Table A7.1 - Data Quality Objectives for Field and Laboratory Measurements

PARAMETER	UNITS	MATRIX	METHOD	STORET	AWRL	PRECISION of laboratory duplicates (RPD)	ACCURACY at AWRLS (%Rec.)	ACCURACY of lab matrix spikes (%Rec.)	LABORATORY PERFORMING ANALYSIS
Field Parameters									
pH	pH/ units	water	SM 4500-H^+ B. and TNRCC SOP	00400	NA[1]	NA	NA	NA	GBRA/UGRA
DO	mg/L	water	SM 4500-O G. and TNRCC SOP	00300	NA[1]	NA	NA	NA	GBRA/UGRA
Conductivity	umhos/cm	water	SM 2510 and TNRCC SOP	00094	NA[1]	NA	NA	NA	GBRA/UGRA
Conductivity[4]	umhos/cm	water	SM 2510	00095	NA[1]	NA	NA	NA	GBRA
Temperature	^{o} C	water	SM 2550 B. and TNRCC SOP	00010	NA[1]	NA	NA	NA	GBRA/UGRA
Flow	cfs	water	TNRCC SOP	00061	NA[1]	NA	NA	NA	GBRA/USGS
Flow severity	1-no flow, 2-low, 3-normal, 4-flood, 5-high, 6-dry	water	TNRCC SOP	01351	NA[1]	NA	NA	NA	GBRA
Flow measurement method	1- gage 2-electric	water	TNRCC SOP	89835	NA[1]	NA	NA	NA	GBRA/USGS
Flow estimate	cfs	water	TNRCC SOP	74069	NA[1]	NA	NA	NA	GBRA
Conventional and Bacteriological Parameters									
TSS	mg/L	water	SM 2540 D.	00530	4	0-10 mg/L: 30[2] 10-100 mg/L: 20 >100 mg/L: 10	NA	80-120	GBRA/UGRA
Turbidity	NTU	water	SM 2130 B	82079	0.5	0-10 NTU 30 10-100 NTU 20 >100 NTU 10	NA	80-120	GBRA/UGRA
Sulfate	mg/L	water	EPA 300	00945	10	10	75-125	80-120	GBRA
Sulfate[4]	mg/L	water	SM 4500-SO_4 E.	00945	10	10	75-125	80-120	GBRA/UGRA
Chloride	mg/L	water	EPA 300	00940	10	10	75-125	80-120	GBRA
Chloride	mg/L	water	SM 4500-Cl B.	00940	10	10	75-125	80-120	UGRA
Chloride[4]	mg/L	water	SM 4500-Cl C.	00940	10	10	75-125	80-120	GBRA
Chlorophyll-a	ug/L	water	SM 10200-H	32211	10^6	0-10 ug/L: 30[2] 10-100 ug/L: 20 >100 ug/L: 10	75-125	NA	GBRA/UGRA
Pheophytin a	ug/L	water	SM 10200-H	32218	10^6	0-10 ug/L: 30[2] 10-100 ug/L: 20 >100 ug/L: 10	75-125	NA	GBRA/UGRA
E. coli, IDEXX Colilert	MPN	water	SM 9223-B	31699	1	1[3]	NA	NA	GBRA/UGRA
Fecal coliform[4]	org/100mL	water	Std. Methods 9222-D	31616	1	1[3]	NA	NA	GBRA

PARAMETER	UNITS	MATRIX	METHOD	STORET	AWRL	PRECISION of laboratory duplicates (RPD)	ACCURACY at AWRLS (%Rec.)	ACCURACY of lab matrix spikes (%Rec.)	LABORATORY PERFORMING ANALYSIS
Conventional and Bacteriological Parameters (con't)									
Ammonia-N	mg/L	water	SM 4500-NH_3 E.	00610	0.02	10	75-125	80-120	GBRA
Hardness, total (as CaC03)	mg/L	water	SM 2340 C.	00900	5	10	NA	80-120	GBRA
Nitrate-N	mg/L	water	EPA 300.0	00620	0.02	10	75-125	80-120	GBRA
Nitrate/ nitrite-N[4]	mg/L	water	SM 4500-NO_3 E. + NO_2 B.	00630	0.04	10	75-125	80-120	GBRA/UGRA
Total phosphorus	mg/L	water	SM 4500-P B. + E.	00665	0.06[6]	10	75-125	80-120	GBRA/UGRA
Calcium, dissolved	mg/L	water	EPA 200.7	00915	10	10	75-125	75-125	ALBION/LCRA[5]
Iron, Total	ug/L	water	EPA 200.7	01046	300	10	75-125	75-125	ALBION/LCRA[5]
Magnesium, dissolved	mg/L	water	EPA 200.7	00925	0.5	10	75-125	75-125	ALBION/LCRA[5]
Manganese, Total	ug/L	water	EPA 200.8	01056	50	10	75-125	75-125	ALBION/LCRA[5]
VSS	mg/L	water	SM 2540 E.	00535	4	0-10 mg/L: 30[2] 10-100 mg/L: 20 >100 mg/L: 10	NA	80-120	UGRA
TSWQS Metals									
Aluminum, dis.	ug/L	water	EPA 200.8	01106	200	10	75-125	75-125	ALBION/LCRA[5]
Arsenic, dis.	ug/L	water	EPA 200.8	01000	5	10	75-125	75-125	ALBION/LCRA[5]
Cadmium, dis.	ug/L	water	EPA 200.8	01025	0.1	10	75-125	75-125	ALBION/LCRA[5]
Chromium, dis.	ug/L	water	EPA 200.8	01030	10	10	75-125	75-125	ALBION/LCRA[5]
Copper, dis.	ug/L	water	EPA 200.8	01040	1	10	75-125	75-125	ALBION/LCRA[5]
Lead, dis.	ug/L	water	EPA 200.8	01049	0.1	10	75-125	75-125	ALBION/LCRA[5]
Mercury, total	ug/L	water	EPA 1631	71900	0.006	10	75-125	75-125	ALBION/LCRA[5]
Nickel, dis.	ug/L	water	EPA 200.8	01065	10	10	75-125	75-125	ALBION/LCRA[5]
Selenium, total	ug/L	water	EPA 200.8	01147	2	10	75-125	75-125	ALBION/LCRA[5]
Silver, dis.	ug/L	water	EPA 200.8	01075	0.5	10	75-125	75-125	ALBION/LCRA[5]
Zinc, dis.	ug/L	water	EPA 200.8	01090	5	10	75-125	75-125	ALBION/LCRA[5]
Diurnal monitoring summary statistics									
24-hour average dissolved oxygen	mg/L	water	TNRCC SOP /Calculation	89857	NA	NA	NA	NA	GBRA
Maximum daily dissolved oxygen	mg/L	water	TNRCC SOP /Calculation	89856	NA	NA	NA	NA	GBRA
Minimum daily dissolved oxygen	mg/L	water	TNRCC SOP /Calculation	89855	NA	NA	NA	NA	GBRA
Number of measurements	none	none	TNRCC SOP	89858	NA	NA	NA	NA	GBRA

PARAMETER	UNITS	MATRIX	METHOD	STORET	AWRL	PRECISION of laboratory duplicates (RPD)	ACCURACY of calibration control stds. AWRLS (%Rec.)	ACCURACY of lab matrix spikes (%Rec.)	LABORATORY PERFORMING ANALYSIS
Diurnal monitoring summary statistics (cont'd)									
24-hour average water temperature	°C	water	TNRCC SOP /Calculation	00209	NA	NA	NA	NA	GBRA
Maximum daily water temperature	°C	water	TNRCC SOP /Calculation	00014	NA	NA	NA	NA	GBRA
Minimum daily water temperature	°C	water	TNRCC SOP /Calculation	00211	NA	NA	NA	NA	GBRA
24-hour average conductivity	umhos/cm	water	TNRCC SOP /Calculation	00212	NA	NA	NA	NA	GBRA
Maximum daily conductivity	umhos/cm	water	TNRCC SOP /Calculation	00213	NA	NA	NA	NA	GBRA
Minimum daily conductivity	umhos/cm	water	TNRCC SOP /Calculation	00214	NA	NA	NA	NA	GBRA
Maximum daily pH	s.u.	water	TNRCC SOP /Calculation	00215	NA	NA	NA	NA	GBRA
Minimum daily pH	s.u.	water	TNRCC SOP /Calculation	00216	NA	NA	NA	NA	GBRA

PARAMETER	UNITS	MATRIX	METHOD	STORET	LABORATORY PERFORMING ANALYSIS
Benthics- Freshwater – Qualitative(cont.)					
Bedrock at sample point	%	water	TNRCC RWA SOP	89928	GBRA
Benthic Organisms, None Present	NA	water	TNRCC RWA SOP	90005	GBRA
Mesh Size, any net or sieve, average bar (diagonal measurement) for benthic collection	cm	NA	TNRCC RWA SOP	89946	GBRA
Stream Order	#	NA	TNRCC RWA SOP	84161	GBRA
Ecoregion (Texas Ecoregion Code)	#	NA	TNRCC RWA SOP	89961	GBRA
Total Taxa (Taxa Richness)	#	water	TNRCC RWA SOP	90055	GBRA
EPT Taxa	#	water	TNRCC RWA SOP	90008	GBRA
Biotic Index (HBI)	NA	water	TNRCC RWA SOP	90007	GBRA
Chironomidae	%	water	TNRCC RWA SOP	92491	GBRA
Dominant Taxon	%	water	TNRCC RWA SOP	90042	GBRA
Dominant FFG	%	water	TNRCC RWA SOP	90010	GBRA
Predators	%	water	TNRCC RWA SOP	90036	GBRA
Ratio of Intolerant:Tolerant taxa	NA	water	TNRCC RWA SOP	90050	GBRA
Total Trichoptera as Hydropsychidae	%	water	TNRCC RWA SOP	92266	GBRA
Non-insect taxa	#	water	TNRCC RWA SOP	90052	GBRA
Collector-gatherers	%	water	TNRCC RWA SOP	90025	GBRA

PARAMETER	UNITS	MATRIX	METHOD	STORET	LABORATORY PERFORMING ANALYSIS
Benthics- Freshwater – Qualitative(cont.)					
Total number as Elmidae	%	water	TNRCC RWA SOP	90054	GBRA
Nekton- Freshwater					
Nekton, none captured	NA	water	TNRCC RWA SOP	98005	GBRA
Electrofishing effort, duration of shocking	Seconds	water	TNRCC RWA SOP	89944	GBRA
Seining effort	# of Hauls	water	TNRCC RWA SOP	89947	GBRA
Combined length of seine hauls	meters	water	TNRCC RWA SOP	89948	GBRA
Seining effort, duration	minutes	water	TNRCC RWA SOP	89949	GBRA
Minimum Mesh Size, net average bar (diagonal measurements) for nekton collection	cm	water	TNRCC RWA SOP		GBRA
Maximum Mesh Size, net average bar (diagonal measurements) for nekton collection	cm	water	TNRCC RWA SOP		GBRA
Net length	m	water	TNRCC RWA SOP	89941	GBRA
Electrofishing method	1 = boat, 2 = backpack, 3=tote barge	water	TNRCC RWA SOP	89943	GBRA
Area seined	m^2	water	TNRCC RWA SOP	89976	GBRA
Stream Order	#	NA	TNRCC RWA SOP	84161	GBRA
Ecoregion (Texas Ecoregion Code)	#	NA	TNRCC RWA SOP	89961	GBRA
Total fish species (richness)	#	water	TNRCC RWA SOP	98003	GBRA
Total darter species	#	water	TNRCC RWA SOP	98004	GBRA
Total sunfish species (except bass)	#	water	TNRCC RWA SOP	98008	GBRA
Total sucker species	#	water	TNRCC RWA SOP	98009	GBRA
Total intolerant species	#	water	TNRCC RWA SOP	98010	GBRA
Tolerant individuals	%	water	TNRCC RWA SOP	98016	GBRA
Omnivore individuals	%	water	TNRCC RWA SOP	98017	GBRA
Insectivore individuals	%	water	TNRCC RWA SOP	98021	GBRA
Piscivore individuals	%	water	TNRCC RWA SOP	98022	GBRA
Total individuals	#	water	TNRCC RWA SOP	98023	GBRA
Hybrid individuals	%	water	TNRCC RWA SOP	98024	GBRA
Individuals w/ disease/anomalies	%	water	TNRCC RWA SOP	98030	GBRA

PARAMETER	UNITS	METHOD	STORET	LABORATORY PERFORMING ANALYSIS
Physical Habitat				
Streambed slope over evaluated reach (from USGS map)	NA	TNRCC RWA SOP	72052	GBRA
Approximate drainage area above the most downstream transect from USGS map	km^2	TNRCC RWA SOP	89859	GBRA
Length of stream	km	TNRCC RWA SOP	89860	GBRA
Lateral transects made	#	TNRCC RWA SOP	89832	GBRA
Average stream width	m	TNRCC RWA SOP	89861	GBRA
Average stream depth	m	TNRCC RWA SOP	89862	GBRA
Instantaneous stream flow	cfs	TNRCC RWA SOP	00061	GBRA
Flow measurement method	1=gage 2= electric 3= mechanical 4=weir/flume	TNRCC RWA SOP	89835	GBRA
Channel Flow Status		TNRCC RWA SOP		GBRA
Maximum pool width at time of study	m	TNRCC RWA SOP	89864	GBRA
Maximum pool depth in study area	m	TNRCC RWA SOP	89865	GBRA
Total stream bends	#	TNRCC RWA SOP	89839	GBRA
Moderately defined stream bends	#	TNRCC RWA SOP	89841	GBRA
Well-defined stream bends	#	TNRCC RWA SOP	89840	GBRA
Poorly defined stream bends	#	TNRCC RWA SOP	89842	GBRA
Riffles	#	TNRCC RWA SOP	89843	GBRA
Dominant substrate	1 = clay, 2 = silt, 3 = sand, 4 = gravel, 5 = cobble, 6 = boulder, 7 = bedrock, 8 = other	TNRCC RWA SOP	89844	GBRA
Avg. % of substrate gravel >2mm	%	TNRCC RWA SOP	89845	GBRA
Avg. % instream cover	%	TNRCC RWA SOP	84159	GBRA
Stream Cover Types	#	TNRCC RWA SOP		
Avg. % stream bank erosion potential	%	TNRCC RWA SOP	89846	GBRA
Avg. stream bank angle	degrees	TNRCC RWA SOP	89847	GBRA
Avg. width natural riparian vegetation	m	TNRCC RWA SOP	89866	GBRA
Avg. % trees as riparian vegetation	%	TNRCC RWA SOP	89849	GBRA
Avg. % shrubs as riparian vegetation	%	TNRCC RWA SOP	89850	GBRA
Avg. % grasses and forbes as riparian vegetation	%	TNRCC RWA SOP	89851	GBRA
Avg. % cultivated fields as riparian vegetation	%	TNRCC RWA SOP	89852	GBRA

PARAMETER	UNITS	METHOD	STORET	LABORATORY PERFORMING ANALYSIS
Physical Habitat				
Avg. % other as riparian vegetation	%	TNRCC RWA SOP	89853	GBRA
Avg.% tree canopy coverage	%	TNRCC RWA SOP	89854	GBRA
Overall Aesthetics	1= wilderness 2= natural 3= common 4= offensive	TNRCC RWA SOP	89867	GBRA
Stream order	#	TNRCC RWA SOP	84161	GBRA
Texas Ecoregion Code	#	TNRCC RWA SOP	89961	GBRA
Land development impact	1= unimpacted 2= low 3= moderate 4=high	TNRCC RWA SOP	89962	GBRA

1 Reporting to be consistent with SWQM guidance and based on measurement capability.
2 Measurement performance criteria will vary according to range of results.
3 Based on range statistic as described in Standard Methods, 20th Edition, Section 9020-B, " Quality Assurance/Quality Control – Intralaboratory Quality Control Guidelines."
4 Secondary method listed. To be used in the event that the primary method cannot be used or needs to be confirmed, i.e. automated method cannot be used due to instrument failure.
5 Albion Laboratory is the primary laboratory for metals analyses. LCRA is listed as back up to the primary lab. Both labs will meet all requirements of the QAPP before being sent samples for analyses.
6 GBRA and UGRA have done studies that show that their AWRLs for these tests are lower than the prescribed AWRLs. Will report lower than the listed AWRL, with acceptable recovery. (GBRA chl a reporting limit = 1.0 ug/L; GBRA Tot P reporting limit = 0.010 mg/L; UGRA Tot P reporting limit = 0.005 mg/L).

References for Table A7.1:

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, 1999.
TNRCC SOP - TNRCC Surface Water Quality Monitoring Procedures Manual, June, 1999 or subsequent editions.
American Society for Testing and Materials (ASTM) Annual Book of Standards, Vol. 11.02
TNRCC SOP - Receiving Water Assessments Procedures Manual, March, 1999 or subsequent editions.
United States Environmental Protection Agency (USEPA) Manual #EPA-821-R-9S-027