

# **Appendix G to the Cypress Creek Basin Clean Rivers Program FY 2018/2019**

## ***Nitrate Monitoring Special Study***

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**Prepared by the Northeast Texas Municipal Water District in cooperation with the Texas Commission on Environmental Quality (TCEQ)**

**Effective: Immediately upon approval by all parties**

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## List of Acronyms

As described in Section A2 of the basin-wide QAPP.

## **SS-A3 Distribution List**

As described in Section A3 of the basin-wide QAPP

## **SS-A4 PROJECT/TASK ORGANIZATION**

As described in Section A4 of the basin-wide QAPP

## **SS-A5 Problem Definition/Background**

In FY 2013, quarterly conventional sampling was resumed at Station 10261 on Tankersley Creek and at Station 10266 on Hart Creek. Both streams run along the boundaries of the City of Mount Pleasant with Hart located on the eastern side of the city while Tankersley is to the west. Both streams are receiving waters from WWTPs with permitted discharges of approximately 3 MGD. Both streams have a similar drainage area, stream order, and land use. Both streams are major tributaries to Segment 0404 Big Cypress Creek below Lake Bob Sandlin and contribute nutrients into Segment 0403 Lake O' the Pines.

As a result of the Lake O' the Pines TMDL, phosphorus reduction has been the focus of water quality improvements in this area of the Big Cypress Creek basin. Since the Pilgrim's Pride WWTP upgrade in 2015, the mean phosphorus concentration has shown a marked reduction from approximately 3.7 mg/L to 0.22 mg/L in Tankersley Creek, while the phosphorus results have remained fairly consistent with a mean of 0.18 mg/L in Hart Creek.

Data, collected from 1992 through 2017, show exceptionally high nitrate concentrations in Tankersley Creek, often exceeding 10 mg/L and as high as 110 mg/L. Out of 18 samples collected between October 2012 and June 2017, twelve results exceeded 10 mg/L with a mean of all samples of 33.6 mg/L. During this same period of time, Hart Creek had two samples (collected in FY 2013) that exceeded 10 mg/L, with a mean of all samples of 5.04 mg/L. These high concentrations are distributed across all seasons and flow regimens.

## **SS-A6 Project/Task Description**

The TCEQ 2014 *Texas Integrated Report for Clean Water Act Sections 305(b) and 303(d)* shows concerns for Ammonia and Total Phosphorus in Tankersley Creek and a concern for Nitrate in Hart Creek. These concerns in both streams have been identified from samples collected at stations located downstream of a WWTP outfall.

For this Special Study, sampling will be conducted on a monthly basis at all stations without the intentional examination of any particular target environmental condition or flow-based monitoring. The two most downstream stations will continue to be sampled on a quarterly basis as part of the routine CRP monitoring effort detailed in the FY 2018 – FY 2019 QAPP.

Monitoring of physical and chemical parameters will be submitted to TCEQ for inclusion in SWQMIS as part of the assessment. A major objective of this Special Study is to identify potential source(s) of nutrients in each watershed as they directly affect the water quality of Big Cypress Creek and Lake O' the Pines.

### ***Amendments to the Appendix***

Amendments to the Special Study Appendix may be necessary to address incorrectly documented information or to reflect changes in project organization, tasks, schedules, objectives, and methods. Requests for amendments will be directed from the Water Monitoring Solutions, Inc. (WMS) Project Manager to the CRP Project Manager electronically. Amendments are effective immediately upon approval by the Northeast Texas Municipal Water District (NETMWD) Project Manager, WMS Project Manager, WMS QAO, TCEQ CRP Project Manager, TCEQ CRP Lead QA Specialist, TCEQ CRP Project QA Specialist, TCEQ QA Manager (or designee), and additional parties affected by the amendment. Amendments are not retroactive. No work shall be implemented without an approved Special Study Appendix or amendment prior to the start of work. Any activities under this contract that commence prior to the approval of the governing QA document constitute a deficiency and are subject to corrective action as described in section C1 of the basin-wide QAPP. Any deviation or deficiency from this Appendix which occurs after the execution of this Appendix should be addressed through a Corrective Action Plan (CAP). An Amendment may be a component of a CAP to prevent future recurrence of a deviation. Amendments will be incorporated into the Appendix by way of attachment and distributed to personnel on the distribution list by the WMS Project Manager.

### **SS-A7 Quality Objectives and Criteria**

The main objective of this Special Study is to identify potential source(s) of nutrients in Tankersley Creek and Hart Creek watersheds and to determine whether the contribution is primarily point or non-point sources. Potential sources include WWTP discharge, WWTP sludge application, failing septic systems, livestock, wildlife, and overuse of commercial fertilizers.

Another objective of this Special Study is to compare the water quality of each stream since both are similar in relation to population density, land use, and watershed size.

The third objective is to attempt to develop a relationship between nutrient concentrations and stream flow (nutrient loading) in each watershed, which may prove difficult to due to the limited number of observations.

The measurement performance specifications to support the project objectives are specified in Table SS-A7.1 (page 10).

**Table SS-A7.1 - Measurement Performance Specifications**

Conventional Parameters in Water										
Parameter	Units	Matrix	Method	Parameter Code	TCEQ AWRL	LOQ	LOQ Check Sample %Rec	Precision (RPD of LCS/LCSD)	Bias %Rec. of LCS	Lab
NITROGEN, AMMONIA, TOTAL (MG/L AS N)	mg/L	water	EPA 350.1 Rev. 2.0 (1993)	00610	0.1	0.02	70-130	20	80-120	LCRA ELS
NITRITE NITROGEN, TOTAL (MG/L AS N)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00615	0.05	0.02	70-130	20	80-120	LCRA ELS
NITRATE NITROGEN, TOTAL (MG/L AS N)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00620	0.05	0.02	70-130	20	80-120	LCRA ELS
NITROGEN, KJELDAHL, TOTAL (MG/L AS N)	mg/L	water	EPA 351.2	00625	0.2	0.2	70-130	20	80-120	LCRA ELS
PHOSPHORUS, TOTAL, WET METHOD (MG/L AS P)	mg/L	water	EPA 365.4	00665	0.06	0.02	70-130	20	80-120	LCRA ELS
<p>References:</p> <p>United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020</p> <p>American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 20th Edition, 1998. (Note: The 21st edition may be cited if it becomes available.)</p> <p>TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).</p>										

<b>Flow Parameters</b>					
<b>Parameter</b>	<b>Units</b>	<b>Matrix</b>	<b>Method</b>	<b>Parameter Code</b>	<b>Lab</b>
FLOW STREAM, INSTANTANEOUS (CUBIC FEET PER SEC)	cfs	water	TCEQ SOP V1	00061	Field
FLOW SEVERITY:1=No Flow,2=Low,3=Normal,4=Flood,5=High,6=Dry	NU	water	TCEQ SOP V1	01351	Field
STREAM FLOW ESTIMATE (CFS)	cfs	Water	TCEQ SOP V1	74069	Field
FLOW MTH 1=GAGE 2=ELEC 3=MECH 4=WEIR/FLU 5=DOPPLER	NU	other	TCEQ SOP V1	89835	Field
<p>References:</p> <p>United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020</p> <p>American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 20th Edition, 1998. (Note: The 21st edition may be cited if it becomes available.)</p> <p>TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).</p>					

Field Parameters					
Parameter	Units	Matrix	Method	Parameter Code	Lab
TEMPERATURE, WATER (DEGREES CENTIGRADE)	DEG C	water	SM 2550 B and TCEQ SOP V1	00010	Field
TRANSPARENCY, SECCHI DISC (METERS)	meters	water	TCEQ SOP V1	00078	Field
SPECIFIC CONDUCTANCE, FIELD (US/CM @ 25C)	us/cm	water	EPA 120.1 and TCEQ SOP, V1	00094	Field
OXYGEN, DISSOLVED (MG/L)	mg/L	water	SM 4500-O G and TCEQ SOP V1	00300	Field
PH (STANDARD UNITS)	s.u	water	EPA 150.1 and TCEQ SOP V1	00400	Field
DAYS SINCE PRECIPITATION EVENT (DAYS)	days	other	TCEQ SOP V1	72053	Field
WIND INTENSITY (1=CALM,2=SLIGHT,3=MOD.,4=STRONG)	NU	other	NA	89965	Field
PRESENT WEATHER (1=CLEAR,2=PTCLDY,3=CLDY,4=RAIN,5=OTHER)	NU	other	NA	89966	Field
WATER ODOR (1=SEWAGE, 2=OILY/CHEMICAL, 3=ROTTEN EGGS, 4=MUSKY, 5=FISHY, 6=NONE, 7=OTHER (WRITE IN COMMENTS))	NU	water	NA	89971	Field
WATER COLOR 1=BRWN 2=RED 3=GRN 4=BLCK 5=CLR 6=OT	NU	water	NA	89969	Field
TEMPERATURE, AIR (DEGREES CENTIGRADE)	DEG C	air	NA	00020	Field

References:

United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020  
 American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF),  
 Standard  
 Methods for the Examination of Water and Wastewater, 20th Edition, 1998. (Note: The 21st edition may be cited if it becomes available.)  
 TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).

## **Ambient Water Reporting Limits (AWRLs)**

As described in Section A7 of the basin-wide QAPP.

## **Precision**

As described in Section A7 of the basin-wide QAPP.

## **Bias**

As described in Section A7 of the basin-wide QAPP.

## **Representativeness**

Site selection, the appropriate sampling regime, the sampling of all pertinent media according to TCEQ SOPs, and use of only approved analytical methods will assure that the measurement data represents the conditions at the site. Water Quality samples will be collected on a routine, monthly basis. Although data may be collected during varying regimes of weather and flow, the data sets will not be biased toward unusual conditions of flow, runoff, or season. The goal of the Special Study is to determine if the excess nutrients are from point or non-point sources and/or identify the probable non-point sources.

## **Comparability**

As described in Section A7 of the basin-wide QAPP.

## **Completeness**

As described in Section A7 of the basin-wide QAPP.

## **SS-A8 Special Training/Certification**

As described in section A7 of the basin-wide QAPP.

## **SS-A9 Documents and Records**

As described in Section A9 of the basin-wide QAPP. The same field forms, documents, records, laboratory reports, and the same parties as the basin-wide QAPP will be involved in this Special Study.

## **SS-B1 Sampling Process Design**

The data collection design is summarized in Table SS-B1a (Sample Design and Schedule, FY 2018), and Table SS-B1b (Sample Design and Schedule, FY 2019), and Figure SS-B1 (Sample Sites Map). Samples will be collected in FY 2018 and FY 2019. Data from Station 10266 and Station 10261 will be collected as part of routine quarterly sampling in FY 2018 Q4 and in FY 2019 Q1 - Q3 in order to minimize labor and laboratory costs. The FY 2018 Q4 and FY 2019 Q1 – Q3 CRP routine samples at these two stations will also be used for data analysis as part of this Special Study.

**Table B1.1a Sample Design and Schedule, FY 2018**

Site Description	Station ID	Waterbody ID	Region	SE	CE	MT	Field	Conv	Flow
TANKERSLEY CREEK AT FM 899 IN MOUNT PLEASANT	10264	0404B	5	NT	WM	RTSI	2	2	2
TANKERSLEY CREEK AT FM127 3 KM SW OF MOUNT PLEASANT	10263	0404B	5	NT	WM	RTSI	2	2	2
TANKERSLEY CREEK AT FM3417 5.7 KM SOUTH OF MOUNT PLEASANT	10261	0404B	5	NT	WM	RTSI	1	1	1
HART CREEK AT TITUS COUNTY ROAD SE 12 3.8 KM UPSTREAM OF BIG CYPRESS CREEK CONFLUENCE SOUTH OF MOUNT PLEASANT	10266	0404C	5	NT	WM	RTSI	1	1	1
HART CREEK AT SH 49 SSE OF MOUNT PLEASANT	10272	0404C	5	NT	WM	RTSI	2	2	2

**Table B1.1b Sample Design and Schedule, FY 2019**

Site Description	Station ID	Waterbody ID	Region	SE	CE	MT	Field	Conv	Flow
TANKERSLEY CREEK AT FM 899 IN MOUNT PLEASANT	10264	0404B	5	NT	WM	RTSI	10	10	10
TANKERSLEY CREEK AT FM127 3 KM SW OF MOUNT PLEASANT	10263	0404B	5	NT	WM	RTSI	10	10	10
TANKERSLEY CREEK AT FM3417 5.7 KM SOUTH OF MOUNT PLEASANT	10261	0404B	5	NT	WM	RTSI	7	7	7
HART CREEK AT TITUS COUNTY ROAD SE 12 3.8 KM UPSTREAM OF BIG CYPRESS CREEK CONFLUENCE SOUTH OF MOUNT PLEASANT	10266	0404C	5	NT	WM	RTSI	7	7	7
HART CREEK AT SH 49 SSE OF MOUNT PLEASANT	10272	0404C	5	NT	WM	RTSI	10	10	10

## **Figure SS-B1. Sampling Site Map**

A map of the stations monitored by the NETMWD is provided below. The map was generated by WMS. This product is for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. It does not represent an on-the-ground survey and represents only the approximate relative location of property boundaries. For more information concerning this map, contact the WMS Project Manager, Randy Rushin at 903-439-4741.



## Sample Design Rationale and Site Selection Criteria

There are concerns for Ammonia and Total Phosphorus in Tankersley Creek and a concern for Nitrate in Hart Creek. These concerns in both streams have been identified from samples collected at stations located downstream of WWTP outfalls. Samples will be collected at stations located both upstream and downstream of the WWTPs on a monthly basis for one year. Eight (8) samples will be collected at station 10266 and station 10261 for the Special Study. The remaining four (4) samples will be collected as part of the routine quarterly CRP sampling schedule in FY 2018 and FY 2019. The FY 2018 and FY 2019 CRP routine samples at these two stations will be used for data analysis for this Special Study. Samples will be collected during ambient conditions without bias towards a particular flow condition.

Monitoring will be conducted at three sites in Tankersley Creek and at two stations in Hart Creek. Station 10263 in Tankersley Creek is located immediately downstream of the Pilgrim’s Pride WWTP while 10264 is located upstream of the plant and 10261 is downstream of the plant and sludge application fields. Station 10272 in Hart Creek is located upstream of the City of Mount Pleasant WWTP and 10266 is located downstream.

The goal of the Special Study is to identify the source(s) of excess nutrients. Other objectives include comparing nutrient inputs between the two watersheds and making an observational nutrient loading relationship.

## SS-B2 Sampling Methods

### Field Sampling Procedures

As described in Section B2 of the basin-wide QAPP.

### **Sample volume, container types, minimum sampling volume, preservation requirements, and holding time requirements**

As described in Section A9 of the basin-wide QAPP.

**Table SS-B2. Sample Storage, Preservation, and Handling Requirements**

Parameter	Matrix	Container	Preservation	Sample Volume	Holding Time
Nitrate and Nitrite (N)	Water	New Plastic or New Cubitainer	Cool to < 6 °C, dark	150 ml	48 hrs
Ammonia	Water	New Plastic or New Cubitainer	1-2 ml conc. H <sub>2</sub> SO <sub>4</sub> to pH <2 and cool to < 6 °C, dark	150 ml	28 days
Total Phosphorus	Water			150 ml	28 days
TKN	Water			200 ml	28 days

## ***Sample Containers***

As described in Section B2 of the basin-wide QAPP

## ***Processes to Prevent Contamination***

As described in Section B2 of the basin-wide QAPP

## ***Documentation of Field Sampling Activities***

As described in Section B2 of the basin-wide QAPP

## ***Recording Data***

As described in Section B2 of the basin-wide QAPP.

## **Sampling Method Requirements or Sampling Process Design Deficiencies, and Corrective Action**

As described in Section B2 of the Basin-wide QAPP

## **SS-B3 Sample Handling and Custody**

### ***Chain-of-Custody***

As described in Section B3 of the basin-wide QAPP.

### ***Sample Labeling***

As described in Section B3 of the basin-wide QAPP.

### ***Sample Handling***

As described in Section B3 of the basin-wide QAPP.

### ***Sample Tracking Procedure Deficiencies and Corrective Action***

As described in Section B3 of the basin-wide QAPP.

## **SS-B4 Analytical Methods**

The analytical methods, associated matrices, and performing laboratories are listed in Table SS-A7.1 of section SS-A7. The authority for analysis methodologies under CRP is derived from the 30 Tex. Admin. Code Ch. 307, in that data generally are generated for comparison to those standards and/or criteria. The Standards state “Procedures for laboratory analysis must be in accordance with the most recently published edition of the book entitled Standard Methods for the Examination of Water and Wastewater, the TCEQ Surface Water Quality Monitoring Procedures as amended, 40 CFR 136, or other reliable procedures acceptable to the TCEQ, and in accordance with chapter 25 of this title.” Copies of laboratory SOPs are retained by the LCRA ELS Laboratory and are available for review by the TCEQ. Laboratory SOPs are consistent with EPA requirements, as specified in the method.

## ***Standards Traceability***

As described in Section B4 of the basin-wide QAPP

## ***Analytical Method Deficiencies and Corrective Actions***

As described in section B4 of the basin-wide QAPP

## **SS-B5 Quality Control**

### ***Sampling Quality Control Requirements and Acceptability Criteria***

As described in Section B5 of the basin-wide QAPP.

### ***Laboratory Measurement Quality Control Requirements and Acceptability Criteria***

As described in Section B5 of the basin-wide QAPP.

### ***Quality Control or Acceptability Requirements Deficiencies and Corrective Actions***

As described in Section B5 of the basin-wide QAPP.

## **SS-B6 Instrument/Equipment Testing, Inspection, and Maintenance**

As described in Section B6 of the basin-wide QAPP.

## **SS-B7 Instrument Calibration and Frequency**

As described in Section B7 of the basin-wide QAPP.

## **SS-B8 Inspection/Acceptance of Supplies and Consumables**

As described in Section B8 of the basin-wide QAPP.

## **SS-B9 Acquired Data**

Only data collected directly under this Appendix will be submitted to the SWQMIS database. No outside data sources will be used as for data analysis in this Special Study.

## **SS-B10 Data Management**

As described in Section B10 of the basin-wide QAPP.

### ***Data Dictionary***

Terminology and field descriptions are included in the DMRG, or most recent version. A table outlining the entities that will be used when submitting data under this Appendix is included below

for the purpose of verifying which entity codes are included in this Appendix.

<b>Name of Entity</b>	<b>Tag Prefix</b>	<b>Submitting Entity</b>	<b>Collecting Entity</b>
NETMWD	CY	NT	NT
WMS	CY	NT	WM

## **SS-C1 Assessments and Response Actions**

As described in Section C1 of the basin-wide QAPP.

### ***Corrective Action***

As described in Section C1 of the basin-wide QAPP.

## **SS-C2 Reports to Management**

### ***Reports to Planning Agency Project Management***

As described in Section C2 of the basin-wide QAPP.

### ***Reports to TCEQ Project Management***

As described in Section C2 of the basin-wide QAPP.

### ***Reports by TCEQ Project Management***

As described in Section C2 of the basin-wide QAPP.

## **SS-D1 Data Review, Verification, and Validation**

As described in Section D1 of the basin-wide QAPP.

## **SS-D2 Verification and Validation Methods**

As described in Section D2 of the basin-wide QAPP.

## **SS-D3 Reconciliation with User Requirements**

Data produced in this project will be analyzed and reconciled with project data quality requirements. Data which do not meet requirements will not be submitted to SWQMIS nor will be considered appropriate for any of the uses. NETMWD and TCEQ staff will be notified when data do not meet DQOs and the reason for not including results in data submittals for inclusion in SWQMIS.