Appendix K to the Houston-Galveston Area Council Clean Rivers Program FY 2016/2017

Biological Monitoring at Selected Locations in the H-GAC Region

Prepared by the Houston-Galveston Area Council (H-GAC) in cooperation with the Texas Commission on Environmental Quality (TCEQ)

Effective: June 12, 2017

Questions concerning this QAPP should be directed to:
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SS-A1 Approval Page

Texas Commission on Environmental Quality

Water Quality Planning Division

Electronically signed 6/9/2017

Sarah Eagle, Work Leader Date
Clean Rivers Program

Electronically signed 6/9/2017

Kelly Rodibaugh Date
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Clean Rivers Program

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Team Leader
Data Management and Analysis Team

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Houston-Galveston Area Council (H-GAC)

Electronically signed 6/9/2017

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Todd Running Date
H-GAC Project Manager

Electronically signed 6/10/2017

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Jean Wright Date
H-GAC Quality Assurance Officer

The H-GAC will secure written documentation from each sub-tier project participant (e.g., subcontractors, other units of government) stating the organization's awareness of and commitment to requirements contained in this quality assurance project plan and any amendments or added appendices of this plan. Alternatively, additional signature blocks for primary sub-tier participants have been added to section A1. Signatures in section A1 will eliminate the need to adherence letters to be maintained. The H-GAC will maintain this documentation as part of the project's quality assurance records, and will ensure the documentation is available for review.

ENVIRONMENTAL INSTITUTE OF HOUSTON – UNIVERSITY OF HOUSTON CLEAR LAKE (EIH)

Electronically signed 6/9/2017

_____

Dr. George Guillen Date
EIH CRP Project Manager

Electronically signed 6/9/2017

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Jenny Oakley Date
EIH Field Quality Assurance Officer

Eastex Environmental Laboratory

Electronically signed 6/12/2017

Pam Hickman Date
Eastex Laboratory Director

Electronically signed 6/12/2017

Daniel Bowen Date
Eastex Laboratory Quality Assurance Officer

SS-A2 Table of Contents

List of Acronyms

As described in Section A2 of the basin-wide QAPP plus a few additions found only in this Appendix.

7Q2	Minimum 7-day, 2-year discharge
ADV	Acoustic Doppler Velocimeter
BLOBs	Binary Large Objects
DOC	Demonstration of Capability
DQO	Data Quality Objective
NELAC	National Environmental Lab Accreditation Conference
RBP	Rapid Bioassessment Protocol
RWA	Receiving Water Assessment
SS	Special Study
SWQMIS	Surface Water Quality Monitoring Information System
USGS	United State Geological Survey

SS-A3 Distribution List

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The Houston-Galveston Area Council will provide copies of this project plan and any amendments or appendices of this plan to each person on this list and to each sub-tier project participant, e.g., subcontractors, other units of government. H-GAC will document distribution of the plan and any amendments and appendices, maintain this documentation as part of the project's quality assurance records, and will ensure the documentation is available for review.

Sub-Tier Participating Organizations to receive copies of the Appendix include: The Environmental Institute of Houston and Eastex Environmental Laboratory

SS-A4 PROJECT / TASK ORGANIZATION

Description of Responsibilities

TCEQ

Sarah Eagle
CRP Work Leader
As described in the FY2016-2017 basin-wide QAPP, Section A4.

Sharon R. Coleman
Acting Lead CRP Quality Assurance Specialist
As described in the FY2016-2017 basin-wide QAPP, Section A4.

Kelly Rodibaugh
CRP Project Manager & Project Quality Assurance Specialist
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Environmental Institute of Houston (EIH) University of Houston Clear Lake (UHCL)

Dr. George Guillen
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Eastex Environmental Laboratory

Pam Hickman
Laboratory Director - Eastex Environmental Laboratory (Contract Lab)
As described in the FY2016-2017 basin-wide QAPP, Section A4.

Daniel Bowen
Eastex Lab QAO
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SS-A5 Problem Definition / Background

The primary goal of the H-GAC Clean Rivers Program is to provide the appropriate quality assured data to allow continuing assessment and management of water quality in the San Jacinto River Basin as well as four other basins located in the region. Objectives of this monitoring program include local participation in the collection and submittal of quality-assured data to assist the TCEQ in attaining reliable information concerning water quality conditions within the basin. Impairments and/or concerns are frequently carried forward due to the lack of current data sufficient enough to reassess a waterbody. To this end, H-GAC, in partnership with the Environmental Institute of Houston, University of Houston – Clear Lake (EIH), will be conducting biological monitoring and habitat assessments on two stream segments that had concerns carried forward in the *2014 Texas Integrated Report* approved by EPA in November 2015.

Assessment Unit (AU) 1008A_01, is a perennial stream from the normal pool elevation of Neidigk Lake upstream to the confluence of Hurricane Creek and Kickapoo Creek. This assessment unit has a high aquatic life use (ALU) designation and is currently impaired for dissolved oxygen. Mill Creek is at the edge of the greater Houston 'growth boundary' and is expected to become more urbanized over time. There is one monitoring site located on this section of Mill Creek – site 21957. Site 21957 is located at the intersection of Mill Creek with FM 149, north of Tomball, TX.

Assessment Unit AU 1013A_01, on Segment 1013, is an urban perennial stream with an intermediate ALU designation. There are two monitoring stations on this AU – sites 11148 and 16648. Although Little White Oak Bayou tracks along the I-45 corridor, going underground via culverts under the freeway in a few locations, there is a reach of 685 meters on which to conduct the stream habitat assessment above routine monitoring site 11148.

The purpose of this Special Study QAPP Appendix is to define the quality assurance processes with respect to this project. Data describing the physical, chemical, and biological characteristics of each waterbody will be collected.

This Special Study QAPP Appendix will be reviewed and approved by the TCEQ to ensure that data generated for the purposes described are scientifically valid and legally defensible. This review and approval process will also ensure that all project data submitted to SWQMIS have been collected, analyzed, and handled in ways that are consistent with existing protocol to ensure data quality compatibility.

SS-A6 Project/Task Description

EIH will conduct Aquatic Life Monitoring at 2 locations in the San Jacinto River Basin (Basin 10). The 2 selected sites are located on Mill Creek (Segment 1008A_01) and Little White Oak Bayou (Segment 1013A_01). These sites were selected because TCEQ's 2014 Integrated Report identified these sites as being on the 303D List for having depressed dissolved oxygen (DO) and other water quality issues. More data is needed to evaluate their current status. All sampling associated with this project will be completed between the execution date of this appendix to the QAPP and the end of August 2017.

All monitoring will be conducted in accordance with TCEQ's *Surface Water Quality Monitoring Procedures Manual, Volume 1: Physical and chemical Monitoring Methods (RG-415, Revised August 2012)* and *Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data (RG-416, Revised May 2014)* plus the applicable updates to Volume 1 & Volume 2. Two sampling events will be conducted at each of the 2 selected locations. Both monitoring events will be collected during the index period with one event conducted in the non-critical period and one event conducted during the critical period as defined by TCEQ. All monitoring events will be completed at least 30 days apart and when stream conditions reflect normal flow conditions. Data to be collected during each event will include field multi-probe parameters, diel (24-hour) measurements, routine water chemistry samples, flow measurements and observations, a fish survey, a benthic macroinvertebrate survey, and a stream physical habitat survey. Additionally, the following items will be submitted to the TCEQ with all data submittals: copies of field notes and forms, latitude/longitude coordinates of each reach, color photographs, and the required biological data documentation as described in the DMRG. All data and files submitted will conform to the requirements set forth in the DMRG (most recent version). Biological data requirements are specifically addressed in chapter 12 of the DMRG which include the submission of BLOBs. The data will be analyzed using the regional approach as outlined in the *Regionalization of the Index of Biotic Integrity for Texas Streams* currently used by the

TCEQ. All new data will be submitted to TCEQ using this approved regional metrics format.

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 H-GAC Project Manager to the CRP Project Manager electronically. Amendments are effective immediately upon approval by the H-GAC Project Manager, the H-GAC QAO, the CRP Project Manager, the CRP Lead QA Specialist and/or the TCEQ QA Manager (or designee), 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 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 this Appendix by way of attachment and distributed to personnel on the distribution list by the H-GAC Project Manager.

SS-A7 Quality Objectives and Criteria

The overall goal of this project is for EIH to collect environmental data describing the physical, chemical, and biological characteristics of each waterbody. Other uses TCEQ may use this data are to compare against the assigned water quality standards for each stream segments and aquatic life use designations/dissolved oxygen (DO) criteria. The data will be provided to the TCEQ and may be used in future water quality assessments and/or to make water quality management decisions for the two waterways.

During each event, EIH will collect field parameters, flow, and water samples to analyze for water quality parameters and bacteria. A sonde will be deployed to collect twenty-four hour data for the basic field parameters – temperature, conductivity, dissolved oxygen, and pH. Multi-parameter sondes will be deployed in accordance with the requirements outlined in *TCEQ's Surface Water Quality Monitoring (SWQM) Procedures, Volume 1: Physical and Chemical Monitoring Methods (RG-415, Revised August 2012)*. Additionally, EIH will collect habitat data, freshwater macrobenthic data per the rapid bio-assessment protocol (RBP), and freshwater nekton data according to procedures outlined in the most current *SWQM Procedures Manual, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data (RG-416, Revised May 2014)*.

All sampling events are to occur during the non-critical and critical periods (one sampling event during each period, as defined in the SWQM Procedures, Volume 2). Conditions during the sampling events should include stable, unscoured flow conditions, ideally when the flow is at or just above, the 7Q2 for the particular stream. If flow conditions are not stable or do not reflect baseline conditions, the sampling will be rescheduled. If an extreme weather event occurs, such as significant drought or

heavy rains, or if the stream has been dry, the sampling event will be delayed for an appropriate amount of time as determined by the SWQM Procedures, Volume 2. Data will be assigned a "BS" monitoring type code, representing biased-season monitoring, when submitted to TCEQ.

EIH will perform biological monitoring complete with vouchering of individual, representative fish species collected during seining and shocking efforts. Fish data collected by seining will be reported separately from fish data collected by shocking. Collected aquatic invertebrates will be preserved and stored. Habitat assessment and diel data along with field parameters and observations, water chemistry and bacteriological samples and flow will be collected when biological monitoring is performed. All biological monitoring will be performed per TCEQ's *Surface Water Quality Monitoring Procedures, Volume 1: Physical and chemical Monitoring Methods (RG-415, Revised August 2012)* and *Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data (RG-416, Revised May 2014)* plus the applicable updates to Volume 1 & Volume 2.

- Fish collection methods will include both seining and electrofishing. All fish data will be collected and submitted by collection type (seining or shocking). If unable to employ multiple gear types, effort will be increased accordingly using the available gear. To obtain information on the composition and integrity of the fish community, all collected fish will be identified and enumerated to promote an accurate representation of the fish community.
- Benthic macroinvertebrates will be collected using the rapid bioassessment protocols (RBPs) approved by TCEQ. The qualitative collection methods employed will include 5-minute kicknets and snag sampling. At least one representative of each benthic macroinvertebrate taxon collected will be preserved and retained as a voucher specimen. There are no plans to sample depositional habitats such as pools.
- Habitat assessments will be conducted by completing the 3 TCEQ assessment forms:
    - Stream Physical Characteristics Worksheet – Part I;
    - Summary of Physical Characteristics of Water Body – Part II; and
    - Habitat Quality Index (HQI) – Part III.

The measurement performance specifications (MPS) to support the project purpose for a minimum data set are specified in the SS-A7.1 tables found in SS–Appendix A. The MPS tables have been modified to reflect actual parameters, methods, etc. employed by EIH and the contract lab. In a few cases, alternative methods other than those listed in the shell table have been used. Procedures for laboratory analysis are in accordance with the most recently published edition of Standard Methods for the Examination of Water and Wastewater, 40 CFR 136.

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

Per the TCEQ *Surface Water Quality Monitoring Procedures Manual, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data (RG-416, Revised May 2014),* biological organisms should be collected and identified in a manner that accurately reflects the biological community composition at the time of sampling. Bioassessment data should be collected during the index period with one event conducted during critical conditions; the prevailing theory being that if the standards attainment criteria are met during the most stressful conditions, it is expected that these criteria would be met during other seasons as well. These two monitoring sites were chosen for this special study because of concerns carried forward from past Integrated Reports. They were also chosen because they are routine water quality monitoring stations currently being monitored by either a CRP partner or by the TCEQ Region 12 office. The sites represent conditions commonly found along the entire length of the waterway. They are located in the middle of each segment and are accessible with some effort. Investigators should find a good variety of microhabitats to sample while avoiding major tributaries and contaminant 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. Additionally, EIH personnel have attended TCEQ's Biological Monitoring Training Course. EIH's field QAO (or their designee) evaluates and documents each employee's demonstration of capabilities for their personnel files. These records are shared with H-GAC and made available during the routine monitoring systems audits.

SS-A9 Documents and Records

As described in Section A9 of the basin-wide QAPP. Plus, EIH shall complete documentation required by Chapter 12 of the DMRG, in BLOB format. All data, including biological, will be entered into SWQMIS. Data and biological attachments will be submitted in the formats required by the DMRG (most recent version).

Table SS-A9.1. Project Documents and Records: Environmental Institute of Houston (EIH)

Document/Record for PL	Location	Retention (yrs)	Format
QAPPs, amendments and appendices	TCEQ/H-GAC/EIH	7	Paper
Field SOPs	H-GAC/EIH	7	Paper
Laboratory QA Manuals	Eastex Lab	7	Current version – electronic & paper; prior versions paper only
Laboratory SOPs	Eastex Lab	7	Current version – electronic & paper; prior versions paper only
Laboratory Staff Training Records	Eastex Lab	7	Paper
QAPP distribution documentation	EIH	7	Paper
Field staff training records	H-GAC	7	Paper
Field equipment calibration/maintenance logs	EIH	7	Paper
Field instrument printouts	EIH	7	Paper
Field notebooks or data sheets	H-GAC/EIH	7	Paper
Data Summary Packets	H-GAC/EIH	7	Paper
Chain of custody records	H-GAC/EIH & Eastex Lab	7	Paper
Laboratory calibration records	Eastex Lab	7	Paper
Laboratory instrument printouts	Eastex Lab	7	Paper
Laboratory data reports/results	Eastex Lab	7	Paper
Laboratory equipment maintenance logs	Eastex Lab	7	Paper
Corrective Action Documentation	H-GAC/EIH &/or Eastex Lab	7	Paper

SS-B1 Sampling Process Design

The data collection design is summarized in Table B1.1 (Sample Design and Schedule) and Figure SS-B1 (Sample Site Maps). See Table A7.1 for a list of all parameters being collected under each category.

Sample Design Rationale and Site Selection Criteria

Biological sampling will be conducted twice during the Index/Critical Period of 2017 at two monitoring sites located on Assessment Units (AU) that are on the 303d List for concerns or impairments of one or more aquatic life use category. Each of these locations has been identified as needing additional or more current information to reassess the AU. Each of the locations selected will have field, flow, bacteria, and conventional lab parameters collected plus diel monitoring conducted along with habitat, microbenthic community and fish community assessments.

Table B1.1 Sample Design and Schedule, FY 2017

Site Description	Station ID	Waterbody ID	Region	SE	CE	MT	24 hr DO	AqHab	Benthics	Nekton	Metal Water	Organic Water	Metal Sed	Organic Sed	Conventional Lab	Amb Tox Water	Amb Tox Sed	Bacteria	Flow	Fish Tissue	Field	Comments
MILL CREEK AT FM 149, NORTH OF TOMBALL	21957	1008A	12	HG	UI	BS	2	2	2	2					2			2	2		2	This special project is for FY2017 only
LITTLE WHITE OAK BAYOU AT TRIMBLE STREET/NORTH EDGE OF HOLLYWOOD CEMETERY IN HOUSTON	11148	1013A	12	HG	UI	BS	2	2	2	2					2			2	2		2	This special project is for FY2017 only

Figures SS-B1. Sampling Site Maps

Maps of stations monitored by the H-GAC are provided below. The maps were generated using Goggle Earth. These maps are 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 these maps, contact the Jean Wright at 713-499-6660.

Figure SS-B1a. Sampling Station 21957 located on Mill Creek at FM 149 north of Tomball, TX.

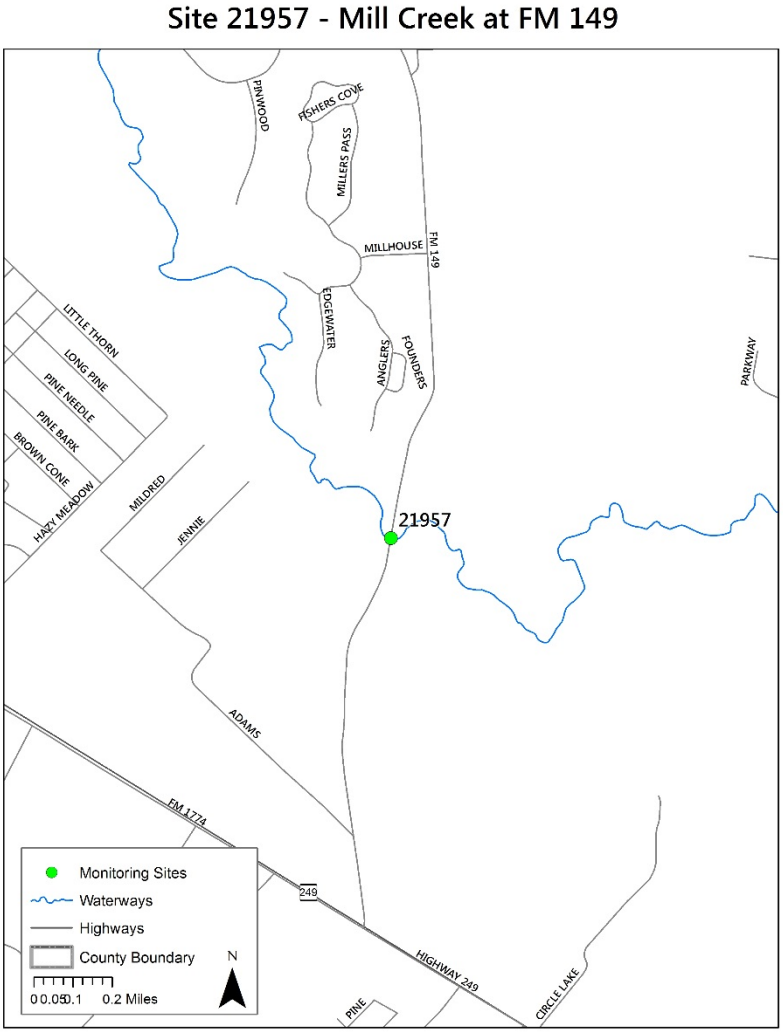
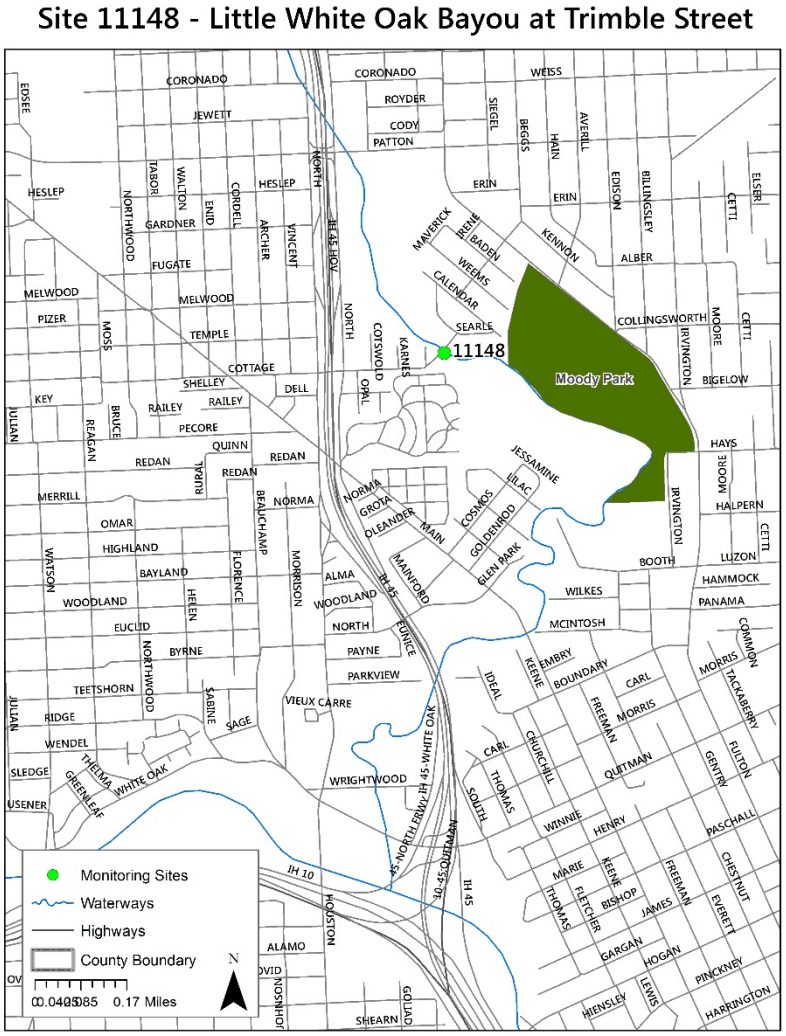


Figure SS-B1b. Sampling Station 11148 located on Little White Oak Bayou immediately upstream of Trimble Street, north of downtown Houston.



SS-B2 Sampling Methods

Field Sampling Procedures

Field sampling will be conducted using procedures documented in the TCEQ's *Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods (RG-415, Revised August 2012)* and *Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data (RG-416, Revised May 2014)*. Additional aspects outlined in Section B below reflect specific requirements for sampling under the Clean Rivers Program and/or provide additional clarification.

Field Monitoring and Conventional Water Quality Sampling Procedures

As described in Section B2 of the basin-wide QAPP, plus EIH investigators will deploy multi-probe data sondes for periods of 24-72 hours to capture the diel variation in temperature, DO, pH, and specific conductance, following the guidance for 24-hour DO measurements in the *SWQM Procedures, Volume 1*.

Hydrologic Monitoring Procedures

Hydrologic monitoring will be conducted using the standard method described in TCEQ's *Surface Water Quality Monitoring Procedures Volume 1: Physical and Chemical Monitoring Methods (RG-415, Revised August 2012)*. These data will include instantaneous discharge measurements that are collected during each sampling event using either a Sontek Flowtracker handheld acoustic doppler velocimeter (ADV), a Sontek M-9 River Surveyor (ADV), or the USGS gage station associated with the monitoring site.

Habitat Characterizations and Biological Monitoring Procedures

Habitat characterizations and biological monitoring will be conducted using procedures specified in TCEQ's *Surface Water Quality Monitoring Procedures Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data (RG-416, Revised May 2014).* Benthic macroinvertebrate samples will be collected for qualitative analysis using RBP procedures. Macroinvertebrates collected using the standard D-frame kicknet method will be supplemented (and combined) with individuals attached to snags located in riffles and/or runs. Nekton samples will be collected using both seining and electrofishing techniques from all habitats present. Each site's nekton samples will be processed and kept separate so that data from electrofishing and seining will not be combined into one sample. "Time fished over a fixed distance" will be recorded for each site. Habitat characterization will consist of observations and measurements from at least 5 transects at each site. In addition, general qualitative observations about the entire reach where the biotic assessments were conducted will be recorded. Voucher specimens and photographs will be taken at each location on each sampling event.

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

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

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

Parameter	Matrix	Container	Preservation	Sample Volume	Holding Time
TSS	water	Plastic	Cool to 4°C	1 L	7 days
Sulfate	water	Plastic	Cool to 4°C	100 ml[3]	28 days
Chloride	water	Plastic	Cool to 4°C	100 mL[3]	28 days
E. coli IDEXX Colilert[1]	water	Sterile Plastic w/ sodium thiosulfate	Cool to <6°C but not frozen	120 mL[4]	8 hours[1]
TKN	water	Plastic	Cool to 4°C H_2SO_4 to pH <2	500 mL[2]	28 days
Ammonia-N	water	Plastic	Cool to 4°C H_2SO_4 to pH <2	125 mL[2]	28 days
Nitrite + nitrate-N	water	Plastic	Cool to 4°C, H_2SO_4 to pH <2	125 mL[2]	28 days
Phosphorus-P, total	water	Plastic	Cool to 4°C H_2SO_4 to pH <2	125 mL[2]	28 days
Fish Vouchers	water	Plastic	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	As needed to submerge samples without crowding	7 days in Formalin, indefinite for isopropyl alcohol or ethanol
Benthic Macroinvertebrates	water	Plastic	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	As needed to submerge samples without crowding (no more than half full)	7 days in Formalin, indefinite for isopropyl alcohol or ethanol

1 *E.coli* samples analyzed by SM 9223-B should always be processed as soon as possible and within 8 hours. When transport conditions necessitate delays in delivery longer than 6 hours, the holding time may be extended and samples must be processed as soon as possible and within 30 hours.
2 Five tests are analyzed from one 1L plastic bottle.
3 One 500 mL plastic container is used to collect these three samples.
4. Maximum volume analyzed for E. coli is 50 ml allowing duplicate analyses from 1 container.

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. Additional forms for biological field work, identification/ enumeration bench sheets, and tracking logs can be found in Appendix SS-B.

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

Sample Tracking

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

Sample Labeling

As described in Section B3 of the basin-wide QAPP. Labeling of biological specimens will be completed as described in the TCEQ's *Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data (RG-416, Revised May 2014).*

Sample Handling

As described in Section B3 of the basin-wide QAPP plus any special handling of biological samples will be conducted using procedures outlined in TCEQ's *Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data (RG-416, Revised May 2014).*

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." Laboratory SOPs are consistent with EPA requirements, as specified in the method. Copies of laboratory QMs and SOPs are retained by Eastex Laboratory and are available for review by H-GAC or TCEQ upon request.

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

As described in Section B9 of the basin-wide QAPP. Only data collected directly under this QAPP is submitted to the SWQMIS database.

SS-B10 Data Management

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

Data Dictionary

Terminology and field descriptions are included in the most recent version of the DMRG. A table outlining the entities that will be used when submitting data under this QAPP is included below for the purpose of verifying which entity codes are included in this QAPP.

Name of Entity	Tag Prefix	Submitting Entity	Collecting Entity
Environmental Institute of Houston – University of Houston Clear Lake	I	HG	UI

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

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

SS-APPENDIX A – Measurement Performance Specifications

TABLE A7.1 Measurement Performance Specifications for Environmental Institute of Houston (EIH)

Field Parameters

Parameter	Units	Matrix	Method	Parameter Code	TCEQ 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
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
SALINITY - PARTS PER THOUSAND	PPT	water	SM 2520 and TCEQ SOP V1	00480	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
MAXIMUM POOL WIDTH AT TIME OF STUDY (METERS)***	meters	other	TCEQ SOP V2	89864	NA*	NA	NA	NA	NA	Field
MAXIMUM POOL DEPTH AT TIME OF STUDY(METERS)***	meters	other	TCEQ SOP V2	89865	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
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
WATER SURFACE(1=CALM,2=RIPPLE,3=WAVE,4=WHITECAP)	NU	water	NA	89968	NA	NA	NA	NA	NA	Field
TIDE STAGE 1=LOW,2=FALLING,3=SLACK,4=RISING,5=HI	NU	water	NA	89972	NA	NA	NA	NA	NA	Field
WATER COLOR (1=BROWNISH, 2=REDDISH, 3=GREENISH, 4=BLACKISH, 5=CLEAR, 6=OTHER)	NU	water	NA	89969						Field
WATER ODOR (1=SEWAGE, 2=OILY/CHEMICAL, 3=ROTTEN EGG, 4=MUSKY, 5=FISHY, 6=NONE, 7=OTHER)	NU	water	NA	89971						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

* Reporting to be consistent with SWQM guidance and based on measurement capability.
*** To be routinely reported when collecting data from perennial pools.
† As published by the Texas Water Development Board on their website http://wiid.twdb.state.tx.us/ims/resinfo/BushButton/lakestatus.asp?selcat=3&slbasin=2

References:
United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
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TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416)

TABLE A7.1 Measurement Performance Specifications for Environmental Institute of Houston (EIH)

Flow Parameters

Parameter	Units	Matrix	Method	Parameter Code	Lab
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

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.)
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TABLE A7.1 Measurement Performance Specifications for Environmental Institute of Houston (EIH)

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
RESIDUE, TOTAL NONFILTRABLE (MG/L)	mg/L	water	SM 2540 D	00530	5	1	NA	NA	NA	Eastex
NITROGEN, AMMONIA, TOTAL (MG/L AS N)	mg/L	water	SM 4500 NH3 - G	00610	0.1	0.1	70-130	20	80-120	Eastex
NITROGEN, KJELDAHL, TOTAL (MG/L AS N)	mg/L	water	SM 4500-NH3 C B; SM 4500-N_{org}	00625	0.2	0.2	70-130	20	80-120	Eastex
NITRITE PLUS NITRATE, TOTAL ONE LAB DETERMINED VALUE (MG/L AS N)	mg/L	water	SM 4500-NO3 - F	00630	0.05	0.04	70-130	20	80-120	Eastex
PHOSPHORUS, TOTAL, WET METHOD (MG/L AS P)	mg/L	water	SM 4500-P E	00665	0.06	0.02	70-130	20	80-120	Eastex
CHLORIDE (MG/L AS CL)	mg/L	water	SM 4500 Cl-C	00940	5	5	70-130	20	80-120	Eastex
SULFATE (MG/L AS SO4)	mg/L	water	ASTM D516	00945	5	5	70-130	20	80-120	Eastex

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.)

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TABLE A7.1g Measurement Performance Specifications for Environmental Institute of Houston (EIH)

Bacteriological Parameters in Water

Parameter	Units	Matrix	Method	Parameter Code	TCEQ AWRL	LOQ	LOQ Check Sample %Rec	Log Difference of Duplicates	Bias %Rec. of LCS	Lab
E. COLI, COLILERT, IDEXX METHOD, MPN/100ML	MPN/100 mL	water	Colilert-18 **	31699	1	1	NA	0.50*	NA	Eastex
E.COLI, COLILERT, IDEXX, HOLDING TIME	hours	water	NA	31704	NA	NA	NA	NA	NA	Eastex

* This value is not expressed as a relative percent difference. It represents the maximum allowable difference between the logarithm of the result of a sample and the logarithm of the duplicate result. See Section B5.

** E.coli samples analyzed by these methods should always be processed as soon as possible and within 8 hours. When transport conditions necessitate delays in delivery longer than 6 hours, the holding time may be extended and samples must be processed as soon as possible and within 30 hours.

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.)

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TABLE A7.1 Measurement Performance Specifications for Environmental Institute of Houston - University of Houston Clear Lake (EIH)

24 HourParameters in Water

Parameter	Units	Matrix	Method	Parameter Code	Lab
TEMPERATURE, WATER (DEGREES CENTIGRADE), 24HR AVG	DEG C	Water	TCEQ SOP V1	00209	field
WATER TEMPERATURE, DEGREES CENTIGRADE, 24HR MAX	DEG C	Water	TCEQ SOP V1	00210	field
TEMPERATURE, WATER (DEGREES CENTIGRADE) 24HR MIN	DEG C	Water	TCEQ SOP V1	00211	field
SPECIFIC CONDUCTANCE, US/CM, FIELD, 24HR AVG	uS/cm	Water	TCEQ SOP V1	00212	field
SPECIFIC CONDUCTANCE, US/CM, FIELD, 24HR MAX	uS/cm	Water	TCEQ SOP V1	00213	field
SPECIFIC CONDUCTANCE, US/CM, FIELD, 24HR MIN	uS/cm	Water	TCEQ SOP V1	00214	field
PH, S.U., 24HR MAXIMUM VALUE	std. units	Water	TCEQ SOP V1	00215	field
PH, S.U., 24HR, MINIMUM VALUE	std. units	Water	TCEQ SOP V1	00216	field
WATER TEMPERATURE, # OF MEASUREMENTS IN 24-HRS	NU	Water	TCEQ SOP V1	00221	field
SPECIFIC CONDUCTANCE, # OF MEASUREMENTS IN 24-HRS	NU	Water	TCEQ SOP V1	00222	field
pH, # OF MEASUREMENTS IN 24-HRS	NU	Water	TCEQ SOP V1	00223	field
DISSOLVED OXYGEN, 24-HOUR MIN. (MG/L) MIN. 4 MEA	mg/l	Water	TCEQ SOP V1	89855	field
DISSOLVED OXYGEN, 24-HOUR MAX. (MG/L) MIN. 4 MEA	mg/l	Water	TCEQ SOP V1	89856	field
DISSOLVED OXYGEN, 24-HOUR AVG. (MG/L) MIN. 4 MEA	mg/l	Water	TCEQ SOP V1	89857	field
DISSOLVED OXYGEN, # OF MEASUREMENTS IN 24-HRS	NU	Water	TCEQ SOP V1	89858	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.)
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TABLE A7.1 Measurement Performance Specifications for Environmental Institute of Houston - University of Houston Clear Lake (EIH)

Biological - Habitat					
Parameter	**Units**	**Matrix**	**Method**	**Parameter Code**	**Lab**
FLOW STREAM, INSTANTANEOUS (CUBIC FEET PER SEC)	cfs	Water	TCEQ SOP V2	00061	field
BIOLOGICAL DATA	NS	Other	NA/Calculation	89888	field
STREAM TYPE; 1=PERENNIAL 2=INTERMITTENT S/PERENNIAL POOLS 3=INTERMITTENT 4=UNKNOWN	NU	Water	NA/Calculation	89821	field
STREAMBED SLOPE (M/KM)	M/KM	Other	NA/Calculation	72051	field
AVERAGE PERCENTAGE INSTREAM COVER	%	Other	TCEQ SOP V2	84159	field
STREAM ORDER	NU	Water	TCEQ SOP V2	84161	field
NUMBER OF LATERAL TRANSECTS MADE	NU	Other	TCEQ SOP V2	89832	field
FLOW MTH 1=GAGE 2=ELEC 3=MECH 4=WEIR/FLU 5=DOPPLER	NU	Other	TCEQ SOP V2	89835	field
TOTAL NUMBER OF STREAM BENDS	NU	Other	TCEQ SOP V2	89839	field
NUMBER OF WELL DEFINED STREAM BENDS	NU	Other	TCEQ SOP V2	89840	field
NUMBER OF MODERATELY DEFINED STREAM BENDS	NU	Other	TCEQ SOP V2	89841	field
NUMBER OF POORLY DEFINED STREAM BENDS	NU	Other	TCEQ SOP V2	89842	field
TOTAL NUMBER OF RIFFLES	NU	Other	TCEQ SOP V2	89843	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	field
AVERAGE PERCENT OF SUBSTRATE GRAVEL SIZE OR LARGER	%	Other	TCEQ SOP V2	89845	field
AVERAGE STREAM BANK EROSION (%)	%	Other	TCEQ SOP V2	89846	field
AVERAGE STREAM BANK SLOPE (DEGREES)	deg	Other	TCEQ SOP V2	89847	field
HABITAT FLOW STATUS, 1=NO FLOW, 2=LOW,3=MOD,4=HIGH	NU	Other	TCEQ SOP V2	89848	field
AVERAGE PERCENT TREES AS RIPARIAN VEGETATION	%	Other	TCEQ SOP V2	89849	field
AVERAGE PERCENT SHRUBS AS RIPARIAN VEGETATION	%	Other	TCEQ SOP V2	89850	field
AVERAGE PERCENT GRASS AS RIPARIAN VEGETATION	%	Other	TCEQ SOP V2	89851	field
AVERAGE PERCENT CULTIVATED FIELDS AS RIPARIAN VEGETATION	%	Other	TCEQ SOP V2	89852	field
AVERAGE PERCENT OTHER AS RIPARIAN VEGETATION	%	Other	TCEQ SOP V2	89853	field
AVERAGE PERCENTAGE OF TREE CANOPY COVERAGE	%	Other	TCEQ SOP V2	89854	field
DRAINAGE AREA ABOVE MOST DOWNSTREAM TRANSECT*	km2	Other	TCEQ SOP V2	89859	field
REACH LENGTH OF STREAM EVALUATED (M)	m	Other	NA/Calculation	89884	field
AVERAGE STREAM WIDTH (METERS)	M	Other	TCEQ SOP V2	89861	field
AVERAGE STREAM DEPTH (METERS)	M	Other	TCEQ SOP V2	89862	field
MAXIMUM POOL WIDTH AT TIME OF STUDY (METERS)	M	Other	TCEQ SOP V2	89864	field
MAXIMUM POOL DEPTH AT TIME OF STUDY(METERS)	M	Other	TCEQ SOP V2	89865	field
AVERAGE WIDTH OF NATURAL RIPARIAN VEGETATION (M)	M	Other	TCEQ SOP V2	89866	field
AVERAGE WIDTH OF NATURAL RIPARIAN BUFFER ON LEFT BANK (M)	M	Other	NA/Calculation	89872	field
AVERAGE WIDTH OF NATURAL RIPARIAN BUFFER ON RIGHT BANK (M)	m	Other	NA/Calculation	89873	field
AESTHETICS OF REACH(1=WILD 2=NAT. 3=COMM. 4=OFF.)	NU	Other	TCEQ SOP V2	89867	field
NUMBER OF STREAM COVER TYPES	NU	Other	TCEQ SOP V2	89929	field
LAND DEVELOP IMPACT (1=UNIMP,2=LOW,3=MOD,4=HIGH)	NU	Other	TCEQ SOP V2	89962	field
RIPARIAN VEGETATION %; LEFT BANK - TREES	%	Other	NA/Calculation	89822	field
RIPARIAN VEGETATION %; RIGHT BANK - TREES	%	Other	NA/Calculation	89823	field
RIPARIAN VEGETATION %; LEFT BANK SHRUBS	%	Other	NA/Calculation	89824	field
RIPARIAN VEGETATION %; RIGHT BANK - SHRUBS	%	Other	NA/Calculation	89825	field
RIPARIAN VEGETATION %: LEFT BANK - GRASSES OR FORBS	%	Other	NA/Calculation	89826	field

TABLE A7.1 Measurement Performance Specifications for Environmental Institute of Houston - University of Houston Clear Lake (EIH)

Biological - Habitat					
Parameter	Units	Matrix	Method	Parameter Code	Lab
RIPARIAN VEGETATION %; RIGHT BANK - GRASSES OR FORBS	%	Other	NA/Calculation	89827	field
RIPARIAN VEGETATION %: LEFT BANK - CULTIVATED FIELDS	%	Other	NA/Calculation	89828	field
RIPARIAN VEGETATION %: RIGHT BANK - CULTIVATED FIELDS	%	Other	NA/Calculation	89829	field
RIPARIAN VEGETATION %: LEFT BANK - OTHER	%	Other	NA/Calculation	89830	field
RIPARIAN VEGETATION %: RIGHT BANK - OTHER	%	Other	NA/Calculation	89871	field
AVAILABLE INSTREAM COVER HQI SCORE: 4=ABUNDANT 3=COMMON 2=RARE 1=ABSENT	NU	Other	NA/Calculation	89874	field
BOTTOM SUBSTRATE STABILITY HQI SCORE: 4=STABLE 3=MODERATELY STABLE 2=MODERATELY UNSTABLE 1=UNSTABLE	NU	Other	NA/Calculation	89875	field
NUMBER OF RIFFLES HQI SCORE: 4=ABUNDANT 3=COMMON 2=RARE 1=ABSENT	NS	Other	NA/Calculation	89876	field
DIMENSIONS OF LARGEST POOL HQI SCORE: 4=LARGE 3=MODERATE 2=SMALL 1=ABSENT	NU	Other	NA/Calculation	89877	field
CHANNEL FLOW STATUS HQI SCORE: 3=HIGH 2=MODERATE 1=LOW 0=NO FLOW	NU	Other	NA/Calculation	89878	field
BANK STABILITY HQI SCORE: 3=STABLE 2=MODERATELY STABLE 1=MODERATELY UNSTABLE 0=UNSTABLE	NU	Other	NA/Calculation	89879	field
CHANNEL SINUOSITY HQI SCORE: 3=HIGH 2=MODERATE 1=LOW 0=NONE	NU	Other	NA/Calculation	89880	field
RIPARIAN BUFFER VEGETATION HQI SCORE: 3=EXTENSIVE 2=WIDE 1=MODERATE 0=NARROW	NU	Other	NA/Calculation	89881	field
AESTHETICS OF REACH HQI SCORE: 3=WILDERNESS 2=NATURAL AREA 1=COMMON SETTING 0=OFFENSIVE	NU	Other	NA/Calculation	89882	field
HQI TOTAL SCORE	NU	Other	NA/Calculation	89883	field
LENGTH OF STREAM EVALUATED (KM)	KM	Other	NA/Calculation	89860	field
STREAMBED SLOPE (FT/FT)	FT/FT	Other	NA/Calculation	72052	field
NO FLOW ISOLATED POOL: LARGEST POOL MAX WIDTH (M	M	Other	NA/Calculation	89908	field
NO FLOW ISOLATED POOL: LARGEST POOL MAX LENGTH (	M	Other	NA/Calculation	89909	field
NO FLOW ISOLATED POOL: LARGEST POOL MAX DEPTH (M	M	Other	NA/Calculation	89910	field
NO FLOW ISOLATED POOL: SMALLEST POOL MAX DEPTH (	M	Other	NA/Calculation	89911	field
NO FLOW ISOLATED POOL: SMALLEST POOL MAX WIDTH (	M	Other	NA/Calculation	89912	field
NO FLOW ISOLATED POOL: SMALLEST POOL MAX LENGTH	M	Other	NA/Calculation	89913	field
NO FLOW ISOLATED POOLS: NUMBER OF POOLS EVALUATED	NU	Other	NA/Calculation	89914	field

* From USGS map.

References:

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

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TABLE A7.1 Measurement Performance Specifications for Environmental Institute of Houston - University of Houston Clear Lake (EIH)

Biological - Benthics (Quantitative)

Parameter	Units	Matrix	Method	Parameter Code	Lab
STREAM ORDER	NU	Water	TCEQ SOP V1	84161	field
BIOLOGICAL DATA	NS	Other	NA/Calculation	89888	field
QUANTITATIVE PROTOCOLS REGIONAL BENTHIC MACROINVERTEBRATE IBI SCORE	NS	Other	NA/Calculation	90085	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	field
SURBER SAMPLER EFFORT,AREA SAMPLED (SQ. METER)	m2	Other	TCEQ SOP V2	89901	field
UNDERCUT BANK AT COLLECTION POINT (%)	%	Other	TCEQ SOP V2	89921	field
OVERHANGING BRUSH AT COLLECTION POINT (%)	%	Other	TCEQ SOP V2	89922	field
GRAVEL BOTTOM AT COLLECTION POINT (%)	%	Sediment	TCEQ SOP V2	89923	field
SAND BOTTOM AT COLLECTION POINT (%)	%	Sediment	TCEQ SOP V2	89924	field
SOFT BOTTOM AT COLLECTION POINT (%)	%	Sediment	TCEQ SOP V2	89925	field
MACROPHYTE BED AT COLLECTION POINT (%)	%	Other	TCEQ SOP V2	89926	field
SNAGS AND BRUSH AT COLLECTION POINT (%)	%	Other	TCEQ SOP V2	89927	field
BEDROCK STREAMBED AT COLLECTION POINT (%)	%	Sediment	TCEQ SOP V2	89928	field
HESTER-DENDY DURATION (DAYS)	days	Other	TCEQ SOP V2	89933	field
PETERSEN SAMPLER EFFORT, AREA SAMPLED (SQ. MTR.)	m2	Other	TCEQ SOP V2	89934	field
EKMAN SAMPLER EFFORT, AREA SAMPLED (SQ.METER)	m2	Other	TCEQ SOP V2	89935	field
MESH SIZE, ANY NET OR SIEVE, AVERAGE BAR (CM)	cm	Other	TCEQ SOP V2	89946	field
BENTHIC SAMPLE COLLECTION METHOD (1=SURBER, 2=EKMAN, 3=KICKNET, 4=PETERSON, 5=HESTER DENDY, 6=SNAG, 7=HESS)	NU	Other	TCEQ SOP V2	89950	field
ECOREGION LEVEL III (TEXAS ECOREGION CODE)	NU	Other	TCEQ SOP V1	89961	field
AREA OF SNAG SURFACE SAMPLED (SQ.MT)	m2	Other	TCEQ SOP V2	89975	field
BENTHOS ORGANISMS -NONE PRESENT (0=NONE PRESENT)	NS	Other	TCEQ SOP V2	90005	field
BENTHIC GRAZERS, PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90020	field
BENTHIC GATHERERS, PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90025	field
BENTHIC FILTERERS, PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90030	field
TOTAL TAXA RICHNESS, BENTHOS	NU	Other	TCEQ SOP V2	90055	field
NUMBER OF DIPTERA TAXA	NU	Other	TCEQ SOP V2	90056	field
NUMBER OF EPHEMEROPTERA TAXA	NU	Other	TCEQ SOP V2	90057	field
TOTAL NUMBER OF INTOLERANT TAXA, BENTHOS	NU	Other	TCEQ SOP V2	90058	field
EPT, PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90060	field
CHIRONOMIDAE, PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90062	field
BENTHIC SHREDDERS (% OF COMMUNITY)	%	Other	TCEQ SOP V2	90035	field
TOTAL # OF FAMILIES IN BENTHIC SAMPLE	NU	Other	TCEQ SOP V2	90012	field
HESS SAMPLER EFFORT, AREA SAMPLED (SQ. METER)	m2	Other	TCEQ SOP V2	89956	field

TABLE A7.1 Measurement Performance Specifications for Environmental Institute of Houston - University of Houston Clear Lake (EIH)

Biological - Benthics (Quantitative)

Parameter	Units	Matrix	Method	Parameter Code	Lab
TOLERANT BENTHOS, PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90066	field
DOMINANT 3 TAXA, PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90067	field
TOTAL # OF BENTHIC GENERA IN SAMPLE	NU	Other	TCEQ SOP V2	90011	field

References:

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TABLE A7.1 Measurement Performance Specifications for Environmental Institute of Houston - University of Houston Clear Lake (EIH)

Biological - Benthics (Qualitative)

Parameter	Units	Matrix	Method	Parameter Code	Lab
STREAM ORDER	NU	Water	TCEQ SOP, V1	84161	field
BIOLOGICAL DATA	NS	Other	NA/Calculation	89888	field
RAPID BIOASSESSMENT PROTOCOLS BENTHIC MACROINVERTEBRATE IBI SCORE	NS	Other	NA/Calculation	90081	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	field
DIP NET EFFORT,AREA SWEPT (SQ.METER)	m2	Other	TCEQ SOP V2	89902	field
KICKNET EFFORT,AREA KICKED (SQ.METER)	m2	Other	TCEQ SOP V2	89903	field
KICKNET EFFORT,MINUTES KICKED (MIN.)	min.	Other	TCEQ SOP V2	89904	field
DEBRIS/SHORELINE SAMPLING EFFORT, MINUTES	min.	Other	TCEQ SOP V2	89905	field
NUMBER OF INDIVIDUALS IN BENTHIC SAMPLE	NU	Other	TCEQ SOP V2	89906	field
UNDERCUT BANK AT COLLECTION POINT (%)	%	Other	TCEQ SOP V2	89921	field
OVERHANGING BRUSH AT COLLECTION POINT (%)	%	Other	TCEQ SOP V2	89922	field
GRAVEL BOTTOM AT COLLECTION POINT (%)	%	Sediment	TCEQ SOP V2	89923	field
SAND BOTTOM AT COLLECTION POINT (%)	%	Sediment	TCEQ SOP V2	89924	field
SOFT BOTTOM AT COLLECTION POINT (%)	%	Sediment	TCEQ SOP V2	89925	field
MACROPHYTE BED AT COLLECTION POINT (%)	%	Other	TCEQ SOP V2	89926	field
SNAGS AND BRUSH AT COLLECTION POINT (%)	%	Other	TCEQ SOP V2	89927	field
BEDROCK STREAMBED AT COLLECTION POINT (%)	%	Sediment	TCEQ SOP V2	89928	field
PETERSEN SAMPLER EFFORT, AREA SAMPLED (SQ. MTR.)	m2	Other	TCEQ SOP V2	89934	field
EKMAN SAMPLER EFFORT, AREA SAMPLED (SQ.METER)	m2	Other	TCEQ SOP V2	89935	field
MESH SIZE, ANY NET OR SIEVE, AVERAGE BAR (CM)	cm	Other	TCEQ SOP V2	89946	field
BENTHIC SAMPLE COLLECTION METHOD (1=SURBER, 2=EKMAN, 3=KICKNET, 4=PETERSON, 5=HESTER DENDY, 6=SNAG, 7=HESS)	NU	Other	TCEQ SOP V2	89950	field
ECOREGION LEVEL III (TEXAS ECOREGION CODE)	NU	Other	TCEQ SOP V1	89961	field
BENTHOS ORGANISMS -NONE PRESENT (0=NONE PRESENT)	NS	Other	TCEQ SOP V2	90005	field
HILSENHOFF BIOTIC INDEX (HBI)	NU	Other	TCEQ SOP V2	90007	field
NUMBER OF EPT INDEX	NU	Other	TCEQ SOP V2	90008	field
DOMINANT BENTHIC FUNCTIONAL FEEDING GRP, % OF INDIVIDUALS	%	Other	TCEQ SOP V2	90010	field
BENTHIC GATHERERS, PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90025	field
BENTHIC PREDATORS, PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90036	field
DOMINANT TAXON, BENTHOS PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90042	field
RATIO OF INTOLERANT TO TOLERANT TAXA, BENTHOS	NU	Other	TCEQ SOP V2	90050	field
NUMBER OF NON-INSECT TAXA	NU	Other	TCEQ SOP V2	90052	field

TABLE A7.1 Measurement Performance Specifications for Environmental Institute of Houston - University of Houston Clear Lake (EIH)

Biological - Benthics (Qualitative)

Parameter	Units	Matrix	Method	Parameter Code	Lab
ELMIDAE, PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90054	field
TOTAL TAXA RICHNESS, BENTHOS	NU	Other	TCEQ SOP V2	90055	field
CHIRONOMIDAE, PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90062	field
PERCENT OF TOTAL TRICHOPTERA INDIVIDUALS AS HYDROPSYCHIDAE	%	Other	TCEQ SOP V2	90069	field
TOTAL # OF BENTHIC GENERA IN SAMPLE	NU	Other	TCEQ SOP V3	90011	field
BENTHIC SHREDDERS (% OF COMMUNITY)	%	Other	TCEQ SOP V2	90035	field
TOTAL # OF FAMILIES IN BENTHIC SAMPLE	NU	Other	TCEQ SOP V2	90012	field
HESS SAMPLER EFFORT, AREA SAMPLED (SQ. METER)	m2	Other	TCEQ SOP V2	89956	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).

TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.1 Measurement Performance Specifications for Environmental Institute of Houston - University of Houston Clear Lake (EIH)

Biological - Nekton					
Parameter	Units	Matrix	Method	Parameter Code	Lab
STREAM ORDER	NU	Water	TCEQ SOP V1	84161	field
NEKTON TEXAS REGIONAL IBI SCORE	NS	Other	NA/Calculation	98123	field
BIOLOGICAL DATA	NS	Other	NA/Calculation	89888	field
SEINE, MINIMUM MESH SIZE, AVERAGE BAR, NEKTON,IN	IN	Other	TCEQ SOP V2	89930	field
SEINE, MAXIMUM MESH SIZE, AVG BAR, NEKTON,INCH	IN	Other	TCEQ SOP V2	89931	field
NET LENGTH (METERS)	M	Other	TCEQ SOP V2	89941	field
ELECTROFISHING METHOD 1=BOAT 2=BACKPACK 3=TOTEBARGE	NU	Other	TCEQ SOP V2	89943	field
ELECTROFISH EFFORT, DURATION OF SHOCKING (SEC)	SEC	Other	TCEQ SOP V2	89944	field
SEINING EFFORT (# OF SEINE HAULS)	NU	Other	TCEQ SOP V2	89947	field
COMBINED LENGTH OF SEINE HAULS (METERS)	M	Other	TCEQ SOP V2	89948	field
SEINING EFFORT, DURATION (MINUTES)	MIN	Other	TCEQ SOP V2	89949	field
ECOREGION LEVEL III (TEXAS ECOREGION CODE)	NU	Other	TCEQ SOP V1	89961	field
AREA SEINED (SQ METERS)	M2	Other	TCEQ SOP V2	89976	field
NUMBER OF SPECIES, FISH	NU	Other	TCEQ SOP V2	98003	field
NEKTON ORGANISMS-NONE PRESENT (0=NONE PRESENT)	NS	Other	TCEQ SOP V2	98005	field
TOTAL NUMBER OF SUNFISH SPECIES	NU	Other	TCEQ SOP V2	98008	field
TOTAL NUMBER OF INTOLERANT SPECIES, FISH	NU	Other	TCEQ SOP V2	98010	field
PERCENT OF INDIVIDUALS AS OMNIVORES, FISH	%	Other	TCEQ SOP V2	98017	field
PERCENT OF INDIVIDUALS AS INVERTIVORES, FISH	%	Other	TCEQ SOP V2	98021	field
PERCENT OF INDIVIDUALS AS PISCIVORES, FISH	%	Other	TCEQ SOP V2	98022	field
PERCENT OF INDIVIDUALS WITH DISEASE OR ANOMALY	%	Other	TCEQ SOP V2	98030	field
TOTAL NUMBER OF NATIVE CYPRINID SPECIES	NU	Other	TCEQ SOP V2	98032	field
PERCENT INDIVIDUALS AS NON-NATIVE FISH SPECIES (% OF COMMUNITY)	%	Other	TCEQ SOP V2	98033	field
TOTAL NUMBER OF INDIVIDUALS SEINING	NU	Other	TCEQ SOP V2	98039	field
TOTAL NUMBER OF INDIVIDUALS ELECTROFISHING	NU	Other	TCEQ SOP V2	98040	field
TOTAL NUMBER OF BENTHIC INVERTIVORE SPECIES	NU	Other	TCEQ SOP V2	98052	field
TOTAL NUMBER OF BENTHIC FISH SPECIES	NU	Other	TCEQ SOP V2	98053	field
NUMBER OF INDIVIDUALS PER SEINE HAUL	NU	Other	TCEQ SOP V2	98062	field
NUMBER OF INDIVIDUALS PER MINUTE ELECTROFISHING	NU	Other	TCEQ SOP V2	98069	field
PERCENT INDIVIDUALS AS TOLERANT FISH SPECIES (EXCLUDING WESTERN MOSQUITOFISH)	%	Other	TCEQ SOP V2	98070	field
TOTAL NUMBER OF SUCKER SPECIES	NU	Other	TCEQ SOP V2	98009	field
PERCENT OF INDIVIDUALS AS HYBRIDS	%	Other	TCEQ SOP V2	98024	field
TOTAL NUMBER OF INDIVIDUALS IN SAMPLE, FISH	NU	Other	TCEQ SOP V2	98023	field
PERCENT OF INDIVIDUALS AS TOLERANTS, FISH	%	Other	TCEQ SOP V2	98016	field
TOTAL NUMBER OF DARTER SPECIES	NU	Other	TCEQ SOP V2	98004	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).

TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

SS-APPENDIX B – Field and Bench Sheets for Aquatic Life Monitoring and Habitat Assessments

Environmental Institute of Houston - University of Houston Clear Lake

Clean Rivers Program Field Data/Sampling Sheet

Station ID:_____ Date:_____ Sample Time: _____

Location:_____ Lat:_____ Long:_____

Collected By:_____

FIELD MEASUREMENTS (If < 1.5m deep - record @ 0.3m from surface; If≥ 1.5m deep - perform profile @ 0.3m from bottom, @ middle, and @ 0.3m from surface)

	1	2	3	4	5
Temp (C)					
Conductivity (uS)					
Salinity (psu)					
DO (%sat)					
DO mg/L					
pH					
Depth (m)					

FIELD OBSERVATIONS

	TOTAL DEPTH (m)		PRESENT WEATHER 1-clear 2-partly cloudy 3-cloudy 4-rain 5-other
	WATER ODOR 1-sewage 2-oily/chemical 3-rotten egg 4-musky 5-fishy 6-none 7-other		FLOW SEVERITY 1-no flow 2-low 3-normal 4-flood 5-high 6-dry
	WATER SURFACE 1-calm 2-ripples 3-waves 4-whitecap		FLOW (cfs)
	WIND INTENSITY 1-calm 2-slight 3-moderate 4-strong		FLOW METHOD 1-gage 2-electric 3-mechanical 4-weir/flume 5-doppler
	WATER COLOR 1-brownish 2-reddish 3-greenish 4-blackish 5-clear 6-other		SECCHI DISK (m)
	TIDE STAGE 1-low 2-falling 3-slack 4-rising 5-high		RECREATIONAL USE 1=1° observed, 2=2° observed, 3=non-contact observed, 4=1° evidence, 5=2° evidence, 6=non-contact evidence, 7=no evidence
	DAYS SINCE LAST SIG. RAINFALL		Primary Contact Rec. Observed (enter number of people)
			Evidence of Primary Contact Rec. Observed 0= no evidence observed, 1= evidence observed

WATER SAMPLES

☐ **FRESH** (Non-Tidal) ☐ **MARINE** (Tidal)

☐ *E. coli* ☐ *Enterococcus*

Field Split Collected (yes/no)

Container	Preservative	Analysis Requested	Comments
2 x 1L - Plastic	Ice	TSS	
2 x 1L - Plastic	Ice, 2 mL H_2SO_4 added	NH_3, TPO_4, NO_2+NO_3	
2 x 500ml - Plastic	Ice, 1 mL H_2SO_4 added	TKN	
2 x 500ml - Plastic	Ice	Cl, SO_4 (fresh water only)	
2 x 4L - Plastic (amber)	Ice	Chlorophyll-*a* (select sites)	
1 x 100ml - Plastic	Ice, $Na_2S_2O_3$ tablet	Bacteria (Entero and/or *E. coli*)	

ADDITIONAL INFORMATION & REMARKS

* If site is dry, determine if there is any pool with 500m reach, If pool(s) exists (> 10 m in length and 0.4m deep) record: Lat _____ Long_____ of largest pool in reach Maximum pool width_____(m), Maximum pool depth _____ (m), Pool length _____(m), and percent pool coverage in 500m reach _____%.

Elements of the Biological-Data Summary Packet

This document provides guidance for submitting biological data that are collected for routine ALMs, ALUs, UAAs, and RWAs. For guidance in the **collection** of the biological data, consult the text of this manual in conjunction with the current approved version of the *2012 Guidance for Assessing and Reporting Surface Water Quality in Texas*, available online at <www.tceq.texas.gov/assets/public/waterquality/swqm/assess/12twqi/2012_guidance.pdf>.

Items 1 to 4 below are the minimum data which that should be submitted to the TCEQ, in a packet, as part of any biological assessment. If submitting the data as part of a UAA, please also use the UAA Report Outline to ensure the summary of the collection efforts is complete. The TCEQ regional staff should submit the packets to the SWQM Team. CRP Planning Agencies and other cooperating authorities should submit packets to the appropriate TCEQ CRP or appropriate project manager. Item 5 is optional.

1. Checklist for aquatic-life monitoring and habitat assessment.
2. Biological assessment
   - TCEQ Nekton Biological-Data Reporting Form or equivalent for seining.
   - TCEQ Nekton Biological-Data Reporting Form or equivalent for electrofishing.
   - TCEQ Benthic Macroinvertebrate Biological-Data Reporting Form or equivalent.
3. Habitat assessment
   - TCEQ Habitat Reporting Form or equivalent.
   - Part I—Stream physical characteristics worksheet.
   - Part II—Summary of physical characteristics of water body.
4. Field-Data Reporting Form or equivalent and Stream Flow (Discharge) Measurement Form or equivalent.
5. Metric sets for biological and habitat assessments
   Ecoregion scoring criteria for determining ALU—nekton
   Scoring criteria for benthic macroinvertebrate rapid bioassessment
   - Scoring criteria for benthic macroinvertebrate quantitative samples (Surber)
   - Part III—Habitat-Quality Index

Checklist: Aquatic-Life Monitoring and Habitat Assessment

Background Information

Name of water body: _____

Segment number: _____ Station ID: _____

On segment? Yes No

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

Historic stream characterization:

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

Field data entry (FDE) information:

Date entered into FDE: _____ RTAG no.: _____
(TCEQ regional biologists only)

Field data (CRP partners only): Tag no.:

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 (March 15–June 30 and Oct. 1–Oct. 15) and critical period (July 1–Sept. 30).

Stream characterization event 1, date:

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

Note: If the sampling event is for an 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 the stream during each sampling event (for example, recent rains, drought, and 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

Method(s) used:

Rapid bioassessment (5-minute kicknet or snags):

Quantitative (Surber, snags, or dredge):

Habitat-assessment event 1

TCEQ habitat protocols? Yes No

Streamflow-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 not, please describe why:

Benthic-macroinvertebrate sampling event 2

Method(s) used:

Rapid bioassessment (5-minute kicknet or snags):

Quantitative (Surber, snags or dredge):

Habitat-assessment event 2:

TCEQ habitat protocols?	Yes	No

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

Streamflow-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

Nekton Data-Reporting Form

RTAG# | REGION | E-MAIL ID OF COLLECTOR

STATION ID | SEGMENT | SEQUENCE | DATA SOURCE

Station Description_____

Composite—coded as Space, Time, or Both

COMPOSITE SAMPLE

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

M M D D Y Y Y Y — START DATE

H H M M — START TIME

START DEPTH (SHALLOWEST) . — M = meters F = feet

M M D D Y Y Y Y — END DATE

H H M M — END TIME

END DEPTH (DEEPEST) . — M = meters F = feet

PARAMETRIC DATA

Enter the codes and values appropriate for this sample. Enter "<" or ">" if necessary; otherwise, leave this column blank. Continue, if necessary, on additional worksheets. Codes to describe the habitat-sampling effort are on the back.

Code	< or >	Value	Description

Choose the most characteristic location and report data from this location as representative of the entire reach.

Nekton Parameter Codes

Note: Report all measurements in metric units.

Codes					
98005		Nekton, None Captured	98003		Total No. Fish Species (Richness)
89944		Electrofishing Effort, Duration of Shocking (sec.)	98008		Total No. of Sunfish Species (except bass)
89947		Seining Effort (No. of Seine Hauls)	98010		Total No. 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 No. of Individuals, Seining
89943		Electrofishing Method (1 = boat, 2 = backpack, 3 = tote barge)	98040		Total No. of Individuals, Electrofishing
89976		Area Seined (m^2)	98062		No. of individuals per seine haul
89961		Ecoregion (Texas Ecoregion Code)	98069		No. of individuals per minute electrofishing
98032		Total No. of Native Cyprinid Species	98052		Total No. of Benthic Invertivore Species
98033		Individuals as Nonnative Species (% of community)	98053		Total No. of Benthic Species (catfish, suckers, and darters)
98030		Individuals with Disease or Anomalies (% of community)			
Additional Parameters					
89942		Net or Hook-and-Line Effort, Duration in Water (hrs.)	89951		Cooling-Water Intake Screen (1 = revolving, 2 = static)
89945		Castnetting Effort (No. of casts)	89940		Intake-Screen Collection, Duration (min.)
89907		Trawl, Otter, Duration (min.)	89953		Trawl, Otter, Width (meters)

Benthic Macroinvertebrate Data-Reporting Form

RTAG# | REGION | E-MAIL ID OF COLLECTOR

STATION ID | SEGMENT | SEQUENCE | DATA SOURCE

Station Description_____

Composite—coded as Space, Time, or Both

COMPOSITE SAMPLE

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

M M D D Y Y Y Y — START DATE

H H M M — START TIME

START DEPTH (SHALLOWEST) . — M = meters F = feet

M M D D Y Y Y Y — END DATE

H H M M — END TIME

END DEPTH (DEEPEST) . — M = meters

PARAMETRIC DATA

Enter the codes and values appropriate for this sample. Enter "<" or ">" if necessary; otherwise, leave this column blank. Continue, if necessary, on additional worksheets. Codes to describe the habitat-sampling effort are on the back.

Code	< or >	Value	Description

Choose the most characteristic location and report data from this location as representative of the entire reach.

Benthic-Macroinvertebrate Parameter Codes

Note: Report all measurements in metric units.
*Indicates parameter measured at sample point (for example, riffle from which benthic sample is collected)

Quantitative Benthic-Sample Descriptors					
89899		Biological-data reporting units (Values: 1= no. of individuals from subsample; 2 = no. of individuals/ft^2; 3 = no. of individuals/m^2; 4 = total no. in kicknet)	89946		Mesh size, any net or sieve (diagonal measurements) for benthic collection (cm)
89901		Surber-sampler effort, area sampled (m^2)	89961		Ecoregion (Texas Ecoregion Code)
89935		Ekman-sampler effort, area sampled (m^2)	84161		Stream order
89934		Petersen-sampler effort, area sampled ($m^{2)}$	90005		Benthos sampled—no organisms present
89933		Hester-Dendy duration (days)	90055		Total taxa (taxa richness), benthos no. taxa
89950		Benthic sampler (1 = Surber, 2 = Ekman, 3 = kicknet, 4 = Petersen, 5 = Hester-Dendy)	90056		Total no. of Diptera taxa
89975		Area of snag surface sampled (m^2)	90057		Total no. of Ephemeroptera taxa
*89921		Undercut bank at sample point (%)	90058		Total no. of intolerant taxa
*89922		Overhanging brush at sample point (%)	90060		EPT taxa (% of community)
*89923		Gravel substrate at sample point (%)	90062		Chironomidae (% of community)
*89924		Sand substrate at sample point (%)	90066		Tolerant taxa (% of community), benthos
*89925		Soft bottom at sample point (%)	90020		Benthic grazers (% of community)
*89926		Macrophyte bed at sample point (%)	90025		Benthic gatherers (% of community)
*89927		Snags and brush at sample point (%)	90030		Benthic filterers (% of community)
*89928		Bedrock at sample point (%)	90067		Dominance (3 taxa) (% of community)
RBAP Benthic Sample Descriptors					
89899		Biological-data reporting units (Values: 1 = no. of individuals from subsample; 2 = no. of individuals/ft^2; 3 = no. of individuals/m^2; 4 = total no. in kicknet)	89946		Mesh size, sieve (diagonal measurements) (cm)
89950		Benthic Sampler (1 = Surber, 2 = Ekman, 3 = kicknet, 4 = Petersen, 5 = Hester-Dendy)	89961		Texas Ecoregion Code
89902		Dip-net effort, area swept (m^2)	84161		Stream order
89903		Kicknet effort, area kicked (m^2)	90005		Benthos el
89904		Kicknet effort, minutes kicked (min.)	90055		Total taxa (taxa Richness), Benthos, no. taxa
89905		Snags-and-shoreline sampling effort, minutes picked	90008		EPT taxa abundance (no. taxa)
89906		Number of individuals in benthic RBA subsample (± 100)	90007		Biotic index (HBI)
89950		Benthic sampler (1= Surber, 2 = Ekman, 3 = kicknet, 4 = Petersen, 5 = Hester-Dendy)	90062		Chironomidae (% of community)
*89921		Undercut bank at sample point (%)	90042		Dominant taxon, benthos (% of community)
*89922		Overhanging brush at sample point (%)	90010		Dominant functional feeding group (% of community)
*89923		Gravel substrate at sample point (%)	90036		Benthic predators (% of community)
*89924		Sand substrate at sample point (%)	90050		Ratio of intolerant : tolerant taxa
*89925		Soft bottom at sample point (%)	90069		Total Trichoptera as Hydropsychidae (%)
*89926		Macrophyte bed at sample point (%)	90052		Total no. non-insect taxa
*89927		Snags and brush at sample point (%)	90025		Benthic collector-gatherers (% of community)
*89928		Bedrock at sample point (%)	90054		Total no. as Elmidae (% of community)

Habitat Data-Reporting Form

RTAG# | REGION | E-MAIL ID OF COLLECTOR

STATION ID | SEGMENT | SEQUENCE | DATA SOURCE

Station Description_____

Composite—code as Space, Time, or Both.

COMPOSITE SAMPLE

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

M M D D Y Y Y Y — START DATE

H H M M — START TIME

START DEPTH (SHALLOWEST) . — M = meters F = feet

M M D D Y Y Y Y — END DATE

H H M M — END TIME

END DEPTH (DEEPEST) . — M = meters F = feet

PARAMETRIC DATA

Enter the codes and values appropriate for this sample. Enter "<" or ">" if necessary; otherwise, leave this column blank. Continue, if necessary, on additional worksheets. Codes to describe the habitat-sampling effort are on the back.

Code	< or >	Value	Description

Choose the most characteristic location and report data from this location as representative of the entire reach.

Habitat Parameter Codes

HABITAT DESCRIPTORS					
NOTE: All measurements reported in metric units (except for flow)					
72051		Streambed slope over evaluated reach (from USGS map; elevation change in meters / reach length in kilometers)	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 substrate gravel > 2 mm or larger (%)
89860		Length of stream evaluated (km)	84159		Average instream cover (%)
89832		Number of lateral transects made	89929		Number of stream cover types
89861		Average stream width (m)	89846		Average stream-bank erosion (%)
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		Flow measurement method (1=flow-gage station, 2= electronic, 3=mechanical, 4=weir or flume)	89849		Average trees as riparian vegetation (%)
			89850		Average shrubs as riparian vegetation (%)
89848		Channel flow (1 = none, 2 = low, 3 = moderate, 4 = high)	89851		Average grasses and forbs as riparian vegetation (%)
89864		Maximum pool width at time of study (m)	89852		Average cultivated fields as riparian vegetation (%)
89865		Maximum pool depth in study area (m)	89853		Average other as riparian vegetation (%)
89839		Total number of stream bends	89854		Average 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		Texas Ecoregion Code
89843		Total number of riffles	89962		Land-development impact (1 = none, 2 = low, 3 = moderate, 4 = high)

Specific to No Flow with Isolated Pools

Largest pool (m)	89910		Max. depth
	89908		Max. width
	89909		Max. length
Smallest pool (m)	89911		Max. depth
	89912		Max. width
	89913		Max. length
No. perennial pools evaluated	89914		

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

Ecoregions 33 and 35					
Stream name:			**Location:**	**Date:**	
Collector:			**County:**		
No. seine hauls:			**Electrofishing effort (min.):**		
Metric Category	**Intermediate Totals for Metrics**		**Metric Name**	**Raw Value**	**IBI Score**
	Drainage basin size (km^2)				
Species richness and composition	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 tolerant species[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		
	Number of individuals as piscivores		% of individuals as piscivores		
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		
	Number of individuals as nonnative species		% of individuals as nonnative species		
	Number of individuals with disease or anomaly		% of individuals with disease or anomaly		
			Index of Biotic Integrity numeric score:		
			Aquatic-life use:		

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Note: These data should be incorporated with water quality, habitat, and other available biological data to assign an overall stream score.

[a] Excluding western mosquitofish.

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

Ecoregion 34					
Stream name:			**Location:**		**Date:**
Collector:			**County:**		
No. seine hauls:			**Electrofishing effort (min.):**		
Metric Category	**Intermediate Totals for Metrics**		**Metric Name**	**Raw Value**	**IBI Score**
	Drainage basin size (km^2)				
Species richness and composition	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		
	Number of individuals as nonnative species		% of individuals as nonnative species		
	Number of individuals with disease or anomaly		% of individuals with disease or anomaly		
			Index of Biotic Integrity numeric score:		
			Aquatic-life use:		

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Note: These data should be incorporated with water quality, habitat, and other available biological data to assign an overall stream score.

[a] Excluding western mosquitofish.

BIBI Metrics and Scoring for Kick Samples, Rapid Bioassessment Protocol—Benthic Macroinvertebrates

Stream name:		
Date:	**Collectors:**	
Location:		
County:	**Ecoregion No.:**	
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. % total Trichoptera as Hydropsychidae		
10. No. of non-insect taxa		
11. % Collector-gatherers		
12. % of total number as Elmidae		
Aquatic-life-use point-score ranges:	Exceptional: High: Intermediate: Limited:	> 36 29–36 22–28 < 22
Total score:		
Aquatic-life use:		

Metrics and Scoring for Surber Samples for Benthic Macroinvertebrates by Bioregion: Central, East, or North

Stream Name:						
Date:		**Collectors:**				
Location:						
County:		**Ecoregion #:**				
Type of assessment:		UAA	ALA	ALM	RWA	

Metric	**Value**	**Score**
1. Total taxa		
2. Diptera taxa		
3. Ephemeroptera taxa		
4. Intolerant taxa		
5. % EPT taxa		
6. % Chironomidae		
7. % Tolerant taxa		
8. % Grazers		
9. % Gatherers		
10. % Filterers		
11. % Dominance (3 taxa)		
Aquatic life use point score ranges:	Exceptional: High: Intermediate: Limited:	> 40 31–40 21–30 < 21
Total Score:		
Aquatic-Life Use:		

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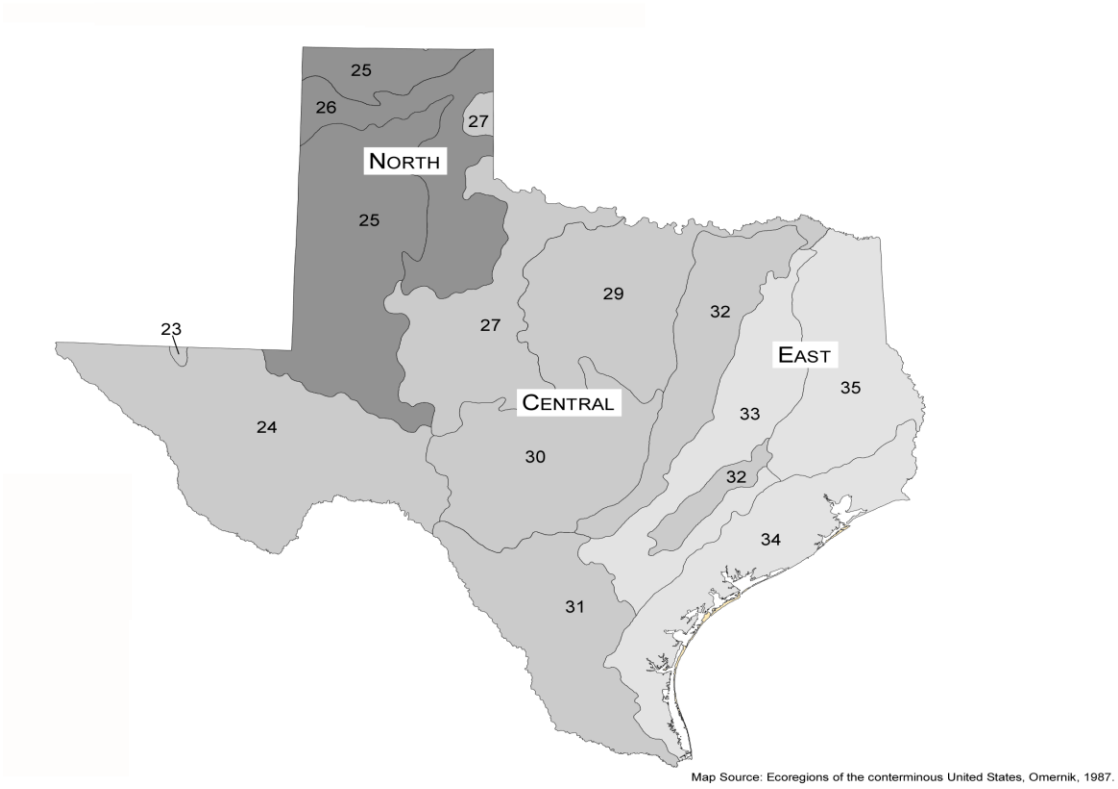
Note: This form should be used as part of the biological monitoring packet. If you chose to use another format, all information must be included.

Figure F.1. Macrobenthic bioregions (North, Central, East) and Level III ecoregions of Texas for use with Surber BIBI.



Level III Ecoregions of Texas

23 Arizona–New Mexico Mountains
24 Southern Deserts
25 Western High Plains
26 Southwestern Tablelands
27 Central Great Plains
29 Central Oklahoma–Texas Plains
30 Central Texas Plateau
31 Southern Texas Plains
32 Texas Blackland Prairies
33 East Central Texas Plains
34 Western Gulf Coastal Plain
35 South Central Plains

Streamflow (Discharge) Measurement Form

Streamflow (Discharge) Measurement Form

Stream:____Date:_______________
Station ____
Description:____
Time Began:____________ Time Ended: ____________Meter Type:______________
Observers: ______________Total Stream Width: ________Section Width (W):________
Observations:____

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

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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 with 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:			

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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 Thalweg Depth:	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
							CR
Macrophytes (circle one) **Abundant** **Common** **Rare** **Absent**	Algae (circle one) **Abundant** **Common** **Rare** **Absent**		Width of natural buffer vegetation (m) LB:	Instream cover types RB:		% Instream cover	LB
							RB

Location of Transect	Stream width (m)	Left-bank slope (°)	Left-bank erosion potential (%)	Stream depths (m) at points across transect Thalweg depth:	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
							CR
Macrophytes (circle one) **Abundant** **Common** **Rare** **Absent**	Algae (circle one) **Abundant** **Common** **Rare** **Absent**		Width of natural buffer vegetation (m) LB:	Instream cover types RB:		% Instream cover	LB
							RB

Location of transect	Stream width (m)	Left-bank slope (°)	Left-bank erosion potential (%)	Stream depths (m) at points across transect Thalweg depth:	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
							CR
Macrophytes (circle one) **Abundant** **Common** **Rare** **Absent**	Algae (circle one) **Abundant** **Common** **Rare** **Absent**		Width of natural buffer vegetation (m) LB:	Instream cover types RB:		% Instream cover	LB
							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 Thalweg Depth:	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
							CR
Macrophytes (circle one) **Abundant** **Common** **Rare** **Absent**	Algae (circle one) **Abundant** **Common** **Rare** **Absent**		Width of natural buffer vegetation (m) LB:	RB:	Instream cover types	% Instream cover	LB
							RB

Location of Transect	Stream width (m)	Left-bank slope (°)	Left-bank erosion potential (%)	Stream depths (m) at points across transect Thalweg depth:	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
							CR
Macrophytes (circle one) **Abundant** **Common** **Rare** **Absent**	Algae (circle one) **Abundant** **Common** **Rare** **Absent**		Width of natural buffer vegetation (m) LB:	RB:	Instream cover types	% Instream cover	LB
							RB

Location of transect	Stream width (m)	Left-bank slope (°)	Left-bank erosion potential (%)	Stream depths (m) at points across transect Thalweg depth:	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
							CR
Macrophytes (circle one) **Abundant** **Common** **Rare** **Absent**	Algae (circle one) **Abundant** **Common** **Rare** **Absent**		Width of natural buffer vegetation (m) LB:	RB:	Instream cover types	% Instream cover	LB
							RB

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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 kilometers)	
Approximate drainage area above the transect furthest downstream (from USGS or county highway map in km^2)	
Stream order	
Length of stream evaluated (meters or kilometers)	
Number of lateral transects made	
Average stream width (meters)	
Average stream depth (meters)	
Stream discharge (ft^3/sec)	
Flow measurement method	
Channel flow status (high, moderate, low, or no flow)	
Maximum pool width (meters)	
Maximum pool depth (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 (degrees)	
Average width of natural buffer vegetation (meters)	
Average percent composition of riparian vegetation by: (total to equal 100%)	
Trees	
Shrubs	
Grasses and forbs	
Cultivated fields	
Other	
Average percent of tree-canopy coverage	
Overall aesthetic appraisal of the stream	

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
Water Level	**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 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 < 30º	**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 **or** ≥ 3 moderately-defined bends present	**Low** < 3 moderately-defined bends **or** 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; no obvious indications of human activity	**Natural Area** Trees or native vegetation is common; some development evident (from fields, pastures, rural dwellings) little evidence of human activity	**Common Setting** Not offensive; area is developed, but uncluttered such as in an urban park	**Offensive** Stream does not enhance the aesthetics of the area; cluttered; highly developed; may be a dumping area
Score_____	3	2	1	0
Total Score_____				

Habitat-Quality Index

26– 31	**Exceptional**
20–25	**High**
14– 19	**Intermediate**
≤ 13	**Limited**

Example Laboratory Bench Sheet: Fish

Laboratory Bench Sheet: Fish			**Page ____ of _____**
Stream Name:		Location:	
Station No.:	Log No.:	River Basin:	County:
Date Collected:	Time:	Collector:	
Date Identified:		Identifier:	
Sample Type:		Rep No. _____ of _____ (if applicable)	
Tag ID:		Sample-Set ID:	
Collection Method: Electrofishing Seining Other			

Taxon	**No. of Individuals**	**Parameter Code**	**Trophic Group**	**Tolerance**

Example Laboratory Bench Sheet: Benthic Macroinvertebrates

Laboratory Bench Sheet: Benthic Macroinvertebrates			**Page ____ of _____**
Stream Name:		Location:	
Station No.:	Log No.:	River Basin:	County:
Date Collected:	Time:	Collector:	
Date Identified:		Identifier:	
Sample Type:			Rep No. _____ of _____ (if applicable)
Tag ID:			Sample-Set ID:
Collection Method: Kicknet Snag Sample Surber Multiplate Other			

Taxon	No. of Individuals	Parameter Code	Tolerance Value	Functional Group