Clean Water Act §319(h) Nonpoint Source Grant Program

Development and Implementation of an Environmental Training Program for Manure and Compost Haulers/Applicators in the Texas High Plains

TSSWCB Project 09-04
Quality Assurance Project Plan
Texas State Soil and Water Conservation Board

Revision 0

prepared by

Texas AgriLife Research and Extension Center at Amarillo
Texas AgriLife Research and Extension Center at Vernon
Texas Cattle Feeders Association
Effective Period: USEPA Approval to October 31, 2012

Questions concerning this quality assurance project plan should be directed to:

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Section A1: Approval Sheet

Development and Implementation of an Environmental Training Program for Manure and Compost Haulers/Applicators in the Texas High Plains

United States Environmental Protection Agency (USEPA), Region VI

Name: Curry Jones
Title: USEPA Chief State/Tribal Programs Section

Signature: ______________________________ Date: ___________________

Name: Henry Brewer
Title: USEPA Texas Nonpoint Source Project Officer

Signature: ______________________________ Date: ___________________

Texas State Soil and Water Conservation Board (TSSWCB)

Name: Mitch Conine
Title: TSSWCB Project Manager (PM)

Signature: ______________________________ Date: ___________________

Name: Pamela Casebolt
Title: TSSWCB Quality Assurance Officer (QAO)

Signature: ______________________________ Date: ___________________

Texas AgriLife Research and Extension Center at Amarillo (AgriLife Amarillo)

Name: Brent W. Auvermann, Ph.D.
Title: Professor, Environmental Quality and Natural Resources; Project Co-Leader

Signature: ______________________________ Date: ___________________

Texas AgriLife Research and Extension Center at Vernon (AgriLife Vernon)

Name: Paul B. DeLaune, Ph.D.
Title: Assistant Professor, Environmental Soil Scientist

Signature: ______________________________ Date: ___________________

Texas Cattle Feeders Association

Name: Ben Weinheimer
Title: Vice President, Texas Cattle Feeders Association; Co-Leader

Signature: ______________________________ Date: ___________________

Servi-Tech Laboratories

Name: Todd Whatley
Title: Laboratory Manager

Signature: ______________________________ Date: ___________________

Name: Brandon Hulsey
Title: Quality Assurance Officer (QAO)

Signature: ______________________________ Date: ___________________

Section A2: Table of Contents

List of tables

List of figures

List of acronyms and abbreviations

AgriLife Vernon	Texas AgriLife Research and Extension Center at Vernon
AgriLife Amarillo	Texas AgriLife Research and Extension Center at Amarillo
BMP	best management practice
CAFO	concentrated animal feeding operation
CAR	corrective action report
CCA	certified crop advisor
COC	chain of custody
CWA	Clean Water Act
DQO	data quality objectives
EQIP	USDA NRCS Environmental Quality Incentives Program
ESSL	AgriLife Vernon Environmental Soil Science Laboratory
GPS	global positioning system
LIMS	laboratory information management system
NIST	National Institute of Standards and Technology
PM	project manager
QA	quality assurance
QAO	Quality Assurance Officer
QAPP	quality assurance project plan
QC	quality control
QPR	quarterly progress report
RPD	relative percent deviation
SOP	standard operating procedure
SWCD	soil and water conservation district
TCEQ	Texas Commission on Environmental Quality
TCFA	Texas Cattle Feeders Association
TSSWCB	Texas State Soil and Water Conservation Board
USEPA	United States Environmental Protection Agency

Section A3: Distribution List

Organizations, and individuals within, which will receive copies of the approved QAPP and any subsequent revisions include:

United States Environmental Protection Agency, Region VI

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> Title: USEPA Chief State/Tribal Programs Section
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Name: Todd Whatley
Title: Laboratory Manager

Name: Brandon Hulsey
Title: Quality Assurance Officer (QAO)

Section A4: Project/Task Organization

The following is a list of individuals and organizations participating in the project with their specific roles and responsibilities:

USEPA **–** Provides project oversight and funding at the federal level.

Henry Brewer, USEPA Texas Nonpoint Source Project Officer
Responsible for overall performance and direction of the project at the federal level. Ensures that the project assists in achieving the goals of the CWA. Reviews and approves the QAPP, project progress, and deliverables.

TSSWCB **–** Provides project oversight and funding at the state level.

Mitch Conine, TSSWCB PM
Responsible for ensuring that the project delivers data of known quality, quantity, and type on schedule to achieve project objectives. Tracks and reviews deliverables to ensure that tasks in the workplan are completed as specified. Responsible for determining that the QAPP meets the requirements for planning, QA/QC, and reporting activities conducted by Texas AgriLife Extension Service. Responsible for technical oversight of activities involved in generating analytical data by the AgriLife Vernon laboratory. Responsible for general facilitation of audits and reporting of corrective actions.

Pamela Casebolt, TSSWCB QAO
Reviews and approves the QAPP and any amendments or revisions and ensures distribution of approved/revised QAPPs to TSSWCB and USEPA participants. Responsible for verifying that the QAPP is followed by project participants. Determines that the project meets the requirements for planning, QA/QC, and reporting. Monitors implementation of corrective actions. Coordinates or conducts audits of field and laboratory systems and procedures.

TCFA **–** Provides the primary point of contact between the TSSWCB and the project contractors.

Ben Weinheimer
Tracks and reviews deliverables to ensure that tasks in the workplan are completed as specified.

Texas AgriLife Extension Service Amarillo – Responsible for day-to-day project coordination, including soil and manure sampling, manure-spreader calibration activities, and field demonstrations; and preparation, review, and delivery of QPRs. Responsible for maintaining and updating the website with assistance from the TSSWCB.

Dr. Brent W. Auvermann
Responsible for ensuring tasks and other requirements in the contract are executed on time as defined by the grant workplan; assessing the quality of work by participants; submitting accurate and timely deliverables and costs to the TSSWCB; and coordinating attendance at conference calls, meetings, and related project activities. Responsible for ensuring applicable tasks and other requirements in the contract are executed on time and with the QA/QC requirements in the system as defined by the contract workplan and in the QAPP. Responsible for verifying that data are of known and acceptable quality. Responsible for ensuring adequate training and supervision of all activities involved in generating analytical data for this project. Responsible for news releases, public presentations, and publications including accuracy of data disseminated concerning ongoing activities in the Buck Creek, Sweetwater Creek, and Palo Duro Creek watersheds.

Texas AgriLife Vernon – Responsible for collection of stormwater runoff samples and data analysis.

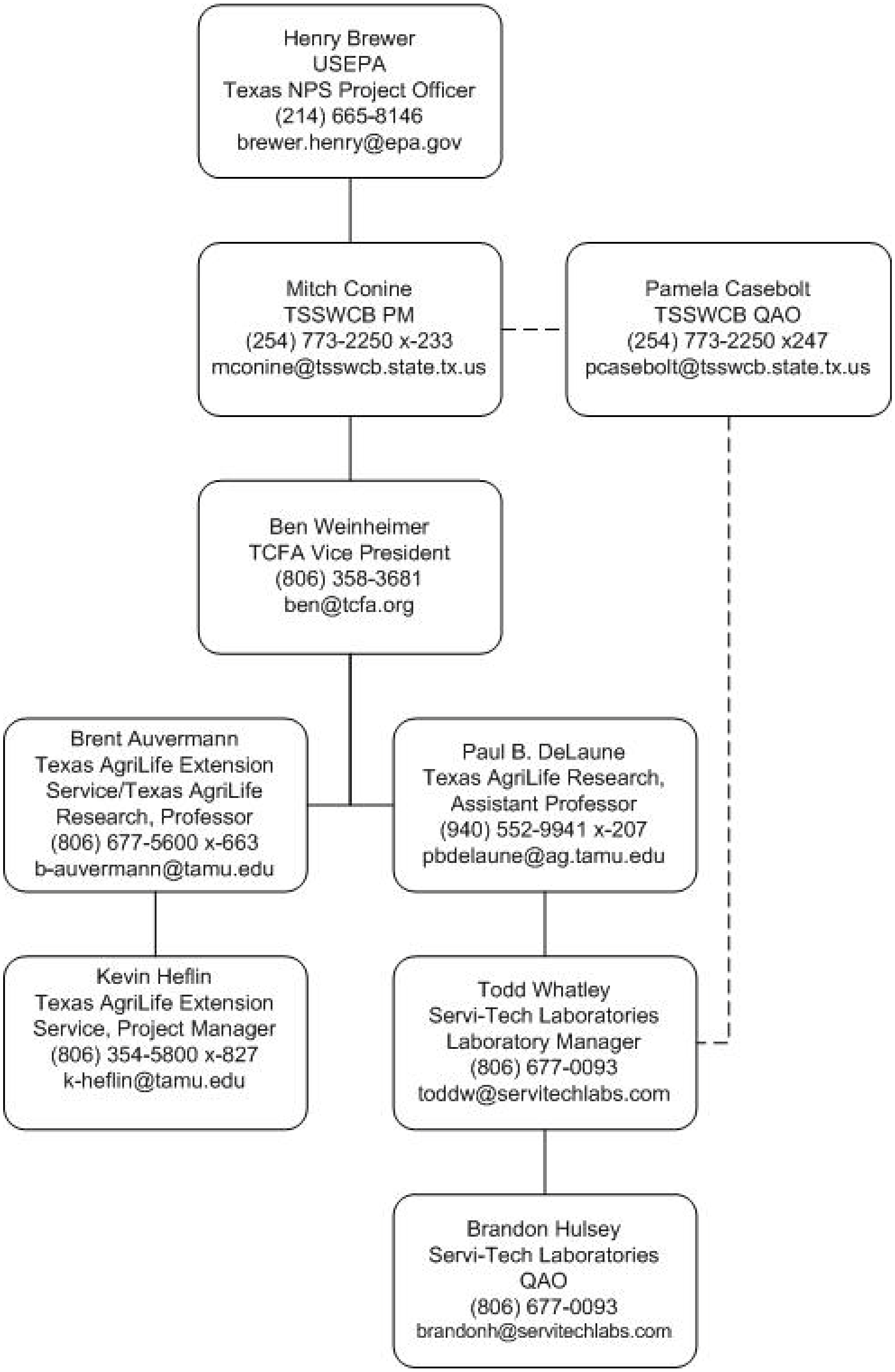
Dr. Paul B. DeLaune, Assistant Professor; Research Agronomist
Responsible for coordinating and supervising runoff sampling activities. Responsible for ensuring that field personnel have adequate training, equipment, and a thorough knowledge of SOPs specific to the analysis or task performed and/or supervised. Responsible for ensuring applicable tasks and other requirements in the contract are executed on time and with the QA/QC requirements in the system as defined by the contract workplan and in the QAPP. Responsible for verifying that data are of known and acceptable quality. Responsible for ensuring adequate training and supervision of all activities involved in generating analytical data for this project. Responsible for news releases, public presentations, and publications including accuracy of data disseminated concerning ongoing activities in the Buck Creek watershed. Responsible for the facilitation of audits and the implementation, documentation, verification, and reporting of corrective actions. Responsible for submitting accurate and timely data analyses and other materials for QPRs and final reports to AgriLife Amarillo. Responsible for conducting analysis of water samples collected by AgriLife Vernon and reporting of those data back to AgriLife Amarillo for inclusion in project reports and data sets.

Servi-Tech Laboratories –

Todd Whatley, Servi-Tech Laboratory Manager
Responsible for supervision of laboratory personnel involved in generating analytical soils data for this project. Responsible for ensuring that laboratory personnel involved in generating analytical data have adequate training and a thorough knowledge of the QAPP and all SOPs specific to the analyses or task performed and/or supervised. Responsible for oversight of all operation, ensuring that all QA/QC requirements are met, and documentation related to the analysis is completely and accurately reported. Enforces corrective action, as required. Develops and facilitates monitoring systems audits.

Brandon Hulsey, Servi-Tech Laboratory QAO
Monitors the implementation of the quality assurance manual (QAM) and the QAPP within the laboratory to ensure complete compliance with QA objectives as defined by the contract and in the QAPP. Conducts internal audits to identify potential problems and ensure compliance with written SOPs. Responsible for supervising and verifying all aspects of the QA/QC in the laboratory. Performs validation and verification of data before the report is sent to the AgriLife Vernon. Ensures that all QA reviews are conducted in a timely manner from real-time review at the bench during analysis to final pass-off of data to the laboratory manager.

Figure A4-1 Project Organizational Chart - Lines of Communication



Section A5: Problem Definition/Background

The land application of manure/compost is a viable organic nutrient option for crop production across the Texas High Plains. Within 150 mile radius of Amarillo, 5.8 million head of beef cattle are fed in feedyards; this is about 30% of the nation's fed cattle production. The cattle feeding industry has served as an important economic driver in this region since the 1960s. Manure has been primarily used as a nutrient and soil amendment on cropland. Primary crops in the region include corn, wheat, cotton, alfalfa, peanuts, grain sorghum and hay.

The movement of manure/compost to cropland is typically a three-way relationship consisting of a crop producer, a feedyard source of manure/compost and a third-party custom hauler/applicator. Over the past five decades, custom manure and compost companies have become an important component in the operation of feedyards and farms that purchase manure or compost. Application rates are determined by the crops to be grown, residual nutrients and the soil recommendations of crop advisors and soil testing laboratories at land grant universities. Manure and compost companies generally have a fixed rate for loading and spreading (i.e., $3.50 per ton) and a hauling charge (i.e., $0.25 per ton per mile). The cost of manure/compost to the crop producer serves as an important self-limiting tool to prevent the over-application of nutrients.

Manure and compost companies have strived over the years to provide a service to both feedyards and crop producers in the most cost-effective manner possible. Unfortunately, little attention has been given to environmental impacts, by this important segment of the cattle feeding industry. This project, through training and demonstrations, will establish a program to provide for long-term implementation of BMPs to be utilized during the land application of manure or compost. A comprehensive environmental training program, which will use printed materials, videos and web-based materials (in both English and Spanish) will heighten the environmental awareness of custom manure and compost owners and their employees. In addition, crop producers will benefit by participating in the workshops, field days and seminar. This will give producers a greater assurance that using manure or compost in their nutrient management programs has tremendous benefits and can be applied in a manner that is protective of the environment.

In the 2000 and 2002 Texas 303(d) Lists, two watersheds in the Texas High Plains were identified as impaired based on elevated bacteria levels in the creeks (Sweetwater Creek and Buck Creek) and have continued to be listed on the 2008 Texas 303(d) List. The source of the bacteria is not yet known. Buck Creek is currently being investigated through TSSWCB project 06-11 *Watershed Protection Plan Development for Buck Creek.* These two watersheds will serve as pilot watersheds for the "beta-testing" portion of the environmental training curriculum to be developed through this project. A targeted educational program to assist manure and compost applicators will increase their understanding of appropriate BMPs that complement any watershed protection plan measures that are developed.

While the land under the control of the feedyard is typically covered under the facility's CAFO permit, manure may be applied to that land by a custom manure/compost hauler. This manure must be applied in accordance to the feedyards nutrient management plan and the pollution prevention plan as defined by the feedyard's permit.

This project will be the first of its kind, in the Texas High Plains region, that targets a diverse group of stakeholders and is specific to the independent business relationship (feedyards, manure/compost haulers, CCAs, and crop producers) as well as the cropping systems that are implemented. TCFA is uniquely situated to facilitate the development and implementation of this environmental training curriculum. TCFA represents the cattle feeding industry in Texas, Oklahoma and New Mexico and has nearly 200 Feedyard Members with a total membership around 5,000. As a result, this environmental training program has the potential, if successful in Texas, to expand to Oklahoma and New Mexico.

Section A6: Project/Task Description

The primary focus of this project is to facilitate the development and implementation of an education, training, and demonstration program to improve the understanding of environmental protection principles by manure/compost haulers, equipment operators, CCAs, and crop producers. The project will focus on areas that are generally described as the Texas High Plains (the Amarillo and Lubbock regions of Texas). The demonstration sites are situated within the Red River Basin, and will be specifically located in the Buck Creek, Silver Creek, Sweetwater Creek, and the Palo Duro Creek watersheds.

The project will design and develop an environmental training curriculum, in both English and Spanish, tailored to the current business relationship that exists between feedyard, manure/compost companies and crop producers. The curriculum will outline key concepts for environmental management and water quality protection. A survey will be developed and administered at the initiation of the project to assess the current level of environmental knowledge of custom manure/compost haulers and the extent of training provided to equipment operators. A summary of the survey results will be used as guidance for the curriculum. Also, a project advisory group will be organized, consisting of CAFO operators, manure and compost haulers, livestock industry organizations (i.e., Texas Farm Bureau, Texas Association of Dairymen, Texas and Southwestern Cattle Raisers Association), commodity organizations (i.e., Corn Producers Association of Texas, Plains Cotton Growers, Texas Grain Sorghum Producers Board), AgriLife Extension, TSSWCB, SWCDs, Texas Department of Agriculture, U.S. Department of Agriculture-Natural Resources Conservation Service, CCAs and crop producers, stakeholders of the pilot watersheds (Buck Creek and Sweetwater Creek) and demonstration site cooperators, to design and develop the environmental training curriculum and prioritize the selection of project demonstration sites.

Three to four demonstration sites will be established to train custom manure hauler owners, equipment operators, CCAs and crop producers on the principles of environmental management for land application of manure. A variety of BMPs are available to consider when applying manure and compost to the land. BMP recommendations will be compiled and discussed with manure/compost company owners and equipment operators at project field days workshops. All educational materials will be made available through websites.

The project will notify custom manure haulers of the availability of on-site technical assistance and field training for owners and operators, and encourage implementation of USDA-NRCS conservation practices by landowners through the EQIP. In addition, TCFA, with assistance from local SWCDs and the TSSWCB Hale Center Regional Office, will promote the availability of technical assistance and encourage the development and implementation of TSSWCB-certified Water Quality Management Plans (WQMPs). A WQMP is a site-specific plan developed through and approved by SWCDs which includes appropriate land treatment practices, production practices, management measures, and technologies that prevent and abate agricultural and silvicultural nonpoint source pollution. TCFA and AgriLife Extension will explore options for future development of a certification program for manure and compost haulers based on the outcomes of the training and demonstration efforts of this project.

Table A6-1: Project Plan Task List and Milestones

Color legend to indicate lead agency
- --Texas Cattle Feeders Association
- --Texas AgriLife Research & Extension Service
- --Multiple agencies involved

Task #	Description	Lead Agency: TCFA	Lead Agency: AgriLife	Lead Agency: WT
1	Project Administration			
1.1	Admin process--quarterly reports	x	x	
1.2	Accounting functions	x		
1.3	Participate in public meetings	x	x	
1.4	Cooridation meetings	x	x	
1.5	Project information materials	x	x	
1.6	Host and maintain webpage		x	
1.7	Hire project manager		x	
1.8	Develop and submit final report	x	x	x
2	Quality Assurance			
2.1	Develop a QAPP		x	
2.2	Submit revisions and necessary amendments		x	
3	Environmental Knowledge Assessment			
3.1	Prepare survey instrument		x	
3.2	Update existing lists of manure/compost haulers		x	
3.3	Establish current state-of-knowledge by haulers		x	
3.4	Conduct post-survey of manure/compost haulers		x	
4	Project Advisory Group			
4.1	Meet with Extension agents on objectives of project	x		
4.2	Identify members for the project advisory group	x		
4.3	Host meetings and/or conference calls	x		
4.4	Group will discuss & prioritize criteria for site selection	x	x	x
4.5	Group will review project objectives	x	x	x
5	Manure Spreader Calibration Kits			
5.1	Identify options for field calibration	x		
5.2	Assemble manure/compost calibration kits	x		
5.3	Verify field-scale technique		x	x
6	Curriculum Development			
6.1	Produce educational materials	x	x	
6.2	Deploy educational materials		x	
6.3	Provide template		x	
7	Demonstrate and Program Delivery			
7.1	Select demonstration sites	x	x	x
7.2	Train for application of manure	x	x	
7.3	Host field days	x	x	
7.4	Organize seminars/workshops	x		
7.5	Provide project results to state livestock organizations	x		
7.6	Present results to Property Rights & Env.-NCBA Comm.	x		
8	Technical Assistance			
8.1	Establish system of tracking & providing notifications		x	
8.2	Encourage to attend group workshops	x	x	
8.3	Promote the availability of technical assistance	x		
8.4	Explore options--future development of cert. program	x	x	
9	BMP Effectiveness Monitoring			
9.1	Establish control and treatment plots	x	x	
9.2	Install automatic water samplers & collect runoff data		x	
9.3	Annually collect soil samples from plots	x		
9.4	Collect water well samples	x		
9.5	Collect manure/compost samples	x		

Schedule columns (months):

Year	Month #	Month
Year 1	1	Nov-09
	2	Dec-09
	3	Jan-10
	4	Feb-10
	5	Mar-10
	6	Apr-10
	7	May-10
	8	Jun-10
	9	Jul-10
	10	Aug-10
	11	Sep-10
	12	Oct-10
Year 2	13	Nov-10
	14	Dec-10
	15	Jan-11
	16	Feb-11
	17	Mar-11
	18	Apr-11
	19	May-11
	20	Jun-11
	21	Jul-11
	22	Aug-11
	23	Sep-11
	24	Oct-11
Year 3	25	Nov-11
	26	Dec-11
	27	Jan-12
	28	Feb-12
	29	Mar-12
	30	Apr-12
	31	May-12
	32	Jun-12
	33	Jul-12
	34	Aug-12
	35	Sep-12
	36	Oct-12

Project Goals

To facilitate the development and implementation of an education, training and demonstration program to improve the understanding of environmental protection principles by manure/compost haulers, equipment operators, CCAs and crop producers.

- Assess the current level of environmental knowledge of custom manure/compost haulers and the extent of training provided to equipment operators.
    - To establish a solid foundation for this project, a survey instrument will be developed by AgriLife Extension and TCFA.
    - Manure and compost company representatives will be given the option of completing the survey in writing or via phone conversations with project personnel.
    - A summary of the survey results will be used as guidance for the second objective below.
    - A post-project survey will also be conducted to measure levels of implementation.
- Design and develop an environmental training curriculum for custom manure/compost hauler owners, equipment operators, CCAs and crop producers, including materials in Spanish.
    - Project will develop a training curriculum tailored to the current business relationship that exists between feedyard, manure/compost companies and crop producers.
    - For the first time, equipment operators will have access to concise and specific information, in English and Spanish, outlining the key concepts for environmental management and water quality protection.
- Promote adoption of sound water quality protection practices by custom manure/compost haulers, equipment operators and crop producers.
    - There are a variety of BMPs to consider when applying manure and compost to the land. BMP recommendations will be compiled and discussed with manure/compost company owners and equipment operators.
    - Practices eligible for financial assistance.
    - Different considerations, where appropriate, for compost vs. manure will be identified.
- Utilize workshops, field days and hands-on demonstration of BMPs and ensure availability of education materials through website.
    - The internet contains an extensive volume of information on manure and compost.
    - Hands-on training and demonstration of BMPs, in conjunction with field-collected data, will be used to develop a strong and successful education program.

Measures of Success

- Custom manure/compost haulers will have an enhanced understanding of bacteria concerns and issues.
  - Owner and employee/equipment operator training will be implemented for proper application of manure/compost, including measures to protect water quality.
- Custom manure/compost haulers will have an enhanced understanding of manure application BMPs.
  - Surveys of manure/compost haulers will be conducted at the start of the project and again at the end of the project to measure the change in practices implemented and adoption of employee training programs.
- Operators of manure/compost spreaders will understand the methodologies for field calibration of manure/compost spreading equipment.
  - Calibration kits will be assembled and distributed to manure and compost hauling companies.
  - Training/demonstration of spreader calibration provided to owners/operators will be documented.
- Materials and trainings will be available in English and Spanish.
  - Printed training materials, videos and web-based resources will be available for English and Spanish speaking owners and employees.

QAPP Revision and amendments

Until the work described is completed, this QAPP shall be revised at least annually, or revised within 120 days of significant changes, whichever is sooner. The most recently approved version of the QAPP shall remain in effect until the revised version has been fully approved. If the entire QAPP is current, valid, and accurately reflects the project goals and the organization's policy, the annual re-issuance may be done by a certification that the plan is current. This will be accomplished by submitting a cover letter stating the status of the QAPP and a copy of new, signed approval pages for the QAPP. QAPP amendments may be necessary to reflect changes in project organization, tasks, schedules, objectives and methods; address deficiencies and nonconformance's; improve operational efficiency; and/or accommodate unique or unanticipated circumstances. Written requests for amendments are directed from the TCFA Co-Leader or designee to the TSSWCB PM and are effective immediately upon approval by the TSSWCB PM and QAO. Amendments to the QAPP and the reasons for the changes will be documented and distributed to all individuals on the QAPP distribution list by the TCFA Co-Leader or designee. Amendments shall be reviewed, approved, and incorporated into a revised QAPP during the annual revision process.

Section A7: Quality Objectives and Criteria

Precision

Precision is the degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves. It is a measure of agreement among replicate measurements of the same property, under prescribed similar conditions, and is an indication of random error.

Field splits are used to assess the variability of sample handling, preservation, and storage, as well as the analytical process, and are prepared by splitting samples in the field. Control limits for field splits are defined in Section B5.

Laboratory precision is assessed by comparing replicate analyses of sample/duplicate pairs. Precision results are compared against measurement performance specifications and used during evaluation of analytical performance. Program-defined measurement performance specifications for precision are defined in Table A7-1 and A7-2.

Table A7-1: Estimated precision limits of measured parameters for Soil and Manure/Compost Media

Laboratory Parameters for Soil	Precision Limits[1] (RPD)	Accuracy Limits	Duplicates Accuracy Limits	ServiTech[2] Code	Method Reporting Limit[3]
pH	NA	±0.2	±10%	A1.003.001	NA[3]
Electrical Conductivity	NA	± 2% of range	±10%	A1.042.001	0.05 dS/m
Organic Matter	10%	±10%	±10%	A1.008.001	0.20%
Excess Lime	10%	±10%	±10%	A1.043.001	NA[3]
Nitrate-Nitrogen	20%	±20%	±10%	A1.002.001	1.0 mg/L
Phosphorus (ICP)	20%	±20%	±10%	A1.005.000	1.0 mg/L
Potassium	20%	±20%	±10%	A1.013.000	1.0 mg/L
Calcium	20%	±20%	±10%	A1.013.000	1.0 mg/L
Magnesium	20%	±20%	±10%	A1.013.000	1.0 mg/L
Sodium	20%	±20%	±10%	A1.013.000	1.0 mg/L
Sulfur	20%	±20%	±10%	A1.013.000	1.0 mg/L

[1] RPD = relative percent deviation

[2] ServiTech SOP code

[3]-Rounded to 0.1, Range: 0.1-13.9

NA = Not applicable; mg/L = milligrams per liter; mL = milliliters; mg/kg = milligrams per kilogram; dS/m = decisiemens per meter

References for Table A7.1:

United States Environmental Protection Agency (USEPA) "Determination of Metals and Trace Elements in Water and Wastes by Inductively Coupled Plasma-Atomic Emission Spectrometry," EPA-200.7; Methods for the Determination of Metals in EnvironmentalSamples-Supplement 1, Manual # EPA/600/R-94-111.

American Society for Testing and Materials (ASTM), Annual Book of Standards, Vol. 11.02

Table A7-2: Measurement performance specifications for water analysis

Parameter	Units	Analysis Method	Method Reference	Reproducibility Limits	Precision Limits	% Complete
Nitrate	mg/L	EPA 353.2	APHA, 2005	1 S.D.	10%	90
Ammonia	mg/L	EPA 350.1	APHA, 2005	1 S.D.	10%	90
Soluble reactive P (ortho-P)	mg/L	EPA 365.1	APHA, 2005	1 S.D.	10%	90
TKN	mg/L	EPA 353.2	APHA, 2005	1 S.D.	10%	90
Total P	mg/L	EPA 365.1	APHA, 2005	1 S.D.	10%	90
E. coli	CFU/100 ml	EPA 1603	EPA, 2009	NA	10%	90

Representativeness

Site selection and sampling of all pertinent media (water, soil or compost), and use of only approved analytical methods, will assure that the measurement data represents the conditions at the site. Representativeness also depends on the number of samples taken to accurately reflect the technological effectiveness at a given site. The goal for meeting total representation for effectiveness of each technology is tempered by the potential funding for complete representativeness. Soil samples will be collected in a pre-determined grid pattern, which is designed to provide for a consistent and representative series of sub-samples from year to year.

Comparability

Confidence in the comparability of data sets from this project to those for similar uses is based on the commitment of project staff to use only approved sampling and analysis methods and QA/QC protocols in accordance with quality system requirements and as described in this QAPP and project SOPs. Comparability is also guaranteed by reporting data in standard units, by using accepted rules for rounding figures, and by reporting data in a standard format.

Completeness

The completeness of the data is a measure of how much of the data is available for use compared with the total potential data. Ideally, 100% of the data would be available. However, the possibility of unavailable data due to accidents, weather, insufficient sample volume, broken or lost samples, etc. is to be expected. Therefore, it will be a general goal of the project that 90% data completion is achieved. Should less than 90% data completeness occur, the AgriLife Amarillo project leader will initiate corrective action. Data completeness will be calculated as a percent value and evaluated with the following formula:

$$\% \text{ completeness} = (SV \times 100) / ST$$

Where: SV = number of samples with a valid analytical report
ST = total number of samples collected

Section A8: Special Training/Certifications

All personnel involved in sampling, sample analyses, and statistical analyses have received the appropriate education and training required to adequately perform their duties. No special certifications are required. AgriLife Vernon personnel involved in this project have been trained in the appropriate use of field equipment, laboratory equipment, laboratory safety, cryogenics safety, and all applicable SOPs.

Laboratory analysts have a combination of experience, education, and training to demonstrate knowledge of their function. To perform analyses for the TSSWCB, laboratory analysts will have a demonstration of capability (DOC) on record for each test that the analyst performs. The initial DOC should be performed prior to analyzing samples and annually thereafter. For cases in which analysts have been analyzing samples prior to an official certification of capability being generated, a certification statement is made part of the training record to document the analyst's initial on the job training. Annual DOCs are a part of analyst training thereafter.

Section A9: Documentation and Records

Hard copies of general maintenance records, all field data sheets, COC forms, laboratory data entry sheets, calibration logs, and CARs will be archived by each laboratory for at least five years. In addition, TCFA, AgriLife Amarillo and AgriLife Vernon will archive electronic forms of all project data for at least five years. All electronic data are backed up on an external hard drive monthly, compact disks weekly, and is simultaneously saved in an external network folder and the computer's hard drive. A blank CAR form is presented in Appendix A, blank field data reporting forms are presented in Appendices B and C, and a blank COC form is presented in Appendix D. QPRs will note activities conducted in connection with the water quality monitoring program, items or areas identified as potential problems, and any variations or supplements to the QAPP. CARs will be utilized when necessary. CARs that result in any changes or variations from the QAPP will be made known to pertinent project personnel and documented in an update or amendment to the QAPP. All QPRs and QAPP revisions will be distributed to personnel listed in Section A3. The TSSWCB may elect to take possession of records at the conclusion of the specified retention period.

Section B1: Sampling Process Design (Experimental Design)

A primary goal of this project is to organize a diverse stakeholder group that participates in the development of BMPs for land application of manure and compost. This project will also monitor stormwater surface runoff from artificial sub-watersheds receiving different application rates of manure or compost. Trends in soil nutrient status downgradient of land application areas will be monitored as an indicator of transport of manure derived contaminants. In all cases, project collaborators intend to provide data to inform SWCDs and landowners of any potential or existing water quality threats. The demonstration sites are located in the Texas High Plains in 5 distinct watersheds located in 3 different counties as seen in Figure B1-1 and Table B1-1.

Soil samples will primarily be collected from October to January depending upon field conditions and crop rotations. Stormwater sampling cannot be regularly scheduled as it is dependent on climatic conditions of the study area. Therefore, due to the climate of the project area storm sampling will continue through the duration of the project due to the limited amounts of rainfall.

Figure B1-1: Demonstration sites in the Texas High Plains (n=15)

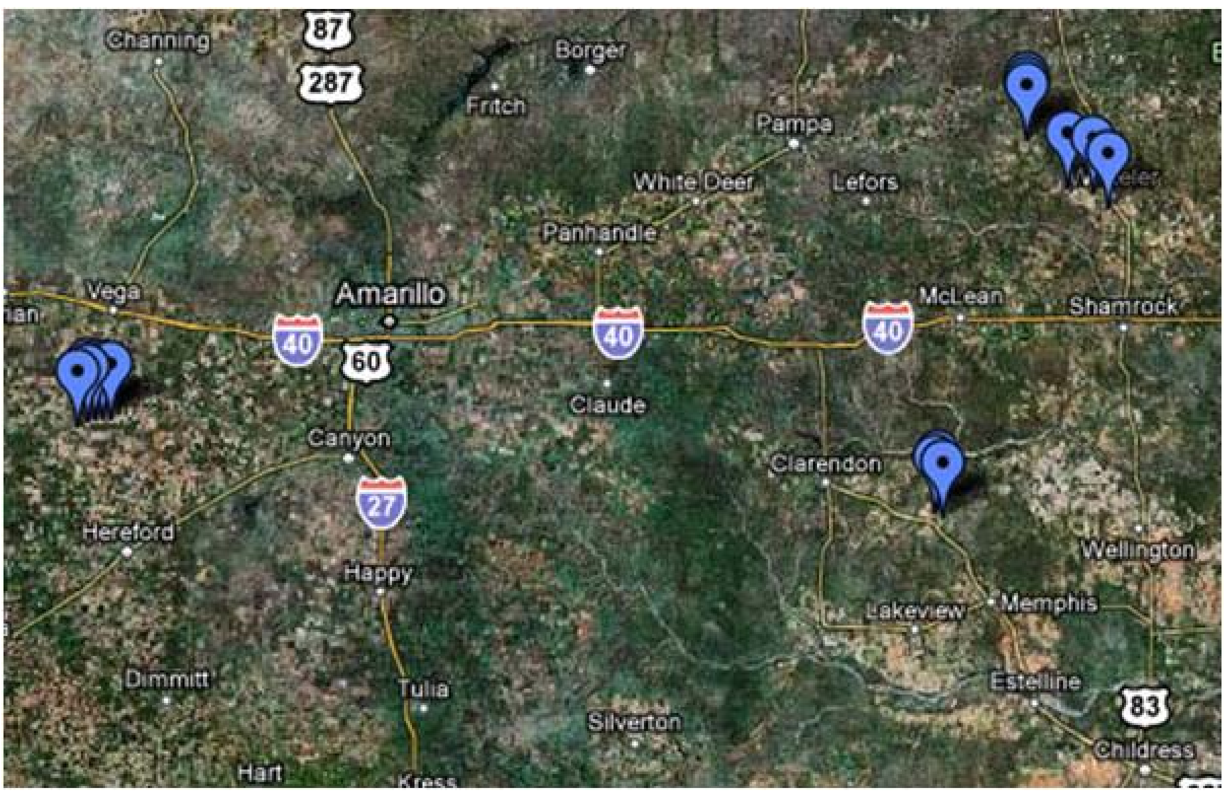


Table B1-1: Demonstration site location by county and watershed with GPS coordinates in latitude/longitude (decimal degrees) and UTM units

Site	County	Latitude	Longitude	UTM East	UTM North	Zone	Watershed
WC-1	Wheeler	35.419	-100.276	384133.775	3920272.887	14s	Sweetwater Creek
WC-2	Wheeler	35.455	-100.367	375991.060	3924376.961	14s	Silver Creek
WC-3	Wheeler	35.557	-100.455	368127.310	3935814.230	14s	Sweetwater Creek
WC-4	Wheeler	35.550	-100.455	368099.364	3934977.916	14s	Sweetwater Creek
WC-5	Wheeler	35.542	-100.455	368118.561	3934171.860	14s	Sweetwater Creek
WC-6	Wheeler	35.448	-100.312	380915.443	3923546.173	14s	Silver Creek
DC-1	Donley	34.889	-100.649	349346.878	3862027.639	14s	Salt Fork
DC-2	Donley	34.883	-100.650	349240.722	3861299.070	14s	Salt Fork
DC-3	Donley	34.871	-100.633	350748.514	3859930.730	14s	Buck Creek
DSC-1	Deaf Smith	35.049	-102.429	734528.380	3881528.352	13s	Palo Duro Creek
DSC-2	Deaf Smith	35.049	-102.447	732883.637	3881501.682	13s	Palo Duro Creek
DSC-3	Deaf Smith	35.050	-102.464	731316.821	3881492.892	13s	Palo Duro Creek
DSC-4	Deaf Smith	35.052	-102.479	729901.104	3881706.582	13s	Palo Duro Creek
DSC-5	Deaf Smith	35.044	-102.481	729798.673	3880799.193	13s	Palo Duro Creek
DSC-6	Deaf Smith	35.036	-102.500	728051.630	3879850.347	13s	Palo Duro Creek

Section B2: Sampling Methods

Soil, manure, compost, and water sampling

Soil samples will be collected by TCFA Environmental Services Program staff members. Samples will be collected using a hydraulic 1-inch auger probe that is mounted on the side of utility vehicle. TCFA will utilize soil sampling GPS software developed by SST. Prior to collecting samples in the field, TCFA staff will map the field and down-gradient soil sampling locations using the aerial and topographic maps provided in the SST software. In the field, TCFA staff will utilize a handheld GPS mapping unit. Fields and down-gradient areas will be sampled in a consistent grid pattern from year-to-year. Individual sub-sample locations will be recorded on the GPS unit and subsequently uploaded to the SST desktop computer software upon return to the office. For each of the sampled areas, a minimum of 10 sub-samples will be collected and combined to create composite soil samples for the target area and sampling depth.

Soil samples will be collected at the 0-6 inch and 6-24 depths at each sampling point. Sub-samples will be composited in a clean bucket, thoroughly mixed and transferred to cloth soil bags provided by Servi-Tech Laboratories. Samples will primarily be collected from October to January depending upon field conditions and crop rotations.

Manure and compost samples will be collected prior to any land application event to obtain the nutrient concentration of the manure/compost. Samples will be collected from the manure/compost storage location when in-field stockpiles are available. Multiple sub-samples (i.e. 3-6) of manure/compost will be collected using a clean shovel. Sub-samples will be composited into a one-gallon plastic Ziploc bag.

Storm event runoff water samples will be collected using refrigerated ISCO Avalanche samplers collecting from flow through a 1 ft. H-flume. Initial water level (if there is still flow), date, time, and collector's name will be recorded at time of sampling. Water samples will be collected based on flow volume, not time. Samplers will be triggered when flow level is >0.25 inches. Samples will continue to be collected based on flow rates until the flow depth is <0.25 inches or the single sterile bottle configuration is full. Once the sampling program is triggered, data will be recorded at 5 minute intervals and 100 mL of water will be collected into a single 5 gal container per 250 gal flow. After the first sample is collected until the completion of the running program, the Avalanche cools the refrigerated compartment to 1^{o}C +/- 1. One hour after the last sample of the program is taken, the Avalanche adjusts its control to maintain the samples at 3^{o}C +/- 1. The 5 gal collection bottle will be removed from the sampler and thoroughly mixed by shaking. Thereafter, aliquots will be collected/transported in disposable, pre-cleaned, sterile bags or containers labeled with plot number, date, time and collector's name. The samples will be transported in an iced container and delivered to the ESSL where they will be analyzed. Samples will be analyzed for TKN, TP, SRP, NH3-N, NO3-N, and *E. coli*. Aliquots for SRP, NH_3-N, and NO_3-N analysis will be filtered using a .45 micron filter and acidified to pH 2 with H_2SO_4. A sub-sample will also be taken for *E. coli* enumeration and preserved using refrigeration. Stormwater sample data will be used to assist in evaluating BMP effectiveness of application rates. Stormwater sampling cannot be regularly scheduled as it is dependent on climatic conditions of the study area. Therefore, due to the climate of the project area storm sampling will continue through the duration of the project due to the limited amounts of rainfall.

Groundwater samples will be collected from the well head only after the pump has been running for at least 1 hr. Water will be collected in a syringe and immediately filtered through a 0.45 μm membrane and acidified to pH 2 with H_2SO_4. Samples will be transported to the ESSL and stored in a refrigerator at 4^oC. A sample will also be collected in a sterile syringe and collected/transported in sterile bags or containers for *E. coli*. Samples will primarily be collected from April to September depending on crop rotation and field conditions

Storm event holding time

Stormwater samples will be collected using automatic ISCO samplers as described above. The samples will be transported in an iced container and delivered to the ESSL for analysis. A minimum of 125 ml will be collected by automatic samplers into sterile plastic bottles and when removed from the automatic samplers stored at 4^oC. Edge-of-field samples must be removed from refrigerated automated samplers, transported to ESSL, filtered, and placed in the incubator within 24 hours of the start of a runoff event, that is, from the first automatically collected stormwater sample. Samples must be stored at 4°C until processed by ESSL. In the event samples cannot be processed within 24 hours, samples may be analyzed but flagged for holding time violation and not used in the BMP effectiveness evaluation per section D3.

Section B2-1: Demonstration site soil sampling

Manure and compost samples will be collected prior to any land application event to obtain the nutrient concentration of the manure/compost. Samples will be collected as outlined above in Section B2.

Soil sampling will be conducted in the demonstrations sites, listed in Table B1-1, to monitor trends in soil nutrient status downgradient of land application areas as an indicator of transport of manure derived contaminants. Soil samples will be taken from areas within the field that contribute to runoff. Then soil samples will be taken downgradient from these areas to determine if there is nutrient transport. In all cases we intend to provide data to inform SWCDs and landowners of any potential or existing water quality threats.

Figures B2 (1-10) show each field that will be sampled, its soil characteristics, topography, the area that may contribute to runoff, direction of runoff, and the intended downgradient sampling area. Table B2-1 gives a short description of the historical farming practices along with the projected plans for each demonstration site. All soil sample sites with be geo-referenced to the maps shown in Figures B2 (1-10).

Figure B2-1: Demonstration site, downgradient soil sampling location, topographic features, and soil map for WC-1. Downgradient soil sampling will be from a channel that starts in the field and exits the crop circle. Topography prevents downgradient sampling areas from being influenced by adjacent portions of the circle. All runoff originates within circle.

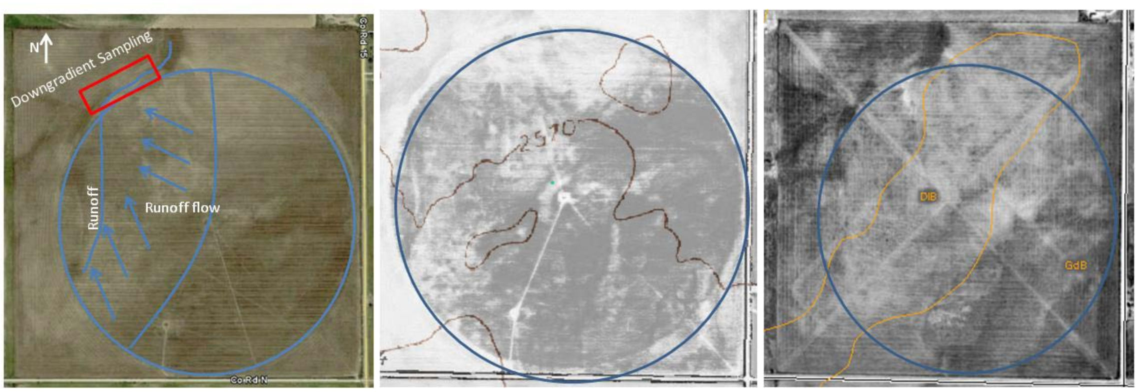


Figure B2-2: Demonstration site, downgradient soil sampling location, topographic features, and soil map for WC-2. Downgradient soil sampling will be from a channel that starts in the field and exits the crop circle. Topography prevents downgradient sampling areas from being influenced by adjacent portions of the circle. All runoff originates within circle.

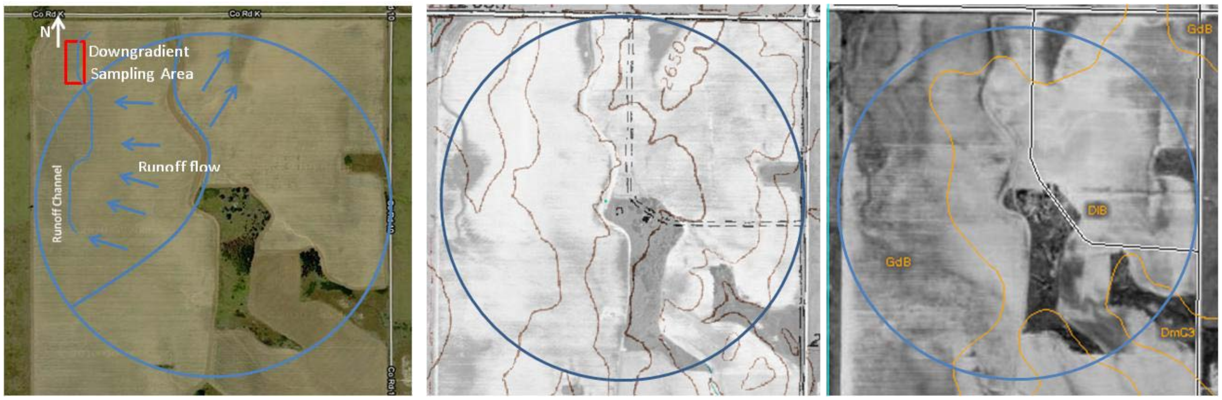


Figure B2-3: Demonstration site, downgradient soil sampling locations, topographic features, and soil map for WC-3, WC-4, and WC-5. Downgradient sampling locations are located within the same channel to evaluate the net as well as the cumulative contributions of runoff from each field to the watershed. The runoff channel originates in field 1 and flows through fields 2 and 3.

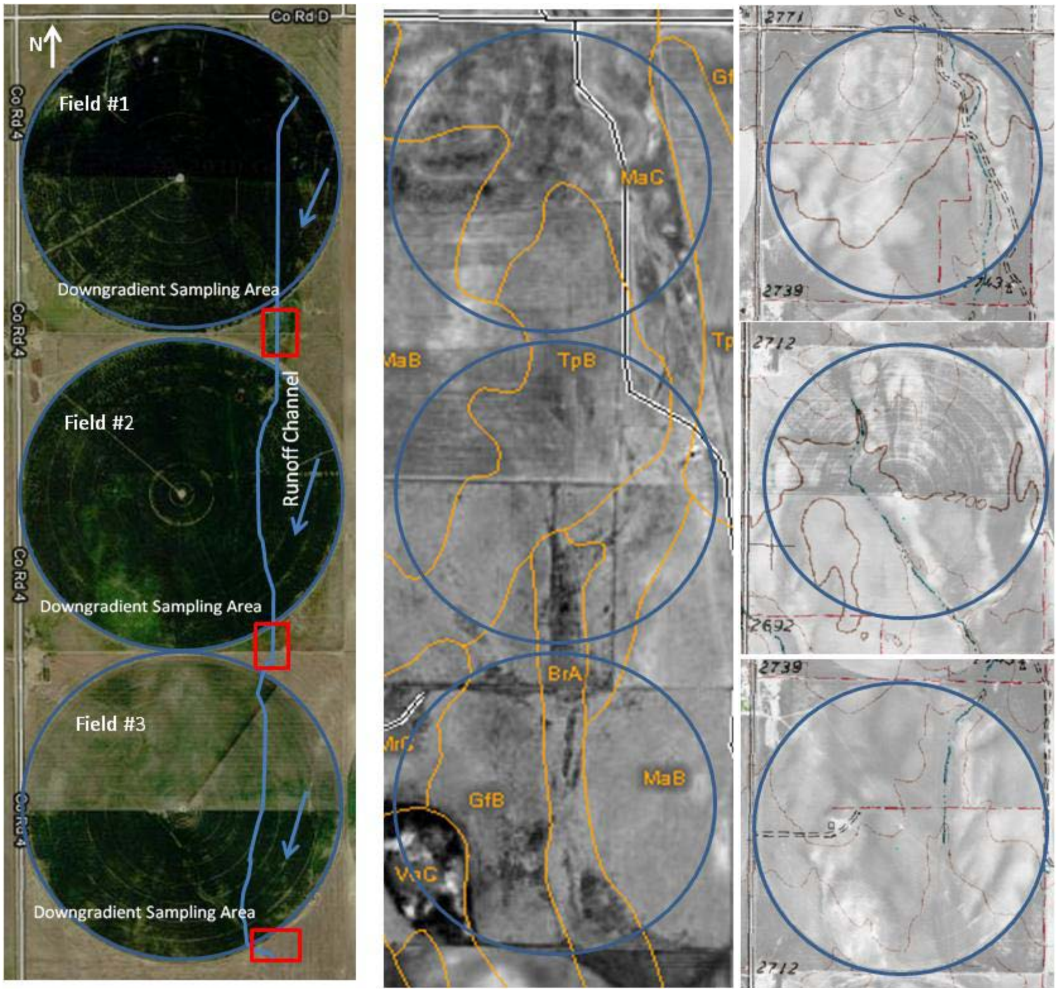


Figure B2-4: Demonstration site, downgradient/upgradient soil sampling locations, topographic features, and soil map for WC-6. Up gradient soil samples will be collected to determine background concentrations that may affect downgradient concentrations.

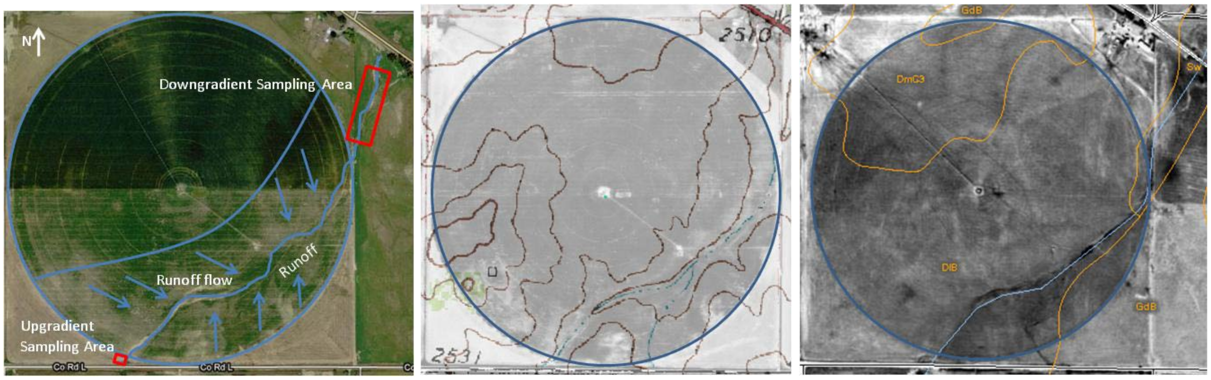


Figure B2-5: Demonstration site, downgradient soil sampling location, topographic features, and soil map for DC-1 and DC-2. Topography prevents downgradient sampling areas from being influenced by adjacent watersheds from each field.

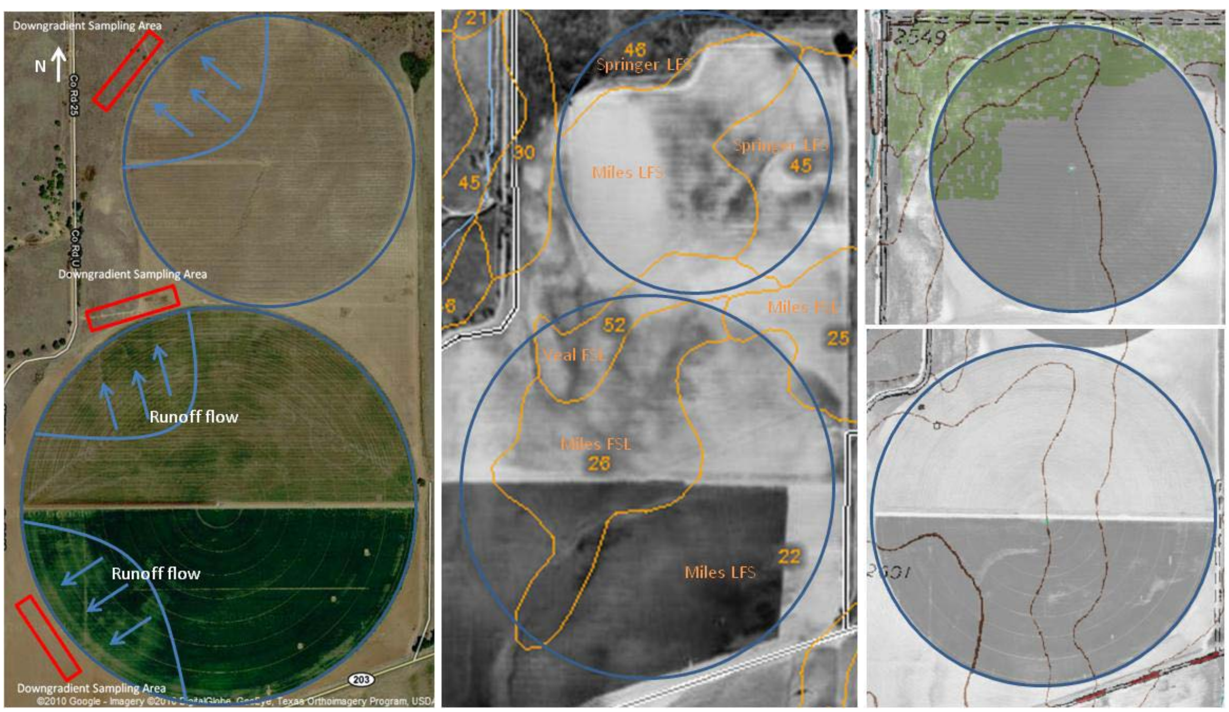


Figure B2-6: Demonstration site, downgradient soil sampling location, topographic features, and soil map for DC-3. Downgradient soil sampling will be from a channel that starts in the field and exits the crop circle. Topography prevents downgradient sampling areas from being influenced by adjacent portions of the circle. All runoff originates within circle.

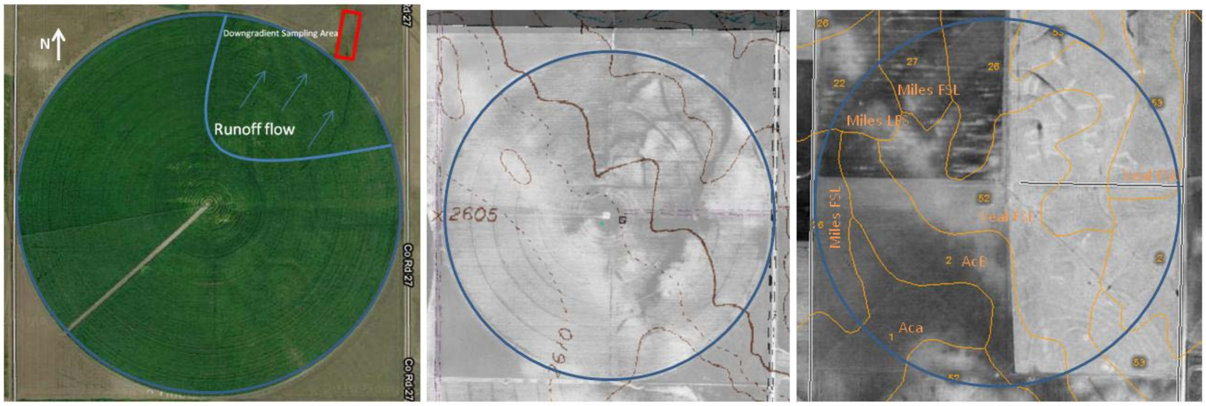


Figure B2-7: Demonstration site, downgradient soil sampling location, topographic features, and soil map for DSC-1. Downgradient soil sampling will be from a channel that starts in the field and exits the crop circle. Topography prevents downgradient sampling areas from being influenced by adjacent portions of the circle. All runoff originates within circle.

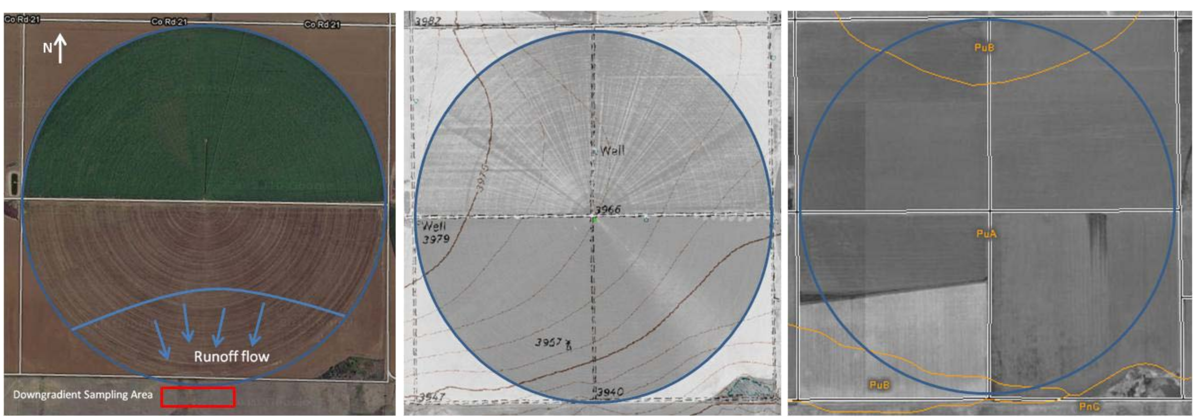


Figure B2-8: Demonstration site, downgradient soil sampling location, topographic features, and soil map for DSC-2. Downgradient soil sampling will be from a two channels that start in the field and exits the crop circle. Topography prevents downgradient sampling areas from being influenced by adjacent portions of the circle. All runoff originates within circle.

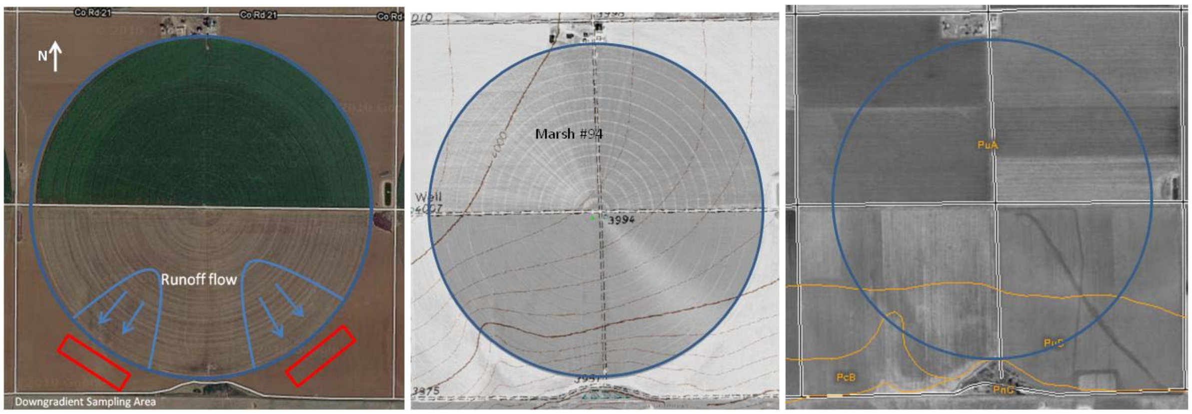


Figure B2-9: Demonstration site, downgradient soil sampling location, topographic features, and soil map for DSC-3. Downgradient soil sampling will be from a channel that starts in the field and exits the crop circle. Topography prevents downgradient sampling areas from being influenced by adjacent portions of the circle. All runoff originates within circle.

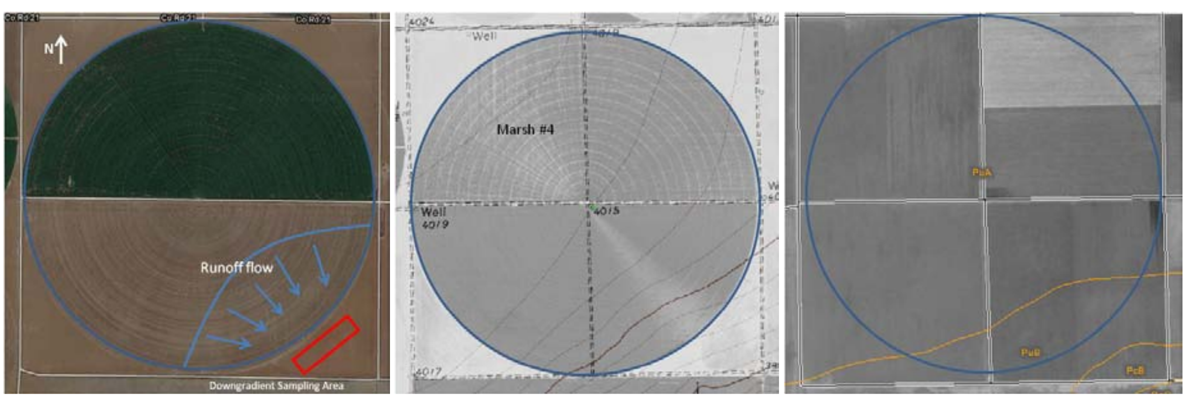


Figure B2-10: Demonstration site, downgradient soil sampling location, topographic features, and soil map for DSC-4 and DSC-5. Downgradient soil sampling in 17N will be from a channel that starts in the field and exits the crop circle. The downgradient soil sampling site for 17N is located in the circle 17S, but does not influence sampling areas in 17S due to topography. Topography prevents downgradient sampling areas from being influenced by adjacent portions of the circle in 17S. Downgradient soil sampling in 17S will be from channels that start in the field and exits the crop circle. Topography prevents downgradient sampling areas from being influenced by 17N. All runoff originates within each circle.

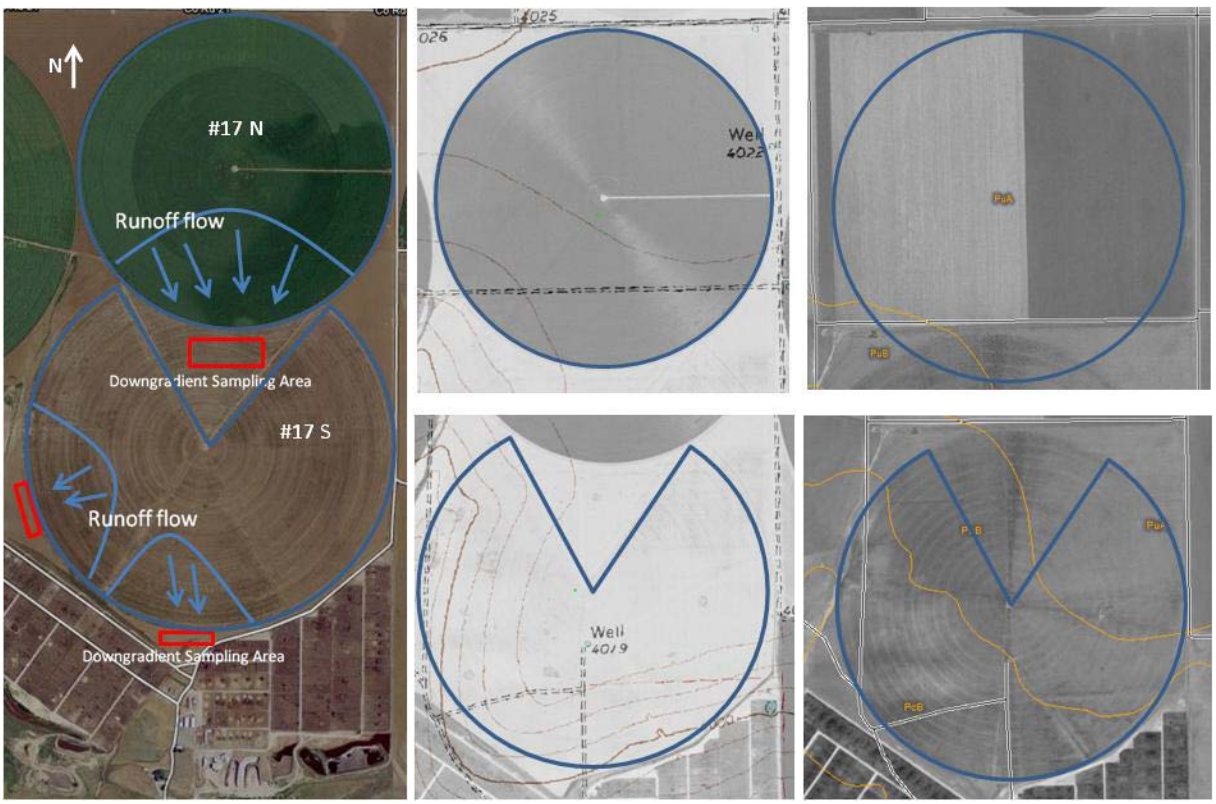
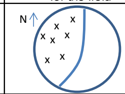
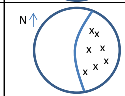
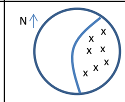
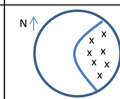
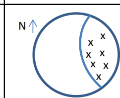
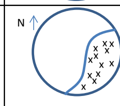
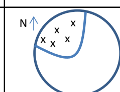
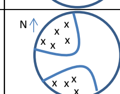
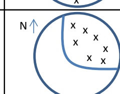
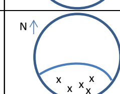
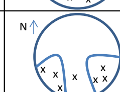
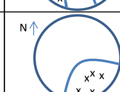
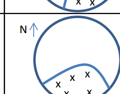
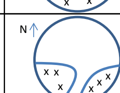
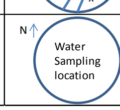


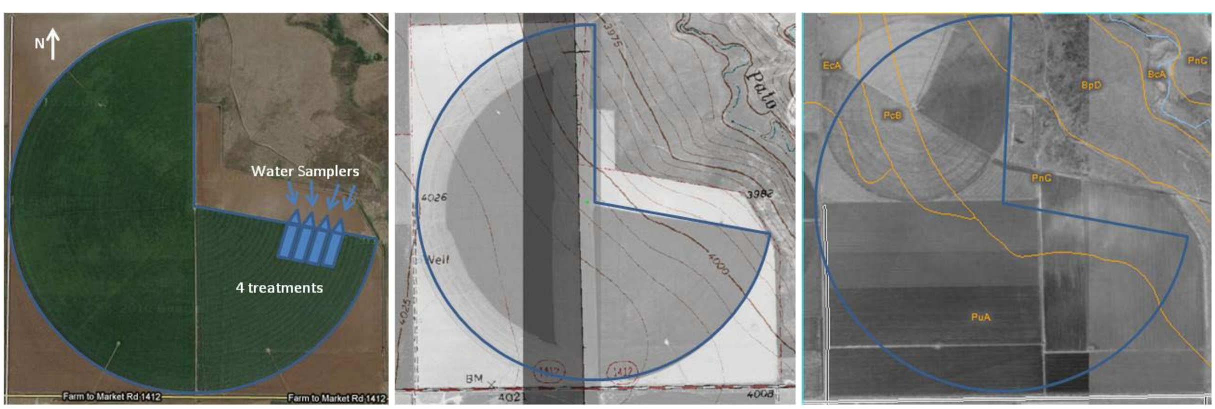
Table B2-1: Demonstration site historical and projected cropping systems.

Demo Site	Notes	Predominant Soil Series	Summer Cropping Projection	Winter Cropping Projection	Fertilizer Projection	Tillage	Soil test P (ppm)	Projected Sampling Map for the field	Watershed
WC-1	Only commercial fertilizer has been used on this pivot, no history of manure or compost	Devol - Loamy fine sand, Grandfield - Loamy fine sand	2010 Cotton, 2011 Fallow, 2012 Cotton, 2013 Cotton	Winter wheat graze out/cover crop or Triticale silage 2011-2013	Compost 2 ton/acre every fall	Minimum	< 10ppm		Sweetwater Creek
WC-2	Has received manure consistently from Wheeler County Feedyard	Devol - Loamy fine sand (LFS), Grandfield -LFS	2010, 75% cotton, 25% wheat stubble, peanuts possibly in 2012, 2013	Winter wheat graze out/cover crop or Triticale silage 2011-2013	Manure 8-17 tons every other year	Minimum	~30-50 ppm		Siver Creek
WC-3	Area was CRP until 2000, manure has been applied prior to corn for 10 years	Mansker, Mobeetie fine sand loam (FSL), Grandfield FSL and LFS	Cotton 2010,2012 Corn 2011, 2013	After corn it goes to triticale silage, after cotton it is fallow	Manure before corn 10ton/acre and comercial fert for cotton	Cotton and triticale is no till, chisel and disk after corn	20-25 ppm		Sweetwater Creek
WC-4	Area was CRP until 2000, manure has been applied prior to corn for 10 years	Mansker, Mobeetie fine sand loam (FSL), Grandfield FSL and LFS	Corn 2010, 2012 Cotton 2011, 2013	After corn it goes to triticale silage, after cotton it is fallow	Manure before corn 10ton/acre and comercial fert for cotton	Cotton and triticale is no till, chisel and disk after corn	20-25 ppm		Sweetwater Creek
WC-5	Area was CRP until 2000, manure has been applied prior to corn for 10 years	Mansker, Mobeetie fine sand loam (FSL), Grandfield FSL and LFS	Cotton (north Half), Corn (south half) 2010, 2012 Corn (north Half), Cotton (south half) 2011, 2013	After corn it goes to triticale silage, after cotton it is fallow	Manure before corn 10ton/acre and comercial fert for cotton	No till on Cotton and triticale, chisel and disk after corn	20-25 ppm		Sweetwater Creek
WC-6	Heavily manured	Devol loamy fine sand, Devol Sev. Eroded (wind)	Fallow/corn rotation 2010-2013 (1/2 field fallow, 1/2 corn each year)	Triticale for silage or grain	Manure per NMP, or commercial fert to satisfy N	No till on triticale, chisel and disk after corn	> 200ppm		Siver Creek
DC-1	Feb. 2010, 4 tons/acre of compost applied	Miles LFS, Springer LFS, Veal FSL	2010, 2011, 2012, 2013 - Peanuts	2011, 2012, 2013 - Winter Fallow	4 ton/acre compost or 10-20 manure if available	Minimum	NA		Salt Fork Creek
DC-2	North half of circle had 20 tons/acre of manure applied in 2009. South half had 4 tons/acre of compost applied in 2008	Miles FSL, Veal FSL, Miles LFS	2010, 2011, 2012, 2013 - Cotton on half circle	2011, 2012, 2013 - Winter Fallow	4 ton/acre compost or 10-20 manure if available	Minimum	NA		Salt Fork Creek
DC-3	Currently in cotton, farmed same as BW south field	Acuff loam, Veal FSL, Miles FSL	2010, 2011, 2012, 2013 - Cotton	2011, 2012, 2013 - Winter Fallow	4 ton/acre compost or 10-20 manure if available	Minimum	NA		Buck Creek
DSC-1	South half of the pivot is manure/corn/cotton fallow rotation	Pullman clay loam	South 1/2-Corn (grain or silage) in 2012, Cotton in 2013	Fallow	Manure at 28 tons/acre in 2012 on south half of the circle, supplemented with liquid nitrogen 125 lbs/acre	Minimum or stip till	NA		Palo Duro Creek
DSC-2	South half of the pivot is manure/corn/cotton fallow rotation, 3 different areas of runnof on south half of the pivot circle	Pullman clay loam, and Berda-Potter complex	South 1/2-Corn (grain or silage) in 2012, Cotton in 2013	Fallow	Manure at 28 tons/acre in 2012 on south half of the circle, supplemented with liquid nitrogen 125 lbs/acre	Minimum or stip till	NA		Palo Duro Creek
DSC-3	30 tons/applied in 2008 and 2010 on south half of the circle	Pullman clay loam, and Berda-Potter complex	Wheat hay in 2011, Corn (grain or silage) in 2013	Fallow	30 tons/acre of manure in 2010 on the south half of the circle, supplemented with liquid nitrogen 125 lbs/acre	Minimum or stip till	NA		Palo Duro Creek
DSC-4	Manure applied in 2007 at 26 tons/acre	Pullman clay loam	Sorghum silage 2012, Corn (grain or silage) in 2013	Fallow	15 tons/acre 2010, supplemented with liquid nitrogen 125 lbs/acre	Minimum or stip till	NA		Palo Duro Creek
DSC-5	30 tons of manure/acre to be applied in the fall 2010	Pep clay loam, and Berda-Potter complex	Sorghum silage 2012 and 2013	Fallow	*30 tons/acre 2010, supplemented with liquid nitrogen 125 lbs/acre	Minimum or stip till	NA		Palo Duro Creek
DSC-6	Manure applied to south east quarter of the field in 2009 at a rate of 20 tons/acre, total area = 111 acres	Plemons loam, and Pullman clay loam	Cotton in 2012, corn or cotton in 2013	Fallow	manure in 2011 and supplemented with liquid nitrogen 125 lbs/acre	Minimum or stip till	NA		Palo Duro Creek

Section B2-2: Storm event runoff water sampling

One of the primary objectives of this task is to monitor implementation of manure/compost BMPs through collection of water runoff using automatic water samplers and water well samples. The water-sampling program is designed to characterize water quality in rainfall and irrigation runoff from constructed watersheds receiving various rates of manure and compost. The experimental design will consist of 4 treatment plots on site DSC-6, shown in Figure B2-1, via automated water samplers after each rainfall event. The plots are labeled 1-4 with #1 being the easternmost plot and #4 being the westernmost plot. The treatment for plot #1 will consist of a single application of manure at a nominal rate of 20-25 tons/acre. The treatment for plot #2 will consist of 4-5 tons/acre of composted cattle manure applied annually. Commercial fertilizer will be applied annually to plot #3 by the producer at standard agronomic rates based upon whole-field, soil-test recommendations. The treatment for plot #4 will consist of 10 tons/acre of cattle manure applied annually. AgriLife Research will install automatic water samplers to collect runoff water. Water samples will be analyzed for nutrients and bacteria by the Texas AgriLife Research ESSL at Vernon. All water samples collected by the automated water samples will be handled as described in section B2. Berms will surround each plot as to isolate it from "run-on" from other adjacent sources as well as direct the flow in the specific direction of the water-sampling device. Each plot will have a separate sampling device and great efforts will be made to insure that the water sample will be as representative of the runoff as possible. This includes the isolation mentioned as well as a protective cover to prevent possible contamination or dilution. Composite samples will then be taken, labeled, filtered, preserved, and properly stored until analysis can be completed at ESSL. Safety will be the primary concern when collecting these samples. If the research technician feels that their safety is in jeopardy, they will not collect samples. In the instance that a sampling site is inaccessible, no sample will be taken and it will be documented in the field notebook. If, near the end of the study, the TSSWCB PM/QAO agrees that the sampling has not achieved good representativeness of typical conditions, the final sampling event(s) may be restricted to target a particular environmental condition (e.g., rainfall).

Figure B2-1: Demonstration site, water sampling location, topographic features, and soil map for site DSC-6.



Section B3: Sample Handling and Custody

Documentation of field sampling activities

Field sampling activities are documented on field data reporting forms as presented in Appendices B and C. Samples are collected based on SOP of TCFA as outlined above in Section B2. All sample information will be logged into a field logbook. The following will be recorded for all manure/compost samples:

- site ID
- location
- sampling time (for water samples)
- date
- sample collector's name/initials

Any additional observations may be noted in the comments section of field logbook, as needed.

For the purposes of this section and subsequent sections, all field and laboratory personnel follow the basic rules for recording information as documented below:

- Legible writing with no modifications, write-overs or cross-outs;
- Correction of errors with a single line followed by an initial and date;
- Close-outs on incomplete pages with an initialed and dated diagonal line.

Failures in sampling methods requirements and/or deviations from sample design and corrective action

Examples of failures in sampling methods and/or deviations from sample design requirements include but are not limited to such things as sample container problems, sample site considerations, etc. Failures or deviations from the QAPP are documented on the field data reporting form and reported to TCFA, and project contractors with Texas AgriLife Extension Service, and Texas AgriLife Research, who will determine if the deviation from the QAPP compromises the validity of the resulting data. This information will then be shared with the TSSWCB QAO, who will decide to accept or reject data associated with the sampling event, based on best professional judgment. The resolution of the situation will be reported to the TSSWCB in the QPR.

Sample handling and custody requirements

- **Chain-of-custody**

  Proper sample handling and custody procedures ensure the custody and integrity of samples beginning at the time of sampling and continuing through transport, sample receipt, preparation, and analysis. The COC form is used to document sample handling during transfer from the field to the laboratory and inter-laboratory. The sample number, location, date, changes in possession and other pertinent data will be recorded in indelible ink on the COC. The COC will also contain the start and end times for each of the composited water samples collected by the automated water samplers. The sample collector will sign the COC and transport it with the sample to the laboratory. At the laboratory, samples are inventoried against the accompanying COC. Any discrepancies will be noted at that time and the COC will be signed for acceptance of custody. Sample numbers will then be recorded into a laboratory sample log, where the laboratory staff member who receives the sample will sign it. A copy of a blank COC form used on this project is included as Appendix D.

❖ **Failures in chain-of-custody and corrective action**

All failures associated with COC procedures are to be immediately reported to the TSSWCB PM. Failures include such items as delays in transfer, resulting in holding time violations; violations of sample preservation requirements; incomplete documentation, including signatures; possible tampering of samples; broken or spilled samples, etc. The Project Leader and the TSSWCB PM/QAO will determine if the procedural violation may have compromised the validity of the resulting data. Any failure that potentially compromises data validity will invalidate data, and the sampling event should be repeated. The resolution of the situation will be reported to the TSSWCB in the QPR. The CARs will be maintained by the TSSWCB PM.

❖ **Sample labeling**

Samples will be labeled on the container with an indelible, waterproof marker. Label information will include site identification, date, sampler's initials, and time of sampling. The COC form will accompany all sets of sample containers.

These unique identifiers on the sample container can be matched with data on COC forms that are submitted to the laboratory, generally, the same day as samples are collected. A unique identifier is added to each bottle received by the laboratory and tracks each bottle from collection thru disposal. Each sample is assigned a unique sample number when it is received by the laboratory. The preservation is indicated adding the letter A, B, C, D, E, F, G, or H after the lab number on the bottle. (A=Unpreserved, B=Nitric Preserved, C=Sulfuric Preserved, D=Hydrochloric Preserved, E=Sterile, F=Filtration/Nitric Preserved, G=Zinc Acetate/Sodium Hydroxide Preserved, H = Other preservative.). The preservation number is followed by a bottle number. The second bottle with the same preservative has a "2" after the preservation letter. The letter and number are included in the raw data record for each analysis. Digests and other prepared samples are clearly marked on the bottle with the lab number, method number (i.e. 3050) and date.

After sample collection and transportation to the facility, the laboratory verifies the integrity of the sample by checking the following items:

- Leakage or breakage.
- Completeness of sample collection forms.
- Correct sample identification.

- Appropriate use of sample labels (such as water resistant) and use of indelible ink.
- Use of appropriate sample containers, adequate volume, preservation, and holding.
- Temperature of samples requiring thermal preservation is checked and recorded.
- Chemical preservation is checked prior to or during sample preparation or analysis. Results are recorded on the Sample Receipt Form (Attachment G).

When the sample received does not meet the sample acceptance requirements, the condition of the sample is documented on the Chain-of-Custody form. The laboratory, after consultation with the client, makes a determination whether another sample will be collected or the sample will be analyzed. Any conversations or correspondence with the client is documented.

Samples analyzed by the laboratory not meeting the sample acceptance requirements are qualified on the final report.

After samples are checked for integrity and all submitted documentation is checked for completeness, the samples are logged in the LIMS.

- **Sample handling**

Following collection, samples will be transported following the guidelines in Table B2 (1-4) for transport to the laboratory. At the laboratory, samples will be handled according to the laboratory QAP. The field personnel and laboratory supervisor have the responsibility to ensure that holding times are met with soil, manure and compost samples. The holding time is documented on the COC. Any problem will be documented with a CAR.

After samples are received at the laboratory, they are inventoried against the accompanying COC. Any discrepancies are noted at that time, remediated if possible, and the COC is signed for acceptance of custody. Sample numbers are then assigned and samples are checked for preservation (as allowed by the specific analytical procedure). Any problems will be documented with a CAR.

Table B3-1: Soil sample handling protocols

Soil Parameters	Container	Preservation	Temperature	Holding Time
pH	Sample Bag	Air Drying/Dehumidification	40°C	NA
Electrical Conductivity	Sample Bag	Air Drying/Dehumidification	40°C	NA
Nitrate-Nitrogen	Sample Bag	Air Drying/Dehumidification	40°C	NA
Phosphorus (ICP)	Sample Bag	Air Drying/Dehumidification	40°C	NA
Potassium	Sample Bag	Air Drying/Dehumidification	40°C	NA
Calcium	Sample Bag	Air Drying/Dehumidification	40°C	NA
Magnesium	Sample Bag	Air Drying/Dehumidification	40°C	NA
Sodium	Sample Bag	Air Drying/Dehumidification	40°C	NA
Sulfur	Sample Bag	Air Drying/Dehumidification	40°C	NA
Boron	Sample Bag	Air Drying/Dehumidification	40°C	NA
Aluminum	Sample Bag	Air Drying/Dehumidification	40°C	NA
Copper	Sample Bag	Air Drying/Dehumidification	40°C	NA
Iron	Sample Bag	Air Drying/Dehumidification	40°C	NA
Manganese	Sample Bag	Air Drying/Dehumidification	40°C	NA
Zinc	Sample Bag	Air Drying/Dehumidification	40°C	NA

°C = degrees centigrade

NA = not applicable, indefinite holding time after air drying

Table B3-2: Storm event runoff sample handling protocols

Parameter	Medium	Container	Volume	Preservative	Holding Time
TKN and TP	Water	Sterile polyethylene container with lid	125 ml	H2SO4, pH<2, Refrigerate (4°C)	28 days
Soluble Reactive Phosphorus (SRP), NH3-N, NO3-N	Water	Sterile polyethylene container with lid	40 ml	Sub-sample and filter immediately (.45 micron filter) and refrigerate; H_2SO_4, pH<2	28 days for no3-N and NH3-N; 48 hrs for SRP
E. coli	Water	Sterile plastic bag or container	125 ml	Refrigerate after collection (<10°C)	24 hours

Table B3-3: Ground water sample handling protocols

Parameter	Medium	Container	Volume	Preservative	Holding Time
NO3-N	Water	Sterile polyethylene container with lid	40 ml	H2SO4, pH<2, Refrigerate (4°C)	28 days
Soluble Reactive Phosphorus	Water	Sterile polyethylene container with lid	40 ml	Sub-sample and filter immediately (.45 micron filter) and refrigerate	48 hrs
E. coli	Water	Sterile Plastic bag or container	125 ml	Refrigerate after collection (<10°C)	24 hours

Table B3-4: Manure sample handling protocols

Parameter	Medium	Container	Volume	Preservative	Holding Time
Total Nitrogen	Manure/Compost	Sterile plastic bag	1L	none	180 days
Carbon	Manure/Compost	Sterile plastic bag	1L	none	180 days
Total minerals	Manure/Compost	Sterile plastic bag	1L	none	180 days

Section B4: Analytical Methods

Analytical methods requirements for soil and manure samples

The analytical methods, associated matrices, and performing laboratories are listed in Table A7.1 of Section A7. Copies of laboratory SOPs are available for review by the TSSWCB. Laboratory SOPs are consistent with EPA requirements as specified in the method.

In the event of a failure in the analytical system the PM will be notified. The Laboratory Director, QAO, and PM will then determine if the existing sample integrity is intact, if re-sampling should and/or can be done, or if the data should be omitted.

The baseline Mehlich III soil sample size will be a 2 gram sample and 20 mL of Mehlich III extracting solution. All samples will be scooped using a NCR-13 standard soil scoop 2 grams. The QA Officer is responsible for verifying that all measuring protocols are followed prior to conducting any chemical extraction procedures.

In the event of a failure in the analytical system, the PM will be notified. The Laboratory Manager, QAO, and PM will then determine if the existing sample integrity is intact, if re-sampling can and should be done, or if data should be omitted.

Analytical methods requirements for water samples

Filtered water samples will be analyzed for NO_3, NH_3, and SRP using an auto-analyzer similar to EPA methods 353.2, 350.1, and 365.1, respectively. Unfiltered water samples will be digested based upon EPA method 351.2. Copper sulfate will be used in place of mercuric oxide. Digested samples will be analyzed for TKN and TP based upon methods listed in Table B2-5.

E. coli in water samples will be isolated and enumerated by laboratory personnel using modified mTEC agar, USEPA Method 1603 [USEPA/821/R-02/023 September 2002. *E. coli* in Water by Membrane Filtration Using Modified Membrane-Thermotolerant *E. coli* (modified m-TEC) Agar]. The modified mTEC method is a single-step method that uses one medium and does not require testing using any other substrate. The modified medium contains a chromogen, 5-bromo-6-chloro-3-indolyl-ß-D-glucuronide, which is catabolized to glucuronic acid and a red- or magenta-colored compound by *E. coli* that produce the enzyme ß-D-glucuronidase. This enzyme is the same enzyme tested for using the MUG substrate and UV fluorescence in other *E. coli* assays. All laboratory sampling areas and equipment will be sterilized with at least one or in any combination of the following methods--ethyl alcohol, bleach, UV light, or autoclave. All disposables will be placed in a heat-resistant biohazard bag and autoclaved prior to disposal.

Table B4-1: Laboratory analytical methods for water samples

Laboratory Parameter	Method	Equipment Used
Nitrate	USEPA 353.2	Skalar SAN Analyzer
Ammonia	USEPA 350.1	Skalar SAN Analyzer
TKN	USEPA 350.1	Skalar SAN Analyzer
Total P	USEPA 365.1	Skalar SAN Analyzer
SRP	USEPA 365.1	Skalar SAN Analyzer
Escherichia coli	USEPA 1603	Filtration apparatus, incubator

Section B5: Quality Control

Sampling QC Requirements and Acceptability Criteria

Table A7-1 lists the required accuracy, precision, and completeness limits for the parameters of interest. It is the responsibility of the Texas AgriLife Extension and Research leads at Amarillo and Vernon, to verify that the data are representative. All incidents requiring corrective action will be documented through use of CARs. Laboratory audits, sampling site audits, and QA of field sampling methods will be conducted by the TSSWCB QAO and TSSWCB PM.

Field Split – A field split is a single sample subdivided by field staff immediately following collection and submitted to the laboratory as two separately identified samples according to procedures specified in the *TCEQ SWQM Procedures, Volume 1.* Split samples are preserved, handled, shopped, and analyzed identically and are used to assess variability in all of these processes. Field splits apply to conventional samples only. Accordingly, for samples collected in this project, at least annually, one field split for soil, and manure/compost will be submitted from each of the three county cooperator locations.

Laboratory Measurement QC Requirements and Acceptability Criteria

Method Specific QC requirements – QC samples, other than those specified later in this section, are run (e.g., sample duplicates, positive control, negative control, and media blank) as specified in the methods. The requirements for these samples, their acceptance criteria or instructions for establishing criteria, and corrective actions are method-specific.

Detailed laboratory QC requirements and corrective action procedures are contained within the individual laboratory QAMs. Measurement performance specifications are used to determine the acceptability of duplicate analyses, as specified in Table A7-1.

Laboratory Duplicates – A laboratory duplicate is prepared by taking aliquots of a sample form the same container under laboratory conditions and processed and analyzed independently.

Laboratory Blanks – Laboratory blanks, or negative controls, consist of 100-mL aliquots of sterile distilled water that are processed in the same manner as a field sample, at the beginning and the end of the sample set for each sampling event. The analysis of laboratory blanks should yield a value of no detection.

Laboratory Duplicate – Laboratory duplicates are used to assess precision. A laboratory duplicate is prepared by splitting aliquots of a single sample (or a matrix spike or a laboratory control standard) in the laboratory. Both samples are carried through the entire preparation and analytical process. Laboratory duplicates are run at a rate of one per batch. Precision is calculated by the RPD of duplicate results as defined by 100 times the difference (range) of each duplicate set, divided by the average value (mean) of the set. For duplicate results, X_1 and X_2, the RPD is calculated from the following equation:

$$RPD = \{(X_1-X_2)/[(X_1+X_2)/2)]\}*100$$

A 20% RPD criteria will be used to screen field split results as a possible indicator of excessive variability in the sample handling and analytical system. If it is determined that elevated quantities of analyte were measured and analytical variability can be eliminated as a factor, then variability in field split results will primarily be used as a trigger for discussion with field staff to ensure samples are being handled in the field correctly. Some individual sample results may be invalidated based on the examination of all extenuating information. The information derived from field splits is generally considered to be event specific and would not normally be used to determine the validity of an entire batch; however, some batches of samples may be invalidated depending on the situation. Professional judgment during data validation will be relied upon to interpret the results and take appropriate action. The qualification (i.e., invalidation) of data will be documented on the Data Summary. Deficiencies will be addressed as specified in this section under Deficiencies, Non conformances, and Correction Action released to QC.

Limit of quantitation (LOQ)

The laboratory will analyze a calibration standard (if applicable) at the LOQ on each day project samples are analyzed. Calibrations including the standard at the LOQ will meet the calibration requirements of the analytical method or corrective action will be implemented.

Matrix Spikes

No spiked sample analyses will be performed in the course of this project due to the varied adsorptive capacities of different soil types in relation to the majority of elements being evaluated. Adding elements to soils would always yield varying returns due to the chemical properties of the soils. The spiking of P or other elements risks precipitation of those parameters. Matrix blanks, and known standards not used in the calibration of the instrument, will be employed in place of spiked samples to insure accurate and proper recovery of P and other non-critical elements. All standards, whether a calibration standard, continuing verification standard or non-calibration standard used for additional instrument performance monitoring will be in the Mehlich 3 matrix. All standards with added concentrations of elements or compounds to be analyzed will be comprised of purchased NIST solutions whenever possible and practical. These matrix blanks and/or standards will be included in each batch of samples analyzed. Recovery of P in the non-calibration standards must be within 10% of known value.

Failures in QC and Corrective Action

Notations of blank contamination will be noted in QPRs and the final report. Corrective action will involve identification of the possible cause (where possible) of the contamination failure. Any failure that has potential to compromise data validity will invalidate data and the sampling event should be repeated. The resolution of the situation will be reported to the TSSWCB in the QPR. The CARs will be maintained by the Project Leader and the TSSWCB PM.

Method specific QC requirements

QC samples, other than those specified later in this section, are run as specified in the methods listed in Table B5-1 (e.g., sample duplicates, surrogates, internal standards, continuing calibration samples, interference check samples, positive control, negative control, and media blank). The requirements for these samples, their acceptance criteria or instructions for establishing criteria, and corrective actions are method-specific.

Detailed laboratory QC requirements and corrective action procedures are contained within the individual laboratory quality assurance manuals (QAMs). The minimum requirements that all participants abide by are stated below.

The use of accepted sampling and analytical methods will ensure that measured data accurately represent field conditions. Tables A7-1 and A7-2 list the reproducibility limits for the parameters of interest. The completeness of the data will be affected by the reliability of the equipment, frequency of field and laboratory errors or accidents, and unexpected events; however, the general goal requires 90 percent data completion.

In the database, missing values will be left as blanks. The AgriLife Amarillo project leader will graphically screen data to highlight questionable data points. Questionable data will be traced through the COC forms, CARs, and, as necessary, through research laboratory benchsheets and field data sheets to ensure that data are properly entered. Changes will be made only if an error is found in transcription into database. Values determined to be below the laboratory method detection limit will be noted as such in the comment column of the database and used in statistical analyses as one-half the method detection limit (MDL), as recommended by Gilliom and Helsel (1968) and Ward et al. (1988). Values that are greater than the upper method detection limit will be diluted and reanalyzed.

It is the responsibility of the AgriLife Amarillo project leader to verify that the data are representative. The chemistry data's precision, accuracy, and comparability generated in the Servi-Tech Laboratory will be the responsibility of the laboratory manager. The PM has the responsibility of determining that the 90 percent completeness criteria is met, or will justify acceptance of a lesser percentage. All incidents at Extension requiring corrective action will be documented through use of CARs (Appendix A). Data collected that does not meet the QC requirements outlined will be identified by the AgriLife Amarillo project leader as out of compliance and be rejected from entry into the project databases. The project leader will meet with the laboratory manager and Texas AgriLife Extension Service PM to discuss the deficiencies and outline a resolution to prevent future non-compliance to the QAPP. The problem and resolution will be documented with a CAR

Table B5-1: Required QC analyses

Soil Parameters	Blank	Standard	Duplicate
pH	NA	A	B
Electrical Conductivity	NA	A	B
Nitrate-Nitrogen	A	A	B
Phosphorus	A	A	B
Potassium	A	A	B
Calcium	A	A	B
Magnesium	A	A	B
Sodium	A	A	B
Sulfate-Sulfur	A	A	B
Boron	A	A	B
Aluminum	A	A	B
Copper	A	A	B
Iron	A	A	B
Manganese	A	A	B
Zinc	A	A	B

A - Where specified, blanks and standards shall be performed each day that samples are analyzed.

B - Where specified, duplicate analyses of the laboratory soil check sample extract shall be performed every 30 samples each day that samples are analyzed.

NA indicates not applicable

Section B6: Instrument/Equipment Testing, Inspection, and Maintenance

To minimize downtime of all measurement systems, spare parts for field and laboratory equipment will be kept in the laboratory, and all field measurement and sampling equipment, in addition to all laboratory equipment, must be maintained in a working condition. All calibration procedures will meet the requirements specified in the USEPA-approved methods of analysis. The frequency of calibration as well as specific instructions applicable to the analytical methods recommended by the equipment manufacturer will be followed. All information concerning calibration will be recorded in a calibration logbook by the person performing the calibration and will be accessible for verification during either a laboratory or field audit. All instruments or devices used in obtaining environmental data will be used according to appropriate laboratory or field practices. Written copies of SOPs are available for review upon request. Standards used for instrument or method calibrations shall be of known purity and be NIST traceable whenever possible. When NIST traceability is not available, standards shall be of American Chemical Society or reagent grade quality, or of the best attainable grade. All certified standards will be maintained traceable with certificates on file in the laboratory. Dilutions from all standards will be recorded in the standards log book and given unique identification numbers. The date, analyst initials, stock sources with lot number and manufacturer, and how dilutions were prepared will also be recorded in the standards log book. Failures in any testing, inspections, or calibration of equipment will result in a CAR and resolution of the situation will be reported to the TSSWCB in the QPR. CARs will be maintained by the Project Leader and the TSSWCB PM.

Section B7: Instrument/Equipment Calibration and Frequency

All instruments or devices used in obtaining data will be used according to appropriate laboratory or field practices. Standards and purchased solutions used for instrument or method calibrations shall be of known purity and be National Institute for Standards and Testing (NIST) traceable whenever possible. When NIST traceability is not available, standards shall be of American Chemical Society (ACS) or reagent grade quality, or of the best attainable grade. All certified standards will be maintained traceable with certificates on file in the laboratory. Dilutions from all primary standards will be recorded in the standards log book and given unique identification numbers. The date, analyst initials, stock standards sources with lot number and manufacturer, and the dilution concentrations/ratios will also be recorded in the standards log book and be identified by a unique standards number which will also be placed on the standards bottle.

All instruments or devices used in obtaining data will be calibrated prior to use. Each instrument has a specialized procedure for calibration and a specific type of standard used to verify calibration. All calibration procedures will meet the requirements that are specified by the equipment manufacturer, as well as any instructions specified by applicable analytical methods. All information concerning required data calibration will be recorded in the project laboratory book by the person performing the calibration and will be accessible for verification during either a laboratory or field audit.

All calibration procedures used in the field or laboratory will meet or exceed the calibration frequencies published in the test methods used for this project. Additional calibration procedures may be conducted if laboratory personnel determine additional calibration is warranted as beneficial to this project. Instruments and laboratory equipment used in the analyses of these that require calibration prior to use will be calibrated before each day’s analyses.

Calibration requirements for automated monitoring equipment are outlined in the following SOPs, which are available upon request for review:

- TIAER SOP-F-112 Programming Automated Samplers
- TIAER SOP-F-114 Downloading Automated Sampling Sites

Calibration requirements for other field equipment are contained in the TCEQ SWQM Procedures. Post-calibration error limits will be adhered to. Data not meeting post-error limit requirements invalidates associated data collected subsequent to the pre-calibration and will not be used for evaluation of project objectives.

Detailed laboratory calibrations are contained within the laboratory SOPs. The laboratory SOPs identify all tools, gauges, instruments, and other sampling, measuring, and test equipment used for data collection activities affecting quality that must be controlled and, at specified periods, calibrated to maintain bias within specified limits. Calibration records are maintained, are traceable to the instrument, and are available for inspection by the TSSWCB. Equipment requiring periodic calibrations include, but are not limited to, thermometers, pH meters, balances, incubators, and analytical instruments.

Section B8: Inspection/Acceptance for Supplies and Consumables

All standards, reagents, media, plates, filters, and other consumable supplies are purchased from manufacturers with performance guarantees, and are inspected upon receipt for damage, missing parts, expiration date, and storage and handling requirements. Labels on reagents, chemicals, and standards are examined to ensure they are of appropriate quality, initialed by staff member and marked with receipt date. Volumetric glassware is inspected to ensure class "A" classification, where required. Media will be checked as described in QC procedures. All supplies will be stored as per manufacturer labeling and discarded past expiration date. In general, supplies for microbiological analysis are received pre-sterilized, used as received, and not reused.

Section B9: Non-Direct Measurements

Data that may be used from this project include global positioning points and their associated land use/land cover. The data collected has been collected and analyzed using similar assessment objectives, sampling techniques, laboratory protocols and data validation procedures.

Section B10: Data Management

Field collection and management of routine samples

Field staff will visit sampling sites on a yearly basis to collect soil and manure/compost samples, if available. Site identification, date, personnel, type of manure (raw or composted), and any comment concerning conditions at the site are noted on a field data sheet. One field data sheet is filled out in the field for each site visited. An example of a field data sheet is shown in Appendix C. If no manure/compost application is planned for the coming year, samples will not be collected but information about the site visit will be recorded on the field data sheet and the site noted as no manure/compost on site. Information on the dates that sites were visited will be recorded into a separate Microsoft Excel workbook. All COC and field observations data will be manually entered into an electronic database. The electronic database will be created in Microsoft Excel software. The project database will be maintained on the computer's hard drive, which is also simultaneously saved in an external network folder. All pertinent data files will be backed up at least monthly on an external hard drive and stored in a fire proof location. Original data recorded on paper files will be stored for at least five years in a locked, restricted access, fire-resistant storage area. Electronic data files will be archived to CD-ROM after approximately one year, and then maintained in the above storage area.

Field sample data

All field samples will be logged upon receipt; COC forms (if applicable) will be checked for number of samples, proper and exact I.D. number, signatures, dates, and type of analysis specified. The TSSWCB will be notified if any discrepancy is found and laboratory analysis will not occur until proper corrections are made. At least 10% of all data manually entered in the database will be reviewed for accuracy by the Project Leaders to ensure that there are no transcription errors. Hard copies of data will be printed and housed in the AgriLife Amarillo Extension Center for a period of five years.

Sample delivery to other laboratories

The Technician ensures that these samples are handled according to procedures laid out in this QAPP and that COC forms are correctly filled out for sample delivery.

Data reporting

Data transmission between labs will occur electronically. In the event that data files are too large to send via Email, a copy of the data set is copied to a CD-RW disc or flash drive and mailed to the appropriate party. Data are recorded in Microsoft Excel format and submitted to the respective entity. TCFA maintains the project database and follows the guidelines listed above in protecting the data from corruption or loss. Data will be reported according to the standards of the TSSWCB.

Data dissemination

At the conclusion of the project, the Project Leaders will provide a copy of the complete project electronic database via recordable CD-ROM media to the TSSWCB PM. The TSSWCB may elect to take possession of all project records. However, summaries of the data will be presented in the final project report.

Section C1: Assessments and Response Actions

Corrective Action

The AgriLife Amarillo Project Leader is responsible for implementing and tracking corrective action procedures as a result of audit findings. Records of audit findings and corrective actions are maintained by the TSSWCB QAO and the AgriLife Amarillo Project Leader. If audit findings and corrective actions cannot be resolved, then the authority and responsibility for terminating work is specified in the TSSWCB QMP and in agreements or contracts between participating organizations.

Section C2: Reports to Management

QPRs will be generated by AgriLife Amarillo and will note activities conducted in connection with the water quality monitoring program, items or areas identified as potential problems, and any variation or supplement to the QAPP. CARs will be utilized when necessary (Appendix A) and will be maintained in an accessible location for reference at AgriLife Amarillo. CARs that result in changes or variations from the QAPP will be made known to pertinent project personnel, documented in an update or amendment to the QAPP and distributed to personnel listed in Section A3.

Section D1: Data Review, Verification, and Validation

All data obtained from field and laboratory measurements will be reviewed and verified for integrity, continuity, reasonableness, and conformance to project requirements, and then validated against the DQOs outlined in Section A7. Only those data that are supported by appropriate QC data and meet the DQOs defined for this project will be considered acceptable for use.

The procedures for verification and validation of data are described in Section D2, below. AgriLife Vernon, AgriLife Amarillo and TCFA are responsible for ensuring that field and laboratory data collected are properly reviewed, verified, and submitted in the required format for the project database. AgriLife Amarillo is responsible for validating that all data collected meet the DQOs of the project are suitable for submission to TSSWCB.

Section D2: Verification and Validation Methods

All data will be verified to ensure they are representative of the samples analyzed and locations where measurements were made, and that the data and associated QC data conform to project specifications. The Project Leader is responsible for the integrity, validation, and verification of the data each field and laboratory task generates or handles throughout each process. The field and laboratory QA tasks ensure the verification of field data, electronically generated data, and data on COC forms and hard copy output from instruments.

Verification, validation, and integrity review of data will be performed using self-assessments and peer review, as appropriate to the project task, followed by technical review by the manager of the task. The data to be verified are evaluated against project specifications (Section A7 and Section B5) and are checked to ensure the verification of raw data for errors, especially errors in transcription, calculations, and data input. Potential outliers are identified by examination for unreasonable data, or identified using computer-based statistical software such as SAS. If a question arises or an error or potential outlier is identified, the manager of the task responsible for generating the data is contacted to resolve the issue. Issues that can be corrected are corrected and documented electronically or by initialing and dating the associated paperwork. If an issue cannot be corrected, the task manager consults with the TSSWCB QAO to establish the appropriate course of action, or the data associated with the issue are rejected.

The AgriLife Amarillo Project Leader and TCFA are responsible for validating that the verified data are scientifically sound, defensible, of known precision, accuracy, integrity, meet the DQOs of the project, and are reportable to the TSSWCB.

Section D3: Reconciliation with User Requirements

Data produced by this project will be evaluated against the established DQOs and user requirements to determine if any reconciliation is needed. Reconciliation concerning the quality, quantity or usability of the data will be reconciled with the user during the data acceptance process. CARs will be initiated in cases where invalid or incorrect data have been detected. Data that have been reviewed, verified, and validated will be summarized for their ability to meet the DQOs of the project and the informational needs of water quality agency decision-makers and watershed stakeholders. As described in the EPA-approved workplan, the scope of this QAPP is restricted to the laboratory analysis and field sampling activities only (Task 9 of the workplan).

Most sample fields will require some type of modification to allow concentration and quantitative measurement of runoff volumes. Storm flow surface runoff from each study field will be diverted through a flume or weir where samples will be automatically collected and water flows will be measured. Runoff data from this site will be used to determine event mean concentration associated with each BMP. The data will be used measure the effectiveness of each BMP. The edge-of-field BMP effectiveness data collected through this project is not appropriate for use in CWA §§305(b) and 303(d) assessment purposes and therefore will not be reported by TSSWCB or any project collaborator to TCEQ for CWA assessment purposes.

The final data for the project will be reviewed to ensure that it meets the requirements as described in this QAPP. Data summaries along with descriptions of any limitations on data use will be included in the technical and final reports. Data and information produced thru this project will be used to develop the technical reports. Ultimately, stakeholders will use the information produced by this project for the development of comprehensive BMPs that outline management measures needed to address water quality concerns in the Texas High Plains.

Appendix A: Corrective action report

Corrective Action Report
CAR #:_______________

Date: ______________________ Area/Location: _______________________

Reported by: ______________________ Activity: ______________________________

State the nature of the problem, nonconformance, or out-of-control situation:

____
____
____
____
____

Possible causes:

____
____
____

Recommended corrective action:

____
____
____

CAR routed to: ___________________________________
Received by: _____________________________________

Corrective Actions taken:

____
____
____
____

Has problem been corrected?: YES NO

Immediate Supervisor: __________________________________

Project Leader: _____________________________________

Quality Assurance Officer: ______________________________

Appendix B: Field data sheet for soil sampling

Servi-Tech Laboratories

SOIL SAMPLE INFORMATION SHEET

1602 Park West Drive • P.O. Box 169 • Hastings, NE 68902
1816 East Wyatt Earp Blvd. • P.O. Box 1397 • Dodge City, KS 67801
6921 S. Bell • Amarillo, TX 79109
800-557-7509

Name Ben Weinheimer, TCFA

Address 5501 I-40 West

City/St/Zip Amarillo, TX 79106

Date sampled ____________

Date sent ____________

Fax/email results ☐ ____________

Lab Use Only	Producer / Field I.D.	Sample I.D.	Depth	Test	Crop	YG
	1.		to			
	2.		to			
	3.		to			
	4.		to			
	5.		to			
	6.		to			
	7.		to			
	8.		to			
	9.		to			
	10.		to			
	11.		to			
	12.		to			
	13.		to			
	14.		to			
	15.		to			
	16.		to			
	17.		to			
	18.		to			
	19.		to			
	20.		to			
	21.		to			
	22.		to			
	23.		to			
	24.		to			
	25.		to			
	26.		to			
	27.		to			
	28.		to			
	29.		to			
	30.		to			

Comments

Appendix C: Field data sheet for manure and compost sampling

Please do not fill sample containers completely full

Servi-Tech Laboratories

1602 Park West Drive
Hastings, NE 68902

1816 East Wyatt Earp
Dodge City, KS 67801

6921 S. Bell
Amarillo, TX 79109

800-557-7509

Results To:______________________________

Bill To:______________________________

Sample ID:______________________________

Date Sampled:______________________________

Comments: ______________________________

Compost/Manure Sample

Please do not send liquid in glass containers

Package Tests

NPK Analysis....................................☐

Nitrogen:	Potassium
Total	Moisture
Organic	Solids
Urea & ammonium	Organic matter
Nitrate– nitrogen	Ash
Phosphorus	Carbon:nitrogen ratio

Total Nutrient Analysis...............................☐

Nitrogen:	Zinc
Total	Iron
Organic	Manganese
Urea & ammonium	Copper
Nitrate– nitrogen	Boron
Phosphorus	Moisture
Calcium	Solids
Magnesium	Organic matter
Sulfur	Carbon:nitrogen ratio
Sodium	

Interpretations: Pounds of nutrient available first year

Please do not fill sample containers completely full

Servi-Tech Laboratories

1602 Park West Drive
Hastings, NE 68902

1816 East Wyatt Earp
Dodge City, KS 67801

6921 S. Bell
Amarillo, TX 79109

800-557-7509

Results To:______________________________

Bill To:______________________________

Sample ID:______________________________

Date Sampled:______________________________

Comments: ______________________________

Compost/Manure Sample

Please do not send liquid in glass containers

Package Tests

NPK Analysis....................................☐

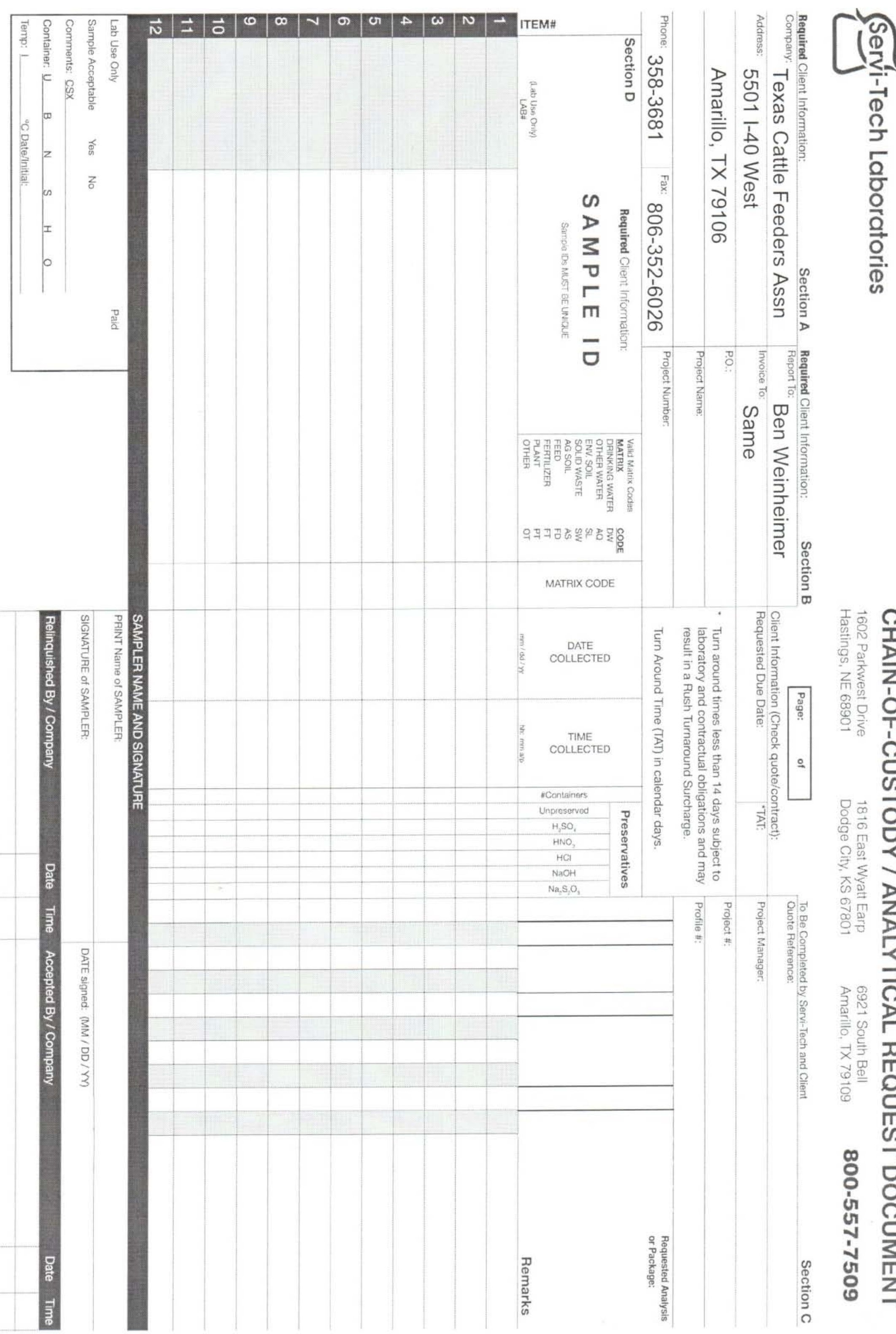
Nitrogen:	Potassium
Total	Moisture
Organic	Solids
Urea & ammonium	Organic matter
Nitrate– nitrogen	Ash
Phosphorus	Carbon:nitrogen ratio

Total Nutrient Analysis...............................☐

Nitrogen:	Zinc
Total	Iron
Organic	Manganese
Urea & ammonium	Copper
Nitrate– nitrogen	Boron
Phosphorus	Moisture
Calcium	Solids
Magnesium	Organic matter
Sulfur	Carbon:nitrogen ratio
Sodium	

Interpretations: Pounds of nutrient available first year

Appendix D: Chain of custody form



Servi-Tech Laboratories

C-

CHAIN-OF-CUSTODY / ANALYTICAL REQUEST DOCUMENT

1602 Parkwest Drive, Hastings, NE 68901 | 1816 East Wyatt Earp, Dodge City, KS 67801 | 6921 South Bell, Amarillo, TX 79109 | 800-557-7509

Section A – **Required** Client Information:
Company: Texas Cattle Feeders Assn
Address: 5501 I-40 West
Amarillo, TX 79106
Phone: 358-3681 Fax: 806-352-6026

Section B – **Required** Client Information:
Report To: Ben Weinheimer
Invoice To: Same
P.O.:
Project Name:
Project Number:

Page: of
Client Information (Check quote/contract):
Requested Due Date: *TAT:
* Turn around times less than 14 days subject to laboratory and contractual obligations and may result in a Rush Turnaround Surcharge.
Turn Around Time (TAT) in calendar days.

Section C – To Be Completed by Servi-Tech and Client
Quote Reference:
Project Manager:
Project #:
Profile #:
Requested Analysis or Package:

Section D – **Required** Client Information:

Valid Matrix Codes: MATRIX	CODE
DRINKING WATER	DW
OTHER WATER	AQ
ENV. SOIL	SL
SOLID WASTE	SW
AG SOIL	AS
FEED	FD
FERTILIZER	FT
PLANT	PT
OTHER	OT

ITEM#	(Lab Use Only) LAB#	SAMPLE ID (Sample IDs MUST BE UNIQUE)	MATRIX CODE	DATE COLLECTED (mm / dd / yy)	TIME COLLECTED (hr: mm a/p)	#Containers	Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Remarks
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													

Preservatives: Unpreserved, H_2SO_4, HNO_3, HCl, NaOH, $Na_2S_2O_3$

Lab Use Only Paid
Sample Acceptable Yes No
Comments: CSX
Container: U B N S H O
Temp: I °C Date/Initial:

SAMPLER NAME AND SIGNATURE
PRINT Name of SAMPLER:
SIGNATURE of SAMPLER: DATE signed: (MM / DD / YY)

Relinquished By / Company	Date	Time	Accepted By / Company	Date	Time

LEGENDS