

Little White Oak Bayou @ Timble Rd. TCEQ ID – 11148



Biological Monitoring Summary Packet

EIH Final Report #18-002
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Prepared by the Environmental Institute of Houston University of Houston - Clear Lake in cooperation with the Houston-Galveston Area Council and the Texas Commission on Environmental Quality





Prepared by the Environmental Institute of Houston / University of Houston-Clear Lake

Jenny Oakley, Environmental Scientist
Mandi Gordon, Senior Biologist

Principal Investigator

Dr. George Guillen
Environmental Institute of Houston
University of Houston Clear Lake
2700 Bay Area Blvd
Houston, Texas 77058

Prepared in cooperation with and for the Houston-Galveston Area Council

Jean Wright, Project Manager
Houston-Galveston Area Council
P.O. Box 22777 | 3555 Timmons
Houston, TX 77227-2777

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Summary of the Biological Assessment

Sample Collection

At the request of the Houston-Galveston Area Council (HGAC), under Amendment #6 to the Houston-Galveston Area Council's Clean Rivers Program FY 2016-2017 QAPP, the Environmental Institute of Houston (EIH) conducted an aquatic life monitoring (ALM) study on Little White Oak Bayou (segment 1013A_01), Harris County, TX. The sampling event was conducted during the index period (June) in 2017. A second (critical) event was not conducted due to safety concerns of the field crew, and clear impairment of the segment. This packet contains a summary of the biological information collected at Texas Commission on Environmental Quality (TCEQ) site 11148 (Little White Oak Bayou at Timble Rd.).

The monitoring effort for each sample event included collection of instantaneous flow (discharge), field parameters (temperature, specific conductance, dissolved oxygen [D.O.], and pH), water chemistry (bacteria, nutrients, Chlorophyll, and solids), nekton (seining and electrofishing), benthic macroinvertebrates (RBP kicknet), physical habitat characterization and Twenty-four hour (diel) monitoring for dissolved oxygen.

All measurements were recorded according to protocols outline in the TCEQ's Surface Water Quality Monitoring (SWQM) Procedures Manual Volume 1 (August 2012) and Volume 2 (May 2014). All data represented herein has been submitted to the HGAC for entry into the Surface Water Quality Monitoring Information System (SWQMIS).

Results

Index sampling was conducted on June 28, 2017. Flow data were obtained from the USGS gage (8074540) located at the Trimble Rd Bridge. Flow severity was normal with an instantaneous flow value of 29.70 cfs).

During index sampling, instantaneous water temperature was 28.10°C, while diel averaged 27.49°C (range: 26.96-29.28°C, $n = 96$). Instantaneous specific conductance was 287.7 $\mu\text{S}/\text{cm}$ while diel averaged 214 $\mu\text{S}/\text{cm}$ (range: 116-390 $\mu\text{S}/\text{cm}$, $n = 96$). Instantaneous D.O. was 5.69 mg/L, while diel averaged 5.95 mg/L (range: 5.41-7.3 mg/L, $n = 96$). Instantaneous pH was 7.57, while diel ranged from 7.16-7.58 ($n = 96$).

Conventional parameters sampled included sulfate (21.6 mg/L), chloride (30.5 mg/L), *E. coli* (31 MPN/100mL), total phosphorus (0.210mg/L), total suspended solid (14 mg/L), total kjeldahl nitrogen (0.6 mg/L), nitrate/nitrite nitrogen (0.32 mg/L), and ammonia nitrogen (0.3 mg/L).

IBI scores for nekton indicate limited ALU, while benthic and habitat IBI score indicates intermediate ALU, and the dissolved oxygen 24 hr average/minimum indicates intermediate ALU.

At the time of sampling there was a large amount of trash and anthropogenic debris on the stream bed, banks, and riparian zone. Extensive vagrant camps were observed on the left bank within the sampling reach and appeared to extend downstream of the sampling reach. Evidence

of human fecal contamination to the waterbody was observed. In addition, a recreational fisherman was observed in the sampling reach.

Conclusion

The Little White Oak Bayou (segment 1013A) is listed on the 2014 Texas Integrated Report 303(d) list for bacteria (CS) and macrobenthic community (CN) and has an intermediate ALU designation. Our results suggest that site 11148 (segment 1013A) is not supporting its designated ALU rating of intermediate for nekton. It is supporting its designated ALU rating of intermediate for microbenthic community, physical habitat and 24hr dissolved oxygen. Because only one event was conducted, the coefficient of variance of the adjusted means for the IBIs was not calculated.

Aquatic Life Monitoring and Habitat Assessment Checklist

Background Information

Name of Water Body: Little White Oak Bayou @ Timble Rd.

Segment Number: 1013A Station ID: 11148 On Segment: Yes No

Permit number, if applicable: SPR-0504-383 Check monitoring objective: ALM ALU UAA RWA

Historic Stream Characterization (choose one):

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

Basis for historic stream characterization (describe): Historical classification for stream characterization was based on topographic USGS maps and previously established TCEQ stream classifications (including TSWQS and 2014 Texas Integrated Report).

Current Aquatic Life Use Designation (if classified segment or site specific standard determined):

Exceptional High Intermediate Limited

Current Assessment Status on the 2014 Water Quality Inventory, 305(b) Report:

Supported Partially Supported Not Supported Concern Not Assessed

Data Entry

Field Data Entry (FDE) Information:

Date Entered Into FDE: _____ RTAG #: _____ (TCEQ Regional Biologists only)

Field Data (CRP Partners only):

Tag #'s: Index – HGI698014, HGI698018, HGI698010, HGI698002, HGI698001, HGI698006

Objective for Aquatic Life Use Assessment

Is this water body supporting its designated uses? Yes No

Reason: Nekton scores were limited for the index period. Note: Due to reduced battery voltage of backpack electrofisher (unit malfunction) the unit lost power multiple times throughout the reach. As a result we had to swap out batteries and take some breaks to re-charge batteries in order to get the required shock time (900 seconds). Because of stopping and starting e-shock collection, it is possible that the nekton community may have been underrepresented due to movement of fish during battery swaps.

Known or potential causes of Aquatic Life Use concern or impairment: Segment 1013A is listed on the 2014 Texas Integrated Report 303(d) list for depressed dissolved oxygen.

Identify Sources of Pollution:

Point Source: Yes No Identify: Municipal point source discharges
 Nonpoint Source: Yes No Identify: Sanitary sewer overflows, NPS urban runoff/storm sewers, observation and evidence of urination and defecation directly into waterbody by homeless community taking shelter in riparian habitat around waterbody

Ambient Toxicity Tests in Water body? Yes No

Results:

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

Monitoring Information

Biological monitoring conducted during index period (03/15 to 06/30 and 10/01 to 10/15):

Stream Characterization Event 1 Date: 6/28/2017

| | | |
|---------------------------------|---|------------------------------------|
| Flow Severity: <u>Normal</u> | Pools covering <u>30.7</u> % of the <u>309</u> meters assessed | Flowing at <u>29.70</u> cfs (gage) |
|---------------------------------|---|------------------------------------|

Describe conditions that may have adversely affected stream during each sampling event (for example, recent rains, drought, and construction): Prior to index sampling, the area experience a rain event that resulted in higher flow severity prior to sampling. Site was in "normal" conditions when sampled.

Nekton Sampling Event 1

Minimum 15-minute (900 seconds) electrofishing: Yes No
 Minimum 6 seine hauls (or equivalent effort to sample 60 meters): Yes No
 Fish sampling conducted in all available habitat types: Yes No
 If no, please describe why:

Benthic Macroinvertebrate Sampling Event 1

Indicate method(s) used:

Rapid Bioassessment: 5-minute kicknet Snags
 Quantitative: Surber Snags Dredge

Habitat Assessment Event 1

TCEQ Habitat Protocols: Yes No

Stream Flow Measurement Event 1

Instantaneous measurement: Yes No
 USGS Gage Reading: USGS Gage: 8074540 Yes No

Assessment Results (Optional)

Fish community index Event 1

Exceptional High Intermediate Limited

Benthic macroinvertebrate community index Event 1

Exceptional High Intermediate Limited

Habitat index Event 1

Exceptional High Intermediate Limited

Maps of Sample Location

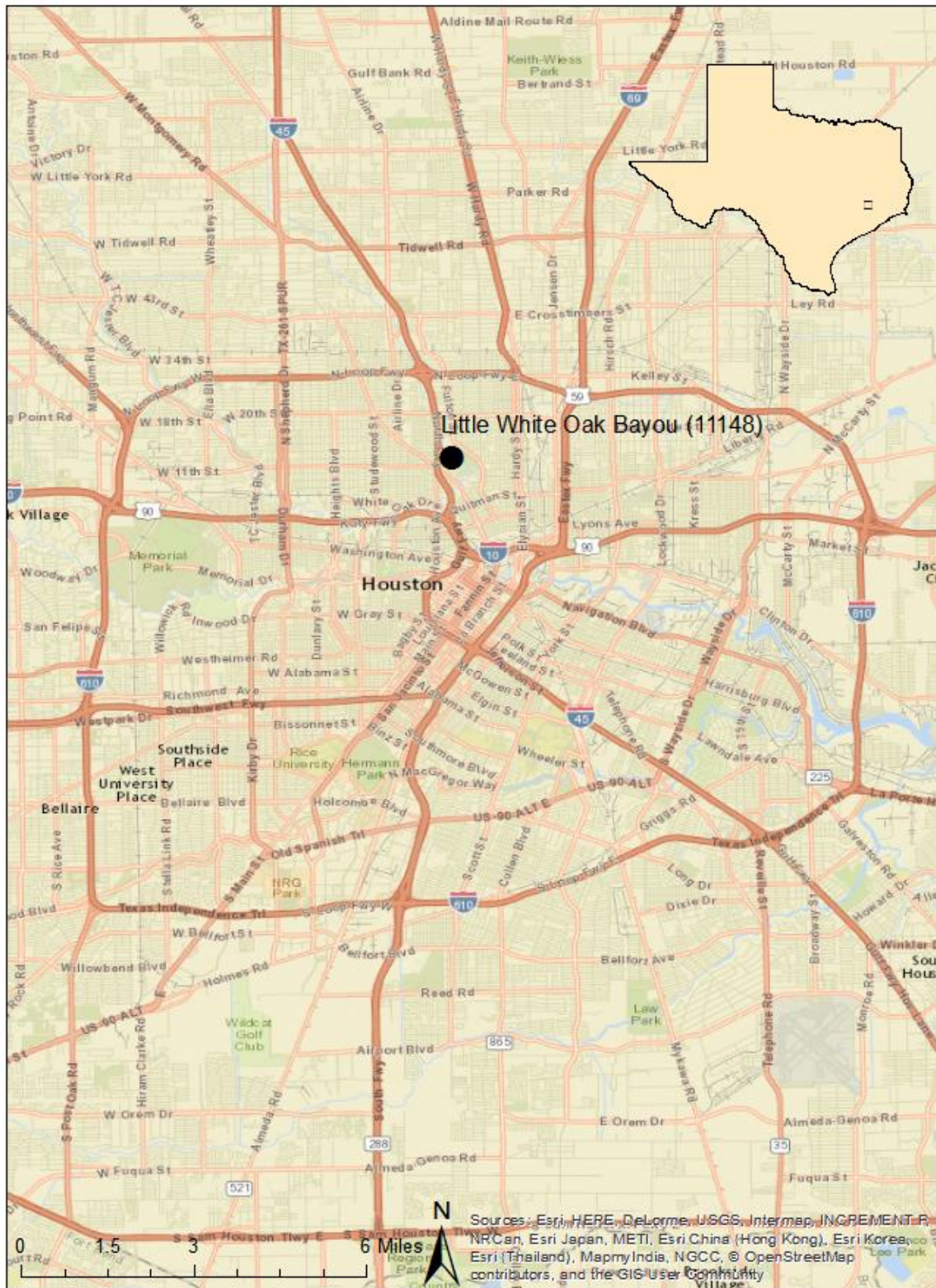


Figure 1 Map of overall sample area.

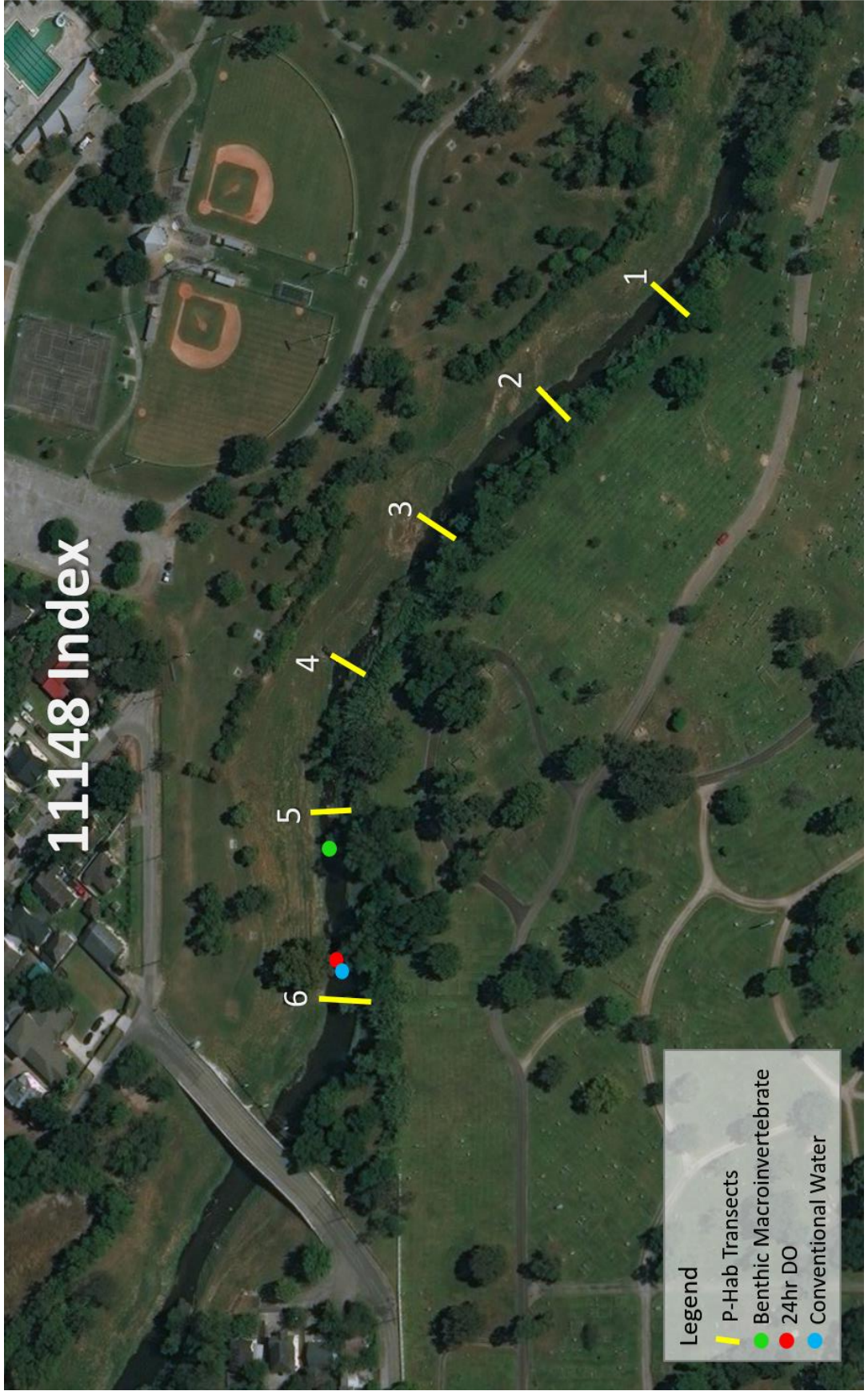


Figure 2 Sample reach map for index event showing location of physical habitat transects, benthic macroinvertebrate sampling, 24hr dissolved oxygen, and conventional water sampling locations.

Nekton Community IBI Data, Summary Data, and Species Lists

| Ecoregion 34 Nekton IBI | | | |
|---|--------------------------------------|----------------|-------|
| Date | 06/28/2017 | TCEQ ID | 11148 |
| Site | Little White Oak Bayou @ Timble Road | | |
| Metric | Value | Score | |
| Total Number of Fish Species | 5 | 3 | |
| Number of Native Cyprinid Species | 2 | 3 | |
| Number of Benthic Invertivore Species | 0 | 1 | |
| Number of Sunfish Species | 0 | 1 | |
| % of Individuals as Tolerant Species ^a | 25.6 | 3 | |
| % of Individuals as Omnivores | 11.6 | 3 | |
| % of Individuals as Invertivores | 88.4 | 5 | |
| % of Individuals as Piscivores | 0 | NA | |
| Number of Individuals in Sample | 121 | 1 | |
| Number of Individuals/seine haul | 14.0 | 1 | |
| Number of Individuals/min electrofishing | 2.43 | 1 | |
| % of Individuals as Non-native Species | 0.8 | 5 | |
| % of Individuals With Disease/Anomaly | 5.0 | 1 | |
| Regional Score and Aquatic Life Use | 27 | Limited | |
| ^a not including <i>G. affinis</i> | | | |
| Scoring Criteria | | | |
| Exceptional | | > 49 | |
| High | | 41 – 48 | |
| Intermediate | | 35 – 40 | |
| Limited | | < 35 | |

| Nekton Summary Data | | | |
|--|--------------------------------------|----------------|-------|
| Date | 06/28/2017 | TCEQ ID | 11148 |
| Site | Little White Oak Bayou @ Timble Road | | |
| Description | STORET | Value | |
| Stream order | 84161 | 2 | |
| Minimum seine mesh diagonal (cm) | 89930 | 0.125 | |
| Maximum seine mesh diagonal (cm) | 89931 | 0.125 | |
| Seine length (m) | 89941 | 4.572 | |
| Electrofishing method (1=boat, 2=backpack) | 89943 | 2 | |
| Electrofishing effort (sec) | 89944 | 915 | |
| Seining effort (number of hauls) | 89947 | 6 | |
| Combined length of seine hauls (m) | 89948 | 64 | |
| Seining effort (duration, minutes) | 89949 | 3:55 | |
| Ecoregion | 89961 | 34 | |
| Area seined (m ²) | 89976 | 292.6 | |
| Total fish species (n) | 98003 | 5 | |
| Number of sunfish species (n) | 98008 | 0 | |
| Total intolerant species (n) | 98010 | 0 | |
| Omnivore individuals (%) | 98017 | 11.6 | |
| Invertivore individuals (%) | 98021 | 88.4 | |
| Piscivore individuals (%) | 98022 | 0 | |
| Individuals with disease or anomaly (%) | 98030 | 5 | |
| Number of native cyprinid species (n) | 98032 | 2 | |
| Individuals as non-native species (%) | 98033 | 0.8 | |
| Total individuals seining (n) | 98039 | 84 | |
| Total individuals electroshocking (n) | 98040 | 37 | |
| Number of benthic invertivores (n) | 98052 | 0 | |
| Individuals per seine haul (n) | 98062 | 14 | |
| Individuals per minute electroshocking (n) | 98069 | 2.43 | |
| Tolerant individuals (except <i>G. affinis</i>) (%) | 98070 | 25.6 | |

SPECIES LIST AND ABUNDANCE- NEKTON

Date 6/28/2017
Site Little White Oak Bayou @ Timble Rd.
TCEQ ID 10145

| | | (E = electro, S = seine) | E1 | E2 | E3 | ES | S1 | S2 | S3 | S4 | S5 | S6 | Seine | Overall Total |
|------------------------|--|-----------------------------|-----|-----|-------|-----|----|----|----|----|----|-------|-------|--------------------------|
| | | (for E: sec; for S: meters) | 307 | 307 | 301 | 915 | 8 | 10 | 16 | 10 | 10 | 10 | 64 | |
| STORET | Collection Method Collection Effort Scientific Name | Common Name | | | Total | | | | | | | Total | | |
| 98564 | Ameiurus natalis | Yellow bullhead | 4 | 5 | 4 | 13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13 |
| 98474 | Cyprinella lutrensis | Red shiner | 0 | 0 | 0 | 0 | 2 | 12 | 1 | 13 | 0 | 0 | 28 | 28 |
| 98713 | Gambusia affinis | Western mosquitofish | 22 | 1 | 0 | 23 | 1 | 24 | 18 | 1 | 10 | 0 | 54 | 77 |
| 98441 | Notemigonus crysoleucas | Golden shiner | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 2 | 2 |
| 98583 | Oreochromis aureus | Blue tilapia | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Total Collected | | | 27 | 6 | 4 | 37 | 3 | 36 | 19 | 15 | 11 | 0 | 84 | 121 |
| Total Taxa | | | 3 | 2 | 1 | 3 | 2 | 2 | 2 | 3 | 2 | 0 | 3 | 5 |

Benthic Community IBI Data, Summary Data, and Species Lists

| Qualitative Benthos IBI | | |
|---------------------------------------|-------------------------------------|----------------------|
| Date | 6/28/2017 | TCEQ ID 11148 |
| Site | Little White Oak Bayou @ Timble Rd. | |
| Metric | Value | Score |
| Taxa Richness | 13 | 2 |
| EPT Taxa Abundance | 4 | 2 |
| Biotic Index (HBI) | 6.78 | 1 |
| % Chironomidae | 30.34 | 1 |
| % Dominant Taxon | 34.83 | 2 |
| % Dominant FFG | 37.36 | 3 |
| % Predators | 24.72 | 3 |
| Intolerant : Tolerant | 0.02 | 1 |
| % Total Trichoptera as Hydropsychidae | 100.00 | 1 |
| # of Non-Insect Taxa | 6 | 4 |
| % Collector-Gatherers | 37.36 | 2 |
| % of Total Number as Elmidae | 0.56 | 1 |
| AQUATIC LIFE USE SCORE | 23 | |
| AQUATIC LIFE USE RATING | Intermediate | |
| Scoring Criteria | | |
| Exceptional | >36 | |
| High | 29 - 36 | |
| Intermediate | 22 - 28 | |
| Limited | <22 | |

| Benthos Summary Data | | |
|---|------------------------------------|----------------------|
| Date | 6/28/2017 | TCEQ ID 11148 |
| Site | Little White Oak Bayou @ Timble Rd | |
| Description | STORET | Value |
| Stream order | 84161 | 2 |
| Data reporting units | 89899 | 1 |
| Kicknet effort (m ²) | 89903 | 10 |
| Kicknet effort (min) | 89904 | 7:38 |
| Debris/shoreline effort, min picked (min) | 89905 | NA |
| Total n for sample (n) | 89906 | 178 |
| Gravel substrate (%) | 89923 | 85 |
| Macrophyte bed (%) | 89926 | 2 |
| Snags and brush (%) | 89927 | 0 |
| Bedrock (%) | 89928 | 0 |
| Net mesh size (cm) | 89946 | 0.05 |
| Benthic sampler | 89950 | 3 |
| Ecoregion | 89961 | 34 |
| HBI | 90007 | 6.78 |
| EPT index (n) | 90008 | 4 |
| Dominant FFG (%) | 90010 | 37.36 |
| Collector-gatherers (%) | 90025 | 78.09 |
| Predators (%) | 90036 | 44.94 |
| Dominant taxon (%) | 90042 | 34.83 |
| Intolerant : Tolerant taxa | 90050 | 0.02 |
| Non-insect taxa (n) | 90052 | 6 |
| n as Elmidae (%) | 90054 | 0.56 |
| Taxa richness (n) | 90055 | 13 |
| Chironomidae (%) | 90062 | 30.34 |
| Trichoptera as Hydropsychidae (%) | 90069 | 100.0 |

SPECIES LIST - BENTHIC MACROINVERTEBRATES

Date 6/28/2017
Site Little White Oak Bayou @ Timble Rd
TCEQ ID 11148

| STORET | Phylum | Class | Order | Family | Genus | Count |
|--------------|------------|-------------|---------------|----------------|-----------------------|------------|
| 90913 | Annelida | Hirudinea | | | | 20 |
| 90382 | Annelida | Oligochaeta | | | | 12 |
| 91241 | Arthropoda | Crustacea | Amphipoda | Taltridae | <i>Hyalella</i> | 7 |
| 92900 | Mollusca | Gastropoda | Limnophila | Ancylidae | <i>Ferrissia</i> | 2 |
| 93030 | Mollusca | Bivalvia | Veneroida | Sphaeriidae | <i>Pisidium</i> | 2 |
| 93036 | Mollusca | Bivalvia | Veneroida | Corbiculidae | <i>Corbicula</i> | 8 |
| 92253 | Arthropoda | Insecta | Coleoptera | Elmidae | <i>Stenelmis</i> | 1 |
| 92491 | Arthropoda | Insecta | Diptera | Chironomidae | | 54 |
| 91651 | Arthropoda | Insecta | Ephemeroptera | Baetidae | <i>Fallceon</i> | 2 |
| 91600 | Arthropoda | Insecta | Ephemeroptera | Caenidae | <i>Caenis</i> | 62 |
| 91510 | Arthropoda | Insecta | Ephemeroptera | Heptageniidae | <i>Maccaffertium</i> | 1 |
| 91683 | Arthropoda | Insecta | Odonata | Coenagrionidae | <i>Argia</i> | 6 |
| 92292 | Arthropoda | Insecta | Trichoptera | Hydropsychidae | <i>Cheumatopsyche</i> | 1 |
| Total | | | | | | 178 |

Physical Habitat IBI Data, Summary Data, and Transect Data

| Habitat Quality Index | | |
|--|------------------------------------|--------------|
| Date | 06/28/2017 | |
| Site | Little White Oak Bayou @ Timble Rd | |
| TCEQ ID | 11148 | |
| Metric | Value | Score |
| Instream Cover, mean (%) | 26.00 | 2 |
| Riffles, number of | 2 | 3 |
| Pools, maximum depth (m) | 2.20 | 4 |
| Bank Stability | — | 1 |
| Slope component, mean angle (°) | 53.8 | — |
| Erosion component, mean (%) | 30.0 | — |
| Riparian Buffer Vegetation, mean width (m) | >20 | 1 |
| Channel Flow Status (4=High, 3=Moderate, 2=Low, 1=No flow) | 3 | 3 |
| Channel Sinuosity | 1 | 1 |
| Bottom Substrate, mean gravel or larger (%) | 80.0 | 4 |
| Aesthetics (1=Wilderness, 2=Natural, 3=Common, 4=Offensive) | 4 | - |
| AQUATIC LIFE USE SCORE | 19 | |
| AQUATIC LIFE USE RATING | Intermediate | |
| Scoring Criteria | | |
| Exceptional | 26 - 31 | |
| High | 20 - 25 | |
| Intermediate | 14 - 19 | |
| Limited | < 14 | |

Habitat Summary Data

Date 6/28/2017
Site Little White Oak Bayou @ Timble Rd.
TCEQ ID 11148

| Description | STORET | Value |
|---|--------|-------|
| Instantaneous flow measurement (cfs) | 00061 | 29.7 |
| Mean stream slope over evaluated reach (m/km) | 72051 | 2.152 |
| Mean instream cover (%) | 84159 | 26.0 |
| Stream order | 84161 | 2 |
| Number of transects | 89832 | 6 |
| Flow measurement method (1=gage, 2=electric, 3=mechanical, 4=weir, 5=doppler) | 89835 | 1 |
| Total number of stream bends | 89839 | 6 |
| Well defined stream bends | 89840 | 0 |
| Moderately defined stream bends | 89841 | 1 |
| Poorly defined stream bends | 89842 | 5 |
| Number of riffles | 89843 | 2 |
| Dominant substrate (1=clay, 2=silt, 3=sand, 4=gravel, 5=cobble, 6=boulder, 7=bedrock) | 89844 | 4 |
| Mean substrate gravel or larger (%) | 89845 | 80.0 |
| Mean bank erosion (%) | 89846 | 30.0 |
| Mean bank slope (°) | 89847 | 53.8 |
| Channel flow status (4=high, 3=moderate, 2=low, 1=no flow) | 89848 | 4 |
| Riparian vegetation | — | |
| Trees (%) | 89849 | 20.0 |
| Shrubs (%) | 89850 | 0.0 |
| Grasses/forbes (%) | 89851 | 78.0 |
| Cultivated fields (%) | 89852 | 0.0 |
| Other (%) | 89853 | 2 |
| Mean tree canopy (%) | 89854 | 45.0 |
| Drainage area above location (km ²) | 89859 | 49.2 |
| Length of segment evaluated (km) | 89860 | 0.309 |
| Mean stream width (m) | 89861 | 9.20 |
| Mean stream depth (m) | 89862 | 0.382 |
| Maximum pool width (m) | 89864 | 8.00 |
| Maximum pool depth (m) | 89865 | 2.20 |
| Mean width natural buffer vegetation (m) | 89866 | 10.0 |
| Aesthetics (1=wilderness, 2=natural, 3=common, 4=offensive) | 89867 | 4 |
| Number of instream cover types | 89929 | 6 |
| Ecoregion | 89961 | 34 |
| Land development (1=unimpacted, 2=low, 3=moderate, 4=high) | 89962 | 3 |

Habitat Transect Data

Date 6/28/2017
Site Little White Oak Bayou @ Timble Rd.
TCEQ ID 11148

| Description | Transect 1 | Transect 2 | Transect 3 | Transect 4 | Transect 5 | Transect 6 |
|---|---------------|---------------|---------------|---------------|---------------|---------------|
| Stream type (RI=riffle, RU=run, G=glide, P=pool) | RU | RU | G | RU | RI | P |
| Stream width (m) | 9.2 | 11.5 | 11.5 | 6.5 | 8.8 | 14.0 |
| Left bank slope (°) | 42.5 | 35 | 20 | 22.5 | 50 | 88 |
| Left bank erosion potential (%) | 40 | 30 | 20 | 30 | 20 | 25 |
| Left bank width of natural buffer vegetation (m) | 0 | 0 | 0 | 0 | 0 | 0 |
| Right bank slope (°) | 65 | 55 | 50 | 70 | 65 | 50 |
| Right bank erosion potential (%) | 20 | 30 | 20 | 5 | 35 | 20 |
| Right bank width of natural buffer vegetation (m) | 20 | 20 | 20 | 20 | 20 | 20 |
| Tree canopy (%) | 45 | 50 | 50 | 26 | 26.5 | 47.1 |
| Dominant substrate type (1=clay, 2=silt, 3=sand, 4=gravel, 5=cobble, 6=boulder, 7=bedrock, 8=other) | 4 | 4 | 4 | 4 | 4 | 4 |
| Stream depth at point 1 (m) | 0 | 0 | 0 | 0 | 0.129 | 0.126 |
| Stream depth at point 2 (m) | 0.65 | 0.33 | 0.665 | 0.282 | 0.458 | 0.52 |
| Stream depth at point 3 (m) | 0.645 | 0.48 | 1.46 | 0.38 | 0.515 | 0.63 |
| Stream depth at point 4 (m) | 0.62 | 0.435 | 1.68 | 0.362 | 0.523 | 0.84 |
| Stream depth at point 5 (m) | 0.63 | 0.395 | 1.73 | 0.45 | 0.302 | 1.225 |
| Stream depth at point 6 (m) | 0.56 | 0.42 | 1.785 | 0.44 | 0.3 | 1.62 |
| Stream depth at point 7 (m) | 0.43 | 0.525 | 1.78 | 0.432 | 0.302 | 1.895 |
| Stream depth at point 8 (m) | 0.36 | 0.655 | 1.79 | 0.312 | 0.235 | 1.83 |
| Stream depth at point 9 (m) | 0.18 | 0.68 | 1.645 | 0.364 | 0.263 | 1.52 |
| Stream depth at point 10 (m) | 0.125 | 0.55 | 0.525 | 0.322 | 0.246 | 0.95 |
| Stream depth at point 11 (m) | 0 | 0 | 0 | 0 | 0 | 0 |
| Substrate gravel or larger (%) | 80 | 65 | 70 | 95 | 95 | 35 |
| Instream cover (%) | 26 | 8 | 20 | 38 | 45 | 28 |
| Left bank trees (%) | 0 | 0 | 0 | 0 | 0 | 10 |
| Left bank shrubs (%) | 0 | 0 | 0 | 0 | 0 | 0 |
| Left bank grasses/forbes (%) | 96 | 98 | 100 | 93 | 100 | 90 |
| Left bank cultivated fields (%) | 0 | 0 | 0 | 0 | 0 | 0 |
| Left bank other (%) | 4 | 2 | 0 | 7 | 0 | 0 |
| Right bank trees (%) | 40 | 95 | 30 | 5 | 35 | 5 |
| Right bank shrubs (%) | 0 | 0 | 0 | 0 | 0 | 0 |
| Right bank grasses/forbes (%) | 60 | 5 | 63 | 95 | 50 | 95 |
| Right bank cultivated fields (%) | 0 | 0 | 0 | 0 | 0 | 0 |
| Right bank other (%) | 0 | 0 | 7 | 0 | 15 | 0 |
| Transect Latitude (decimal degrees) | 29.7914 | 29.7917 | 29.79213 | 29.7925 | 29.7925 | 29.79243 |
| Transect Longitude (decimal degrees) | -95.365 | -95.3655 | -95.3659 | -95.3664 | -95.367 | -95.36767 |
| Total length of reach (m) | 309 | | | | | |

Diel Summary Data and Measurements

| Diel Measurement Summary | | | |
|---------------------------------|-------------------------------------|-------------------|-------|
| Start Date | 06/27/2017 | Start Time | 13:15 |
| End Date | 06/28/2017 | End Time | 13:00 |
| Site | Little White Oak Bayou @ Timble Rd. | | |
| TCEQ ID | 11148 | | |
| Parameter | STORET | Value | |
| Temp Mean | 00209 | 27.49 | |
| Temp Maximum | 00210 | 29.28 | |
| Temp Minimum | 00211 | 26.96 | |
| Spec Cond Mean | 00212 | 214 | |
| Spec Cond Maximum | 00213 | 390 | |
| Spec Cond Minimum | 00214 | 116 | |
| pH Maximum | 00215 | 7.58 | |
| pH Minimum | 00216 | 7.16 | |
| # Temp Measurements | 00221 | 96 | |
| # Spec Cond Measurements | 00222 | 96 | |
| # pH Measurements | 00223 | 96 | |
| DO Minimum | 89855 | 5.41 | |
| DO Maximum | 89856 | 7.3 | |
| DO Mean | 89857 | 5.95 | |
| # DO Measurements | 89858 | 96 | |

| Diel Data | | | | | | |
|--------------|------------------------------------|-------|------------|------------------|------------------|----------------------|
| Date | 6/27/2017 | | TCEQ ID | 11148 | | |
| Site Name | Little White Oak Bayou @ Timble Rd | | | | | |
| Date | Time | Temp | pH | Dissolved Oxygen | Dissolved Oxygen | Specific Conductance |
| (mm/dd/yyyy) | (hh:mm) | (°C) | Std. Units | (mg/L) | (%) | (µS/cm) |
| 06/27/2017 | 13:15 | 29.16 | 7.58 | 6.46 | 84.3 | 390 |
| 06/27/2017 | 13:30 | 29.28 | 7.56 | 6.44 | 84.2 | 390 |
| 06/27/2017 | 13:45 | 29.19 | 7.53 | 6.41 | 83.6 | 390 |
| 06/27/2017 | 14:00 | 28.67 | 7.53 | 6.53 | 84.5 | 379 |
| 06/27/2017 | 14:15 | 28.39 | 7.45 | 6.69 | 86.1 | 340 |
| 06/27/2017 | 14:30 | 28.08 | 7.41 | 6.79 | 86.9 | 192 |
| 06/27/2017 | 14:45 | 27.86 | 7.26 | 5.97 | 76.2 | 239 |
| 06/27/2017 | 15:00 | 27.79 | 7.22 | 6.00 | 76.4 | 267 |
| 06/27/2017 | 15:15 | 27.75 | 7.24 | 6.55 | 83.3 | 221 |
| 06/27/2017 | 15:30 | 27.77 | 7.31 | 6.90 | 87.9 | 204 |
| 06/27/2017 | 15:45 | 28.01 | 7.56 | 7.30 | 93.3 | 182 |
| 06/27/2017 | 16:00 | 28.00 | 7.54 | 7.15 | 91.4 | 167 |
| 06/27/2017 | 16:15 | 27.89 | 7.47 | 6.91 | 88.1 | 156 |
| 06/27/2017 | 16:30 | 27.83 | 7.47 | 6.82 | 86.8 | 134 |
| 06/27/2017 | 16:45 | 27.74 | 7.46 | 6.81 | 86.6 | 124 |
| 06/27/2017 | 17:00 | 27.64 | 7.42 | 6.73 | 85.4 | 118 |
| 06/27/2017 | 17:15 | 27.60 | 7.40 | 6.67 | 84.6 | 117 |
| 06/27/2017 | 17:30 | 27.56 | 7.38 | 6.61 | 83.8 | 119 |
| 06/27/2017 | 17:45 | 27.52 | 7.35 | 6.58 | 83.3 | 118 |
| 06/27/2017 | 18:00 | 27.50 | 7.34 | 6.55 | 82.9 | 117 |
| 06/27/2017 | 18:15 | 27.47 | 7.33 | 6.55 | 82.9 | 116 |
| 06/27/2017 | 18:30 | 27.45 | 7.32 | 6.53 | 82.6 | 116 |
| 06/27/2017 | 18:45 | 27.46 | 7.31 | 6.48 | 81.9 | 117 |
| 06/27/2017 | 19:00 | 27.46 | 7.32 | 6.45 | 81.6 | 119 |
| 06/27/2017 | 19:15 | 27.48 | 7.30 | 6.40 | 81.0 | 123 |
| 06/27/2017 | 19:30 | 27.49 | 7.28 | 6.33 | 80.2 | 127 |
| 06/27/2017 | 19:45 | 27.51 | 7.27 | 6.28 | 79.6 | 131 |
| 06/27/2017 | 20:00 | 27.52 | 7.25 | 6.22 | 78.8 | 135 |
| 06/27/2017 | 20:15 | 27.53 | 7.24 | 6.17 | 78.1 | 139 |
| 06/27/2017 | 20:30 | 27.54 | 7.24 | 6.14 | 77.8 | 143 |
| 06/27/2017 | 20:45 | 27.54 | 7.23 | 6.10 | 77.3 | 147 |
| 06/27/2017 | 21:00 | 27.55 | 7.21 | 6.06 | 76.8 | 150 |
| 06/27/2017 | 21:15 | 27.54 | 7.22 | 6.04 | 76.6 | 153 |
| 06/27/2017 | 21:30 | 27.53 | 7.21 | 6.01 | 76.1 | 156 |
| 06/27/2017 | 21:45 | 27.51 | 7.22 | 5.97 | 75.6 | 158 |
| 06/27/2017 | 22:00 | 27.50 | 7.21 | 5.95 | 75.3 | 161 |
| 06/27/2017 | 22:15 | 27.48 | 7.20 | 5.95 | 75.3 | 164 |
| 06/27/2017 | 22:30 | 27.47 | 7.19 | 5.93 | 75.1 | 167 |
| 06/27/2017 | 22:45 | 27.45 | 7.19 | 5.92 | 74.9 | 168 |
| 06/27/2017 | 23:00 | 27.43 | 7.19 | 5.91 | 74.7 | 171 |
| 06/27/2017 | 23:15 | 27.41 | 7.19 | 5.89 | 74.5 | 174 |
| 06/27/2017 | 23:30 | 27.39 | 7.19 | 5.89 | 74.5 | 176 |
| 06/27/2017 | 23:45 | 27.38 | 7.18 | 5.86 | 74.0 | 178 |
| 06/28/2017 | 0:00 | 27.37 | 7.18 | 5.84 | 73.8 | 182 |
| 06/28/2017 | 0:15 | 27.36 | 7.18 | 5.86 | 74.0 | 184 |
| 06/28/2017 | 0:30 | 27.35 | 7.19 | 5.85 | 73.8 | 187 |

| Date | Time | Temp | pH | Dissolved Oxygen | Dissolved Oxygen | Specific Conductance |
|------------|-------|-------|------|------------------|------------------|----------------------|
| 06/28/2017 | 0:45 | 27.34 | 7.18 | 5.80 | 73.3 | 190 |
| 06/28/2017 | 1:00 | 27.32 | 7.17 | 5.81 | 73.3 | 192 |
| 06/28/2017 | 1:15 | 27.30 | 7.18 | 5.80 | 73.2 | 194 |
| 06/28/2017 | 1:30 | 27.29 | 7.18 | 5.78 | 73.0 | 198 |
| 06/28/2017 | 1:45 | 27.28 | 7.18 | 5.74 | 72.4 | 200 |
| 06/28/2017 | 2:00 | 27.28 | 7.19 | 5.76 | 72.7 | 203 |
| 06/28/2017 | 2:15 | 27.26 | 7.18 | 5.77 | 72.8 | 206 |
| 06/28/2017 | 2:30 | 27.25 | 7.18 | 5.75 | 72.5 | 208 |
| 06/28/2017 | 2:45 | 27.24 | 7.17 | 5.73 | 72.3 | 211 |
| 06/28/2017 | 3:00 | 27.22 | 7.17 | 5.71 | 72.0 | 213 |
| 06/28/2017 | 3:15 | 27.21 | 7.17 | 5.68 | 71.6 | 217 |
| 06/28/2017 | 3:30 | 27.19 | 7.18 | 5.69 | 71.7 | 220 |
| 06/28/2017 | 3:45 | 27.18 | 7.18 | 5.66 | 71.3 | 222 |
| 06/28/2017 | 4:00 | 27.16 | 7.18 | 5.67 | 71.4 | 225 |
| 06/28/2017 | 4:15 | 27.15 | 7.18 | 5.62 | 70.8 | 227 |
| 06/28/2017 | 4:30 | 27.14 | 7.17 | 5.62 | 70.8 | 230 |
| 06/28/2017 | 4:45 | 27.12 | 7.18 | 5.59 | 70.3 | 232 |
| 06/28/2017 | 5:00 | 27.10 | 7.18 | 5.54 | 69.7 | 235 |
| 06/28/2017 | 5:15 | 27.08 | 7.17 | 5.59 | 70.2 | 237 |
| 06/28/2017 | 5:30 | 27.06 | 7.17 | 5.58 | 70.1 | 239 |
| 06/28/2017 | 5:45 | 27.04 | 7.18 | 5.56 | 69.9 | 241 |
| 06/28/2017 | 6:00 | 27.02 | 7.17 | 5.54 | 69.6 | 242 |
| 06/28/2017 | 6:15 | 27.01 | 7.17 | 5.52 | 69.3 | 244 |
| 06/28/2017 | 6:30 | 26.99 | 7.17 | 5.45 | 68.4 | 245 |
| 06/28/2017 | 6:45 | 26.98 | 7.17 | 5.48 | 68.8 | 247 |
| 06/28/2017 | 7:00 | 26.96 | 7.16 | 5.43 | 68.2 | 250 |
| 06/28/2017 | 7:15 | 26.97 | 7.16 | 5.43 | 68.1 | 252 |
| 06/28/2017 | 7:30 | 26.98 | 7.17 | 5.43 | 68.2 | 254 |
| 06/28/2017 | 7:45 | 26.99 | 7.17 | 5.46 | 68.6 | 255 |
| 06/28/2017 | 8:00 | 27.00 | 7.18 | 5.45 | 68.4 | 256 |
| 06/28/2017 | 8:15 | 27.01 | 7.17 | 5.41 | 67.9 | 258 |
| 06/28/2017 | 8:30 | 27.03 | 7.17 | 5.46 | 68.6 | 260 |
| 06/28/2017 | 8:45 | 27.06 | 7.18 | 5.48 | 68.9 | 262 |
| 06/28/2017 | 9:00 | 27.10 | 7.18 | 5.47 | 68.9 | 264 |
| 06/28/2017 | 9:15 | 27.12 | 7.18 | 5.49 | 69.1 | 266 |
| 06/28/2017 | 9:30 | 27.14 | 7.19 | 5.48 | 69.0 | 268 |
| 06/28/2017 | 9:45 | 27.23 | 7.19 | 5.49 | 69.2 | 269 |
| 06/28/2017 | 10:00 | 27.30 | 7.19 | 5.53 | 69.8 | 271 |
| 06/28/2017 | 10:15 | 27.32 | 7.19 | 5.53 | 69.8 | 273 |
| 06/28/2017 | 10:30 | 27.39 | 7.19 | 5.54 | 70.1 | 275 |
| 06/28/2017 | 10:45 | 27.44 | 7.20 | 5.54 | 70.2 | 276 |
| 06/28/2017 | 11:00 | 27.53 | 7.20 | 5.55 | 70.3 | 278 |
| 06/28/2017 | 11:15 | 27.63 | 7.20 | 5.56 | 70.5 | 280 |
| 06/28/2017 | 11:30 | 27.76 | 7.20 | 5.59 | 71.1 | 282 |
| 06/28/2017 | 11:45 | 27.78 | 7.20 | 5.60 | 71.3 | 283 |
| 06/28/2017 | 12:00 | 27.79 | 7.21 | 5.59 | 71.2 | 285 |
| 06/28/2017 | 12:15 | 27.85 | 7.22 | 5.59 | 71.3 | 286 |
| 06/28/2017 | 12:30 | 27.86 | 7.20 | 5.60 | 71.4 | 287 |
| 06/28/2017 | 12:45 | 27.91 | 7.21 | 5.61 | 71.6 | 288 |
| 06/28/2017 | 13:00 | 27.98 | 7.20 | 5.59 | 71.4 | 289 |

Additional Field Data Measurements

| Additional Parameter Data | | | |
|--|-------------------------------------|-------|--|
| Date | 06/28/2017 | | |
| Site | Little White Oak Bayou @ Timble Rd. | | |
| TCEQ ID | 11148 | | |
| Description | STORET | Value | |
| <i>E. coli</i> IDEXX Colilert (MPN/100 ml) | 31699 | 31 | |
| Holding Time, <i>E. coli</i> IDEXX Colilert (hh:mm) | 31704 | 1:50 | |
| TSS (mg/l) | 00530 | 14 | |
| Ammonia-N, Total (mg/l) | 00610 | 0.3 | |
| Nitrate/Nitrite-N, Total (mg/l) | 00630 | 0.32 | |
| Total Phosphorus-P (mg/l) | 00665 | 0.210 | |
| Total Kjeldahl Nitrogen (mg/l) | 00625 | 0.6 | |
| Chloride (mg/l) | 00940 | 30.5 | |
| Sulfate (mg/l) | 00945 | 21.6 | |
| Temperature (°C) | 00010 | 28.10 | |
| Secchi Depth (m) | 00078 | 0.620 | |
| Specific Conductance (µS/cm) | 00094 | 287.7 | |
| DO (mg/L) | 00300 | 5.69 | |
| pH (standard units) | 00400 | 7.57 | |
| Salinity (ppt) | 00480 | 0.14 | |
| Flow Severity (1=No Flow, 2=Low, 3=Normal, 4=Flood, 5=High, 6=Dry) | 01351 | 3 | |
| Days Since Last Significant Rainfall (days) | 72053 | 1 | |
| Total Water Depth (m) | 82903 | 0.472 | |
| Wind Intensity (1=Calm, 2=Slight, 3=Moderate, 4=Strong) | 89965 | 2 | |
| Present Weather (1=Clear, 2=Partly Cloudy, 3=Cloudy, 4=Rain, 5=Other) | 89966 | 2 | |
| Water Surface (1=Calm, 2=Ripples, 3=Waves, 4=Whitecap) | 89968 | 2 | |
| Water Color (1=Brownish, 2=Reddish, 3=Greenish, 4=Blackish, 5=Clear, 6=Other) | 89969 | 1 | |
| Water Odor (1=sewage, 2=Chemical, 3=Rotten Egg, 4=Musky, 5=Fishy, 6=None, 7=Other) | 89971 | 4 | |

Site Photographs

Index – Transect 1

(Bottom of reach)



Upstream taken from transect 1 during index period.



Right bank taken from transect 1 during index period.



Left bank taken from transect 1 during index period.



Downstream taken from transect 1 during index period.

Index – Transect 2



Upstream taken from transect 2 during index period.



Right bank taken from transect 2 during index period.



Left bank taken from transect 2 during index period.



Downstream taken from transect 2 during index period.

Index – Transect 3



Upstream taken from transect 3 during index period.



Right bank taken from transect 3 during index period.



Left bank taken from transect 3 during index period.



Downstream taken from transect 3 during index period.

Index – Transect 4



Upstream taken from transect 4 during index period.



Right bank taken from transect 4 during index period.



Left bank taken from transect 4 during index period.



Downstream taken from transect 4 during index period.

Index – Transect 5



Upstream taken from transect 5 during index period.



Right bank taken from transect 5 during index period.



Left bank taken from transect 5 during index period.



Downstream taken from transect 5 during index period.

Index – Transect 6

(Top of reach)



Upstream taken from transect 6 during index period.



Right bank taken from transect 6 during index period.



Left bank taken from transect 6 during index period.



Downstream taken from transect 6 during index period.

Nekton Photographic Vouchers

NONE: All specimens were preserved, and will be stored at EIH laboratory facilities for 5 years.