Assessment and Mitigation of Agricultural and Other Nonpoint Source Activities in the Cypress Creek Basin
Quality Assurance Project Plan
Project Number 04-14-S
Revision #2

Northeast Texas Municipal Water District
P.O. Box 955
Hughes Springs, Texas 75656

Texas State Soil and Water Conservation Board
P.O. Box 658 / 311 North 5th
Temple, Texas 76503

Nonpoint Source Program CWA § 319 (h)
Prepared in cooperation with the Texas State Soil and Water Conservation Board and the U.S. Environmental Protection Agency

Effective Period: July 1, 2005 through March 2008

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

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A1 APPROVAL PAGE

Environmental Protection Agency

Ellen Caldwell 4/2/07
Date
EPA Project Officer
State/Tribal Programs Section

Donna Miller 4/2/07
Date
Chief, State/Tribal Programs Section

Texas State Soil and Water Conservation Board

T.J. Helton 3-1-07
Date
Project Manager

Aaron Wendt 3/1/07
Date
Quality Assurance Officer

Northeast Texas Municipal Water District

Walt Sears, Jr. 1-26-07
Date
General Manager

Ric Blevins 1-29-07
Date
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Field Operations Supervisor

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Paul Price 02/05/07
Date
Project Manager

Peggy Jones 2/2/07
Date
Quality Assurance Officer/Data Manager
(Entire Project)

David Thomas 2-2-07
Date
Technical Coordinator

Ana-Lab Corporation

2/08/07

Bill Peery — Date
Laboratory Manager

Texas Cooperative Extension Soil, Water and Forage Testing Laboratory

1/29/07

John Pitt — Date
Laboratory Manager, Extension Associate

The Northeast Texas Municipal Water District (NETMWD) will secure written documentation from each sub-tier project participant (e.g., subcontractors, other units of government, laboratories) stating the organization's awareness of and commitment to requirements contained in this quality assurance project plan and any amendments or revisions of this plan. NETMWD will maintain this documentation as part of the project's quality assurance records, and will be available for review. (See sample letter in Attachment 1 of this document.)

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LIST OF ACRONYMS

ASAP	As Soon As Possible
AWRL	Ambient Water Reporting Limit
BMP	Best Management Practices
CAR	Corrective Action Report
COC	Chain-of Custody
CRP	Clean Rivers Program
DM	Data Manager
DOC	Demonstration of Capability
DO	Dissolved Oxygen
EOF	Edge-of-field
EPA	U.S. Environmental Protection Agency
FOS	Field Operations Supervisor
FY	Fiscal Year
GPS	Global Positioning System
HDPE	High Density Polyethyene
HDR	HDR Engineering, Inc.
H_2SO_4	Sulfuric Acid
LCS	Laboratory Control Standard
LMU	Land Management Unit
MDMA	Monitoring Data Management & Analysis
MG/L	Milligrams per liter
MUID	Map Unit Identification
NA	Not Applicable
NCR	Non-conformance Report
NETMWD	Northeast Texas Municipal Water District
NPS	Nonpoint Source
NRCS	USDA Natural Resources Conservation Service
OSSF	On-Site Sewage Facility
PI	Phosphorous Index
PM	Project Manager
QA	Quality Assurance
QAM	Quality Assurance Manual
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QAS	Quality Assurance Specialist
QC	Quality Control
QMP	Quality Management Plan
%R	Percent Recovery
RPD	Relative Percent Deviation
RL	Reporting Limit
SOP	Standard Operating Procedure
SWAT	Soil and Water Assessment Tool
SWCD	Soil and Water Conservation District
SWQM	Surface Water Quality Monitoring

TC	**Technical Coordinator**
TCE	**Texas Cooperative Extension**
TMDL	**Total Maximum Daily Load**
TDS	**Total Dissolved Solids**
TRACS	**TCEQ Regulatory Activities and Compliance System**
TSS	**Total Suspended Solids**
TSSWCB	**Texas State Soil and Water Conservation Board**
TSWQS	**Texas Surface Water Quality Standards**
WMT	**Watershed Management Team**
WQMP	**Water Quality Management Plan**

A3 DISTRIBUTION LIST

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College Station, Texas 77843-2474

John Pitt, Laboratory Manager and Extension Associate
(979) 845-4816

A4 PROJECT/TASK ORGANIZATION

Description of Responsibilities

ENVIRONMENTAL PROTECTION AGENCY

Ellen Caldwell
EPA Project Officer

The EPA Project Officer (PO) is responsible for programmatically and financially managing, on EPA's behalf, all CWA Section 319 funded grants and associated projects that the State of Texas receives. The EPA PO also manages other federal allocations as designated. The PO assists the State in approving projects that are consistent with the management goals designated under the State's NPS management plan and meet federal guidance. The PO coordinates reviews of project work plans, QAPPs, draft deliverables, and works with the State in making these items approvable. The PO also meets with the State at least semi-annually to evaluate the progress of each project and when conditions permit, participate in a site visit on the project. The PO fosters communication within EPA by updating management and others, both verbally and in writing, on the progress of the State's program and on other issues as they arise. The PO assists the regional NPS coordinator in tracking a State's annual progress in its management of the NPS program. The PO assists in grant close-out procedures ensuring all deliverables have been satisfied prior to closing a grant.

TEXAS STATE SOIL AND WATER CONSERVATION BOARD

Aaron Wendt
Quality Assurance Officer

Responsible for determining that the Quality Assurance Project Plan (QAPP) meets the requirements for planning, quality control, quality assessment, and reporting under the CWA Section 319 program. Reviews and approves QAPP and any amendments or revisions. Responsible for verifying that the QAPP is followed by project participants. Monitors implementation of corrective actions. Coordinates or conducts audits of field and laboratory systems and procedures.

T. J. Helton
NPS Project Manager

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 work plan are completed as specified. Reviews and approves QAPP and any amendments or revisions and ensures distribution of approved/revised QAPPs to TSSWCB and USEPA participants. Determines that the project meets the requirements for planning, quality assessment (QA), quality control (QC), and reporting under the CWA Section 319 program

NORTHEAST TEXAS MUNICIPAL WATER DISTRICT

Walt Sears, Jr.
General Manager

Responsible for coordination and cooperation between the Northeast Texas Municipal Water District (NETMWD) Steering Committee members and HDR Engineering, Inc.

Ric Blevins
Project Manager/Project Field Operations Supervisor

Responsible for contact and coordination with HDR Engineering, Inc. (HDR), Texas State Soils and Water Conservation Board (TSSWCB), and other entities participating in the NETMWD TSSWCB activities. Responsible for implementing TSSWCB requirements in contracts, QAPPs, and QAPP amendments and appendices. Coordinates basin planning activities and work of basin partners. Ensures monitoring systems audits are conducted to ensure QAPPs are followed by the NETMWD participants and that projects are producing data of known quality. Ensures that subcontractors are qualified to perform contracted work. Ensures TSSWCB Project Manager and/or Quality Assurance Officer is notified of circumstances which may adversely affect quality of data derived from collection and analysis of samples. Responsible for transmitting all data collected by NETMWD or HDR staff that meets the data quality objectives of the project to the TSSWCB.

Responsible for performing field sampling and data processing duties in accordance with standard operating procedures (SOPs), data quality objectives (DQOs) and this QAPP, reporting to the Technical Coordinator any deviation from SOPs or DQOs, maintaining proper documentation of sampling events, sample preservation, sample shipment, and field procedures at NPS designated stations. Responsible for data review from all monitoring events and provides data quality comments to the QAO. Responsible for supervising sampling and oversight of project activities. Responsible for field scheduling, staffing, and ensuring that staff are appropriately trained. Responsible for the acquisition of water samples and field data measurements in a timely manner that meet the quality objectives specified in Section A7 (table A.1) as well as the requirements of Sections B1 through B8. Reports status, problems, and progress to Cypress Creek Basin Technical Coordinator.

HDR Engineering, Inc.

Paul Price
HDR Project Manager

Responsible for contact and coordination with NETMWD, TSSWCB, and other entities participating in the Cypress Creek Basin NPS activities. Responsible for implementing NPS requirements in contracts, QAPPs, and QAPP amendments and appendices. Coordinates basin planning activities and work of basin partners. Ensures monitoring systems audits are conducted to ensure QAPPs are followed by planning agency participants and that projects are producing data of known quality. Ensures that subcontractors are qualified to perform contracted work. Ensures NPS project managers and/or QA Specialists are notified of circumstances which may adversely affect quality of data derived from collection and analysis of samples.

Responsible for transmitting all data collected by NETMWD that meets the data quality objectives of the project to the TSSWCB.

Peggy Jones
HDR Quality Assurance Officer/Data Manager

Responsible for coordinating the implementations of the Quality Assurance program that includes identifying, receiving, and maintaining project quality assurance records. Responsible for determining if all data collected meet the data quality objectives of the project and are suitable for reporting to the TSSWCB. Coordinates and monitors deficiencies, nonconformances and corrective action, coordinates and maintains records of data verification and validation, and coordinates the research and review of technical QA material and data related of water quality monitoring system design and analytical techniques. Conducts monitoring systems audits on project participants to determine compliance with project and program specifications, issues written reports, and follows through on findings.

Oversees data management plan for the study. Ensures that field data are properly reviewed and verified prior to transfer of data to TSSWCB. Responsible for the acquisition, verification, and transfer of quality-assured data to the TSSWCB. Responsible for transferring data to the TSSWCB in the acceptable format. Ensures that the data review checklist is completed and data are submitted with appropriate codes and data. Documents task progress and track labor and non-labor expenditures to produce the necessary reimbursement forms and progress reports specified in the NPS contract. Provides the point of contact for the TSSWCB Project Manager to resolve issues related to the data and assumes responsibility for the correction of any data errors.

David Thomas
HDR Technical Coordinator

Responsible for writing and maintaining the QAPP and monitoring its implementation that involves maintaining records of QAPP distribution (including appendices and amendments) and maintaining written records of sub-tier commitment to requirements specified in this QAPP. Responsible for the supervision (through direct contact with the Project Field Operations Supervisor) of all NPS field activities, equipment preparation, sampling, sample preservation, fieldwork, sample transport and chain-of-custody maintenance in compliance with the approved QAPP. Ensures that field staff is properly trained (in cooperation with the Project Field Operations Supervisor) and that training records are maintained.

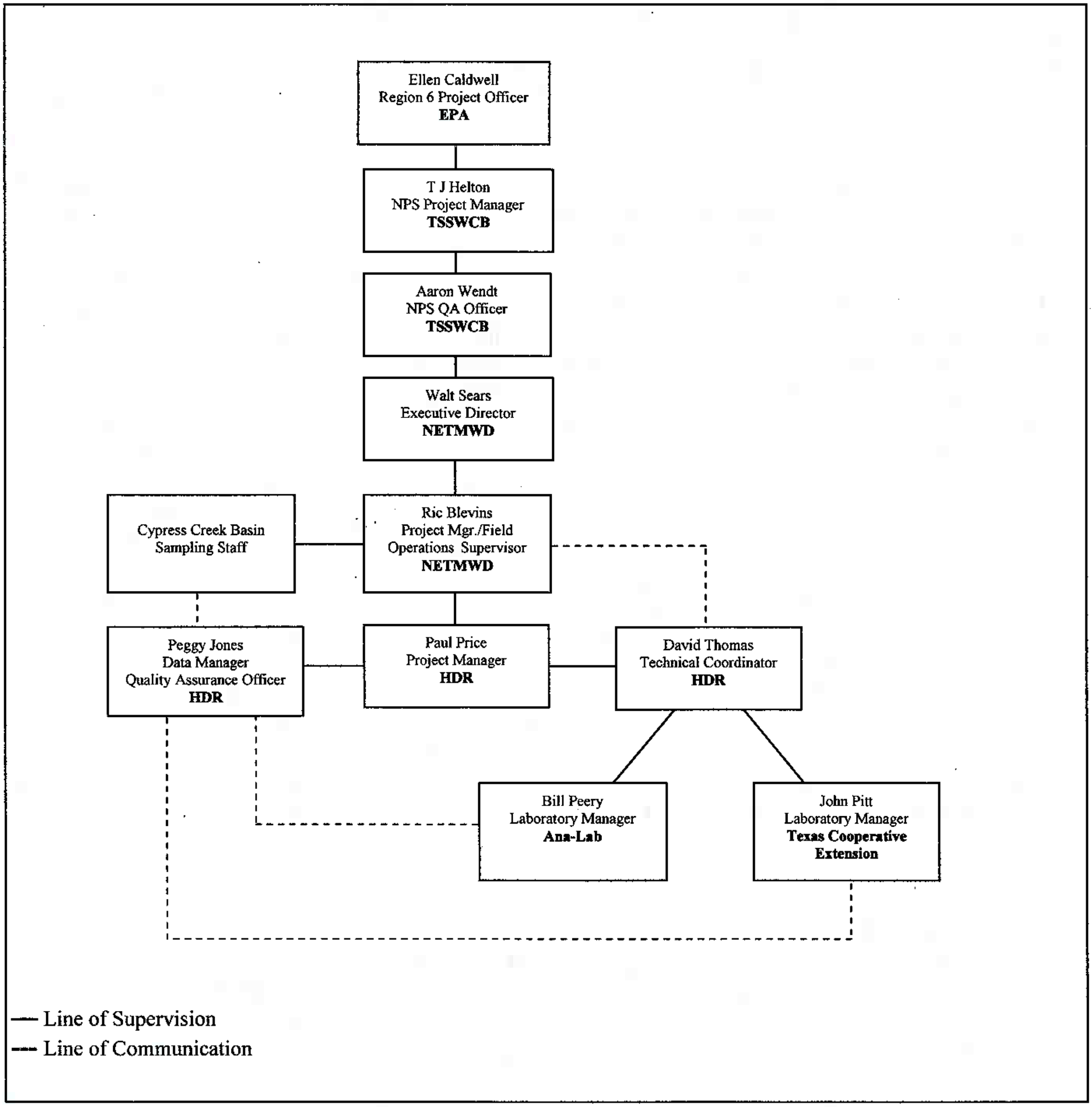
Bill Peery
Laboratory Manager, Ana-Lab Corporation

Responsible for supervision of analytical laboratory personnel involved in generating analytical data for the 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 compiling QC statistics. Responsible for oversight of all laboratory operations ensuring that all QA/QC requirements are met, documentation related to the analysis is complete and adequately maintained, and that results are reported accurately. Responsible for ensuring that corrective actions are implemented, documented, reported and verified. Monitors the implementation of the quality assurance protocols within the laboratory to ensure complete compliance with project data quality objectives as defined by the contract and in the QAPP. Responsible for supervising and verifying all aspects of the QA/QC in the laboratory. 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 QA Officer.

John Pitt
Laboratory Manager, Texas Cooperative Extension Soil, Water and Forage Testing Laboratory

Responsible for supervision of Texas Cooperative Extension Soil, Water and Forage Testing Laboratory (TCE) personnel involved in generating analytical data for the 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 compiling QC statistics. Responsible for oversight of all laboratory operations ensuring that all QA/QC requirements are met, documentation related to the analysis is complete and adequately maintained, and that results are reported accurately. Responsible for ensuring that corrective actions are implemented, documented, reported and verified. Monitors the implementation of the quality assurance protocols within the laboratory to ensure complete compliance with project data quality objectives as defined by the contract and in the QAPP. Responsible for supervising and verifying all aspects of the QA/QC in the TCE laboratory. 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 QA Officer.

Figure 1. PROJECT ORGANIZATION CHART



A5 PROBLEM DEFINITION/BACKGROUND

The purpose of this QAPP (319-04-14-S) is to clearly delineate the NETMWD QA/QC policy, management structure, and procedures, which will be used to implement the QA/QC requirements necessary to verify and validate the water quality data collected under Tasks 4, 5, and 6. Modeling activities under Task 9 will be carried out through a separate and independent QAPP (319-04-14-M). The QAPP is reviewed by the TSSWCB to help ensure that data generated for the purposes described above are scientifically valid and legally defensible.

The purpose of this project is to evaluate the effectiveness of selected Better Management Practices (BMPs) in the reduction of nutrient inputs by agricultural operations to Big Cypress Creek and Lake O' the Pines. The Lake O' the Pines watershed includes some of the leading broiler producing counties in the state. The area around Pittsburg has experienced particularly intense development of poultry production facilities. The 303(d) listing process for the State of Texas has identified water quality and aquatic life impairments in the Lake O' the Pines watershed. The Final 2002 303(d) list found approximately 2,000 acres in the upper end of the reservoir exhibited dissolved oxygen (DO) concentrations that were occasionally lower than the 24-hour criterion (5mg/l) established to assure optimum conditions for aquatic life. The Draft 2002 303(d) found approximately 3,700 acres in the upper reservoir exhibited dissolved oxygen concentration below the level established to assure optimum conditions for aquatic life. The draft 2002 305(b) assessment of Segment 0403 also indicated that excessive nutrient levels were a cause of concern in the upper 3,700 acres of the reservoir. The draft 2004 303(d) list indicates that the upper 3,700 acres of the reservoir as partially supporting its aquatic life use due to low levels of dissolved oxygen.

A Total Maximum Daily Load (TMDL) program summary document developed for Lake O' the Pines (Segment 0403) with the guidance of the Texas Commission on Environmental Quality (TCEQ) and the U.S. Environmental Protection Agency (EPA) is currently in peer technical review. Following management review and TCEQ approval, public comment will be sought on the draft TMDL prior to submission to TCEQ for adoption and to EPA for approval. Water quality monitoring, storm runoff studies, and modeling results have shown that poultry production, processing, and waste disposal are a source of significant contribution to the nutrient load currently entering Big Cypress Creek from both point and nonpoint source, and the cause of violations of the dissolved oxygen standard in Lake O' the Pines (Segment 0404).

This project will be an integral and essential part of Lake O' the Pines TMDL Implementation Plan that will entail the evaluation of nutrient losses from agricultural operations and on-site wastewater disposal facilities. Edge-of-field monitoring sites were recommended to permit evaluation of the magnitude and relative importance of various types of non-point sources and identification of specific major sources of nutrients and oxygen demand from land use data. Additional specifications of the problem to be addressed under this QAPP are described in Appendix A, the project Work Plan.

Agencies cooperating in this project include the EPA, TSSWCB, and the Cypress Creek Basin Planning Agency. See Appendix A for the TSSWCB/NETMWD Work Plan that discusses the overall project.

NETMWD is responsible for project coordination and administration of the overall project and has subcontracted with HDR to provide technical assistance to NETMWD, data management and reporting and assistance in project coordination. The TSSWCB has provided the funding for the edge of field and intermittent stream monitoring portion of this project. The Cypress Creek Basin Planning Agency will utilize Ana-Lab Corporation for water analysis and the Texas Cooperative Extension Soil, Water & Forage Testing Laboratory for soil analysis.

A6 PROJECT/TASK DESCRIPTION

See Appendix A for the project-related work plan tasks and schedule of deliverables for a description of work defined in this QAPP.

The primary goal of this project is to evaluate the effectiveness of selected BMPs in reducing nutrient inputs to Big Cypress Creek and Lake O' the Pines by documenting runoff quality from sites representing dominant soil and land use types, with and without BMPs implemented and replace failing septic systems thus initiating a nutrient reduction program by mitigating overflowing sewage from on-site systems in the rural areas. The project will support determination of the steps that could be taken to implement the current Lake O' the Pines TMDL as it relates to non-point source nutrient input. The project includes the establishment of a public outreach program to educate the public about nonpoint source water quality issues, particularly the role of agricultural activities in basin-wide nutrient loading.

This project will evaluate the effectiveness of applied Water Quality Management Plans (WQMPs) in reducing the runoff of nutrients from fields that receive applications of poultry litter. The litter used in the production of poultry (broiler chickens) in the Lake O' the Pines watershed is commonly disposed of by its beneficial application as fertilizer to fields used in the production of grasses used as forage for cattle. Application sites may be located on the poultry growers property, or it may be applied to the property of other parties. It is estimated that roughly half of the poultry litter generated in the Cypress Creek Basin is applied outside of the basin. An important component of the WQMPs being implemented in the Lake O' the Pines watershed (and, more broadly in the Cypress Creek Basin) are Best Management Practices (BMPs) to reduce runoff of sediments and nutrients from the waste application fields. These BMPs include limitations on application rates, soil nutrient thresholds above which waste application are to be limited, and structural improvements such as filter strips and setbacks from stream courses.

Storm water studies conducted as part of the Lake O' the Pines TMDL program have shown that the presence of poultry litter application sites in a subwatershed can substantially increase nitrogen and phosphorus loads in the receiving streams. However, the relationships among poultry litter application rates, soil types, soil nutrient levels, vegetation cover, presence of BMPs, and field runoff loads of nutrient and sediment is known only generally for the Cypress Creek Basin. Demonstration of varying efficiencies of nutrient retention in the agricultural system, or positive delineation of the extent to which agricultural activities affect the retention of nutrients in the soil or their loss downstream, will lead to better public understanding of the problem and support for water quality protection measures, and will be beneficial to securing voluntary participation in the WQMP program.

TABLE A6.1

NETMWD Agricultural NPS Evaluation: Edge-of-Field-Monitoring Schedule of Milestones

Task	Project Milestones	Start	End
1	Project coordination and administration	December 2004	March 2008
1.1	Coordinate project fund expenditures	October 2004	March 2008
1.2	Coordination with overall NETMWD project	December 2004	March 2008
1.3	Watershed Advisory Committee organization	October 2004	March 2008
1.4	Organize and coordinate OSSF Replacement Program committee	January 2004	September 2006
1.5	GIS mapping of potential study sites	December 2004	April 2005
2	Site selection and study planning	January 2005	May 2005
2.1	Determine sampling site locations	January 2005	April 2005
3; 3.1	Quality Assurance Project Plan Development	January 2005	March 2008
4	Sample station construction and calibration	April 2005	June 2005
4.1	Install equipment	April 2005	April 2005
4.2	Implementation and operation of monitoring	July 2005	October 2007
5	Maintenance of equipment/Sample collection	July 2005	March 2008
5.1; 5.2	Establish consistent schedule for station maintenance and field calibration	July 2005	March 2008
5.3	Conduct edge-of-field monitoring	July 2005	March 2008
5.4	Conduct soil testing	July 2005	July 2007
6	Data management and quality assurance	May 2005	March 2008
6.1	Screen laboratory data to ensure consistency	July 2005	March 2008
7	On-Site Sewage System Replacement Project	December 2004	March 2008
7.1	Organize committee to inventory OSSF in a 8-county area for potential replacement or upgrade	December 2004	April 2005
7.2	Reports	Quarterly; Yearly	March 2008
8	Public Outreach and Education	December 2004	March 2008
8.1	Education about sediment & nutrient loss	December 2004	April 2005
8.2	Education for groups unable to attend meetings	December 2004	March 2008
8.3	Hold annual meetings on OSSF information	December 2004	December 2005
8.4	Develop biannual newsletter for rural residents	December 2004	December 2005
8.5	Presentation of project information	December 2004	March 2008
9	SWAT modeling	Following QAPP approval	March 2008
9.1	Validated SWAT model for each study site	Following QAPP approval	March 2008
9.2	Estimate nutrient reductions to evaluate effectiveness of WQMPs	Following QAPP approval	March 2008
10	Data analysis and reporting	July 2005	March 2008
10.1	Perform analyses of data and final project report	July 2005	March 2008
10.2	Present data in final report	July 2005	March 2008

The effectiveness of these BMPs will be evaluated through a series of small-scale comparative runoff studies which will be integrated with the water quality data collected and compiled in the CRP and TMDL programs. This analysis will supplement and complement monitoring in Lake O' the Pines and its watershed currently conducted under the Clean Rivers Program, or as part of the TMDL implementation plan. Landowners willing to participate in the project will be sought with the help of an advisory committee consisting of invited representatives of NETMWD, TSSWCB, Sulphur/Cypress Soil and Water Conservation District (SWCD), Pilgrims Pride Corporation, interested agricultural operators, local independent contractors, local commercial fertilization companies, and Texas Cooperative Extension.

Study sites will be selected from among properties offering participation in the project using a set of criteria that includes land use, soil type and vegetation cover characteristics, history of poultry litter or other fertilizer application, suitability for efficiently capturing runoff from a defined area from a 10 year rainfall event, and accessibility during inclement weather. Landowners identified as potential candidates will be contacted to determine if they would agree to participate in the study. The identity of participants in this study is confidential and the list of landowners who volunteer their property with NETMWD will be assigned a number by HDR to protect their privacy. A substantial base of information on water quality, soils, land use and poultry litter application has been developed under the Cypress Creek Basin Clean Rivers Program and the Lake O' the Pines TMDL program. This data is available to assist NETMWD and its contractors in site selection, study design, approval and implementation.

Because of the large contribution of nutrients, particularly phosphorus, from non-point agricultural sources, implementation of the TMDL in the Lake O' the Pines watershed will depend critically on the increased efficiency with which those nutrients can be retained in the agricultural systems, and not be allowed to escape to cause problems in the receiving waterways. However, the effectiveness of the WQMPs in reducing nutrient runoff from waste application fields in the particular context of the Lake O' the Pines watershed is not known with certainty beyond the rather wide ranges reported in existing literature (Young et al., 1996).

Water samples will be collected from application field sampling sites only during rainfall events with sufficient runoff to trigger automated samplers. When sufficient overland water flow exists, water samples will be collected from project sampling sites using automated samplers. Laboratory analysis will be performed for orthophosphate phosphorus, total phosphorus, total suspended solids, total dissolved solids, ammonia nitrogen, total Kjeldahl nitrogen, nitrite nitrogen, nitrate nitrogen, and total organic carbon. The measurement performance criteria to support the project objectives for a minimum data set are specified in Table A7.1. Water samples will only be analyzed if they meet preservation requirements and holding times. Datalogger printouts will be checked routinely to ensure that samples come from a rainfall event rather than from some anomaly.

Additionally, soil samples will be collected prior to storm water equipment installation to measure existing soil conditions. Soil samples will be analyzed within the estimated accuracy and precision limits of measured parameters to insure data quality (Table A7.1). The Texas Cooperative Extension Soil, Water and Forage Testing laboratory will provide analysis for soil samples collected under this project. Ana-Lab Corporation will analyze the water samples.

Activities associated with collection of direct data for this project are presented briefly below. See Appendix A for details on these activities.

- Appendix A, Task 1 - Project Coordination and Administration
- Appendix A, Task 2 - Site Selection and Study planning
- Appendix A, Task 3 - Quality Assurance Project Plan Development
- Appendix A, Task 4 - Sample Station Construction and Calibration
- Appendix A, Task 5 - Maintenance/Sample Collection
- Appendix A, Task 6 - Data Management and Quality Assurance
- Appendix A, Task 7 - On-Site Sewage System Replacement Project
- Appendix A, Task 8 - Public Outreach and Education
- Appendix A, Task 9 - SWAT Modeling
- Appendix A, Task 10 - Data Analysis and Reporting

See Appendix B for sampling design and monitoring pertaining to this QAPP.

Amendments to the QAPP

Revisions to the QAPP may be necessary to reflect changes in project organization, tasks, schedules, objectives, and methods; to improve operational efficiency; and to accommodate unique or unanticipated circumstances. Requests for amendments are directed from the NETMWD Project Manager to the TSSWCB Project Manager in writing. They are effective immediately upon approval by the NETMWD Project Manager, HDR Project Manager, HDR Quality Assurance Officer, the TSSWCB Project Manager, and the TSSWCB Quality Assurance Officer. They will be distributed by the HDR Technical Coordinator and incorporated into the QAPP by way of attachment (along with a letter of agreement - see Attachment 1) and distributed to personnel on the distribution list.

Expedited Changes

Expedited Changes to the QAPP should be approved before implementation to reflect changes in project organization, tasks, schedules, objectives, and methods, address deficiencies and non-conformance, improve operational efficiency and accommodate unique or unanticipated circumstances. Requests for expedited changes are directed from the NETMWD Project Manager to the TSSWCB Project Manager in writing. They are effective immediately upon approval by the TSSWCB Project Manager and Quality Assurance Officer.

Expedited changes to the QAPP and the reasons for the changes shall be documented, and revised pages shall be initialed by the TSSWCB Project Manager and QAO, the EPA Project Officer, and the NETMWD Project Manager, and then distributed to all persons on the QAPP distribution list by the HDR Technical Coordinator. Expedited changes shall be reviewed, approved, and incorporated into a revised QAPP during the annual revision process or within 120 days of the initial approval in cases of significant changes.

A7 QUALITY OBJECTIVES AND CRITERIA

The main objective for this project is to collect data to evaluate the effectiveness of selected BMPs in reducing nutrient inputs to Big Cypress Creek and Lake O' the Pines by documenting runoff quality from 12 study sites representing dominant soil and land use types, with and without BMPs implemented and replace failing septic systems thus initiating a nutrient reduction program by mitigating overflowing sewage from on-site systems in the rural areas. The project will support determination of the steps that could be taken to implement the Lake O' the Pines TMDL as it relates to non-point source nutrient input.

The project includes the establishment of a public outreach program to educate the public about nonpoint source water quality issues, particularly the role of agricultural activities in basin-wide nutrient loading. Using the Supplemental Environmental (SEP) Fund, NETMWD will identify and mitigate failing on-site sewage facilities in the SEP Project boundary.

Another objective is to focus data analysis using the results of the individual field studies together with the land use and soil sampling information in the GIS database together with runs of the updated SWAT model to extrapolate the non-point nutrient contributions of the studied agricultural or silvicultural land uses/activities throughout the Cypress Creek Basin. This analysis will also use the results of water quality monitoring projects in Segments 0403 and 0404 to provide continuing validation of SWAT model updates.

Additionally, the nutrient information obtained from the study sites selected for this project will be made available to the present TSSWCB Phosphorous Index (PI) study that is aimed at developing and implementing a phosphorous index tool for Texas. This PI tool is intended for field personnel, crop advisors, watershed planners and farmers to identify agricultural areas or practices that have the greatest potential to lose phosphorous to adjacent streams. Comparison of the results of this study will provide direct evaluation of the relationship between the PI and nutrient loadings to area streams and to Lake O' the Pines, and will likely be useful to this study in providing insight to the relationship between nutrient runoff and antecedent conditions, information notoriously difficult to obtain with storm event monitoring only.

See Appendix B Figure 2 for the 12 study sites selected for this project. Individual landowners' identity will not be disclosed to encourage cooperation in addressing the study objectives. The location map was prepared to show the general area for all study participants to disguise their exact location.

The measurement performance specifications to support the project objectives for a minimum data set are specified in Table A7.1 and in the text following. Note: Due to the high concentrations of solids and nutrients in the storm samples, samples will not be filtered in the field.

Table A7.1 Measurement Performance Specifications

PARAMETER	UNITS	METHOD	STORET CODE	AWRL	Laboratory Reporting Limit (RL)	RECOVERY AT RLs	Precision (RPD of LCS/LCS dup)	BIAS (% Rec. of LCS/LCSD mean)	LAB
Field Parameters									
Flow at Weir	cfs	ISCO SOP	NA	NA*	NA	NA	NA	NA	NETMWD Sampling Staff
Water Parameters									
TSS	mg/L	EPA 160.2	00530	4.0	4.0	NA	20	NA	ANA-LAB
TDS, dried at 180°C	mg/L	EPA 160.1	70300	10.0	10.0	NA	20	NA	ANA-LAB
Ammonia-Nitrogen	mg/L	EPA 350.1	00610	0.02	0.02	75-125	20	80-120	ANA-LAB
Ortho-Phosphate Phosphorus, dissolved; lab filtered	mg/L	EPA 365.2	70507	0.02	0.01	90-110	20	90-110	ANA-LAB
Nitrite-Nitrogen	mg/L	EPA 300.0	00615	0.02	0.02	75-125	20	80-120	ANA-LAB
Nitrate-Nitrogen	mg/L	EPA 300.0	00620	0.02	0.02	75-125	20	80-120	ANA-LAB
Total Phosphorus	mg/L	EPA 365.2	00665	0.02	0.02	75-125	20	80-120	ANA-LAB
Total Kjeldahl Nitrogen	mg/L	EPA 351.2	00625	0.2	0.2	75-125	20	80-120	ANA-LAB
TOC	mg/L	SM 5310C	00680	2.0	2.0	75-125	20	80-120	ANA-LAB

Table A7.1 Measurement Performance Specifications (continued)

PARAMETER	UNITS	METHOD	STORET CODE	AWRL	Laboratory Reporting Limit (RL)	RECOVERY AT RLs	Precision (RPD of LCS/LCS dup)	BIAS (% Rec. of LCS/LCSD mean)	LAB
Soil Parameters									
Extractable Phosphorus	mg/kg or PPM	SWFTL079R0.SOP	None	NA	1.0	NA	20%	NA	TCE Lab
Extractable Potassium	mg/kg or PPM	SWFTL079R0.SOP	None	NA	5.0	NA	20%	NA	TCE Lab
Nitrate Nitrogen, extractable	mg/kg or PPM	SWFTL014R0.SOP	None	NA	1.0	NA	20%	NA	TCE Lab
Sodium, extractable	mg/kg or PPM	SWFTL079R0.SOP	None	NA	10.0	NA	20%	NA	TCE Lab
Magnesium, extractable	mg/kg or PPM	SWFTL079R0.SOP	None	NA	5.0	NA	20%	NA	TCE Lab
Calcium, extractable	mg/kg or PPM	SWFTL079R0.SOP	None	NA	10.0	NA	20%	NA	TCE Lab
Soluable salts/electrical conductivity	dS/m^2	SWFTL015R0.SOP	None	NA	0.05	NA	NA	NA	TCE Lab
Soil water pH	Standard Units	SWFTL015R0.SOP	None	NA	NA	NA	NA	NA	TCE Lab

References for Table A1.7:

American Public Health Association (APHA), American Water Works Association (AWWA), Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, @20th Edition, 1999.

Dorich, R.A., and D.W. Nelson. 1984. Evaluation of manual cadmium reduction methods for determination of nitrate in potassium chloride extracts of soils. Soil Sci. Soc. Am. J. 48:72-75.

Mehlich, A. 1984. Mehlich-3 soil test extractant: A modification of Mehlich-2 extractant. Communications in Soil Science and Plant Analysis 15:1409-1416

SSSA – Soil Science Society of America. 1996. Methods of Soils Analysis, part 3: Chemical Methods. SSSA, Madison, WI.

Schofield, R.K. and A.W. Taylor. 1955. The measurement of soil pH. Soil Sci. Soc. Amer. Proc. 19: 164-167.

Rhoades, J.D. 1982. Soluble Salts. In: Methods of Soil Analysis. Part 2. Eds. Page, Miller and Keeney. Am. Soc. Agron., Madison, WI.

United States Environmental Protection Agency (USEPA), Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600-4-79-020.

Ambient Water Reporting Limits

The AWRL establishes the reporting specification at **or below** which data for a parameter must be reported to be compared with freshwater screening criteria. The AWRLs specified in Table A7.1 are the program-defined reporting specifications for each analyte and yield data acceptable for routine water quality monitoring. The reporting limit is the lowest concentration at which the laboratory will report quantitative data within a specified recovery range. The laboratory will meet two requirements in order to report meaningful results to the TSSWCB:

- The laboratory's reporting limit for each analyte will be at **or below** the AWRL.
- The laboratory will demonstrate and document on an ongoing basis the laboratory's ability to quantitate at its reporting limits.

Acceptance criteria are defined in Section B5.

Precision

Precision is a statistical measure of the variability of a measurement when a collection or an analysis is repeated and includes components of random error. It is strictly defined as the degree of mutual agreement among independent measurements as the result of repeated application of the same process under similar conditions.

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 laboratory control standards. Precision results are plotted on quality control charts, which are based on historical data and used during evaluation of analytical performance. Program-defined measurement performance specifications for laboratory control standard/laboratory control standard duplicate pairs are defined in Table A7.1.

Bias

Bias is a statistical measurement of correctness and includes multiple components of systematic error. A measurement is considered unbiased when the value reported does not differ from the true value. Bias is verified through the analysis of laboratory control standards prepared with certified reference materials and by calculating percent recovery. Results are plotted on quality control charts, which are calculated based on historical data and used during evaluation of analytical performance. Program-defined measurement performance specifications for laboratory control standards are specified in Table A7.1.

For soil samples, bias is verified through laboratory media standard results compared to replicated results of the same sample on a large volume basis.

Representativeness

Representativeness is a measure on how accurately a monitoring program reflects the actual water quality conditions. The representativeness of the data is dependent on 1) site selection, 2) the number of samples collected, 3) the number of years and seasons when sampling is performed and 5) the appropriate sampling procedures, and use of only approved analytical methods will assure that the measurement data represents the conditions at the site. Representativeness will be measured with the completion of samples collected in accordance with the approved QAPP.

Comparability

Confidence in the comparability of data sets for this project and for water quality assessments 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 all applicable water and soil sampling references footnoted for Table A7.1. The TCE Testing Laboratory will conduct all soil sampling analyses. This facility offers a professional soil testing service and is involved with other studies funded through TSSWCB. 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 as specified in Section B10.

Completeness

The completeness of the data is basically a relationship of how much of the data is available for use compared to the total potential data. Ideally, 100% of the data should be available. However, the possibility of unavailable data due to accidents, insufficient sample volume, broken or lost samples, etc. is to be expected. Therefore, it will be a general goal of the project(s) that 90% data completion is achieved.

A8 SPECIAL TRAINING/CERTIFICATION

New field personnel will receive training in proper sampling and field analysis. Before actual sampling or field analysis occurs, they will demonstrate to the designee appointed by the QA Officer their ability to properly calibrate field equipment and perform field sampling and analysis procedures. Training will be documented and retained in the personnel file and be available during a monitoring systems audit.

Laboratory analysts have a combination of experience, education, and training to demonstrate knowledge of their function. Laboratories have documented training records for each test that an analyst performs. Training is performed prior to analyzing samples and annually thereafter.

NETMWD personnel involved in use of Global Positioning System (GPS) for sampling station locations have been trained in the appropriate use of GPS.

A9 DOCUMENTS AND RECORDS

The documents and records that describe, specify, report, or certify activities, requirements, procedures or results for this project and the items and materials that furnish objective evidence of the quality of items or activities are listed in Table A9.1. The approved QAPP document and any revisions to the original QAPP that may be necessary to reflect any changes to the project (amendments) will be distributed by the HDR Technical Coordinator and incorporated into the QAPP by way of attachment and distributed to personnel on the distribution list found in Section A3.

Table A9.1 Project Documents and Records

Document/Record	Location	Retention (yrs)	Format
QAPPs, amendments and appendices	NETMWD/HDR	5 years	Paper
Field SOPs	NETMWD/HDR	5 years	Paper
Laboratory QA Manuals	ANA-LAB	5 years	Paper
Laboratory QA Manuals	TCE Lab	5 years	Paper
Laboratory SOPs	ANA-LAB	5 years	Paper
Laboratory SOPs	TCE Lab	5 years	Paper
QAPP distribution documentation	ANA-LAB	5 years	Paper
QAPP distribution documentation	TCE Lab	5 years	Paper
Field staff training records	NETMWD/HDR	5 years	Paper
Field equipment calibration/maintenance logs	NETMWD/HDR	5 years	Paper
Field instrument printouts	NETMWD/HDR	5 years	Paper
Field notebooks or data sheets	NETMWD/HDR	5 years	Paper/Electronic
Chain of custody records	NETMWD/HDR	5 years	Paper
Laboratory calibration records	ANA-LAB	5 years	Paper/Electronic
Laboratory calibration records	TCE Lab	5 years	Paper/Electronic
Laboratory instrument printouts	ANA-LAB	5 years	Paper/Electronic
Laboratory instrument printouts	TCE Lab	5 years	Paper/Electronic
Laboratory data reports/results	NETMWD/HDR/ ANA-LAB	5 years	Paper
Laboratory equipment maintenance logs	ANA-LAB	5 years	Paper
Laboratory equipment maintenance logs	TCE Lab	5 years	Paper
Corrective Action Documentation	NETMWD/HDR/ ANA-LAB	5 years	Paper

Laboratory Data Reports

Data reports from Ana-Lab Corporation will report the test results clearly and accurately. The test report will include the information necessary for the interpretation and validation of data and will include the following:

- Name and address of the laboratory
- Name and address of the client
- A clear identification of the sample(s) analyzed
- Identification of samples that did not meet QA requirements and why (e.g., holding times exceeded)
- Date of sample receipt
- Sample results
- Field split results (as applicable)
- Clearly identified subcontract laboratory results (as applicable)
- A name and title of person accepting responsibility for the report
- Project-specific quality control results to include LCS sample results (% recovery), LCS duplicate results (%RPD), equipment, trip, and field blank results (as applicable), and RL confirmation (% recovery)
- Narrative information on QC failures or deviations from requirements that may affect the quality of results.

In addition, a lab data report from the TCE laboratory, with sample results and QC results, will be submitted to NETMWD for inclusion with project data submittals.

Electronic Data

Project data will be submitted electronically to the TSSWCB in a format appropriate for subsequent data submittal. A completed Data Summary page (See Appendix C) will be provided with each data submittal.

Backup/Disaster Recovery

The HDR network server is backed up daily to a tape drive in a climate controlled environment. In the event of a catastrophic systems failure, the tapes can be used to restore the data. Data generated on the day of the failure may be lost, but can be reproduced from raw data in most cases. Critical paper files containing original data will be kept for a minimum of five years.

B1 SAMPLING PROCESS DESIGN

A total of twelve study sites will be selected based on their accessibility during inclement weather and suitability for runoff sampling. Overland flow from local rainfall events will be directed into a flume or weir installed at the downgradient edge of a field at each experimental monitoring site to measure water levels and collect water quality samples. Sampling will utilize automated sampling equipment, which include programmable operation and memory, water level recorder, sample collection pump, and sample bottles. A weather station consisting of a tipping bucket rain gage and event datalogger will also be used at each monitoring location. All gages will be programmed, setup, and calibrated according to manufacturers' specifications.

Examination of these areas will permit evaluation of the magnitude and relative importance of various types of agricultural non-point sources and identify specific major sources of nutrients and oxygen demand in the Cypress Creek Basin. All data collected involving land use, soil and hydrologic conditions will be critical in the development of small-scale SWAT models. Laboratory results may detect temporal and spatial variation of chemical constituent concentrations between any given site exhibiting various land management activities during any given sampling event that will be statistically analyzed and incorporated into the modeling results.

See Appendix B for sampling process design information and monitoring tables associated with data collected under this QAPP.

B2 SAMPLING METHODS

Field Sampling Procedures

Field sampling will be conducted according to the sampling handling procedures described in Section B3 and in Appendix B. A listing of instruments and equipment, individuals responsible for testing, inspection and maintenance, schedule of periodic maintenance, frequency of calibration, how deficiencies are resolved and documented required by the field operations staff and the water and soil analysis laboratories is presented in Appendix B.

Soil Samples

Soil sampling depth is dependent on the type of crop cultivated, cultural practice, tillage depth, and the nutrient parameter analyzed. A composite soil sample should represent a uniform field area. Sampling procedures will be consistent with the accepted soil science techniques for achieving representative and analytical results. A minimum of 10 sample cores will be collected at random with a stainless steel coring device and composited from soil depth zones of 0-6 inches and 6-24 inches making sure that each sampling depth is kept separate. Tools must be clean and free of rust. The subsamples will be mixed thoroughly and at least one pint of material will be kept in a clean soil sample bag for analysis. This pint mixture is the composite soil sample. Soil analysis will include the testing for nitrate, phosphorous, potassium, sodium, magnesium, calcium, soluble salts/electrical conductivity and soil water pH.

Storm Water Samples

Obtaining a total of 5 valid monitored storm event samples per study site over the course of the project is believed to be sufficient to provide estimates of seasonal and interannual variation in runoff loading. Automated storm water sampling will be conducted using ISCO autosamplers set to collect a water sample from the study field periodically over the course of each runoff event. Single-bottle flow-interval composite sampling will be used as described Harmel et al., 2003. The resulting sample from the single-bottle composite sampling strategy represents the event mean concentration. Samples will be collected based on flow-volume, thus is termed "flow-interval" sampling. Samples will be collected at 2 mm volumetric depth intervals. Referring to discharge intervals in volumetric depth units such as mm, which represent mean runoff depth over the entire watershed, as opposed to volume units such as m^3, allows a consistent transfer of methods and results to watersheds of differing size. Each sub-sample will be 300 ml thus allowing 107 mm runoff events to be entirely captured in each 16 liter bottle.

Sampler enable levels (corresponding to flow rates of 0.001 - 0.04 m^3/s depending on field size) will be set to capture the "first flush" of runoff, which is expected to account for a large portion of the total nutrient and sediment loading in a runoff event and continue sampling throughout the duration of the runoff event.

Flow rate (discharge) measurement at each site will be conducted with a hydraulic structure such as a weir or flume that has a known depth-to-flow relationship.

Samples will be retrieved from autosamplers, mixed thoroughly to ensure homogeneity of the water, transferred to bottles provided by Ana-Lab Corporation with the appropriate preservative, and delivered to the laboratory in Kilgore, Texas within 12 hours of their collections. Autosamplers will be cleaned between runoff events. Storm water sample data will not be reported, but will be used to assist in calibration of the nonpoint source watershed model.

Sample volume, container types, minimum sample volume, preservation requirements, and holding time requirements are presented in Table B2.1.

Table B2.1 Sample Storage, Preservation and Handling Requirements

Parameter	Matrix	Container	Preservation	Sample Volume	Holding Time
Total Suspended Solids	water	Plastic or glass	Cool to 4°C, dark	400 mL	7 days
Total Dissolved Solids	water	Plastic or glass	Cool to 4°C, dark	400 mL	7 days
Ammonia-Nitrogen	water	Plastic or glass	2 mL 1:1 H_2SO_4 to pH <2; cool to 4°C, dark	150 mL	28 days
Ortho-Phosphorus, lab filtered	water	Plastic or glass	Cool to 4°C, dark	150 mL	48 hrs
Nitrite Nitrogen	water	Plastic or glass	Cool to 4°C, dark	150 mL	48 hrs
Nitrate Nitrogen	water	Plastic or glass	Cool to 4°C, dark	150 mL	48 hrs
Total Kjeldahl Nitrogen	water	Plastic or glass	2 mL 1:1 H_2SO_4 to pH <2; cool to 4°C, dark	200 mL	28 days
Total Phosphorus	water	Plastic or glass	2 mL 1:1 H_2SO_4 to pH <2; cool to 4°C, dark	150 mL	28 days
Total Organic Carbon	water	Plastic or glass	2 mL 1:1 H_2SO_4 to pH <2; cool to 4°C, dark	150 mL	28 days
Extractable Phosphorus	soil	plastic or paper	air dried	100 g	6 months
Extractable Potassium	soil	plastic or paper	air dried	100 g	6 months
Extractable Nitrate-N	soil	plastic or paper	air dried	100 g	6 months
Extractable Sodium	soil	plastic or paper	air dried	100 g	6 months
Extractable Magnesium	soil	plastic or paper	air dried	100 g	6 months
Extractable Calcium	soil	plastic or paper	air dried	100 g	6 months
Soluble salts/Electrical Conductivity	soil	plastic or paper	air dried	100 g	6 months
Soil Water pH	soil	plastic or paper	air dried	100 g	6 months

Sample Containers

Sample containers for water will include glass and plastic bottles. All glassware and plasticware provided by Ana-Lab are new and will not be reused. Clean plastic-lined bags available through County Extension offices or unused gallon zip-lock bags will be used to collect soil samples. Bags for soil samples will not reused.

Processes to Prevent Contamination

Procedures outlined in the 2003 TCEQ *Surface Water Quality Procedures Manual, Volume 1* outline the necessary steps to prevent contamination of samples. These include direct collection into sample containers, when possible. Field QC samples (i.e., field blanks as discussed in Section B5) are collected to verify that contamination has not occurred.

Documentation of Field Sampling Activities

Field sampling activities are documented on field data sheets, which are included in Appendix D. For all visits, station ID, station location, sampling time, sampling date, sampling depth (if appropriate) and sample collector's name/signature are recorded. Values for all field parameters along with the type and quantity of sample preservative added, if applicable, are recorded. Detailed observational data are recorded including water appearance, weather conditions, and the number of days since last significant rainfall. Other applicable observational data may include type and extent of biological activity, pertinent observations related to water quality or stream uses, watershed or instream activities that may have an impact on water quality such as bridge construction or livestock watering upstream, unusual odors, specific sample information (number of grabs, type, etc.) and missing parameters (i.e., when a scheduled parameter or group of parameters is not collected).

Recording Data

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

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

Deficiencies, Nonconformances and Corrective Action Related to Sampling Requirements

Deficiencies are defined as unauthorized deviations from procedures documented in the QAPP or other applicable documents. Nonconformances are deficiencies that affect quality and render the data unacceptable or indeterminate. Deficiencies related to sampling methods requirements include, but are not limited to, such things as sample container, volume, and preservation variations, improper/inadequate storage temperature, holding-time exceedances, and sample site adjustments.

Deficiencies are documented in logbooks, field data sheets, etc. by field or laboratory staff and are reported to the cognizant field or laboratory supervisor via a corrective action report (CAR). The supervisor(s) notifies the HDR Technical Coordinator if the deficiency has the potential of being a nonconformance. The HDR Technical Coordinator will notify the HDR QAO of the potential nonconformance within 24 hours.

The HDR Technical Coordinator, in consultation with HDR QAO (and other affected individuals/ organizations), will determine if the deficiency constitutes a nonconformance. If it is determined the activity or item in question does not affect data quality and therefore, is not a valid nonconformance, the CAR will be completed accordingly and closed. If it is determined a nonconformance does exist, the HDR Technical Coordinator in consultation with the HDR QAO will determine the disposition of the nonconforming activity or item and necessary corrective action(s); results will be documented on the CAR. Any recurring or unresolved QA/QC problem will be brought to the immediate attention of the HDR QAO and the Laboratory Manager.

CARs document root cause(s); impact(s); specific corrective action(s) to address the deficiency; action(s) to prevent recurrence; individual(s) responsible for each action; the timetable for completion of each action; and the means by which completion of each corrective action will be documented. CARs associated with nonconformances will be included with quarterly progress reports. In addition, significant conditions (i.e., situations which, if uncorrected, could have a serious effect on safety or on the validity or integrity of data) will be reported to the TSSWCB both verbally and in writing. A copy of the CAR form to be used on this project is included as Appendix E.

B3 SAMPLE HANDLING AND CUSTODY

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.

Water quality data are generated in the field and the Ana-Lab analytical laboratory. A sample is in custody if it is in actual physical possession or in a secured area that is restricted to authorized personnel. A Chain-of-Custody (COC) form is used to record sample identification parameters and to document sample handling during transfer from the field staff to the subcontract analytical laboratories and among other contractors. The following information concerning the sample is recorded on the COC form. These are standard requirements for COC forms. All COC forms to be used during the project are included in Appendix F.

1. Date and time of collection
2. Site identification
3. Sample matrix
4. Number of containers, if applicable
5. Preservative, if applicable
6. Color code to indicate required analyses
7. Name of collector
8. Custody transfer signatures and dates and time of transfer
9. Bill of lading

Sample Labeling

Water samples are labeled on the container label with an indelible marker. Label information includes the site identification, the date and time of sampling, and the preservative added.

This sample identification number, time, and station location serve to match the sample with the data on the COC. All water samples will be submitted to Ana-Lab on ice. No samples for this project will be filtered in the field.

Soil sample labeling is described in a paragraph below.

Sample Handling

The NETMWD Project Field Operations Supervisor (or person under supervision) will notify Ana-Lab prior to a sampling event with information regarding the expected sampling date and number of sample containers required. Ana-Lab will deliver all sample containers, ice chests, and appropriate chain-of-custody forms to the NETMWD Project Field Operations Supervisor (or person under supervision) at a pre-determined location prior to the sampling event. The containers used will be provided by Ana-Lab, supplied with correct preservatives, and labeled accordingly. Quality control for sample containers will be provided by Ana-Lab.

The NETMWD Project Field Operations Supervisor (or person under supervision) will be responsible for collection of the samples consistent with the methods outlined in the TCEQ 2003 edition of the *Surface*

Water Quality Monitoring Procedures Manual, Volume 1. The NETMWD Project Field Operations Supervisor (or person under supervision) will fill out a COC form for each sample taken during the sampling event. Ana-Lab will pick up the samples from the NETMWD Project Field Operations Supervisor (or person under supervision) from a pre-determined location after each day's sampling event is completed to assure that the COC forms are correctly filled out and signed. The Ana-Lab transfer custodian will also see that the samples arrive within holding time constraints. Ana-Lab will have a sample custodian who examines all arriving samples for proper documentation, and proper preservation. This custodian will accept delivery by signing the final portion of the COC form. The sample custodian will log and monitor the progress of the samples through the analysis stage.

Wet Weather (Storm) Samples

After a rainfall event, the ISCO samplers will be inspected to retrieve all water samples that have been collected. Properly collected water samples from each ISCO sampler will be subdivided on-site by field staff into three separate containers provided by Ana-Lab after assuring that the single bottle sample is well mixed. The site name, collection date, collection time and collector name are written in waterproof ink on each sample container, all samples logged on COC forms and immediately transported to the laboratory under direct custody or custody-sealed delivery for chemical analysis.

ISCO flow meters will be downloaded in the field onto a field laptop computer to obtain sample collection times and corresponding flow data. The final volume of water collected will then be transferred to sample bottles provided by Ana-Lab with the appropriate preservatives and immediately transported to meet the required parameter holding times.

Soil Samples

Soil samples will be air-dried for at least 24 hours prior to shipping to the TCE Laboratory for analysis. Each soil sample will be placed in a soil sample bag, with sample identification marked on the outside of the sample bag. The label on the soil sample bag will contain the sample identification number, the station location, and the depth(s) from which the sample was taken. Soil sample bags containing soil samples will be boxed and shipped to TCE Soil, Water, and Forage Testing Laboratory, College Station, Texas. A "Soil Sample Information Form" and a Chain of Custody Form (Appendix F) will be completed in duplicate. One copy of the soil sample information form will accompany the composite samples to the TCE Laboratory and one copy will be included in the project file at NETMWD.

Laboratory Analysis and Data Collection

Upon receipt of samples and COC, the laboratory staff member compares the time of collection and the shortest holding time for the required analyses against the time of receipt to ensure that sufficient time has been allowed to complete the analyses. When analyses are complete, the laboratory staff will check again to see whether the samples were analyzed within the holding time. This can become an issue when quality control checks are not met and the analysis must be repeated. Laboratory staff consistently monitor the remaining time for analyses and work to ensure that samples are analyzed within holding time restraints.

Deficiencies, Nonconformances and Corrective Action Related to Chain-of-Custody

Deficiencies are defined as unauthorized deviations from procedures documented in the QAPP or other applicable documents. Nonconformances are deficiencies, which affect quality and render the data unacceptable or indeterminate. Deficiencies related to chain-of-custody include but are not limited to delays in transfer, resulting in holding time violations; incomplete documentation, including signatures; possible tampering of samples; broken or spilled samples, etc.

Deficiencies are documented in logbooks, field data sheets, etc. by field or laboratory staff and reported to the cognizant field or laboratory. The HDR Technical Coordinator or NETMWD Project Manager will notify the HDR QAO of potential nonconformances within 24 hours. The HDR Technical Coordinator, in consultation with HDR QAO (and other affected individuals/organizations), will determine if the deficiency constitutes a nonconformance. If it is determined the activity or item in question does not affect data quality and, therefore, is not a valid nonconformance, the CAR will be completed accordingly and closed. If it is determined a nonconformance does exist, the HDR Technical Coordinator in consultation with the HDR QAO will determine the disposition of the nonconforming activity or item and necessary corrective action(s); results will be documented on the CAR.

Corrective Action Reports (CARs) document: root cause(s); impact(s); specific corrective action(s) to address the deficiency; action(s) to prevent recurrence; individual(s) responsible for each action; the timetable for completion of each action; and the means by which completion of each corrective action will be documented. Notification of deficiencies documented by CARs will be included with quarterly progress reports. In addition, significant conditions (i.e., situations which, if uncorrected, could have a serious effect on safety or on the validity or integrity of data) will be reported to the TSSWCB immediately both verbally and in writing.

B4 ANALYTICAL METHODS

The analytical methods, associated matrices, and performing laboratories are listed in Table A7.1 of Section A7. Procedures for laboratory analysis will be in accordance with the most recently published edition of *Standard Methods for the Examination of Water and Wastewater*, the latest version of the TCEQ *Surface Water Quality Monitoring Procedures Manual, Volume 1*, 40 CFR 136, or other reliable procedures acceptable to the TSSWCB. Exceptions to this include analyses and sample matrices for which no regulated methods exist, or where EPA has not approved any method with adequate sensitivity. In this project, these methods include all of the analyses for soil analytes because no methods have been approved by EPA. The analytical methods chosen to provide soils data include methods outlined in the Soil Science Society of America Soil Methods Book and used by the Texas Cooperative Extension Soil, Water, and Forage Testing Laboratory and listed in Table A7.1.

Copies of Ana-Lab laboratory SOPs are retained by the Ana-Lab and are available for review by the TSSWCB. Copies of TCE laboratory SOPs are retained by the TCE laboratory and are available for review by the TSSWCB.

Standards Traceability

All standards used in the field and laboratory are traceable to certified reference materials. Standards preparation is fully documented and maintained in a standard log book. Each documentation includes information concerning the standard identification, starting materials, including concentration, amount used and lot number; date prepared, expiration date and preparer's initials/signature. The reagent bottle is labeled in a way that will trace the reagent back to preparation.

Analytical Method Modification

Only data generated using TCEQ-approved analytical methodologies specified in this QAPP will be submitted to the TSSWCB. Requests for method modifications will be documented and submitted for approval to the TSSWCB Project Manager. Approval by the TSSWCB will be granted or denied based on review of the application, specifically the section documenting an initial demonstration of method equivalency conducted by the laboratory. Work will only begin after the modified procedures have been approved.

Deficiencies, Nonconformances and Corrective Action Related to Analytical Methods

Deficiencies are defined as unauthorized deviations from procedures documented in the QAPP or other applicable documents. Nonconformances are deficiencies, which affect quality and render the data unacceptable or indeterminate. Deficiencies related to field and laboratory measurement systems include but are not limited to instrument malfunctions, blank contamination, quality control sample failures, etc.

Deficiencies are documented in logbooks, field data sheets, etc. by field or laboratory staff and are reported to the cognizant field or laboratory supervisor via a corrective action report (CAR). The supervisor(s) notifies the HDR Technical Coordinator if the deficiency has the potential of being a nonconformance. The HDR Technical Coordinator will notify the HDR QAO of the potential nonconformance within 24 hours.

The HDR Technical Coordinator, in consultation with HDR QAO (and other affected individuals/organizations), will determine if the deficiency constitutes a nonconformance. If it is determined the activity or item in question does not affect data quality and therefore, is not a valid nonconformance, the CAR will be completed accordingly and closed. If it is determined a nonconformance does exist, the HDR Technical Coordinator in consultation with the HDR QAO will determine the disposition of the nonconforming activity or item and necessary corrective action(s); results will be documented on the CAR.

CARs document root cause(s); impact(s); specific corrective action(s) to address the deficiency; action(s) to prevent recurrence; individual(s) responsible for each action; the timetable for completion of each action; and the means by which completion of each corrective action will be documented. Notification of deficiencies documented by CARs associated with nonconformances will be included with quarterly progress reports. In addition, significant conditions (i.e., situations which, if uncorrected, could have a serious effect on safety or on the validity or integrity of data) will be reported to the TSSWCB both verbally and in writing.

Analyses associated with the remark codes “holding time exceedance,” “sample received unpreserved,” “estimated value,” etc. may have unacceptable measurement uncertainty associated with them. Therefore, data with these types of problems are not to be reported to NETMWD and TSSWCB.

B5 QUALITY CONTROL

Sampling Quality Control Requirements and Acceptability Criteria

The following minimum Field QC Requirements for water samples are outlined in the TCEQ *Surface Water Quality Monitoring Procedures Manual.* Specific requirements are outlined below. Field QC sample results are submitted with the laboratory data report (see Sections A9 and C2).

Field Equipment Blank – Field equipment blanks are required for samples when collected using sampling equipment such as peristaltic pumps, buckets, bailers, or autosamplers. An equipment blank is a sample of reagent water poured into a sample bottle, or poured over or pumped through a sampling or analysis device. It is collected in the same type of container as the environmental sample, preserved in the same manner and analyzed for the same parameter. The analysis of equipment blanks should yield values less than the AWRL. Field equipment blanks will be analyzed at a rate of one per 10 samples (10%) collected with each type of equipment.

Laboratory Measurement Quality Control Requirements and Acceptability Criteria

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. Lab QC sample results are submitted with the laboratory data report (see Section A9.).

AWRL/Reporting Limit Verification

The laboratory's reporting limit for each limit will be at or below the AWRL. To demonstrate the ongoing ability to recover at the reporting limit, the laboratory will analyze a calibration standard (if applicable) at or below the reporting limit on each day Nonpoint Source Program samples are analyzed.

Two acceptance criteria will be met or corrective action will be implemented. First, calibrations including the standard at the reporting limit will meet the calibration requirements of the analytical method. Second, the instrument response (e.g., absorbance, peak area, etc.) for the standard at the reporting limit will be treated as a response for a sample by use of the calibration equation (e.g., regression curve, etc.) in calculating an apparent concentration of the standard. The calculated and reference concentrations for the standard will then be used to calculate percent recovery (%R) at the reporting limit using the equation:

$$\%R = CR/SA * 100$$

where CR is the calculated result and SA is reference concentration for the standard. Recoveries must be within 75-125% of the reference concentration.

When daily calibration is not required, or a method does not use a calibration curve to calculate results, the laboratory will analyze a check standard at the reporting limit on each day wet weather samples are analyzed. The check standard does not have to be taken through sample preparation, but must be recovered within 75-125% of the reference concentration for the standard. The percent recovery of the check standard is calculated using the following equation in which %R is percent recovery, SR is the sample result, and SA is the reference concentration for the check standard:

$$\%R = SR/SA * 100$$

If the calibration (when applicable) or the recovery of the calibration or control standard is not acceptable, corrective actions (e.g., re-calibration) will be taken to meet the specifications before proceeding with analyses of NPS samples.

The laboratory will report results of quantitation checks with the data.

Laboratory Control Standard (LCS) - A LCS consists of analyte-free water spiked with the analyte of interest prepared from standardized reference material. The LCS is spiked into laboratory-pure water at a level less than or equal to the mid-point of the calibration curve for each analyte. The LCS is carried through the complete preparation and analytical process. The LCS is used to document the bias of the analytical process. LCSs are run at a rate of one per batch. Results of LCSs are calculated by percent recovery (%R), which is defined as 100 times the measured concentration, divided by the true concentration of the spiked sample.

The following formula is used to calculate percent recovery, where %R is percent recovery; SR is the measured result; SA is the true result

$$\%R = SR/SA * 100$$

Performance limits and control charts are used to determine the acceptability of LCS analyses. Project control limits are specified in Table A7.1.

Laboratory Duplicates - A laboratory duplicate is prepared in the laboratory by splitting aliquots of an LCS. Both samples are carried through the entire preparation and analytical process. LCS duplicates are used to assess precision and are performed at a rate of at least one per batch of 20 samples, or once per day, whichever is greater.

For most parameters, precision is calculated by the relative percent difference (RPD) of LCS 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:

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

Performance limits and control charts are used to determine the acceptability of duplicate analyses. Project control limits are specified in Table A7.1.

Matrix spike (MS) - A matrix spike is an aliquot of sample spiked with a known concentration of the analyte of interest. Percent recovery of the known concentration of added analyte is used to assess accuracy of the analytical process. The spiking occurs prior to sample preparation and analysis. Spiked samples are routinely prepared and analyzed at a rate of 10% of samples processed, or one per batch whichever is greater. The MS is spiked at a level less than or equal to the midpoint of the calibration or analysis range for each analyte. Percent recovery (%R) is defined as 100 times the observed concentration, minus the sample concentration, divided by the true concentration of the spike.

The percent recovery of the matrix spike is calculated using the following equation in which %R is percent recovery, SSR is the observed spiked sample concentration, SR is the sample result, and SA is the reference concentration of the spike added:

$$\%R = (SSR - SR)/SA * 100$$

MS recoveries are plotted on control charts and used to control analytical performance. Measurement performance specifications for matrix spikes are not specified in this document.

Method blank - A method blank is an analyte-free matrix to which all reagents are added in the same volumes or proportions as used in the sample processing and analyzed with each batch. The method blank is carried through the complete sample preparation and analytical procedure. The method blank is used to document contamination from the analytical process. The analysis of method blanks should yield values less than the reporting limit. For very high-level analyses, the blank value should be less then 5% of the lowest value of the batch, or corrective action will be implemented.

Additional method specific QC requirements - Additional QC samples are run (e.g., special LCS studies, continuing calibration samples) as specified in the methods. The requirements for these samples, their acceptance criteria, and corrective action are method-specific.

Deficiencies, Nonconformances and Corrective Action Related to Quality Control

Deficiencies are defined as unauthorized deviations from procedures documented in the QAPP. Nonconformances are deficiencies, which affect quality and render the data unacceptable or indeterminate. Deficiencies related to quality control include but are not limited to field and laboratory quality control sample failures.

Deficiencies are documented in logbooks, field data sheets, etc. by field or laboratory staff and are reported to the cognizant field or laboratory supervisor via a corrective action report (CAR). The NETMWD Project Manager/Field Operations Supervisor notifies the HDR Technical Coordinator if the deficiency has the potential of being a nonconformance. The HDR Technical Coordinator will notify the HDR QAO of the potential nonconformance within 24 hours.

The HDR Technical Coordinator, in consultation with HDR QAO (and other affected individuals/organizations), will determine if the deficiency constitutes a nonconformance. If it is determined the activity or item in question does not affect data quality and therefore, is not a valid nonconformance, the CAR will be completed accordingly and closed. If it is determined a nonconformance does exist, the HDR Technical Coordinator in consultation with the HDR QAO will determine the disposition of the nonconforming activity or item and necessary corrective action(s); results will be documented on the CAR.

CARs document root cause(s); impact(s); specific corrective action(s) to address the deficiency; action(s) to prevent recurrence; individual(s) responsible for each action; the timetable for completion of each action; and the means by which completion of each corrective action will be documented. Notification of deficiencies documented by CARs associated with nonconformances will be included with quarterly progress reports. In addition, significant conditions (i.e., situations which, if uncorrected, could have a serious effect on safety or on the validity or integrity of data) will be reported to the TSSWCB both verbally and in writing.

B6 INSTRUMENT/EQUIPMENT TESTING, INSPECTION AND MAINTENANCE

All sampling equipment testing and maintenance requirements are detailed in the 2003 TCEQ *Surface Water Quality Monitoring Procedures Manual*. Sampling equipment is inspected and tested upon receipt and is assured appropriate for use. Equipment records are kept on all field equipment and a supply of critical spare parts is maintained. Automated samplers are inspected at least every two weeks. A general maintenance (GM) sheet (Appendix D) is completed to ensure that the equipment is in good working order. If problems cannot be corrected on-site during the inspection, required adjustments or repairs will be made as soon as possible. The GM sheet is also filled out when samples are retrieved during rainfall runoff events.

All laboratory tools, gauges, instrument, and equipment testing and maintenance requirements are contained within laboratory standard operating procedures or manufacturer's operation manuals. Testing and maintenance records are maintained and are available for inspection by the TSSWCB. Instruments requiring daily or in-use testing include, but are not limited to, water baths, ovens, autoclaves, incubators, refrigerators, and laboratory-pure water. Critical spare parts for essential equipment are maintained to prevent downtime. Maintenance records are available for inspection by the TSSWCB.

Incidents that involve deficiencies associated with instrument/equipment testing, inspection and maintenance will be resolved and documented as discussed in Section B4 (Analytical Methods).

B7 INSTRUMENT CALIBRATION AND FREQUENCY

Field equipment calibration requirements are contained in the 2003 TCEQ *Surface Water Quality Monitoring Procedures Manual*. Post-calibration error limits and the disposition resulting from error are adhered to. Data not meeting post-error limit requirements invalidate associated data collected subsequent to the pre-calibration and are not submitted to the TSSWCB.

Detailed laboratory calibrations are contained within the standard operating procedures. Each contracting Laboratory standard operating procedures 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 includes, but is not limited to, thermometers, pH meters, balances, incubators, and analytical instruments.

Incidents that involve deficiencies associated with instrument/equipment calibration and frequency will be resolved and documented as discussed in Section B4 (Analytical Methods).

B8 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

All new batches of field and laboratory supplies are inspected and tested before use to ensure that they are adequate and not contaminated. Supplies are inspected upon receipt to confirm shipping condition, quality requirements, and quantity. Chemicals, reagents and standards are dated upon receipt of initial purchase or logged into an inventory database that documents grade, lot number, manufacturer, dates received, opened & emptied. All reagents shall meet ACS grade or equivalent where required. Acceptance criteria are detailed in organization's standard operating procedures. The laboratory standard operating procedures provide additional details on acceptance requirements for laboratory supplies and consumables.

B9 NON-DIRECT MEASUREMENTS

Evaluations used in this project will be based on data collected from the edge-of-field study sites during the time frame of this project. The study sites selected for this project will utilize technology consistent with other open pasture management procedures used in similar studies to help in the development and establishment of small scale mathematical models (SWAT modeling). Mathematical modeling of nonpoint source loading derived from this study will require a separate quality assurance project plan (QAPP).

B10 DATA MANAGEMENT

Data Path

Samples are collected and transferred to the laboratory for analysis as described in Sections B2, and B3 and Appendix B. After the data have been received from the lab analyst, the data management plan is implemented. Each sampling event is given a unique tag that will correlate to the site location, date, time, sampling depth, and any other specific data collected at that event. Results from laboratory data sheets and field data sheets, which correspond with the same sampling event, are manually entered into the interim database tables using Excel software. This information will be quality checked by comparing it with the appropriate monitoring schedule to verify that the correct stations have been sampled, that the correct sets of measurements and samples have been collected, and that calibration procedures have been correctly applied. Data forms specifically designed for use with this project will assist in timely and accurate data input. Quality assurance and control is integrated at all points along this process, with review of sample field sheets, chain of custody forms, analyst's bench sheets, control charts, and lab reports. After data verification and validation, data are exported from the temporary database in ASCII delimited text files in an approved format. The interim data are added to the primary database following final approval of the data.

Record-keeping and Data Storage

Contractor record keeping and document control procedures are contained in the water quality sampling and laboratory standard operations procedures (SOPs) and this QAPP. Copies of Ana-Lab laboratory SOPs are retained by the Ana-Lab and are available for review. Copies of TCE laboratory SOPs are retained by the TCE laboratory and are available for review. Original field data sheets, copies of the Chain of Custody forms sent to the lab, field notes, and other data will be deposited with HDR Engineering, Inc. (HDR), for data screening, quality assurance, and input to the interim database. Once the data management procedures have been completed, copies of all information will be deposited with NETMWD and retained by NETMWD in the central office files for 10 years. No current project files or critical data are stored on the hard drive of any workstation, or floppy disks. Database files are backed up daily with a mirror hard drive system installed on the HDR network. In addition, files are also backed up with a tape drive, which runs a scheduled program each evening after regular office hours. These backup tapes are removed from the office each week and stored off site. Disaster recovery will be accomplished by utilizing one or both of these backup methods to restore project files.

Data Verification/Validation

The analytical laboratory supervisor is responsible for the management and submission of valid data from the laboratory analyses. The laboratory supervisor either validates the analytical data by comparing the various quality control measurements and by recalculating a random selection of the results produced by each analyst submitting data or verifies the analytical data by comparing the sample data to historical QC data and internal reference standards. The laboratory services manager using the labs standard reporting format will provide results to the HDR (HDR Engineering, Inc.) Data Manager. The analytical laboratory will retain files of all quality assurance verifications for at least ten years and make them available for inspection on request.

The HDR Data Manager will be responsible for the review of all field and laboratory generated data for consistency with QA criteria, for accuracy of the input operations, and for timely entry into the interim database and transfer to the primary database after final approval. The Data Manager will also be responsible for assuring that all field activity reports, calibration records, and general information are maintained and properly filed according to the particular investigations of the project.

The HDR Project Manager will be responsible for determining what data, if any, will be deleted from the database. The Project Manager and laboratory responsible for analysis will initially review any questions concerning analytical data. If a modification of the data originally reported is deemed necessary, documentation of the original data, the question concerning that data, and the modified data along with the copies of the data change will be entered in the Data Managers data log and saved in paper format. Data will only be deleted from the database files if it is determined to be erroneous, or is found to have been collected in a manner that does not follow the appropriate guidelines for data procurement. The Data Manager will alert the Project Manager to any abnormalities or apparent outliers. The Project Manager will evaluate the data and determine if any statistical tests need to be performed to further evaluate the data. The Quality Assurance Officer will be responsible for reviewing a random 10% of the data for any problems such as exceeded holding times or exceeded precision/accuracy limits.

Forms and Checklists

See Appendix C for the Data Summary
See Appendix D for the Field Data Sheets
See Appendix E for the Corrective Action Report Form
See Appendix F for the Chain of Custody Forms

Data Handling

Data are processed using the Microsoft Excel software program. All Excel files exported are in tab delimited text format or comma delimited format to ensure correct transfer of all information. After the conversion of any database files into another format, a ten-percent check of the transferred files occurs. File transfer and checking is primarily a responsibility of the Quality Assurance Officer. No data from external sources are maintained within the database files for this project.

Hardware and Software

Project requirements are evaluated by NETMWD and its consultants to insure that the dedicated hardware continues to be suitable. The recommended software and hardware required to meet the basic requirements of the program have been identified, and are being utilized. Criteria for hardware includes performance capable of running anticipated software and potentially useful future software products, as well as storage capacity appropriate to maintain all program-related software, and numerous years of data. Criteria for software includes the capability to manipulate, evaluate, report, and manage all data.
HDR Engineering, Inc. maintains commercial software operating in the Microsoft Windows 2000 environment. Microsoft Office 2000, which includes Microsoft Word, Microsoft Excel, and Microsoft Access, is maintained for basic report preparation, data entry, and exploratory data analysis. For more complex data analysis, Sigma Stat and Statistical Ecology statistics programs are maintained. Once entered, screened, quality checked and accepted the data is converted into tab-delimited text files for database storage and transfer to NETMWD. Arc View 3.1, and Corel Draw 9.0 are maintained for GPS (Global Positioning System), GIS (Geographic Information Systems), and graphics support.

Information Resource Management Requirements

All data submitted will be screened by the Quality Assurance Officer prior to submission to ensure that all data records use the proper format and contain all required information.

C1 ASSESSMENTS AND RESPONSE ACTIONS

The following table presents the types of assessments and response actions for data collection activities applicable to the QAPP.

Table C1.1 Assessments and Response Requirements

Assessment Activity	Approximate Schedule	Responsible Party	Scope	Response Requirements
Status Monitoring Oversight, etc.	Continuous	NETMWD HDR	Monitoring of the project status and records to ensure requirements are being fulfilled	Report to TSSWCB in Quarterly Report
Monitoring Systems Audit	Biennially	TSSWCB	Field sampling, handling and measurement; facility review; and data management as they relate to NPS	30 days to respond in writing to the TSSWCB to address corrective actions
Monitoring Systems Audit	Biennially	NETMWD HDR	Field sampling, handling and measurement; facility review; and data management as they relate to NPS	30 days to respond in writing to Cypress Creek Basin Planning Agency. PA will report problems to TSSWCB in Progress Report.
Laboratory Inspection	Biennially	TSSWCB Laboratory Inspector	Requirements appearing in lab SOPs and QAPP, ISO/IEC Guide 25, applicable EPA methods and Standard Methods, 40 CFR 136, and other documents applicable to NPS programs including portions of the Texas Administrative Code and the Code of Federal Regulations.	30 days to respond in writing to the TSSWCB to address corrective actions

Corrective Action

The HDR QAO 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 and the HDR QAO. Corrective action documentation will be submitted to the TSSWCB on a quarterly basis with the Progress Report.

If audit findings and corrective actions cannot be resolved, then the authority and responsibility for terminating work are specified in the TSSWCB QMP and in agreements in contracts between participating organizations.
Corrective actions include identification of root causes and a methodology for correcting the problems. The effect of the problem on the quality of the data is ascertained and documented on the CAR. The programmatic impact (up to and including the removal of data from the database) of the deficiency must be ascertained and documented. The impact of deficiencies must be made on a case-by-case basis in consultation with the Cypress Creek Basin QAO.

C2 REPORTS TO MANAGEMENT

Laboratory Data Reports

Laboratory data reports contain the results of all specified QC measures listed in section B5, including but not limited to laboratory duplicates, laboratory control standards, and calibrations. This information is reviewed by the Cypress Creek Basin QAO and compared to the pre-specified acceptance criteria to determine acceptability of data before forwarding to the Cypress Creek Basin Project Manager. This information is available for inspection by NETMWD and TSSWCB.

Reports to Cypress Creek Basin Planning Agency Project Management

Each project participants submit written quarterly progress reports to the Cypress Creek Basin QAO concerning the status of each project task, including data collection activities, for which they are responsible. Any issues or problems associated with the quality of the data are reported to the Cypress Creek Basin Project Manager through the use of Corrective Action Reports.

Reports to TSSWCB Project Management

Quarterly Progress Report – HDR will summarize the NETMWD, Ana-Lab and TCE activities for each task; reports problems, delays, and corrective actions; and outlines the status of each task's deliverables.

Monitoring Systems Review Audit Report/Laboratory Audit Report and Response - Following any audit performed by TSSWCB, a report of findings, recommendations and response is sent to the Cypress Creek Basin Planning Agency in the quarterly progress report.

Final Project Report - Summarizes NETMWD's and subcontractors' activities for the entire project period including a description and documentation of major project activities; evaluation of the project results and environmental benefits; and a conclusion.

D1 DATA REVIEW, VERIFICATION, AND VALIDATION

All field and laboratory data will be reviewed and verified for integrity and continuity, reasonableness, and conformance to project requirements, and then validated against the data quality objectives, which are listed in Section A7. Only those data, which are supported by appropriate quality control data and meet the data quality objectives defined for this project will be considered acceptable, and will be reported to NETMWD and TSSWCB.

The procedures for verification and validation of data are described in Section D2, below. The Cypress Creek Basin Planning Agency Data Manager (or designee) is responsible for ensuring that field data are properly reviewed and verified for integrity and submitted in the required format to the project database. The Ana-Lab Laboratory Manager and TCE Testing Laboratory Director are responsible for ensuring that analytical laboratory data are scientifically valid, defensible, of acceptable precision and accuracy, and reviewed for integrity. The Cypress Creek Basin Planning Agency Data Manager will be responsible for ensuring that all data are properly reviewed and verified, and submitted in the required format to the project database. The Cypress Creek Basin Planning Agency QAO is responsible for validating the data. Finally, the Cypress Creek Basin Planning Agency Project Manager, with the concurrence of the Cypress Creek Basin Planning Agency QAO, is responsible for validating that all data to be reported meet the objectives of the project and are suitable for reporting to TSSWCB.

D2 VERIFICATION AND VALIDATION METHODS

All field and laboratory data will be reviewed, verified and validated to ensure they conform to project specifications and meet the conditions of end use as described in Section A7 of this document.

Data review, verification, and validation will be performed using self-assessments and peer and management review as appropriate to the project task. The information to be reviewed, verified, and validated (listed by task and responsible party in Table D2.1) is evaluated against technical and project specifications and checked for errors, especially errors in calculations, data reduction, and transcription. Potential errors are identified by examination of documentation and by manual (and computer-assisted) examination of corollary or unreasonable data. If a question arises or an error is identified, the manager of the task responsible for generating the data is contacted to resolve the issue. Issues, which can be corrected are corrected and documented. If an issue cannot be corrected, the task manager consults with higher-level project management to establish the appropriate course of action, or the data associated with the issue are rejected. Field and laboratory reviews, verifications, and validations will be documented.

Data validation tasks to be addressed by Cypress Creek Basin Planning Agency include, but are not limited to, the confirmation of lab and field data review, evaluation of field QC results, additional evaluation of anomalies and outliers, analysis of sampling and analytical gaps, and confirmation that all parameters and sampling sites are included in the QAPP. Any suspected errors or anomalous data must be addressed by the manager of the task associated with the data before data validation can be completed. A second element of the validation process is consideration of any findings identified during the annual monitoring systems audit conducted by the TSSWCB Quality Assurance Officer assigned to the project. Any issues requiring corrective action must be addressed, and the potential impact of these issues on previously collected data will be assessed. Finally, the HDR Project Manager validates that the data meet the data quality objectives of the project and are suitable for reporting to NETMWD and TSSWCB. Pertinent information having to do with inconsistencies with reporting limit specifications; failures in sampling methods and/or laboratory procedures resulting in unavailable data; etc. will be provided on the Data Summary when the data are submitted to the to NETMWD and TSSWCB.

Table D2.1 Data Review, Verification, and Validation Tasks

Task	Verification	Validation	Responsibility
Field data reviewed for conformance with data collection, sample handling and chain of custody, analytical and QC requirements	Y		FOS and TC
Post-calibrations checked to ensure compliance with error limits	Y		Field Operation Supervisor
Field data calculated, reduced, and transcribed correctly	Y		FOS and TC
Laboratory data reviewed for conformance with data collection, sample handling and chain of custody, and analytical and QC requirements to include documentation, holding times, sample receipt, sample preparation, sample analysis, project and program QC results, and reporting	Y		Laboratory Manager/Director, QAO and DM
Laboratory data calculated, reduced, and transcribed correctly	Y		Laboratory Manager/Director & QAO
Reporting limits consistent with requirements for Ambient Water Reporting Limits.	Y	Y	Laboratory Manager/Director & QAO
Analytical data documentation evaluated for consistency and/or improper practices	Y	Y	Laboratory Manager/Director QAO and DM
Analytical QC information evaluated to determine impact on individual analyses	Y	Y	Laboratory Manager/Director & QAO
All laboratory samples analyzed for all parameters	Y	Y	Laboratory Manager/Director & QAO
Data set (to include field and laboratory data) evaluated for reasonableness and if corollary data agree	Y	Y	Laboratory Manager/Director & QAO
Data review, verification, and validation performed and deviations documented		Y	Laboratory Manager/Director & QAO
Outliers confirmed and documented		Y	QAO
Field QC acceptable (e.g., field splits)		Y	Laboratory Manager/Director
Sampling and analytical data gaps checked and documented		Y	QAO
Verification and validation confirmed. Data meets conditions of end use and are reportable		Y	QAO, DM, TC, PM Manager

D3 RECONCILIATION WITH USER REQUIREMENTS

The data collected in this project can be used by TSSWCB and other agencies as part of efforts to address nonpoint source pollution issues in impaired watersheds. Data that do not meet requirements will not be submitted to NETMWD, TSSWCB or EPA nor will be considered appropriate for any of the uses noted above. Data, which do not meet requirements (i.e., not considered representative of ambient water quality), will not be submitted.

Samples collected from this project will be analyzed by the Ana-Lab and Texas Cooperative Extension laboratories and reported to project partners for evaluation

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APPENDIX A. Work Plan

Assessment and Mitigation of Agricultural and Other Nonpoint Source Activities in the Cypress Creek Basin
Texas State Soil and Water Conservation Board
FY05 CWA Section 319(h)
WORK PLAN

Problem/Need Statement: The basis for this project is to support implementation of agricultural best management practices (BMPs) to reduce nutrient runoff from agricultural operations in the Lake O' the Pines watershed. The upper reservoir was listed on the State of Texas 303(d) lists for 1998 and 2000 for the stream standards violations of dissolved oxygen concentrations found to be below the level established to assure optimum conditions for aquatic life. The Cypress Creek Basin, which includes the Lake O' the Pines watershed, is the site of major poultry (chicken) production facilities activity. Water quality monitoring, storm runoff studies, and modeling results have shown that poultry production, processing, and waste disposal are a source of significant contribution to the nutrient load currently entering Big Cypress Creek from both point and nonpoint sources, and the cause of violations of the dissolved oxygen standard in Lake O' the Pines (Segment 0404).

Operation of production facilities, particularly the use of poultry litter as fertilizer on pasturelands, contributes excess nitrogen, phosphorus, oxygen demanding organic matter, and possibly other materials, to surface water, while the discharge of treated wastewater from poultry processing facilities is contributing substantial amounts of nutrients to Big Cypress Creek and the Lake O' the Pines. Local effects on water quality have been shown to be positively related to poultry production activity under low flow conditions, while storm-generated surface runoff is the primary route through which nitrogen and phosphorous along with other pollutants enter Lake O' the Pines at the bottom of this impaired watershed (Paul Price Associates, Inc., 2001; Ward, 2003).

This project is an integral and essential part of the Implementation Plan following the findings and recommendations of the completed Lake O' the Pines Total Maximum Daily Load (TMDL) program submitted to TCEQ for adoption and ultimately EPA approval. Monitoring results from twelve study sites will be used to calibrate and verify (validate) small scale SWAT models developed at each study site. As part of the sampling process, it is expected to identify important variables that generally define nutrient loss rates in the local setting, to quantify loss rates from the study sites, and to estimate the reductions in nutrient loss with present and projected levels of BMP implementation.

Presently, the largest poultry producer in the Cypress Creek Basin, Pilgrims Pride Corporation, is in the process of making major changes in its operations. These changes include construction of new processing facilities and changes in waste handling practices which are intended to achieve major reductions in point source loadings of nitrogen and phosphorus. At the same time, Best Management Practices (BMPs) developed for handling and disposal of poultry litter and nutrient management plans are being implemented among Pilgrims Pride corporate and contract growers with assistance from the local Soil and Water Conservation Districts. Pilgrims Pride Corporation is requiring their corporate and contract growers to implement appropriate practices by developing Water Quality Management Plans (WQMP) with assistance from the Texas State Soil and Water Conservation Board (TSSWCB). TSSWCB administers and carries out Texas' soil and water conservation law, and coordinates Texas' soil and water conservation program with Soil and Water Conservation Districts (SWCDs). The TSSWCB is the lead agency in Texas for the management of agricultural and silvicultural nonpoint source (NPS) pollution, as designated under Title 7, Chapter 201, Section 201.026 of the Agriculture Code of Texas. The TSSWCB addresses the prevention and/or the abatement of nonpoint source pollution through WQMP development and implementation. A WQMP is a site-specific plan, which includes appropriate land treatment practices, production practices, technologies and combinations thereof, and an implementation schedule.

Because of the large contribution of nutrients, particularly phosphorus, from non-point agricultural sources, implementation of the TMDL in the Lake O' the Pines watershed will depend critically on the increased efficiency with which those nutrients can be retained in the agricultural systems, and not be allowed to escape to cause problems in the receiving waterways. However, the effectiveness of the WQMPs in reducing nutrient runoff from waste application fields in the particular context of the Lake O' the Pines watershed is not known with certainty beyond the rather wide ranges reported in existing literature (Young et al., 1996).

Additionally, partially treated sewage from malfunctioning on-site sewage facilities for homes or businesses not connected to a public sewer system has been identified as a principal or contributing source of water quality degradation. Improper system operation and maintenance or the use of outdated technologies can cause water quality problems allowing wastewater to come in contact with people or enter the natural environment untreated. Public outreach will be necessary for the identification and replacement of failing on-site sewage facilities.

General Project Description: The primary focus of the 319(h) program is to provide funds to states to implement technical assistance/best management practices (BMPs) that abate or reduce NPS pollution. This particular project will evaluate the effectiveness of applied WQMPs in reducing the runoff of nutrients from fields that receive applications of poultry litter. The litter used in the production of poultry (broiler chickens) in the Lake O' the Pines watershed is commonly disposed of by its beneficial application as fertilizer to fields used in the production of grasses used as forage for cattle. Application sites may be located on the poultry growers' property, or it may be applied to the property of other parties. It is estimated by Pilgrims Pride Corporation that roughly half of the poultry litter generated in the Cypress Creek Basin is applied outside of the basin. An important component of the WQMPs being implemented in the Lake O' the Pines watershed (and, more broadly in the Cypress Creek Basin) are Best Management Practices (BMPs) to reduce runoff of sediments and nutrients from the waste application fields. These BMPs include limitations on application rates, soil nutrient thresholds above which waste application are to be limited, and structural improvements such as filter strips and setbacks from stream courses.

Storm water studies conducted as part of the Lake O' the Pines TMDL program have shown that the presence of poultry litter application sites in a subwatershed can substantially increase nitrogen and phosphorus loads in the receiving streams. However, the relationships among poultry litter application rates, soil types, soil nutrient levels, vegetation cover, presence of BMPs, and field runoff loads of nutrient and sediment is known only generally for the Cypress Creek Basin. Demonstration of varying efficiencies of nutrient retention in the agricultural system, or positive delineation of the extent to which agricultural activities affect the retention of nutrients in the soil or their loss downstream, will lead to better public understanding of the problem and support for water quality protection measures, and will be beneficial to securing voluntary participation in the WQMP program.

The effectiveness of these BMPs will be evaluated through a series of small-scale comparative runoff studies which will be integrated with the water quality data collected and compiled in the CRP and TMDL programs. This analysis will supplement and complement monitoring in Lake O' the Pines and its watershed currently conducted under the Clean Rivers Program, or as part of the TMDL implementation plan. Land owners willing to participate in the project will be sought with the help of an advisory committee consisting of invited representatives of NETMWD, TSSWCB, Sulphur/Cypress Soil and Water Conservation District (SWCD), TCEQ, Pilgrims Pride Corporation, interested agricultural operators, local independent contractors, local commercial fertilization companies, and Texas Cooperative Extension.

The TSSWCB will contract with NETMWD who will then subcontract with HDR. NETMWD will monitor rainfall induced runoff from and soil test the monitoring fields located on the property of cooperating agricultural operations. The runoff monitoring effort will make use of automated sampling systems in NETMWD's possession that will be made available to this project. Laboratory analysis of samples will be conducted using Ana-Lab Corporation's water quality laboratory.

This project consists of installing and operating edge-of-field monitoring equipment at 12 study sites to represent three litter application histories (none, <1ton/acre, >5tons/acre, cumulative for the last five years), presence/absence of WQMP approved BMPs, and the two predominant soil types in the subwatersheds already identified as sources of excess nutrients (i.e., Tankersley, Hart, Dry, Prairie, and Boggy Creeks). Installation of monitoring equipment will require trained personnel to address the runoff characteristics and topography of the litter application fields to be monitored. Automated samplers and runoff flumes will be placed at locations where natural flow occurs during storm events in effort to minimize installation costs. However, it may be necessary to perform site work to direct flow if the landscape does not properly lend itself naturally.

Addressing surface and groundwater protection from NPS impacts due to failing on-site sewerage facilities will require the establishment of a committee comprised of On-Site Sewage System Enforcement Agencies from Franklin, Titus, Camp, Morris, Upshur, Harrison, Marion and Cass counties. This committee will utilize the NETMWD Supplemental Environment Project (SEP) fund to identify and mitigate failing on-site sewage facilities within the SEP Project boundary.

NETMWD will produce a final report 1) summarizing three years of project activities, 2) reviewing project goals and objectives and their achievement and 3) detailing the investigations and findings of the edge of all field studies conducted over a three year period. Data analysis will be focused on using the results of the individual field studies together with the land use and soil sampling information in the GIS database together with runs of the updated SWAT model to extrapolate the non-point nutrient contributions of the studied agricultural or silvicultural land uses/activities throughout the Cypress Creek Basin. This analysis will also use the results of water quality monitoring projects in Segments 0403 and 0404 to provide continuing validation of SWAT model updates

Section A.1 represents the Work Plan submitted to TSSSCB for the Assessment and Mitigation of Agricultural and Other Nonpoint Source Activities in the Cypress Creek Basin Project.

Section A.1 Assessment and Mitigation of Agricultural and Other Nonpoint Source Activities in the Cypress Creek Basin Work Plan

The Work Plan provides details on the nine specific tasks and subtasks of the contract.

Task 1: Project Coordination and Administration.

Objective: To coordinate project efforts with all project participants, perform accounting functions for project funds, facilitate the organization of the project's Watershed Advisory Committee, organize the group of enforcement entities to be involved in the OSSF replacement task, and secure permission to survey properties for inclusion in the project.

Task 1.1 Northeast Texas Municipal Water District (NETMWD) will perform accounting functions necessary to coordinate project fund expenditures.

Task 1.2 NETMWD will act as the lead agency to coordinate all efforts of the project. NETMWD will work closely with all agencies and entities involved to ensure project objectives are properly met.

Task 1.3 NETMWD will facilitate the organization of the Watershed Advisory Committee. The committee would be made up of stakeholders (point and nonpoint source users) and government agency partners. The committee is to be established by the current Clean Rivers Program Steering Committee. NETMWD will continue to facilitate information exchange among participants for the duration of the project.

Task 1.4 NETMWD will organize and coordinate a committee made up of Designated Representatives from OSSF Program enforcement entities involved in the OSSF replacement task.

Task 1.5 HDR Engineering, Inc. (HDR), with assistance from NETMWD staff, will initiate the identification of 12 potential study sites within participating properties using existing GIS-based data.

Deliverables

- Copies of materials employed to solicit Watershed Advisory Committee membership.
- List of Watershed Advisory Committee members.
- Quarterly and annual reports including updated Watershed Advisory Committee membership, minutes of meetings.
- List of OSSF Replacement Program committee members.
- GIS map(s) of potential study sites.

Task 2: Site Selection and Study Planning

Objective: To identify and select twelve study sites to represent three litter application histories (none, <1ton/acre, >5tons/acre, cumulative for the last five years), presence/absence of WQMP approved BMPs, and the two predominant soil types in the subwatersheds already identified as sources of excess nutrients (i.e., Tankersley, Hart, Dry, Prairie, and Boggy Creeks). Study sites will not be replicated; instead all sites will be monitored for the duration of the study on the assumption that variation among storm events will be substantially greater than variation among sites. This study will confirm or deny that assumption and provide basic data to evaluate the necessity, and guide the design of, future studies of the influence of specific site characteristics programs and in Big Cypress Creek and Lake O' the Pines.

Task 2.1 HDR will assist NETMWD staff and participants from the Watershed Advisory Committee to conduct field surveys and develop a matrix evaluation of site suitability. Somewhat simplifying matters, the soils do not vary greatly across the subwatersheds, consisting predominantly of acid and sandy alfisols and ultisols weathered from sandstone, and occasionally shale (Scott, 2000). Table 1 was developed from the STATSGO and SSURGO data bases (NRCS, 1994, 1995) during the Lake O' the Pines TMDL project (Ward, 2002, 2003). The dominant land use (typically 60-80%) in all these basins is "crop and pastureland", which is overwhelmingly rangeland for cattle grazing, fertilized pasture employed for hay production or some combination of the two (Paul Price Associates, Inc., 1998, 2001, Ward, 2003). Obtain GPS coordinates for sampling stations.

Table 1
Main MUID soil associations for wet weather catchments used in SWAT validation (Ward, 2002)

MUID		description	fraction of watershed
	10263	***Tankersley Creek at FM127***	
TX620		WOODTELL-FREESTONE-BERNALDO	0.83
TX619		WOLFPEN-PICKTON-WOODTELL	0.08
TX172		ESTES-MANTACHIE-BIENVILLE	0.09
	10266	***Hart Creek at Titus County Road***	
TX620		WOODTELL-FREESTONE-BERNALDO	0.61
TX619		WOLFPEN-PICKTON-WOODTELL	0.21
TX357		NAHATCHE-CROCKETT-WOODTELL	0.16
TX067		BOWIE-CUTHBERT-KIRVIN	0.03
	16455	***Alley Creek approx. 8 KM SW of Avinger at SH155***	
TX296		LILBERT-DARCO-BRILEY	0.50
TX122		CUTHBERT-REDSPRINGS-ELROSE	0.50
	17030	***Unnamed Tributary of Prairie Creek at Camp CR1264***	
TX492		SACUL-BOWIE-KULLIT	1.00
	17031	***Tributary of Prairie Creek at Camp CR1140***	
TX067		BOWIE-CUTHBERT-KIRVIN	1.00
	17033	***Boggy Creek at FM144***	
TX620		WOODTELL-FREESTONE-BERNALDO	0.76
TX316		IUKA-GUYTON-MANTACHIE	0.13
TX067		BOWIE-CUTHBERT-KIRVIN	0.11
	17057	***Little Boggy Creek at Crossing of Morris CR3301 (Green Street Rd.)***	
TX620		WOODTELL-FREESTONE-BERNALDO	0.66
TX067		BOWIE-CUTHBERT-KIRVIN	0.18
TX316		IUKA-GUYTON-MANTACHIE	0.15

Deliverables

- GIS based map(s) of selected study sites.
- Tabular summary of study site characteristics
- GPS locations of sampling stations

Task 3: Quality Assurance Project Plan Development

Objective: To develop a Quality Assurance Project Plan (QAPP) using guidelines in EPA QA/R-5 "EPA Guidance for Quality Assurance Project Plan".

Task 3.1: PPAI (now HDR Engineering, Inc.) will develop a Quality Assurance Project Plan (QAPP) that will detail project goals and objectives, the data needs to fulfill those objectives, lists field and laboratory methods, procedures and schedules to be followed, and specify a data management structure and quality assurance protocols.

Deliverables
- Draft QAPP submitted to TSSWCB
- Draft QAPP approved by USEPA

Task 4: Sample Station Construction and Calibration

Objective: To set up all equipment and monitoring site associated construction materials to allow the gathering of flow data and wet weather samples for analysis. Preparation of the Quality Assurance Project Plan (QAPP) and Data Quality Objectives will be developed that details project goals and objectives, the data needs to fulfill those objectives, lists field and laboratory methods, procedures and schedules to be followed, and specify a data management structure and quality assurance protocols.

Task 4.1 HDR will provide assistance to NETMWD personnel during sample station construction and calibration. Most sample fields will require some type of modification to allow concentration and quantitative measurement of runoff volumes. This could include construction or installation of small lengths of fencing, terracing or berms to direct overland flow to the sampling point, but suitability of the field for runoff sampling will obviously be a major factor in site selection. Surface runoff will be diverted into an artificial flume or channel with a temporary weir installed downslope from each experimental site to provide an optimal environment in which to measure water flows and collect water quality samples for the three-year the duration of this project. A weather station consisting of a tipping bucket rain gage and event datalogger will also be established at each of the sample sites, as they are occupied. Rainfall is an extremely variable parameter in the Cypress Creek Basin and will be critical in evaluating runoff and nutrient loading data.

Task 4.2 Install an automated, battery operated sampling system, consisting of a suitable flow meter, automatic sampler, modem and vital accessories at selected locations to collect samples on initiation of surface runoff, at 15 minutes, and at up to three additional samples depending on the persistence of the runoff events. Discharge will be monitored throughout the hydrograph of the event. All gages and loggers will be programmed, setup, and calibrated according to manufacturers' specifications. The flow meters will be calibrated using the most convenient available water source, for example a water truck or a high-volume pump and hose to take water from a nearby pond or stream. Equipment will be quality checked in the lab prior to installation, and function tested subsequent to initial installation following the manufacturers' instructions. Telemetry equipment activated by the water level sensor will be installed to initiate water level monitoring and automated water sampling, and to alert local, trained personnel that a sample event is taking place, so that water samples can be collected and transported to the chemistry laboratory.

Deliverables

- As built diagrams of each automated sampler installation put into service.

Task 5: Maintenance/Sample Collection

Objective: To allow for the maintenance, calibration, and data logging of flow measurement and water sample collection devices and the collection of both storm water quality and soil samples.

Task 5.1 The NETMWD Technician will perform all the necessary station maintenance and sample collection. Sample collection for both soil and wet weather to be performed with assistance from existing NETMWD staff and HDR staff.

Task 5.2 The NETMWD Technician will be responsible for field calibrations of the automated sample stations, and will establish a regular schedule for service and maintenance. The NETMWD Technician will visit the study sites and perform required maintenance immediately following a runoff event sample collection.

Task 5.3 The Technician with assistance from existing NETMWD staff, will maintain up to date event sample plans, insure adequate manpower to collect the runoff water samples as rain events occur and deliver samples to the water quality laboratory within the QAPP specified time limits. Given the climatic conditions typical of the Cypress Creek Basin and the difficulty of event-response sampling, it is reasonable to expect that 3 to 6 adequately monitored events can be obtained from each sample site. Manpower estimates and costs are based on obtaining 5 valid samples per study site over the course of the project, sufficient to provide estimates of seasonal and interannual variation in runoff loading. Parameters to be sampled for include total organic carbon (TOC) total and dissolved phosphorus (TP, OP), ammonia (NH_4^+), nitrite (NO_2^-), nitrate (NO_3^-), total Kjeldahl nitrogen (TKN), total dissolved solids (TDS), and total suspended solids (TSS). The NETMWD Field Operations Supervisor will coordinate with an accredited water quality analysis laboratory to obtain timely, quality assured data, as specified in the QAPP.

Task 5.4 Soil samples will be collected and transported for analysis to a laboratory capable of achieving precision levels consistent with testing techniques accepted by EPA and TCEQ regarding Confined Animal Feeding Operations (CAFOs). According to the rules set forth for Pollution Prevention Plans in Title 30, Part1, Chapter 321 Subchapter B, Rule §321.39 of the Texas Administrative Code, soil analysis shall include the testing for nitrate, phosphorous, potassium, sodium, magnesium, calcium, soluble salts/electrical conductivity and soil water pH. Sampling procedures will be consistent with the accepted soil science techniques for achieving representative and analytical results. TCEQ guidance suggests the collection of one composite soil sample for each soil depth zone per land management unit and for each uniform soil type found within the land management unit. Soil sampling depth is dependent on the type of crop cultivated, cultural practices, tillage depth, and the nutrient parameter to be analyzed. A minimum of 10 sample cores will be collected at random and composited from each of the following soil depth zones: 0-6 inches and 6-24 inches. Surface soil samples are needed from a sample depth zone of 0-6 inches for each of the aforementioned parameters and from 6-24 inches for the more mobile nutrients associated with the nitrogen series. Typical areas such as eroded sections, dead furrows, and fence lines will be avoided during sample collection. Laboratory tracking and quality assurance measures will be consistent with the ongoing Cypress Creek Basin Clean Rivers Program.

Deliverables

- Quality assured data sets reported quarterly as they are collected and analyzed.
- Standard maintenance schedule, quarterly summaries of maintenance activities reported quarterly.

Task 6: Data Management and Quality Assurance

Objective: To utilize data management procedures previously developed by HDR, to screen and store digital data, convert the data received in non-compatible formats to a format suitable for analysis, apply quality control and assurance procedures, and provide data access for current and future users of the data. The software most commonly used for data management are Excel© and Access©. The database is linked to an ArcView© based GIS-type system in which sample results can be mapped and analyzed in a graphic environment. Quality assurance and control is integrated at all points along this process, with sample field sheets, chain of custody forms, analyst's bench sheets, control charts, and lab reports.

Task 6.1 After the data has been received from the source laboratories, it will be screened to insure consistency with the QAPP, including (1) transcription accuracy, and (2) that the quality criteria for that data type was met (e.g., were holding times exceeded, were AWRLs met) prior to its addition to the active database. The analytical structure of the database will consist of tables of descriptive data, such as water quality test results and monitoring data. Water quality data collected through this monitoring program will be introduced into the system by either manual entry, or digital electronic files. A final ten percent validation of all data prior to its submission will be performed before timely entry into the active database. Once the data has been entered, screened, and quality checked, it will be submitted to NETMWD. (Data management Plan for inclusion in QAPP completed by end of month 1, Submit quality assurance documentation quarterly with data submitted under Task 5.4). This task includes screened data transmission to and coordination with Dr George Ward, who will be responsible for refinement and updating of the existing SWAT model of the Lake O' the Pines watershed.

Deliverables

- Quality assurance documentation (field activity reports, calibration records, and general information, field data sheets and notes, copies of the Chain of Custody forms, raw analytic results).

Task 7: On-Site Sewage System Replacement Project

Objective: To utilize NETMWD Supplemental Environmental Project (SEP) fund to identify and mitigate failing on-site sewage facilities in the SEP Project boundary.

Task 7.1: NETMWD will organize a committee made up of the On-Site Sewage System Enforcement Agencies in Franklin, Titus, Camp, Morris, Upshur, Harrison, Marion, and Cass Counties. This committee will develop a list of systems in each of these counties that may qualify for replacement or upgrade.

Task 7.2: This committee will meet on a quarterly basis to determine which of the systems identified should be replaced or brought into compliance with current standards. (The committee will be established in month 2, system replacement and upgrade will begin in month 4, and the project will end when funds are exhausted, estimated time frame 2 years. Quarterly reports submitted by the end of months 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, and 36, annual reports submitted to TSSWCB by end of months 11 and 23.

Deliverables

- 12 quarterly reports and 2 annual reports containing the status of the replacement and upgrade project (# of systems identified, # of systems replaced).
- Final report containing estimates on impact reduction to the environment, total # of systems identified and replaced, and recommendation for future projects.

Task 8: Public Outreach and Education

Objective: 1) To educate ranchers and farmers on the importance of maintaining effective BMPs and WQMPs and the importance of nutrient reductions as it relates to the Lake O' the Pines TMDL, and 2) To educate the rural public and those whom utilize on-site sewage facilities to dispose of wastewater from their household or business on the Environmental and Health & Safety impacts associated with failing septic system waste, some of the steps being taken to mitigate these problems, and best management practices associated with the use of septic systems.

Task 8.1: NETMWD will work with the Texas A&M Texas Cooperative Extension Service, local Soil and Water Conservation District, and County Extension Agents to direct a public outreach program for education of agricultural operators and the public at large concerning sediment and nutrient loss from agricultural land and their impact on water quality. This educational meeting will be held in the City of Mount Pleasant Convention Center in the fall of 2004. This opportunity will be advertised as a basin wide event.

Task 8.2: NETMWD will also work with local Soil and Water Conservation District, and County Extension Agents, to introduce the same educational opportunity to smaller groups for those whom could not be at the area wide meeting or whom choose to have smaller group settings. Have possibly 6 additional meetings in the Cypress Basin area beginning month 9 and being completed by month 14.

Task 8.3: NETMWD will also hold annual meetings in different areas of the basin, to invite the public to hear presentations on the importance of proper maintenance of an on-site sewage system and our program to replace failing systems. Three meetings during the project with the anticipation that we have 125 participants at each meeting and each meeting to last 2 hours. (meetings to be held in month 5, 8, and 11)

Task 8.4: NETMWD will also develop a biannual newsletter for the purpose of reaching those rural residents that fail to come to the OSSF educational meeting, when given in their area. The newsletter will encompass the educational information given at the area meetings as well as information on new technology in the on-site industry.

Task 8.5: NETMWD will also speak at public engagements with civic groups and explain the aspects of this study approach and the various task associated with this project. (Speak with 4 groups/year throughout the duration of the project). HDR will assist NETMWD staff in the presentation of this information at least two engagements per year.

Deliverables

- Quarterly reports to include all information associate with each meeting or publication from that quarter, to include copies of notices, copies of publications, meeting agendas and notes or minutes.

Task 9: SWAT Modeling

Objective: Employ the results of non point nutrient loss from specific land use types (this study), together with the results of other aquatic monitoring programs, to examine and refine, as appropriate, elements of the SWAT model which are currently based on literature values or limited local data. Operate the SWAT model to better evaluate land use impacts to nutrient loading to Lake O' the Pines, effectiveness of BMPs, and progress toward achieving the goals of the TMDL.

Task 9.1: Small scale SWAT models will be calibrated and verified for each study site using measured properties (e.g., soils and soil nutrients, vegetative cover and cover types, seasonal effects, antecedent conditions, runoff rates, TSS and nutrient concentrations) instead of the literature values employed in the Lake O' the Pines TMDL modeling.

Task 9.2: The validated models will be used to identify the major variables affecting nutrient loss from the study sites and examine the relationships among those variables in order to evaluate the effectiveness of water quality management plans (WQMPs) in limiting nutrient loss and to estimate basinwide progress in reducing agricultural nutrient loss since the widespread imposition of WQMPs in the Lake O' the Pines watershed began in about 2000.

Deliverables

- A validated SWAT model for each study site. Model documentation including identification of measured variables used in each model together with an evaluation their respective confidence intervals and major differences, where they occur, with previously employed input variables.
- Model runs necessary to estimate the nutrient reductions achieved through time as WQMPs have been implemented. The results of the SWAT modeling of the study sites will be appropriately presented in the final report (Task 10)

Task 10: Data Analysis and Reporting

Objective: To allow for the preparation and submittal of quarterly status report summarizing activities conducted and raw data collected during each preceding quarter and annual reports, detailing progress in achieving Task goals and objectives, and success in meeting project schedules will be submitted at the end of the first and second year.

Task 10.1: A final project report will be prepared briefly summarizing three years of project activities, reviewing project goals and objectives and their achievement, and detailing the investigations and findings of the edge of all field studies conducted during the three years of the 319(h) grant. The final report will include discussion of the methods used and the locations sampled, a results presentation summarizing the data collected, the edaphic conditions, and the agricultural activities and characteristics at each sample site, and an analysis, discussion and conclusions section. Data analysis will be focused on using the results of the individual field studies together with the land use and soil sampling information in the GIS database together with runs of the updated SWAT model to extrapolate the non-point nutrient contributions of the studied agricultural or silvicultural land uses/activities throughout the Cypress Creek Basin. This analysis will also use the results of water quality monitoring projects in Segments 0403 and 0404 to provide continuing validation of SWAT model updates. The authors of the Phosphorus Index study will be invited to collaborate on a final report section comparing the results of the two studies, evaluating the relationship between the two methodologies and their respective results. (Quarterly reports submitted by the end of months 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, and 36, Annual reports submitted to TSSWCB by end of months 11 and 23.

Task 10.2: A draft Watershed Implementation Plan will be developed in cooperation with Texas Commission on Environmental Quality and watershed stakeholders as part of this project. The results to be obtained in the proposed 319(h) study is critical to the development of a Watershed Implementation Plan that incorporates all nine elements recommended by EPA. While the existing SWAT model implies that the use of poultry litter as a source of nitrogen, phosphorus and organic material on crops and pastures is the major cause of excessive phosphorus loading in the Lake O' the Pines watershed, two problems remain. First, no distinction between poultry litter and other nutrient sources are made in the SWAT models, and no direct comparisons of runoff loading from alternative land use types, fertilization levels and BMP implementation in the Lake O' the Pines watershed are available. Second, the litter application levels and most of the monitoring data used in model development were obtained prior to the significant implementation of BMPs in the poultry production industry here.

Deliverables:

- Twelve quarterly reports.
- Two annual reports.
- One draft and one final version of the comprehensive project report.
- Drafting of the 9 Element Watershed Plan for inclusion to the TMDL Implementation Plan for Lake O' the Pines.

APPENDIX B. Sampling Process Design and Monitoring Schedule (Plan)

Sample Design Rationale

Storm water runoff from agricultural fields, which can potentially affect water quality in receiving streams, will be monitored to obtain actual nutrient and sediment loading data from agricultural fields that represent the major soil types, fertilizations levels and BMP implementation used to develop the SWAT model for the Lake O' the Pines watershed.

Site Selection Criteria

Monitoring stations associated with storm water runoff will be chosen from among properties offering participation using a set of criteria that includes land use, soil type and vegetation cover characteristics, history of poultry litter or other fertilizer application, suitability for efficiently capturing runoff from a defined area from a 10 year rainfall event, and accessibility during inclement weather.

Wet Weather Sampling at Edge-of-field Stations

Quantification of non-point source inputs of nutrient and oxygen-demanding materials to the Lake O' the Pines watershed will require information concerning rainfall-runoff relationships in selected sub-watersheds and information about the water quality characteristics of runoff accompanying rainfall events onto major vegetational cover and land use types.

The project will incorporate twelve automated samplers installed in agricultural fields representing different litter application histories (Figure 2). Water samples will be collected by the samplers throughout periods of rainfall runoff and will be analyzed for nutrients, TOC, TDS, and TSS. The sampling stations will be monitored with the intent of obtaining as much localized data to identify and quantify the agricultural practices resulting in the largest proportion of nutrient and sediment loading in the watershed.

Most sample fields will require some type of modification to allow concentration and quantitative measurement of runoff volumes. 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.

An automated, battery operated sampling system, consisting of a bubbler-type flow meter, automatic sampler, modem and necessary accessories, will be installed in secure enclosures at each study location. Equipment will be quality checked in the lab prior to installation, and function tested following installation following manufacturers' instructions. A hydraulic structure with a known level to discharge relationship will be employed. Samplers will be routinely visited every 2 weeks for data retrieval and general maintenance. Total Kjeldahl nitrogen, ammonia nitrogen, nitrite nitrogen, nitrate nitrogen, total phosphorus, orthophosphate phosphorus (lab filtered), total dissolved solids, and total suspended solids will be measured at the automated sites.

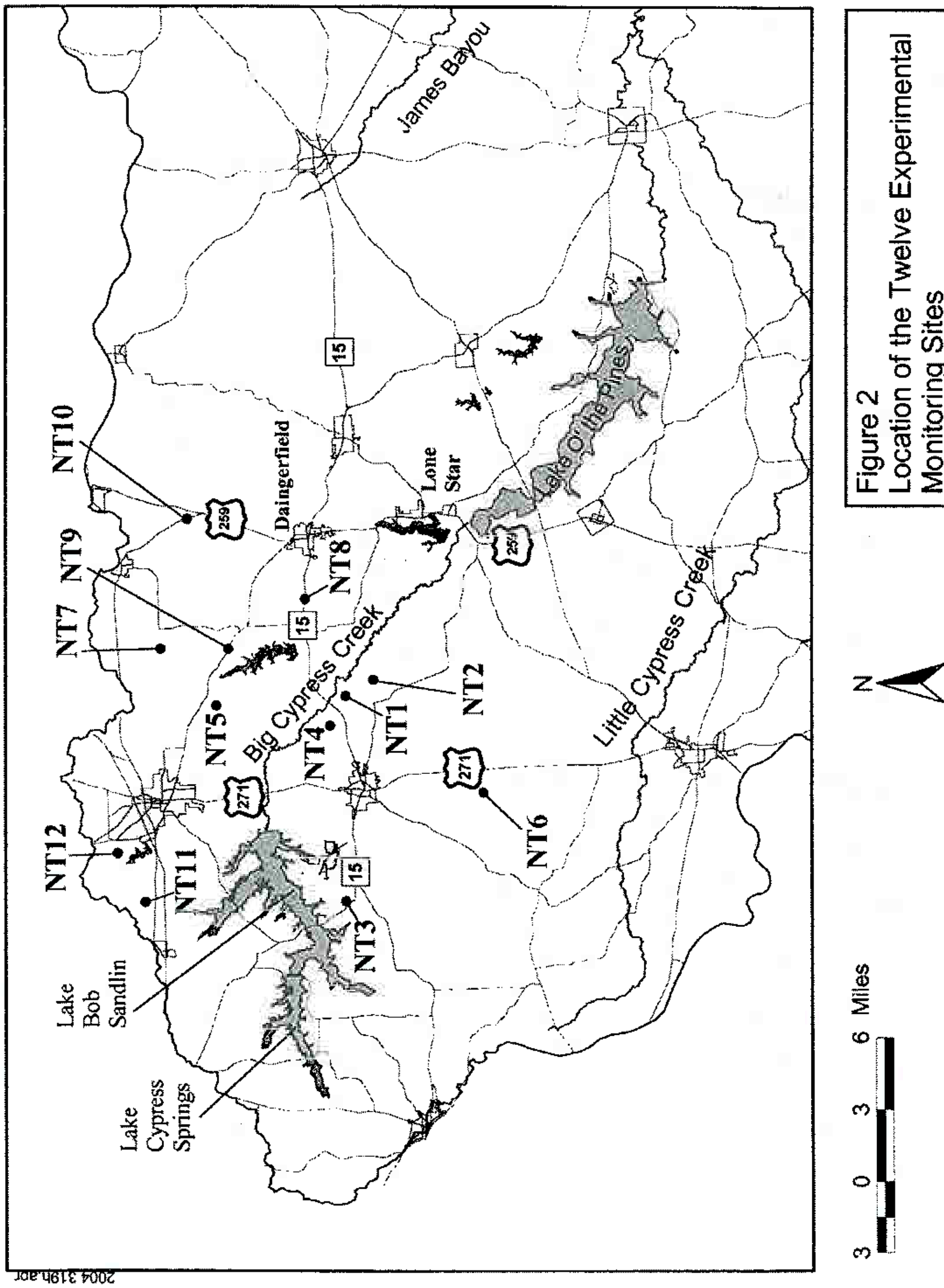

Figure 2
Location of the Twelve Experimental Monitoring Sites

Soil Samples

Soil samples will be collected and analyzed using the routine analysis by the TCE Soil, Water & Forage Testing Laboratory in College Station, Texas. Analytes to be analyzed include extractable phosphorous (P), extractable potassium (K), nitrate-nitrogen (NO3-N), extractable sodium (Na), extractable magnesium (Mg), extractable calcium (Ca), soluable salts/electrical conductivity and soil water pH. A minimum of 10 subsample cores will be randomly collected during Spring/Summer 2005 and composited from 0-6 inches and 6-24 inches. Samples will be collected for each study site specified in Table B1.1 and no less than 10 subsamples will be collected and combined to produce a composite sample that is representative of the area.

Monitoring Sites for FY 2005-07

Monitoring Tables for the monitoring year beginning January 2005 are presented in Table B1.1. Figure 2 presents the twelve experimental monitoring station locations selected for the edge-of-field study program.

Table B1.1 Sample Design and Schedule

Site Description	Station ID	Latitude and Longitude	Land Use (Last 5 Yrs)	Water[1]	Water Level[2]	Soil[3]
Edge-of-field	NT1	33°.00236 N; 094°.87787 W	Cattle; hay production	x	x	x
Edge-of-field	NT2	32°.97935 N; 094°.85909 W	Cattle; hay production	x	x	x
Edge-of-field	NT3	33°.01333 N; 095°.07314 W	Cattle; hay production	x	x	x
Edge-of-field	NT4	33°.02048 N; 094°.90637 W	Cattle; hay production	x	x	x
Edge-of-field	NT5	33°.11134 N; 094°.87746 W	Hay meadow	x	x	x
Edge-of-field	NT6	32°.54942 N; 094°.58388 W	Hay meadow	x	x	x
Edge-of-field	NT7	33°.15216 N; 094°.82566 W	Hay meadow	x	x	x
Edge-of-field	NT8	33°.03788 N; 094°.78183 W	Cattle; hay meadow	x	x	x
Edge-of-field	NT9	33°.09983 N; 094°.82126 W	Cattle; hay meadow	x	x	x
Edge-of-field	NT10	33°.01259 N; 094°.70367 W	Cattle; hay meadow	x	x	x
Edge-of-field	NT11	33°.17206 N; 095°.05957 W	Hay production	x	x	x
Edge-of-field	NT12	33°.19165 N; 095°.01484 W	Hay production	x	x	x

[1]Five storm events over the course of the study for a total of 60 samples
[2] Continuous to record hydrograph at each site/event
[3] Soil will be taken from the area that drains the site

Table B1.2 List of Equipment/Instruments for Flow Measurement and Water Collection

Equipment/ Instruments	Frequency of calibration	Deficiencies resolved and documented	Periodic Maintenance	Individual responsible	Responsible Party
Lock Box Cabinet	N/A	Corrective action report, see CAR SOP.	Every 2 weeks	Water Protection Specialist II (BMP)	NETMWD
Maintenance/Calibration Log Book	N/A	Corrective action report	Every 2 weeks	Water Protection Specialist II (BMP)	NETMWD
Instruction, Installation & Operation Manuals For All Equipment	N/A	Corrective action report	N/A	Water Protection Specialist II (BMP)	NETMWD
ISCO Model 3700 Sampler	Annual or as needed	Corrective action report	Every 2 weeks	Water Protection Specialist II (BMP)	NETMWD
ISCO Model 6712 Sampler	Annual or as needed	Corrective action report	Every 2 weeks	Water Protection Specialist II (BMP)	NETMWD
ISCO Model 4230 Bubble Flow Meter	Annual or as needed	Corrective action report	Bubbler level, count and sampler line Every 2 weeks	Water Protection Specialist II (BMP)	NETMWD
ISCO Model 730 Bubbler Module	Annual or as needed	Corrective action report	Bubbler level, count and sampler line Every 2 weeks	Water Protection Specialist II (BMP)	NETMWD
ISCO Model 674 Rain Gauge, Clamps & Cable	Annual or as needed	Corrective action report	Every 2 weeks	Water Protection Specialist II (BMP)	NETMWD
12 volt Marine Battery & ISCO Connect Cable	N/A	Corrective action report	Every 2 weeks	Water Protection Specialist II (BMP)	NETMWD
ISCO Sampler to Flow Meter Cable, Sampler Collars, Sampler Float Housing	N/A	Corrective action report	Every 2 weeks	Water Protection Specialist II (BMP)	NETMWD
Solar Panel, Cable & Mounting Hardware	N/A	Corrective action report	Every 2 weeks	Water Protection Specialist II (BMP)	NETMWD
Motorola Cell Phone	N/A	Corrective action report	Every 2 weeks	Water Protection Specialist II (BMP)	NETMWD
Modem Compartment, Connection & Cable	N/A	Corrective action report	Every 2 weeks	Water Protection Specialist II (BMP)	NETMWD
External Dessicant Tube; Internal & External Dessicant	N/A	Corrective action report	Every 2 weeks	Water Protection Specialist II (BMP)	NETMWD
Laptop Computer and Software, Rapid Transfer Device for Data Retrieval	N/A	Corrective action report	Every 2 weeks	Water Protection Specialist II (BMP)	NETMWD
Sampler Bottles & Laboratory Bottles with Lids	N/A	Corrective action report	Inspect containers for cracks and determine if contamination free	Water Protection Specialist II (BMP)	NETMWD

Table B1.3 List of Laboratory Equipment/Instruments for the Analysis of Water

PARAMETER	METHOD	STORET CODE	Equipment/ instruments	Frequency of calibration	Deficiencies resolved and documented	Periodic Maintenance	Individual responsible	LAB
Water Parameters								
TSS	EPA 160.2	00530	Oven, balance	Per EPA Method	Corrective action report, see CAR SOP.	As needed	Classical Chemistry Supervisor	ANA-LAB
TDS, dried at 180°C	EPA 160.1	70300	Oven, balance	Per EPA Method	Corrective action report	As needed	Classical Chemistry Supervisor	ANA-LAB
Ammonia-Nitrogen	EPA 350.1	00610	Bran and Luebbe TRAACS 2000 analyzer	Per EPA Method	Corrective action report	As needed	TRAACS technician	ANA-LAB
Ortho-Phosphate Phosphorus, dissolved; lab filtered	EPA 365.2	70507	Ion Chromatography system	Per EPA Method	Corrective action report	As needed	IC technician	ANA-LAB
Nitrite-Nitrogen	EPA 300.0	00615	Ion Chromatography system	Per EPA Method	Corrective action report	As needed	IC technician	ANA-LAB
Nitrate-Nitrogen	EPA 300.0	00620	Ion Chromatography system	Per EPA Method	Corrective action report	As needed	IC technician	ANA-LAB
Total Phosphorus	EPA 365.2	00665	Spectrophotometer	Per EPA Method	Corrective action report	As needed	Classical Chemistry Supervisor	ANA-LAB
Total Kjeldahl Nitrogen	EPA 351.2	00625	Bran and Luebbe TRAACS 2000 analyzer	Per EPA Method	Corrective action report	As needed	TRAACS technician	ANA-LAB
TOC	SM 5310C	00680	Astro 2001 Carbon analyzer	Per EPA Method	Corrective action report	As needed	Metals technician	ANA-LAB

Table B1.4 List of Laboratory Equipment/Instruments for the Analysis of Soil

PARAMETER	METHOD	STORET CODE	Equipment/ instruments	Frequency of calibration	Deficiencies resolved and documented	Periodic Maintenance	Individual responsible	LAB
Soil Parameters								
Extractable Phosphorus	SWFTL079R0.SOP	NA	ICP	Per SOP	Documented in Equipment Log	As needed	ICP technician	TCE
Extractable Potassium	SWFTL079R0.SOP	NA	ICP	Per SOP	Documented in Equipment Log	As needed	ICP technician	TCE
Nitrate Nitrogen, extractable	SWFTL014R0.SOP	NA	Lachat Chem Station 800	Per SOP	Documented in Equipment Log	As needed	ICP technician	TCE
Sodium, extractable	SWFTL079R0.SOP	NA	ICP	Per SOP	Documented in Equipment Log	As needed	ICP technician	TCE
Magnesium, extractable	SWFTL079R0.SOP	NA	ICP	Per SOP	Documented in Equipment Log	As needed	ICP technician	TCE
Calcium, extractable	SWFTL079R0.SOP	NA	ICP	Per SOP	Documented in Equipment Log	As needed	ICP technician	TCE
Soluable salts/electrical conductivity	SWFTL015R0.SOP	NA	Robotic pH/Conductivity Station	Per SOP	Documented in Equipment Log	As needed	ICP technician	TCE
Soil water pH	SWFTL015R0.SOP	NA	Robotic pH/Conductivity Station	Per SOP	Documented in Equipment Log	As needed	ICP technician	TCE

APPENDIX C. Data Summary

Data Information

Data Source: ______________________________

Date Submitted: ______________________________

Tag_id Range: ______________________________

Date Range: ______________________________

Comments

Please explain in the space below any data discrepancies including:

- **Inconsistencies with AWRL specifications;**
- **Failures in sampling methods and/or laboratory procedures that resulted in data that could not be reported to the TSSWCB; and**
- **Other discrepancies.**

____

____

____

____

____

Planning Agency Data Manager: ______________________________

Date: ______________________________

APPENDIX D. Field Data Sheets

1. Physical Characteristics Checklist
2. General Maintenance and Storm Water Sample Collection
3. Rain Gage Maintenance Form

PHYSICAL CHARACTERISTICS CHECKLIST

Job Name: ____________________ Job No.: _______ Date: ___/___/___ Observers: _____________

Stream: ____________________ Station ID: ________ Time: ________ Nearest Stream Segment: _______

Location of Station: ____

Weather Conditions: clear partly cloudy cloudy rain Wind Intensity: calm slight moderate strong

Air Temp °C: _____________________ Days Since Last Significant Rain: __________________

Water Conditions: turbid moderate clear Adjacent Land Use: right bank____________________

left bank____________________

Type of Sample Collected: _____________________ Number of Bottles: ____________________

Evidence of Biological Activity: _____________________

Photographs Taken: ___________________

General Observations:____

General Maintenance and Storm Water Sample Collection

SITE________ DATE _________ TIME (CST)________ INITIALS _______

Level Enable callout

Desiccants: OK Changed

Flowmeter SPA652 4230 3230

Sampler:
Display Reset to SI Yes No
Reset arm to bottle 1 Yes
Checked distributor arm nut
Time interval: Uniform Reset start time Yes Time
NonUniform Reset start time No
Sampling interval: Time Flow
Line: OK Clear Damaged Silted/Clogged
Purged Acid Washed Test sample collected (monthly)
Position in arm OK Reset
Pump tubing Current counts Alarm counts
Changed Reversed Checked all connections
Reset counter # counts Restart sampler YES
Bubbler: XS OK Silted Scoured Requires new survey
Line OK Clear Damaged Requires new survey
TB Rain Gauge: Clear Cleaned Weekly inches recorded

QA rain gauge: Clear Cleaned Weekly inches collected
Downloaded: **Sampler** **Flowmeter** Met **Viewed graph**
Color Code:
Bottles used for composite:

Comments:

RAIN GAGE MAINTENANCE FORM

Station Location:	Date:	____ Logger #: ____ Gage #:
Station #:	Start Time: End Time:	Initial Gage Deployment: End Time:
Successful data transfer? Yes ____ No		Successful re-launch? Yes ____ No
If no, explain:		If no, explain:
Clean Gage Bucket ____ Clean Gage Funnel ____	Replace Logger ____ Plumb Bucket ____	Replace and Level Funnel Upload data from Shuttle to Computer
Tipping Bucket Calibration Performed? Yes __ No __		Calibration Results (Test # / Result / Adjustment):
Comments:		
Name:		Signature:

RAIN GAGE MAINTENANCE FORM

Station Location:	Date:	____ Logger #: ____ Gage #:
Station #:	Start Time: End Time:	Initial Gage Deployment: End Time:
Successful data transfer? Yes ____ No		Successful re-launch? Yes ____ No
If no, explain:		If no, explain:
Clean Gage Bucket ____ Clean Gage Funnel ____	Replace Logger ____ Plumb Bucket ____	Replace and Level Funnel Upload data from Shuttle to Computer
Tipping Bucket Calibration Performed? Yes __ No __		Calibration Results (Test # / Result / Adjustment):
Comments:		
Name:		Signature:

APPENDIX E. Field and Laboratory Corrective Action Form

Date:	
Problem:	
Person(s) Involved:	
Cause of Problem:	
Corrective Action:	

Date:	
Follow-up Action:	
Quality Review:	

Reviewed by:

____________________ ____________________

Field or Lab Supervisor Date

Approved by:

____________________ ____________________

Quality Assurance Officer Date

APPENDIX F. Chain-of-Custody Forms

1. Ana-Lab Corporation (Water)
2. Texas Cooperative Extension Soil, Water and Forage Testing Laboratory (Soil)
3. HDR/NETMWD Soil Sample Chain of Custody Form

ANA-LAB CORP. THE COMPLETE SERVICE LAB

Ana-Lab Corporate Laboratory P.O. Box 9000 Kilgore, TX

Phone 903/984-0551 FAX 903/984-5914 e-Mail corp@ana-lab.com NELAP-accredited #02008

Chain of Custody

07/26/2005 Page 1 of 2

Report To

David Thomas
HDR Engineering
4401 West Gate
Suite 400
Austin, TX 78745

HDR3

101

Wet Weather Monitoring

Lab Number

Phone 512/912-5100
Fax 512/912-5158

Matrix: Liquid Aqueous

Printed Name	*Affiliation*	*Signature*

☐ ***Plastic 1/2 gal (White)**

Test	*Name*	*Requested Test Methods*
OPWB	Ortho-Phosphate as P	EPA 365.2
TDS	Total Dissolved Solids	EPA Method 160.1
TSS	Total Suspended Solids	EPA Method 160.2
!N3L	Nitrate-Nitrogen, Total	EPA Method 300.0
!N2L	Nitrite-Nitrogen, Total	EPA Method 300.0

☐ ***H2SO4 to pH <2 Amber Glass 250 mL w/Teflon lined lid**

Test	*Name*	*Requested Test Methods*
TOCL	Total Organic Carbon	SM 20th, 5310 C

☐ ***H2S04 to pH <2 250 ml Plastic**

Test	*Name*	*Requested Test Methods*
NHaN	Ammonia Nitrogen	EPA Method 350.1
TKN	Total Kjeldahl Nitrogen	EPA Method 351.2
TPWB	Phosphorus	EPA Method 365.2

Ana-Lab #	Sample ID	Bottles	Date	Time	Notes

Ana-Lab Corporate Laboratory P.O. Box 9000 Kilgore, TX
Phone 903/984-0551 FAX 903/984-5914 e-Mail corp@ana-lab.com NELAP-accredited #02008

Chain of Custody

07/26/2005 Page 2 of 2

Report To

David Thomas
HDR Engineering
4401 West Gate
Suite 400
Austin, TX 78745

HDR3

101

Wet Weather Monitoring

Lab Number ____________

Phone 512/912-5100
Fax 512/912-5158

Ambient Conditions ____________

Comments

Date	Time	Relinquished		Received	
		Printed Name	*Affiliation*	*Printed Name*	*Affiliation*
		Signature		*Signature*	
		Printed Name	*Affiliation*	*Printed Name*	*Affiliation*
		Signature		*Signature*	
		Printed Name	*Affiliation*	*Printed Name*	*Affiliation*
		Signature		*Signature*	
		Printed Name	*Affiliation*	*Printed Name*	*Affiliation*
		Signature		*Signature*	

Sample Recieved on Ice? ☐ *Yes* ☐ *No* **Method of Shipment:** ☐ *UPS* ☐ *Bus* ☐ *FedEx* ☐ *Lone Star* ☐ *Hand Delivered*

Cooler/Sample Secure? ☐ *Yes* ☐ *No* **Tracking/Shipping #** ____________ ☐ *Other*

Comments

S00

SOIL SAMPLE INFORMATION FORM

D-494

TEXAS AGRICULTURAL EXTENSION SERVICE
THE TEXAS A&M UNIVERSITY SYSTEM
Soil, Water and Forage Testing Laboratory

Please submit this completed form and payment with samples. Mark each soil sample bag with your sample identification and ensure that it corresponds with the sample identification written on this form. See sampling procedures and mailing instructions on the back of this form. **(PLEASE DO NOT SEND CASH)**

SUBMITTED BY: Results will be mailed to this address **ONLY**

Name ______________________ County where sampled ____________

Address ______________________ Phone ____________

City ____________ State ______ Zip ______ ____________

FOR: (Optional-will not receive copy)

Name ______________________

Address ______________________

City ____________ State ______ Zip ______

Payment *(DO NOT SEND CASH).*
☐ Check
☐ Money Order
☐ Government Account

Amount Paid $ ____________

Make Checks Payable to: Soil Testing Laboratory

CROP/PLANT INFORMATION (Required for Recommendations)					Requested Analyses (See Options Listed Below)	How Is Forage Used?
Laboratory # (For Lab Use)	Your Sample I.D.	Acreage Represented	Previous Lime or Fertilizer	What Are You Growing-Yield Goal?		
					☐1 ☐4 ☐7 ☐2 ☐5 ☐8 ☐3 ☐6 ☐9	☐ Grazing (G) ☐ G & H ☐ Hay (H) ☐ * Min. Requirement
					☐1 ☐4 ☐7 ☐2 ☐5 ☐8 ☐3 ☐6 ☐9	☐ Grazing (G) ☐ G & H ☐ Hay (H) ☐ * Min. Requirement
					☐1 ☐4 ☐7 ☐2 ☐5 ☐8 ☐3 ☐6 ☐9	☐ Grazing (G) ☐ G & H ☐ Hay (H) ☐ * Min. Requirement
					☐1 ☐4 ☐7 ☐2 ☐5 ☐8 ☐3 ☐6 ☐9	☐ Grazing (G) ☐ G & H ☐ Hay (H) ☐ * Min. Requirement
					☐1 ☐4 ☐7 ☐2 ☐5 ☐8 ☐3 ☐6 ☐9	☐ Grazing (G) ☐ G & H ☐ Hay (H) ☐ * Min. Requirement
					☐1 ☐4 ☐7 ☐2 ☐5 ☐8 ☐3 ☐6 ☐9	☐ Grazing (G) ☐ G & H ☐ Hay (H) ☐ * Min. Requirement
					☐1 ☐4 ☐7 ☐2 ☐5 ☐8 ☐3 ☐6 ☐9	☐ Grazing (G) ☐ G & H ☐ Hay (H) ☐ * Min. Requirement

Describe any specific problems you have observed or want to correct:

Choose one analysis group per sample

1. Routine Analysis (R) (pH, NO_3^-, P, K, Ca, Mg, Na, S, and Conductivity)	**$10 per sample**
2. R + Micronutrients (Micro) (Zn, Fe, Cu, Mn)	**$15 per sample**
3. R + Micro + Boron (B)	**$20 per sample**
4. R + Detailed Salinity (Sal)	**$25 per sample**
5. R + Micro + Sal	**$30 per sample**
6. R + Micro + Detailed Lime Requirement (Lime)	**$20 per sample**
7. R + Micro + B + Lime + Organic Matter + Sal	**$50 per sample**
8. R + Texture Analysis	**$20 per sample**
9. R + Organic Matter	**$20 per sample**

Note: Organic Matter, Detailed Salinity and Texture may require longer processing time.

***Minimum requirement for establishment**

FORM S2-700

HDR Engineering, Inc.
4401 West Gate
Austin, Texas 78745
(512) 912-5100
Northeast Texas Municipal Water District
Highway 250 South
Hughes Springs, Texas 75656
(903) 639-7538

ASSESSMENT AND MITIGATION OF AGRICULTURAL AND OTHER NONPOINT SOURCE ACTIVITES IN THE CYPRESS CREEK BASIN - SOIL SAMPLES

Project Name: NETMWD Agricultural NPS Evaluation, Edge-of-Field Monitoring Project No.: 28973
Samplers: Page: of
Sample Location (s): Cypress Creek Basin

Station ID	Collection Date	Time of Collection	Station Location/Description	Soil Depth Zone	Number/Type of Containers
			The identity and location of all study participants are confidential		

Relinquished by: Date: Time: Received by:

Relinquished by: Date: Time: Received by:

Relinquished by: Date: Time: Received by:

ATTACHMENT 1 Letter to Document Adherence to the Assessment and Mitigation of Agricultural and Other Nonpoint Source Activities in the Cypress Creek Basin Quality Assurance Project Plan on Behalf of Northeast Texas Municipal Water District

TO: (name)
(organization)

FROM: (name)
(organization)

Please sign and return this form by (date) to:

(name)
(organization)
(address)

I acknowledge receipt of the referenced document(s). I understand the document(s) describe quality assurance, quality control, data management and reporting, and other technical activities that must be implemented to ensure the results of work performed will satisfy stated performance criteria.

____

Signature Date

Copies of the signed forms should be sent by the Planning Agency to the TSSWCB NPS Project Manager within 60 days of TSSWCB approval of the QAPP.