Use Attainability and Water Quality Assessment of Coffee Creek, Mossy Lake, and the Ouachita River, Southern Arkansas Contract 68-C-02-111 (Task Order 0011)

Quality Assurance Project Plan

U.S. EPA Region 6
1445 Ross Avenue, Suite 1200, 6WQ-AT
Dallas, Texas 75202

Prepared by:

PARSONS

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Effective Period October 2004 to September 2006

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Version 2.0

March 2006

A1 APPROVAL PAGE

Use Attainability and Water Quality Assessment of Coffee Creek, Mossy Lake, and the Ouachita River, Southern Arkansas (Task Order 0011*)*

U.S. Environmental Protection Agency Region 6

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Austin, TX 78754

Note: Parsons will secure written documentation from the analytical laboratory stating the organization's awareness of and commitment to requirements contained in this quality assurance project plan (QAPP) and any amendments or revisions of this plan. Parsons will maintain this documentation as part of the project's quality assurance records, and will ensure that the document is available for review.

University of Arkansas

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Dr. Marty Matlock Date
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Todd Sanders
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Little Rock, AR 72209

Date

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A3 DISTRIBUTION LIST

The following individuals will receive copies of the approved quality assurance project plan (QAPP) and all approved changes to the QAPP.

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(979)-268-2677

Sorrells Research Associates, Inc.
8002 Stanton Road
Little Rock, AR 72209

Todd Sanders, Project Manager
(501)-562-8139

Note: Parsons will provide copies of this project plan and any amendments or revisions of this plan to each sub-tier project participant, e.g., subcontractors, other units of government, laboratories. Parsons will document distribution of the plan by sub-tier participants and maintain this documentation as part of the project's quality assurance records. This documentation will be available for review.

A4 PROJECT/TASK ORGANIZATION

All project activities covered by the QAPP are performed for EPA Region 6 by Parsons and its subcontractors. The primary individuals and organizations participating in the project and their roles and responsibilities are identified below.

EPA Region 6

Sondra McDonald/Jessica Franks, Ph.D.

Task Order Manager

Responsible for oversight of individual tasks performed by Parsons under Contract 68-C-02-111 Task Order 0011. Reviews and approves all work plans, contracts, and Quality Assurance Project Plans (QAPP) and QAPP revisions. Enforces corrective action, as required, where QA protocols are not met.

EPA Region 6 Laboratory

Christy Warren

Lab Analysis Manager

Responsible for analysis and quality control of samples. Enforces corrective action, as required, where QA protocols are not met.

Parsons

Steve Manning, P.E.

Project Manager

Responsible for implementing the EPA requirements in the contract and in the QAPP. Assesses the quality of subcontractor/participant work as defined in the workplan. Coordinates activities of the field crew to ensure project objectives are met. Identifies, receives, and maintains project quality assurance records. Submits accurate and timely deliverables to the EPA Task Order Manager. Coordinates attendance at conference calls, training events, meetings, and related project activities with the EPA.

Randy Palachek

Quality Assurance Officer

Responsible for reviewing and approving QAPP and ensuring the quality of data submitted to the EPA. Responsible for the validation of data prior to the submission of data to the EPA. Responsible for coordinating with the EPA Task Order Manager to resolve QA related issues. Responsible for maintaining written records of sub-tier commitment to requirements specified in this QAPP. Responsible for maintaining records of QAPP distribution, including appendices and amendments.

Chris Ryon

Parsons Field and Data Manager

Responsible for supervising all aspects of the sampling and measurement of surface waters and other parameters in the field. Responsible for the acquisition of water samples and field data measurements in a timely manner that meet the quality objectives specified in Section A7 (Table A.1), as well as the requirements of Sections B1 through B8. Responsible for field scheduling, staffing, and ensuring that staff are appropriately trained. When monitoring activities include University of Arkansas entities the field supervisor shall coordinate with the University of Arkansas Project Manager as necessary. Responsible for preparing status reports and communicating problems and progress to the Parsons Project Manager. Responsible for the acquisition of data from field crews and laboratories, data verification, and transfer of data to EPA. Oversees data management for the study. Performs data quality assurances prior to transfer of data to EPA. Responsible for transferring data to the EPA in the acceptable format.

University of Arkansas

Dr. Marty Matlock, PE, CSE

Project Manager

Responsibilities include designing the field sampling and lab analytical plan, data interpretation, coordinating and supervising collection of field samples by UofA staff and students. Ensures that field sampling equipment is available and in working order. Prepares required project reports for submittal to Parsons and EPA Task Order Manager. Assures field sampling meets the QAPP requirements and final review of all project reports prepared by UofA staff. Coordinates with Parsons on all project matters.

Eric Cummings

Field Supervisor

Responsibilities include implementing all field data collection activities, overseeing field data collection, communicating and coordinating with Parsons' Field Manager, and with the UofA Project Manager.

Albion Environmental

Dr. Paul Boothe

Senior Scientist

Responsible for supervision of Albion Environmental laboratory personnel involved in generating analytical data for this project. Responsible for ensuring that Albion Environmental laboratory personnel involved in generating analytical data have adequate training and a thorough knowledge of the QAPP and all SOPs specific to the analyses or task performed and/or supervised. Responsible for oversight of all Albion Environmental laboratory operations

ensuring that all QA/QC requirements are met and documentation related to the analysis is completely and accurately reported. Albion will be analyzing ultra clean metals samples.

Sorrells Research Associates, Inc.

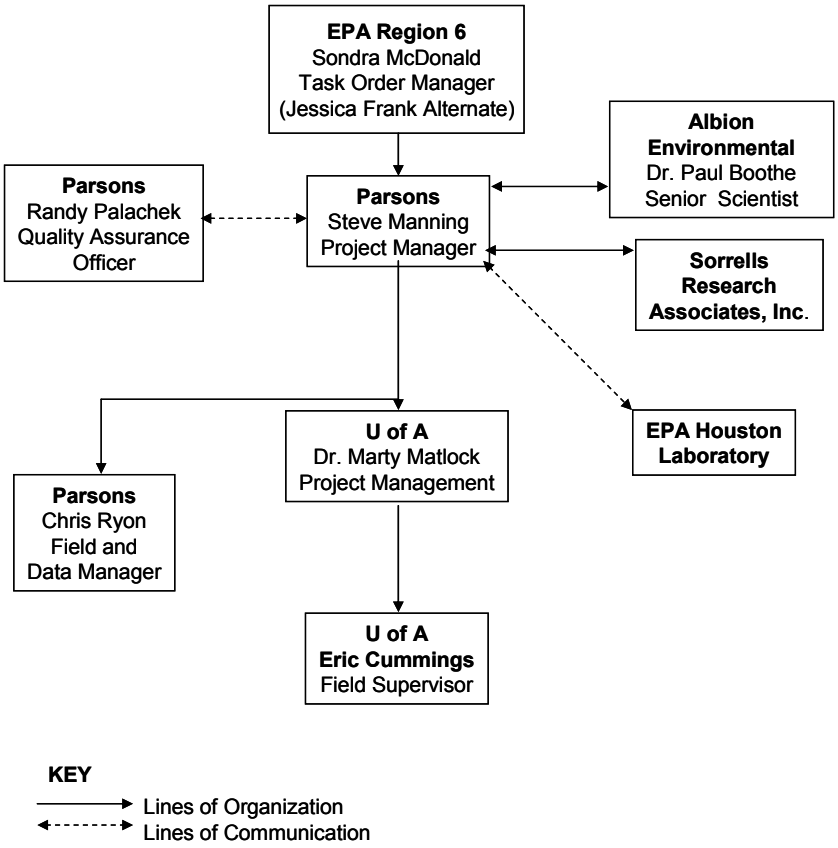
Todd Sanders

Project Manager

Responsible for supervision of laboratory personnel involved in generating analytical data for the project. Responsible for ensuring that laboratory personnel involved in generating analytical data have adequate training and a thorough knowledge of the QAPP and all SOPs specific to the analyses or task performed and/or supervised. Responsible for oversight of all laboratory operations ensuring that all QA/QC requirements are met, documentation related to the analysis is complete and adequately maintained, and that results are reported accurately. Responsible for ensuring corrective actions are implemented, documented, reported and verified. Sorrells Research Associates, Inc. will be performing *E. coli* analyses.

Figure 1 illustrates the project team personnel organization.

Figure 1 Project Organization Chart



A5 PROBLEM DEFINITION

The purpose of this investigation is to determine if the current "no aquatic life use designation" for Coffee Creek and Mossy Lake is appropriate and perform a water quality assessment of the Ouachita River, which is the receiving water of the Georgia-Pacific Crossett (G-P) paper mill discharge. The Ouachita River area for this study is located in southern Arkansas below the Felsenthal Lock and Dam and upstream of the Louisiana state line. The study area consists of Coffee Creek, Mossy Lake, and the Ouachita River, a short distance upstream and downstream of the confluence with Coffee Creek. Figure 2 shows the area of investigation including Crossett, Arkansas and the G-P Crossett Facility.

In a March 2002 letter, Louisiana Congressman John Cooksey requested that EPA assess the impact of the G-P discharge on the Ouachita River. In response EPA hired Parsons to assess existing data. Parsons published the *Water Quality Data Assessment for the Ouachita River, Between Felsenthal reservoir Lock and Dam, Arkansas and Sterlington, Louisiana* in January 2003. A major finding of this initial review was that available data on water quality was very limited. Thus, an additional project is needed to address the data gaps to assess potential aquatic life uses of Coffee Creek and Mossy Lake, and assess water quality in Coffee Creek, Mossy Lake and the Ouachita River.

Given the need for additional data, EPA Region 6 has contracted Parsons to develop a water quality assessment of Coffee Creek, Mossy Lake, and the Ouachita River upstream and downstream of the Coffee Creek confluence. This task will include collecting field measurements and water and sediment sample data for conventional pollutants and toxic substances. The second goal of this project is to determine if the designation of no aquatic life uses in Coffee Creek and Mossy Lake are appropriate. This task only covers the water quality components of a Use Attainability Analysis (UAA) including investigations of habitat, macroinvertebrate, and fish characteristics at the Coffee Creek and Mossy Lake locations, and a reference site on Coffee Creek upstream of G-P Outfall 001. These tasks will be performed under this single quality assurance project plan.

DESCRIPTION OF WATERBODIES

The headwaters of the Ouachita River are in the Ouachita Mountains near Eagleton, in western Arkansas. The water flows southeast to form Lake Ouachita near Hotsprings, Arkansas. The River then continues south through a series of lakes, including Felsenthal Reservoir, approximately 6-miles upstream from the Arkansas-Louisiana border (see Figure 2). The Ouachita River then flows through northeast Louisiana and joins the Tensas River to form the Black River. The Black River is a large tributary to the Red River, which is a tributary of the Mississippi River.

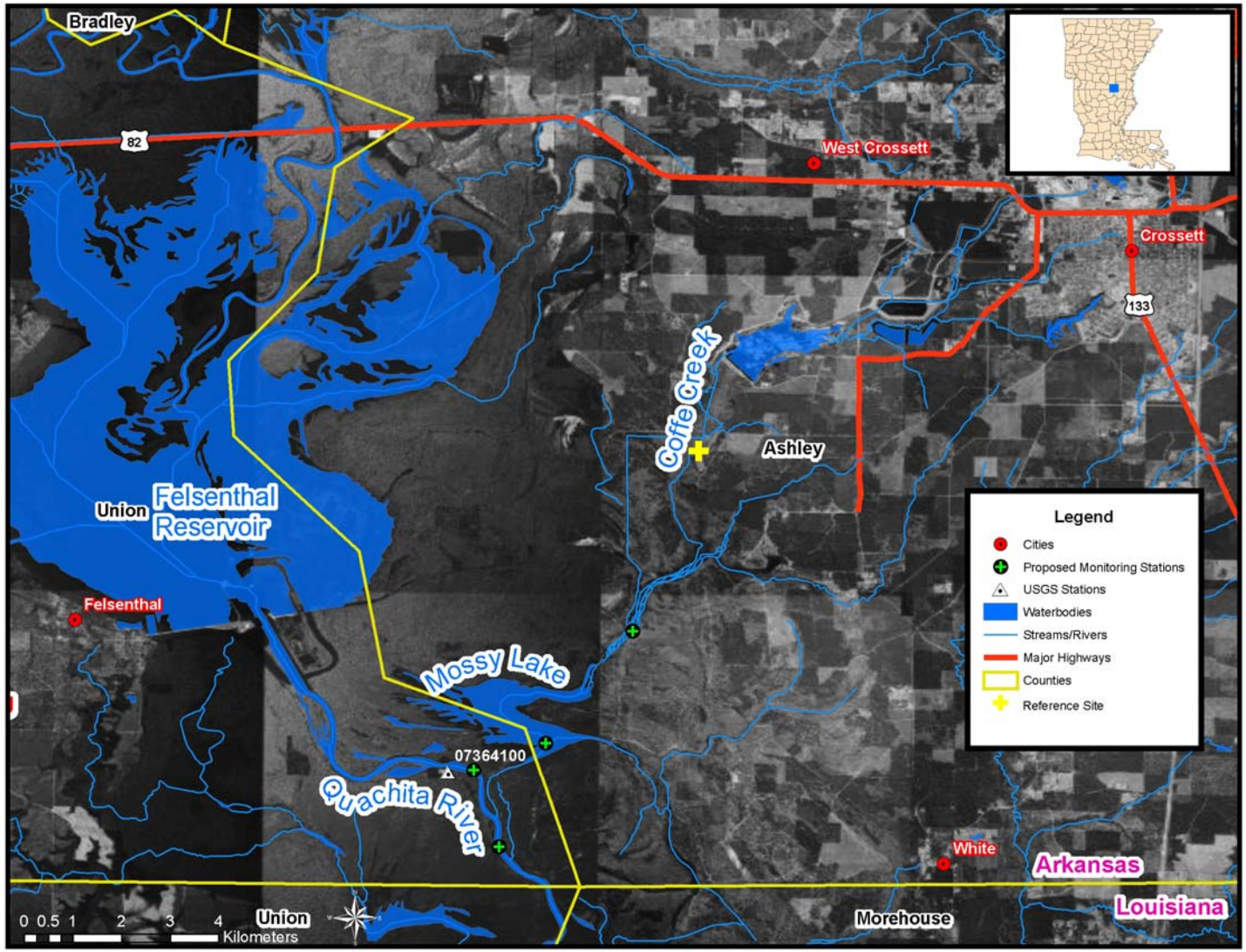
A chain of locks and dams on the river was initiated by the Vicksburg District, U.S. Army Corps of Engineers in the 1960s with the objective being to link the ports along the Ouachita River to the Gulf of Mexico. This was achieved in 1984 with completion of the

H. K. Thatcher and Felsenthal locks and dams in southern Arkansas. These locks, along with Columbia and Jonesville locks in Louisiana, now provide year-round 9-foot navigation to Camden, Arkansas. The 6 miles of the Ouachita River between Felsenthal Dam and the state line has a flat gradient (<0.5 feet/mile), steep cut sandy banks, deep channel, no riffle areas, a heavy sediment load, and a bottom characterized as shifting sand and silt (LORWG 1993).

Coffee Creek and Mossy Lake

G-P's Crossett, Arkansas paper mill (NPDES permit number AR 0001210) has been permitted to discharge 48.5 MGD to the Ouachita River via Coffee Creek and Mossy Lake. According to the provisions of this permit, Georgia Pacific is allowed to discharge effluent to Coffee Creek and Mossy Lake via Outfall 001. The outlet of Mossy Lake is to the Ouachita River and is considered Outfall 002. The effluent is primarily composed of wastewater from paper production operations, including the plant's sanitary facilities. Other wastewater discharges from the facility include approximately 1.6 MGD added by its building products operations, 0.4 MGD resulting from its chemical plant operations, and an additional 1.0 MGD of treated sanitary wastewater contributed by the City of Crossett. Prior to discharge, the effluent is treated by screening, primary clarification, settling, and stabilization in an aerated basin. The aerated basin discharges via Outfall 001 to Coffee Creek, which flows into Mossy Lake. Coffee Creek and Mossy Lake provide some measure of dilution and effluent polishing by natural degradation processes and are considered by the state of Arkansas to be part of G-P's treatment processes. Mossy Lake discharges to the Ouachita River through Outfall 002.

Figure 2 Proposed Monitoring Stations



A6 PROJECT / TASK DESCRIPTIONS

The purpose of this investigation is to determine if the current "no aquatic life use designation" for Coffee Creek and Mossy Lake is appropriate and develop a water quality assessment of the receiving water (Ouachita River) of the Georgia-Pacific Crossett (G-P) paper mill discharge.

UAA Tasks

Portions of a UAA will be performed to determine if aquatic life uses for Coffee Creek and Mossy Lake are obtainable. The UAA tasks in this investigation are as follows:

UAA Planning - UAA planning steps are: define objectives; determine designated uses; determine physical, chemical, and biological minimum requirements for uses; establish data needs (critical and seasonal); and, gather existing data. The UAA will be designed to include habitat assessments; fish and macroinvertebrate sampling; and water and sediment sampling and analysis.

Physical Evaluation – The Arkansas Department of Environmental Quality Continuing Planning Process (ADEQ CPP) requires a physical evaluation to "establish where, in relation to the discharge, the physical characteristics of the stream or waterbody could potentially support the use." The evaluation will address fisheries habitat and watershed characteristics. Parsons will establish the physical conditions by determining instream characteristics, substrate composition and characteristics, channel debris, sludge deposits, riparian characteristics, downstream characteristics, land uses, and hydrologic conditions.

Chemical and Toxicity Evaluation – All data analysis will comply with ADEQ and Region 6 data management protocols for use in the state's §305/303(d) assessment process. This investigation will include a water quality assessment on the ambient water and sediment laboratory analysis results using the water quality standards in ADEQ Regulation 2.

Biological Evaluation – The ADEQ CPP requires documenting the presence or absence of key species of fish and a field evaluation of benthic macroinvertebrates. The potential for this ecosystem to support fish and benthic communities without the G-P discharge will be assessed by surveying benthic and fish communities in the various effluent dominated sites (Coffee Creek, Mossy lake, downstream of Outfall 002) and at a site on Coffee Creek upstream of the effluent discharge (Reference Site). The project team will conduct assessments at these four sample sites using the ADEQ wadeable stream assessment protocol, a modified version of the RBP method (Barbour et al., 1999) for habitat, algae, benthics, and fish. A modified method will be used in Mossy Lake according to the judgment of Dr. Marty Matlock (UofA) and Dr. Bill Layher (consulting Ichthyologist with over 30 years experience and President of Layher Biologics RTEC, Inc.)). Sampling will be conducted at these four distinct locations three times over the duration of this project

(Critical Season 2005, winter, Critical Season 2006). The specific details for the habitat and biological assessments are provided in Element B1.

Perform Assessment Evaluation – Parsons will document potential causes of non-attainment for standards and uses in accordance with ADEQ's assessment methodology. Ambient water and sediment analysis data will be compared to the appropriate narrative and numeric water quality standards applicable to streams and lakes in the Gulf Coastal Plain Ecoregion as described in ADEQ's Regulation 2. Since no designated use currently exists, Parsons will compare the current conditions with the most probable scenarios for designated use attainment in similar streams in the Gulf Coastal Plain Ecoregion. Parsons will compare Coffee Creek with the upstream Reference Site to evaluate the potential impact of G-P's discharge on water quality and aquatic life. Parsons will document the water quality and biological condition including habitat for Mossy Lake.

Water Quality Assessment Tasks – Ouachita River

The water quality assessment tasks of this investigation will include collection of water quality measurements and samples for laboratory analysis from two stations on the Ouachita River. Media sampled will include sediment and water samples. Data collected will be compared to Arkansas Administrative Code (ACC) Regulation 2 numerical water quality standards and narrative criteria in Chapter 4 of Regulation 2.

PLANNED MEASUREMENTS

This section outlines the measurements being performed in this investigation. Detailed descriptions of sample collection methods and rationale are presented in Sections B1, B2, and B3 of this document. Specific measured and analyzed parameters are detailed in Section A7 of this document.

Water Quality Measurements and Analysis

The water sampling tasks include:

- standard water quality field measurements at 1 foot below water surface (48-hour time period, data collected every 15 minutes, measurement of dissolved oxygen, pH, conductivity, and temperature),
- physical water conditions at 1 foot below water surface (observed color, flow severity, and any anomalies), and
- laboratory analysis for conventional pollutants, water color, priority pollutants, ultra-clean metals, and toxicity
- GPS coordinates of sample sites for future reference.

- Written observation/description of ambient weather conditions.

Sediment Analysis

Sediment sampling and analysis will be performed for semi-volatiles, pesticides, PCBs, metals, toxicity, total organic carbon (TOC) and grain size analysis. The sample sites identified in this project represent lentic to lotic conditions, with a variety of depositional and scouring environments. Sampling sediments in these sites requires careful attention to the hydrologic conditions of the site. Sediment will be sampled at each site in such a way as to best represent the depositional conditions present at the site (rather than sampling bank materials, for example). Sediment samples will not be collected using ultra clean techniques.

Use Attainability Analysis Tasks

Rapid Bioassessment Protocols (RBP) modified by ADEQ for wadeable streams will be conducted at the Reference Site, Coffee Creek and Mossy Lake Outfall locations for measurement of habitat/substrate, fish community, and macroinvertebrate community. Assessment of the lentic habitat in Mossy Lake will be conducted using a metric agreed upon by UA, Parsons, and USEPA. A candidate metric is the Washington State Wetland Assessment Method. The goal of these assessments is to track changes, if any, over time, and to evaluate the potential for supporting aquatic life in these bodies. In addition, observations required to perform the UAA tasks will be made during sampling events (see Section A6, Physical Evaluation, and will include documentation of general hydraulic observations). Biota will be sampled at these sites using the most appropriate techniques available; where possible, sites will be shocked for fish and riffle kick-net sampling will be used for macro-invertebrates. However, there are several sites that these techniques are not appropriate for, due to high conductivity of the stream, large amounts of debris in the stream, or absence of riffles. For those sites, combinations of hoop nets, gill nets, minnow traps, and block seining will be used for fish, and Course Particulate Organic Matter (CPOM) sampling for macro-invertebrates.

PERSONNEL AND EQUIPMENT REQUIREMENTS

Sampling will be conducted by the Ecological Engineering Group (EEG) students and staff in the Biological and Agricultural Engineering Department of the University of Arkansas, Fayetteville. All sampling is to be conducted under the direct supervision of the UofA Project Manager with minor support from Parsons. All equipment requirements for this project are industry standard. See Section A8 for personnel training requirements.

ASSESSMENT TECHNIQUES

See section C1 for a listing of project assessments.

QUALITY ASSURANCE RECORDS

See section A9 for a listing project quality assurance documents and records.

REVISIONS TO THE QAPP

Until the work described is completed, this QAPP shall be revised as necessary and reissued annually on the anniversary date, or revised and reissued within 120 days of significant changes, whichever is sooner. The last approved version of the QAPP shall remain in effect until revised versions have been approved. If the entire QAPP is current, valid, and accurately reflects the project goals and the organizations policy, the annual re-issuance may be done by a certification that the plan is current, and include a copy of new, signed approval pages for the QAPP.

EXPEDITED CHANGES

Expedited changes to the QAPP may be approved to reflect changes in project organization, tasks, schedules, objectives, and methods, address deficiencies and non-conformance, improve operational efficiency; and accommodate unique or unanticipated circumstances. Requests for expedited changes are directed from Parsons Project Manager to the EPA Task Order Manager in writing. They are effective immediately upon approval by the EPA Task Order Manager. Expedited changes to the QAPP and the reasons for the changes shall be documented, and revised pages shall be initialed by the EPA Task Order Manager, the Parsons Project Manager and Quality Assurance Officer (QAO), then distributed to all persons on the QAPP distribution list by the Parsons QAO.

Expedited changes shall be reviewed, approved, and incorporated into a revised QAPP during the annual revision process or within 120 days of the initial approval in cases of significant changes.

A7 QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA

The purpose of this investigation is to determine if aquatic life uses are appropriate and obtainable in Coffee Creek and Mossy Lake and develop a water quality assessment of the receiving water (Ouachita River) of the Georgia-Pacific Crossett (G-P) paper mill discharge. The UAA tasks, quality objectives, and criteria are detailed in Section A6 of this QAPP.

The water quality assessment tasks of this investigation will include collection of water quality measurements and samples for analysis, sediment collection and analysis, and comparison of data collected to Arkansas Administrative Code (ACC) Regulation 2 numerical water quality standards and narrative criteria in Chapter 4 of Regulation 2.

The measurement performance criteria to support the project are specified in Table A.1. Parsons is responsible for all analyses performed by The University of Arkansas, Albion Environmental, and Sorrells Research Associates, Inc. Table A.1 includes the list of parameters and associated Data Quality Objectives to be performed by in this investigation. Table A.1 also includes parameter group headings for analysis and associated Data Quality Objectives to be performed by USEPA Region 6 Laboratory. USEPA Region 6 Laboratory (Houston) will use laboratory QC precision/accuracy that is either equivalent to that listed in the methods, or is more stringent.

Table A.1 Data Quality Objectives for Field, Special Parameters, and Clean Metals

PARAMETER	UNITS	MATRIX	METHOD	STORET	REPORTING LIMIT (RL)	PRECISION of laboratory duplicates RPD	ACCURACY of lab matrix spikes %Rec.	COMPLETE %	RESPONSIBLE AGENCY
Field Measurement Parameters (Water)									
pH	Standard units	water	EPA 150.1	00400	0.1	NA	NA	90	UofA
DO	mg/L	water	EPA 360.1	00300	0.1	NA	NA	90	UofA
Turbidity	NTU	water	SM 2130B	82079	.5	NA	NA	90	UofA
Conductivity	uS/cm	water	EPA 120.1	00094	1	NA	NA	90	UofA
Temperature	° C	water	EPA 170.1	00010	NA	NA	NA	90	UofA
Laboratory Parameters; Conventional Parameters (Water)									
Ammonia-N	mg/l	water	EPA 350.1	00610	0.02	±20%	±20%	90	USEPA Houston
Chl-*a*	mg/l	water	SM10200H	13855*	0.01	±20%	±20%	90	USEPA Houston
Chloride	mg/l	water	EPA 300.1	00940	1.0	±20%	±20%	90	USEPA Houston
Sulfate	mg/l	water	EPA 300.1	00945	3.0	±20%	±20%	90	USEPA Houston
Nitrite N	mg/l	water	EPA 353.2	00615	0.04	±20%	±20%	90	USEPA Houston
Nitrate-N	mg/l	water	EPA 353.2	00620	0.02	±20%	±20%	90	USEPA Houston

PARAMETER	UNITS	MATRIX	METHOD	STORET	REPORTING LIMIT (RL)	PRECISION of laboratory duplicates RPD	ACCURACY of lab matrix spikes %Rec.	COMPLETE %	RESPONSIBLE AGENCY
Total Kjeldahl N (TKN)	mg/l	water	EPA 351.2	00625	0.02	±20%	±20%	90	USEPA Houston
Total N	mg/l	water	Calculation	00630	--	--	--	--	USEPA Houston
Total P (TPO_4)	mg/l	water	EPA 365.4	00665	0.01	±20%	±20%	90	USEPA Houston
TOC	mg/l	water	EPA 415.2	00680	0.1	±20%	±20%	90	USEPA Houston
TDS	mg/l	water	EPA 160.1	70300	0.1	±20%	±20%	90	USEPA Houston
TSS	mg/L	water	EPA 160.2	00530	4.0	0-10 mg/L: 30 10-100 mg/L: 20 >100 mg/L: 10	NA	90	USEPA Houston
Laboratory Parameters; Special Parameters (Water)									
Color, True & Apparent	Platinum-cobalt units	water	EPA 110.2	00080	5	NA	NA	90	Albion
Color, Apparent	Color units	water	EPA 110.3	00081	1	NA	NA	90	Albion
E. coli	MPN/100 ml	water	SM 9223 B	31699	1	1*	NA	90	Sorrells Research Associates, Inc.
Laboratory Parameters; Ultra Clean Metals (Water)									
Mercury, total	ug/L	water	EPA 1631e	71900	0.0005	25	NA	90	Albion
Selenium, total	ug/L	water	EPA 1632 (mod)	01147	0.1	25	NA	90	Albion
Silver, dissolved	ug/L	water	EPA 1638/200.8	01075	0.1	25	NA	90	Albion
Cadmium, dissolved	ug/L	water	EPA 1638/200.8	01025	0.1	25	NA	90	Albion
Chromium, total dissolved	ug/L	water	EPA 200.8	01030	1.0	25	NA	90	Albion
Copper, dissolved	ug/L	water	EPA 1638/200.8	01040	0.3	25	NA	90	Albion
Nickel, dissolved	ug/L	water	EPA 1638/200.8	01065	1.0	25	NA	90	Albion
Lead, dissolved	ug/L	water	EPA 1638/200.8	01049	0.1	25	NA	90	Albion
Zinc, dissolved	ug/L	water	EPA 1638/200.8	01090	0.5	25	NA	90	Albion
Laboratory Parameters; Toxicity (Water)									
Acute Toxicity (*Ceriodaphnia dubia and Pimephales promelas)*	LC50 in ug/L	water	600/4/90/027F	89808, 89809	NA	NA	NA	90	USEPA Houston
Laboratory Parameters; Pesticides (Water)									
Pesticides: Approximately 17	ug/L	water	8081A,8141A, 505	NA	NA	NA	NA	90	USEPA Houston

PARAMETER	UNITS	MATRIX	METHOD	STORET	REPORTING LIMIT (RL)	PRECISION of laboratory duplicates RPD	ACCURACY of lab matrix spikes %Rec.	COMPLETE %	RESPONSIBLE AGENCY
common pesticide analytes.									
Laboratory Parameters; Conventional Parameters (Sediment)									
Sieve Analysis (Grain Size)	% Particle size	Sediment	EPA 600/2-78-054	89991, 82009, 82008, 80256	NA	NA	NA	90	USEPA Houston
TOC	mg/L	Sediment	415.2	NA	NA	NA	NA	90	USEPA Houston
Laboratory Parameters; Metals (Sediment)									
Metals: Approximately 22 common metals analytes.	mg/L	Sediment	7000A,6010B,7470A/7471A	NA	NA	NA	NA	90	USEPA Houston
Laboratory Parameters; Pesticides/Herbicides/PCBs (Sediment)									
Pesticides: Approximately 20 common pesticide analytes.	ug/L	Sediment	8081A,8141A	NA	NA	NA	NA	90	USEPA Houston
PCBs: Approximately 7 common PCB analytes.	ug/L	Sediment	8082	NA	NA	NA	NA	90	USEPA Houston
Laboratory Parameters; Semivolatiles (Sediment)									
Semivolatiles: Approximately seventy common semivolatile analytes.	ug/L	Sediment	8270	NA	NA	NA	NA	90	USEPA Houston
Laboratory Parameters; Toxicity (Sediment)									
Acute Toxicity (*Ceriodaphnia dubia and Pimephales promelas)*	LC50 in mg/Kg	Sediment	600/4/90/027F	NA	NA	NA	NA	90	USEPA Houston

References for Table A.1:

*Based on range statistic as described in Standard Methods, 20th Edition, Section 9020-B, "Quality Assurance/Quality Control-Intralaboratory Quality Control Guidelines."
United States Environmental Protection Agency (USEPA), "Methods for Chemical Analysis of Water and Wastes," Manual #EPA-600-4-79-020 American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), "Standard Methods for the Examination of Water and Wastewater," 20th Edition, 1999

Precision

The precision of data is a measure of the reproducibility of a measurement when a collection or an analysis is repeated. It is strictly defined as the degree of mutual agreement among independent measurements as the result of repeated application of the same process

under similar conditions. Performance limits for laboratory duplicates are defined in Table A.1. Performance limits for field duplicates are defined in Section B5.

Accuracy

Accuracy is a statistical measurement of correctness and includes components of systemic error. A measurement is considered accurate when the value reported does not differ from the true value. Accuracy is verified through the analysis of laboratory spikes and blank samples. Performance limits for laboratory spikes are specified in Table A.1. Performance limits for blank analyses are discussed in Section B5.

Representativeness

The representativeness of the data is dependent on the sampling locations and the sampling procedures to adequately represent the true conditions at the sampling sites. Site selection and use of only EPA-approved analytical methods will assure that the measurement data represents the conditions at the site. Sampling methods and frequency will be optimized to achieve the highest level of representativeness practical.

Comparability

The comparability of the data produced is predetermined by the commitment of the staff to use only approved procedures as described in this QAPP. Comparability is also guaranteed by reporting data in standard units and by using accepted rules for rounding figures.

Completeness

The completeness of the data is basically a relationship of how much of the data is available for use compared to the total potential data. Ideally, 100% of the data should be available. However, the possibility of unavailable data due to accidents, insufficient sample volume, broken or lost samples, etc. is to be expected. Therefore, it will be a general goal of the project(s) that 90% data completion is achieved.

A8 SPECIAL TRAINING REQUIREMENTS/CERTIFICATIONS

Biological Collection

All biological collection will be performed by personnel trained in the proper technique for collection under the Rapid Bioassessment Protocol (Barbour et al., 1999) and where appropriate, ADEQ modifications of those sampling protocols. Dr. Marty Matlock, EEG director and Certified Senior Ecologist (Ecological Society of America), will supervise collection of samples. He has over 15 years experience collecting field biological data. Taxonomic identification of fish and macro-invertebrates will be performed by Dr. Bill Layher. Biological collection will be performed under a valid state permit for scientific collection. Proper notification of state fish and game personnel for scientific collection will be made according to the permit. Fish collected will be reported on an annual report to the state, in accordance with requirements in the Arkansas Game and Fish Commission Scientific Collection Permit.

Ultra Clean Metals Sample Collection

The study conclusions will rely in part on low level and clean metal analytical techniques for the water metals samples. These techniques are applicable to generating quality data for assessment of water quality standards. Parsons team members and their associated subcontractors have designed and implemented a wide variety of related surface water evaluations. Only data that meet QA/QC objectives will be considered. This includes specific activities such as; ultra clean field sampling for metals in water and quality review of the resulting trace metal analysis. The project laboratory teams employ state of the art capabilities and experience in trace metal analyses in water. The team will be trained prior to the first field effort in clean metals sampling for ambient water by Dr. Paul Boothe of Albion Environmental. Refer to Appendix C for details. Note that sediment samples will not be collected using ultra-clean methods.

E. coli Sample Analysis

Laboratory analysts have a combination of experience, education, and training to demonstrate knowledge of their function. Laboratory staff responsible for analyzing samples for this project will have at least six months of experience in microbiological analysis, and be supervised by personnel with at least a master's degree in microbiology (or the equivalent) and ten years of experience in microbiological analysis. Laboratory analysts will have a demonstration of capability (DOC) on record for E. Coli analysis by EPA Method 9223 B. The initial DOC should be performed prior to analyzing samples and annually thereafter.

A9 DOCUMENTATION AND RECORDS

The documents that describe, specify, report, or certify activities are listed in Table A.2.

Table A.2 Documentation and Records

Document/Record	Location	Retention (yrs)	Form
QAPP, amendments, appendices	Parsons/EPA	5	Paper
QAPP distribution documentation	Parsons	5	Paper
Field notebooks or field data sheets	Parsons	5	Paper
Field equipment calibration logs	Parsons	5	Paper
Chain-of-Custody records	Parsons	5	Paper
Laboratory QA manuals	Labs	5	Paper
Laboratory SOPs	Labs	5	Paper
Laboratory procedures	Labs	5	Paper
Laboratory data reports	Parsons/Labs	5	Paper
Lab equipment maintenance logs	Labs	5	Paper
Laboratory calibration records	Labs	5	Paper
Final report/data	Parsons/EPA	5	Paper/Electronic

B1 SAMPLING PROCESS DESIGN

Sample Collection

The sampling plan will include five separate water quality sampling events for field measurements and analytical parameters in water, three separate events for biota (habitat, macroinvertebrates, and fish) and two separate events for analytical parameters in sediment. UofA personnel will perform all sample collections over a 15 month period. Sampling schedules will be coordinated with the USEPA Environmental Laboratory in Houston, Texas. Reasonable effort will be taken to schedule sampling events that fall outside of the annual flooding regime such that samples from all sites will be collected during a single sampling event. An indicator of flood conditions used by G-P personnel is when the Ouachita River height at the lower pool at the Felsenthal Lock and Dam is 65 feet msl or above. No sampling events should be scheduled during these conditions. Sampling activities during scheduled sample events will be dictated by hydrologic and meteorological conditions. In the event that a site or sites are inaccessible during a scheduled sample event due to flooding or other safety factors, those conditions will be documented, and samples will be collected from those sites as soon as possible to complete the data collection. Specific sample collection methods are detailed in Sections B2 Sampling Methods Requirements and B3 Sample Handling and Custody Procedures.

Table B.1 itemizes the sampling sites and the parameter groups that will be analyzed at each site. The study watershed is known to flood annually for several months out of the year. Water quality samples (analytical and field) are scheduled to be collected on a bi-monthly schedule (every two months) coordinating around the annual flooding period. Sediment sampling will be performed twice over the study period (early summer 2005 and winter 2005). Biological sampling using the Rapid Bioassessment Protocol as described earlier will be performed three times over the 15 month period (early summer 2005, winter 2005, and early summer 2006).

Sample Analysis

Samples will be collected by UofA personnel and shipped or delivered to three laboratories for analysis. Most analysis for this investigation will be performed by USEPA Region 6 Laboratory in Houston, Texas. The USEPA Region 6 Laboratory will analyze the samples for the parameters as designated in the "Responsible Agency" column in Table A.1. Samples for clean metals in water and water color will be shipped to Albion Environmental (College Station, Texas) for analysis. Samples collected for *E. coli* analysis will be delivered by UofA personnel to Sorrells Research Associates, Inc, (Little Rock, Arkansas) to achieve the six-hour holding time required for this parameter. More detail on sample handling and analysis is provided in Section B3 - Sample Handling and Custody Procedures, specifically in Table B.2 - Field Sampling and Handling Procedures.

Table B.1 Sample Design

Location	RBP	Analytical Parameters in Water	Field Parameters in Water	Analytical Parameters in Sediment
	Events: 3	Events: 5	Events: 5	Events: 2
Ouachita River, >= 100 ft upstream of Coffee Creek confluence. At or near USGS Station 07364100.	Not Applicable	Conventional parameters (including *E. coli*), specialty parameters, color, pesticides, ultra clean metals, and toxicity	DO, pH, conductivity, turbidity, and temperature	Conventional parameters, grain size, TOC, pesticides/herbicides, PCBs, semivolatiles, metals, and toxicity
Ouachita River, 300 ft downstream of Coffee Creek confluence.	Not Applicable	Same as above (including *E. coli*).	Same as above	Same as above
Mossy Lake, upstream of G-P Outfall 002	Habitat, macroinvertebrates, fish in Mossy Lake	Same as above (excluding *E. coli*).	Same as above	Same as above
Coffee Creek upstream of confluence with Ouachita River	Habitat, macroinvertebrates, and fish	Not Applicable	Not Applicable	Not Applicable
Coffee Creek below confluence of GP Outfall 001 below abandoned railroad crossing, in braided channel upstream of Mossy Lake	Habitat, macroinvertebrates, and fish	Same as above (excluding *E. coli*).	Same as above	Same as above
Coffee Creek above confluence of G-P Outfall 001 (Reference Site)	Habitat, macroinvertebrates, and fish	Not Applicable	Not Applicable	Not Applicable

Sample Design Rationale

The sample design is based on the intent of this study, to collect data sufficient to perform an assessment of aquatic life use in Coffee Creek and Mossy Lake in southern Arkansas. The sample design is also intended to determine whether applicable water quality standards are being met in these two waterbodies and the Ouachita River both upstream and downstream of the discharge of Mossy Lake.

Site Selection Criteria

The sampling sites listed in Table B.1 may be slightly modified in the field, relying on the experience and judgment of the UofA Project Manager and Field Supervisor, history of sampling by ADEQ, and access.

The following general guidelines will also be followed when selecting the sites:

1. Sites will be chosen to be representative of the area being sampled.
2. Overall consideration will be given to the accessibility and safety of the site.
3. Availability of fish may require sampling sites to be expanded.
4. The sites will include:
    a. A site on the Ouachita River located upstream of the mixing zone at the confluence of Mossy Lake/Coffee Creek discharge (Ouachita Up);
    b. A site on the Ouachita River located downstream of the mixing zone at the confluence of Mossy Lake/Coffee Creek discharge (Ouachita Down);
    c. A site on Coffee Creek located upstream of G-P Outfall 001 (the Reference Site);
    d. A site on Coffee Creek located downstream of G-P Outfall 001 confluence with Coffee Creek, at the railroad trestle (Coffee Creek);
    e. A site in Mossy Lake above the control structure (Mossy Lake);
    f. A site on Coffee Creek below Mossy Lake but upstream of the confluence with the Ouachita River, to be sampled for biota only.

B2 SAMPLING METHODS REQUIREMENTS

Additional information regarding sample collection, handling, labeling, and chain-of-custody requirements is given in Section B3 of this document.

Field Sampling Procedures

All data generated shall be representative of the quality and quantity of water or substrate at the time of collection. All sampling and analysis shall be performed in accordance with the techniques prescribed in 40 CFR Part 136 and amendments thereto.

The method reference for all field and laboratory parameter analysis will be "Standard Methods for the Examination of Water and Wastewater" APHA, 20th edition or later unless otherwise cited. Standard field measures of DO, pH, conductivity, temperature, and turbidity will be made at each site at each visit.

An industry standard water quality multi-parameter field measurement instrument (YSI® or InSitu®) will be used to collect water quality measurements at each location during each event. Parameters measured include: dissolved oxygen, temperature, pH, and conductivity. The instrument utilized will be calibrated and post-calibrated to industry standard each deployment. Datasondes will be deployed at a nominal depth of 1 ft (0.3 M) below the water surface, for 48 hours. A detailed description of sampling methodology is provided in Section B3 of this QAPP.

Rapid Bioassessment Protocols (RBP)

Sample Collection, Benthic Macroinvertebrates

Samples will be collected using RPB methods and the method described by ADEQ (Davidson, undated). This method uses D-frame dip nets (500 µm mesh) to sample diagonal traveling transects across riffles within each sample reach. In the event there are no riffles in the system, sampling will be performed by taking transect sweeps of substrate and bank material. The samples will be cleaned of larger debris in the field before preservation. The samples will be preserved in 70% ethanol and labeled with the appropriate identifying information.

Macro-Invertebrate Handling

The investigators will attempt to collect at least 400 organisms at each of the four sample locations. A subsample of approximately 200 organisms will be picked in the laboratory. A 4-inch diameter metal ring will be randomly tossed into the tray and organisms within the ring removed for the subsample. Subsampling will continue until a minimum of 200 organisms is removed. The sample may exceed 200 organisms, but should not be less than 180. Subsamples will be identified to the minimum practical levels for taxonomic resolution as listed below (Merritt and Cummins, 1988).

TAXONOMIC LEVEL	GROUPS
Genus	Plecoptera, Ephemeroptera, Odonata, Trichoptera, Megaloptera, Neuroptera, Lepidoptera, Coleoptera, Hemiptera, Diptera (in part), Crustacea, Mollusca
Tribe	Chironominae
Family	Diptera (in part)
Order	Other non-insect groups

Physical Habitat Assessment

The ADEQ method for physical habitat assessment of Gulf Coastal Plains Ecoregion streams will be used (modified from Barbour et al., 1998). A qualitative (visual estimates) and quantitative (in-stream measurements) approach will be used to develop a habitat profile for each sample reach based on eight broad categories. These categories include measurements/estimates of the in-channel cover, substrate, canopy cover, large woody debris within bankfull width, flow and visual riparian and human influence estimates. Each tier employs a comparative metrics approach, using a simple scoring protocol that enables quantitative comparison of sites with each other and reference site conditions.

For the wetland area of Mossy Lake, the Washington State's Wetland rating system (Hurby, T. 2004), Washington State wetland rating system for eastern Washington – Revised, Washington State Department of Ecology Publication # 04-06-15 will be used. This method employs a habitat rating metric similar to the RBP method.

Sample Collection, Fish,

At each sampling site, a representative reach will be selected and measured. The exact location (i.e., latitude and longitude) of the downstream limit of the reach will be recorded. Each sampling reach will be a minimum of 40x the width of the channel and incorporate each representative physical or structural element type (i.e. riffle/pool). A habitat assessment and physical/chemical characterization of water quality will be performed within the same sampling reach (See above).

Sampling fish in areas receiving effluent and exhibiting extremely high conductivities precludes the use of conventional electrofishing gear. Alternative methods will be employed to capture fishes in such areas. Gear types used in areas receiving effluent will be selected based on physical habitat conditions such as depth, velocity, and the presence of snags.

Coffey Creek above Mossy Lake consists of a series of braided channels. While velocities are fairly swift, the channel is essentially devoid of woody debris and seining with small mesh seines is practical. At least ten seine hauls will be made in such areas sampled. The channels are fairly narrow and the seine can easily traverse the channel width. One seine end will be held downstream near the left bank, facing downstream, while the other end will be pulled perpendicular to the thawleg, then upstream the length of the seine, then across the channel. At that point, the upstream end will be maneuvered downstream to the starting point where the seine will be drawn out of the water. This procedure should effectively capture any small fishes present as well as potentially larger fishes. Additionally, hoop nets will be placed in the stream channel. These nets consist of a series of seven four-foot diameter hoops with throats which prevent exit of fishes once they have entered the net. Nets are placed with openings facing downstream. Fishes moving upstream enter the first chamber and continue to move deeper into the net passing through a series of throats to the back chamber. These nets consist of 1 and 1/2 –inch bar mesh and are effective in capturing most medium to large fish moving upstream. Nets are anchored upstream and the current holds the nets open.

Coffey Creek below Mossy Lake consists of one channel with relatively high velocity. Conductivities are also too high to allow electrofishing. These areas also contain a large amount of wood debris such as tree roots in the channel which prevent seining. The channel is relatively homogeneous and has become entrenched with continuous and sustained flows which vary little. The downgrading of the channel has resulted in the uniform nature of the channel. The channel shape in concert with the relatively high continuous velocity affords little habitat variability thereby reducing species diversity. Such an area can be effectively sampled with hoop nets described in the previous paragraph.

Mossy Lake is also characterized by high conductivities. Gear types often used on lakes will be employed to assess fishes of the lake. An experimental gill net consisting of three 100-ft panels of 2, 3, and 4-inch bar mesh composed of monofilament webbing will be placed across a cove or neck of the lake. This net will traverse a total of three hundred feet and capture fishes of a variety of sizes moving in either direction if present. Mini-fyke nets will be used near shorelines to capture smaller fishes and/or larger fishes which follow shoreline habitats. These nets consist of very small mesh similar to seines and are set perpendicular to the shoreline or vegetation lines. The net is composed of a lead tied or staked to the shoreline. When fishes encounter the lead they follow it as if it were the shoreline which directs the fishes into the net-trap. The trap is very much like a hoop net but with rectangular frames rather than circular. The rear of the trap is anchored to keep the net open in deeper water. Fishes swim into the throats and enter rear chambers of the apparatus

where they cannot escape. All sizes of fishes can be captured using this technique along shorelines with little or no current.

Fish Handling

All fish greater than 20 millimeters total length collected within the sample reach will be identified to species (or subspecies). Specimens that cannot be identified with certainty in the field will be preserved in a 10% formalin solution and stored in labeled jars for subsequent laboratory identification. A representative voucher collection will be retained for unidentified specimens, very small specimens, new locality records, and/or a particular region. In addition to the unidentified specimen jar, a voucher collection of a subsample of each species identified in the field will be preserved and labeled for subsequent laboratory verification, if necessary. Species of special concern (e.g., threatened, endangered) will be noted and released immediately on site. Labels will contain (at a minimum) location data (verbal description and coordinates), date, collectors' names, and sample identification code and/or station numbers for the particular sampling site. Young-of-the-year fish less than 20 millimeters (total length) will not be identified or included in the sample, and will be released on site. Specimens that can be identified in the field will be counted, examined for external anomalies (i.e., deformities, eroded fins, lesions, and tumors), and recorded on field data sheets. Following the data-recording phase of the procedure, specimens that have been identified and processed in the field will be released on site to minimize mortality.

All fishes captured will be identified in the field if possible. Fishes will be placed in a live well immediately after being removed from nets. Fishes will be measured to the nearest mm in length. Fork lengths and total lengths will be recorded for sturgeons. Paddle fish will be measured from eye to fork length. All other fishes will be recorded as total length. All fishes will be weighed. Fish over 1,000 grams will be weighed to the nearest 10 g; those over 10 kg will be weighed to the nearest 20 g; and those less than 1000 g will be weighed with an accuracy of + or – 2 g.

All samples received in the laboratory will be tracked using a sample log-in procedure which includes sample collection location, date, and batch. This approach is similar to water quality sample chain-of-custody methods. Laboratory fisheries professionals must be capable of identifying fish to the lowest possible taxonomic level (i.e., species or subspecies) and should have access to suitable regional taxonomic references to aid in the identification process. Taxonomic nomenclature will be consistent and current. Common and scientific names of fishes from the United States and Canada are listed in Robins et al. (1991). Assessment of fish population and index conditions will be made according to Regulation 2 requirements, Arkansas Department of Pollution Control and Ecology (Littlerock, AR).

Process to Prevent Cross Contamination

To prevent cross-contamination of water samples, each discrete sample will be collected directly from the stream into the composite sample container. Only new sample containers will be utilized.

Documentation of Field Sampling Activities

Sampling activities will be documented in a field logbook or on field logsheets for pertinent tasks. At each sample site the following information will be recorded: location, sampling time, date, water depth and appearance, standard water quality parameters (DO, pH, conductivity, turbidity, and temperature), ambient weather conditions, any observations or anomalies such as unusual odors, and the names of the field crew. In addition, physical descriptions of each sampling location will be documented, along with GPS latitude and longitude coordinates.

Recording Data

For the purposes of this section and subsequent sections, all field and laboratory personnel follow the basic rules for recording information as documented below:

1. Legible writing with no modifications, write-overs or cross-outs;
2. Correction of errors with a single line followed by an initial and date;

Failures in Sampling Methods Requirements and/or Deviations from Sample Design and Corrective Action

Examples of failures in sampling methods and/or deviations from sample design requirements include but are not limited to such things as sample container problems, sample site considerations, etc. Any potential deviations from the QAPP are discussed in the field via cellular phone conversation with the UofA Project Manager, and if necessary, the Parson's Project Manager and the EPA Task Order Manager. Discussions and outcomes of any deviations will be documented in the field logbook.

The UofA Project Manager will determine if the deviation from the QAPP compromises the validity of the resulting data. The UofA Project Manager, in consultation with the Parsons Quality Assurance Officer and USEPA will decide to accept or reject data associated with the sampling event, based on best professional judgment. The resolution of the situation will be reported to the EPA.

B3 SAMPLE HANDLING AND CUSTODY PROCEDURES

Proper sample handling and custody procedures ensure the custody and integrity of samples beginning at the time of sampling and continuing through transport, sample receipt, preparation, and analysis.

SAMPLE COLLECTION AND HANDLING

Field Measurements

Field measurements for water quality will be collected with a multiprobe water quality measurement device (YSI 600XLM data sonde or similar) deployed to collect 48 hours of data at 15 minute intervals. The unit will be calibrated to manufacturer's recommendations using reference standards before use. Calibration conditions will be documented in the field logbook. The measurement probe area of each sonde will be positioned at approximately 1 foot below water surface and documented in the field logbook. The units will be post-calibrated at the completion of measurements using reference standards to document calibration drift.

Field Sampling

Field water quality samples will be collected using grab sample methods. Samples will be collected in an area undisturbed by the sample team, with samples being collected facing upstream (when wadeable) to minimize disturbance of water conditions. Samples will be collected at 1.0-foot under the water surface unless conditions are deemed by the field team manager to warrant otherwise. Ultra clean metals water samples will be collected following the Ultra Clean Metals Sampling Procedure in Appendix C.

For sediment samples, a representative composite sample will be collected during two events. Sediment from approximately the top 2.5 centimeters of sediment will be homogenized for the composite sample.

All samples will be stored in the dark at or below 4 degrees C after collection and prior to analysis. Samples will be logged on the Sample Chain of Custody form in the field.

Chain-of -Custody

All samples (water, sediment, and biological) will be handled under Chain of Custody protocols. A sample will be considered in custody for this project only when it is in actual physical possession, in a secured area that is restricted to authorized personnel, or shipped under custody seal. The Chain of Custody (COC) form is used to document sample handling during transfer from the field to the laboratory. The following information concerning the sample is recorded on the COC form (See Appendix A).

1. Date and time of collection
2. Site identification

3. Sample matrix
4. Number of containers
5. Analyses required
6. Name of collector
7. Custody transfer signatures and dates and time of transfer

Field personnel will be responsible for recording all data and relevant observation on the field logbook and COC forms. Samples, with a COC form, will be sent in a custody sealed cooler, via overnight courier to the analytical laboratory. Chain of custody tape and bottle labels will be affixed to containers to insure integrity during shipping. Field sampling and handling procedures are outlined in Table B.2.

Table B.2 Field Sampling and Handling Procedures

Parameter	Matrix	Container/Volume	Preservation	Holding Time
Laboratory Parameters; (Water)				
Nitrite, Chloride, Sulfate, TSS, TDS	Water	1 liter HDPE	Cool 4°C	48 hours (NO-2), 7 days TSS & TDS, anions 28 days
Chlorophyll-a	Water	1 liter cubitainer	Cool 4°C	2 days
Total Phosphorus, Nitrate	Water	1 liter cubitainer	pH<2 H2SO4, Cool 4°C	2 days (NO-3), TP 28 days
Ammonia, TKN	Water	1 liter HDPE	pH<2 H2SO4, Cool 4°C	28 days
TOC	Water	250 ml HDPE	pH<2 H2SO4, Cool 4°C	28 days
Pesticides	Water	3 - 1 liter amber glass	Cool 4°C	7 days
Color, True & Apparent	Water	500 m1 HDPE or glass	Cool 4°C	24 hours
E. coli	Water	100 ml sterile plastic	Cool 4°C, dark	6 hours
Ultra Clean Metals	Water	Hg 125 ml glass, Diss. 60 ml LDPE, Totals 125 ml LDPE	Preserved in Ultra Clean Laboratory, Cool 4 oC, sealed in ziplock bags	6 months 28-days Hg
Laboratory Parameters; (Sediment)				
TOC/Grain Size	Sediment	1-8 oz glass	Cool 4°C	28 days
Total Metals	Sediment	1 - 8 oz glass	Cool 4°C	6 months 28-days Hg
Semi-volatiles	Sediment	1-8 oz glass	Cool 4°C	14 days
Pesticides/ PCBs	Sediment	1-8 oz glass	Cool 4°C	14 days
Chronic Toxicity Testing				
Chronic Toxicity	Water	1 gallon cubitainer	Cool 4°C	36 hours
Chronic Toxicity	Sediment	1 liter glass	Cool 4°C	14 days

Sample Labeling

Samples (water, sediment, macroinvertebrates, and fish vouchers) will be labeled on the container or a label with an indelible marker. All samples will be labeled with the sample identification, collection date, and collection time. Sample identification will include the waterbody name (Reference Site (RS), Coffee Creek (CC), Mossy Lake (ML), Ouachita-up (O-Up), and Ouachita –down (O-down)). The sample collection date and time will be used to differentiate sampling events. Parameters to be measured will be noted in the Sample COC.

Failures in Chain-of-Custody and Corrective Action

Any failures associated with chain-of-custody procedures are immediately reported to the UofA Project Manager. These include such items as delays in transfer, resulting in holding time violations; violations of sample preservation requirements; incomplete documentation, including signatures; possible tampering of samples; broken or spilled samples, etc. The UofA Project Manager will determine if the procedural violation may have compromised the validity of the resulting data. The UofA Project Manager in consultation with the Parsons QAO will decide how the issue will be resolved based on best professional judgment. Possible courses of action include, document and proceed; redo the entire sampling event; or selectively analyze the samples. The resolution of the situation will be reported to EPA.

B4 ANALYTICAL METHODS REQUIREMENTS

The analytical methods, associated matrices, and performing laboratories are listed in Table A.1 of Section A7. Laboratory SOPs are consistent with EPA requirements as specified in the method.

Standards Traceability

All standards used in the laboratory are traceable to certified reference materials. Standards preparation is fully documented and maintained in a standards log book. Each documentation includes information concerning the standard identification, starting materials, including concentration, amount used and lot number; date prepared, expiration date and preparer's initials/signature. The reagent bottle is labeled in a way that will trace the reagent back to preparation.

Alternative Methodologies

Only data collected under EPA approved analytical methodologies as specified in this QAPP will be submitted to EPA.

Failures or Deviations in Analytical Method Requirements and Corrective Actions

Failures in field and laboratory measurement systems involve, but are not limited to such things as, instrument malfunctions, failures in calibration, blank contamination, QC sample problems, etc. In many cases, the field technician or lab analyst will be able to correct the problem. If the problem is resolvable by the field technician or lab analyst, then they will document the problem on the field data sheet or laboratory record and complete the analysis. If the problem is not resolvable, then it is conveyed to the respective supervisor, who will make the determination. If the analytical system failure compromises the sample results, the data will not be reported to EPA as part of this study. The nature and disposition of the problem is reported on the data report that is sent to Parsons QAO and the UofA Project Manager. This information will be included in the final report that will be sent to EPA.

B5 QUALITY CONTROL REQUIREMENTS

Sampling Quality Control Requirements and Acceptability Criteria

The method for rejection of samples will be based on statistically derived QA limits or the data quality objectives, as defined previously. Required QC checks for field samples will include the following elements. Sample handling QC check will be performed by the analysis of one field blank per sampling trip. The field blank will be created by adding standard de-ionized water to an empty bottle at the time of sample collection. This blank will be logged into the laboratory and analyzed for all project parameters. The results will be compared to analytical instrument blanks to determine any possible contamination from sample handling. Any deviation of fifteen percent over the detection limit or greater will be reported in the final QA report. Sampling precision will be checked by taking one field duplicate grab sample per sampling deployment. Standard deviations will be calculated from these duplicates and reported in the QA report.

Laboratory Measurement Quality Control Requirements and Acceptability Criteria

Detailed laboratory QC requirements are contained within the individual Laboratory Quality Manuals. The minimum requirements that all participants abide by are stated below. Lab QC sample results will be reported with the analytical results on the laboratory report form (see Section C2).

Laboratory duplicate - Laboratory duplicates are used to assess precision. A laboratory duplicate is prepared by splitting aliquots of a single sample (or a matrix spike or a laboratory control standard) in the laboratory. Both samples are carried through the entire preparation and analytical process. Laboratory duplicates and matrix spikes are performed for each sampling event. Acceptability criteria are outlined in Table 1 of Section A7.

Precision is calculated by the relative percent difference (RPD) of duplicate results as defined by 100 times (the difference (range) of each duplicate set, divided by the average value (mean) of the set). For duplicate results, X_1 and X_2, the RPD is calculated from the following equation: *Note: If other formulas apply, adjust appropriately.*

$$RPD = ((X_1 - X_2)/\{(X_1+X_2)/2\}) * 100$$

Laboratory Control Standard (LCS) - A laboratory control sample is analyte-free water spiked with the analyte of interest prepared from standardized reference material. The laboratory control standard is generally spiked into laboratory pure water at a level less than or equal to the mid-point of the calibration curve for each analyte. The LCS is carried through the complete preparation and analytical process. The LCS is used to document the accuracy of the method due to the analytical process. LCSs are generally run at a rate of one per batch. Acceptability criteria are laboratory specific and usually based on results of past

laboratory data. LCSs are routinely incorporated into the analysis program. The analysis of LCSs is a measure of accuracy and is calculated by percent recovery (%R). Percent recovery is defined as 100 times the observed concentration, divided by the true concentration of the spike.

The formula used to calculate percent recovery, where %R is percent recovery; SR is the sample result; SA is the spike added:

$$\%R = (SR/SA) * 100$$

Matrix spikes (MS)- A matrix spike is an aliquot of sample spiked with a known concentration of the analyte of interest. Matrix spikes are performed for each sampling event. Percent recovery of the known concentration of added analyte is used to assess accuracy of the analytical process. The spiking occurs prior to sample preparation and analysis. Spiked samples are routinely prepared and analyzed at a rate of 10% of samples processed for each sampling event. The MS is spiked at a level less than or equal to the midpoint of the calibration or analysis range for each analyte. The MS is used to document the accuracy of a method due to sample matrix and not to control the analytical process. Acceptability criteria are outlined in Table 1 of Section A7 and are calculated by Percent Recovery. Percent Recovery (%R) is defined as 100 times (the observed concentration, minus the sample concentration, divided by the true concentration of the spike).

The formula used to calculate percent recovery, where %R is percent recovery; SSR is the observed spiked sample concentration; SR is the sample concentration; and, SA is the spike added; is:

$$\%R = ((SSR - SR)/SA) * 100$$

Method Blank- A method blank is an analyte-free matrix to which all reagents are added in the same volumes or proportions as used in the sample processing and analyzed with each batch. The method blank is carried through the complete sample preparation and analytical procedure. The method blank is used to document contamination from the analytical process. The analysis of method blanks should yield values less than the Minimum Analytical Level. For very high level analyses, blank value should be less then 5% of the lowest value of the batch.

Additional method specific QC requirements - Additional QC samples are run (e.g., surrogates, internal standards, continuing calibration samples, interference check samples) as specified in the methods. These include instrument calibrations for spectrophotometers, zero-saturation standards for DO, etc. The requirements for these samples, their acceptance criteria, and corrective action are method-specific (Standard Methods, 1998).

Failures in Field and Laboratory Quality Control and Corrective Action

Sampling QC deviations are evaluated by the UofA Project Manager in consultation with Parsons QAO. Professional judgment will be relied upon in evaluating results which may not subscribe directly to QC requirements. Documentation of such determinations will be made in the report sent to EPA.

Laboratory measurement quality control failures are evaluated by the laboratory staff. The disposition of such failures and conveyance to EPA are discussed in Section B4 under Failures or Deviations in Analytical Method Requirements and Corrective Actions.

B6 INSTRUMENT/EQUIPMENT TESTING, INSPECTION AND MAINTENANCE REQUIREMENTS

Field equipment testing, inspection, calibration, and maintenance are detailed in section B3 of this document.

All laboratory tools, gauges, instrument, and equipment testing and maintenance requirements are contained within the laboratory quality assurance manual (QAM). Testing and maintenance records are maintained and are available for inspection by EPA. Instruments requiring daily or in-use testing include, but are not limited to, water baths, ovens, autoclaves, incubators, refrigerators, and laboratory pure water. Critical spare parts for essential equipment are maintained to prevent downtime. Maintenance records are available for inspection by EPA.

Autonomous water quality datasondes will be calibrated according to manufacturing specifications. Specifically, each potentiometric sensor (conductivity, DO, pH) will be calibrated using standards (100% saturation for DO) in the laboratory prior to field deployment. After retrieval, post-calibration will be checked and documented.

B7 INSTRUMENT CALIBRATION AND FREQUENCY

Field Equipment

Field Equipment calibration procedures are detailed in section B3 of this document. Possible post calibration error limits and the disposition resulting from any errors will be documented in the report.

Laboratory Equipment

Detailed Laboratory calibrations are contained within the QAM. The laboratory QAM identifies all tools, gauges, instruments, and other sampling, measuring, and test equipment used for data collection activities affecting quality that must be controlled and, at specified periods, calibrated to maintain bias within specified limits. Equipment requiring periodic calibrations include, but are not limited to, thermometers, pH meters, balances, incubators, turbidity meters, and analytical instruments.

B8 INSPECTION/ACCEPTANCE REQUIREMENT FOR SUPPLIES AND CONSUMABLES

No special requirements for acceptance are specified for field sampling supplies and consumables. Laboratory acceptance requirements in order to satisfy the technical and quality objectives of this project are documented in the laboratory's QAM.

B9 DATA ACQUISITION REQUIREMENTS

UofA staff and students, in accordance with the requirements of this QAPP, will generate primary data used for this assessment. Any additional existing data used to support this project will be reviewed by Parsons and UofA to determine its relevancy and appropriateness for inclusion in this analysis. Additional data may include reports and research conducted by local, state, and federal agencies. The review process will include a clear documentation of the quality control methods used in the collection, analysis, and reporting phases of each added body of information. USEPA and ADEQ-approved QAPPs for other data will be appended to the additional data or clearly referenced.

B10 DATA MANAGEMENT

Data collected in the field will be entered in the field logbook or field logsheets. This data will be input into computer spreadsheet format (MS Excel) for electronic use and presentation. A quality control check will be performed on a minimum of 20 percent of the input data.

Data from the laboratory will be transferred in hardcopy or electronically in spreadsheet or database format (MS Excel or Access). In the event the data is in hardcopy format, the data will be input into computer spreadsheet format for electronic use and presentation. A quality control check will be performed on a minimum of 20 percent of the input data.

All electronic data will be backed up at three locations: 1. Parsons' LAN drive; 2. Ecological Engineering Group's Watershed Modeling Server (University of Arkansas), and 3. Parsons Project Manager's project file.

Citations for Section B

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. U.S. Environmental Protection Agency; Office of Water; Washington, DC

Davidson, Chris, Undated. ADEQ Aquatic Macroinvertebrate Sample Collection and Processing. Coordinator of Aquatic Macroinvertebrate Studies, 501-682-0667; davidson@adeq.state.ar.us. ADEQ, Littlerock, AR

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Matlock M. D., M. E. Matlock, D. E. Storm, M. D. Smolen and W.J. Henley. 1998. Limiting nutrient determination in lotic ecosystems using a quantitative nutrient enrichment periphytometer. *Journal of the American Water Resources Association*. 35 (5): 1141-1147.

Merritt, R. and K. Cummins. 1988. An Introduction to the Aquatic Insects of North America (Second Edition). Kendall/Hunt Publishing Co. Dubuque, IA

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Shelton, L.R., 1994, Field guide for collecting and processing stream-water samples for the National Water-Quality Assessment Program: U.S. Geological Survey Open-File Report 94–455, 42 p

Standard Methods for the Examination of Water and Wastewater (20th Edition). 1998. Edited by Lenore S. Clesceri, Arnold E. Greenberg and Andrew D. Eaton. Published by the American Public Health Association, the American Water Works Association and the Water Environment Federation. Washington, DC

Wehr, J. and R. Sheath. 2003. Freshwater algae of North America: Ecology and Classification. Academic Press. New York, NY.

C1 ASSESSMENTS AND RESPONSE ACTIONS

Information Expected

This sampling project will yield a suite of water quality and ecological data for 5 sites in southern Arkansas. These data will be analyzed to determine if aquatic life uses are appropriately supported in Coffee Creek and Mossy Lake. The second goal is to present a water quality assessment of the receiving waters of the Georgia-Pacific Crossett (G-P) paper mill discharge.

Success Criteria

The criteria for success for this sampling project will be completion of each task within the designated quality control criteria.

Parsons will perform the following types of assessments and response action for data collection activities on an as needed basis:

- Status Monitoring and Oversight,
- Monitoring Systems Audit,
- Monitoring Systems Audit/Lab Inspection, and
- Performance Evaluation Samples.

Corrective Action

The Project Managers (Parsons and UofA) will be responsible for implementing and tracking corrective action procedures as a result of audit findings. All audit findings and corrective actions will be documented in the Audit form. Both Project Managers will maintain records of audit findings and corrective actions.

C2 REPORTS TO MANAGEMENT

Reports to Project Management

Laboratory data reports contain QC information and will be reviewed by the UofA Project Manager. Copies of field data sheets will also be given to the UofA Project Manager. The Parsons Project Manager will be informed either informally or by formal memorandum of any quality assurance problems encountered and solutions adopted by both field and laboratory personnel.

Reports to EPA Project Management

All reports detailed in this section are contract deliverables and are transferred to EPA in accordance with contract requirements.

Final Report – This report will provide background for the study, describe the methodology used and any delays, problems, and collective actions, report the findings and interpret the data to assess aquatic life use potential and water quality standards attainment.

D1 DATA REVIEW, VERIFICATION, AND VALIDATION

All data obtained from field and laboratory measurements will be reviewed and verified for integrity and continuity, reasonableness, and conformance to project requirements, and then validated against the data quality objectives that are listed in Section A7. Only those data that are supported by appropriate quality control data and meet the data quality objectives defined for this project will be considered acceptable, and will be reported to EPA.

The procedures for verification and validation of data are described below in Section D2. The UofA Project Manager is responsible for ensuring that field data are properly reviewed, verified, and submitted in the required format. Likewise, the Laboratory Manager is responsible for ensuring that laboratory data are reviewed, verified, and submitted in the required format. Finally, the UofA Project Manager is responsible for validating that all data collected meet the data quality objectives of the project and are suitable for reporting to EPA.

D2 VERIFICATION AND VALIDATION METHODS

All data will be verified to ensure they are representative of the samples analyzed and locations where measurements were made, and that the data and associated quality control data conform to project specifications. Verification refers to the process of confirming that a process or procedure was followed, while validation is the process of confirming that a method or instrument is measuring within acceptable QC ranges. The staff and management of the respective field and laboratory tasks are responsible for verifying the data each task generates or handles. The field and laboratory tasks ensure the verification of raw data, electronically generated data, and data on chain-of-custody forms and hard copy output from instruments.

Verification of data will be performed using self-assessments and peer review, as appropriate to the project task, followed by technical review by the manager of the task. The data to be verified (listed by task in Table D.1) are evaluated against project specifications and are checked for errors, especially errors in transcription, calculations, and data input. Potential outliers are identified by examination for unreasonable data, or identified using computer-based statistical software. If a question arises or an error or potential outlier is identified, the manager of the task responsible for generating the data is contacted to resolve the issue. Issues that can be corrected will be corrected and documented electronically or by initialing and dating the associated paperwork. If an issue cannot be corrected, the task manager consults with higher-level project management to establish the appropriate course of action, or the data associated with the issue are rejected.

The UofA Project Manager is responsible for validating that the verified data are usable and reportable to EPA. One element of the validation process involves evaluating the data again for anomalies. The Parsons QAO will reevaluate the data to determine whether any anomalies are present. The Parsons QAO will compare suspect or anomalous data with the limited historical data for the Ouachita River and from recent data from other water bodies in the Arkansas to determine reasonableness.

D3 RECONCILIATION WITH DATA QUALITY OBJECTIVES

The UofA Project Manager will evaluate the data to ensure that they meet the data quality objectives specified in section A7. If the data do not meet the goals specified in section A7, they will not be transferred to EPA. Data to be verified are described in Table D.1.

Table D.1 Data Quality Tasks

Data to be Verified	Field Task	Laboratory Task
Collection and analysis techniques consistent with SOPs and QAPP	X	X
Sample documentation complete	X	X
QC samples collected and analyzed at required frequencies	X	X
QC samples within acceptance limits	X	X
Chain of custody	X	X
Sample preservation and handling	X	X
Sample identifications	X	X
Holding times	X	X
MALs		X
Instrument calibration data	X	X
Measurement results	X	X
Calculations	X	X
Data entered in required format	X	X
Absence of transcription error	X	X
Reasonableness of data		X
Valid STORET codes		X
Electronic submittal errors	X	X
Sampling and analytical data gaps	X	X

Results obtained from this sampling project will be analyzed for anomalies based on the criteria described in Sections A, B, and C. The data will meet these criteria, or will not be reported. Any modifications of procedures or assumptions will be documented and submitted for variance approval by EPA. Neither Parsons nor the UofA will be responsible for QC of work performed outside the scope of this QAPP.

Additional Data To Be Considered

Parsons and the UofA may incorporate existing data from An Environmental and Economic Assessment for an Alternative Wastewater Treatment System at the Georgia-Pacific Facility at Crossett, Arkansas, September 1987, Mike D. McDaniel & Associates, Zachary, Louisiana. Data from sources outside of this QAPP are not to be construed as conforming to this QAPP; sources of additional data will be clearly cited.

APPENDIX A

Example Letter To Document Adherence to the QAPP

TO: (name)

(organization)

FROM: (name)

(organization)

Please sign and return this form by (date) to:

(address)

I acknowledge receipt of the referenced document(s). I understand the document(s) describe quality assurance, quality control, and other technical activities that must be implemented to ensure the results of work performed will satisfy stated performance criteria.

_____ _____

Signature Date

APPENDIX B
CHAIN-OF-CUSTODY FORM

Parsons
8000 Centre Park Dr., Suite 200
Austin, Texas 78754

CHAIN OF CUSTODY RECORD

Project: No. of containers																		
Name of collector:						Name of Company:												
Bill of Lading (if applicable):																		
Sample ID	Date:	Time:	Matrix:	Filtered?	Analysis and Preservative: Number of Containers	A												Comments
Relinquished by: (Signature):			Date:	Time:	Received by: (Signature)	Date:			Time:		Laboratory remarks:							

APPENDIX C

Albion Environmental ACMSK Clean Metals Sampling Kits
Instructions for Using Freshwater Kits
(Total Rec. & Dissolved Trace Metals & Total Rec. Mercury)

Albion Environmental ACMSK Clean Metals Sampling Kits
Instructions for Using Freshwater Kits
(Total Rec. & Dissolved Trace Metals & Total Rec. Mercury)

GENERAL INSTRUCTIONS

The ACMSK kit configurations described here are designed for manual grab sampling of fresh surface waters in a manner fully compliant with all EPA clean metals and mercury (Hg) guidance (i.e. EPA 1600 series methods including 1669, 1631, 1638/200.8, etc.). It is assumed that there is direct access to the water body being sampled either from the shore (wading) or from a boat. If more remote access is needed, Albion Environmental (AE) has other equipment that can be supplied with the ACMSK kits to allow clean sampling from bridges, grab sampling using pvc poles, etc. Each sampling kit configuration comes individually bagged and is separate from any accessory equipment such as CleanBox clean sampling enclosures, etc. Sample bottles within each kit have a unique identifying number and indicate the analytes to be collected in the bottle. The bottles are not further identified as to sample location, etc. and so it is important to use the AE unique bottle number to identify each sample collected. For example, trace metals samples are collected in plastic bottles and mercury samples use glass bottles. Usually total recoverable metals samples use 125 ml plastic bottles and dissolved (syringe filtered) samples use both 60 ml and 125 ml (where a larger volume is needed for laboratory QC samples) plastic bottles. The same syringe is used for all dissolved metals sampling at a site. One or more new syringe filters are used to filter each dissolved sample depending on the difficulty of hand filtration anticipated. The only exception is that the syringe filter used to take the dissolved field blank should be used to take the first dissolved field sample at the same site. Any questions concerning use of the ACMSK kits, please contact Albion Environmental at (979)-268-2677.

ACMSK freshwater kits are supplied with a 250 ml or 500 ml plastic narrow mouth bottle. This bottle is used to take a single grab composite trace metals (not Hg) sample of the waterbody being sampled. The bottle is supplied in two different ways: (1) Partially filled with blank water for those configurations (i.e. # 1100 and 1101 series) including field blanks and (2) empty for those configurations (i.e. # 1102 and 1103 series) with no field blanks. If the composite bottle comes with blank water, take the field blank first before using the bottle to take the composite grab of the waterbody being sampled. This approach means that you will have to make only one visit to the waterbody to collect your sample. You will then return to the CleanBox and all total recoverable and dissolved metals samples will be taken from the single 250 ml or 500 ml composite sample. Be sure to shake the composite bottle thoroughly before pouring each sample aliquot. Please return the composite bottle to Albion Environmental along with used syringes and syringe filters when you are finished using the kit. Unless specifically requested, no similar glass composite bottle is supplied for Hg sampling. Each Hg sample is taken directly from the waterbody being sampled.

If collected samples are being returned to AE for preservation/digestion and analysis, all ACMSK equipment is shipped to you in Albion Environmental coolers. This approach facilitates the return shipment of both samples and used equipment (e.g. CleanBoxes, composite bottles, syringes, syringe filters, etc.). If collected samples are not being returned to AE, then the equipment is shipped in cardboard boxes that should be re-used to return used and unused equipment to AE at the conclusion of sampling.

The following general clean sampling instructions apply to both trace metals and Hg sampling. Particulates in the air (including rainwater) and from sampling personnel themselves and

contaminated surfaces coming in contact with the water being sampled are the most common and important sources of sample contamination. To minimize such contamination, the following general instructions are designed to avoid contamination. Keep them in mind as you collect your sample.

1. Anyone handling the ACMSK sampling equipment **must wear the gloves provided**. Change gloves at each sampling site or whenever you feel the current pair may have become contaminated with particulates, etc. that could compromise the sample. **Wear clean outer clothing** to minimize the shedding of potentially contaminating particulates. Before the start of sampling at any station, step away from the sample handling area and brush off any particulates from your clothing. Remove all jewelry, watches and other metallic items from your hands and arms before handling any pre-cleaned equipment. **One person can collect clean metals samples using ACMSK kits.** Remember to always change gloves when shifting from a "dirty hands" to a "clean hands" activity such as processing samples inside the CleanBox.

2. Take only equipment needed for the grab sampling [i.e. sample containers (plastic and glass), trace metal free blank water (in plastic bottles) and mercury-free blank water (in glass bottles)] to the field. Keep all double-bagged, pre-cleaned sample bottles inside the original outer plastic bags and cooler (if supplied).

3. Use the two person "clean hands / dirty hands" approach whenever possible. Only the "clean hands" person touches the sample bottles or other pre-cleaned sampling equipment. If only one person is available, be sure to change to new gloves when you shift from performing "dirty hands" activities to conducting "clean hands" procedures. One person can successfully collect clean metals samples compliant with the "clean hands / dirty hands" approach described in EPA method 1669 guidance.

4. Do as much sample handling as possible inside a clean enclosure (e.g. large clear plastic bag used as a portable clean area, AE CleanBox, plastic glove bag, etc.). The CleanBox is a simple, portable device that provides an isolated, "clean" area in which to work in the field. Do as much sample handling as possible inside the CleanBox. The CleanBox comes triple bagged and if re-bagged after every station can be used for one entire day of sampling. The outer bag also serves as a groundcover.

5. **Do not open the sample bottles except when actually taking samples**. Keep the pre-cleaned sample bottles in their original double plastic bags except when actually sampling. Uncap sample bottles only long enough to put the sample into the pre-cleaned sample bottle. Pre-rinsing the bottles with sample is not necessary. Do not preserve the samples in the field.

6. **Avoid stirring up particulates at the sampling site.** Use the outer bag of the CleanBox (or large clear plastic bag provided) as a groundcover to shield the CleanBox area from ground generated particulates. If the outer bag becomes dirty during use it can be discarded and the second outer bag used for subsequent sampling on the same day. When not in use keep the syringe and other sampling equipment inside the original bags and inside the CleanBox or original outer shipping bags provided. Having two persons in gloves is helpful, but one person can easily collect clean metals samples using the kit.

7. **Avoid sampling during rain events**. However, by working inside the CleanBox it is possible to take contamination-free samples in the rain if necessary.

8. **Order of sample collection.** To the extent possible, sample from the cleanest (lowest metals or mercury) sampling site to the "dirtiest" site.

9. **Do not preserve the samples in the field.** All preservation will be done under clean room conditions when the samples are returned to AE or another laboratory.

10. **Follow the sampling plan** that is usually provided with the pre-cleaned sampling equipment.

Setting up the CleanBox

Always wear a clean pair of gloves provided when handling the sampling equipment. Work as much as possible inside the plastic bag shrouded CleanBox to avoid contamination. Do not remove the CleanBox from inside the outer shrouding bags. To use the CleanBox simply untie the three outer bags, open the lid inside the bags and snap the two white plastic clips (provided inside the CleanBox) onto the rear rail of the bottom half of the box. The clips will hold the lid open. You can see through the clear inner shrouding bag while you work and this bag should completely cover the CleanBox at all times. Try to work with the second outer bag completely covering the CleanBox most of the time to provide the best shielding from external contamination. The third outer bag covering the CleanBox can be used as a groundcover to minimize the generation of particulates. The CleanBox is lightweight and you may have to shield it from wind to keep it in place. For example, you can use a tree on the shoreline as a windbreak. If you are in a boat, the CleanBox may have to be used on the floor of the boat with the sides of the boat serving as windbreaks. One CleanBox is being provided for each day of sampling. If this approach is not satisfactory, we can provide additional CleanBoxes or clean, spare bags to shroud the CleanBox if the original ones become contaminated.

Collecting Manual Grab Clean Metals Samples

Field Blanks

One field blank must be taken during each day of sampling at a given site or a minimum of one field blank per day. At the site chosen, take both the total recoverable and dissolved metals field blanks and total recoverable Hg field blank first before taking any field samples. Field blanks should be taken entirely inside the CleanBox.

Total Recoverable Metals Field Blank. Wearing gloves and working inside the CleanBox, simply open the 250 ml or 500 ml plastic bottle of blank (reagent) water and pour the metal-free water it into one of the 125 ml bottles provided in the kit. When done, recap the sample bottle, replace it into the original double bags and place it inside another larger plastic bag on ice. Record the unique bottle identification number (e.g. EE-2500). Recap the blank water bottle and save for taking the field composite sample.

Total Recoverable Hg Field Blank. Wearing gloves and working inside the CleanBox, simply open the 125 ml or 250 ml glass bottle of blank (reagent) water and pour the mercury-free water it into one of the 125 ml or 250 ml glass bottles provided in the kit. When done, recap the sample bottle, replace it into the original double bags and place it inside another larger plastic bag on ice. Record the unique bottle identification number (e.g. EE-2500).

Dissolved Metals Field Blank. Wearing gloves and working inside the CleanBox do the following:

1. Remove the syringe from the double bag. The syringe comes full of metal-free water to be used to take the dissolved field blank.

2. Remove the syringe filter from its double bags, remove the protective end caps and install the filter onto the end of the syringe barrel (pressure fit). There is a protective end cap on the syringe that has to be removed just before installing the syringe filter. After the syringe filter is installed, turn the syringe outlet end down.

3. Apply steady, even pressure to begin to force water through the syringe filter. Do not try to rush the filtration. Using the calibration on the syringe barrel filter about 5-10 ml of water through the filter. The first 5-10 ml is a filter rinse (purge) and should be discarded.

4. After pre-rinsing the filter, the syringe can be placed in the original bags without leaking. Find a 60 ml sample bottle to use for the dissolved field blank. Remove the bottle cap and place the cap temporarily on the original double bags.

5. Place the uncapped field blank bottle on a flat surface inside the CleanBox and place the syringe filter flush against the bottle rim. Applying steady, even pressure, filter the entire contents of the syringe into the sample bottle. The resulting sample is the dissolved metals field blank. When done, recap the sample bottle, replace it into the original double bags and place it inside another larger plastic bag on ice. Record the unique bottle identification number (e.g. EE-2500).

6. Replace the syringe with filter attached into the original double bags until needed.

Manual Grab Metals Samples

Take a single composite sample of the waterbody being sampled using the 250 ml or 500 ml narrow mouth plastic bottle provided. Wearing gloves and working inside the CleanBox remove the 250 ml or 500 ml composite bottle from the original double bags. Loosen the cap but do not remove it from the bottle. Proceed to the water body being sampled. **Do not pre-rinse the sample bottle**. If some blank water remains in the bottle, discard it now before proceeding with the sample collection. Submerge the bottle under the surface of the water. Be sure to face the bottle up current to insure fresh water is entering the bottle and not water which has first contacted your gloved hands. Uncap the bottle under water and allow it to fill completely. Recap the bottle under water. Remove the capped bottle from the water and tighten the cap. Return to the CleanBox and place the bottle inside the CleanBox for further processing.

Total Recoverable Grab Sample (All configurations). Wearing gloves and working inside the CleanBox remove a 125 ml sample bottle from the original double bags. Loosen the cap but do not remove it from the bottle. Shake the 250 ml or 500 ml composite sample thoroughly. Pour a sample from the composite bottle into the 125 ml sample bottle. Recap the composite bottle and tighten the cap on the sample bottle and replace it in the original double bags. Place the bagged sample bottle inside another larger plastic bag on ice. Record the unique bottle identification number (e.g. EE-2500).

Total Recoverable Grab Field Duplicate Sample (Configurations series # 1101 and # 1103). Wearing gloves and working inside the CleanBox, simply repeat the procedure above using a new 125 ml sample bottle.

Dissolved Grab Sample (All configurations). Wearing gloves and working entirely inside the CleanBox do the following:

1. Use the same syringe and syringe filter used to take the dissolved field blank. With the filter not installed, remove the syringe plunger completely from the syringe body and place it in the original double bags to avoid contamination. **Please note** that this step exposes pre-cleaned

surfaces to the outside atmosphere and so considerable care should be taken when handling such exposed sampling equipment. Re-install the syringe filter on the syringe body. Shake the 250 ml or 500 ml composite sample thoroughly. Pour a sample from the composite bottle into the open syringe body. Recap the composite bottle. Re-install the syringe plunger into the syringe body just enough to avoid leakage. Remove the syringe filter and place it in the original double bags to avoid contamination. Turn the syringe outlet end up. This step is necessary so that any air trapped in the syringe barrel can be expelled by pushing the plunger and allowing the air and a small amount of water to escape from the syringe outlet. Once all air is out of the syringe barrel, re-install the same syringe filter used to take the field blank and turn the syringe outlet end down.

2. Apply steady, even pressure to begin to force water through the syringe filter. Do not try to rush the filtration. Using the calibration on the syringe barrel filter about 5-10 ml of water through the filter. The first 5-10 ml is a filter rinse (purge) and should be discarded.

3. After pre-rinsing the filter, the syringe can be placed in the original double bags without leaking. Find a 60 ml sample bottle to use for the dissolved grab sample. Remove the bottle cap and place the cap temporarily in the original double bags.

4. Place the open bottle on a flat surface inside the CleanBox and place the syringe filter flush against the bottle rim. Applying steady, even pressure, filter the entire contents of the syringe into the sample bottle. Do not rush the filtration. It may take 2-3 minutes to filter each water sample.

   a. **Please note** that spare syringe filters are provided in a separate dated bag in case it becomes too difficult to filter the water being sampled using the original syringe filter or if the original filter fails. You should not have to press unusually hard to filter the water sample. If you do, the syringe filter may be "clogging" and a second filter should be used. If you use the second syringe filter simply remove the first one and install the new (second) one. Then flush and discard 5-10 ml of water through the new filter. Be sure to keep the sample bottle covered while you are flushing the new filter. Then continue filtering the water sample through the second syringe filter into the sample bottle in the same manner as before.

5. **Please note** that for some kit configurations a second syringe full of sample should be filtered because of the larger sample volume required for some laboratory quality control (QC) samples. Consult the instruction sheet included with the kit itself to see if a larger volume (125 ml plastic bottle) is needed for a dissolved sample. If so, simply repeat the process (steps 1-4) to filter another syringe full of sample water. The resulting sample is the dissolved field sample. When done, recap the sample bottle, replace it into the original double bags and place it inside another larger plastic bag on ice. Record the unique bottle identification number.

6. Remove the used syringe filter(s) and place it in the original double bags. The used filters should be returned to AE for inspection.

7. Replace the syringe into the original double bags if it will be needed again (i.e. field duplicate sample being taken). Do not re-use the syringe filter.

Dissolved Grab Field Duplicate Metals Sample. Wearing gloves and working inside the CleanBox repeat the procedure described above using the same syringe but a new 60 or 125 ml sample bottle and a new syringe filter.

Manual Grab Mercury Samples

Unless specifically requested, Hg grab samples are all taken directly from the waterbody being sampled. Remember 125 ml or 250 ml **glass sample bottles only are used to collect Hg samples.** Consequently, if a field duplicate is being taken, take both glass Hg sample bottles to the waterbody along with the plastic composite bottle used to take the metals composite sample.

Manual Grab Hg Samples (All configurations): Wearing gloves and working inside the CleanBox, remove the glass Hg sample bottle from the original double bag. Loosen the cap but do not remove it from the bottle. Proceed to the waterbody being sampled. Submerge the bottle under the surface of the water being sampled. Try to face the bottle up current to insure fresh water is contacting the bottle and not water which has first contacted your gloved hands. Uncap the bottle under water and allow it to fill completely. Recap the bottle under water. Remove the capped bottle from the water and tighten the cap. Replace the bottle in the original double bags and place the bagged sample bottle inside another larger plastic bag on ice. Record the unique bottle identification number (e.g. EE-2500).

Field Duplicate Hg Samples. Simply repeat the steps in paragraph above using a new the proper bottle labeled for the event.

Before Leaving a Sampling Station

1. Seal all samples collected in a single outer bag and be sure they are well iced for shipment. **Do not preserve the samples in the field.**

2. Place all used equipment (i.e. syringes, syringe filters, reagent water bottles, CleanBoxes, unused gloves, etc.) in the original configuration bag. This equipment will be returned to Albion Environmental for possible recycling or disposal (see section below).

3. Close the CleanBox by removing the rear rail clips (and placing them inside the CleanBox) and lowering the lid. Reseal all three outer bags to avoid contaminating the CleanBox between stations on the same day.

At the End of the Sampling Day

Shipping Instructions for Trace Metals and Hg Samples:

1. Metals and Hg samples as collected in the field should already be tightly capped and in their original double bags and in an outer plastic bag on ice. Confirm this situation before packing the samples for shipment. Mercury samples no longer have to be shipped on ice but you may find it easier to ship both metals and Hg samples on ice.

2. Use plenty of ice to keep the temperature < 4 deg. C. during shipment. To minimize the chance for melt water contamination of the samples during shipping, place the ice in a separate plastic bag.

3. Metals and mercury samples should be shipped on ice by FEDEX standard overnight to arrive at Albion Environmental by the afternoon of the next day. Special packing materials (bubble bags and plastic sleeves) are provided to insure that there is no glass Hg sample bottle breakage during shipment. **SEE SEPARATE PACKING INSTRUCTIONS FOR GLASS HG BOTTLES**. The shipping address is as follows:

Albion Environmental
3800 State Highway 6 South, Suite 218
College Station, TX 77845-5840
ATTN: Dr. Paul Boothe
(979-268-2677)

Returning Used Clean Metals and Hg Sampling Equipment

ACMSK prices are based on the return of all used equipment to AE for possible re-use and recycling. Please do not discard any used equipment. Please accumulate all used equipment (i.e. syringe, syringe filters, empty blank water/ composite grab plastic bottles, empty glass blank water bottles, used Clean Boxes, AE ice chests, etc.) as the field sampling proceeds. As soon as convenient, return all used equipment to Albion Environmental at the address given above by the least expensive method available to you. It is easiest to use any remaining AE coolers to ship the used equipment. Thank you very much for your help with this request.

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ATTACHMENT 1

Outline of Report for
Use Attainability and Water Quality Assessment of
Coffee Creek, Mossy Lake, and the Ouachita River, Southern Arkansas

USE ATTAINABILITY AND WATER QUALITY ASSESSMENT OF COFFEE CREEK, MOSSY LAKE, AND THE OUACHITA RIVER

EXECUTIVE SUMMARY

INTRODUCTION

- Scope and Objectives
- Existing Information
- Existing Data

METHODS AND MATERIALS

- Sample Site Descriptions
- Sample Collection Methods
- Laboratory Analysis Methods
- Data Quality Review

RESULTS AND DISCUSSION

- Use Attainability Analysis Results
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- Interpretation of Findings

CONCLUSIONS

RECOMMENDATIONS

LITERATURE CITED

APPENDICES

Appendix A References
Appendix B Water Quality Data
Appendix C Water Flow Data
Appendix D Macroinvertebrate Data
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