

Appendix H to the Trinity River Authority Clean Rivers Program FY 2014/2015

Trinity River Basin Biological Monitoring

Prepared by the Trinity River Authority 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 in addition to the acronyms below.

Lab acronym

ALM Aquatic Life Monitoring

WMS Water Monitoring Solutions, Inc.

SS-A3 Distribution List

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903-439-4741

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Linard Arocha, Lab QAO

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SS-A4 PROJECT/TASK ORGANIZATION

Sarah Eagle, CRP Project Manager – as described in Section A4 of the basin-wide QAPP.

Allison Fischer, CRP Project Quality Assurance Specialist – as described in Section A4 of the basin-wide QAPP.

Patricia Wise, CRP Work Leader – as described in Section A4 of the basin-wide Quality Assurance Project Plan (QAPP).

Daniel R. Burke, CRP Lead Quality Assurance Specialist – as described in Section A4 of the basin-wide Quality Assurance Project Plan (QAPP).

Jonathan West, CRP Data Manager, Data Management and Analysis Group – as described in Section A4 of the basin-wide QAPP.

Nancy Ragland, Team Leader, Data Management and Analysis Team -- as described in Section A4 of the basin-wide QAPP.

Trinity River Authority

Webster Mangham, Senior Project Manager and Field Team Leader – as described in Section A4 of the basin-wide QAPP.

Angela Kilpatrick, Project Manager and Quality Assurance Officer – as described in Section A4 of the basin-wide QAPP.

Kelly McKnight, Field Team Leader – as described in Section A4 of the basin-wide QAPP.

Hong Wu, Data Manager – as described in Section A4 of the basin-wide QAPP.

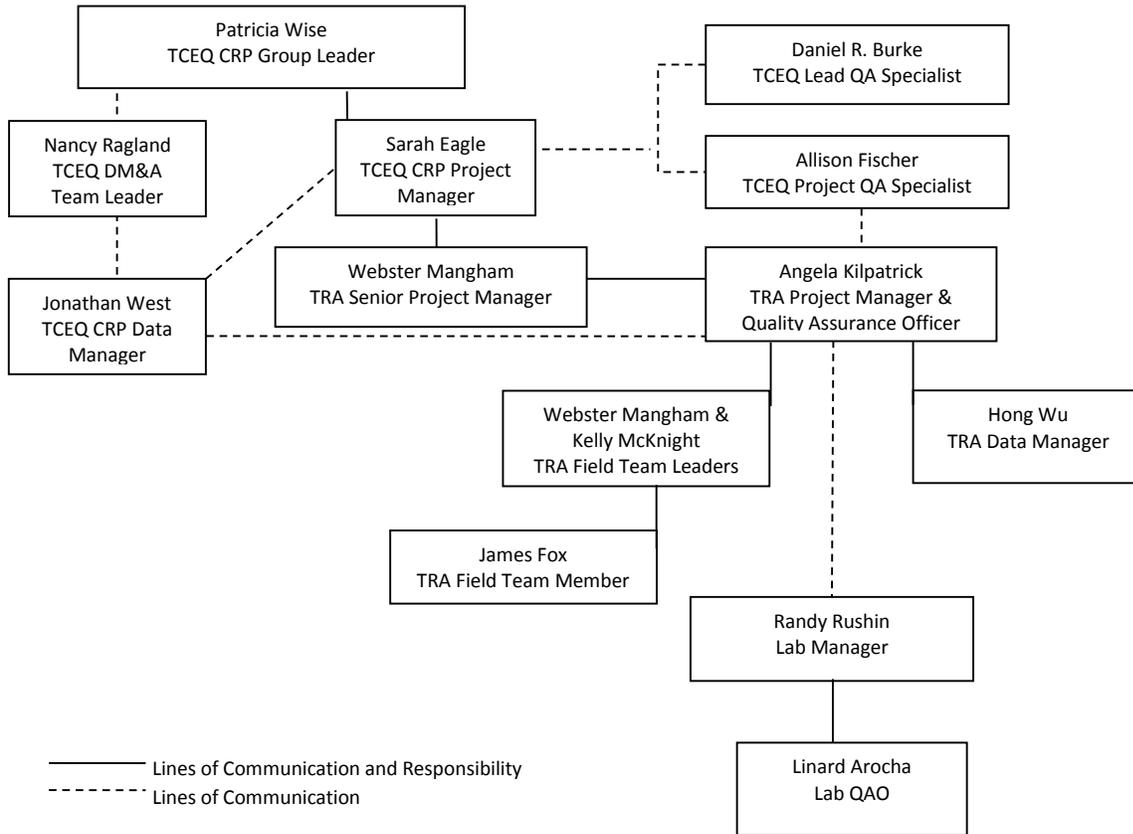
James Fox, Field Team Member – will work under the direction of the Field Team Leader as necessary to ensure the integrity of samples and field measurements, and will be responsible for following sampling and field measurement methodologies detailed in this QAPP Appendix.

Water Monitoring Solutions, Inc.

Randy Rushin, Lab Manager – will oversee all analytical work performed at the laboratory to assure that proper and appropriate clean analytical techniques are utilized. When quality assurance issues arise in the laboratory, the laboratory manager will be responsible for initiating corrective actions and for notifying the TRA QAO of any such issues. The laboratory manager will also maintain the laboratory's QA records and analysts' training records.

Linard Arocha, Lab QAO – in cooperation with the laboratory manager, is responsible for ensuring the data produced by the lab meets CRP requirements as specified in this appendix. Data should be reviewed and approved prior to submittal to the TRA DM.

Figure SS-A4.1 – Project Organization Chart



SS-A5 Problem Definition/Background

Routine water quality grab sampling has been an ongoing effort in the TRA Clean Rivers Program. However, this type of sampling provides only a short term view of water quality in an area; especially for streams and rivers which are highly dynamic. Due to the dynamic nature of these systems, specific acute water quality issues may be missed due to sample timing. For example, illicit discharges or stormwater runoff may not be captured by routinely scheduled monthly or quarterly grab sampling. Biological monitoring, on the other hand, may be able to provide a broader view of water quality in these systems. Biological monitoring consists of the collection of fish and benthic macroinvertebrates which are then identified and evaluated to determine either the level of aquatic life use in a stream or if the assigned aquatic life use level is being met. Biological populations will respond to water quality issues and alert samplers to issues that may not be captured in a water quality grab sample. For example, in a system that frequently receives discharges of poor water quality, the species present will typically be more tolerant of poor water quality. However, in a system that does not receive such discharges, the biological community may contain tolerant species but it will also contain species that are intolerant of poor water quality and therefore may indicate that the system generally maintains good water quality. In addition, biological monitoring can be used to determine the level of aquatic life use the system can sustain as well as the associated standards that are appropriate for the system. In the previous biennium, TRA CRP conducted aquatic life monitoring (ALM) at two sites in the critical and index period of 2013. This represented the beginning of the biological monitoring efforts for the TRA CRP. The ALM events covered in this appendix represent the continuation of these efforts.

SS-A6 Project/Task Description

Two sites have been selected for biological monitoring in this biennium. One site (to be sampled in FY 2014) is in a rural environment below the mixing zone of the Red Oak Creek Regional Wastewater System. The other site (to be sampled in FY 2015) is on the West Fork Trinity River downstream of Gateway Park in Fort Worth. These sites have been determined to be appropriate for biological monitoring and meet the qualifications stated in the "Representativeness" section of this appendix (SS-A7). See Sample Design Rationale and Site Selection Criteria in section SS-B1 for details about site selection.

As part of this study, Aquatic Life Monitoring procedures as described in the *Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2007* will be followed and will result in data of sufficient quality to achieve the goals of this monitoring. All efforts will be made to collect one sample in the index period, between March 15 and July 1 of 2014 and 2015, as well as one sample in the critical period, between July 1 and September 30 of 2014 and between July 1 and August 31 of 2015. This project will include collection of fish and benthic macroinvertebrates for identification. In addition, physical habitat will be quantified. Instantaneous field measurements, flow measurements, and 24 hour diurnal monitoring will also be conducted. No water chemistry samples will be collected. TRA staff will conduct all field work. Fish and benthic macroinvertebrate identification will be conducted by Water Monitoring Solutions, Inc.

Results will be summarized in a Biological Monitoring Reporting Packet (Exhibit A) and submitted to TCEQ in the required format. Results will also be submitted to the TCEQ SWQMIS database.

Amendments to the QAPP

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 Trinity River Authority Project Manager to the CRP Project Manager electronically. Amendments are effective immediately upon approval by the Trinity River Authority Project Manager, the Trinity River Authority QAO, the CRP Project Manager, the CRP Lead QA Specialist, the CRP Project QA Specialist, 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 QAPP which has occurs after the execution of this QAPP 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 QAPP by way of attachment and distributed to personnel on the distribution list by the Trinity River Authority Project Manager.

SS-A7 Quality Objectives and Criteria

The measurement performance specifications listed in Table SS-A7.1 will generate data of sufficient quality to meet the objectives as described in Sections SS-A5 and SS-A6. Additional parameters associated with Aquatic Life Monitoring which will be included in the final data set but are not listed in Table SS-A7.1 include those for the reporting of species counts.

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

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

Monitoring sites were selected that best represent conditions (both biological and water quality) of

the entire water body. The chosen sites have a good variety of microhabitats to sample, including a mixture of riffles, runs, and pools. Potential sampling reaches will be avoided where water quality conditions and hydrology change dramatically over the reach, such as areas with a major tributary or contaminant source. See Sample Design Rationale and Site Selection Criteria in section SS-B1 for details about site selection.

Comparability

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

Completeness

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

Table SS-A7.1 – Measurement Performance Specifications

Field Parameters										
Parameter	Units	Matrix	Method	Parameter Code	AWRL	LOQ	LOQ Check Sample %Rec	Precision (RPD of LCS/LCSD)	Bias %Rec. of LCS	Lab
TEMPERATURE, WATER (DEGREES CENTIGRADE)	DEG C	water	SM 2550 B and TCEQ SOP V1	00010	NA*	NA	NA	NA	NA	Field
TEMPERATURE, AIR (DEGREES CENTIGRADE)	DEG C	air	SM 2550 B and TCEQ SOP V1	00020	NA*	NA	NA	NA	NA	Field
TRANSPARENCY, SECCHI DISC (METERS)	meters	water	TCEQ SOP V1	00078	NA*	NA	NA	NA	NA	Field
SPECIFIC CONDUCTANCE, FIELD (US/CM @ 25C)	us/cm	water	EPA 120.1 and TCEQ SOP, V1	00094	NA*	NA	NA	NA	NA	Field
OXYGEN, DISSOLVED (MG/L)	mg/L	water	SM 4500-O G and TCEQ SOP V1	00300	NA*	NA	NA	NA	NA	Field
PH (STANDARD UNITS)	s.u	water	EPA 150.1 and TCEQ SOP V1	00400	NA*	NA	NA	NA	NA	Field
DAYS SINCE PRECIPITATION EVENT (DAYS)	days	other	TCEQ SOP V1	72053	NA*	NA	NA	NA	NA	Field
DEPTH OF BOTTOM OF WATER BODY AT SAMPLE SITE	meters	water	TCEQ SOP V2	82903	NA*	NA	NA	NA	NA	Field
WIND INTENSITY (1=CALM,2=SLIGHT,3=MOD.,4=STRONG)	NU	other	NA	89965	NA	NA	NA	NA	NA	Field
PRESENT WEATHER (1=CLEAR,2=PTCLDY,3=CLDY,4=RAIN,5=OTHER)	NU	other	NA	89966	NA	NA	NA	NA	NA	Field
PRIMARY CONTACT, OBSERVED ACTIVITY (# OF PEOPLE OBSERVED)	# of people observed	other	NA	89978	NA	NA	NA	NA	NA	Field
EVIDENCE OF PRIMARY CONTACT RECREATION (1 = OBSERVED, 0 = NOT OBSERVED)	NU	other	NA	89979	NA	NA	NA	NA	NA	Field
Flow Parameters										
Parameter	Units	Matrix	Method	Parameter Code	AWRL	LOQ	LOQ Check Sample %Rec	Precision (RPD of LCS/LCSD)	Bias %Rec. of LCS	Lab
FLOW STREAM, INSTANTANEOUS (CUBIC FEET PER SEC)	cfs	water	TCEQ SOP V1	00061	NA*	NA	NA	NA	NA	Field
FLOW:1=No Flow,2=Low,3=Normal,4=Flood ,5=High,6=Dry	NU	water	TCEQ SOP V1	01351	NA*	NA	NA	NA	NA	Field
FLOW MTH 1=GAGE 2=ELEC 3=MECH 4=WEIR/FLU 5=DOPPLER	NU	other	TCEQ SOP V1	89835	NA*	NA	NA	NA	NA	Field

24 Hour Parameters in Water										
Parameter	Units	Matrix	Method	Parameter Code	AWRL	LOQ	LOQ Check Sample %Rec	Precision (RPD of LCS/LCSD)	Bias %Rec. of LCS	Lab
TEMPERATURE, WATER (DEGREES CENTIGRADE), 24HR AVG	DEG C	Water	TCEQ SOP V1	00209	NA	NA	NA	NA	NA	Field
WATER TEMPERATURE, DEGREES CENTIGRADE, 24HR MAX	DEG C	Water	TCEQ SOP V1	00210	NA	NA	NA	NA	NA	Field
TEMPERATURE, WATER (DEGREES CENTIGRADE) 24HR MIN	DEG C	Water	TCEQ SOP V1	00211	NA	NA	NA	NA	NA	Field
SPECIFIC CONDUCTANCE, US/CM, FIELD, 24HR AVG	uS/cm	Water	TCEQ SOP V1	00212	NA	NA	NA	NA	NA	Field
SPECIFIC CONDUCTANCE, US/CM, FIELD, 24HR MAX	uS/cm	Water	TCEQ SOP V1	00213	NA	NA	NA	NA	NA	Field
SPECIFIC CONDUCTANCE, US/CM, FIELD, 24HR MIN	uS/cm	Water	TCEQ SOP V1	00214	NA	NA	NA	NA	NA	Field
PH, S.U., 24HR MAXIMUM VALUE	std. units	Water	TCEQ SOP V1	00215	NA	NA	NA	NA	NA	Field
PH, S.U., 24HR, MINIMUM VALUE	std. units	Water	TCEQ SOP V1	00216	NA	NA	NA	NA	NA	Field
WATER TEMPERATURE, # OF MEASUREMENTS IN 24-HRS	NU	Water	TCEQ SOP V1	00221	NA	NA	NA	NA	NA	Field
SPECIFIC CONDUCTANCE, # OF MEASUREMENTS IN 24-HRS	NU	Water	TCEQ SOP V1	00222	NA	NA	NA	NA	NA	Field
pH, # OF MEASUREMENTS IN 24-HRS	NU	Water	TCEQ SOP V1	00223	NA	NA	NA	NA	NA	Field
DISSOLVED OXYGEN, 24-HOUR MIN. (MG/L) MIN. 4 MEA	mg/l	Water	TCEQ SOP V1	89855	NA	NA	NA	NA	NA	Field
DISSOLVED OXYGEN, 24-HOUR MAX. (MG/L) MIN. 4 MEA	mg/l	Water	TCEQ SOP V1	89856	NA	NA	NA	NA	NA	Field
DISSOLVED OXYGEN, 24-HOUR AVG. (MG/L) MIN. 4 MEA	mg/l	Water	TCEQ SOP V1	89857	NA	NA	NA	NA	NA	Field
DISSOLVED OXYGEN, # OF MEASUREMENTS IN 24-HRS	NU	Water	TCEQ SOP V1	89858	NA	NA	NA	NA	NA	Field
Biological- Habitat										
Parameter	Units	Matrix	Method	Parameter Code	AWRL	LOQ	LOQ Check Sample %Rec	Precision (RPD of LCS/LCSD)	Bias %Rec. of LCS	Lab
FLOW STREAM, INSTANTANEOUS (CUBIC FEET PER SEC)	cfs	Water	TCEQ SOP V2	00061	NA	NA	NA	NA	NA	Field
BIOLOGICAL DATA	NS	Other	NA/ Calculation	89888	NA	NA	NA	NA	NA	Field
STREAM TYPE; 1=PERENNIAL 2=INTERMITTENT S/PERENNIAL POOLS 3=INTERMITTENT 4=UNKNOWN	NU	Other	NA/ Calculation	89821	NA	NA	NA	NA	NA	Field

STREAMBED SLOPE (M/KM)	M/KM	Other	NA/ Calculation	72051	NA	NA	NA	NA	NA	Field
AVERAGE PERCENTAGE INSTREAM COVER	%	Other	TCEQ SOP V2	84159	NA	NA	NA	NA	NA	Field
STREAM ORDER	NU	Water	TCEQ SOP V2	84161	NA	NA	NA	NA	NA	Field
NUMBER OF LATERAL TRANSECTS MADE	NU	Other	TCEQ SOP V2	89832	NA	NA	NA	NA	NA	Field
FLOW MTH 1=GAGE 2=ELEC 3=MECH 4=WEIR/FLU 5=DOPPLER	NU	Other	TCEQ SOP V2	89835	NA	NA	NA	NA	NA	Field
TOTAL NUMBER OF STREAM BENDS	NU	Other	TCEQ SOP V2	89839	NA	NA	NA	NA	NA	Field
NUMBER OF WELL DEFINED STREAM BENDS	NU	Other	TCEQ SOP V2	89840	NA	NA	NA	NA	NA	Field
NUMBER OF MODERATELY DEFINED STREAM BENDS	NU	Other	TCEQ SOP V2	89841	NA	NA	NA	NA	NA	Field
NUMBER OF POORLY DEFINED STREAM BENDS	NU	Other	TCEQ SOP V2	89842	NA	NA	NA	NA	NA	Field
TOTAL NUMBER OF RIFFLES	NU	Other	TCEQ SOP V2	89843	NA	NA	NA	NA	NA	Field
DOMINANT SUBSTRATE TYPE(1=CLAY,2=SILT,3=SAND,4=GRAVEL,5=COBBLE,6=BOULDER,7=BEDROCK,8=OTHER)	NU	Sediment	TCEQ SOP V2	89844	NA	NA	NA	NA	NA	Field
AVERAGE PERCENT OF SUBSTRATE GRAVEL SIZE OR LARGER	%	Other	TCEQ SOP V2	89845	NA	NA	NA	NA	NA	Field
AVERAGE STREAM BANK EROSION (%)	%	Other	TCEQ SOP V2	89846	NA	NA	NA	NA	NA	Field
AVERAGE STREAM BANK SLOPE (DEGREES)	deg	Other	TCEQ SOP V2	89847	NA	NA	NA	NA	NA	Field
HABITAT FLOW STATUS, 1=NO FLOW, 2=LOW,3=MOD,4=HIGH	NU	Other	TCEQ SOP V2	89848	NA	NA	NA	NA	NA	Field
AVERAGE PERCENT TREES AS RIPARIAN VEGETATION	%	Other	TCEQ SOP V2	89849	NA	NA	NA	NA	NA	Field
AVERAGE PERCENT SHRUBS AS RIPARIAN VEGETATION	%	Other	TCEQ SOP V2	89850	NA	NA	NA	NA	NA	Field
AVERAGE PERCENT GRASS AS RIPARIAN VEGETATION	%	Other	TCEQ SOP V2	89851	NA	NA	NA	NA	NA	Field
AVERAGE PERCENT CULTIVATED FIELDS AS RIPARIAN VEGETATION	%	Other	TCEQ SOP V2	89852	NA	NA	NA	NA	NA	Field
AVERAGE PERCENT OTHER AS RIPARIAN VEGETATION	%	Other	TCEQ SOP V2	89853	NA	NA	NA	NA	NA	Field
AVERAGE PERCENTAGE OF TREE CANOPY COVERAGE	%	Other	TCEQ SOP V2	89854	NA	NA	NA	NA	NA	Field
DRAINAGE AREA ABOVE MOST DOWNSTREAM TRANSECT^	km2	Other	TCEQ SOP V2	89859	NA	NA	NA	NA	NA	Field
REACH LENGTH OF STREAM EVALUATED (M)	m	Other	NA/ Calculation	89884	NA	NA	NA	NA	NA	Field
AVERAGE STREAM WIDTH (METERS)	M	Other	TCEQ SOP V2	89861	NA	NA	NA	NA	NA	Field
AVERAGE STREAM DEPTH (METERS)	M	Other	TCEQ SOP V2	89862	NA	NA	NA	NA	NA	Field
MAXIMUM POOL WIDTH AT TIME OF STUDY (METERS)***	M	Other	TCEQ SOP V2	89864	NA	NA	NA	NA	NA	Field

MAXIMUM POOL DEPTH AT TIME OF STUDY(METERS)***	M	Other	TCEQ SOP V2	89865	NA	NA	NA	NA	NA	Field
AVERAGE WIDTH OF NATURAL RIPARIAN VEGETATION (M)	M	Other	TCEQ SOP V2	89866	NA	NA	NA	NA	NA	Field
POOL LENGTH, METERS***	meters	other	TCEQ SOP V2	89869	NA*	NA	NA	NA	NA	Field
% POOL COVERAGE IN 500 METER REACH***	%	other	TCEQ SOP V2	89870	NA*	NA	NA	NA	NA	Field
AVERAGE WIDTH OF NATURAL RIPARIAN BUFFER ON LEFT BANK (M)	M	Other	NA/ Calculation	89872	NA	NA	NA	NA	NA	Field
AVERAGE WIDTH OF NATURAL RIPARIAN BUFFER ON RIGHT BANK (M)	m	Other	NA/ Calculation	89873	NA	NA	NA	NA	NA	Field
AESTHETICS OF REACH(1=WILD 2=NAT. 3=COMM. 4=OFF.)	NU	Other	TCEQ SOP V2	89867	NA	NA	NA	NA	NA	Field
NUMBER OF STREAM COVER TYPES	NU	Other	TCEQ SOP V2	89929	NA	NA	NA	NA	NA	Field
ECOREGION LEVEL III (TEXAS ECOREGION CODE)	NU	Other	TCEQ SOP V1	89961	NA	NA	NA	NA	NA	Field
LAND DEVELOP IMPACT (1=UNIMP,2=LOW,3=MOD,4=HIGH)	NU	Other	TCEQ SOP V2	89962	NA	NA	NA	NA	NA	Field
RIPARIAN VEGETATION %; LEFT BANK - TREES	%	Other	NA/ Calculation	89822	NA	NA	NA	NA	NA	Field
RIPARIAN VEGETATION %; RIGHT BANK - TREES	%	Other	NA/ Calculation	89823	NA	NA	NA	NA	NA	Field
RIPARIAN VEGETATION %; LEFT BANK SHRUBS	%	Other	NA/ Calculation	89824	NA	NA	NA	NA	NA	Field
RIPARIAN VEGETATION %; RIGHT BANK - SHRUBS	%	Other	NA/ Calculation	89825	NA	NA	NA	NA	NA	Field
RIPARIAN VEGETATION %: LEFT BANK - GRASSES OR FORBS	%	Other	NA/ Calculation	89826	NA	NA	NA	NA	NA	Field
RIPARIAN VEGETATION %; RIGHT BANK - GRASSES OR FORBS	%	Other	NA/ Calculation	89827	NA	NA	NA	NA	NA	Field
RIPARIAN VEGETATION %: LEFT BANK - CULTIVATED FIELDS	%	Other	NA/ Calculation	89828	NA	NA	NA	NA	NA	Field
RIPARIAN VEGETATION %: RIGHT BANK - CULTIVATED FIELDS	%	Other	NA/ Calculation	89829	NA	NA	NA	NA	NA	Field
RIPARIAN VEGETATION %: LEFT BANK - OTHER	%	Other	NA/ Calculation	89830	NA	NA	NA	NA	NA	Field
RIPARIAN VEGETATION %: RIGHT BANK - OTHER	%	Other	NA/ Calculation	89871	NA	NA	NA	NA	NA	Field
AVAILABLE INSTREAM COVER HQI SCORE: 4=ABUNDANT 3=COMMON 2=RARE 1=ABSENT	NU	Other	NA/ Calculation	89874	NA	NA	NA	NA	NA	Field
BOTTOM SUBSTRATE STABILITY HQI SCORE: 4=STABLE 3=MODERATELY STABLE 2=MODERATELY UNSTABLE 1=UNSTABLE	NU	Other	NA/ Calculation	89875	NA	NA	NA	NA	NA	Field

NUMBER OF RIFFLES HQI SCORE: 4=ABUNDANT 3=COMMON 2=RARE 1=ABSENT	NS	Other	NA/ Calculation	89876	NA	NA	NA	NA	NA	Field
DIMENSIONS OF LARGEST POOL HQI SCORE: 4=LARGE 3=MODERATE 2=SMALL 1=ABSENT	NU	Other	NA/ Calculation	89877	NA	NA	NA	NA	NA	Field
CHANNEL FLOW STATUS HQI SCORE: 3=HIGH 2=MODERATE 1=LOW 0=NO FLOW	NU	Other	NA/ Calculation	89878	NA	NA	NA	NA	NA	Field
BANK STABILITY HQI SCORE: 3=STABLE 2=MODERATELY STABLE 1=MODERATELY UNSTABLE 0=UNSTABLE	NU	Other	NA/ Calculation	89879	NA	NA	NA	NA	NA	Field
CHANNEL SINUOSITY HQI SCORE: 3=HIGH 2=MODERATE 1=LOW 0=NONE	NU	Other	NA/ Calculation	89880	NA	NA	NA	NA	NA	Field
RIPARIAN BUFFER VEGETATION HQI SCORE: 3=EXTENSIVE 2=WIDE 1=MODERATE 0=NARROW	NU	Other	NA/ Calculation	89881	NA	NA	NA	NA	NA	Field
AESTHETICS OF REACH HQI SCORE: 3=WILDERNESS 2=NATURAL AREA 1=COMMON SETTING 0=OFFENSIVE	NU	Other	NA/ Calculation	89882	NA	NA	NA	NA	NA	Field
HQI TOTAL SCORE	NU	Other	NA/ Calculation	89883	NA	NA	NA	NA	NA	Field
NO FLOW ISOLATED POOL: LARGEST POOL MAX WIDTH (M)	M	Other	NA/ Calculation	89908	NA	NA	NA	NA	NA	Field
NO FLOW ISOLATED POOL: LARGEST POOL MAX LENGTH (M)	M	Other	NA/ Calculation	89909	NA	NA	NA	NA	NA	Field
NO FLOW ISOLATED POOL: LARGEST POOL MAX DEPTH (M)	M	Other	NA/ Calculation	89910	NA	NA	NA	NA	NA	Field
NO FLOW ISOLATED POOL: SMALLEST POOL MAX DEPTH (M)	M	Other	NA/ Calculation	89911	NA	NA	NA	NA	NA	Field
NO FLOW ISOLATED POOL: SMALLEST POOL MAX WIDTH (M)	M	Other	NA/ Calculation	89912	NA	NA	NA	NA	NA	Field
NO FLOW ISOLATED POOL: SMALLEST POOL MAX LENGTH(M)	M	Other	NA/ Calculation	89913	NA	NA	NA	NA	NA	Field
NO FLOW ISOLATED POOLS: NUMBER OF POOLS EVALUATED	NU	Other	NA/ Calculation	89914	NA	NA	NA	NA	NA	Field
Biological- Benthics (Qualitative/RBAP)										
Parameter	Units	Matrix	Method	Parameter Code	AWRL	LOQ	LOQ Check Sample %Rec	Precision (RPD of LCS/LCSD)	Bias %Rec. of LCS	Lab
STREAM ORDER	NU	Water	TCEQ SOP, V1	84161	NA	NA	NA	NA	NA	Field

BIOLOGICAL DATA	NS	Other	NA/ Calculation	89888	NA	NA	NA	NA	NA	Field
RAPID BIOASSESSMENT PROTOCOLS BENTHIC MACROINVERTEBRATE IBI SCORE	NS	Other	NA/ Calculation	90081	NA	NA	NA	NA	NA	Field
BENTHIC DATA REPORTING UNITS (1=NUMBER OF INDIVIDUALS IN SUB-SAMPLE, 2=NUMBER OF INDIVIDUALS/FT2, 3=NUMBER OF INDIVIDUALS/M2, 4=TOTAL NUMBER OF INDIVIDUALS IN SAMPLE)	NU	Other	TCEQ SOP V2	89899	NA	NA	NA	NA	NA	Field
DIP NET EFFORT,AREA SWEEP (SQ.METER)	m2	Other	TCEQ SOP V2	89902	NA	NA	NA	NA	NA	Field
KICKNET EFFORT,AREA KICKED (SQ.METER)	m2	Other	TCEQ SOP V2	89903	NA	NA	NA	NA	NA	Field
KICKNET EFFORT,MINUTES KICKED (MIN.)	min.	Other	TCEQ SOP V2	89904	NA	NA	NA	NA	NA	Field
DEBRIS/SHORELINE SAMPLING EFFORT, MINUTES	min.	Other	TCEQ SOP V2	89905	NA	NA	NA	NA	NA	Field
NUMBER OF INDIVIDUALS IN BENTHIC SAMPLE	NU	Other	TCEQ SOP V2	89906	NA	NA	NA	NA	NA	WMS
UNDERCUT BANK AT COLLECTION POINT (%)	%	Other	TCEQ SOP V2	89921	NA	NA	NA	NA	NA	Field
OVERHANGING BRUSH AT COLLECTION POINT (%)	%	Other	TCEQ SOP V2	89922	NA	NA	NA	NA	NA	Field
GRAVEL BOTTOM AT COLLECTION POINT (%)	%	Sediment	TCEQ SOP V2	89923	NA	NA	NA	NA	NA	Field
SAND BOTTOM AT COLLECTION POINT (%)	%	Sediment	TCEQ SOP V2	89924	NA	NA	NA	NA	NA	Field
SOFT BOTTOM AT COLLECTION POINT (%)	%	Sediment	TCEQ SOP V2	89925	NA	NA	NA	NA	NA	Field
MACROPHYTE BED AT COLLECTION POINT (%)	%	Other	TCEQ SOP V2	89926	NA	NA	NA	NA	NA	Field
SNAGS AND BRUSH AT COLLECTION POINT (%)	%	Other	TCEQ SOP V2	89927	NA	NA	NA	NA	NA	Field
BEDROCK STREAMBED AT COLLECTION POINT (%)	%	Sediment	TCEQ SOP V2	89928	NA	NA	NA	NA	NA	Field
MESH SIZE, ANY NET OR SIEVE, AVERAGE BAR (CM)	cm	Other	TCEQ SOP V2	89946	NA	NA	NA	NA	NA	Field
BENTHIC SAMPLE COLLECTION METHOD (1=SURBER, 2=EKMAN, 3=KICKNET, 4=PETERSON, 5=HESTER DENDY, 6=SNAG)	NU	Other	TCEQ SOP V2	89950	NA	NA	NA	NA	NA	Field
ECOREGION LEVEL III (TEXAS ECOREGION CODE)	NU	Other	TCEQ SOP V1	89961	NA	NA	NA	NA	NA	Field
BENTHOS ORGANISMS -NONE PRESENT	NS	Other	TCEQ SOP V2	90005	NA	NA	NA	NA	NA	WMS
HILSENHOFF BIOTIC INDEX (HBI)	NU	Other	TCEQ SOP V2	90007	NA	NA	NA	NA	NA	Field
NUMBER OF EPT INDEX	NU	Other	TCEQ SOP V2	90008	NA	NA	NA	NA	NA	WMS

DOMINANT BENTHIC FUNCTIONAL FEEDING GRP, % OF INDIVIDUALS	%	Other	TCEQ SOP V2	90010	NA	NA	NA	NA	NA	WMS
BENTHIC GATHERERS, PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90025	NA	NA	NA	NA	NA	WMS
BENTHIC PREDATORS, PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90036	NA	NA	NA	NA	NA	WMS
DOMINANT TAXON, BENTHOS PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90042	NA	NA	NA	NA	NA	WMS
RATIO OF INTOLERANT TO TOLERANT TAXA, BENTHOS	NU	Other	TCEQ SOP V2	90050	NA	NA	NA	NA	NA	WMS
NUMBER OF NON-INSECT TAXA	NU	Other	TCEQ SOP V2	90052	NA	NA	NA	NA	NA	WMS
ELMIDAE, PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90054	NA	NA	NA	NA	NA	WMS
TOTAL TAXA RICHNESS, BENTHOS	NU	Other	TCEQ SOP V2	90055	NA	NA	NA	NA	NA	WMS
CHIRONOMIDAE, PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90062	NA	NA	NA	NA	NA	WMS
PERCENT OF TOTAL TRICHOPTERA INDIVIDUALS AS HYDROPSYCHIDAE	%	Other	TCEQ SOP V2	90069	NA	NA	NA	NA	NA	WMS
Biological- Nekton										
Parameter	Units	Matrix	Method	Parameter Code	AWRL	LOQ	LOQ Check Sample %Rec	Precision (RPD of LCS/LCSD)	Bias %Rec. of LCS	Lab
STREAM ORDER	NU	Water	TCEQ SOP V1	84161	NA	NA	NA	NA	NA	Field
NEKTON TEXAS REGIONAL IBI SCORE	NS	Other	NA/ Calculation	98123	NA	NA	NA	NA	NA	Field
BIOLOGICAL DATA	NS	Other	NA/ Calculation	89888	NA	NA	NA	NA	NA	Field
SEINE, MINIMUM MESH SIZE, AVERAGE BAR, NEKTON,IN	IN	Other	TCEQ SOP V2	89930	NA	NA	NA	NA	NA	Field
SEINE, MAXIMUM MESH SIZE, AVG BAR, NEKTON,INCH	IN	Other	TCEQ SOP V2	89931	NA	NA	NA	NA	NA	Field
NET LENGTH (METERS)	M	Other	TCEQ SOP V2	89941	NA	NA	NA	NA	NA	Field
ELECTROFISHING METHOD 1=BOAT 2=BACKPACK 3=TOTEBARGE	NU	Other	TCEQ SOP V2	89943	NA	NA	NA	NA	NA	Field
ELECTROFISH EFFORT, DURATION OF SHOCKING (SEC)	SEC	Other	TCEQ SOP V2	89944	NA	NA	NA	NA	NA	Field
SEINING EFFORT (# OF SEINE HAULS)	NU	Other	TCEQ SOP V2	89947	NA	NA	NA	NA	NA	Field
COMBINED LENGTH OF SEINE HAULS (METERS)	M	Other	TCEQ SOP V2	89948	NA	NA	NA	NA	NA	Field
SEINING EFFORT, DURATION (MINUTES)	MIN	Other	TCEQ SOP V2	89949	NA	NA	NA	NA	NA	Field
ECOREGION LEVEL III (TEXAS ECOREGION CODE)	NU	Other	TCEQ SOP V1	89961	NA	NA	NA	NA	NA	Field
AREA SEINED (SQ METERS)	M2	Other	TCEQ SOP V2	89976	NA	NA	NA	NA	NA	Field
NUMBER OF SPECIES, FISH	NU	Other	TCEQ SOP V2	98003	NA	NA	NA	NA	NA	Field
NEKTON ORGANISMS-NONE PRESENT	NS	Other	TCEQ SOP V2	98005	NA	NA	NA	NA	NA	WMS

TOTAL NUMBER OF SUNFISH SPECIES	NU	Other	TCEQ SOP V2	98008	NA	NA	NA	NA	NA	WMS
TOTAL NUMBER OF INTOLERANT SPECIES, FISH	NU	Other	TCEQ SOP V2	98010	NA	NA	NA	NA	NA	WMS
PERCENT OF INDIVIDUALS AS OMNIVORES, FISH	%	Other	TCEQ SOP V2	98017	NA	NA	NA	NA	NA	WMS
PERCENT OF INDIVIDUALS AS INVERTIVORES, FISH	%	Other	TCEQ SOP V2	98021	NA	NA	NA	NA	NA	WMS
PERCENT OF INDIVIDUALS AS PISCIVORES, FISH	%	Other	TCEQ SOP V2	98022	NA	NA	NA	NA	NA	WMS
PERCENT OF INDIVIDUALS WITH DISEASE OR ANOMALY	%	Other	TCEQ SOP V2	98030	NA	NA	NA	NA	NA	WMS
TOTAL NUMBER OF NATIVE CYPRINID SPECIES	NU	Other	TCEQ SOP V2	98032	NA	NA	NA	NA	NA	WMS
PERCENT INDIVIDUALS AS NON-NATIVE FISH SPECIES (% OF COMMUNITY)	%	Other	TCEQ SOP V2	98033	NA	NA	NA	NA	NA	WMS
TOTAL NUMBER OF INDIVIDUALS SEINING	NU	Other	TCEQ SOP V2	98039	NA	NA	NA	NA	NA	Field
TOTAL NUMBER OF INDIVIDUALS ELECTROFISHING	NU	Other	TCEQ SOP V2	98040	NA	NA	NA	NA	NA	Field
TOTAL NUMBER OF BENTHIC INVERTIVORE SPECIES	NU	Other	TCEQ SOP V2	98052	NA	NA	NA	NA	NA	WMS
TOTAL NUMBER OF BENTHIC FISH SPECIES	NU	Other	TCEQ SOP V2	98053	NA	NA	NA	NA	NA	WMS
NUMBER OF INDIVIDUALS PER SEINE HAUL	NU	Other	TCEQ SOP V2	98062	NA	NA	NA	NA	NA	Field
NUMBER OF INDIVIDUALS PER MINUTE ELECTROFISHING	NU	Other	TCEQ SOP V2	98069	NA	NA	NA	NA	NA	Field
PERCENT INDIVIDUALS AS TOLERANT FISH SPECIES(EXCLUDING WESTERN MOSQUITOFISH)	%	Other	TCEQ SOP V2	98070	NA	NA	NA	NA	NA	WMS

* Reporting to be consistent with SWQM guidance and based on measurement capability.

*** To be routinely reported when collecting data from perennial pools.

^ From USGS map.

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, 2012 (RG-415).

TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2007 (RG-416)

SS-A8 Special Training/Certification

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

Collection of habitat, benthics, and fish will be in accordance with the *Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2007*. Individuals conducting identification of benthic macroinvertebrates and fish have adequate training and education to accurately identify species.

SS-A9 Documents and Records

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

Table SS-A9.1 – Project Documents and Records

Document/Record	Location	Retention	Format
QAPPs, amendments, and appendices	TCEQ / TRA / WMS	min 7 years	Paper / Electronic
QAPP distribution documentation	TRA	min 7 years	Paper / Electronic
Field notebooks or data sheets	TRA	min 7 years	Paper / Electronic
Field equipment calibration/maintenance logs	TRA	min 7 years	Paper / Electronic
Field equipment printouts	TRA	min 7 years	Paper / Electronic
Chain of Custody records (see Exhibit A for Tracking Logs for Benthics and Fish)	TRA / WMS	min 7 years	Paper / Electronic
Field SOPs	TRA	min 7 years	Paper / Electronic
Field staff training records	TRA	min 7 years	Paper / Electronic
Laboratory QA Manuals	TRA / WMS	min 7 years	Paper / Electronic
Laboratory SOPs	TRA / WMS	min 7 years	Paper / Electronic
Laboratory data reports/results	TRA / WMS	min 7 years	Paper / Electronic
Corrective action documentation	TRA / WMS	min 7 years	Paper / Electronic

Laboratory Test Reports

Water Monitoring Solutions, Inc. will provide data to TRA in a format sufficient to transfer into the TCEQ required Event/Result format for submittal to SWQMIS. The provided data will include information about the location, date, and time of sample collection as well as any other necessary metadata required for completion of the Biological Monitoring Reporting Packet (Exhibit A) and the associated Event/Result file for SWQMIS.

Electronic Data

Data will be submitted electronically to the TCEQ in the Event/Result format described in the most current version of the DMRG. A completed Data Review Checklist and Data Summary (see Appendix E of the basin-wide QAPP) will be submitted with the data submittal. Data from Water Monitoring Solutions, Inc. will be received in the most appropriate format for the data set (Excel, Word) which

will then be converted by the TRA to the Event/Result file format specified in the TCEQ DMRG. The Biological Monitoring Reporting Packet (Exhibit A) will be submitted by TRA to TCEQ in the required BLOB format as described in the *Surface Water Quality Monitoring Data Management Reference Guide*.

SS-B1 Sampling Process Design

The data collection design is summarized in Tables SS-B1.1 and SS-B1.2 (Sampling Sites and Monitoring Frequencies) and Figures SS-B1.1 and SS-B1.2 (Sample Site Maps).

Table B1.1 – Sample Design and Schedule, FY 2014

Region	Segment	Station Description	Station ID	SE/CE*	Mon Type*	Start Date	End Date	Frequency (samples per year)															
								24 HR	Aq Hab	Benthics	Nekton	Metals Water	Org Water	Metals Sed	Org Sed	Conventionals	Amb Tox Wat	Amb Tox Sed	Indicator Bacteria	Inst Flow	Fish Tissue	Field	
4	0805A	Red Oak Creek 0.37 km downstream of the Red Oak Creek Regional Wastewater System outfall near Bells Chapel Road	TR331/ 21521	TR/ TR	BS	3/15/2014	9/30/2014	2	2	2	2									2			2

Table B1.2 – Sample Design and Schedule, FY 2015

Region	Segment	Station Description	Station ID	SE/CE*	Mon Type*	Start Date	End Date	Frequency (samples per year)																
								24 HR	Aq Hab	Benthics	Nekton	Metals Water	Org Water	Metals Sed	Org Sed	Conventionals	Amb Tox Wat	Amb Tox Sed	Indicator Bacteria	Inst Flow	Fish Tissue	Field		
4	0805	West Fork Trinity River 1.25 km upstream of East 1st Street off of the Fort Worth Branch Trinity Trails System in Gateway Park in Fort Worth	TR330/ 21520	TR/ TR	BS	3/15/2015	8/31/2015	2	2	2	2											2		2

See Data Dictionary in Section SS-B10 for definitions of codes in Table B1.1.

Sample Design Rationale and Site Selection Criteria

Station TR331/21521 is located at Red Oak Creek 0.37 km downstream of the Red Oak Creek Regional Wastewater System outfall near Bells Chapel Road. The site was selected because it is representative of Red Oak Creek, a tributary of the Trinity River, below the mixing zone of the TRA Red Oak Creek Regional Wastewater System; a 6 MGD plant. The selected reach in this stream contains a variety of microhabitats to sample, such as riffles, runs and pools. It is anticipated that ALM results at this site will support other TRA water quality projects. In addition, this drainage area is rural and the stream has been noted to be intermittent above the discharge during extended periods of dry weather. Therefore, during these periods, the effluent from the plant is the basis of the biological habitat downstream. This monitoring will provide background information for this stream and may help to determine if further biological monitoring needs to be conducted.

Station TR330/21520 is located at West Fork Trinity River 1.25 km upstream of East 1st Street off of the Fort Worth Branch Trinity Trails System in Gateway Park in Fort Worth. The site was selected because it is representative of the West Fork Trinity River downstream of the channelized portion in Fort Worth. In addition, this reach of the river has routinely been monitored for water quality by the City of Fort Worth, Tarrant Regional Water District and Trinity River Authority. Therefore, this location is of great interest to TRA and its partners. Biological monitoring in this reach is intended to increase background information about the site. Segment 0806 was found to be impaired for fish consumption by the TCEQ's 2012 Integrated Report. Although an analysis of fish tissue will not be conducted as part of this study, nekton sampling may show if fish communities are being adversely affected by Dioxins and PCBs which are the source of the fish consumption impairment. Flows in this reach are typically wadeable during Index and Critical periods as it is upstream of large dischargers. The selected reach in this stream contains a variety of microhabitats to sample, such as riffles, runs and pools.

Sampling Site Maps

Maps of stations monitored by the Trinity River Authority are provided on the following pages. The maps were generated by the Trinity River Authority. 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 Angela Kilpatrick at 817-493-5179.

Figure SS-B1.1 – Sampling Site Map for Red Oak Creek

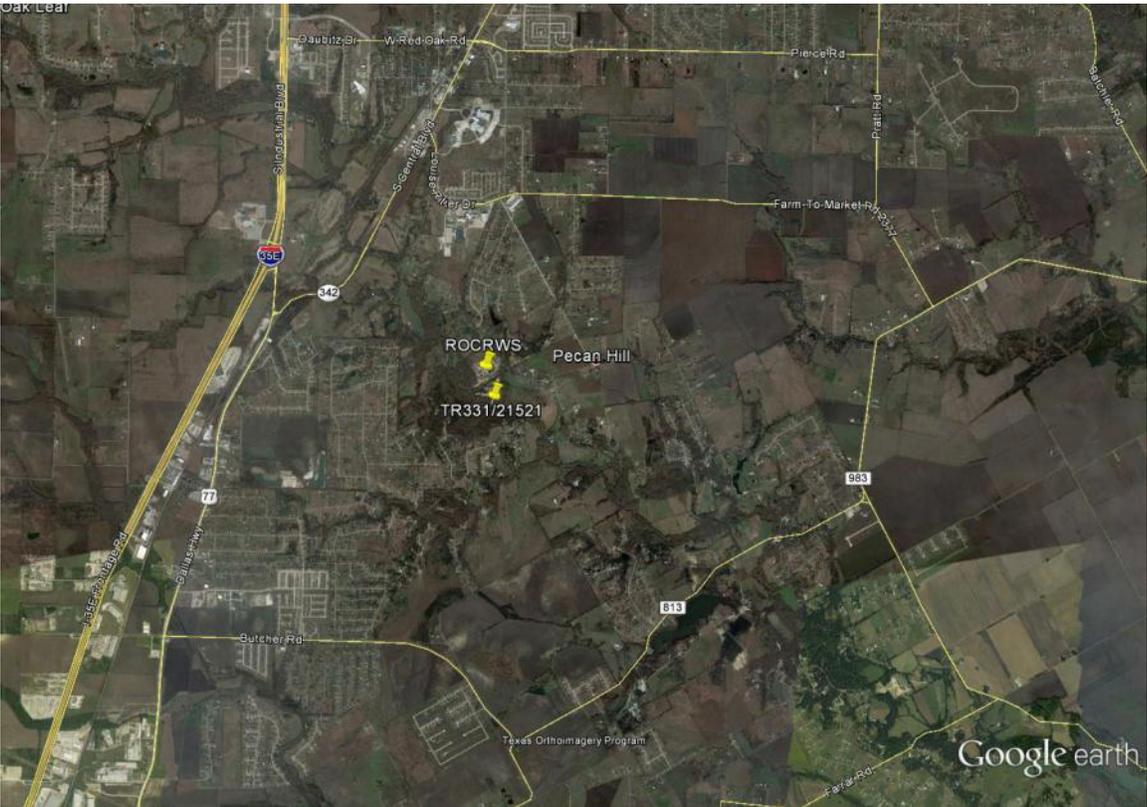
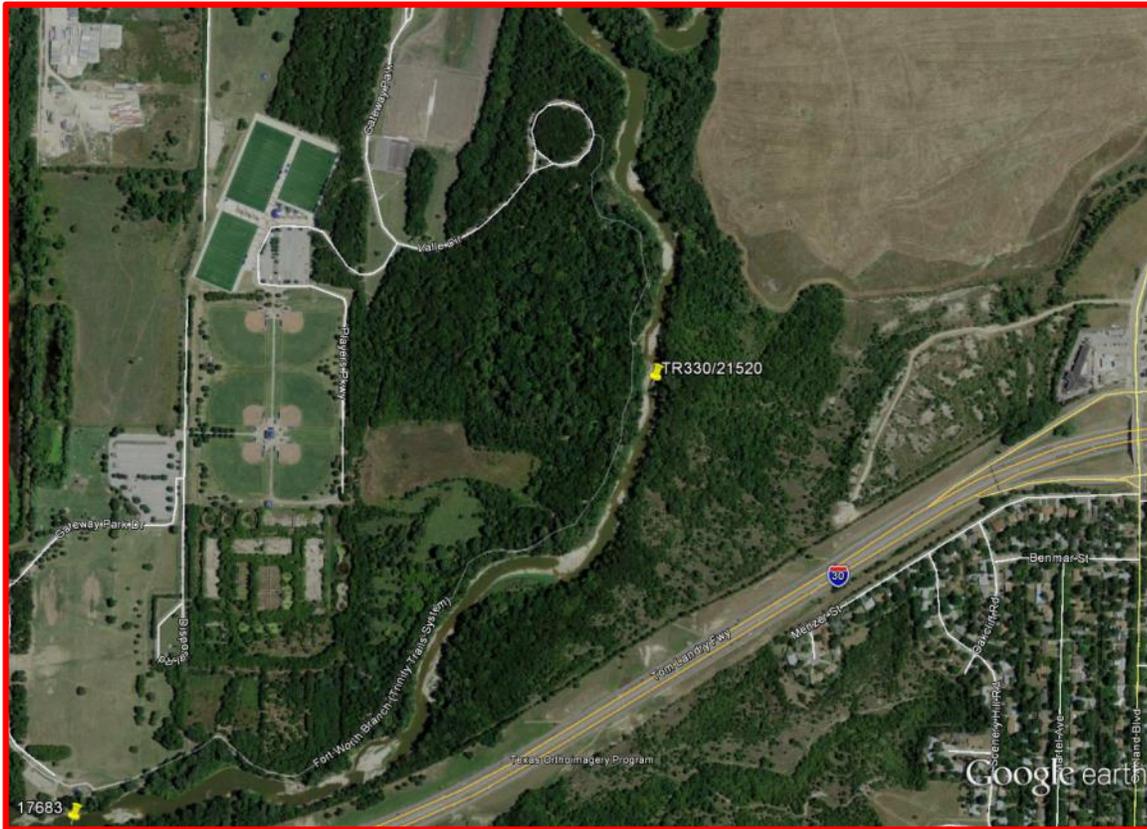
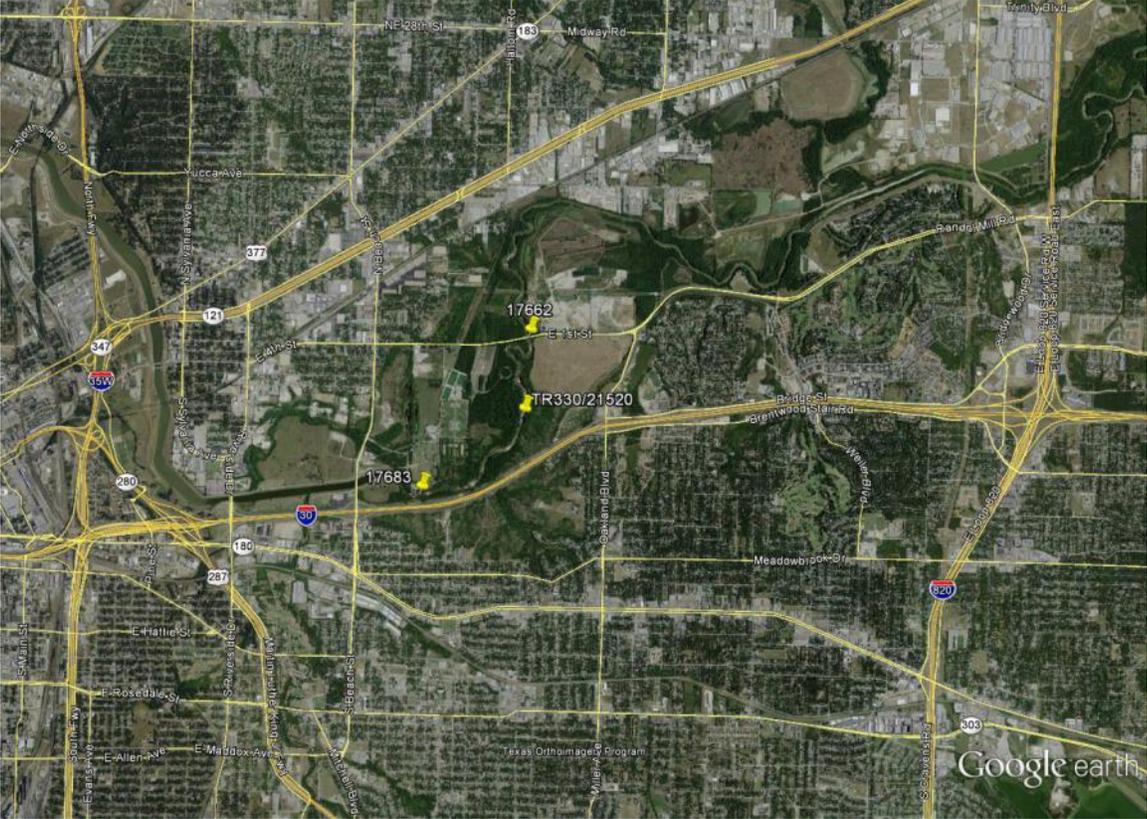


Figure SS-B1.2 – Sampling Site Map for West Fork Trinity River



SS-B2 Sampling Methods

Field Sampling Procedures

Field sampling will be conducted according to procedures documented in the *TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue, 2012 (RG-415)* and the *TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2007 (RG-416)*. Additional aspects outlined in Section B below reflect specific requirements for sampling under the Clean Rivers Program and/or provide additional clarification.

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

Handling and preservation of fish and benthics samples will be in accordance with chapters 3 and 5 of the *TCEQ Surface Water Quality Monitoring Procedure, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2007 (RG-416)*.

Table SS-B2.1 – Sample Storage, Preservation, and Handling Requirements

PARAMETER	CONTAINER	MINIMUM SAMPLE VOLUME (mL)	PRESERVATION	MAXIMUM STORAGE
Fish Vouchers	Plastic	As needed to submerge samples without crowding	10% Formalin in field, store in Formalin for at least one week, soak in fresh water each day for three days, transfer to 50% isopropyl alcohol or 75% ethanol for indefinite storage	7 days in Formalin, indefinite for isopropyl alcohol or ethanol.
Benthic Macroinvertebrates	Plastic	As needed to submerge samples without crowding (no more than half full)	If processing in the field, 70% ethanol or 40% isopropyl alcohol. If processing in the lab immediately after collection, 95% ethanol. If processing in the lab at least a week after collection, 10% Formalin. Transfer to 70% ethanol or 40% isopropyl alcohol for indefinite storage.	7 days in Formalin, indefinite for isopropyl alcohol or ethanol.

Sample Containers

Sample containers for this project are Nalgene® type, leak-proof, high-density polyethylene, wide-mouth bottles in various sizes. The appropriate size will be used to adequately store and preserve samples without crowding.

Processes to Prevent Contamination

Procedures outlined in the *TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2007 (RG-416)* describe the necessary steps to prevent contamination of samples. These procedures will be adhered to during sampling, identification, and storage.

Documentation of Field Sampling Activities

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

Examples of Field Data Sheets to be used in this study are shown in Exhibit A. The Discharge Measurement Summary Report is from a SonTek FlowTracker. The Stream Flow (Discharge) Measurement Form is for flow measurements conducted with a Marsh McBirney or equivalent flow meter. The instrument used for flow measurement will be determined in the field based on flow conditions and the appropriate flow measurement report or form will be included in the data packet. Additional forms for biological monitoring data reporting as described in Appendix C of the *TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2007 (RG-416)*, are also located in Exhibit A of this appendix. Nekton samples will be identified and separated by collection type – seining and/or electroshocking – and will include associated metadata.

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. See Exhibit A for a copy of the Chain-of-Custody to be used in this project. Tracking Logs for Benthics and Fish are found in Exhibit A.

Sample Labeling

As described in Section B3 of the basin-wide QAPP and in the *TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2007 (RG-416)*.

Sample Handling

Samples will be handled in accordance with the *TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2007 (RG-416)*. Forms used to document field conditions and sample collection are shown in Exhibit A.

Sample Tracking Procedure Deficiencies and Corrective Action

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

SS-B4 Analytical Methods

This section is not applicable as no water chemistry samples will be taken.

Standards Traceability

This section is not applicable as no water chemistry samples will be taken.

Analytical Method Deficiencies and Corrective Actions

This section is not applicable as no water chemistry samples will be taken.

SS-B5 Quality Control

Sampling Quality Control Requirements and Acceptability Criteria

This section is not applicable as no water chemistry samples will be taken.

Laboratory Measurement Quality Control Requirements and Acceptability Criteria

This section is not applicable as no water chemistry samples will be taken.

Quality Control or Acceptability Requirements Deficiencies and Corrective Actions

This section is not applicable as no water chemistry samples will be taken.

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 QAPP is submitted to the SWQMIS database.

SS-B10 Data Management

Data management will be conducted as described in Section SS-A9, Laboratory Test Reports and Electronic Data. All data will be prepared by the TRA Data Manager in the format required for submittal to the SWQMIS database as well as for submittal of the Biological Monitoring Reporting Packet (Exhibit A). Data will be coded with the Submitting Entity (SE), Collecting Entity (CE), and Monitoring Types (Mon Type) specified in Table SS-B1.1 of this appendix and defined in the Data Dictionary.

Data Dictionary

Terminology and field descriptions are included in the DMRG, or most recent version. Table SS-B10.1 defines the codes that will be used when submitting data under this QAPP.

Table SS-B10.1 – Data Dictionary

Code Definition	Tag Prefix	Submitting Entity	Collecting Entity	Monitoring Type
Trinity River Authority	TR	TR	TR	
Bias to Season				BS

SS-C1 Assessments and Response Actions

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

Table SS-C1.1 – Assessments and Response Requirements

Assessment Activity	Approximate Schedule	Responsible Party	Scope	Response Requirements
Status Monitoring Oversight, etc.	Continuous	TRA	Monitoring of the project status and records to ensure requirements are being fulfilled	Report to TCEQ in Quarterly Report
Monitoring Systems Audit of Trinity River Authority	Dates to be determined by TCEQ CRP	TCEQ	Field sampling, handling and measurement; facility review; and data management as they relate to CRP	30 days to respond in writing to the TCEQ to address corrective actions

Corrective Action

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

SS-C2 Reports to Management

Reports to Planning Agency Project Management

All data will be submitted to the TRA Data Manager by field staff and by Water Monitoring Solutions, Inc. in an appropriate format as described in Section SS-A9, Laboratory Test Reports and Electronic Data.

Reports to TCEQ Project Management

As described in Section C2 of the basin-wide QAPP. In addition to submittal of the electronic data for inclusion in SWQMIS, the completed Biological Monitoring Reporting Packet (Exhibit A) will be submitted by TRA in the format required at the time of submittal.

Reports by TCEQ Project Management

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

SS-D1 Data Review, Verification, and Validation

All field, habitat, benthic, and nekton data will be reviewed and verified for integrity and continuity, reasonableness, and conformance to project requirements, and then validated against the project objectives and measurement performance specifications which are listed in Section SS-A7. Only those data which are supported by appropriate quality control data and meet the measurement performance specifications defined for this project will be considered acceptable, and will be reported to the TCEQ for entry into SWQMIS.

SS-D2 Verification and Validation Methods

As described in Section D2 of the basin-wide QAPP and as shown in Table SS-D2.1.

Table SS-D2.1: Data Review Tasks

Data to be Verified	Field Task (TRA)	Laboratory Task (WMS)	TRA DM/QAO Task
Sample documentation complete; samples labeled, sites identified	TRA		
Tracking Logs complete/acceptable	TRA	WMS	
Sample preservation and handling acceptable	TRA	WMS	
Collection, preparation, and identification consistent with SOPs and QAPP	TRA	WMS	QAO
Field documentation (e.g., biological, stream habitat) complete	TRA		DM
Instrument calibration data complete	TRA		
Results, calculations, transcriptions checked		WMS	
Laboratory bench-level review performed		WMS	
Corollary data agree		WMS	DM
Nonconforming activities documented	TRA	WMS	QAO
Dates formatted correctly	TRA		DM
Depth reported correctly and in correct units	TRA		DM
TAG IDs correct	TRA		DM
TCEQ Station ID number assigned	TRA		DM
Valid parameter codes	TRA		DM
Time based on 24-hour clock	TRA		DM
Absence of transcription error confirmed	TRA		DM
Absence of electronic errors confirmed	TRA		DM
Sampling and analytical data gaps checked (e.g., all sites for which data are reported are on the coordinated monitoring schedule)	TRA		DM
10% of data manually reviewed	TRA		DM

SS-D3 Reconciliation with User Requirements

Data produced in this project will be analyzed and reconciled with data quality requirements. Data meeting project requirements will be used by TRA and TCEQ to provide information, inform future studies and support publications

Exhibit A – Data Forms and Biological Monitoring Packet

See the TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological *Assemblage* and Habitat Data, 2007 (RG-416) for instructions on completing the Biological Data Summary Packet.

Elements of the Biological Data Summary Packet

Aquatic Life Monitoring and Habitat Assessment Checklist

Background Information

Name of water body:	
---------------------	--

Segment number:		Station ID:	
-----------------	--	-------------	--

On segment: Yes No

Permit number, if applicable: _____ Check monitoring objective: ALM ALU UAA RWA

Historic Stream Characterization (circle one):

Intermittent Intermittent with perennial pools sufficient to support significant aquatic life use Perennial Unknown

Basis for historic stream characterization (describe):

Current aquatic life use designation (if classified segment or site specific standard determined):

Exceptional High Intermediate Limited

Current assessment status on the (year) _____ Water Quality Inventory, 305(b) Report:

Supported Partially Supported Not Supported Concern Not Assessed

Data Entry

Field data entry (FDE) information: Date entered into FDE:

RTAG #: _____ (TCEQ regional biologists only)

Field data (CRP partners only): Tag #:

Objective for Aquatic Life Use Assessment

Is this water body supporting its designated uses? Yes No Reason:

Known or potential causes of aquatic life use concern or impairment:

Identify sources of pollution:

Point source: Yes No Identify:

Nonpoint source: Yes No Identify:

Ambient toxicity tests in water body? Yes No

Results:

	Sediment Chronic	Sediment Acute	Water Chronic	Water Acute
Significant effect				
No significant effect				

Monitoring Information

Biological monitoring conducted during index period (03/15 to 06/30 and 10/01 to 10/15) and critical period (07/01-09/30).

Stream characterization event 1, date: _____

Dry	Pools covering _____% of the _____ meters assessed	Flowing at _____ cfs (measured)
-----	--	---------------------------------

Describe conditions that may have adversely affected stream during each sampling event (for example, recent rains, drought, construction):

Note: If sampling event for a RWA, characterize the receiving stream upstream of the existing discharge point or downstream of the proposed discharge point.

Stream characterization event 2, date: _____

Dry	Pools Covering _____% of the _____ meters assessed	Flowing at _____ cfs (measured)
-----	--	---------------------------------

Describe conditions that may have adversely affected stream during each sampling event (for example, recent rains, drought, construction):

Nekton sampling event 1:

Minimum 15-minute (900 seconds) electrofishing:

Yes No

Minimum 6 seine hauls (or equivalent effort to sample 60 meters):

Yes No

Fish sampling conducted in all available habitat types:

Yes No

If no, please describe why:

Benthic macroinvertebrate sampling event 1:

Indicate method(s) used:

Rapid bioassessment : 5-minute kicknet snags

Quantitative: Surber snags dredge

Habitat assessment event 1:

TCEQ habitat protocols:

Yes No

Stream flow measurement event 1:

Instantaneous measurement:

Yes No

USGS gauge reading:

Yes No

Nekton sampling event 2:

Minimum 15-minute (900 seconds) electrofishing:

Yes No

Minimum 6 seine hauls (or equivalent effort to sample 60 meters):

Yes No

Fish sampling conducted in all available habitat types:

Yes No

If no, please describe why:

Benthic macroinvertebrate sampling event 2:

Indicate method(s) used:

Rapid bioassessment: 5-minute kicknet snags

Quantitative: Surber snags dredge

Habitat assessment event 2:

TCEQ habitat protocols:

Yes No

If no, flow, wetted channel width, photographs, description of bank conditions relative to first event, and description of canopy cover conditions relative to first event must be provided in this packet.

Stream flow measurement event 2:

Instantaneous measurement:

Yes No

USGS gauge reading:

Yes No

Assessment Results (Optional)

Fish community index event 1:

Exceptional High Intermediate Limited

Fish community index event 2:

Exceptional High Intermediate Limited

Benthic macroinvertebrate community index event 1:

Exceptional High Intermediate Limited

Benthic macroinvertebrate community index event 2:

Exceptional High Intermediate Limited

Habitat index event 1:

Exceptional High Intermediate Limited

Habitat index event 2:

Exceptional High Intermediate Limited

TRA BIOLOGICAL FIELD DATA REPORTING FORM



Tag No:

Station: _____
 Segment: _____ Region: _____ Ecoregion: _____
 Sample(s) Collected By: _____

GRAB SAMPLE

Date: _____ Time: _____ Depth (m): _____

COMPOSITE SAMPLE

Composite Category: T=Time S=Space (i.e. Depth) B=Both F=Flow Weight
 Start _____ Start _____
 Date: _____ Time: _____ Start Depth (m) (shallowest): _____
 End _____ End _____
 Date: _____ Time: _____ End Depth (m) (deepest): _____

Secchi Depth (m): _____ Flow(cfs): _____
 Flow Measurement Method: 1=Gage 2=Electric 3=Mechanical 4=Weir/Flume 5=Doppler
 Flow Severity: 1=No Flow 2=Low 3=Normal 4=Flood 5=High 6=Dry
 Air Temperature(°C): _____ Days Since Last Rain: _____

Weather Parameters
 Wind Intensity: 1=Calm 2=Slight 3=Moderate 4=Strong
 Present Weather: 1=Clear 2=Partly Cloudy 3=Cloudy 4=Rain 5=Other

Contact Recreation Parameters
 Evidence of Primary Contact Rec (0=Not Observed, 1=Observed): _____ # of People Observed: _____

Drought Parameters
 Depth at Sample Site (m): _____ Max Pool Width (m): _____ Max Pool Depth (m): _____
 Pool Length (m): _____ % Pool Coverage in 500 Meter Reach: _____

Observations (weather, obvious signs of eutrophication, etc.): _____

Sample Depth	Water Temp	pH	Cond	Do
Calibration Acceptable				

Corrections must be made with a single strike-thru and initialed. No writeovers, scratchouts, or whiteout.



TRA BIOLOGICAL CHAIN-OF-CUSTODY

Station: _____	Region: _____	Ecoregion: _____
Segment: _____		

NEKTON SAMPLES FOR SPECIES IDENTIFICATION

Start Date: _____	Start Time: _____
End Date: _____	End Time: _____

Container Type/Size	# of Containers	Container ID	Preservative	Collected By

BENTHIC MACROINVERTEBRATE SAMPLES FOR SPECIES IDENTIFICATION

Start Date: _____	Start Time: _____
End Date: _____	End Time: _____

Container Type/Size	# of Containers	Container ID	Preservative	Collected By

Relinquished By: _____
 Date/Time: _____
 Received By: _____
 Date/Time: _____

Relinquished By: _____
 Date/Time: _____
 Received By: _____
 Date/Time: _____

Relinquished By: _____
 Date/Time: _____
 Received By: _____
 Date/Time: _____

Corrections must be made with a single strike-thru and initialed. No writeovers, scratchouts, or whiteout.

Customer: Trinity River Authority
 Attention: Angela Kilpatrick
 5300 South Collins
 Arlington, TX 76018
 817-493-5179
 kilpatricka@trinityra.org

Discharge Measurement Summary

Date Generated: Thu Mar 6 2014

File Information

File Name SOUTH.C2.WAD
Start Date and Time 2013/11/19 12:20:29

Site Details

Site Name TOWN CREEK
Operator(s) KM AK

System Information

Sensor Type FlowTracker
Serial # P4853
CPU Firmware Version 3.9
Software Ver 2.30
Mounting Correction 0.0%

Units (English Units)

Distance ft
Velocity ft/s
Area ft²
Discharge cfs

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.2%	2.4%
Velocity	0.7%	3.0%
Width	0.1%	0.1%
Method	1.8%	-
# Stations	1.9%	-
Overall	2.9%	4.0%

Summary

Averaging Int. 40 # Stations 27
Start Edge LEW Total Width 18.750
Mean SNR 27.2 dB Total Area 21.062
Mean Temp 61.19 °F Mean Depth 1.123
Disch. Equation Mid-Section Mean Velocity 0.4213
Total Discharge 8.8740

Measurement Results

St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	12:20	0.50	None	0.250	0.0	0.0	0.0000	1.00	0.0669	0.094	0.0063	0.1
1	12:22	1.25	0.6	0.600	0.6	0.240	0.0669	1.00	0.0669	0.300	0.0201	0.2
2	12:20	1.50	0.6	0.250	0.6	0.100	0.0033	1.00	0.0033	0.094	0.0003	0.0
3	12:25	2.00	0.6	1.000	0.6	0.400	0.0965	1.00	0.0965	0.625	0.0603	0.7
4	12:27	2.75	0.6	1.200	0.6	0.480	0.2802	1.00	0.2802	0.900	0.2522	2.8
5	12:28	3.50	0.6	1.550	0.6	0.620	0.2605	1.00	0.2605	1.162	0.3028	3.4
6	12:30	4.25	0.6	2.000	0.6	0.800	0.1677	1.00	0.1677	1.500	0.2515	2.8
7	12:32	5.00	0.6	2.100	0.6	0.840	0.1775	1.00	0.1775	1.575	0.2796	3.2
8	12:33	5.75	0.6	2.000	0.6	0.800	0.1647	1.00	0.1647	1.500	0.2470	2.8
9	12:34	6.50	0.6	1.900	0.6	0.760	0.3130	1.00	0.3130	1.425	0.4460	5.0
10	12:35	7.25	0.6	1.800	0.6	0.720	0.2976	1.00	0.2976	1.350	0.4017	4.5
11	12:36	8.00	0.6	1.650	0.6	0.660	0.4491	1.00	0.4491	1.237	0.5558	6.3
12	12:38	8.75	0.6	1.550	0.6	0.620	0.5843	1.00	0.5843	1.162	0.6792	7.7
13	12:39	9.50	0.6	1.400	0.6	0.560	0.7287	1.00	0.7287	1.050	0.7651	8.6
14	12:40	10.25	0.6	1.400	0.6	0.560	0.8278	1.00	0.8278	1.050	0.8691	9.8
15	12:41	11.00	0.6	1.400	0.6	0.560	0.6460	1.00	0.6460	1.050	0.6783	7.6
16	12:42	11.75	0.6	1.100	0.6	0.440	0.6736	1.00	0.6736	0.825	0.5557	6.3
17	12:43	12.50	0.6	0.950	0.6	0.380	0.5669	1.00	0.5669	0.713	0.4040	4.6
18	12:44	13.25	0.6	0.850	0.6	0.340	0.6181	1.00	0.6181	0.638	0.3941	4.4
19	12:45	14.00	0.6	0.750	0.6	0.300	0.6191	1.00	0.6191	0.563	0.3482	3.9
20	12:46	14.75	0.6	0.650	0.6	0.260	0.6827	1.00	0.6827	0.487	0.3328	3.8
21	12:47	15.50	0.6	0.600	0.6	0.240	0.6683	1.00	0.6683	0.450	0.3008	3.4
22	12:48	16.25	0.6	0.550	0.6	0.220	0.5650	1.00	0.5650	0.412	0.2330	2.6
23	12:49	17.00	0.6	0.450	0.6	0.180	0.5577	1.00	0.5577	0.338	0.1883	2.1
24	12:50	17.75	0.6	0.400	0.6	0.160	0.4685	1.00	0.4685	0.300	0.1405	1.6
25	12:54	18.50	0.6	0.350	0.6	0.140	-0.6148	-1.00	0.6148	0.263	0.1614	1.8
26	12:54	19.25	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

Discharge Measurement Summary

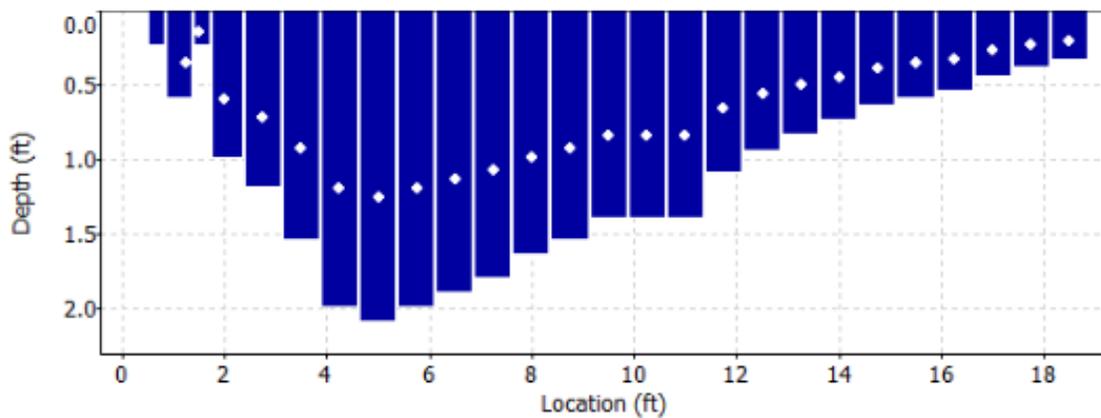
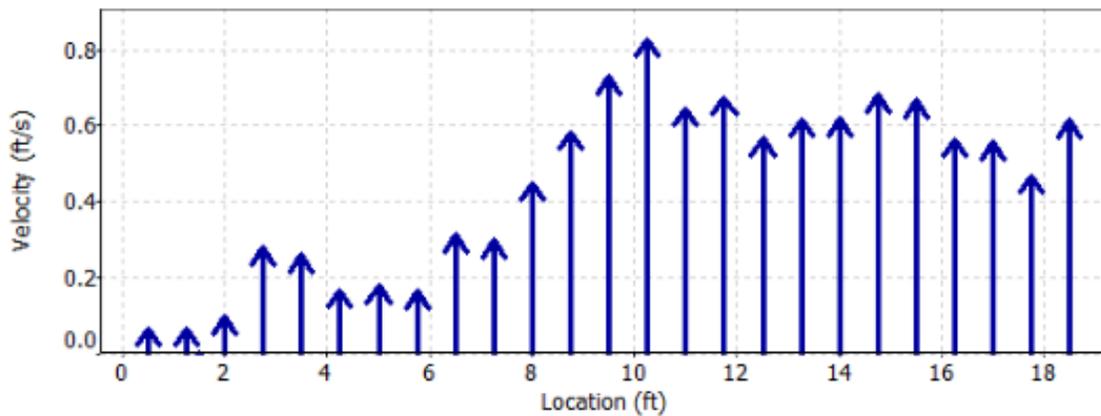
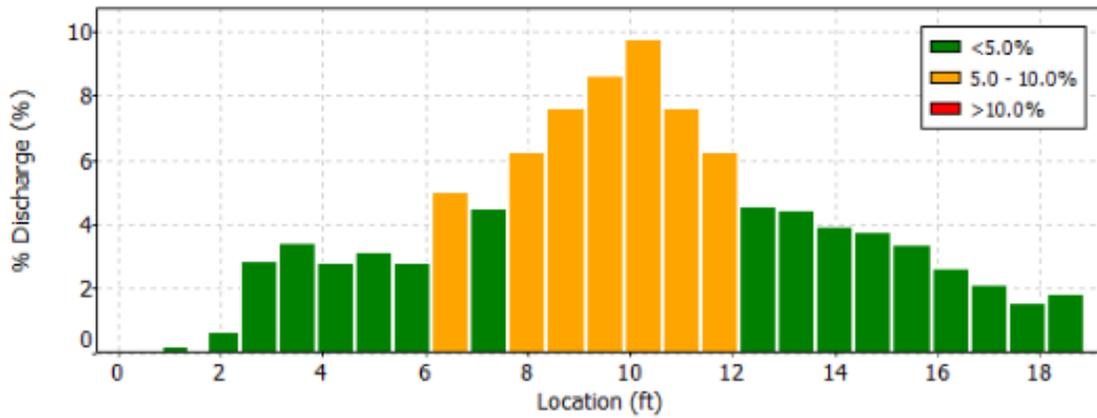
Date Generated: Thu Mar 6 2014

File Information

File Name SOUTH.C2.WAD
 Start Date and Time 2013/11/19 12:20:29

Site Details

Site Name TOWN CREEK
 Operator(s) KM AK



Discharge Measurement Summary

Date Generated: Thu Mar 6 2014

File Information

File Name SOUTH.C2.WAD
Start Date and Time 2013/11/19 12:20:29

Site Details

Site Name TOWN CREEK
Operator(s) KM AK

Quality Control

St	Loc	%Dep	Message
1	1.25	0.6	SNR (42.5) is different from typical SNR (27.2)
2	1.50	0.6	SNR (47.0) is different from typical SNR (27.2)
		0.6	Boundary QC is Good; possible boundary interference
3	2.00	0.6	High angle: 35
6	4.25	0.6	High angle: 23
7	5.00	0.6	High angle: 23
24	17.75	0.6	Boundary QC is Poor; possible boundary interference
25	18.50	0.6	High angle: -180

Habitat Data Reporting Form

RTAG#				REGION		EMAIL-ID:							
STATION ID				SEGMENT		SEQUENCE		COLLECTOR					
STATION ID				SEGMENT		SEQUENCE		DATA SOURCE					

Station Description _____

Composite - habitat events will be Both

COMPOSITE SAMPLE

COMPOSITE CATEGORY: T=Time S=Space B=Both

START DATE				START TIME				START DEPTH (SHALLOWEST)		M = meters F = feet				
M	M	D	D	Y	Y	Y	Y	H	H	M	M	.		
END DATE				END TIME				END DEPTH (DEEPEST)		M = meters F = feet				
M	M	D	D	Y	Y	Y	Y	H	H	M	M	.		

HABITAT DESCRIPTORS					
NOTE: All measurements reported in metric units					
72051		Streambed slope over evaluated reach (from USGS map; elevation change in meters/reach length in kilometers multiplied by 1000)	89844		Dominant substrate type (1=clay, 2=silt, 3=sand, 4=gravel, 5=cobble, 6=boulder, 7=bedrock, 8=other)
89859		Approximate drainage area above the most downstream transect from USGS map (km ²)	89845		Average percent of substrate gravel size (> 2mm) or larger (%)
89884		Reach length of stream evaluated (m)	84159		Average percent instream cover (%)
89832		Number of lateral transects that were made	89929		Number of Stream Cover Types
89861		Average stream width (m)	89846		Average percent stream bank erosion potential (%)
89862		Average stream depth (m)	89847		Average stream bank angle (degrees)
00061		Instantaneous stream flow (ft ³ /sec)	89866		Average width of natural riparian vegetation (m)
89835		Indicate flow measurement method 1=Flow Gage Station, 2= Electronic, 3=Mechanical, 4=Weir/Flume, 5=Doppler	89849		Average percent trees as riparian vegetation, over reach (%)
			89850		Average percent shrubs as riparian vegetation, over reach (%)
89848		Channel Flow Status 1=no flow, 2=low, 3=moderate, 4=high	89851		Average percent grasses and forbes as riparian vegetation, over reach (%)
89864		Maximum pool width at time of study (m)	89852		Average percent cultivated fields as riparian vegetation, over reach (%)
89865		Maximum pool depth in study area (m)	89853		Average percent other as riparian vegetation, over reach (%)
89839		Total number of stream bends	89854		Average percent tree canopy coverage (%)
89840		Number of well-defined stream bends	89867		Aesthetics (1=wilderness, 2=natural, 3=common, 4=offensive)
89841		Number of moderately defined stream bends	84161		Stream Order
89842		Number of poorly defined stream bends	89961		Ecoregion (Texas Ecoregion Code)
89843		Total number of riffles	89962		Land Development Impact (1=unimpacted, 2=low, 3=moderate, 4=high)

Page 1 of ____		Part I - Stream Physical Characteristics Worksheet	
Observers:		Date:	Time:
Weather conditions:			
Stream:		Stream segment no.	
Location of site:		Length of reach:	
Observed stream uses:			
Stream type (circle one): perennial or intermittent w/ perennial pools			
Stream bends:	No. well defined	No. moderately defined	No. poorly defined
Aesthetics (circle one): (1) wilderness (2) natural (3) common (4) offensive			
Channel obstructions or modifications:			No. of riffles
Channel flow status (circle one): high moderate low no flow			
Riparian vegetation (%):	Left Bank	Right Bank	Maximum Pool Depth:
Trees			Maximum Pool Width:
Shrubs			Notes
Grasses or forbs			
Cultivated fields			
Other			
Site map:			

Part I - Stream Physical Characteristics Worksheet (continued)

Date: _____ Stream Name: _____

Location of transect	Stream width (m)	Left bank slope (°)	Left bank erosion potential (%)	Stream Depths (m) at Points Across Transect										Right bank slope (°)	Right bank erosion potential (%)	Tree canopy (%)	
				Thalweg Depth:												Total	
	Habitat type (circle one) Riffle Run		Dominant substrate type			Dominant types riparian vegetation:										% Gravel or larger	CL
Glide Pool					Left bank: Right bank:										CR		
Macrophytes (circle one) Abundant Common Rare Absent	Algae (circle one) Abundant Common Rare Absent	Width of natural buffer vegetation (m)		Instream cover types:										% Instream cover	LB		
		LB:	RB:												RB		
Location of transect	Stream width (m)	Left bank slope (°)	Left bank erosion potential (%)	Stream depths (m) at points across transect										Right bank slope (°)	Right bank erosion potential (%)	Tree canopy (%)	
				Thalweg depth:												Total	
	Habitat type (Circle One) Riffle Run		Dominant substrate type			Dominant types riparian vegetation:										% Gravel or larger	CL
Glide Pool					Left bank: Right bank:										CR		
Macrophytes (circle one) Abundant Common Rare Absent	Algae (circle one) Abundant Common Rare Absent	Width of natural buffer vegetation (m)		Instream cover types:										% Instream cover	LB		
		LB:	RB:												RB		

Part I - Stream Physical Characteristics Worksheet (continued)

Date: _____ Stream Name: _____

Location of transect	Stream width (m)	Left bank slope (°)	Left bank erosion potential (%)	Stream Depths (m) at Points Across Transect										Right bank slope (°)	Right bank erosion potential (%)	Tree canopy (%)	
				Thalweg Depth:												Total	
	Habitat type (circle one) Riffle Run		Dominant substrate type			Dominant types riparian vegetation:										% Gravel or larger	CL
Glide Pool					Left bank: Right bank:										CR		
Macrophytes (circle one) Abundant Common Rare Absent	Algae (circle one) Abundant Common Rare Absent	Width of natural buffer vegetation (m)			Instream cover types:										% Instream cover	LB	
		LB:	RB:											RB			

Location of transect	Stream width (m)	Left bank slope (°)	Left bank erosion potential (%)	Stream depths (m) at points across transect										Right bank slope (°)	Right bank erosion potential (%)	Tree canopy (%)	
				Thalweg depth:												Total	
	Habitat type (Circle One) Riffle Run		Dominant substrate type			Dominant types riparian vegetation:										% Gravel or larger	CL
Glide Pool					Left bank: Right bank:										CR		
Macrophytes (circle one) Abundant Common Rare Absent	Algae (circle one) Abundant Common Rare Absent	Width of natural buffer vegetation (m)			Instream cover types:										% Instream cover	LB	
		LB:	RB:											RB			

Part I - Stream Physical Characteristics Worksheet (continued)

Date: _____ Stream Name: _____

Location of transect	Stream width (m)	Left bank slope (°)	Left bank erosion potential (%)	Stream Depths (m) at Points Across Transect										Right bank slope (°)	Right bank erosion potential (%)	Tree canopy (%)				
																		Total		
	Habitat type (circle one) Riffle Run Glide Pool		Dominant substrate type			Dominant types riparian vegetation: Left bank: Right bank:										% Gravel or larger		CL		
Macrophytes (circle one) Abundant Common Rare Absent	Algae (circle one) Abundant Common Rare Absent	Width of natural buffer vegetation (m)		Instream cover types:										% Instream cover		LB				
		LB:	RB:																RB	

Location of transect	Stream width (m)	Left bank slope (°)	Left bank erosion potential (%)	Stream depths (m) at points across transect										Right bank slope (°)	Right bank erosion potential (%)	Tree canopy (%)				
																		Total		
	Habitat type (Circle One) Riffle Run Glide Pool		Dominant substrate type			Dominant types riparian vegetation: Left bank: Right bank:										% Gravel or larger		CL		
Macrophytes (circle one) Abundant Common Rare Absent	Algae (circle one) Abundant Common Rare Absent	Width of natural buffer vegetation (m)		Instream cover types:										% Instream cover		LB				
		LB:	RB:																RB	

Habitat Assessment Worksheet B Part II of III

Part II - Summary of Physical Characteristics of Water Body

Using information from all of the transects and measurements in Part I and other sources, report the following general characteristics or averages for the entire reach:

Stream Name	Date
Physical Characteristics	Value
Stream bed slope over evaluated reach (from USGS map; elevation change in meters/reach length in meters)	
Approximate drainage area above the transect furthest downstream (from USGS or county highway map in km ²)	
Stream order	
Length of stream evaluated (in meters or kilometers)	
Number of lateral transects made	
Average stream width (in meters)	
Average stream depth (in meters)	
Instantaneous stream flow (in ft ³ /sec)	
Indicate flow measurement method	
Channel flow status (high, moderate, low, or no flow)	
Maximum pool width (in meters)	
Maximum pool depth (in meters)	
Total number of stream bends	
Number of well defined bends	
Number of moderately defined bends	
Number of poorly defined bends	
Total number of riffles	
Dominant substrate type	
Average percent of substrate gravel sized or larger	
Average percent instream cover	
Number of stream cover types	
Average percent stream bank erosion potential	
Average stream bank slope (in degrees)	
Average width of natural buffer vegetation (in meters)	
Average riparian vegetation percent composition by: (total to equal 100%)	
Trees	
Shrubs	
Grasses and Forbes	
Cultivated fields	
Other	
Average percent tree canopy coverage	
Overall aesthetic appraisal of the stream	

Habitat Assessment Worksheet B Part III of III
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

Part III - Habitat Quality Index (continued)

Habitat Parameter	Scoring Category			
Bank Stability	Stable Little evidence (<10%) of erosion or bank failure; bank angles average <30°	Moderately Stable Some evidence (10-29.9%) of erosion or bank failure; small areas of erosion mostly healed over; bank angles average 30-39.9 °	Moderately Unstable Evidence of erosion or bank failure is common (30-50%); high potential of erosion during flooding; bank angles average 40-60 °	Unstable Large and frequent evidence (>50%) of erosion or bank failure; raw areas frequent along steep banks; bank angles average >60 °
Score_____	3	2	1	0
Channel Sinuosity	High ≥ 2 well-defined bends with deep outside areas (cut banks) and shallow inside areas (point bars) present	Moderate 1 well-defined bend <u>or</u> ≥ 3 moderately-defined bends present	Low <3 moderately-defined bends <u>or</u> only poorly-defined bends present	None Straight channel; may be channelized
Score_____	3	2	1	0
Riparian Buffer Vegetation	Extensive Width of natural buffer is >20 meters	Wide Width of natural buffer is 10.1-20 meters	Moderate Width of natural buffer is 5-10 meters	Narrow Width of natural buffer is <5 meters
Score_____	3	2	1	0
Aesthetics of Reach	Wilderness Outstanding natural beauty; usually wooded or unpastured area; water clarity is usually exceptional	Natural Area Trees and/or native vegetation are common; some development evident (from fields, pastures, dwellings); water clarity may be slightly turbid	Common Setting Not offensive; area is developed, but uncluttered such as in an urban park; water clarity may be turbid or discolored	Offensive Stream does not enhance the aesthetics of the area; cluttered; highly developed; may be a dumping area; water clarity is usually turbid or discolored
Score_____	3	2	1	0
Total Score _____				
HABITAT QUALITY INDEX 26 - 31 Exceptional 20 - 25 High 14 - 19 Intermediate ≤ 13 Limited				

Nekton Parameter Codes

NOTE: All measurements reported in metric units

Nekton Parameter Codes					
98005		Nekton, None Captured	98003		Total # Fish Species (Richness)
89944		Electrofishing Effort, Duration of Shocking (sec.)	98008		Total # of Sunfish Species (except bass)
89947		Seining Effort (# of Seine Hauls)	98010		Total # of Intolerant Fish Species
89948		Combined Length of Seine Hauls (meters)	98070		% of individuals as tolerant species (excluding western mosquitofish)
89949		Seining Effort, Duration (min.)	98017		Omnivore Individuals (% of community)
89930		Minimum Seine Mesh Size, net average bar (inches)	98021		Invertivore Individuals (% of community)
89931		Maximum Seine Mesh Size, net average bar (inches)	98022		Piscivore Individuals (% of community)
89941		Net Length (meters)	98039		Total # of Individuals, Seining
89943		Electrofishing Method (1= boat, 2=backpack, 3=tote barge)	98040		Total # of Individuals, Electrofishing
89976		Area Seined (m ²)	98062		# of individuals per seine haul
89961		Ecoregion (Texas Ecoregion Code)	98069		# of individuals per minute electrofishing
98032		Total # of Native Cyprinid Species	98052		Total # of Benthic Invertivore Species
98033		Individuals as Non-native Species (% of community)	98053		Total # of Benthic Species (catfish, suckers, and darters)
98030		Individuals with Disease / Anomalies (% of community)	84161		Stream Order
Additional Parameters					
89942		Net or Hook & Line Effort, Duration in Water (hrs)	89951		Cooling Water Intake Screen (1=revolving, 2=static)
89945		Castnetting Effort (# of casts)	89940		Intake Screen Collection, Duration (min.)
89907		Trawl, Otter, Duration (min.)	89953		Trawl, Otter, Width (meters)

**Quantitative Biological Scoring for Evaluating
Aquatic Life Use Subcategories
Regional Criteria Worksheets for Fish**

Ecoregions 27, 29, & 32

Stream Name:		Location:		Date:	
Collector:			County:		
No. seine hauls:		Electrofishing effort (min):			
Metric Category	Intermediate Totals for Metrics	Metric Name	Raw Value	IBI Score	
Species richness and composition	Drainage basin size (km ²)				
	Number of fish species		Number of fish species		
	Number of native Cyprinid species		Number of native Cyprinid species		
	Number of benthic invertivore species		Number of benthic invertivore species		
	Number of sunfish species		Number of sunfish species		
	Number of intolerant species		Number of intolerant species		
	Number of individuals as tolerants ^a		% of individuals as tolerant species ^a		
Trophic composition	Number of individuals as omnivores		% of individuals as omnivores		
	Number of individuals as invertivores		% of individuals as invertivores		
Fish abundance and condition	Number of individuals (seine)		Number of individuals in sample		
	Number of individuals (electrofishing)		Number of individuals/seine haul		
	Number of individuals in sample		Number of individuals/min electrofishing		
	# of individuals as non-native species		% of individuals as non-native species		
	# of individuals with disease/anomaly		% of individuals with disease/anomaly		
			Index of biotic integrity numeric score:		
			Aquatic life use:		
This data should be incorporated with water quality, habitat, and other available biological data to assign an overall stream score.					

^a Excluding western mosquitofish

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
Fish-Collection Data
Scientific-Collection Permit No. _____

Water body:*		Date:*	Time:*
Location:*			
Station no.:		County:*	
Weather:		Lat/Long:	
Secchi depth (m):	Flow (cfs):	Avg depth:	Max depth:
Water temp (1'):	DO (1'):	Spec cond (1'):	pH (1'):
Collectors:**			
Gear Used			
Boat-Mounted Electrofisher	Low range:	High range:	AC or DC?
	Pulses/sec:	% on:	
	Amps: ____ A	Duration: ____ sec	
Backpack Electrofisher	Voltage ____ V	Frequency ____ pps	
	Pulse width ____ msec		Duration ____ sec
Gill net	Mesh size:	Length:	Duration of set:
Trawl	Width:	No. hauls _____	Duration of haul:
Seine	Length:	No. hauls _____	Duration of haul:
Cast net	Diameter:	No. casts _____ or Duration of casting:	
Other (specify)			
Habitat(s) sampled:			
Observations/comments:			
<p>* Required information when reporting fish-collection data to the Texas Parks and Wildlife Department. Holders of scientific-collection permits are required to submit an annual collection summary to the TPWD.</p> <p>** Collectors must be listed in Appendix I of the scientific-collection permit. Each permit contains detailed requirements.</p>			

TCEQ Fish Sample Tracking Log

Sample tracking log number:		TCEQ Station ID:	
Location description:			
Collector(s):			
Identifier(s):			
Dates			
Collected	Entered into Log	Transferred to EtOH	Identified
Methods			
Seine hauls:	Electrofishing (secs.):	Gill net duration:	Other:

Sample tracking log number:		TCEQ Station ID:	
Location description:			
Collector(s):			
Identifier(s):			
Dates			
Collected	Entered into Log	Transferred to EtOH	Identified
Methods			
Seine hauls:	Electrofishing (secs.):	Gill net duration:	Other:

Sample tracking log number:		TCEQ Station ID:	
Location description:			
Collector(s):			
Identifier(s):			
Dates			
Collected	Entered into Log	Transferred to EtOH	Identified
Methods			
Seine hauls:	Electrofishing (secs.):	Gill net duration:	Other:

Benthic Macroinvertebrate Parameter Codes

NOTE: Measurements reported in metric units

**** Indicates Parameter Measured at Sample Point (e.g. riffle from which benthic sample is collected)**

RBAP Benthic Sample Descriptors			
89899		Biological Data Reporting Units (Values: 1= number of individuals from sub-sample; 2 = number of individuals/ft ² ; 3 = number of individuals/m ² ; 4 = total number in kicknet)	89946
			Mesh size, sieve (diagonal measurements) (cm)
89950		Benthic Sampler (1=Surber, 2=Ekman, 3=kicknet, 4=Petersen, 5=Hester-Dendy)	89961
			Ecoregion (Texas Ecoregion Code)
89902		Dip Net Effort, area swept (m ²)	84161
			Stream Order
89903		Kicknet Effort, area kicked (m ²)	90005
			Benthos Sampled--No Organisms Present
89904		Kicknet Effort, minutes kicked (min.)	90055
			Total Taxa (Taxa Richness), Benthos, # Taxa
89905		Snags and Shoreline Sampling Effort, minutes picked	90008
			EPT Taxa Abundance (# Taxa)
89906		Number of individuals in benthic RBA sub-sample (∇ 100)	90007
			90062
			Biotic Index (HBI)
**89921		Percent undercut bank at sample point (%)	90042
			Chironomidae (% of community)
**89922		Percent overhanging brush at sample point (%)	90010
			Dominant Taxon, Benthos (% of community)
**89923		Percent gravel substrate at sample point (%)	90036
			Dominant Functional Feeding Group (% of community)
**89924		Percent sand substrate at sample point (%)	90050
			Benthic Predators (% of community)
**89925		Percent soft bottom at sample point (%)	90069
			Ratio of Intolerant: Tolerant Taxa
**89926		Percent macrophyte bed at sample point (%)	90052
			% of Total Trichoptera as Hydropsychidae
**89927		Percent snags and brush at sample point (%)	90025
			Total # Non-insect Taxa
**89928		Percent bedrock at sample point (%)	90054
			Benthic Collector-Gatherers (% of community)
			% of Total # as Elmidae (% of community)

**Metrics and Scoring for Kick Samples
Rapid Bioassessment Protocol
Benthic Macroinvertebrates Worksheet**

Stream Name:				
Date:		Collectors:		
Location:				
County:		Ecoregion Number:		
Type of Assessment:	UAA	ALA	ALM	RWA
Metric	Value			Score
1. Taxa Richness				
2. EPT Taxa Abundance				
3. Biotic Index (HBI)				
4. % Chironomidae				
5. % Dominant Taxon				
6. % Dominant FFG				
7. % Predators				
8. Ratio of Intolerant:Tolerant Taxa				
9. % of Total Trichoptera as Hydropsychidae				
10. # of Non-Insect Taxa				
11. % Collector-Gatherers				
12. % of Total Number as Elmidae				
Aquatic Life Use Point Score Ranges:	Exceptional: > 36 High: 29-36 Intermediate: 22-28 Limited: < 22			
Total Score:				
Aquatic Life Use:				

TCEQ Benthic Macroinvertebrate Sample Tracking Log

Sample tracking log number:
Name of collector:
TCEQ Station ID:
Location description:
Date of collection:
Date entered in sample tracking log:
Date identification started:
Date identification completed:
Method of collection:

Sample tracking log number:
Name of collector:
TCEQ Station ID:
Location description:
Date of collection:
Date entered in sample tracking log:
Date identification started:
Date identification completed:
Method of collection:

Sample tracking log number:
Name of collector:
TCEQ Station ID:
Location description:
Date of collection:
Date entered in sample tracking log:
Date identification started:
Date identification completed:
Method of collection: