EXHIBIT F

USE ATTAINABILITY ANALYSIS REPORT BAYOU DeVIEW BIG CREEK CRAIGHEAD COUNTY, ARKANSAS

USE ATTAINABILITY ANALYSIS REPORT
BAYOU DeVIEW
BIG CREEK
CRAIGHEAD COUNTY, ARKANSAS

Prepared for:

City Water and Light
PO Box 1289
Jonesboro, AR 72403-1289

Prepared by:

FTN Associates, Ltd.
3 Innwood Circle, Suite 220
Little Rock, AR 72211

FTN No. 4470W-040

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1.0 SUMMARY AND CONCLUSIONS

1.1 Summary

A use attainability analysis (UAA) was completed to determine existing and attainable uses of Big Creek (BC), the Unnamed Tributary to Big Creek (UT), and Bayou DeView (BDV), and to evaluate Arkansas water quality criteria (AWQC) for total dissolved solids (TDS), chloride, and sulfate in these streams. UAA activities followed the Final UAA Work Plan (FTN Associates, Ltd. (FTN) September 2008, Appendix A) that was reviewed by the Arkansas Department of Environmental Quality (ADEQ) and the United States Environmental Protection Agency (EPA) Region 6 prior to beginning the fieldwork. The UAA included field studies, toxicity testing, mass balance modeling, engineering analysis of alternatives for discharge/treatment, and an analysis of designated uses and water quality criteria associated with these ditches.

The field studies evaluated physical, chemical, and biological characteristics of the ditches and occurred during spring (May 2009) and summer (September 2008) flow conditions. The biological assessment included toxicity testing and fish and benthic macroinvertebrate sampling during each field study. Water quality data (in situ measurements and chemical laboratory analyses) were collected concurrently with the biological data. A mass balance model was developed and used to evaluate downstream dissolved minerals concentrations under various flow and discharge scenarios. The engineering analysis of alternatives evaluated cost and feasibility of options to manage the discharge and meet the AWQC. The use analysis integrated the results from the field, the literature, and modeling studies to develop recommendations for modifications to the AWQC for the receiving streams.

The recommended modified AWQC, presented below, were developed and evaluated according to requirements in the Arkansas Pollution Control & Ecology Commission (APCEC) Regulation No. 2 (Section 2.306), the Administrative Guidance Document (AGD), and the State of Arkansas Continuing Planning Process (CPP).

Per the AGD, letters have been sent to the Arkansas Natural Resources Conservation Commission (ANRCC), Arkansas Department of Health (ADH), and Arkansas Game and Fish Commission (AGFC) requesting:

- ANRCC to determine if the proposed discharge conflicts with the State Water Plan,
- ADH to verify that BDV and BC are not domestic water supplies, and
- AGFC to verify that proposed changes do not conflict with the protection and management of fish and wildlife.

The official letter responses from these agencies will be forwarded to APCEC, ADEQ, and EPA Region 6 when they are received.

1.2 Conclusions

1.2.1 Field Survey (See Figures 3.1 and 3.2)

1. Water quality sampling results indicated that, although outfall and UT-0 mineral concentrations generally exceeded ecoregion criteria, there was sufficient dilution in BC to result in downstream compliance with ecoregion TDS criteria, but not with sulfate and chloride criteria.
2. Benthic invertebrate communities were dominated by gatherers, predators, and filterers at all locations. No dense areas of freshwater mussel abundance were observed and no individuals (living or dead) of endangered or threatened freshwater mussel species were collected.
3. Fish communities at all sampling locations, including those influenced by the West Plant discharge (i.e., UT-0, BDV-1 and BDV-2), showed the presence of ecoregion key and indicator species and species composition consistent with the attainment of a Channel-altered Delta Ecoregion fishery designated use per APCEC (2007).
4. A weight of evidence evaluation of the limiting factors at locations upstream and downstream of Outfall 001 indicated that differences in benthic invertebrate and fish communities are consistent with expectations based on habitat differences and that there is no evidence of limiting factors other than habitat.

This analysis indicates that current conditions, with respect to instream concentrations of TDS, sulfate and chloride, support and do not limit attainment of aquatic life designated uses in UT, BC, and BDV.

1.2.2 Designated Uses

This analysis indicates that current conditions in the receiving stream support that the designated uses for UT, BC, and BVD are existing and attainable.

1.2.3 Alternatives Evaluation

An evaluation of alternatives for meeting ecoregion minerals criteria in UT indicated that treatment (reverse osmosis) or an alternative discharge location are not feasible alternatives. Accordingly, because of technical and economic limitations regarding treatment and alternate discharge locations, this study recommends a site-specific modification to the AWQC that will allow the West Plant to continue its current discharge and will protect the existing and attainable designated uses.

1.3 Recommendations

In accordance with APCEC Regulation No. 2 (Section 2.306), Title 40 Code of Federal Regulations (CFR) Part 131.10 and the ADEQ CPP, recommendations for modifications to AWQC found in APCEC Regulation No. 2 are summarized in Table 1.1.

Table 1.1. Summary of recommended site-specific AWQC modifications.

Description of reach	Corresponding Existing Assessment Reach(es)	Approximate Length (miles)	Recommended Criteria		
			Chloride (mg/L)	Sulfate (mg/L)	TDS (mg/L)
Unnamed Tributary receiving Jonesboro effluent	none	1.0	71	60	453
Big Creek Ditch from Unnamed Tributary to Whitsle Ditch	08020302-009	15.5	58	49	Ecoregion criterion (411)
Bayou DeView from Whitsle Ditch to AR Highway 14	08020302-007 (upper portion)	11.5	Ecoregion criterion (48)	38	Ecoregion criterion (411)
Bayou DeView from AR Highway 14 to mouth	08020302-007 (lower portion), 08020302-006, 08020302-005, 08020302-004, 08020302-003, 08020302-002, 08020302-001	67.5	Ecoregion criterion (48)	Ecoregion criterion (37.3)	Ecoregion criterion (411)

The following sections of the UAA Report demonstrate that these proposed modifications protect the existing and attainable uses of the receiving streams, and also allow the West Plant discharge to the UT and BC to continue.

2.0 INTRODUCTION

2.1 Overview

City Water & Light (CWL) of Jonesboro, Arkansas, discharges treated wastewater under authority of its National Pollutant Discharge Elimination System (NPDES) permit (No. AR0037907), relating specifically to its West Wastewater Treatment Plant (West Plant). This permit is scheduled for renewal in 2010. ADEQ is considering future permit limits for dissolved minerals (TDS, sulfate (SO_4), and chloride (Cl)) in CWL's permit when it is renewed. In the draft Arkansas 2008 303(d) list, stream segment 08020302-009 (located on BDV downstream of the CWL discharge; Figure 2.1) was listed as impaired due to exceedences of the Arkansas chloride and TDS water quality criteria. The suspected source of the chloride noted on the draft Arkansas 2008 303(d) list was municipal point source(s). Lost Creek (LC), a tributary of BC downstream of the CWL discharge, was also included on the draft Arkansas 2008 303(d) list as impaired due to high chloride concentrations. The source of the chloride in LC cited in the list was industrial point source(s).

Prior to data collection, a study plan was submitted to ADEQ to describe the approach for conducting a UAA to evaluate chloride, TDS, and sulfate levels and their effects on designated uses in the systems near CWL's discharge. It was anticipated that modified AWQC would be proposed for chloride, TDS, and sulfate in an unnamed tributary, BC downstream of the CWL discharge, and possibly for a portion of BDV. It was not anticipated that modifications to any designated or existing uses would be proposed.

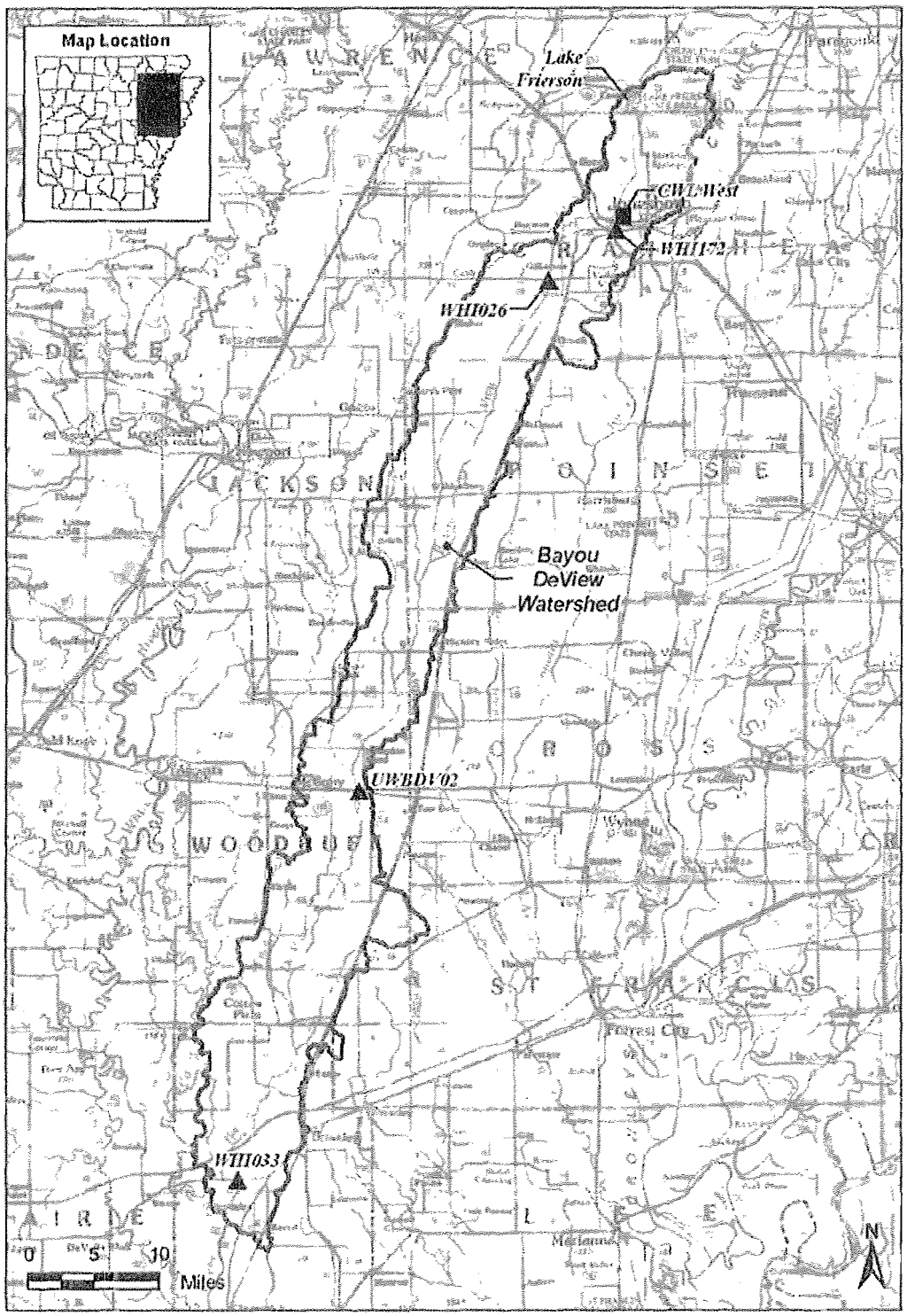

Figure 2.1. Map of study area including locations of ADEQ monitoring stations.

2.2 Objectives

A UAA was conducted to:

1. Define existing and attainable uses in the UT (carries West Plant discharge to BC), BC, and BDV;
2. Determine if a direct discharge from the West Plant to the UT, BC, and BDV would negatively affect existing or attainable uses in the receiving streams;
3. Develop modified water quality criteria for the receiving streams that, if justified, protect existing and attainable uses and allow the discharge to occur; and
4. Identify non-attainable or inappropriate uses that were assigned to the streams by default.

2.3 Approach

It was anticipated that the study would support modified AWQC for chloride, TDS, and sulfate. Therefore, it was necessary to determine whether existing and attainable uses of these waterbodies can be protected with less stringent site-specific mineral criteria. Demonstrating that the discharge of the plant effluent protects existing and attainable uses in the receiving streams requires demonstrating that current effluent concentrations of chloride, TDS, and sulfate do not limit aquatic life and will not impair existing or attainable uses.

The following were components of the approach to address these issues:

1. Waterbody surveys to document current water quality, hydrology, biological, and physical habitat conditions (high flow and low flow), and gather information on other area streams;
2. Toxicity testing of effluent samples; and
3. An evaluation of the technical, environmental, and economic feasibility of treatment to reduce chloride, TDS, and sulfate.

Development of the UAA approach was in accordance with:

1. *The EPA Water Quality Standards Handbook* (EPA 1994) *Second Edition,*
2. *The EPA Technical Support Document for Waterbody Surveys and Assessments for Conducting UAAs* (EPA 1983),

3. The Water Environment Research Foundation's (WERF) reports "*Suggested Framework for Conducting UAAs and Interpreting Results*" (WERF 1997a) and "*A Comprehensive UAA Technical Reference*" (WERF 1997b),
4. The State of Arkansas Continuing Planning Process document (ADEQ 2000),
5. APCEC Regulation No. 2 (2007, including Section Reg. 2.306), and
6. 40 CFR 131.10(a) through (k).

The proposal for changes to APCEC Regulation No. 2 is in accordance with applicable requirements in Regulation No. 2, Sections 2.3.03 "Use Attainability Analysis" and 2.306, "Procedures for Removal of Any Designated Use Except Fishable/ Swimmable, Extraordinary Resource Water, Ecologically Sensitive Waterbody, or Natural and Scenic Waterway, and Modification of Water Quality Criteria not Related to These Uses" (APCEC 2007). The proposal for changes to APCEC Regulation No. 2 is also in accordance with the applicable sections of 40 CFR 131.10 including:

1. 40 CFR 131.10(b): In designating uses of a water body and the appropriate criteria for those uses, the State shall take into consideration the water quality standards of downstream waters and shall ensure that its water quality standards provide for the attainment and maintenance of the water quality standards of downstream waters.
2. 40 CFR 131.10(e): Prior to adding or removing any use, or establishing sub-categories of a use, the State shall provide notice and an opportunity for a public hearing under Sec. 131.20(b) of this regulation.
3. 40 CFR 131.10(g): States may remove a designated use which is not an existing use, as defined in Sec. 131.3, or establish sub-categories of a use if the State can demonstrate that attaining the designated use is not feasible because:
    a. Naturally occurring pollutant concentrations prevent the attainment of the use;
    b. Natural, ephemeral, intermittent or low flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges without violating State water conservation requirements to enable uses to be met;
    c. Human caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place;

d. Dams, diversions or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the water body to its original condition or to operate such modification in a way that would result in the attainment of the use;

e. *Physical conditions related to the natural features of the water body, such as the lack of a proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to water quality, preclude attainment of aquatic life protection uses; or*

f. *Controls more stringent than those required by Sections 301(b) and 306 of the Act would result in substantial and widespread economic and social impact.*

(Note: Italics indicate applicable 40 CFR 131.10(g) criteria.)

The approach to address the potential for dissolved mineral effluent limitations and downstream exceedences of dissolved mineral AWQC was to conduct a UAA to evaluate alternatives to meet AWQC. The UAA alternatives analysis section included the option of developing appropriate site-specific water quality criteria for dissolved minerals that are protective of existing and attainable uses in UT, BC, and BDV.

The UAA process included development of a UAA Study Plan prior to the field studies in order to document the various strategies and planned tasks for ADEQ and EPA review. The revised plan (September 16, 2008) incorporated comments from ADEQ and EPA and was provided to the Agencies. As part of this process, both ADEQ and EPA indicated conceptual agreement with the UAA approach that was proposed. The final UAA Study Plan is included as Appendix A.

2.4 NPDES Permit

The CWL West Plant has been in operation for over 30 years. Outfall 001 is the discharge point from the plant. The West Plant has a design flow of 3 million gallons per day (MGD). The average effluent flow from 1998 through 2007 was 1.74 MGD. The current NPDES permit (No. AR0037907), which became effective February 1, 2005, authorizes discharges of treated municipal wastewater and includes limitations for carbonaceous biochemical oxygen

demand (CBOD), total suspended solids (TSS), ammonia nitrogen, dissolved oxygen, fecal coliform bacteria, residual chlorine, pH, and whole effluent toxicity (Table 2.1).

Table 2.1. Current NPDES permit discharge limits for Outfall 001.

Effluent Characteristics	Discharge Limitations		
	Mass (lbs/day, unless otherwise specified)	Concentration (mg/L, unless otherwise specified)	
	Monthly Average	Monthly Average	7-Day Average
Flow (MGD)	N/A	Report	Report
$CBOD_5$ (mg/L)	375 (0)	15 (0)	23 (0)
TSS (mg/L)	501 (0)	20 (0)	30 (0)
Ammonia Nitrogen (NHS-N) (NH_3-N; mg/L)	100 (0)	4 (0)	6 (0)
Dissolved Oxygen (mg/L)	N/A	5.0 (Inst. Min.)	
Fecal coliform bacteria (FCB)		(colonies/100 mL)	
(Apr-Sept)	N/A	200 (0)	400 (0)
(Oct-Mar)	N/A	1,000 (0)	2,000 (0)
Total Residual Chlorine (TRC)[3]	N/A	< 0.1 mg/L (Inst. Max.)	
pH (standard units)	N/A	Minimum 6.0 su	Maximum 9.0 su
Whole Effluent Lethality (7-day NOEC)	Daily Average Minimum not <100%	7-day Minimum not 100% (0)	

Percent exceedances in routine monitoring from February 2005 through June 2008 are indicated in parentheses.

2.5 Discharge Characteristics

Discharge monitoring data are summarized in Table 2.1. The summary indicates that the West Plant is in compliance with its current permit requirements. Table 2.2 summarizes chloride, TDS, and sulfate data from additional weekly mineral sampling that CWL implemented in April 2008 to evaluate mineral concentrations in the discharge. Mineral data summarized in Table 2.2 indicate that chloride, TDS, and sulfate concentrations in the discharge frequently exceed ecoregion mineral criteria.

Table 2.2. Summary of Outfall 001 water quality based on weekly monitoring from April 2008 through May 2009 (chloride, sulfate, TDS) and routine DMR monitoring (all other parameters).

Parameter		Chloride	Sulfate	TDS
Percentile	10	36.2	35	281
	20	45.8	37	314
	30	51.2	39	338
	40	53.9	41	367
	50	56.6	42	385
	60	59.7	45	396
	70	62.5	46	408
	80	65.5	48	422
	90	69.5	51	432
	95	71.0	60	453
Average		55.2	44.0	369.3
Minimum		21.9	27	198
Maximum		82.5	90	467
No. of samples (N)		61	61	61

2.6 Watershed and Waterway Description

2.6.1 Receiving Stream Water Quality

The discharge enters an UT that flows approximately 0.6 mile to BC, which flows approximately 16 miles to BDV in Craighead County in northeast Arkansas (Figure 2.1). BDV eventually flows into the Cache River in Monroe County. From available maps, it was not clear where BC ends and BDV begins. Therefore, for purposes of clarity in this study, BDV was designated as the stream formed by the confluence of BC and LC. Watershed areas for selected stream reaches are summarized in Table 2.3.

Table 2.3. Selected watershed areas.

Stream Location	Watershed (square miles)
Big Creek at confluence with Unnamed Tributary	50
Big Creek at its confluence with Lost Creek to become Bayou DeView	56
Bayou DeView at Highway 226	102
Bayou DeView at County Road 229	171

Beginning in June 2008, CWL began weekly monitoring of sulfate, chloride, and TDS in the effluent and upstream and downstream of the UT confluence with BC. Results of this monitoring showing the influence of the West Plant discharge on downstream minerals concentrations are provided Figures 2.2 through 2.4. "Upstream" in these figures refers to Big Creek upstream of the West Plant inflow carried by UT. These figures show that Outfall 001 entering BC via the UT causes increases in BC mineral concentrations that sometimes exceed ecoregion criteria.

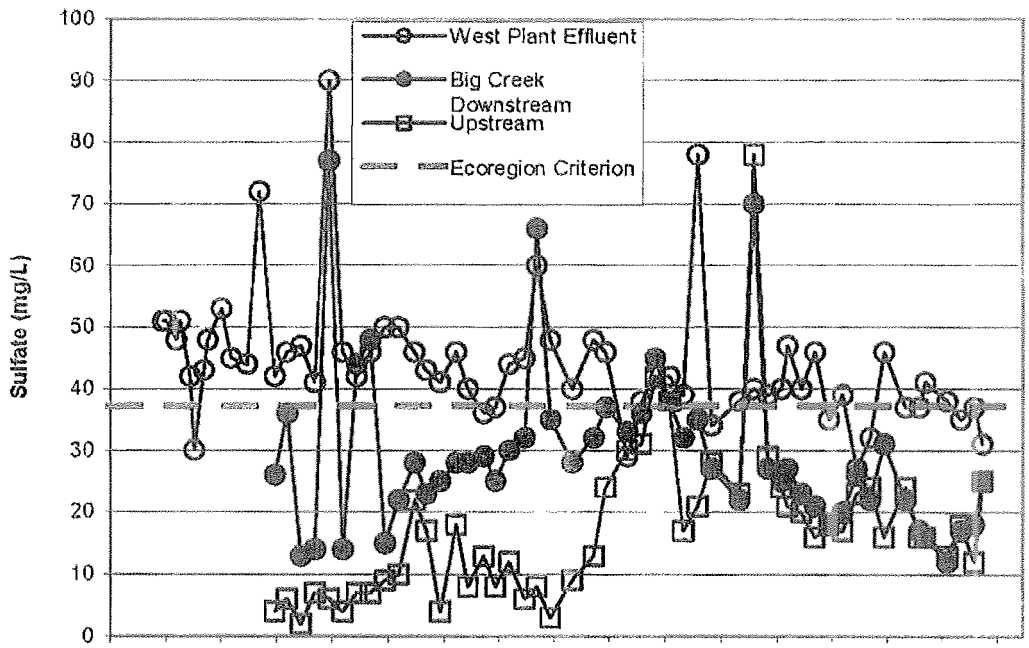

Figure 2.2. Results of weekly monitoring of sulfate in the effluent and upstream and downstream of the UT in BC.

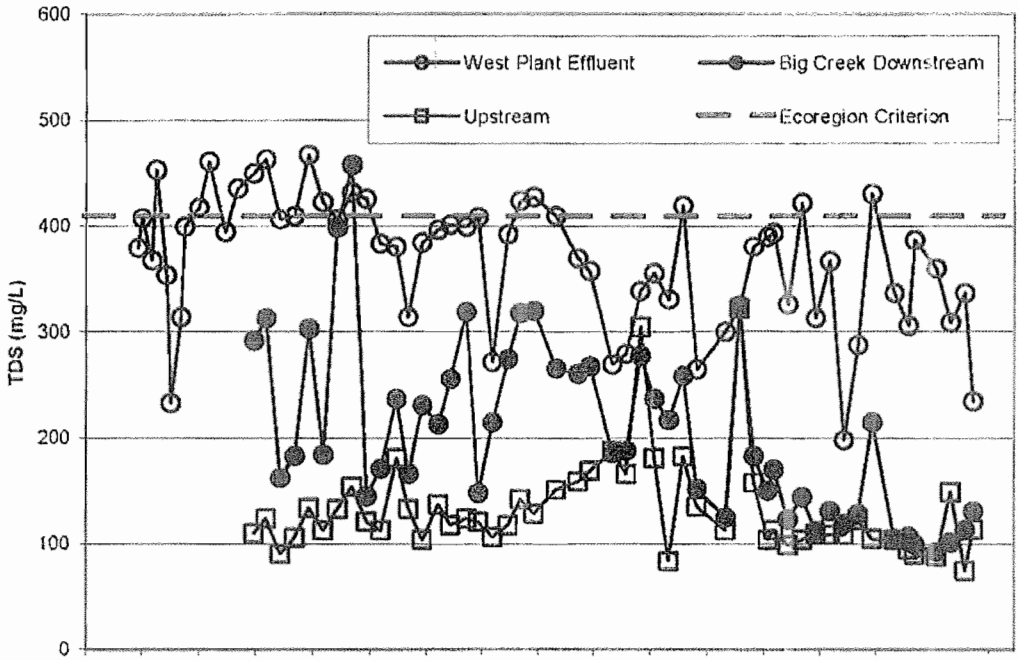

Figure 2.3. Results of weekly monitoring of TDS in the effluent and upstream and downstream of the UT in BC.

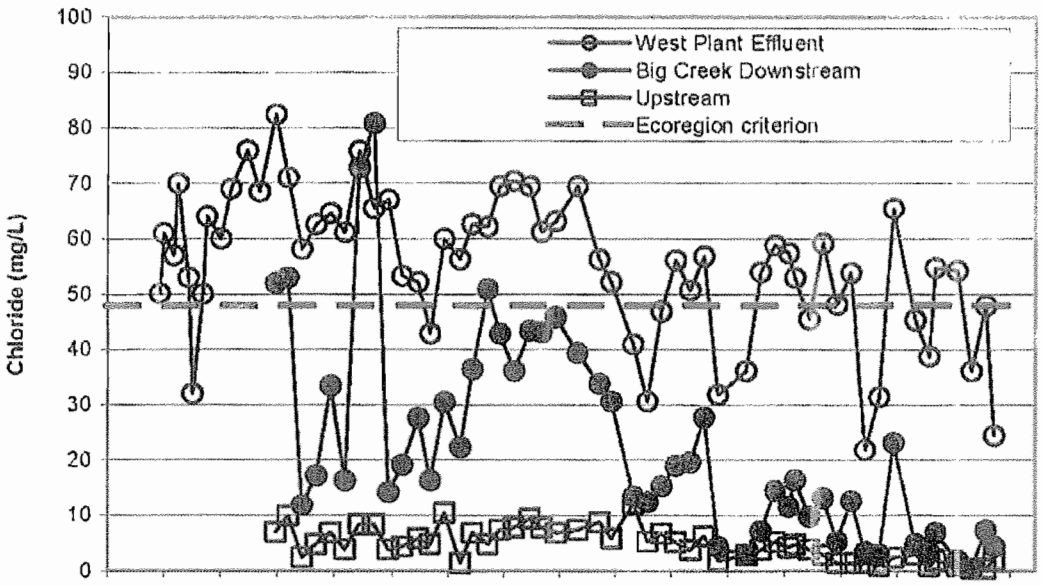

Figure 2.4. Results of weekly monitoring of chloride in the effluent and upstream and downstream of the UT in BC.

2.6.2 AWQC and Designated Uses (APCEC Regulation No. 2)

The receiving streams are within the Delta ecoregion according to Arkansas Pollution Control and Ecology Commission Regulation No. 2, Plate D-1 (APCEC 2007). Applicable AWQC (APCEC 2007) are as follows:

1. Dissolved minerals:
   a. BDV and LC:
      - Chloride: 20 mg/L,
      - Sulfate: 30 mg/L, and
      - TDS: 270 mg/L.
   b. BC and the UT to BC (Delta ecoregion values):
      - Chloride: 48 mg/L,
      - Sulfate: 37.3 mg/L, and
      - TDS: 411.3 mg/L.

2. Designated Uses for the UT to BC, BC, BDV, and LC:
   a. Channel-altered Delta ecoregion streams,
   b. Primary contact recreation (not including the UT),
   c. Secondary contact recreation,
   d. Domestic, industrial, and agricultural water supply, and
   e. Perennial Delta fishery.

The segment of BDV that receives BC drainage (HUC stream segment 08020302-009) was classified as impaired in the draft 2008 Arkansas 303(d) list due to exceedences of the applicable TDS and chloride AWQC. LC (designated as HUC stream segment 08020302-909) was also reported to be impaired due to exceedences of the applicable chloride WQC. The reported suspected sources of the high TDS and chloride concentrations in these stream segments were point sources (municipal point sources for BDV and industrial point sources for LC). Based on review of permitted sources in these watersheds, there are no permitted industrial point source discharges to LC. Identifying the source of the chloride in LC is beyond the scope of this project.

3.0 FIELD SURVEYS

The field surveys included sampling during the spring high-flow primary period (May 13 and 14, 2009), and the summer low-flow critical period (September 17 through 19, 2008). The purpose of the field surveys was to:

1. Establish the range of chemical, physical, habitat and biological conditions present in BDV, BC, and other stream environments near the site, and
2. Evaluate factors (habitat, pollutants) that limit aquatic life in stream reaches affected by the West Plant discharges.

3.1 Sampling Stations

Sampling locations included those specified in the UAA Work Plan (Appendix A). These stations were chosen to characterize representative reaches of BC/BDV upstream and downstream of the West Plant discharge. Accessibility was a major factor in selecting sampling locations due to the highly incised stream channels and dense riparian vegetation. Due to the steepness of the bank, only water samples and measurements could be collected at the BC-0 reach. The locations of the sampling stations are indicated on the map provided on Figure 3.1, illustrated schematically on Figure 3.2 and described in Table 3.1.

A reference stream location was identified based a reconnaissance of streams with watersheds similar in size to BC near its confluence with the UT (approximately 50 square miles). Photographs of selected locations are provided in Appendix B. Ideally, the reference stream watershed should also lie entirely within Crowley's Ridge so that stream gradient and substrate might be similar. However, the number of suitable reference streams locations was limited because the only local streams with approximately 50-square-mile watersheds included substantial portions of channelized reach in the Delta. A location on Sugar Creek was ultimately chosen for a reference location (Figure 3.3) because, although its watershed area is only 19.5 square miles upstream of the sampling location, the watershed above the sampling location lies entirely within Crowley's Ridge.

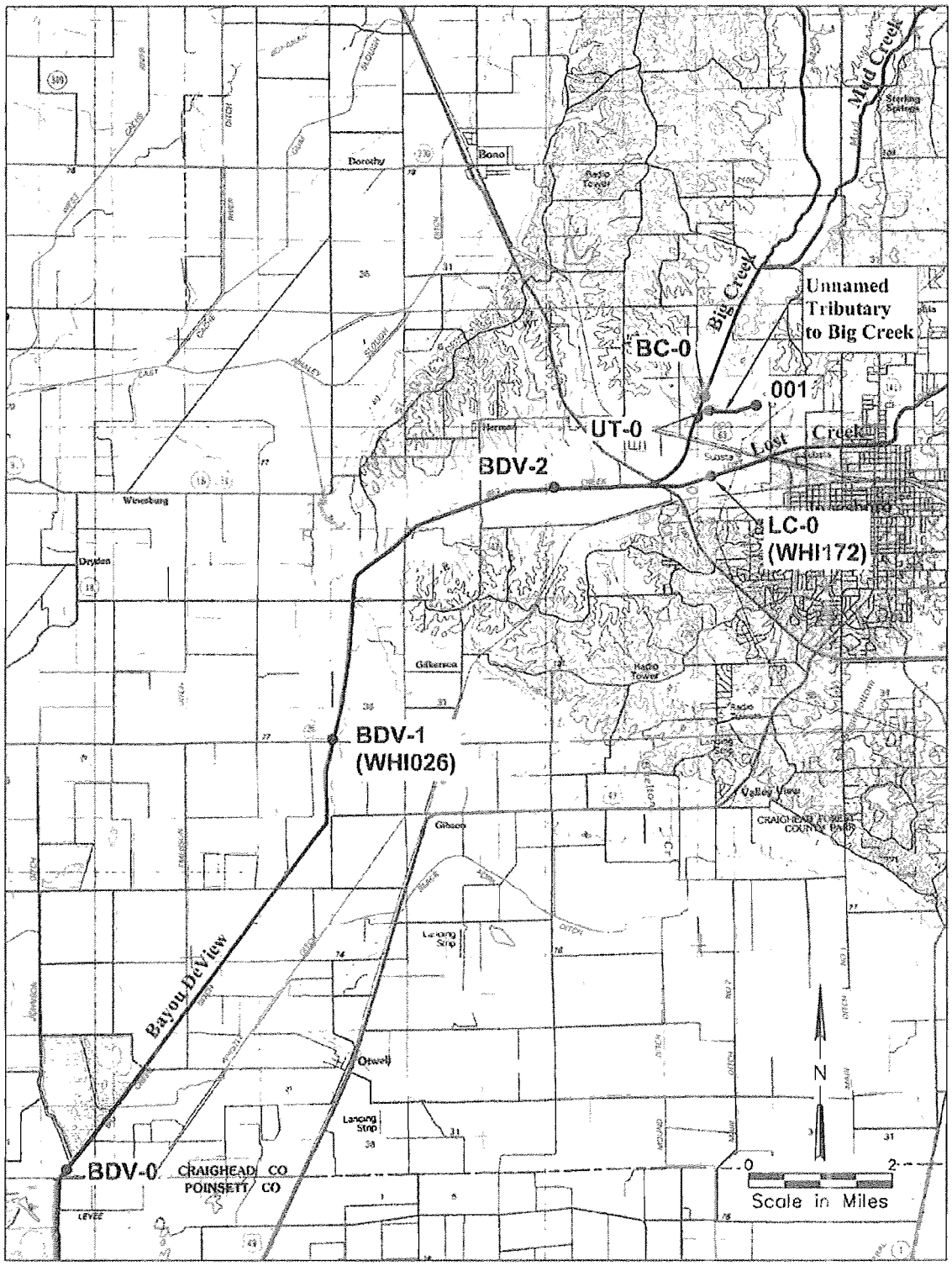

Figure 3.1. Map of study area showing sampling locations.

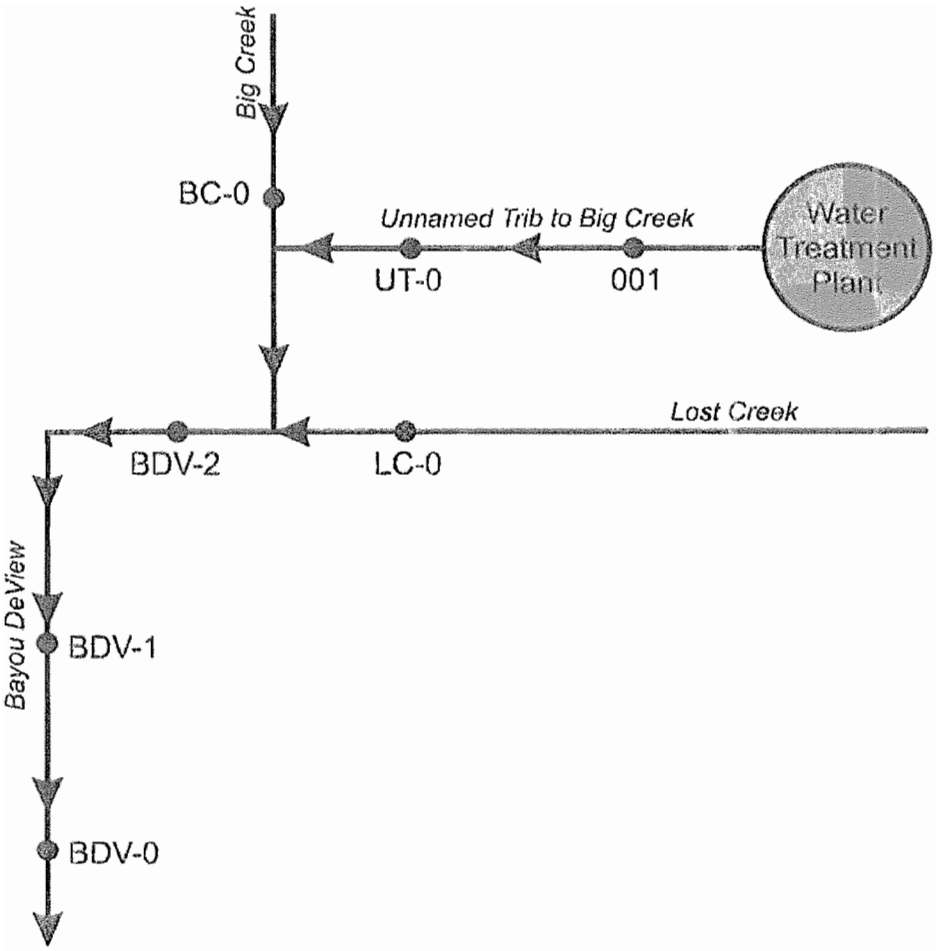

Figure 3.2. Schematic illustration of sampling locations.

Table 3.1. CWL UAA location and sampling plan layout.

		Physical /Habitat Data of Typical Low-gradient Stream Habitat Assessment Procedures						In-situ Chemistry Data				Samples-Chemistry Data				Biological Sampling	Toxicity Testing
Proposed Sampling Location	**Station ID**	Widths	Depths	Flow	Substrate Type	Pool to Riffle Ratio	% Cover	pH (s.u.)	Conductivity (umhos)	Dissolved Oxygen (mg/L)	Temp (degree C)	Sulfate (mg/L)	Chloride (mg/L)	TDS (mg/L)	TSS (mg/L)	Rapid Bioassessments	7-day Chronic Biomonitoring
Reference Streams																	
Big Creek Ditch Upstream of CWL	BC-0	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Reference Stream	Ref-0	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Unnamed Tributary of Big Creek (carries CWL effluent)																	
Unnamed Tributary upstream from Big Creek Ditch	UT-0	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Big Creek Ditch/Bayou DeView																	
Downstream from CWL Discharge	BDV-2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
At Highway 226 (ADEQ Station WHI0026)	BDV-1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
At Highway 229	BDV-0	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
Lost Creek Ditch																	
Upstream from Big Creek Ditch (ADEQ WHI0172)	LC-0	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
CWL Outfall 001																	
CWL Effluent	001							X	X	X	X	X	X	X	X		X

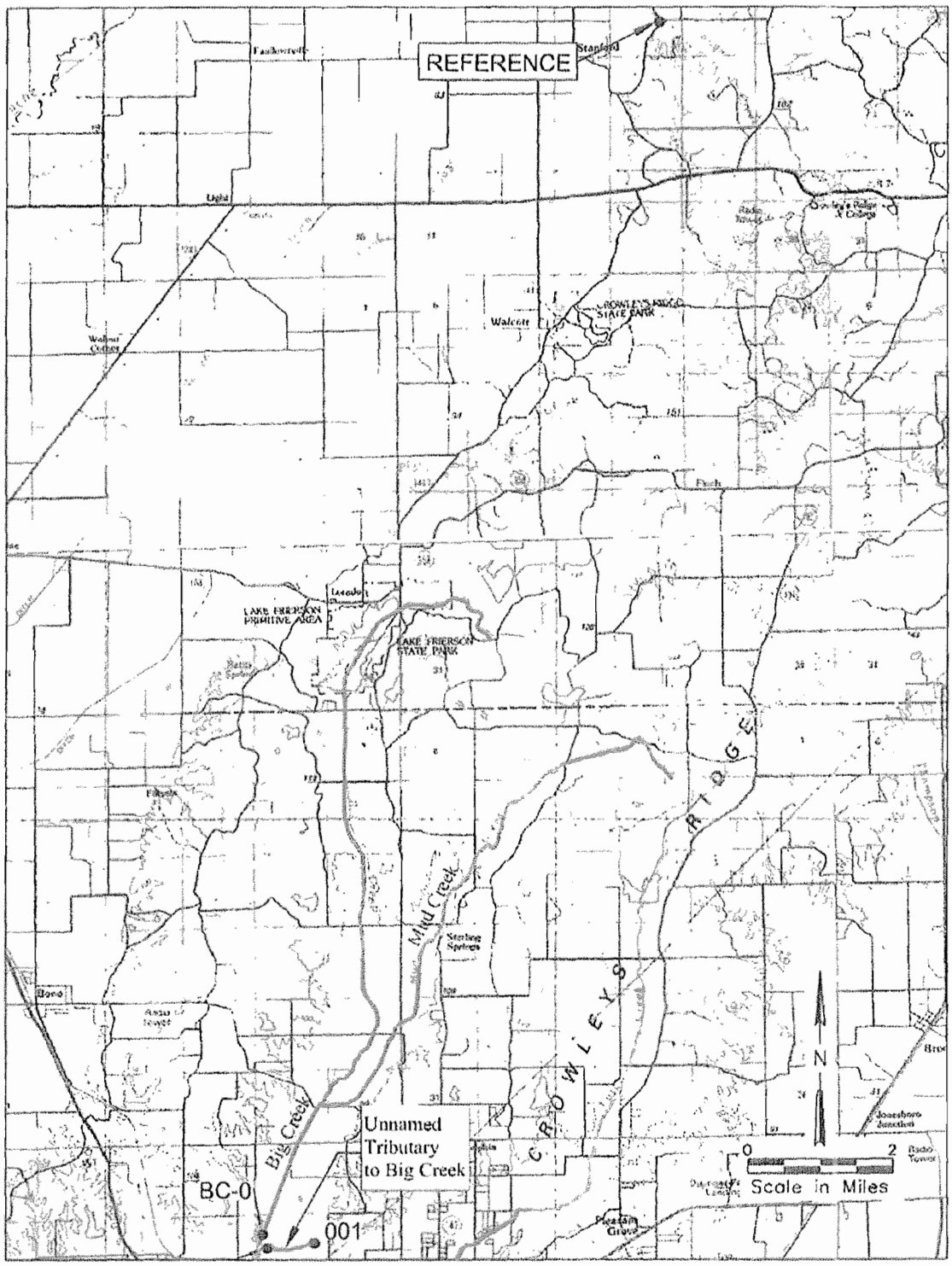

Figure 3.3. Location of reference stream station in relation to other sampling stations.

Chemical and biological conditions were collected at the confluence of BC and the UT that carries CWL effluent, in BDV approximately 2 miles downstream of the confluence, and approximately 8 miles downstream of the confluence at the ADEQ water quality monitoring station location (WHI0026). Chemical conditions were monitored at the CWL outfall, in LC 0.50 mile before its confluence with BC, and BDV approximately 7 miles downstream of ADEQ water quality monitoring station WHI026 (Figure 3.1). Field reconnaissance indicated that the habitats contained in these areas are representative of habitats found near the Outfall. Chemical parameters measured at each station are summarized in Table 3.2.

Table 3.2. Analytical methods used for chemical analysis of water samples collected during the field survey.

Analytical Method	Analyte	Holding time	Method Detection Limit
SM2540C	TDS	7 days	10.0 mg/L
USGS3765	TSS	7 days	4.0 mg/L
EPA 300.0	Sulfate	28 days	0.2 mg/L
EPA 300.0	Chloride	28 days	0.2 mg/L

Sampling during the spring of 2009 was hampered by chronically high water levels due to an unusually wet season. Spring sampling was postponed several times until the streams became reasonable accessible. Nonetheless, spring flows were still somewhat high during sampling. This condition affected the types and numbers of samples/measurements, especially biological samples and flow measurement that could be reliably collected.

3.2 Water Quality and Flow

3.2.1 Measurement Methods

Grab samples were collected at all sample locations according to FTN sampling protocols. Samples were taken from approximately 1 ft below the surface from flowing portions of the stream using a clean plastic bucket. The sample was then split into aliquots and placed into sample containers containing preservative appropriate for the selected analyses. Samples were placed on ice immediately upon collection and delivered to American Interplex Corporation

(AIC) (8600 Kanis Road, Little Rock, AR 72204), which is certified by ADEQ for the selected analyses. Samples were analyzed for the list of analytes using the methods listed in Table 3.2.

Stream flow was measured at the upstream end of each sampling reach indicated. Flows were measured by measuring stream width, depth and current velocity per the United States Geological Survey (USGS) (1982) using a calibrated wading rod and a Marsh-McBirney (Flow Mate Model 2000) flow meter. All flow measurements were made concurrently with grab sample collection.

Although not part of the original study plan, semi-continuous monitoring of dissolved oxygen (DO), temperature, pH, and specific conductance was conducted using a Hydrolab MiniSonde™ calibrated per FTN protocols. Measurements were taken at 15-minute intervals over a period of 24 to 36 hours at Outfall 001, BC-0 and BDV-2.

Measurement of in situ parameters was performed using Hydrolab Minisonde Multiprobe water quality monitors. Instruments were calibrated on the day of use or deployment. Calibration of the DO function on all instruments was performed using air calibration. Calibration of conductivity and pH functions was performed using standard buffers (pH) and calibration standards (conductivity). Calibration was checked upon completion of each day's measurements by comparing instrument readings with readings in standard buffers, calibration standards or saturated air, as appropriate. All calibration information was documented and retained as part of the project records. Discreet in situ measurements were taken in mid-current at a depth of approximately 1 ft, concurrently with grab water samples.

3.2.2 Water Quality and Flow Measurement Results

Results of flow and chemical measurements are presented in Tables 3.3 and 3.4 for the September 2008 and May 2009 sampling, respectively. Laboratory analytical data reports are provided in Appendix D. During the May 2009 sampling flow, measurements could not be obtained from at BDV-0, BDV-1, BDV-2 or REF-0 due to high-stream levels. May 2009 flows were 20 to 100 times higher than in September 2008 at BC-0 and LC-0. Flows at UT-0, which are almost exclusively from Outfall 001, were similar in the 2008 and 2009 sampling.

Table 3.3. Summary of results of flow and water chemistry analyses of grab samples and in situ measurements taken September 17 through 19, 2008.

Analyte	Station (Time of day of sample collection and in situ measurements)							
	BC-0	UT-0	BDV-0	BDV-1	BDV-2	LC-0	001	REF-0
Date	9/17/08	9/17/08	9/18/08	9/16/08	9/16/08	9/17/08	9/18/08	9/18/08
Time	14:54	09:48	12:40	09:25	13:40	07:50	08:15	08:54
Flow (gpm)	537	1138	856	2303	2275	251	Not taken	621
Temperature (°C)	19.75	20.43	20.21	20.21	21.98	18.14	23.93	17.07
DO	9.0	4.2	6.7	6.0	7.8	3.9	7.4	8.7
pH (su)	6.7	6.7	7.0	6.8	7.0	6.2	7.0	6.9
Specific Conductance (uS)	155.6	579.7	313.9	326.7	374.7	180.8	600.1	50.7
TDS	180	440*/480*	250	220	200	160	480*	49
TSS	12	< 4/<4	10	5	6.8	4.4	4.4	7.6
Chloride	7.8	83*/82*	34*	33*	34*	18	80*	5
Sulfate	4.1	39*/37*	14	23	26	20	43*	1.1

*Indicates values not meeting ecoregion WQC; Units = mg/L unless otherwise noted.

Table 3.4 Summary of results of flow and water chemistry analyses of grab samples and in situ measurements taken May 13 and 14, 2009.

Analyte	Station(Time of day of sample collection and in situ measurements)							
	BC-0	UT-0	BDV-0	BDV-1	BDV-2	LC-0	001	REF-0
Date	5/13/09	5/13/09	5/14/09	5/14/09	5/13/09	5/13/09	5/14/09	5/14/09
Time	16:30	14:14	13:10	12:30	11:30	18:30	11:20	9:00
Flow (gpm)	50,899	1,743	Not taken	Not taken	Not taken	10,989	Not taken	Not taken
Temperature (°C)	21.92	24.57	21.38	19.98	20.08	25.34	20.49	18.48
DO	7.7	5.9	6.5	7.7	8.1	7.4	8.7	7.9
pH (su)	6.2	6.3	6.1	6.2	6.1	6.4	6.4	5.7*
Specific Conductance (uS)	55.9	570.5	81.8	79.4	71.5	82.4	466.8	55.3
TDS	86	340*	100	91	53	72	270	110
TSS	47	8.8	150	720	43	28	12	290
Chloride	1.7	50*	3.1	3.6	3	3.3	37*	3.1
Sulfate	4.0	29	4.1	4.1	4.4	5.1	23	2.4

*Indicates values not meeting ecoregion WQC; Units = mg/L unless otherwise noted.

TDS, sulfate and chloride concentrations in UT-0 and Outfall 001 exceeded ecoregion criteria during the September 2008 samples. During the May 2009 sampling, TDS and chloride exceeded criteria at UT-0. BDV locations exceeded chloride criteria during the September sampling. Spring sampling at the reference location showed an in situ pH reading of 5.7 and higher TDS than in the fall low-flow sample.

3.2.3 Water Quality and Flow Measurement Conclusions

Water quality parameters such as TDS, sulfate, and chloride and related in situ parameters, such as specific conductance, showed expected decreases in response to increased flows at all locations except the reference. At REF-0, TDS concentration increased with increased flow (49 to 119 mg/L). However, since there was no concomitant increase in specific conductance, the May 2009 TDS concentration of 110 mg/L is questionable and likely is due to an analytical error.

Although Outfall 001 and UT-0 mineral concentrations generally exceeded ecoregion criteria, there was sufficient dilution in the receiving stream to result in downstream compliance with mineral criteria, except for chloride at BDV locations during the September sampling.

3.3 Physical Habitat Characteristics

3.3.1 Physical Habitat Characteristics Methods

Physical and habitat characteristics based on the entire length of each sampling reach were documented by visual assessment using the approach outlined in Barbour et al. (1999). Field forms used for this assessment of physical characteristics were taken directly from Barbour et al.

Physical variables assessed included:

1. Canopy cover,
2. Substrate type,
3. Sediment characteristics,
4. Dominant aquatic vegetation,
5. Proportion of reach with aquatic vegetation,

6. Pool/riffle ratio,
7. Pool depths,
8. Pool widths,
9. Dominant riparian vegetation, and
10. Watershed features.

Habitat characterization followed low-gradient stream habitat assessment procedures per Barbour et al. (1999). Field forms used for the habitat assessment were taken directly from Barbour et al. In contrast to the evaluation of physical variables, the habitat characterization per Barbour et al. provides a scoring methodology that allows a rough comparison of habitat quality among sites.

Scored habitat variables included:

1. Epifaunal substrate/available cover,
2. Pool substrate characterization,
3. Pool variability,
4. Sediment,
5. Channel flow status deposition,
6. Channel alteration,
7. Channel sinuosity,
8. Bank stability,
9. Vegetative protection, and
10. Riparian vegetative zone width.

Assessment of physical and habitat characteristics was performed once at each site during both the September and May sampling to account for habitat differences due to flow. However, as noted earlier, high flows during the May sampling prevented a complete evaluation.

3.3.2 Physical Habitat Characteristics Results

Results of the assessment of physical characteristics and habitat variables of each site are presented in Tables 3.5 and 3.6 for the September 2008 sampling. Complete habitat forms are provided in Appendix C. Results of the evaluation conducted in May are not provided because high flows allowed only a partial evaluation of habitat. Therefore, this evaluation draws solely on the more complete habitat information obtained during the September 2008 sampling.

Silt and clay dominated the substrates of most locations except for BDV-0 where some gravel, cobble, and sand was present and the reference location which was entirely sand. Local land use was primarily agriculture and forest. Trees and shrubs dominated all riparian zones. Non-point runoff from agricultural fields and roads potentially affected all locations except UT-0 (Table 3.5).

BC-0 habitat was of higher quality than downstream location (BDV-1 and BDV-2) due to marginally higher scores across all habitat categories. The BC-0 location contained a riffle, and had a more diverse substrate (Table 3.5) and a more sinuous channel (Table 3.6). UT-0, BDV-1 and BDV-2 had similar substrate characteristics and differed mainly in bank and riparian zone characteristics.

Table 3.5. Summary of physical and habitat characteristics evaluation performed September 17 through 19, 2008.

Category		BC-0	UT-0	BDV-1	BDV-2	REF
Canopy Cover		**Partly Shaded**	**Shaded**	**Partly Shaded**	**Partly Shaded**	**Shaded**
Inorganic Substrate (% coverage)	Bedrock	0	0	0	0	0
	Boulder	0	0	0	0	0
	Cobble	5	0	0	0	0
	Gravel	20	0	0	0	0
	Sand	5	0	0	0	100
	Silt	70	50	30	10	0
	Clay	0	50	70	90	0
Organic Substrate (% coverage)	CPOM	10	20	< 5	Not Recordable	< 1
	FPOM	0	50	40	Not Recordable	0
	Shell	0	0	0	0	0
Dominant Aquatic Vegetation		None	*Justica americana*	None	Algae	None
Percent of reach with aquatic vegetation		0	90	0	10	0
Pool/Riffle Ratio		4:1	No riffles	No riffles	No riffles	No riffles
Average Stream Depth (m)		0.5	1	1		0.2
Average Stream Width (m)		2	2.4	6.5	7	2
Average Current Velocity (m/s)		0.17	0.02	0.03	0.06	0.12
Substrate odors		Normal	Normal/Anaerobic	None	Normal	Normal
Substrate oils		Absent		Absent	Absent	Absent
Substrate deposits		None				Sand
Embedded stones black on underside?		Yes	No stones	No stones	No stones	No stones
Dominant Riparian Vegetation		Trees/Shrubs	Trees/Shrubs	Trees/Shrubs	Trees	Trees/Shrubs
Watershed Features	Landuse	Forest/Agricultural	Forest/Agricultural	Agricultural	Forest/Agricultural	Forest/Agricultural
	Pollution sources	Non-point runoff	Non-point runoff	Non-point runoff	Non-point runoff	Non-point runoff
	Erosion	Moderate	Moderate	Moderate	Moderate	Moderate
Weather		Clear	Clear	Clear	75% Cloud Cover	

Table 3.6. Summary of habitat characteristics evaluation performed September 17 through 19, 2008.

Category	BC-0	UT-0	BDV-1	BDV-2	REF
Epifaunal substrate/available cover	15	13	11	14	5
Pool substrate characterization	8	6	9	8	13
Pool variability	13	14	11	13	8
Sediment deposition	11	16	15	18	5
Channel flow status	15	16	13	8	13
Channel alteration	13	11	10	6	18
Channel sinuosity	10	6	4	1	13
Bank stability (right/left)	7/7	10/10	6/6	8/6	8/8
Vegetative protection (right/left)	10/10	8/8	2/2	8/8	10/10
Riparian vegetative zone width (right/left)	8/10	10/10	5/8	10/6	10/6
Total habitat score	112	110	89	88	99

3.3.3 Physical Habitat Characteristics Conclusions

Habitat assessments indicated waterbodies with generally silty substrates and landuse dominated by forest and agriculture. BC-0 had the highest quality habitat owing to the presence of a riffle, the most diverse substrate and the most sinuous channel.

Substrate characteristics are a key factor in using habitat to interpret differences in benthic communities among locations. Although the information presented in Table 3.6 suggests similar habitat at BC-0 and UT-0, BC-0 contained a greater diversity of flow regimes a including a riffle (and its corresponding coarse substrate), had a more diverse substrate, and a more sinuous channel. Therefore a more diverse and/or productive aquatic community is expected at BC-0.

Substrate at UT-0, BDV-1 and BDV-2 was uniformly fine and silty suggesting that benthic communities might be expected to be similar.

For purposes of interpreting differences in benthic communities based on habitat quality, the abundance and diversity of benthic macroinvertebrates and fish is expected to follow the same general pattern as habitat quality. Large deviations from this expectation indicate other limiting factors such as water quality.

3.4 Biological Characteristics

3.4.1 Biological Characteristics Methods

Biological assessment procedures followed rapid bioassessment protocols for fish and invertebrates given in Barbour et al. (1999). Based on prior reconnaissance, sampling reaches were chosen to contain habitats that were comparable, to the extent possible, among sampling locations. Five stream reaches ranging in length from approximately 80 to 240 ft were sampled.

3.4.1.1 Invertebrates

Prior to sampling each reach, the upper and lower ends of the reach were cordoned off using block nets. Invertebrate sampling was conducted before fish sampling in order to avoid disturbing substrate. Invertebrates were sample using D-frame kick nets with 0.5-mm mesh net. A total of 12 individual samples were collected from all available habitat, including woody debris, emergent vegetation, snags, undercut banks, open substrate, and riffles (if present). The sampling effort was distributed among habitat types in proportion to the availability of habitats, as assessed by visual inspection. After removal and washing of large debris, the entire contents of the net was washed into wide-mouth glass jars and immediately preserved with 70% ethanol.

Samples were sorted in the laboratory by dispensing the entire sample onto a Caton grid. All organisms were sorted from randomly selected grids until a minimum of 280 organisms were collected. Sorted organisms were transferred to 70% ethanol in glass vials. To assure thorough removal of specimens from the sample, the sorted residue was retained and examined by a second biological technician. If the second sorting produced fewer than 10% of the number of organisms found in the initial sorting, the sorting of that sample was considered complete. If the second sorting produced more than 10% of the number of organisms found in the initial sorting, the sample was resorted until the 10% goal was reached.

Taxonomic identifications were carried out to the lowest practical taxon according to Merritt and Cummins (1996), Thorp and Covich (2001) and Houston (1980). In general, macroinvertebrates were identified to genus except for bivalve mollusks, gastropods, dipteran larvae, and decapod shrimp, which were identified to family. A voucher collection of invertebrate taxa collected at the sites was retained for further reference. All invertebrate taxa

were classified into functional feeding groups (Predator, Shredder, Omnivore, Gatherer/collector, Scraper, and filterer/collector) per Barbour et al. (1999).

Benthic invertebrate data were evaluated by visually examining changes and/or differences in taxa richness and relative abundance of functional feeding groups.

3.4.1.2 Fish Sampling

Fish sampling was conducted using a Smith-Root LR-24 DC current backpack electroshocker. Sampling of each reach was conducted by probing all available habitat beginning at the downstream end of the reach, and proceeding upstream. Two sampling passes were performed on each reach. Stunned fish were collected in a plastic bucket and maintained with aeration until processed. Each individual captured was identified in the field to species according to Robison and Buchanan (1984). Individuals not positively identified in the field were killed, preserved in formalin and identified in the laboratory. Up to 25 individuals of each species were weighed to the nearest 0.1 g and measured (total length) to the nearest mm. After processing, all living fish were returned to the sampling reach.

Fish data were evaluated by visually examining differences in species richness among locations in relation to habitat.

3.4.2 Biological Characteristics Results

3.4.2.1 Benthic Invertebrates

Benthic invertebrate taxa and relative abundance from the September 2008 and May 2009 sampling are summarized in Tables 3.7 and 3.8.

Table 3.7. Summary of benthic macroinvertebrate sampling results from September 17 through 19, 2008.

Metric		Sampling Location				
		BC-0	UT-0	BDV-1	BDV-2	REF-0
Functional Feeding Group (% of individuals)	Gatherer	45	56	10	38	33
	Predator	9	11	70	23	61
	Filterer	42	1	14	9	3
	Scraper	2	2	2	24	1
	Shredder	2	28	4	7	2
	Parasite	0	2	0	0	0
Taxa Richness		16	19	12	14	19
% EPT*		12	1	1	1	7
% Diptera		30	48	9	38	26

* Individuals of Ephemeroptera, Plecoptera, Trichoptera

Table 3.8. Summary of benthic macroinvertebrate sampling results from May 13 and 14, 2009.

Metric		Sampling Location				
		BC-0	UT-0	BDV-1	BDV-2	REF-0
Functional Feeding Group (% of individuals)	Gatherer	55	75	Not Sampled	95	50
	Predator	7	< 1		4	5
	Filterer	27	2		1	25
	Scraper	4	23		0	0
	Shredder	0	0		0	0
	Omnivore	7	0		0	19
	Parasite	0	0		0	
Taxa Richness		12	7		8	14
% EPT*		35	1		1	37
% Diptera		30	47		27	28

* Individuals of Ephemeroptera, Plecoptera, Trichoptera

September Sampling

The highest taxa richness was seen at UT-0, REF-0, and BC-0, where the number of invertebrate taxa were similar, ranging from 16 to 19 (Table 3.7). Gatherers or predators were the most numerous feeding groups at all locations. Gatherers and filterers were the dominant feeding group (87%) at BC-0, while gatherers, predators, and scapers dominated the benthic taxa of the downstream locations (BDV-1 and BDV-2) and the reference location. Gatherers and shredders dominated the UT-0 community.

Percent EPT was low across all locations, ranging from 1 to 12% of individuals, with the highest proportion of EPT found at the upstream location (BC-0) and the reference location. Percent diptera was highest at UT-0 (48% of individuals) and lowest (9% of individuals) at BDV-1.

May Sampling

High water levels prevented sampling at BDV-1. The highest taxa richness was seen at REF-0 (14 taxa) and BC-0 (12 taxa) (Table 3.8). Gatherers were with most numerous feeding groups at all locations. Gatherers and filterers were the dominant feeding group (82%) at BC-0 while gatherers dominated the benthic taxa of the downstream location (BDV-2). Gatherers and scarpers dominated the UT-0 community.

Percent EPT was highest at the upstream location (BC-0) and the reference location. Percent diptera was highest at UT-0 (48% of individuals) and uniform (27 to 30% of individuals) at the remaining locations.

3.4.2.2 Fish

Species relative abundance for the September 2008 sampling is summarized in Table 3.9. Taxa richness ranged from five species at BDV-1 to 13 species at BC-0. Species relative abundance for the May 2009 sampling is summarized in Table 3.10. Taxa richness ranged from seven species at UT-0 to 14 species at the reference location. No fish sampling was possible at BDV-2 during the May sampling because of high water levels.

Table 3.9. Summary of fish collections conducted September 17 through 19, 2008.

Species	Sampling Location				
	BC-0	UT-0	BDV-1	BDV-2	REF
Ameiurus natalis	5.3	1.2			6.5
Campostoma anomalum	9.5				
Cyprinella venusta (1)	14.3				6.5
Erimyzon oblongus					0.9
Etheostoma gracile	0.5				
Fundulus olivaceus	5.3		2.7	3.6	12.0
Gambusia affinis (2)	0.5	88.6	28.3	3.6	7.4
Lepomis cyanellus (1)	9.5	3.6	64.6	8.4	21.3
Lepomis gulosus	1.6				
Lepomis macrochirus	13.8		1.8	67.5	
Lepomis megalotis	36.0	2.4			16.7
Lepomis sp.	1.1			1.2	
Luxilus chrysocephalus		0.6			13.9
Micropterus punctalatus	2.1				
Micropterus salmoides	0.5			1.2	
Notemigonus crysoleucas		3.6			
Notropis maculatus				14.5	
Pimephales notatus			2.7		
Semotilus atromaculatus					14.8
Total Taxa	**13**	**6**	**5**	**7**	**9**
Total Number	**189**	**166**	**113**	**83**	**108**

Notes:
(1) Channel-Altered Delta ecoregion key species
(2) Channel-Altered Delta ecoregion indicator species

Table 3.10. Summary of fish collections conducted May 13 and 14, 2009.

Species	Site			
	BC-0	UT-0	BDV-2	REF
Ameiurus melas		4.1		
Ameiurus natalis	0.6	0.8		4.0
Cyprinella venusta (1)	1.2		11.0	11.0
Dorosoma cepedianum (2)			1.4	
Erimyzon oblongus				4.0
Etheostoma gracile		1.6		
Fundulus olivaceus	8.8		9.6	21.4
Gambusia affinis (2)	2.4	23.8	2.7	0.6
Lepomis cyanellus (1)	13.5		15.1	27.7
Lepomis gulosus	0.6		1.4	
Lepomis macrochirus	8.2	4.9	13.7	6.4
Lepomis megalotis	61.8	36.1	39.7	14.5
Luxilus chrysocephalus				5.2
Lythrurus umbratilis	1.2		2.7	
Micropterus dolomieu	0.6		1.4	
Micropterus punctulatus				0.6
Micropterus salmoides	0.6			
Notemigonus crysoleucas		28.7		
Notropis texanus				0.6
Percina maculata				2.9
Percina sciera				0.6
Pimephales tenellus	0.6			0.6
Pomoxis annularis			1.4	
Total Taxa	**12**	7	**11**	**14**
Total Number	**170**	**122**	**73**	**173**

Notes:
(3) Channel-Altered Delta ecoregion key species
(4) Channel-Altered Delta ecoregion indicator species

Fish species relative abundance for both sampling dates is summarized in Table 3.11. A total of two Channel-Altered Delta Ecoregion key species (*Cyprinella venusta* and *Lepomis cyanellus*) and two indicator species (*Dorosoma cepedianum* and *Gambusia affinis*) (APCEC 2007) were collected among all locations. All four species were collected at BDV-2; two were collected at UT-0 and three were collected at BDV-1 and REF-0.

Table 3.11. Summary of combined September and May fish collections.

Species	BC-0	UT-0	BDV-2	REF
Ameiurus melas	0.0	1.7	0.0	0.0
Ameiurus natalis	3.1	1.0	0.0	5.0
Campostoma anomalum	5.0	0.0	0.0	0.0
Cyprinella venustus (K)	8.1	0.0	5.1	9.3
Dorosoma cepedianum (I)	0.0	0.0	0.6	0.0
Erimyzon oblongus	0.0	0.0	0.0	2.8
Etheostoma gracile	0.3	0.7	0.0	0.0
Fundulus olivaceus	7.0	0.0	6.4	17.8
Gambusia affinis (I)	1.4	61.1	3.2	3.2
Lepomis cyanellus (K)	11.4	2.1	11.5	25.3
Lepomis gulosus	1.1	0.0	0.6	0.0
Lepomis macrochirus	11.1	2.1	42.3	3.9
Lepomis megalotis	48.2	16.7	18.6	15.3
Lepomis sp.	0.6	0.0	0.6	0.0
Luxilus chrysocephalus	0.0	0.3	0.0	8.5
Lythrurus umbratilis	0.6	0.0	1.3	0.0
Micropterus dolomieu	0.3	0.0	0.6	0.0
Micropterus punctulatus	1.1	0.0	0.0	0.4
Micropterus salmoides	0.6	0.0	0.6	0.0
Notemigonus crysoleucas	0.0	14.2	0.0	0.0
Notropis maculates	0.0	0.0	7.7	0.0
Notropis texanus	0.0	0.0	0.0	0.4
Percina maculate	0.0	0.0	0.0	1.8
Percina sciera	0.0	0.0	0.0	0.4
Pimephales notatus	0.0	0.0	0.0	0.0
Pimephales tenellus	0.3	0.0	0.0	0.4
Pomoxis annularis	0.0	0.0	0.6	0.0
Semotilus atromaculatus	0.0	0.0	0.0	5.7
Total Taxa	15	9	13	15
Total Number	359	288	156	281
CPUE	239	377	113	308
No. Cyprinidae Species	4	2	3	5
% Cyprinidae Individuals	14	15	14	24
No. Centrarchidae Species	6	3	8	4
% Centrarchidae Individuals	73	21	75	45
No. Ictaluridae Species	1	2	0	1
% Ictaluridae Individuals	3.1	2.7	0	5.0

I = indicator species; K = key species

3.4.3 Biological Characteristics Conclusions

3.4.3.1 Benthic Invertebrates

Benthic invertebrate data collected in May and July indicate habitats that are, in general, dominated by scrapers (primarily pulmonate and prosobranch snails) and decapod shredders (primarily palaemonid shrimp). This result is consistent with The Arkansas Department of Pollution Control & Ecology survey of least disturbed streams (ADPCE 1987) which found that decapods (primarily palaemonid shrimp) dominated benthic communities. However, the benthic communities of the waterbodies in this study had far fewer taxa (12 to 19) than the least disturbed streams described in ADPCE (1987), which showed an average of 50 taxa. No dense areas of freshwater mussel abundance were observed and no individuals (living or dead) of endangered or threatened freshwater mussel species were collected.

A comparison of benthic communities with expectations based on habitat is presented below.

3.4.3.2 Fish

Evaluation of the combined September and May fish sampling (Table 3.11) provides the best indication of the fish communities that the various sampling locations can support. This information indicates that the greatest species richness was found at BC-0. This result is consistent with the somewhat higher quality habitat found at BC-0. A more detailed comparison of fish communities with expectations based on habitat is presented below.

Sunfish (Centrarchidae) and minnows (Cyprinidae) were conspicuous features of the species composition at all locations. APCEC Regulation No. 2 (2007) describes a "Channel-altered Delta ecoregion fishery" designated use as "streams supporting diverse communities of indigenous of adapted species of fish and other forms of aquatic life. Fish communities are characterized by an absence of sensitive species; sunfishes and minnows dominate the population followed by catfishes. The community may be generally characterized by [see key and indicator fish species for Channel-altered Delta ecoregion streams in Table 3.12]." Examination of the summary rows at the bottom of Table 3.11 indicates that all locations support this type of fish community ("fishery"). The lowest proportion of sunfish was

seen at UT-0. This location supported a large number of *Gambusia affinis,* which is a Channel-altered Delta ecoregion indicator species (Table 3.12). Key and/or indicator species (Table 3.12) were present at all locations (Table 3.11). These results indicate that all locations support components of a "Channel-altered Delta ecoregion fishery."

Table 3.12 Key and indicator species that generally characterize the Channel-Altered Delta ecoregion fishery.

Key Species	Indicator Species
Blacktail shiner (*Notropis venustus*) *	Mosquito fish (*Gambusia affinis*) *
Drum (*Aplodinotus grunniens*)	Gizzard shad (*Dorosoma cepedianum*) *
Carp (*Cyprinis carpio*)	Emerald shiner (*N. atherinoides*)
Channel catfish (*Ictalurus punctatus*)	Spotted gar (*Lepisosteus oculatus*)
Green sunfish (*Lepomis cyanellus*) *	

* Species collected in present study.

3.4.3.3 Factors Limiting Biological Communities

An important aspect of detecting impacts of pollutants on aquatic communities is to separate the effects of habitat from those of pollutants. Often habitat effects are confounded with possible pollutant effects. A case in point is the fish species richness in BC upstream and downstream of the confluence of UT-0, which discharges Outfall 001 effluent into BC. Fish species richness is higher at BC-0 than at UT-0, BDV-1, or BDV-2 (Tables 3.9 through 3.11). If habitat were similar at all locations, this pattern would strongly suggest a negative impact of the discharge on the fish community. However, because habitat varies in important ways among the sampling locations, the effect of the discharge is confounded with habitat effects.

One approach to this problem is to evaluate whether community differences change in accordance with expectations based on habitat. Strong departures from expectations based on habitat indicate that other factors (e.g., pollutants) might limit the diversity and/or production of the biological communities present.

There is no single reliable measure of habitat quality. Therefore, a weight of evidence approach must be used. If a number of biological metrics are considered and a preponderance of those metrics are consistent with habitat, we can conclude that the observed differences in biological communities are consistent with habitat differences and that other potential limiting

factors (e.g., pollutants) are not limiting aquatic life. Conversely, if a preponderance of metrics contradicts expectations based on habitat (e.g., low biotic diversity/production in locations with relatively high-quality habitat), then additional limiting factors (e.g., pollutants) are indicated.

For this data set, an approach similar to that used in EPA's *Stressor Identification Guidance Document* (EPA 2000) was used to develop a weight of evidence-based analyses. Habitat information was evaluated to develop a set of expected community metric responses:

1. Strongly agreed with expectations based on habitat,
2. Weakly agreed with expectations based on habitat,
3. Contradicted expectations based on habitat, or
4. Were inconclusive.

The habitat characteristics considered were substrate, channel sinuosity, and stream size. The community metrics considered were taxa richness, % EPT and % diptera for the benthic communities, and species richness for fish communities. Habitat characteristics and community metrics were assumed to be related as follows.

For benthic communities:

1. Coarser substrate (i.e., containing cobble or gravel) supports higher taxa richness and % EPT than fine, silty substrate;
2. Fine substrates support a greater % diptera than coarse substrate; and
3. Greater channel sinuosity results in a greater variety of flow regimes (fast and slow current, deep and shallow depths) and substrates, and supports greater taxa richness and % EPT.

For fish communities:

1. Greater channel sinuosity results in a greater variety of flow regimes (fast and slow current, deep and shallow depths), and substrates, and supports greater diversity/production; and
2. Larger streams support greater species richness.

The evaluation was then conducted as follows:

1. A table was prepared (Table 3.13) that summarized these habitat characteristics for BC-0, UT-0, BDV-1, and BDV-2. For simplicity, the reference location REF-0 was not included in this analysis.
2. The sites were ranked for each community metric according to the relative metric values that were expected based on the habitat. For example, benthic taxa richness was expected to be greatest at BC-0 (Diverse Substrate; sinuous channel) than UT-0, BDV-1, and BDV-2 (straight channels, fine silty substrate). Similarly, fish species richness was expected to be greater at BC-0 (Diverse Substrate; sinuous channel) than other locations and greater at BDV-1 and BDV-2 than UT-0 (straight channels at all three but smaller stream size at UT-0). Scientific judgment was applied to combine similar metric values into the same ranking.
3. The observed rankings of each location for each metric were entered into the table.
4. The observed rankings were then compared with the expected rankings according to the four categories given above and evaluated as to whether the preponderance of comparisons agreed with or contradicted expectations based on habitat.

This evaluation indicated that the preponderance of biological metrics either strongly or weakly agreed with expectations based on habitat. The analysis concluded, therefore, that fish and benthic macroinvertebrate community metrics varied among sampling location in accordance with expectations based on habitat, and that pollutants such as TDS, sulfate, and chlorides are not limiting aquatic life in UT-0, BDV-1 or BDV-2.

Table 3.13. Weight of evidence analysis of fish and benthic macroinvertebrate communities versus expectations based on habitat.

Sampling Location	Habitat	Expectation				Observed						
		Benthic			Fish	Benthic						Fish
						May 2009			September 2008			
		Rich	% EPT	% Dip	Rich	Rich	% EPT	% Dip	Rich	% EPT	% Dip	Rich
BC-0	Diverse Substrate; sinuous channel; Small size	2	2	1	3	2	2	1	2	2	2	3
UT-0	Silty substrate; straight channel; small size	1	1	2	1	1	1	2	3	1	3	1
BDV-1	Silty substrate; straight channel; large size	1	1	2	2	NS	NS	NS	1	1	1	NS
BDV-2	Silty substrate; straight channel; large size	1	1	2	2	1	1	1	1	1	2	2
		Strong agreement with expectation				X	X		X	X		X
		Weak agreement with expectation but not contradictory						X			X	
		Contradicts expectation										
		Inconclusive										

Rich = species richness (fish) or taxa richness (benthic invertebrates); Dip = % diptera; NS = No sample;

3.5 Field Survey Conclusions

The purpose of the field surveys was to:

1. Establish the range of chemical, physical, habitat, and biological conditions present in BDV, BC, and other stream environments near the site; and
2. Evaluate factors (habitat, pollutants) that limit aquatic life in stream reaches affected by the West Plant discharge.

Conclusions of the field survey can be summarized as follows:

1. Water quality sampling results indicated that, although Outfall 001 and UT-0 mineral concentrations generally exceeded ecoregion criteria, there was sufficient dilution in BC to result in downstream compliance with mineral criteria.
2. Benthic invertebrate communities were dominated by gatherers, predators, and filterers at all locations. No dense areas of freshwater mussel abundance were observed and no individuals (living or dead) of endangered or threatened freshwater mussel species were collected.
3. Fish communities at all sampling locations, including those influenced by the West Plant discharge (i.e., UT-0, BDV-1, and BDV-2), showed the presence of ecoregion key and indicator species and species composition consistent with the attainment of a Channel-altered Delta Ecoregion fishery use per APCEC Regulation No. 2 (2007).
4. A weight of evidence evaluation of limiting factors at locations upstream and downstream of Outfall 001 indicated that differences in benthic invertebrate and fish communities are consistent with expectations based on habitat differences, with no evidence of limiting factors other than habitat.

This analysis indicates that current conditions with respect to instream concentration of TDS, sulfate, and chloride support and do not limit attainment of aquatic life uses in UT, BC, and BDV.

4.0 TOXICITY

4.1 Toxicity Test Methods

A grab sample of effluent collected on September 16, 2008, was tested using chronic static renewal toxicity tests with *Ceriodaphnia dubia* and *Pimephales promelas* per EPA (2002). Effluent was tested at full strength (100%) only. Three effluent samples were collected and used for renewals during the tests. Each sample was also analyzed for TDS, sulfate, and chloride. Growth and reproduction data were analyzed per EPA (2002) to evaluate lethal and/or sub-lethal effects relative to the control.

4.1.1 Toxicity Test Results

Toxicity test results are summarized in Table 4.1. No significant lethal or sub-lethal toxicity was observed with either test organism. Results of mineral analyses are presented in Table 4.2.

Table 4.1 Results of chronic toxicity screening tests on Outfall 001 grab samples collected on September 16, 2008.

Test Concentration	*Pimephales promelas*		*Ceriodaphnia dubia*	
	% Survival	Mean Weight per Fish (mg)	% Survival	Mean Number of Neonates per Female
Control	97.5	0.297	100	25.5
100%	100	0.311	100	26.2

Table 4.2. Results of mineral analysis of three grab samples collected for toxicity tests on September 16, 2008.

Sample	TDS	Chloride	Sulfate
1	450	73	34
2	450	78	59
3	450	73	35
Average	450	75	41
Percentile rank from Table 2.2	93	96	39

4.1.2 Toxicity Test Conclusions

Toxicity tests on effluent samples indicated no lethal or sub-lethal toxicity. TDS and chloride concentrations of the effluent samples used in the toxicity tests were in the high range (93rd and 96th percentiles, respectively) of TDS and chloride concentrations measured at Outfall 001 weekly during April 2008 through May 2009 (Table 2.2). This result indicates that TDS and chloride concentrations should not reach lethally or sub-lethally toxic concentrations in the outfall. The sulfate concentration in the September 16 sample was relatively low (average = 41 mg/L) and corresponded to the 39th percentile during April 2008 through May 2009.

The 95th percentile sulfate concentration based on Outfall 001 monitoring is 60 mg/L. Literature information (Mount et al. 1997) indicates that the sulfate ion, in combination with other ions commonly found in fresh water (sulfate, carbonate, chloride), shows a relatively low level of toxicity to *C. dubia*. Table 4.3 summarizes the 48-hour LC50 values for sulfate in combination with various anions based on Table 2 in Mount et al. (1997). This summary shows that acute LC50's for sulfate are well over the 95th percentile sulfate concentration from Outfall 001 monitoring. Previous analyses by FTN have indicated acute to chronic ratios (ACRs) for TDS (with negligible contribution from K) of approximately 5 or 6. Based on an ACR of 5, the 95th percentile sulfate concentration is well below sulfate concentrations expected to be associated with chronic toxicity.

Table 4.3. Calculated sulfate 48-hour acute LC50 concentrations for various salts based on Table 2 in Mount et al (1997).

Salt	LC50 of salt (mg/L)	LC50 of sulfate (mg/L)
K_2SO_4	770*	423
$CaSO_4$	> 1910	1356
$MgSO_4$	1770	1416
Na_2SO_4	3080	2094

*Based on 24-hour LC50.

5.0 MASS BALANCE MODEL

A steady state mass balance was developed for Big Creek Ditch and Bayou DeView downstream of the discharge of treated wastewater from the CWL West Plant. The objective of the mass balance was to estimate concentrations of chloride, sulfate, and TDS in Big Creek Ditch and Bayou DeView under critical conditions. Mass balance predictions were based on the data summarized in Table 5.1. A printout of the mass balance is shown o Figure 5.1. These predicted mineral concentrations can be used as a basis for site-specific mineral criteria.

Table 5.1. Input data used for preliminary mass balance modeling of mineral concentrations in BC and BDV downstream of the mouth of the UT.

Source	Data Source	Flow (gpm)	TDS	Sulfate	Chloride
BC-0; Big Creek upstream of mouth of Unnamed Tributary	September 2008 field survey	537	180	4.1	7.8
Outfall 001	95th percentile of weekly monitoring data from April 2008 through May 2009	2,083*	453	60	71
LC-0; Lost Creek	September 2008 field survey	251	160	20	18

* Design flow of the West Plant

Critical conditions were defined as summer low-flow conditions for two reasons. First, low-flow conditions are normally the time when continuous point source discharges, like the CWL discharge, would have the greatest potential to impact the receiving stream. Second, ADEQ historical water quality data for BDV (station WHI0026) indicate that concentrations of dissolved minerals (i.e., chloride, sulfate, and TDS) tend to be somewhat higher in summer and fall than in other seasons.

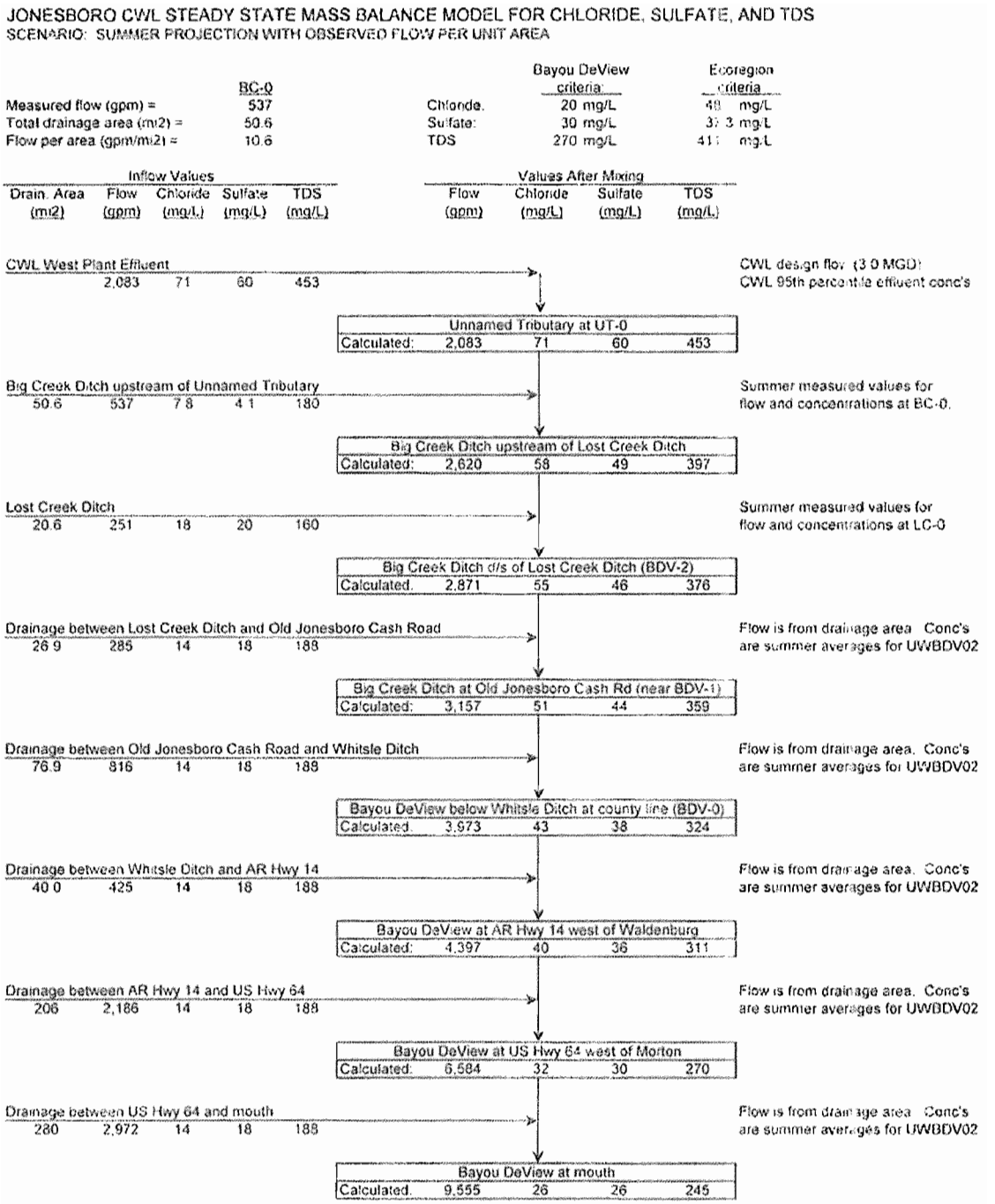

Figure 5.1. CWL mass balance model.

For the CWL effluent, the flow rate was set to the facility design flow (3.0 MGD) and each of the concentrations was set to the 95th percentile of 62 effluent values that CWL measured on an approximately weekly basis between April 28, 2008, and June 16, 2009. These 95th percentile concentrations were 71 mg/L chloride, 60 mg/L sulfate, and 453 mg/L TDS.

Measured values from the FTN summer field study were used to specify the quantities and quality of inflow from Big Creek Ditch, upstream of CWL and from Lost Creek Ditch.

Quantities of inflow entering downstream of the confluence of Big Creek Ditch and Lost Creek Ditch were estimated based on drainage areas and the flow per unit area for Big Creek Ditch upstream of CWL (station BC-0) that was measured during the FTN summer field study (537 gpm, which is equivalent to 10.6 gpm per square mile). The following drainage areas were obtained from USGS (1974):

1. 50.6 mi^2, Big Creek Ditch at Dan Avenue (US Highway 63B);
2. 20.6 mi^2, Lost Creek Ditch at Dan Avenue (US Highway 63B);
3. 98.1 mi^2, Big Creek Ditch at Old Jonesboro Cash Rd (2.0 miles north of BDV-1);
4. 175 mi^2 ,Bayou DeView below Whitsle Ditch (at Craighead-Poinsett County line);
5. 215 mi^2, Bayou DeView at AR Highway 14 west of Waldenburg;
6. 421 mi^2, Bayou DeView at US Highway 64 west of Morton;
7. 701 mi^2, Bayou DeView at its mouth (confluence with Cache River);

Concentrations for inflow entering downstream of the confluence of Big Creek Ditch and Lost Creek Ditch were estimated using average summer and fall values from the ADEQ data for BDV at US Highway 64 west of Morton (station UWBDV02). Data from this location were assumed to be representative of ambient inflow entering BDV with negligible influence from CWL. The average concentrations for the summer and fall period (June through November) were 14 mg/L chloride, 18 mg/L sulfate, and 188 mg/L TDS.

The results of the mass balance are conservative for several reasons. First, the CWL discharge is assumed to be operating at design flow and 95th percentile concentrations. Second, the amount of ambient inflow to the receiving stream per unit of drainage area (10.6 gpm per

square mile = 0.024 cfs per square mile) is based on a measurement during a dry period and is an order of magnitude lower than the median flow per unit area at the USGS flow on Bayou DeView at Morton (111 cfs for 421 square miles = 0.26 cfs per square mile; USGS 2009). Third, the mass balance inherently assumes that low-flow conditions exist for a duration that is equal to the travel time from the CWL outfall to the mouth of BDV without any additional ambient dilution.

The results of the mass balance show that, under critical conditions with the conservative assumptions listed above, the existing criterion of 20 mg/L chloride would be exceeded throughout the entire length of BDV. The existing criteria of 30 mg/L sulfate and 270 mg/L TDS would be exceeded upstream of US Highway 64. However, the ecoregion criteria of 48 mg/L chloride, 37.3 mg/L sulfate, and 411 mg/L TDS would be exceeded only in areas upstream of Arkansas Highway 14 west of Waldenburg.

Based on the mass balance results, the criteria in Table 5.2 below are recommended.

Table 5.2. Summary of recommended site-specific AWQC modifications.

Description of Reach	Corresponding Existing Assessment Reach(es)	Approximate Length (miles)	Recommended Criteria		
			Chloride (mg/L)	Sulfate (mg/L)	TDS (mg/L)
Unnamed Tributary receiving Jonesboro effluent	none	1.0	71	60	453
Big Creek Ditch from Unnamed Tributary to Whitsle Ditch	08020302-009	15.5	58	49	Ecoregion criterion (411)
Bayou DeView from Whitsle Ditch to AR Highway 14	08020302-007 (upper portion)	11.5	Ecoregion criterion (48)	38	Ecoregion criterion (411)
Bayou DeView from AR Highway 14 to mouth	08020302-007 (lower portion), 08020302-006, 08020302-005, 08020302-004, 08020302-003, 08020302-002, 08020302-001	67.5	Ecoregion criterion (48)	Ecoregion criterion (37.3)	Ecoregion criterion (411)

Each of the values in the table above was selected as the highest "predicted" concentration within the specified reach or the ecoregion criterion, whichever was higher.

6.0 EXISTING USES

The following sections provide an evaluation of existing uses in waterbodies downstream of the influence of Outfall 001.

6.1 Primary and Secondary Contact Recreation

This use is assigned by default and is assumed to be an existing use because, theoretically, people can come in contact with water in at all sampling locations. However, the field surveys did not find evidence that this is an existing use. The physical conditions (steep side slopes, lack of consistent flow, mud bottom, etc.) are not conducive to secondary contact recreation in this system. However, this analysis does not preclude primary and/or secondary contact as an existing use.

6.2 Industrial Water Supply

None of the waterbodies is presently used as a source of water for industry, and no evidence of such use was discovered during the field surveys.

6.3 Agricultural Water Supply

The ANRCC requires that irrigation (or other) water withdrawals from these drainage ditches be registered. No ANRCC-registered water withdrawals exist for UT. Field observations indicated that both BC and BDV are likely used for irrigation.

6.4 Domestic Water Supply

The field surveys did not find any evidence that any of the waterbodies' sampled are presently used for domestic water supply. A review of the ADH public water supply database (http://www.healthyarkansas.com/eng/pwslist0.htm) did not indicate any domestic water supply users for BC or BDV upstream of BDV-2 (or UT).

6.5 Aquatic Life

A habitat-limited aquatic life use (Channel-altered Delta ecoregion fishery) presently exists in UT and the BC, and BDV reaches affected by the West Plant discharge.

6.6 Conclusions

This evaluation of existing uses indicates the following:

1. Primary and secondary contact recreation are presumed to be existing uses.
2. No evidence of domestic or industrial water supply uses were noted during the field survey. It is not likely that these are existing uses.
3. Agricultural water supply is an existing use.
4. The Channel-altered Delta ecoregion fishery is an existing use in the waterbodies downstream of the West Plant discharge.

7.0 ATTAINABLE USES

The following sections provide an evaluation of attainable uses in waterbodies downstream of the influence of Outfall 001. In evaluating attainable uses, it is assumed that the West Plant is operating continuously and discharging TDS, sulfate, and chloride concentrations equal to the 95th percentile of Outfall 001 data as summarized in Table 2.2 (i.e., 453 mg/L TDS, 60 mg/L sulfate, and 71 mg/L chloride).

7.1 Primary and Secondary Contact Recreation

Although these uses are assumed to exist, the field surveys did not find evidence of contact recreation. Mineral concentrations from Outfall 001 should not affect the attainability of this use. Therefore, this use is an attainable use under the stated discharge conditions.

7.2 Industrial Water Supply

Although not likely an existing use, mineral concentrations from Outfall 001 should not affect the attainability of this use. Therefore, this use is an attainable use under the stated discharge conditions.

7.3 Domestic Water Supply

Although not likely an existing use, Outfall 001 concentration of TDS and sulfate are below drinking water standards of 250, 250, and 500 mg/L choride, sulfate, and TDS, respectively. Therefore, with respect to mineral quality, the domestic water supply use is attainable under the stated discharge conditions.

7.4 Agricultural Water Supply

Literature values and guidelines for salinity tolerance for crops and salinity of irrigation waters were reviewed and summarized below.

7.4.1 TDS

The most commonly used guideline for salinity tolerance of crops is Ayers and Westcot (1985). In this document, yield potentials for a number of crops are associated with soil and water salinity values measured as electrical conductance. Salinity values associated with yield potentials for cotton, soybeans, and rice are summarized in Table 8.1. The water salinity values reported in Ayers and Westcot (1985) have been calculated from the soil salinity values reported (ECw=ECe/1.5). TDS values shown in Table 7.1 were calculated from the conductivity values (TDS=650*Conductivity). The calculated irrigation water TDS values summarized in Table 7.1 indicate that an effluent TDS of 1,000 mg/L would not be expected to negatively affect crop productivity.

Table 7.1 Influence of soil salinity (ECe) and irrigation water salinity (ECw) on crop tolerance and yield potential of selected crops (Ayers and Westcot 1985).

Crop	Parameter	100% yield		90% yield		75% yield		50% yield		0% yield	
		ECe	ECw	ECe	ECw	ECe	ECw	ECe	ECw	ECe	ECw
Cotton	Cond, dS/m	7.7	5.1	9.6	6.4	13	8.4	17	12	27	18
	TDS, mg/L		3315		4160		5460		7800		11700
Rice	Cond, dS/m	3	2	3.8	2.6	5.1	3.4	7.2	4.8	11	7.6
	TDS, mg/L		1300		1690		2210		3120		4940
Soybean	Cond, dS/m	5	3.3	5.5	3.7	6.3	4.2	7.5	5	10.	6.7
	TDS, mg/L		2145		2405		2730		3250		4355

The US Salinity Laboratory, USDA-ARS, has calculated linear regressions of irrigation water salinity (measured as the conductivity) to relative rice yield measurements based on experiments conducted in the late 1990s (Zeng and Shannon 2000). These relationships are based on the response of rice to sodium chloride (NaCl) solutions of various strengths that were used for irrigation in the experiments. Table 7.2 shows irrigation water conductivities for relative yields of grain weight per panicle and grain weight per plant that correspond to the yield potentials that are shown in Table 7.1. These values were calculated using Zeng and Shannon's (2000) linear regression equations. TDS values in Table 7.2 are calculated using the same equation as for Table 7.1 values. The linear regression relationships developed by the US Salinity Laboratory indicate that a TDS (due primarily to NaCl) of 1,000 mg/L could reduce rice

productivity by about 10%. Tacker et al. (1994) also report that irrigation water with conductivity greater than 1.2 dS/m (approximately 780 mg/L TDS) is borderline for use on rice. The U of A Cooperative Extension Service reports that levels greater than 770 ppm in irrigation water for rice are cause for concern (www.aragriculture.org/agengineering/irrigation /crop/rice/quality.asp). The proposed criteria are considerably below levels which are cause for concern, so no negative effect on crop yield would be expected.

Table 7.2 Irrigation water salinity for selected relative rice yield measurements calculated using US Salinity Laboratory linear regression equations (Zeng and Shannon 2000).

Yield Measurement	Parameter	Percent Yield				
		100	90	75	50	0
Grain weight per panicle [1]	Cond, dS/m	0.49	1.71	3.54	6.59	12.68
	TDS, mg/L	317	1,110	2,299	4,280	8,244
Grain weight per plant [2]	Cond, dS/m	0.46	1.52	3.12	5.78	11.10
	TDS, mg/L	297	989	2,026	3,755	7,212

Notes:
1. ECw = (1.040 – relative yield)/0.082, r^2=0.87
2. ECw = (1.043 – relative yield)/0.094, r^2=0.83

7.4.2 Sulfate

Sulfate in irrigation is generally considered to be beneficial to crops rather than harmful (Tracy and Hefner 1993, Bauder et al. 2004, Glover 2001, Baser and Gilmour 1982). James et al. (1982) classify irrigation water with sulfate concentrations of 673 mg/L to 1,153 mg/L, and TDS concentrations of 488 mg/L to 1,300 mg/L as useable for crop irrigation when leaching is used. The proposed sulfate limit is less than 673 mg/L, so no negative effect on crop yield from sulfate is expected. It has been found (Baser and Gilmour 1982) that SO_4^{2-} in the soil forms gypsum ($CaSO_4$), which is insoluble. This reaction acts as a mechanism to limit the amount of SO_4^{2-} that can dissolve and damage rice or other crops.

7.4.3 Chloride

Soybeans are more sensitive to chloride levels than rice or cotton (the most tolerant). A threshold of 100 mg/L of chloride was identified by Arkansas researchers for soybeans

(F. Miller 2005). Sherrard et al. (1987) recommend chloride concentrations <250 mg/L for irrigation water. James et al. (1982) classify irrigation water with >12 mg/L of chloride and conductivity >2,000 µmhos (approximately 1,300 mg/L TDS) as being of doubtful use. Tacker et al. (1994) state that irrigation water with chloride concentrations >3 mg/L (100 ppm) are not recommended for rice production. Foliar injury to cotton can result when sprinkler water has chloride levels >700 mg/L (Tanji 1990, Bauder et al. 2004). Soybean cultivars vary in their chloride tolerance (Ames et al. 2000, Rupe et al. 2000). The proposed chloride WQC are well below levels which are cause for concern, so no negative effect on crop yields is expected.

7.4.4 Conclusions: Agricultural Water Supply as an Attainable Use

If the undiluted effluent were used to irrigate crops, the current TDS, sulfate, and chloride levels in the effluent are not expected to affect yields of rice, soybeans, or cotton. Therefore, this use is an attainable use under the stated discharge conditions.

7.5 Aquatic Life

The analysis presented in Section 3.0 of this document demonstrates that, under current discharge conditions, ecoregion fishery designated uses are being met and that fish and benthic macroinvertebrate communities are consistent with expectations based on habitat and not limited by water quality. Therefore, this use is an attainable use under the stated discharge conditions.

7.6 Conclusions: Attainable Uses

This evaluation of attainable uses indicates that all designated uses are attainable under the stated discharge conditions.

8.0 ALTERNATIVES EVALUATION

The direct discharge of West Plant wastewater would be the most direct and least expensive method for managing this wastewater. However, since the effluent comprises 100% of the flow in the UT, the elevated dissolved minerals concentrations downstream from the discharge would exceed AWQC. Direct discharge, therefore, requires modified AWQC.

UAA guidance requires that an evaluation be made of the alternatives to the direct discharge of the water. These alternatives are evaluated for technical and economic considerations. Based on a number of similar evaluations in previous UAAs, the alternatives for management of effluents with elevated dissolved minerals are limited. Two alternatives that could be applicable to meet AWQC are reverse osmosis (RO) treatment of the wastewater or pumping the wastewater to a larger stream that holds the potential for dilution of the minerals. Accordingly, the following section evaluates three alternatives for an environmentally safe discharge of the plant effluent:

- RO treatment to remove or reduce dissolved minerals;
- Pumping the wastewater to a larger stream that holds the potential for dilution of the minerals; or
- Site-specific criteria modification for chloride, sulfate, and TDS.

The evaluation of these alternatives follows.

8.1 TDS Treatment Through Reverse Osmosis

Wastewater technologies, such as conventional precipitation, can efficiently remove the heavy metals from wastewater to meet the effluent requirements. However, these systems do not remove the dissolved compounds like sulfate and TDS. As a result, the effluent flow from the treatment plant is limited by the dilution of the flow in the receiving stream to reduce these constituents to acceptable concentrations.

RO is an advanced water/wastewater treatment process capable of removing dissolved contaminants such as TDS, sulfate, and chloride. It is essentially an extension of a filtration

process in which highly pressurized feed water flows across a membrane, with a portion of the flow, identified as "permeate," going through the membrane. The rest of the feed is called "concentrate" because it carries off the concentrated contaminants rejected by the membrane. The concentrate amount depends on many factors and can vary between 10 to 30% of the feed. Depending on the size of the pores in the membrane, the process results in different classes of separation. For the removal of dissolved solids, a membrane capable of rejecting elemental particles must be utilized.

8.1.1 Technical Considerations

Based on the preliminary information available from equipment manufacturers, RO is a possible alternative treatment for effluent to meet the limits for TDS and sulfate. The RO permeate would be of high quality and meet downstream AWQC in this process.

The most common problems with RO involve the tendency for fouling problems when applied to concentrated waste streams and the cost of operation (i.e., electricity, membrane cleaning, etc).

The disposal of the concentrated brine generated by this process is a larger problem. This issue generally becomes the controlling factor in the selection of RO for many applications. RO separates the contaminants from water, but it does not chemically change them to other non-polluting compounds. This concentrate would require disposal by other methods.

8.1.1.1 Concentrate Disposal Options

The brine solution may be solidified and disposed onsite, transported offsite for stabilization prior to landfilling, or transported offsite to a municipal or industrial wastewater treatment system. The waste brine solution is not a hazardous waste in Arkansas, but disposal in neighboring states may be restricted to industrial or hazardous waste facilities. Transportation will be a critical factor for two of the three options.

8.1.1.2 Onsite Stabilization

The concentrate could be stabilized onsite, using a cementitious element such as Portland cement or fly ash. This would require the construction of a mixing facility, purchase of the cementitious agent, crews, and equipment to mix the waste solution, regulatory authority to dispose of the waste onsite, and engineering support for selection and operation of a disposal area. The critical and unknown costs for this option are the mixing ratio for the waste solution/stabilization agent, and any required environmental protection controls for the disposal area. The mixing ratio determines the tonnage necessary for purchase of the stabilizing agent, and the environmental protection controls could range from open disposal on land adjacent to the facility or the installation of a landfill with liners and caps.

8.1.1.3 Offsite Treatment

The wastewater could be transported offsite by truck to an industrial or municipal wastewater treatment facility. It would be necessary to provide waste profile information to each facility to obtain cost information. For treatment and discharge, the treatment facility would need to be located at a site with capabilities for discharging to a large waterbody or to an underground disposal well. The critical cost component would be the cost of transportation and the cost per disposal on a per-gallon basis.

8.1.1.4 Offsite Stabilization

The wastewater could be transported to an industrial or municipal landfill for stabilization and disposal. Offsite disposal offers several advantages. The site earthwork balance does not have to account for onsite disposal, and there is a minimum of regulatory approval required when the waste is removed to an offsite facility. For local landfills, the costs may be lower than for landfills dedicated to industrial or hazardous waste, but the environmental control can differ from cell to cell, requiring more oversight of disposal operations.

8.1.2 Economic Considerations

The water analysis and the design flow requirements are primary considerations in the sizing and cost of the equipment. Pumps and piping that are associated with the RO process would be required along with controls, building, utilities, etc.

8.1.2.1 Assumptions

The basic assumptions used in the analysis of costs are shown below:

1. An average of approximately 1,500 gpm of water will be treated in the RO system.
2. Approximately 6.3 million gallons per year will be generated as brine solution reject from the RO treatment system and will require disposal.
3. The system will consist of a minimum of three RO units in series, and a holding tank to facilitate disposal of the concentrate.
4. The treated effluent will be discharged to waters of the US.
5. The waste brine solution would be about 4.5% solids and 80% water.

The following cost information is based upon a three stage RO system, able to sequentially concentrate the effluent approximately 100 times. The concentrate could then be stored in an onsite holding tank.

The capital costs of installing an RO treatment system have been estimated by the US Army Corps of Engineers (USACE) to range from $1.44 to $2.13 per gpd. This is for a single-stage RO unit. For a three-stage RO unit, it is estimated that the costs would be a factor of 1.5 higher. For purposes of this discussion, the costs for installing an RO system are estimated at $3 per gpd. This provides an estimated capital cost of the treatment system of approximately $6,500,000.

USACE further estimated the operating costs of an RO system (less the costs of brine disposal) at about $0.001 per gallon for a large-scale treatment system. This cost would translate to an annual operating cost of about $630,000.

For both the capital and operating costs, the factors provided by USACE may be low due to the relative size of this application. However, the cost estimates should provide a method for

comparison. Also, as stated above, the costs of disposal of the concentrate actually becomes the controlling factor with this application.

For the disposal of the concentrate, the critical cost components for offsite treatment or disposal are the cost of transportation and the per ton disposal fee for the waste. Safety Kleen provided a preliminary cost quote for a similar project of $1.00 per gallon for transport and disposal at an Oklahoma facility. The use of a local landfill or at a deep well disposal site in Louisiana, if acceptance of the waste can be obtained, may lower that cost to about $0.60 per gallon. Even at this lower cost, the annual costs associated with disposal would be about $3,780,000.

Therefore, based on these preliminary calculations, RO treatment would have a capital cost of about $6,500,000 and an annual operating cost of about $4,400,000.

8.2 Pipeline

This alternative is not feasible because there is no nearby waterbody that could serve as an appropriate receiving stream.

8.3 Summary of Costs

The two available options for management of the mineral concentrations from the facility are:

1. Direct discharge to UT, under modified WQC; and
2. Installation of an RO treatment system.

Table 8.1 provides a summary of the estimated costs with each option. Any capital and operating costs associated with the direct discharge option (e.g., effluent monitoring) would also be required in the other options, and therefore were not added to the cost estimates. The implementation costs refer to costs for the UAA study and consulting and legal costs to support the rule-making process for change in AWQC.

Table 8.1. Summary of capital, operating, and implementation costs.

Option Description	Estimated Capital Cost	Estimated Annual Operating Cost	Implementation Cost
Discharge to UT (Site-specific criteria or designated use sub-category)	--	--	$150,000
RO Treatment	$6,500,000	$4,400,000	--

8.1 Conclusions

The information presented in this section indicates that the most cost-effective option for the West Plant discharge is direct discharge to UT. Implementing this option, however, will require modified water quality criteria for TDS, sulfate, and chloride in UT, BC, and BDV.

8.2 Site-Specific Criteria

These criteria are based on the mass balance modeling results presented in Section 5.0 of this document. These proposed criteria are intended to maintain current conditions in UT and BC downstream of the mouth of UT and BDV. The UAA analysis indicates that current conditions will support and protect existing and attainable uses in UT and BC downstream of the mouth of UT and BDV. For the purpose of this evaluation, the proposed minerals criteria are summarized in Table 8.2.

Table 8.2. Summary of recommended site-specific modifications to existing mineral criteria.

Description of Reach	Corresponding Existing Assessment Reach(es)	Approximate Length (miles)	Criteria (mg/L)					
			Existing			Recommended		
			Chloride	Sulfate	TDS	Chloride	Sulfate	TDS
Unnamed Tributary receiving Jonesboro effluent	None	1.0	48*	37.3*	411.1*	71	60	453
Big Creek Ditch from Unnamed Tributary to Whitsle Ditch	08020302-009	15.5	48*	37.3*	411.1*	58	49	411.3*
Bayou DeView from Whitsle Ditch to AR Highway 14	08020302-007 (upper portion)	11.5	20	30	270	48*	38	411.3*
Bayou DeView from AR Highway 14 to mouth	08020302-007 (lower portion), 08020302-006, 08020302-005, 08020302-004, 08020302-003, 08020302-002, 08020302-001	67.5	20	30	270	48*	37.3*	411.3*

*Ecoregion criteria

9.0 REFERENCES

ADEQ. 2000. State of Arkansas Continuing Planning Process: Update and revisions, January, 2000. Arkansas Department of Environmental Quality, Water Division.

ADPCE. 1987. Physical chemical and biological characteristics of least-disturbed reference streams in Arkansas ecoregions. Arkansas Department of Pollution Control & Ecology. June 1987.

Ames, KA, SA Ebelhar, KL Barber, and WL Pendersen. 2000. Soybean and wheat responses to chloride in potassium chloride fertilizers for suppression of disease. Illinois Fertilizer Conference Proceedings, January 24-26, 2000. Illinois.

APCEC. 2007. Regulation No. 2: Regulation establishing water quality standards for surface water of the State of Arkansas. Arkansas Pollution Control & Ecology Commission. April 23, 2004.

Arkansas Soil and Water Conservation Commission. Flow Duration and Low-Flow Characteristics of Selected Arkansas Streams. Water-Resources Investigations Report 92-4026. 1992.

Ayers, RS, and DW Westcot. 1985. Water quality for Agriculture. FAO Irrigation and Drainage Paper 29 Rev.1. Food and Agriculture Organization of the United Nations. Rome.

Barbour, MT, J Gerritsen, BD Snyder, and JB Stribling. 1999. Rapid bioassessment protocols for use in streams and wadeable rivers: Periphyton, benthic macroinvertebrates and fish, second edition [EPA 841-B-99-002]. US Environmental Protection Agency, Office of Water. Washington, DC.

Baser, RE, and JT Gilmour. 1982. Tolerance of rice seedlings to potassium salts. Bulletin 860. University of Arkansas Agricultural Experiment Station.

Bauder, TA, RM Waskom, and JG Davis. 2004. Irrigation Water Quality Criteria. Crop Series No. 506. Colorado State Cooperative Extension.

Environmental Consulting & Technology, Inc. November 2001. Mixing Zone and 7Q10 Low-Flow Analysis, TPS Dell Power Station, ECT No. 001063-0100. Gainesville, FL.

EPA. 1983. Technical support document for waterbody surveys and assessments for conducting use attainability analysis. US Environmental Protection Agency, Office of Water Regulation and Standards. Washington, DC.

EPA. 1991. Methods for measuring the acute toxicity of effluents and receiving waters to freshwater and marine organisms, fourth edition [EPA-600-4-90-027]. US Environmental Protection Agency, Office of Research and Development. Washington, DC.

EPA. 1994. Water Quality Standards Handbook, second edition, Update #1 [EPA-823-B-94-006]. US Environmental Protection Agency, Office of Water. Washington, DC.

EPA. 2000. Stressor Identification Guidance Document [EPA-822-B-00-025]. US Environmental Protection Agency, Office of Research and Development. Washington, DC.

EPA. 2002. Short-term methods for estimating the chronic toxicity of effluents and receiving waters to freshwater organisms, fourth edition [EPA-821-R-02-013]. US Environmental Protection Agency, Office of Water. Washington, DC.

Freiwald, David. 1984. Average Annual Precipitation and Runoff for Arkansas, 1951 through 1980. US Geological Survey.

FTN. 2008. UAA Study Plan: City Water & Light West Treatment Plant Discharge To Big Creek Ditch. Prepared For Associated Electric Cooperative, Inc. Final Revised dated September 16, 2008.

Gilmour, JT. 2001. Water Quality in Rice Production. In RJ Norman and JF Meullenet (eds). B.R. Wells Rice Research Studies, Research Series 485. University of Arkansas Agricultural Experiment Station. Pp.171-177.

Glover, CR. 2001. Irrigation water classification systems. Guide A-116. New Mexico State University Cooperative Extension. Online at: http://cahe.nmsu.edu/pubs/_a/a-116.html.

Houston, J. 1980. Checklist of the Damselflies (Odonata: Zygoptera) of Arkansas. Arkansas Academy of Science, Arkansas Biota Survey Checklist No. 25. 1p.

James, DW, RJ Hanks, and JH Jurinak. 1982. Modern Irrigated Soils. John Wiley and Sons. New York.

Merritt, RW, and KW Cummins. 1996. *An Introduction to the Aquatic Insects of North America.* Kendall/Hunt Publishing Company. Dubuque, IA.

Mount DR, DD Gulley, JR Hockett, TD Garrison, and JM Evans. 1997. Statistical models to predict the toxicity of major ions to *Ceriodaphnia dubia, Daphnia magna* and *Pimephales promelas* (fathead minnows). *Environ. Toxicol. Chem.* 16:2009-2019.

National Climatic Data Center. 2005. Daily meteorological data from the Cooperative National Weather Service network. Web site maintained by the National Climatic Data Center, Asheville, NC. Available online at: http://www.ncdc.noaa.gov/oa/climate/climatedata.html

Robison, HW, and TM Buchanan. 1988. *Fishes of Arkansas.* University of Arkansas Press. Fayetteville, AR. 536 p.

Rupe, JC, JD Widick, WE Sabbe, RT Robbins, and CB Becton. 2000. Effect of chloride and soybean cultivar on yield and the development of sudden death syndrome, soybean cyst nematode, and southern blight. *Plant Dis.* 84:669-674.

Sherrard, JH, DR Moore, and TA Dillaha. 1987. TDS: determinations, sources, effects, and removal. *Journal of Environmental Education* 18(2):19-24.

Tacker, P, J Langston, J Ferguson, and E Vories. 1994. Water management. In RS Helms (ed). Rice Production Handbook. MP 192. University of Arkansas Cooperative Extension Service.

Tanji, KK (ed). 1990. Crop Salt Tolerance, Agricultural Salinity Assessment and Management Manual. ASCE. New York. p. 8-5.

Thorpe, JH, and AP Covich (eds). 2001. *Ecology and Classification of North American Freshwater Invertebrates,* second edition. Academic Press, 1056 p.

Tracy, P, and SG Hefner. 1993. Calculating crop nutrient value form irrigation water inputs: A survey of southeast Missouri irrigation. WQ278. University of Missouri Cooperative Extension. Online at http://muextension.missouri.edu/explore/envqual/wq0278.htm.

USGS. 1982. Measurement and computation of streamflow: Volume 1. Measurement of stage and discharge. Geological Survey Water-Supply Paper 2175.

WERF. 1997a. A comprehensive UAA technical reference. Final Report, Project 91-NPS-1, 1997. Water Environment Research Foundation.

WERF. 1997b. A suggested framework for conducting UAAs and interpreting results. Final Report, Project 91-NPS-1, 1997. Water Environment Research Foundation.

Zeng, L, and MC Shannon. 2000. Salinity effects on seedling growth and yield components of rice. *Crop Sci.* 40:996-1003.

APÉNDICE

USE ATTAINABILITY ANALYSIS STUDY PLAN

CITY WATER & LIGHT
WEST TREATMENT PLANT
DISCHARGE TO BIG CREEK DITCH

JONESBORO, ARKANSAS

REVISED
SEPTEMBER 16, 2008

USE ATTAINABILITY ANALYSIS STUDY PLAN

CITY WATER & LIGHT
WEST TREATMENT PLANT
DISCHARGE TO BIG CREEK DITCH

JONESBORO, ARKANSAS

Prepared for

City Water & Light
Jonesboro, Arkansas
PO Box 1289
Jonesboro, AR 72403-1289

Prepared by

FTN Associates, Ltd.
3 Innwood Circle, Suite 220
Little Rock, AR 72211

FTN No. 4470W-040

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1.0 INTRODUCTION AND OVERVIEW

City Water & Light of Jonesboro, Arkansas (CWL) discharges treated wastewater under authority of its National Pollutant Discharge Elimination System (NPDES) permit (No. AR0037907) relating specifically to its West Wastewater Treatment Plant (referred to as West Plant). This permit is scheduled for renewal in 2010. The discharge enters an unnamed tributary that flows approximately 0.6 mile to Big Creek Ditch, which flows approximately 16 miles to Bayou DeView in Craighead County in northeast Arkansas (Figures 1.1 and 1.2). Bayou DeView eventually flows into the Cache River in Monroe County. The Arkansas Department of Environmental Quality (ADEQ) is considering future permit limits for dissolved minerals (total dissolved solids (TDS), sulfate, and chloride) in CWL's permit when it is renewed. In the draft Arkansas 2008 303(d) list, stream segment 08030203-009 (located on Bayou DeView downstream of the CWL discharge) was listed as impaired due to exceedences of the Arkansas chloride water quality standard (WQS). The suspected source of the chlorides noted on the draft Arkansas 2008 303(d) list was municipal point source(s). Lost Creek Ditch, a tributary of Big Creek Ditch downstream of the CWL discharge, was also included on the draft Arkansas 2008 303(d) list as impaired due to high chloride concentrations. The source of the chlorides in Lost Creek Ditch cited in the list was industrial point source(s).

This study plan describes the approach for conducting a Use Attainability Analysis (UAA) to evaluate natural chloride, TDS, and sulfate levels in the systems near CWL's discharge. It is anticipated, at this point, that modified water quality criteria will be proposed for chloride, TDS, and sulfate for the unnamed tributary that carries the CWL effluent to Big Creek Ditch, for Big Creek Ditch downstream of the CWL discharge, and possibly for a portion of Bayou DeView. It is not anticipated that modifications to any designated or existing uses will be proposed.

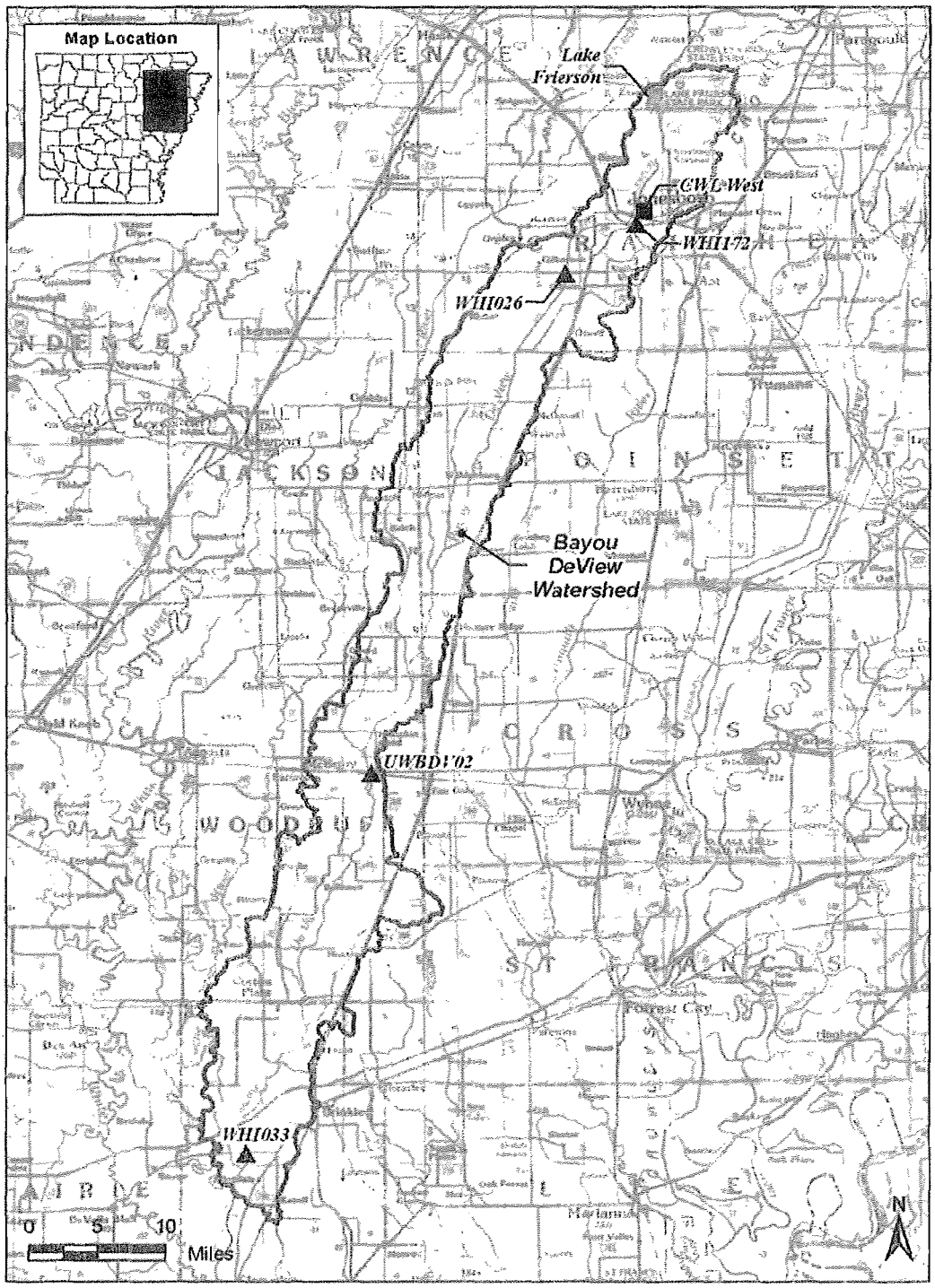

Figure 1.1. ADEQ monitoring stations in the Bayou DeView watershed.

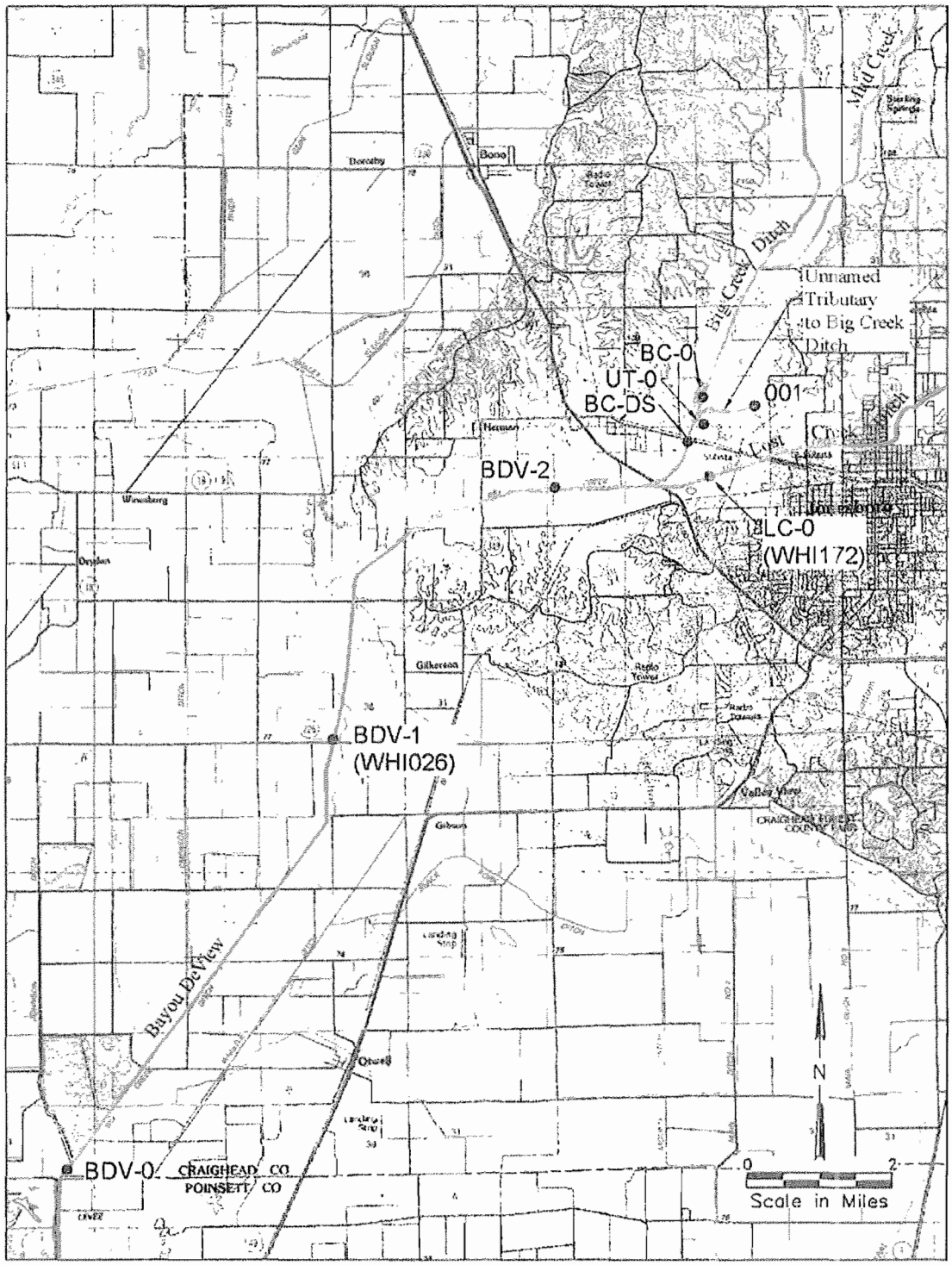

Figure 1.2. UAA study proposed sampling locations.

2.0 BACKGROUND

2.1 NPDES Permit

The NPDES permit (No. AR0037907 (2005-renewal)) for CWL West Plant became effective February 1, 2005. The plant has been in operation for over 30 years. The NPDES permit authorizes discharges of treated municipal wastewater and includes limitations for carbonaceous biochemical oxygen demand (CBOD), total suspended solids (TSS), ammonia nitrogen, dissolved oxygen, fecal coliform bacteria, residual chlorine, pH, and whole effluent lethality (see Part I of the permit in Appendix A). The receiving stream for this discharge is an unnamed tributary to Big Creek Ditch. A stream segment of Bayou DeView downstream of Big Creek Ditch was included on the draft Arkansas 2008 303(d) list as impaired due to TDS and chloride exceedences. ADEQ will consider adding TDS and chloride limits to the NPDES permit when it is renewed in 2010.

2.2 Outfall 001

Outfall 001 is the discharge point from the CWL West Plant. The West Plant design flow is 3 million gallons per day (MGD) and the average effluent flow from 1998 through 2007 was 1.74 MGD.

2.3 Dissolved Mineral Concentrations

At the suggestion of ADEQ, CWL has recently collected TDS, chloride and sulfate data from the CWL West Plant effluent (Station 001; Figure 1.2) and in Big Creek Ditch upstream (Station BC-0; Figure 1.2) and downstream (Station BC-DS; Figure 1.2) of the CWL discharge point. These data are provided in Table 2.1. Review and analysis of these data, including using the ADEQ reasonable potential analysis for dissolved minerals, indicate that the UAA to evaluate dissolved minerals is necessary.

Table 2.1. Dissolved mineral data from CWL effluent (Station 001) and Big Creek Ditch upstream (Station BC-0) and downstream (Station BC-DS) of the CWL discharge.

Sample Date	Chloride (mg/L)			Sulfates (mg/L)			TDS (mg/L)		
	Upstream	Effluent	Downstream	Upstream	Effluent	Downstream	Upstream	Effluent	Downstream
4/28/08		50.1			51			380	
4/30/08		61.0			51			408	
5/5/08		57.0			48			368	
5/7/08		70.0			51			453	
5/12/08		53.0			42			354	
5/14/08		32.0			30			233	
5/19/08		50.0			43			314	
5/21/08		64.0			48			400	
5/28/08		60.0			53			418	
6/2/08		69.0			45			461	
6/10/08		76.0			44			395	
6/16/08		68.5			72			436	
6/24/08	7.0	82.5	** 52.0	4	42	26	110	450	** 292
6/30/08	10.0	71.0	** 53.0	6	46	** 36	124	463	** 313
7/7/08	2.5	58.1	11.8	2	47	13	91	407	162
7/14/08	4.9	62.6	17.2	7	41	14	106	410	183

** WQS exceedences

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2.4 Recommended Approach to Address Dissolved Mineral Limits

The recommended approach to address (1) the potential for dissolved mineral effluent limitations, and (2) downstream exceedences of dissolved mineral WQS, is to conduct a UAA to evaluate alternatives to meet WQS. The UAA alternatives analysis section will include the option of developing appropriate site-specific water quality criteria for dissolved minerals that are protective of existing and attainable designated uses in the unnamed tributary to Big Creek Ditch, Big Creek Ditch, and Bayou DeView. This UAA study plan presents the approach to obtain the necessary data and documentation to perform this evaluation and produce recommendations to resolve the issues.

3.0 PERTINENT DATA / INFORMATION

3.1 Waterbody Information

The streams to be addressed in the UAA include the unnamed tributary to Big Creek Ditch, Big Creek Ditch, and Bayou DeView. Lost Creek Ditch, a tributary to Big Creek Ditch downstream from the CWL discharge (Figure 1.2), will also be monitored due to its size and its proximity to the discharge point, and because it is also listed as impaired for chloride in the draft Arkansas 2008 303(d) list. The headwaters of the unnamed tributary, Big Creek Ditch, and Lost Creek Ditch (and therefore Bayou DeView) are in Crowley's Ridge, north of Jonesboro. Big Creek Ditch is essentially the outflow from Lake Frierson in southern Greene County. It flows southwesterly around Jonesboro to form Bayou DeView west of Jonesboro (Figure 1.1). The major tributary to Big Creek Ditch within Crowley's Ridge is Mud Creek. Lost Creek Ditch originates near the Craighead County boundary and flows southwesterly 10 miles to join Big Creek Ditch north and west of Jonesboro (Figure 1.2). Watershed areas are listed in Table 3.1.

Table 3.1. Relevant watershed areas.

Stream Location	Watershed (square miles)
Big Creek at CWL Discharge	50
Big Creek Ditch where it joins Lost Creek Ditch and becomes Bayou DeView	56
Bayou DeView at Highway 226	102.1
Bayou DeView at County Road 229	170.5

3.2 Receiving Streams Regulatory Background

The receiving streams are within the Delta ecoregion according to Arkansas Pollution Control and Ecology Commission Regulation No. 2, Plate D-1 (APCEC 2007). Applicable Arkansas WQS (APCEC 2007) are as follows:

1. Dissolved minerals:
   a. Bayou DeView and Lost Creek Ditch: chloride - 20 mg/L, sulfate - 30 mg/L, TDS - 270 mg/L; and

b. Big Creek Ditch and the unnamed tributary to Big Creek Ditch (Delta ecoregion values): chloride - 48 mg/L, sulfate - 37.3 mg/L, TDS - 411.3 mg/L.

2. Designated Uses for the unnamed tributary to Big Creek Ditch, Big Creek Ditch, Bayou DeView, and Lost Creek Ditch:

   a. Channel-altered Delta ecoregion streams,

   b. Primary contact recreation (not including the unnamed tributary),

   c. Secondary contact recreation,

   d. Domestic, industrial, and agricultural water supply, and

   e. Perennial Delta fishery (for the unnamed tributary – Delta Seasonal Fishery).

Every 2 years, ADEQ is required by the Clean Water Act to assess the condition of the waters of the state. Those waterbodies determined to not be meeting state WQS are classified as impaired, and a list of the impaired waters of the state is compiled – the Arkansas 303(d) list. The segment of Bayou DeView that receives Big Creek Ditch drainage (HUC stream segment 08020302-009) has been classified as impaired. In the draft 2008 Arkansas 303(d) list, this segment of Bayou DeView was reported to be impaired due to exceedences of the applicable TDS and chloride WQS. Lost Creek Ditch (designated as HUC stream segment 08020302-909) was also reported to be impaired due to exceedences of the applicable chloride WQS.

In the draft 2008 Arkansas 303(d) list, the reported suspected sources of the high TDS and chloride concentrations in these stream segments were point sources (municipal point sources for Bayou DeView and industrial point sources for Lost Creek Ditch). Based on review of permitted sources in these watersheds, there are no permitted industrial point source discharges to Lost Creek Ditch, and identifying the source of the chloride in Lost Creek Ditch is beyond the scope of this project.

3.3 Project Technical Approach

One goal of the study described by this document will be to evaluate existing and attainable uses (as defined by APCEC Regulation No. 2) in the receiving streams and determine if those uses can be attained with less stringent criteria for dissolved minerals.

Specifically the project will address the following questions:

1. Can onsite controls for TDS, chloride, and sulfate result in discharges from the CWL West Plant NPDES outfall that will meet existing downstream Arkansas WQS?
2. Will implementing these controls (if they exist) be economically feasible and result in significantly increased protection for the receiving streams?
3. Do current TDS, chloride and sulfate concentrations in discharges from the CWL NPDES outfall impair the fishery or other designated uses in the unnamed tributary to Big Creek Ditch, Big Creek Ditch, or Bayou DeView?
4. Would site-specific criteria for TDS, chloride, and sulfate in the receiving streams that are consistent with current effluent concentrations and/or natural background concentrations be protective of designated uses?

To accomplish the goals, a comprehensive waterbody assessment will be performed to determine the following:

1. The existing and attainable uses of the unnamed tributary to Big Creek Ditch that carries the CWL effluent, and Big Creek Ditch; and
2. Impacts of the discharges, if any, on the existing and attainable uses of the unnamed tributary, Big Creek Ditch, and Bayou DeView.

The approach contained within this Study Plan for developing the waterbody surveys follows applicable guidance contained within the following documents:

1. The United States Environmental Protection Agency (EPA) WQS Handbook (EPA 1994);
2. The EPA Technical Support Manual: Waterbody Surveys and Assessments for Conducting UAAs (EPA 1983);
3. The Water Environment Research Foundation's (WERF) reports *A Suggested Framework for Conducting UAAs and Interpreting Results* (WERF 1997a), *A Comprehensive UAA Technical Reference* (WERF 1997b) and *Collaborative Water Quality Solutions: Exploring UAAs* (WERF 1997); and
4. Applicable portions of the EPA Region 6 WQS Submission Checklist (date unknown).

3.3.1 UAA Technical Phase

This phase of the process includes development of a UAA Study Plan to lay out strategies and planned tasks for review and comment by ADEQ and EPA Region 6. The technical phase of this UAA also includes historical data compilation, sampling (physical/chemical/biological) to characterize current conditions, and analysis and preparation of technical documentation for development of modified Arkansas WQS for TDS, chloride, and sulfate. Specific technical phase tasks are described below:

1. UAA Study Plan Development:
   a. FTN will prepare a UAA Study Plan (this document – the Study Plan) that provides pertinent regulatory information and history about the CWL discharge, an unnamed tributary to Big Creek Ditch, and downstream drainages;
   b. The Study Plan describes the strategic and technical approach to the project for ADEQ and EPA review and conceptual approval in order to identify and limit uncertainties in the process; and
   c. This Study Plan will be submitted to ADEQ and EPA in July 2008 in order to obtain conceptual agreement for the approach during late summer of 2008.
2. Compilation of Historical Data: Historical data compilation, review, and identification of data gaps will be performed. Chemistry, habitat, macroinvertebrate, and fishery data collected during ADEQ special studies in the area will also be reviewed. These include data collected during studies to characterize Delta reference streams (Keith and Shirley 1985, ADEQ 1987), and the TMDL investigation of Big Creek Ditch and Lost Creek Ditch (ADEQ 1998).

   Of particular importance is the review of available historical data from the receiving streams to understand the biological communities present at the time designated uses were implemented into the regulations (November 1975).
3. Sampling - Toxicity: Toxicity testing (chronic screens and existing NPDES permit toxicity testing information) for the CWL effluent toxicity evaluations will be used to evaluate potential 'biological' effects of the discharge.

   Toxicity testing (7-day chronic test, single sample for renewals) will use fathead minnows and *Ceriodaphnia dubia* and will be conducted in samples to represent potential "worst case" dissolved minerals levels in the CWL discharge.
4. Sampling – Chemistry and Biological Evaluations: The sampling described below will be used to characterize the chemistry and biology present in the downstream aquatic systems in the presence of the CWL discharge. Also, an upstream station

on Big Creek Ditch (upstream of the CWL NPDES outfall) and a similar stream in the vicinity of Big Creek Ditch without upstream point source discharges will be utilized to characterize reference conditions for comparison purposes.

a. Sampling Periods: Summer low flow conditions sampling will be conducted in 2008 and spring high flow conditions sampling will be conducted in 2009.

b. Extent of Sampling: Data collection will focus on:

   i. Chemical – analytical: The unnamed tributary of Big Creek Ditch, Big Creek Ditch downstream of CWL's discharge, Lost Creek Ditch, and Bayou DeView. In addition, a station on Big Creek Ditch upstream of CWL's discharge point and one suitable reference stream will be surveyed and sampled. Water samples for chemical analysis will be collected at each station for each sampling period. Analytical parameters will include TDS, sulfate and chloride and TSS. Pesticides, metals, herbicides, and nutrients are not expected to be analyzed.

   ii. Chemical – in situ measurements: Temperature, pH, dissolved oxygen, and conductivity data will also be collected at all stations during each sampling period. Continuous recording in situ meters will be deployed during each sampling period at key stations.

   iii. Biological and Habitat: The unnamed tributary of Big Creek Ditch, Big Creek Ditch downstream of the CWL discharge, and Bayou DeView. In addition, a station on Big Creek Ditch upstream of CWL's discharge point and one suitable reference stream will be surveyed and sampled for biology and habitat. This information will be supplemented by ADEQ data that have been collected on Big Creek Ditch and Bayou DeView in the past (ADEQ 1998 and 1987). For biological sampling, benthic macroinvertebrate and fish communities will be sampled using standard methods (i.e., rapid bioassessment (Barbour et al. 1999) and electrofishing/netting) to evaluate aquatic biota. For physical and habitat measurements, data will be collected from each sampling location and will include stream widths, depths and velocities; percent cover, substrate type, pool to riffle ratio, pool depths, widths, etc., following typical low-gradient stream habitat assessment procedures.

c. Sampling Locations: Proposed sampling locations are shown on Figure 2. Table 3.2 lists the anticipated sampling locations with descriptions and tasks. Sampling locations (reaches) will be established on:

   i. The unnamed tributary of Big Creek Ditch,

ii. Big Creek Ditch upstream and downstream of the CWL NPDES outfall,

iii. Lost Creek Ditch upstream from Big Creek Ditch,

iv. Bayou DeView at Highway 226 approximately 8.1 miles downstream from CWL's discharge and also at County Road 229 approximately 16 miles downstream of CWL's discharge.

v. In addition, a reach on Big Creek Ditch upstream of CWL's discharge and on one reference stream. A suitable reference stream for Big Creek Ditch comparisons will be located based on site reconnaissance conducted before field sampling begins.

5. Analyses - the following primary analyses are anticipated:

a. An alternatives analysis using engineering and economic evaluations of the feasibility of removing or reducing the dissolved minerals' concentrations (TDS, chloride, and sulfate) with available controls (i.e., address treatment/control feasibility of dissolved minerals) including, but not limited to:

i. Treatment of the dissolved minerals in the effluent,

ii. Piping the water to a dilution source, and

iii. An onsite discharge with modification of receiving stream(s) WQS.

b. An analysis of existing and attainable uses in receiving streams based on comparisons of water quality data, biological data, and habitat data to those from the reference stream(s). Data from the waterbody assessment will be compared to state criteria and EPA guidance to evaluate pollutants that may be limiting attainment of the designated uses. Biological data from the literature and the reference streams will be used to evaluate what species might exist in the receiving streams.

c. An analysis of existing and attainable uses in the unnamed tributary to Big Creek Ditch, Big Creek Ditch below the CWL discharge, and potentially Bayou DeView based on existing TDS, chloride and sulfate concentrations.

d. Toxicity testing to evaluate and identify potential effects of current levels of TDS, chloride and sulfate in the CWL discharge considering the specific matrix of the effluent.

Table 3.2. CWL UAA location and sampling plan layout.

		Physical /Habitat Data of Typical Low-gradient Stream Habitat Assessment Procedures						In-situ Chemistry Data				Samples-Chemistry Data				Biological Sampling	Toxicity Testing
Proposed Sampling Location	Station ID	Widths	Depths	Flow	Substrate Type	Pool to Riffle Ratio	% Cover	pH (s.u.)	Conductivity (umhos)	Dissolved Oxygen (mg/L)	Temp (degree C)	Sulfate (mg/L)	Chloride (mg/L)	TDS (mg/L)	TSS (mg/L)	Rapid Bioassessments	7-day Chronic Biomonitoring
Reference Streams																	
Big Creek Ditch Upstream of CWL	BC-0	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Reference Stream	Ref-0	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Unnamed Tributary of Big Creek (carries CWL effluent)																	
Unnamed Tributary upstream from Big Creek Ditch	UT-0	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Big Creek Ditch/Bayou DeView																	
Downstream from CWL Discharge	BDV-2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
At Highway 226 (ADEQ Station WHI0026)	BDV-1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
At Highway 229	BDV-0	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
Lost Creek Ditch																	
Upstream from Big Creek Ditch (ADEQ WHI0172)	LC-0	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
CWL Outfall 001																	
CWL Effluent	001							X	X	X	X	X	X	X	X		X

6. Summary Report and Submittals: This task will involve preparing the technical report necessary to provide results of the waterbody assessments and determining if modified Arkansas WQS are justified. The analysis and resulting report will be comprehensive and scientifically defensible. All data and analyses will be provided, integrated, and summarized to support criteria modifications as necessary. The UAA report will be submitted to ADEQ and EPA Region 6. Communications with both ADEQ and EPA are planned in order to facilitate their understanding and review of the technical results and analyses.

3.3.2 Stakeholder Coordination, Project Communications, and Briefings

Communication and coordination with parties (stakeholders) who will have an interest in the potential WQS changes, assuming that technical justification for modified Arkansas WQS is developed, will be necessary and addressed in the form of routine progress reports and presentations as necessary to address questions and third-party rulemaking requirements. Based on experience with similar projects, the following stakeholders will likely be actively involved/interested in the third-party rulemaking process:

1. The general public,
2. Municipal and county governments,
3. The Arkansas Department of Health (ADH),
4. Arkansas Natural Resources Conservation Commission (ANRCC),
5. ADEQ,
6. EPA Region 6,
7. APCEC,
8. State and local legislators,
9. US Fish & Wildlife Service (USFWS),
10. The Arkansas Game & Fish Commission (AGFC),
11. Arkansas Audubon,
12. Other point source dischargers to Big Creek Ditch or its tributaries, and
13. Local and/or downstream agricultural or industrial interests.

3.3.3 Legal and Administrative Tasks

Assuming that technical justification for modified Arkansas WQS is developed, the following legal documents will be required during the third-party rulemaking process. These documents, should they be justified and supported by the technical conclusions of the UAA, will be prepared by appropriate legal and technical staff with previous rulemaking process experience:

1. Petition for third-party rulemaking;
2. Various public notices;
3. Documents for the full APCEC review as well as the APCEC Rules and Regulations Committee;
4. Documents for Joint Legislative Committees (Administrative Rules and Regulations and Health, Welfare, and Labor);
5. Responsiveness Summary to Public Comments;
6. Statements for Public Hearings;
7. Code Revisions to the Arkansas Code; and
8. Others as necessary.

3.3.4 Schedule

1. UAA Study Plan: FTN requests that EPA and ADEQ facilitate their review of this Study Plan to provide feedback and technical input to the proposed approach and to limit uncertainty in later phases of the UAA. Conceptual agreement with this Study Plan is requested by late August 2008 although feedback following that date will also be appreciated.
2. Technical Phases: FTN plans to complete the technical phases of the project by spring of 2009. The technical phase primary tasks are the dry season sampling in summer of 2008 and wet season sampling in spring of 2009 and analyses of the information and data from these field tasks.
3. Stakeholder Meetings: FTN will assist ADEQ as necessary to schedule meetings with stakeholders as well as communicate with other agencies to facilitate their review of the project (e.g., state congressmen, APCEC, ANRCC, USFWS, AGFC, ADH, etc.) during the summer of 2009.
4. UAA Report: FTN anticipates submitting the UAA Report for agency review in July of 2009.

5. Administrative Rulemaking Processes: If modified Arkansas WQS are justifiable and represent the logical alternative for addressing this situation, a third-party rulemaking process will be initiated in order to develop modified Arkansas WQS for the receiving stream(s). This task involves administrative and legal processes and is estimated to take approximately 6 to 8 months to complete, depending upon the schedule for the legislative committees.

6. Total Project Timeframe: The total estimated project schedule for the tasks described above is estimated to end by early 2010.

4.0 REFERENCES

ADEQ. 1987. Physical, Chemical and Biological Characteristics of Least-Disturbed Reference Streams in Arkansas' Ecoregions, Volume 1 - Data Compilation. WQ87-06-1. ADEQ. Little Rock, AR.

ADEQ. 1998. TMDL Investigation of Water Quality Impairments to Big Creek Ditch and Lost Creek Ditch.WQ98-10-1. ADEQ.

APCEC. 2007. Regulation No. 2: Regulation establishing water quality standards for surface water of the State of Arkansas. Arkansas Pollution Control and Ecology Commission. November 2007.

Barbour, M.T., J. Gerritsen, B.D. Snyder, and J.B. Stribling. 1999. Rapid bioassessment protocols for use in streams and wadeable rivers: Periphyton, benthic macroinvertebrates and fish, Second Edition. EPA 841-B-99-002. US Environmental Protection Agency, Office of Water. Washington, DC.

EPA. Date unknown. EPA Region 6 Water Quality Standards Submission Checklist. US Environmental Protection Agency, Region 6. Dallas, TX.

EPA. 1983. Technical support document for waterbody surveys and assessments for conducting use attainability analysis. US Environmental Protection Agency, Office of Water Regulation and Standards. Washington, DC.

EPA. 1994. Water quality standards handbook: Second Edition. EPA-823-B-94-005a. US Environmental Protection Agency, Office of Water. Washington, DC. August 1994.

Keith, W., and K. Shirley. 1985. Comparison of the fish populations and the abiotic characteristics of a channelized and unchannelized stream in the Delta Area of Arkansas. Proceedings of Arkansas Academy of Science.

USGS. 1970. Drainage Areas of Streams in Arkansas – Arkansas River Basin, United States Geological Survey Open-File Report.

WERF. 1997a. A comprehensive UAA technical reference. Final Report, Project 91-NPS-1, 1997; Water Environment Research Foundation.

WERF. 1997b. A suggested framework for conducting UAAs and interpreting results. Final Report, Project 91-NPS-1, 1997; Water Environment Research Foundation.

WERF-NACWA. 1997. Collaborative Water Quality Solutions: Exploring Use Attainability Analyses. Water Environment Research Foundation (Alexandria, VA) and National Association of Clean Water Agencies (Washington, DC).

APPENDIX A

City Water & Light NPDES Permit No. AR0037907 (2005)

Permit number: AR0037907

AUTHORIZATION TO DISCHARGE UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM AND THE ARKANSAS WATER AND AIR POLLUTION CONTROL ACT

In accordance with the provisions of the Arkansas Water and Air Pollution Control Act (Act 472 of 1949, as amended, Ark. Code Ann. 8-4-101 et seq.), and the Clean Water Act (33 U.S.C. 1251 et seq.),

City Water and Light of Jonesboro-West Plant
P.O. Box 1289
Jonesboro, AR 72403

is authorized to discharge from a facility located at

1605 Willett Road; north of and adjacent to Craighead County Jail property, in Section 11, Township 14 North, Range 3 East in Craighead County, Arkansas.

Latitude: 35° 51' 22"; Longitude: 90° 44'55"

to receiving waters named:

unnamed tributary of Big Creek, thence to Big Creek, thence to Bayou DeView, thence to the Cache River, thence to the White River in Segment 4B of the White River Basin.

The outfall is located at the following coordinates:

Outfall 001: Latitude: 35° 51' 22"; Longitude: 90° 44'55"

in accordance with effluent limitations, monitoring requirements, and other conditions set forth in Parts I, II , III, and IV hereof.

This permit shall become effective on February 1, 2005.

This permit and the authorization to discharge shall expire at midnight, January 31, 2010.

Signed this 31st day of January, 2005.

_____

Martin Maner, P.E.
Chief, Water Division
Arkansas Department of Environmental Quality

PART I
PERMIT REQUIREMENTS

SECTION A. FINAL EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS: OUTFALL 001-treated municipal wastewater

During the period beginning on from the effective date and lasting until the date of expiration, the permittee is authorized to discharge from outfall serial number 001. Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristics	**Discharge Limitations**			**Monitoring Requirements**	
	Mass (lbs/day, unless otherwise specified)	Concentration (mg/l, unless otherwise specified)		Frequency	Sample Type
	Monthly Avg.	Monthly Avg.	7-Day Avg.		
Flow[1]	N/A	Report	Report	once/day	totalizing meter
Carbonaceous Biochemical Oxygen Demand (CBOD5)	375	15	23	three/week	6-hr composite
Total Suspended Solids (TSS)	501	20	30	three/week	6-hr composite
Ammonia Nitrogen (NH3-N)	100	4	6	three/week	6-hr composite
Dissolved Oxygen[2]	N/A	5.0 (Inst. Min.)		three/week	grab
Fecal Coliform Bacteria (FCB)		(colonies/100ml)			
(Apr-Sept)	N/A	200	400	three/week	grab
(Oct-Mar)	N/A	1000	2000	three/week	grab
Total Residual Chlorine (TRC)[3]	N/A	<0.1 mg/l (Inst. Max.)		three/week	grab
pH	N/A	Minimum 6.0 s.u.	Maximum 9.0 s.u.	three/week	grab
	Daily Average Minimum		7-day Minimum		
Whole Effluent Lethality (7-day NOEC)[4,5] 22414	not < **100%**		not < **100%**	Once/quarter	24-hr composite
Pimephales promelas (Chronic)[5]	7-day Average				
Pass/Fail Lethality (7-day NOEC) **TLP6C**	Report (Pass=0/Fail=1)			Once/quarter	24-hr composite
Pass/Fail Growth (7-day NOEC) **TGP6C**	Report (Pass=0/Fail=1)			Once/quarter	24-hr composite
Survival (7-day NOEC) **TOP6C**	Report %			Once/quarter	24-hr composite
Growth (7-day NOEC) **TPP6C**	Report %			Once/quarter	24-hr composite
Coefficient of variation **TQP6C**	Report %			Once/quarter	24-hr composite
Ceriodaphnia dubia (Chronic)[5]	7-day Average				
Pass/Fail Lethality (7-day NOEC) **TLP3B**	Report (Pass=0/Fail=1)			Once/quarter	24-hr composite
Pass/Fail Report. (7-day NOEC) **TGP3B**	Report (Pass=0/Fail=1)			Once/quarter	24-hr composite
Survival (7-day NOEC) **TOP3B**	Report %			Once/quarter	24-hr composite
Reproduction(7-day NOEC) **TPP3B**	Report %			Once/quarter	24-hr composite
Coefficient of variation **TQP3B**	Report %			Once/quarter	24-hr composite

PART I
PERMIT REQUIREMENTS

SECTION A. FINAL EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS (CONT.): OUTFALL 001-treated municipal wastewater

1 Report monthly average and daily maximum as MGD.
2 Instantaneous Minimum. Dissolved Oxygen must be equal or exceed the permit limit at all times.
3 See Condition No. 10 of Part III.
4 The NOEC (No Observed Lethal Effect Concentration) is defined as the greatest effluent dilution at and below which lethality that is statistically different from the control (0% effluent) at the 95% confidence level does not occur. Chronic lethal test failure is defined as a demonstration of a statistically significant lethal effect at test completion to a test species at or below the critical dilution.
5 See Condition No. 8 of Part III.

There shall be no discharge of distinctly visible solids, scum or foam of a persistent nature, nor shall there be any formation of slime, bottom deposits or sludge banks. No visible sheen (Sheen means an iridescent appearance on the surface of the water).

Samples taken in compliance with the monitoring requirements specified above shall be taken at the discharge from the final treatment unit. The permittee is allowed to take the flow measurement prior to the disinfection unit.

SECTION B. SCHEDULE OF COMPLIANCE

The permittee shall achieve compliance with the effluent limitations specified for discharges in accordance with the following schedule:

Compliance with final limits is required on effective date of the permit.

PART II
STANDARD CONDITIONS

SECTION A – GENERAL CONDITIONS

1. Duty to Comply

The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the federal Clean Water Act and the Arkansas Water and Air Pollution Control Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application. **Any values reported in the required Discharge Monitoring Report which are in excess of an effluent limitation specified in Part I shall constitute evidence of violation of such effluent limitation and of this permit.**

2. Penalties for Violations of Permit Conditions

The Arkansas Water and Air Pollution Control Act provides that any person who violates any provisions of a permit issued under the Act shall be guilty of a misdemeanor and upon conviction thereof shall be subject to imprisonment for not more than one (1) year, or a fine of not more than ten thousand dollars ($10,000) or by both such fine and imprisonment for each day of such violation. Any person who violates any provision of a permit issued under the Act may also be subject to civil penalty in such amount as the court shall find appropriate, not to exceed ten thousand dollars ($10,000) for each day of such violation. The fact that any such violation may constitute a misdemeanor shall not be a bar to the maintenance of such civil action.

3. Permit Actions

This permit may be modified, revoked and reissued, or terminated for cause including, but not limited to the following:

a. Violation of any terms or conditions of this permit; or
b. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts; or
c. A change in any conditions that requires either a temporary or permanent reduction or elimination of the authorized discharge; or
d. A determination that the permitted activity endangers human health or the environment and can only be regulated to acceptable levels by permit modification or termination.
e. Failure of the permittee to comply with the provisions of APCEC Regulation No. 9 (Permit fees) as required by condition II A.10 herein.

The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

4. Toxic Pollutants

Notwithstanding Part II. A.3., if any toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is promulgated under Regulation No. 2, as amended, (regulation establishing water quality standards for surface waters of the State of Arkansas) or Section 307(a) of the Clean Water Act for a toxic pollutant which is present in the discharge and that standard or prohibition is more stringent than any limitations on the pollutant in this permit, this permit shall be modified or revoked and reissued to conform to the toxic effluent standards or prohibition and the permittee so notified.

The permittee shall comply with effluent standards, narrative criteria, or prohibitions established under Regulation No. 2 (Arkansas Water Quality Standards), as amended, or Section 307 (a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish those standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.

5. Civil and Criminal Liability

Except as provided in permit conditions on "Bypassing" (Part II.B.4.a.), and "Upsets" (Part II.B.5.b), nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance. Any false or materially misleading representation or concealment of information required to be reported by the provisions of this permit or applicable state and federal statues or regulations which defeats the regulatory purposes of the permit may be subject the permittee to criminal enforcement pursuant to the Arkansas Water and Air Pollution Control Act (Act 472 of 1949, as amended).

6. Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Section 311 of the Clean Water Act.

7. State Laws

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities or penalties established pursuant to any applicable State law or regulation under authority preserved by Section 510 of the Clean Water Act.

8. Property Rights

The issuance of this permit does not convey any property rights of any sort, or any property rights of any sort, or any exclusive privileges, nor does it authorize any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations.

9. Severability

The provisions of this permit are severable, and if any provision of this permit, or the application of any provisions of this permit to any circumstance is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

10. Permit Fees

The permittee shall comply with all applicable permit fee requirements for wastewater discharge permits as described in APCEC Regulation No. 9 (Regulation for the Fee System for Environmental Permits). Failure to promptly remit all required fees shall be grounds for the Director to initiate action to terminate this permit under the provisions of 40 CFR 122.64 and 124.5 (d), as adopted in APCEC Regulation No. 6 and the provisions of APCEC Regulation No. 8.

SECTION B – OPERATION AND MAINTENANCE OF POLLUTION CONTROLS

1. Proper Operation and Maintenance

a. The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of backup or auxiliary facilities or similar systems which are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit.

b. The permittee shall provide an adequate operating staff which is duly qualified to carryout operation, maintenance and testing functions required to insure compliance with the conditions of this permit.

2. Need to Halt or Reduce not a Defense

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit. Upon reduction, loss, or failure of the treatment facility, the permittee shall, to the extent necessary to maintain compliance with its permit, control production or

discharges or both until the facility is restored or an alternative method of treatment is provided. This requirement applies, for example, when the primary source of power for the treatment facility is reduced, is lost, or alternate power supply fails.

3. Duty to Mitigate

The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment, or the water receiving the discharge.

4. Bypass of Treatment Facilities

a. **Bypass not exceeding limitation.**

The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of Part II.B 4.b.and 4 c.

b. **Notice**

(1) Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible at least ten days before the date of the bypass.
(2) Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required in part II.D.6 (24-hour notice).

c. **Prohibition of bypass**

(1) Bypass is prohibited and the Director may take enforcement action against a permittee for bypass, unless:
  (a) Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;
  (b) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if the permittee could have installed adequate backup equipment to prevent a bypass which occurred during normal or preventive maintenance; and
  (c) The permittee submitted notices as required by Part II.B.4.b.
(2) The Director may approve an anticipated bypass, after considering its adverse effects, if the Director determines that it will meet the three conditions listed above in Part II.B.4.c(1).

5. Upset Conditions

a. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology base permit effluent limitations if the requirements of Part II.B.5.b of this section are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.
b. Conditions necessary for demonstration of upset. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:
   (1) An upset occurred and that the permittee can identify the specific cause(s) of the upset.
   (2) The permitted facility was at the time being properly operated.
   (3) The permittee submitted notice of the upset as required by Part II.D.6.: and
   (4) The permittee complied with any remedial measures required by Part II.B.3.
c. Burden of proof. In any enforcement proceeding the permittee seeking to establish the occurrence of an upset has the burden of proof.

6. **Removed Substances**

Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of waste waters shall be disposed of in a manner such as to prevent any pollutant from such materials from entering the waters of the State. Written approval must be obtained from the ADEQ for land application only.

7. **Power Failure**

The permittee is responsible for maintaining adequate safeguards to prevent the discharge of untreated or inadequately treated wastes during electrical power failure either by means of alternate power sources, standby generators, or retention of inadequately treated effluent.

SECTION C: MONITORING AND RECORDS

1. **Representative Sampling**

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge during the entire monitoring period. All samples shall be taken at the monitoring points specified in this permit and, unless otherwise specified, before the effluent joins or is diluted by any other waste stream, body of water, or substance. Monitoring points shall not be changed without notification to and the approval of the Director. Intermittent discharges shall be monitored.

2. Flow Measurement

Appropriate flow measurement devices and methods consistent with accepted scientific practices shall be selected and used to insure the accuracy and reliability of measurements of the volume of monitored discharges. The devices shall be installed, calibrated and maintained to insure the accuracy of the measurements are consistent with the accepted capability of that type of device. Devices selected shall be capable of measuring flows with a maximum deviation of less than +/- 10% from true discharge rates throughout the range of expected discharge volumes and shall be installed at the monitoring point of the discharge.

3. Monitoring Procedures

Monitoring must be conducted according to test procedures approved under 40 CFR Part 136, unless other test procedures have been specified in this permit. The permittee shall calibrate and perform maintenance procedures on all monitoring and analytical instrumentation at intervals frequent enough to insure accuracy of measurements and shall insure that both calibration and maintenance activities will be conducted. An adequate analytical quality control program, including the analysis of sufficient standards, spikes, and duplicate samples to insure the accuracy of all required analytical results shall be maintained by the permittee or designated commercial laboratory. At a minimum, spikes and duplicate samples are to be analyzed on 10% of the samples.

4. Penalties for Tampering

The Arkansas Water and Air Pollution Control Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate, any monitoring device or method required to be maintained under the Act shall be guilty of a misdemeanor and upon conviction thereof shall be subject to imprisonment for not more than one (1) year or a fine of not more than ten thousand dollars ($10,000) or by both such fine and imprisonment.

5. Reporting of Monitoring Results

Monitoring results must be reported on a Discharge Monitoring Report (DMR) form (EPA No. 3320-1). Permittees are required to use preprinted DMR forms provided by ADEQ, unless specific written authorization to use other reporting forms is obtained from ADEQ. Monitoring results obtained during the previous calendar month shall be summarized and reported on a DMR form postmarked no later than the 25th day of the month, following the completed reporting period to begin on the effective date of the permit. Duplicate copies of DMR's signed and certified as required by Part II.d.11 and all other reports required by Part II.D. (Reporting Requirements), shall be submitted to the Director at the following address:

NPDES Enforcement Section
Water Division

Arkansas Department of Environmental Quality
8001 National Drive
P.O. Box 8913
Little Rock, AR 72219-8913

If permittee uses outside laboratory facilities for sampling and/or analysis, the name and address of the contract laboratory shall be included on the DMR.

6. Additional Monitoring by the Permittee

If the permittee monitors any pollutant more frequently than required by this permit, using test procedures approved under 40 CFR 136 or as specified in this permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR. Such increased frequency shall also be indicated on the DMR.

7. Retention of Records

The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit for a period of at least 3 years from the date of the sample, measurement, report or application. This period may be extended by request of the Director at any time.

8. Record Contents

Records and monitoring information shall include:

a. The date, exact place, time and methods of sampling or measurements, and preservatives used, if any;
b. The individuals(s) who performed the sampling or measurements;
c. The date(s) analyses were formed;
d. The individual(s) who performed the analyses;
e. The analytical techniques or methods used; and
f. The measurements and results of such analyses.

9. Inspection and Entry

The permittee shall allow the Director, or an authorized representative, upon the presentation of credentials and other documents as may be required by law, to:

a. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;
b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit, and
d. Sample, inspect or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act, any substances or parameters at any location.

SECTION D – REPORTING REQUIREMENTS

1. Planned Changes

The permittee shall give notice and provide plans and specification to the Director for review and approval prior to any planned physical alterations or additions to the permitted facility. Notice is required only when:

For Industrial Dischargers

a. The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source in 40 CFR Part122.29(b).
b. The alternation or addition could significantly change the nature or increase the quality of pollutants discharged. This notification applies to pollutants which are subject neither to effluent limitations in the permit, nor to notification requirements under 40CRF Part 122.42 (a)(1).

For POTW Dischargers:

Any change in the facility discharge (including the introduction of any new source or significant discharge or significant changes in the quantity or quality of existing discharges of pollutants) must be reported to the permitting authority. In no case are any new connections, increased flows, or significant changes in influent quality permitted that cause violation of the effluent limitations specified herein.

2. Anticipated Noncompliance

The permittee shall give advance notice to the Director of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

3. Transfers

The permit is nontransferable to any person except after notice to the Director. The Director may require modification or revocation and reissuance of the permit to change the name of the permittee and incorporate such other requirements as may be necessary under the Act.

4. Monitoring Reports

Monitoring results shall be reported at the intervals and in the form specified in Part II.C.5. (Reporting). **Discharge Monitoring Reports must be submitted even when no discharge occurs during the reporting period.**

5. Compliance Schedule

Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit shall be submitted no later than 14 days following each schedule date. Any reports of noncompliance shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirement.

6. Twenty-four Hour Report

a. The permittee shall report any noncompliance which may endanger health or the environment. Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances. A written submission shall also be provided within 5 days of the time the permittee becomes aware of the circumstances. The written submission shall contain the following information:
   (1) a description of the noncompliance and its cause;
   (2) the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and
   (3) steps taken or planned to reduce, eliminate and prevent reoccurrence of the noncompliance.

b. The following shall be included as information which must be reported within 24 hours:
   (1) Any unanticipated bypass which exceeds any effluent limitation in the permit;
   (2) Any upset which exceeds any effluent limitation in the permit and
   (3) Violation of a maximum daily discharge limitation for any of the pollutants listed by the Director in Part III of the permit to be reported within 24 hours.

c. The Director may waive the written report on a case-by-case basis if the oral report has been received within 24 hours.

7. Other Noncompliance

The permittee shall report all instances of noncompliance not reported under Part II.D.4,5 and 6, at the time monitoring reports are submitted. The reports shall contain the information listed at Part II.D.6.

8. **Changes in Discharge of Toxic Substances for Industrial Dischargers**

The permittee shall notify the Director as soon as he/she knows or has reason to believe:

a. That any activity has occurred or will occur which would result in the discharge, in a routine or frequent basis, of any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the "notification levels" described in 40 CFR Part 122.42(a)(1).

b. That any activity has occurred or will occur which would result in any discharge, on a non-routine or infrequent basis, of a toxic pollutant which is not limited in the permit if that discharge will exceed the highest of the "notification levels" described in 40 CFR Part 122.42(a)(2).

9. **Duty to Provide Information**

The permittee shall furnish to the Director, within a reasonable time, any information which the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Director, upon request, copies of records required to be kept by this permit. Information shall be submitted in the form, manner and time frame requested by the Director.

10. **Duty to reapply**

If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit. The complete application shall be submitted at least 180 days before the expiration date of this permit. The Director may grant permission to submit an application less than 180 days in advance but no later than the permit expiration date. Continuation of expiring permits shall be governed by regulations promulgated in APCEC Regulation No. 6.

11. **Signatory Requirements**

All applications, reports or information submitted to the Director shall be signed and certified

a. All permit applications shall be signed as follows:
   (1) For a corporation: by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:
      (i) A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation: or
      (ii) The manager of one or more manufacturing, production, or operation facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and

directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

(2) For a partnership or sole proprietorship: by a general partner or proprietor, respectively; or

(3) For a municipality, State, Federal, or other public agency; by either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency includes:

(i) The chief executive officer of the agency, or

(ii) A senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency.

b. All reports required by the permit and other information requested by the Director shall be signed by a person described above or by a duly authorized representative of that person.

A person is a duly authorized representative only if:

(1) The authorization is made in writing by a person described above.

(2) The authorization specified either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, or position of equivalent responsibility. (A duly authorized representative may thus be either a named individual or any individual occupying a named position); and

(3) The written authorization is submitted to the Director.

c. Certification. Any person signing a document under this section shall make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

12. Availability of Reports

Except for data determined to be confidential under 40 CFR Part 2 and Regulation 6, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Department of Pollution and Ecology. As required by the Regulations, the name and address of any permit applicant or permittee, permit applications, permits and effluent data shall not be considered confidential.

13. Penalties for Falsification of Reports

The Arkansas Air and Water Pollution Control Act provides that any person who knowingly makes any false statement, representation, or certification in any application, record, report, plan or other document filed or required to be maintained under this permit shall be subject to civil penalties specified in Part II.A.2. and/or criminal penalties under the authority of the Arkansas Water and Air Pollution Control Act (Act 472 of 1949, as amended).

PART III
OTHER CONDITIONS

1. The operator of this wastewater treatment facility shall be licensed by the State of Arkansas in accordance with Act 211 of 1971, Act 1103 of 1991, Act 556 of 1993, and Regulation No. 3, as amended.

2. For publicly owned treatment works, the 30-day average percent removal for Biochemical Oxygen Demand and Total Suspended Solids shall not be less than 85 percent unless otherwise authorized by the permitting authority in accordance with 40 CFR 133.102, as adopted by reference in APCEC Regulation No. 6.

3. Produced sludge shall be disposed of by land application only when meeting the following criteria:

    a. Sewage sludge from treatment works treating domestic sewage (TWTDS) must meet the applicable provisions of 40 CFR Part 503; and

    b. The sewage sludge has not been classified as a hazardous waste under state or federal regulations.

4. The permittee shall report all overflows with the Discharge Monitoring report (DMR) submittal. These reports shall be summarized and reported in tabular format. The summaries shall include: the date, time, duration, location, estimated volume, and cause of overflow; observed environmental impacts from the overflow; action taken to address the overflow; and ultimate discharge location if not contained (e.g., storm sewer system, ditch, tributary.) Overflows which endanger health or the environment shall be orally reported to this department (Enforcement Section of Water Division), within 24 hours from the time the permittee becomes aware of the circumstance. A written report of overflows which endanger health or the environment, shall be provided within 5 days of the time the permittee becomes aware of the circumstance.

5. In accordance with 40 CFR Parts 122.62 (a) (2) and 124.5, this permit may be reopened for modification or revocation and/or reissuance to require additional monitoring and/or effluent limitations when new information is received that actual or potential exceedance of State water quality criteria and/or narrative criteria are determined to be the result of the permittee's discharge (s) to water body, or a Total Maximum Daily Load (TMDL) is established or revised for the water body that were not available at the time of permit issuance that would have justified the application of different permit conditions at the time of permit issuance.

6. Contributing Industries and Pretreatment Requirements

A. The permittee shall operate an industrial pretreatment program in accordance with Section 402(b)(8) of the Clean Water Act, the General Pretreatment Regulations (40 CFR Part 403) and the approved POTW pretreatment program submitted by the permittee. The pretreatment program was approved on **November 1, 1983**, modified on **May 15, 1990, December 2, 1993** and **May 11, 1999**. The POTW pretreatment program is hereby incorporated by reference and shall be implemented in a manner consistent with the following requirements:

1. Industrial user information shall be updated at a frequency adequate to ensure that all IUs are properly characterized at all times.

2. The frequency and nature of industrial user compliance monitoring activities by the permittee shall be commensurate with the character, consistency and volume of waste. However, in keeping with the requirements of 40 CFR 403.8(f)(2)(v), the permittee must inspect and sample the effluent from each Significant Industrial User at least once a year. This is in addition to any industrial self-monitoring activities;

3. The permittee shall enforce and obtain remedies for noncompliance by any industrial users with applicable pretreatment standards and requirements.

4. The permittee shall control through permit, order, or similar means, the contribution to the POTW by each Industrial User to ensure compliance with applicable Pretreatment Standards and Requirements. In the case of Industrial Users identified as significant under 40 CFR 403.3(t), this control shall be achieved through permits or equivalent individual control mechanisms issued to each such user. Such control mechanisms must be enforceable and contain, at a minimum, the following conditions:

   a. Statement of duration (in no case more than five years;

   b. Statement of non-transferability without, at a minimum, prior notification to the POTW and provision of a copy of the existing control mechanism to the new owner or operator;

   c. Effluent limits based on applicable general pretreatment standards, categorical pretreatment standards, local limits, and State and local law;

   d. Self-monitoring, sampling, reporting, notification and recordkeeping requirements, including an identification of the

pollutants to be monitored, sampling location, sampling frequency, and sample type, based on the applicable general pretreatment standards in 40 CFR 403, categorical pretreatment standards, local limits, and State and local law;

e. Statement of applicable civil and criminal penalties for violation of pretreatment standards and requirements, and any applicable compliance schedule. Such schedules may not extend the compliance date beyond federal deadlines.

5. The permittee shall evaluate, at least once every two years, whether each Significant Industrial User needs a plan to control slug discharges. If the POTW decides that a slug control plan is needed, the plan shall contain at least the minimum elements required in 40 CFR 403.8 (f)(2)(v).

6. The permittee shall provide adequate staff, equipment, and support capabilities to carry out all elements of the pretreatment program; and,

7. The approved program shall not be modified by the permittee without the prior approval of the Department.

B. The permittee shall establish and enforce specific limits to implement the provisions of 40 CFR Parts 403.5(a) and (b), as required by 40 CFR Part 403.5(c). Each POTW with an approved pretreatment program shall continue to develop these limits as necessary and effectively enforce such limits.

All specific prohibitions or limits developed under this requirement are deemed to be conditions of this permit. The specific prohibitions set out in 40 CFR Part 403.5(b) shall be enforced by the permittee unless modified under this provision.

C. The permittee shall analyze the treatment facility influent and effluent for the presence of the toxic pollutants listed in 40 CFR 122 Appendix D (NPDES Application Testing Requirements) Table II at least **once/year** and the toxic pollutants in Table III at least **once/quarter**. If, based upon information available to the permittee, there is reason to suspect the presence of any toxic or hazardous pollutant listed in Table V, or any other pollutant, known or suspected to adversely affect treatment plant operation, receiving water quality, or solids disposal procedures, analysis for those pollutants shall be performed at least **once/quarter** on both the influent and effluent.

1. The influent and effluent samples collected shall be composite samples consisting of at least 12 aliquots collected at approximately equal intervals over a representative 24 hour period and composited according to flow.

Sampling and analytical procedures shall be in accordance with guidelines established in 40 CFR 136. Where composite samples are inappropriate, due to sampling, holding time, or analytical constraints, at least four (4) grab samples, taken at equal intervals over a representative 24 hour period, shall be taken.

D. The permittee shall prepare annually a list of Industrial Users which during the preceding twelve months were in significant noncompliance with applicable pretreatment requirements. For the purposes of this Part, significant noncompliance shall be determined based upon the more stringent of either criteria established at 40 CFR Part 403.8(f)(2)(vii) [rev. 7/24/90] or criteria established in the approved POTW pretreatment program. This list is to be published annually in the largest daily newspaper in the municipality during the month of **December**.

In addition, during the month of **December** the permittee shall submit an updated pretreatment program status report to ADEQ containing the following information:

1. An updated list of all significant industrial users. For each industrial user listed, the following information shall be included:

   a. Standard Industrial Classification (SIC) code and categorical determination.

   b. Control document status. Whether the user has an effective control document, and the date such document was last issued, reissued, or modified, (indicate which industrial users were added to the system (or newly identified) within the previous 12 months).

   c. A summary of all monitoring activities performed within the previous 12 months. The following information shall be reported:

      (1) total number of inspections performed;
      (2) total number of sampling visits made;

   d. Status of compliance with both effluent limitations and reporting requirements. Compliance status shall be defined as follows:

      (1) Compliant (C) - no violations during the previous 12 month period;

(2) Non-compliant (NC) - one or more violations during the previous 12 months but does not meet the criteria for significant noncompliant industrial users.

(3) Significant Noncompliance (SNC) - in accordance with requirements described in d. above.

e. For significantly noncompliant industrial users, indicate the nature of the violations, the type and number of actions taken (notice of violation, administrative order, criminal or civil suit, fines or penalties collected, etc.) and current compliance status. If ANY industrial user was on a schedule to attain compliance with effluent limits, indicate the date the schedule was issued and the date compliance is to be attained.

2. A list of all significant industrial users whose authorization to discharge was terminated or revoked during the preceding 12 month period and the reason for termination.

3. A report on any interference, pass through, upset or POTW permit violations known or suspected to be caused by industrial contributors and actions taken by the permittee in response.

4. The results of all influent, effluent analyses performed pursuant to paragraph (c) above;

5. A copy of the newspaper publication of the significantly noncompliant industrial users giving the name of the newspaper and the date published; and

6. The information requested may be submitted in tabular form as per the example tables provided for your convenience (See Attachments A, B and C); and

7. The monthly average water quality based effluent concentration necessary to meet the state water quality standards as developed in the approved technically based local limits.

E. The permittee shall provide adequate notice to the Department of the following:

1. Any new introduction of pollutants into the treatment works from an indirect discharger which would be subject to Section 301 and 306 of the Act if it were directly discharging those pollutants; and

2. Any substantial change in the volume or character of pollutants being introduced into the treatment works by a source introducing pollutants into the treatment works at the time of issuance of the permit.

Adequate notice shall include information on (i) the quality and quantity of effluent to be introduced into the treatment works, and (ii) any anticipated impact of the change on the quality or quantity of effluent to be discharged from the POTW.

7. ADDITIONAL CONDITIONS FOR LAND APPLICATION OF BIOSOLIDS

A. GENERAL REQUIREMENTS:

1. Only biosolids which are not classified as a hazardous waste under state or federal regulations may be land applied.

2. Plant Available Nitrogen (PAN) will not be applied at a rate exceeding the annual nitrogen uptake of the crop. At no time will the nitrogen application rate (PAN/acre-year) be allowed to exceed the site specific rate approved by the Department.

3. Biosolids with Polychlorinated Biphenyls (PCB's) concentrations equal or greater than 50 mg/kg (dry basis) will not be land applied at any time.

4. CEILING CONCENTRATIONS (milligrams per kilogram, dry weight basis): If the biosolids to be land applied exceed any of the pollutant concentrations listed below, the biosolids **may not** be land applied.

Pollutant	Ceiling Concentrations
Arsenic	75
Cadmium	85
Copper	4300
Lead	840
Mercury	57
Molybdenum	75
Nickel	420
Selenium	100
Zinc	7500

5. CUMULATIVE CONCENTRATION LIMITS: When the cumulative amount of any pollutant land applied to a specific site exceeds any of the loading rates listed below, no more biosolids may be land applied the specific site.

Element	Cumulative Pollutant Loading Rate kg/ha (lbs/ac)
Arsenic	41 (37)
Cadmium	39 (35)
Copper	1500 (1350)
Lead	300 (270)
Mercury	17 (15)
Nickel	420 (378)
Selenium	100 (90)
Zinc	2800 (2520)

6. The biosolids generator must issue a signed certification stating that the Pathogen Reduction, Vector Attraction Reduction, and Pollutant Concentration limits have been met each time the biosolids are released for disposal. The State requirements on Pathogen Reduction, Vector Attraction and Pollutant Concentration limits are the same as those listed in the Federal Regulation 40 CFR Part 503, as amended. All the above information must be made available to the land-applicator, if different from the permittee, before the material is delivered. Concurrently, a signed copy of each certification must be also submitted to ADEQ's Water Division.

7. Proper containers shall be utilized to transport the biosolids. No biosolids material shall be allowed to be blown out of containers, truck beds, or spilled during transportation.

8. Transportation of the biosolids must be such that will prevent the attraction, harborage or breeding of insects or rodents. It must not produce conditions harmful to public health, the environment, odors, unsightliness, nuisances, or safety hazards.

9. Transportation equipment must be leak-proof and kept in top sanitary conditions at all times. Biosolids must be enclosed or covered as to prevent littering, vector attraction, or any other nuisances.

10. The permittee will be responsible for assuring that the land owner, of any land application site not owned by the permittee, and the waste applicator, if different from the permittee, abide by the conditions of this permit.

11. Biosolids will be spread evenly over the application area and in no way biosolids will be allowed to enter the waters of the State.

12. Biosolids will not be applied to slopes with a gradient greater than 15%; or to soils that are saturated, frozen or covered with snow, during rain, or when precipitation is imminent.

13. The permittee will take all necessary measures to reduce obnoxious and offensive odors. Equipment will be maintained and operated to prevent spillage and leakage.

14. Disposal of biosolids in a floodplain will not restrict the flow of the base flood, reduce the temporary storage capacity of the floodplain, or result in a washout of solid waste, so as to pose a hazard to human life, wildlife or land and water uses.

15. Biosolids will not be spread within 25 feet of rock outcrops; 50 feet of property lines; 200 feet of drinking water well; 100 feet of lakes, ponds, springs, streams, wetlands, and sinkholes; 300 feet of occupied buildings and streams classified as an "extraordinary resource stream."

16. The permittee will give 120 days prior notice to the Director of any change planned in the biosolids disposal practice.

17. All new land application sites must have a waste management plan approved by the Department prior to land application of biosolids. This may require a permit modification.

B. MONITORING AND REPORTING REQUIREMENTS:

The permittee will be responsible for the biosolids analyses, soil analyses, and a reporting schedule that must include the following:

a. Biosolids Analysis

1. Biosolids samples collected must be representative of the treated biosolids to be land applied. The samples are to be stored in appropriate glass or plastic containers and kept refrigerated or frozen to prevent any change in composition.

2. Quarterly grab samples of the land applied biosolids will be analyzed and results expressed in dry basis in mg/kg, except as otherwise indicated:

Volatile Solids (%)	Total Kjeldahl Nitrogen
Total Solids (%)	Total Phosphorus
Nitrate Nitrogen	Total Potassium
Nitrite Nitrogen	Ammonia Nitrogen
Arsenic	Cadmium
Chromium	Copper
Lead	Mercury
Nickel	Selenium
Zinc	pH (SU)
Molybdenum	

b. Soils Analysis

Each land application site will be soil tested in the Spring prior to application for the following parameters:

Nitrate-Nitrogen	Potassium
Phosphorus	Magnesium
Arsenic	Cadmium
Copper	Lead
Selenium	Mercury
Nickel	pH (SU)
Zinc	C.E.C. (mequivalent/100 grams)
Salt Content (micro mohs/cm)	

c. Reporting

1. Annual reports will be sent to the Department and to the owner of the land receiving biosolids **prior to May 1,** which must include the following:

The biosolids and soil analyses conducted under section above (including a statement that the analyses were performed in accordance with EPA Document SW-846, "Test Methods for Evaluation of Solid Waste," or other procedures approved by the Director), application dates and locations, volumes of biosolids applied (in dry tons/acre-year and gallons/acre-year of biosolids), methods of disposal, identity of hauler, and type of crop grown, amounts of nitrogen applied, total elements added that year (lbs/acre), total elements applied to date, and copies of soil analyses for each site.

2. The permittee will also maintain copies of the above records for Department personnel review at the biosolids generating facility.

8. **WHOLE EFFLUENT TOXICITY TEST REQUIREMENT** (WET Limits, 7 DAY CHRONIC, FRESHWATER)

1. SCOPE AND METHODOLOGY

a. The permittee shall test the effluent for toxicity in accordance with the provisions in this section.

APPLICABLE TO OUTFALL(S): **001**

REPORTED ON DMR AS OUTFALL: 001

CRITICAL DILUTION:	**100%**
EFFLUENT DILUTION SERIES:	**32%,42%,56%,75%,100%**
TEST SPECIES/METHODS:	**40 CFR Part 136**

Ceriodaphnia dubia chronic static renewal survival and reproduction test, Method 1002.0, EPA/600/4-91/002 or the most recent update thereof. This test should be terminated when 60% of the surviving adults in the control produce three broods.

Pimephales promelas (Fathead minnow) chronic static renewal 7-day larval survival and growth test, Method 1000.0, EPA/600/4-91/002, or the most recent update thereof. A minimum of five (5) replicates with eight (8) organisms per replicate must be used in the control and in each effluent dilution of this test.

b. The NOEC (No Observed Effect Concentration) is defined as the greatest effluent dilution at and below which lethality that is statistically different from the control (0% effluent) at the 95% confidence level does not occur. Chronic lethal test failure is defined as a demonstration of a statistically significant lethal effect at test completion to a test species at or below the critical dilution.

c. When the testing frequency stated above is less than monthly and the effluent fails the survival endpoint at the critical dilution, the permittee shall be considered in violation of this permit limit and the frequency for the affected species will increase to monthly until such time compliance with the Lethal No Observed Effluent Concentration (NOEC) effluent limitation is demonstrated for a period of three consecutive months, at which time the permittee may return to the testing frequency stated in Part I of this permit. During the period the permittee is out of compliance, test results shall be reported on the DMR for that reporting period.

d. This permit may be reopened to require chemical specific effluent limits, additional testing, and/or other appropriate actions to address toxicity.

e. Test failure is defined as a demonstration of statistically significant sub-lethal or lethal effects to a test species at or below the effluent critical dilution.

2. REQUIRED TOXICITY TESTING CONDITIONS

a. Test Acceptance

The permittee shall repeat a test, including the control and all effluent dilutions, if the procedures and quality assurance requirements defined in the test methods or in this permit are not satisfied, including the following additional criteria:

i. The toxicity test control (0% effluent) must have survival equal to or greater than 80%.

ii. The mean number of Ceriodaphnia dubia neonates produced per surviving female in the control (0% effluent) must be 15 or more.

iii. The mean dry weight of surviving Fathead minnow larvae at the end of the 7 days in the control (0% effluent) must be 0.25 mg per larva or greater.

iv. The percent coefficient of variation between replicates shall be 40% or less in the control (0% effluent) for: the young of surviving females in the Ceriodaphnia dubia reproduction test, the growth and survival of the Fathead minnow test.

v. The percent coefficient of variation between replicates shall be 40% or less in the critical dilution, unless significant lethal or nonlethal effects are exhibited for: the young of surviving females in the Ceriodaphnia dubia reproduction test; the growth and survival endpoints in the Fathead minnow test.

Test failure may not be construed or reported as invalid due to a coefficient of variation value of greater than 40%. A repeat test shall be conducted within the required reporting period of any test determined to be invalid.

b. Statistical Interpretation

i. For the Ceriodaphnia dubia survival test, the statistical analyses used to determine if there is a significant difference between the control and the critical dilution shall be Fisher's Exact Test as described in EPA/600/4-91/002, or the most recent update thereof.

If the conditions of Test Acceptability are met in Item 2.a above and the percent survival of the test organism is equal to or greater than 80% in the critical dilution concentration and all lower dilution concentrations, the test shall be considered to be a passing test, and the permittee shall report an NOEC of not less than the critical dilution for the DMR reporting requirements found in Item 3 below.

ii. For the Ceriodaphnia dubia reproduction test and the Fathead minnow larval survival and growth test, the statistical analyses used to determine if there is a significant difference between the control and the critical

dilution shall be in accordance with the methods for determining the No Observed Effect Concentration (NOEC) as described in EPA/600/4-91/002, or the most recent update thereof.

c. Dilution Water

i. Dilution water used in the toxicity tests will be receiving water collected as close to the point of discharge as possible but unaffected by the discharge. The permittee shall substitute synthetic dilution water of similar pH, hardness and alkalinity to the closest downstream perennial water where the receiving stream is classified as intermittent or where the receiving stream has no flow due to zero flow conditions.

ii. If the receiving water is unsatisfactory as a result of instream toxicity (fails to fulfill the test acceptance criteria of Item 2.a.), the permittee may substitute synthetic dilution water for the receiving water in all subsequent tests provided the unacceptable receiving water test met the following stipulations:

A. a synthetic dilution water control which fulfills the test acceptance requirements of Item 2.a. was run concurrently with the receiving water control;

B. the test indicating receiving water toxicity has been carried out to completion (i.e., 7 days);

C. the permittee includes all test results indicating receiving water toxicity with the full report and information required by Item 3.a. below; and

D. the synthetic dilution water shall have a pH, hardness and alkalinity similar to that of the receiving water or closest downstream perennial water not adversely affected by the discharge, provided the magnitude of these parameters will not cause toxicity in the synthetic dilution water.

d. Samples and Composites

i. The permittee shall collect a minimum of three flow-weighted 24-hour composite samples from the outfall(s) listed at item 1.a. above. A 24-hour composite sample consists of a minimum of 4 effluent portions collected at equal time intervals representative of a 24-hour operating day and

combined proportional to flow or a sample continuously collected proportional to flow over a 24-hour operating day.

ii. The permittee shall collect second and third 24-hour composite samples for use during 24-hour renewals of each dilution concentration for each test. The permittee must collect the 24-hour composite samples such that the effluent samples are representative of any periodic episode of chlorination, biocide usage or other potentially toxic substance discharged on an intermittent basis.

iii. The permittee must collect the 24-hour composite samples so that the maximum holding time for any effluent sample shall not exceed 72 hours. The permittee must have initiated the toxicity test within 36 hours after the collection of the last portion of the first 24-hour composite sample. Samples shall be chilled to 4 degrees Centigrade during collection, shipping and/or storage.

iv. If the flow from the outfall(s) being tested ceases during the collection of effluent samples, the requirements for the minimum number of effluent samples, the minimum number of effluent portions and the sample holding time are waived during that sampling period. However, the permittee must collect an effluent composite sample volume during the period of discharge that is sufficient to complete the required toxicity tests with daily renewal of effluent. When possible, the effluent samples used for the toxicity tests shall be collected on separate days if the discharge occurs over multiple days. The effluent composite sample collection duration and the static renewal protocol associated with the abbreviated sample collection must be documented in the full report required in Item 3. of this section.

v. MULTIPLE OUTFALLS: If the provisions of this section are applicable to multiple outfalls, the permittee shall combine the 24-hour composite effluent samples in proportion to the average flow from the outfalls listed in item 1.a. above for the day the sample was collected. The permittee shall perform the toxicity test on the flow-weighted composite of the outfall samples.

vi. At the time of sample collection the permittee shall measure the TRC of the effluent. The measured concentration of TRC for each sample shall be included in the lab report submitted by the permittee. The permittee shall not allow the sample to be dechlorinated prior to delivery to the laboratory nor at the laboratory.

3. REPORTING

a. The permittee shall prepare a full report of the results of all tests conducted pursuant to this section in accordance with the Report Preparation Section of EPA/600/4-91/002, or the most current publication, for every valid or invalid toxicity test initiated whether carried to completion or not. The permittee shall retain each full report pursuant to the provisions of Part III.C. of this permit. The permittee shall submit full reports only upon the specific request of the Department.

b. The permittee shall report the Whole Effluent Lethality values for the 30-Day Average Minimum and the 7-Day Minimum under Parameter No. 22414 on the DMR for that reporting period.

If more than one valid test for a species was performed during the reporting period, the test NOECs will be averaged arithmetically and reported as the DAILY AVERAGE MINIMUM NOEC for that reporting period.

If more than one species is tested during the reporting period, the permittee shall report the lowest 30-Day Average Minimum NOEC and the lowest 7-Day Minimum NOEC for Whole Effluent Lethality.

A valid test for each species must be reported on the DMR during each reporting period specified in PART I of this permit. Only ONE set of biomonitoring data for each species is to be recorded on the DMR for each reporting period. The data submitted should reflect the LOWEST Survival results for each species during the reporting period. All invalid tests, repeat tests (for invalid tests), and retests (for tests previously failed) performed during the reporting period must be attached to the DMR for EPA review.

c. The permittee shall submit the results of the valid toxicity test on the DMR for that reporting period. Submit retest information clearly marked as such with the following month's DMR. Only results of valid tests are to be reported on the DMR.

i. **Pimephales promelas** (Fathead Minnow)

A. If the No Observed Effect Concentration (NOEC) for survival is less than the critical dilution, enter a "1"; otherwise, enter a "0" for Parameter No. TLP6C.

B. Report the NOEC value for survival, Parameter No. TOP6C.

C. Report the NOEC value for growth, Parameter No. TPP6C.

D. If the No Observed Effect Concentration (NOEC) for growth is less than the critical dilution, enter a "1"; otherwise, enter a "0" for Parameter No. TGP6C.

E. Report the highest (Critical dilution or control) Coefficient of Variation, Parameter No. TQP6C.

ii. **Ceriodaphnia dubia**

A. If the NOEC for survival is less than the critical dilution, enter a "1"; otherwise, enter a "0" for Parameter No. TLP3B.

B. Report the NOEC value for survival, Parameter No. TOP3B.

C. Report the NOEC value for reproduction, Parameter No. TPP3B.

D. If the No Observed Effect Concentration (NOEC) for reproduction is less than the critical dilution, enter a "1"; otherwise, enter a "0" for Parameter No. TGP3B.

E. Report the highest (Critical dilution or control) Coefficient of Variation, Parameter No. TQP3B.

9. **Storm Water Pollution Prevention Plan Requirements**

A. **General**

(1) If your facility already has a storm water pollution prevention plan (SWPPP) in place, then you shall continue the implementation of this SWPPP. If you do not have a SWPPP, then you shall prepare a SWPPP for your facility within 60 days of the effective starting date of this permit. Your SWPPP must be prepared in accordance with good engineering practices. Your SWPPP must:

(a) Identify potential sources of pollution which may reasonably be expected to affect the quality of storm water discharges from your facility;

(b) Describe and ensure implementation of practices which you will use to reduce the pollutants in storm water discharges from the facility; and

(c) Assure compliance with the terms and conditions of this permit.

(2) No Exposure Exclusions, as allowed by 40 CFR 122.26(g), can be obtained for the storm water discharges from the facility as long as all of the required conditions for applicability can be certified. These required conditions can be found in the federal regulation. The No Exposure Exclusion application form can be obtained from the Storm Water section of the ADEQ. Application for this exclusion must be made on the form obtained from the ADEQ.

B. **Contents of Plan**

(1) **Pollution Prevention Team**

(a) You must identify the staff individual(s) (by name or title) that comprise the facility's storm water Pollution Prevention Team. Your Pollution Prevention Team is responsible for assisting the facility/plant manager in developing, implementing, maintaining and revising the facility's SWPPP. Responsibilities of each staff individual on the team must be listed.

(2) **Site Description**

(a) Your SWPPP must include the following:

i. *Activities at Facility.* Description of the nature of the industrial activity(ies) at your facility;

ii. *General Location Map.* A general location map (e.g., U.S.G.S. quadrangle, or other map) with enough detail to identify the location of your facility and the receiving waters within one mile of the facility;

iii. A legible site map identifying the following:

(a) Directions of storm water flow (e.g., use arrows to show which ways storm water will flow);

(b) Locations of all existing structural BMPs;

(c) Locations of all surface water bodies;

(d) Locations of potential pollutant sources identified under Section B(4)(a) of this Part and where significant materials are exposed to precipitation;

(e) Location where major spills or leaks identified under Section B(5) of this Part have occurred;

(f) Locations of the following activities where such activities are exposed to precipitation: fueling stations, vehicle and equipment maintenance and/or cleaning areas, loading/unloading areas, locations used for the treatment, storage or disposal of wastes, and liquid storage tanks;

(g) Locations of storm water outfalls and an approximate outline of the area draining to each outfall;

(h) Location and description of non-storm water discharges;

(i) Locations of the following activities where such activities are exposed to precipitation: processing and storage areas; access roads, rail cars and tracks; the location of transfer of substance in bulk; and machinery;

(j) Location and source of runoff from adjacent property containing significant quantities of pollutants of concern to the facility (an evaluation of how the quality of the runoff impacts your storm water discharges may be included).

(3) **Receiving Waters and Wetlands**

(a) You must provide the name of the nearest receiving water(s), including intermittent streams, dry sloughs, arroyos and the areal extent and description of wetland or other special aquatic sites that may receive discharges from your facility.

(4) **Summary of Potential Pollutant Source**

(a) You must identify each separate area at your facility where industrial materials or activities are exposed to storm water.

Industrial materials or activities include, but are not limited to, material handling equipment or activities, industrial machinery, raw materials, intermediate products, by-products, final products, or waste products. Material handling activities include the storage, loading/unloading, transportation, or conveyance of any raw material, intermediate product, final product or waste product. For each separate area identified, the description must include:

i. *Activities in Area.* A list of the activities (e.g., material storage, equipment fueling and cleaning, cutting steel beams); and

ii. *Pollutants.* A list of the associated pollutant(s) or pollutant parameter(s) (e.g., crankcase oil, iron, biochemical oxygen demand, pH, etc.) for each activity. The pollutant list must include all significant materials that have been handled, treated, stored or disposed in a manner to allow exposure to storm water between the time of three (3) years before being covered under this permit and the present.

(5) **Spills and Leaks**

(a) You must clearly identify areas where potential spills and leaks, which can contribute pollutants to storm water discharges, can occur, and their accompanying drainage points. For areas that are exposed to precipitation or that otherwise drain to a storm water conveyance at the facility to be covered under this permit, you must provide a list of significant spills and leaks of toxic or hazardous pollutants that occurred during the three (3) year period prior to the starting date of this permit. Your list must be updated if significant spills or leaks occur in exposed areas of your facility during the time you are covered by the permit.

(b) Significant spills and leaks include, but are not limited to releases of oil or hazardous substances in excess of quantities that are reportable under CWA 311 (see 40 CFR 110.10 AND 40 CFR 117.21) or section 102 of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). Significant spills may also include releases of oil or hazardous substances that are not in excess of reporting requirements.

(6) **Sampling Data**

(a) You must provide a summary of existing storm water discharge sampling data taken at your facility. All storm water sampling data collected during the term of this permit must also be summarized and included in this part of the SWPPP.

(7) **Storm Water Controls**

(a) Description of Existing and Planned BMPs. Describe the type and location of existing non-structural and structural best management practices (BMPs) selected for each of the areas where industrial materials or activities are exposed to storm water. All the areas identified in Section B(4)(a) of this Part should have a BMP(s) identified for the areas discharges. For areas where BMPs are not currently in place, describe appropriate BMPs that you will use to control pollutants in storm water discharges. Selection of BMPs should take into consideration:

i. The quantity and nature of the pollutants, and their potential to impact the water quality of receiving waters;

ii. Opportunities to combine the dual purposes of water quality protection and local flood control benefits (including physical impacts of high flows on streams - e.g., bank erosion, impairment of aquatic habitat, etc.);

iii. Opportunities to offset the impact impervious areas of the facility on ground water recharge and base flows in local streams (taking into account the potential for ground water contamination.)

(b) BMP Types to be Considered. The following types of structural, non-structural, and other BMPs must be considered for implementation at your facility. Describe how each is, or will be, implemented. This requirement may have been fulfilled with area-specific BMPs identified under Section B(7)(a) of this Part, in which case the previous descriptions are sufficient. However, many of the following BMPs may be more generalized or non site-specific and therefore not previously considered. If you determine that any of these BMPs are not appropriate for your facility, you must include an explanation of why they are not appropriate. The BMP examples listed below are not intended to be an exclusive list of BMPs that you may use. You are encouraged to keep abreast of

new BMPs or new applications of existing BMPs to find the most cost effective means of permit compliance for your facility. If BMPs are being used or planned at the facility which are not listed here (e.g., replacing a chemical with a less toxic alternative, adopting a new or innovative BMP, etc.), include descriptions of them in this section of the SWPPP.

(c) Non-Structural BMPs

i. *Good Housekeeping:* You must keep all exposed areas of the facility in a clean, orderly manner where such exposed areas could contribute pollutants to storm water discharges. Common problem areas include: around trash containers, storage areas and loading docks. Measures must also include: a schedule for regular pickup and disposal of garbage and waste materials; routine inspections for leaks and conditions of drums, tanks and containers.

ii. *Minimizing Exposure:* Where practicable, industrial materials and activities should be protected by a storm resistant shelter to prevent exposure to rain, snow, snowmelt, or runoff.

iii. *Preventive Maintenance:* You must have a preventive maintenance program which includes timely inspection and maintenance of storm water management devices, (e.g., cleaning oil/water separators, catch basins) as well as inspecting, testing, maintaining and repairing facility equipment and systems to avoid breakdowns or failures that may result in discharges of pollutants to surface waters.

iv. *Spill Prevention and Response Procedures:* You must describe the procedures which will be followed for cleaning up spills or leaks. Those procedures, and necessary spill response equipment, must be made available to those employees that may cause or detect a spill or leak. Where appropriate, you must explain existing or planned material handling procedures, storage requirements, secondary containment, and equipment (e.g., diversion valves), which are intended to minimize spills or leaks at the facility. Measures for cleaning up hazardous material spills or leaks must be consistent with applicable RCRA regulations at 40 CFR Part 264 and 40 CFR Part 265.

v. *Routine Facility Inspections:* In addition to or as part of the comprehensive site evaluation required under Section G of this Part, you must have qualified facility personnel inspect all areas of the facility where industrial materials or activities are exposed to storm water. The inspections must include an evaluation of existing storm water BMPs. Your SWPPP must identify how often these inspections will be conducted. You must correct any deficiencies you find as soon as practicable, but no later than 14 days from the date of the inspection. You must document in your SWPPP the results of your inspections and the corrective actions you took in response to any deficiencies or opportunities for improvement that you identify.

vi. *Employee Training:* You must describe the storm water employee training program for the facility. The description should include the topics to be covered, such as spill response, good housekeeping, and material management practices, and must identify periodic dates (e.g., every 6 months during the months of July and January) for such training. You must provide employee training for all employees that work in areas where industrial materials or activities are exposed to storm water, and for employees that are responsible for implementing activities identified in the SWPPP (e.g., inspectors, maintenance people). The employee training should inform them of the components and goals of your SWPPP.

(d) Structural BMPs

i. *Sediment and Erosion Control:* You must identify the areas at your facility which, due to topography, land disturbance (e.g., construction), or other factors, have a potential for significant soil erosion. You must describe the structural, vegetative, and/or stabilization BMPs that you will be implementing to limit erosion.

ii. *Management of Runoff:* You must describe the traditional storm water management practices (permanent structural BMPs other than those which control the generation or source(s) of pollutants) that currently exist or that are planned for your facility. These types of BMPs typically are used to divert, infiltrate, reuse, or otherwise reduce

pollutants in storm water discharges from the site. Factors to consider when you are selecting appropriate BMPs should include: 1) the industrial materials and activities that are exposed to storm water, and the associated pollutant potential of those materials and activities; and 2) the beneficial and potential detrimental effects on surface water quality, ground water quality, receiving water base flow (dry weather stream flow), and physical integrity of receiving waters. Structural measures should be placed on upland soils, avoiding wetlands and flood plains, if possible. Structural BMPs may require a separate permit under section 404 of the CWA before installation begins.

iii. *Example BMPs:* BMPs you could use include but are not limited to: storm water detention structures (including wet ponds); storm water retention structures; flow attenuation by use of open vegetated swales and natural depressions; infiltration of runoff onsite; and sequential systems (which combine several practices).

(e) Other Controls

i. No solid materials, including floatable debris, may be discharged to waters of the United States, except as authorized by a permit issued under section 404 of the CWA. Off-site vehicle tracking of raw, final, or waste materials or sediments, and the generation of dust must be minimized. Tracking or blowing of raw, final, or waste materials from areas of no exposure to exposed areas must be minimized. Velocity dissipation devices must be placed at discharge locations and along the length of any outfall channel to provide a non-erosive flow velocity from the structure to a water course so that the natural physical and biological characteristics and functions are maintained and protected (e.g., no significant changes in the hydrological regime of the receiving water).

C. Maintenance

(1) All BMPs you identify in your SWPPP must be maintained in effective operating condition. If site inspections required by Section B(7)(c)(v) of this Part identify BMPs that are not operating effectively, maintenance must be performed before the next anticipated storm event, or as necessary

to maintain the continued effectiveness of storm water controls. If maintenance prior to the next anticipated storm event is impracticable, maintenance must be scheduled and accomplished as soon as practicable. In the case of non-structural BMPs, the effectiveness of the BMP must be maintained by appropriate means (e.g., spill response supplies available and personnel trained, etc.).

D. Non-Storm Water Discharges

(1) Certification of Non-Storm Water Discharges

(a) Your SWPPP must include a certification that all discharges (i.e., outfalls) have been tested or evaluated for the presence of non-storm water. The certification must be signed in accordance with Part II Section D.11 of the individual permit, and include:

i. The date of any testing and/or evaluation;

ii. Identification of potential significant sources of non-storm water at the site;

iii. A description of the results of any test and/or evaluation for the presence of non-storm water discharges;

iv. A description of the evaluation criteria or testing method used; and

v. A list of the outfalls or onsite drainage points that were directly observed during the test.

vi. If you are unable to provide the certification required (testing for non-storm water discharges), you must notify the Director 180 days after the effective starting date of this permit to be covered by this permit. If the failure to certify is caused by the inability to perform adequate tests or evaluations, such notification must describe:

vii. The reason(s) why certification was not possible;

viii. The procedure of any test attempted;

ix. The results of such test or other relevant observations; and

x. Potential sources of non-storm water discharges to the storm sewer.

xi. A copy of the notification must be included in the SWPPP at the facility. Non-storm water discharges to waters of the United States which are not authorized by an NPDES permit are unlawful, and must be terminated.

E. Allowable Non-storm Water Discharges

(1) Certain sources of non-storm water are allowable under this permit. In order for these discharges to be allowed, your SWPPP must include:

(a) An identification of each allowable non-storm water source;

(b) The location where it is likely to be discharged; and

(c) Descriptions of appropriate BMPs for each source.

(d) Except for flows from fire fighting activities, you must identify in your SWPPP all sources of allowable non-storm water that are discharged under the authority of this permit.

(e) If you include mist blown from cooling towers amongst your allowable non-storm water discharges, you must specifically evaluate the potential for the discharges to be contaminated by chemicals used in the cooling tower and determined that the levels of such chemicals in the discharges would not cause or contribute to a violation of an applicable water quality standard after implementation of the BMPs you have selected to control such discharges.

F. Comprehensive Site Compliance Evaluation

(1) Frequency and Inspectors

(a) You must conduct facility inspections at least once a year. The inspections must be done by qualified personnel provided by you. The qualified personnel you use may be either your own employees or outside consultants that you have hired, provided they are knowledgeable and possess the skills to assess conditions at your facility that could impact storm water quality and assess the effectiveness of the BMPs you have chosen to use to control the quality of your storm water discharges. If you decide to conduct

more frequent inspections, your SWPPP must specify the frequency of inspections.

(2) **Scope of the Compliance Evaluation**

(a) Your inspections must include all areas where industrial materials or activities are exposed to storm water, as identified in Section B(4)(a) of this Part, and areas where spills and leaks have occurred within the past 3 years. Inspectors should look for: a) industrial materials, residue, or trash on the ground that could contaminate or be washed away in storm water; b) leaks or spills from industrial equipment, drums, barrels, tanks, or similar containers; c) offsite tracking of industrial materials or sediment where vehicles enter or exit the site; d) tracking or blowing of raw, final, or waste materials from areas of no exposure to exposed areas; and e) for evidence of, or the potential for, pollutants entering the drainage system. Storm water BMPs identified in your SWPPP must be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they must be inspected to see whether BMPs are effective in preventing significant impacts to receiving waters. Where discharge locations are inaccessible, nearby downstream locations must be inspected if possible.

(3) **Follow-up Actions**

(a) Based on the results of the inspections, you must modify your SWPPP as necessary (e.g., show additional controls on the map required by Section B(2)(a)(iii) of this Part and revise the description of controls required by Section B(7)(a) of this Part to include additional or modified BMPs designed to correct the problems identified. You must complete revisions to the SWPPP within 14 calendar days following the inspection. If existing BMPs need to be modified or if additional BMPs are necessary, implementation must be completed before the next anticipated storm event. If implementation before the next anticipated storm event is impracticable, they must be implemented as soon as practicable.

(4) **Compliance Evaluation Report**

(a) You must insure a report summarizing the scope of the inspection, name(s) of personnel making the inspection, the date(s) of the inspection, and major observations relating to the implementation

of the SWPPP is completed and retained as part of the SWPPP for at least three years from the date permit coverage expires or is terminated. Major observations should include: the location(s) of discharges of pollutants from the site; and location(s) of BMPs that need to be maintained; location(s) where additional BMPs are needed that did not exist at the time of inspection. You must retain a record of actions taken in accordance with Part II Section C.7 (Retention of Records) of this permit as part of the storm water pollution prevention plan for at least three years from the date that permit coverage expires or is terminated. The inspection reports must identify any incidents of non-compliance. Where an inspection report does not identify any incidents of non-compliance, the report must contain a certification that the facility is in compliance with the storm water pollution prevention plan and this permit. Both the inspection report and any reports of follow-up actions must be signed in accordance with Part II Section D (Reporting Requirements) of this permit.

(5) **Credit As a Routine Facility Inspection**

(a) Where compliance evaluation schedules overlap with inspections required under Section B(7)(c)(v) of this Part, your annual compliance evaluation may also be used as one of the Section B(7)(c)(v) of this Part , routine inspections.

G. **Maintaining Updated SWPPP**

(1) You must amend the storm water pollution prevention plan whenever:

(a) There is a change in design, construction, operation, or maintenance at your facility which has a significant effect on the discharge, or potential for discharge, of pollutants from your facility;

(b) During inspections or investigations by you or by local, State, Tribal or Federal officials it is determined the SWPPP is ineffective in eliminating or significantly minimizing pollutants from sources identified under Section B(4) of this Part, or is otherwise not achieving the general objectives of controlling pollutants in discharges from your facility.

H. **Signature, Plan Review and Making Plans Available**

(1) You must sign your SWPPP in accordance with Part II Section D.11, and retain the plan on-site at the facility covered by this permit (see Part II Section C.7 for records retention requirements).

(2) You must keep a copy of the SWPPP on-site or locally available to the Director for review at the time of an on-site inspection. You must make your SWPPP available upon request to the Director, a State, Tribal or local agency approving storm water management plans, or the operator of a municipal separate storm sewer receiving discharge from the site. Also, in the interest of public involvement, EPA encourages you to make your SWPPPs available to the public for viewing during normal business hours.

(3) The Director may notify you at any time that your SWPPP does not meet one or more of the minimum requirements of this permit. The notification will identify provisions of this permit which are not being met, as well as the required modifications. Within thirty (30) calendar days of receipt of such notification, you must make the required changes to the SWPPP and submit to the Director a written certification that the requested changes have been made.

(4) You must make the SWPPP available to the USFWS or NMFS upon request.

I. **Additional Requirements for Storm Water Discharges Associated With Industrial Activity From Facilities Subject to EPCRA Section 313 Reporting Requirements.**

(1) Potential pollutant sources for which you have reporting requirements under EPCRA 313 must be identified in your summary of potential pollutant sources as per Section B(4) of this Part. Note this additional requirement only applies to you if you are subject to reporting requirements under EPCRA 313.

10. If TRC test results are less than Detection Level Achieved (DL), a value of zero (0) may be used for the Discharge Monitoring Report (DMR) calculations and reporting requirements.

Total residual chlorine (TRC) in the effluent composite sample shall be measured and reported both at the time of sample termination and at the time of toxicity test initiation. The permittee shall ensure that the effluent composite used in toxicity testing is representative of normal facility residual chlorine discharge concentration.

PART IV
DEFINITIONS

All definitions contained in Section 502 of the Clean Water Act shall apply to this permit and are incorporated herein by reference. Additional definitions of words or phrases used in this permit are as follows:

1. **"Act"** means the Clean Water Act, Public Law 95-217 (33.U.S.C. 1251 et seq.) as amended.
2. **"Administrator"** means the Administrator of the U.S. Environmental Protection Agency.
3. **"Applicable effluent standards and limitations"** means all State and Federal effluent standards and limitations to which a discharge is subject under the Act, including, but not limited to, effluent limitations, standards of performance, toxic effluent standards and prohibitions, and pretreatment standards.
4. **"Applicable water quality standards"** means all water quality standards to which a discharge is subject under the federal Clean Water Act and which has been (a) approved or permitted to remain in effect by the Administrator following submission to the Administrator pursuant to Section 303 (a) of the Act, or (b) promulgated by the Director pursuant to Section 303(b) or 303(c) of the Act, and standards promulgated under regulation No. 2, as amended, (regulation establishing water quality standards for surface waters of the State of Arkansas.)
5. **"Bypass"** means the intentional diversion of waste streams from any portion of a treatment facility.
6. **"Daily Discharge"** means the discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling.
Mass Calculations: For pollutants with limitations expressed in terms of mass, the "daily discharge" is calculated as the total mass of pollutant discharged over the sampling day.
Concentration Calculations: For pollutants with limitations expressed in other units of measurement, determination of concentration made using a composite sample shall be the concentration of the composite sample. When grab samples are used, the "daily discharge" determination of concentration shall be the arithmetic average (weighted by flow value) of all the samples collected during that sampling day by using the following formula: where C= daily concentration, F=daily flow and n=number of daily samples; daily average discharge

$$\frac{C_1F_1 + C_2F_2 + \cdots C_nF_n}{F_1 + F_2 + \cdots F_n}$$

7. **Monthly average**: means the highest allowable average of "daily discharges" over a calendar month, calculated as the sum of all "daily discharges" measured during a calendar month divided by the number of "daily discharges" measured during that month. For Fecal Coliform Bacteria (FCB) report the monthly average see 30-day average below.
8. **"Daily Maximum"** discharge limitation means the highest allowable "daily discharge" during the calendar month. The 7-day average for fecal coliform bacteria is the geometric mean of the values of all effluent samples collected during the calendar week in colonies/100 ml.

9. **"Department"** means the Arkansas Department of Environmental Quality (**ADEQ**).
10. **"Director"** means the Administrator of the U.S. Environmental Protection Agency and/or the Director of the Arkansas Department of Environmental Quality.
11. **"Grab sample"** means an individual sample collected in less than 15 minutes in conjunction with an instantaneous flow measurement.
12. **"Industrial User"** means a nondomestic discharger, as identified in 40 CFR 403, introducing pollutants to a publicly-owned treatment works.
13. **"National Pollutant Discharge Elimination System"** means the national program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements, under sections 307, 402, 318 and 405 of the Clean Water Act.
14. **"POTW"** means a Publicly Owned Treatment Works.
15. **"Severe property damage"** means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in products.
16. **"APCEC"** means the Arkansas Pollution Control and Ecology Commission.
17. **"Sewage sludge"** means the solids, residues, and precipitate separated from or created in sewage by the unit processes a publicly-owned treatment works. Sewage as used in this definition means any wastes, including wastes from humans, households, commercial establishments, industries, and storm water runoff that are discharged to or otherwise enter a publicly-owned treatment works.
18. **"7-day average"** discharge limitation, other than for fecal coliform bacteria, is the highest allowable arithmetic means of the values for all effluent samples collected during the calendar week. The 7-day average for fecal coliform bacteria is the geometric mean of the values of all effluent samples collected during the calendar week in colonies/100 ml. The DMR should report the highest 7-day average obtained during the calendar month. For reporting purposes, the 7-day average values should be reported as occurring in the month in which the Saturday of the calendar week falls in.
19. **"30-day average"**, other than for fecal coliform bacteria, is the arithmetic mean of the daily values for all effluent samples collected during a calendar month, calculated as the sum of all daily discharges measured during a calendar month divided by the number of daily discharges measured during that month. The 30-day average for fecal coliform bacteria is the geometric mean of the values for all effluent samples collected during a calendar month.
For Fecal Coliform Bacteria (FCB) report the monthly average as a 30-day geometric mean in colonies per 100 ml.
20. **"24-hour composite sample"** consists of a minimum of 12 effluent portions collected at equal time intervals over the 24-hour period and combined proportional to flow or a sample collected at frequent intervals proportional to flow over the 24-hour period.
21. **"12-hour composite sample"** consists of 12 effluent portions, collected no closer together than one hour and composited according to flow. The daily sampling intervals shall include the highest flow periods.

22. **"6-hour composite sample"** consists of six effluent portions collected no closer together than one hour(with the first portion collected no earlier than 10:00 a.m.) and composited according to flow.
23. **"3-hour composite sample"** consists of three effluent portions collected no closer together than one hour(with the first portion collected no earlier than 10:00 a.m.) and composited according to flow.
24. **"Treatment works"** means any devices and systems used in storage, treatment, recycling, and reclamation of municipal sewage and industrial wastes, of a liquid nature to implement section 201 of the Act, or necessary to recycle reuse water at the most economic cost over the estimated life of the works, including intercepting sewers, sewage collection systems, pumping, power and other equipment, and alterations thereof; elements essential to provide a reliable recycled supply such as standby treatment units and clear well facilities, and any works, including site acquisition of the land that will be an integral part of the treatment process or is used for ultimate disposal of residues resulting from such treatment.
25. **"Upset"** means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the permittee. Any upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, lack or preventive maintenance, or careless of improper operations.
26. **"For Fecal Coliform Bacteria"**, a sample consists of one effluent grab portion collected during a 24-hour period at peak loads. For Fecal Coliform Bacteria (FCB) report the monthly average as a 30-day geometric mean in colonies per 100 ml.
27. **"Dissolved oxygen limit"**, shall be defined as follows:

a. When limited in the permit as a monthly minimum, shall mean the lowest acceptable monthly average value, determined by averaging all samples taken during the calendar month;

b. When limited in the permit as an instantaneous minimum value, shall mean that no value measured during the reporting period may fall below the stated value.

28. **The term "MGD"** shall mean million gallons per day.
29. **The term "mg/l "**shall mean milligrams per liter or parts million (ppm).
30. **The term "µg/l"** shall mean micrograms per liter or parts per billion (ppb).
31. **The term "cfs"** shall mean cubic feet per second.
32. **The term "ppm"** shall mean part per million.
33. **The term "s.u."** shall mean standard units.
34. **Monitoring and Reporting:**

When a permit becomes effective, monitoring requirements are of the immediate period of the permit effective date. Where the monitoring requirement for an effluent characteristic is Monthly or more frequently, the Discharge Monitoring Report shall be submitted by the 25th of the month following the sampling. Where the monitoring requirement for an effluent characteristic is Quarterly, Semi-Annual, Annual, or Yearly, the Discharge Monitoring report shall be submitted by the 25th of the month following the monitoring period end date.

MONTHLY:

is defined as a calendar month or any portion of a calendar month for monitoring requirement frequency of once/month or more frequently.

QUARTERLY:

(1) is defined as a fixed calendar quarter or any part of the fixed calendar quarter for a non-seasonal effluent characteristic with a measurement frequency of once/quarter. Fixed calendar quarters are: January through March, April through June, July through September, and October through December; or

(2) is defined as a fixed three month period (or any part of the fixed three month period) of or dependent upon the seasons specified in the permit for a seasonal effluent characteristic with a monitoring requirement frequency of once/quarter that does not does not coincide with the fixed calendar quarter. Seasonal calendar quarters May through July, August through October, November through January, and February through April.

SEMI-ANNUAL:

is defined as the fixed time periods January through June, and July through December (or any portion thereof) for an effluent characteristic with a measurement frequency of once/6 months or twice/year.

ANNUAL or YEARLY:

is defined as a fixed calendar year or any portion of the fixed calendar year for an effluent characteristic or parameter with a measurement frequency of once/year. A calendar year is January through December, or any portion thereof.

Final Fact Sheet

for renewal of NPDES Permit Number AR0037907 to discharge to Waters of the State

1. **PERMITTING AUTHORITY.**

The issuing office is:

Arkansas Department of Environmental Quality
8001 National Drive
Post Office Box 8913
Little Rock, Arkansas 72219-8913

2. **APPLICANT.**

The applicant is:

City Water and Light of Jonesboro-West Plant
P.O. Box 1289
Jonesboro, AR 72403

3. **PREPARED BY.**

The permit was prepared by:

Alison House
NPDES Branch, Water Division

4. **DATE PREPARED.**

The final permit was prepared on 01/18/2005.

5. **PREVIOUS PERMIT ACTIVITY.**

Effective Date:	8/1/1999
Modification Date:	N/A
Expiration Date:	07/31/2004

The permittee submitted a permit renewal application on 02/27/2004. It is proposed that the current NPDES permit be reissued for a 5-year term in accordance with regulations promulgated at 40 CFR Part 122.46(a).

6. **RECEIVING STREAM SEGMENT AND DISCHARGE LOCATION.**

The outfall is located at the following coordinates:

Latitude: 35° 51' 22" Longitude: 90° 44' 55"

The receiving waters named:

unnamed tributary of Big Creek, thence to Big Creek, thence to Bayou DeView, thence to the Cache River, thence to the White River in Segment 4B of the White River Basin. The receiving stream is a Water of the State classified for primary contact recreation, raw water source for public, industrial, and agricultural water supplies, propagation of desirable species of fish and other aquatic life, and other compatible uses.

a. **303d List and Endangered Species Considerations**

i. **303d List**

The receiving stream is not listed on the 303d list. Therefore no permit action is needed.

ii. **Endangered Species:**

No comments were received from the U.S. Fish and Wildlife Service (USF&WS). Therefore no permit action is needed. The drafted permit and Fact Sheet were sent to the USF&WS for their review.

7. OUTFALL AND TREATMENT PROCESS DESCRIPTION.

The following is a description of the facility described in the application:

a. Design Flow: 3.0 MGD

b. Type of treatment: primary sedimentation, first and second stage trickling filters, secondary sedimentation, chlorination, dechlorination, and re-aeration.

c. Discharge Description: treated municipal wastewater

A quantitative and qualitative description of the discharge described in the NPDES Permit Application Forms received are available for review.

8. INDUSTRIAL WASTEWATER CONTRIBUTIONS.

a. **INDUSTRIAL USERS**

This facility receives significant industrial process wastewater. Based on the applicant's effluent compliance history and the type of industrial contributions,

standard Pretreatment Program implementation conditions are deemed appropriate at this time.

The permittee's second POTW (AR0043401) is used as the "tracking" permit for pretreatment requirements and covers both POTWs, therefore, the requirement to re-evaluate the Maximum Allowable Headworks Loadings (MAHL) or certification that the permittee's Techically Based Local Limits (TBLL) are adequate will not be included.

9. SEWAGE SLUDGE PRACTICES.

Sludge is treated by the following: gravity thickening, lime stabilization and dewatering. It is then land applied at the following location:

Section 11, Township 14 North, Range 3 East; 70+/- total acres with 51.3 available acres; Crop grown: bermuda grass.

10. PERMIT CONDITIONS.

The Arkansas Department of Environmental Quality has made a determination to issue a permit for the discharge described in the application. Permit requirements are based on NPDES regulations (40 CFR Parts 122, 124, and Subchapter N), the National Pretreatment Regulations in 40 CFR 403 and regulations promulgated pursuant to the Arkansas Water and Air Pollution Control Act (Act 472 of 1949, as amended, Ark. Code Ann. 8-4-101 et. seq.).

a. Final Effluent Limitations

Outfall 001 - treated municipal wastewater

i. Conventional and/or Toxic Pollutants

Effluent Characteristics	Discharge Limitations			Monitoring Requirements	
	Mass (lbs/day, unless otherwise specified)	Concentration (mg/l, unless otherwise specified)		Frequency	Sample Type
	Monthly Avg.	Monthly Avg.	7-Day Avg.		
Flow	N/A	Report	Report	once/day	totalizing meter
Carbonaceous Biochemical Oxygen Demand (CBOD5)	375	15	23	three/week	6-hr composite
Total Suspended Solids (TSS)	501	20	30	three/week	6-hr composite

Effluent Characteristics	Discharge Limitations			Monitoring Requirements	
	Mass (lbs/day, unless otherwise specified)	Concentration (mg/l, unless otherwise specified)		Frequency	Sample Type
	Monthly Avg.	Monthly Avg.	7-Day Avg.		
Ammonia Nitrogen (NH3-N)	100	4	6	three/week	6-hr composite
Dissolved Oxygen	N/A	5.0 (Inst. Min.)		three/week	grab
Fecal Coliform Bacteria (FCB)		(colonies/100ml)			
(Apr-Sept)	N/A	200	400	three/week	grab
(Oct-Mar)	N/A	1000	2000	three/week	grab
Total Residual Chlorine (TRC)	N/A	<0.1 mg/l (Inst. Max.)		three/week	grab
pH	N/A	Minimum 6.0 s.u.	Maximum 9.0 s.u.	three/week	grab
	Daily Average Minimum		7-day Minimum		
Whole Effluent Lethality (**7-day NOEC**) 22414	not < **100%**		not < **100%**	Once/quarter	24-hr composite
Pimephales promelas (Chronic)	7-day Average				
Pass/Fail Lethality (7-day NOEC) **TLP6C**	Report (Pass=0/Fail=1)			Once/quarter	24-hr composite
Pass/Fail Growth (7-day NOEC) **TGP6C**	Report (Pass=0/Fail=1)			Once/quarter	24-hr composite
Survival (7-day NOEC) **TOP6C**	Report %			Once/quarter	24-hr composite
Growth (7-day NOEC) **TPP6C**	Report %			Once/quarter	24-hr composite
Coefficient of variation **TQP6C**	Report %			Once/quarter	24-hr composite
Ceriodaphnia dubia (Chronic)	7-day Average				
Pass/Fail Lethality (7-day NOEC) **TLP3B**	Report (Pass=0/Fail=1)			Once/quarter	24-hr composite
Pass/Fail Report. (7-day NOEC) **TGP3B**	Report (Pass=0/Fail=1)			Once/quarter	24-hr composite
Survival (7-day NOEC) **TOP3B**	Report %			Once/quarter	24-hr composite
Reproduction(7-day NOEC) **TPP3B**	Report %			Once/quarter	24-hr composite
Coefficient of variation **TQP3B**	Report %			Once/quarter	24-hr composite

ii. **Solids, Foam, and Free Oil:** There shall be no discharge of distinctly visible solids, scum or foam of a persistent nature, nor shall there be any formation of slime, bottom deposits or sludge banks. No visible sheen (Sheen means an iridescent appearance on the surface of the water).

11. BASIS FOR PERMIT CONDITIONS.

The following is an explanation of the derivation of the conditions of the permit and the reasons for them or, in the case of notices of intent to deny or terminate, reasons suggesting the decisions as required under 40 CFR 124.7 (48 FR 1413, April 1, 1983).

a. **Technology-Based versus Water Quality-Based Effluent Limitations and Conditions**

Following regulations promulgated at 40 CFR Part 122.44 (1) (2) (ii), the permit limits are based on either technology-based effluent limits pursuant to 40 CFR Part 122.44 (a) or on State water quality standards and requirements pursuant to 40 CFR Part 122.44 (d), whichever are more stringent.

b. **Technology-Based Effluent Limitations and/or Conditions**

i. **General Comments**

The permit must at least comply with 40 CFR 133 (Secondary Treatment Regulation) when applicable.

Ammonia:

EPA has recently updated its national criteria for ammonia toxicity, which coincides with EPA Region 6 studies which indicate that discharge of ammonia in excess of 4 mg/l at the critical dilution increases potential of toxic effects instream. 40 CFR 122.44 (d) (1) (v) requires a WET limit where the permitting authority does not demonstrate in the fact sheet that chemical-specific limits are adequate to prevent an exceedance of a state narrative criterion for aquatic life protection. Although the ADEQ does not agree, EPA concluded that the discharge of ammonia in excess of 4 mg/l (Monthly Average) and 6 mg/l (Daily Maximum) at the instream waste concentration are likely to cause or contribute to instream toxicity. This permit has ammonia limits based on modeling for dissolved oxygen which are higher than the federal requirement. ADEQ has evaluated the ammonia data for the past five (5) years, and the highest Monthly Average reported is 2.8 mg/l, with an average Monthly Average reported of 0.5 mg/l. Therefore, ADEQ has concluded that there is not a reasonable potential to exceed the 4 mg/l Monthly Average requirement of EPA However; since permit limits are higher than EPA criteria of 4 mg/l , EPA has forced ADEQ to include (1) a WET limit with testing frequency of once/month OR (2) a monthly average Ammonia concentration limit of 4 mg/l and a 7-day average Ammonia concentration limit of 6 mg/l. Per telephone conversation between ADEQ and Permittee on October 25, 2004, permittee requested that the option number 2 (ammonia limits of 4 mg/l (monthly average) and 6 mg/l (daily Maximum)) to be included in the permit.

c. **State Water Quality Numerical Standards Based Limitations**

i. **Conventional and Non-Conventional Pollutants**

The water quality-based limits for CBOD5, TSS, and DO have been based on the current NPDES permit, and 40 CFR Part 122.44(l). The calculation of the loadings (lbs per day) uses a design flow of 3.0 MGD and the following equation (See below). These limitations are included in the updated Arkansas Water Quality Management Plan (AWQMP). Fecal coliform bacteria and pH are based on chapter 5, Sections 2.507 and 2.504 of Regulation No. 2 as

amended, respectively. The pH limitation has been changed from 6-9 s.u. to 6.0-9.0 s.u. to ensure reporting accuracy.

lbs/day = Concentration (mg/l) X Flow (MGD) X 8.34

d. **Toxics Pollutants-Priority Pollutant Scan (PPS)**

i. **General Comments**

Effluent limitations and/or conditions established in the permit are in compliance with the Arkansas Water Quality Standards and the applicable Water Quality Management Plan.

ii. **Post Third Round Policy and Strategy**

Section 101 of the Clean Water Act(CWA) states that "...it is the national policy that the discharge of toxic pollutants in toxic amounts be prohibited...". To insure that the CWA's prohibitions on toxic discharges are met, EPA has issued a "Policy for the Development of Water Quality-Based Permit Limitations by Toxic Pollutants"(49 FR 9016-9019,3/9/84). In support of the national policy, Region 6 adopted the "Policy for post Third Round NPDES Permitting" and the "Post Third Round NPDES Permit Implementation Strategy" on October 1, 1992. The Regional policy and strategy are designed to insure that no source will be allowed to discharge any wastewater which (1) results in instream aquatic toxicity; (2) causes a violation of an applicable narrative or numerical State water quality standard resulting in non-conformance with the provisions of 40 CFR Part 122.44(d); (3) results in the endangerment of a drinking water supply; or (4) results in aquatic bioaccumulation which threatens human health.

iii. **Implementation**

The State of Arkansas is currently implementing EPA's Post Third-Round Policy in conformance with the EPA Regional strategy. The 5-year NPDES permits contain technology-based effluent limitations reflecting the best controls available. Where these technology-based permit limits do not protect water quality or the designated uses, or where there are no applicable technology-based limits, additional water quality-based effluent limitations and/or conditions are included in the NPDES permits. State narrative and numerical water quality standards from the Regulation No. 2 are used in conjunction with EPA criteria and other available toxicity information to determine the adequacy of technology-based permit limits and the need for additional water quality-based controls.

iv. **Priority Pollutant Scan**

In accordance with the regional policy ADEQ has reviewed and evaluated the effluent in evaluating the potential toxicity of each analyzed pollutant:

(a) The results were evaluated and compared to EPA's Minimum Quantification Levels (MQLs) to determine the potential presence of a respective toxic pollutant. Those pollutants which are greater than or equal to the MQLs are determined to be reasonably present in the effluent and an evaluation of their potential toxicity is necessary.

(b) Those pollutants with one datum shown as "non-detect" (ND), providing the level of detection is equal to or lower than MQL are determined to be not potentially present in the effluent and eliminated from further evaluation.

(c) Those pollutants with a detectable value even if below the MQL are determined to be reasonably present in the effluent and an evaluation of their potential toxicity is necessary.

(d) For those pollutants with multiple data values and all values are determined to be non-detect, therefore no further evaluation is necessary. However, where data set includes some detectable concentrations and some values as ND, one-half of the detection level is used for those values below the level of detection to calculate the geometric mean of the data set.

The concentration of each pollutant after mixing with the receiving stream was compared to the applicable water quality standards as established in the Arkansas Water Quality Standards, Reg. No. 2 and with the aquatic toxicity, human health, and drinking water criteria obtained from the "Quality Criteria for Water, 1986 (Gold Book)". The following expression was used to calculate the pollutant instream waste concentration (IWC):

$$IWC = ((C_e \times Q_e) + (C_b \times Q_b))/(Q_e + Q_b)$$

where:

IWC = instream concentration of pollutant after mixing with receiving stream (μg/l)
C_e = pollutant concentration in effluent (μg/l)
Q_e = effluent flow of facility (cfs)
C_b = background concentration of pollutant in receiving stream (μg/l)
Q_b = background flow of receiving stream (cfs)

The following values were used in the IWC calculations:

C_e = varies with pollutant. A single value from the Priority Pollutant Screen (PPS) submitted by the permittee as part of the NPDES permit application or the geometric mean of a group of data points(less than 20 data points) is multiplied by a factor of 2.13. This factor is based on EPA's Region VI procedure (See attachment IV of Continuing Planning Process(CPP)) to extrapolate limited data sets to better evaluate the potential toxicity for higher effluent concentrations to

exceed water quality standards. This procedure employs a statistical approach which yields an estimate of a selected upper percentile value(the 95th percentile) of an effluent data set which would be expected to exceed 95% of effluent concentrations in a discharge. If 20 or more data points during the last two years are available, do not multiply by 2.13, but instead use the maximum reported values.

Q_e = 3.0 MGD = 4.64 cfs

C_b = 0 µg/l

Q_b = (See below):

(e) Aquatic Toxicity

Chronic Toxicity: Flow = 0 cfs, for comparison with chronic aquatic toxicity. This flow is **67** percent of the 7-day, 10-year low-flow (7Q10) for the receiving stream. The 7Q10 of 0 cfs is based on "Identification and Classification of Perennial Stream of Arkansas", Arkansas Geological Commission Map.

Acute Toxicity: Flow = 0 cfs, for comparison with acute aquatic toxicity. This flow is **33** percent of the 7Q10 for the receiving stream.

(f) Bioaccumulation

Flow = 0 cfs, for comparison with bioaccumulation criteria. This flow is the long term average (LTA) of the receiving stream which is based on the "Identification and Classification of Perennial Stream of Arkansas", Arkansas Geological Commission Map.

(g) Drinking Water

Flow = 0 cfs, for comparison with drinking water criteria. This flow is the 7Q10 for the receiving stream.

The following values were used to determine limits for the pollutants:

Hardness = 81 mg/l, based on attachment VI of CPP.

pH = 7.26 s.u., based on compliance data from "Arkansas Water Quality Inventory Report"305(b).

v. **Water Quality Standards for Metals and Cyanide**

Standards for Chromium (VI), Mercury, Selenium, and Cyanide are expressed as a function of the pollutant's water-effect ratio (WER), while standards for cadmium, chromium (III), copper, lead, nickel, silver, and zinc are expressed as a function of the pollutant's water-effect ratio, and as a function of hardness.

The **Water-effect ratio** (WER) is assigned a value of 1.0 unless scientifically defensible study clearly demonstrates that a value less than 1.0 is necessary or a value greater than 1.0 is sufficient to fully protect the designated uses of the receiving stream from the toxic effects of the pollutant.

The WER approach compares bioavailability and toxicity of a specific pollutant in receiving water and in laboratory test water. It involves running toxicity tests for at least two species, measuring LC50 for the pollutant using the local receiving water collected from the site where the criterion is being implemented, and laboratory toxicity testing water made comparable to the site water in terms of chemical hardness. The ratio between site water and lab water LC50 is used to adjust the national acute and chronic criteria to site specific values.

vi. **Conversion of Dissolved Metals Criteria for Aquatic Life to Total Recoverable Metal**

Metals criteria established in Regulation No. 2 for aquatic life protection are based on dissolved metals concentrations and hardness values (See Page 6 of **Attachment 1**). However, Federal Regulations cited at 40 CFR 122.45(c) require that effluent limitations for metals in NPDES permits be expressed as total recoverable (See Pages 1 and 6 of **Attachment 1**). Therefore a dissolved to the total recoverable metal conversion must be implemented. This involves determining a linear partition coefficient for the metal of concern and using this coefficient to determine the fraction of metal dissolved, so that the dissolved metal ambient criteria may be translated to a total effluent limit. The formula for converting dissolved metals to total recoverable metals for streams and lakes are provided in **Attachment 2** and Region 6 Implementation Guidance for Arkansas Water Quality Standards promulgated at 40 CFR 131.36.

vii. **Results of the comparison of the submitted information with the appropriate water quality standards and criteria**

The following pollutants were determined to be present in the effluent for each pollutant as reported by the permittee.

Pollutant	Concentration Reported, µg/l	MQL, µg/l
Copper, Total Recov.	8.36 = ((15X13X5X5)^1/4)	10
Zinc, Total Recov.	39	20

ADEQ has determined from the information submitted by the permittee that there is no reasonable potential for the discharge to cause an instream excursion above the acute and/or chronic numeric standards as specified in the Arkansas Water Quality Standards, Reg. No. 2 and/or criteria (Gold Book) (See **Attachment 1**.)

e. **Total Residual Chlorine (TRC) Requirements**

No measurable which is defined as <0.1 mg/l is continued from the previous permit.

f. **Final Limitations**

The following effluent limitations or "report" requirements were placed in the permit based on the more stringent of the technology-based, water quality-based or previous NPDES permit limitations:

Parameter	Water Quality-Based		Technology-Based/BPJ		Previous NPDES Permit		Final Permit	
	Monthly Avg. mg/l	7-day Avg. mg/l	Monthly Avg. mg/l	7-day Avg. mg/l	Monthly Avg. mg/l	7-day Avg. mg/l	Monthly Avg. mg/l	7-day Avg. mg/l
CBOD5	15	23	25	40	15	23	15	23
TSS	20	30	30	45	20	30	20	30
NH3-N								
(May-Oct)	7	11	4	6	7	11	4	6
(Nov-Apr)	10	15	4	6	10	15	4	6
DO (inst. Min)	5.0		N/A		5.0		5.0	
FCB (col/100ml)								
(Apr-Sept)	200	400	N/A	N/A	200	400	200	400
(Oct-Mar)	1000	2000	N/A	N/A	1000	2000	1000	2000
TRC (Inst. Max)	<0.1 mg/l		N/A		<0.1 mg/l		<0.1 mg/l	
pH	6.0-9.0 s.u.		6.0-9.0 s.u.		6-9 s.u.		6.0-9.0 s.u.	

g. **Biomonitoring**

A. Post Third Round Policy and Strategy

Section 101(a)(3) of the Clean Water Act states that ".....it is the national policy that the discharge of toxic pollutants in toxic amounts be prohibited....." To ensure that the CWA's prohibitions for toxics are met, EPA has issued a "Policy for the Development of Water Quality-Based Permit Limitations for Toxic Pollutants (49 FR 9016-9019, 3/9/84)." In support of the national policy, Region 6 adopted the "Policy for Post Third Round NPDES Permitting" and the "Post Third Round NPDES Permit Implementation Strategy" on October 1, 1992. In addition, ADEQ is required under 40 CFR Part 122.44(d)(1), adopted by reference in Regulation 6, to include conditions as necessary to achieve water quality standards as established under Section 303 of the Clean Water Act.

The Regional policy and strategy are designed to ensure that no source will be allowed to discharge any wastewater which (1) results in instream aquatic toxicity; (2) causes a violation of an applicable narrative or numerical State Water Quality Standard (WQS) resulting in non-conformance with the provisions of 40 CFR Part 122.44(d); (3) results in the endangerment of a drinking water supply; or (4) results in aquatic bioaccumulation which threatens human health.

Whole effluent toxicity (WET) testing has been establishing for assessing and protecting against impacts upon water quality and designated used caused by the aggregate toxic effect of the discharge of pollutants. The stipulated test species, which are appropriate to measure whole effluent toxicity, are consistent with the requirements of the State Water Quality Standards. The biomonitoring frequency has been established to reflect the likelihood of ambient toxicity and to provide data representative of the toxic potential of the facility's discharge, in accordance with the regulations promulgated at 40 CFR Part 122.48.

B. Implementation

Arkansas has established a narrative water quality standard under the authority of Section 303 of the CWA which states "toxic materials shall not be present in receiving waters in such quantities as to be toxic to human, animal, plant or aquatic life or to interfere with the normal propagation, growth and survival of aquatic biota."

Whole effluent toxicity testing conducted by the permittee has shown potential ambient toxicity to be the result of the permittee's discharge to receiving stream or water body, at the appropriate instream critical dilution. Pursuant to 40 CFR 122.44(d)(1)(v), ADEQ has determined from the permittee's self reporting that the discharge from this facility does have the reasonable potential to cause, or

contribute to an instream excursion above the narrative standard within the applicable State Water Quality Standards, in violation of Section 101(a)(3) of the Clean Water Act. Therefore, the draft permit must establish both monthly average and 7-day minimum effluent limitations for lethality following Regulations promulgated by 40 CFR 122.44(d)(1)(v). These effluent limitations for lethality (7-day NOEC) are continued from the previous permit.

Biomonitoring of the effluent is thereby required as a condition of this permit to assess potential toxicity. The biomonitoring procedures stipulated as a condition of this permit are as follows:

TOXICITY TESTS	**FREQUENCY**
Chronic Biomonitoring	Once/quarter

Since 7Q10 is less than 100 cfs (ft^3/sec) and dilution ratio is less than 100:1, chronic biomonitoring requirements will be included in the permit.

The calculations for dilution used for chronic biomonitoring are as follows:

Critical dilution (CD) = (Qd/(Qd + Qb)) X 100

Qd = Design flow = 3.0 MGD = 4.64 cfs
7Q10 = 0 Cfs
Qb = Background flow = (0.67) X 7Q10 = 0 cfs
CD = (4.64) / (4.64+ 0) X 100 = 100%

A minimum of five effluent dilutions in addition to an appropriate control (0%) are to be used in the toxicity tests. These additional effluent concentrations are 32%, 42%, 56%, 75%, and 100%. The low-flow effluent concentration (critical dilution) is defined as 100% effluent based on a 0 cfs 7Q10 flow of the receiving stream.

Results of all dilutions as well as the associated chemical monitoring of pH, temperature, hardness, dissolved oxygen conductivity, and alkalinity shall be reported according to EPA/600/4-89/001 and shall be submitted as an attachment to the Discharge Monitoring Report (DMR).

C. Administrative Records

See Attachment 5 of the Fact Sheet.

h. **Sample Type and Sampling Frequency**

Requirements for sample type and sampling frequency have been based on the current NPDES permit.

i. **Changes from the previously issued permit**

1. Parts II, III, and IV have been revised.
2. Facility mailing address has changed.
3. Facility location description has changed.
4. pH limitations have changed from 6-9 s.u. to 6.0-9.0 s.u.
5. WET testing requirements have changed.
6. Receiving stream description has been expanded.
7. Pretreatment requirements in Part III (influent/effluent monitoring) were revised.
8. Ammonia limits have been changed.
9. The permittee is now allowed to take the flow measurement prior to the disinfection unit. The need for this change was brought to ADEQ's attention during the comment period and referred to recent inspections performed by ADEQ personnel.

j. **Storm Water Pollution Prevention Plan Requirements**

Storm water pollution prevention plan requirements are included based on Storm water General Permit ARR000000 which requires SWPPP for POTW's with discharges greater than 1.0 MGD. However; in lieu of storm water pollution prevention plan requirements the permittee may submit "No exposure certification for exclusion from NPDES Storm water " to the Department during the public comment period and storm water pollution prevention plan requirements will be deleted in the final permit.

12. SCHEDULE OF COMPLIANCE.

Compliance with final effluent limitations is required by the following schedule:

13. OPERATION AND MONITORING.

The applicant is at all times required to properly operate and maintain the treatment facility; to monitor the discharge on a regular basis; and report the results monthly. The monitoring results will be available to the public.

14. SOURCES.

The following sources were used to draft the permit:

a. NPDES application No. AR0037907 received 02/27/2004.
b. Arkansas Water Quality Management Plan(WQMP).

c. Regulation No. 2.
d. Regulation No. 6.
e. 40 CFRs 122, 125, 133 and 403.
f. NPDES permit file AR00 37907.
g. Discharge Monitoring Reports (DMRs).
h. "Arkansas Water Quality Inventory Report 2000 (305B)", ADEQ.
i. "Identification and Classification of Perennial Streams of Arkansas", Arkansas Geological Commission.
j. Continuing Planning Process (CPP).
k. Technical Support Document For Water Quality-based Toxic Control.
l. Region 6 Implementation Guidance for Arkansas Water Quality Standards promulgated at 40 CFR 131.36.
m. EPA letter dated September 10, 2004
n. Letter dated October 25, 2004.
o. Telephone conversation between ADEQ (Mo Shafii) and permittee (Myra Taylor) dated October 25, 2004.

15. NPDES POINT OF CONTACT.

For additional information, contact:

Alison House
NPDES Branch, Water Division
Arkansas Department of Environmental Quality
8001 National Drive
Post Office Box 8913
Little Rock, Arkansas 72219-8913
Telephone: (501) 682-0622

Attachment 1

Attachment 2

Linear Partition Coefficients for Priority Metals in Streams and Lakes*

METAL	STREAMS		LAKES	
	Kpo	a	Kpo	a
Arsenic	0.48×10^6	-0.73	0.48×10^6	-0.73
Cadmium	4.00×10^6	-1.13	3.52×10^6	-0.92
Chromium**	3.36×10^6	-0.93	2.17×10^6	-0.27
Copper	1.04×10^6	-0.74	2.85×10^6	-0.9
Lead***	2.80×10^6	-0.8	2.04×10^6	-0.53
Mercury	2.90×10^6	-1.14	1.97×10^6	-1.17
Nickel	0.49×10^6	-0.57	2.21×10^6	-0.76
Silver****	2.40×10^6	-1.03	2.40×10^6	-1.03
Zinc	1.25×10^6	-0.7	3.34×10^6	-0.68

$Kp = Kpo \times TSS^a$

Kp = Linear Partition Coefficient
TSS = Total Suspended Solids (mg/l)-(See **Attachment 3**)
Kpo = found from table
a = found from table

$C/Ct = 1/(1+ (Kp \times TSS \times 10^{-6}))$ C/Ct = Fraction of Metal Dissolved

* Delos, C. G., W. L. Richardson, J. V. DePinto, R. B., Ambrose, P. W. Rogers, K. Rygwelski, J. P. St. John, W. J. Shaughnessey, T. A. Faha, W. N. Christie. Technical Guidance for Performing Waste Load Allocations, Book II: Streams and Rivers. Chapter 3:Toxic Substances, for the U. S. Environmental Protection Agency.(EPA-440/4-84-022).

** Linear partition coefficient shall not apply to the Chromium VI numerical criterion. The approved analytical method for Chromium VI measures only the dissolved form. Therefore permit limits for Chromium VI shall be expressed in the dissolved form. See 40 CFR 122.45(c)(3).

*** Reference page 18 of EPA memo dated March 3, 1992, from Margaret J. Stasikowski(WH-586) to Water management Division Directors, Region I-IX.

**** Texas Environmental Advisory Council, 1994

Attachment 3

TOTAL SUSPENDED SOLIDS(15th PERCENTILE) BY RECEIVING STREAM AND ECOREGION

For direct discharges to the Arkansas, Red, Ouachita, White, and St. Francis Rivers use the following mean values:

TSS(15th percentile)		
Receiving Stream	TSS	Unit
Arkansas River:		
Ft. Smith to Dardanelle Dam	12.0	mg/l
Dardanelle Dam to Terry L&D	10.5	mg/l
Terry L&D to L&D #5	8.3	mg/l
L&D #5 to Mouth	9.0	mg/l
Red River	33	mg/l
Ouachita River:		
above Caddo River	2.0	mg/l
below Caddo River	5.5	mg/l
White River:		
above Beaver Lake	2.5	mg/l
Bull Shoals to Black River	3.3	mg/l
Black River to Mouth	18.5	mg/l
St. Francis River	18	mg/l

For all other discharges use the following ecoregion TSS:

TSS (15th percentile)		
Ecoregion	TSS	Unit
Ouachita	2	mg/l
Gulf Coastal	5.5	mg/l
Delta	8	mg/l
Ozark Highlands	2.5	mg/l
Boston Mountains	1.3	mg/l
Arkansas River Valley	3	mg/l

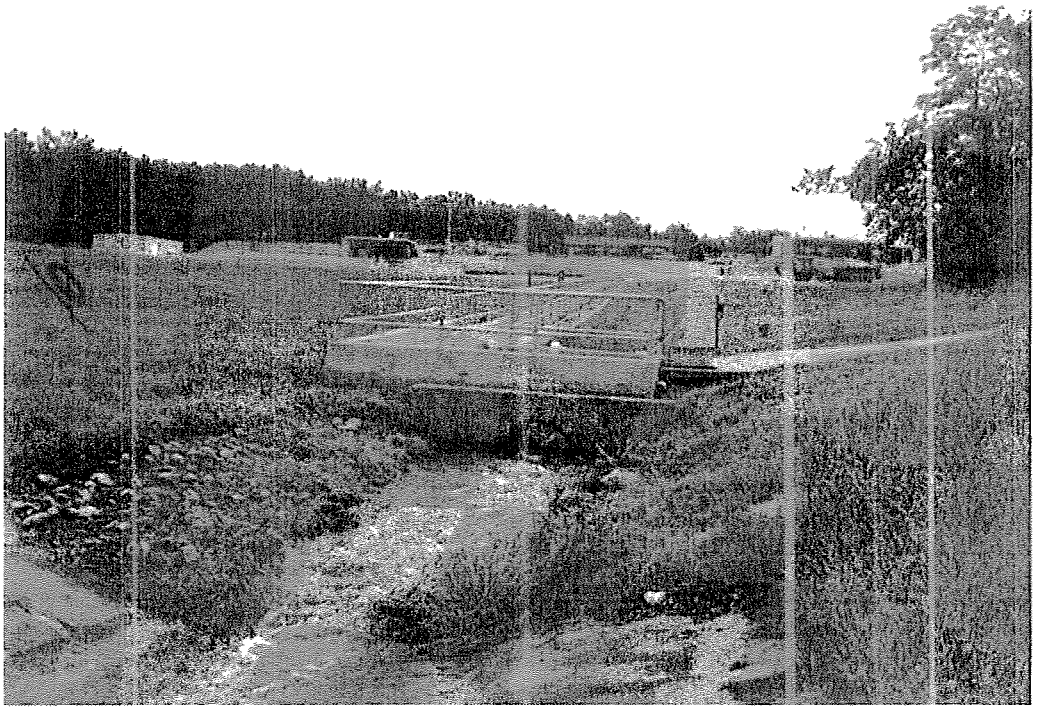
Attachment 4

Calculations/biomonitoring

Pretreatment Attachments

(get package from Cabinet if necessary)

APPENDIX



Outfall 001

UT-0

BC-0

BDV - 1

APPENDIX C

[illegible]

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME Bayou de View	LOCATION NS 226 bridge	
STATION # BDV-1 RIVERMILE _____	STREAM CLASS	
MAP DATUM:_____ Zone:_____	RIVER BASIN	
UTM: Easting _____ Northing _____	AGENCY	
INVESTIGATORS DMR, PSD, STR		
FORM COMPLETED BY DMR	DATE 16 Sept 08 TIME 1100 (AM) PM	REASON FOR SURVEY

WEATHER CONDITIONS

Now		Past 24 Hours
☐	storm (heavy rain)	☐
☐	rain (steady rain)	☐
☐	showers (intermittent)	☐
____% ☐	%cloud cover	☐ ____%
☒	clear/sunny	☐

Has there been a heavy rain in the last 7 days? ☐ Yes ☒ No

Air Temperature ____ °C

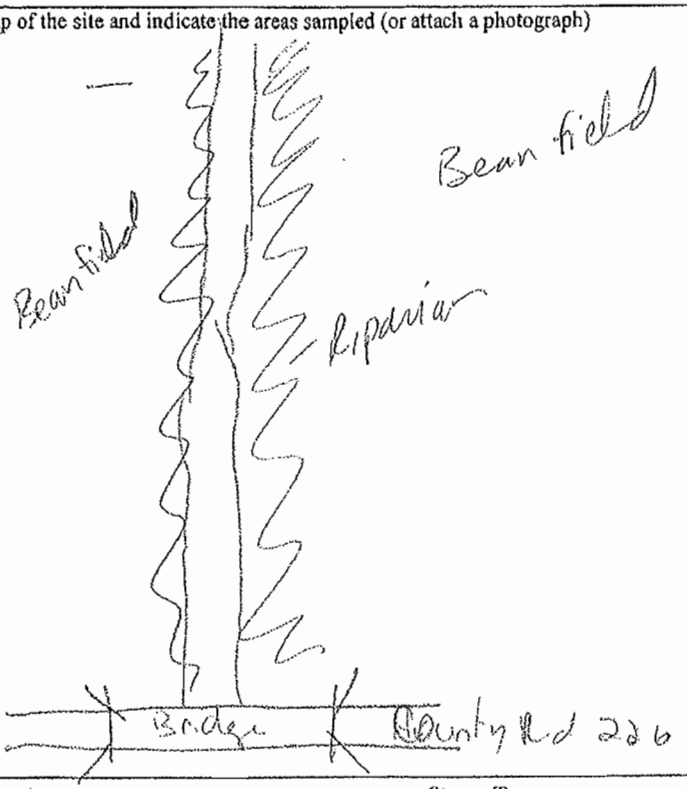
Other_____

SITE LOCATION/MAP

Flow:

Tape Reading from LB/RB	Depth (ft)	Section Length (ft)	Velocity (ft/s)

Draw a map of the site and indicate the areas sampled (or attach a photograph)



STREAM CHARACTERIZATION

Stream Subsystem
☒ Perennial ☐ Intermittent ☐ Tidal

Stream Type
☐ Coldwater ☒ Warmwater

Stream Origin
☐ Glacial ☐ Spring-fed
☒ Non-glacial montane ☐ Mixture of origins
☐ Swamp and bog ☐ Other_____

Catchment Area_____km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES	**Predominant Surrounding Landuse** ☐ Forest ☐ Commercial ☐ Field/Pasture ☐ Industrial ☒ Agricultural ☐ Other _____ ☐ Residential **Local Watershed** ☐ No evidence ☒ Some potential sources ☐ Obvious sources **Local Watershed Erosion** ☐ None ☒ Moderate ☐ Heavy
RIPARIAN VEGETATION (18 meter buffer)	**Indicate the dominant type and record the dominant species present** ☒ Trees ☒ Shrubs ☐ Grasses ☐ Herbaceous dominant species present Acer Saccarinum, Morus alba
INSTREAM FEATURES	**Estimated Reach Length** 240 m **Estimated Stream Width** 6-7 m **Sampling Reach Area** ____ m² **Area in km² (m²x1000)** ____ km² **Estimated Stream Depth** 1 m **Surface Velocity (at thalweg)** ____ m/sec **Canopy Cover** ☐ Partly open ☒ Partly shaded ☐ Shaded **High Water Mark** 3 m **Proportion of Reach Represented by Stream Morphology Types** ☐ Riffle ____ % ☐ Run ____ % ☒ Pool 100 % **Channelized** ☒ Yes ☐ No **Dam Present** ☐ Yes ☒ No
LARGE WOODY DEBRIS	**LWD** < 5 m² **Density of LWD** _____ m²/km² (LWD/reach area)
AQUATIC VEGETATION	**Indicate the dominant type and record the dominant species present** ☐ Rooted emergent ☐ Rooted submergent ☐ Rooted Floating ☐ Free floating ☐ Floating Algae ☐ Attached Algae Dominant species present None Portion of the reach with aquatic vegetation 0 %
WATER QUALITY	**Temperature** 20.2 °C **Specific Conductance** 326.7 uS/cm **Dissolved Oxygen** 6.0 mg/l **pH** 6.80 **Turbidity** _____ **WQ Instrument Used** Minisonde **Water Odors** ☒ Normal/None ☐ Sewage ☐ Petroleum ☐ Chemical ☐ Fishy ☐ Other Methane **Water Surface Oils** ☐ Slick ☐ Sheen ☐ Globs ☐ Flecks ☒ None ☐ Other _____ **Turbidity (if not measured)** ☐ Clear ☒ Slightly turbid ☐ Turbid ☐ Opaque ☐ Stained ☐ Other
SEDIMENT/ SUBSTRATE	**Odors** ☐ Normal ☐ Sewage ☐ Petroleum ☐ Chemical ☐ Anaerobic ☒ None ☐ Other _____ **Oils** ☒ Absent ☐ Slight ☐ Moderate ☐ Profuse **Deposits** ☐ Sludge ☐ Sawdust ☐ Paper fiber ☐ Sand ☐ Relict shells ☐ Other _____ **Looking at stones which are not deeply embedded, are the undersides black in color?** ☐ Yes ☐ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock			Detritus	Sticks, wood, coarse plant materials (CPOM)	< 5 %
Boulder	> 256 mm (10")				
Cobble	64-256 mm (2.5" – 10")		Muck-Mud	Black, very fine organic (FPOM)	40 %
Gravel	2-64 mm (0.1" – 2.5")				
Sand	0.06 – 2mm (gritty)		Marl	Grey, shell fragments	
Silt	0.004-0.06 mm	30			
Clay	<0.004 mm (slick)	70			

HABITAT ASSESSMENT FIELD DATA SHEET – LOW GRADIENT STREAMS (FRONT)

STREAM NAME Bayou DeView	LOCATION @ County Rd 226 Bridge (NJ Bldg)	
STATION # RVD-1 RIVERMILE	STREAM CLASS	
LAT LONG	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS DMR, JJR, PSD,		
FORM COMPLETED BY DMR	DATE 16-Aug-05 TIME 1100 (AM) PM	REASON FOR SURVEY UAA

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient)	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale)	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking
SCORE 11	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation
SCORE 9	20 19 18 17 16	15 14 13 12 11	10 (9) 8 7 6	5 4 3 2 1
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent
SCORE 11	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 15	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-27% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 13	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1

HABITAT ASSESSMENT FIELD DATA SHEET – LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 10	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE 4	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 (4) 3 2 1
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 6 (LB)	Left Bank 10 9	8 7 (6)	5 4 3	2 1 0
SCORE 6 (RB)	Right Bank 10 9	8 7 (6)	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed or grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of stream bank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 2 (LB)	Left Bank 10 9	8 7 6	5 4 3	(2) 1 0
SCORE 2 (RB)	Right Bank 10 9	8 7 6	5 4 3	(2) 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE 5 (LB)	Left Bank 10 9	8 7 6	(5) 4 3	2 1 0
SCORE 8 (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0

Total Score _____

FISH SAMPLING FIELD DATA SHEET (FRONT)

page ___ of ___

STREAM NAME Big Creek	LOCATION BDV-1 Hwy CR 226
STATION # BDV-1 RIVERMILE ___	STREAM CLASS
LAT ___ LONG ___	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS RDD/BMR/DJR/RD	
FORM COMPLETED BY RDD/RD	DATE 9/18 TIME 1100 AM PM · REASON FOR SURVEY

SAMPLE COLLECTION	How were the fish captured? ☒ back pack ☐ tote barge ☐ other ___ Block nets used? ☒ Yes ☐ No Sampling Duration Start Time ___ End Time ___ Duration ___ Stream width (in meters) Max ___ Mean ___
HABITAT TYPES	Indicate the percentage of each habitat type present ☐ Riffles 0 % ☐ Pools 100 % ☐ Runs 0 ☐ Snags / % ☐ Submerged Macrophytes 0 % ☐ Other ( ) ___ %
GENERAL COMMENTS	

PASS 2

SPECIES	TOTAL (COUNT)	OPTIONAL: LENGTH (mm)/WEIGHT (g) (25 SPECIMENT MAX SUBSAMPLE)					ANOMALIES D	E	F	L	M	S	T	Z
Fundulus Not		0.9/50												
GSF	25+16	1.0/40	1.1/42	1.3/42	2.0/47	0.3/34								
		2.5/52	0.8/38	3.5/61	0.3/37	0.8/38								
		0.7/37	0.4/30	2.6/57	0.8/36	0.3/38								
		0.4/39	1.3/42	1.6/46	0.9/35	2.6/54								
		0.4/39	1.7/48	1.6/43	0.2/27	0.2/25								
G. Affinis	4+11	no weight/22	0.1/25	0.2/29	0.1/27									

Rapid Bioassessment Protocols For Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish, Second Edition – Form 1

SPECIES	TOTAL (COUNT)	OPTIONAL: LENGTH (mm)/WEIGHT (g) (25 SPECIMENT MAX SUBSAMPLE)					ANOMALIES							
							D	E	F	L	M	S	T	Z

ANOMALY CODES: D=deformities; E=eroded fins; F=fungus; L=lesions; M=multiple DELT anomalies; S=emaciated; Z=other

FISH SAMPLING FIELD DATA SHEET (FRONT)

STREAM NAME BIG CREEK	LOCATION BDV-1 CP 206
STATION # BDV-1 RIVERMILE ___	STREAM CLASS
LAT ___ LONG ___	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS PJD/DME/JJR/RD	
FORM COMPLETED BY PJD/RD	DATE 9/16 TIME 1500 (AM/PM)
REASON FOR SURVEY	

SAMPLE COLLECTION	How were the fish captured? ☒ back pack ☐ tote barge ☐ other ___ Block nets used? ☒ Yes ☐ No Sampling Duration Start Time ___ End Time ___ Duration ___ Stream width (in meters) Max ___ Mean ___
HABITAT TYPES	Indicate the percentage of each habitat type present ☐ Riffles 0 % ☐ Pools 100% ☐ Runs 0 ☐ Snags 1 % ☐ Submerged Macrophytes 0 % ☐ Other ( ) ___ %
GENERAL COMMENTS	

PASS 2

SPECIES	TOTAL (COUNT)	OPTIONAL: LENGTH (mm)/WEIGHT (g) (25 SPECIMENT MAX SUBSAMPLE)					ANOMALIES							
							D	E	F	L	M	S	T	Z
GSF	5+07	1.3/43	2.3/52	0.15/34	1.1/42	0.3/32								
BGSF		6.6/71	21.0/111											
P NOT		1.3/53	1.3/52	0.09/49										
FUND NOT		0.9/50	0.9/49											

BDV-1 PASS 2

SPECIES	TOTAL (COUNT)	OPTIONAL: LENGTH (mm)/WEIGHT (g) (25 SPECIMENT MAX SUBSAMPLE)					ANOMALIES							
							D	E	F	L	M	S	T	Z
G. AGNIS	3 +/14	0.4/34	0.6/36	0.3/31										

ANOMALY CODES: D=deformities; E=eroded fins; F=fungus; L=lesions; M=multiple DELT anomalies; S=emaciated; Z=other

FISH SAMPLING FIELD DATA SHEET (FRONT)

page ___ of ___

STREAM NAME Big Creek	LOCATION	
STATION # BVD-2 RIVERMILE ___	STREAM CLASS	
LAT ___ LONG ___	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS		
FORM COMPLETED BY DSP	DATE 9/16/08 TIME 1500 AM PM	REASON FOR SURVEY

SAMPLE COLLECTION	**How were the fish captured?** ☒ back pack ☐ tote barge ☐ other ___ **Block nets used?** ☒ Yes ☐ No **Sampling Duration** Start Time ___ End Time ___ Duration ___ **Stream width (in meters)** Max ___ Mean ___
HABITAT TYPES	**Indicate the percentage of each habitat type present** ☐ Riffles ___% ☐ Pools ___% ☐ Runs ___ ☐ Snags ___% ☐ Submerged Macrophytes ___% ☐ Other ( ) ___%
GENERAL COMMENTS	

Pool 2

SPECIES	TOTAL (COUNT)	OPTIONAL: LENGTH (mm)/WEIGHT (g) (25 SPECIMENT MAX SUBSAMPLE)					ANOMALIES							
							D	E	F	L	M	S	T	Z
BGSF	9+	1.2/41	0.8/41	Count										
		0.9/39	0.5/39	82										
		1.0/42	0.9/38	17+8=(25)										
		0.8/40	1.0/48											
		0.9/29	/											
G. flame		0.1/32												
		1.3/49												
		/58												
GSF		1.8/49	43/1											
		0.9/38												
		17.4/102												
		10.3/85												
		21/25												
Unid SF		1												

Pass 2 BDV-2

SPECIES	TOTAL (COUNT)	OPTIONAL: LENGTH (mm)/WEIGHT (g) (25 SPECIMENT MAX SUBSAMPLE)					ANOMALIES D	E	F	L	M	S	T	Z
Ent		[illegible]												
		[illegible]												
LESF														

ANOMALY CODES: D=deformities; E=eroded fins; F=fungus; L=lesions; M=multiple DELT anomalies; S=emaciated; Z=other

FISH SAMPLING FIELD DATA SHEET (FRONT)

STREAM NAME BYD-2 BIG CREEK	LOCATION
STATION #_____ RIVERMILE _____	STREAM CLASS
LAT _____ LONG _____	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS PJD/RD/DMR/JR	
FORM COMPLETED BY RD/PD	DATE 9/16/08 TIME 1300 AM (PM) — REASON FOR SURVEY

SAMPLE COLLECTION	**How were the fish captured?** ☒ back pack ☐ tote barge ☐ other _____ **Block nets used?** ☒ Yes ☐ No **Sampling Duration** Start Time _____ End Time _____ Duration _____ **Stream width (in meters)** Max _____ Mean _____
HABITAT TYPES	**Indicate the percentage of each habitat type present** ☐ Riffles _____% ☐ Pools _____% ☐ Runs _____ ☐ Snags _____% ☐ Submerged Macrophytes _____% ☐ Other ( ) _____%
GENERAL COMMENTS	

SPECIES	TOTAL (COUNT)	OPTIONAL: LENGTH (mm)/WEIGHT (g) (25 SPECIMENT MAX SUBSAMPLE)					ANOMALIES D	E	F	L	M	S	T	Z
N. MACULATUS	45	1.4/58	1.1/50	1.3/55	3.1/64	1.1/54								
		1.8/60	1.1/54	0.6/43	2.0/64	0.8/47								
		0.9/50	1.0/50											
BGSF	22	1.3/45	0.9/39	0.9/42	1.7/48	1.1/40								
		0.6/35	0.4/30	0.5/34	1.0/43	0.5/31								
		1.5/48	0.5/36	1.1/43	0.6/39	0.9/42								
		1.1/46	1.1/43	0.9/40	0.9/50	0.7/36								
		1.5/44	1.0/40											
GSF		11.0/88												
P.F. NOT		0.9/50												

PASS 2

PASS 1

SPECIES	TOTAL (COUNT)	OPTIONAL: LENGTH (mm)/WEIGHT (g) (25 SPECIMENT MAX SUBSAMPLE)					ANOMALIES							
							D	E	F	L	M	S	T	Z
LMB		3.6/51												
G. AFFINIS		0.7/42												

ANOMALY CODES: D=deformities; E=eroded fins; F=fungus; L=lesions; M=multiple DELT anomalies; S=emaciated; Z=other

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME Big G.	LOCATION BVD-2	
STATION # 0 RIVERMILE	STREAM CLASS	
MAP DATUM: Zone:	RIVER BASIN	
UTM: Easting Northing	AGENCY	
INVESTIGATORS VOV/DHR/JJR/RD		
FORM COMPLETED BY POD	DATE 9/16/08 TIME 1355 AM PM	REASON FOR SURVEY VAA

WEATHER CONDITIONS

Wind - SW @ 5-10 mph
70-80% cloud
air temp - 75 °F

Now		Past 24 Hours
☐	storm (heavy rain)	☐
☐	rain (steady rain)	☐
☐	showers (intermittent)	☐
75 % ☐	%cloud cover	☐ 75 %
☐	clear/sunny	☐

Has there been a heavy rain in the last 7 days? ☐ Yes ☒ No

Air Temperature ____ °C

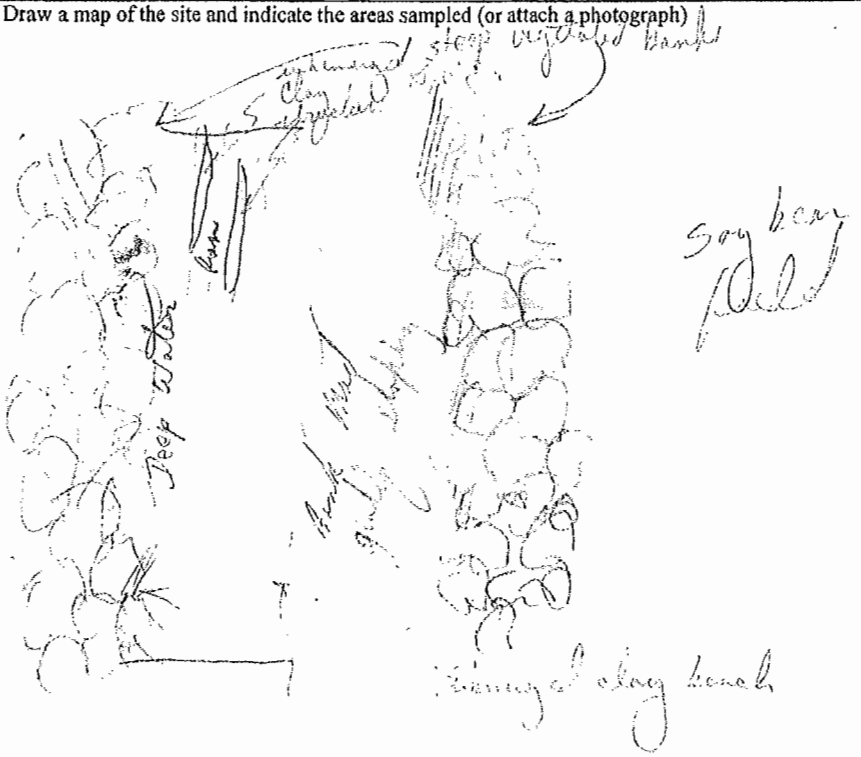
Other_____

SITE LOCATION/MAP

Flow:

Tape Reading from LB/RB	Depth (ft)	Section Length (ft)	Velocity (ft/s)

Draw a map of the site and indicate the areas sampled (or attach a photograph)



STREAM CHARACTERIZATION

Stream Subsystem
☒ Perennial ☐ Intermittent ☐ Tidal

Stream Type
☐ Coldwater ☐ Warmwater

Stream Origin
☐ Glacial ☐ Spring-fed
☐ Non-glacial montane ☒ Mixture of origins
☐ Swamp and bog ☐ Other_____

Catchment Area_____km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES

Predominant Surrounding Landuse
☐ Forest ☒ Commercial
☐ Field/Pasture ☒ Industrial
☒ Agricultural ☐ Other _____
☐ Residential

Local Watershed
☐ No evidence ☒ Some potential sources
☐ Obvious sources

Local Watershed Erosion
☐ None ☒ Moderate ☐ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
☒ Trees ☐ Shrubs ☐ Grasses ☐ Herbaceous
dominant species present Elm, Sycamore

INSTREAM FEATURES

Estimated Reach Length 150 m
Estimated Stream Width 20 m
Sampling Reach Area ____ m²
Area in km² (m²x1000) ____ km²
Estimated Stream Depth ____ m
Surface Velocity (at thalweg) LOL m/sec

Canopy Cover
☐ Partly open ☒ Partly shaded ☐ Shaded

High Water Mark Not Measured m

Proportion of Reach Represented by Stream Morphology Types
☐ Riffle ____ % ☐ Run 2 %
☐ Pool 98 %

Channelized ☒ Yes ☐ No

Dam Present ☐ Yes ☒ No

LARGE WOODY DEBRIS

LWD 2 m²
Density of LWD ____ m²/km² (LWD/reach area)

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☐ Rooted emergent ☐ Rooted submergent ☐ Rooted Floating ☐ Free floating
☐ Floating Algae ☒ Attached Algae

Dominant species present _____

Portion of the reach with aquatic vegetation 10 %

WATER QUALITY

Temperature ____ °C
Specific Conductance ____
Dissolved Oxygen ____
pH ____
Turbidity ____
WQ Instrument Used ____

See published

Water Odors
☒ Normal/None ☐ Sewage
☐ Petroleum ☐ Chemical
☐ Fishy ☐ Other ____

Water Surface Oils
☐ Slick ☐ Sheen ☐ Globs ☐ Flecks
☒ None ☐ Other ____

Turbidity (if not measured)
☐ Clear ☒ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other ____

SEDIMENT/ SUBSTRATE

Odors
☒ Normal ☐ Sewage ☐ Petroleum
☐ Chemical ☐ Anaerobic ☐ None
☐ Other ____

Oils
☒ Absent ☐ Slight ☐ Moderate ☐ Profuse

Deposits
☐ Sludge ☐ Sawdust ☐ Paper fiber ☐ Sand
☐ Relict shells ☐ Other ____

Looking at stones which are not deeply embedded, are the undersides black in color?
☐ Yes ☐ No No stones

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock			Detritus	Sticks, wood, coarse plant materials (CPOM)	
Boulder	> 256 mm (10")				
Cobble	64-256 mm (2.5" – 10")		Muck-Mud	Black, very fine organic (FPOM)	
Gravel	2-64 mm (0.1" – 2.5")				
Sand	0.06 – 2mm (gritty)		Marl	Grey, shell fragments	
Silt	0.004-0.06 mm	10			
Clay	<0.004 mm (slick)	90			

HABITAT ASSESSMENT FIELD DATA SHEET – LOW GRADIENT STREAMS (FRONT)

STREAM NAME Big U. Wilk	LOCATION	
STATION # BDW42 RIVERMILE	STREAM CLASS	
LAT LONG	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS DOD/SMK/JWK/ED		
FORM COMPLETED BY DOD	DATE 9/16/08 TIME 14:10 AM PM	REASON FOR SURVEY UAA

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient)	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale)	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking
SCORE	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-27% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1

HABITAT ASSESSMENT FIELD DATA SHEET – LOW GRADIENT STREAMS (BACK)

BVD-2 9/16/08

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 (1)
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE_____(LB)	Left Bank 10 9	(8) (7) 6	5 4 3	2 1 0
SCORE_____(RB)	Right Bank 10 9	8 (7) (6)	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed or grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of stream bank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE_____(LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE_____(RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE_____(LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE_____(RB)	Right Bank 10 9	8 7 (6)	5 4 3	2 1 0

Total Score _____

HABITAT ASSESSMENT FIELD DATA SHEET – LOW GRADIENT STREAMS (FRONT)

STREAM NAME Un named Trib		LOCATION CWB effluent ditch	
STATION # UT-B	RIVERMILE	STREAM CLASS	
LAT	LONG	RIVER BASIN	
STORET #		AGENCY	
INVESTIGATORS POD/JJR/RP			
FORM COMPLETED BY POD		DATE 9/17/08 TIME 1100 AM PM	REASON FOR SURVEY UAA

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient)	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale)	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking
SCORE	20 19 18 17 16	15 14 (13) 12 11	~~10~~ 9 8 7 6	5 4 3 2 1
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent
SCORE	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	~~20~~ 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-27% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1

HABITAT ASSESSMENT FIELD DATA SHEET – LOW GRADIENT STREAMS (BACK)

OUT0 9/17/08

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE_____(LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE_____(RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed or grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of stream bank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE_____(LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE_____(RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE_____(LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE_____(RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score _____

FISH SAMPLING FIELD DATA SHEET (FRONT)

page ___ of ___

STREAM NAME Unnamed Trib	LOCATION CWA effluent ditch
STATION # UT 8 RIVERMILE ___	STREAM CLASS
LAT ___ LONG ___	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS	
FORM COMPLETED BY PCD/KD	DATE 9/17/08 TIME 1145 AM PM
REASON FOR SURVEY	

SAMPLE COLLECTION	How were the fish captured? ☐ back pack ☐ tote barge ☐ other ___ Block nets used? ☐ Yes ☐ No Sampling Duration Start Time ___ End Time ___ Duration ___ Stream width (in meters) Max ___ Mean ___
HABITAT TYPES	Indicate the percentage of each habitat type present ☐ Riffles ___% ☐ Pools ___% ☐ Runs ___ ☐ Snags ___% ☐ Submerged Macrophytes ___% ☐ Other ( ) ___%
GENERAL COMMENTS	Raw 2

SPECIES	TOTAL (COUNT)	OPTIONAL: LENGTH (mm)/WEIGHT (g) (25 SPECIMENT MAX SUBSAMPLE)					ANOMALIES							
							D	E	F	L	M	S	T	Z
G. affinis														
62+12+13		1.4/54												
GSF		41.9/189	33.3/134	9.4/60										
Golden shiner		141/125												
LESF		33.9/105	9.8/16											

Rapid Bioassessment Protocols For Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish, Second Edition – Form 1

UTØ Pass 2

SPECIES	TOTAL (COUNT)	OPTIONAL: LENGTH (mm)/WEIGHT (g) (25 SPECIMENT MAX SUBSAMPLE)					ANOMALIES							
							D	E	F	L	M	S	T	Z
STRIPED SHINER		94/48												
Y. BULLHEAD		176/120												

ANOMALY CODES: D=deformities; E=eroded fins; F=fungus; L=lesions; M=multiple DELT anomalies; S=emaciated; Z=other

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME Unnamed Trib	LOCATION CW2 effluent ditch		
STATION # UT-0 RIVERMILE	STREAM CLASS		
MAP DATUM: Zone:	RIVER BASIN		
UTM: Easting Northing	AGENCY		
INVESTIGATORS			
FORM COMPLETED BY PDD	DATE 9/17/08 TIME 1148 AM PM	REASON FOR SURVEY UAA	

WEATHER CONDITIONS

Now		Past 24 Hours
☐	storm (heavy rain)	☐
☐	rain (steady rain)	☐
☐	showers (intermittent)	☐
0 % ☐	%cloud cover	☐ 70 %
☒	clear/sunny	☐

Has there been a heavy rain in the last 7 days? ☐ Yes ☒ No

Air Temperature 20 °C

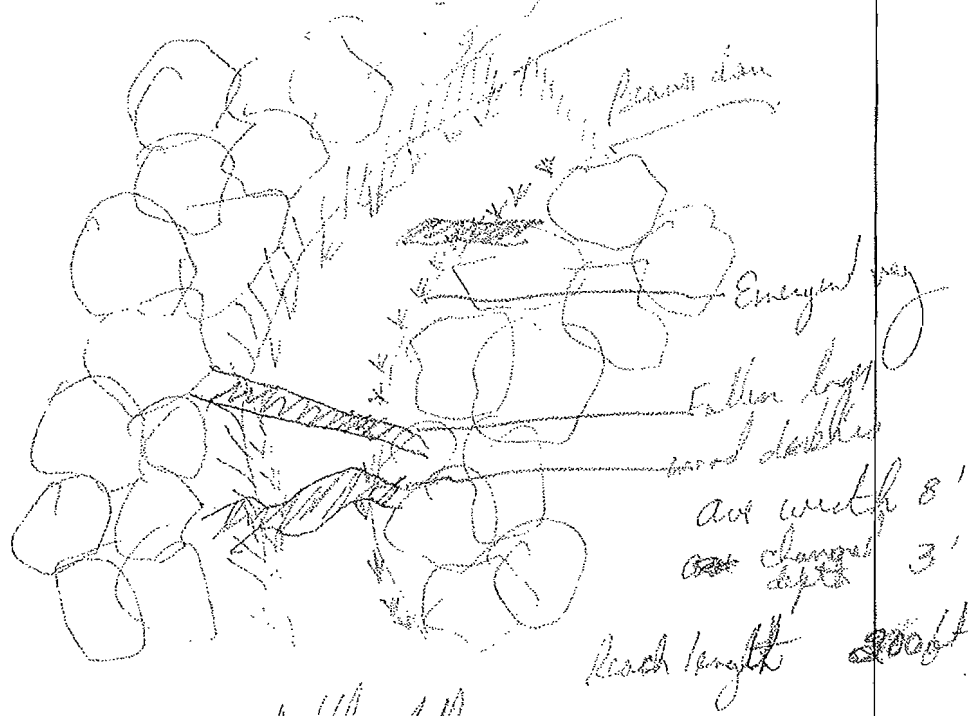
Other

SITE LOCATION/MAP

Flow:

Tape Reading from LB/RB	Depth (ft)	Section Length (ft)	Velocity (ft/s)

Draw a map of the site and indicate the areas sampled (or attach a photograph)



STREAM CHARACTERIZATION

Stream Subsystem
☐ Perennial ☒ Intermittent ☐ Tidal

Stream Type
☐ Coldwater ☒ Warmwater

Stream Origin
☐ Glacial ☐ Spring-fed
☐ Non-glacial montane ☒ Mixture of origins
☐ Swamp and bog ☐ Other

Catchment Area km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES	**Predominant Surrounding Landuse** ☒ Forest ☐ Commercial ☐ Field/Pasture ☒ Industrial ☒ Agricultural ☐ Other ______ ☐ Residential	**Local Watershed** ☐ No evidence ☒ Some potential sources ☐ Obvious sources **Local Watershed Erosion** ☐ None ☒ Moderate ☐ Heavy
RIPARIAN VEGETATION (18 meter buffer)	**Indicate the dominant type and record the dominant species present** ☒ Trees ☒ Shrubs ☐ Grasses ☐ Herbaceous dominant species present Oak, Gum	
INSTREAM FEATURES	**Estimated Reach Length** ____m **Estimated Stream Width** ____m **Sampling Reach Area** ____m^2 **Area in km^2 (m^2x1000)** ____km^2 **Estimated Stream Depth** ____m **Surface Velocity (at thalweg)** ____m/sec	**Canopy Cover** ☐ Partly open ☐ Partly shaded ☐ Shaded **High Water Mark** ____m **Proportion of Reach Represented by Stream Morphology Types** ☐ Riffle ____% ☐ Run ____% ☐ Pool ____% **Channelized** ☐ Yes ☐ No **Dam Present** ☐ Yes ☐ No
LARGE WOODY DEBRIS	**LWD** ______m^2 **Density of LWD** ______m^2/km^2 (LWD/reach area)	
AQUATIC VEGETATION	**Indicate the dominant type and record the dominant species present** ☒ Rooted emergent ☐ Rooted submergent ☐ Rooted Floating ☐ Free floating ☐ Floating Algae ☐ Attached Algae Dominant species present water willow Portion of the reach with aquatic vegetation 90 %	
WATER QUALITY	**Temperature** ____°C **Specific Conductance** ______ **Dissolved Oxygen** ______ **pH** ______ **Turbidity** ______ **WQ Instrument Used** ______ *See field notebook*	**Water Odors** ☒ Normal/None ☐ Sewage ☐ Petroleum ☐ Chemical ☐ Fishy ☐ Other ______ **Water Surface Oils** ☐ Slick ☐ Sheen ☐ Globs ☐ Flecks ☒ None ☐ Other ______ **Turbidity (if not measured)** ☐ Clear ☐ Slightly turbid ☐ Turbid ☐ Opaque ☒ Stained ☐ Other ______
SEDIMENT/ SUBSTRATE	**Odors** ☒ Normal ☐ Sewage ☐ Petroleum ☐ Chemical ☒ Anaerobic ☐ None ☐ Other ______ **Oils** ☐ Absent ☐ Slight ☐ Moderate ☐ Profuse	**Deposits** ☐ Sludge ☐ Sawdust ☐ Paper fiber ☐ Sand ☐ Relict shells ☐ Other ______ **Looking at stones which are not deeply embedded, are the undersides black in color?** ☐ Yes ☒ No NA No stones

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock			Detritus	Sticks, wood, coarse plant materials (CPOM)	20
Boulder	> 256 mm (10")				
Cobble	64-256 mm (2.5" – 10")		Muck-Mud	Black, very fine organic (FPOM)	80 50% Mud
Gravel	2-64 mm (0.1" – 2.5")				
Sand	0.06 – 2mm (gritty)		Marl	Grey, shell fragments	
Silt	0.004-0.06 mm	90 50% mud			
Clay	<0.004 mm (slick)	10 50%			

tn

FISH SAMPLING FIELD DATA SHEET (FRONT)

page ___ of ____

STREAM NAME ~~[illegible]~~ Unnamed Trib	LOCATION CWA effluent ditch
STATION # UT 0 RIVERMILE ______	STREAM CLASS
LAT ________ LONG ________	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS PGD / JRR / RD	
FORM COMPLETED BY PGD	DATE 9/17/08 TIME 1100 (AM) PM — REASON FOR SURVEY OAA

SAMPLE COLLECTION	How were the fish captured? ☐ back pack ☐ tote barge ☐ other ______ Block nets used? ☐ Yes ☐ No Sampling Duration Start Time ______ End Time ______ Duration ______ Stream width (in meters) Max ______ Mean ______
HABITAT TYPES	Indicate the percentage of each habitat type present ☐ Riffles ____% ☐ Pools ____% ☐ Runs ____ ☐ Snags ____% ☐ Submerged Macrophytes ____% ☐ Other (____) ____%
GENERAL COMMENTS	Pedal down 1029 Sec Pass 1

SPECIES	TOTAL (COUNT)	OPTIONAL: LENGTH (mm)/WEIGHT (g) (25 SPECIMENT MAX SUBSAMPLE)					ANOMALIES D	E	F	L	M	S	T	Z
	LESF	[illegible]	33.4/113											
		[illegible]	0.3/25											
	GSF	20.3/105												
		28.1/109												
		8.2/81												
Golden Shiner	[illegible]	9.2/101												
		4.3/82												
		1.6/60												
		1.8/60												
		3.3/76												
A. affinis		0.4/36	0.2/26	0.3/32	0.2/31	0.3/28								
No. 228 AM		0.3/39	2.9/41	0.3/32	0.2/29	0.3/37								
6-6-21976		0.3/38	0.3/31	0.3/29	[illegible]	0.3/35								
		0.4/32	0.2/29	0.3/31	0.5/36	0.6/46								
		0.5/36	0.2/28	0.3/39	0.5/37	0.2/38								

VTØ Pass 1

SPECIES	TOTAL (COUNT)	OPTIONAL: LENGTH (mm)/WEIGHT (g) (25 SPECIMENT MAX SUBSAMPLE)					ANOMALIES							
							D	E	F	L	M	S	T	Z
Y bullhead		260/314												

ANOMALY CODES: D=deformities; E=eroded fins; F=fungus; L=lesions; M=multiple DELT anomalies; S=emaciated; Z=other

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME Bayou de View	LOCATION Nr 226 bridge	
STATION # BDV-1 RIVERMILE ____	STREAM CLASS	
MAP DATUM: ____ Zone: ____	RIVER BASIN	
UTM: Easting ____ Northing ____	AGENCY	
INVESTIGATORS DMR, PSD, STR		
FORM COMPLETED BY DMR	DATE 16 Sept 08 TIME 1100 (AM) PM	REASON FOR SURVEY

WEATHER CONDITIONS

Now		Past 24 Hours
☐	storm (heavy rain)	☐
☐	rain (steady rain)	☐
☐	showers (intermittent)	☐
____% ☐	%cloud cover	☐ ____%
☒	clear/sunny	☒

Has there been a heavy rain in the last 7 days? ☐ Yes ☒ No

Air Temperature ____ °C

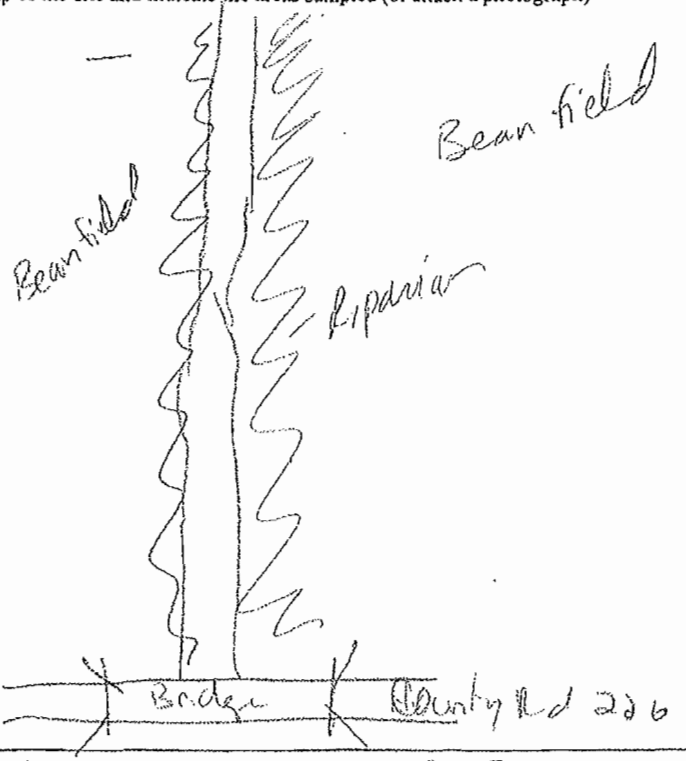
Other ____

SITE LOCATION/MAP

Flow:

Tape Reading from LB/RB	Depth (ft)	Section Length (ft)	Velocity (f/s)

Draw a map of the site and indicate the areas sampled (or attach a photograph)



STREAM CHARACTERIZATION

Stream Subsystem
☒ Perennial ☐ Intermittent ☐ Tidal

Stream Type
☐ Coldwater ☒ Warmwater

Stream Origin
☐ Glacial ☐ Spring-fed
☒ Non-glacial montane ☐ Mixture of origins
☐ Swamp and bog ☐ Other ____

Catchment Area ____ km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES

Predominant Surrounding Landuse
☐ Forest ☐ Commercial
☐ Field/Pasture ☐ Industrial
☒ Agricultural ☐ Other _____
☐ Residential

Local Watershed
☐ No evidence ☒ Some potential sources
☐ Obvious sources

Local Watershed Erosion
☐ None ☒ Moderate ☐ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
☒ Trees ☒ Shrubs ☐ Grasses ☐ Herbaceous
dominant species present Acer saccharinum, Morus alba

INSTREAM FEATURES

Estimated Reach Length 240 m
Estimated Stream Width 6-7 m
Sampling Reach Area _____ m^2
Area in km^2 (m^2x1000) _____ km^2
Estimated Stream Depth 1 m
Surface Velocity (at thalweg) _____ m/sec

Canopy Cover
☐ Partly open ☒ Partly shaded ☐ Shaded

High Water Mark 3 m

Proportion of Reach Represented by Stream Morphology Types
☐ Riffle ____ % ☐ Run ____ %
☒ Pool 100 %

Channelized ☒ Yes ☐ No
Dam Present ☐ Yes ☒ No

LARGE WOODY DEBRIS

LWD < 5 m^2
Density of LWD _____ m^2/km^2 (LWD/reach area)

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☐ Rooted emergent ☐ Rooted submergent ☐ Rooted Floating ☐ Free floating
☐ Floating Algae ☐ Attached Algae

Dominant species present None

Portion of the reach with aquatic vegetation 0 %

WATER QUALITY

Temperature 20.2 °C
Specific Conductance 326.7 uscm
Dissolved Oxygen 6.0 mg/l
pH 6.60
Turbidity _____
WQ Instrument Used Minisonde

Water Odors
☒ Normal/None ☐ Sewage
☐ Petroleum ☐ Chemical
☐ Fishy ☐ Other methane

Water Surface Oils
☐ Slick ☐ Sheen ☐ Globs ☐ Flecks
☒ None ☐ Other _____

Turbidity (if not measured)
☐ Clear ☒ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other _____

SEDIMENT/ SUBSTRATE

Odors
☐ Normal ☐ Sewage ☐ Petroleum
☐ Chemical ☐ Anaerobic ☒ None
☐ Other _____

Oils
☒ Absent ☐ Slight ☐ Moderate ☐ Profuse

Deposits
☐ Sludge ☐ Sawdust ☐ Paper fiber ☐ Sand
☐ Relict shells ☐ Other _____

Looking at stones which are not deeply embedded, are the undersides black in color?
☐ Yes ☐ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock			Detritus	Sticks, wood, coarse plant materials (CPOM)	< 5 %
Boulder	> 256 mm (10")				
Cobble	64-256 mm (2.5" – 10")		Muck-Mud	Black, very fine organic (FPOM)	40 %
Gravel	2-64 mm (0.1" – 2.5")				
Sand	0.06 – 2mm (gritty)		Marl	Grey, shell fragments	
Silt	0.004-0.06 mm	30			
Clay	<0.004 mm (slick)	70			

ftn

FISH SAMPLING FIELD DATA SHEET (FRONT)

page ___ of ____

STREAM NAME Big Cr.	LOCATION U/S of [illegible] 001
STATION # BC[illegible] RIVERMILE ______	STREAM CLASS
LAT ____________ LONG ____________	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS	
FORM COMPLETED BY RDD	DATE 9/17/08 TIME 1400 (AM) PM / REASON FOR SURVEY UAA

SAMPLE COLLECTION	**How were the fish captured?** ☐ back pack ☐ tote barge ☐ other ________ **Block nets used?** ☐ Yes ☐ No **Sampling Duration** Start Time ______ End Time ______ Duration ______ **Stream width (in meters)** Max ______ Mean ______
HABITAT TYPES	**Indicate the percentage of each habitat type present** ☐ Riffles ____% ☐ Pools ____% ☐ Runs ____ ☐ Snags ______% ☐ Submerged Macrophytes ____% ☐ Other (__________) ______%
GENERAL COMMENTS	Pass 1 832

SPECIES	TOTAL (COUNT)	OPTIONAL: LENGTH (mm)/WEIGHT (g) (25 SPECIMENT MAX SUBSAMPLE)					ANOMALIES D	E	F	L	M	S	T	Z
GSF		69.3/154	48.9/130	33.3/79										
		14.9/96	50.3/138											
		84.5/184	4.8/67											
		12.9/125	6.3/40											
		9.9/115	5.3/80											
OGSF		35.5/119												
		41.3/136												
		30.9/116												
		22.9/114												
		/2												
LESF		23.3/159	21.6/101	1.6/42	0.2/33	11.5/[illegible]								
+4+1+2+6		14/92	6.1/71	1.0/40	0.8/35	3.3/46								
		28/110	1.2/49	0.8/31	0.6/35	3.3/[illegible]								
		24.9/[illegible]	1.2/35	1.2/42	0.4/34	1.3/34								
		23/108	1.1/41	0.8/31	0.7/34	0.5/36								
Spotted Bass		5.3/77												
		3.3/75												

BC 4 Pass 1

SPECIES	TOTAL (COUNT)	OPTIONAL: LENGTH (mm)/WEIGHT (g) (25 SPECIMENT MAX SUBSAMPLE)					ANOMALIES D	E	F	L	M	S	T	Z
Lepomis		0.8/63												
Gulosus		1.3/45												
Black tail		2.2/84	2.3/70	1.3/60	0.8/39	0.3/36								
Shiner														
LMB		2.9/61												
Y. Bullhead		2.2/50	1.2/45	1.0/[illegible]	1.1/45	1.0/47								
Bl stpd	Top min	1.9/54	0.6/44	0.6/41	0.9/40	0.5/39								
		0.5/43												
G. affinis		0.8/35												
Camp.	Anal.	[illegible]/62	[illegible]/60	[illegible]/63	[illegible]/65	[illegible]/41								
		1.[illegible]/50	[illegible]/51	[illegible]/62	1.1/49	1.[illegible]/47								
		1.[illegible]/64	1.5/64	[illegible]/63	2.[illegible]/62									

ANOMALY CODES: D=deformities; E=eroded fins; F=fungus; L=lesions; M=multiple DELT anomalies; S=emaciated; Z=other

FISH SAMPLING FIELD DATA SHEET (FRONT)

STREAM NAME	LOCATION
STATION # BC-D RIVERMILE ______	STREAM CLASS
LAT ______ LONG ______	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS	
FORM COMPLETED BY	DATE ______ TIME ______ AM PM / REASON FOR SURVEY

SAMPLE COLLECTION

How were the fish captured? ☐ back pack ☐ tote barge ☐ other ______

Block nets used? ☐ Yes ☐ No

Sampling Duration Start Time ______ End Time ______ Duration ______

Stream width (in meters) Max ______ Mean ______

HABITAT TYPES

Indicate the percentage of each habitat type present

☐ Riffles ____% ☐ Pools ____% ☐ Runs ____ ☐ Snags ____%

☐ Submerged Macrophytes ____% ☐ Other ( ) ____%

GENERAL COMMENTS

Pass 2 [illegible]

SPECIES	TOTAL (COUNT)	OPTIONAL: LENGTH (mm)/WEIGHT (g) (25 SPECIMENT MAX SUBSAMPLE)					ANOMALIES D	E	F	L	M	S	T	Z
Sp. bass		255/226	[illegible]											
Y Bullhead		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]								
LESF		☒	☒	☒										
[illegible]SF		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]								
x2		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]								
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]								
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]								

Pass 2 BC [illegible]

SPECIES	TOTAL (COUNT)	OPTIONAL: LENGTH (mm)/WEIGHT (g) (25 SPECIMENT MAX SUBSAMPLE)					ANOMALIES D	E	F	L	M	S	T	Z
Camp an[illegible]	1	[illegible]/69												
Bl Tail Sh.		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]								
		[illegible]/69	1.0/[illegible]	3.4/25	[illegible]	[illegible]								
		[illegible]/26	[illegible]	[illegible]/56	[illegible]/25	[illegible]/33								
		[illegible]/60	[illegible]/22	[illegible]/31	[illegible]/34	[illegible]/34								
		[illegible]	[illegible]											
L. gulosus		[illegible]												
Bl str. TM		[illegible]	[illegible]	[illegible]	[illegible]									
GSF		[illegible]	[illegible]/60	[illegible]	[illegible]	[illegible]								
		[illegible]	[illegible]											
Unid SF		[illegible]												
C. anomalum		[illegible]	1.0/58	[illegible]										
E. gracil[illegible]		[illegible]												

ANOMALY CODES: D=deformities; E=eroded fins; F=fungus; L=lesions; M=multiple DELT anomalies; S=emaciated; Z=other

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME Big Cr.	LOCATION U/S CWC outfall 002		
STATION # _____ RIVERMILE _____	STREAM CLASS 1		
MAP DATUM: _____ Zone: _____	RIVER BASIN		
UTM: Easting _____ Northing _____	AGENCY		
INVESTIGATORS			
FORM COMPLETED BY PID	DATE 9/17/08 TIME 1500 AM PM	REASON FOR SURVEY N/A	

WEATHER CONDITIONS

Now		Past 24 Hours
☐	storm (heavy rain)	☐
☐	rain (steady rain)	☐
☐	showers (intermittent)	☐
20 %	%cloud cover	☐ 20 %
☑	clear/sunny	☐

Has there been a heavy rain in the last 7 days? ☐ Yes ☐ No

Air Temperature ____ °C

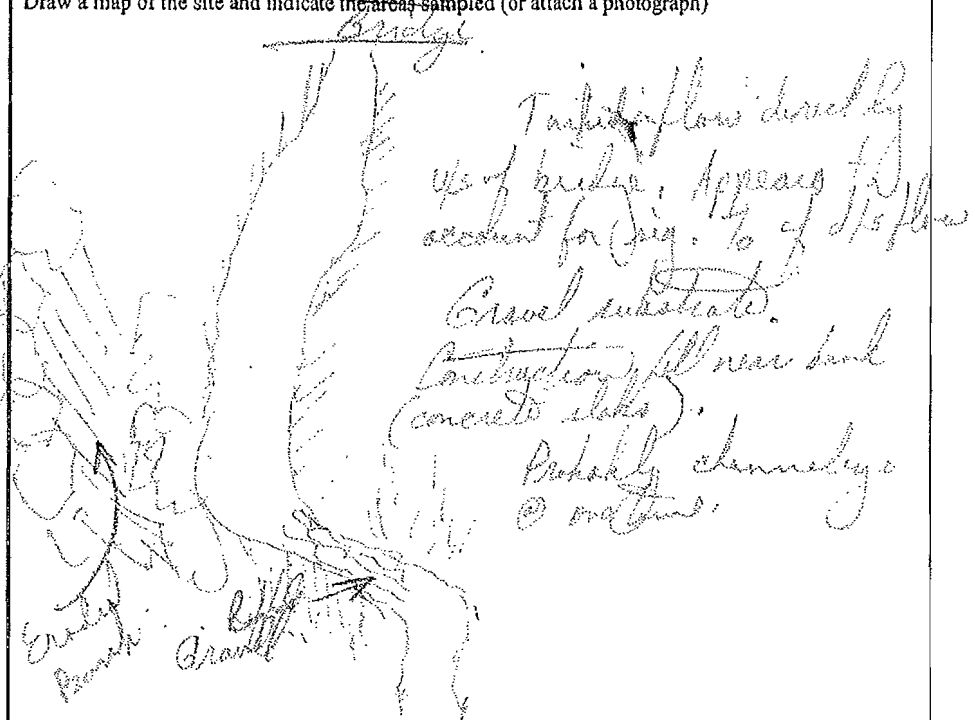
Other _____

SITE LOCATION/MAP

Flow:

Tape Reading from LB/RB	Depth (ft)	Section Length (ft)	Velocity (ft/s)

Draw a map of the site and indicate the areas sampled (or attach a photograph)



STREAM CHARACTERIZATION

Stream Subsystem
☑ Perennial ☐ Intermittent ☐ Tidal

Stream Type
☐ Coldwater ☐ Warmwater

Stream Origin
☐ Glacial ☐ Spring-fed
☐ Non-glacial montane ☒ Mixture of origins
☐ Swamp and bog ☐ Other _____

Catchment Area _____ km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES

Predominant Surrounding Landuse
☒ Forest ☐ Commercial
☐ Field/Pasture ☐ Industrial
☒ Agricultural ☐ Other _____
☐ Residential

Local Watershed
☐ No evidence ☒ Some potential sources
☐ Obvious sources

Local Watershed Erosion
☐ None ☒ Moderate ☐ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
☒ Trees ☐ Shrubs ☐ Grasses ☐ Herbaceous
dominant species present Oak

INSTREAM FEATURES

Estimated Reach Length _____m
Estimated Stream Width 2-10ft _____m
Sampling Reach Area _____m^2
Area in km^2 (m^2x1000) _____km^2
Estimated Stream Depth 2-3ft _____m
Surface Velocity (at thalweg) _____m/sec

Canopy Cover
☐ Partly open ☒ Partly shaded ☐ Shaded
High Water Mark _____m N/A
Proportion of Reach Represented by Stream Morphology Types
☐ Riffle 20 % ☐ Run 0 %
☐ Pool 80 %
Channelized ☐ Yes ☐ No
Dam Present ☐ Yes ☒ No

LARGE WOODY DEBRIS

LWD <10 m^2
Density of LWD _____m^2/km^2 (LWD/reach area)

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☐ Rooted emergent ☐ Rooted submergent ☐ Rooted Floating ☐ Free floating
☐ Floating Algae ☐ Attached Algae
Dominant species present None
Portion of the reach with aquatic vegetation 0 %

WATER QUALITY

Temperature _____°C
Specific Conductance _____ Lab pod
Dissolved Oxygen _____ Lab pod
pH _____
Turbidity _____
WQ Instrument Used _____

Water Odors
☒ Normal/None ☐ Sewage
☐ Petroleum ☐ Chemical
☐ Fishy ☐ Other _____
Water Surface Oils
☐ Slick ☐ Sheen ☐ Globs ☐ Flecks
☒ None ☐ Other _____
Turbidity (if not measured)
☐ Clear ☐ Slightly turbid ☒ Turbid
☐ Opaque ☐ Stained ☐ Other _____

SEDIMENT/ SUBSTRATE

Odors
☒ Normal ☐ Sewage ☐ Petroleum
☐ Chemical ☐ Anaerobic ☐ None
☐ Other _____
Oils
☒ Absent ☐ Slight ☐ Moderate ☐ Profuse
Deposits
☐ Sludge ☐ Sawdust ☐ Paper fiber ☐ Sand
☐ Relict shells ☐ Other None
Looking at stones which are not deeply embedded, are the undersides black in color?
☒ Yes ☐ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock			Detritus	Sticks, wood, coarse plant materials (CPOM)	5-10
Boulder	> 256 mm (10")	0			
Cobble	64-256 mm (2.5" – 10")	5	Muck-Mud	Black, very fine organic (FPOM)	
Gravel	2-64 mm (0.1" – 2.5")	10			
Sand	0.06 – 2mm (gritty)	5	Marl	Grey, shell fragments	
Silt	0.004-0.06 mm	70			
Clay	<0.004 mm (slick)				

HABITAT ASSESSMENT FIELD DATA SHEET – LOW GRADIENT STREAMS (FRONT)

STREAM NAME B.C.	LOCATION U/S of Cole Outfall		
STATION # ____ RIVERMILE ____	STREAM CLASS		
LAT ____ LONG ____	RIVER BASIN		
STORET #	AGENCY		
INVESTIGATORS			
FORM COMPLETED BY PSD	DATE 9/17/00 TIME 1500 AM PM	REASON FOR SURVEY UAA	

	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
Parameters to be evaluated in sampling reach	1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient)	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale)	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking
	SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1
	2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1
	3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent
	SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1
	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	SCORE	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-27% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1

HABITAT ASSESSMENT FIELD DATA SHEET – LOW GRADIENT STREAMS (BACK)

BC 0

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE_____(LB)	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
SCORE_____(RB)	Right Bank 10 9	8 (7) 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed or grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of stream bank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE_____(LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE_____(RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE_____(LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE_____(RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score _____

ftn

FISH SAMPLING FIELD DATA SHEET (FRONT)

page ___ of ____

STREAM NAME Sugar [illegible] Cr	LOCATION @ CR 603
STATION # REF 01 RIVERMILE ______	STREAM CLASS
LAT ____________ LONG ________	RIVER BASIN
STOREET #	AGENCY
INVESTIGATORS RDD/JRR/RD	
FORM COMPLETED BY RD/[illegible]	DATE 9/18/08 TIME 0900 AM PM — REASON FOR SURVEY

SAMPLE COLLECTION	How were the fish captured? ☐ back pack ☐ tote barge ☐ other ________ Block nets used? ☐ Yes ☐ No Sampling Duration Start Time ______ End Time ______ Duration ________ Stream width (in meters) Max ________ Mean ________
HABITAT TYPES	Indicate the percentage of each habitat type present ☐ Riffles _____% ☐ Pools _____% ☐ Runs ______ ☐ Snags ________% ☐ Submerged Macrophytes _____% ☐ Other (____________) ________%
GENERAL COMMENTS	Pass 2

SPECIES	TOTAL (COUNT)	OPTIONAL: LENGTH (mm)/WEIGHT (g) (25 SPECIMENT MAX SUBSAMPLE)					ANOMALIES D	E	F	L	M	S	T	Z
Striped Shiner	8	6.8/71	0.6/42	4.3/80	7.1/96	1.5/58								
LESF		0.[illegible]/34	0.2/27	3.6/61	1.8/49	1.3/48								
		7.9/80												
G. A [illegible]		0.2/29	0.3/30	0.1/28	0.3/30	0.2/26								
Y. Bullhead		[illegible]/16	[illegible]/134	1.3/48	9.3/109	3.6/61								

REF Ø Pass 2

SPECIES	TOTAL (COUNT)	OPTIONAL: LENGTH (mm)/WEIGHT (g) (25 SPECIMENT MAX SUBSAMPLE)					ANOMALIES D	E	F	L	M	S	T	Z
CR. CHUB		5.6/84	0.6/37	5.9/80	1.3/51	1.6/55								
		1.8/57	1.9/48											
GSF		5.0/77	5.0/30	4.8/32	1.7/51	2.7/54								
		3.2/59	3.2/81	6.0/73	3.4/62	1.5/49								
		2.5/46												
BL. STRIPE TOP	MINNOW	2.3/65	0.9/50	0.5/39	0.3/31	2.1/61								
		2.4/66	0.4/38											
N. VENUSTA		1.6/57	0.6/41	2.2/67	1.7/57									

ANOMALY CODES: D=deformities; E=eroded fins; F=fungus; L=lesions; M=multiple DELT anomalies; S=emaciated; Z=other

FISH SAMPLING FIELD DATA SHEET (FRONT)

page ___ of ____

STREAM NAME Sugar Cr.	LOCATION @ CR 603
STATION # REF-10 RIVERMILE ______	STREAM CLASS
LAT ______ LONG ______	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS POD/JAN/RD	
FORM COMPLETED BY POD/RD	DATE 9/18/08 TIME 0900 (AM) PM — REASON FOR SURVEY UAA

SAMPLE COLLECTION	How were the fish captured? ☐ back pack ☐ tote barge ☐ other ______ Block nets used? ☐ Yes ☐ No Sampling Duration Start Time ______ End Time ______ Duration ______ Stream width (in meters) Max ______ Mean ______
HABITAT TYPES	Indicate the percentage of each habitat type present ☐ Riffles ____% ☐ Pools ____% ☐ Runs ____ ☐ Snags ____% ☐ Submerged Macrophytes ____% ☐ Other (______) ____%
GENERAL COMMENTS	Day 1 / Shocking time = 600 sec

SPECIES	TOTAL (COUNT)	OPTIONAL: LENGTH (mm)/WEIGHT (g) (25 SPECIMENT MAX SUBSAMPLE)					ANOMALIES D	E	F	L	M	S	T	Z
GSF		3.2/59	4.9/63	3.9/56	6.4/73	[illegible]/73								
		11.3/90	4.2/58	5.5/62	5.4/71	6.3/76								
		1.5/45	4.3/64											
LESF		10.4/89	5.3/70	5.1/70	4.0/61	1.1/42								
		4.9/67	5.5/71	11.9/91	1.8/49	8.3/83								
		0.9/36	1.5/46											
Y BULL	/	16.8/104	49.1/150											
[illegible]	[illegible]	0.9/45	0.3/31	2.2/63	1.2/54	0.8/40								
		3.0/67	-40-											

Ref Ø – Pass 1

SPECIES	TOTAL (COUNT)	OPTIONAL: LENGTH (mm)/WEIGHT (g) (25 SPECIMENT MAX SUBSAMPLE)					ANOMALIES D	E	F	L	M	S	T	Z
Cr Chub		0.9/83	0.5/38	3.5/71	0.3/32	0.5/46								
		5.1/92	4.8/81	3.3/90	4.3/79									
Str. Shiner	60	0.8/64	0.8/108	1.1/124	0.8/70	4.3/84								
		1.2/53	7.4/97	9.3/89	1.5/55	8.2/109								
N. venustus		1.7/66	1.7/60	3.9/82										
G. olmstedi		3.2/73	0.1/35	0.1/36										
[illegible]	[illegible]	[illegible]												
Cr. Chubsucker		3.9/63												

ANOMALY CODES: D=deformities; E=eroded fins; F=fungus; L=lesions; M=multiple DELT anomalies; S=emaciated; Z=other

HABITAT ASSESSMENT FIELD DATA SHEET – LOW GRADIENT STREAMS (FRONT)

STREAM NAME Sugar Co.	LOCATION 2Q CR 603	
STATION # _____ RIVERMILE _____	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS POD/JRR		
FORM COMPLETED BY POD	DATE 9/18/03 TIME 0930 (AM) PM	REASON FOR SURVEY UAA

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient)	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale)	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking Hard
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools. X	Majority of pools small-shallow or pools absent
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 (8) 7 6	5 4 3 2 1
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-27% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1

HABITAT ASSESSMENT FIELD DATA SHEET – LOW GRADIENT STREAMS (BACK)

* No pools all riffle run – all shallow.

REF

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE_____(LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE_____(RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed or grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of stream bank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE_____(LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE_____(RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE_____(LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE_____(RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score _____

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME Sugar Cr.	LOCATION S @ CR 603
STATION # REF B RIVERMILE ______	STREAM CLASS
MAP DATUM: __________ Zone: ______	RIVER BASIN
UTM: Easting ________ Northing ________	AGENCY
INVESTIGATORS	
FORM COMPLETED BY PJD	DATE 9/18/03 TIME 0825 AM PM — REASON FOR SURVEY UAA

WEATHER CONDITIONS

Now		Past 24 Hours
☐	storm (heavy rain)	☐
☐	rain (steady rain)	☐
☐	showers (intermittent)	☐
____% ☐	%cloud cover	☐ ____%
☐	clear/sunny	☐

Has there been a heavy rain in the last 7 days? ☐ Yes ☐ No

Air Temperature ____ °C

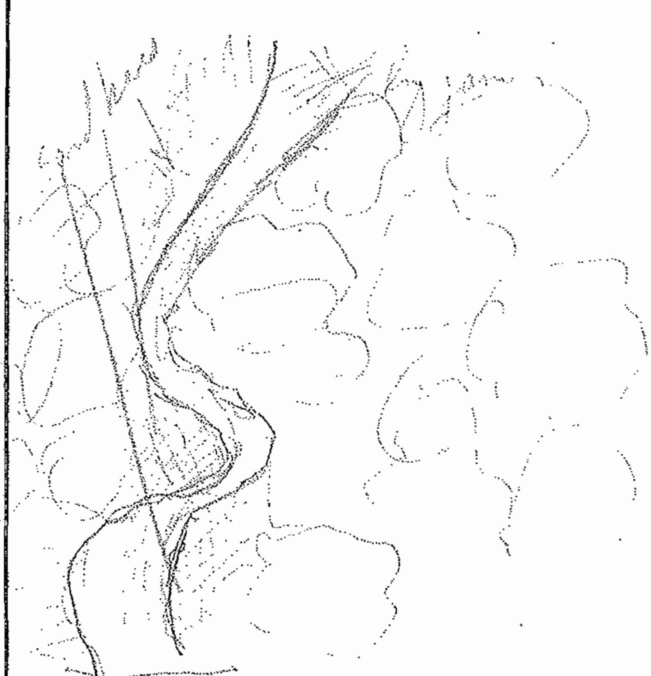
Other________________

SITE LOCATION/MAP

Flow:

Tape Reading from LB/RB	Depth (ft)	Section Length (ft)	Velocity (f/s)

Draw a map of the site and indicate the areas sampled (or attach a photograph)



Shallow riffle/run mostly. Substrate 10% sand

STREAM CHARACTERIZATION

Stream Subsystem
☒ Perennial ☐ Intermittent ☐ Tidal

Stream Type
☐ Coldwater ☒ Warmwater

Stream Origin
☐ Glacial ☐ Spring-fed
☐ Non-glacial montane ☒ Mixture of origins
☐ Swamp and bog ☐ Other________

Catchment Area__________km²

REF-8

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES	**Predominant Surrounding Landuse** ☒ Forest ☐ Commercial ☐ Field/Pasture ☐ Industrial ☒ Agricultural ☐ Other ______ ☐ Residential	**Local Watershed** ☐ No evidence ☐ Some potential sources ☒ Obvious sources **Local Watershed Erosion** ☐ None ☒ Moderate ☐ Heavy
RIPARIAN VEGETATION (18 meter buffer)	**Indicate the dominant type and record the dominant species present** ☒ Trees ☒ Shrubs ☐ Grasses ☐ Herbaceous **dominant species present** Oak, River birch	
INSTREAM FEATURES	**Estimated Reach Length** ____m **Estimated Stream Width** 6 ft **Sampling Reach Area** ____m² **Area in km² (m²x1000)** ____km² **Estimated Stream Depth** ____m 0.2-1 ft **Surface Velocity (at thalweg)** ____m/sec 0.2-1 ft/sec	**Canopy Cover** ☐ Partly open ☐ Partly shaded ☒ Shaded **High Water Mark** ____m 8 ft **Proportion of Reach Represented by Stream Morphology Types** ☐ Riffle 20 % ☐ Run 80 % ☐ Pool ____% **Channelized** ☐ Yes ☒ No **Dam Present** ☐ Yes ☒ No
LARGE WOODY DEBRIS	**LWD** 10 m² **Density of LWD** ______m²/km² (LWD/reach area)	
AQUATIC VEGETATION	**Indicate the dominant type and record the dominant species present** ☐ Rooted emergent ☐ Rooted submergent ☐ Rooted Floating ☐ Free floating ☐ Floating Algae ☐ Attached Algae Dominant species present None Portion of the reach with aquatic vegetation 0 %	
WATER QUALITY	**Temperature** ____°C **Specific Conductance** ______ **Dissolved Oxygen** ______ **pH** ______ **Turbidity** ______ **WQ Instrument Used** ______ (handwritten across fields: See [illegible] sub [illegible])	**Water Odors** ☒ Normal/None ☐ Sewage ☐ Petroleum ☐ Chemical ☐ Fishy ☐ Other ______ **Water Surface Oils** ☐ Slick ☐ Sheen ☐ Globs ☐ Flecks ☒ None ☐ Other ______ **Turbidity (if not measured)** ☒ Clear ☐ Slightly turbid ☐ Turbid ☐ Opaque ☐ Stained ☐ Other ______
SEDIMENT/ SUBSTRATE	**Odors** ☒ Normal ☐ Sewage ☐ Petroleum ☐ Chemical ☐ Anaerobic ☐ None ☐ Other ______ **Oils** ☒ Absent ☐ Slight ☐ Moderate ☐ Profuse	**Deposits** ☐ Sludge ☐ Sawdust ☐ Paper fiber ☒ Sand ☐ Relict shells ☐ Other ______ **Looking at stones which are not deeply embedded, are the undersides black in color?** ☐ Yes ☐ No No stones

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock			Detritus	Sticks, wood, coarse plant materials (CPOM)	41
Boulder	> 256 mm (10")				
Cobble	64-256 mm (2.5" – 10")		Muck-Mud	Black, very fine organic (FPOM)	0
Gravel	2-64 mm (0.1" – 2.5")				
Sand	0.06 – 2mm (gritty)	100%	Marl	Grey, shell fragments	0
Silt	0.004-0.06 mm				
Clay	<0.004 mm (slick)				

9/16/08 BVDI

Time start	0925
DO	6.00
Temp	20.21
pH	6.80
Cond	326.7

1 grab sample collected @ 0930

Shortening pedal down time
Rep 01 - 806 sec
Rep 2 - 830 sec
Water 1,763

Cont monit deployed @ 1600 9/17/08
retrieved @ 1140 9/18/08

BVD-1 Flows 09/16/08

Lt (ft) Rt [illegible] 1540 POD

Loc	Depth	Current	Loc	Depth	Current
6.0	0	0	34.0	1.4	0.01
7.0	0.2	0.01	36.0	0.4	0.02
8.0	0.5	0.04	38.0	0.4	0.03
9.0	0.5	0.04	40.0	0.0	0.0
10.0	0.5	0.05			
11.0	0.5	0.06			
12.0	0.8	0.09			
13.0	—	—			
14.0	2.0	0.09			
15.0	—	—			
16.0	2.5	0.09			
17.0	—	—			
18.0	2.3	0.13			
19.0	—	—			
20.0	2.0	0.15			
22.0	1.8	0.13			
24.0	2.3	0.13			
26.0	1.95	0.12			
28.0	1.95	0.13			
30.0	1.95	0.11			
32.0	1.9	0.10			

BVD-2 9/16/08

13:45

In Situ ([illegible])

Temp	21.98
DO	7.81
pH	7.00
Cond	374.7

1 grab sample collected 13:50

[illegible]

Pass 1 843+461 = 1304

2 1445 sec

Continuous recording Hydrolab deployed @ ~1800

ft Loc	ft depth	ft/sec current
32.4	0	0
31.9	1.4	0.07
31.4	1.7	0.10
30.9	1.6	0.12
30.4	1.1	0.11
29.9	1.8	0.12
29.4	1.8	0.13
28.9	1.8	0.10
28.4	1.3	0.45
27.9	—	—
27.4	1.3	0.17
26.9	—	—
26.4	1.1	0.18
25.9	—	—
25.4	1.6	0.25
24.9	—	—
24.4	1.8	0.27
23.9	—	—
23.4	1.85	0.24
22.9	—	—
22.4	1.85	0.24
21.9	—	—
21.4	1.9	0.25
20.9	—	—

ft Loc	ft Depth	ft/sec current
20.4	1.9	0.21
19.4	1.8	0.22
18.4	1.7	0.21
17.4	1.4	0.13
16.4	0.5	0.07
16.1	0	0

9/17/08 4700W-020

City Water (Jonesboro) UAA

Lost Creek (LC-0)

9/17/08 0750 POD/ERR

Temp	18.14
DO	3.93
pH	180.8
Cond	6.18

LCO (ft) loc	depth (ft)	Flow current (ft/sec)	loc	depth	current
	0	0			
1	0.4	0.01			
2	0.3	0.01			
3	0.45	0.02			
4	0.45	0.02			
5	0.55	0.02			
6	0.6	0.04			
7	0.6	0.04			
8	1.1	0.05			
9	1.2	0.04			
10	1.25	0.05			
11	1.1	0.04			
12	1.1	0.03			
13	1.1	0.02			
14	1.15	0.04			
15	1.25	0.03			
16	1.1	0.05			
17	1.0	0.03			
18	0.6	0.0			
19	0.1	0.0			
19.1	0	0			

UTO 9/17/08 0948

Photo 9413

Temp	20.43	Clear	
DO	4.22	Wind 5 @ 2	
pH	6.70	Temp	70°
Cond	539.7		

(ft) Loc	(ft) Depth	(ft/sec) Current	Loc	Depth	Current
2.9	1.0	0	18.8	1.0	0.02
3.8	0.7	0.01	19.8	0.7	0.02
4.8	1.9	0.04	20.8	0.55	0.01
5.8	2.2	0.05	21.8	0.3	0.01
6.8	2.6	0.12	22.8	0.1	0
7.8	2.0	0.08	23.8	0	0
8.8	2.4	0.07			
9.8	2.3	0.10	Continuous recording		
10.8	2.5	0.12	hydrolab deployed		
11.8	2.2	0.12	@ ~ 11:00		
12.8	2.3	0.08	Retrieved 9/18/08		
13.8	2.2	0.14	1100		
14.8	2.0	0.10			
15.8	1.8	0.05			
16.8	1.2	0.03			
17.8	1.0	0.03			

Gila Water + Lift | 4700W-020

BCD 4

1454, 9/17/08

Grab sample collected @ 1450 PC

DO 9.02

Temp 19.75

pH ~~9.02~~ 8.16

Cond 135.6

Benthic sample

18 jabs - pool

2 " - riffle

Loc	depth	Current
22.5	0	0
22.0	0.1	0.09
21.5	0.2	0.15
21.0	0.3	0.12
20.5	0.45	0.09
20.0	0.4	0.32
19.5	0.3	0.57
19.0	0.45	0.60
18.5	0.45	0.85
18.0	0.45	0.88
17.5	0.35	0.90
17.0	0.4	0.90
16.5	0.5	0.74
16.0	0.2	0.16
15.6	0	0

Cont. monitor

deployed 9/17/08 1720

retrieved 9/18/08 1110

Ref-0 Sagas Cr 9/18/08

Temp	12.98		0854
DO	8.71		PSD
pH	6.93		
Cond	570.7		

(Left) 0816

Loc	(ft) depth	(ft/sec) current	Loc	depth	current
0.8	0.3	0.0	8.0	0.35	0.52
1.0	0.4	0.01	8.5	0.3	0.56
1.5	0.4	0.06	9.0	0.25	0.47
2.0	0.55	0.16	9.5	0.25	0.22
2.5	0.45	0.07	10.0	0.1	0
3.0	0.4	0.16	10.5	<0.1	0
3.5	0.4	0.35	11.0	0	0
4.0	0.35	0.60			
4.5	0.4	0.65			
5.0	0.4	0.63			
5.5	0.4	0.67			
6.0	0.4	0.55			
6.5	0.4	0.61			
7.0	0.4	0.58			
7.5	0.4	0.52			

BDV-Ø @ HWY 214

9/18/08 1240 FJD/CTRR

DO	6.65
Temp	20.21
pH	7.01
Cond	313.9

Loc	Width	Current
0.7	0	0
1.0	0.25	0
1.5	0.45	0.34
2.0	0.45	0.63
2.5	0.55	0.91
3.0	0.55	0.85
3.5	0.55	0.95
4.0	0.60	0.72
4.5	0.60	1.25
5.0	0.9	0.89
5.5	0.4	0.67
6.0	0.15	0
6.2	0	0

AMERICAN INTERPLEX CORPORATION
LABORATORIES

CHAIN OF CUSTODY / ANALYSIS REQUEST FORM

Client: FTN
Project Reference: 4700W-020
Project Manager: Jim Malcolm
Sampled By: PJD

PO No.

SAMPLE MATRIX

NO OF BOTTLES

ANALYSES REQUESTED: Chloride, Sulfate, TDS, TSS

AIC CONTROL NO:
AIC PROPOSAL NO:
Carrier:
Received Temperature C

AIC No.	Sample Identification	Date/Time Collected	GRAB	COMP	WATER	SOIL	NO OF BOTTLES	Remarks
	BC-0	9/17/08 1450	/					
	UT-0-1	9/17/08 0845	/					
	UT-0-2	9/17/08 0845	/					
	BDV-0	9/16/08 1235	/					
	BDV-1	9/16/08 0930	/					
	BDV-2	9/16/08 1350	/					
	LC-0	9/17/08 0800	/					
		Container Type						Field pH calibration
		Preservative						on _____ @ _____
								Buffer:

G = Glass P = Plastic V = VOA vials H = HCl to pH2 T = Sodium Thiosulfate
NO = none S = Sulfuric acid pH2 N = Nitric acid pH2 B = NaOH to pH12 Z = Zinc acetate

Turnaround Time Requested: (Please circle)
NORMAL or EXPEDITED IN ____ DAYS
Expedited results requested by: _____
Who should AIC contact with questions: Jim Malcolm
Phone: 225-7779 Fax: _____
Report Attention to: Jim Malcolm
Report Address to:

Relinquished By:	Date/Time	Received By:	Date/Time
Richard J. Bruning	9/18/08 1500		
Relinquished By:	Date/Time	Received in Lab By: Teresa Hampton	Date/Time 9-18-08 1500

Comments:

AMERICAN INTERPLEX CORPORATION
LABORATORIES

CHAIN OF CUSTODY / ANALYSIS REQUEST FORM

Client: FTN
Project Reference: 470041-020
Project Manager: Jim Malcolm
Sampled By: POD

PO No.

SAMPLE MATRIX: WATER, SOIL

NO OF BOTTLES

ANALYSES REQUESTED: Alkalinity, Sulfate, TSS, TSS

AIC CONTROL NO:
AIC PROPOSAL NO:
Carrier:
Received Temperature C

AIC No.	Sample Identification	Date/Time Collected	GRAB	COMP	WATER	SOIL	NO OF BOTTLES	Alkalinity	Sulfate	TSS	TSS	Remarks
	REF-0	9/18/03 0315	✓					✓	✓	✓	✓	
	Outfall 001	9/18/03 1105	✓					✓	✓	✓	✓	
	Field Blk	9/17/03 1442	✓					✓	✓	✓	✓	
		Container Type										Field pH calibration
		Preservative										on ____ @ ____ Buffer:

G = Glass P = Plastic V = VOA vials H = HCl to pH2 T = Sodium Thiosulfate
NO = none S = Sulfuric acid pH2 N = Nitric acid pH2 B = NaOH to pH12 Z = Zinc acetate

Turnaround Time Requested: (Please circle)
~~NORMAL~~ or EXPEDITED IN ____ DAYS
Expedited results requested by: ____
Who should AIC contact with questions: Jim Malcolm
Phone: 225 7771 Fax: ____
Report Attention to: Jim Malcolm
Report Address to:

Relinquished By:	Date/Time	Received By:	Date/Time
Natalie Downey	9/18/03 1500		
Relinquished By:	Date/Time	Received in Lab By: Eugene Hunter	Date/Time 9-18-03 1500

Comments:

APPENDIX D

Analytical Laboratory Data Reports

AMERICAN INTERPLEX CORPORATION
LABORATORIES

FTN Associates, Ltd.
ATTN: Mr. Jim Malcolm
3 Innwood Circle, Suite 220
Little Rock, AR 72211

Dear Mr. Jim Malcolm:

Project Description: Ten (10) water sample(s) received on September 18, 2008
4700W-020

This report is the analytical results and supporting information for the samples submitted to American Interplex Corporation (AIC) on September 18, 2008. The following results are applicable only to the samples identified by the control number referenced above. Accurate assessment of the data requires access to the entire document. Each section of the report has been reviewed and approved by the appropriate laboratory director or a qualified designee.

Data has been validated using standard quality control measures performed on at least 10% of the samples analyzed. Quality Assurance, instrumentation, maintenance and calibration were performed in accordance with guidelines established by the cited methodology.

AMERICAN INTERPLEX CORPORATION

By _____
John Overbey
Laboratory Director

Enclosure(s): Chains of Custody

PDF cc: FTN Associates, Ltd.
ATTN: Mr. Jim Malcolm
jtm@ftn-assoc.com

AMERICAN INTERPLEX CORPORATION
LABORATORIES

FTN Associates, Ltd.
3 Innwood Circle, Suite 220
Little Rock, AR 72211

CASE NARRATIVE

SAMPLE RECEIPT

Received Temperature: 2°C

Receipt Verification:	Complete Chain of Custody	Y
	Sample ID on Sample Labels	Y
	Date and Time on Sample Labels	Y
	Proper Sample Containers	Y
	Within Holding Times	Y
	Adequate Sample Volume	Y
	Sample Integrity	Y
	Proper Temperature	Y
	Proper Preservative	Y

QUALIFIERS

Qualifiers	Definition
D	Result is from a secondary dilution factor
X	Spiking level is invalid due to the high concentration of analyte in the spiked sample

References:

"Methods for Chemical Analysis of Water and Wastes", EPA/600/4-79-020 (Mar 1983) with updates and supplements EPA/600/5-91-010 (Jun 1991), EPA/600/R-92-129 (Aug 1992) and EPA/600/R-93-100 (Aug 1993).

"Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW846)", Third Edition.

"Standard Methods for the Examination of Water and Wastewaters", 20th edition, 1998.

"American Society for Testing and Materials" (ASTM).

"Association of Analytical Chemists" (AOAC).

"Self-Davis and Moore" (2000).

FTN Associates, Ltd.
3 Innwood Circle, Suite 220
Little Rock, AR 72211

ANALYTICAL RESULTS

AIC No. 122899-1
Sample Identification: BC-0 9/17/08 1450

Analyte	Method	Result	RL	Units	Batch	Qualifier
Total Dissolved Solids	SM 2540C	180	10	mg/l	W26580	
Total Suspended Solids	USGS 3765	12	4	mg/l	W26571	
Chloride	EPA 300.0	7.8	0.2	mg/l	S23942	
Sulfate	EPA 300.0	4.1	0.2	mg/l	S23942	

AIC No. 122899-2
Sample Identification: UTO-1 9/17/08 0945

Analyte	Method	Result	RL	Units	Batch	Qualifier
Total Dissolved Solids	SM 2540C	440	10	mg/l	W26580	
Total Suspended Solids	USGS 3765	< 4	4	mg/l	W26571	
Chloride	EPA 300.0	83	2	mg/l	S23942	D
Sulfate	EPA 300.0	39	2	mg/l	S23942	D

AIC No. 122899-3
Sample Identification: UTO-2 9/17/08 0845

Analyte	Method	Result	RL	Units	Batch	Qualifier
Total Dissolved Solids	SM 2540C	480	10	mg/l	W26580	
Total Suspended Solids	USGS 3765	< 4	4	mg/l	W26571	
Chloride	EPA 300.0	82	2	mg/l	S23942	D
Sulfate	EPA 300.0	37	2	mg/l	S23942	D

AIC No. 122899-4
Sample Identification: BDV-0 9/18/08 1235

Analyte	Method	Result	RL	Units	Batch	Qualifier
Total Dissolved Solids	SM 2540C	250	10	mg/l	W26580	
Total Suspended Solids	USGS 3765	10	4	mg/l	W26571	
Chloride	EPA 300.0	34	2	mg/l	S23942	D
Sulfate	EPA 300.0	14	2	mg/l	S23942	D

AIC No. 122899-5
Sample Identification: BDV-1 9/16/08 0930

Analyte	Method	Result	RL	Units	Batch	Qualifier
Total Dissolved Solids	SM 2540C	220	10	mg/l	W26565	
Total Suspended Solids	USGS 3765	5.0	4	mg/l	W26555	
Chloride	EPA 300.0	33	2	mg/l	S23942	D
Sulfate	EPA 300.0	23	2	mg/l	S23942	D

AIC No. 122899-6
Sample Identification: BDV-2 9/16/08 1350

Analyte	Method	Result	RL	Units	Batch	Qualifier
Total Dissolved Solids	SM 2540C	200	10	mg/l	W26565	
Total Suspended Solids	USGS 3765	6.8	4	mg/l	W26555	
Chloride	EPA 300.0	34	2	mg/l	S23942	D
Sulfate	EPA 300.0	26	2	mg/l	S23942	D

AMERICAN INTERPLEX CORPORATION
LABORATORIES

FTN Associates, Ltd.
3 Innwood Circle, Suite 220
Little Rock, AR 72211

ANALYTICAL RESULTS

AIC No. 122899-7
Sample Identification: LC-0 9/17/08 0800

Analyte	Method	Result	RL	Units	Batch	Qualifier
Total Dissolved Solids	SM 2540C	160	10	mg/l	W26580	
Total Suspended Solids	USGS 3765	4.4	4	mg/l	W26571	
Chloride	EPA 300.0	18	2	mg/l	S23943	D
Sulfate	EPA 300.0	20	2	mg/l	S23943	D

AIC No. 122899-8
Sample Identification: Ref-0 9/18/08 0815

Analyte	Method	Result	RL	Units	Batch	Qualifier
Total Dissolved Solids	SM 2540C	49	10	mg/l	W26580	
Total Suspended Solids	USGS 3765	7.6	4	mg/l	W26571	
Chloride	EPA 300.0	5.0	0.2	mg/l	S23943	
Sulfate	EPA 300.0	1.1	0.2	mg/l	S23943	

AIC No. 122899-9
Sample Identification: Outfall 001 9/18/08 1105

Analyte	Method	Result	RL	Units	Batch	Qualifier
Total Dissolved Solids	SM 2540C	480	10	mg/l	W26580	
Total Suspended Solids	USGS 3765	4.4	4	mg/l	W26571	
Chloride	EPA 300.0	80	2	mg/l	S23943	D
Sulfate	EPA 300.0	43	2	mg/l	S23943	D

AIC No. 122899-10
Sample Identification: Field Blk 9/17/08 1442

Analyte	Method	Result	RL	Units	Batch	Qualifier
Total Dissolved Solids	SM 2540C	29	10	mg/l	W26580	
Total Suspended Solids	USGS 3765	< 4	4	mg/l	W26571	
Chloride	EPA 300.0	< 0.2	0.2	mg/l	S23943	
Sulfate	EPA 300.0	< 0.2	0.2	mg/l	S23943	

AMERICAN INTERPLEX CORPORATION
LABORATORIES

FTN Associates, Ltd.
3 Innwood Circle, Suite 220
Little Rock, AR 72211

SAMPLE PREPARATION REPORT

AIC No. 122899-1

Analyte	Date/Time Prepared	By	Date/Time Analyzed	By	Dilution	Batch	Qualifier
Total Dissolved Solids	24SEP08 0759	275	25SEP08 1327	275		W26580	
Total Suspended Solids	23SEP08 1055	21	24SEP08 0908	21		W26571	
Chloride	-		19SEP08 1131	257		S23942	
Sulfate	-		19SEP08 1131	257		S23942	

AIC No. 122899-2

Analyte	Date/Time Prepared	By	Date/Time Analyzed	By	Dilution	Batch	Qualifier
Total Dissolved Solids	24SEP08 0759	275	25SEP08 1327	275		W26580	
Total Suspended Solids	23SEP08 1055	21	24SEP08 0908	21		W26571	
Chloride	-		19SEP08 1131	257	10	S23942	D
Sulfate	-		19SEP08 1131	257	10	S23942	D

AIC No. 122899-3

Analyte	Date/Time Prepared	By	Date/Time Analyzed	By	Dilution	Batch	Qualifier
Total Dissolved Solids	24SEP08 0759	275	25SEP08 1327	275		W26580	
Total Suspended Solids	23SEP08 1055	21	24SEP08 0908	21		W26571	
Chloride	-		19SEP08 1131	257	10	S23942	D
Sulfate	-		19SEP08 1131	257	10	S23942	D

AIC No. 122899-4

Analyte	Date/Time Prepared	By	Date/Time Analyzed	By	Dilution	Batch	Qualifier
Total Dissolved Solids	24SEP08 0759	275	25SEP08 1327	275		W26580	
Total Suspended Solids	23SEP08 1055	21	24SEP08 0908	21		W26571	
Chloride	-		19SEP08 1131	257	10	S23942	D
Sulfate	-		19SEP08 1131	257	10	S23942	D

AIC No. 122899-5

Analyte	Date/Time Prepared	By	Date/Time Analyzed	By	Dilution	Batch	Qualifier
Total Dissolved Solids	23SEP08 0915	275	24SEP08 1654	275		W26565	
Total Suspended Solids	22SEP08 0808	21	23SEP08 0910	21		W26555	
Chloride	-		19SEP08 1131	257	10	S23942	D
Sulfate	-		19SEP08 1131	257	10	S23942	D

AIC No. 122899-6

Analyte	Date/Time Prepared	By	Date/Time Analyzed	By	Dilution	Batch	Qualifier
Total Dissolved Solids	23SEP08 0915	275	24SEP08 1654	275		W26565	
Total Suspended Solids	22SEP08 0808	21	23SEP08 0910	21		W26555	
Chloride	-		19SEP08 1131	257	10	S23942	D
Sulfate	-		19SEP08 1131	257	10	S23942	D

AIC No. 122899-7

Analyte	Date/Time Prepared	By	Date/Time Analyzed	By	Dilution	Batch	Qualifier
Total Dissolved Solids	24SEP08 0759	275	25SEP08 1327	275		W26580	
Total Suspended Solids	23SEP08 1055	21	24SEP08 0908	21		W26571	

AMERICAN INTERPLEX CORPORATION
LABORATORIES

FTN Associates, Ltd.
3 Innwood Circle, Suite 220
Little Rock, AR 72211

SAMPLE PREPARATION REPORT

AIC No. 122899-7 (Continued)

Analyte	Date/Time Prepared	By	Date/Time Analyzed	By	Dilution	Batch	Qualifier
Chloride	-		19SEP08 1133	257	10	S23943	D
Sulfate	-		19SEP08 1133	257	10	S23943	D

AIC No. 122899-8

Analyte	Date/Time Prepared	By	Date/Time Analyzed	By	Dilution	Batch	Qualifier
Total Dissolved Solids	24SEP08 0759	275	25SEP08 1327	275		W26580	
Total Suspended Solids	23SEP08 1055	21	24SEP08 0908	21		W26571	
Chloride	-		19SEP08 1133	257		S23943	
Sulfate	-		19SEP08 1133	257		S23943	

AIC No. 122899-9

Analyte	Date/Time Prepared	By	Date/Time Analyzed	By	Dilution	Batch	Qualifier
Total Dissolved Solids	24SEP08 0759	275	25SEP08 1327	275		W26580	
Total Suspended Solids	23SEP08 1055	21	24SEP08 0908	21		W26571	
Chloride	-		19SEP08 1133	257	10	S23943	D
Sulfate	-		19SEP08 1133	257	10	S23943	D

AIC No. 122899-10

Analyte	Date/Time Prepared	By	Date/Time Analyzed	By	Dilution	Batch	Qualifier
Total Dissolved Solids	24SEP08 0759	275	25SEP08 1327	275		W26580	
Total Suspended Solids	23SEP08 1055	21	24SEP08 0908	21		W26571	
Chloride	-		19SEP08 1133	257		S23943	
Sulfate	-		19SEP08 1133	257		S23943	

AMERICAN INTERPLEX CORPORATION
LABORATORIES

FTN Associates, Ltd.
3 Innwood Circle, Suite 220
Little Rock, AR 72211

SAMPLE DUPLICATE RESULTS

AIC No. 122899-1

Analyte	Method	Sample Result	Duplicate Result	Units	RPD	RPD Limit	Batch	Qualifier
Total Suspended Solids	USGS 3765	12	12	mg/l	0.00	20	W26571	

LABORATORY CONTROL SAMPLE RESULTS

Analyte	Spike Amount	% Recovery	% Recovery Limits	RPD	RPD Limit	Batch	Qualifier
Total Dissolved Solids	250 mg/l	99.8/101	85-115	1.20	10	W26565	
Total Dissolved Solids	250 mg/l	101/101	85-115	0.199	10	W26580	
Total Suspended Solids	200 mg/l	105/104	80-120	0.957	20	W26555	
Total Suspended Solids	200 mg/l	102/99.0	80-120	2.99	20	W26571	
Chloride	5 mg/l	101/101	90-110	0.792	10	S23942	
Chloride	5 mg/l	99.8/97.8	90-110	2.02	10	S23943	
Sulfate	5 mg/l	102/98.0	90-110	3.61	10	S23942	
Sulfate	5 mg/l	99.8/98.2	90-110	1.62	10	S23943	

MATRIX SPIKE SAMPLE RESULTS

Analyte	Spike Amount	% Recovery	% Recovery Limits	RPD	RPD Limit	Batch	Qualifier
Chloride	5 mg/l	91.0/93.4	80-120	1.28	10	S23942	
Chloride	5 mg/l	- / -	80-120	4.22	10	S23943	X
Sulfate	5 mg/l	89.2/94.1	80-120	2.52	10	S23942	
Sulfate	5 mg/l	- / -	80-120	2.47	10	S23943	X

LABORATORY BLANK RESULTS

Analyte	Method	Result	Units	RL	PQL	QC Sample	Qual
Total Dissolved Solids	SM 2540C	< 10	mg/l	10	10	W26565-1	
Total Dissolved Solids	SM 2540C	< 10	mg/l	10	10	W26580-1	
Total Suspended Solids	USGS 3765	< 4	mg/l	4	4	W26555-1	
Total Suspended Solids	USGS 3765	< 4	mg/l	4	4	W26571-1	
Chloride	EPA 300.0	< 0.2	mg/l	0.2	0.2	S23942-1	
Sulfate	EPA 300.0	< 0.2	mg/l	0.2	0.2	S23942-1	
Chloride	EPA 300.0	< 0.2	mg/l	0.2	0.2	S23943-1	
Sulfate	EPA 300.0	< 0.2	mg/l	0.2	0.2	S23943-1	

AMERICAN INTERPLEX CORPORATION
LABORATORIES

FTN Associates, Ltd.
3 Innwood Circle, Suite 220
Little Rock, AR 72211

QUALITY CONTROL PREPARATION REPORT

DUPLICATE SAMPLES

Analyte	Date/Time Prepared By		Date/Time Analyzed By		Dilution	QC Sample	Qualifier
Total Suspended Solids	23SEP08 1055	21	24SEP08 0908	21		W26571-4	

LABORATORY CONTROL SAMPLES

Analyte	Date/Time Prepared By		Date/Time Analyzed By		Dilution	QC Sample	Qualifier
Total Dissolved Solids	23SEP08 1412	275	24SEP08 1654	275		W26565-2	
Total Dissolved Solids	23SEP08 1412	275	24SEP08 1654	275		W26565-3	
Total Dissolved Solids	24SEP08 0759	275	25SEP08 1327	275		W26580-2	
Total Dissolved Solids	24SEP08 0759	275	25SEP08 1327	275		W26580-3	
Total Suspended Solids	22SEP08 0809	21	23SEP08 0910	21		W26555-2	
Total Suspended Solids	22SEP08 0809	21	23SEP08 0910	21		W26555-3	
Total Suspended Solids	23SEP08 1055	21	24SEP08 0908	21		W26571-2	
Total Suspended Solids	23SEP08 1055	21	24SEP08 0908	21		W26571-3	
Chloride	-		19SEP08 1131	257		S23942-2	
Chloride	-		19SEP08 1131	257		S23942-3	
Chloride	-		19SEP08 1133	257		S23943-2	
Chloride	-		19SEP08 1133	257		S23943-3	
Sulfate	-		19SEP08 1131	257		S23942-2	
Sulfate	-		19SEP08 1131	257		S23942-3	
Sulfate	-		19SEP08 1133	257		S23943-2	
Sulfate	-		19SEP08 1133	257		S23943-3	

MATRIX SPIKE SAMPLES

Analyte	Date/Time Prepared By		Date/Time Analyzed By		Dilution	QC Sample	Qualifier
Chloride	-		19SEP08 1131	257		S23942-4	
Chloride	-		19SEP08 1131	257		S23942-5	
Chloride	-		19SEP08 1133	257		S23943-4	X
Chloride	-		19SEP08 1133	257		S23943-5	X
Sulfate	-		19SEP08 1131	257		S23942-4	
Sulfate	-		19SEP08 1131	257		S23942-5	
Sulfate	-		19SEP08 1133	257		S23943-4	X
Sulfate	-		19SEP08 1133	257		S23943-5	X

LABORATORY BLANKS

Analyte	Date/Time Prepared By		Date/Time Analyzed By		Dilution	QC Sample	Qualifier
Total Dissolved Solids	23SEP08 1412	275	24SEP08 1654	275		W26565-1	
Total Dissolved Solids	24SEP08 0759	275	25SEP08 1327	275		W26580-1	
Total Suspended Solids	22SEP08 0809	21	23SEP08 0910	21		W26555-1	
Total Suspended Solids	23SEP08 1055	21	24SEP08 0908	21		W26571-1	
Chloride	-		19SEP08 1131	257		S23942-1	
Chloride	-		19SEP08 1133	257		S23943-1	
Sulfate	-		19SEP08 1131	257		S23942-1	

AMERICAN INTERPLEX CORPORATION
LABORATORIES

FTN Associates, Ltd.
3 Innwood Circle, Suite 220
Little Rock, AR 72211

QUALITY CONTROL PREPARATION REPORT

LABORATORY BLANKS

Analyte	Date/Time Prepared By	Date/Time Analyzed By	Dilution	QC Sample	Qualifier
Sulfate	-	19SEP08 1133 257		S23943-1	

AMERICAN INTERPLEX CORPORATION
LABORATORIES

CHAIN OF CUSTODY / ANALYSIS REQUEST FORM

Client: FTN
Project Reference: 4700W-020
Project Manager: Jim Malcolm
Sampled By: PJD

PO No.

SAMPLE MATRIX: W A T E R; S O I L

NO OF BOTTLES

ANALYSES REQUESTED: Chloride; Sulfate; TDS; TSS

AIC CONTROL NO: 122899
AIC PROPOSAL NO:
Carrier:
Received Temperature C: 2

AIC No.	Sample Identification	Date/Time Collected	GRAB	COMP	WATER	SOIL	NO OF BOTTLES	Chloride	Sulfate	TDS	TSS	Remarks
1	BC-0	9/17/08 1450	✓					✓	✓	✓	✓	
2	UT-0-1	9/17/08 0845	✓					✓	✓	✓	✓	
3	UT-0-2	9/17/08 0845	✓					✓	✓	✓	✓	
4	BDV-0	9/16/08 1735	✓					✓	✓	✓	✓	
5	BDV-1	9/16/08 0930	✓					✓	✓	✓	✓	
6	BDV-2	9/16/08 1350	✓					✓	✓	✓	✓	
7	LC-0	9/17/08 0800	✓					✓	✓	✓	✓	
		Container Type										Field pH calibration
		Preservative										on ____ @ ____ Buffer:

G = Glass P = Plastic V = VOA vials H = HCl to pH2 T = Sodium Thiosulfate
NO = none S = Sulfuric acid pH2 N = Nitric acid pH2 B = NaOH to pH12 Z = Zinc acetate

Turnaround Time Requested: (Please circle)
NORMAL or EXPEDITED IN ____ DAYS
Expedited results requested by: ____
Who should AIC contact with questions: Jim Malcolm
Phone: 225-7779 Fax: ____
Report Attention to: Jim Malcolm
Report Address to:

Relinquished By:	Date/Time	Received By:	Date/Time
[signature]	9/18/08 1500		
Relinquished By:	Date/Time	Received in Lab By: [signature]	Date/Time 9-18-08 1500

Comments:

AMERICAN INTERPLEX CORPORATION
LABORATORIES

CHAIN OF CUSTODY / ANALYSIS REQUEST FORM

Client: FTN
Project Reference: 4700.11-020
Project Manager: Jim Malcolm
Sampled By: POD

PO No.

SAMPLE MATRIX: WATER, SOIL

AIC No.	Sample Identification	Date/Time Collected	GRAB	COMP	WATER	SOIL	NO OF BOTTLES	Alkalinity	Sulfate	TDS	TSS
8	REF-0	9/18/08 0915	✓					✓	✓	✓	✓
9	Outfall 001	9/18/08 1105	✓					✓	✓	✓	✓
10	Field Blk	9/17/08 1442	✓					✓	✓	✓	✓
		Container Type									
		Preservative									

ANALYSES REQUESTED

AIC CONTROL NO: 122899
AIC PROPOSAL NO:
Carrier:
Received Temperature C: 2
Remarks
Field pH calibration on _____ @ _____ Buffer:

G = Glass P = Plastic V = VOA vials H = HCl to pH2 T = Sodium Thiosulfate
NO = none S = Sulfuric acid pH2 N = Nitric acid pH2 B = NaOH to pH12 Z = Zinc acetate

Turnaround Time Requested: (Please circle)
~~NORMAL~~ or EXPEDITED IN ____ DAYS
Expedited results requested by: _____
Who should AIC contact with questions: Jim Malcolm
Phone: 225 7779 Fax: _____
Report Attention to: Jim Malcolm
Report Address to:

Relinquished By:	Date/Time	Received By:	Date/Time
[signature]	9/18/08 1500		
Relinquished By:	Date/Time	Received in Lab By: Eugene Hopton	Date/Time 9-18-08 1500

Comments:

AMERICAN INTERPLEX CORPORATION
LABORATORIES

CHAIN OF CUSTODY / ANALYSIS REQUEST FORM

Client: FTN
Project Reference: 4700[illegible]-020
Project Manager: Jim Malcolm
Sampled By: POD

PO No.

SAMPLE MATRIX: W A T E R | S O I L

NO OF BOTTLES

ANALYSES REQUESTED: Chloride | Sulfate | TSS | TSS

AIC CONTROL NO:
AIC PROPOSAL NO:
Carrier:
Received Temperature C

AIC No.	Sample Identification	Date/Time Collected	GRAB	COMP	WATER	SOIL	BOTTLES	Chloride	Sulfate	TSS	TSS	Remarks
	REF-0	9/18/03 0915	✓					✓	✓	✓	✓	
	Outfall 001	9/18/03 1105	✓					✓	✓	✓	✓	
	Field Blk	9/17/03 1442	✓					✓	✓	✓	✓	
		Container Type										Field pH calibration
		Preservative										on _____ @ _____
												Buffer:

G = Glass P = Plastic V = VOA vials H = HCl to pH2 T = Sodium Thiosulfate
NO = none S = Sulfuric acid pH2 N = Nitric acid pH2 B = NaOH to pH12 Z = Zinc acetate

Turnaround Time Requested: (Please circle)
~~NORMAL~~ or EXPEDITED IN ____ DAYS
Expedited results requested by: _____
Who should AIC contact with questions: Jim Malcolm
Phone: 225-7779 Fax: _____
Report Attention to: Jim Malcolm
Report Address to:

Relinquished By:	Date/Time	Received By:	Date/Time
[signature]	9/18/03 1500		
Relinquished By:	Date/Time	Received in Lab By: Eugene Hampton	Date/Time 9-18-03 1500

Comments:

AMERICAN INTERPLEX CORPORATION
LABORATORIES

CHAIN OF CUSTODY / ANALYSIS REQUEST FORM

Client: FTN
Project Reference: 4700W-020
Project Manager: Jim Malcolm
Sampled By: PJD
PO No.:

AIC No.	Sample Identification	Date/Time Collected	GRAB	COMP	SAMPLE MATRIX: WATER	SOIL	NO OF BOTTLES	Chloride	Sulfate	TDS	TSS
1	BCØ	9/17/08 1450	✓					✓	✓	✓	✓
2	UTØ-1	9/17/08 0845	✓					✓	✓	✓	✓
3	UTØ-2	9/17/08 0845	✓					✓	✓	✓	✓
4	BDV-Ø	9/16/08 1735	✓					✓	✓	✓	✓
5	BDV-1	9/16/08 0930	✓					✓	✓	✓	✓
6	BDV-2	9/16/08 1350	✓					✓	✓	✓	✓
7	LC-O	9/17/08 0800	✓					✓	✓	✓	✓
		Container Type									
		Preservative									

AIC CONTROL NO: 122899
AIC PROPOSAL NO:
Carrier:
Received Temperature C: 2
Remarks:
Field pH calibration on _____ @ _____
Buffer:

G = Glass P = Plastic V = VOA vials H = HCl to pH2 T = Sodium Thiosulfate
NO = none S = Sulfuric acid pH2 N = Nitric acid pH2 B = NaOH to pH12 Z = Zinc acetate

Turnaround Time Requested: (Please circle)
NORMAL or EXPEDITED IN ____ DAYS
Expedited results requested by: _____
Who should AIC contact with questions: Jim Malcolm
Phone: 325-7779 Fax: _____
Report Attention to: Jim Malcolm
Report Address to:

Relinquished By:	Date/Time	Received By:	Date/Time
Richard J. Deering	9/18/08 1500		
Relinquished By:	Date/Time	Received in Lab By: Eugene Hopton	Date/Time 9-18-08 1500

Comments:

AMERICAN INTERPLEX CORPORATION
LABORATORIES

October 3, 2008

FTN, Associates, Ltd.
ATTN: Mr. Jim Malcolm
3 Innwood Circle, Suite 220
Little Rock, AR 72211

Re: Chronic Toxicity Screen
American Interplex Corporation Control No. 122838

Dear Mr. Malcolm:

On September 17, 2008, three water samples identified as "001", project no. 4470W-040 were received for analytical testing as well as a chronic toxicity screen. As instructed, the toxicity screen was conducted only on the sample identified as "001 9-16, 13:59". The results of the testing are attached.

If I can be of any further assistance with this matter, please feel free to contact me.

Sincerely,

AMERICAN INTERPLEX CORPORATION

John Overbey
Laboratory Director

JO

Cc: Mr. Pat Downey

AMERICAN INTERPLEX CORPORATION

Static Renewal Definitive Chronic Toxicity Toxicity Test
Pimephales promelas Fathead Minnow 7-Day Growth

Date and Time Test Initiated: September 17, 2008 at 1700
Date and Time Test Terminated: September 24, 2008 at 1700

Drying Time : 15 hours
Drying Temp: 104 Deg. C

Concentration	Replicate	Weight of Pan	Weight of Pan + Fish	Total wt of Fish (g)	# of fish weighed	Mean dry wt. (mg)
Control	A	1.02661	1.02878	0.00217	8	0.271
	B	1.01668	1.01921	0.00253	8	0.316
	C	1.02243	1.02510	0.00267	8	0.334
	D	1.01983	1.02221	0.00238	8	0.298
	E	1.03320	1.03533	0.00213	8	0.266
100%	A	1.00631	1.00868	0.00237	8	0.296
	B	1.01076	1.01319	0.00243	8	0.304
	C	1.00671	1.00905	0.00234	8	0.292
	D	0.99674	0.99952	0.00278	8	0.348
	E	1.01607	1.01860	0.00253	8	0.316

AMERICAN INTERPLEX CORPORATION

Static Renewal Definitive Chronic Toxicity Toxicity Test
Pimephales promelas Fathead Minnow 7-Day Survival

Date and Time Test Initiated: September 17, 2008 at 1700
Date and Time Test Terminated: September 24, 2008 at 1700

Concentration	Replicate	No. Survivors						
		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Control	A	8	8	8	8	8	8	8
	B	8	8	8	8	8	8	8
	C	8	8	8	8	8	8	8
	D	8	8	8	8	8	7	7
	E	8	8	8	8	8	8	8
100%	A	8	8	8	8	8	8	8
	B	8	8	8	8	8	8	8
	C	8	8	8	8	8	8	8
	D	8	8	8	8	8	8	8
	E	8	8	8	8	8	8	8

AMERICAN INTERPLEX CORPORATION

Static Renewal Definitive Chronic Toxicity Test
Survival and Reproduction data for *Ceriodaphnia dubia*

Date and Time Test Initiated: September 17, 2008 at 1730
Date and Time Test Terminated: September 23, 2008 at 1730

Concentration: Control													
Day	Replicate										No. of Young	No. of Adults	Young per Adult
	1	2	3	4	5	6	7	8	9	10			
1	0	0	0	0	0	0	0	0	0	0	0	10	0.00
2	0	0	0	0	0	0	0	0	0	0	0	10	0.00
3	0	0	0	0	0	0	0	0	0	0	0	10	0.00
4	7	4	4	8	7	4	3	3	6	6	52	10	5.20
5	11	10	12	11	13	12	9	11	9	11	109	10	10.9
6	0	11	14	11	0	16	14	16	0	12	94	10	9.40
7													
8													
Total	18	25	30	30	20	32	26	30	15	29	255	10	25.5

Concentration: 100 %													
Day	Replicate										No. of Young	No. of Adults	Young per Adult
	1	2	3	4	5	6	7	8	9	10			
1	0	0	0	0	0	0	0	0	0	0	0	10	0.00
2	0	0	0	0	0	0	0	0	0	0	0	10	0.00
3	0	0	0	0	0	0	0	0	0	0	0	10	0.00
4	8	4	4	4	7	7	4	4	3	5	50	10	5.00
5	12	14	11	16	10	10	13	9	11	10	116	10	11.6
6	0	12	16	14	0	14	15	13	0	12	96	10	9.60
7													
8													
Total	20	30	31	34	17	31	32	26	14	27	262	10	26.2

AMERICAN INTERPLEX CORPORATION
LABORATORIES

October 3, 2008
Control No. 122838

FTN Associates, Ltd.
ATTN: Mr. Jim Malcolm
3 Innwood Circle, Suite 220
Little Rock, AR 72211

Dear Mr. Jim Malcolm:

Project Description: Three (3) water sample(s) September 17, 2008
4470W-040
Jonesboro

This report is the analytical results and supporting information for the samples submitted to American Interplex Corporation (AIC) on September 17, 2008. The following results are applicable only to the samples identified by the control number referenced above. Accurate assessment of the data requires access to the entire document. Each section of the report has been reviewed and approved by the appropriate laboratory director or a qualified designee.

Data has been validated using standard quality control measures performed on at least 10% of the samples analyzed. Quality Assurance, instrumentation, maintenance and calibration were performed in accordance with guidelines established by the cited methodology.

AMERICAN INTERPLEX CORPORATION

By _____
John Overbey
Laboratory Director

Enclosure(s): Chain of Custody

PDF cc: FTN Associates, Ltd.
ATTN: Mr. Jim Malcolm
jtm@ftn-assoc.com

FTN Associates, Ltd.
ATTN: Mr. Pat Downey
pjd@ftn-assoc.com

AMERICAN INTERPLEX CORPORATION
LABORATORIES

FTN Associates, Ltd.
3 Innwood Circle, Suite 220
Little Rock, AR 72211

CASE NARRATIVE

SAMPLE RECEIPT

Received Temperature: 2°C

Receipt Verification:	Complete Chain of Custody	Y
	Sample ID on Sample Labels	Y
	Date and Time on Sample Labels	Y
	Proper Sample Containers	Y
	Within Holding Times	Y
	Adequate Sample Volume	Y
	Sample Integrity	Y
	Proper Temperature	Y
	Proper Preservative	Y

QUALIFIERS

Qualifiers	Definition
D	Result is from a secondary dilution factor
X	Spiking level is invalid due to the high concentration of analyte in the spiked sample

References:

"Methods for Chemical Analysis of Water and Wastes", EPA/600/4-79-020 (Mar 1983) with updates and supplements EPA/600/5-91-010 (Jun 1991), EPA/600/R-92-129 (Aug 1992) and EPA/600/R-93-100 (Aug 1993).

"Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW846)", Third Edition.

"Standard Methods for the Examination of Water and Wastewaters", 20th edition, 1998.

"American Society for Testing and Materials" (ASTM).

"Association of Analytical Chemists" (AOAC).

"Self-Davis and Moore" (2000).

AMERICAN INTERPLEX CORPORATION
LABORATORIES

FTN Associates, Ltd.
3 Innwood Circle, Suite 220
Little Rock, AR 72211

ANALYTICAL RESULTS

AIC No. 122838-1
Sample Identification: 001 9-16-08 13:59,14:00,14:04

Analyte	Method	Result	RL	Units	Batch	Qualifier
Total Dissolved Solids	SM 2540C	450	10	mg/l	W26565	
Chloride	EPA 300.0	73	2	mg/l	S23936	D
Sulfate	EPA 300.0	34	2	mg/l	S23936	D

AIC No. 122838-2
Sample Identification: 001 9-16-08 14:00

Analyte	Method	Result	RL	Units	Batch	Qualifier
Total Dissolved Solids	SM 2540C	450	10	mg/l	W26565	
Chloride	EPA 300.0	78	2	mg/l	S23936	D
Sulfate	EPA 300.0	55	2	mg/l	S23936	D

AIC No. 122838-3
Sample Identification: 001 9-16-08 14:04

Analyte	Method	Result	RL	Units	Batch	Qualifier
Total Dissolved Solids	SM 2540C	460	10	mg/l	W26565	
Chloride	EPA 300.0	73	2	mg/l	S23936	D
Sulfate	EPA 300.0	35	2	mg/l	S23936	D

AMERICAN INTERPLEX CORPORATION
LABORATORIES

FTN Associates, Ltd.
3 Innwood Circle, Suite 220
Little Rock, AR 72211

SAMPLE PREPARATION REPORT

AIC No. 122838-1

Analyte	Date/Time Prepared By	Date/Time Analyzed By	Dilution	Batch	Qualifier
Total Dissolved Solids	23SEP08 0915 275	24SEP08 1654 275		W26565	
Chloride	-	18SEP08 1342 257	10	S23936	D
Sulfate	-	18SEP08 1342 257	10	S23936	D

AIC No. 122838-2

Analyte	Date/Time Prepared By	Date/Time Analyzed By	Dilution	Batch	Qualifier
Total Dissolved Solids	23SEP08 0915 275	24SEP08 1654 275		W26565	
Chloride	-	18SEP08 1342 257	10	S23936	D
Sulfate	-	18SEP08 1342 257	10	S23936	D

AIC No. 122838-3

Analyte	Date/Time Prepared By	Date/Time Analyzed By	Dilution	Batch	Qualifier
Total Dissolved Solids	23SEP08 0915 275	24SEP08 1654 275		W26565	
Chloride	-	18SEP08 1342 257	10	S23936	D
Sulfate	-	18SEP08 1342 257	10	S23936	D

AMERICAN INTERPLEX CORPORATION
LABORATORIES

FTN Associates, Ltd.
3 Innwood Circle, Suite 220
Little Rock, AR 72211

SAMPLE DUPLICATE RESULTS

AIC No. 122838-1

Analyte	Method	Sample Result	Duplicate Result	Units	RPD	RPD Limit	Batch	Qualifier
Total Dissolved Solids	SM 2540C	450	450	mg/l	1.33	10	W26565	

LABORATORY CONTROL SAMPLE RESULTS

Analyte	Spike Amount	% Recovery	% Recovery Limits	RPD	RPD Limit	Batch	Qualifier
Total Dissolved Solids	250 mg/l	99.8/101	85-115	1.20	10	W26565	
Chloride	5 mg/l	103/101	90-110	1.76	10	S23936	
Sulfate	5 mg/l	103/104	90-110	0.964	10	S23936	

MATRIX SPIKE SAMPLE RESULTS

Analyte	Spike Amount	% Recovery	% Recovery Limits	RPD	RPD Limit	Batch	Qualifier
Chloride	5 mg/l	- / -	80-120	1.05	10	S23936	X
Sulfate	5 mg/l	- / -	80-120	0.331	10	S23936	X

LABORATORY BLANK RESULTS

Analyte	Method	Result	Units	RL	PQL	QC Sample	Qual
Total Dissolved Solids	SM 2540C	< 10	mg/l	10	10	W26565-1	
Chloride	EPA 300.0	< 0.2	mg/l	0.2	0.2	S23936-1	
Sulfate	EPA 300.0	< 0.2	mg/l	0.2	0.2	S23936-1	

AMERICAN INTERPLEX CORPORATION
LABORATORIES

FTN Associates, Ltd.
3 Innwood Circle, Suite 220
Little Rock, AR 72211

QUALITY CONTROL PREPARATION REPORT

DUPLICATE SAMPLES

Analyte	Date/Time Prepared By	Date/Time Analyzed By	Dilution	QC Sample	Qualifier
Total Dissolved Solids	23SEP08 1412 275	24SEP08 1654 275		W26565-4	

LABORATORY CONTROL SAMPLES

Analyte	Date/Time Prepared By	Date/Time Analyzed By	Dilution	QC Sample	Qualifier
Total Dissolved Solids	23SEP08 1412 275	24SEP08 1654 275		W26565-2	
Total Dissolved Solids	23SEP08 1412 275	24SEP08 1654 275		W26565-3	
Chloride	-	18SEP08 1343 257		S23936-2	
Chloride	-	18SEP08 1343 257		S23936-3	
Sulfate	-	18SEP08 1343 257		S23936-2	
Sulfate	-	18SEP08 1343 257		S23936-3	

MATRIX SPIKE SAMPLES

Analyte	Date/Time Prepared By	Date/Time Analyzed By	Dilution	QC Sample	Qualifier
Chloride	-	18SEP08 1343 257		S23936-4	X
Chloride	-	18SEP08 1343 257		S23936-5	X
Sulfate	-	18SEP08 1343 257		S23936-4	X
Sulfate	-	18SEP08 1343 257		S23936-5	X

LABORATORY BLANKS

Analyte	Date/Time Prepared By	Date/Time Analyzed By	Dilution	QC Sample	Qualifier
Total Dissolved Solids	23SEP08 1412 275	24SEP08 1654 275		W26565-1	
Chloride	-	18SEP08 1343 257		S23936-1	
Sulfate	-	18SEP08 1343 257		S23936-1	

122838

Date	Project Name	Project No.	Project Manager (Print)	Page
9-17-08	**Jonesboro**	**4470W-040**	**Jim Malcolm**	Page 1 of 1

Report and Bill to:	Submitted by:
Jim Malcolm FTN Associates, Ltd. 3 Innwood Circle, Suite 220 Little Rock, AR 72211 (501) 225-7779 • Fax (501) 225-6738	FTN Associates, Ltd. 3 Innwood Circle, Suite 220 Little Rock, AR 72211 (501) 225-7779 • Fax (501) 225-6738
Sampler Signature(s)	Recorded By (Print) David Rupe

Lab Turn-Around-Time
- ☐ 24 Hours
- ☐ 48 Hours
- ☒ Normal
- ☐ Other:

Due: / /

SAMPLE DESCRIPTION

Sample Identification	Date	Time	Matrix* W	Matrix* S	Matrix* O	No. of Containers	Comp	Grab	Parameters (Method Number): Chronic Toxicity test using C. dubia, P. prometas @ 100% only	Parameters (Method Number): TDS, Chloride, sulfate	Laboratory Notes
001	9-16-	13:59	X			3		X	X	X	
001	9-16-	14:00	X			3		X	X	X	
001	9-16-	14:04	X			3		X	X	X	
						Container Type			P	P	
						Preservative			NO	NO	

* Matrix: W = Water S = Soil O = Other

G = Glass P = Plastic V = VOA vials H = HCl to pH2 T = Sodium Thiosulfate

NO = None S = Sulfuric acid pH2 N = Nitric acid pH2 B = NaOH to pH12 Z = Zinc acetate

Relinquished By (Signature)	Print Name	Date	Time	Received By (Signature)	Print Name	Date	Time
	David Rupe						
Relinquished By (Signature)	Print Name	Date	Time	Received By Laboratory (Signature)	Print Name	Date	Time
		9/17/08	0905	Eugene Hampton	Eugene Hampton	9-17-08	0905

Sampler Remarks: Use samples for all renewals; each sample is the same water.

Call Pat Downey @ 501-860-4447 if you have questions.

Laboratory Remarks:

Revision Date 11/22/02

AMERICAN INTERPLEX CORPORATION
LABORATORIES

May 19, 2009
Control No. 129188

FTN Associates, Ltd.
ATTN: Mr. Jim Malcolm
3 Innwood Circle, Suite 220
Little Rock, AR 72211

Dear Mr. Jim Malcolm:

Project Description: Eight (8) water sample(s) received on May 15, 2009
CWL UAA
4470W-040

This report is the analytical results and supporting information for the samples submitted to American Interplex Corporation (AIC) on May 15, 2009. The following results are applicable only to the samples identified by the control number referenced above. Accurate assessment of the data requires access to the entire document. Each section of the report has been reviewed and approved by the laboratory director or a qualified designee.

Data has been validated using standard quality control measures performed on at least 10% of the samples analyzed. Quality Assurance, instrumentation, maintenance and calibration were performed in accordance with guidelines established by the cited methodology.

AMERICAN INTERPLEX CORPORATION

By _____ By KW
John Overbey
Laboratory Director

Enclosure(s): Chain of Custody

PDF cc: FTN Associates, Ltd.
ATTN: Mr. Jim Malcolm
jtm@ftn-assoc.com

FTN Associates, Ltd.
ATTN: Mr. Pat Downey
pjd@ftn-assoc.com

FTN Associates, Ltd.
ATTN: Mr. Jimmy Rogers
jjr@ftn-assoc.com

AMERICAN INTERPLEX CORPORATION
LABORATORIES

FTN Associates, Ltd.
3 Innwood Circle, Suite 220
Little Rock, AR 72211

CASE NARRATIVE

SAMPLE RECEIPT

Received Temperature: 2°C

Receipt Verification:	Complete Chain of Custody	Y
	Sample ID on Sample Labels	Y
	Date and Time on Sample Labels	Y
	Proper Sample Containers	Y
	Within Holding Times	Y
	Adequate Sample Volume	Y
	Sample Integrity	Y
	Proper Temperature	Y
	Proper Preservative	Y

QUALIFIERS

Qualifiers	Definition
D	Result is from a secondary dilution factor

References:

"Methods for Chemical Analysis of Water and Wastes", EPA/600/4-79-020 (Mar 1983) with updates and supplements EPA/600/5-91-010 (Jun 1991), EPA/600/R-92-129 (Aug 1992) and EPA/600/R-93-100 (Aug 1993).

"Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW846)", Third Edition.

"Standard Methods for the Examination of Water and Wastewaters", 20th edition, 1998.

"American Society for Testing and Materials" (ASTM).

"Association of Analytical Chemists" (AOAC).

"Self-Davis and Moore" (2000).

AMERICAN INTERPLEX CORPORATION
LABORATORIES

FTN Associates, Ltd.
3 Innwood Circle, Suite 220
Little Rock, AR 72211

ANALYTICAL RESULTS

AIC No. 129188-1
Sample Identification: BDV-O 5-14-09 1315

Analyte	Method	Result	RL	Units	Batch	Qualifier
Total Dissolved Solids	SM 2540C	100	10	mg/l	W29016	
Total Suspended Solids	USGS 3765	150	4	mg/l	W29039	
Chloride	EPA 300.0	3.1	0.2	mg/l	S25555	
Sulfate	EPA 300.0	4.1	0.2	mg/l	S25555	

AIC No. 129188-2
Sample Identification: LC-O 5-13-09 1830

Analyte	Method	Result	RL	Units	Batch	Qualifier
Total Dissolved Solids	SM 2540C	72	10	mg/l	W29016	
Total Suspended Solids	USGS 3765	28	4	mg/l	W29039	
Chloride	EPA 300.0	3.3	0.2	mg/l	S25555	
Sulfate	EPA 300.0	5.1	0.2	mg/l	S25555	

AIC No. 129188-3
Sample Identification: 001 5-14-09 1115

Analyte	Method	Result	RL	Units	Batch	Qualifier
Total Dissolved Solids	SM 2540C	270	10	mg/l	W29016	
Total Suspended Solids	USGS 3765	12	4	mg/l	W29039	
Chloride	EPA 300.0	37	2	mg/l	S25555	D
Sulfate	EPA 300.0	23	2	mg/l	S25555	D

AIC No. 129188-4
Sample Identification: UT-O 5-13-09 1415

Analyte	Method	Result	RL	Units	Batch	Qualifier
Total Dissolved Solids	SM 2540C	340	10	mg/l	W29016	
Total Suspended Solids	USGS 3765	8.8	4	mg/l	W29039	
Chloride	EPA 300.0	50	2	mg/l	S25555	D
Sulfate	EPA 300.0	29	0.2	mg/l	S25555	

AIC No. 129188-5
Sample Identification: BDV-1 5-14-09 1230

Analyte	Method	Result	RL	Units	Batch	Qualifier
Total Dissolved Solids	SM 2540C	91	10	mg/l	W29016	
Total Suspended Solids	USGS 3765	720	4	mg/l	W29039	
Chloride	EPA 300.0	3.6	0.2	mg/l	S25555	
Sulfate	EPA 300.0	4.1	0.2	mg/l	S25555	

AIC No. 129188-6
Sample Identification: BDV-2 5-13-09 1150

Analyte	Method	Result	RL	Units	Batch	Qualifier
Total Dissolved Solids	SM 2540C	53	10	mg/l	W29016	
Total Suspended Solids	USGS 3765	43	4	mg/l	W29039	
Chloride	EPA 300.0	3.0	0.2	mg/l	S25555	
Sulfate	EPA 300.0	4.4	0.2	mg/l	S25555	

AMERICAN INTERPLEX CORPORATION
LABORATORIES

FTN Associates, Ltd.
3 Innwood Circle, Suite 220
Little Rock, AR 72211

ANALYTICAL RESULTS

AIC No. 129188-7
Sample Identification: BC-O 5-13-09 1630

Analyte	Method	Result	RL	Units	Batch	Qualifier
Total Dissolved Solids	SM 2540C	86	10	mg/l	W29016	
Total Suspended Solids	USGS 3765	47	4	mg/l	W29039	
Chloride	EPA 300.0	1.7	0.2	mg/l	S25555	
Sulfate	EPA 300.0	4.0	0.2	mg/l	S25555	

AIC No. 129188-8
Sample Identification: REF-O 5-14-09 0930

Analyte	Method	Result	RL	Units	Batch	Qualifier
Total Dissolved Solids	SM 2540C	110	10	mg/l	W29016	
Total Suspended Solids	USGS 3765	290	4	mg/l	W29039	
Chloride	EPA 300.0	3.1	0.2	mg/l	S25555	
Sulfate	EPA 300.0	2.4	0.2	mg/l	S25555	

AMERICAN INTERPLEX CORPORATION
LABORATORIES

FTN Associates, Ltd.
3 Innwood Circle, Suite 220
Little Rock, AR 72211

SAMPLE PREPARATION REPORT

AIC No. 129188-1

Analyte	Date/Time Prepared	By	Date/Time Analyzed	By	Dilution	Batch	Qualifier
Total Dissolved Solids	15MAY09 1403	285	19MAY09 0827	285		W29016	
Total Suspended Solids	18MAY09 1033	258	19MAY09 1032	258		W29039	
Chloride	15MAY09 1103	263	15MAY09 1834	263		S25555	
Sulfate	15MAY09 1103	263	15MAY09 1834	263		S25555	

AIC No. 129188-2

Analyte	Date/Time Prepared	By	Date/Time Analyzed	By	Dilution	Batch	Qualifier
Total Dissolved Solids	15MAY09 1403	285	19MAY09 0827	285		W29016	
Total Suspended Solids	18MAY09 1033	258	19MAY09 1032	258		W29039	
Chloride	15MAY09 1103	263	15MAY09 1854	263		S25555	
Sulfate	15MAY09 1103	263	15MAY09 1854	263		S25555	

AIC No. 129188-3

Analyte	Date/Time Prepared	By	Date/Time Analyzed	By	Dilution	Batch	Qualifier
Total Dissolved Solids	15MAY09 1403	285	19MAY09 0827	285		W29016	
Total Suspended Solids	18MAY09 1033	258	19MAY09 1032	258		W29039	
Chloride	15MAY09 1103	263	15MAY09 1914	263	10	S25555	D
Sulfate	15MAY09 1103	263	15MAY09 1914	263	10	S25555	D

AIC No. 129188-4

Analyte	Date/Time Prepared	By	Date/Time Analyzed	By	Dilution	Batch	Qualifier
Total Dissolved Solids	15MAY09 1403	285	19MAY09 0827	285		W29016	
Total Suspended Solids	18MAY09 1033	258	19MAY09 1032	258		W29039	
Chloride	15MAY09 1103	263	15MAY09 1934	263	10	S25555	D
Sulfate	15MAY09 1103	263	15MAY09 2033	263		S25555	

AIC No. 129188-5

Analyte	Date/Time Prepared	By	Date/Time Analyzed	By	Dilution	Batch	Qualifier
Total Dissolved Solids	15MAY09 1403	285	19MAY09 0827	285		W29016	
Total Suspended Solids	18MAY09 1033	258	19MAY09 1032	258		W29039	
Chloride	15MAY09 1103	263	15MAY09 2053	263		S25555	
Sulfate	15MAY09 1103	263	15MAY09 2053	263		S25555	

AIC No. 129188-6

Analyte	Date/Time Prepared	By	Date/Time Analyzed	By	Dilution	Batch	Qualifier
Total Dissolved Solids	15MAY09 1403	285	19MAY09 0827	285		W29016	
Total Suspended Solids	18MAY09 1033	258	19MAY09 1032	258		W29039	
Chloride	15MAY09 1103	263	15MAY09 2113	263		S25555	
Sulfate	15MAY09 1103	263	15MAY09 2113	263		S25555	

AIC No. 129188-7

Analyte	Date/Time Prepared	By	Date/Time Analyzed	By	Dilution	Batch	Qualifier
Total Dissolved Solids	15MAY09 1403	285	19MAY09 0827	285		W29016	
Total Suspended Solids	18MAY09 1033	258	19MAY09 1032	258		W29039	

AMERICAN INTERPLEX CORPORATION
LABORATORIES

FTN Associates, Ltd.
3 Innwood Circle, Suite 220
Little Rock, AR 72211

SAMPLE PREPARATION REPORT

AIC No. 129188-7 (Continued)

Analyte	Date/Time Prepared	By	Date/Time Analyzed	By	Dilution	Batch	Qualifier
Chloride	15MAY09 1103	263	15MAY09 1814	263		S25555	
Sulfate	15MAY09 1103	263	15MAY09 1814	263		S25555	

AIC No. 129188-8

Analyte	Date/Time Prepared	By	Date/Time Analyzed	By	Dilution	Batch	Qualifier
Total Dissolved Solids	15MAY09 1403	285	19MAY09 0827	285		W29016	
Total Suspended Solids	18MAY09 1033	258	19MAY09 1032	258		W29039	
Chloride	15MAY09 1103	263	15MAY09 2152	263		S25555	
Sulfate	15MAY09 1103	263	15MAY09 2152	263		S25555	

129188

Date	Project Name	Project No.	Project Manager (Print)	Page
5-15-09	CWL UAA	4470W-040	PJD	1 of ___

Report / Bill to:	Submitted by:	Parameters (Method Number)	Lab Turn-Around-Time
FTN Phone:	FTN Associates, Ltd. 3 Innwood Circle, Suite 220 Little Rock, AR 72211 (501) 225-7779 • Fax (501) 225-6738	chloride, sulfate, TDS, TSS	☐ 24 Hours ☐ 48 Hours ☒ Normal ☐ Other: Due: __/__/__
Sampler Signature(s)	Recorded By (Print)		
	Jimmy Rogers		

SAMPLE DESCRIPTION

Sample Identification	Date	Time	Matrix* W	Matrix* S	Matrix* O	No. of Containers	Comp	Grab	chloride	sulfate	TDS	TSS	Detection Limits: Parameter	Detection Limits: Detection Limit
~~BVO~~ BOV-0	5-14-09	1315	X			1		X	X	X	X	X		
LC-0	5-13-09	1836	X			1		X	X	X	X	X		
001	5-14-09	1115	X			1		X	X	X	X	X		
UT-0	5-13-09	1415	X			1		X	X	X	X	X		
BOV-1	5-14-09	1230	X			1		X	X	X	X	X		
BOV-2	5-13-09	1150	X			1		X	X	X	X	X		
BC-0	5-13-09	1630	X			1		X	X	X	X	X		
REF-0	5-14-09	0930	X			1		X	X	X	X	X		
								Container Type						
								Preservative						

* Matrix: W = Water S = Soil O = Other

G = Glass P = Plastic V = VOA vials H = HCl to pH2 T = Sodium Thiosulfate

NO = None S = Sulfuric acid pH2 N = Nitric acid pH2 B = NaOH to pH12 Z = Zinc acetate

Relinquished By (Signature)	Print Name	Date	Time	Received By (Signature)	Print Name	Date	Time
	Jimmy Rogers	5-15-09	0803				
Relinquished By (Signature)	Print Name	Date	Time	Received By Laboratory (Signature)	Print Name	Date	Time
					Shana Bicknell	5-15-09	0803

Sampler Remarks: please e-mail results to:
pjd@ftn-assoc.com
jtm@ftn-assoc.com
jsb@ftn-assoc.com

Laboratory Remarks:

2°C

Revision Date 11/22/02