QUALITY ASSURANCE PROJECT PLAN

CONNECTICUT RIVER FISH TISSUE STUDY

Brown Engineering
for
Fort Longstreet

Based on the Intergovernmental Data Quality Task Force Uniform Federal Policy for Quality Assurance Project Plans
(Draft Version 2, January 2004)

April 13, 2000

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Title and Approval Page

Quality Assurance Project Plan for Connecticut River Fish Tissue Study
Document Title

Fort Longstreet
Lead Organization (Agency, State, Tribe, Federal Facility, PRP, or Grantee)

Mary Facts, Brown Engineering
Preparer's Name and Organizational Affiliation

24K Diamond Lane, Hope, Vermont (997-799-1431), mfacts@brown.com
Preparer's Address, Telephone Number, and E-mail Address

April 6, 2000
Preparation Date (Day/Month/Year)

Investigative Organization's Project Manager: *Amy Lee*
Signature

Amy Lee, Brown Engineering, April 6, 2000
Printed Name/Organization/Date

Investigative Organization's Project QA Officer: *Andy Owens*
Signature

Andy Owens, Brown Engineering, April 12, 2000
Printed Name/Organization/Date

Lead Organization's Program Manager: *Thomas Jackson*
Signature

Thomas Jackson, Fort Longstreet, April 15, 2000
Printed Name/Organization/Date

Approval Signatures: *John Smith*
Signature

John Smith, RPM – U.S. EPA Region 13, May 12, 2000
Printed Name/Title/Date

U.S. EPA Region 13
Approval Authority

Other Approval Signatures: *Betty Fox*
Signature

Betty Fox, QAM/U.S. EPA Region 13, May 9, 2000
Printed Name/Title/Date

Document Control Number: FISH-00

QAPP Worksheet #2
QAPP Identifying Information

Site Name/Project Name: Connecticut River Fish Tissue Study
Site Location: Connecticut River

Site Number/Code: N/A
Operable Unit: N/A
Contractor Name: Brown Engineering
Contractor Number: 990032
Contract Title: A8E Support Services
Work Assignment Number: 990032-7

Title: Connecticut River Fish Tissue Study
Revision Number: 0
Revision Date: 04/06/00
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1. Identify guidance used to prepare QAPP:

   Uniform Federal Policy for Quality Assurance Project Plans

2. Identify regulatory program: U.S. EPA Region 13, CWA - Water Quality

3. Identify approval entity: U.S. EPA Region 13

4. Indicate whether the QAPP is a generic or a (project-specific QAPP.) (circle one)

5. List dates of scoping sessions that were held: 9/10/99

6. List dates and titles of QAPP documents written for previous site work, if applicable:

Title	Approval Date
N/A	

7. List organizational partners (stakeholders) and connection with lead organization:

   U.S. EPA Region 13 - Oversight Organization

8. List data users: U.S. EPA Region 13, RPM, Fort Longstreet; U.S. EPA Region 13 Human Health Risk Assessors

9. If any required QAPP elements and required information are not applicable to the project, then circle the omitted QAPP elements and required information on the attached table. Provide an explanation for their exclusion below:

   Worksheet # 20 is not applicable because field QC samples will not be collected for Fish Tissue Matrices.

QAPP elements and required information that are not applicable to the project are circled and an explanation is provided in the QAPP.

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QAPP Worksheet #3
Distribution List

QAPP Recipients	Title	Organization	Telephone Number	Fax Number	E-mail Address	Document Control Number
Thomas Jackson	Program Manager	Fort Longstreet	791-555-1677	791-555-1681	jackson.tom@epa.gov	FISH-01
John Smith	EPA Region 13 RPM	U.S. EPA Region 13	543-555-1214	543-555-1222	smith.john@epa.gov	FISH-02
Betty Fox	EPA Region 13 QAM	U.S. EPA Region 13	543-555-1309	543-555-1222	fox.betty@epa.gov	FISH-03
Amy Lee	Project Manager	Brown Engineering	997-799-1419	997-799-0351	alee@brown.com	FISH-04
Andy Owens	Project QA Officer	Brown Engineering	997-799-1427	997-799-0351	aowens@brown.com	FISH-05
Mary Facts	Project QAPP Preparer	Brown Engineering	997-799-1431	997-799-0351	mfacts@brown.com	FISH-06
Kate Jones	Project Sample Team Leader	Brown Engineering	997-799-1452	997-799-0409	kjones@brown.com	FISH-07
Stan Moore	Project Data Validator	Brown Engineering	997-799-1406	997-799-0351	smoore@brown.com	FISH-08
Rachel Stein	Health and Safety Officer	Brown Engineering	997-799-1460	997-799-0409	rstein@brown.com	FISH-09
Henry Phelps	Human Health Risk Assessor	Brown Engineering	997-799-1437	997-799-0409	hphelps@brown.com	FISH-10
Jane Barber	Laboratory Manager	ELM Laboratories	690-642-1712	690-642-5940	jane_barber@elmlabs.com	FISH-11
Betty Smith	Laboratory QAO	ELM Laboratories	690-642-1710	690-642-5940	betty_smith@elmlabs.com	FISH-12

QAPP Worksheet #4-1
Project Personnel Sign-Off Sheet

Organization: Fort Longstreet

Project Personnel	Title	Telephone Number	Signature	Date QAPP Read
Thomas Jackson	Program Manager	791-555-1677	*Thomas Jackson*	04/15/2000

QAPP Worksheet #4-2
Project Personnel Sign-Off Sheet

Organization: Brown Engineering

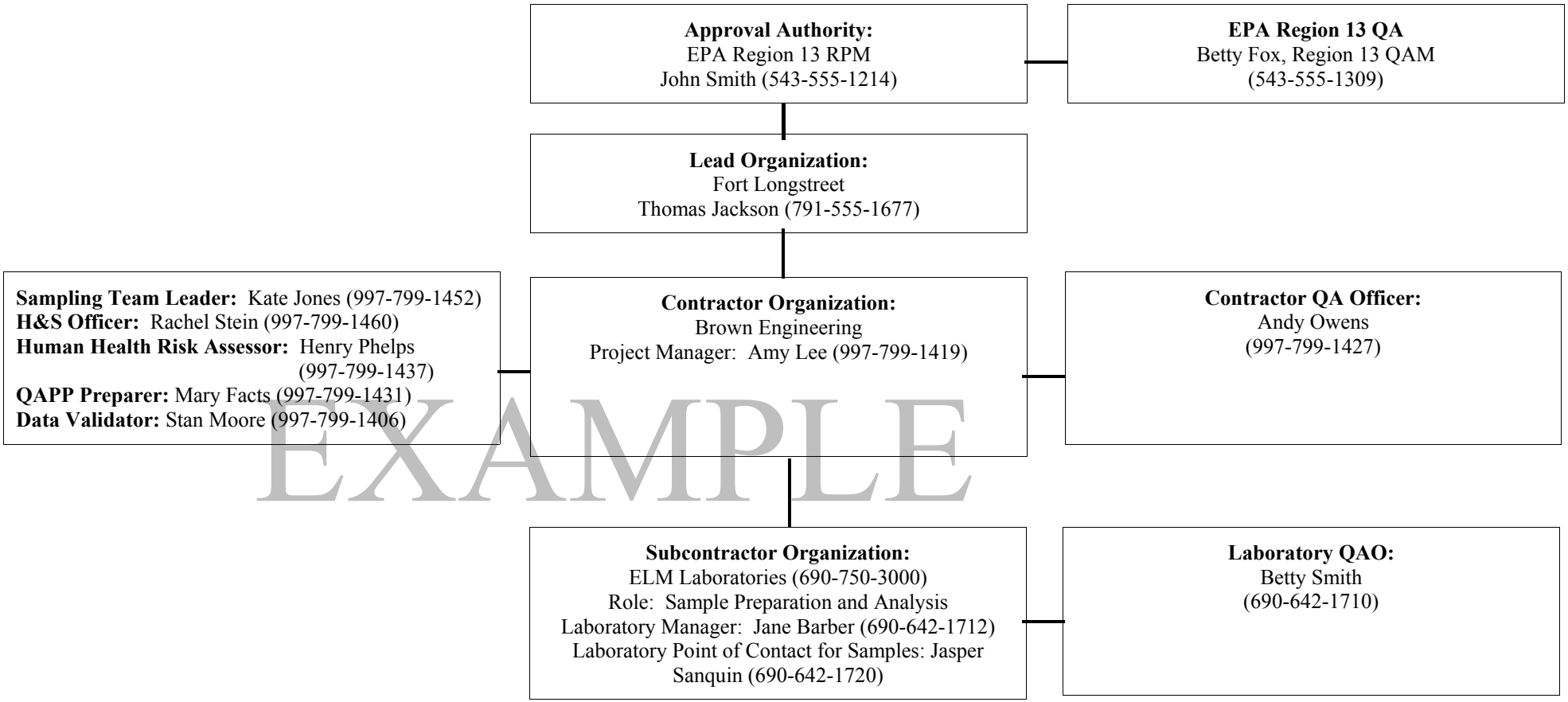
Project Personnel	Title	Telephone Number	Signature	Date QAPP Read
Amy Lee	Project Manager	997-799-1419	*Amy Lee*	04/06/2000
Mary Facts	QAPP Preparer	997-799-1431	*Mary Facts*	N/A
Andy Owens	Project QA Officer	997-799-1427	*Andy Owens*	04/12/2000
Kate Jones	Sample Team Leader	997-799-1452	*Kate Jones*	04/12/2000
Stan Moore	Data Validator	997-799-1406	*Stan Moore*	04/12/2000
Rachel Stein	Health and Safety Officer	997-799-1460	*Rachel Stein*	04/13/2000
Henry Phelps	Risk Assessor	997-799-1437	*Henry Phelps*	04/13/2000
Ben Coates	Field Sampler	997-799-1438	*Ben Coates*	04/14/2000

QAPP Worksheet #4-3
Project Personnel Sign-Off Sheet

Organization: ELM Laboratories

Project Personnel	Title	Telephone Number	Signature	Date QAPP Read
Jane Barber	Laboratory Manager	690-642-1712	*Jane Barber*	04/10/2000
Betty Smith	Laboratory Quality Assurance Officer	690-642-1710	*Betty Smith*	04/11/2000
Jasper Sanquin	Sample Receiving	690-642-1720	*Jasper Sanquin*	04/09/2000

QAPP Worksheet #5
Project Organizational Chart



QAPP Worksheet #6
Communication Pathways

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure (Timing, Pathways, etc.)
Point of Contact with EPA RPM	Lead Organization Program Manager	Thomas Jackson	791-555-1677	All materials and information about the project will be forwarded to John Smith by Thomas Jackson.
Manage all Project Phases	Contractor Project Manager	Amy Lee	997-799-1419	Amy Lee will be Brown Engineering's liaison to Thomas Jackson.
Manage all Project Phases	Contractor Project Manager	Amy Lee	997-799-1419	Notify John Smith of field-related problems by phone, email, or fax by COB the next business day.
QAPP changes in the field	Sampling Team Leader	Kate Jones	997-799-1452	Notify Amy Lee by phone and email of changes to QAPP made in the field and the reasons within 2 business days.
Daily Field Progress Reports	Sampling Team Leader	Kate Jones	997-799-1452	Kate Jones will e-mail or fax daily field progress reports to Amy Lee.
Reporting Lab Data Quality Issues	Laboratory Quality Assurance Officer	Betty Smith	690-642-1710	All QA/QC issues with project field samples will be reported by Betty Smith to Andy Owens within 2 business days.
Field and Analytical Corrective Actions	Contractor Quality Assurance Officer	Andy Owens	997-799-1427	The need for corrective action for field and analytical issues will be determined by Andy Owens.
Release of Analytical Data	Contractor Quality Assurance Officer	Andy Owens	997-799-1427	No analytical data can be released until validation is completed and Andy Owens has approved the release.
QAPP Amendments	EPA Remedial Project Manager	John Smith	543-555-1214	Any major changes to the QAPP must be approved by John Smith before the changes can be implemented[1]

[1]Major changes to the QAPP that would require pre-approval include using alternative SOP's from what is in document

QAPP Worksheet #7
Personnel Responsibilities and Qualifications Table

Name	Title	Organizational Affiliation	Responsibilities	Education and Experience Qualifications
Thomas Jackson, P.E.	Program Manager	Fort Longstreet	Oversees project and responds to EPA	M.S., Environmental Engineering, 18 yrs. exp.
Amy Lee	Project Manager	Brown Engineering	Manages project – coordinates between lead agency and subcontractor	M.S., Biology, 15 yrs. exp.
Andy Owens	QA Officer	Brown Engineering	QA oversight	M.S., Environmental Science, 10 yrs. exp.
Mary Facts	QAPP Preparer	Brown Engineering	Prepares QAPP	B.S., Chemistry, 7 yrs. exp.
Stan Moore	Data Reviewer	Brown Engineering	Performs data validation	B.S., Chemistry, 8 yrs. exp.
Kate Jones	Sampling Team Leader	Brown Engineering	Supervises field sampling and coordinates all field activities	B.S., Biology, 6 yrs. exp.
Rachel Stein	H&S Officer	Brown Engineering	Oversees H&S for field activities	B.S., Biology, 4 yrs. exp.
Henry Phelps	Risk Assessor	Brown Engineering	Performs human health risk assessment	M.S., Biology, 14 yrs. exp.
Jane Barber	Laboratory Manager	ELM Laboratories	Manages generation of analytical data	M.S., Chemistry, 16 yrs. exp.
Betty Smith	Lab QAO	ELM Laboratories	Performs lab QA oversight	B.S., Chemistry, 13 yrs. exp.

QAPP Worksheet #8
Special Personnel Training Requirements Table

Project Function	Specialized Training – Title or Description of Course	Training Provider	Training Date	Personnel/Groups Receiving Training	Personnel Titles/ Organizational Affiliation	Location of Training Records/Certificates
Electro Fishing	Principles and Techniques of Electro Fishing	USFWS	June 1, 1998	Kate Jones Rachel Stein Ben Coates	Sampling Team Leader H&S Officer Field Sampler	Brown Engineering: Certificates available on request

QAPP Worksheet #9
Project Scoping Session Participants Sheet

Project Name: Connecticut River Fish Tissue Study **Projected Date(s) of Sampling: June – September 2000** **Project Manager: Amy Lee**	**Site Name Connecticut River** **Site Location Connecticut River**

Date of Session: 9/10/99
Scoping Session Purpose: Plan Project

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
John Smith	U.S. EPA Region 13 RPM	U.S. EPA	543-555-1214	smith.john@epa.gov	RPM
Betty Fox	U.S. EPA Region 13 QAM	U.S. EPA	543-555-1309	fox.betty@epa.gov	QAM
Thomas Jackson	Program Manager	Fort Longstreet	791-555-1677	jackson.tom@epa.gov	Project Manager
Amy Lee	Project Manager	Brown Engineering	997-799-1419	alee@brown.com	Project Manager
Andy Owens	QA Officer	Brown Engineering	997-799-1427	aowens@brown.com	Provides QA oversight
Mary Facts	QAPP Preparer	Brown Engineering	997-799-1431	mfacts@brown.com	Prepares QAPP
Kate Jones	Sampling Team Leader	Brown Engineering	997-799-1452	kjones@brown.com	Supervises field sampling
Rachel Stein	Health and Safety Officer	Brown Engineering	997-799-1460	rstein@brown.com	Writes and oversees implementation of Health and Safety Plan
Henry Phelps	Risk Assessor	Brown Engineering	997-799-1437	hphelps@brown.com	Develops human health risk assessment
Stan Moore	Data Validator	Brown Engineering	997-799-1406	smoore@brown.com	Ensures data are validated per QAPP requirements
Jane Barber	Laboratory Manager	ELM Laboratories	690-642-1712	jane_barber@elmlabs.com	Oversees sample prep and analysis
Betty Smith	Lab QAO	ELM Laboratories	690-642-1710	betty_smith@elmlabs.com	Reviews data packages and ensure all lab QC objectives are met

Comments/Decisions: Set project analytical action limits

Action Items: Plan initial project phase; select analytical methods, project quantitation limits, and DQIs; establish deliverable schedule

Consensus Decisions: QAPP to be finalized by April 2000

QAPP Worksheet #10

Problem Definition

PROBLEM DEFINITION

The Connecticut River has relatively low concentrations of toxic pollutants in its water column (generally within State and Federal water quality criteria). However, pollutants deposited as a result of past activities at Fort Longstreet represent a potential problem. These past activities have included liberal use of various aroclors/pesticides on the rifle ranges. Mercury contamination is believed to have originated from the use of mercury-containing explosive compounds on the artillery range. It is believed that aroclors/pesticides and mercury have remained in the food chain to bioaccumulate (concentrate) in certain fish species, such as carp and bass. Bioaccumulation to levels which pose long-term health risks for fish consumers is believed to be associated with trace-level contaminants present in the water and sediment. The level of aroclors/pesticides and mercury contamination in fish is unknown.

PROJECT DESCRIPTION

The objective of the fish tissue study is to perform a watershed-wide fish tissue monitoring program which would document current conditions with regard to contaminant concentrations of aroclors/pesticides and mercury in respective fish from the main stream of the Connecticut River and use that data to revise human health consumption advisories. In addition, the monitoring program would allow for subsequent sampling at regular intervals to monitor trends in Connecticut River fish tissue contaminant concentrations.

PROJECT DECISION CONDITIONS

If average concentrations of aroclors/pesticides and/or mercury in fish tissue collected from fish downstream of Ft. Longstreet exceed human health risk-based concentrations for recreational fishermen, then human health consumption advisories will be revised to reflect acceptable consumption rates.

If future sampling indicates contaminant concentrations are decreasing, sampling will continue until average contaminant concentrations are below human risk levels.

QAPP Worksheet #11

Project Quality Objectives/Systematic Planning Process Statements

WHO WILL USE THE DATA?

Data will be used by EPA Region 13 to determine the safety of human consumption of fish from the Connecticut River. All data and other information gathered during the project will be archived for one year. CD-Rs will be used for a permanent archive.

WHAT WILL THE DATA BE USED FOR?

Brown Engineering will be responsible for conducting a human health risk assessment based on the data collected. In addition, sufficient data with reliable quality assurance/quality control will be collected so that statistical comparison of concentrations seen in 2000 can be made to data collected in the future.

WHAT TYPE OF DATA ARE NEEDED?

The program will contain the following elements:

- Representative sampling locations chosen by and located downstream of Fort Longstreet in six separate river reaches (site locations will be well distributed spatially and will also take into consideration major hydrologic features such as dams and tributaries). See Figure 1.
- Standard protocols for sample collection, handling, sample preparation, and analytical methods.
- As consistent a sample type among sampling locations as possible (species, age or size, number in composite).
- All sampling will be conducted within as small a time frame as possible.

HOW MUCH DATA ARE NEEDED?

The fish species targeted for this survey were selected in order to represent the potentially worst cases for contaminant uptake in the waterbody, the species most likely to be consumed by the fishing population on the river, and species representing different in-river habitat niches and trophic feeding levels.

Samples of resident fishes, which include yellow perch (YP), smallmouth bass (SMB), and white sucker (WS), will consist of five 3-fish fillet and offal composites of each species from all sampling locations. Eastern brook trout (EBT) samples will consist of five 3-fish fillet and offal composites. Samples of American shad (AS) and striped bass (SB) will consist of five 3-fish fillet and offal composites of each species, and for blueback (B) herring only, the analyses will be in five 3-whole fish composites.

The river has been divided into six separate reaches for which samples will be collected. YP, SMB, and WS will be collected in all six reaches. AS, SB, and B will be collected only in Reach 3. EBT will be collected only in Reach 6.

HOW GOOD DO DATA NEED TO BE?

The data must support a human health risk assessment.

WHEN WILL DATA BE COLLECTED?

Data will be collected from 6/16/ to 9/4, 2004.

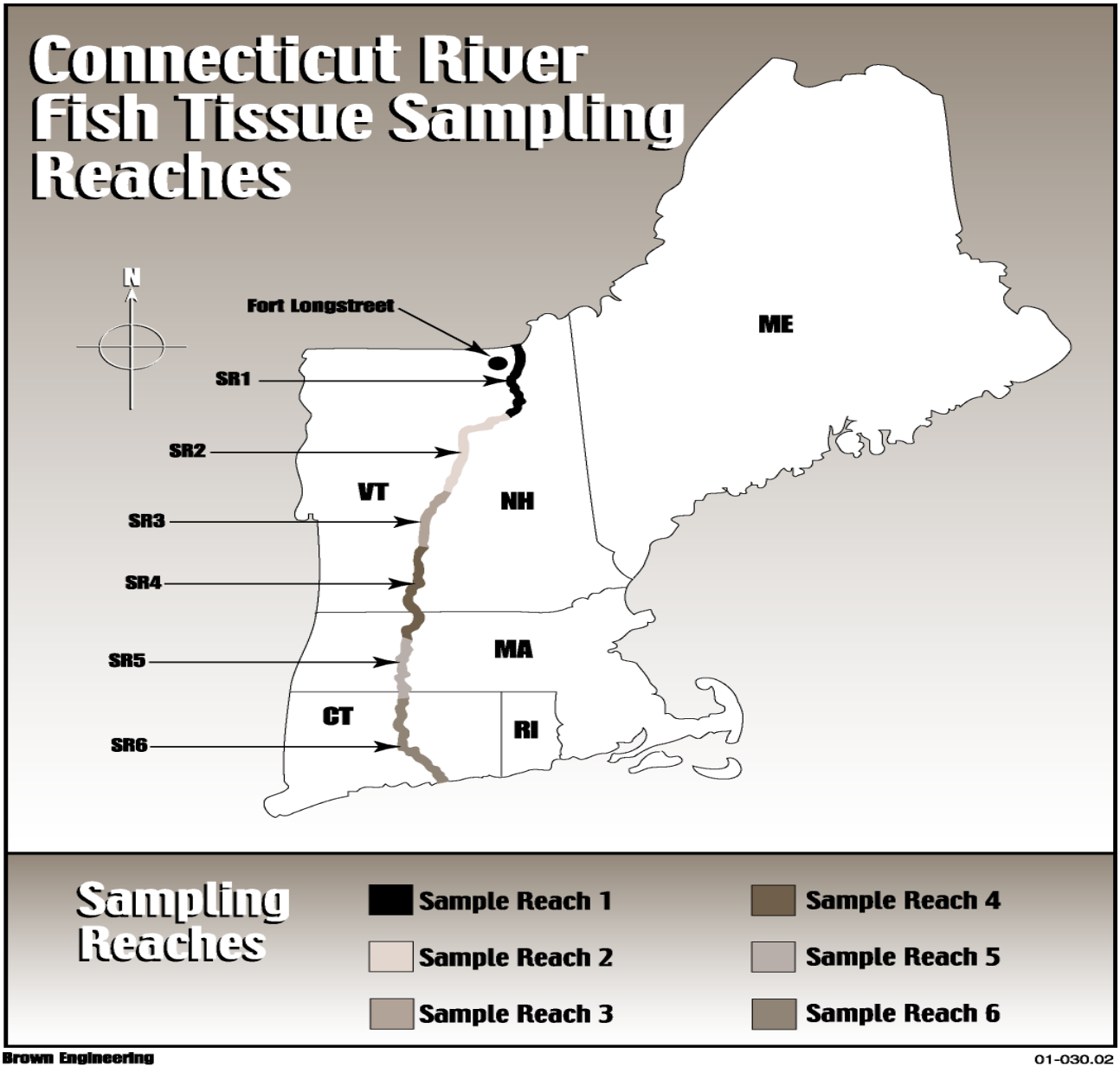

Connecticut River
Fish Tissue Sampling
Reaches
N
Fort Longstreet
SR1
SR2
SR3
SR4
SR5
SR6
ME
VT
NH
MA
CT
RI
Sampling
Reaches
Sample Reach 1
Sample Reach 2
Sample Reach 3
Sample Reach 4
Sample Reach 5
Sample Reach 6
Brown Engineering
01-030.02

Figure 1

QAPP Worksheet #12-1
Measurement Performance Criteria Table

Matrix	Fish Tissue
Analytical Group	Organics - Aroclors/Pesticides
Concentration Level	Low

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
S-1	L-2	Precision - Lab	RPD # 40%	Laboratory Duplicates	A
		Accuracy/Bias	± 20% recovery	QC Standard 2nd Source/SRM	A
		Accuracy/Bias-Contamination	No target compounds $ QL	Method Blanks, Instrument Blanks	A
		Sensitivity	± 40% recovery at QL	Laboratory Fortified Blank at QL	A
		Completeness	> 85% fish collection, > 90% laboratory analysis	Data Completeness Check	S&A

[1]Reference number from QAPP Worksheet #21.
[2]Reference number from QAPP Worksheet #23.

QAPP Worksheet #12-2
Measurement Performance Criteria Table

Matrix	Fish Tissue
Analytical Group	Inorganics - Mercury
Concentration Level	Low

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
S-1	L-1	Precision-Lab	RPD # 20%	Laboratory Duplicates	A
		Accuracy/Bias	± 15% recovery	QC Standard 2nd Source/SRM	A
		Accuracy/Bias-Contamination	No target compounds $ QL	Preparation Blanks	A
		Sensitivity	± 40% recovery at QL	Laboratory Fortified Blank at QL	A
		Completeness	> 85% fish collection, > 90% laboratory analysis	Data Completeness Check	S&A

[1]Reference number from QAPP Worksheet #21.

[2]Reference number from QAPP Worksheet #23.

QAPP Worksheet #13
Secondary Data Criteria and Limitations Table

Secondary Data	Data Source (Originating Organization, Report Title, and Date)	Data Generator(s) (Originating Org., Data Types, Data Generation/Collection Dates)	How Data Will Be Used	Limitations on Data Use
River Water Quality	The Connecticut River Forum The Health of the Watershed: A Report of the Connecticut River Forum; January 1998	The Connecticut River Forum; Description of water quality issues and recommendations; 1997.	River history information; Focus the study; Identify which reaches to sample; Decide species and size fish to collect	No description of fish processing, preparation, and analysis procedures used. No qualitative or quantitative comparisons will be performed using this data.
Policy and Planning	USEPA and State of Connecticut; 1993 Clean Water Strategy and 1994 Connecticut River Water Quality Assessment	USEPA and the State of Connecticut; Description of water quality issues and recommendations; 1985-1994.	Focus the study; Identify which reaches to sample; Decide species and size fish to collect	Not all reaches were sampled. No qualitative or quantitative comparisons will be performed using this data.
Fish Tissue Data	State of Connecticut; 1994 Connecticut River Water Quality Assessment	USEPA and the State of Connecticut; Fish Tissue Analysis - Summary Table of Analytical Results; 1985.	Focus the study; Identify which reaches to sample	Not all reaches were sampled. No description of fish species and sizes. No qualitative or quantitative comparisons will be performed using this data.

QAPP Worksheet #14
Summary of Project Tasks

Sampling Tasks:
1. Fish collection utilizing shock boat and standard electrofishing techniques, gill nets, rod and reel, fyke nets or other appropriate methods.
2. Surface Water quality parameters (pH, specific conductance, dissolved oxygen, and temperature)
3. GPS
4. Digital photos

Analysis Tasks:
1. ELM Laboratories to process, prepare, and analyze fish tissue for Aroclors/Pesticides and Mercury
2. Fish length, weight, age (via extraction and analyses of otoliths), and sex information to be collected by ELM Laboratories.

Quality Control Tasks:
1. Implement SOPs for fish capture, packaging and transport, and post field processing prior to analysis, and sample preparation/analysis methods. QC samples are described on Worksheet #26.

Secondary Data:
1. See Worksheet #13.

Data Management Tasks:
1. Analytical data will be placed in a database after validation.

Documentation and Records:
1. All samples collected will have GPS locations documented, records of each sample collected in notebooks, and all field measurements documented in notebooks. COCs, airbills, and sample logs will be prepared and retained for each sample.
2. Copy of finalized QAPP retained in central file area

QAPP Worksheet #14
Summary of Project Tasks (continued)

Data Packages:
1. ELM Laboratories complete analytical data package [Aroclors/Pesticides, Hg] in accordance with Region 13 Data Validation Functional Guidelines for Evaluating Environmental Analyses.

Assessment/Audit Tasks:
1. Field Sample Collection and Documentation Audits: week of June 16, 2000.
2. Laboratory TSA April 24, 2000.

Data Review Tasks:
1. ELM Laboratories will verify that all data are complete for samples received. All data package deliverables requirements will be met. Data will be validated by Brown Engineering at the Tier II level using Region 13 Data Validation Functional Guidelines for Evaluating Environmental Analyses. Achievement of all project-specific measurement performance criteria (MPC) specified in the QAPP and data validation criteria (DVC) will be evaluated during the Tier II data validation, and the analytical measurement error will be assessed. A Tier II Data Validation Report will be produced for each Sample Delivery Group.

2. Validated data and all related field logs/notes/records will be reviewed to assess total measurement error and determine overall usability of the data for project purposes. Data limitations will be determined and data will be compared to Project Quality Objectives and required Action Limits. Corrective action is initiated, as necessary. Final data are placed in database, with any necessary qualifiers, and tables, charts, and graphs are generated.

QAPP Worksheet #15-1
Reference Limits and Evaluation Table

Matrix: Fish Tissue

Analytical Group: Organic - Aroclors/Pesticides

Concentration Level: Low

Analyte	CAS Number	Project Action Limit	Project Quantitation Limit Goal	Analytical Method[1]		Achievable Laboratory Limits[2]	
				MDLs	Method QLs	MDLs	QLs
Aldrin	309-00-2	0.01 mg/Kg	0.002 mg/Kg	0.00025 mg/Kg	0.001 mg/Kg	0.000031 mg/Kg	0.00015 mg/Kg
alpha-BHC*	319-84-6	0.01 mg/Kg	0.002 mg/Kg	0.00025 mg/Kg	0.001 mg/Kg	0.000021 mg/Kg	0.0001 mg/Kg
beta-BHC	319-85-7	0.01 mg/Kg	0.002 mg/Kg	0.00025 mg/Kg	0.001 mg/Kg	0.000052 mg/Kg	0.00025 mg/Kg
delta-BHC	319-86-8	0.01 mg/Kg	0.002 mg/Kg	0.00025 mg/Kg	0.001 mg/Kg	0.000030 mg/Kg	0.00015 mg/Kg
gamma-BHC	58-89-9	0.01 mg/Kg	0.002 mg/Kg	0.00025 mg/Kg	0.001 mg/Kg	0.000010 mg/Kg	0.00005 mg/Kg
alpha-Chlordane	5103-71-9	0.01 mg/Kg	0.002 mg/Kg	0.00025 mg/Kg	0.001 mg/Kg	0.000027 mg/Kg	0.00013 mg/Kg
gamma-Chlordane	5103-74-2	0.01 mg/Kg	0.002 mg/Kg	0.00025 mg/Kg	0.001 mg/Kg	0.000031 mg/Kg	0.00015 mg/Kg
Chlordane (technical)*	57-74-9	0.1 mg/Kg	0.02 mg/Kg	0.001 mg/Kg	0.005 mg/Kg	0.0002 mg/Kg	0.008 mg/Kg
4, 4' DDD*	72-54-8	0.01 mg/Kg	0.002 mg/Kg	0.00025 mg/Kg	0.001 mg/Kg	0.000116 mg/Kg	0.00058 mg/Kg

*Target analytes/contaminants of concern

[1] Analytical MDLs and QLs are those documented in validated methods.

[2] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

QAPP Worksheet #15-1 (continued)
Reference Limits and Evaluation Table

Matrix: Fish Tissue
Analytical Group: Organic - Aroclors/Pesticides
Concentration Level: Low

Analyte	CAS Number	Project Action Limit	Project Quantitation Limit Goal	Analytical Method[1]		Achievable Laboratory Limits[2]	
				MDLs	Method QLs	MDLs	QLs
4, 4' DDE*	72-55-9	0.01 mg/Kg	0.002 mg/Kg	0.00025 mg/Kg	0.001 mg/Kg	0.000064 mg/Kg	0.00032 mg/Kg
4, 4' DDT*	50-29-3	0.01 mg/Kg	0.002 mg/Kg	0.00025 mg/Kg	0.001 mg/Kg	0.000092 mg/Kg	0.00046 mg/Kg
Dieldrin*	60-57-1	0.01 mg/Kg	0.002 mg/Kg	0.00025 mg/Kg	0.001 mg/Kg	0.000028 mg/Kg	0.00014 mg/Kg
Endosulfan I	959-98-8	0.01 mg/Kg	0.002 mg/Kg	0.00025 mg/Kg	0.001 mg/Kg	0.000022 mg/Kg	0.00011 mg/Kg
Endosulfan II	33212-65-9	0.01 mg/Kg	0.002 mg/Kg	0.00025 mg/Kg	0.001 mg/Kg	0.000098 mg/Kg	0.00049 mg/Kg
Endosulfan sulfate	1031-078	0.01 mg/Kg	0.002 mg/Kg	0.00025 mg/Kg	0.001 mg/Kg	0.000044 mg/Kg	0.00022 mg/Kg
Endrin*	72-20-8	0.01 mg/Kg	0.002 mg/Kg	0.00025 mg/Kg	0.001 mg/Kg	0.000061 mg/Kg	0.0003 mg/Kg
Endrin Aldehyde	7421-93-4	0.01 mg/Kg	0.002 mg/Kg	0.00025 mg/Kg	0.001 mg/Kg	0.000135 mg/Kg	0.00067 mg/Kg
Endrin Ketone	53494-70-5	0.01 mg/Kg	0.002 mg/Kg	0.00025 mg/Kg	0.001 mg/Kg	0.000061 mg/Kg	0.0003 mg/Kg
Heptachlor	76-44-8	0.01 mg/Kg	0.002 mg/Kg	0.00025 mg/Kg	0.001 mg/Kg	0.000023 mg/Kg	0.00012 mg/Kg

* Target analytes/contaminants of concern
[1] Analytical MDLs and QLs are those documented in validated methods.
[2] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

QAPP Worksheet #15--1 (continued)
Reference Limits and Evaluation Table

Matrix: Fish Tissue
Analytical Group: Organic - Aroclors/Pesticides
Concentration Level: Low

Analyte	CAS Number	Project Action Limit	Project Quantitation Limit Goal	Analytical Method[1]		Achievable Laboratory Limits[2]	
				MDLs	Method QLs	MDLs	QLs
Heptachlor Epoxide*	1024-57-3	0.01 mg/Kg	0.002 mg/Kg	0.00025 mg/Kg	0.001 mg/Kg	0.000043 mg/Kg	0.00021 mg/Kg
Methoxychlor*	72-43-5	0.5 mg/Kg	0.2 mg/Kg	0.0005 mg/Kg	0.002 mg/Kg	0.000180 mg/Kg	0.0009 mg/Kg
Toxaphene*	8001-35-2	0.5 mg/Kg	0.2 mg/Kg	0.0025 mg/Kg	0.01 mg/Kg	0.0025 mg/Kg	0.01 mg/Kg
Aroclor-1016*	12674-11-2	0.5 mg/Kg	0.2 mg/Kg	0.0025 mg/Kg	0.01 mg/Kg	0.0018 mg/Kg	0.009 mg/Kg
Aroclor-1221*	11104-28-2	0.5 mg/Kg	0.2 mg/Kg	0.0025 mg/Kg	0.01 mg/Kg	0.002 mg/Kg	0.01 mg/Kg
Aroclor-1232*	11141-16-5	0.5 mg/Kg	0.2 mg/Kg	0.0025 mg/Kg	0.01 mg/Kg	0.002 mg/Kg	0.01 mg/Kg
Aroclor-1242*	53469-21-9	0.5 mg/Kg	0.2 mg/Kg	0.0025 mg/Kg	0.01 mg/Kg	0.002 mg/Kg	0.01 mg/Kg
Aroclor-1248*	12672-29-6	0.5 mg/Kg	0.2 mg/Kg	0.0025 mg/Kg	0.01 mg/Kg	0.002 mg/Kg	0.01 mg/Kg
Aroclor-1254*	11097-69-1	0.5 mg/Kg	0.2 mg/Kg	0.0025 mg/Kg	0.01 mg/Kg	0.002 mg/Kg	0.01 mg/Kg
Aroclor-1260*	11096-82-5	0.5 mg/Kg	0.2 mg/Kg	0.0025 mg/Kg	0.01 mg/Kg	0.0019 mg/Kg	0.009 mg/Kg

* Target analytes/contaminants of concern
[1] Analytical MDLs and QLs are those documented in validated methods.
[2] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

QAPP Worksheet #15-1 (continued)
Reference Limits and Evaluation Table

Matrix: Fish Tissue
Analytical Group: Organic - Aroclors/Pesticides
Concentration Level: Low

Analyte	CAS Number	Project Action Limit	Project Quantitation Limit Goal	Analytical Method[1]		Achievable Laboratory Limits[2]	
				MDLs	Method QLs	MDLs	QLs
Aroclor-1262*	11100-14-4	0.5 mg/Kg	0.2 mg/Kg	0.0025 mg/Kg	0.01 mg/Kg	0.002 mg/Kg	0.01 mg/Kg

* Target analytes/contaminants of concern
[1] Analytical MDLs and QLs are those documented in validated methods.
[2] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

QAPP Worksheet #15-2
Reference Limits and Evaluation Table

Matrix: Fish Tissue
Analytical Group: Mercury
Concentration Level: Low

Analyte	CAS Number	Project Action Limit	Project Quantitation Limit Goal	Analytical Method[1]		Achievable Laboratory Limits[2]	
				MDLs	Method QLs	MDLs	QLs
Mercury (total)*	7439-97-6	200 Fg/Kg	40 Fg/Kg	0.2 Fg/Kg	1 Fg/Kg	0.08 Fg/Kg	0.4 Fg/Kg

* Target analytes/contaminants of concern
[1] Analytical MDLs and QLs are those documented in validated methods.
[2] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

QAPP Worksheet #16
Project Schedule/Timeline Table

Activities	Organization	Dates (MM/DD/YY)		Deliverable	Deliverable Due Date
		Anticipated Date(s) of Initiation	Anticipated Date of Completion		
QAPP Preparation	Brown Engineering	3/13/00	4/13/00	QAPP Document	4/13/00
Fixed Laboratory Technical Systems Audit	Brown Engineering	4/24/00	4/24/00	TSA Report	5/24/00
Fish Collection	Brown Engineering	6/16/00	9/4/00	All Fish Samples to Laboratory	9/5/00
Field Sampling Technical Systems Audit	Brown Engineering	6/16/00-6/23/00	6/23/00	TSA Report	3/13/00
Fish Processing	Brown Engineering	6/17/00	9/5/00	All Fish Samples Processed	4/24/00
Laboratory Analysis	ELM Laboratories	6/26/00	10/2/00	Data Package	11/2/00
Data Review	Brown Engineering	7/30/00	11/30/00	Data Report Review	12/30/00
Risk Assessment	Brown Engineering	12/4/00	1/3/01	Risk Assessment Report	2/3/01
Final Project Report Preparation	Brown Engineering	1/4/01	2/4/01	Final Project Report	3/4/01

QAPP Worksheet #17
Sampling Design and Rationale

Fish sampling will consist of collecting fish from six different reaches of the Connecticut River Watershed. Sampling segment boundaries were selected based on documented water quality issues and threatened resources. Sampling will be initiated in the southernmost locations first and move north. Target fish species will be collected using gill nets, electrofishing, rod and reel, fyke nets, or other appropriate methods. Samples of resident fish, which include yellow perch with white perch the alternate target species, smallmouth bass with largemouth bass or walleye as the alternate target species and white sucker with white catfish as the alternate target species will consist of five 3-fish fillet and offal composites of each species from all sampling reaches as described above. Samples of American Shad and Striped Bass will also consist of five 3-fish fillet and offal composites, but Blueback Herring will consist of five 3-whole fish composites. The anadromous fish species, American Shad, Striped Bass and Blueback Herring, will only be collected in Reach 3. Eastern brook trout will only be collected in Reach 6 and will consist of five 3-fish fillet and offal composites. The reason for collecting the specified fish in Reach 3 and reach 6 is these are the principle game fish in these reaches. The sampling period will begin in June for collection of the pre-spawning anadromous species and the remainder of the reaches will be sampled during July and August. Fifteen fish (five 3-fish composites) from each species will be the target number within a similar age. Yellow perch or white perch will be selected in a size ranging between 7 to 9 inches. Smallmouth bass or largemouth bass or walleye will be selected in a size ranging from 12 to 14 inches, and white sucker or white catfish will be selected in a size ranging from 12 to 16 inches. Eastern brook trout will be selected in a size ranging from 5 to 7 inches. American shad will be selected in a size ranging from 17 to 20 inches, striped bass will be selected in a size ranging from 28 to 30 inches, and Blueback herring from 8 to 10 inches.

Whole fish samples will be shipped on ice to ELM Laboratories within 12 hours of collection. Whole fish samples will be processed immediately upon receipt by the laboratory. Sample processing will consist of scaling fresh fish and leaving the skin on, filleting the fish, and combining similar age/weight/size classes of an individual species for human health concerns (edibility), and separate collection of the remaining offal. Samples of the resident fish species will consist of five 3-fish fillet and offal composites. Samples of the Eastern brook trout and American shad and Striped Bass will consist of five 3-fish fillet and offal composites. The sample for blueback herring will consist of five 3-whole fish composites. The offal composites will be used to calculate whole fish contaminant levels to evaluate potential ecological receptors through the development of food chain models. Processed composite samples will be immediately frozen at < -20EC and frozen composite samples must be prepared and analyzed within a maximum of 1 year of collection for aroclors/pesticides and 28 days of collection for mercury. Within 12 hours of thawing, composite samples will be prepared for analysis (extracted/digested). Instrumental analysis of extracts/digestates will immediately follow. Archival of remaining processed composite sample material and remaining extract/digestate material will be for 16 months from sample receipt.

QAPP Worksheet 18
Sampling Locations and Methods/SOP Requirements Table

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
Connecticut River - 1	Fish	N/A	Aroclors/ Pesticides	Low	45 Fish (3 fish/species, 5 replicate/species, 3 species) separate fillet & offal samples	S-1	See Worksheet #17 and Table 1
			Mercury	Low	45 Fish (3 fish/species, 5 replicate/species, 3 species) separate fillet & offal samples	S-1	See Worksheet #17 and Table 1
Connecticut River - 2	Fish	N/A	Aroclors/ Pesticides	Low	45 Fish (3 fish/species, 5 replicate/species, 3 species) separate fillet & offal samples	S-1	See Worksheet #17 and Table 1
			Mercury	Low	45 Fish (3 fish/species, 5 replicate/species, 3 species) separate fillet & offal samples	S-1	See Worksheet #17 and Table 1

QAPP Worksheet 18 (continued)
Sampling Locations and Methods/SOP Requirements Table

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
Connecticut River - 3	Fish	N/A	Aroclors/ Pesticides	Low	75 Fish (3 fish/species, 5 replicate/species, 6 species) separate fillet & offal samples - - - - - - 15 whole-bodied fish (B)	S-1	See Worksheet #17 and Table 1
			Mercury	Low	75 Fish (3 fish/species, 5 replicate/species, 6 species) separate fillet & offal samples - - - - - - 15 whole-bodied fish (B)	S-1	See Worksheet #17 and Table 1
Connecticut River - 4	Fish	N/A	Aroclors/ Pesticides	Low	45 Fish (3 fish/species, 5 replicate/species, 3 species) separate fillet & offal samples	S-1	See Worksheet #17 and Table 1
			Mercury	Low	45 Fish (3 fish/species, 5 replicate/species, 3 species) separate fillet & offal samples	S-1	See Worksheet #17 and Table 1

QAPP Worksheet 18 (continued)
Sampling Locations and Methods/SOP Requirements Table

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
Connecticut River - 5	Fish	N/A	Aroclors/ Pesticides	Low	45 Fish (3 fish/species, 5 replicate/species, 3 species) separate fillet & offal samples	S-1	See Worksheet #17 and Table 1
			Mercury	Low	45 Fish (3 fish/species, 5 replicate/species, 3 species) separate fillet & offal samples	S-1	See Worksheet #17 and Table 1
Connecticut River - 6	Fish	N/A	Aroclors/ Pesticides	Low	60 Fish (3 fish/ species, 5 replicate/ species, 3 species) separate fillet & offal samples	S-1	See Worksheet #17 and Table 1
			Mercury	Low	60 Fish (3 fish/species, 5 replicate/species, 3 species) separate fillet & offal samples	S-1	See Worksheet #17 and Table 1

[1]FROM the Project Sampling SOP References table (Worksheet #21).

Table 1. Types, Reaches, and Total Number of Fish to be Caught

Reach	Target Species (alternate)	Target Length (inches)	Total Fish to Catch	Total # Composites (3 Fish/Composite)			# Analyses	
				Fillet	Offal	Whole-Bodied	Aroclors/ Pesticides	Hg
1	YP (WP)	7-9	15	5	5	0	10	10
	SMB (LMB)	12-14	15	5	5	0	10	10
	WS (WC)	12-16	15	5	5	0	10	10
2	YP (WP)	7-9	15	5	5	0	10	10
	SMB (LMB)	12-14	15	5	5	0	10	10
	WS (WC)	12-16	15	5	5	0	10	10
3	YP (WP)	7-9	15	5	5	0	10	10
	SMB (LMB)	12-14	15	5	5	0	10	10
	WS (WC)	12-16	15	5	5	0	10	10
	AS	17-20	15	5	5	0	10	10
	SB	28-30	15	5	5	0	10	10
	B	8-10	15	0	0	5	5	5
4	YP (WP)	7-9	15	5	5	0	10	10
	SMB (LMB)	12-14	15	5	5	0	10	10
	WS (WC)	12-16	15	5	5	0	10	10
5	YP (WP)	7-9	15	5	5	0	10	10
	SMB (LMB)	12-14	15	5	5	0	10	10
	WS (WC)	12-16	15	5	5	0	10	10
6	YP (WP)	7-9	15	5	5	0	10	10
	SMB (LMB)	12-14	15	5	5	0	10	10
	WS (WC)	12-16	15	5	5	0	10	10
	EBT	5-7	15	5	5	0	10	10
						TOTAL	215	215

QAPP Worksheet 19
Analytical SOP Requirements Table

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference[1]	Sample Volume[2]	Containers (number, size, and type)[2]	Preservation Requirements (chemical, temperature, light protected)[2]	Maximum Holding Time (preparation/ analysis)
Fish	Aroclors/ Pesticides	Low	L-2	150 grams minimum	8 oz. wide mouth glass amber	Homogenize, freeze @ <-20°C	See Worksheet #17
Fish	Mercury	Low	L-1	10 grams minimum	2 oz. wide mouth glass amber	Homogenize, freeze @ <-20°C	See Worksheet #17

[1]From the Analytical SOP References table (Worksheet #23).
[2] Refer to requirements after processing of fish by the laboratory

QAPP Worksheet 21
Project Sampling SOP References Table

Reference Number	Title, Revision Date and/or Number	Originating Organization	Equipment Type	Modified for Project Work? (Y/N)	Comments
S-1	Standard Operating Procedures for Collection of Free Swimming Aquatic Fauna	Brown Engineering	N/A	N	Includes descriptions and procedures for a variety of techniques for fish collection, required equipment, and equipment decontamination.
S-2	Standard Operating Procedures for Field Sample Packaging and Transport	Brown Engineering	N/A	N	Includes sample packaging, shipping, and chain-of-custody requirements

QAPP Worksheet #22
Field Equipment Calibration, Maintenance, Testing, and Inspection Table

Field Equipment	Calibration Activity	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[1]
Shock boat engine				Check engine oil	Prior to each sampling event	Prior to each sampling event	Fill	Boat operator	S-1
Shock boat engine				Check cooling water discharge	Continuously during operation	Continuously during operation	Clear debris/replace or fix pump	Boat operator	S-1
Shock boat engine				Check fuel level	Prior to leaving on survey	Prior to leaving on survey	Fill tanks	Boat operator	S-1
Shock boat			Check bilge pump		Prior to survey and intermittently during survey operation	Prior to survey and intermittently during survey operation	Fix or replace pump	Boat operator	S-1
Shock boat		Check freshwater intake pump			Before leaving landing area or dock, upon start up of generator, when filling live wells, and continuously while operating shock boat	Before leaving landing area or dock, upon start up of generator, when filling live wells, and continuously while operating shock boat	Fix or replace pump	Boat operator	S-1
Shock boat			Check holding well recirculating pump		Prior to departure from dock/landing area	Pump in good working order	Fix or replace pump	Boat operator	S-1

QAPP Worksheet #22 (continued)
Field Equipment Calibration, Maintenance, Testing, and Inspection Table

Field Equipment	Calibration Activity	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[1]
Shock boat			Check Thru-Hull		Before off loading boat and upon return	No visible damage or clogged debris on intake	Clean out, repair as necessary	Boat operator	S-1
Shock boat				Check Sea Strainer	Continuously during operation	Strainer free and clear of debris	Clean out, repair as needed	Boat operator	S-1
Shock boat			Navigation Lights		Prior to leaving on survey	Working	Replace bulb, repair wiring	Boat operator	S-1
Shock boat			Holding tank lights		Prior to leaving on survey	Working	Replace bulb, repair wiring	Boat operator	S-1
Shock boat			Holding tank flood lights		Prior to leaving on survey	Working	Replace bulb, repair wiring	Boat operator	S-1
Shock boat			Work-up lights		Prior to leaving on survey	Working	Replace bulb, repair wiring	Boat operator	S-1
Shock boat			Work-up flood lights		Prior to leaving on survey	Working	Replace bulb, repair wiring	Boat operator	S-1
Shock boat trailer				Trailer lights	All lights & signals are working	Working	Replace bulb, repair wiring	Boat operator	S-1
Shock boat trailer		Wheel bearings & rollers lubricated			Twice per season	Completed	Grease bearings	Boat operator	S-1
Shock boat trailer				Winch	Prior to leaving on survey	Good working condition	Fix or replace	Boat operator	S-1

QAPP Worksheet #22 (continued)
Field Equipment Calibration, Maintenance, Testing, and Inspection Table

Field Equipment	Calibration Activity	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[1]
Shock boat trailer				Winch drawn tight to boat	Prior to leaving on survey	Boat drawn tight against roller block	Winch tight	Boat operator	S-1
Shock boat trailer				Breakaway chain hooked on boat	Prior to leaving on survey	Chain hooked on boat	Hook up chain	Boat operator	S-1
Shock boat trailer				Belly strap hooked on trailer and over boat	Prior to leaving on survey	Belly strap securely holding boat on trailer	Cinch down belly strap	Boat operator	S-1
Shock boat generator	Calibrate probe with 3 temp. equilibrated stds. to bracket expected pH values	Check oil level; Cooling water discharge			Prior to operation; continuously during operation	Oil level full; Water is discharging	Fill; Check intake/pump, fix or replace	Boat operator	S-1
YSI 600 XLM Dissolved Oxygen Probe	Calibrate with 2 stds - % Saturated DO std. and 0.0 mg/L DO std.				Daily before use; Calibration check every 4 hours of use and at end of day	± 0.2 mg/L for 0.0 mg/L DO std.	If DO reading exceeds criterion, then prepare new 0.0 mg/L DO std., clean probe and/or change membrane. Recalibrate or service as necessary. Repeat analysis of affected samples or qualify data if analysis cannot be repeated.	Project lead: Kate Jones	F-1
YSI 600 XLM Dissolved Oxygen Probe		See SOP F-1							F-1

QAPP Worksheet #22 (continued)
Field Equipment Calibration, Maintenance, Testing, and Inspection Table

Field Equipment	Calibration Activity	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[1]
YSI 600 XLM pH Probe	Calibrate probe with 3 temp. equilibrated stds. To bracket expected pH values				Daily before use; Calibration check every 4 hours of use and at end of day	3 stds. provide stable readings ± 0.1 pH unit within 3 min.	If probe reading fails to stabilize, do not use. Check/replace membrane and recalibrate or service as necessary. Repeat analysis of affected samples or qualify data if analysis cannot be repeated.	Project lead: Kate Jones	F-1
YSI 600 XLM pH Probe		Check mechanical and electronic parts, verify system continuity, check battery, and clean probe.			Daily before use and when unstable readings occur	Stable after 3 min.	Clean probe, and/or replace membrane, and/or replace or service other defective parts. Back-up instrument stored in field trailer on-site.	Kate Jones	F-1
		Calibration check			After daily calibration, every 4 hours of use, and at end of day	± 0.1 pH unit within 3 min.			
			Visual inspection		Daily before use	No defective parts noted			

QAPP Worksheet #22 (continued)
Field Equipment Calibration, Maintenance, Testing, and Inspection Table

Field Equipment	Calibration Activity	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[1]
YSI 600 XLM Conductivity Probe	Calibrate electrode with 1 std.				Daily before use; Calibration check at end of day	± 1 Fmho/cm of std.	If sp. conductance reading exceeds criterion, then clean probe or service as necessary and recalibrate. Repeat analysis of affected samples or qualify data if analysis cannot be repeated.	Project lead: Kate Jones	F-1
YSI 600 XLM Conductivity Probe		See SOP F-1							F-1
YSI 600 XLM Temperature Sensor	Calibrate against NIST certified thermometer				Daily before use; Calibration check at end of day	± 0.15°C of NIST certified thermometer	If temperature sensor reading exceeds criterion, service or replace as necessary and recalibrate. Repeat analysis of affected samples or qualify data if analysis cannot be repeated.	Project lead: Kate Jones	F-1
YSI 600 XLM Temperature Sensor		See SOP F-1							F-1

1From the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #23
Analytical SOP References Table

Reference Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
F-1	Standard Operating Procedures for Calibration and Use of Field Instruments, June 3, 1999	Definitive	pH	YSI 600 XLM	Brown Engineering	N
F-1	Standard Operating Procedures for Calibration and Use of Field Instruments, June 3, 1999	Definitive	Dissolved oxygen	YSI 600 XLM	Brown Engineering	N
F-1	Standard Operating Procedures for Calibration and Use of Field Instruments, June 3, 1999	Definitive	Temperature	YSI 600 XLM	Brown Engineering	N
F-1	Standard Operating Procedures for Calibration and Use of Field Instruments, June 3, 1999	Definitive	Specific conductance	YSI 600 XLM	Brown Engineering	N
L-1	ELM Laboratories Standard Operating Procedure for Processing, Preparing and Analyzing Fish Samples by EPA Method 245.6	Definitive	Mercury	CV AAS	ELM Laboratories	N
L-2	ELM Laboratories Standard Operating Procedure for Processing, Preparing and Analyzing Fish Samples by NOAA NOS ORCA 130 Mussel Watch Method	Definitive	Aroclors/Pesticides	GC/ECD	ELM Laboratories	N

QAPP Worksheet #24
Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference[1]
GC/ECD	See L-2	Initial calibration after instrument set up, then when daily 12-hour calibration verification criteria not met	For all target compounds, initial RSD # 10% or R^2 >0.995; and calibration verification %D #15%	Inspect system; correct problem; re-run calibration and affected samples	Betty Smith	L-2
CVAAS	See L-1	Calibration and initial calibration verification after instrument set up, then daily; continuing calibration verification 10% or every 2 hours, whichever is more frequent	Calibration R^2 >0.995; initial and continuing calibration verification ± 20% of true value	Inspect system; correct problem; re-run calibration and affected samples	Betty Smith	L-1

1From the Analytical SOP References table (Worksheet #23).

QAPP Worksheet #25
Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[2]
GC/ECD	Replace disposables, bake out instrument, recondition column		Check connections, replace disposables, bake out instrument, recondition column, and perform leak tests	See L-2	See L-2	Inspect system; correct problem; re-run calibration and affected samples	Betty Smith[1]	L-2
CVAAS	Replace disposables, flush lines		Check connections, replace disposables, and flush lines	See L-1	See L-1	Inspect system; correct problem; re-run calibration and affected samples	Betty Smith[1]	L-1

1 Betty Smith of ELM Laboratories will also be responsible for verifying that all supplies used for analytical work comply with ELM's Quality Manual and any appropriate SOPs.
2 From the Analytical SOP References table (Worksheet #23).

QAPP Worksheet #26-1
QC Samples Table

Matrix	*Fish Tissue*
Analytical Group	*Aroclors/Pesticides*
Concentration Level	*Low*
Sampling SOP	*S-1*
Analytical Method/ SOP Reference	*L-2*
Sampler's Name	*Kate Jones*
Field Sampling Organization	*Brown Engineering*
Analytical Organization	*ELM Laboratories*
No. of Sample Locations	*6*

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	1/Extraction batch (20 samples)	No target compounds $ QL	If sufficient sample volume is available, re-extract and reanalyze affected samples. If insufficient amount of sample is available, reanalyze extracts. Qualify data as needed.	Betty Smith	Accuracy/Bias-Contamination	No target compounds $ QL
Instrument Blank	After initial calibration and every 12 hours	No target compounds $ ½ QL	Reanalyze affected sample extracts. Qualify data as needed.	Betty Smith	Accuracy/Bias-Contamination	No target compounds $ ½ QL
Laboratory Duplicate	1/Extraction batch	RPD # 40%	If sufficient sample volume is available, re-extract and reanalyze affected samples. If insufficient amount of sample is available, reanalyze extracts. Qualify data as needed.	Betty Smith	Precision	RPD # 40%
2nd Source Standard/SRM	1/Extraction batch	All target compounds ± 20% recovery	If sufficient sample volume is available, re-extract and reanalyze affected samples. If insufficient amount of sample is available, reanalyze extracts. Qualify data as needed.	Betty Smith	Accuracy/Bias	All target compounds ± 20% recovery
LFB	1/Extraction batch prior to sample analysis	All target compounds ± 40% recovery at QL	If sufficient sample volume is available, re-extract and reanalyze affected samples. If insufficient amount of sample is available, reanalyze extracts. Qualify data as needed.	Betty Smith	Sensitivity	All target compounds ± 40% Recovery at QL
Surrogates	2 per sample	30-150% Recovery	Reanalyze affected sample extracts. Qualify data as needed.	Betty Smith	Accuracy/Bias	30-150% Recovery

QAPP Worksheet #26-2
QC Samples Table

Matrix	*Fish Tissue*
Analytical Group	*Mercury*
Concentration Level	*Low*
Sampling SOP	*S-1*
Analytical Method/ SOP Reference	*L-1*
Sampler's Name	*Kate Jones*
Field Sampling Organization	*Brown Engineering*
Analytical Organization	*ELM Laboratories*
No. of Sample Locations	*6*

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Preparation	1/Preparation batch (20 samples)	No target compounds $ QL	If sufficient sample volume is available, re-extract and reanalyze affected samples. If insufficient amount of sample is available, reanalyze extracts. Qualify data as needed.	Betty Smith	Accuracy/Bias-Contamination	No target compounds $ QL
Laboratory Duplicate	1/Preparation batch	#20% RPD	If sufficient sample volume is available, re-extract and reanalyze affected samples. If insufficient amount of sample is available, reanalyze extracts. Qualify data as needed.	Betty Smith	Accuracy/Bias-Contamination	# 20% RPD
2nd Source Standard/SRM	1/Preparation batch	±15% Recovery	If sufficient sample volume is available, re-extract and reanalyze affected samples. If insufficient amount of sample is available, reanalyze extracts. Qualify data as needed.	Betty Smith	Accuracy/Bias	± 15% Recovery
LFB	1/Preparation batch prior to sample analysis	± 40% Recovery at QL	If sufficient sample volume is available, re-extract and reanalyze affected samples. If insufficient amount of sample is available, reanalyze extracts. Qualify data as needed.	Betty Smith	Sensitivity	± 40% Recovery at QL

QAPP Worksheet #27
Project Documents and Records Table

Sample Collection Documents and Records	On-site Analysis Documents and Records	Off-site Analysis Documents and Records	Data Assessment Documents and Records	Other
Field Notes	Sample Receipt, Custody, and Tracking Records	Sample Receipt, Custody, and Tracking Records	Field Sampling Audit Checklists	
Chain-of-Custody Records	Standards Traceability Logs	Standard Traceability Logs	Field Analysis Audit Checklists	
Air Bills	Equipment Calibration Logs	Equipment Calibration Logs	Fixed Laboratory Audit Checklists	
Custody Seals	Sample Prep Logs	Sample Prep Logs	Data Validation Reports	
Telephone Logs	Run Logs	Run Logs	Corrective Action Forms	
Corrective Action Forms	Equipment Maintenance, Testing, and Inspection Logs	Equipment Maintenance, Testing, and Inspection Logs	Telephone Logs	
	Corrective Action Forms	Corrective Action Forms		
	Reported Field Sample Results	Reported Field Sample Results		
	Sample Disposal Records	Reported Results for Standards, QC Checks, and QC Samples		
	Telephone Logs	Instrument Printouts (raw data) for Field Samples, Standards, QC Checks, and QC Samples		
		Data Package Completeness Checklists		
		Sample Disposal Records		
		Telephone Logs		
		Extraction/Clean-up Records		
		Raw Data (stored on disk or CD-R)		

QAPP Worksheet #28
Analytical Services Table

Matrix	Analytical Group	Concentration Level	Analytical SOP	Data Package Turnaround Time	Laboratory/Organization (Name and Address, Contact Person and Telephone Number)	Backup Laboratory/Organization (Name and Address, Contact Person and Telephone Number)
Fish Tissue	Aroclors/ Pesticides	Low	L-2	28 days	ELM Laboratories, Cheddar, VT Jasper Sanquin, 690-642-1720	N/A
Fish Tissue	Mercury	Low	L-1	28 days	ELM Laboratories, Cheddar, VT Jasper Sanquin, 690-642-1720	N/A

Data Handling, Management, Tracking and Control

All data handling and management and data tracking and control procedures are described in ELM's Quality Manual.

QAPP Worksheet #29
Planned Project Assessments Table

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment (Title and Organizational Affiliation)	Person(s) Responsible for Responding to Assessment Findings (Title and Organizational Affiliation)	Person(s) Responsible for Identifying and Implementing Corrective Actions (CA) (Title and Organizational Affiliation)	Person(s) Responsible for Monitoring Effectiveness of CA (Title and Organizational Affiliation)
Field Sampling Technical Systems Audit	1/At sampling startup (6/16/00-6/23/00)	Internal	Brown Engineering	Andy Owens, QAO, Brown Engineering	Kate Jones, Sample Team Leader, Brown Engineering	Kate Jones, Brown Engineering	Andy Owens, Brown Engineering
Offsite Laboratory Technical Systems Audit	1/Prior to sampling startup (4/24/00)	External	Brown Engineering	Andy Owens, QAO, Brown Engineering	Betty Smith, QAO, ELM Laboratories	Betty Smith, ELM Laboratories	Andy Owens, Brown Engineering

QAPP Worksheet #30
Assessment Findings and Corrective Action Responses

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings (Name, Title, Organization)	Timeframe of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response (Name, Title, Org.)	Timeframe for Response
Field Sampling TSA	Written Audit Report	Amy Lee, Project Manager, Brown Engineering	24 hours after audit	Letter	Kate Jones, Sampling Team Leader, Brown Engineering	24 hours after notification
Field Sampling Technical Systems Audit	Written Audit Report	Betty Smith, Laboratory QAO, ELM Laboratories	48 hours after audit	Letter	Andy Ownes, QA Officer, Brown Engineering	3 days after notification

QAPP Worksheet #31
QA Management Reports Table

Type of Report	Frequency (daily, weekly monthly, quarterly, annually, etc.)	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation (Title and Organizational Affiliation)	Report Recipient(s) (Title and Organizational Affiliation)
Field Sampling Technical Systems Audit Report	1/At startup of sampling	7/6/00	Andy Owens, QAO, Brown Engineering	John Smith, RPM, USEPA; Betty Fox, QAM, USEPA; Thomas Jackson, PM, Fort Longstreet; Amy Lee, Project Manager, Brown Engineering; Kate Jones, Sample Team Leader, Brown Engineering
Offsite Laboratory Technical Systems Audit Report	1/Prior to sampling startup	5/8/00	Andy Owens, QAO, Brown Engineering	John Smith, RPM, USEPA; Betty Fox, QAM, USEPA; Thomas Jackson, PM, Fort Longstreet; Amy Lee, Project Manager, Brown Engineering; Jane Barber, Laboratory Manager, ELM Laboratories; Betty Smith, ELM Laboratories
Data Usability Assessment Report	1/After all data are generated and validated	12/1/00	Amy Lee, Project Manager, Brown Engineering	John Smith, RPM, USEPA; Betty Fox, QAM, USEPA; Thomas Jackson, PM, Fort Longstreet; Andy Owens, QAO, Brown Engineering; Henry Phelps, Risk Assessor, Brown Engineering
Final Project Report	1/After QA Management Reports and risk assessment completed	2/4/01	Amy Lee, Project Manager, Brown Engineering	John Smith, RPM, USEPA; Betty Fox, QAM, USEPA; Thomas Jackson, PM, Fort Longstreet; Andy Owens, QAO, Brown Engineering

QAPP Worksheet #32
Verification (Step I) Process Table

Verification Input	Description	Internal/ External	Responsible for Verification (Name, Organization)
Chain-of-custody and shipping forms	Chain-of-custody forms and shipping documentation will be reviewed internally upon their completion and verified against the packed sample coolers they represent. The shipper's signature on the chain-of-custody should be initialed by the reviewer, a copy of the chain-of-custody retained in the site file, and the original and remaining copies taped inside the cooler for shipment. See chain-of-custody SOP for further details.	I	Kate Jones Brown Engineering
Audit Reports	Upon report completion, a copy of all audit reports will be placed in the site file. If corrective actions are required, a copy of the documented corrective action taken will be attached to the appropriate audit report in the site file. At the beginning of each week, and at the completion of the site work, site file audit reports will be reviewed internally to ensure that all appropriate corrective actions have been taken and that corrective action reports are attached. If corrective actions have not been taken, the site manager will be notified to ensure action is taken.	I	Andy Owens Brown Engineering
Field Notes	Field notes will be reviewed internally and placed in the site file. A copy of the field notes will be attached to the final report.	I	Kate Jones Brown Engineering
Laboratory Data	All laboratory data packages will be verified internally by the laboratory performing the work for completeness and technical accuracy prior to submittal. All received data packages will be verified externally according to the data validation procedures specified in Worksheet #34.	I E	Betty Smith ELM Laboratories Stan Moore Brown Engineering

QAPP Worksheet #33
Validation (Steps IIa and IIb) Process Table

Step IIa/IIb	Validation Input	Description	Responsible for Validation (Name, Organization)
IIb	Onsite analytical work	All onsite analytical data will be reviewed against QAPP requirements for completeness and accuracy based on the field calibration records.	Stan Moore, Brown Engineering
IIa	SOPs	Ensure that all sampling and analytical SOPs were followed.	Stan Moore, Brown Engineering
IIa	Documentation of Method QC Results	Establish that all method required QC samples were run and met required limits.	Stan Moore, Brown Engineering
IIb	Documentation of QAPP QC Sample Results	Establish that all QAPP required QC samples were run and met required limits.	Stan Moore, Brown Engineering
IIb	Project Quantitation Limits	All sample results met the project quantitation limit specified in the QAPP.	Stan Moore, Brown Engineering
IIa	Raw data	10% review of raw data to confirm laboratory calculations.	Stan Moore, Brown Engineering

QAPP Worksheet #34
Validation (Steps IIa and IIb) Summary Table

Step IIa/IIb	Matrix	Analytical Group	Concentration Level	Validation Criteria	Data Validator (title and organizational affiliation)
IIa	Fish Tissue	Aroclors/Pesticides	Low	Region 13 - Data Validation Guidelines	Stan Moore, Chemist, Brown Engineering
IIa	Fish Tissue	Mercury	Low	Region 13 - Data Validation Guidelines	Stan Moore, Chemist, Brown Engineering
IIb	Fish Tissue	Aroclors/Pesticides	Low	QAPP Worksheets 12, 15, and 24	Stan Moore, Chemist, Brown Engineering
IIb	Fish Tissue	Mercury	Low	QAPP Worksheets 12, 15, and 24	Stan Moore, Chemist, Brown Engineering

QAPP Worksheet #35
Usability Assessment

The Data Usability Assessment will be performed by a team of personnel at Brown Engineering. Amy Lee, Project Manager, will be responsible for information in the Usability Assessment. She will also be responsible for assigning task work to the individual task members who will be supporting the Data Usability Assessment. Note that the Data Usability Assessment will be conducted on validated data. After the Data Usability Assessment has been performed, data deemed appropriate for use will then be used to conduct a human health risk assessment on fish consumption. The results of the Data Usability Assessment will be presented in the final project report. The following items will be assessed and conclusions drawn based on their results:

Precision – Results of all laboratory duplicates for both aroclors/pesticides and mercury will be presented separately in tabular format for each analysis. For each duplicate pair, the relative percent difference (RPD) will be calculated for each analyte whose original and duplicate values are both greater than or equal to the quantitation limit. The RPDs will be checked against the measurement performance criteria presented on Worksheet #12. The RPDs exceeding criteria will be identified on the tables. Additionally, the RPD of each analyte will be averaged across all duplicate pairs whose original and duplicate values are both greater than or equal to the quantitation limit, and the combined overall average RPD for each analysis will be calculated for the laboratory duplicates. A discussion will follow summarizing the results of the laboratory precision. Any conclusions about the precision of the analyses will be drawn and any limitations on the use of the data will be described.

Accuracy/Bias Contamination – Results for all laboratory method blanks and instrument blanks will be presented separately in tabular format for each analysis for both aroclors/pesticides and mercury. The results for each analyte will be checked against the measurement performance criteria presented on Worksheet #12. Results for analytes that exceed criteria will be identified on the tables. A discussion will follow summarizing the results of the laboratory accuracy/bias. Any conclusions about the accuracy/bias of the analyses based on contamination will be drawn and any limitations on the use of the data will be described.

Overall Accuracy/Bias – The results for the 2nd Source Standard/SRM will be presented in tabular format to compare these results to the sample batch they apply to. These results will be compared to the requirements listed on Worksheet #12. A discussion will follow summarizing overall accuracy/bias. Any conclusions about the overall accuracy/bias of the analyses will be drawn and any limitations on the use of the data will be described.

Sensitivity – Results for all laboratory fortified blanks will be presented separately in tabular format for each analysis for both aroclors/pesticides and mercury. The results for each analyte will be checked against the measurement performance criteria presented on Worksheet #12 and cross-checked against the quantitation limits presented on Worksheet #15. Results for analytes that exceed criteria will be identified on the tables. A discussion will follow summarizing the results of the laboratory sensitivity. Any conclusions about the sensitivity of the analyses will be drawn and any limitations on the use of the data will be described.

QAPP Worksheet #35
Usability Assessment (continued)

Representativeness – Although sample size somewhat limits the statistical confidence for applying contaminant levels to the entire population, it does conform to currently accepted methods. Composite sample data can be used to set fish consumption advisories if the number of fish/species/reach within the required size range are collected and 85% fish collection completeness is achieved.

Comparability – The results of this study will be used as a benchmark for determining comparability for data collected during any potential future sampling events using the same or similar sampling and analytical SOPs.

Completeness – A completeness check will be done on all of the data generated by the laboratory. Completeness criteria are presented on Worksheet #12. Completeness will be calculated for each analyte as follows. For each analyte, completeness will be calculated as the number of data points for each analyte that meets the measurement performance criteria for precision, accuracy/bias, and sensitivity, divided by the total number of data points for each analyte. A discussion will follow summarizing the calculation of data completeness. Any conclusions about the completeness of the data for each analyte will be drawn and any limitations on the use of the data will be described.

Graphics – Fish Tissue Analysis: Graphic plots will be constructed depicting the contaminant concentrations (fillet, offal, and total) found at each sampling location by fish species. Each plot will present the total concentration range of each contaminant (Hg), or combined group of contaminants (aroclors/pesticides) and the number of valid data points used. **Note:** Based on the results of the data, a statistician will use his/her professional judgment to include other pertinent parameters. Each graphic will contain a detailed legend. Additionally, each graphic will include a summary report indicating trends, anomalies, or other factors pertinent to the understanding of the data.

Reconciliation – Each of the Project Quality Objectives (PQOs) presented on Worksheet #12 will be examined to determine if the objective was met. This examination will include a combined overall assessment of the results of each analysis pertinent to an objective. Each analysis will first be evaluated separately in terms of the major impacts observed from the Data Validation, Data Quality Indicators, and measurement performance criteria assessments. Based on the results of these assessments, the quality of the data will be determined. Based on the quality determined, the usability of the data for each analysis will be determined. Based on the combined usability of the data from all analyses for an objective, it will be determined if the PQO was met and whether project action limits were exceeded. The final report will include a summary of all the points that went into the reconciliation of each objective. As part of the reconciliation of each objective, conclusions will be drawn and any limitations on the usability of any of the data will be described.

QAPP Worksheet #36
Sample Handling System

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT
Sample Collection (Personnel/Organization): Kate Jones, Ben Coates, Rachel Stein/Brown Engineering
Sample Packaging (Personnel/Organization): Kate Jones/Brown Engineering
Coordination of Shipment (Personnel/Organization): Kate Jones/Brown Engineering
Type of Shipment/Carrier: Overnight/Fed Ex
SAMPLE RECEIPT AND ANALYSIS
Sample Receipt (Personnel/Organization): Jasper Sanquin/ELM Laboratories
Sample Custody and Storage (Personnel/Organization): Jasper Sanquin/ELM Laboratories
Sample Preparation (Personnel/Organization): TBD by Jane Barber/ELM Laboratories
Sample Determinative Analysis (Personnel/Organization): TBD by Jane Barber/ELM Laboratories
SAMPLE ARCHIVING
Field Sample Storage (No. of days from sample collection): See Worksheet 17
Sample Extract/Digestate Storage (No. of days from extraction/digestion): See Worksheet 17
Biological Sample Storage (No. of days from sample collection): See Worksheet 17
SAMPLE DISPOSAL
Personnel/Organization: Jane Barber/ELM Laboratories
Number of Days from Analysis: 16 months from sample receipt

SAMPLE CUSTODY PROCEDURES

Sample custody, or chain-of-custody, protocols are in three parts: (1) sample collection, (2) laboratory analysis, and (3) final evidence files.

A sample or evidence file is considered under custody if:

- Sample or file is in possession,
- Sample or file is in view, and
- Sample or file is placed in a designated secure area after being properly sealed to prevent tampering.

Field Chain-of-Custody Procedures

The sample packaging and shipment procedures summarized below ensure that the samples will arrive at the laboratory with the chain-of-custody intact. The protocols for specific sample numbering and other sample designations are included in Section 2.1.1 of the Field Sampling Plan.

Field Procedures

The field sampler will be personally responsible for the care and custody of the samples until the samples are transferred or properly dispatched. As few people as possible will handle the samples.

All sample containers will be tagged or labeled with sample identification numbers and locations, including time and date of sample collection. Sample tags or labels will be completed for each sample using a permanent, waterproof ink either prior to or immediately after sample collection.

The Project Manager will review all field activities to determine whether proper custody procedures were followed during the field work and decide if additional samples are required.

Field Logbooks/Documentation

The sequentially numbered field logbook will provide the means of recording data collection activities performed. As such, logbook entries will be described in as much detail as possible so that particular site activities could be re-constructed without reliance on memory.

Field logbooks will be bound logbooks, field survey books or notebooks. Logbooks will be assigned to field personnel, but will be stored in the document control center when not in use.

Each logbook will be identified by a project-specific document number. The title page of each logbook will contain the following information:

- Person to whom the logbook is assigned,
- Logbook number,
- Project name,
- Project start date, and
- Project end date.

Entries into the logbook will contain a variety of information. The beginning of each entry will include: the date, start time, weather conditions, names of all sampling team members present, level of personal protection being used, and the signature of the person making the entry. The names of visitors to the site (including additional field sampling or investigative team personnel), and the purpose of their visit will also be recorded in the field logbook.

Measurements made and samples collected will be recorded in the field logbook. All entries will be made in ink and no erasures will be made. If an incorrect entry is made, the incorrect information will be crossed-out with a single strike mark and initialed. Whenever a sample is collected, or a measurement is made, a detailed description of the location of the station (which includes compass and distance measurements) will be recorded in the logbook. The number of photographs taken at the station, if any, will also be noted. The logbook will identify all equipment used to made measurements, along with the date of calibration.

Samples will be collected in accordance with the sampling procedures documented in the Field Sampling Plan. The equipment used to collect samples will be noted, along with the time of sampling, sample description, depth of sample collection, volume, and the number of sample containers. The corresponding sample identification number will be prominently listed.

Transfer of Custody and Shipment Procedures

The following procedures will be incorporated for the transfer of sample custody and sample shipment:

Samples are accompanied by a properly completed chain-of-custody form. The sample identification numbers and locations will be listed on the chain-of-custody record. The custody record will be signed by the sampler. The chain-of-custody form will document the transfer of guardianship of samples from the sampler to another person, to a mobile laboratory, to the permanent laboratory, or to/from a secure storage area. Upon transferring the possession of samples, the individuals relinquishing and receiving the samples will sign, date, and note the time on the custody form.

Samples will be properly packaged for shipment and dispatched to the appropriate laboratory for analysis, with a separate signed custody record enclosed in each sample cooler. Shipping coolers will be secured with strapping tape and tamper-proof custody seals for shipment to the laboratory. The tamper-evident custody seal will be attached to the front right and back left of the cooler. The custody seals are covered with clear plastic tape. The cooler will be strapped shut with strapping tape in at least two locations.

Whenever samples are located with a source or government agency, a separate Sample Receipt is prepared for those samples and marked to indicate with whom the samples are being co-located. The person relinquishing the samples to the facility or agency should request the representatives signature acknowledging sample receipt. If the representative is unavailable or refuses, this should be noted in the "Received By" space.

All shipments will be accompanied by the chain-of-custody record identifying the contents. The original record will accompany the shipment, and the pink copy will be retained by the sampler for returning to the sampling office.

If the samples are sent by common carrier, a bill of lading will be used. Receipts of bills of lading will be retained as part of the permanent documentation. If sent by mail, the package will be registered with return receipt requested. Commercial carriers are not required to sign off on the custody form as long as the custody forms are sealed inside the sample cooler and the custody seals remain intact.

Laboratory Chain Of Custody Procedures

Laboratory custody procedures for sample receiving and log in; sample storage; tracking during sample preparation and analysis; and storage of analytical data are described below:

Samples submitted to the Laboratory will be accompanied by a chain-of-custody form. The chain-of-custody forms will be completed and sealed within the sample transport container, which will be opened and examined by the Laboratory Sample Custodian. The Laboratory Sample Custodian will ensure that all entries on the chain-of-custody form correspond with the sample label. If discrepancies are noted by the Laboratory Sample Custodian, project staff will be contracted to resolve any conflicting information.

Evidentiary documentation procedures will be implemented by the Laboratory. The designated Laboratory Sample Custodian will receive and document all samples submitted to the Laboratory. The Laboratory Custodian will examine the condition, preservation, and accompanying documentation of all submitted samples prior to approval and formal acceptance by the Laboratory. Any sample, preservation, or documentation discrepancies (i.e., broken sample container, improper preservation, inadequate sample volume, or poor documentation) will be resolved before the sample is approved and formally accepted for analyses. All required acceptance data will be recorded and documented in the Laboratory Sample Log and Laboratory Computerized Data Management System. The sample will be labeled with Laboratory identification information and placed in the secure sample storage area prior to distribution to the appropriate analyst(s).

Once the sample has been officially entered into the Laboratory computer system, the computer generates individual sample sheets. These sample sheets contain all pertinent information relevant to the sample. The sample record will be put into the Sample Control Logbook, which is located in the Sample Receiving Area. The analyst(s) will sign out samples from the Sample Receiving Area by entering their initials, date, and time of sample removal into the logbook. The sample will be taken to the appropriate laboratory section and logged into the analyst's Sample Control Record. Any time the sample or extract is removed from or returned to the refrigerator, the pertinent information (analyst initials, date, and time)

will be recorded into the logbook. The sample or extract will remain in the freezer until it is time to dispose of it. At that time, disposal information will also be recorded on the Sample Control Record.

Final Evidence Files Custody Procedures

The evidence files for the project are maintained at the Brown Engineering office. The content of the evidence file will include all relevant records, reports, correspondence, logs, field logbooks, laboratory sample preparation and analysis logbooks, data package, pictures, subcontractor reports, chain of custody records, data review reports, etc. The evidence file will be under custody of the contractor project manager in a locked, secured area. Evidence files of analytical data will also be retained by the selected contract laboratory for a minimum of seven years.

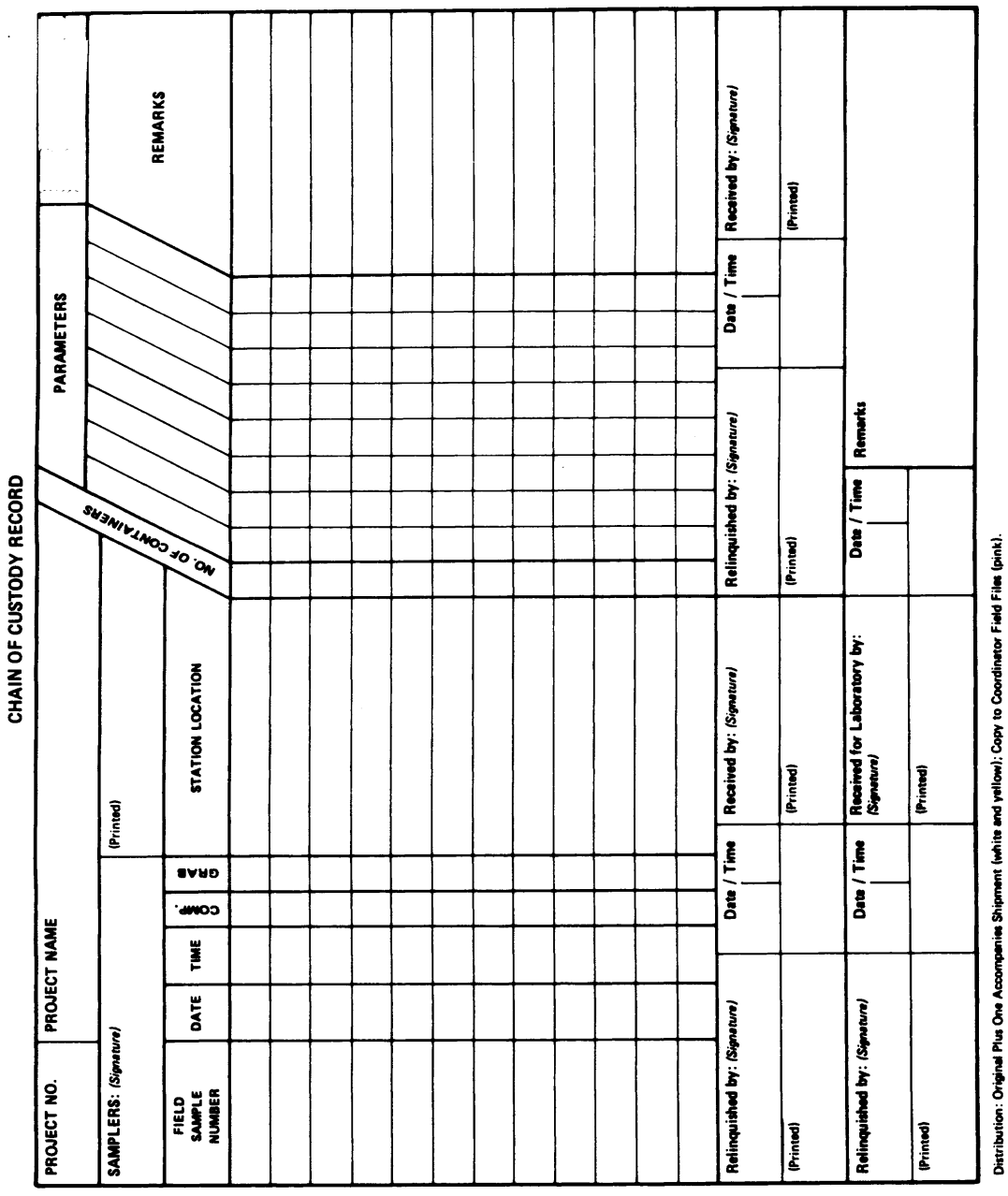

CHAIN OF CUSTODY RECORD
PROJECT NO.
PROJECT NAME
PARAMETERS
SAMPLERS: (Signature)
(Printed)
NO. OF CONTAINERS
REMARKS
FIELD SAMPLE NUMBER
DATE
TIME
COMP.
GRAB
STATION LOCATION
Relinquished by: (Signature)
Date / Time
Received by: (Signature)
(Printed)
Relinquished by: (Signature)
Date / Time
Received by: (Signature)
(Printed)
Relinquished by: (Signature)
Date / Time
Received for Laboratory by: (Signature)
(Printed)
Remarks
Distribution: Original Plus One Accompanies Shipment (white and yellow); Copy to Coordinator Field Files (pink).

Figure 2

SAMPLE CUSTODY SEAL

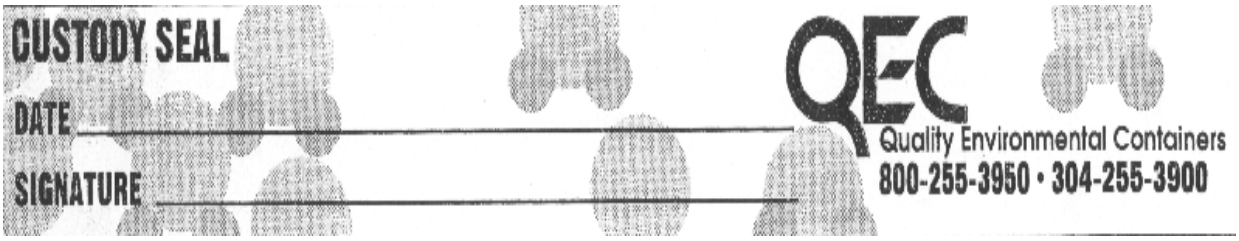


Figure 3

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ATTACHMENT 1

STANDARD OPERATING PROCEDURES (SOPs)

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The IDQTF did not want to release samples of SOPs with this example QAPP. However, note that SOPs contain critical information for understanding, approving, and implementing project operations as presented in the QAPP and, as such, all relevant SOPs must be available in order for the QAPP to be reviewed and approved.