected by GBRA. The USGS will collect water-quality samples that will be analyzed for select nutrient species, nitrogen isotopes, and major ions. The nutrient and major ion samples will be analyzed at the USGS's National Water Quality Laboratory (NWQL) in Denver, CO, and the nitrogen isotope samples will be analyzed at the USGS's Reston Stable Isotope Laboratory (RSIL) in Reston, VA.			
	Start Date	Month 6	Completion Date	Month 24
Subtask 5.2	GBRA and USGS will conduct quarterly targeted spring quality monitoring at 1 site in the Geronimo Creek watershed over a range in hydrologic conditions (wet and dry conditions), collecting field, flow and conventional parameter groups; specific parameters are defined in Subtask 3.1. Sampling will extend over 12 months. Four samples will be collected for a total of 4 samples. The spring site (GB719) was identified in TSSWCB CWA Section 319(h) project 11-06, "*Water Quality Monitoring in the Geronimo Creek Watershed and Facilitation of the Geronimo and Alligator Creeks Watershed Partnership*". Flow and field parameters will be collected by GBRA. The USGS will collect water-quality samples that will be analyzed for select nutrient species, nitrogen isotopes, and major ions. The nutrient and major ion samples will be analyzed at the USGS's National Water Quality Laboratory (NWQL) in Denver, CO, and the nitrogen isotope samples will be analyzed at the USGS's Reston Stable Isotope Laboratory (RSIL) in Reston, VA.			
	Start Date	Month 6	Completion Date	Month 24
Deliverables	• Water quality data on spring monitoring • Information to be included in USGS technical report (Task 7) that includes isotopic data and data interpretation of spring quality			

Tasks, Objectives and Schedules						
Task 6	Additional Monitoring					
Costs	Federal	$0	Non-Federal	$0	Total	$0
Objective	To provide nutrient and isotope ratios to identify possible sources of nitrate-nitrogen and to assess the proportion of those sources in precipitation and wastewater effluent.					

Subtask 6.1	GBRA and USGS will conduct targeted water quality monitoring of precipitation at 1 site in the Plum Creek watershed collecting field (pH, specific conductance) and conventional parameter groups; specific parameters are defined in Subtask 3.1. Sampling will extend over 12 months. Four precipitation events will be collected for a total of 4 samples. The site was selected to be representative of nonpoint atmospheric sources. Field parameters will be collected by the USGS. USGS will collect precipitation samples that will be analyzed for select nutrient species, nitrogen isotopes, and major ions. The nutrient and major ion samples will be analyzed at the USGS's National Water Quality Laboratory (NWQL) in Denver, CO, and the nitrogen isotope samples will be analyzed at the USGS's Reston Stable Isotope Laboratory (RSIL) in Reston, VA.			
	Start Date	Month 6	Completion Date	Month 36
Subtask 6.2	GBRA and USGS will conduct quarterly targeted wastewater effluent monitoring at up to 4 sites in the Plum Creek watershed, collecting field, flow and conventional parameter groups; specific parameters are defined in Subtask 3.1. Sampling will extend over 12 months. Four wastewater effluent samples will be collected for a total of 4 samples. The sites will be representative of point source discharges to Plum Creek. Flow and field parameters will be collected by GBRA. The USGS will collect water-quality samples that will be analyzed for select nutrient species, nitrogen isotopes, and major ions. The nutrient and major ion samples will be analyzed at the USGS's National Water Quality Laboratory (NWQL) in Denver, CO, and the nitrogen isotope samples will be analyzed at the USGS's Reston Stable Isotope Laboratory (RSIL) in Reston, VA.			
	Start Date	Month 6	Completion Date	Month 36
Deliverables	• Water quality data on spring monitoring • Information to be included in USGS technical report (Task 7) that includes isotopic data and data interpretation of precipitation samples • Information to be included in USGS technical report (Task 7) that includes isotopic data and data interpretation of wastewater effluent samples			

Tasks, Objectives and Schedules						
Task 7	Data Management and Technical Report					
Costs	Federal	$104,500	Non-Federal	$7,689	Total	$112,189
Objective	To provide a technical report that compiles all nutrient and isotope ratios to identify possible sources of nitrate-nitrogen and assessments of the proportion of those contributions from the all water sources and to manage and transfer monitoring data for use in evaluating the success of implementing the Plum Creek WPP and the Geronimo and Alligator Creeks WPP and for inclusion into the TCEQ SWQMIS.					
Subtask 7.1	USGS will prepare an interpretive technical report on the isotopic relationships and probable sources of nitrate-nitrogen from all targeted water resources in each watershed. This technical report will function as the Final Report for this project. USGS will publish the report online and the report will be submitted to GBRA in a camera-ready, digital file. TSSWCB must approve all materials prior to publication.					
	Start Date	Month 6	Completion Date	Month 36		

Subtask 7.2	Monitoring data from activities in Task 3 will be uploaded into the TCEQ SWQMIS at least quarterly. Data will be transferred in the correct format using the TCEQ file structure along with a completed Data Summary, as described in the most recent version of the *TCEQ Surface Water Quality Monitoring Data Management Reference Guide*. GBRA will transfer the data from activities in Tasks 4,5 and 6 to TSSWCB in the appropriate format for those monitoring activities. GBRA will post data from monitoring activities collected in Tasks 3, 4, 5 and 6 to the WPP websites in a timely manner. GBRA will submit Station Location Requests to TCEQ, as needed, to obtain TCEQ station numbers for new monitoring sites. Data Correction Request Forms will be submitted to TSSWCB whenever errors are discovered in data already reported. All monitoring data files, data summary reports and data correction request forms for data collected in the Geronimo Creek Watershed will also be provided to Extension. GBRA will input monitoring regime, as detailed in the QAPP, into the TCEQ CMS.			
	Start Date	Month 6	Completion Date	Month 36
Subtask 7.3	GBRA will print a minimum of 50 hard copies of the technical report provided by USGS. The hard copies will be distributed to the Plum Creek Partnership, the Geronimo and Alligator Creek Partnership, the TSSWCB and any other agencies as requested.			
	Start Date	Month 6	Completion Date	Month 36
Deliverables	• USGS technical report that includes isotopic data and data interpretation of all targeted water sources. • Station Location Request Forms (as needed) in electronic format • Monitoring data files and Data Summary in electronic format • Data Correction Request Forms (as needed) in electronic format			

Project Goals (Expand from Summary Page)

- Analyze groundwater from the Leona Aquifer,surface water from Plum Creek and Geronimo Creek, precipitation and wastewater effluent for nitrate-nitrogen and isotopes of nitrogen and oxygen to determine possible sources of nitrate-nitrogen, i.e. geologic, human, animal or fertilizer.
- Increase the understanding of the interaction between surface water and underlying groundwater by comparing and assessing the nitrogen sources in each water body identified by the isotopic signatures, i.e. are the sources the same, or are they different, and if different, to what magnitude are they different.
- Evaluate strategies and practices for reducing nitrate levels in the surface water and groundwater. These evaluations can help determine what implementation projects or best management practices would be the most beneficial to each water body and which would benefit both surface and groundwater.
- Provide results and recommendations to agricultural and water resource managers in two watersheds

Measures of Success (Expand from Summary Page)

- Data of known and acceptable quality are generated for surface water quality monitoring of Plum Creek and Geronimo Creek for field, flow and conventional parameters (nitrate-nitrogen and its nitrogen and oxygen isotopes)
- Data of known and acceptable quality are generated for groundwater monitoring in the Leona Aquifer associated with the Plum and Geronimo Creek watersheds for field and conventional parameters (nitrate-nitrogen and its nitrogen and oxygen isotopes)
- Data of known and acceptable quality are generated for precipitation and wastewater effluent associated with the Plum Creek and Geronimo Creek watersheds for field and conventional parameters (nitrate-nitrogen and its nitrogen and oxygen isotopes)
- Water quality data is used to develop isotopic signatures to indicate most likely sources of elevated nitrate nitrogen in Plum and Geronimo Creeks and the Leona Aquifer
- Increased knowledge of citizens, landowners, agricultural producers, water resource managers, and regulatory

agencies regarding sources of elevated nitrate-nitrogen identified by isotopic ratios in groundwater and surface water in the two priority watersheds

2012 Texas Nonpoint Source Management Program **Reference (Expand from Summary Page)**
Goals and/or Milestone(s)
Component One – Explicit short- and long-term goals, objectives and strategies that protect surface and groundwater.
Long-Term Goal One – To… restore water quality from NPS pollution through assessment, implementation, and education. • Objective A – Focus NPS abatement efforts, implementation strategies, and available resources in watersheds identified as impacted by nonpoint source pollution. • Objective F – Increase overall public awareness of NPS issues and prevention activities.
Long-Term Goal Three – Support the implementation of state, regional, and local programs to reduce NPS pollution, such as the implementation strategies defined in…WPPs.
Long-Term Goal Six – Increase overall public awareness of NPS issues and prevention activities
Short-Term Goal One – Data Collection and Assessment – Objective B – Ensure that monitoring procedures meet quality assurance requirements and are in compliance with EPA-approved TCEQ and/or TSSWCB Quality Management Plans.
Short-Term Goal One – Data Collection and Assessment – Objective C – Conduct special studies to determine sources of NPS pollution and gain information to target…BMP implementation.
Short-Term Goal Three – Education – Objective D - Conduct outreach through the Clean Rivers Program, Texas Cooperative Extension, Soil and Water Conservation Districts, and others to facilitate broader participation and Partnerships…
Short-Term Goal Three – Education – Objective F – Implement public outreach and education to maintain and restore water quality in water bodies by NPS pollution.
Component Five – The state program identifies … watersheds impaired by NPS … Further, the state establishes a process to progressively address these identified waters by conducting more detailed watershed assessments and developing watershed implementation plans, and then by implementing the plans.

Part III – Financial Information

Budget Summary				
Federal	$	162,000	% of total project	75%
Non-Federal	$	54,113	% of total project (≥ 40%)	25%
Total	$	216,113	Total	100%

Category	Federal	Non-Federal	Total
Personnel	$ 0	$ 31,537	$ 31,537
Fringe Benefits	$ 0	$ 12,615	$ 12,615
Travel	$ 0	$ 0	$ 0
Equipment	$ 0	$ 0	$ 0
Supplies	$ 0	$ 0	$ 0
Contractual	$ 162,000	$ 0	$ 162,000
Construction	$ 0	$ 0	$ 0
Other	$ 0	$ 500	$ 500
Total Direct Costs	$ 162,000	$ 44,652	$ 206,652
Indirect Costs (≤ 15%)	$ 0	$ 9,461	$ 9,461
Total Project Costs	$ 162,000	$ 54,113	$ 216,113

Budget Justification (Federal)		
Category	Total Amount	Justification
Personnel	$ 0	N/A
Fringe Benefits	$ 0	N/A
Travel	$ 0	N/A
Equipment	$ 0	N/A
Supplies	$ 0	N/A
Contractual*	$ 162,000	U.S. Geological Survey
Construction	$ 0	N/A
Other	$ 0	N/A
Indirect	$ 0	N/A

Budget Justification (Non-Federal)		
Category	Total Amount	Justification
Personnel	$ 31,537	Director of WQ Services @ .17% FTE ($19,819) WQ Technician @ .19% FTE ($8,260) Admin Assistant @ .08% FTE ($3,458)
Fringe Benefits	$ 12,615	40% of GBRA Labor
Travel	$ 0	N/A
Equipment	$ 0	N/A
Supplies	$ 0	N/A
Contractual*	$ 0	N/A
Construction	$ 0	N/A
Other	$ 500	Printing – 50 copies of technical report
Indirect	$ 9,461	30% of GBRA Labor

Contractual Budget Justification (Federal) - USGS		
Category	Total Amount	Justification
Personnel	$ 64,491	Senior Hydrologist @ .03% FTE ($4,004) Senior Hydrologic Technician @ .08% FTE ($7,100) Supervisory Hydrologist @ .03% FTE ($3,240) Senior Hydrologist @ .17% FTE ($24,327) Senior Hydrologist- Nutrient Specialist @ .08% FTE ($8,740) GIS Specialist @ .11% FTE ($9,467) Supervisory Hydrologist- Report Specialist @ .03% FTE ($4,720) Supervisory Hydrologist @ .03% FTE ($2,893)
Fringe Benefits	$ 0	N/A
Travel	$ 1,576	FY13 sample runs and two meetings, day trips only, 1,600 est. miles at $0.85 /mile. FY14 travel is day trips for est. 2-3 meetings, 240 miles total at $0.90 / mile
Equipment	$ 0	N/A
Supplies	$ 6,450	field supplies ($150), IT supplies ($300), Office supplies ($500), Sampling supplies ($5,000) + misc. other supplies (est. @ $500)
Contractual*	$ 0	N/A
Construction	$ 0	N/A
Other	$ 68,353	Facilities rent, power / utilities, telecom services, broadband, calculated per project at 38.7186% of total project est. salary cost ($24,970). Water Quality Analyses/Analytical Services (major ions-bromide, calcium, chloride, fluoride, iron, magnesium, manganese, potassium, TDS, silica, sodium and sulfate; nutrients-ammonia-nitrogen, TKN, nitrite, nitrate, orthophosphate, total phosphorus; isotopes-15N/14N of nitrate and 18O/16O of nitrate) – 44 samples ($562/sample), Fedex shipments of samples $555, Enterprise Publishing Network Costs for Scientific Info Report (SIR) $15,600, professional services from Gov't Printing Office to print final SIR $2,500
Indirect	$ 21,130	15% of total direct costs above