TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

August 8, 2012

David Reid
Project Manager
Aransas County
1931 FM 2165
Rockport, TX 78382

Re: Tule Creek Stormwater BMP Improvement Project Monitoring Quality Assurance Project Plan (QAPP)
Approval Date: August 10, 2012 (Expiration Date: August 10, 2013)

Dear Mr. Reid:

The above named QAPP has been approved. The original document and signature pages are enclosed as documentation of approval.

In accordance with the terms of the QAPP, **please ensure that copies of this document and any subsequent amendments are distributed to each sub-tier participant as noted in Section A3 of the QAPP.** This approval letter must be available for review during a monitoring systems audit.

Should you have questions, please contact me at (512) 239-0425.

Sincerely,

Kyle Girten
Quality Assurance Specialist

enclosure

cc: Sharon Coleman, Senior Quality Assurance Specialist, MC 165
Anju Chalise, Project Manager, MC 203

Tule Creek Stormwater BMP Improvement Projects Monitoring Quality Assurance Project Plan

C. H. "Burt" Mills, County Judge
Aransas County
301 N. Live Oak
Rockport Texas, 78382

Funding Source:

Nonpoint Source Program CWA §319(h)
Prepared in cooperation with the Texas Commission on Environmental Quality
And the U.S. Environmental Protection Agency
FY 09 319(h) Grant Federal ID #99614613

Effective Period: One year from date of final approval

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

David J. Reid, P.E.
Assistant County Engineer
1931 FM 2165
Rockport, Texas 78382
(361) 790-0152
dreid@aransascounty.org

A1 Approval Page

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Field Operations Support Division

8-10-12
Stephen Stubbs, TCEQ QA Manager Date

8/10/12
Kyle Girten, Lead NPS QA Specialist Date
Quality Assurance Team

Water Quality Planning Division

8/6/12
Kerry Niemann, Team Leader Date
Nonpoint Source Program

8/9/12
Nancy Ragland, Team Lead Date
Data Management and Analysis

for 8/6/12
Anju Chalise, NPS QA Specialist Date
Nonpoint Source Program

8/3/12
Jeff Foster, TCEQ NPS Project Manager Date
Project Manager, Nonpoint Source Program

Aransas County

8-3-12
David J. Reid, P.E. Date
Aransas County Project Manager and QAO

Test America Corpus Christi

8/3/2012
Tim Kellogg, Lab Director Date

08/03/12
~~Corrina~~ Hoyle Lab QA Officer Date
CORINNA CSH 8/3/12

Aransas County will secure written documentation from additional project participants (e.g., subcontractors, 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. Aransas County will maintain this documentation as part of the project's quality assurance records. This documentation will be available for review. Copies of this documentation will also be submitted as deliverables to the TCEQ NPS Project Manager within 30 days of final TCEQ approval of the QAPP (See sample letter in Appendix A of this document).

Subcontractors

8/3/12
Craig B. Thompson, P.E. Date
NEI Project Manager

8-3-12
David E. Sullivan, CEP Date
NEI Monitoring QAO

2012/08/02
Linda D. Pechacek, P.E. Date
LDP Project Manager and Modeling QAO
Monitoring/Analytical & Technical Support

2012/08/03
A. Charles Rowney, PhD, D.WRE Date
ACR
Monitoring/Analytical & Technical Support

A2. Table of Contents

A3 Distribution List

The Lead NPS QA Specialist will provide original versions of this project plan and any amendments or revisions of this plan to the TCEQ NPS Project Manager and the Aransas County Project Manager. The TCEQ NPS Project Manager will provide copies to the TCEQ Data Management and Analysis Team Leader and EPA Project Officer within two weeks of approval. The TCEQ NPS Project Manager will document receipt of the plan and maintain this documentation as part of the project's quality assurance records. This documentation will be available for review.

Texas Commission on Environmental Quality
PO Box 13087
MC - 234
Austin, TX 78711-3087

Nancy Ragland, Team Leader
Data Management and Analysis
(512) 239-6546

U.S. Environmental Protection Agency Region 6
State/Tribal Section
1445 Ross Avenue
Suite # 1200
Dallas, TX 75202-2733

Leslie Rauscher, Project Officer
(214) 665-2773

Aransas County will provide copies of this project plan and any amendments or revisions of this plan to each project participant defined in the list below. Aransas County will document receipt of the plan by each participant and maintain this documentation as part of the project's quality assurance records. This documentation will be available for review.

Aransas County
1931 FM 2165
Rockport, Texas 78382

David J. Reid, P.E.
Project Manager and QAO
(361)790-0152

Subcontractors

NEI
4501 Gollihar
Corpus Christi, TX 78411

Craig B. Thompson, P.E.
NEI Project Manager
(361) 814-9900

David E. Sullivan, CEP
NEI Monitoring QAO
(361) 814-9900

Sandi Hart, CEP
NEI Field Supervisor
(361) 814-9900

LDP
2115 Chantilly Ln
Houston, TX 77018

Linda D. Pechacek, P.E.
LDP Project Manager and Modeling QAO
(832) 489-9928

ACR, LLC
184 Tollgate Branch
Longwood, FL 32750

A. Charles Rowney, Ph.D., D. WRE
ACR Analytical and Technical Assistance
(407)970-8744

The Grant Connection
916 E. Cedar St
Rockport TX 78382

Greg Harlan
Aransas County Data and Project Coordinator
(361)790-0002

TestAmerica Corpus Christi
1733 N. Padre Island Drive
Corpus Christi, TX 78408

Tim Kellogg, Laboratory Director
(361) 289-2673

Corrina Hoyle, Laboratory QAO
(361) 289-2673,

LIST OF ACRONYMS

ACND	Aransas County Navigation District
ACR	ACR, LLC
ACSMP	Aransas County Regional Stormwater Management Plan
AWRL	Ambient Water Reporting Limit
BMP	Best Management Practice
CAP	Corrective Action Plan
COC	Chain of Custody
CWA	Clean Water Act
DO	Dissolved Oxygen
DOC	Demonstration of Capability
DMP	Data Management Plan
DMRG	Data Management Reference Guide
DM&A	Data Management and Analysis
DQO	Data Quality Objective
EPA	Environmental Protection Agency
GIS	Geographic Information System
GPS	Global Positioning System
IT	Information Technology
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LDP	LDP Consultants Inc.
LOD	Limit of Detection
LOQ	Limit of Quantitation
MA-NERR	Mission Aransas National Estuarine Research Reserve
MS	Matrix Spike
MS4	Municipal Separate Storm Sewer System
NEI	Naismith Engineering Inc.
NELAC	National Environmental Laboratory Accreditation Conference
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint Source
PM	Project Manager
PO	Project Officer

QA/QC	Quality Assurance/Quality Control
QAM	Quality Assurance Manual
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QAS	Quality Assurance Specialist
QM	Quality Manuals
QMP	Quality Management Plan
QUALHYMO	Quality Hydrologic Model
RPD	Relative Percent Difference
SLOC	Station Location
SOP	Standard Operating Procedure
SWQM	Surface Water Quality Monitoring
SWQMIS	Surface Water Quality Monitoring Information System
TCEQ	Texas Commission on Environmental Quality
TMDL	Texas Maximum Daily Load
TSS	Total Suspended Solids
TSWQS	Texas Surface Water Quality Standards
WERF	Water Environment Research Foundation
WQI	Water Quality Inventory
WWTP	Waste Water Treatment Plant

A4 Project/Task Organization

Texas Commission on Environmental Quality (TCEQ)

Field Operations Support Division

Kyle Girten
Lead NPS QA Specialist
Assists the TCEQ Project Manager in QA related issues. Serves on planning team for NPS projects. Participates in the planning, development, approval, implementation, and maintenance of the QAPP. Determines conformance with program quality system requirements. Coordinates or performs audits, as deemed necessary and using a wide variety of assessment guidelines and tools. Provides a point of contact at the TCEQ to resolve QA issues. Recommends to TCEQ management that work be stopped in order to safe guard project and programmatic objectives, worker safety, public health, or environmental protection.

Water Quality Planning Division

Kerry Niemann, Team Leader
NPS Program
Responsible for management and oversight of the TCEQ NPS Program. Oversees the development of QA guidance for the NPS program to be sure it is within pertinent frameworks of the TCEQ. Monitors the effectiveness of the program quality system. Reviews and approves all NPS projects, internal QA audits, corrective actions, reports, work plans, and contracts. Ensures NPS personnel are fully trained and adequately staffed.

Jeff Foster, NPS Project Manager
NPS Program
Maintains a thorough knowledge of work activities, commitments, deliverables, and time frames associated with projects. Develops lines of communication and working relationships between the contractor, the TCEQ, and the EPA. Tracks deliverables to ensure that tasks are completed as specified in the contract. Responsible for ensuring that the project deliverables are submitted on time and are of acceptable quality and quantity to achieve project objectives. Serves on planning team for NPS projects. Participates in the development, approval, implementation, and maintenance of the QAPP. Assists the TCEQ QAS in technical review of the QAPP. Responsible for verifying that the QAPP is followed by the contractor.

Anju Chalise
NPS Quality Assurance Specialist
Assists Lead QAS with NPS QA management. Serves as liaison between NPS management and Agency QA management. Responsible for NPS guidance development related to program quality assurance. Serves on planning team for NPS projects. Participates in the development, approval, implementation, and maintenance of the QAPP.

Texas Commission on Environmental Quality (TCEQ)
Rebecca Ross
NPS Data Manager
Responsible for coordination and tracking of NPS data sets from initial submittal through NPS Project Manager review and approval. Ensures that data is reported following instructions in the Surface Water Quality Monitoring Data Management Reference Guide (January 2012, or most current version). Runs automated data validation checks in SWQMIS and coordinates data verification and error correction with NPS Project Managers' data review. Generates SWQMIS summary reports to assist NPS Project Managers' data reviews. Provides training and guidance to NPS and Planning Agencies on technical data issues. Reviews QAPPs for valid stream monitoring stations. Checks validity of parameter codes, submitting entity code(s), collecting entity code(s), and monitoring type code(s). Develops and maintains data management-related standard operating procedures for NPS data management. Serves on planning team for NPS projects.

Aransas County

David J. Reid, P.E.
Aransas County Project Manager
Responsible for ensuring tasks and other requirements in the contract are executed on time and are of acceptable quality. Monitors and assesses the quality of work. Coordinates attendance at conference calls, training, meetings, and related project activities with the TCEQ. Meets with NEI staff throughout project as needed to oversee project.

Test America – Corpus Christi

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

Corrina Hoyle
Laboratory QAO
Monitors the implementation of the QAM and the QAPP within the laboratory to ensure complete compliance with QA objectives as defined by the contract and in the QAPP as related to laboratory tasks. Conducts internal audits to identify potential problems and ensure compliance with written SOPs. Responsible for supervising and verifying all aspects of the QA/QC in the laboratory. Performs validation and verification of data before the report is sent to the contractor. Insures 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.

Subcontractors

The Grant Connection
Greg Harlan
Aransas County Data Manager
Responsible for the transfer of data to the TCEQ. Oversees data reporting for the study. Transfers data to TCEQ. Responsible for transferring data to the TCEQ in the Event/Result file format specified in the DMRG. Ensures data are submitted according to workplan specifications. Provides the point of contact for the TCEQ Data Manager to resolve issues related to the data.

Naismith Engineering, Inc. (NEI)
Craig B. Thompson, P.E.
NEI Project Manager
Responsible for ensuring tasks and other requirements on the contractor side are executed on time and are of acceptable quality. Monitors and assesses the quality of work. Provides input on model selection and implementation. Notifies Aransas County Project Manager of circumstances that may adversely affect quality of data derived. Meets with TCEQ, Aransas County, LDP and ACR, staff as needed. Coordinates development and implementation of QA program.

David E. Sullivan (CEP)
NEI Quality Assurance Officer (Monitoring QAO)
Responsible for writing and maintaining the QAPP. Responsible for maintaining written records of sub-tier commitment to requirements specified in the QAPP. Responsible for maintaining records of QAPP distribution, including appendices and amendments. Responsible for identifying, receiving and maintaining project quality assurance records. Responsible for coordinating with Aransas County QAO and TCEQ QAS to resolve QA related issues. Notifies the NEI Project Manager and TCEQ Project Manager of particular circumstances which may adversely affect the quality of data.

Sandi Hart (CEP)
NEI Field Supervisor
Responsible for supervising all aspects of the sampling and measurement of surface waters and other parameters in the field. 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. Responsible for field scheduling, staffing, and ensuring that staff is appropriately trained as specified in Sections A6 and A8.

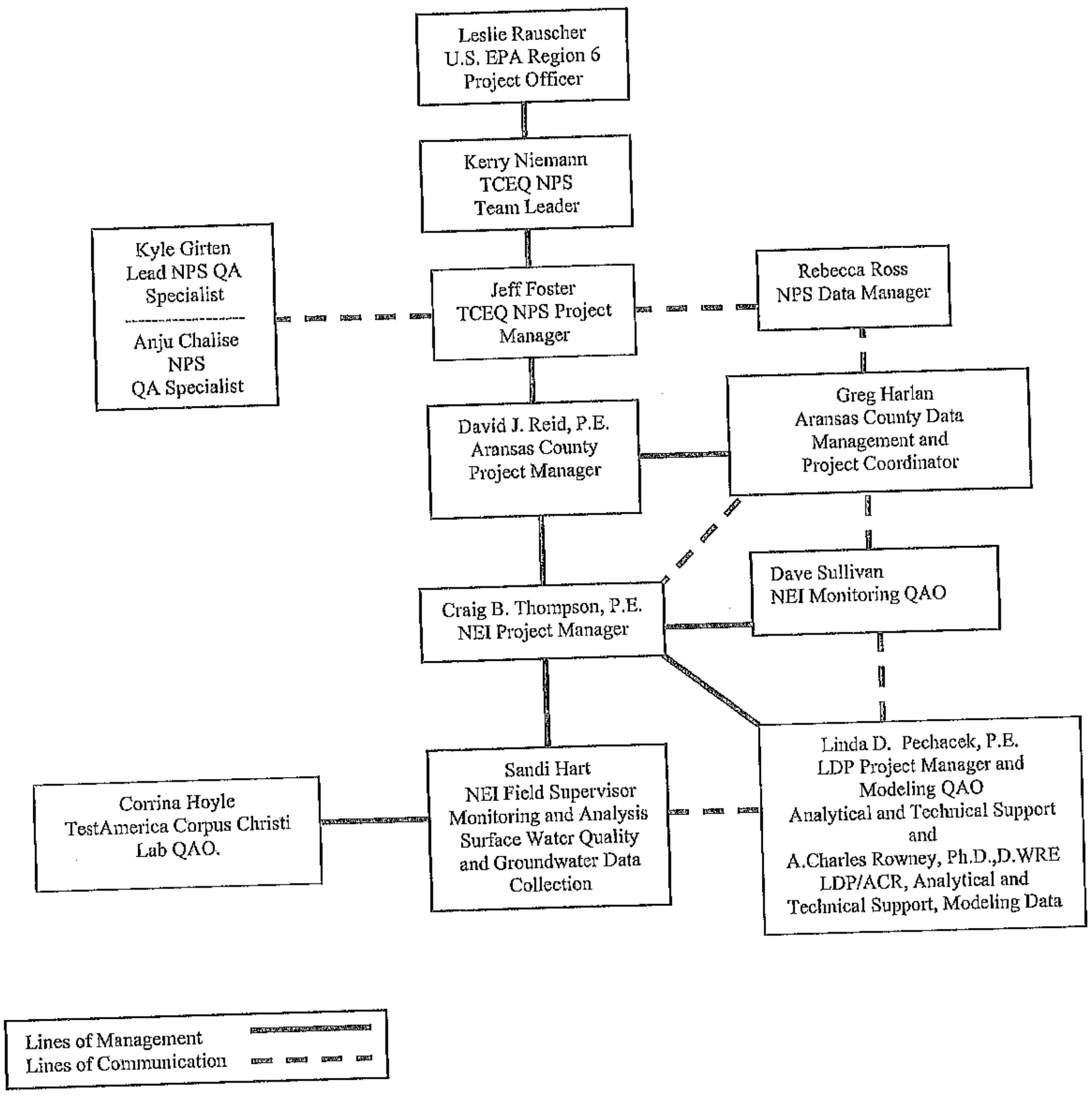
LDP
Linda D. Pechacek, P.E
LDP Project Manager and Modeling QAO
Ensures project oversight on contractor side is consistent with QAPP requirements as related to the Modeling QAPP and communicates project status to NEI Project Manager and NEI Monitoring QAO. Provides input on model selection and implementation. Notifies the NEI Project Manager and/or the NEI Monitoring QAO of circumstances that may adversely affect the quality of data derived from the modeling efforts. Helps coordinate planning activities and works with other

project team members. Responsible for the ensuring that proper methods and protocols are followed for all LDP and ACR activities related to this effort. Manages production of final Modeling results, meets with NEI, Aransas County, TCEQ and ACR staff as needed.

ACR
Analytical and Technical Support
Charles Rowney, Ph.D., D.WRE (LDP Associate / ACR)
Analytical and Technical Support, QUALHYMO Model
Responsible for ensuring that selected model is employed in a manner that is technically valid and consistent with its intended purpose and capabilities. . Coordinates and maintains records of data verification and validation carried out by ACR and/or LDP. Oversees interpolation of flow data, preparation of data for model, calibration and validation procedures, and all water quality data, groundwater data, infiltrometer data, and meteorological observations to be used in the QUALHYMO Model.

U.S. EPA Region 6
Leslie Rauscher
EPA Project Officer
Responsible for managing the CWA Section 319 funded grant on the behalf on EPA. Assists the TCEQ in approving projects that are consistent with the management goals designated under the State's NPS management plan and meet federal guidance. Coordinates the review of project workplans, draft deliverables, and works with the State in making these items approvable. 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. 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. Assists the regional NPS coordinator in tracking a State's annual progress in its management of the NPS program. Assists in grant close-out procedures ensuring all deliverables have been satisfied prior to closing a grant.

FIGURE A4.1. ORGANIZATION CHART - LINES OF COMMUNICATION



A5 Problem Definition/Background

BACKGROUND

Tule Creek watershed is a 2,340-acre watershed that carries both stormwater drainage and sewage effluents into Little Bay. The creek drains areas of the City of Rockport, the Town of Fulton, and areas of Aransas County outside the jurisdiction of either municipality (See Appendix B-Area Location Map). Water quality studies have been previously conducted to determine the extent of problems within the surrounding Aransas County, and the City of Rockport's Water Quality Committee has several years' data documenting the decline in water quality in Little Bay. The studies indicated high levels of nitrogen loading from land-based activities, reduced salinity due to stormwater outflows (exacerbated by poor water exchange with Aransas Bay), and persistent eutrophication problems surrounding algal blooms. Little Bay has also experienced declines in the once extensive beds of submerged seagrasses and the west side of the Live Oak Peninsula, sections of Copano Bay and Port Bay have been closed to oystering due to localized water pollution problems. Fishing is less productive, and winter flocks of waterfowl have declined in numbers and diversity in recent years.

Aransas County, along with the City of Rockport, ACND, and the Town of Fulton have cooperatively developed a regional stormwater master plan, the Aransas County Regional Stormwater Management Plan (ACSMP). The ACSMP includes implementing stormwater controls within the priority Tule Creek watershed as well as other programs and projects county-wide. The plan's approach is to integrate stormwater quantity and quality concerns with ecological habitat considerations to help guide land development, construction, and stormwater runoff requirements county-wide. The proposed Tule Creek Stormwater BMP Improvement Projects (hereinafter Tule Creek Project) will help address stormwater issues involving the priority Little Bay and decrease the discharge of sediment and pollutant-clad sediments transported into Little Bay while helping to preserve the ecological integrity of the creek system.

The proposed Tule Creek Stormwater BMP Projects were developed through the ACSMP process to satisfy the objective of implementing stormwater BMP projects that can help reduce stormwater pollutants entering important natural resources such as Little Bay.

This QAPP is reviewed by the TCEQ to help ensure that data generated for the purpose described above are scientifically valid and legally defensible. This process will ensure that all data submitted to SWQMIS have been collected and analyzed in a way that guarantees their reliability and therefore can be used in programs deemed appropriate by the TCEQ.

PROBLEM DEFINITION

At present, Tule Creek experiences severe erosion, high rates of sediment transport and periods of stagnation. Sediments and non-point source pollutants associated with fine sediment are a primary pollutant of concern found in Tule Creek and discharged to Little Bay. The sediment carried by runoff can be reduced through implementation of stormwater BMPs. The proposed sediment trap is an in-line treatment device intended to reduce some of the transported sediment from reaching Little Bay. Other stormwater BMPs upstream of the proposed sediment trap along the Upper Tule

Creek West combined with the sediment trap will help control the erosion and sediment discharging to Little Bay.

A6 Project/Task Description

The ultimate goal of the monitoring described in this QAPP is to integrate monitoring efforts for the County's 2009 and 2011 TCEQ Nonpoint Source Grant BMP stormwater projects for the Tule Creek Watershed. Additionally, it will provide data to be utilized in a modeling effort described in a separate Modeling QAPP titled "**West Tule Creek Sediment Trap Pond and Habitat Enhancement Quality Assurance Project Plan for Modeling.**"

The County's 2009 Nonpoint Source grant provided for construction of a sediment trap and habitat enhancement project at the West Tule Creek area downstream from the Upper Tule Creek West project area. The Upper Tule Creek West project area (Phase 1) provided by the County's 2011 Nonpoint Source grant, is an improved earthen drainage ditch with steep and barren slopes that has been modified over the years, including filling and ditch excavating of various areas as well as pipe-type culverts. The restoration of this area with stormwater BMPs will provide a range of control benefits and improved stormwater quality and habitat.

The Upper Tule Creek West extends from the City of Rockport Wastewater Treatment Plant to the Tule Lake West area. The western bank of the project section has not been cleared or maintained and currently contains native riparian vegetation. The creek, and especially the east bank, is experiencing significant erosion during rainfall events. Alternatives to be evaluated will involve varying degrees of widening and re-sloping; some alternatives may not involve any widening or re-sloping, such as earth retention systems, liners, gabions, or combinations of techniques, materials and strategies.

Several analyses will be conducted to evaluate various aspects of the sediment trap behavior. The main requirement is to assess sediment buildup and control in the sediment trap using the QUALHYMO model (covered under a separate QAPP). Key data to be inputted in the QUALYMO Model include rainfall, estimated flow data at each water quality sampling station, TSS, soil infiltration rate, evaporation data, groundwater elevation at each piezometer location and evapo-transpiration data. In addition, a *general qualitative review of stream and habitat quality indicators and physical observations* along the creek will be performed. Procedures to obtain supporting data for both the QUALHYMO parameters and the Qualitative Review of the Stream and Habitat are included in the Monitoring QAPP.

The stream and habitat quality indicators collected in the program outlined in this QAPP will not provide definitive baseline or planning data, but is intended to provide insight responding to questions identified during local community coordination (i.e. Rockport Water Quality Committee) involving potential non-point source contributions to Tule Creek and the issue involving poor water quality conditions. The stream and habitat quality indicators may help identify gross non-point source contributions that could potentially influence downstream conditions, and will provide general habitat characterization information during and after construction to help identify habitat enhancements from invasive plant removal and implementation of the BMP improvements. The local community also had questions involving the need to avoid undesirable water quality conditions as a result of implementing the proposed stormwater BMP improvements. In particular, the question involved the construction of the proposed in-line sediment trap and the avoidance of stagnant water conditions in the sediment trap that could get washed downstream to Little Bay during a flood or high water stage event in Tule Creek. However, it should be noted that Tule Creek is already experiencing periods of stagnation and low flow, low velocity conditions during extreme dry weather. The City of Rockport Wastewater Treatment Plant (WWTP) discharges to Tule Creek upstream of the proposed in-line sediment trap facility. During extreme dry weather conditions as experienced in 2011, a significant portion of the treatment plant's effluent was diverted to the Rockport golf course for irrigation purposes. Given these conditions, Tule Creek was an extreme low flow effluent dominated stream. This extreme low flow condition was typified by very slow velocities, stagnant pools located immediately adjacent to major outfalls, and the appearance of fine sediment deposits within the creek bed.

As a precaution, given these lingering local concerns and the existence of evidence that Tule Creek can demonstrate water quality degradation; the following stream water and habitat quality indicators were incorporated into the stormwater monitoring program at a screening level:

- Total Suspended Solids (TSS) and Turbidity
- pH, Temperature, Conductivity
- Dissolved Oxygen (DO)
- Oil and Grease
- Physical Characteristics of Tule Creek and BMP Improvement Area
- Habitat Characteristics of Tule Creek and BMP Improvement Area

The City of Rockport and the Rockport Water Quality Committee collects nutrient samples of Tule Creek and Little Bay, on a periodic basis to help better understand nutrient related effects on Little Bay. However, stream flow and nutrient loading are not being measured through the City sampling effort. Since certain data is being collected under this QAPP that can benefit the City sampling program, an attempt will be made to coordinate the City sampling program with the sampling described in this QAPP. There are three (3) Rockport Water Quality Committee's sampling sites that coincide with this project's stream sampling sites. It should be noted that the City is constructing modifications to the WWTP to reduce nutrients in the effluent.

It is noted that the data to be acquired under this QAPP is not being collected on behalf of a regulatory required program such as the Total Maximum Daily Load (TMDL) Program, Stormwater Permit Program, Clean Rivers Program, and for WWTP permit requirements.

The TCEQ *Surface Water Quality Monitoring Procedure, Volume 1 and Volume 2 (most recent version)* were also generally reviewed as a guideline for addressing these other stream water and habitat quality indicators in the Monitoring QAPP. The Texas Surface Water Quality Standards (Appendix A) and the 2010 Guidance for Assessing and Reporting Surface Water Quality in Texas (August 25, 2010) were also generally used as a guideline for identifying a set of parameters to address the stagnation or eutrophication in the sediment trap. Tule Creek and Little Bay are unclassified, and aquatic life uses are not being assessed as part of this project.

The purpose of the project is to assess the sediment trap and BMP performance of the proposed Tule Creek Stormwater BMP Projects and to determine the need and basis for improvements to the BMPs. In addition, this project will identify the potential for non-point source contributions and address concerns regarding the potential water quality conditions. The overall monitoring plan follows.

1. Monitoring initiated with the 2009 grant will address the West Tule Creek Project post-construction conditions and the 2011 grant will address conditions before and after construction of the Upper Tule Creek West Project.
2. Monitoring will be performed at six (6) locations to assess sediment loading when assessing the performance of the West Tule Creek Project and Upper Tule Creek West Project. This assessment will be conducted with and without the Upper Tule Creek West BMPs (Phase 1).
3. Eight (8) total representative sampling events will be attempted to represent four (4) baseline dry and four (wet) wet weather stormwater conditions.
4. A discrete grab sample will be collected and analyzed for TSS, turbidity, and oil and grease. A multi-parameter probe will be used to collect data for pH, specific conductivity, and temperature. A DO meter will be used to collect dissolved oxygen readings.
5. To estimate stream flow, a pygmy flow meter will be used to capture velocity at the sampling sites along with water depths to then estimate flow at each sampling station.
6. An infiltrometer will be used at locations representative of differing soil conditions in the watershed to estimate the soil infiltration rate.
7. Six piezometers will be constructed along Tule Creek: three piezometers on the west side and three piezometers on the east side. Water levels at the wells will be measured and used in the QUALHYYMO model (cover under separate modeling QAPP).
8. TSS, infiltration rate, and piezometer data will be input into the QUALHYMO model (covered by separate modeling QAPP).

Appendix C provides the Work Plan Tasks and Schedule associated with this QAPP. Appendix D, Map of Monitoring Sites, contains a map of the sampling station locations used to provide data inputs into the QUALHYMO model (QUALHYMO model covered under separate modeling QAPP). The tasks listed in Appendix C and the following descriptions are those relevant to the scope of this QAPP. See Section B1 for monitoring to be conducted under this QAPP.

Project Task Timeline
See Appendix C, Work Plan Tasks and Schedule.

Revisions to the QAPP
Until the work described is completed, this QAPP shall be reissued annually on the anniversary date, or revised and reissued prior to any significant changes being made in activities, whichever is sooner. Reissuances and annual updates must be submitted to the TCEQ for approval at least 90 days before the last approved version has expired. If the QAPP expires, the QAPP is longer in effect and the work covered by the QAPP must be halted. If the entire QAPP is current, valid, and accurately reflects the project goals and the organization's policy, the annual re-issuance may be done by a certification that the plan is current. This can be accomplished by submitting a cover letter stating the status of the QAPP and a copy of new, signed approval pages for the QAPP. If the QAPP needs to be updated to incorporate amendments made earlier in the year or to incorporate new changes, a full annual update is required. This is accomplished by submitting a cover letter, a document detailing changes made, and a full copy of the updated QAPP (including signature pages).

Amendments

Amendments to the QAPP may be necessary to reflect changes in project organization, tasks, schedules, objectives, and methods; address deficiencies and nonconformance; improve operational efficiency; and/or accommodate unique or unanticipated circumstances. Requests for amendments are directed from the contractor Project Manager to the TCEQ Project Manager in writing using the QAPP Amendment shell. The changes are effective immediately upon approval by the TCEQ NPS Project Manager and Quality Assurance Specialist, or their designees, and the EPA Project Officer (if necessary).

Amendments to the QAPP and the reasons for the changes will be documented, and full copies of amendments will be forwarded–to all persons on the QAPP distribution list by the Contractor QAO. Amendments 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

Only data collected that have a valid parameter code in Table A7.1 will be stored in SWQMIS. Any parameters listed in Table A7.1 that do not have a valid TCEQ parameter code assigned will not be stored in SWQMIS.

Quantitative and qualitative information regarding measurement data needed to assess sediment trap performance and stream water quality indicators are provided below.

TABLE A7.1 MEASUREMENT PERFORMANCE SPECIFICATIONS FOR BMP EFFECTIVENESS MONITORING (QUALHYMO)

PARAMETER	UNITS	MATRIX (LAB)	METHOD	PARAMETER CODE	AWRL*	Limit of Quantitation (LOQ)	Recovery at LOQ (%)	PRECISION (RPD of LCS/LCSD)	BIAS %Rec. of LCS	Completeness (%)
TSS 'Residue, Total Nonfiltrable'	mg/L	Water LAB	SM 2540 D	00530	4	3	80-120	20	80-120	90
Infiltration rate (infiltrometer)	cm/s	Soil FIELD	Modified ASTM 3385-09	NA	NA	NA	NA	NA	NA	NA
Stream Flow Estimate	cfs	Water FIELD	sample station flow estimates	74069	NA	NA	NA	NA	NA	NA

TABLE A7.2 STREAM WATER QUALITY INDICATORS

Parameter	Units	Matrix (LAB)	Method	Parameter Code	AWRL*	Limit of Quantitation (LOQ)	Recovery at LOQ (%)	PRECISION (RPD of LCS/LCSD)	BIAS %Rec. of LCS	Completeness (%)
pH	pH/ units	Water FIELD	TCEQ SOP	00400	NA	NA	NA	NA	NA	90
DO	mg/L	Water FIELD	TCEQ SOP	00300	NA	NA	NA	NA	NA	90
specific conductance	uS/cm	Water FIELD	TCEQ SOP	00094	NA	NA	NA	NA	NA	90
Oil and Grease	mg/L	Water LAB	EPA 1664A	00556	NA	5 mg/l	NA	NA	NA	90
Temperature	C	Water FIELD	TCEQ SOP	00010	NA	NA	NA	NA	NA	90
Turbidity	NTU	Water LAB	SM 180.1	82079	NA	1 NTU	NA	NA	NA	NA

Water Depth	meters	Water FIELD	TCEQ SOP	82903	NA	NA	NA	NA	NA	90
Water Velocity	cfs	Water FIELD	TCEQ SOP		NA	NA	NA	NA	NA	90

*the most up-to-date AWRL is located at http://www.tceq.state.tx.us/compliance/monitoring/nps/grants/NPS-QAPP.html

References: US EPA Methods for Chemical Analysis of Water and Wastewater, Manual #EPA-600/4-79-020. American Public Health Association, American Water Works Association and Water Environment Federation, *Standard Methods for the Examination of Water and Waste Water*, 20th Ed., **TCEQ SOP is taken from the Texas Commission on Environmental Quality *Surface Water Quality Monitoring Procedures*, Volume 1, October 2008 (or most recent version).**

Precision

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

Field sample 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 sample splits are defined in Section B5. However, no field sample will be split in the field for this project.

Laboratory precision is assessed by comparing replicate analyses of laboratory control samples in the sample matrix (e.g. deionized water, sand, commercially available tissue) or sample/duplicate pairs in the case of bacterial analysis. Precision results are compared against measurement performance specifications and used during evaluation of analytical performance. Program-defined measurement performance specifications for precision are defined in Table A7.1.

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 determined through the analysis of laboratory control samples and LOQ Check Standards prepared with verified and known amounts of all target analytes in the sample matrix (e.g. deionized water, sand, commercially available tissue) and by calculating percent recovery. Results are compared against measurement performance specifications and used during evaluation of analytical performance. Program-defined measurement performance specifications for bias are specified in Table A7.1.

Representativeness

Data collected under this project will be considered representative of ambient water quality for dry/low flow sampling conditions and of stormwater (high flow) during wet/runoff conditions. Representativeness is a measure of how accurately a monitoring program reflects the actual water quality conditions typical of receiving waters. The representativeness of the data is dependent on 1) the sampling locations, 2) the number of samples collected, 3) the number of years, the seasons and weather conditions when sampling is performed, 4) the number of depths sampled, and 5) the sampling procedures. Measurement data will represent conditions at the sampling sites at the time of sampling. One half of the samples will be taken during wet weather, and one half during dry weather.

Flow for sites will be estimated based on water depth, velocity, and channel configuration. A flow severity of low, medium, or high, recent precipitation amounts, and days since last significant precipitation will also be recorded. This information will be used to determine if a sampling event was a runoff event or dry weather event. The County will transfer monitoring data to the TCEQ for inclusion in the TCEQ surface water quality monitoring database. Data will be transferred in the correct format using the TCEQ file structure as described in the most recent version of TCEQ Surface Water Quality Monitoring Data Management Reference Guide.

Representative wet-weather events (high flow), targeted for sampling will generally be defined as greater than 1/4" of precipitation as recorded by the Rockport Airport Rain Gauge, will be taken within 4 hours of the event following no less than approximately 72 hours from the prior rain event or greater of dry weather (less than 0.1 inches of rainfall). This reasonably representative rain event range is also expected to create a stream flow with a width of less than 15 feet and a water depth of less than 3 feet which will be safe for a manual sampling approach with an earthen ditch with such steep slope sides. This rain event is considered to be reasonably representative of a stormwater sediment and pollutant loading event. One velocity and depth measurement will be taken per location for high flow events (see Appendix F, Surface Water Quality Sampling Standard Operating Procedures).

Dry weather sampling (low flow), defined as less than a 1-foot water depth, will take place on a scheduled basis tentatively planned for the first month of each quarter depending on weather conditions and representativeness. One velocity and depth measurement will be taken per location for low flow events.

The goal for meeting total representation of the water body and watershed is tempered by the availability of time and funding. With only four samples each for dry and wet weather, confidence limits of the sample sets will tend to be wide, but the average of each set will constitute the best available representation of wet and dry weather conditions at each site. Representativeness will be measured with the completion of sample collection in accordance with the approved QAPP

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.

Comparability

Confidence in the comparability of routine 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 in TCEQ SOPs. Comparability is also guaranteed by reporting data in standard units, by using accepted rules for rounding figures, and by reporting data in a standard format as specified in Section B10.

Limit of Quantitation

AWRLs (Table A7.1) are used in this project as the *limit of quantitation specification*, so data collected under this QAPP can be compared against the TSWQS or TCEQ's Habitat Quality Index (Forms for Biological Monitoring, 06/2007). Laboratory *limits of quantitation* (Table A7.1) must be at or below the AWRL for each applicable parameter.

Laboratory Measurement Quality Control Requirements and Acceptability Criteria are provided in Section B5.

Analytical Quantitation
To demonstrate the ability to recover at the limit of quantitation, the laboratory will analyze an LOQ check standard for each batch of samples run.

Laboratory Measurement Quality Control Requirements and Acceptability Criteria are provided in Section B5

A8 Special Training/Certification

Field personnel will receive training in proper sampling and field analysis. Before actual sampling or field analysis occurs, they will demonstrate to the QA officer (or designee), their ability to properly operate the sampling equipment described elsewhere and retrieve the samples. The QA officer will sign off each field staff in their field logbooks.

Global Positioning System (GPS) equipment may be used as a component of the information required by the Station Location (SLOC) request process for creating the certified positional data that will ultimately be entered into the TCEQ's SWQMIS database. Any positional data obtained by Nonpoint Source Program grantees using a Global Positioning System will follow the TCEQ's OPP 8.11 and 8.12 policy regarding the collection and management of positional data.

Positional data entered into SWQMIS will be collected by a GPS certified individual with an agency approved GPS device to ensure that the agency receives reliable and accurate positional data. Certification can be obtained in any of three ways: completing a TCEQ training class, completing a suitable training class offered by an outside vendor, or by providing documentation of sufficient GPS expertise and experience. Contractors must agree to adhere to relevant TCEQ policies when entering GPS-collected data.

In lieu of entering certified GPS Coordinates, positional data may be acquired with a GPS and verified with photo interpolation using a certified source, such as Google Earth or Google Map. The verified coordinates and map interface can then be used to develop a new SLOC.

Contractors and subcontractors must ensure that laboratories analyzing samples under this QAPP meet the requirements contained in TNI Volume 1, Module 2, (Section 4.5.5) (concerning Review of Requests, Tenders and Contracts). The laboratory, TestAmerica Corpus Christi, does have Certification of NELAC compliance which is included in their reports.

A9 Documents and Records

Laboratory Test Reports

Routine data reports should be consistent with the TNI Volume 1, Module 2, (Section 5.10) and include the information necessary for the interpretation and validation of data. The requirements for reporting data and the procedures are provided

TestAmerica Corpus Christi reports for this project will include the following information:

- Sample results
- Units of measurement
- Sample matrix
- Dry weight or wet weight (as applicable)
- Station information
- Date and time of collection
- Sample depth
- LOQ and LOD (formerly referred to as the reporting limit and the method detection limit, respectively), and qualification of results outside the working range (if applicable)
- Certification of NELAC compliance on a result by result basis

TestAmerica Corpus Christi uses the chain of custody form and the sample identification supplied by the NEI regarding the location or sample site identification to identify the sample for reporting purposes. The sample identification number along with Test America's work order number is used to identify the results in the report.

TestAmerica Corpus Christi's QAQC Manual is available upon request.

Electronic Data

Data will be submitted to the TCEQ in the event/result format specified in the TCEQ Data Management Reference Guide (DMRG; January 2012 or most recent version) for upload to the Surface Water Quality Monitoring Information System (SWQMIS). The Data Review Checklist and Summary as contained in Appendix N of this document will be submitted with the data.

A submitting entity will submit a station location (SLOC) directly to the TCEQ Data Manager through SWQMIS for each sampling site to obtain a station identification number. If submitting entity does not have access to the SWQMIS, TCEQ Project Manager will assist the submitting entity to get the access. TCEQ Project Manager should be copied on all the correspondence throughout the process. The TCEQ Project Manager will ensure that submitting entity actually requests SLOCS before submitting any data to the TCEQ.

All reported Events will have a unique TagID (see DMRG). A Tag Prefix must be requested from the TCEQ in accordance with the DMRG where the Submitting Entity does not already have one. Tag IDs used in this project will be seven-character alphanumerics with the structure of the two-letter Tag prefix followed by a four digit number and ending with the character "N": for example – KI1234N, KI1235N, etc.

Submitting Entity, Collecting Entity, and Monitoring Type codes will reflect the project organization and monitoring type in accordance with the DMRG. The proper coding of Monitoring Type is essential to accurately capture any bias toward certain environmental condition (for example, high flow events). The Project Manager should be consulted to assure proper use of the Monitoring Type code.

Records and Documents Retention Requirements

Document/Record	Location	Retention	Form
QAPP, amendments, and appendices	Aran. County	5 years	Paper
QAPP distribution documentation	Aran. County	5 years	Paper
Training records	Aran. County	5 years	Paper
Field notebooks or field data sheets	Aran. County	5 years	Paper
Field equipment calibration/maintenance log	Aran. County	5 years	Paper
Chain of custody records	Lab	5 years	Paper
Field SOPs	Aran. County	5 years	Paper
Laboratory QA manuals	Lab	5 years	Paper
Laboratory SOPs	Lab	5 years	Paper
Laboratory procedures	Lab	5 years	Paper
Instrument raw data files	Lab	5 years	LIMS Electronic
Instrument readings/printouts	Lab	5 years	Paper
Laboratory data reports/results	Lab	5 years	Paper
Laboratory equipment maintenance logs	Lab	5 years	Paper
Laboratory calibration records	Lab	5 years	LIMS Electronic
Corrective action documentation	Lab	5 years	Paper

B1 Sampling Process Design (Experimental Design)

WATER QUALITY MODELING

The parameters to be monitored for the QUALHYMO modeling include:

- o TSS
- o Stream Depth and Velocity (for Stream Flow Estimates)
- o Infiltration rates
- o Groundwater level

GENERAL QUALITATIVE REVIEW OF STREAM WATER AND HABITAT QUALITY

- o Dissolved Oxygen
- o pH, Temperature
- o Oil and Grease
- o Turbidity
- o Stream Physical Characteristics and Observations
- o Habitat Quality Index

These parameters were selected since TCEQ Water Quality Standards for representative freshwater streams are available for ease of comparison and at limited cost and time. In addition, the stream riparian physical and habitat/vegetative indicators can be obtained with reasonable effort and point out undesirable conditions, including stagnation that maybe influenced by not just the BMPs but also potential non-point source contributions. The collection of this data may also help identify other stream conditions not associated with the stormwater BMP implementation that could influence downstream conditions.

The water and habitat quality indicators are not required for inclusion as modeling parameters for the QUALHYMO Modeling (see Modeling QAPP). The water and habitat quality indicators will be collected during each sampling event at each station and will be logged on the Stream Physical Characteristics Worksheet (See Appendix E). During the construction period, one set of TSS samples of Tule Creek will be collected to help represent baseline disturbed conditions for later comparison. The baseline disturbed conditions for the sediment trap were otherwise estimated as addressed in the 2009 TCEQ Grant.

Sample Design and Rationale

The sampling design and rationale are to assess the sediment trap and other BMP performance and to help identify potential non-point source contributors. Water quality data will be collected for a total of eight (8) sampling events to attempt to represent four (4) baselines dry and four (4) wet weather stormwater conditions. The primary rationale for the sample design is based on the data needed for the QUALHYMO Modeling of stormwater BMP performance (See Modeling QAPP). In addition, parameters were added (General Qualitative Review of Stream and Habitat Water Quality) as indicators of poor water quality conditions. The rationale for this sampling design also relies on guidance as outlined in TCEQ's *Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, and the Urban Stormwater BMP Performance Monitoring Manual.*

Site Selection Criteria

The data collection effort is to monitor water quality and hydrological parameters using procedures that are consistent with the guidance as outlined in TCEQ's *Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, and the Urban Stormwater BMP Performance Monitoring Manual.* All plans for monitoring efforts were coordinated with the City of Rockport. To this end, some general guidelines were followed when selecting sample sites, as identified below.

- Sample sites were chosen to best represent the performance of the implemented BMPs and the water quality of Tule Creek Watershed (i.e. – Sediment Trap, Upper Tule Creek West BMPs vs North Tule Creek contributions).
- Some sites were also chosen, where feasible, to allow coordination and combined efforts with the City of Rockport.
- Overall consideration was given to accessibility of sites and safety of sampling crew.

TABLE B1.1 MONITORING SITES

TCEQ Station ID**	Site Description	Latitude Longitude	Sample Matrix	Habitat and Physical Characteristics	Total Suspended Solids	Flow Estimate	Infiltration rate	Comments
21185 (WQS-1)	Below sediment trap above TX Bus. 35	28°03'02.03"N 97°02'33.4"W	Water	Water	Water	Water	NA	Wet and dry weather sampling
21189 (WQS-2)	Above sediment trap at confluence	28°03'05.88"N 97°02'36.74"W	Water	Water	Water	Water	NA	Wet and dry weather sampling
21190 (WQS-3)	Traylor Ave.	28°03'13.63"N 97°02'38.33"W	Water	Water	Water	Water	NA	Wet and dry weather sampling
21191 (WQS-4)	Below Upper Tule Creek West – Phase 1	28°03'02.11"N 97°02'47.58"W	Water	Water	Water	Water	NA	Wet and dry weather sampling
21192 (WQS-5)	Above Upper Tule Creek West – Phase 1	28°02'42.54"N 97°03'01.67"W	Water	Water	Water	Water	NA	Wet and dry weather sampling
21193 (WQS-6)	Tule Creek Drive	28°02'46.60"N 97°02'21.30"W	Water	Water	Water	Water	NA	Wet and dry weather sampling
GWP-1A	Rockport Country Club ROW	28°2'51.79"N 97°3'14.52"W	Water	NA	NA	NA	Soil	Groundwater level
GWP-1B	Inverrary Dr, ROW of Frost Property	28°2'50.32"N 97°3'3.64"W	Water	NA	NA	NA	Soil	Groundwater level
GWP-1C	Inverrary Dr, ROW of Frost Property	28°2'50.30"N 97°3'1.07"W	Water	NA	NA	NA	Soil	Groundwater level
GWP-2A	City of Rockport Aquatic Center Park	28°02'47.39"N 97°02'57.42"W	Water	NA	NA	NA	Soil	Groundwater level
GWP-2B	City of Rockport Aquatic Center Park	28°02'42.08"N 97°02'59.84"W	Water	NA	NA	NA	Soil	Groundwater level
GWP-2C	Rockport/Fulton High School	28°02'45.35"N 97°02'50.57"W	Water	NA	NA	NA	Soil	Groundwater level

** Station Location Requests (SLOC) have been made for the water quality sample locations only. WQS # coincides with sampling location map.

B2 Sampling Methods

Field Sampling Procedures
Field sampling procedures documented in TCEQ's *Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data* and the *Urban Stormwater BMP Performance Monitoring Manual* will be utilized. Additional procedures for field sampling outlined in this section reflect specific requirements for sampling under this project and/or provide additional clarification. See Appendix F for sampling SOP procedures.

<u>Water Quality Assessment</u>
Routine sample collection will follow the field sampling procedures for conventional parameters TSS, pH, DO, conductivity, oil and grease, temperature, turbidity, water depth, and water velocity documented in TCEQ's *Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods* (most recent version). The *Urban Stormwater BMP Performance Monitoring Manual (October 2009)* will be used as guidance for the evaluation of the sediment trap BMP. Discrete water quality measurements and samples will be taken 1/3 of the flow depth below the water surface.

The approach to obtaining high quality data from a multi-parameter probe and pygmy meter for calculating velocity is to ensure that calibrated values are repeatable at the end of the measurement period. The maintenance and calibration procedures for the multi-parameter probe will follow the manufacturer's guidelines for equipment that would satisfy EPA/TCEQ regulatory requirements.

Discrete sampling will occur based on forecasted and monitored dry and wet weather periods.. Discrete sampling will be done with a multi-parameter probe for pH, temperature, conductivity, and dissolved oxygen. TSS, turbidity, and oil and grease will be grab samples delivered to an analytical lab. A pygmy meter will be used to calculate velocity.

The sample volumes, container types, minimum sample volume, preservation requirements, and holding time requirements are specified in Tables B2.1 and B2.2.

<u>Modified Instantaneous Flow Measurement</u>
There are no nearby stream gauges or safe and appropriate monitoring locations where flow can be measured. Therefore, a modified instantaneous flow measurement procedure has been developed which relies on use of a pending surveyed cross-section profile of each stream sampling location (using the TCEQ SWQM Procedures for cross sections), water depth, and velocity measurements to calculate flow at the sampling location using the TCEQ SWQM Procedures. The procedure involves the calculation where flow (Q) in cubic feet per second (cfs) is equal to the stream cross-sectional area (A), which will be defined by the water depth, multiplied by stream velocity (V). This calculation is represented as: Q (cfs) = V (ft/sec) * A (ft^2). There will be a known cross-sectional profile surveyed for the sampling location which will be used to estimate stream width from the stream depth at the time of sampling. See Appendix E for Streamflow and Cross Section Measurement Forms.

The TCEQ instantaneous method (Surface Water Quality Monitoring Procedures, Volume 1, most recent version, SWQM) has been modified to estimate stream flow at the specific water quality sampling time and location, and includes one mid-stream water depth and velocity measurement. The subject Tule Creek stream (open channel) as well as the sediment trap pond sampling locations are fairly uniform and the one water depth is considered adequate for representing the dry and wet-weather stormwater runoff period for the QUALHYMO model (see Modeling QAPP).

The water depth will be measured at one location (mid-stream) using a graduated stream gauge staff. The water flow velocity will be measured using a pygmy meter mounted on a pole involving an impellar and digital readout that can be calculated to velocity in ft/sec. The stream cross-section will be obtained at each sample site. The water velocity measured using a pygmy meter will be taken mid-stream and mid-point within the upper one-third of the water column.

Provided in Appendix D is a map showing the water quality and flow sampling locations as well as the location where the typical profile of the stream will be surveyed. Provided in Appendix F is the Surface Water Quality Sampling Standard Operating Procedures with added information on sampling and measuring protocol. Also provided in Appendix G is a photo of each sampling location.

<u>Groundwater Piezometer Gauging (Groundwater Surface Tracking) Assessment</u>
A total of six piezometers will be constructed and groundwater water elevation data collected as part of the QUALHYMO Modeling (See Modeling QAPP). Three piezometers will be constructed on the west bank and three piezometers on the east bank. Water elevation changes at the wells in response to precipitation events will be assessed. The water level information will be used in the QUALHYMO model (covered under separate modeling QAPP) in modeling hydrologic responses along Tule Creek. The SOP for Gauging Piezometers can be found in Appendix H.

<u>Infiltration Rate Assessment</u>
An infiltrometer will be used at three locations to estimate the soil infiltration rate of various soil types found in the Tule Creek watershed as part of the QUALHYMO Modeling effort (See Modeling QAPP). The locations will be selected near verifiable and reliable water sources with suitable access and located in the general proximity of the piezometers. Given that this part of Texas is in a 3-year drought and water supply is limited, it is necessary to modify the ASTM standard to waste less water and to increase the test's reliability for high infiltrating soils, as detailed in the manufacturer's instruction for using the Double Ring Infiltrometer. As such, specific elements of the ASTM D3385 – 09 standard and recommended instructions from the manufacturer of the infiltrometer rings have both been incorporated into the Modified Double Ring Infiltrometer procedure. The Modified Double Ring Infiltrometer SOP can be found in Appendix I.

<u>Habitat and Physical Characteristics</u>

A general stream riparian and proposed sediment trap and stream BMPs area survey will also be performed. The survey will primarily involve visual observations of stream habitat characteristics and changes at the water quality sampling locations. Special attention will also be given to the proposed sediment trap area. As previously discussed there are various physical stream conditions and observations which will be logged on the Stream Physical Characteristics Worksheet (See Appendix E) and will include riparian vegetation, aquatic vegetation, and particular attention to the presence of blue-green algae.

Blue-green algae can build-up in fresh and marine waters if water temperature, light conditions, and nutrient levels increase and water flows are low or stagnant. The presence of large persistent amounts of blue-green algae can be a sign of eutrophic or stagnant water conditions. Blue-green algae prefer low turbidity waters.

The comparison of pre-construction conditions with post construction conditions will be used as a screening tool for identifying the potential for undesirable conditions in the proposed sediment trap. These habitat observations will generally identify species composition and percent cover generally within the stream reach where stream stormwater BMP's are implemented as well as the proposed sediment trap and shoreline. The habitat quality inspection will involve the collection of the data using the Habitat Quality Index Worksheets at each sample location. In addition, on the sample collection day there will be a general drive-by and walk about along the entire creek to identify any other stream or riparian conditions that could also contribute or influence the stream conditions as well as the performance of the BMP. Although the scope of the monitoring program is limited with regards to the assessment of other stormwater runoff contributions and controls throughout the drainage basin outfalling into Tule Creek, the habitat quality and physical characteristics survey can help identify issues of interest in explaining the results of the modeling BMP performance, and addressing the community's issues and questions. The Habitat Quality Index Worksheets (See Appendix E) will be used to log the instream, bottom, riparian cover, and other physical stream features at each sample location.

Documentation of Field Sampling Activities

The parameters monitored as part of the Stream Habitat and Physical Characteristics Inspection is for purposes of identifying potentially poor conditions potentially influenced by BMPs and primarily in the proposed sediment trap. The number of parameters and sampling approach is limited and should not be expected to be conclusive. The combined visits and site inspections between the QAPP monitoring efforts will be used to help determine the need for a sampling and inspection event or other necessary inspection of the proposed Tule Creek sediment trap. The data collected will be reported to the TCEQ at the same schedule and other reporting schedules as indicated in the TCEQ grants involving the monitoring of Tule Creek. The data will be submitted quarterly to TCEQ and routine reporting will be made to the City of Rockport Water Quality Committee.

Field sampling activities are documented on the Field Data Measurement Form as presented in Appendix J. Calibration records are a part of the field data record. For all visits, station ID, location, sampling time, sampling date, sampling depth, preservatives added to samples, sample collector's name/signature are recorded, flow, groundwater elevation, temperature, pH, total suspended solids, turbidity, dissolved oxygen, and conductivity in accordance with TCEQ's *Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods*, and the *Urban Stormwater BMP Performance Monitoring Manual.* Values for all measured field parameters are recorded. Detailed observational data are recorded including but not limited to water appearance, weather, stream uses, unusual odors, specific sample information, days since last significant rainfall, flow severity and vegetative habitat assessment.

The sample volumes, container types, minimum sample volume, preservation requirements, and holding time requirements are specified in tables B2.1 and B2.2. for those parameters involving laboratory analysis.

TABLE B2.1 BMP EFFECTIVENESS MONITORING (QUALHYMO)

Parameter	Matrix	Sample Type	Container*	Preservation	Sample Volume	Holding Time
TSS	Water	Grab	Pre-cleaned plastic cubitainer	ice, dark	500 mL	7 days

TABLE B2.2 MEASUREMENT PERFORMANCE SPECIFICATIONS FOR STREAM WATER AND SEDIMENT QUALITY INDICATORS

Parameter	Matrix	Sample Type	Container	Preservation	Sample Volume	Holding Time
Oil and Grease	Water	Grab	Pre-cleaned amber cubitainer	ice, dark pH<2 with HCl	1000 mL (1 L)	28 days
Turbidity	Water	Grab	Pre-cleaned plastic cubitainer	ice, dark	500 mL	48 hours

Processes to Prevent Cross Contamination

Procedures outlined in the TCEQ *Surface Water Quality Procedures* outline the necessary steps to prevent cross-contamination of samples. These include such things as direct collection into sample containers and the use of commercially pre-cleaned sample containers.

Recording Data

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

1. Legible writing in indelible, waterproof ink with no modifications, write-overs or cross-outs;
2. Changes should be made by crossing out original entries with a single line, entering the changes, and initialing and dating the corrections.
3. Close-outs on incomplete pages with an initialed and dated diagonal line.

Field sampling activities will be documented in a field data sheet that will be archived in a binder at NEI. An example of the field measurement data sheet is given in Appendix J.

Sampling Method Design Deficiencies and Corrective Action

Examples of sampling method requirement or sample design deficiencies include but are not limited to such things as inadequate sample volume due to spillage or container leaks, failure to preserve samples appropriately, contamination of a sample bottle during collection, storage temperature and holding time exceedance, sampling at the wrong site, etc. Any deviations from the QAPP and appropriate sampling procedures may invalidate resulting data and may require corrective action. Corrective action may include for samples to be discarded and re-collected. It is the responsibility of the NEI Project Manager, in consultation with the NEI Monitoring QAO, to ensure that the actions and resolutions to the problems are documented and that records are maintained in accordance with this QAPP. In addition, these actions and resolutions will be conveyed to the NPS Project Manager both verbally and in writing in the project progress reports and by completion of a corrective action plan (CAP).

The definition of and process for handling deficiencies and corrective actions are defined in Section C1.

B3 Sample Handling and Custody

The sample handling and custody only applies to the samples collected for TSS, Oil and Grease, and Turbidity since these are the only water quality samples that will be transported to the laboratory for analysis.

Sample Labeling

Samples from the field are labeled on the container with an indelible marker. Label information includes:

1. Site identification
2. Date and time of collection
3. Preservative added, if applicable
4. Sample type (i.e., analysis (es)) to be performed

Sample Handling

If the contractor has written procedures describing sample handling, then that documentation should be cited and included with the COC form in Appendix K. In lieu of referencing sample handling procedures, this section should be used to comprehensively describe how samples are handled from collection though delivery to the laboratory. The discussion should incorporate information on how samples are moved from lab to lab, if applicable. Include details concerning how the samples are logged in at the laboratory, how they are examined for documentation and preservation, how holding times are insured, etc. A discussion of sample shipping should be included if applicable.

Sample Tracking

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.

A sample is in custody if it is in actual physical possession or in a secured area that is restricted to authorized personnel. The COC form is used to document sample handling during transfer from the field to the laboratory and among contractors. The following information concerning the sample is recorded on the COC form (See Appendix K).

1. Date and time of collection
2. Site identification
3. Sample matrix
4. Number of containers
5. Preservative used
6. Analyses required
7. Name of collector
8. Custody transfer signatures and dates and time of transfer

Sample Tracking Procedure Deficiencies and Corrective Action

All deficiencies associated with chain-of-custody procedures as described in this QAPP are immediately reported to the Contractor Project Manager. These include such items as delays in transfer, resulting in holding time violations; violations of sample preservation requirements; incomplete documentation, including signatures; possible tampering of samples; broken or spilled samples, etc. The NEI Project Manager in consultation with the NEI Monitoring QAO will determine if the procedural violation may have compromised the validity of the resulting data. Any failures that have reasonable potential to compromise data validity will invalidate data and the sampling event should be repeated. The resolution of the situation will be reported to the TCEQ NPS Project Manager in the project progress report. Corrective Action Plans will be prepared by the NEI Monitoring QAO and submitted to TCEQ NPS Project Manager along with project progress report.

The definition of and process for handling deficiencies and deficiencies, nonconformance, and corrective action are defined in Section C1.

B4 Analytical Methods

The analytical methods are listed in Table A7.1. Laboratories in this QAPP have the necessary accreditation, so that data may be accepted by TCEQ in accordance with 30 TAC 25.

Copies of laboratory SOPs are retained by the contractor and are available for review by the TCEQ. Laboratory SOPs are consistent with EPA requirements as specified in the method.

Standards Traceability

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

Analytical Method Deficiencies and Corrective Actions
Deficiencies in field and laboratory measurement systems involve, but are not limited to such things as instrument malfunctions, failures in calibration, blank contamination, quality control samples outside QAPP defined limits, etc. In many cases, the field technician or lab analyst will be able to correct the problem. If the problem is resolvable by the field technician or lab analyst, then they will document the problem on the field data sheet or laboratory record and complete the analysis. If the problem is not resolvable, then it is conveyed to the NEI Project Manager, who will make the determination and notify the NEI Monitoring QAO. If the analytical system failure may compromise the sample results, the resulting data will not be reported to the TCEQ. The nature and disposition of the problem is reported on the data report which is sent to the NEI Project Manager. The NEI Project Manager will include this information in the CAP and submit with the Progress Report which is sent to the TCEQ NPS Project Manager.

The definition of and process for handling deficiencies and deficiencies, nonconformance, and corrective action are defined in Section C1.

The TCEQ has determined that analyses associated with the qualifier codes holding time exceedance, sample received unpreserved, estimated value, etc. may have unacceptable measurement uncertainty associated with them. This will immediately disqualify analyses from submittal to SWQMIS. Therefore, data with these types of problems should not be reported to the TCEQ. Additionally, any data collected or analyzed by means other than those stated in the QAPP, or data suspect for any reason should not be submitted for loading and storage in SWQMIS.

B5 Quality Control

Laboratory Measurement Quality Control Requirements and Acceptability Criteria
Batch – A batch is defined as environmental samples that are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A **preparation batch** is composed of one to 20 environmental samples of the same NELAC-defined matrix, meeting the above mentioned criteria and with a maximum time between the start of processing of the first and last sample in the batch to be 25 hours. An **analytical batch** is composed of prepared environmental samples (extract, digestates or concentrates) which are analyzed together as a group. An analytical batch can include prepared samples originating from various environmental matrices and can exceed 20 samples.

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

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

Limit of Quantitation (LOQ) – The laboratory will analyze a calibration standard (if applicable) at the LOQ on each day calibrations are performed. In addition, an LOQ check standard will be analyzed with each analytical batch. Calibrations including the standard at the LOQ will meet the calibration requirements of the analytical method or corrective action will be implemented.

LOQ Sediment and Tissue Samples – When considering LOQs for solid samples and how they apply to results, two aspects of the analysis are considered: (1) the LOQ of the sample, based on the Areal-world@ in which moisture content and interferences affect the result and (2) the LOQ in the QAPP which is a value less than or equal to the AWRL based on an idealized sample with zero % moisture.

The LOQ for a solid sample is based on the lowest non-zero calibration standard (as are those for water samples), the moisture content of the solid sample, and any sample concentration or dilution factors resulting from sample preparation or clean-up.

To establish solid-phase LOQs to be listed in Table A7.1 of the QAPP, the laboratory will adjust the concentration of the lowest non-zero calibration standard for the amount of sample extracted, the final extract volume, and moisture content (assumed to be zero % moisture). Each calculated LOQ will be less than or equal to the AWRL on the dry-weight basis to satisfy the AWRL requirement for sediment and tissue analyses. When data are reviewed for consistency with the QAPP, they are evaluated based on this requirement. Results may not Aappear@ to meet the AWRL requirement due to high moisture content, high concentrations of non-target analytes necessitating sample dilution, etc. These sample results will be submitted to the TCEQ with an explanation on the Data Review Checklist and Summary as to why results do not appear to meet the AWRL requirement.

LOQ Check Standard – An LOQ check standard consists of a sample matrix (e.g., deionized water, sand, commercially available tissue) free from the analytes of interest spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. It is used to establish intra-laboratory bias to assess the performance of the measurement system at the lower limits of analysis. The LOQ check standard is spiked into the sample matrix at a level less than or near the LOQ for each analyte for each analytical batch of samples run.

The LOQ check standard is carried through the complete preparation and analytical process. LOQ Check Standards are run at a rate of one per analytical batch.

The percent recovery of the LOQ 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

Measurement performance specifications are used to determine the acceptability of LOQ Check Standard analyses as specified in Table A7.1.

<u>Laboratory Control Sample (LCS)</u> – An LCS consists of a sample matrix (e.g., deionized water, sand, commercially available tissue) free from the analytes of interest spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. It is used to establish intra-laboratory bias to assess the performance of the measurement system. The LCS is spiked into the sample matrix at a level less than or near the mid-point of the calibration for each analyte. In cases of test methods with very long lists of analytes, LCSs are prepared with all the target analytes and not just a representative number, except in cases of organic analytes with multipeak responses.

The LCS is carried through the complete preparation and analytical process. LCSs are run at a rate of one per preparation 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; and SA is the true result:

%R = SR/SA * 100

Measurement performance specifications are used to determine the acceptability of LCS analyses as specified in Table A7.1.

<u>Laboratory Duplicates</u> – A laboratory duplicate is prepared by taking aliquots of a sample from the same container under laboratory conditions and processed and analyzed independently. A laboratory control sample duplicate (LCSD) is prepared in the laboratory by splitting aliquots of an LCS. Both samples are carried through the entire preparation and analytical process. LCSDs are used to assess precision and are performed at a rate of one per preparation batch.

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: *(If other formulas apply, adjust appropriately.)*

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

Laboratory equipment blank – Laboratory equipment blanks are prepared at the laboratory where collection materials for metals sampling equipment are cleaned between uses. These blanks document that the materials provided by the laboratory are free of contamination. The QC check is performed before the metals sampling equipment is sent to the field. The analysis of laboratory equipment blanks should yield values less than the LOQ. Otherwise, the equipment should not be used.

Matrix spike (MS) – Matrix spikes are prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. Matrix spikes are used, for example, to determine the effect of the matrix on a method's recovery efficiency.

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 preparation batch whichever is greater. The information from these controls is sample/matrix specific and is not used to determine the validity of the entire batch. 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 results from matrix spikes are primarily designed to assess the validity of analytical results in a given matrix and are expressed as percent recovery (%R). The laboratory shall document the calculation for %R. 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:

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

Measurement performance specifications for matrix spikes are not specified in this document.

The results are compared to the acceptance criteria as published in the mandated test method. Where there are no established criteria, the laboratory shall determine the internal criteria and document the method used to establish the limits. For matrix spike results outside established criteria, corrective action shall be documented or the data reported with appropriate data qualifying codes.

Method blank – A method blank is a sample of matrix similar to the batch of associated samples (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as the samples through all steps of the analytical procedures, and in which no target analytes or interferences are present at concentrations that impact the analytical results for sample analyses. The method blanks are performed at a rate of once per preparation batch. The method blank is used to document contamination from the analytical process. The analysis of method blanks should yield values less than the LOQ. For very high-level analyses, the blank value should be less than 5% of the lowest value of the batch, or corrective action will be implemented. Samples associated with a contaminated blank shall be evaluated as to the best corrective action for the samples (e.g. reprocessing or data qualifying codes). In all cases the corrective action must be documented.

The method blank shall be analyzed at a minimum of once per preparation batch. In those instances for which no separate preparation method is used (example: volatiles in water) the batch shall be defined as environmental samples that are analyzed together with the same method and personnel, using the same lots of reagents, not to exceed the analysis of 20 environmental samples.

Quality Control or Acceptability Requirement Deficiencies and Corrective Actions

Sampling QC excursions are evaluated by the NEI Project Manager, in consultation with the NEI Monitoring QAO. In that differences in sample results are used to assess the entire sampling process, including environmental variability, the arbitrary rejection of results based on pre-determined limits is not practical. Therefore, the professional judgment of the NEI Project Manager and NEI Monitoring QAO will be relied upon in evaluating results. Rejecting sample results based on wide variability is a possibility. Field blanks for trace elements and trace organics are scrutinized very closely. Field blank values exceeding the acceptability criteria may automatically invalidate the sample, especially in cases where high blank values may be indicative of contamination which may be causal in putting a value above the standard.

Laboratory measurement quality control failures are evaluated by the laboratory staff. The disposition of such failures and the nature and disposition of the problem is reported to the Laboratory QAO. The Laboratory QAO will discuss with the NEI Project Manager. If applicable, the NEI Project Manager will include this information in the CAP and submit with the Progress Report which is sent to the TCEQ NPS Project Manager.

The definition of and process for handling deficiencies and deficiencies, nonconformance, and corrective action are defined in Section C1.

B6 Instrument/Equipment Testing, Inspection and Maintenance

Instrument and equipment testing, inspection, and maintenance for the monitoring equipment are included in Appendix L of this document

B7 Instrument/Equipment Calibration and Frequency

Calibration requirements for the monitoring equipment are included in Appendix L of this document.

B8 Inspection/Acceptance of Supplies and Consumables

New batches of supplies from the laboratory will be inspected before use to verify that they function properly and are not contaminated. The laboratory QAM provides additional details on acceptance requirements for laboratory supplies and consumables.

B9 Non-direct Measurements

AQUIRED DATA
ACQUIRED DATA INCLUDES INFORMATION OBTAINED OUTSIDE THE SCOPE OF THE FUNDED TCEQ GRANT.

Sampling Data
Prior to the performance of the TCEQ funded monitoring program and QAPP submittal, sampling of pre-sediment trap construction conditions was conducted including TSS, DO and Turbidity on January 17, 2012 at three of the proposed sample locations during a low flow event. The stream physical characteristics were evaluated using TCEQ 20156-A (Rev. 4-15-2004) form (page 1 only) from the TCEQ *Surface Water Quality Monitoring Procedures, Volume 2* to compile the data at three of the six proposed sampling stations and recorded on the Stream Physical Characteristics Worksheet (Appendix E). In addition, infiltrometer testing was also performed (see Appendix I, Infiltrometer SOP).

Rainfall
Rainfall records from the Aransas County Airport from 1959 to current will be used as acquired data for use in the QUALHYMO Model.

Evaporation Data
Evaporation Data for Aransas County and distributed by the Texas Water Development Board from 1954 to 2010 will be used as acquired data for the QUALHYMO Model.

Table B9.1 – Acquired Data

PARAMETER	UNITS	MATRIX (LAB)	SOURCE
Turbidity	NTU	water	Sample collected 1/17/2012 (pre-construction)
TSS	mg/L	water	Sample collected 1/17/2012 (pre-construction
DO	mg/L	water	Sample collected 1/17/2012 (pre-construction
Evaporation Data	inches	Water	TWDB
Rainfall (inches, gauge data)	inches	Water	Rockport Airport gauge station

B10 Data Management

Personnel
Section A4 lists responsibilities and lines of communication for data management personnel.

Data Management Process
Samples are collected by field staff and transferred to the laboratory for analyses as described in Sections B1 and B2. Sampling information (e.g. site location, date, time, sampling depth, etc.) is used to generate a unique sampling event in an interim database. Measurement results from both the field data sheets and laboratory data sheets are manually entered (by field and laboratory staff, respectively) into the interim database for their corresponding event. Customized data entry forms facilitate accurate data entry.

Only data collected directly under this QAPP will be submitted to the TCEQ for storage in SWQMIS. This project will not submit any acquired or non-direct measurement data to SWQMIS that has been or is going to be collected under another QAPP. All data collected under this QAPP and any acquired or non-direct measurements will comply with all requirements/guidance of the project

Following the data verification and validation, the data are exported from the interim database into the Event/Result format required for submission to TCEQ's SWQMIS (as described in the SWQM DMRG 2012 or later version). Once the TCEQ approval of the data is obtained, the data are loaded into SWQMIS by TCEQ data managers.

See Appendix M for the Data Management Process Flow Chart

Record-keeping and Data Storage
NEI record keeping and document control procedures are contained in the water quality sampling and laboratory standard operating procedures (SOPs) and this QAPP. Original field and laboratory data sheets are stored in the NEI offices in accordance with the record-retention schedule in Section A9. Two copies of the database are backed up each Friday on magnetic tape. One copy is stored off-site with Aransas County. If necessary, disaster recovery will be accomplished by information resources staff using the backup database.

Archives/Data Retention
Complete original data sets are archived on permanent media and retained on-site by the Contractor for a retention period specified in section A9.

Data Verification/Validation
The control mechanisms for detecting and correcting errors and for preventing loss of data during data reduction, data reporting, and data entry are contained in Sections D1, D2, and D3.

Forms and Checklists
See Appendix J for the Field Data Sheets.
See Appendix N for the Data Review Checklist and Summary.

Data Dictionary
Terminology and field descriptions are included in the SWQM DMRG (January 2012 or most current version). For the purposes of verifying which entity codes are included in this QAPP, a table outlining the entities that will be used when submitting data under this QAPP is included below:

Name of Monitoring Entity	Tag Prefix	Submitting Entity	Collecting Entity	Sample Description	Monitoring Type
Naismith Engineering, Inc.	NE	NE	NE		BF

Data Handling
Data are processed using the Microsoft Excel suite of tools and applications. Data integrity is maintained by the implementation of password protections which control access to the database and by limiting update rights to a select user group. No data from external sources are maintained in the database. The database administrator is responsible for assigning user rights and assuring database integrity.

Hardware and Software Requirements
Hardware configurations are sufficient to run Microsoft Excel under the Windows NT operating system in a networked environment. Information Resources staff are responsible for assuring hardware configurations meet the requirements for running current and future data management/database software as well as providing technical support. Software development and database administration are also the responsibility of the information resources department.

Information Resources develops applications based on user requests and assures full system compatibility prior to implementation.

Information Resource Management Requirements
NEI information technology (IT) policy is contained in IT SOPs which are available for review at NEI offices.

Quality Assurance/Control
See Section D of this QAPP.

C1Assessments and Response Actions

FIGURE C1.1 ASSESSMENTS AND RESPONSE ACTIONS

Assessment Activity	Approximate Schedule	Responsible Party	Scope	Response Requirements
Status Monitoring Oversight, etc.	Continuous	NEI Project Manager	Monitoring of the project status and records to ensure requirements are being fulfilled.	Report to TCEQ in Quarterly Report

Assessment Activity	Approximate Schedule	Responsible Party	Scope	Response Requirements
Monitoring Systems Audit	Dates to be determined by TCEQ	TCEQ QAS	The assessment will be tailored in accordance with objectives needed to assure compliance with the QAPP. Field sampling, handling and measurement; facility review; and data management as they relate to the NPS Project	30 days to respond in writing to the TCEQ to address corrective actions
Laboratory Inspection	Based on work plan and or discretion of contractor	NEI Monitoring QAO	Analytical and quality control procedures employed at the laboratory and the contract laboratory	30 days to respond in writing to the NEI Monitoring QAO to address corrective actions
Monitoring Systems Audit	Based on work plan and or discretion of contractor	NEI Monitoring QAO	The assessment will be tailored in accordance with objectives needed to assure compliance with the QAPP. Field sampling, handling and measurement; facility review; and data management as they relate to the NPS Project	30 days to respond in writing to the NEI Monitoring QAO to address corrective actions
Site Visit	Dates to be determined by NEI	NEI PM	Status of activities. Overall compliance with work plan and QAPP	As needed

Corrective Action Process for Deficiencies

Deficiencies are any deviation from the QAPP, SWQM Procedures Manual, SOPs, or Data Management Reference Guide. Deficiencies may invalidate resulting data and may require corrective action. Corrective action may include for samples to be discarded and re-collected. Deficiencies are documented in logbooks, field data sheets, etc. by field or laboratory staff. It is the responsibility of the NEI Project Manager, in consultation with the NEI Monitoring QAO, to ensure that the actions and resolutions to the problems are documented and that records are maintained in accordance with this QAPP. In addition, these actions and resolutions will be conveyed to the NPS Project Manager both verbally and in writing in the project progress reports and by completion of a corrective action plan (CAP).

Corrective Action

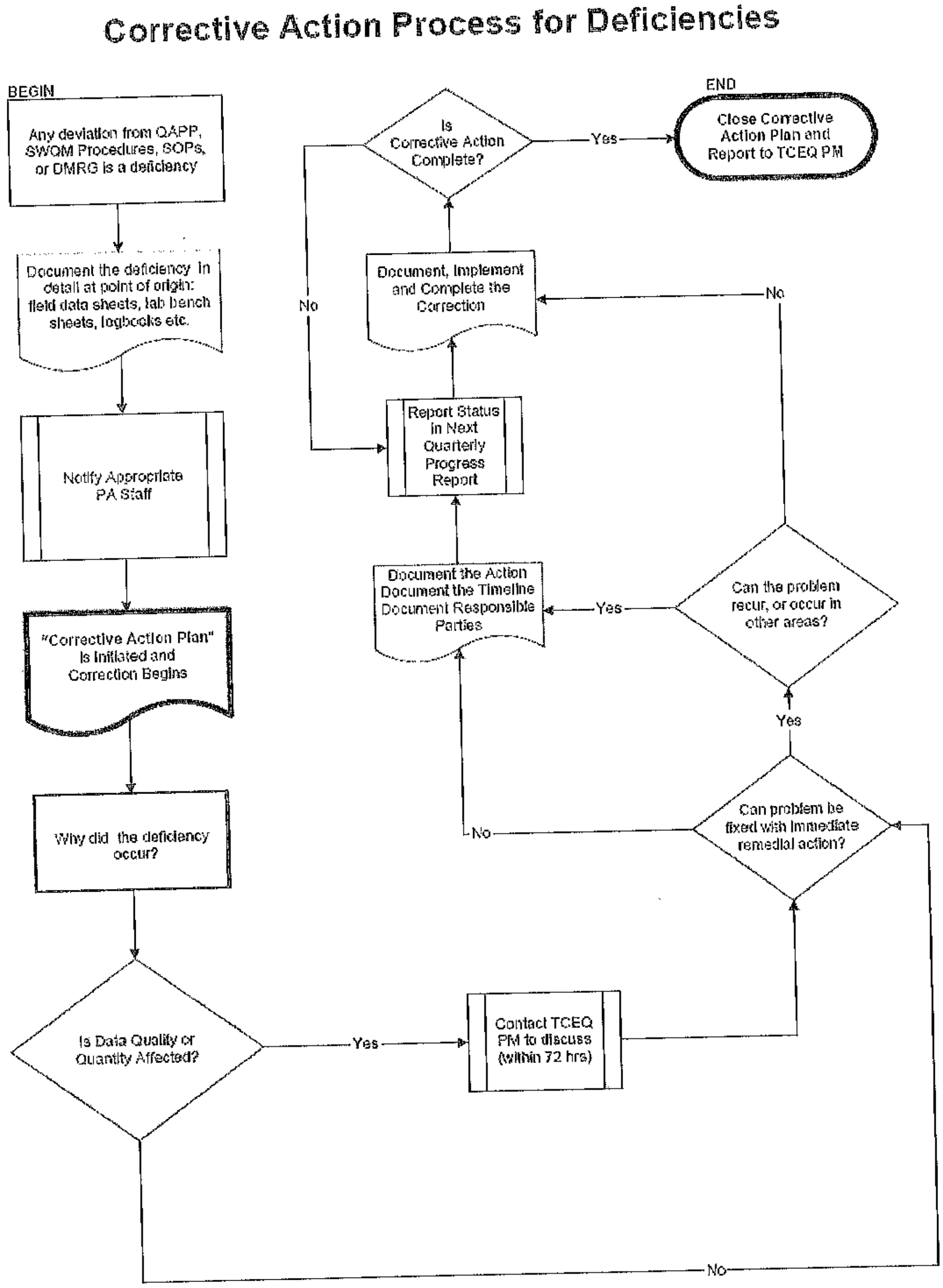
CAPs should:

- Identify the problem, nonconformity, or undesirable situation
- Identify immediate remedial actions if possible
- Identify the underlying cause(s) of the problem

- Identify whether the problem is likely to recur, or occur in other areas
- Evaluate the need for Corrective Action
- Use problem-solving techniques to verify causes, determine solution, and develop an action plan
- Identify personnel responsible for action
- Establish timelines and provide a schedule
- Document the corrective action

To facilitate the process a flow chart has been developed (see figure C1.1: Corrective Action Process for Deficiencies).

FIGURE C1.2 CORRECTIVE ACTION PROCESS FOR DEFICIENCIES



Status of CAPs will be documented on the Corrective Action Status Table (See Appendix O) and 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 TCEQ immediately.

The NEI Project Manager is responsible for implementing and tracking corrective actions. Corrective action plans will be documented on the Corrective Action Plan Form (See Appendix P) and submitted, when complete, to the TCEQ Project Manager. Records of audit findings and corrective actions are maintained by both the TCEQ and the NEI Monitoring QAO. Audit reports and corrective action documentation will be submitted to the TCEQ with the Quarterly Progress Report.

If audit findings and corrective actions cannot be resolved, then the authority and responsibility for terminating work are specified in the TCEQ QMP and in agreements in contracts between participating organizations.

C2 Reports to Management

Reports to TCEQ Project Management

All reports detailed in this section are contract deliverables and are transferred to the TCEQ in accordance with contract requirements.

Quarterly Progress Report - Summarizes the Contractor's activities for each task; reports monitoring status, problems, delays, and corrective actions; and outlines the status of each task's deliverables.

Final Project Report - Summarizes the Contractor's 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. Final Report will include all the Task Reports that are describe in the Scope of Work.

Reports to Contractor Project Management

Reports by TCEQ Project Management

Contractor Evaluation - The Contractor participates in a Contractor Evaluation by the TCEQ annually for compliance with administrative and programmatic standards. Results of the evaluation are submitted to the TCEQ Financial Administration Division, Procurement and Contracts Section.

D1 Data Review, Verification, and Validation

For the purposes of this document, data verification is a systematic process for evaluating performance and compliance of a set of data to ascertain its completeness, correctness, and consistency using the methods and criteria defined in the QAPP. Validation means those processes taken independently of the data-generation processes to evaluate the technical usability of the verified data with respect to the planned objectives or intention of the project. Additionally, validation can provide a level of overall confidence in the reporting of the data based on the methods used.

The procedures for verification and validation of data are described in Section D2, below. The NEI Field Supervisor is responsible for ensuring that field data are properly reviewed and verified for integrity. The Laboratory Supervisor is responsible for ensuring that laboratory data are scientifically valid, defensible, of acceptable precision and bias, and reviewed for integrity. The (Aransas County) Data Manager will be responsible for ensuring that all data are properly reviewed and verified, and submitted in the required format to be loaded into SWQMIS. The NEI Monitoring QAO is responsible for validating a minimum of 10% of the data produced in each task. Finally, the NEI Project Manager, with the concurrence of the NEI Monitoring QAO, is responsible for validating that all data to be reported meet the objectives of the project and are suitable for reporting to TCEQ.

D2 Verification and Validation Methods

All data will be verified to ensure they are representative of the samples analyzed and locations where measurements were made, and that the data and associated quality control data conform to project specifications. The staff and management of the respective field, laboratory, and data management tasks are responsible for the integrity, validation and verification of the data each task generates or handles throughout each process. The field and laboratory tasks ensure the verification of raw data, electronically generated data, and data on chain-of-custody forms and hard copy output from instruments.

Verification, validation and integrity review of data will be performed using self-assessments and peer review, as appropriate to the project task, followed by technical review by the manager of the task. The data to be verified (listed in table D2.1) are evaluated against project performance specifications (Section A7) and are checked for errors, especially errors in transcription, calculations, and data input. 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 electronically or by initialing and dating the associated paperwork. If an issue cannot be corrected, the task manager consults with the higher level project management to establish the appropriate course of action, or the data associated with the issue are rejected and not reported to the TCEQ for storage in SWQMIS. The performance of these tasks is documented by completion of the Data Review Checklist and Summary (Appendix N).

The NEI Project Manager and NEI Monitoring QAO are each responsible for validating that the verified data are scientifically valid, defensible, of known precision, bias, integrity, meet the data quality objectives of the project, and are reportable to TCEQ. One element of the validation process involves evaluating the data again for anomalies. 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 monitoring systems audit conducted by the TCEQ QAS 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 NEI Project Manager, with the concurrence of the NEI Monitoring QAO validates that the data meet the data quality objectives of the project and are suitable for reporting to TCEQ.

TABLE D2.1 - DATA VERIFICATION PROCEDURES

Data to be Verified	Field Task	Laboratory Task	Lead Organization Data Manager Task
Sample documentation complete; samples labeled, sites identified	Y	Y	
Field QC samples collected for all analytes as prescribed in the TCEQ *SWQM Procedures Manual*	Y		
Standards and reagents traceable	Y	Y	
Chain of custody complete/acceptable	Y	Y	
Sample preservation and handling acceptable	Y	Y	
Holding times not exceeded	Y	Y	
Collection, preparation, and analysis consistent with SOPs and QAPP	Y	Y	Y
Field documentation (e.g., biological, stream habitat) complete	Y		
Instrument calibration data complete	Y	Y	
QC samples analyzed at required frequency	Y	Y	Y
QC results meet performance and program specifications	Y	Y	Y
Analytical sensitivity (Minimum Analytical Levels/Ambient Water Reporting Limits) consistent with QAPP		Y	Y
Results, calculations, transcriptions checked	Y	Y	
Laboratory bench-level review performed		Y	
All laboratory samples analyzed for all parameters		Y	
Corollary data agree	Y	Y	Y
Nonconforming activities documented	Y	Y	Y
Outliers confirmed and documented; reasonableness check performed			Y
Dates formatted correctly			Y
Depth reported correctly			Y
TAG IDs correct			Y
TCEQ ID number assigned			Y
Valid parameter codes			Y
Codes for submitting entity(ies), collecting entity(ies), and monitoring type(s) used correctly			Y
Time based on 24-hour clock			Y
Absence of transcription error confirmed	Y	Y	Y
Absence of electronic errors confirmed	Y	Y	Y
Sampling and analytical data gaps checked (e.g., all sites for which data are reported are on the coordinated monitoring schedule)	Y	Y	Y
Field QC results attached to data review checklist			Y

Data to be Verified	Field Task	Laboratory Task	Lead Organization Data Manager Task
Verified data log submitted			Y
10% of data manually reviewed			Y

D3 Reconciliation with User Requirements

Data collected from this project will be analyzed by Aransas County, Naismith Engineering, LDP and ACR to report the performance of the BMPs and the measured reductions in NPS loadings. The percentage of pollutant removal achieved as a result of the stormwater sediment trap performance will be one of several criteria examined in the design and sizing of similar wet ponds and BMPS. Neither BMP nor in-stream monitoring data that do not meet data quality objectives will not be used in the project or submitted to SWQMIS.

QUALHYMO Model
Although the QUALHYMO Model is described in much greater specificity in the separate NPS Model QAPP titled "**West Tule Creek Sediment Trap Pond and Habitat Enhancement Quality Assurance Project Plan for Modeling**" a summary of primary characteristics of the model and the model BMP assessment follows.

Aransas County and its subconsultants will conduct a modeling effort to characterize suspended solids present in Tule Creek's runoff and sediment removal associated with a sediment trap. The project will expand the body of baseline data available for Tule Creek watershed and Aransas County. The model uses continuous simulation of the local rainfall record to calculate generated pollutant loads. QUALHYMO's capability to simulate many processes with the added capability to use the full rainfall record differentiates it from spreadsheet calculator models that operate by inputting the *average annual rainfall value* as the initial step to calculate generated pollutant loads of various selected parameters for 2 scenarios - with and without a BMP in place.

BMP behavior will be estimated based on volumetric routing through the sediment trap itself, as determined by QUALHYMO modeling. Model outputs will include:

a. estimated flow mass balance accounting (inflow, outflow, bypass and evaporation),
b. estimated sediment load and removal, and
c. estimated volumetric detention time in the BMP.

Appendix A. Signed Letters to Document Adherence to the QAPP

TO:

FROM: David J. Reid, P.E.
Assistant County Engineer

RE: Aransas County, Tule Creek Stormwater BMP Improvement Projects Monitoring Quality Assurance Project Plan

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

1931 FM 2165
Rockport, Texas 78382

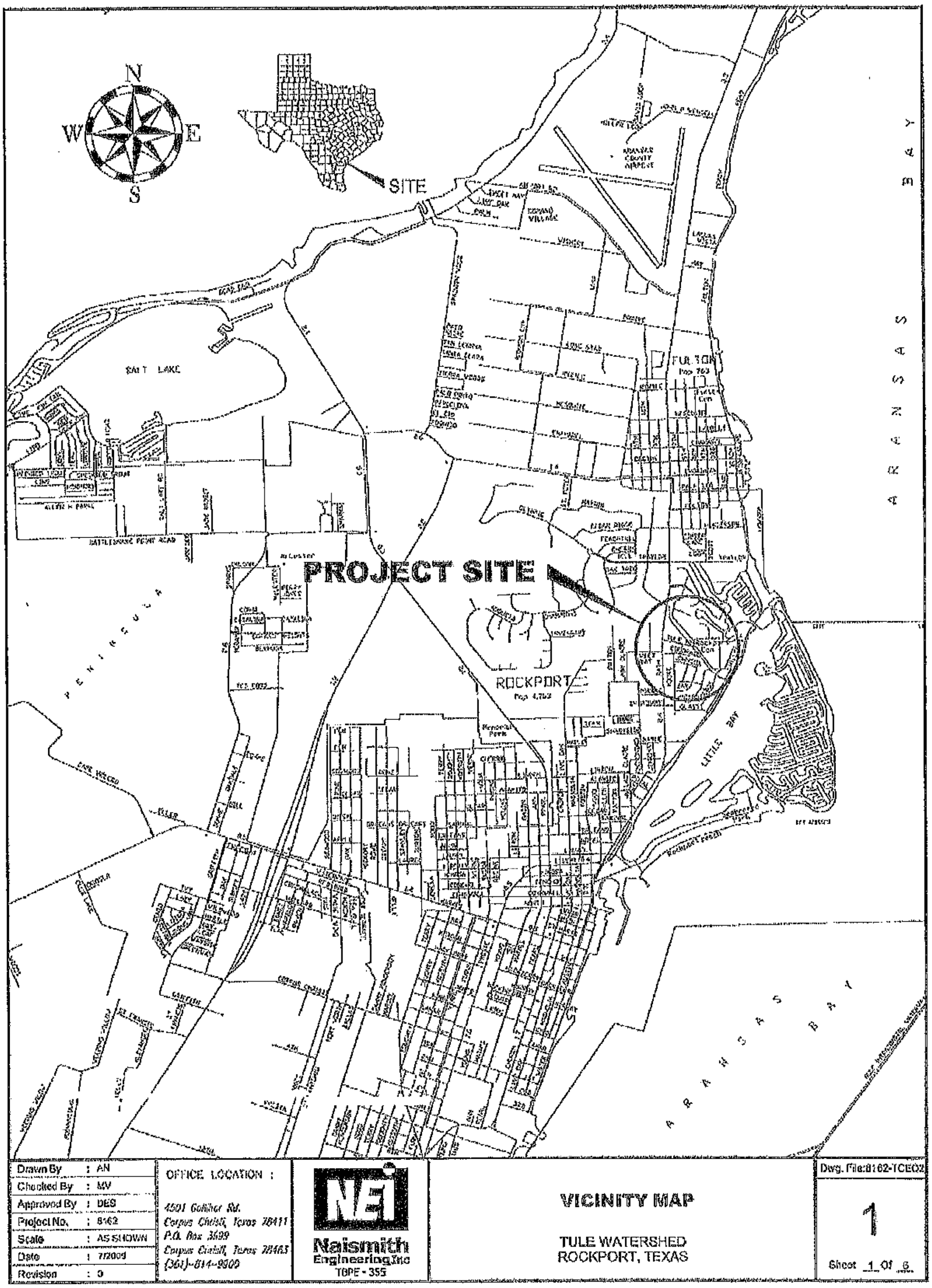
I acknowledge receipt of the "Tule Creek Stormwater BMP Improvement Projects Monitoring Quality Assurance Project Plan, May 30, 2012". I understand that the document describes quality assurance, quality control, data management and reporting, and other technical activities that must be implemented to ensure the results of work performed will satisfy stated performance criteria.

My signature on this document signifies that I have read and approved the document contents. Furthermore, I will ensure that all staff members participating in activities covered under this QAPP will be required to familiarize themselves with the document contents and adhere to the contents as well.

____

Signature Date

Appendix B. Area Location Map


N
W
E
S
SITE
SALT LAKE
FULTON
PROJECT SITE
ROCKPORT
ARANSAS BAY
ARANSAS BAY
LITTLE BAY
Drawn By : AN
Checked By : MV
Approved By : DES
Project No. : 8162
Scale : AS SHOWN
Date : 7/2009
Revision : 0
OFFICE LOCATION :
4501 Gollihar Rd.
Corpus Christi, Texas 78411
P.O. Box 3699
Corpus Christi, Texas 78463
(361)-814-9900
NEI
Naismith Engineering Inc
TBPE - 355
VICINITY MAP
TULE WATERSHED
ROCKPORT, TEXAS
Dwg. File:8162-TCE02
1
Sheet 1 Of 6

Appendix C. Work Plan Tasks and Schedule

Tule Creek Grant Projects
Project/Task Reconciliation

GRANT:	TCEQ FY09 319(h) (amendment 1) August 2012 - August 2013	TCEQ FY11 319(h) August 2011 - August 2014
Goal/Objectives Mode of Coordination	To improve water quality in Tule Creek by 1) Restoring wetlands with non-point source run off treatment capability and habitat value and 2) Improving water quality from Tule Creek discharge to Little Bay and Aransas Bay.	To reduce erosion, sloughing of creek banks, and transportation of loose sand and other sediments through the West Tule Creek System into Little Bay (Phase 1).
Activity	TASK DESCRIPTION	TASK DESCRIPTION
Stakeholder facilitation	Task 1 Project Administration includes oversight, QPRs, Reimbursements, contract communication, contractor evaluation, project fact sheet, and annual report. Task 2 Invasive Tree Removal includes tree removal, seedling regeneration, and removal report. Task 3 Includes sediment pond construction and sediment pond report. Task 4 Data Collection and Analysis includes Data Quality Objectives and Monitoring Plan, QAPP planning meeting, Modeling QAPP, Monitoring QAPP, QAPP updates and amendments, modeling, monitoring, and data submittal. Task 5 Signage Task 6 Final Report	Task 1 Project Administration including oversight, QPRs, Reimbursements, contract communication, and annual report. Task 2 Engineering Analysis, Permitting, Design, and Construction Bid Selection Process includes preliminary engineering analysis of bank stabilization and slope protection strategies and permitting, final design plans and specifications, construction bid selection process, and Final Report. Task 3 Performance monitoring and QUALHYMO modeling includes QAPP updates and amendments, wq and streamflow monitoring, groundwater monitoring, QUALHYMO modeling and assessment, and data submittal. Task 4 Construction includes upland vegetation clearing, excavation and wide/degree-sloping of east side of ditch, bank stabilization and slope protection, and construction report. Task 5 Final Report
WQ Monitoring: Monitoring QAPPs will be coordinated as part of the development of the monitoring component. The study designs will be [illegible] and the monitoring sites will be different	Subtask 4.1 Data Quality Objectives and Monitoring Plan have been identified to estimate load reductions of the bmp performance. Subtask 4.2 QAPP Planning Meeting Subtask 4.3 Development and submittal of QAPP for Monitoring Subtask 4.5 and 4.6 QAPP updates and amendments. Subtask 4.7 Monitoring at 4 locations for 8 sampling events (dry and wet) post construction for TSS, pH, conductivity, salinity, do, temperature, and oil and grease.	Subtask 3.1 QAPP updates and amendments. Subtask 3.2 Monitoring at 8 locations for 8 sampling events (dry and wet) pre and post-construction for TSS, pH, conductivity, salinity, do, temperature, and oil and grease. Subtask 3.3 Groundwater and rainfall gauge monitoring.
WQ Modeling: All the modeling will be conducted under a single QAPP with TCEQ and EPA [illegible] with the 319 FM (Arcy Chalker).	Subtask 4.1 Data Quality Objectives and Monitoring Plan have been identified to estimate load reductions of the bmp performance. Subtask 4.2 QAPP Planning Meeting Subtask 4.3 Development and submittal of QAPP for Monitoring. Subtask 4.5 and 4.6 QAPP updates and amendments. Subtask 4.8 Modeling using the QUALHYMO model to evaluate bmp assessment evaluating data from flow, groundwater elevations, infiltrometer tests, stream flow rating curves, and meteorological data.	Subtask 3.1 QAPP updates and amendments. Subtask 3.4 Modeling using the QUALHYMO model to evaluate bmp assessment evaluating data from flow, groundwater elevations, infiltrometer tests, stream flow rating curves, and meteorological data
DELIVERABLES	Post-Award Meeting Minutes Quarterly Progress Reports Quarterly Conference Call Meeting Minutes Project Fact Sheet Annual Report Invasive Tree Removal Report (June 2012) Sediment Pond Report with Photos (Sept-Oct 2012) Draft QAPP for Monitoring (January - April 2012) Draft QAPP for Modeling (April 2012) Final QAPP for Monitoring (January - April 2012) Final QAPP for Modeling (April 2012) QAPP Updates and Amendments Data Submittals (every 6 months) Photos of Signs (Feb 2012) Draft Final Report (June 2013) Final Report (July 2013)	Post-Award Meeting Minutes Quarterly Progress Reports Quarterly Conference Call Meeting Minutes Annual Report Project Designs and Specifications (Sept 2012) USACE Permit Bid Package (Feb 2012) Engineering Analysis, Permitting, Design Report (April 2012) Draft and Final QAPP Updates Draft and Final QAPP Amendments Data Submittals (quarterly) Excavation and Widening Photos (April 2014) Construction Photos (April 2014) Construction Report (June 2014) Draft Final Report (August 2014) Final Report (Sept 2014)

Compiled from the TCEQ FY09 and TCEQ FY11 319(h) Grants

Agreement No. 582-10-90462

CWA §319(h) Nonpoint Source Grant Program
FY 2009 Proposal 1.08

NONPOINT SOURCE SUMMARY PAGE
for the CWA §319(h) Urban Nonpoint Source Grant Program

Title of Project:	1.03 West Tule Creek Sediment Trap Pond and Habitat Enhancement					
Project Goals:	To improve the water quality in Tule Creek by 1) Restoring wetlands with non-point source runoff treatment capability and habitat value and 2) Improving water quality from Tule Creek discharge to Little Bay and Aransas Bay.					
Project Tasks:	(1) Project Administration; (2) Invasive Tree Removal; (3) West Tule Creek Sedimentation Pond and Habitat Enhancement; (4) Data Collection and Analysis; (5) Signage; (6) Final report					
Measures of Success:	Success will be measured through completion of stormwater Best Management Practices (BMPs) that have non- point source runoff capability and habitat value.					
Project Type:	Implementation (X); Education (X); Planning ( ); Assessment ( ); Groundwater ( )					
Status of Water Body: 2008 Texas Water Quality Inventory and 303(d) List	Segment ID: Aransas Bay/Copano Bay Watershed		Parameter: Bacteria		Category: 5a	
Project Location (Statewide or Watershed and County)	Tule Creek - Aransas County					
Key Project Activities:	Hire Staff ( ); Surface Water Quality Monitoring ( ); Technical Assistance ( ); Education (X); Implementation (X); BMP Effectiveness Monitoring ( ); Demonstration ( ); Planning ( ); Modeling ( ); Bacterial Source Tracking ( ); Other ( )					
Texas NPS Management Program Elements:	Element One (LTG Objectives 1 and 2; STG 2A, STG 2B, STG 3A, STG 3B, STG 3D) Element Two Element Four This project is also consistent with Texas Coastal Nonpoint Source Pollution Control Program Chapter 5 - 5.2.5.2 and 5.2.5.3.					
Project Costs:	Federal: (TCEQ)	$229,502	Non-Federal: (Match)	$153,001	Total:	$382,503
Project Management:	Aransas County					
Project Period:	January 1, 2010 – August 31, 2013					

Part I – Applicant Information

Applicant

Project Lead:	David Reid, P.E.						
Title:	Assistant County Engineer						
Organization:	Aransas County						
E-mail Address	dreid@aransascounty.org						
Street Address	1931 FM 2165						
City	Rockport	County	Aransas	State	Tx	Zip Code	78382

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Telephone Number:	361-790-0152, extension 31	Fax Number:	361-790-0125

Project Partners

Names	Roles and Responsibilities
Texas Commission On Environmental Quality (TCEQ)	Provide state oversight and management of all project activities and ensure coordination of activities with related projects and Texas State Soil and Water Conservation Board (TSSWCB).
Aransas County	Project oversight and management of all project activities.
The Mission - Aransas The National Estuarine Research Reserve (MA-NEER)	Technical data and support.
Coastal Bend Bays and Estuaries Program (CBBEP)	Public outreach and education.
Aransas First, Stewardship Aransas and Chamber of Commerce Environmental Committee	Land Trust, public outreach and education.
Coastal Bends Bays Foundation (CBBF)	Public outreach and education.

Part II – Project Information

Project Type

Surface Water	X	Groundwater	

Does the project implement recommendations made in a completed Watershed Protection Plan or an adopted TMDL or Implementation Plan?	Yes		No	X
If yes, identify the document. If yes, identify the agency/group that developed and/or approved the document.		Year Developed		

Watershed Information

Watershed Name(s)	Hydrologic Unit Code (8 digit)	Segment ID	305(b) Category	Size (Acres)
Aransas Bay/Copano Bay Watershed	12100405	2472	5a	2,100

Water Quality Impairment

Describe all known causes (pollutants of concern) of water quality impairments from any of the following sources: 2008 Texas Water Quality Inventory and 303(d) List, Clean Rivers Program Basin Summary, Basin Highlights Reports or Other Documented Sources.

Aransas County is surrounded by seven bay systems including four (Copano Bay-Port Bay-Mission Bay, and Redfish Bay) that are listed as "water bodies that do not meet applicable water quality standards or is threatened for one or more designated uses" and are also listed as Category 5a. These bays are listed due to bacteria contamination (oyster waters) and stormwater runoff from land use practices upstream.

Project Narrative

Problem/Need Statement

Aransas County is experiencing growth in population of both permanent and part-time residents. Development pressure poses a serious threat to the quality of the wetlands, wildlife habitats, and water resources that make the region attractive. As more and more land is converted to residential or commercial uses, the potential for water quality degradation is increased. Pollutants that threaten the health of the area's six bays are nutrients and sediments from human activities such as shoreline development, and polluted runoff.

This threat is most obvious in Little Bay, a shallow bay within the corporate boundaries of the City of Rockport that historically has supported a productive fishery, large flocks of wintering waterfowl, and large populations of nesting water birds. Little Bay is bounded on the south and southeast by public lands (Rockport Beach Park, Festival Grounds) and on the west by a street with multiple parking areas. It is fully accessible to the public and usage levels are high, especially on weekends. It is utilized year round with a variety of water-based recreation, including kayaking, boat pier, wade fishing, swimming, windsurfing, skiing, and birding. Universities and public schools from throughout South Texas use Little Bay as a research and teaching resource, and it is common to see groups of students on Little Bay or along its shore, taking part in environmental studies and field trips. Apart from Little Bay there are very few locations in Aransas County that provide public access to wade fisherman, and the shore-based recreational opportunities afforded by Rockport Beach Park.

Scientists have identified polluted stormwater runoff, a product of urbanization, as a principal cause of declining water quality and loss of wildlife habitat within Little Bay. Studies documented high levels of nitrogen loading from land-based activities, reduced salinity due to stormwater outflows (exacerbated by poor water exchange with Aransas Bay), and persistent eutrophication problems surrounding algal blooms during the summer months. Little Bay has experienced a decline in the once extensive beds of submerged seagrasses. Fishing is less productive, and winter flocks of waterfowl have declined in numbers and diversity in recent years.

Water Quality studies have been conducted by MA-NERR to determine the extent of problems within the surrounding Aransas County, and the City of Rockport's Water Quality Committee has several years' data surrounding the decline in water quality in Little Bay. In addition, CBBEP has determined that the seagrasses in Little Bay have been declining since the 1960's as a direct result of the reduced water quality in Little Bay. Just four years ago flats of Little Bay were lush with marsh grasses. In recent years, the bay bottom that has historically supported the seagrasses and fringe marsh that line the perimeter of the bay have almost disappeared.

On the west side of the Live Oak Peninsula, sections of Copano Bay and Port Bay have been closed to oystering due to localized water pollution problems.

Tule Creek is a 2,100 acre watershed that carries both stormwater drainage and sewage effluents into Little Bay. The stream drains areas of the City of Rockport, the Town of Fulton, and areas of Aransas County outside the jurisdiction of either municipality. The Tule Creek watershed is urbanizing, and the population in the area is expected to increase in the next two decades. The Aransas County Navigation District (ACND) owns Little Bay by virtue of a land patent from the Texas Legislature, and the ACND cooperates with the City of Rockport in managing Little Bay. Thus, all governmental entities in Aransas County are involved in a cooperative effort to protect Little Bay, and there is consensus among these entities that the Tule Creek drainage and pollution of Little Bay are top-priority concerns within the framework of the regional program to protect water and improve wildlife habitat described above.

The project site, Upper Tule Ditch, is an improved earthen drainage ditch that has been modified over the years, including filling and ditch excavating of various areas as well as pipe-type culverts. The U.S. Fish and Wildlife Service National Wetland Inventory Maps (1970-1980) identify the wetlands in this floodway to be palustrine emergent, forested, persistent and temporarily flooded. There are also upland areas within and along the drainage way. The restoration of this area with storm water best management practices (BMPs) will provide improved storm water quality habitat along with a range of control benefits.

Brazilian pepper trees (*Schinus terebinthifolius*), which are native to Brazil, Argentina, and Paraguay, were introduced to the U.S. as an ornamental from the mid- to late 1800s, however, it did not establish outside of cultivation in Florida until the 1950s. According to unpublished surveys, Brazilian pepper has inhabited over 700,000 acres in Florida including over 91% of the preserves in southern Florida. This pepper tree has occurred in Texas since the 1950s, and has recently become extremely invasive within Texas wetlands and coastal prairies. Brazilian pepper trees are very aggressive in their growth as they form extremely dense, ten-meter high thickets. This pepper tree threatens the destruction of natural vegetative communities and ecosystems.

Brazilian pepper trees are so invasive that they will quickly change native vegetative communities to monotypic stands of pepper trees. Native vegetation plays an important role in stabilizing the banks of ditches and canals thereby reducing erosion and sediment loadings. The native vegetation occurring along the non-maintained sections of Tule Ditch West, Tule Lake West, and within the Tule Marsh East is comprised of wetland and aquatic plants such as Coastal bacopa (*Bacopa monnieri*), lesser duckweed (*Lemna minor*), sedges (*Cyperus* spp.), and spikerush (*Eleocharis* spp.). These areas also contain native forbs and grasses such as bushy broomsedge (*Andropogon glomeratus*), panic grasses (*Panicum* spp.), horsemint (*Monarda punctata*), fleabane (*Erigeron myrionactis*), and little bluestem (*Schizachyrium scoparium*). The shrub and tree layers contain laurel and live oak (*Quercus* spp.), wax myrtle (*Myrica cerifera*), coral bean (*Erythrina herbacea*), and yaupon (*Ilex vomitoria*). These various vegetative types play an important role in stabilizing the banks of the Tule Ditch, Tule Lake, and Tule Marsh areas with their root systems. In addition, each vegetative type has important filtration and contaminant uptake functions which improve local and downstream water quality conditions.

Brazilian pepper trees damage areas by crowding out native vegetative assemblages. The pepper tree's shallow root systems allow for soil erosion to take place. These pepper trees are also known to clog wetlands and waterways. Their colonization coupled with their prodigious water uptake allows them to change soil moisture and water table levels to conditions that favor them at the expense of native riparian species. Furthermore, the Brazilian pepper trees have little to no wildlife values. They are salt tolerant and they have no natural known predators.

Aransas County and the City of Rockport are not regulated municipal separate storm sewer (MS4) systems. The ACND is also not a regulated MS4. As a result, these local governments are not required to have a storm water permit. Aransas County is voluntarily developing a Drainage Master Plan with an emphasis on stormwater management and implementing BMPs. Aransas County, along with the City of Rockport, ACND, and the Town of Fulton, are cooperatively developing a regional storm water master plan – the Aransas County Regional Storm Water Management Plan (ACRSMP) - that includes implementing storm water BMPs within the priority Tule Creek watershed. The proposed project will help accomplish the following objectives of the ACRSMP:

- Decrease flooding impact on infrastructure,
- Decrease siltation, pollutants, and nutrient loading in the surrounding bays,
- Preserve ecological integrity of Aransas County and the Live Oak Peninsula,
- Develop standards to accommodate sustainable quality growth,
- Introduce a regional, long term, and low maintenance approach toward the water volume and quality issues,
- Continue to identify local issues and concerns and potential water quality programs,

- Identify and implement immediate and continued storm water BMPs,
- Identify and assist in the acquisition of public grants for the implementation of projects as a result of the ACRSMP,
- Integrate an ACRSMP into the existing permitting process for Aransas County, the City of Rockport, and the Town of Fulton, including cohesive design criteria and accepted storm event frequencies,
- Create flexible and practical standards that can be used by County staff,
- Identify and cultivate collaborative efforts with all partners within the region,
- Use a planning process that is transparent with opportunities for public participation and education, and
- Identify alternative funding methods for the procurement of easements and infrastructure improvements.

Using an overall watershed management approach to this ACRSMP project will include implementing storm water BMPs that provide water quality and ecological enhancements with drainage control improvements.

The ACRSMP will be completed in three (3) phases. The First Phase will include the Project Planning and Needs Assessment. The Second Phase will include the Modeling, Evaluation and Alternative Analysis; and the Third Phase will include Preparation and Implementation of the Master Plan and BMP Implementation. Aransas County has developed a Stormwater Management Advisory Committee and Technical Advisory Committee composed of representatives from Aransas County, the Cities of Rockport, Aransas Pass and Fulton, and the ACND to assist in guiding the performance of the ACRSMP. The Naismith Engineering Project Team has been selected by Aransas County to prepare the ACRSMP.

The County executed a contract with Naismith Engineering, Inc. on March 23, 2009. The ACRSMP will be a 12-18 month process. The First Phase of work was authorized by the Aransas County Commissioners Court and included work through July, 2009. Coordination has also started with a wide range of local, state, federal authorities and institutions, conservation groups, and private individuals to collect and evaluate information on water quality as well as flooding/drainage problems and ecological issues, priorities, constraints, and opportunities to implement stormwater improvements. The Tule Creek and Little Bay watersheds have been identified as priority areas for implementing improvements.

Phase II of the ACRSMP is currently being authorized by the County in Work Authorization No. 2 to be funded by Aransas County. Aransas County plans to utilize Coastal Impact Assistance Program (CIAP) funds to reimburse portions of the Phase II work and will fund outstanding costs not reimbursed by CIAP. The work under this phase will conduct drainage analysis and water quality modeling. The task also outlines that a water quality sampling and monitoring program will be recommended. Load reductions expected from the modeling and specific water quality improvements are not available until the Phase II tasks are completed which will be at the end of 2009. Phase II includes two modeling activities, H& H Modeling and QUALHYMO. H&H modeling will use HEC-HMS and ICPR (Interconnected pond routing software), and QUALHYMO will be used for BMP design and water quality modeling. The QUALHYMO was originally developed for use at a watershed scale and it is therefore watershed oriented. This model is based on a continuous simulation methodology that includes rainfall/runoff and snowmelt processes. It can stimulate water and can add sediments and dissolved constituents to the analysis process.

The H&H modeling and drainage analysis is being finalized and initial findings on water quality and BMP design is expected by the end of October, 2009.

There is no adequate water quality monitoring data for Tule Creek or Little Bay. The researchers, CBBEP, and MA-NERR have all recognized a decline in seagrass in Little Bay and expected that stormwater input to Little Bay is a major contributing course. The CBBEP and MA-NERR are conducting water quality and seagrass/habitat monitoring in Little Bay and areas of Tule Creek.

This monitoring has just begun and will be completed in 2010. The purpose of the CBBEP study is to assess water quality in Little Bay and expand the existing monitoring effort by the City of Rockport in the Little Bay system located in Rockport, Texas, in order to characterize the bay's recent (last 5 years) environmental degradation. The purpose of MA-NERR sampling plan is to identify the cause of seagrass decline in Little Bay in Rockport, Texas.

The ACRSMP will recommend additional water quality sampling and monitoring which will compliment the results of the ongoing CBBEP and MA-NERR testing. This monitoring by CBBEP and MA-NERR includes stations on Tule Creek.

Aransas County is committed to providing all the modeling results- quality and quantity, as well as project designs and recommended projects. A range of stormwater quality mitigative improvement projects have been identified along the Tule watershed including areas surrounding Little Bay. The suite of improvement projects includes the best management practices included in this workplan. The water quality sampling and monitoring recommended in the ACRSMP will further substantiate and support implementation of continued projects.

Project Narrative

General Project Description (Include Project Location Map)

The proposed project includes the following components: Invasive Tree Removal; West Tule Creek Sediment Trap Pond and Habitat Enhancement; Water Quality Monitoring and Modeling; and Informational Signage.

Invasive Tree Removal

The eradication of Brazilian peppers, Chinese Tallow, and other invasive species is a part of wetland and riparian area restoration and enhancement that serve a significant NPS abatement function. Maintaining desirable vegetation along channelized streams also has Best Management Practice (BMP) functions. Native vegetation plays an important role in stabilizing the banks of ditches and canals, thereby reducing erosion and sediment loadings. The native vegetation occurring along and within the areas of Tule Creek and Upper Tule Creek is comprised of wetlands, aquatic plants, and black willow trees. The root systems of the various native vegetative types play an important role in stabilizing the banks along Tule Creek. In addition, each vegetative type has important filtration and contaminant uptake functions which improve local and downstream water quality conditions.

The proposed removal of invasive trees will involve selectively removing these trees from the West Tule Creek area. The goal of this project is to reduce these non-native invasive plants, which will allow for the natural colonization of nearby native trees, shrubs, and forbs. The restoration of riparian habitat and bottomlands will improve shoreline stabilization functions, will reduce erosion and sedimentation, and will help improve water quality conditions in the immediate wetland area and downstream through sediment trapping and maintaining enhanced wetland function. This habitat restoration effort will also provide significant improvements in the habitat quality for wildlife use.

West Tule Creek Sediment Trap Pond and Habitat Enhancement

This project is located in a site that will enable capture of sediment from the watershed before discharge to Little Bay. A sediment pond will be constructed immediately below the confluence where the Upper West Tule Creek connects with the North Tule Creek, to remove sediment transported from erosion occurring upstream. Due to forested wetlands at this site already functioning as a BMP and supporting a stable ecosystem, the emphasis is to maintain the majority of existing forested wetlands and live oaks, and minimize the loss of their stormwater quality functions and/or ecological values. As previously discussed an invasive removal plan will be implemented to reduce invasive species in areas along the proposed pond. Construction specifications will involve "least harm approaches" and use of mats or large track equipment to avoid rutting and damage to habitat. The relatively small pond (approximately 1.5-2 acres) emphasizing sediment control will be placed more or less on-line but so as to avoid changes to flood and drainage control.

Water Quality Monitoring

The subject stream is not an "impaired stream segment." The purpose of this monitoring task is to assess the water quality treatment performance of the proposed sediment pond and to determine the need and basis for improvements to the sediment pond. The Monitoring Program will involve post sediment pond construction sampling and analysis of Tule Creek surface water chemical/physical/biological characteristics, groundwater elevations, geotechnical characterization, and hydrologic and hydraulic characterization of Tule Creek watershed above the proposed sediment pond location. Surface water quality monitoring will be performed at four (4) locations to assess post-construction total suspended solids (TSS) loading and the performance of the West Tule Creek Sediment Trap Project. Approximately eight (8) sampling events will be attempted to represent baseline dry and wet weather stormwater conditions. Samples will be analyzed for TSS, pH, conductivity, salinity, dissolved oxygen (DO), temperature, and oil and grease. The TSS samples will be collected since that is the principle stream pollutant to be controlled in the subject BMP. DO will be used to identify the potential for anoxic or eutrophic conditions in the sediment trap pond caused by organic nutrient loading. Oil and grease will be monitored to assist in identification of stormwater contributors from urban development (roadways). The pH, temperature, and conductivity will be collected with minimal time and cost using a multi-parameter probe and will help further distinguish stormwater contribution/sources from Waste Water Treatment Plant effluent without incurring a substantial additional cost. Streamflow monitoring will include stream velocity, elevation, and development of rating curves. Flow rate will be determined by measuring depth with a gauge placed at a point where depth/flow functions are known, and depths can be recorded. The depth can then be converted to a flow rate and a rating curve. The rating curve will be obtained by measuring flow near a location where a relationship between flow and depth exists at various times to obtain a series of records of flow rates. The stream flow gauge will be installed near the Highway 35 bridge and monitored concurrently. Piezometers are useful in characterizing deeper flow patterns, how the recharge behaves long-term, and groundwater flow direction towards a creek or bay. Piezometers provide an indication of water pressure and soil properties. By placing paired sets of piezometers, the water pressure difference is known and can provide information related to the water flow. Three (3) paired sets of groundwater piezometers will be installed and monitored at three (3) locations, to be determined in the field, to assess groundwater elevation, and conductivity. Infiltration testing is important in the consideration of water balance and stream erosion estimates. The infiltometer will take a series of measurements of the behavior of the way water soaks into the dominant soil types of Aransas County. Infiltration testing provides good insight into the behavior of the surface of the ground. Infiltration testing will occur simultaneously at the three (3) locations at the same time the piezometers are installed. Rainfall gauges will be installed to assess rainfall estimates correlated with the sampling to assess stormwater representation. Vegetative habitat characterization and changes will be noted from each field sampling event.

Signage

Signage will be installed to acknowledge the source of grant funding for the project, and at the same time actively involve the public in educational efforts to expand both the appreciation for, and the sense of responsibility for, stewardship and proactive protection of our aquatic resources. The signage will be attractive, informative, easy to understand, and will educate people about the effects of their actions on the local and regional environment.

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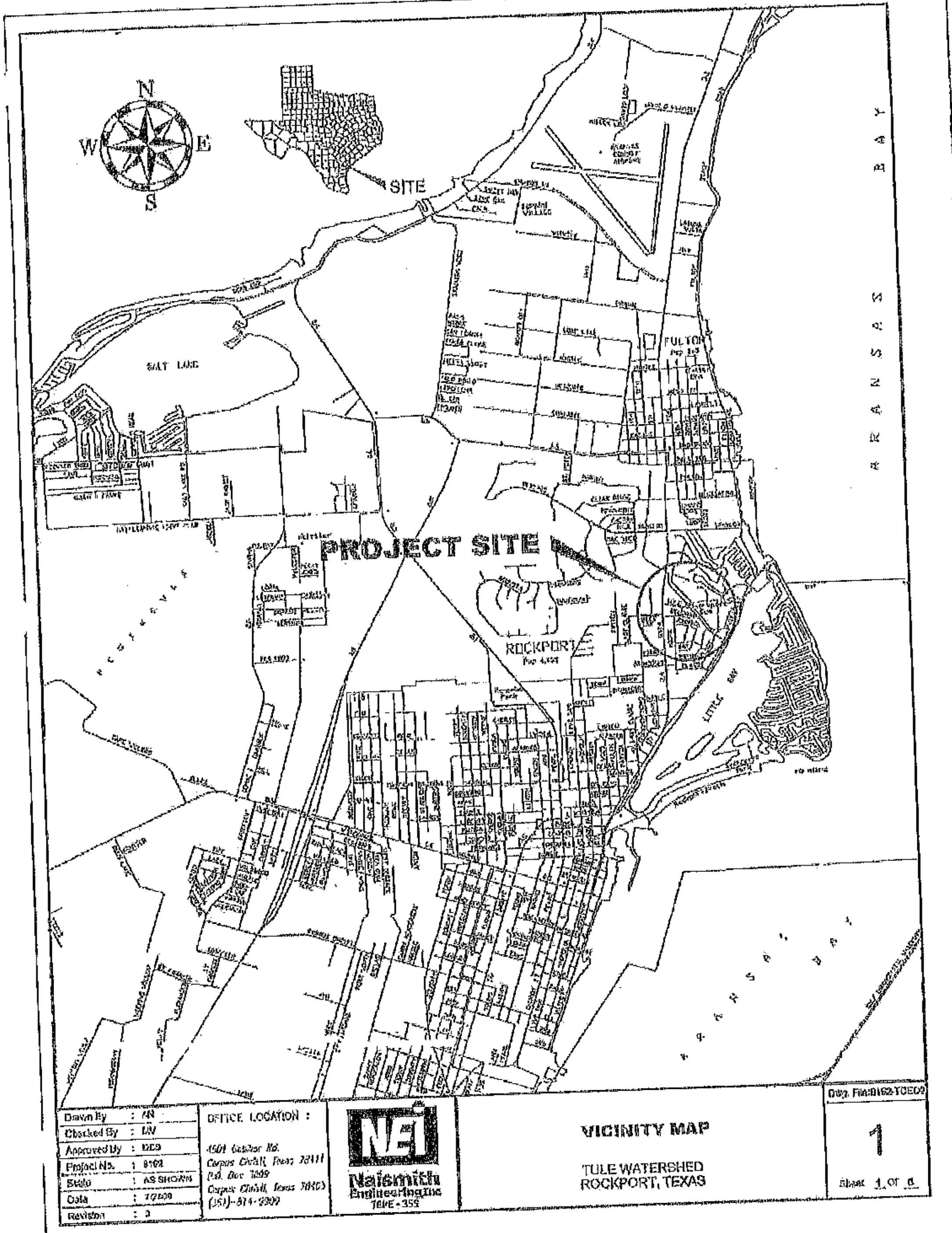

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Tasks, Objectives and Schedules

Task 1:	**Project Administration**
Costs:	Federal (TCEQ): $23,500 / Non-Federal (Match): $0 / Total: $23,500
Objective:	To effectively administer, coordinate and monitor all work performed under this project including technical and financial supervision and preparation of status reports
Subtask 1.1	**Project Oversight** - Aransas County will provide technical and fiscal oversight of the project staff and/or subgrantee(s)/ subcontractor(s) to ensure Tasks and Deliverables are acceptable, and are completed as scheduled and within budget. With the TCEQ Project Manager's authorization, Aransas County may secure the services of subgrantee(s)/ subcontractor(s) as necessary for technical support, repairs, and training. Project oversight status will be provided to the TCEQ with the Quarterly Progress Reports (QPRs).
Subtask 1.2:	**QPRs**- Aransas County will submit QPRs to the TCEQ by the 15th of the month following each state fiscal quarter for incorporation into the Grant Reporting and Tracking System (GRTS). Progress reports will contain a level of detail sufficient to document the activities that occurred under each task during the quarter, and will contain a comprehensive tracking of deliverable status under each task. Progress reports will be distributed to all project partners.
Subtask 1.3:	**Reimbursement Forms**- Aransas County will submit Reimbursement Forms to the TCEQ by the last day of the month following each state fiscal quarter. For the last reporting period of the project, Reimbursement Forms are required on a monthly basis, specifically for the months of June, July, and August of 2013.
Subtask 1.4:	**Contract Communication** – Aransas County will participate in a post award orientation meeting with TCEQ within 60 days of contract execution. Aransas County will maintain regular telephone and/or email communication with the TCEQ Project Manager regarding the status and progress of the project in regard to any matters that require attention between QPRs. This will include a call or meeting each January, April, July, and October. Minutes recording the important items discussed and decisions made during each call will be attached to each QPR. Matters that must be communicated to the TCEQ Project Manager in the interim between QPRs may include the following: • Requests for prior approval of activities or expenditures for which the contract requires advance approval or that are not specifically included in the scope of work. • Notification in advance when Aransas County has scheduled public meetings or events, initiation of construction, or other major task activities under this contract. • Information regarding events or circumstances that may require changes to the budget, scope of work, or schedule of deliverables; these events or circumstances must be reported within 48 hours of discovery.
Subtask 1.5:	**Contractor Evaluation** - Aransas County will participate in an annual Contractor Evaluation.
Subtask 1.6:	**Project Fact Sheet** - Aransas County will develop a one page fact sheet of the project using the TCEQ NPS Projects Template. The fact sheet will briefly describe what the project is being conducted, to accomplish, and will provide background information on why the project is being conducted, the current status of the project, and who is involved in the project. The project fact sheet will be submitted to the TCEQ within 60 days after contract initiation. The fact sheet will be updated annually, and submitted with the fourth quarter QPR. The fact sheet will be updated more often, as the project status changes. The fact sheet will be published on Aransas County website after approval from the TCEQ Project Manager.

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Subtask 1.7	**Annual Report Article** - Aransas County will provide an article for the NPS Annual Report upon request by the TCEQ. This report is produced annually in accordance with Section 319(h) of the Clean Water Act (CWA), and is used to report Texas' progress toward meeting the CWA § 319 goals and objectives, and toward implementing its strategies as defined in the Texas NPS Management Program. The article will include a brief summary of the project and describe the activities of the past fiscal year.
Deliverables	• Minutes of Post - Award Orientation Meeting • Quarterly Progress Reports • Reimbursement Forms • Minutes of Quarterly Contract Conference Calls • Contractor Evaluation • Project Fact Sheet • Annual Report Article

Tasks, Objectives and Schedules						
Task 2:	**Invasive Tree Removal**					
Costs:	Federal (TCEQ):	$22,000	Non-Federal (Match):	$ 0	Total:	$ 22,000
Objective:	Remove Brazilian peppertree, Chinese tallow, and other invasive trees from the West Tule Creek and Upper Tule Ditch area, in order to allow for the natural colonization of nearby native trees, shrubs, and forbs which will provide shoreline stabilization, improve wetland functions, reduce erosion and sedimentation, and help improve water quality conditions in the immediate area and downstream.					
Subtask 2.1:	**Invasive Tree Removal** – Aransas County will identify, cut, and treat invasive root systems, to prevent resprouting. This will be accomplished through physical removal with heavy equipment such as bulldozers, front-end loaders, and other specialized equipment, as well as hand tools such as chain saws, followed by herbicidal treatment.					
Subtask 2.2:	**Prevent Seedling Regeneration** – Aransas County will take steps to prevent seedling regeneration with "basal spot" applications of acceptable herbicides. Nearby desired vegetation will not be harmed.					
Subtask 2.3:	**Invasive Tree Removal Report** – Aransas County will prepare a report detailing the implementation of invasive tree removal along Tule Creek.					
Deliverables	• Invasive Tree Removal Report					

Tasks, Objectives and Schedules						
Task 3:	**West Tule Creek Sedimentation Pond and Habitat Enhancement**					
Costs:	Federal (TCEQ):	$127,802	Non-Federal (Match):	$ 124,201	Total:	$ 252,003
Objectives:	To remove sediment transported from erosion occurring upstream, reduce erosion, and protect/enhance habitat.					
Subtask 3.1:	**Sediment Pond Construction**- Aransas County will construct an elongated sediment pond immediately below the confluence where the Upper West Tule Creek connects with the North Tule Creek. Construction specifications will involve "least harm approaches" and use of mats or large track equipment to avoid rutting and damage to habitat. The relatively small pond (approximately 1.5 acres) emphasizing sediment control will be placed more or less on-line but so as to avoid changes to flood and drainage control.					
Subtask 3.2	**Sediment Pond and Habitat Enhancement Report** – Aransas County will prepare Sedimentation Pond and Habitat Enhancement Report.					
Deliverables	• Photographs documenting construction of pond • Sediment Pond Report					

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Tasks, Objectives and Schedules

Task 4:	**Data Collection and Analysis**					
Costs:	Federal:	$43,200	Non-Federal:	$28,800	Total:	$72,000
Objective:	To provide the baseline information for determination of amounts of existing TSS NPSs of pollution; to provide additional data for incorporation into a model, which will serve to determine pollutant load reductions needed to achieve the goals of the sediment trap pond. The information collected will also form the baseline for future monitoring to determine if pollutant load reduction goals of the sedimentation pond are being met.					
Subtask 4.1:	**Data Quality Objectives and Monitoring Plan** - Estimated Load Reductions- A TSS concentration of 165 mg/L was used as the influent TSS concentration value for the Tule Creek sediment trap BMP. It is possible to estimate total loads discharged by Tule Creek now and also with the sediment trap in place based on this estimate and on an estimate of flows from the watershed. Taking 35 inches of rain a year, with an estimated volumetric runoff coefficient of about 0.75. Assumptions include 1/3 of all events will be captured (large events will flow through) and 100% of the coarse solids and 50% of fine sediment will be removed. All that is needed is an estimate of removal rate to enable this calculation. It is assumed that for this small trap, coarse materials will be removed essentially completely, but that finer materials will be reduced by about 50%. Again, all of these numbers will need to be verified or updated by actual numbers from the site, but the suggested estimate load from Tule Creek is about 2.1 million pounds of sediment with the trap in place, per year. The above numbers are indicative, but need to be updated with closer estimates. The field data associated with this monitoring program will be used along with the Quality Hydrologic Model (QUALHYMO) for that purpose. This model was originally built for BMP analysis on a continuous simulation basis, and is able to assess settling and decay removal processes in a BMP, as well as, watershed flow generation and receiving water transport. Recent funding by the Environmental Protection Agency (EPA) and the City of Austin, as well as other public entities has expanded the capabilities of the tool, in particular its ability to represent portioning of contaminants between fluid and solid phases. Sediments can be simulated in 5 size fractions, and are tracked independently. Each fraction is removed according to user specified velocities. BMP characteristics can include by-pass, overflow, through-flow, exfiltration and regular discharge. Losses to evapotranspiration are also calculated on a continuous basis. In addition, the model has an effective set of calculation modules that enable simulation of distributed BMPs (Low Impact Development methods) and instream characteristics. The instream computations include several sediment transport modules able to represent stream power, excess critical shear, and sediment transport, which will be useful in this project in the event that erosive potential and erosive loads from the Tule Creek stream bank or bottom are to be calculated. For the present, as a part of this monitoring program, it is intended that the tool will be used to estimate loads into the sediment trap based on monitored flow and suspended solids data, and to simulate removal in the trap as a function of grain size, particle density, trap volume, outlet characteristics, mixing, through flow rate, overflow rate and sediment concentration distribution.					
Subtask 4.2:	**Quality Assurance Project Plan (QAPP) Planning Meeting** – The Aransas County will coordinate planning meetings with the TCEQ Project Manager to implement a systematic planning process. The information developed during the planning meetings will be incorporated into a QAPP. A planning meeting may also be conducted to determine if any changes need to be made to an existing QAPP.					

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Subtask 4.3:	**Develop a QAPP for Monitoring** – The Aransas County will develop and submit a **QAPP** with project specific data quality objectives using *EPA Requirements for Quality Assurance Project Plans for Modeling Plans (QA/R5)* format and the TCEQ NPS QAPP Shell as a general guideline prior to the initiation of any data collection to TCEQ. All of the monitoring procedures and methods prescribed in the QAPP will use the TCEQ Surface Water Quality Monitoring Procedures, Volume 1 and 2 as a guide. The QAPP will be developed by Aransas County with technical assistance from the TCEQ Project Manager, Quality Assurance staff, technical staff, management, and contractors. The QAPP must be approved by TCEQ before any data collection begins.
Subtask 4.4:	**Develop a QAPP for Modeling** – The Aransas County will develop and submit a QAPP with project specific data quality objectives consistent with the *EPA Requirements for Quality Assurance Project Plans for Modeling* QA/G-5M format 120 days prior to the initiation of any modeling activities to the TCEQ. The QAPP will be developed by Aransas County, with technical assistance from the TCEQ Project Manager, Quality Assurance staff, technical staff, management, and contractors. The QAPP must be approved by TCEQ before any data collection begins.
Subtask 4.5:	**QAPP Update** – Aransas County will provide input to TCEQ 60 days prior to the end of the effective period of the QAPP, and will develop annual QAPP revisions no less than 45 days prior to the end of the effective period of the QAPP.
Subtask 4.6	**QAPP Amendments** – Aransas County will document changes and reasons for amendments to the QAPP, and revised pages will be forwarded to all persons on the QAPP distribution list by the Contractor Quality Assurance Officer. Amendments 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.
Subtask 4.7	**Monitoring** - Monitoring will include surface water quality monitoring performed at four (4) locations to assess post-construction TSS loading and the performance of the West Tule Creek Sediment Trap Project. Approximately eight (8) sampling events will be attempted to represent baseline dry and wet weather stormwater conditions. Samples will be analyzed for TSS, pH, conductivity, salinity, DO, temperature, and oil and grease.
Subtask 4.8	**Modeling** - QUALHYMO modeling and BMP assessment will be conducted to assess the performance of the West Tule Creek Sediment Trap Project. The model can track mass balance and concentration on a continuous basis at any watershed or BMP discharge point. As part of this monitoring plan, the model will be used to estimate loads into the sediment trap based on monitored flow and TSS data, and to simulate removal in the trap as a function of grain size, particle density, trap volume, outlet characteristics, mixing, overflow rate, through flow rate, and sediment concentration distribution. This task will include the evaluation of the data from the stream water quality sampling program, stream flow gauge station, piezometer groundwater well elevation data, infiltrometer soil testing, stream flow rating curve field measurements, biological and other field observations, and monitoring of rainfall gauges and rainfall meteorological data.
Subtask 4.9	Data Submittal - The Aransas County will review, verify, and validate water quality monitoring modeling data before it is submitted to TCEQ. Data will be submitted to TCEQ twice per year prior to use, or prior to presenting to stakeholders.
Deliverables	• Draft and Final Monitoring and Modeling QAPPs • Draft and Final Monitoring and Modeling QAPP Annual Updates • Draft and Final Monitoring and Modeling QAPP Amendments • Data Submittals • Water quality monitoring non-conformances, reported in quarterly progress reports

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Tasks, Objectives and Schedules						
Task 5:	**Signage**					
Costs:	Federal (TCEQ):	$5,000	Non-Federal (Match):	$ 0	Total:	$5,000
Objective:	To acknowledge the source of grant funding for the project, and expand the public's appreciation and sense of responsibility for stewardship and proactive protection of the aquatic resources.					
Subtask 5.1:	Signage will be installed that blends into the environment and is not visually disruptive.					
Deliverables	• Photographs documenting installation of signs.					

Tasks, Objectives and Schedules						
Task 6:	**Final Report**					
Costs:	Federal (TCEQ):	$8,000	Non-Federal (Match):	$ 0	Total:	$8,000
Objective:	To provide the TCEQ and the EPA with a comprehensive report on the activities and success of the proposed project.					
Subtask 6.1:	**Draft Final Report** - Aransas County will provide a draft final report summarizing all project activities, findings, and the contents of all previous deliverables, referencing and/or attaching them as web links or appendices. This comprehensive, technical report will provide analysis of all activities and deliverables under this scope of work. The report will include the following information: • Title • Table of Contents • Executive Summary • Introduction • Project Significance and Background • Methods • Results and Observations • Discussion • Summary • References • Appendices					
Subtask 6.2:	**Final Report** - Aransas County will revise the Draft report to address comments provided by the TCEQ Project Manager. • Draft Final Report • Final Report					
Deliverables:	• Draft Final Report • Final Report					

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Project Goals (Expand from NPS Summary Page)

To improve the water quality in Tule Creek by 1) trapping sediments and cleansing stormwater before it is discharged downstream; 2) monitoring water quality to assess the water quality treatment performance of the proposed sediment pond, to determine the need and basis for improvements to the sediment pond, and to identify the stormwater pollutant characterization of Tule Creek; and 3) providing for the natural colonization of native trees, shrubs, and forbs, which will provide shoreline stabilization, reduce erosion and sedimentation, and filter and uptake pollutants.

Measures of Success (Expand from NPS Summary Page)

Success will be measured by:

1) Construction of a sediment pond along West Tule Creek;
2) Reduction of sediment from erosion occurring upstream along West Tule Creek;
3) Water quality monitoring, to assess the water quality treatment performance of the proposed sediment pond, to determine the need and basis for improvements to the sediment pond, and to identify the stormwater pollutant characterization of Tule Creek; and
4) Reduction in the number of invasive trees.

2005 Texas Nonpoint Source Management Program Reference (Expand from NPS Summary Page)

Goals and/or Milestone(s)

Element one – Explicit short- and long- term goals, objectives and strat egies that protect surface water.

LTG Objectives

1 - Aransas County will focus NPS abatement efforts, implementation strategies, and available resources in watersheds identified by Regional Stormwater Master Plan as impacted by nonpoint source pollution.

2 - Aransas County will support the implementation of regional Stormwater Master Plan to prevent nonpoint source pollution through implementation and education.

STG Objectives

2A - Aransas County will work with regional and local entities to determine priority areas and develop and implement strategies to address NPS pollution in those areas

2B - Aransas County will develop and implement BMPs to address decline in water quality and loss of seagrass as identified by MA-NERR, City of Rockport's and CBBEP's water quality data.

3A - Aransas County will enhance existing outreach programs at the regional level to maximize the effectiveness of NPS education.

3B - Aransas County will administer programs to educate citizens about water quality and their potential role in causing NPS pollution.

3C - Where applicable Aransas County will expedite development of technology transfer activities to be conducted upon completion of BMP implementation.

Element Two - Aransas County will work with the regional Stormwater Master Plan partnerships to prioritize and implement the stormwater BMPs along Tule Creek.

Element Four - Aransas County will abate water quality impairments from nonpoint source pollution and prevention of significant threats to water quality from present and future nonpoint source activities.

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Texas Coastal Nonpoint Source Pollution Control Program

Chapter 5 - Management Measures

5.2 - Urban Developing Areas

5.2.5 - Urban and Developing Areas Management Measure

5.2.5.2 - Urban Runoff: Watershed Protection from Urban Runoff - Aransas County is developing watershed protection program to:

(1) Avoid conversion, to the extent practicable, of areas that are particularly susceptible to erosion and sediment loss;

(2) Preserve areas that provide important water quality benefits and/or are necessary to maintain riparian and aquatic biota; and

(3) Site development, to protect to the extent practicable the natural integrity of waterbodies and natural drainage systems.

5.2.5.3 - Urban Runoff: Site Development Management Measures Aransas County will plan, design, and develop sites to:

(1) Protect areas that provide important water quality benefits and/or are particularly susceptible to erosion and sediment loss;

(3) Limit land disturbance activities such as clearing and grading, and cut and fill to reduce erosion and sediment loss; and

(4) Limit disturbance of natural drainage features and vegetation.

Milestone 1: Completion of Stakeholder Involvement Plan
Milestone 2: Conduct Public Outreach Workshop
Milestone 3: Construct Preferred Stormwater BMPs
Milestone 4: Eliminate Brazilian Peppertree and Stabilize the bank
Milestone 4: Submit Final Report

Estimated Load Reductions Expected (Only applicable to implementation projects)

Estimated Load Reductions- A TSS concentration of 165 mg/L was used as the influent TSS concentration value for the Tule Creek sediment trap BMP. It is possible to estimate total loads discharged by Tule Creek now and with the sediment trap in place, based on this estimate and on an estimate of flows from the watershed. Taking 35 inches of rain a year, with an estimated volumetric runoff coefficient of about 0.75, and assuming the sediment trap captures 1/3 of the events, all that is needed is an estimate of removal rate to enable this calculation. It is assumed that for this small trap, coarse materials will be removed essentially completely, but that finer materials will be reduced by about 50%. Estimated load from Tule Creek is about 2.1 million pounds of sediment with the trap in place, per year.

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Part III – Financial Information

Budget Summary			
Federal (TCEQ Reimbursable)	$229,502	% of total project	60%
Non-Federal (Match)	$153,001	% of total project (at least 40%)	40%
Total	$382,503	Total	100%

Category	Federal	Non-Federal	Total
a. Personnel	$	$	$
b. Fringe Benefits	$	$	$
c. Travel	$	$	$
d. Supplies	$	$	$
e. Equipment	$	$	$
f. Contractual	$229,502	$153,001	$382,503.00
g. Construction	$	$	0
h. Other	$	$	$
i. Total Direct Costs (sum a-h)	$229,502	$153,001	$382,503.00
j. Indirect Costs (≤15%)	$	$	$
k. Total Grantee Costs (sum I & j)	$	$	$
l. Other In-kind / Third Party		$	$
m. Total Project Costs (sum k & l)	$229,502	$153,001	$382,503.00

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[illegible] Budget Justification (Federal)

Category	Total Amount	Justification
Personnel	$0.	
Fringe Ben	$0.	
Travel	$0.	
Equipment	$0.	
Supplies	$0.	
Contractual	$229,502	Grant Administration- $23,500 Aransas County contracted with The Grant Connection, a local grant services provider, to administer the grant requirements of this project. The Grant Administrator will work closely with the Project Manager (David Reid) to make certain that the project proceeds on time and within budget, and that all project deliverables are submitted on time. **The Grant Administrator will:** • Be in charge of the compliance with TCEQ program rules and regulations by monitoring project reports, invoices, deliverables, and providing resources needed for the success of the project; • Assist county personnel with preparation of performance and financial reports as required by the terms described in the grant Agreement; • Meet with the Aransas County Project Manager weekly, at a minimum, by phone or in person to receive oral reports regarding the progress of the project, and to discuss potential problems; and • Visit the project sites, along with the Project Manager, at least once per month. Invasive Tree Removal- $22,000 Physical removal of approximately 1.5 - 2 acres, with heavy equipment, as well as, hand tools- $15,000 Treat invasive root systems, to prevent resprouting - $7,000 Sedimentation Pond Construction- $127,802 Initial TSS Characterization, BMP Performance Monitoring and QUALHYMO Modeling- $43,200 Pygmy Meter $600 Multi – Parameter Meter $1,500 Flow Monitoring Equipment and Installation $12,000 Field Sampling/Flow Rating Curve $4,500 Analytical Lab Sample Analysis $300 Piezometer/Infiltration Monitoring $7,800 QUALHYMO Modeling/Data Evaluation $6,000 QAPP Plan Preparation $6,000 Reporting $4,500 Signage- $5,000 (2) 24 x 36 panels on lexan for UV protection Sign design - $2000 Sign fabrication - $2000 Materials, Mounting and Labor - $1000 Final Report- $8,000
Construction	$0	
Other	$0.	
Indirect	$0.	

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Budget Justification (Non-Federal)		
Category	Total Amount	Justification
Personnel	$0.	
Fringe Benefits	$0.	
Travel	$0.	
Equipment	$0.	
Supplies	$0.	
Contractual	$153,001	Sedimentation Pond Construction- $124,201 Initial TSS Characterization, BMP Performance Monitoring and QUALHYMO Modeling- $28,800 Pygmy Meter $400 Multi – Parameter Meter- $1,000 Flow Monitoring Equipment and Installation $8,000 Field Sampling/Flow Rating Curve $3,000 Analytical Lab Sample Analysis $200 Piezometer/Infiltration Monitoring $5,200 QUALHYMO Modeling/Data Evaluation $4,000 QAPP Plan Preparation $4,000 Reporting $3,000
Construction	$0	
Other	$0.	
Indirect	$0.	

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2009 319(h)
Aransas County Deliverable Due Dates
REVISED July 14, 2011

Schedule of Deliverables Based on Anticipated Project Funding/Initiation Date

Task 1- Project Administration		
Task No.	**Subtasks and Deliverables**	**Due Date**
Subtask 1.1	Post Award Meeting	Within 60 days of contract execution
Subtask 1.2	Quarterly Progress Reports	the 15th of the month following each state fiscal quarter
Subtask 1.3	Quarterly Reimbursement Requests	The last day of the month following each state fiscal quarter
Subtask 1.4	Quarterly conference call with TCEQ	The last day of January, April, July, and October
Subtask 1.5	Contractor Evaluation	15 days following the end the state fiscal year
Subtask 1.6	Initial Project Fact Sheet	Within 60 days of contract execution
Subtask 1.6	Project Fact Sheet Update	15 days following the end the state fiscal year
Subtask 1.6	Final Project Fact Sheet Update	15 days following the end the state fiscal year
Subtask 1.7	Annual Report Article – upon request by TCEQ	15 days following the end of the state fiscal year
Task 2- Invasive Tree Removal		
Task No.	**Subtasks and Deliverables**	**Due Date**
Subtask 2.1	Invasive Tree Removal	June 15, 2012
Subtask 2.2	Prevent Seedling Regeneration	June 15, 2012
Subtask 2.3 Deliverable	Invasive Tree Removal Report	June 15, 2012
Task 3- Tule Creek West Sedimentation Pond and Habitat Enhancement		
Task No.	**Deliverable**	**Due Date**

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Subtask 3.1	Sediment Pond Construction	September 30, 2012
Deliverable Subtask 3.2	Photo documenting construction of pond and Sediment Pond and Habitat Enhancement Report	October 30, 2012
Task 4- Water Quality Monitoring		
Task No.	**Tasks and Deliverables**	**Due Date**
Subtask 4.1	Data Quality Objectives and Monitoring Plan	Included in QAPP
Subtask 4.2	Quality Assurance Project Plan (QAPP) Planning Meeting	As needed basis
Deliverable Subtask 4.3	Develop a draft QAPP for Monitoring Develop a final QAPP for Monitoring	January 31, 2012 April 30, 2012
Deliverable Subtask 4.4	Develop a draft QAPP for Modeling Develop a final QAPP for Modeling	January 31, 2012 April 30, 2012
Deliverable Subtask 4.5	QAPP Update	Aransas County will provide input to TCEQ 60 days prior to the end of the effective period of the QAPP, and will develop annual QAPP revisions no less than 45 days prior to the end of the effective period of the QAPP.
Deliverable Subtask 4.6	QAPP Amendments	Amendments 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.
Subtask 4.7	Monitoring	Included in QAPP.
Subtask 4.8	Modeling	Included in QAPP.
Deliverable Subtask 4.9	Data Submittal	Available data will be submitted in 6 month intervals upon final approval of the QAPP.
Deliverable	Water quality monitoring non-conformances	Reported in quarterly progress reports.

Task 5- Signage		
Task No.	**Tasks and Deliverables**	**Due Date**
5.1	Install Signage	January 30, 2012
Deliverable	Photographs documenting installation of signs.	February 15, 2012
Task 6- Final Report		
Task No.	**Tasks and Deliverables**	**Due Date**
Deliverable	Draft Final Report	June 15, 2013
Deliverable	Final Report	July 30, 2013

Texas Commission on Environmental Quality (TCEQ)

Clean Water Act (CWA) Section 319(h) Categorical Nonpoint Source (NPS) Grant Agreement

CONTRACT SIGNATURE PAGE

Contract Name	Upper Tule Creek West	
Contract Number	582-12-10077	
Grantee	Aransas County	
Grantee Identification Number	74-6001998-1	
Maximum TCEQ Obligation: $206,156.00	Effective Date: Date of last signature	Expiration Date: 8/31/2014

TCEQ, an agency of the State of Texas, and the named Grantee, a governmental body, agency, or political subdivision of the United States, the State of Texas, or another State, enter this agreement (Contract) to cooperatively conduct authorized governmental functions and activities under the laws of the State of Texas, including, the Interagency Cooperation Act, the Interlocal Cooperation Act, and Texas Water Code (TWC) §§ 5.124 and 5.229.

The Parties agree: to be effective, the Contract must be signed by an authorized official of TCEQ and the Grantee; as authorized by TCEQ, the Grantee will conduct Grant Activities as part of its own authorized governmental functions and TCEQ will [illegible]urse Allowable Costs subject to the Texas Uniform Grant Management Standards (UGMS) and this Contr[illegible]ee is not a vendor of goods and services under Texas Government Code Chapter 2251, therefo[illegible]s applicable; and the Contract may be terminated by TCEQ for its own convenience with 10 days' [illegible]

Grant [illegible] 05[illegible]0	CFDA Number:66.460	
Parties to the Contract	TCEQ	Aransas County (Grantee)
By (Authorized Signature)	[illegible]	[illegible]
Printed Name:	L'Oreal W. Stepney, P.E.	The Honorable C.H. Burt Mills
Title:	Deputy Director	Aransas County Judge
Date of Signature:	8/15/11	
Procurement and Contracts Representative	Deborah Brown, CTPM	
Printed Name	Deborah Brown, CTPM, CTCM	
Date	8/3/11	

Aransas County | TCEQ Contract Number: 582-12-10077

[illegible]					
1. Title of Project	1.05 Upper Tule Creek West Widening and Slope Protection and Realignment Project				
2. Project Goals	To reduce erosion; sloughing of creek banks; and transportation of fine sand and other sediments through the West Tule Creek System to Little Bay.				
3. Project Tasks	(1) Project Administration; (2) Engineering Analysis, Modeling, Permitting, Design, Water Quality and Best Management Practice (BMP) Performance Monitoring, and Project Management; (3) Construction; (4) Final Project Report.				
4. Measures of Success	Success will be measured through completion of stormwater BMPs that have NPS runoff pollution control capability and habitat value and load reduction from the BMPs.				
5. Project Type	**Implementation (X); Education ( ); Planning ( ); Assessment ( ); Groundwater ( )**				
6. Status of Water Body on 2008 Texas Water Quality Inventory and 303(d) List	Segment ID: Aransas Bay/Copano Bay Watershed		Parameter: Bacteria		Category: 5a
7. Project Location (Statewide or Watershed and County)	Tule Creek- Aransas County				
8. Key Project Activities	Hire Staff ( ); Surface Water Quality Monitoring ( ); Technical Assistance ( ); Education ( ); Implementation (X); BMP Effectiveness Monitoring (X); Demonstration ( ); Planning ( ); Modeling (X); Bacterial Source Tracking ( ); Other ( )				
9. Texas NPS Management Program Elements	Element One (LTG Objectives 1 and 2; STG 1B, STG 1C, STG 1E, STG 2A, STG 2B, STG 3C) Element Two Element Four This project is also consistent with the Texas Coastal NPS Pollution Control Program Chapter 5 - 5.2.5.2 and 5.2.5.3.				
10. Project Costs	Federal (TCEQ)	$206,156	Non-Federal (Match)	$137,438	Total	$343,594
11. Project Management	Aransas County				
12. Project Period	Upon signature of both parties – August 31, 2014				

Part I – Applicant Information

[illegible]					
13. Project Lead	David Reid, P.E.				
14. Title	Assistant County Engineer				
15. Organization	Aransas County				
16. Federal ID No.	74-6001998-1				
17. E-mail Address	dreid@aransascounty.org				
18. Street Address	1931 FM 2165				
City	Rockport	County	Aransas	State	TX	Zip Code	78382
19. Telephone No.	361-790-0152, extension 23			Fax Number	361-790-0125		

Aransas County TCEQ Contract Number: 582-12-10077

[illegible]	
Names	Roles & Responsibilities
TCEQ	Provide state oversight and management of all project activities and ensure coordination of activities with related projects and the Texas State Soil and Water Conservation Board (TSSWCB).
City of Rockport, Texas	Provide planning and design guidance and assistance.
Town of Fulton, Texas	Provide planning and design guidance and assistance.
Aransas County Navigation District (ACND)	Provide planning and design guidance and assistance.

Part II – Project Information

[illegible]						
21. Surface Water	X	Groundwater				
22. Does the project implement recommendations made in a completed Watershed Protection Plan or an adopted Total Maximum Daily Load (TMDL) or Implementation Plan (I-Plan)?				Yes	X	No
23. If yes, identify the document	This project is designed to address requirements of the Coastal Zone Reauthorization Amendments (CZARA) and implement the Texas Coastal Management Program (CMP)					
24. If yes, identify the agency/group that developed and/or approved the document				25. Year Developed		

26. Watershed Information				
Watershed Name(s)	Hydrologic Unit Code (8 Digit)	Segment ID	305 (b) Category	Size (Acres)
Aransas Bay/Copano Bay Watershed	12100405	2472	5a	2,100

27. Water Quality Impairment
Describe all known causes (pollutants of concern) of water quality impairments from any of the following sources: 2008 Texas Water Quality Inventory and 303(d) List, Clean Rivers Program Basin Summary, Basin Highlights Reports or Other Documented Sources.
Aransas County is surrounded by six bay systems including three (Copano Bay, Port Bay, and Mission Bay,) that are listed as "water bodies that do not meet applicable water quality standards or are threatened for one or more designated uses" and are also listed as Category 5a. These bays are listed due to bacteria contamination (oyster waters). Sediment has been identified as a pollutant issue in Little Bay, which discharges into Aransas Bay.

[illegible]
28. Problem/Need Statement
Aransas County is experiencing growth in population of both permanent and part-time residents. Development pressure poses a serious threat to the quality of the wetlands, wildlife habitats, and water resources that make the region attractive. As more and more land is converted to residential or commercial uses, the potential for water quality degradation is increased. Pollutants that threaten the health of the area's six bays are nutrients and sediments shoreline development, and polluted runoff. This threat is most obvious in Little Bay, a shallow bay within the corporate boundaries of the City of Rockport that historically has supported a productive fishery, large flocks of wintering waterfowl, and large populations of nesting water birds. Little Bay is bounded

on the south and southeast by public lands (Rockport Beach Park, Festival Grounds) and on the west by a street with multiple parking areas. It is fully accessible to the public and usage levels are high, especially on weekends. It is utilized year round with a variety of water-based recreation, including kayaking, boat pier utilization, wade fishing, swimming, windsurfing, skiing, and birding. Universities and public schools from throughout South Texas use Little Bay as a research and teaching resource, and it is common to see groups of students on Little Bay or along its shore, taking part in environmental studies and field trips. Apart from Little Bay, there are very few locations in Aransas County that provide public access to wade fisherman, and the shore-based recreational opportunities afforded by Rockport Beach Park.

Water Quality studies have been conducted by Mission Aransas-National Estuarine Research Reserve (MA-NERR) to determine the extent of problems within the surrounding Aransas County. The City of Rockport's Water Quality Committee has several years' data surrounding the decline in water quality in Little Bay. In addition, Coastal Bend Bays and Estuaries Program (CBBEP) has determined that the seagrasses in Little Bay have been declining since the 1960's. Just four years ago flats of Little Bay were lush with marsh grasses. In recent years, the bay bottom that has historically supported the seagrasses and the fringe marsh that lines the perimeter of the bay have almost disappeared. Recent studies completed by the University of Texas Marine Science Institute, MA-NERR, and the CBBEP's, "Assessment of Little Bay Water and Sediment Quality in Relation to Indices of Seagrass Condition" have identified stormwater as a possible factor limiting seagrass growth in Little Bay. A comparison of historical aerial photography indicated that sediment to Little Bay near stormwater outfalls was displacing vegetated wetlands. On the west side of the Live Oak Peninsula, sections of Copano Bay and Port Bay have been closed from time to time to oystering due to localized water pollution problems.

Tule Creek is a 2340-acre watershed that carries both stormwater drainage and sewage effluents into Little Bay. The stream drains areas of the City of Rockport, the Town of Fulton, and areas of Aransas County outside the jurisdiction of either municipality. The Tule Creek watershed is urbanizing, and the population in the area is expected to increase in the next two decades. The ACND owns Little Bay by virtue of a land patent from the Texas Legislature, and the ACND cooperates with the City of Rockport in managing Little Bay. Thus, all governmental entities in Aransas County are involved in a cooperative effort to protect Little Bay, and there is consensus among these entities that the Tule Creek drainage and pollution of Little Bay are top-priority concerns within the framework of the regional program to protect water and improve wildlife habitat described above.

The project site, Upper Tule Creek West, is an improved earthen drainage ditch with steep and barren slopes that has been modified over the years, including filling and ditch excavating of various areas, as well as, installing pipe-type culverts. The U.S. Fish and Wildlife Service National Wetland Inventory Maps (1970-1980) identify the wetlands in this floodway to be palustrine emergent, forested, persistent, and temporarily flooded. There are also upland areas within and along the drainage way. The restoration of this area with stormwater BMPs will provide improved stormwater quality habitat.

Stormwater moving through Tule Creek eventually discharges into Little Bay. The steep banks of the creek, which is unable to maintain adequate vegetation, is badly eroding. Upper Tule Creek West Ditch also takes a sharp turn that is causing severe erosion. The water rushing down the creek has to make an almost ninety degree turn; the energy of the water, particularly during time of major storm events, erodes at the sandy banks of the ditch.

Aransas County and the City of Rockport are not regulated municipal separate storm sewer (MS4) systems. ACND is also not a regulated MS4. As a result, these local governments are not required to have a stormwater permit. Aransas County is voluntarily developing a Stormwater Master Plan with an emphasis on stormwater management and implementing BMPs. Aransas County, along with the City of Rockport, ACND, and the Town of Fulton, are cooperatively developing a regional Stormwater Master Plan – the Aransas County Stormwater Management Plan (ACSMP) – that includes implementing stormwater BMPs within the priority Tule Creek watershed. The City of Rockport owns the Tule Creek and right-of-way, which is the location of the proposed BMPs. The coordination between the City of Rockport and Aransas County will help manage Tule Creek stormwater and BMP facilities to be constructed on City property through Interlocal Agreements.

The proposed project will help accomplish the following objectives of the ACSMP:

- Decrease flooding impact on infrastructure;
- Decrease siltation, pollutants, and nutrient loading in the surrounding bays;
- Preserve ecological integrity of Aransas County and the Live Oak Peninsula;
- Introduce a regional, long term, and low maintenance approach toward the water volume and quality issues;
- Identify and implement immediate and continued stormwater BMPs;
- Integrate an ACSMP into the newly developed county permitting process for Aransas County, the City of Rockport, and the Town of Fulton, including cohesive design criteria and accepted storm event frequencies; and
- Use a planning process that is transparent with opportunities for public participation and education.

Using an overall watershed management approach to this ACSMP project will include implementing stormwater BMPs that provide water quality and ecological enhancements with drainage control improvements.

The ACSMP is being completed in three (3) phases, the first two of which are completed. The First Phase involved a Project Planning and Needs Assessment. The Second Phase focused on Modeling, and Evaluation and Alternative Analysis; and the Third Phase, currently underway, includes Preparation and Implementation of the Master Plan and BMP Implementation. Aransas County has developed a Stormwater Management Advisory Committee and Technical Advisory Committee composed of representatives from Aransas County, the Cities of Rockport, Aransas Pass and Fulton, and the ACND to assist in guiding the performance of the ACSMP. The Naismith Engineering Project Team has been selected by Aransas County to prepare the ACSMP.

In Phase II, a detailed hydrologic and hydraulic model (H&H) was created to closely simulate existing conditions and determine existing peak flows and water levels for three design storms, 5-yr, 25-yr and the 100-year 24-hour storms. H&H modeling used HEC-HMS and ICPR (Interconnected Pond Routing Software) and the modeling information, along with site visits, identified the sites suited for BMPs. The set of the recommended projects and conceptual plans were developed based on a combination of flood and drainage control, stormwater quality, and ecological considerations. The H&H modeling and drainage analysis has been finalized and initial findings on water quality and BMP design is addressed in the Tule Creek Watershed Report, which recommends the County address 5 priority areas along the creek.

The Tule Creek Project and entire ACSMP is a voluntary effort by a non-regulated County to improve stormwater management and head-off the potential for Tule Creek or Little Bay-Aransas Bay to become impaired like their neighbor Copano Bay-Mission Bay. The Upper Tule Ditch is a source of sediment load to Little Bay and the proposed project will reduce the loss of sediment from unimproved ditch slopes. Providing improved ditch sloping and vegetated slope protection will reduce sediment load. This project when combined with the FY2009 West Tule Creek Sediment Trap Pond will reduce the sediment transport to Little Bay.

As part of the ACSMP, various local, state and federal grant opportunities have been evaluated and acquired through a competitive grant solicitation effort. These grant opportunities were pursued in order to obtain added funds that could be used to implement stormwater management devices. The grant opportunities that have been successfully accomplished are summarized as follows-

FY 2009 CWA Section 319(h) grant- Aransas County was awarded this grant for construction of a sediment pond and habitat enhancement project at the Tule Marsh East and Tule Ditch West area. This project will start construction in late summer or early fall, 2011. The purpose of the grant is to improve the stormwater quality of Tule Creek by constructing a sediment trap pond with NPS treatment capability and improving forested wetlands habitat and thereby improving water quality from Tule Creek discharging to Little Bay and Aransas Bay. There is little to no pollutant load data for Tule Creek. only studies by MA-NERR and CBBEP, which identify problem and concerns with habitat changes in Little Bay. Some very limited water quality data has been collected by the City of Rockport Water Quality Committee for purposes of identifying baseline nutrient levels. This study by the Water Quality Committee only involves grab samples of certain nutrient levels, does not involve any measurements of streamflow or loading, and included no data on solids. There has never been a water quality study by any entity on Tule Creek that has established loading related to stormwater or any other source. There is coordination ongoing between the City and County to collaborate on continued water quality monitoring. The stream is currently under no regulatory controls such as a TMDL or aquatic life use criteria. A proposed amendment to this project includes a monitoring plan to collect baseline and BMP effectiveness monitoring data for Tule Creek. If approved, the monitoring included will be the first opportunity to start quantifying pollutants, as well as, data from piezometers and infiltrometers to help in better understanding stormwater influences on Tule Creek. The key pollutant in question is sediment, although there is a history of septic tank use in the watershed. Bacteria from such septic tank discharges can be expected to adhere to sediment particles. Sediment is the key pollutant expected to be reduced in the watershed by the recommended BMP project.

Tule Creek West Sediment Pond and Habitat Enhancement (FY 09 319(h) project) and Upper Tule Creek West Widening/Enhancement (proposed FY 11 319(h) project) are priority #1 and #2 according to the priority project recommendations. The total FY 09 project is $238,000 which includes $95,200 in local in-kind contribution of excavation work from Aransas County, which was developed as a part of the county's stormwater planning and processing with advice from the project team, further refined by stormwater management committee, and ultimately approved by the Aransas County Commissioners court.

Texas General Land Office (TXGLO) CMP grant for Land Acquisition- Aransas County was awarded TXGLO CMP grant to purchase approximately ten acres areas within the City of Rockport property for a combined stormwater pond and riparian habitat and woodland habitat protection and enhancement project. The project called Tule Creek North Pond and Habitat Enhancement, which is priority # 5 according to the priority project recommendations. The total project is $485,000 which includes local contribution of $194,040.

Coastal Impact Assistance Program (CIAP) Live Oak Peninsula Shoreline Enhancement Project- The County was awarded a CIAP grant which will involve shoreline stabilization using living shorelines techniques along the Fulton Road-Aransas Bay shoreline. In addition, the project will involve wetland protection and enhancement along Little Bay. The County has thus far dedicated $1,124,418 of their FY07 and 08 allocations to this project.

The County has essentially used $1.496 million in County special use taxes for quality of life improvement (through stormwater improvements) to leverage almost another $1.6 million in grants related to stormwater management, habitat protection, and education. Aransas County has acquired a range of grants which do not overlap, do not violate any state/federal grant rule regarding use of match, and all target different aspects of stormwater management from construction BMP facilities, to land acquisition, to constructing education facilities, and performing stormwater management plans. Aransas County has utilized CIAP funds to reimburse portions of the Phase II work and will fund outstanding costs not reimbursed by CIAP.

The ACSMP recommendations include additional water quality sampling and monitoring which will compliment the results of the ongoing CBBEP and MA-NERR testing, including stations along Tule Creek.

The BMPs identified thus far are to construct the West Tule Creek Sediment Trap Pond using TCEQ FY2009 funds. In addition, Aransas County will propose to use TCEQ FY2011 funds to correct a source of the sediment pollutants from an unimproved-eroding

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ditch (Upper Tule Creek Ditch) by improving the ditch slope with vegetated slope protection.

This project is designed to address requirements of the CZARA and implement the Texas CMP. The project will reduce the erosion of sediment from Upper Tule Creek to Little Bay. Consistent with the requirements of the CZARA, the state's strategy for meeting one of the requirements for New and Existing Development; Site Development; and Watershed Protection was to fund projects in areas within the coastal boundary with future CWA Section 319(h) allocations. While the FY 2009 Tule Creek project was already listed under implementation activities which will support above conditions, the proposed 2011 project is also a TCEQ NPS initiative that will have tangible results by providing sediment load reductions in Tule Creek and Little Bay which drain into Aransas Bay.

2.2 General Project Description (Include Project Location Map)

The Upper Tule Creek West extends from the City of Rockport Wastewater Treatment Plant to the Tule Lake West area. The western bank of the project section has not been cleared or maintained and it currently contains native riparian vegetation. The creek is experiencing significant erosion during rainfall events. This sediment is carried downstream and will ultimately reach the Little Bay ecosystem. The purpose of the Upper Tule Creek West project is to stop immediate, chronic erosion in specific areas.

The project will effectively improve water quality moving downstream into Little Bay by creating a shallow sloped, vegetated, meandering stream with small "riffle ponds" in place of the present straight ditch. Improvements to the creek farther downstream, with widening and sloping, have proven highly successful in preventing erosion.

This area of the Upper Tule Creek West channel is a principal source of erosion problems and sediment discharged to Little Bay. This project will provide slope protection, widening, and realignment, to reduce erosion runoff and downstream sedimentation occurring within the existing channel, along with invasive tree removal. Widening the bottom of the channel will establish an aesthetically pleasing, natural meander with pool areas and riffles. Possible slope protection techniques include a combination of vegetated or articulated block-type slope protection. Following engineering analysis and public input, the county will determine a solution for the erosion problems caused by the sharp bend in the creek, which is causing severe erosion on the north side of the bank near adjacent homes. Alternatives for correcting the problem will likely include the "softening" and realignment of the bend, with a settling pool or by structural means, such as construction of a concrete bank or installation of articulated block to absorb energy.

The proposed project involves the excavation of upland areas to establish a wider and more gradual bank slope conducive to re-vegetation and stabilization. The project site contains native trees such as live oak (*Quercus virginiana*), sweet bay (*Persea borbonia*) and black willow (*Salix Niger*), shrubs such as yaupon (*Ilex vomitoria*), coral bean (*Erythrina herbacea*), bayberry (*Morella cerifera*), and American beautyberry (*Callicarpa Americana*). All excavation and construction activities will be performed within upland areas and no existing natural wetlands will be filled as a result of this project. Approximately 1 acre of woodland will be cleared. Some of the excavated material will be placed in designated upland areas, and the cleared vegetation will be hauled to nearby disposal sites.

A water quality sampling and monitoring program and Quality Hydrology Mode (QUALHYMO) modeling is being proposed as part of the Upper Tule Creek West Widening and Slope Protection and Realignment Project and West Tule Creek Sediment Trap and Habitat Enhancement Project. The current FY 09 CWA Section 319 (h) grant project (West Tule Creek Sediment Trap Project) will be amended to begin the monitoring and modeling program by preparing a QAPP, purchasing testing equipment, installing stream gauges/groundwater elevation monitoring piezometers/soil hydraulic conductive infiltrometer testing, initializing work involving the QUALHYMO model, and BMP performance assessment and reporting.

The Upper Tule Creek West Widening and Slope Protection and Realignment Project will involve the majority of actual field sampling and measurements, finalizing the QUALHYMO modeling and BMP performance assessment, reporting, and final report preparation. The QUALHYMO was originally developed for use at a watershed scale and it is, therefore, watershed oriented. This model is based on a continuous simulation methodology that includes rainfall/runoff and snowmelt processes. It can stimulate water and can add sediments and dissolved constituents to the analysis process. The data from the monitoring task in the FY 09 319(h) grant project will help simulate this model. The model will estimate the water quality pollutant loadings in the Tule Creek and load reductions from the Tule Creek West Sediment Pond and Habitat Enhancement BMP (FY 09 319(h) grant project). This model will also help in estimating pollutant reduction from Upper Tule Creek West Widening/Enhancement BMP (Proposed FY 11 319(h) grant project).

An initial and ongoing step in the construction process will involve selected clearing of various invasive trees, including the Chinese Tallow, which thrives in river corridors and sandbars and is capable of rapidly replacing existing native vegetation, and Brazilian Peppertree, which threatens the destruction of natural vegetative communities and ecosystems. Eliminating the invasive trees will help provide for the natural colonization of native trees, shrubs, and forbs, which will provide shoreline stabilization, reduce erosion and sedimentation, and filter and uptake pollutants.

The project will require the United States Army Corps of Engineering (USACE) permitting determination and possible permitting. It is possible that the Upper Tule Creek West project area is non-jurisdictional. A permit determination process has been indicated to determine the need for a permit. If a USACE permit is required, it is expected to be a Nationwide Permit, which will be obtained during preliminary engineering design.

It has been shown in numerous studies that river bottom sediments serve as a reservoir for *E Coli* and fecal bacteria. The sediment load reductions realized through this project will decrease the available bacteria reservoir and curtail re-suspension of sediments into the water column. Using literature values, Aransas County will analyze bacteria reduction as a result of sediment reduction from the BMPs.

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[illegible]	
Task 1:	**Project Administration**
Objective:	To effectively administer, coordinate, and monitor all work performed under this project including technical and financial supervision and preparation of status reports.
Subtask 1.1:	**Project Oversight** –Aransas County will provide technical and fiscal oversight of the staff and/or subgrantee(s)/ subcontractor(s) to ensure Tasks and Deliverables are acceptable and completed as scheduled and within budget. With the TCEQ Project Manager authorization, Aransas County may secure the services of subgrantee(s)/ subcontractor(s) as necessary for technical support, repairs and training. Project oversight status will be provided to TCEQ with the Quarterly Progress Reports (QPRs).
Subtask 1.2:	**QPRs** – Progress will be reported to TCEQ by the 15th of the month following each state fiscal quarter for incorporation into the Grant Reporting and Tracking System (GRTS). The Reports are to include the following: • Status of deliverables for each task; and • A narrative description in Progress Report format.
Subtask 1.3:	**Reimbursement Forms** - Reimbursement forms will be submitted to TCEQ by the last day of the month following each state fiscal quarter. For the last reporting period of the project, Reimbursement Forms are required on a monthly basis.
Subtask 1.4:	**Contract Communication** – Aransas County will participate in a post-award orientation meeting with TCEQ within 30 days of contract execution. Aransas County will maintain regular telephone and/or email communication with the TCEQ Project Manager regarding the status and progress of the project in regard to any matters that require attention between QPRs. This will include a call or meeting each January, April, July, and October. Minutes recording the important items discussed, and decisions made, during each call will be attached to each QPR. Matters that must be communicated to the TCEQ Project Manager in the interim between QPRs may include: • Requests for prior approval of activities or expenditures for which the contract requires advance approval or that are not specifically included in the grant activities; and • Notification in advance when Aransas County has scheduled public meetings or events, initiation of construction, or other major task activities under this contract. Information regarding events or circumstances that may require changes to the budget, grant activities, or schedule of deliverables must be reported within 48 hours of discovery.
Subtask 1.5:	**Annual Report Article** – Aransas County will provide an article for the NPS Annual Report upon request by TCEQ. This report is produced annually in accordance with Section 319(h) of the CWA, and it is used to report Texas' progress toward meeting the CWA § 319 goals and objectives and toward implementing its strategies as defined in the Texas NPS Management Program. The article will include a brief summary of the project and describe the activities of the past fiscal year.
Deliverables:	• QPRs; • Reimbursement Forms; • Annual Report Article (as requested by TCEQ); • Post-Award Orientation Meeting Minutes; and • Quarterly Conference Call Meeting Minutes.

[illegible]	
Task 2:	**Engineering Analysis, Permitting, Design, and Construction Bid Selection Process**
Objective:	1) To evaluate the project site along approximately 1,600 feet of creek, through engineering analyses, data collections, surveys, and environmental assessments; and 2) based on recommendations from the engineer as a result of the evaluation, to prepare project designs, obtain permits, and produce plans and specifications, and bid packages for techniques to stabilize the eroding banks. Due to budget constraints, the extent of improvements may be limited to 1,000 feet or less of the creek.

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Subtask 2.1	**Preliminary engineering analysis of bank stabilization and slope protection strategies and permitting** - An engineering and environmental analysis will be performed and a preferred vegetated slope protection alternative will be selected based on cost, engineering (soils, slope, anchoring system, and erosion control), environmental, and regulatory or USACE permitting considerations. There are various slope protection alternatives that will be evaluated including various types of concrete revetment block or articulated block, geogrid materials, or erosion control mats with various options involving earth retention and re-vegetation re-establishment. These options involve various degrees of vegetated slope protection, as well as, habitat establishment along the improved channel bank to provide a stormwater management control benefit by reducing bank erosion and downstream sedimentation. In addition, the application of the desired "vegetated" slope protection alternative involves alternative anchoring systems and appropriate slope and grade considering the channel bank soils and right-of-way considerations. A preliminary design of the preferred alternative will be prepared that will also serve as the proposed project addressed in a permit application to USACE. Since the project will involve greater than 500 ft. of drainage ditch, a pre-construction notification will be submitted to USACE to obtain approval under Nationwide Permit (NWP) No. 41, Reshaping Existing Drainage Ditches.
Subtask 2.2	**Final design plans and specifications** - Once the USACE-NWP No. 41 approval is obtained, the final designs, plans and specifications will be prepared. The preliminary engineering drawings and construction plans, procedures, and methods outlined in the permit will be further detailed in plan sheets and specifications for purposes of obtaining construction bids.
Subtask 2.3	**Construction Bid Selection Process** - Contract documents will be prepared to include all the construction plans and specifications including "bidding and contract" requirements, site work and ditch excavation and widening, clearing and grubbing, slope protection and revegetation materials and placement, Texas Pollutant Discharge Elimination System (TPDES) Construction Site Permit requirements, and Stormwater Pollution Prevention Plans (SW3P). The Contract Documents will be advertized to receive Contractor Construction bids, and the bids will be reviewed and recommendations provided to the TCEQ and Commissioners Court for action. The recommended and approved construction contractor will be awarded the bid and will enter into a contract with Aransas County as per the Construction Contract Documents and Specifications.
Subtask 2.4	**Engineering Analysis, Permitting, Design, and Construction Bid Selection Process Report** - Aransas County will submit a report summarizing Tasks 2.2, 2.2 and 2.3.
Deliverables	• Project Designs and Specifications; • USACE Permit; • Bid Packages; and • Engineering Analysis, Permitting, Design, and Construction Bid Selection Process Report.

[illegible]	
Task 3	**Performance Monitoring and QUALHYMO Modeling**
Objective	To establish pre-construction and post-construction water quality total suspended solids (TSS) baseline loading data and BMP performance data on the Upper West Tule Project and 2009 West Tule Creek Sediment Trap Project by collecting stream water quality and flow data, groundwater elevation data, soils infiltrometer data, and performing QUALHYMO modeling and assessment of BMP performance for both BMPs.

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Subtask 3.1	**QAPP Updates and Amendments** – There will be two QAPPs, one for monitoring and one for modeling. The QAPP for Modeling and Monitoring, prepared with FY 09 Section 319 (h) grant funds, will be updated annually and amended as necessary. Aransas County will provide input to TCEQ 60 days prior to the end of the effective period of the QAPP and develop annual QAPP revisions no less than 45 days prior to the end of the effective period of the QAPP. Amendments to the QAPP, and the reasons for the changes, will be documented by the County and revised pages will be forwarded to all persons on the QAPP distribution list by the County Quality Assurance Officer. Amendments 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. *Activities covered under this QAPP:* · Data collection; and · An evaluation of BMP Effectiveness through modeling and monitoring. *Tasks/Subtasks covered under this QAPP:* · Subtask 3.2 · Subtask 3.3 · Subtask 3.4 · Subtask 3.5
Subtask 3.2	**Water Quality and Streamflow Monitoring** - Surface water quality monitoring will be performed at six (6) locations to assess pre-construction TSS loading, and post construction TSS loading to assess performance of the Upper West Tule Creek Improvement Project and post construction monitoring of the 2009 Upper Tule Creek West Widening and Slope Protection and Realignment Project. Approximately eight sampling events will be performed to represent baseline dry and wet weather stormwater conditions. The surface water samples will be analyzed for pH, conductivity, dissolved oxygen, temperature, and oil and grease. Cost estimates reflect a total of 48 stream samples.
Subtask 3.3	**Groundwater Piezometer** - The groundwater piezometers installed with 2009 TCEQ grant funds will be monitored and maintained along with rainfall gauges.
Subtask 3.4	**QUALHYMO Modeling and Assessment** - The QUALHYMO modeling and BMP assessment of both the Upper Tule Creek West Widening Project BMP and Tule Creek West Sediment Trap Project BMP will be finalized to include performance assessment of both BMPs.
Subtask 3.5	**Data Submittals** – Aransas County will review, verify, and validate water quality monitoring data before it is submitted to TCEQ. Aransas County will submit data to TCEQ quarterly and at least one month prior to use, or prior to presenting to stakeholders. Aransas County will submit a semi-annual report of water quality data consistent with TCEQ formatting requirements for upload into the Surface Water Quality Monitoring Information System (SWQMIS).The modeling and assessment report will be submitted in the Final Report.
Deliverables	• Draft and Final QAPP Annual Updates; • Draft and Final QAPP Amendments; • Data Submittals; and • Reports of Water Quality non-conformances. These reports will be reported to the TCEQ Project Manager and will be included in the QPRs.

[illegible]	
Task 4	**Construction**
Objective	To widen and re-slope the ditch, in order to reduce erosion; and to remove invasive trees, in order to allow for the natural colonization of nearby native trees, shrubs, and forbs which will provide shoreline stabilization functions, reduce erosion and sedimentation, and improve water quality conditions in the immediate area and downstream through the filtration and uptake of pollutants (an estimated 800-1,000 feet of creek is expected to be improved).
Subtask 4.1	**Upland vegetation clearing**
Subtask 4.2	**Excavation and widening/re-sloping of East side of ditch**
Subtask 4.3	**Bank Stabilization and Slope Protection**

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Subtask 4.4	**Construction Report** - Aransas County will prepare a Construction Report summarizing Tasks 4.1, 4.2 and 4.3.
Deliverables	• Photographs documenting excavation and widening of creek; • Photographs documenting construction of selected solution for the erosion problems caused by the sharp bend in the creek; and • A Construction Report.

Task 5	**Final Project Report**
Objective	To produce a Final Report that summarizes all project activities completed and conclusions reached, and that contains all the reports completed under previous tasks either in the text or as appendices.
Subtask 5.1	**Draft Report** –Aransas County will provide a draft report summarizing all project activities, findings, and the contents of all previous deliverables, referencing and/or attaching them as web links or appendices. This comprehensive, technical report will provide analysis of all activities and deliverables under this grant activity. The report will include the following information: • Title; • Table of Contents; • Executive Summary; • Introduction; • Project Significance and Background; • Methods; • Results and Observations; • Discussion; • Summary; • References; and • Appendices.
Subtask 5.2	**Final Report** –The Draft Report will be revised to address comments provided by the TCEQ Project Manager. The final report will be submitted to the TCEQ Project Manager and subsequently to EPA.
Deliverables	• Draft Report; and • Final Report.

Project Goals (Expand from Summary Page)

To improve the water quality in Tule Creek by 1) decreasing erosion of fine sand going from Upper Tule Ditch West to Little Bay by widening and re-sloping up to 1,000 linear feet of creek bank; 2) correcting a sharp turn in the creek which is causing severe erosion; and 3) re-vegetating the creek banks, providing for the natural colonization of native trees, shrubs, and forbs, which will provide shoreline stabilization, reduce erosion and sedimentation, and filter and uptake pollutants.

Measures of Success (Expand from Summary Page)

1) Tule Ditch re-sloped, widened, and realigned;

2) Effectiveness of re-sloping and widening the project area in reducing TSS; and

3) Elimination of Chinese Tallow, Brazilian Peppertrees, and other invasive species.

The data from the proposed monitoring task in both the FY 09 and FY 11 319(h) grant projects will be used to complete the QUALHYMO modeling and BMP performance assessment. The model will estimate the water quality pollutant loadings in the Tule Creek and load reductions and performance from Upper Tule Creek West Widening/Enhancement BMP, as well as, the 2009 West Tule Creek Sediment Trap Project. Load reduction resulted from the modeling and monitoring and will determine the measure of success of these projects.

Estimated Load Reductions Expected (Only applicable if demonstration BMPs will be implemented)

The field data associated with this monitoring program will be used along with the QUALHYMO model for load reduction purposes. This model was originally built for BMP analysis on a continuous simulation basis, and is able to assess settling and decay removal processes in a BMP, as well as, watershed flow generation and receiving water transport. Recent funding EPA and the City of Austin, as well as, other public entities has expanded the capabilities of the tool, in particular in its ability to represent portioning of contaminants between fluid and solid phases. Sediments can be simulated in 5 size fractions, and are tracked independently. Each fraction is removed according to user specified settling velocities. BMP characteristics can include by-pass, overflow, through-flow, exfiltration and regular discharge. Losses to evapotranspiration are also calculated on a continuous basis. In addition, the model has an effective set of calculation modules that enable simulation of distributed BMPs (Low Impact Development methods) and instream characteristics. The instream computations include several sediment transport modules able to represent stream power, excess critical shear, and sediment transport, which will be useful in this project in the event that erosive potential and erosive loads from the Tule Creek stream bank or bottom are to be calculated. For the present, as a part of this monitoring program, it is intended that the tool will be used to estimate loads into the sediment trap based on monitored flow and suspended solids data, and to simulate removal in the trap as a function of grain size, particle density, trap volume, outlet characteristics, mixing, through flow rate, overflow rate and sediment concentration distribution.

Aransas County is committed to providing all the modeling results quality and quantity, as well as, project designs and recommended projects. A range of stormwater quality mitigative improvement projects have been identified along the Tule watershed including areas surrounding Little Bay. The suite of improvement projects includes the BMPs included in this grant activity. The water quality sampling and monitoring recommended in the ACRSMP will further substantiate and support implementation of continued projects.

It has been shown in numerous studies that river bottom sediments serve as a reservoir for *E Coli* and fecal bacteria. The sediment load reductions realized through this project will decrease the available bacteria reservoir and curtail resuspension of sediments into the water column. Using literature values, Aransas County will analyze bacteria reduction associated with sediment reductions from the BMPs.

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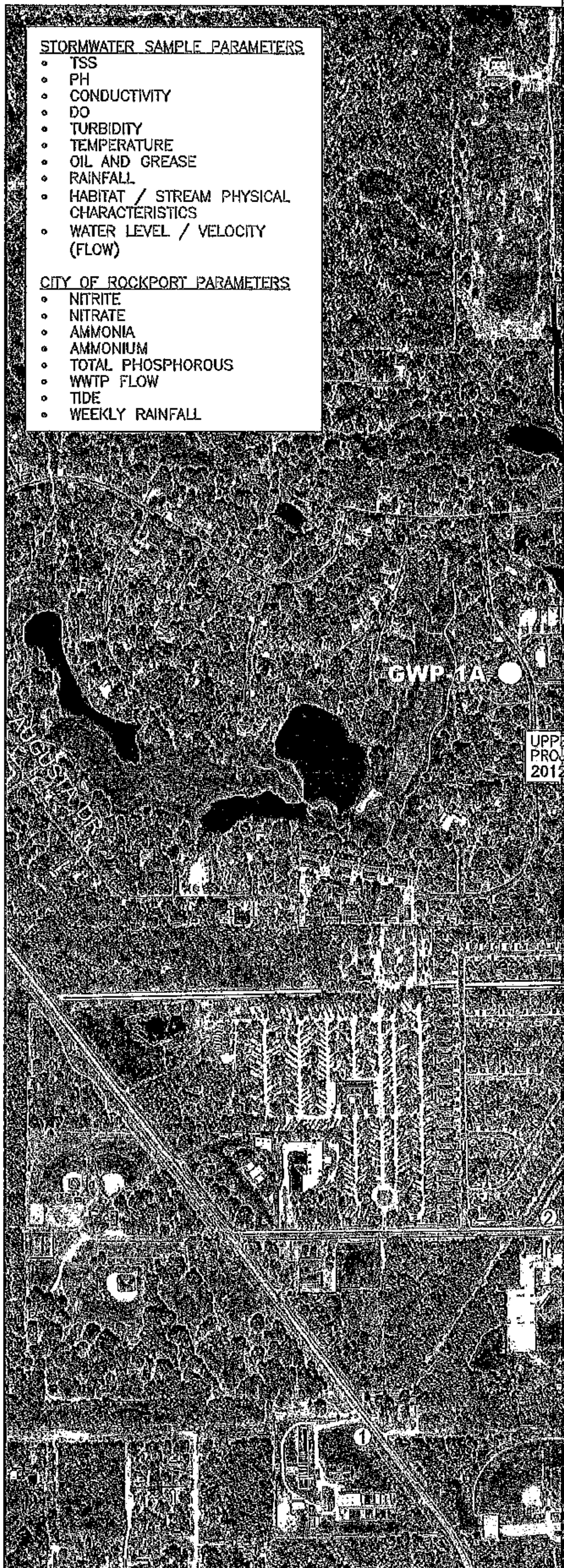
Aransas County – Upper Tule Creek West Improvement
Schedule of Deliverables

Schedule of Deliverables Based on Anticipated Project Funding/Initiation Date

Task No.	Deliverable	Due Date
1.1	Project oversight status	Quarterly
1.2	QPR's	The 15th of the month following each state fiscal quarter
1.3	Quarterly Reimbursement Request Forms	The last day of the month following each state fiscal quarter, and for the last reporting period of the project, reimbursement forms are required on a monthly basis.
1.4	Post Award Meeting	Within 30 days of contract execution
1.4	Post Award Meeting Minutes	Within 15 days of Post Award Meeting
1.4	Quarterly conference call or meeting with the TCEQ Project Manager & Minutes	The second month of each state fiscal quarter
1.7	Project Annual Report Article	Upon TCEQ Request
2.1	Preliminary engineering analysis of bank stabilization and slope protection strategies and permitting	Within 3 months of Contract execution
2.2	Final design plans and specifications	Within 12 months of Contract execution
2.3	Construction Bid Selection Process	Within 6 months of Contract execution
2.4	Engineering Analysis, Permitting, Design, and Construction Bid Selection Process Report	Within 8 months of Contract execution
3.1	Draft QAPP Updates submitted to the TCEQ Annually	60 days prior to the end of the effective period
3.1	Final QAPP Updates submitted to the TCEQ Annually	45 days prior to the end of the effective period
3.2	Draft QAPP Amendments	75 days prior to change in sampling plan implemented
3.2	Final QAPP Amendments	45 days prior to change in sampling plan implemented
3.3	Water Quality and Stream flow Monitoring	Within 36 months of contract execution
3.3	The groundwater piezometers installed	Within 36 months of contract execution
3.4	QUALHYMO Modeling and Assessment	Within 36 months of contract execution
4.1	Upland vegetation clearing	Within 10 months of Contract execution
4.2	Excavation and widening/re-sloping of East side of ditch	Within 30 months of contract execution
4.3	Bank Stabilization and Slope Protection	Within 30 months of contract execution
4.4	Construction Report	Within 32 months of

		contract execution
5.1	Draft –Final Report	Within 34 months of contract execution
5.2	Final Report	Within 36 months of contract execution

Appendix D. Map of Monitoring Sites



LEGEND

- WATER QUALITY SAMPLE LOCATION (WQS)
- GROUNDWATER PIEZOMETER LOCATION (GWP)
- ① CITY SAMPLE LOCATIONS
- Ⓕ FLOW MONITORING SITE

LOCATION DESCIPTIONS

WQS-1 – BELOW PROPOSED POND ABOVE TX BUSINESS 35.
WQS-2 – ABOVE PROPOSED POND AT CONFLUENCE.
WQS-3 – AT TRAYLOR AVE. ABOVE BRIDGE.
WQS-4 – BELOW THE UPPER TULE CREEK WEST PHASE 1.
WQS-5 – ABOVE THE UPPER TULE CREEK WEST PHASE 2.
WQS-6 – UPPER TULE CREEK DRIVE

GWP-1A – (ROCKPORT COUNTRY CLUB R.O.W.)
GWP-1B,1C – (INVERRARY DRIVE, R.O.W. ON FROST PROPERTY
GWP-2A,2B – (CITY OF ROCKPORT AQUATIC CENTER PARK)
GWP-2C – (NEAR ROCKPORT/FULTON HIGH SCHOOL)

NOTES:

1. GROUNDWATER PIEZOMETER LOCATIONS HAVE UP GRADIENT AND DOWN GRADIENT LOCATIONS.

3. INFILTROMETER TEST LOCATIONS ARE LOCATED NEAR PIEZOMETER LOCATIONS

NaismithEngineering,Inc
ENGINEERING ■ ENVIRONMENTAL ■ SURVEYING
TBPE No. F-355
4501 GOLLIHAR RD. CORPUS CHRISTI,TEXAS 78411 PH. NO. 361-814-9900

WATER QUALITY, STREAM FLOW GROUNDWATER PIEZOMETER SAMPLE LOCATIONS

TULE CREEK STORM WATER PROJECT

Drawn By: ECF	Appr. By: DES	Scale: AS SHOWN	Dwg. File: 8701-SAMPLE-LOCATION	Sheet 1
Checked By: DES	Project No.: 8701	Date: 06/2012	Rev.: 0	of 1

X:\8701 ARANSAS COUNTY TCEQ 2009 WEST TULE CREEK PROJECT\CAD\8701-SAMPLE-LOCATION.DWG

Appendix E. Stream Physical Characteristics and Habitat Quality Worksheet

Field Data Reporting Form

Streamflow Measurement Form

Cross Section Measurement Form

Stream Physical Characteristics Worksheet

Observers:	Date:	Time:

Weather Conditions:

Sample Station Location and Number:	Length of Reach: Water Color:

Observed stream uses:

Stream Type (circle one): **perennial** or **intermittent w/perennial pools**

Stream bends/ Stability	Well Defined	Moderately Defined	Poorly Defined

Aesthetics (circle one): **(1) wilderness** **(2) natural** **(3) common** **(4) offensive**

Channel Obstructions or modifications:	No. of riffles:

Flow Status (circle one): **High** **Moderate** **Low** **No Flow**

Riparian Vegetation (%)	Left Bank	Right Bank	Maximum Pool Depth: Maximum Pool Width:
Trees			NOTES:
Shrubs			
Grasses or forbs			
Cultivated Fields			
Other			
Steam/Aquatic Vegetation: Site Map: (Attached) Stream Observations (Other issues):			PICTURES (LOG):

Part III - Habitat Quality Index

Habitat Parameter	Scoring Category			
Available Instream Cover	**Abundant** >50% of substrate favorable for colonization and fish cover; good mix of several stable (not new fall or transient) cover types such as snags, cobble, undercut banks, macrophytes	**Common** 30-50% of substrate supports stable habitat; adequate habitat for maintenance of populations; may be limited in the number of different habitat types	**Rare** 10-29.9% of substrate supports stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed	**Absent** <10% of substrate supports stable habitat; lack of habitat is obvious; substrate unstable or lacking
Score______	4	3	2	1
Bottom Substrate Stability	**Stable** >50% gravel or larger substrate; gravel, cobble, boulders; dominant substrate type is gravel or larger	**Moderately Stable** 30-50% gravel or larger substrate; dominant substrate type is mix of gravel with some finer sediments	**Moderately Unstable** 10-29.9% gravel or larger substrate; dominant substrate type is finer than gravel, but may still be a mix of sizes	**Unstable** <10% gravel or larger substrate; substrate is uniform sand, silt, clay, or bedrock
Score______	4	3	2	1
Number of Riffles To be counted, riffles must extend >50% the width of the channel and be at least as long as the channel width	**Abundant** ≥ 5 riffles	**Common** 2-4 riffles	**Rare** 1 riffle	**Absent** No riffles
Score______	4	3	2	1
Dimensions of Largest Pool	**Large** Pool covers more than 50% of the channel width; maximum depth is >1 meter	**Moderate** Pool covers approximately 50% or slightly less of the channel width; maximum depth is 0.5-1 meter	**Small** Pool covers approximately 25% of the channel width; maximum depth is <0.5 meter	**Absent** No existing pools; only shallow auxiliary pockets
Score______	4	3	2	1
Channel Flow Status	**High** Water reaches the base of both lower banks; < 5% of channel substrate is exposed	**Moderate** Water fills >75% of the channel; or <25% of channel substrate is exposed	**Low** Water fills 25-75% of the available channel and/or riffle substrates are mostly exposed	**No Flow** Very little water in the channel and mostly present in standing pools; or stream is dry
Score______	3	2	1	0

Streamflow (Discharge) Measurement Form

Streamflow (Discharge) Measurement Form

Stream:______________________________ Date:__________

Station ______________________________

Description:______________________________

Time Begin:__________ Time End: __________ Meter Type:__________

Observers: __________ Total Stream Width: ________ Section Width (W):________

Observations:______________________________

Section Midpoint (ft)	Section Depth (ft) (D)	Sensor Depth (ft)	Velocity (V) At Point (ft/s)	Velocity (V) Average (ft/s)	Flow (Q) (ft^3/s) Q = (W)(D)(V)
$m^3/s \times 35.3 = ft^3/s$			Total Flow (Discharge)		

TCEQ-20117 (Rev. 04-22-2004)

Cross Section Measurement Form		
Stream:	Date:	Time Begin: Time End:
Weather Conditions:		
Station:	Meter Type:	
Observers:		
Description:		
Total Stream Width:	Section Width (W):	
STATION	**ELEVATION**	**OBSERVATIONS**

Appendix F. Surface Water Quality Sampling Standard Operating Procedures

Surface Water Quality Sampling SOP

Purpose

This appendix provides a convenient summary of the protocol used for collecting the Tule Creek surface water samples for water quality testing in the lab as well as in-situ field measurements and data collection, and observations of stream physical characteristics and habitat quality indicators. This standard operating procedure (SOP) is intended to be used in the field as a resource for the water quality sampling, testing, and field observation personnel.

General

As stated in the QAPP, monitoring will be conducted at six(6) in-stream monitoring locations to help identify potential non-point source contributions and stormwater discharges and evaluation of the Tule Creek Sediment Trap and associated BMP performance from the Tule Creek Watershed BMP projects.

Sampling will be conducted during periods of dry weather as well as wet weather events. Prior to sampling a storm event, consideration will be given to allow at least 72 hours or greater of dry weather (less than 0.1 inches of rainfall) and as the antecedent dry weather prior to sampling a reasonably representative wet weather or storm event. Stormwater samples will be collected from storm events that are greater than 0.25 inches of rainfall for the duration of the event, and typically less than a 3 inch rainfall. Prior experience observing rain events within the Tule Creek Watershed have determined that rainfall within this range will allow a reasonable representative and safe rain event for sampling.

There is great variability in runoff characteristics in the Aransas County and Tule Creek Watershed, and as affected by the antecedent moisture within the watershed. The antecedent moisture is a hydrologic term used to define the relative wetness or dryness with the watershed. A rain event following an antecedent dry period is understood to best represent the stormwater pollutant contribution to the receiving stream. The nature of the scope, budget, and schedule for this project can only allow for reasonably representative sampling events. The antecedent moisture is high when there has been a lot of recent rainfall and the ground is moist. The antecedent moisture is low when there has been little rainfall and the ground becomes dry. In the Aransas County and Tule Creek Watersheds the soil conditions are sandy and observations and results of available hydrologic and hydraulic modeling and field observation following various rain events have indicated that the aforementioned conditions for sampling the wet weather or storm event will be reasonably representative.

Records need to be maintained on all analytical results; the date and duration (hours) of the sampled storm event; rainfall estimates (inches) of the storm event that created the sample run-off; and the time (hours) between a sampled event and the end of the previous measurable storm event. All sampling and measurements are grab samples and in-situ measurements.

Safety

Basic safety is everyone's responsibility. The following information has been adopted as a result of continuing training by team members and observing stream characteristics. The most significant safety issue sampling Tule Creek is avoiding a storm event that can create a water depth in the creek greater than approximately three (3) to four (4) feet deep. Tule Creek is an earthen ditch with eroded banks typically at a slope of 2:1. Precaution should be taken especially at sample stations #4 and #5 due to the ditch depth and slope at these stations. The sample stations #1 and #2 will be taken from the small sediment trap pond banks which will have safe access. Sample stations #3 and #6 will be taken from the small bridge and allow for convenient access along the bridge. There will normally always be two (2) individuals on the sampling team also for safety purposes.

MSDS Sheets
In accordance with OSHA's "Worker Right-to-Know Rule," MSDSs (Material Safety Data Sheets) are located in the truck binders. MSDS sheets are available for chemicals that are contained in the provided grab sample bottles and are used as preservatives for the samples. Sample bottles that contain these chemicals are labeled. Information contained in the MSDS sheets includes, but is not limited to: physical description, exposure/symptoms information, and first aid practices.

First Aid
Each supply box in the back of the trucks contains a first aid kit. Each team should have a mobile phone. Contact numbers are listed in each truck binder. In the case of an emergency call 911. Since you are on a mobile phone the 911 system cannot automatically track you. Be prepared to give the emergency operator your location, your name, and cell phone number if it is your personal number and REMAIN CALM. Once the proper authorities have been notified, and are en route, notify NEI at 361-814-9900. There is also a list of hospitals with their approximate regions listed.

General Precautions

- Always dress appropriately. Since you may be out in the rain, use a raincoat and as necessary dress for the temperature. It is better to remove layers in the field than to be too cold.
- If you have plenty of notice, do not forget your odds and ends to make life easier. Bring snacks, or anything else that you might want, such as mosquito spray and snake leggings.
- Bring plenty of water.
- As the weather gets warmer it becomes increasingly more important to have water with you. Be aware of signs of heat exhaustion and heat stroke in your team members. If someone seems to be experiencing deleterious effects from the heat, move them to a shaded area and try to cool them as quickly as possible-another reason to have water with you. (You should have ice for the samples that can also be used to quickly lower the core temperature of someone experiencing heat stroke.)
- Use gloves when taking samples.

CALIBRATION AND MAINTENANCE

Field equipment calibration should be conducted as necessary on the **direct reading instruments.** All equipment should be calibrated and maintained according to specific equipment instruction manuals (*See Appendix L).*

Direct Reading Instruments:

- Multiprobe Instrument – used to measure the pH, temperature, and conductivity of the sample. Calibration of the meter needs to be done prior to each sampling event. A calibration log will need to be kept. Calibration will be performed according to the manufacturers' specifications. There are multi-parameter probes that include pH, temperature, conductivity, and dissolved oxygen.

- Dissolved Oxygen Meter – used to measure dissolved oxygen concentrations of the sample. Calibration of the meter needs to be done prior to each sampling event. A calibration log will need to be kept. Calibration will be performed according to the manufacturers' specifications.

- Flow Meter – A student stream flow meter or similar device will be used to measure and calculate streamflow. The meter uses an impeller with a digital readout mounted on a pole. Data is recorded with the pole upstream from any obstruction including the sampling individual if flow is measured while standing in a low flow condition.

SAMPLING PROCEDURES

For a complete list of parameters sampled, container type, preservatives used, and sample holding times, see Section B2, Table B2.1 and B2.2 in QAPP.

1. Select someone to monitor the rainfall from the office via the Internet and the National Weather Service. This person will serve as base operations and will notify the samplers of any weather changes.
2. When the storm is near, make sure you have all of your equipment ready. You should have the following:
    a. Sampling Pole/Bucket
    b. Tape measure/Yard Stick/Graduated surveyor staff-pole
    c. Ice
    d. Ice chest for grab samples
    e. Chain of Custody form
    f. Calibrated Multiprobe Instrument (pH, temperature, conductivity)
    g. Calibrated Dissolved Oxygen Meter

h. Sample Containers from Lab(TSS, Turbidity, Oil and Grease)
i. Sharpie pen
j. Labels
k. Paper towels
l. Pygmy Meter (Velocity)
m. Stream Physical Characteristics Form
n. Habitat Quality Index Form
o. Camera (documentation)

2. Use a graduated streamgauge staff or yard stick to measure water level mid-stream (at sampling sites) and record data on Sampling Form.

3. Get bailer (bucket) or sampling pole ready.

4. Grab a sample of the stormwater with the bucket or sampling pole. Rinse the bucket or container out 3 times with the sampled stormwater prior to obtaining the first sample (grab). Throw rinse water away from the storm sewer system. Do not rinse the sample containers for Oil and Grease since the container includes fixing agents (see Grab Samples below).

5. Label the sample containers prior to filling. Labeled information should include the client, site identification, date and time of sampling, type of sample (grab), names of samplers, and preservation added to the bottles if applicable. After labeling sample containers make sure to record exact time, date, cfs, and sample type on the data sheet.

6. Field personnel will be responsible for recording all data and relevant observations on the field data sheets and chain of custody (COC) forms and for making sure the information matches on the bottles, the data sheets, and the COC forms. Proper handling and custody procedures should be followed to ensure the custody integrity of samples beginning at the time of sampling and continuing through transport, sample receipt, preparation, and analysis.

Grab Samples Collection Measurement

a. Use sampling bottles as provided by the laboratory. Using the sampling pole, fill directly to the base of the neck. The bottle for the Oil and Grease sample is preserved with hydrochloric acid (HCl). Place all grab samples in zip-loc bag and seal. Ice sample immediately

b. Temperature, pH, and conductivity: Use bailer to bring up water sample. Take temperature, pH, and conductivity readings and record data on the field data sheets.

c. Record dissolved oxygen readings in stream. Take readings and record data on the field data sheets. The multi-parameter probe for pH, temperature, conductivity, and DO can all be taken while in the field. Precaution is always necessary to avoid entrapment of bubbles or creation of bubble that would influence the DO measurement.

The COC forms are used to document sample handling during transfer from the field to the laboratory. The following information concerning the sample is recorded on the COC form:

- date and time of collection
- site identification
- sample matrix
- number of containers
- preservative used
- analysis required
- name of collector
- custody transfer signatures and time and date of transfer
- purchase order number
- container type

The COC forms are a legally binding document. The purpose of a chain of custody is to determine that no one other than the sampler has had access to or tampered with the samples. Once the sampler signs the COC forms and turns over the contents of the coolers, that sampler is releasing the samples to the laboratory and is no longer responsible for any tainting or damage that may occur after that point.

Sampling Precautions

- Make sure to wear gloves while sampling to protect yourself and the sample.
- Remove gloves.
- Make sure not to touch the rim or inside the cap of the sample jars to prevent contamination of the sample.
- Prevent cross-contamination of samples by taking direct collection into sample containers when possible.
- Prevent dislodging any materials that can influence the sample at the time of collection within the stream or along the stream bank.
- Dissolved Oxygen samples are sensitive to sample techniques that can create bubbles within the probe membrane causing a non-representative measurement.

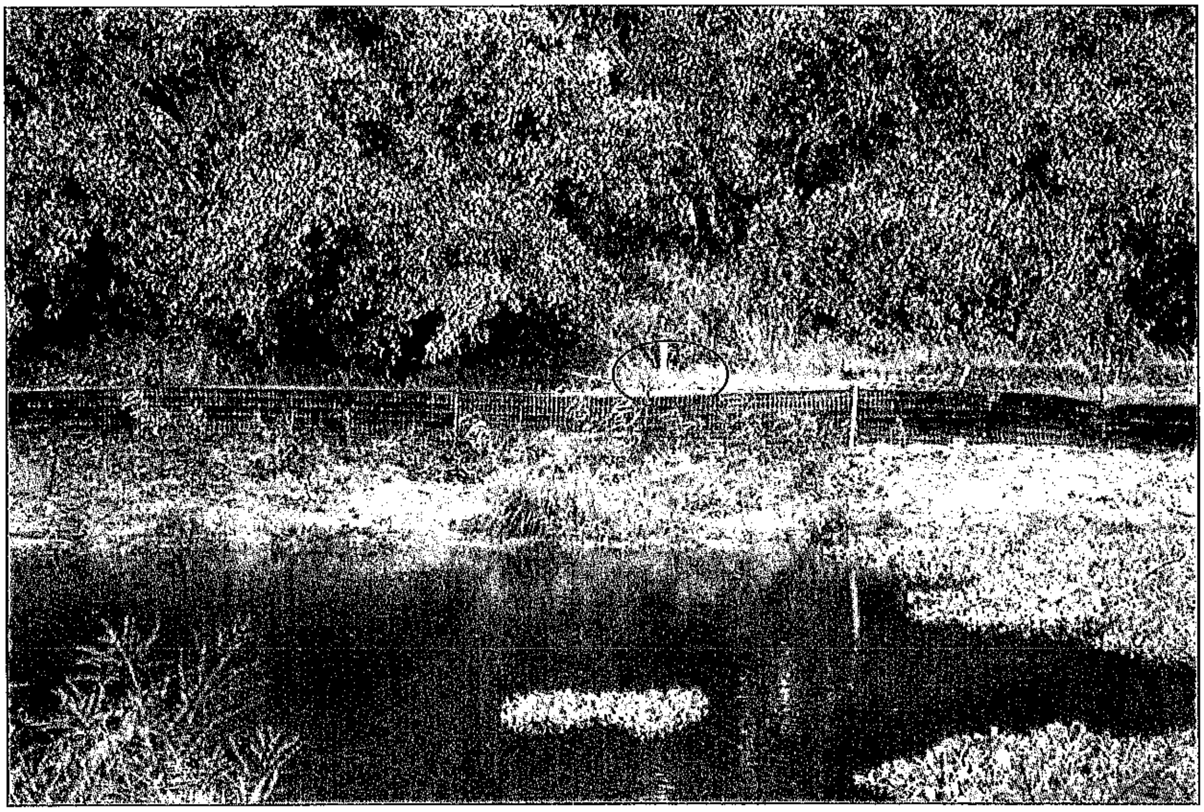
Calculating Precipitation

Data will be obtained using the Rockport Airport FAA-ASOS and the National Weather Service Website. There are also other weather websites available, however, it is necessary to verify other data sources rely on the National Weather Service and National Climatological Data Center (NOAA) data (also see the Modeling QAPP for use on the rainfall data in the QUALHYMO model).

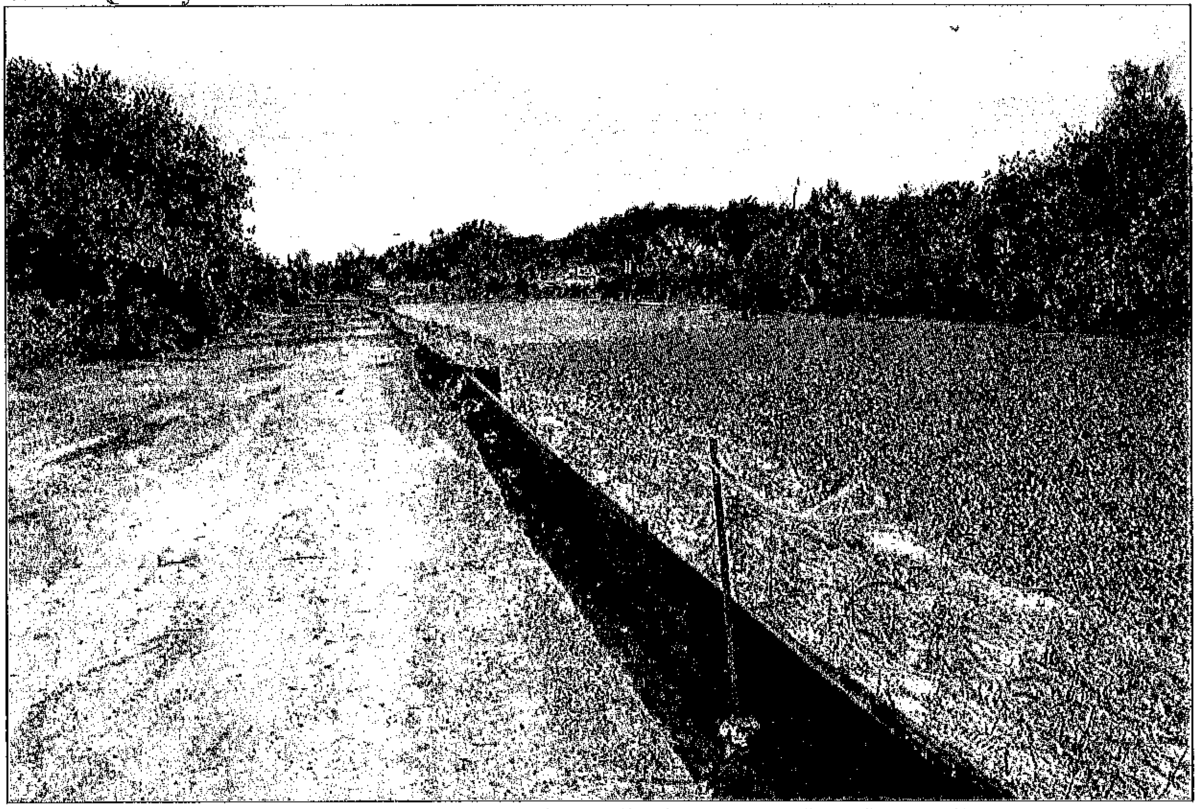
Table 1. Parameters, sample containers and volumes, preservatives, sample hold times, analytical methods and minimum detection limits.

Parameter	Sample Container and Volume	Field Preservative	Sample Hold Time	Laboratory Analytical Method	Minimum Detection Limit
Grab Samples		***ALL SAMPLES Cool to 4°C***			
Suspended Solids, Total (TSS)	500 ml Pre-cleaned plastic cubitainer	ice, dark	7 days	SM 2540 D	3
Oil & Grease	1000 ml Pre-cleaned amber glass cubitainer	ice, dark pH<2 with HCl	28 days	EPA 1664A	5
Turbidity	500 ml	ice, dark	48 hours	SM 180.1	1

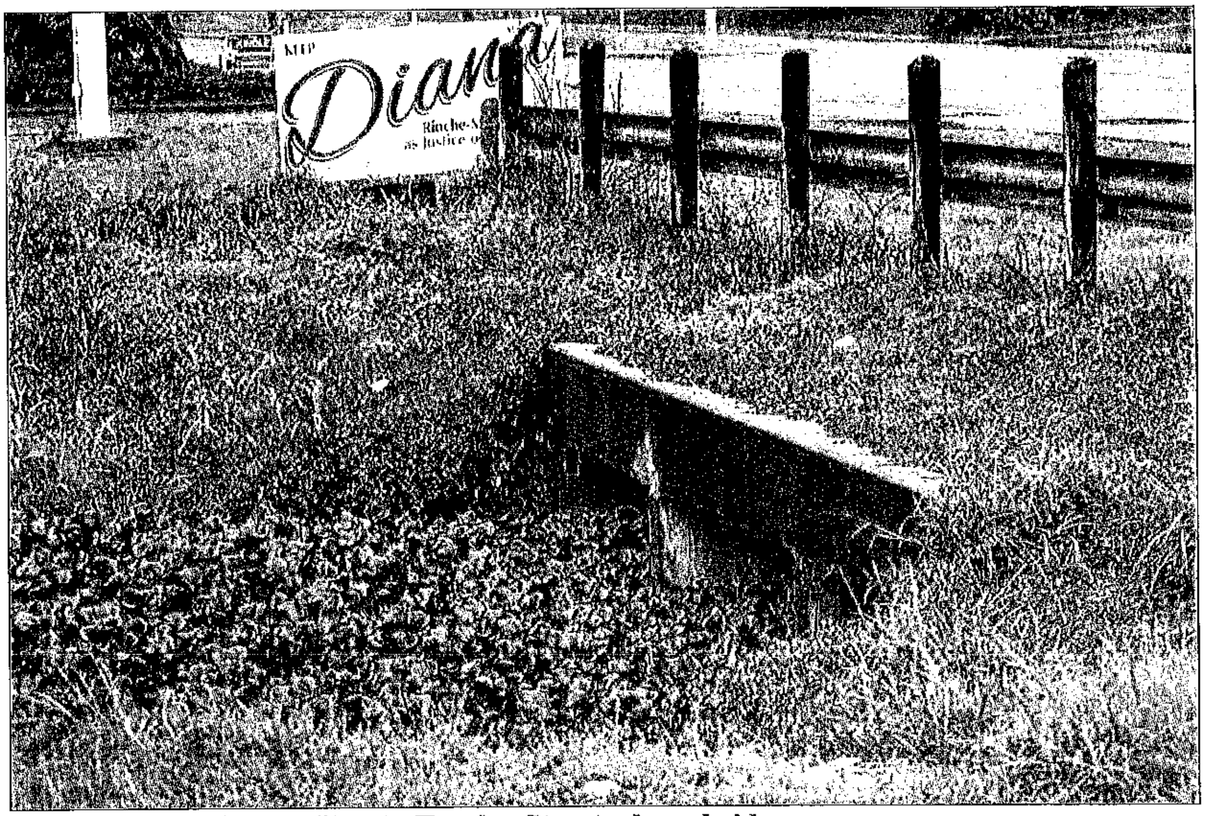
Appendix G Photos of Sample Location Sites



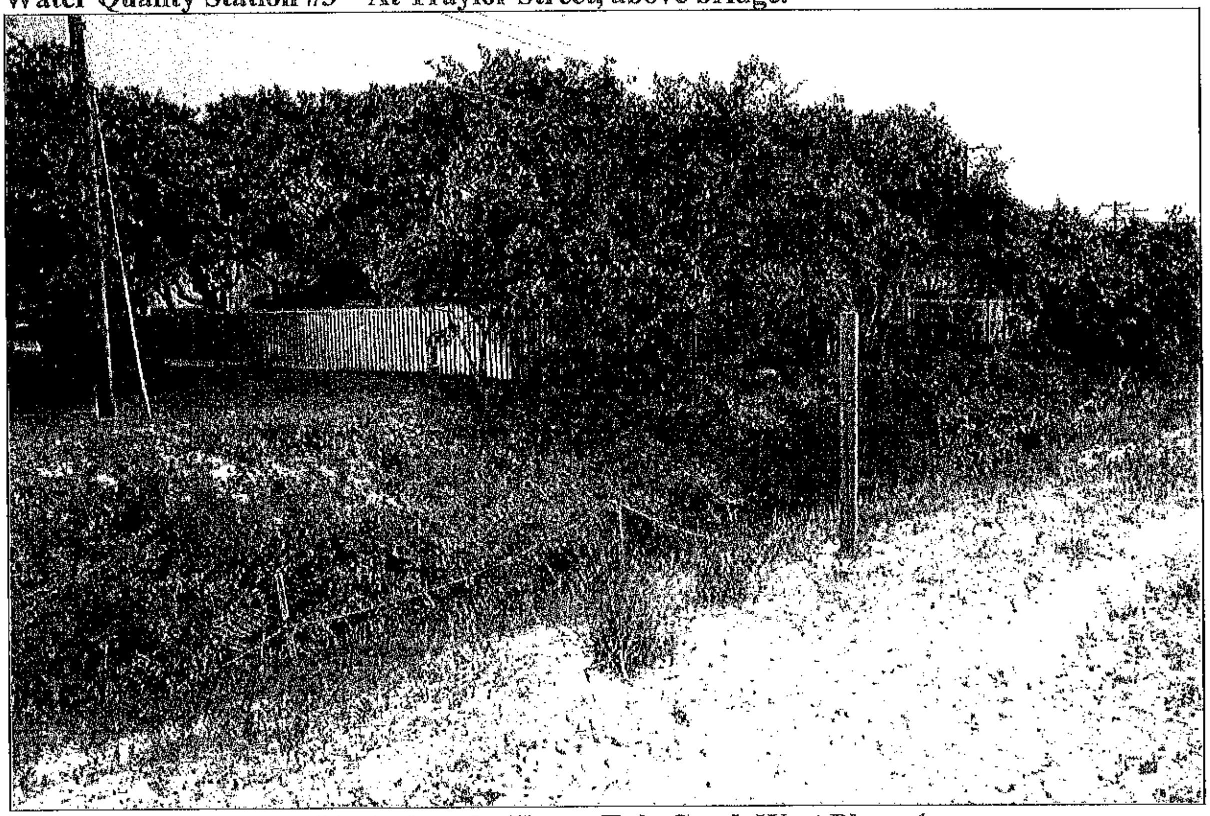
Water Quality Station #1 – Below Tule Creek Sediment Pond above TX Business 35



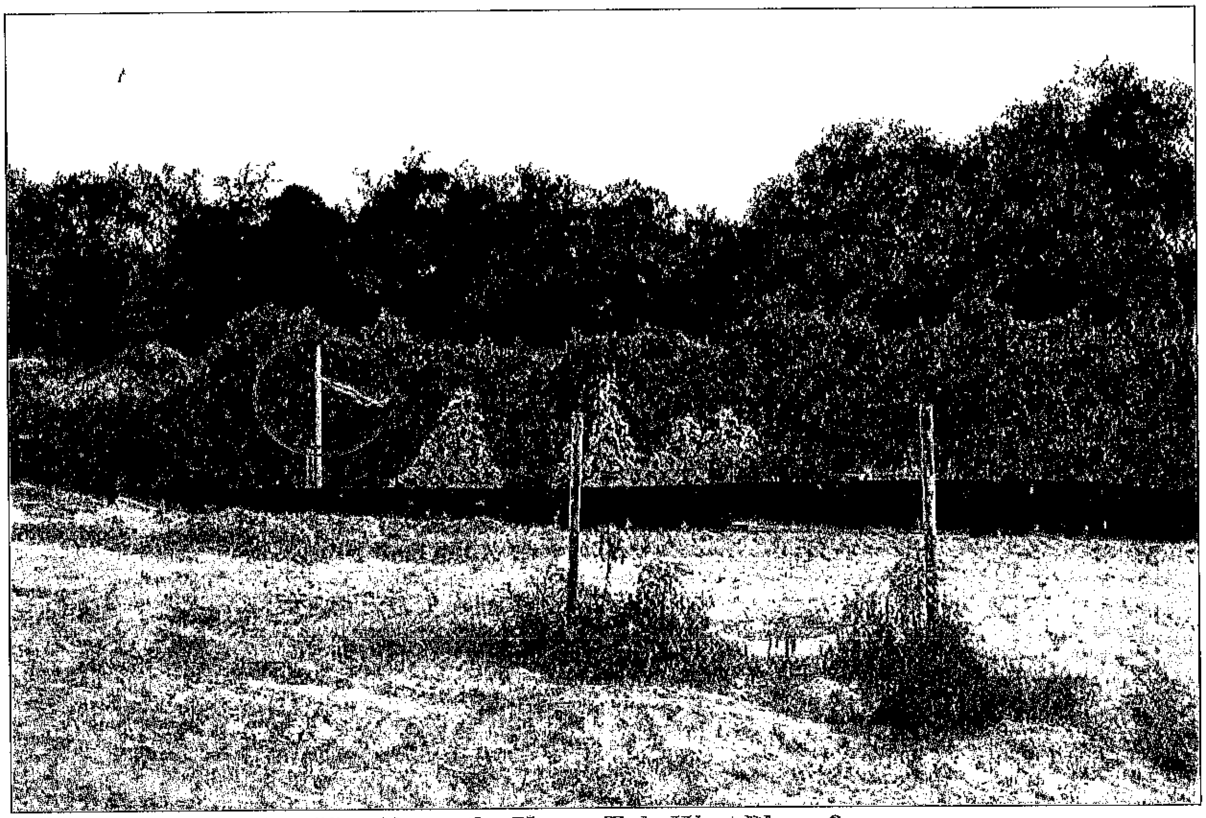
Water Quality Station #2 – Above Tule Creek Sediment Pond at the confluence



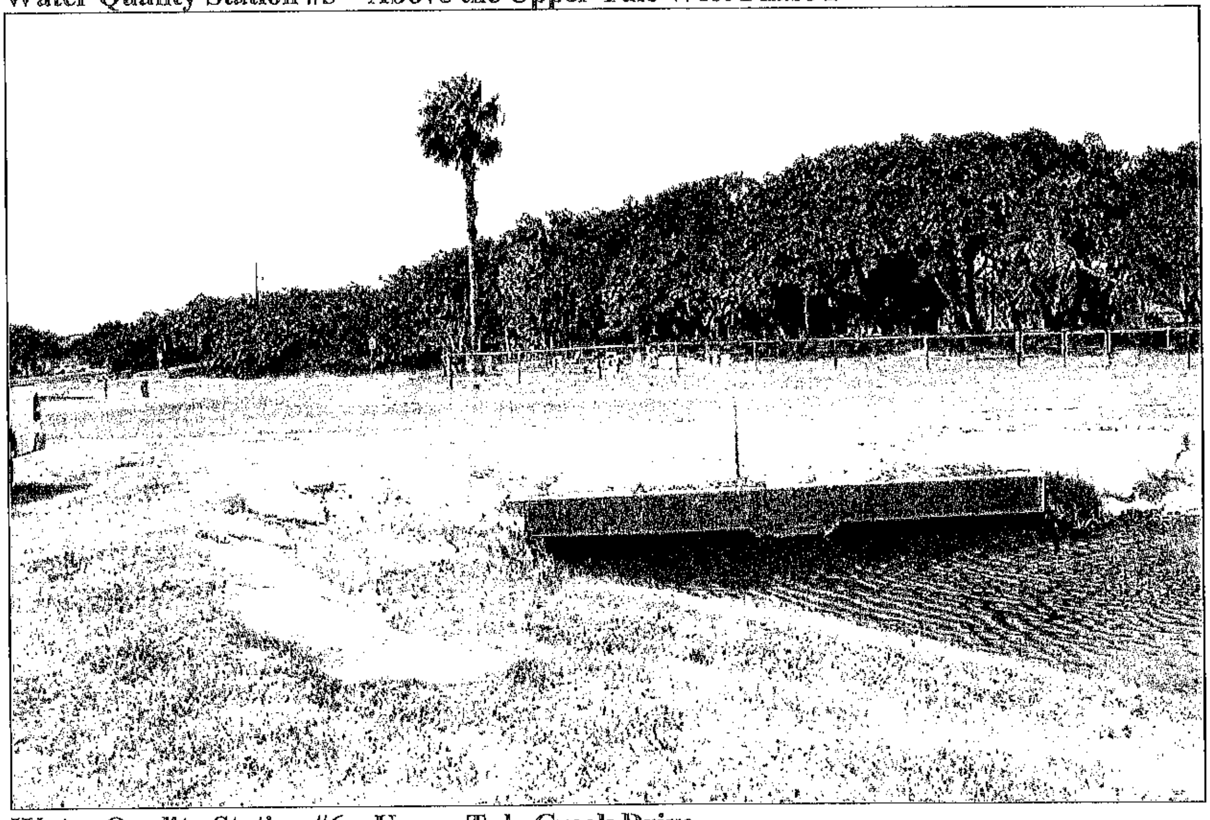
Water Quality Station #3 – At Traylor Street, above bridge.



Water Quality Station #4 – Below the Upper Tule Creek West Phase 1



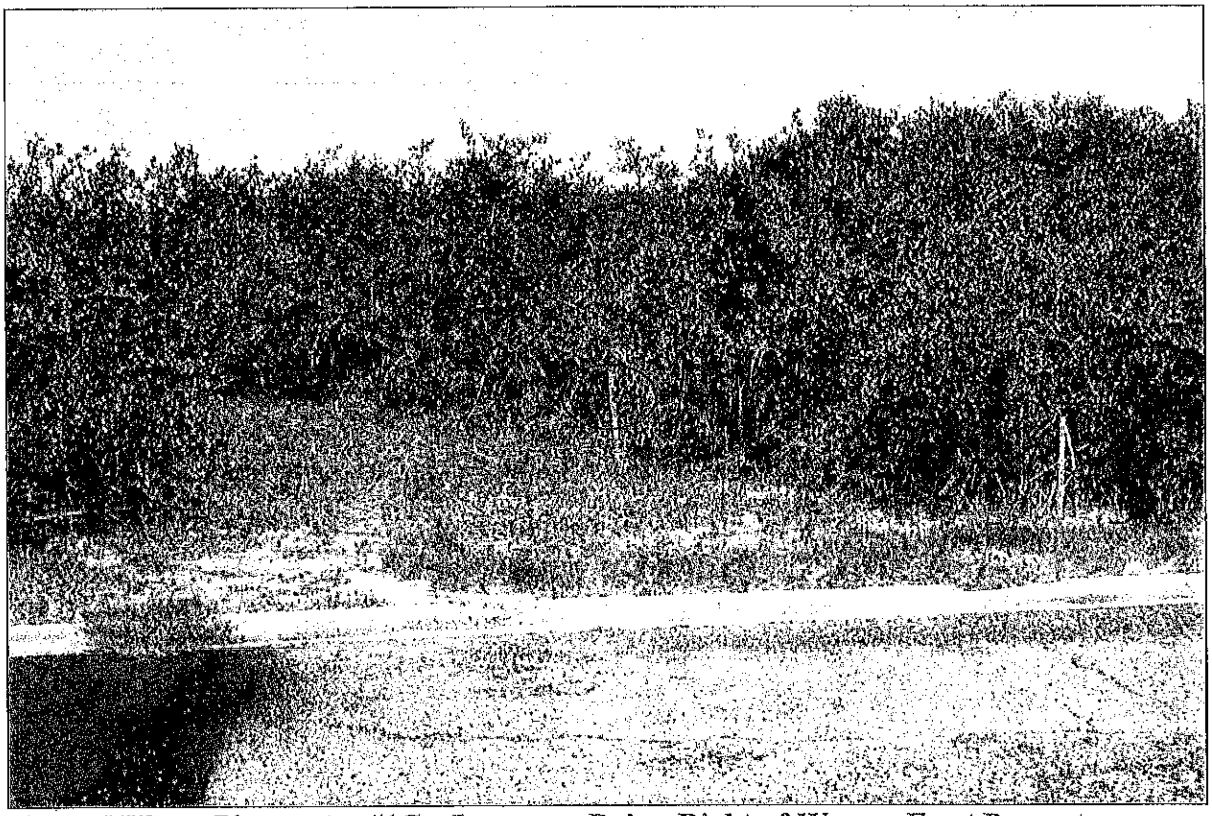
Water Quality Station #5 – Above the Upper Tule West Phase 2



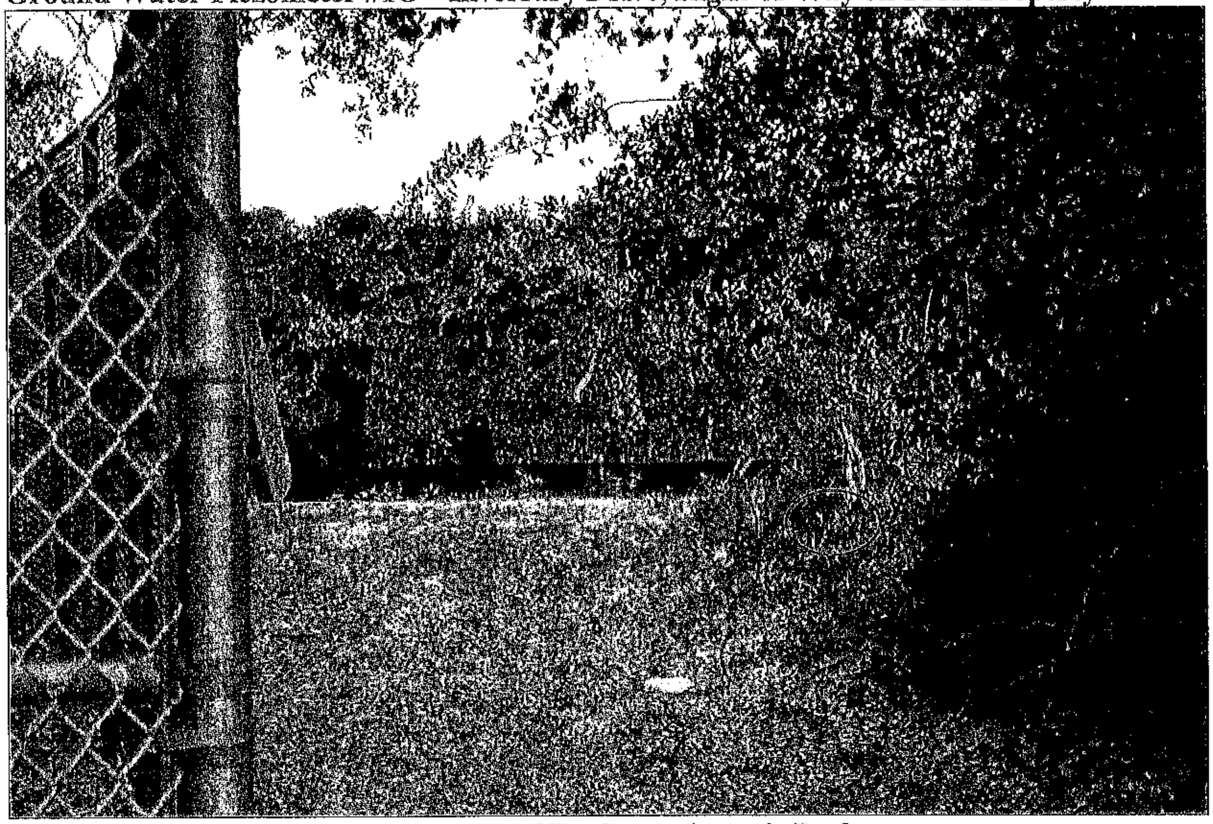
Water Quality Station #6 – Upper Tule Creek Drive

Ground Water Piezometer #1A – Rockport Country Club Right-of-Way

Ground Water Piezometer #1B – Inverrary Drive, Right-of-Way on Frost Property

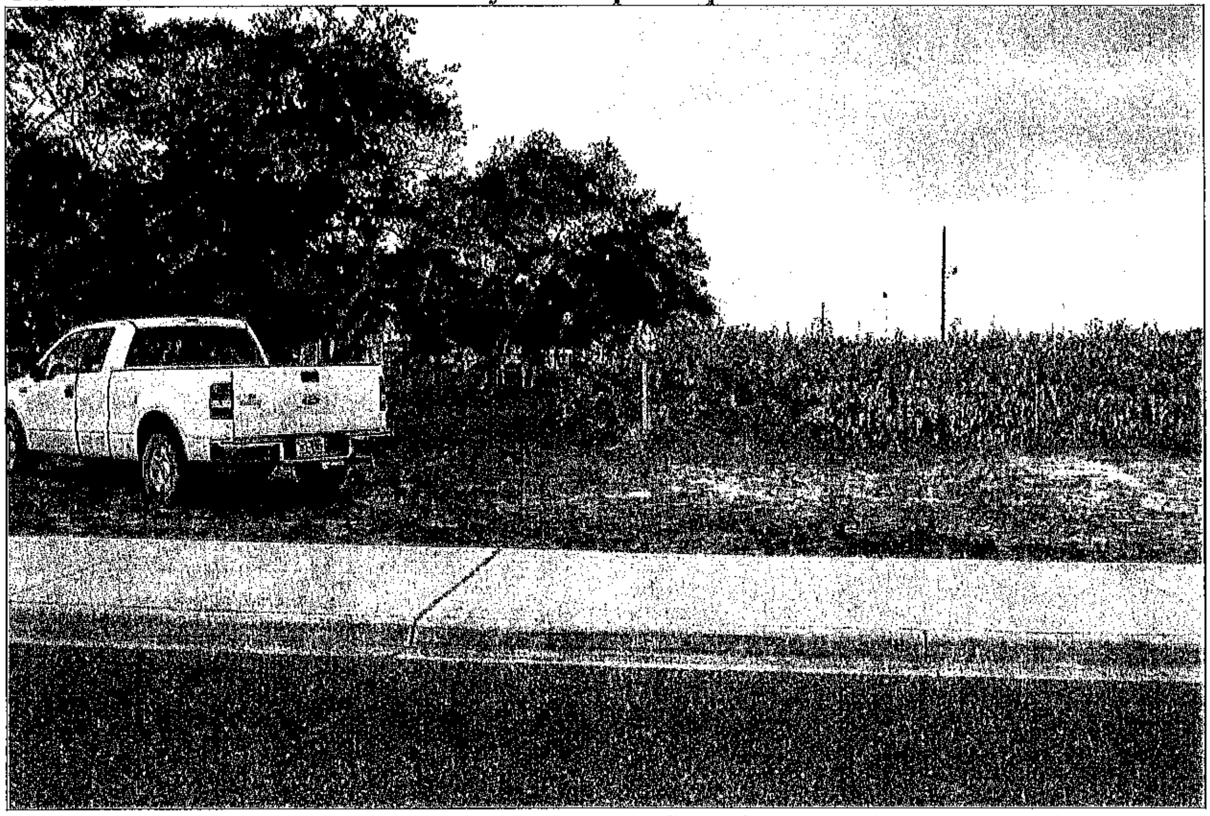


Ground Water Piezometer #1C – Inverrary Drive, Right-of-Way on Frost Property



Ground Water Piezometer #2A – City of Rockport Aquatic Park

Ground Water Piezometer #2B – City of Rockport Aquatic Park



Ground Water Piezometer #2C – Near dirt stockpile by Rockport/Fulton High School

Appendix H. Gauging Piezometers SOP

Standard Operating Procedures (SOP) for Gauging Piezometers

INTRODUCTION

Piezometers are installed as a tool to measure groundwater levels for a certain area. The groundwater levels indicate the fluid pressures in an area, and the groundwater elevation. The piezometer locations have been selected in order to help identify groundwater elevation in proximity to the Tule Creek, as well as the groundwater gradient. It is important that these observation wells are installed properly, in order to achieve precise and accurate measurements.

All piezometers and monitoring wells shall be installed according to 16 Texas Administrative Code (TAC) Chapter 76: Water Well Drillers and Water Well Pump Installers. Piezometer wells must be developed prior to the first gauging event. Well development can be accomplished using a PVC bailer. Agitate the sediment at the bottom of the well and aggressively bail water until it appears clean. Water quality parameters should be monitored during well development and conductivity values must be stabilized for three consecutive readings before well is considered clean and developed. The piezometer "top of casing" will be surveyed in order to determine the groundwater elevation using a known coordinate system also used to determine the Tule Creek water surface elevation.

GAUGING PROCEDURES

Upon arrival to the site, remove all piezometer caps or plugs to allow groundwater pressures and levels to stabilize for an accurate measurement.

Before gauging each piezometer the water-level measuring probe must be cleaned before use. Using a mixture of Alconox ® detergent and distilled water clean the probe and the required length of tape that will likely come in contact with water, and then rinse with distilled water. Make sure to clean all sides of the probe and to lift the mechanical float (if possible). Clean the instrument again before gauging the next well.

If the piezometers have been surveyed, there should be a permanent mark or notch on the top on the well casing; this is the point to record a measurement from. If the piezometers have not been surveyed place a permanent mark on the top of the north side of the well casing. The piezometers will need to be surveyed from this location. Gauging from this location every time is very important and provides consistent and accurate well gauging data.

Turn on the water level indicator and slowly lower it down the well. An audible tone will indicate the depth to water (DTW). Record the DTW measurement to the nearest o.o1 feet from the location of the permanent mark on the top of casing.

If a total depth (TD) is required continue to lower the probe in the water until the bottom of the well is encountered. Slowly lift the probe up (slightly off the bottom) and lower back down (as to perfectly rest on the bottom) to measure the total depth (TD) of the well to the nearest 0.01 feet. The depth to the water subtracted from the piezometer well "top of casing" will give the groundwater elevation.

Appendix I: Modified Double Ring Infiltrometer SOP

Double Ring Infiltrometer SOP

Purpose

This document describes the protocol to be followed in the use of a double-ring infiltrometer to estimate near-surface infiltration characteristics in Aransas County, Texas, in the context of an evaluation of watershed BMP options. The intent of this summary is to describe application of ASTM D3385 – 09 in that context. ASTM D3385 – 09 should therefore be regarded as the authoritative statement of method, while this document highlights procedural adaptations particular to the Aransas County for the purposes stated below.

The specific interest in this case is in establishing near surface infiltration rates associated with several soil types characteristically found in the county, so that future estimates of stormwater runoff can be made with a better understanding of near surface losses. In addition, these results may provide insights into distributed BMPs that may be dependent on near surface infiltration characteristics. Application of this protocol or results obtained in accordance with this protocol in other contexts or locations should only be considered after a careful review of all relevant factors.

When Testing should be conducted

Testing should be conducted prior to design and implementation of BMPs in accordance with SOP so that estimates of near surface infiltration and watershed runoff can be based on better data than presently exists.

Testing Personnel

Testing will be conducted by a team with experience in field scale measurement of watershed parameters. A Texas registered PE with experience in water resources planning and analysis shall be present during testing or during test planning to the extent necessary to confirm that equipment, methods and plans are consistent with this document.

Selection of Test Areas

Site development tends to decrease natural infiltration, which prompts the use of BMPs to offset this effect. Ideally, infiltration testing would be therefore be carried out for all areas where development may occur (i.e. the land surface is disturbed as a result of development). In this case, however, that would be cost prohibitive. Therefore, testing will be carried out in three locations selected as representative of the three soil types identified as prevailing in this area. Final selection of test areas will be made with due consideration of safety (e.g. no dangerous vehicle traffic, potential hazards or nuisances arising from testing, or other factors), land access permissions, available water supply for testing, apparent representativeness of the areas, suitability for testing and location in the watershed. Ideally, the areas to be tested will be located mid-watershed above areas that are already developed, but not at the extreme periphery where they may not represent any significant contributing area.

Water Supply Source

Since water supply is a consideration in testing, a water supply source must be secured for the duration of the testing procedure. Suitable water sources include municipal sources, such as fire hydrants, or mobile tanker trucks such as from a volunteer fire department. In the event that water supply is limited, it may be necessary to truncate the experiment to some degree; as long as the results indicate an essentially stable phase of the infiltration process has been reached, this is acceptable for the purposes of this testing.

Safety

Field work and testing procedures shall follow current Occupational Safety and Health Association (OSHA) standards and regulations, together with any requirements defined by the City and County. In addition, regardless of acceptability from other perspectives, the PE who is on site or responsible for review of testing procedures shall consider apparent safety hazards and may without question rule out any aspect of testing that they in their sole judgment consider or suspect is likely to constitute a danger to test crews or others.

Double-Ring Infiltrometer Testing Procedure

Testing shall be done in accordance with ASTM standards and practices, and these should be referred to for a definitive statement of experimental methods. Specifically, standard testing method designated D3385 – 09 should be followed. Some notable aspects of this are as follows:

- Testing methods dictate that ambient temperature, ground temperature and the water used during the course of testing be measured and recorded. This will be done using an electronic thermometer with a calibrated range of at least 60 – 130 degrees Fahrenheit +/- 0.1 degrees.
- Initial set-up requires hammering two open cylinders, one inside the other, into the ground to a depth of six inches. Standard ring sizes will be used (inside diameter12 inches and outside ring diameter 24 inches for low infiltration areas and if necessary, 5 inches and 12 inches for high infiltration areas). To avoid deformation of the rings and to ensure regular placement, particularly in areas where soil penetration is difficult, hammering will be by means of a hard plastic mallet, with a hardwood impact surface will be interposed between the ring and the mallet.
- The rings are to be filled with water which shall be maintained to the extent possible at a constant depth. To facilitate this, the interior of each ring shall be provided with a scale. Scale depth to ground surface shall be subtracted from scale depth to water surface to establish estimated depth.
- Over the course of six hours, the water levels must be maintained at a constant depth and the water needed to maintain this depth is measured. Readings will be taken initially every fifteen minutes and eventually at hourly intervals to verify the stability of water depths. Records of readings will be electronically maintained in a portable logging device and transferred each evening to non-volatile storage.
- During times of drought, the standard six hour time period is to be truncated once the stability of water depth has been recorded and verified.
- If variability between readings at one soil type location exceeds 60% (calculated as total range of depth over mean value of depth at one location), testing shall be repeated once at new sites representative of the same soil type. (Therefore,

backup locations will be identified jointly with City and County representatives at the time initial locations are determined.)

- High order accuracy in determining test site locations is not needed, but a reasonable documentation of location is appropriate. In order to document testing locations, a consumer-level hand held GPS will be used. Photos will also be taken to document site conditions at the time of testing.

Calculations

Calculations are made to determine the infiltration of a given area based on including values for time, area of the inner ring and temperature. ASTM D3385 – 09 describes this. It is noted that infiltration rate shall be estimated as the average of the values obtained for a particular soil type, and shall be accompanied by ranges represented by the high and low measured values. In cases where multiple measurements are made, and statistical properties merit, ranges may be represented by the standard deviation of the measured values.

Exclusions

It is known that while useful, infiltration rates as determined here are not necessarily representative of conditions in deeper soil strata. It is also known that infiltration behavior varies substantially about the County as a result of differing degrees of land use and impacts on surface soils. Further, it is known that clay lensing and other factors materially affect infiltration and/or permeability through the soil column. Consequently, the results of these tests shall be limited to interpretations of the near surface infiltration characteristics for the purposes stated above.

The test method is difficult to use in very pervious soils. Site conditions are anticipated to be marginal. Two soils types predominate in the area: USDA Types A and D. For that reason backup testing methods will be provided if the infiltrometer method proves problematic.

Appendix J. Field Measurement Data Sheets

Client: Aransas County
Sampling ID: ____
Project Name: ____
Sampling Date: ____
Location: ____
Screen Type PVC *Screen Length* ____ *Well Diameter* 2" *Total Depth* ____
Depth to Water ____ *Rain Gauge* ____
Sampling Device ____ *Tubing Type* ____
Instrument Information *Mfg.* ____ *Model* ____ *Parameters* Temp, Cond, DO, pH
Instrument Information *Mfg.* ____ *Model* ____ *Parameters* ____
Sampling Personnel ____

STATION	Time	Temp. (°C)	Cond. (mS)	DO (mg/L)	pH (SU)	Water Depth	Stream Velocity (L/min)	Comments
WQS -1								
WQS -2								
WQS -3								
WQS -4								
WQS -5								
WQS -6								

Appendix K: Chain of Custody Form

NAISMITH ENGINEERING, INC.
4501 GOLLIHAR ROAD
CORPUS CHRISTI, TEXAS
PHONE NO: (361) 814-9900
FAX NO.: (361) 814-4401

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

CLIENT ____________ NEI PROJ. NO. ________

PROJECT ____________

SITE LOCATION ____________

LABORATORY ____________

I attest that the proper field sampling procedures were used during the collection of these samples. Signature:

ANALYSES Page __ of __

				MATRIX			PRESERVATION				SAMPLING		METHOD	METHOD	METHOD	METHOD	METHOD	METHOD	METHOD	METHOD	METHOD	METHOD	METHOD	METHOD	METHOD	METHOD	METHOD	METHOD
Sample I.D.	Sample Location	Sample Quantity	No. of Containers	WATER	SOIL	AIR	HCL	HNO3	ICE		Date	Time	BOD5	TSS	TDS	TPH	BTEX	MTBE	PAH									

RELINQUISHED BY: ________ SIGNATURE:	DATE	TIME	RECEIVED BY: ________ SIGNATURE:	DATE	TIME	SPECIAL HANDLING
RELINQUISHED BY: ________ SIGNATURE:	DATE	TIME	RECEIVED BY: ________ SIGNATURE:	DATE	TIME	
RELINQUISHED BY: ________ SIGNATURE:	DATE	TIME	RECEIVED BY: ________ SIGNATURE:	DATE	TIME	Turn Around Time: ☐ 24 HR ☐ 48 HR ☐ 7 DAY ☐ OTHER

White: Original Pink: Field Copy Yellow: Laboratory Copy

YSI Environmental
Model 556
Quick-Start Guide

This Quick-Start Guide is meant to serve as a quick reference in operating the YSI Model 556. It is not intended to replace the information found in the Operations Manual. For your convenience, included in parenthesis for each section, are the section numbers from the full-length manual where additional information may be found.

INSTALLING THE DO MEMBRANE (3.4)

Note: The DO sensor is shipped with a dry shipping membrane to protect the electrode. **A new membrane cap must be installed before the first use.**

1. Prepare the O_2 probe solution according to the instructions on the bottle. After mixing, allow the solution to sit for 1 hour. This will help prevent air bubbles from later developing under the membrane.
2. Unscrew and remove the probe sensor guard.
3. Unscrew, remove, and discard the old membrane cap.
4. Thoroughly rinse the sensor tip with distilled or deionized water.
5. Fill a new membrane cap with O2 probe solution. **Be very careful not to touch the membrane surface.**
6. Thread the membrane cap onto the sensor, moderately tight. A small amount of electrolyte should overflow.
7. Screw the probe sensor guard on moderately tight.

MENU FUNCTIONS (2.9 – 2.11)

The Model 556 is set up with a menu-based interface. To navigate through the menus, use the up and down arrow keys to highlight a desired menu option, then press the **Enter** key to open the menu feature. Press the **Esc** key to return to a previous screen. The 556 will automatically power on to the Run screen. Press the **Esc** key to display the main menu screen.

SETTING THE DATE AND TIME (10.2)

1. Select **System Setup** from the main menu and then select **Date & Time**.
2. Highlight **Date** and press **Enter**.
3. Use the keypad to enter the correct date and press **Enter**.
4. Highlight **Time** and press **Enter**.
5. Use the keypad to enter the correct military time and press **Enter**.
6. Press **Esc** several times to return to the main menu.

TAKING MEASUREMENTS AND STORING DATA (7 - 9)

1. Power the instrument on, or select **Run** from the Main Menu.
2. Insert the probe into the sample to be measured. Continuously stir, or move the probe, through the sample until the readings on the screen stabilize.
3. Use the arrow keys to highlight **Log one sample**, or select **Start logging** to record a series of data. Press **Enter**. The Enter Information screen should appear.
4. Use the keypad to enter a filename for the measurement. If no file name is entered, the instrument will assign a default of NONAME. Press **Enter**.
5. If you would like to enter an optional site description, highlight that field and use the keypad to enter the information. Press **Enter**.
6. Highlight **OK** and press **Enter**. If logging one sample, the instrument will confirm the data point was successfully logged.
7. If a series of points is being logged, the Start logging entry in the run screen will change to Stop logging. At the end of the logging interval, press **Enter** to stop logging.

UPLOADING DATA TO A PC (8.4)

1. Make sure EcoWatch for Windows is installed on the PC.
2. Disconnect the probe assembly from the 556 instrument and use the 655173 PC interface cable to connect the meter to the serial port of the PC.
3. Open EcoWatch for Windows on the PC.
4. Click on the sonde/probe icon in the upper toolbar.
5. Set the com port number to match the serial port the 556 is connected to and choose OK. A terminal window should appear with a flashing cursor.
6. Power on the 556. From the Main menu select **File**, then **Upload to PC**.
7. From the File List, highlight the file you wish to transfer and press **Enter**. The file transfer should begin with a progress shown on both the 556 and PC. **Note: The file will automatically upload to C:\ECOWIN\DATA.**
8. After the file transfer is complete, close the terminal window in EcoWatch.
9. Press **Esc** on the 556 until you have returned to the main menu.

CONTACT INFORMATION

Contact YSI Environmental if you need assistance or have questions regarding any YSI Environmental Product. Business hours are Monday through Friday, 8AM to 5PM ET.

YSI Environmental
1725 Brannum Lane
Yellow Springs, OH 45387
Toll Free: 800-897-4151
Phone: 937-767-7241
Fax: 937-767-1058
E-Mail: environmental@ysi.com
www.ysi.com/environmental

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Revision A • July 2003

SETTING UP SENSORS & REPORTING PARAMETERS (4 - 5)

Although a sensor may be installed on the probe of the 556, it must be enabled in the Sensor menu for it to operate. Once a sensor is enabled, the parameters and units to display for that sensor must then be selected in the Report menu.

1. From the main menu, select **Sensor.**
2. Sensors which are enabled will appear with a black dot. If a sensor is disabled, it will appear with an empty circle. Use the arrow keys to highlight the sensor you want to change. Press the **Enter** key to enable or disable it.
3. When Dissolved Oxygen is selected, a submenu will appear with a selection of membranes. Each membrane type is also identified by the color of the membrane cap. Highlight the desired membrane choice and press **Enter** to activate the selection. Press **Esc** to return to the Sensor menu.
4. Once changes to the Sensor menu have been completed, press **Esc** to return to the main menu.
5. Select the **Report** menu option.
6. Parameters which are enabled will appear with a black dot. If a parameter is disabled, it will appear with an empty circle. Use the arrow keys to highlight the parameter you want to change. Press the **Enter** key to enable or disable it.
7. For some parameters, a new submenu will appear to allow a selection of units for the parameter. Make a selection from the submenu and then press **Esc** to return to the Report menu.
8. Once all changes are complete, press **Esc** to return to the main menu.

BAROMETER CALIBRATION (10.9 - 10.10)

Note: The following information is only for 556 Instruments equipped with the optional internal barometer.

1. Determine your local barometric pressure (BP) in mmHg from a mercury barometer, an independent laboratory or from a local weather service. If the BP reading has been corrected to sea level, use the following equation to determine the true BP in mmHg for your altitude:

   True BP = (Corrected BP) – {2.5 * (Local Altitude/100)}

2. Select **System Setup** from the main menu and then select **Calibrate Barometer.**
3. Use the keypad to input the known barometric pressure as determined in steps 1 and 2. Press **Enter** to confirm the value.
4. Press **Esc** to return to the main menu.

CONDUCTIVITY, pH, ORP CALIBRATION (6)

1. From the main menu, select **Calibrate.**
2. Place the correct amount of calibration standard into a clean, dry or pre-rinsed calibration cup.
3. Immerse the probe into the solution, making sure the sensor to be calibrated is adequately covered.
4. Allow at least one minute for temperature to stabilize.
5. Select the sensor to be calibrated. For conductivity, a second menu will offer the option of calibrating in **specific conductance, conductivity,** or **salinity.** Calibration of any one option automatically calibrates the other two. For pH, a second menu will appear offering the choice of a 1-, 2-, or 3-point calibration.
6. Enter the value of the standard being used. (For pH, always calibrate in the 7 buffer first.) Be certain that the units are correct and press **Enter.** The current values of all enabled sensors will appear.
7. Observe the readings and when they show no significant change for approximately 30 seconds, press **Enter.** The screen will indicate if the calibration has been accepted.
8. Press **Enter** again to return to the Calibrate screen, or, for pH, to continue with the second point of the calibration.

DO CALIBRATION (6)

The Model 556 offers two options for calibration of dissolved oxygen. The first is an air calibration method in % saturation. The second is calibrating in mg/L to a solution with a known DO concentration (usually determined by a Winkler Titration). Calibration of either option (% or mg/L) will automatically calibrate the other. The procedure outlined here is the % saturation calibration, the easier of the two methods to perform.

1. Place approximately 3 mm (1/8 inch) of water in the bottom of the transport/calibration cup. Screw the transport/calibration cup onto the probe, engaging only 1 or 2 threads to ensure venting to the atmosphere.
   Note: Make sure the DO and temperature sensors are <u>not</u> immersed in the water.
2. Turn the instrument on to the Run mode and wait 10 minutes for the DO sensor to stabilize.
3. From the main menu, select **Calibrate**, then **Dissolved Oxygen**, then **DO %.**
4. Use the keypad to enter the current local barometric pressure and press **Enter.** The current values of all enabled sensors will appear.
5. Observe the readings and when they show no significant change for approximately 30 seconds, press **Enter.** The screen will indicate if the calibration has been accepted.
6. Press **Enter** again to return to the DO Calibration screen.

Appendix I

CARE OF YOUR FLOWMETER

Check your equipment before you start work.

BEFORE leaving for fieldwork check your equipment as follows:

> Switch on the meter by plugging the impeller jack-plug into the socket turning the switch down and spinning the impeller.
>
> If nothing is displayed, check the batteries are correctly fitted. Batteries are accessed in the Basic flowmeter by undoing the small cross-headed screws on the back of the unit (try not to lose the screws!). Fit new batteries if necessary: always carry spare AAA for the Basic meter with an average life of several months.

Although your flowmeter has been designed for use by fieldwork parties under a wide range of conditions and is reasonably robust, it can be damaged by rough treatment or immersion in water. Should the meter be immersed in water, REMOVE the batteries IMMEDIATELY; the flow meter can be left open to dry in a warm room. Just remove the batteries, leave the battery panel off and leave it to dry slowly. In case of a serious dunking then, after removing the batteries, wipe dry with a towel and cover the meter entirely with dry rice and leave for 24 hours. The rice will absorb any moisture, discard the rice and replace the batteries.

Should the flowmeter (impeller stick and/or meter) be damaged or otherwise malfunction we can repair/replace damaged parts at a very reasonable cost and will also provide repairs under guarantee where appropriate.

Please telephone Geopacks on 0843 2160 456 and speak to customer services or email us on service@geopacks.com **before** returning the meter to the address below:

GEOPACKS
Unit 4A, Hatherleigh Industrial Estate
Holsworthy Road
Hatherleigh
Devon, EX20 3LP

We can also customise your Flowmeter for any special requirements.

After each field session we recommend that the flowstick and impeller are rinsed in clean water and allowed to dry before being stored back in the carry case. Also, the batteries should be removed if the equipment is not being used for any length of time.

YOUR FLOWMETER IS GUARANTEED AGAINST DEFECTS IN MATERIALS AND WORKMANSHIP FOR 12 MONTHS FROM THE DATE OF PURCHASE.

5.0 Calibration

Before shipment the impeller unit has been carefully calibrated under laboratory conditions. The formulae and graphs from what we call the Calibration Data are essential for users of the Basic Flowmeter with impeller stick.

5.1 Pre –shipment Impeller Stick Calibration

The impeller sticks have been calibrated in a flume where flow velocities can be strictly controlled by combined variations in discharge, gradient and weir height adjustments. Flow rate was monitored by a miniature Nixon electronic flowmeter and an Ott flowmeter. The formula required to convert counts per minute (C) recorded by the Flowmeter to water velocity (V) in m/s is:

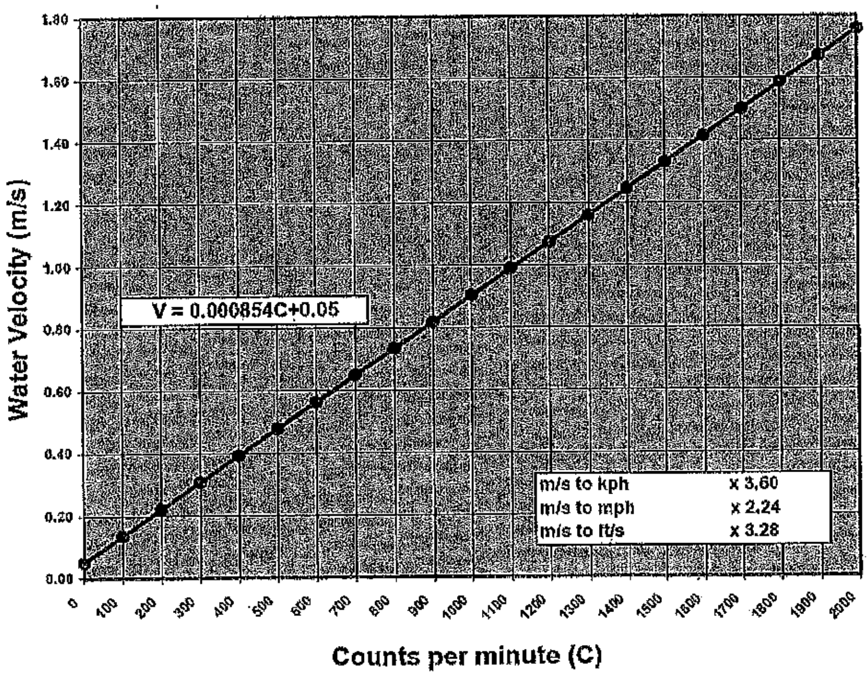
Water Velocity (V) m/s = (0.000854C) + 0.05

Alternative units can be calculated using the following conversion factors:

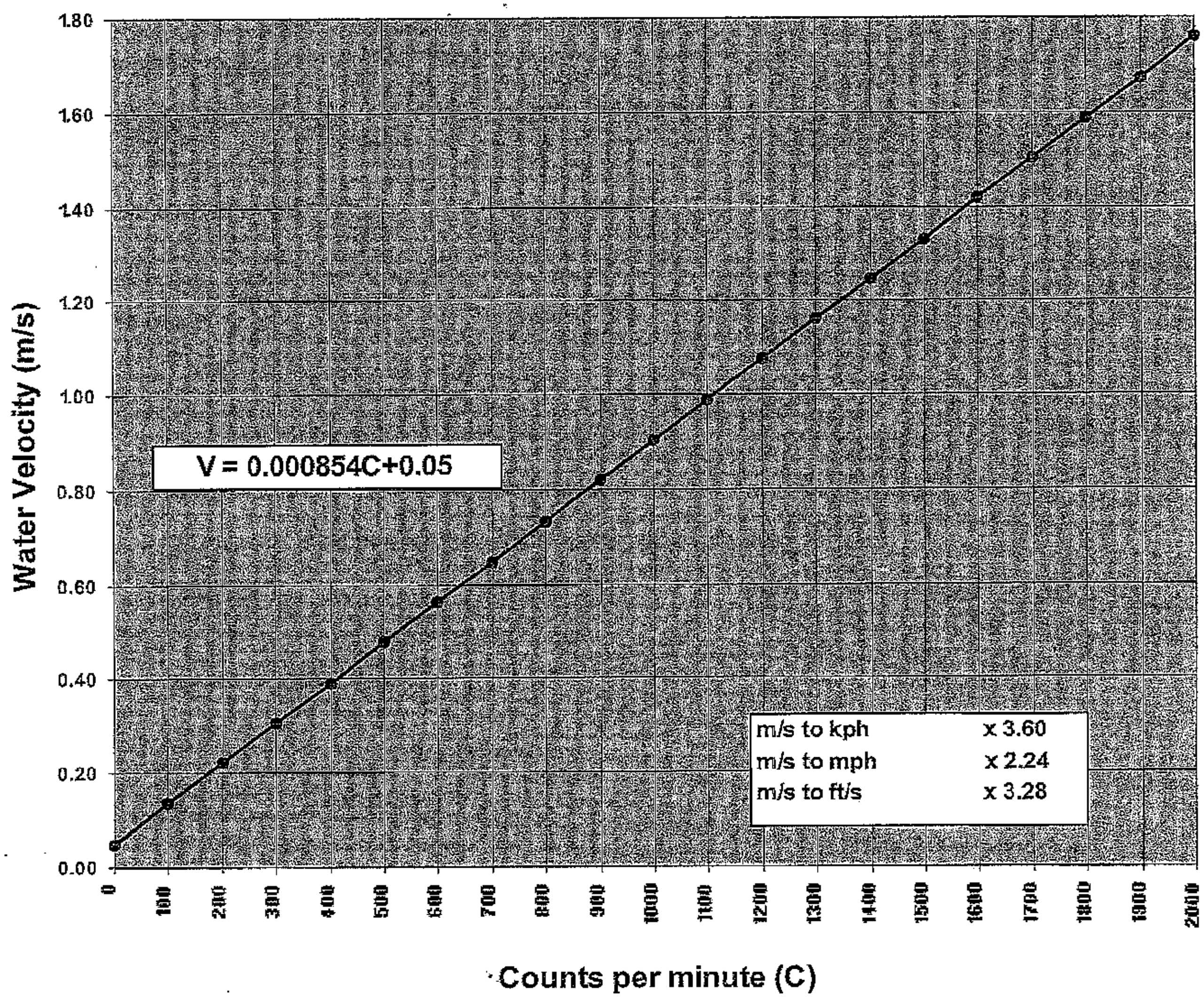
m/s to kph	**x**	**3.60**
m/s to mph	**x**	**2.24**
m/s to ft/s	**x**	**3.28**

Values in this manual are given in metres per second (m/s). The formula can be entered into a spreadsheet or other computer program and used to convert counts per minute into the desired unit of velocity. Alternatively, a Calibration Chart can be used which shows the relationship between revolutions of the impellor and calculated velocity displayed on the meter. The chart (Figure 15) is reproduced in laminated format with this manual for use in the field.

Figure 15 Calibration Chart showing the relationship between revolutions of the impellor and Water Velocity



Water Velocity Calibration Chart

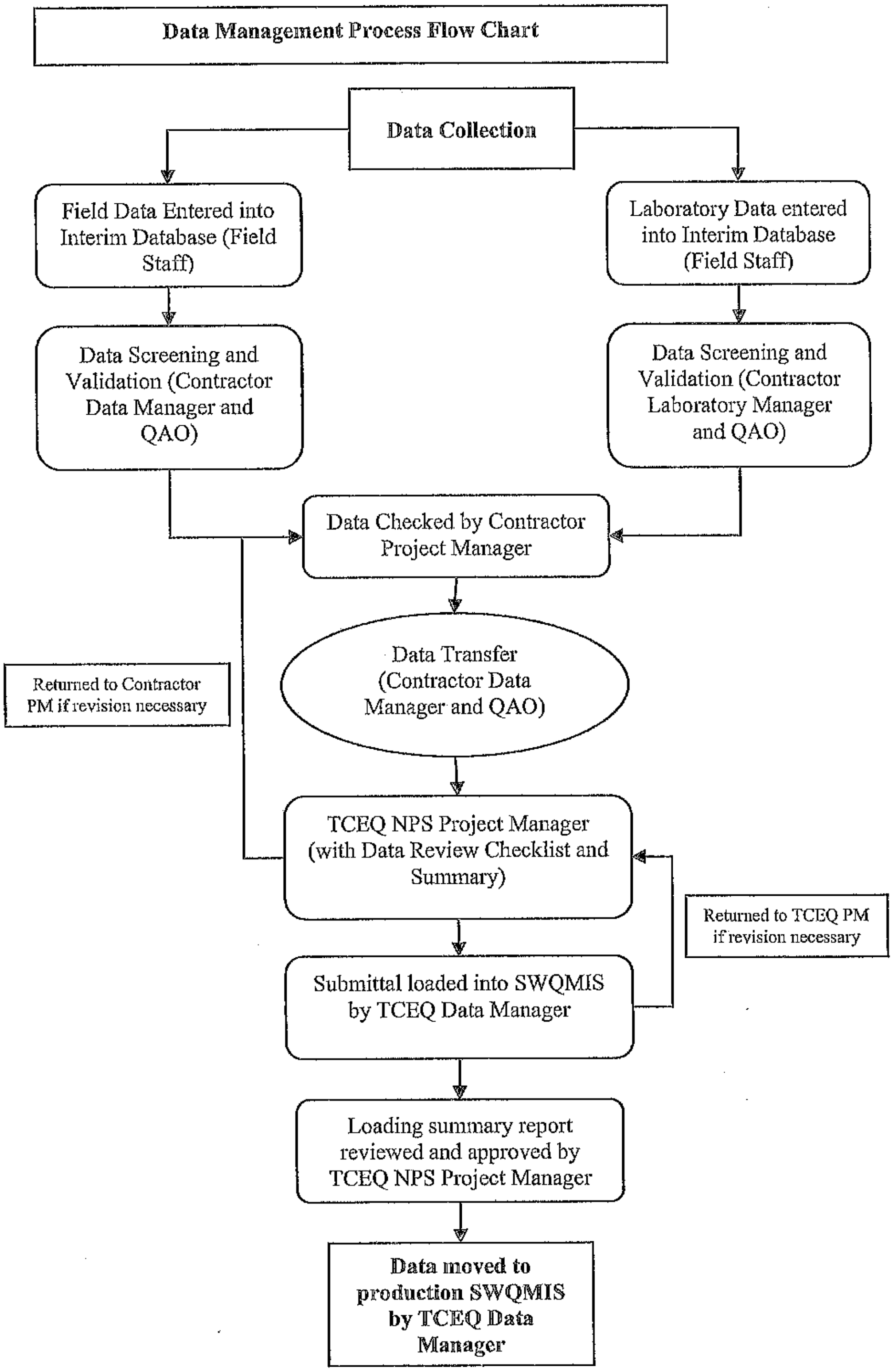


Obs #	Distance Out	Depth	Counts/ Minute (C)	Velocity (V)	Obs #	Distance Out	Depth	Counts/ Minute (C)	Velocity (V)
1					51				
2					52				
3					53				
4					54				
5					55				
6					56				
7					57				
8					58				
9					59				
10					60				
11					61				
12					62				
13					63				
14					64				
15					65				
16					66				
17					67				
18					68				
19					69				
20					70				
21					71				
22					72				
23					73				
24					74				
25					75				
26					76				
27					77				
28					78				
29					79				
30					80				
31					81				
32					82				
33					83				
34					84				
35					85				
36					86				
37					87				
38					88				
39					89				
40					90				
41					91				
42					92				
43					93				
44					94				
45					95				
46					96				
47					97				
48					98				
49					99				
50					100				

V.1 For use with the Geopacks Flowmeter for Stream Velocity
(users may copy this sheet)

Appendix L: Maintenance Requirements/Calibration

Appendix M: Data Management Process Flow Chart


Data Management Process Flow Chart
Data Collection
Field Data Entered into Interim Database (Field Staff)
Laboratory Data entered into Interim Database (Field Staff)
Data Screening and Validation (Contractor Data Manager and QAO)
Data Screening and Validation (Contractor Laboratory Manager and QAO)
Data Checked by Contractor Project Manager
Returned to Contractor PM if revision necessary
Data Transfer (Contractor Data Manager and QAO)
TCEQ NPS Project Manager (with Data Review Checklist and Summary)
Returned to TCEQ PM if revision necessary
Submittal loaded into SWQMIS by TCEQ Data Manager
Loading summary report reviewed and approved by TCEQ NPS Project Manager
Data moved to production SWQMIS by TCEQ Data Manager

Appendix N: Data Review Checklist and Summary

NPS DATA REVIEW CHECKLIST AND SUMMARY

A completed checklist must accompany all data sets submitted to the TCEQ by NEI.

QAPP Title: ______________________________

Effective Date of QAPP: ______________________

Data Format and Structure		**Y, N, or N/A**
A.	Are there any duplicate *Tag Id* numbers in the Events file?	
B.	Do the *Tag* prefixes correctly represent the entity providing the data?	
C.	Have any *Tag Id* numbers been used in previous data submissions?	
D.	Are TCEQ station location (SLOC) numbers assigned?	
E.	Are sampling *Dates* in the correct format, MM/DD/YYYY with leading zeros?	
F.	Are the sampling *Times* based on the 24 hour clock (e.g. 13:04) with leading zeros?	
G.	Is the *Comment* field filled in where appropriate (e.g. unusual occurrence, sampling problems, unrepresentative of ambient water quality)?	
H.	*Submitting Entity, Collecting Entity, and Monitoring Type* codes used correctly?	
I.	Are the sampling dates in the *Results* file the same as the one in the *Events* file for each Tag Id?	
J.	Are values represented by a valid parameter code with the correct units?	
K.	Are there any duplicate parameter codes for the same *Tag Id*?	
L.	Are there any invalid symbols in the *Greater Than/Less Than* (*GT/LT*) field?	
M.	Are there any *Tag Ids* in the *Results* file that are not in the *Events* file or vice versa?	
Data Quality Review		**Y, N, or N/A**
A.	Are all the "less-than" values reported at the LOQ? **If no, explain on next page.**	
B.	Have the outliers been verified and a "1" placed in the *Verify_flg* field?	
C.	Have checks on correctness of analysis or data reasonableness been performed? e.g.: Is ortho-phosphorus less than total phosphorus? Are dissolved metal concentrations less than or equal to total metals?	
D.	Have at least 10% of the data in the data set been reviewed against the field and laboratory data sheets?	
E.	Are all parameter codes in the data set listed in the QAPP?	
F.	Are all stations in the data set listed in the QAPP?	
Documentation Review		**Y, N, or N/A**
A.	Are blank results acceptable as specified in the QAPP?	
B.	Were control charts used to determine the acceptability of field duplicates?	
C.	Was documentation of any unusual occurrences that may affect water quality included in the *Event* table's *Comments* field?	
D.	Were there any failures in sampling methods and/or deviations from sample design requirements that resulted in unreportable data? **If yes, explain on next page.**	
E.	Were there any failures in field and/or laboratory measurement systems that were not resolvable and resulted in unreportable data? **If yes, explain on next page.**	
F.	Was the laboratory's NELAC Accreditation current for analysis conducted?	

Data Set Information

Data Source:

Date Submitted:

Tag_ID Range:

Date Range:

Comments:

Please explain in the space below any data discrepancies discovered during data review including:

- Inconsistencies with AWRL specifications or LOQs
- Failures in sampling methods and/or laboratory procedures that resulted in data that could not be reported to the TCEQ
- Include completed Corrective Action Reports with the applicable Progress Report

☐ I certify that all data in this data set meets the requirements specified in Texas Water Code Chapter 5, Subchapter R (TWC §5.801 et seq) and Title 30 Texas Administrative Code Chapter 25, Subchapters A & B.

☐ This data set has been reviewed using the Data Review Checklist.

Contractor's Data Manager:

Date:

Appendix O: Corrective Action Status Table

Corrective Action Status Table

Corrective Action #	Date Issued	Description of Deficiency	Action Taken	Date Closed

Appendix P. Corrective Action Plan Form

Corrective Action Plan Form

Corrective Action Plan
Issued by:_______________ **Date Issued**_______________ **Report No.**_______________
Description of deficiency
Root Cause of deficiency
Programmatic Impact of deficiency
Does the seriousness of the deficiency require immediate reporting to the TCEQ? If so, when was it?
Corrective Action to address the deficiency and prevent its recurrence
Proposed Completion Date for Each Action
Individual(s) Responsible for Each Action
Method of Verification
Date Corrective Action Plan Closed?

Appendix Q: Corrective Action Report Format

Deficiency / Nonconformance / Corrective Action Report		
Report No.:	Issued by:	Date Issued:

Description of deficiency	
Is the deficiency a nonconformance and why? (If yes, complete report. If no, indicate the date of closure.)	
Root cause of nonconformance	
Programmatic impact of nonconformance to include impact on existing data in question.	
Does the seriousness of the nonconformance require immediate reporting to the TCEQ? If so, to whom and when was it report?	
Corrective action to address the nonconformance and prevent its recurrence.	
Proposed completion date for each action	
Individual(s) responsible for each action	
Method of Verification	
Date "Correction Action Report" Closed	