PERRINE DUPONT SETTLEMENT
SPELTER VOLUNTEER FIRE DEPARTMENT CLAIMS OFFICE
55 B. STREET
P.O. BOX 257
SPELTER, WV 26438
304-622-7443
1-800-345-0837
www.perrinedupont.com
perrinedupont@gtandslaw.com

June 4, 2012

2012 JUN 4 PM 12: 18
CLERK CIRCUIT COURT

BY HAND DELIVERY
The Honorable Thomas A. Bedell
Circuit Judge of Harrison County
301 West Main Street, Room 321
Clarksburg, West Virginia 26301

Re: **Perrine, et al. v. DuPont, et al.;**
Civil Action No. 04-C-296-2 (Circuit Court of Harrison County, West Virginia) – Report RE Addendum to Sampling Provider Agreement
Our File No. 4609-1 {DD-14} and 4609-1{DD-27}

Dear Judge Bedell:

As the Court will recall, by the Final Order Approving Agreement For Soil and House Sampling Services Between the Perrine DuPont Settlement and CORE Environmental Services, Inc., entered October 11, 2011, the Court approved the agreement between CORE Environmental Services, Inc. ("CORE") and the Perrine DuPont Settlement (the "Settlement") which authorized CORE to conduct pre-remediation property soil and house sampling services outlined in the Request for Proposals ("RFP") approved by Order of the Court dated August 3, 2011.

In addition, by the Final Order Approving Agreement for Remediation Services Between the Perrine DuPont Settlement and NCM Demolition and Remediation, LP, dated May 1, 2012, the Court approved the Remediation Agreement between the Settlement and NCM Demolition and Remediation, LP, ("NCM") regarding the property (soil and house) remediation services to be provided by NCM in connection with the Settlement Property Remediation Program (the "NCM Contract"). The terms of the NCM Contract include payment after post-remediation sampling of remediated soil and houses to verify successful remediation of soils and houses, so that heavy metals concentrations of cadmium, arsenic, zinc and lead are below the Court-approved risk levels in your Final Order dated May 4, 2012.

After sharing this proposal with the Finance Committee and CORE for comments and edits, and based upon a strong existing relationship with CORE, we recommend that CORE be engaged to provide the post-remediation sampling services outlined in the NCM Contract and

under the same testing methods as outlined in the Original CORE Contract and in accordance with the NCM Contract (the "Post-Remediation Testing Services").

Your Claims Administrator has negotiated the attached proposed First Addendum to the Original CORE Contract (the "First Addendum") with CORE, to carry out this requirement under the NCM Contract, and we hereby request Court Approval thereof.

A proposed Order is provided for the Court's convenience.

Please note that the Cost Quote of the First Addendum to conduct the Post-Remediation Testing Services is $492,009, which is $92,009 in excess of the $400,000 amount given in the Working Budget for such services in the April 9, 2012 Report that was addressed by the Court in the May 1 and 2, 2012 Fairness Hearing respecting the final aspects of the Settlement Remediation Program. However, this unforeseen additional expense is easily accommodated by the $2.4 million reserve in the Working Budget, with the Cost Quote being $200,000 less than originally estimated by CORE as a result of due diligence by the Settlement in obtaining the lowest reasonable price from CORE, which, as the Court will recall, was the lowest qualified bidder for property testing services.

Thank you for the Court's consideration.

Yours very truly,

Edgar C. Gentle, III
Claims Administrator

ECGIII/kah
Enclosure

cc: (with enclosures)(by e-mail)(confidential)

Mr. Stephen A. Zbur
Mr. Thomas M. Rebar
CORE

Stephanie D. Thacker, Esq.
James S. Arnold, Esq.
David B. Thomas, Esq.
DuPont Representatives on the Settlement Finance Committee

Virginia Buchanan, Esq.
Perry B. Jones, Esq.
Farrest Taylor, Esq.
Angela Mason, Esq.
Plaintiff Class Representatives on the Settlement Finance Committee

cc's continued: (with enclosures)(by e-mail)(confidential)

Meredith McCarthy, Esq.,
Guardian Ad Litem for Children

Michael A. Jacks, Esq.

Mr. Billy Sublett
Settlement Construction Supervisor

Mr. Dennis Raver
NCM

Mr. Marc Glass
Court-Appointed Property Remediation Technical Advisor

Clerk of Court of Harrison County,
West Virginia, for filing (via hand delivery)

IN THE CIRCUIT COURT OF HARRISON COUNTY, WEST VIRGINIA

LENORA PERRINE, et al., individuals residing in West Virginia, on behalf of themselves and all others similarly situated,

Plaintiffs,

v.

Case No. 04-C-296-2
Thomas A. Bedell, Circuit Judge

E.I. DU PONT DE NEMOURS AND COMPANY, et al.,

Defendants.

FINAL ORDER APPROVING FIRST ADDENDUM TO AGREEMENT FOR SOIL AND HOUSE SAMPLING SERVICES BETWEEN THE PERRINE DUPONT SETTLEMENT AND CORE ENVIRONMENTAL SERVICES, INC.

Presently before the Court is the Claims Administrator's June 4, 2012, Report, which recommends that the proposed First Addendum to the October 5, 2011, Agreement for Soil and House Sampling Services for the Property Remediation Program Between the Perrine DuPont Settlement (the "Settlement") and CORE Environmental Services, Inc. ("CORE") (the "First Addendum"), be approved by this Court.

The Court notes that the October 5, 2011, Agreement between the Settlement and CORE (the "CORE Contract") was approved by the Court on October 11, 2011.

After a careful review of the Claims Administrator's Report, and in consideration of applicable law, the Court **ORDERS** that the First Addendum is hereby **APPROVED** and that the Claims Administrator, on behalf of the Settlement, is hereby **AUTHORIZED, EMPOWERED** and **DIRECTED** to enter into the First Addendum on

behalf of the Settlement, with the Claims Administrator's execution and delivery of the First Addendum to be conclusively presumed to be the valid and binding act of the Settlement.

Lastly, pursuant to Rule 54(b) of the West Virginia Rules of Civil Procedure, the Court directs entry of this Order as a Final Order as to the claims and issues above upon an express determination that there is no just reason for delay and upon an express direction for the entry for judgment.

IT IS SO ORDERED.

Finally, it is **ORDERED** that the Clerk of this Court shall provide certified copies of this Order to the following:

David B. Thomas
James S. Arnold
Stephanie D. Thacker
Guthrie & Thomas, PLLC
P.O. Box 3394
Charleston, WV 25333-3394

Meredith McCarthy
901 W. Main St.
Bridgeport, WV 26330
Guardian ad litem

Edgar Gentle, III
Michael Jacks
Settlement Claims Office
P.O. Box 257
Spelter, WV 26438
Special Master

J. Farrest Taylor
Angela Mason
Cochran, Cherry, Givens, Smith,
Lane & Taylor, P.C.
163 West Main St.
Dothan, AL 36301

Virginia Buchanan
Levin, Papantonio, Thomas, Mitchell
Eshsner & Proctor, P.A.
316 South Baylen St., Suite 600
Pensacola, FL 32502-5996

Steve Zbur
Tom Rebar
CORE Environmental Services, Inc.
4 Brookstone Plaza
Morgantown, WV 26508

Perry B. Jones, Esq.
West & Jones
360 Washington Avenue
Clarksburg, WV 26301

This Order Prepared By:

Edgar C. Gentle, III, Esq.
Gentle, Turner & Sexton
P. O. Box 257
Spelter, WV 26438
Claims Administrator

Michael A. Jacks, Esq.
W. Va. Bar No. 11044
P.O. Box 257
Spelter, WV 26438

ENTER: _____

_____
Thomas A. Bedell, Circuit Judge

FIRST ADDENDUM TO THE OCTOBER 5, 2011 AGREEMENT FOR SOIL AND HOUSE SAMPLING SERVICES INCONNECTION WITH THE PROPERTY REMEDIATION PROGRAM BETWEEN THE PERRINE DUPONT SETTLEMENT AND CORE ENVIRONMENTAL SERVICE,INC. (THE "FIRST ADDENDUM")

THIS FIRST ADDENDUM is made and entered into as of June 4, 2012, and serves as an addendum to the Agreement for Soil and House Sampling Services executed on October 5, 2011 by and between CORE Environmental Services, Inc., a Pennsylvania corporation qualified to do business in West Virginia, with its principal places of business at 4 Brookstone Plaza, Morgantown, West Virginia, 26508, and 4068 Mt. Royal Blvd, Suite 225, Allison Park, Pennsylvania 15101-2951 ("CORE" or "CORE Environmental") and the Perrine DuPont Settlement (hereinafter the "Settlement") (the "Agreement"), which was approved on October 11, 2011, by the Circuit Court of Harrison County, West Virginia (the "Court"), in *Lenora Perrine, et al., v. E.I. DuPont de Nemours and Company, et al.*, Case No. 04-C-296-2 (the "Litigation" or the "Perrine DuPont Case").

RECITALS

WHEREAS, CORE and the Settlement entered into the Agreement on October 5, 2011, which was approved by the Court on October 11, 2011 (the "CORE Contract");

WHEREAS, CORE desires to be engaged by the Settlement to furnish post-remediation soil testing services for approximately 160 properties and post-remediation house or commercial structure testing services for approximately 600 houses or commercial structures for cadmium, arsenic, zinc and lead using the same methodology and under the same terms as the CORE Contract except as modified by this First Addendum (the "Post-Remediation Testing Services").

WHEREAS, CORE desires to be engaged by the Settlement and the Settlement wishes to engage CORE to provide the Post-Remediation Testing Services and shall furnish such

services in accordance with the terms of this First Addendum and the terms of the CORE Contract.

WHEREAS, CORE has submitted its May 25, 2012 Post-Remediation Testing Services Cost Quote in Exhibit 1 (the "Cost Quote"), with the Cost Quote hereby supplementing Exhibit G to the CORE Contract, and the Cost Quote is acceptable to the Settlement provided it is approved by the Court;

NOW, THEREFORE, in consideration of the premises and the mutual promises and covenants herein contained and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties agree as follows:

THE CORE CONTRACT IS HEREBY SUPPLEMENTED AND AMENDED AS STATED BELOW WITH ALL TERMS AND CONDITONS OF THE CORE CONTRACT TO BE VALID AND BINDING EXCEPT ONLY TO THE EXTENT PROVIDED BELOW:

1.1 Additional Services.

1.1.1 Pursuant to Article III(C) on page 29 of the CORE Contract, CORE and the Settlement hereby add the Post-Remediation Testing Services in Exhibit 1 as a supplement to Exhibit G and as additional services under the CORE Contract.

1.1.2 Pursuant to Article III(C) on Page 29, and Section 8.1 of the CORE Contract, CORE and the Settlement mutually agree to the provision of the Post-Remediation Testing Services as set forth in Exhibit 1.

1.1.3 Pursuant to the CORE Contract, CORE shall immediately provide the Settlement with a Performance Bond equal in amount to the Cost Quote in Exhibit 1 for the

Post-Remediation Testing Services, with the Settlement to provide a reasonable amount for purchasing the Performance Bond.

1.2 Termination. In addition to the termination provisions to the CORE Contract, the Parties agree that CORE's provision of the Post-Remediation Testing Services will end upon the completion of the Post-Remediation Testing Services which is estimated to be December 31, 2013.

2.1 **Full Force and Effect.** The execution of this First Addendum, and the addition of the Post-Remediation Testing Services to the CORE Contract, under the performance time frame agreed to above, shall not be and is not intended to alter any other term of the CORE Contract, and does not serve as a revocation, termination, amendment, and/or alteration of any or all terms of the CORE Contract, except as set forth explicitly hereinabove. The CORE Contract remains in full force and effect.

IN WITNESS WHEREOF, the Parties have executed this Agreement as of the day and year first above written.

The undersigned certifies that he has legal authority to bind CORE.

CORE Environmental Services, Inc.

By: _____

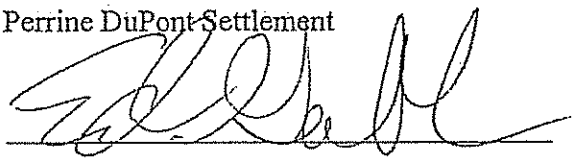
Print Name: Steve A. Zbur, P.G.

Title: President

Date: June 4, 2012

The undersigned certifies that he has legal authority to bind the Settlement upon approval of this First Amendment by the Court in the DuPont Case.

The Perrine DuPont Settlement

By: 

Edgar C. Gentle, III

Title: Special Master and Claims Administrator

Date: June 4, 2019

EXHIBITS

EXHIBIT 1	CORE Proposal for Additional Services including proposed Cost of May 25, 2012

EHXIBIT 1

CORE
ENVIRONMENTAL SERVICES, INC
Consulting • Operation & Maintenance • Risk Assessment • Engineering

May 25, 2012
VIA E-MAIL

Perrine DuPont Property Remediation Administration
Gentle, Turner, & Sexton
501 Riverchase Parkway East, Suite 100
Hoover, Alabama 35244

Attention: Mr. Edgar C. Gentle, III, Esq.
Special Master and Claims Administrator

Subject: Environmental Services Proposal R.2
Clean-up Verification Sampling
Perrine DuPont Settlement Remediation Project
Spelter, West Virginia

Dear Mr. Gentle:

On behalf of CORE Environmental Services, Inc. (CORE), we are pleased to submit a revised cost proposal and qualifications to perform the clean-up verification sampling of selected properties as part of the Perrine DuPont Settlement. We appreciate the opportunity to offer our services, and look forward to working with you should we be awarded the project.

This proposal was prepared in response to the Request for Proposal (RFP) issued on January 26, 2012, for clean-up verification sampling of the soil and houses in the class area defined in the Perrine DuPont settlement as well as communications with the Settlement regarding updated requirements for dust sample analysis turnaround time of 24 hours. Based on the Memorandum dated February 23, 2012, it is CORE's understanding, that the costs for clean-up verification sampling are not to be included as part of the RFP. As such, CORE presents the following proposal based upon the RFP, Memorandum and subsequent discussions the Settlement. This proposal includes the requested information regarding our project team's ability and costs to conduct the clean-up verification sampling scope of work.

PROJECT TEAM

If selected, CORE will perform the scope of work by utilizing key members of our staff to complete the work scope in a professional and cost-effective manner. All project tasks will be supervised by our LRS, Thomas M. Rebar (WV LRS No. 109), who will serve as your sole point of contact for our project team. In addition, CORE's field technician, Kyle Baiker-McKee has, over the course of the initial property contamination assessment performed as part of the Perrine DuPont Settlement, built an exceptional relationship with the Settlement team and the residents of Spelter. Mr. Baiker-McKee currently holds an EPA Dust Sampling

Technician Certification and has completed numerous relevant soil sampling projects throughout his time with CORE.

CORE Environmental Services, Inc.

CORE is a full-service environmental consulting firm with a professional staff of 20 and offices in Morgantown, Beckley, West Virginia; and Allison Park, Pennsylvania. CORE is currently an approved vendor to the West Virginia Department of Environmental Protection (WVDEP) (No. 225131837), the West Virginia Department of Highways (WVDOH) (Vendor ID: 0000462724), a West Virginia licensed contractor (No. WV037360), certified by the West Virginia Board of Professional Engineers (No. C021-70-00), and is in good standing with the West Virginia State Worker's Compensation Commission.

In addition to the ongoing phase of the Perrine-DuPont Settlement project, CORE's recent West Virginia operations client list includes work for law firms on projects in West Virginia and Pennsylvania; manufactures, lending institutions; local, regional, and national oil marketers; energy production and transmission companies; developers; the Pennsylvania State Department of General Services, and direct contracts for environmental consulting services to the WVDEP and WVDOH. We are also currently performing field services for out-of state environmental consulting firms on their project sites within West Virginia and Pennsylvania.

CORE provides services on a daily basis to clients with quality assurance/ quality control (QA/QC) requirements equal to or greater than those required for the referenced scope of work. In addition to the Perrine-DuPont Settlement project, we are currently performing site assessment and risk assessment tasks on over 15 projects within West Virginia's Voluntary Remediation and Redevelopment Program (VRRP) and Uniform Environmental Covenant Act (UECA) program which require the preparation of and strict adherence to site-specific Quality Assurance Project Plans (QAPPs) and Health and Safety Plans (HASPs). Our professional staff are experts in obtaining and evaluating data that meets data quality objectives required for use in the preparation of Human Health and Ecological Risk Assessments per West Virginia's *Voluntary Remediation and Redevelopment Act (VRRA)*, W. Va. Code §22-22-1 *et seq.*, and the rules promulgated thereto.

Services provided during the referenced project would be managed from our Morgantown, West Virginia office. Our Morgantown office is managed by Mr. Thomas Rebar. Engineering tasks performed by the CORE West Virginia staff are supervised by a Licensed West Virginia Professional Engineer (Jeffery S. Holmes, PE). We currently work closely with all of the various divisions of the WVDEP, and maintain a professional working relationship with the State regulators.

CORE will perform all professional consulting and soil and dust sampling services in-house, including any associated AutoCAD, GIS database, accounting, and administrative tasks. Subcontracted services would include sample analysis provided REI Consultants, Inc. (REIC).

REI Consultants, Inc.

REIC is a WVDEP-certified analytical laboratory with a long history of providing reliable and cost-effective services. REIC is a privately held, full service sampling and analytical firm operating a network of one main laboratory and three service centers. REIC's main laboratory located in Beaver, West Virginia is NELAC accredited. The laboratory utilizes USEPA, ASTM, Standard Methods, NIOSH, and other accepted test procedures to provide defensible analytical results in accordance with Federal and State regulations.

CORE has established a productive and lasting professional relationship with REIC over the past 8 years. CORE is confident in REIC's ability to integrate into Phase 2 of the Perrine-DuPont Settlement project, and provide timely and accurate analytical data. REIC's Comprehensive Quality Assurance Plan is included as for your reference.

EXCEPTIONS/ SPECIAL CONDITIONS

There are no exceptions to the requested scope of work or special conditions applied to the scope by the CORE project team. We are fully capable of performing the required soil and dust sampling tasks as described in the RFP and in subsequent communications with the Settlement regarding the expected project schedule, laboratory turnaround requirements, and number of samples to be collected.

SUMMARY OF RECENT TESTING PROJECTS

As requested in the original RFP, a summary of recent soil and dust testing jobs performed by the CORE project team and contact person details are presented below:

Perrine DuPont Settlement, Property Contamination Assessment, Zone 1A, 2 & 3, Spelter, WV

CORE recently completed the soil sampling of 200 properties included in Zone 1A of the Perrine DuPont Settlement. The soil assessment was completed in accordance with a site-specific QAPP and HASP prepared by CORE. The assessment data was obtained in accordance with the field QA/QC requirements required for production of Level IM2/ M3 data reports which will be validated by a third party data validator.

In addition, CORE is currently managing the completion of dust sampling at approximately 2,000 homes throughout Zone 1A, 2 and 3 as part of the Perrine DuPont Settlement team. Wipe and vacuum samples are being collected from the accessible interior areas of the homes and submitted for laboratory analysis. Full field QA/QC requirements are being maintained throughout the project.

During the course of the Phase 1 soil and dust sampling activities, CORE personnel developed an excellent working relationship with the Settlement team, as well as with the residents of the class areas.

Former Sellaro's Service Station, 2673 University Avenue, Morgantown, WV

CORE recently completed the assessment of surface soil, subsurface soil, groundwater, and soil vapors at the referenced site in Star City, WV. The site assessment was completed in accordance with a site-specific QAPP and HASP prepared by CORE. The assessment data was obtained in accordance with the field

QA/QC requirements required for production of Level IM2/M3 data reports which will be validated by a third party data validator. The assessment data will be utilized by CORE to complete a Human Health and Ecological Risk Assessment and to obtain regulatory closure and relief of liability for our client through the WV UECA program.

Project Client Contact: Chris Sellaro, Owner (304) 685-2923

Former Quiet Dell Chevron, Rt. 20 South, Quiet Dell, WV

CORE recently completed the assessment of surface soil, subsurface soil, groundwater, and soil vapors at the referenced site in Quiet Dell, WV. The site assessment was completed in accordance with a site-specific QAPP and HASP prepared by CORE. The assessment data was obtained in accordance with the field QA/QC requirements required for production of Level IM2/M3 data reports which will be validated by a third party data validator. The assessment data will be utilized by CORE to complete a Human Health and Ecological Risk Assessment and to obtain regulatory closure and relief of liability for our client through the WV UECA program.

Project Client Contact: Olie Bastin, Owner (304) 622-8489

Sheetz Store # 239, 205 North Center Avenue, New Stanton, PA

CORE recently completed the initial phase of soil and groundwater assessment at the referenced site in New Stanton, Pennsylvania. The site assessment was completed in accordance with a site-specific QAPP and HASP prepared by CORE. Although the remediation standard for the site has not yet been selected pending further investigation and exposure pathway evaluation, the investigation is being completed and data obtained as required by the Pennsylvania department of Environmental Protection (PADEP) for potential use in a risk-based closure to a site-specific standard (SSS).

Project Client Contact: David Dodson, Environmental Compliance Manager (814) 239-1402

Cost Estimate

CORE will provide sampling and analysis services as described in the RFP and based on CORE's understanding regarding the anticipated project schedule and changes form the original RFB regarding the project laboratory analytical turnaround time requirements, as communicated by the Settlement team.

It is CORE's understanding that soil sampling will be conducted at a total of 160 properties and dust sampling will be conducted at a total of 600 properties. Approximately five to ten properties will be sampled per week, over the course of 24 to 30 months. As such, this proposal is based upon the above mentioned maximum quantities of soil and dust properties to be sampled, over the course of 30 months.

Laboratory analysis of dust samples will be submitted for one business day turn around time (TAT) and laboratory analysis of soil samples will be submitted for 5 business days TAT to REIC. Dust sample analytical results will be available to the Settlement by 5 PM the business day following sample collection. Business days are Monday through Friday. CORE will be available to collect samples on Saturdays, if requested. Analytical results for samples collected on Saturdays will be available by 5 PM on the following Monday.

Below is a breakdown of the estimated costs to perform the post remediation soil and dust sampling, based on the unit cost breakdown provided in the RFP and subsequent modifications mentioned above:

A. Quality Assurance

1. Fixed Fee to develop Quality Assurance Project Plan, Health and Safety Plan:

$ 1,350

B. Soil Remediation*

2. Price Per Soil Property for the wrap-up sampling and laboratory analysis of the samples of the clean replacement soil after remediation is complete for each soil property.

$ 358.31

C. House Remediation**

3. Price per house for wrap-up sampling and laboratory analysis of the samples after remediation is complete for each house.

$ 709

D. Other

1. Per Soil Property and per house price for removal and disposal of investigation derived waste and decontamination waste disposal fee (if any) and any other charges not included above.

(per property fee) $ 10.43

Soil and Dust Sampling Total Based on Quantities and Schedule as Described: $ 492,009

*The per soil property price is based on collection and analysis of two samples per property, with a maximum of 160 properties to be sampled. In addition, QA/QC procedures and sample quantities will be based upon the current Quality Assurance Project Plan (QAPP) dated October 2011.

This estimate includes up to 160 properties sampled once, upon completion of soil remediation. Re-sampling of properties will require additional charges invoiced based on the per-property price. It should be noted, this assumption does not account for larger properties which may require additional soil samples, which CORE

understands will be at the discretion of the Settlement team. As such, additional costs will be invoiced for properties that will require more than two soil samples.

**The per house dust price is based on dust wipe collection and analysis of six samples per house, with a maximum 600 houses to be sampled. The QA/QC procedures and sample quantities will be based upon the current Quality Assurance Project Plan (QAPP) dated October 2011, with the exception of blank samples which will be collected on a daily basis.

PERFORMANCE & CONSTRUCTION BOND

Please note, this proposal does not include the cost for CORE to obtain a Performance and Construction Bond. CORE would be happy to provide you with a cost estimate for obtaining a Performance and Construction Bond, if requested.

DATA VALIDATION

CORE routinely contracts qualified firms to perform independent third party validation of data obtained for our projects. We would welcome the opportunity to recommend a provider or to assist you with coordination of data validation if requested.

ATTACHMENTS

The following attachments are included, as requested in the original RFP:

Attachment 1: Insurance Certificate
Attachment 2: Project Team Qualifications
Attachment 3: REIC's Comprehensive Quality Assurance Plan

We appreciate this opportunity to offer our services and look forward to working with you on the second phase of the project.. If you have any questions regarding this submittal or CORE's organization, please contact Tom Rebar at (304) 266-7207 or Steve Zbur at (412) 977-2737.

Sincerely,

CORE Environmental Services, Inc.

Thomas M. Rebar, LRS
Senior Project Manager

Stephen A. Zbur, PG
President

Enclosures:
C: Kip Harbison – Gentle, Turner, & Sexton

ATTACHMENT 1

INSURANCE CERTIFICATE

CERTIFICATE OF LIABILITY INSURANCE

OP ID P1

DATE (MM/DD/YYYY): 06/30/11

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER

First Nat'l Ins - Robinson
100 Park Manor Drive
Pittsburgh PA 15205
Phone:412-446-1010 Fax:412-446-1022

CONTACT NAME:
PHONE (A/C, No, Ext):
FAX (A/C, No):
E-MAIL ADDRESS:
PRODUCER CUSTOMER ID #: COREE-1

INSURED

Core Environmental Services Inc.
4068 Mount Royal Blvd. Ste 225
Pittsburgh PA 15101-2951

INSURER(S) AFFORDING COVERAGE	NAIC #
INSURER A: Endurance American Specialty	
INSURER B: Hartford Insurance Group	
INSURER C:	
INSURER D:	
INSURER E:	
INSURER F:	

COVERAGES CERTIFICATE NUMBER: REVISION NUMBER:

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSR	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	GENERAL LIABILITY X COMMERCIAL GENERAL LIABILITY CLAIMS-MADE X OCCUR X PROF & POLL LIAB GEN'L AGGREGATE LIMIT APPLIES PER: X POLICY PRO-JECT LOC			ECC101008342-02	07/02/11	07/02/12	EACH OCCURRENCE	$ 2,000,000
							DAMAGE TO RENTED PREMISES (Ea occurrence)	$ 50,000
							MED EXP (Any one person)	$ 5,000
							PERSONAL & ADV INJURY	$ 2,000,000
							GENERAL AGGREGATE	$ 2,000,000
							PRODUCTS - COMP/OP AGG	$ 2,000,000
								$
B	AUTOMOBILE LIABILITY X ANY AUTO ALL OWNED AUTOS SCHEDULED AUTOS HIRED AUTOS NON-OWNED AUTOS			40UECPX1705	07/02/11	07/02/12	COMBINED SINGLE LIMIT (Ea accident)	$ 1,000,000
							BODILY INJURY (Per person)	$
							BODILY INJURY (Per accident)	$
							PROPERTY DAMAGE (Per accident)	$
								$
								$
A	X UMBRELLA LIAB OCCUR EXCESS LIAB X CLAIMS-MADE DEDUCTIBLE X RETENTION $ 0			EXS101008343-02	07/02/11	07/02/12	EACH OCCURRENCE	$ 1,000,000
							AGGREGATE	$ 1,000,000
								$
								$
B	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? Y/N N/A (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below			40WECBE9933	07/02/11	07/02/12	X WC STATU-TORY LIMITS OTH-ER	
							E.L. EACH ACCIDENT	$ 1000000
							E.L. DISEASE - EA EMPLOYEE	$ 1000000
							E.L. DISEASE - POLICY LIMIT	$ 1000000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)
EVIDENCE OF COVERAGE

CERTIFICATE HOLDER

INSU-CO

INSURED'S COPY

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

6/30/11

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ATTACHMENT 2

PROJECT TEAM QUALIFICATIONS

CORE
ENVIRONMENTAL SERVICES, INC.
Consulting • Operation & Maintenance • Risk Assessment • Engineering

Stephen A. Zbur, PG
President/ Owner

Experience Summary

Stephen A. Zbur is President and Owner of CORE Environmental Services, Inc. He has over 25 years of experience in the environmental consulting field, and his specialties include project management and negotiations with regulatory agencies, directing remedial investigations, conducting regulatory compliance audits, and due diligence assessments for property transfers (prepurchase, acquisition, divestiture), and soil and groundwater remediation investigations.

Education

B.S. Geology - Indiana University of Pennsylvania

40-Hour HAZWOPER Training Course & Associated 8-Hour Refresher Training to Date Complying with OSHA Standard 29 CFR 1910.120.

Professional Affiliations & Registrations

Pennsylvania Registered Professional Geologist #PG-338-G
North Carolina Licensed Geologist #1090
South Carolina Professional Geologist #1131
Virginia Certified Professional Geologist #775
Tennessee Registered Geologist #TN219

Representative Experience

Managed and performed full-scale environmental compliance audits for an international chemicals manufacturer at 20 facilities throughout the US and Canada. The facilities included such diverse chemical processes as plasticizer manufacturing, chemical blending operations, and peroxide production.

Performed due diligence environmental investigations at more than 100 facilities for potential buyers, sellers, lending institutions and insurance companies. Activities included Phase I and Phase II Environmental Assessments along with developing tasks of potential environmental liabilities to assist in purchase negotiations.

Performed environmental compliance audits for such clients as electronic cable manufacturers, film manufacturers, international construction and industrial equipment manufacturers, high-grade industrial detergent manufacturers, electronic components manufacturers, foam producers, commercial heating and coating industries, and electronic and printing facilities. Audits included regulatory review of all environmental and compliance issues and determination of compliance to applicable environmental regulations.

Directed the preparation and implementation of a remediation workplan at a textile facility in accordance with the New York Voluntary Cleanup Program. The nature and extent of volatile organic compounds were determined in the subsurface and a dual-phase extraction pilot test was performed and selected as the remedial alternative. A remediation workplan was prepared and submitted to the New York State Department of Environmental Conservation. The extraction system was designed, installed and brought on-line in July 2000.

Provided project management oversight for due diligence and full-scale compliance audits concurrently at various facilities throughout the United States. These activities were performed as part of major acquisitions or mergers for our manufacturing clientele. As a result of these investigations, compliance and remediation issues were identified and completed as part of the agreement between the buyer and the seller.

Directed an environmental assessment for the seller of an electrolytic capacitor manufacturer. Activities, which were performed in concurrence with the buyers consultant and counsel, included: performing a remedial investigation to determine the extent and magnitude of chlorinated solvents, removing and properly disposing of domestic sludge and soil, coordinating the removal and disposal of out-of-service transformers and spent chemicals and abandoning two former etchant process pits by sampling and filling with concrete.

Directed a Remedial Investigation/Feasibility Study according to the National Contingency Plan (40 CFR, Part 300) at a solvent recovery facility in North Carolina. Tasks included: project scoping, developing a plan to conform with community relations and obtaining substantial data to determine a score for the NPL Hazard Ranking System.

Directed a site characterization at a printing facility as part of the Virginia Voluntary Remediation program. Site-specific action levels were developed using site-specific data to justify natural attenuation/degradation as a remedial alternative. Site closure was received from the Virginia DEQ after one year of quarterly ground water and soil monitoring.

Directed removal actions of buried drums and scrap PCB capacitors at an electrolytic capacitor manufacturer in Virginia. Activities included: performing a surface geophysical survey to identify the buried debris, preparing an excavation workplan, retaining subcontractors to perform the removal activities, coordinating transportation and disposal of TSCA material, and performing a remedial investigation upon completion of removal actions.

Project Manager for a PCB spill cleanup in a building interior classified by TSCA as a non-restricted area. Activities included delineating the PCB impacted area by performing grid sampling, cleaning and encapsulating the concrete floor and performing final cleanup verification sampling.

Directed a site investigation at a former textile and chemical manufacturing facility in Rhode Island. The work was done in accordance with Rhode Island Brownfield regulations and included developing site-specific soil and ground water action levels using approved fate and transport models. The remedial activities included the excavation of impacted soil and remediating ground water through the use of vacuum enhanced recovery wells to risk based concentrations.

Directed remedial investigations at adhesive manufacturing sites in New Jersey and New York

to determine the lateral and vertical extent of chlorinated volatile organic compounds

Provided oversight for dual-phase extraction system pilot tests at sites in New York, New Jersey, Ohio and Pennsylvania.

Provided oversight of natural attenuation analysis for chlorinated volatile organic compounds at various sites. Based on this data, natural attenuation calculations and degradation parameters were calculated and presented to regulatory bodies.

Directed the closure of seven non-hazardous retention ponds at an electrolytic capacitor manufacturer in North Carolina. Activities included: developing a sludge, soil and surface water sampling and sounding program, evaluating and recommending sludge and surface water disposal options, preparing a closure plan, retaining and coordinating with subcontractors to remove surface water from the ponds, solidifying the sludge in place, and backfilling the lagoons to satisfy the conditions of the site specific erosion control plan.

Project Manager for a RCRA Closure/ Post Closure at a manufacturing facility in North Carolina. Activities included: performing a contamination assessment including a bedrock investigation and geophysical well logging to assist in determining the extent of TCA, closing a Hazardous Waste Management Unit, designing and permitting a Corrective Action Management Unit for the on-site treatment of contaminated soil, and designing, installing and maintaining a ground water and soil treatment system.

Directed a Site Assessment Plan at former fertilizer manufacturing facility. The plan was prepared in accordance with the North Carolina Superfund Section, Voluntary Site Remedial Action Program.

Directed a site assessment at a former plating facility in Pennsylvania. Activities included developing a sampling and analysis plan, classifying and disposing of process related hazardous wastes and determining costs for facility decommissioning.

Performed drip pad assessments and assisted in bring a wood treating facility into compliance with drip pad technical standards (40 CFR, Part 265, Subpart W).

Provided senior oversight to project managers with respect to all aspects of petroleum-related assessment and remediation projects.

Served as project manager for petroleum contamination investigation and remedial activities at underground storage tank facilities. Responsibilities included directing the investigative and remedial study and managing the project team responsible for the installation and maintenance of the recovery and treatment system and negotiating closure criteria.

Program Director for two multi-year contracts for the State of North Carolina. Services include investigating petroleum releases and mitigating

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Stephen A. Zbur, PG
President/ Owner

potential health exposures by installing supply wells, coordinating the extension of public water lines and installing point-of-entry systems.

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Thomas M. Rebar, LRS
Senior Project Manager
West Virginia Licensed Remediation Specialist

Experience Summary

Mr. Rebar has over fifteen years of experience as an environmental consultant working with petroleum industry clients in Pennsylvania, West Virginia and the surrounding states, including nine years as a WV Licensed Remediation Specialist (LRS). Mr. Rebar currently manages CORE's West Virginia office and staff, and is the primary contact for clients and regulatory agencies on projects he manages in West Virginia and throughout the mid-Atlantic region.

Mr. Rebar's professional experience includes acting as the LRS on Projects in West Virginia's Voluntary Remediation and Redevelopment Program (VRRP), and Uniform Environmental Covenant Act (UECA) program, including retail petroleum sites, former glass plants, and former bulk petroleum plants with multiple contaminant sources.

Mr. Rebar is proficient in the management of a wide variety of environmental assessment and remediation projects, for a wide range of client types with varying project objectives. His experience as a Project Manager covers responsibilities from proposal preparation and budgetary management, through field personnel and subcontractor supervision, regulatory interaction and site closure negotiations.

In addition to project level management and supervision, Mr. Rebar has extensive hands-on experience in the field as a Project Scientist and Senior Field Technician. Field experience includes the installation and operation of various types of soil and ground water remediation systems, soil boring and monitoring well installation, Phase I and II site assessments, remedial feasibility studies, emergency spill response, and on-site construction management.

Mr. Rebar has hands-on experience with various methods of subsurface exploration, including the utilization of air knife, direct-push, hollow-stem auger, and air rotary boring methods to complete subsurface delineation.

Education

B.S. in Geology - California University of Pennsylvania

Annual continuing education credits obtained through participation in the Risk Assessment/ Brownfield Site Assessment Workshops presented by the West Virginia Department of Environmental Protection (WVDEP), 2000 through 2010

Pennsylvania Department of Environmental Protection (PADEP) Land Recycling Workshops, December 2007 and 2008

40-Hour HAZWOPER Training Course and Associated 8-Hour Refresher Training current to date, complying with OSHA Standard 29 CFR 1910.120

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Thomas M. Rebar, LRS
Senior Project Manager
West Virginia Licensed Remediation Specialist

8-Hour Supervisors Course complying with 29 CFR 1910.120(e)(4)

Red Cross First Aid and CPR Certified

Professional Affiliations & Registrations

West Virginia Licensed Remediation Specialist
Registration No. 109

Associate Member of the Pennsylvania Council of Professional Geologists

Associate Member of the West Virginia Oil Marketers & Grocers Association (OMEGA)

Member of the West Virginia Chapter of the Air and Waste Management Association (AWMA)

West Virginia Chapter, Allegheny Mountain Section

Morgantown Area Chamber of Commerce, Morgantown, West Virginia

Representative Experience

As a LRS, Mr. Rebar is certified by the director of the West Virginia Department of Environmental Protection as an individual qualified to perform professional remediation services and to supervise the assessment and remediation of contaminated sites within West Virginia's VRRP and UECA Programs. Mr. Rebar's LRS experience in West Virginia includes performance of site assessments according to EPA and VRRP QA/QC standards and risk-based closures for petroleum industry and local government clients.

As a Project Manager, Mr. Rebar has performed management duties on over 250 projects for over 80 different petroleum industry clients in PA and WV, including acting as the project LRS on projects within West Virginia's VRRP and UECA.

Recent projects include Risk-Based closure of a petroleum bulk storage terminal in northern WV through West Virginia's Voluntary Remediation Program, and risk-based closure projects of various size and scope throughout PA, OH and WV. Mr. Rebar prepares proposals, contracts and work plans for these projects and is the primary contact for client representatives and state regulators. Mr. Rebar is responsible for the scheduling and supervision of a full-time staff working on these projects and performs final review of all reports, permits and correspondence related to the projects. Mr. Rebar also is responsible for all budget-related and financial management issues on these projects. He has been responsible for the application of state and federal regulations to petroleum projects in multiple states. As a Staff level Scientist, Mr. Rebar has supervised soil boring and remediation system installations, directed underground storage tank closures and performed

Phase I and Phase II Environmental Site Assessments and site delineation. Previous

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technical level field experience included operation and monitoring of remediation systems, pilot testing, groundwater sampling, installation and maintenance of Oxygen Releasing Compound® and other passive remediation units, supervising construction subcontractors, surveying, well abandonment, coordinating laboratory services and field activities, and setting up and operating mobile point-source remediation systems.

Remedial system experience includes the installation and operation of dual phase recovery systems, pneumatic pump-and-treat systems, ozone injection systems, and high and low vacuum vapor recovery systems. He is experienced with the operation of systems utilizing carbon absorption and catalytic oxidation, air strippers, product skimmers, and multi-phase vacuum extraction equipment.

Professional staff level report preparation experience includes data analysis and preparation of technical reports in various States, for numerous and diverse clientele, and for all phases of environmental projects. Mr. Rebar has been the primary author and/or primary reviewer on Phase I Site Assessments, Phase II Site Characterization Reports (SCRs), Corrective Action Pans (CAPs), and Remedial Action Completion Reports (RACRs) submitted to regulatory agencies in multiple States.

Retail & Bulk Petroleum Facilities - Managed projects on over 180 retail petroleum sites for over 65 individual clients. These sites are in various stages of cleanup including initial assessment, site delineation and characterization, remediation system design and installation, system optimization and regulatory closure negotiations. Mr. Rebar has managed site closures in WV via the Leaking Underground Storage Tank (LUST) program and in Pennsylvania through Underground Storage Tank Program and Act II.

Phase I Site Assessments – Mr. Rebar has recently completed Phase I site assessments per ASTM E-1527 on petroleum and industrial sites in West Virginia, Pennsylvania, and Florida. His role on these projects included on-site assessment and interviews, senior report review, and project management.

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Jeffrey S. Holmes
Senior Project Manager

Experience Summary

Mr. Holmes is responsible for managing environmental contamination assessment projects, RCRA permitting projects, compliance auditing projects, development and preparation of various types of pollution prevention plans, RCRA and solid waste closure plan preparation and management and certification of RCRA and solid waste closures. Mr. Holmes also participates in and manages site characterization studies. His duties include planning and implementation of projects, coordination with clients, state regulators and subcontractors, interpretation of data, preparation of reports, job accounting and invoicing.

Education

BS, Environmental Engineering, Pennsylvania State University, State College, 1981

Professional Affiliations & Registrations

Professional Engineer, Pennsylvania, 035724-E, 1986

Professional Engineer, Connecticut, 15046, 1987

Professional Engineer, Ohio, E-51145, 1987

Professional Engineer, New York, 070285-1, 1993

Professional Engineer, West Virginia, 15759, 2003

West Virginia Licensed General Engineering Contractor, 2004

Professional Memberships

US EPA Common Sense Initiative Iron and Steel Sector, Brownfields Workgroup, 1995-1998

Society of American Military Engineers, 1993-2000

Publications

"Time-Release Electron Donor Application in a Low Permeability PCE Contaminated Aquifer" - Proceedings of the Third International Conference on Remediation of Chlorinated and Recalcitrant Compounds, Monterey, CA, May 2002.

Awards

1995 WMX Technical Excellence Award, 3rd Place

Representative Experience

Confidential Steel Corporation, Williamsport, Pennsylvania. Development and preparation of Post-Closure Permit modification to reduce the sampling frequency of the ground water monitoring program, eliminate some program monitoring wells, reduce some recordkeeping requirements and eliminate some analytical parameters from the post-closure program. The application was submitted to the PADEP and the application approved. [1999-2001]

Reclamation Facility, Ellwood City, Pennsylvania. Project manager for initial development of and periodic updates to Part B RCRA Storage and Processing Permit

Application for the facilities rotary hearth furnace, electric arc furnace and cadmium recovery processes as well as related activities. Conducted meetings with PADEP and client and provided permit revisions in the form of revised applications to address facility modifications and subsequent regulatory agency comments. Draft permit issued in 1992, final permit issued in 1994, amended permit issued in December 1995 to include cadmium recovery operations. Presently involved in major permit modification to include new storage areas, processing modifications and a new waste stream. [1987 - present]

American Environmental Services Company Site, Jacksonville, Florida Area. Project manager and design coordinator for development of RCRA storage facility Part B Permit applications. Three different sites were evaluated and went through a partial or the complete permit application process. Application preparation involved regulatory liaison with Florida DEP and other environmental agencies, design of storage facilities and associated layout per applicable regulations, preparation of required Florida DEP Permit forms, development of spill plans and erosion control plans. [1993-1995].

NGK Metals Corporation, RCRA Facility Investigation, Reading, Pennsylvania. Construction manager for a RCRA Correction Action Program for a manufacturer of beryllium alloys, one of the first RCRA Corrective Action Projects to be undertaken by EPA. Groundwater Model and Pump Test Report were the best reviewed by the EPA Region III project officer. The purpose of the project was to determine the impact of on-site waste disposal practices by prior owners of the site which included the operation of an on-site industrial waste landfill and several waste water and sludge lagoons. Provided construction oversight supervision and design engineer roles, periodic site visits and participation in meetings and regulatory agency negotiations.

DuPont, New Castle, Pennsylvania. Quality Control Supervisor for closure of a 13-acre landfill. Managed field QC staff, responsible for development and preparation of all work plans, including: Construction Execution Plan; Contractor Quality Control Plan; Security Plan; Environmental Protection Plan; Spill and Discharge Control Plan; Decontamination Plan; Submittal Register; and, Traffic Control Plan. Responsible for development and preparation of all project QC submittals (material approvals, laboratory data, field testing results) responsible for QC oversight of contaminated waste regrading, placement of cover soils, installation of erosion control measures, fencing and site revegetation operations. Conducted task specific meeting agendas and conducted Preparatory Phase and Initial Phase Meetings with required site personnel and contractors. Participated in Weekly Progress Meetings, prepared daily construction quality control reports and was involved with client and PADEP negotiations of project changes. [2001]

El Paso Energy, Calvert City, Kentucky. Participated in confidential due diligence evaluation associated with the acquisition of a natural gas fired power plant in western Kentucky by evaluating potential for liability associated with off-site sources, wastewater, storm water, ground water and waste management conditions. [2001]

Hukill Chemical Corporation, RCRA Closure Plan for Storage Tank Farm, Bedford, Ohio. Design engineer for development and preparation of RCRA closure plan for the company's hazardous waste tank farm involving a alternative capping system and subsurface drainage system. Conducted regulatory negotiations for alternative capping system and modified statistical groundwater data evaluation procedures. [1999-Present]

NGK Metals Corporation, Residual Waste Study and Phase I & II Permit, Reading, Pennsylvania. Primary designer and certifying engineer for a residual waste study at this beryllium alloys manufacturing facility, which identified and classified the waste streams according to the new residual waste regulations. A thorough overview of the new regulations and their effect on NGK was presented along with viable action options which included compliance requirements, schedules, and cost. As a result of this study, NGK decided to upgraded their facility to a Class I landfill. [1997]

Naval Surface Warfare Facility, Navy CLEAN, Dahlgren, Virginia. Worked as a subcontract employee to aid and manage the 65% and 100% design phases for a landfill capping system, marsh area cover system, soil cover system for a stream backchannel, stabilization of streambanks, identification and quantification of excavation areas for incorporation under the landfill cap, slurry wall, sedimentation basin and stormwater management features. Managed the design team and was responsible for development of project work plans and related documents including erosion and sediment control plan; environmental permits report; basis of design report; stormwater pollution prevention plan; design specifications; design drawing; and, the construction cost estimate. [1998-1999]

Aluminum Manufacturer, Rockdale, Texas. Project manager for development and preparation of comprehensive spill pollution and prevention plans for the facilities pump station, mining operations, power plant and manufacturing operations. Spill plans were developed in accordance with the company's standard format to address all facility operations and waste materials as well as raw materials.

Specialty Steel Manufacturer, Pollution Prevention, Louisville, Ohio, and Midland, Pennsylvania. Project manager for developing and managing numerous spill prevention plan projects, including SPCC Plans, Stormwater Pollution Prevention Plans, and Preparedness Prevention and Contingency Plans. [1997 - present]

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Jeffrey S. Holmes
Senior Project Manager

Specialty Steel Manufacturer, Waste Minimization, Louisville, Ohio. Project manager for a waste minimization study and lagoon closures. [1997-Present]

Norfolk Southern Corporation, UST Site Assessment and O&M Services, New London, Ohio. Project manager for assessing the viability of purchasing an in-place pump and treat system to remediate petroleum product releases. Recommended purchase of the system and assisted in the negotiation of the purchase price with BUSTR. Managed installation of two additional groundwater wells and operation of the system, maximizing the efficiency of product recovery efforts at the site. Managed preparation of a Remedial Action Plan and performance of a dual-phase extraction test. Directing evaluation of additional remedial alternatives in efforts to bring the site to closure and satisfy BUSTR cleanup standards. [1997-Present]

Component Intertechnologies, System Design, Hadley, Pennsylvania. Project manager for system design of two extraction wells, air stripper, transfer pump and flow equalization tank. Involved in negotiations with PADEP for system design, permitting and monitoring program development. Provided oversight of extraction and treatment system construction activities and involved in ongoing system operation, maintenance and monitoring program activities. Provided oversight of design of ground water extraction and treatment system for DNAPL recovery and containment.

Old City of York Landfill Superfund Site, Remedial Design Work Plan, York, Pennsylvania. Project engineer for development of Remedial Design Work Plan and associated documents, and assisted in coordination of conceptual, prefinal, and final design activities. Participated in cover thickness evaluation, borrow area evaluation, landfill gas survey, evaluation of collected data, and development of remediation design reports to include plans for capping a 16-acre portion of a landfill and collection and treatment of contaminated ground water from five on-site ground water extraction wells. Coordinated development of design reports for submittal to EPA regarding landfill capping and landfill gas assessment, monitoring and collection. As part of pre-final and final design, assisted in development of routine monitoring and performance verification plans. Acted as quality assurance director during remedial construction activities, responsible for construction oversight, participant in bi-weekly construction meetings and negotiations with regulatory agency. Presently involved in post-remedial action operation and maintenance activities.

Confidential Client, Aluminum Extrusion Facility, Girard, Ohio. Project manager for consulting assistance immediately following release of industrial wastewater containing hexavalent chromium, design and oversight of site investigation activities related to the release. Investigation involved soil boring and ground water monitoring well installation and monitoring activities to assess extent of

contamination. Following assessment activities, assisted in development of design of ground water extraction system. Responsible for oversight of system construction, operation, maintenance and development and implementation of monitoring program. Project resulted in the recovery of the vast majority of contaminated wastewater.

Confidential Client, Hazardous Waste Landfill, Model City, New York. Project manager for development of detailed design report, specifications and construction drawings for ground water interceptor trench system and associated extraction wells for DNAPL recovery. Assisted in preparation of design calculations for total system flow rates, sizing extraction well pumps and trench configurations. Also involved in design of pilot boring program to determine depth of interceptor/collection trench and presence of DNAPL as well as system performance monitoring program to evaluate extraction system flow rates and drawdown for system optimization.

Confidential Steel Corporation, Closure Management and Oversight, Johnstown, Pennsylvania. Certifying engineer for closure of a 5-acre hazardous waste pile. Participated in negotiation with PADEP for cost-saving modifications to the approved closure plan (prepared by others) and coordination of other contractors during closure.

Aluminum Finishing Facility, Northeast Ohio. Developed and implemented a closure plan for facility decommissioning of finishing operations prior to relocation of a concrete sump, paint booths and surrounding areas, pretreatment (chromate conversion coating and cleaning) area, paint room, wastewater treatment facilities and several storage areas. Implemented decontamination of structures and associated analytical verification testing, oversight and management of contractors and preparation of closure certification documentation. [1998-1999]

Former Steel Processing Facility, Williamsport, Pennsylvania. Project and field manager for field oversight and certification of RCRA closure of three inactive hazardous waste surface impoundments and three non-hazardous waste drying beds. Managed verification sampling, review of contract change orders, oversight of contaminated waste stabilization QA/QC, management of soil testing contractor, synthetic liner installation supervision and surveying oversight. Weekly reports were provided to the client as well as a comprehensive certification document. [1989-1990]

Plumbing Hardware Manufacturer, Western Ohio. Project manager for verification sampling, oversight of field engineers and construction contractor, coordinated QA/QC testing procedures for soils and synthetic liner and was responsible for surveying activities during closure of six RCRA plating wastewater sludge lagoons. Provided oversight of additional site investigation activities to define extent of contamination outside impoundments, negotiation with regulatory agency officials

regarding closure issues and performance of risk assessment for clean closure. A comprehensive certification document was also provided to the client. [1989-1991]

Specialty Steel Manufacturer, Youngstown, Ohio. Project manager and field manager for development of three RCRA closure plans for 1) an electroplating wastewater treatment plant sludge drum storage area, 2) carbon steel pickle liquor storage tank, and 3) stainless steel pickle liquor storage tank. Negotiated closure plan approvals with Ohio EPA. Provided oversight and certification of closure for drum storage area and carbon steel pickle liquor storage tank to include decontamination activities, verification sampling and analysis review and approval, and periodic inspections during closure. [1989-1992]

Former Pin and Fastener Manufacturer, Dayville, Connecticut. Project manager and field manager for oversight of closure activities for two RCRA electroplating wastewater surface impoundments. Management of closure activities included contractor oversight, soils verification sampling and approval of laboratory analysis results as "clean," soils QA/QC testing and surveying services. Performed periodic compliance inspections, involved in negotiations with CTDEP regarding soil compaction and additional waste material removal and establishment of modified cleanup criteria. Supplied client with comprehensive closure certification document. [1988-1989]

Residential and Architectural Hardware Manufacturer, New Haven, Connecticut. Project manager and field manager for oversight of RCRA closure activities for five electroplating wastewater surface impoundments and two sludge disposal areas. Oversight of closure activities involving removal of wastes for off-site disposal, soil verification sampling and analysis with approval of "clean" levels, backfilling and soils QA/QC testing. Involved in negotiations with CTDEP to revise cleanup levels to less stringent criteria during closure. Supplied client with comprehensive closure certification document. [1987-1988]

Residential and Architectural Hardware Manufacturer, New Haven, Connecticut. Project manager for developing and managing state grant program authorized waste minimization audit. Audit addressed metal finishing operations, painting, degreasing operations and various other operations involving oils, solid wastes and wastewater. Program was developed with company input and through meetings with their waste minimization committee. Previous operations were reviewed in detail including chemical usage, waste generation rates, process water usage and electricity usage. Final report included recommendations regarding product substitutions, new treatment/reuse equipment, water conservation and provided payback period evaluations. [1990]

Specialty Steel Manufacturer, Youngstown, Ohio and New Britain, Connecticut. Project manager for environmental compliance auditing

at the company's manufacturing facilities to include RCRA and solid waste issues, underground storage tanks, SARA Title III issues, Clean Water Act NPDES permitting and pretreatment requirements, OSHA flammable storage areas and TSCA PCB issues. Comprehensive final summary reports were prepared in conjunction with post-audit meetings. [1986-1988]

Bicycle Manufacturer, Maysville, Kentucky. Project manager for development of post-closure permit application to include ground water monitoring program, statistical evaluation of ground water monitoring data and site inspection program. [1986-1987]

Industrial Park, Bridgeport, Pennsylvania. Project manager for three comprehensive property transfer assessments of this 25 acre park to include asbestos, storage tanks, hazardous substances, PCBs, solid wastes, ground water monitoring well installation and sampling, development of soil sampling program. Final reports provided recommendations on waste characterization, tenant activities and operations and a summary of liabilities based on field sampling activities and walkover surveys. Cost estimates for remedial activities were also provided. [1987-1991]

Miniature Bellows Manufacturer, Cedar Grove, New Jersey. Project manager for review of soil gas survey and soil sampling program and for oversight of groundwater monitoring well installation and sampling program development related to VOC contamination. Provided oversight of record search activities, aerial photograph acquisition, review of prior plant operations, development of isoconcentration maps and ground water contour maps for incorporation into final contamination investigation report. A final report was prepared addressing findings, possible sources, and recommendations for additional investigation activities. [1989-1990]

Specialty Steel Manufacturer, New Britain, Connecticut. Project manager for Phase I and Phase II property assessment activities, including development of soil, groundwater and surface water sampling program, collection of samples and data interpretation. Reviewed manufacturing operations, interviewed plant personnel, and prepared a comprehensive summary report developed for the client's use in filing appropriate state property transaction forms. [1987-1988]

Carbon-Graphite Magnet Manufacturer, Saint Marys, Pennsylvania. Project and field manager providing field oversight and certification of two non-hazardous waste surface impoundments. Provided oversight and approval of contractor QA/QC procedures, negotiations with regulatory agency officials, and oversight of surveying activities. [1987]

Steel Manufacturer, Neville Island, Pennsylvania. Technical assistant responsible for comprehensive records search program development and performance of record search,

including Sanborn map acquisition and review, interviews with PADEP officials, plant personnel and Army Corps of Engineer personnel, title search of properties, PADEP compliance file history review of surrounding property owners, aerial photograph acquisition and review. Involved in development of soil and groundwater sampling and analytical program based on records search findings. [1991]

Special Training

American Red Cross First Aid and CPR Training, 2000 and 2001

Hazardous Materials Shipping Training, DIT, 49 CFR Parts 171 and 172, 1995

Treatment of Contaminated Soils and Groundwater, 1992

Air and Waste Management Association, Cincinnati, OH

Data Consultants Computer Training - Lotus 1-2-3, 1990

Data Consultants, Mars, PA

Hazardous Waste Site Manager's Training, OSHA 29 CFR 1910.120, 1987

Hygiene, Safety and Training Company, Pittsburgh, PA

Hazardous Waste Field Investigations Health and Safety Training, OSHA 29 CFR 1910.120, 1987

Hygiene, Safety and Training Company, Pittsburgh, PA

Real Estate Transaction Environmental Evaluations, Pittsburgh, PA 1988

Project Management, Skill Path Inc., 1989, Pittsburgh, PA

10-Hour Construction Safety Training

8-Hour OSHA Refresher, 1993 - 2002

DOT Training, 1998

ATTACHMENT 3

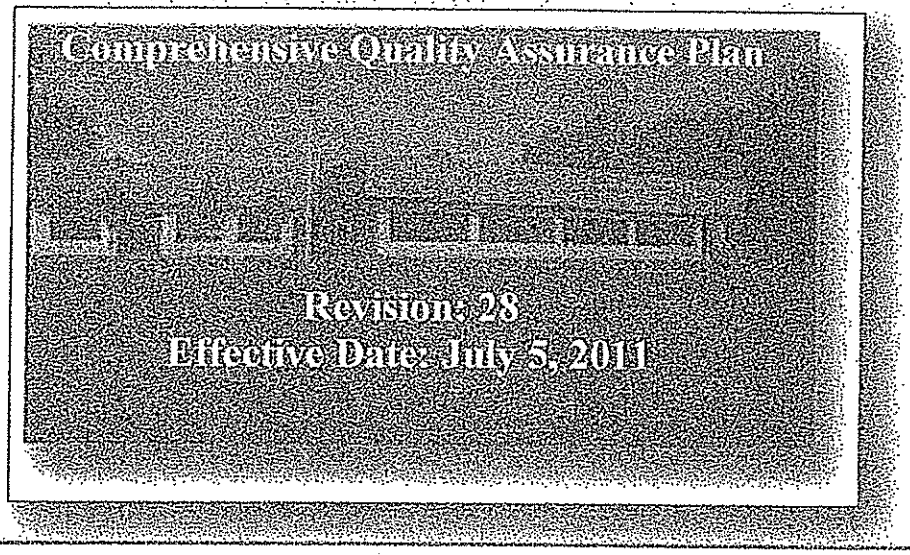
REICS COMPREHENSIVE QUALITY ASSURANCE PLAN

Comprehensive Quality Assurance Plan

REVISION: 28 EFFECTIVE DATE: JULY 2011

REI Consultants, Inc.

1-800-999-0105



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101 17th Street
Ashland, Kentucky 41101
606-393-5027

Shenandoah Service Center
1557 Commerce Road, Suite 201
Verona, Virginia 24482
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REIC

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APPROVED SIGNATURES

Clarence Haile, PhD Laboratory Manager	5 May 2011 Date
Ray Erickson Laboratory Operations Director	5/4/2011 Date
Brenda Barnett Quality Program Manager	5-5-11 Date
Tammy Church Organic Laboratory Manager	5/3/11 Date
Ivan Leef Inorganic Laboratory Manager	5-3-11 Date
Ed Kirk Biological Laboratory Director	04/22/11 Date
Mike Lester Bioassay Analytical Supervisor	4-25-11 Date
Erin Bryant Roanoke Analytical Supervisor	4-20-11 Date
Todd Gibson Shenandoah Analytical Supervisor	4-22-11 Date
Joy Mullins Mid-Ohio Valley Analytical Supervisor	4-18-11 Date

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1.0 QUALITY ASSURANCE POLICIES

1.1 Approved Signatories: The REIC Quality Assurance Manual (QAM) will be signed by the Laboratory Director/General Manager, Assistant Laboratory Director, Quality Programs Manager, Biological Department Director and Service Center Supervisor(s). This will be the approved signatories for the REIC QAM.

1.2 Quality Assurance Policy Statement: This is a comprehensive quality assurance plan (Quality Assurance (QA) Manual) for Research, Environmental and Industrial Consultants, Inc. (REIC). This document describes REIC's Quality Assurance (QA) Program as a consulting and analytical services laboratory. A well conceived Quality Assurance (QA) Program enables REIC to provide a sound framework for generating of field and laboratory data that is valid, comparable, representative and defensible. Specifically, these objectives are routinely achieved by:

- Assessing the quality of each analytical system, including precision, accuracy, and sensitivity sufficient for requirements of each project;
- Ensuring early identification of conditions which might affect quality of data of each project;
- Requiring sufficient documentation to verify the quality of data generated for each project;
- Requiring all personnel participate in annual Quality Training and maintain a signed and dated record of this training in their personnel file; and
- Validating and evaluating field information and analytical results to ensure data usability.

REIC emphasizes the application of sound quality assurance (QA) and quality control (QC) principles starting from the project initiation, through all laboratory activities and finally, to the production of the final project analytical report. REIC also emphasizes laboratory management's commitment to compliance with the NELAC standards. Management shall also be committed to continually improving the Quality System. Management shall be committed to meeting the customer's requirements, operating n accordance with statutory and regulatory requirements and operate in accordance with laboratory's ethics policy. This document is designed to provide not only a uniform set of procedures, but also a means to measure the quality of data generated.

The validity and reliability of the information generated is assured and enhanced by the adherence to documented quality control procedures and quality assurance protocols.

1.3 Code of Ethics: Every effort must be made to ensure that all business decisions, products, and interactions are initiated and completed in a manner characteristic of honest, responsible and equitable actions. REIC's Code of Ethics is established to protect REIC, our clients, and our employees from actual or potential conflicts of interest and unlawful acts, and to ensure that only the highest of professional ethics are incorporated in all facets of work. Each employee is required to attend annual training on REIC's Code of Ethics and to maintain a signed Code of Ethic agreement in their training file. A copy of REIC's Code of Ethics agreement is included as *Appendix C* of this QA Manual.

1.4 Scope of the QA Program: Understanding the scope of the QA program requires discerning the differences between QC and QA. Quality control refers to specific actions (procedures) designed to ensure that system performance is consistent with established acceptance criteria (limits). It is these specific actions that will ensure data accuracy, precision, and comparability. When the system performance is consistent with the established limits, we say that the data has been generated under in-control conditions. When not consistent, data is considered generated under out-of-control system conditions.

Quality assurance refers to the system whereby an organization, such as REIC, provides assurance to its clients that monitoring of quality-related activities has occurred (or is occurring). Implementation of the QA program, described in this QA Manual, is designed to ensure that data generated by REIC is collected under in-control conditions and sufficient documentation is available to support the data.

1.5 Application: This Comprehensive QA Plan describes REIC's QA program as it applies to field and laboratory activities, which generate analytical chemical data. This includes field activities, which may affect chemical integrity of samples, as well as chemical laboratory activities. Air sampling, biological sampling, toxicological studies, geotechnical parameter measurements, while not directly addressed in this plan, are sufficiently supported by the general principles described herein. Specific procedures and requirements are provided for sampling and analysis of:

- Domestic and industrial solid waste and wastewater sampling
- Soil and sediment sampling
- Non-potable water
- Potable water
- Surface water sampling (ponds, streams, rivers)
- Monitoring wells sampling
- Air screening/monitoring
- Method development to support toxicological studies (acute and/or chronic effects).

Note: REIC is not responsible for field activities conducted by the client(s).

Analytical methodologies to which this QA Manual will support include:

- Gas Chromatography (GC)
- Gas Chromatography / Mass Spectrometry (GC/MS)
- Liquid Chromatography (LC)
- Atomic Absorption (AA) / Atomic Emission (AE)
- Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP/AES)
- Inductively Coupled Plasma/Mass Spectroscopy (ICP/MS)
- Hydride Generation-Atomic Fluorescence Spectroscopy (HG-AFS)
- Wet Chemistry analysis
- Ion Chromatography (IC)

- Ultraviolet-Visible Spectrophotometry (UV-VIS)
- Combustion UV / Wet Oxidation analysis for TOC (Total Organic Carbon)
- Material Characterization
- Hydrocarbon Characterization
- Infrared (IR) Characterization
- Aquatic Biology evaluations
- TCLP (Toxic Characterization Leaching Procedure) Extractions and Evaluations

(Please note that a comprehensive listing of equipment and instrumentation is covered in Appendix G of this QA Manual.)

1.6 **Document Updates:** This QA Manual shall be reviewed at least annually and updated as necessary. The QA manual's newest revision will become effective 60 days from the date that the Quality Manager signs the signatory page. Also, as new quality control procedures for field and laboratory work are developed and approved, they will be introduced to provide additional statistical information. Date and revision number will document all changes. For more information see Section 9.5.

1.7 **Quality Assurance Project Plans (QAPP):** A site specific Quality Assurance Project Plan may be prepared for a specific project based on this QA Manual. The site-specific requirements of a project as specified in the project scope of work (or work plan) are incorporated into the Quality Assurance Project Plan (QAPP). A typical project description will include the following information:

- Project background, site description, overall project objectives, intended use of acquired data and project schedule (this information will be presented in section 1.0 of the QAPP and will be adapted from Section 1.0 of this QA Manual).
- List of measurement parameters, including the acceptance criteria (precision/ accuracy) of control analytes and the detection limits for the full list of the project analytes (adapted from section 3.0 of this QA Manual).
- Tables for the number of samples to be collected and field QC samples, map of sampling locations, and types of samples to be collected i.e. surface water, groundwater, soil, sediment, and/or sludge will be included in Section 4.0.

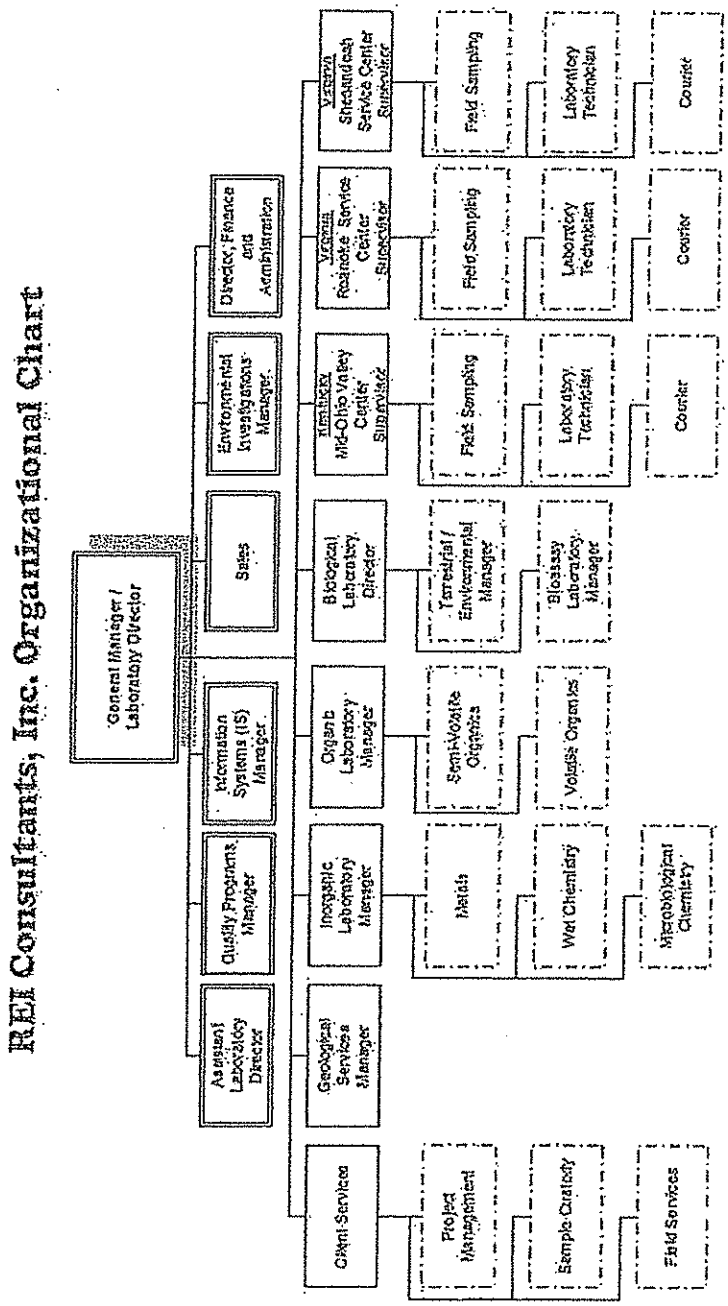
1.8 **Proficiency Test Program:** REIC participates in at least three major USEPA supported Federal and State proficiency testing programs. These include the Water Supply Study (WS Series), Water Pollution Study (WP Series)/DMRQA Study for the NPDES Program and RCRA/UST Study (Soil/UST Series). Drinking water PTs are required annually during the 1st quarter of each year for WVDHHR and KYDEP. Accreditations by NELAP, WVDEP, PADEP and VELAP are performed twice per year, no more than 7 months apart. The specific analytes and matrices are based on the scope of laboratory services.

1.9 **Review of Requests for the Acceptance of New Work:** All requests, tenders and contracts are reviewed and accepted by the General Manager (GM). Each client is assigned a Project Manager (PM) who will serve as the primary contact for the client. When the client's Quality Assurance Project Plan (QAPP) requires, REIC will review with the client the physical,

personnel and information resources required, methods to be used, reporting levels, previous proficiency testing, current accreditation status and sub-contracting of analysis, as needed. All record of review, including any significant changes, will be maintained as part of the client's permanent file. The client will be immediately notified of any deviation from the contract.

1.10 **Confidentiality and Proprietary Rights of Customers:** All data, reports and associated documents regarding clients will be treated with the utmost confidentiality. A statement will be included with all electronic transfers, emails and faxes of related customer reports. This statement will be "The information contained in this email is intended only for the individual or entity to whom it is addressed. Its contents (including any attachments) are confidential and may contain privileged information. If you are not an intended recipient you must not use, disclose, disseminate, copy or print its contents. If you receive this email/fax in error, please notify the sender by reply email/fax and delete and destroy the message."

Figure 1: REI Consultants, Inc. Organizational Chart



2.0 ORGANIZATION AND RESPONSIBILITES

- See Organization Chart on Previous Page -

2.1 Project Director: REIC's General Manager is the project director for all field and laboratory projects. The project director is responsible for all contractual obligations of the proposed work and direct corporate efforts as needed to achieve the project goals of schedule, cost, and technical performance. The Project Director's responsibilities include: Appointing the Project Manager/Coordinator for field project operations, the Laboratory Operations Directors and Laboratory Managers (Inorganic and Organic) for laboratory operations, supervising these individuals in performance of project duties, approving all field and laboratory QC procedures, allocating manpower, reviewing and approving new contracts and contract changes.

2.2 Laboratory Operations:

2.2.1 General Manager – The General Manager is responsible for management oversight and direction for all laboratory, field, financial, and administrative operations of REIC.

2.2.2 Laboratory Operations Directors – Laboratory Operations Directors are responsible for management oversight and direction of assigned laboratory and field operations. This includes ensuring that all personnel under their direction understand and conduct all work in compliance with this Quality Manual. Responsibilities also include ensuring that all results are properly validated prior to release to clients.

2.2.3 Laboratory Manager - Laboratory Managers are under the direct supervision of the Laboratory Operations Directors. The Laboratory Managers are responsible for providing consistent and accurate laboratory data produced by the analysts for compliance with precision, accuracy, and completeness objectives before final report generation. Other responsibilities include the review of any QC deficiencies reported by the analyst and/or project Quality Manager.

2.2.4 Laboratory Supervisor – It is the responsibility of the Supervisors to assist the Laboratory Managers in providing consistent and accurate laboratory data produced by the analysts for compliance with precision, accuracy, and completeness objectives before final report generation. This includes assisting the Laboratory Managers in the review of any QC deficiencies reported by the analyst and/or project Quality Manager.

2.2.5 Laboratory Analyst/Technician - It is the responsibility of the Analysts to perform instrument calibrations, calibration verifications, and preliminary QC checks to ensure that each batch of data being generated is compliant with all method and quality program criteria. The Analyst is responsible for incorporating any data changes, resulting from the review by the Quality Manager and/or the Project Chemist, into the respective job file folder and LIMS.

2.2.6 Project Manager/Coordinator – Duties and responsibilities of which include serving as the point of contact for assigned clients, reviewing the *Statement of Work* for each project and verifying compatibility with laboratory capabilities, communicating project

requirements to lab department managers and analysts, and reviewing project invoices and reports for completeness and compatibility with project requirements.

2.2.7 **Field Team Leader:** The Project Manager/Coordinator is responsible for effective day-to-day management of the project as well as direct communication and liaison with the client and the Laboratory Operations Directors and General Manager. The Project Manager/Coordinator has the ultimate responsibility of ensuring that all project quality control (QC) procedures are followed by the field team in the performance of the project. The Project Manager may appoint the field team leader (sampling team project leader). The field team leader is responsible to the Project Manager for ensuring that all QC and technical field procedures are followed, and that all field activities are documented properly. The field team leader and field team members must bring any unusual observations or problems to the immediate attention of the Project Manager/Coordinator and/or the Quality Manager.

2.2.8 LIMS Administrator - The LIMS Administrator reports to the General Manager and is responsible for managing the day-to-day operations of REIC's LIMS and computer network. These duties include all training of new personnel utilizing LIMS and any training required for new LIMS procedures. The LIMS Administrator maintains a current inventory of all hardware and software for damages/defects, troubleshooting problems and arranging for repair or replacement of all network and LIMS computers and associated equipment. The LIMS Administrator serves as the primary technical resource for LIMS and network users. The Administrator also develops, implements, and maintains policies, procedures, and SOPs for use of the network and LIMS. All security, privacy, and licensing issues are set and monitored by the Administrator. These duties also include any customization of the network and/or LIMS tests and any detailed programming as deemed necessary by the General Manager and/or Laboratory Operations Directors.

2.3 Quality Assurance Program - REIC's General Manager appoints the Quality Manager and is responsible for supervising the Quality Manager in the performance of his/her project duties. The Quality Manager maintains the overall company QA program and interacts with the Laboratory Operations Directors, Laboratory Managers, Project Managers/Coordinators, Laboratory Supervisors, and client QA/QC personnel to correct problem situations as necessary. The REIC Quality Manager has direct responsibility for assessing QC performance, determining if QA objectives are being met, recommending corrective actions, and keeping the General Manager and Laboratory Operations Directors informed of all relevant QA/QC information. The Quality Manager is independent of the project team and answers directly to the General Manager. The Quality Manager is specifically responsible for the following:

- Assessing that approved QA/QC procedures are being applied to a project;
- Conducting both performance and systems audits of laboratory and field operations to ensure compliance with the requirements of the company QA program (stated in SOPs, QA Manual and/or QAPP);
- Identifying any QC deficiencies on project activities and notifying the General Manager and/or the Laboratory Operations Directors of any QC deficiencies discovered during audits;

- Providing an independent review of field information and analytical data packages to ensure the quality of all deliverables from the project team to the client;
- Interacting and communicating with client Quality Manager to resolve QA/QC problems specific to a project;
- Reporting to the General Manager as needed on the QA status of on-going projects and on the findings from formal audits;
- Monitoring the QA and QC activities of the laboratory to ensure conformance with approved company policies, procedures, sound practices, and recommend improvements as necessary;
- Ensure that sampling is conducted in a manner consistent with the QA Manual or QAPP;
- Periodically conduct field audits to inspect sampling activities; and
- Periodically audit sampling documentation and procedures to ensure that samples are labeled, preserved, stored, and transported according to approved chain-of-custody procedures.

2.4 Training – All personnel are trained in new methods utilizing a mentoring process. New staff members (or staff members learning new methodologies) are assigned to their immediate supervisor or an experienced staff member. Each employee must read, understand, and use the latest version of the laboratory's SOPs, which relates to the new methodology as well as the associated reference material. The development and training associated with new analytical methods is discussed in Section 10.3 (Demonstration of Method Capability).

The mentoring process occurs as follows:

- The staff member is familiarized with the method by observation of an experienced staff member;
- Supervised practice of the method, with review by the trainer and supervisor;
- Unsupervised practice of the method, with review, this may include a blind spike sample or other blind unknown;
- Unsupervised performance of the method.

Completion of these steps is documented on a training checklist signed by the supervisor/laboratory manager of the department. For newly trained employees, work is reviewed daily by the supervisor until the supervisor is satisfied the employee is competent in the procedure. All analytical data produced by the new staff member is also reviewed and signed off by the laboratory supervisor.

Each employee demonstrates continued proficiency by acceptable performance on in-house laboratory control spikes, blind samples, and/or inter-laboratory comparison exercises. Training records (to include continuing education, participation in vendor or industry training classes) are kept in the personnel training records maintained by the laboratory managers and the personnel office.

2.5 Laboratory Capabilities – The professional staff of REIC consists of over sixty trained, undergraduate and graduate scientists whose knowledge and experience span the disciplines of analytical chemistry, environmental chemistry, biochemistry, chemical engineering, geology,

and biology. All work is based on methodologies and approaches established by the US EPA, State agencies, industrial standards, and professional codes, and are enforced by a stringent QA/QC program. A more complete listing of REIC's qualifications can be found in REIC's "Statement of Qualifications" document. A complete listing of REIC's instrumentation can be found in Appendix G. A copy of REIC's "Data Integrity and Ethics Policy" is also included in Appendix C.

2.6 Laboratory Minimum Level of Qualifications – Employment in the laboratory must meet the following criteria at a minimum:

- Technician – High school graduate or GED.
- Analyst – Above criteria plus experience or additional training in a laboratory.
- Biologist/Chemist/Engineer – College degree.
- Laboratory Manager – College courses and/or degree plus items (1) and (2) above.

2.7 Laboratory Transfer of Ownership or Closure – If the ownership of the laboratory is transferred or the laboratory is closed existing clients will be notified immediately. A letter will be provided to all clients detailing re-organization conditions and an explanation of any effects or changes in laboratory operations. In case of laboratory closure, clients may not be ready to terminate contact by the closing date. Sufficient time will be allowed for clients needing additional analyses to transfer samples to other laboratories. All existing clients will be provided referral options. New clients will be referred upon contact. The relocation of client records will be considered carefully. While some clients will have copies of their analytical records transferred to another laboratory, the original client records will either be returned upon request at their expense or destroyed. A signed release of information form will be obtained before transferring records.

3.0 QUALITY ASSURANCE OBJECTIVES FOR DATA MEASUREMENTS

The overall quality assurance objective is to ensure that data of known and acceptable quality is generated. The quality of data is measured through qualitative and quantitative parameters. These parameters include accuracy, precision, completeness, representativeness, and comparability. Proper execution of each project task is needed in order to yield consistent information, results that are representative of the media and conditions being measured, and ultimately be useful for meeting the intended project objectives. REIC will calculate and report data in units consistent with those of other organizations and agencies to allow comparability of databases. REIC performs analyses for specified compounds using the standardized methods. In the process, baseline data is applied to establishing control limits for daily analyses. These control limits, which include precision, accuracy, and reporting limits, may therefore be considered for typical performance.

3.1 **Comparability** - Comparability is the confidence with which one data set can be compared with another. These data sets include data generated by different laboratories performed under the same work plan, data generated by laboratories in previous years, or data generated using differing techniques or analytical protocols. The comparability objectives of REIC are as follows:

- Demonstrate traceability of standards to the National Institute of Standards and Technology (NIST) or EPA approved sources,
- Use standard methodology,
- Report results from similar matrices in standard units,
- Apply appropriate levels of QC within the context of the laboratory QA program, and
- Participate in inter-laboratory studies to document laboratory performance.

When traceable standards and standard methodology are used, the analytical results can be compared to other similarly operating laboratories.

3.2 **Representativeness** - Representativeness expresses the degree to which sample data accurately and precisely represents actual conditions. Representativeness is a qualitative determination. The representativeness objective of REIC's quality assurance program is to eliminate conditions that may result in non-representative data. In the laboratory proper temperature, extraction, and sample holding times are closely observed to ensure that sample integrity is maintained. Also, blank samples are examined for cross contamination.

3.3 **Completeness** – Completeness is a measure of the amount of the data obtained from a measurement system compared to the amount that is expected to be obtained under correct normal conditions. The minimum level of completeness expected is 95 percent for each analytical method requested. This is expected to be achieved by ensuring proper sample extraction procedures. Also, for each sample received by the laboratory, especially those shipped in fragile containers, a backup sample is to be made available in case breakages occur, or when the analyses criteria are not initially met.

3.4 Accuracy - Accuracy is the degree to which a measurement agrees with the actual value, i.e. amount of measurement bias. Accuracy is expressed as a percent recovery of a concentration of reference material (or laboratory standard). The accuracy of an analytical procedure is determined by addition of a known amount of spike standard to a field sample matrix or a laboratory control matrix. A control matrix is made of distilled (or deionized) water or sterile, clean soil (with known physical and chemical properties). The field sample matrix is described as all components of the sample mixture except the analyte (compound being measured). A method for the determination of accuracy values, which is routinely used in the laboratory, is described in Section 13.0 of this QA Manual. Examples of accuracy acceptance criteria for control analytes and associated method reporting limits can be provided to clients upon request.

3.5 Precision - Precision is a measure of the degree of reproducibility of an analytical value and it is used as a check of the quality of the sampling and analytical procedures. Precision is determined by analyzing replicate samples. The significance of a precision measurement depends on whether the sample is a field duplicate, laboratory control matrix duplicate, or a matrix spike duplicate. Laboratory determination of precision is discussed in Section 13.0 of this QA Manual. Examples of current precision acceptance criteria for control analytes along with associated method reporting limits and method detection limits can be provided to clients upon request.

3.6 Detection Limits – REIC references two types of reporting limits: Method Detection Limits (MDLs) and Practical Quantitation Limits (PQLs).

3.6.1 MDLs are determined for all analytes as specified in 40CFR 136 Appendix B[1] and as described in the NELAC standards. The MDL is defined as the minimum concentration of an analyte that can be measured by the method and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte. All MDLs are determined for each test and matrix according to US EPA requirements as part of an initial demonstration of capability. MDLs are determined on for each method and sample matrix unless stated otherwise by the determinative method.

3.6.2 PQLs are defined as the lowest standard of the initial calibration curve for the inorganic and organic assays. This standard is typically between 5 to 10 times the MDL. The PQL is confirmed by analyzing a laboratory control sample spiked at this level with an expected recovery that is dependent upon the analytical method.

REIC references PQLs as the default reporting limits for all clients who do not specify reporting limit requirements. Data are flagged between the PQL and the MDL when clients request reporting to MDLs. The MDLs and PQLs are compiled by the Laboratory Supervisors and Quality Manager. See Section 13.0 for more detailed information.

[1] Appendix B to Part 136 – Definition and Procedure for the Determination of the Method Detection Limit. Revision 1.11 (40CFR Chapter 1-Part 136).

4.0 SAMPLING PROCEDURES AND SAMPLE HANDLING

4.1 Field Sampling Operations: Prior to any field operations, the Field Services Supervisor and field team personnel will review the project work plan and the associated QAPP. These documents should be referenced for specific information concerning equipment, supplies, and sampling procedures. The field sampling procedures included in these documents and REIC's field sampling standard operating procedures include: documentation requirements, sample collection, preservation, packaging, shipping, and equipment decontamination.

4.2 Sample Handling

4.2.1 Sample Containers/Preservation/Holding Times - Standard sampling kits are used. The kits are prepared according to the type of analysis requested *(See Appendix F)*. All sample kits are prepared by the sample custodian and made ready for walk-in clients, delivery by REIC courier, or shipment by bonded courier. All kit supplies are stored in REIC's kit preparation room to avoid cross contamination. Unless specified, all sample containers used are pre-cleaned commercially. They are purchased from commercial vendors as pre-cleaned containers. Sample containers used at REIC laboratory are disposable; therefore, washing is not necessary before sample kits are prepared for clients or REIC field personnel. All sample kits are transported in coolers to the field. A Chain-of-Custody (COC) sheet is enclosed. The sample identification labels on the containers must always match those on the sample COCs. Sample kits can be delivered by a REIC courier, picked up by the client, or shipped by bonded carrier (i.e. UPS, Federal Express). Clients are encouraged to transport samples to the laboratory as soon as possible so that holding times *(See Appendix F)* will not be exceeded. *Although REIC will give advice on sample shipping and packing, it is the sampler's ultimate responsibility to representatively sample, pack, and ship the samples to REIC Laboratory.* The types of preservatives used are provided in *Appendix F*. Clients or REIC field personnel may receive sample containers pre-preserved. The laboratory will supply additional preservatives in suitable containers for sample preservation in the field.

4.2.2 Sample Dispatch to the Laboratory: Field documentation will consist of (at a minimum): field notes, sample labels, and COC forms (or sample transmittal forms). Samples will be packed such that they are segregated by site, sampling location or sample analysis type. VOC samples from different locations may be placed in the same coolers with materials (i.e. bubble wrapped and sealed in a Ziploc-type bag) to avoid breakage. Shipping containers will be insulated (if cooling is required) and will be sealed with tape or locked to avoid tampering. Reusable refrigerant packs (not dry ice) or a water ice bath will be used in cooling samples to 4°C. Packed samples will be delivered to the laboratory by the sampling team or via a common carrier.

4.2.3 Field Reagents and Waste Handling: All chemicals transported to the field will be stored in appropriate containers, labeled, and will be packed to avoid breakage. Chemicals will be segregated from sample containers so as to avoid accidental contamination. All reagents must be reagent grade or higher.

4.2.4 Field Waste Disposal: All field-generated wastes will be segregated and contained for proper disposal by a commercial contractor. Associated cost may be negotiated with

clients in advance of the project initiation. All non-chlorinated solvents (isopropanol, hexane, and acetone) will be collected and returned to the laboratory to be disposed of or recycled by a commercial contractor. Acids and bases will be diluted or neutralized and can be flushed into a sanitary sewer or will be disposed of commercially. Contaminated purge waters will be contained and disposed of commercially or will be allowed to evaporate on an impermeable surface. Calibration standards for field meters will be diluted and flushed into the community treatment sewer.

5.0 TEST METHODS AND STANDARD OPERATING PROCEDURES

REIC maintains Standard Operating Procedures (SOPs) for all laboratory methods, field activities, and general operations. The SOPs are based on the guidance as published by EPA (QA/G-6 Guidance for the preparation of Standard Operating Procedures and other pertinent industry references[2]. The SOPs describe the equipment and actual procedures used in the laboratory. Copies of the SOPs are readily available to all personnel. A current listing of REIC SOPs (at the time of this revision) can be found in *APPENDIX I*. Each SOP indicates the effective date and the revision number. Any calculations that are performed external to an instrument or in its automation software are documented in the SOP.

SOPs are used to ensure consistency and to save time and effort. Any deviations from the established procedure during an analysis are documented. All SOPs are reviewed on an annual basis and as changes become necessary (incorporating advances in instrumentation/technology and/or EPA approved methodology updates) under the direction of the laboratory managers and Quality Manager.

5.1 Exceptional Departures from Documented Policies and Procedures

5.1.1 Whenever departures from documented policies and procedures or from standard specifications result in a compromised analytical result, the data is qualified in the sample narrative of the report of analytical results. Also, the client may be informed of the problem by telephone.

5.1.2 Sometimes departures from documented policies and procedures or from standard specification do not result in a compromised analytical result. Under these circumstances the Laboratory Management may permit a temporary excursion from control provided there is a reasonable advantage to permitting the departure (i.e. holding time compliance) and provided there is an effective corrective action in process.

5.1.3 Finally, samples occasionally fail to conform to typical matrix expectations to such an extent that they are unable to be analyzed by the method without modification. If the modification is significant, this modification is explained in the sample narrative.

[2] Other SOP references include Good Laboratory Practices (40 CFR Part 160) and the USACE's Shell for Analytical Chemistry Requirements.

6.0 SAMPLE CUSTODY AND INTEGRITY

Sample custody is a vital aspect of an environmental measurement program. Some environmental study programs generate data that may be used as evidence in a court of law. The samples must be traceable from the time of sample collection until the data is introduced as evidence in enforcement proceedings. A sample is said to be in someone's custody if it meets the following criteria:

- It is in someone's physical possession,
- It is in one's view, after being in one's physical possession,
- It is in one's physical possession and then locked or sealed so that tampering will be evident, or
- It is kept in a secure area, restricted to authorized personnel only.

6.1 Field Sampling Operations: The chain-of-custody (COC) record is initiated at the time the sample containers are dispatched to the field sampling team. The field sampling team may be the client's or REIC's field sampling personnel. A formal sample custody record *(See REIC's COC – Appendix B)* accompanies each set of containers. The form ensures that a system is made available by which sample information is logged from the point of sampling through each change of custody until the samples arrive at the laboratory. Although the laboratory can give advice to the client on sample packaging and shipping procedures, it is the client's ultimate responsibility to provide proper and adequate documentation until the samples are relinquished. A Chain-of-Custody (COC) is used by the field team to record sample identification and the following information: sample description, collection date and time, sampling location, preservation, analyses required, and samplers' names, comments concerning the samples, client name, and the signature of the person relinquishing the samples to the bonded carrier or REIC personnel. Errors in all field sampling documents are deleted with one line through the error, initialed and dated.

6.2 Laboratory Operations:

6.2.1 Receiving Samples - Samples may be shipped to the laboratory or picked up by a REIC courier (when locality allows). In all cases, a REIC representative will sign, date, and record the time on appropriate custody forms as receiving the sample cooler. At the laboratory, the sample custodian will immediately initiate the following steps:

- Check samples for breakage or leakage,
- Check the temperature of the ice bath,
- Verify the number of samples received and confirm that all container designations agree with information provided on the Chain-of-Custody.
- Record any breakage of sample bottle seals, which may have occurred during transport to the laboratory.
- The sample custodian notes the condition of the samples and coolers on the accompanying Chain-of-Custody forms and
- Then proceeds to log the samples into a Laboratory Information Management System (LIMS).
- Upon finding any sample preservation or documentation discrepancies (broken sample containers, cooler damage) or any suspicious findings which might indicate

that sample integrity has been compromised, the client is notified immediately and the matter is resolved before the samples are approved and actually accepted for analysis.

- A copy of the custody form is returned to the client with the sample analysis deliverable report and another copy is kept on project file at the laboratory.
- If the scope of the project should change after the samples have been received in the lab, this is documented on the Chain-of-Custody.

6.2.2 Bill of Lading - A bill of lading (bus bill or air bill) documents receipt of the samples by the carrier. It is not possible for the carrier's representative to sign the custody form since it is sealed in the sample cooler. Bills of lading are kept on project files at REIC.

6.2.3 Tracking of Samples - Proceeding with log-in, the sample custodian enters sample identifications (IDs) and other associated information such as: Lab sample IDs, sampling date, client IDs, etc., into a computerized sample tracking system -- *Laboratory Information Management System (LIMS)*. The tracking system consists of a customized program having the ability to search and locate individual samples in the laboratory. All data within the computer system is copied (backed-up) on magnetic tape and secured at the end of each working day. Hard copies of sample tracking worksheets are maintained and copies placed in sample file folders along with Chain-of-Custody forms. These tracking documents, as well as the LIMS, help to coordinate the analyses required. Sample handling, preparation, and analysis are documented on tracking worksheets throughout their analysis period in the laboratory. The tracking worksheets include such information as the Lab sample IDs, clients IDs, storage, preservation, actions, sample date, extraction date, analysis date, etc.

6.2.4 Unique LIMS identification number for Samples – Each sample entered into the LIMS is given a unique identification number. This number is a series of seven numbers and/or letters; the first two numbers indicate the year, the second two numbers indicate the month, and the last three numbers/letters indicate the specific place in the numbering system. When samples in LIMS reach 999 for any given month, the system applies a letter and two digits, which will continually roll over with each 00 samples entered into the system. For example the sample ID 0906A05 indicates 09 for the year (2009), 06 for the sixth month (June) and A05 which indicates it is the 105th sample entered into LIMS for the month of June.

6.3 Maintaining Sample Integrity - Upon receiving samples from the field, improper conditions for each sample will be documented on the chain of custody and will be reported to the Project Manager/Coordinator and the client. The Project Manager/Coordinator will then make a decision after consulting with the General Manager, Laboratory Operations Directors, and/or client Project Officer on whether to reject the sample. REIC maintains walk-in environmental chambers, which are specific for various types of sample analyses. For specific guidelines on sample acceptance criteria and policies, please refer to the Sample Acceptance Criteria SOP. They are maintained in a manner such that internal contamination is minimized. The chambers are monitored and their environmental conditions are recorded continuously. Additionally, the chambers have both audible and electronic notification alarm systems to warn if ambient conditions drastically change due to chamber malfunctions. Upon conclusion of the appropriate analysis, any additional sample materials are stored for a period of two weeks after formal notification of results being submitted to the client. At that time, the samples are disposed of in

an environmentally friendly manner or returned to the client. All sample disposal is carried out in accordance with Federal and State Regulations.

7.0 CALIBRATION PROCEDURES AND FREQUENCY

The quality assurance objective of instrument calibration is to ensure that the instrument employed is capable of producing acceptable quantitative data. Initial calibration is designed to indicate that the instrument is capable of acceptable performance at the beginning of the sample analysis sequence. Continuing calibration verification is necessary in order to demonstrate satisfactory instrument performance (calibration accuracy) over the duration of sample analysis. Calibration procedures used by REI Consultants, Inc, will include, but not be limited to linear regression and response factor.

7.1 Field Instruments:

7.1.1 pH Meter - Standardize the pH meter immediately before taking any measurements. The calibrating solutions must bracket the sample analyses - either pH 7.0 and pH 4.0 or pH 7.0 and pH 10.0. Use the following procedure to standardize the meter:

- Place the probe in the pH 7.0 and adjust the knob to achieve a reading of 7.0.
- Place the probe in the second solution (whether 4.0 or 10.0) and adjust the knob to achieve the reading of 4.0 or 10.0, accordingly.
- Repeat those steps until adjustment is no longer needed. Clean the probe with distilled water and clean tissue.

Note: Store the probe in De-Ionized (DI) water when not in use.

7.1.2 Temperature - No calibration is required in the field for the temperature probe. See laboratory thermometer comparison with the NIST certified thermometer *(Section 7.4.8 "Temperature Monitoring").*

7.1.3 Conductivity - Use a KCl solution to check the (K) constant daily. Maintain a record (log book) of each check. Clean the probe with distilled water and tissues. Measure conductivity of the sample in a Teflon or plastic bottle.

7.1.4 Dissolved Oxygen (DO) - The oxygen meter to be used in the field will be calibrated in the laboratory. A record for calibration must be reviewed by the field technician before taking the instrument to the field.

7.2 Standard Receipt and Traceability of Calibrations: All calibrations and working standards are prepared from pure or commercially available materials. Upon receipt, standards are dated and all information concerning these standards including LOT#, supplier, concentration, and purity is filed. If the standard has an expiration date, the date is circled in ink to ensure the analyst does not use expired standard. As the standards expire, each is disposed of in an environmentally safe manner. All other information concerning these chemicals can be obtained through the information in the purchase order book/REIC's inventory system and/or the supplier of chemicals as necessary. Working standards are prepared either directly from the stock standard or an intermediate standard is prepared and the working standards are prepared from the intermediate standard. A standards preparation log(s) is maintained for analytical sections. The daily working standards are entered as prepared in a standards logbook. All stock

and intermediate standards are prepared either in Class A volumetric glassware or serially diluted from standards prepared in Class A volumetric glassware.

7.3 Laboratory Equipment: such as balances, ovens, refrigerators, freezers, incubators, water baths, temperature measuring devices and volumetric dispensing devices are documented as follows:

- Records are kept of all activities such as maintenance and service calls.
- Calibrations are documented per method and/or manufacturer's instructions, using NIST traceable references where available over the entire range of use.

7.4 Laboratory Instruments: The major instrumentation and calibration procedures are discussed below. This is only the general overview. Detailed calibration procedures and frequency are in each method and instrument manufacturer operation manual. All calibration materials are purchased (where possible) in a pure form and are diluted to working concentration levels using standard analytical techniques.

7.4.1 Spectrophotometric, Potentiometric, Colorimetric, Turbidimetric, Infrared (IR), and Ultraviolet Absorption - This section applies to those inorganic and organic analyses that require the use of a standard calibration curve for calibration. The working calibration is generated by plotting the standard response for each standard versus the concentration of each standard. Quality control acceptance criteria for calibration of this group of instruments includes:

- Constructing a 3-5 point calibration curve (3-5 standards and a blank) prior to any sample analysis, as needed. Refer to the calibration instructions of the manufacturer and the specific calibration section of each EPA method. The correlation coefficient of the line must be $\geq$0.995. Failure to meet these criteria will necessitate reanalysis of the standards.
- Monitoring of the instrument's consistency response is demonstrated through the analysis of a midlevel standard or Continuing Calibration Verification (CCV) after the analysis of ten (10) samples. The response of the CCV must generally be within $\pm$10 percent of the true value. Failure to meet these criteria will necessitate reanalysis of all samples analyzed since the last acceptable CCV.
- Demonstrating system cleanliness through the analysis of a method reagent blank prior to sample analysis.
- Maintaining sample response within the response limits of the standards.

7.4.2 pH and Ion Specific Analyzers: Quality control acceptance criteria for the calibration of this group of instruments includes:

- Constructing a three (3) point (2 points for pH) calibration curve prior to the analysis of any sample(s).
- Verifying instrument's consistency response through the periodic analysis (after the analysis of every 10 samples) of standards.
- Demonstrating system cleanliness through the analysis of a method reagent blank prior to sample analysis.

- Maintaining sample response within the limits of the standards' response. The pH meter is calibrated with known buffer via the pH closest to the expected sample pH. A second buffer (4, 7, or 10) is used to verify that the first measurement (buffer) was correct.

7.4.3 Trace Metals and Cyanide Analysis Calibration:

Atomic Absorption Analysis

Volumetric dilutions are made from stock solutions to obtain intermediate standards (100, 10 and 1.0 ppm) solutions. These intermediate standards may be used directly as working standard solutions or diluted as necessary for flame analysis. However, for more sensitive graphite furnace and hydride analyses, volumetric dilutions must be prepared from the 1.0 and 10 ppm standard solutions to generate working standards. The working standard solutions must be prepared daily. The acceptance criteria for calibration of the AA are as follows:

- The instrument must be calibrated daily and each time the instrument is set up. A blank and at least three standards must be used in establishing the calibration curve. One of the standards must be at the PQL.
- The correlation coefficient of the line must be $\geq$0.995. Failure to meet this criterion will necessitate reanalysis of the standards.
- Instrument consistency is monitored through the analysis of a midlevel standard (CCV) and the calibration blank after the analysis of ten (10) samples. The response of the CCV must be within $\pm$10 percent of the true value. Failure to meet this criterion will necessitate reanalysis of all samples analyzed since the last acceptable CCV.
- System cleanliness is demonstrated through the analysis of a reagent blank prior to sample analysis.
- The sample response must be maintained within the limits of the response of the standards.

Mercury Analysis

- The instrument must be calibrated daily and each time the instrument is set up. A blank and 5 standards must be used in establishing the calibration curve.
- The correlation coefficient should be $\geq$0.995.
- Continuing calibration verification (CCV) standards are analyzed at a minimum of every 10 samples to document consistent instrument response. The CCV result must be within $\pm$10% of the true value.

Cyanide Analysis

- The instrument must be calibrated daily and each time the instrument is set up. A blank and at least three standards must be used in establishing the calibration curve.
- The correlation coefficient for the photometric calibration should be $\geq$0.995.
- Initial calibration verification (ICV) and Continuing calibration verification (CCV) standards are analyzed at a minimum of every 10 samples to document consistent

instrument response. The results of ICV and CCVs for each element in the solution must be within 10% of their respective true values.

Inductivity Coupled Plasma – Emission Spectroscopy (ICP-AES)

Multi-element calibration standards are prepared as needed. The analyte concentrations in the standards are verified daily by observing changes in emission intensity and by analyzing known independent check standards.

- The instrument is calibrated daily and each time it is set up. A blank and at least three standards are used in establishing the analytical calibration curve.
- A Continuing calibration verification standard and a continuing calibration blank are analyzed at a minimum of every 10 samples to document consistent instrument response. The results of CCVs for each element in the CCV solution must be within 10% of their respective true values.
- A laboratory control sample (LCS) serves as a monitor of the overall performance of all steps in the analysis, including the sample preparation. All aqueous LCS results must fall within 15% or less of the true value.

Inductivity Coupled Plasma – Mass Spectroscopy (ICP-MS)

Multi-element calibration standards are prepared as needed. Analyte concentrations in the standards are verified daily by analyzing known independent check standards.

- The instrument is calibrated daily and during each set up. A blank and at least two standards (generally 3) are used in establishing the analytical calibration curves.
- The continuing calibration verification (CCV) solution and a continuing calibration blank are analyzed after every 10 samples to document consistent instrument response. The results of the CCVs for each element must be within 10% of their respective true values.
- A laboratory control matrix spike (LCS) serves as a monitor of the overall performance of all steps in the analysis, including the sample preparation. All aqueous LCS results must fall within 15% or less of the true value.
- Mass and detector calibrations are performed on a weekly basis. Tuning of the instrument is performed daily.

7.4.4 Tuning and GC/MS Calibration

- Refer to calibration instructions of the manufacturer and the specific calibration section of each EPA method for analysis of volatiles and semivolatiles.
- A tune must be performed during each analytical shift (every 12 hours for SW846 8260/8270 and EPA 524/525, and every 24 hours for EPA 624 and 625 Methods). For BNA analysis the instrument shall be tuned to DFTPP. For VOA analysis the instrument is tuned to BFB. Tuning is designed to assure that instrument response meets specifications. (See table on next page for examples of mass intensity specifications for DFTPP and BFB.)

- No data may be collected prior to the initial tune. For VOA analyses, the BFB tune and the initial or continuing calibration may be performed simultaneously as long as the tune is performed before calibration. The same is true for BNA analysis.
- Generate a minimum five (5) point initial calibration for SW-846 8260/8270, a minimum six (6) point for EPA 525, and a minimum three (3) point initial calibration for EPA 624/625/524 to include all target analytes. The relative response factor (RRF) and percent relative deviation (%RSD) will be calculated for each compound.
- For all CCCs (VOA and BNA), the %RSD must be less than or equal to 30 percent according to SW-846 8260/8270, or the %RSD for all compounds must be less than or equal to 30% for EPA 524/525 (35 percent according to EPA 624/625). *Note: Other calibration approaches may be used but must follow guidelines established by the determinative method.*
- A midlevel standard from the initial calibration standards is used in daily analysis. The difference (or drift) between the average RRF of the CCCs in the daily calibration and initial calibration standards must be less than or equal to 20 percent for SW-846 8260/8270 or the difference or drift of all compounds must be less than or equal to 20 percent for EPA 625. (See EPA 624 for specific midlevel QC requirements.)

FIGURE 2:

TUNE CRITERIA FOR VOLATILE AND SEMI-VOLATILE GC/MS ANALYSIS

Tune Criteria for Volatile and Semi-Volatile GC/MS Analyses

BFB Key Ion Abundance Criteria[3]	
Mass	Ion Abundance Criteria
50	15 - 40% of mass 95
75	30 -60% of mass 95
95	Base peak, 100% relative abundance
96	5 to 9% of mass 95
173	< 2% of mass 174
174	> 50% of mass 95
175	5 to 9% of mass 174
176	> 95% but < 101% of mass 174
177	5 - 9% of mass 176

DFTPP Key Ion Abundance Criteria[3]	
Mass	Ion Abundance Criteria
51	30 - 60% of mass 198
68	< 2% of mass 69
70	< 2% of mass 69
127	40 - 60% of mass 198
197	< 1% of mass 198
198	base peak, 100% relative abundance
199	5 - 9% of mass 198
275	10 - 30% of mass 198
365	> 1% of mass 198
441	present but < mass 443
442	> 40% of mass 198
443	17 - 23% of mass 442

[3] Test Methods for Evaluating Solid Waste, Final Updates III. Revision 4, December 1996.

7.4.5 GC/HPLC Analysis:

- Generate a 5-point calibration curve (minimum of 3-point for drinking water and wastewater methods) for all analyzed compounds monthly or prior to any sample analysis, as needed. Refer to the calibration instructions of the manufacturer and the specific calibration section of each SW846/EPA method.
- Analyze the instruments consistency response through the analysis of a standard after every analytical shift or daily (12hours for SW846).
- Demonstrate system cleanliness through the analysis of a reagent blank prior to sample analysis.
- Maintain sample response within the limits of the response of the standards.

7.4.6 Gravimetric Methods Calibration: A set of Class 1 certified weights is used to check the calibration daily. The analytical balance is checked with at least one weight. The weight selected is to reflect the routine use of the balance. The check is performed by the first analyst to use the balance during the day. Results are recorded in the balance calibration logbook. The full set of Class 1 weights is used to check calibration on a monthly basis. All analytical balances are re-certified on an annual basis.

7.4.7 Titrimetric Methods Calibration: Primary standard reference materials are purchased through a supplier. All purchased titrants and back titrants must be standardized and certified by the supplier. QC check standards of the parameter of interest will be prepared and analyzed to verify standardization and the analyst ability to discern the end point.

7.4.8 Temperature Monitoring: Temperatures for refrigerators, ovens and incubators are measured on a daily basis and recorded in appropriate temperature logbooks. Dedicated thermometers are checked annually against the NIST certified thermometer and documented. Walk in coolers and study chambers are fitted with wheel chart recording thermometers that monitor and record temperatures continuously on a 24 hour basis. These recording thermometers have both audible and electronic alarm systems. The temperature recordings are verified annually against the NIST certified thermometer. Equipment with out-of-control temperature findings will be adjusted to correct the temperature and it will be monitored more frequently until the temperature is in-control and steady. The NIST certified thermometer will be re-certified every five years.

7.4.9 TOC Analysis – An operating calibration curve is prepared daily prior to sample analysis by measuring a reagent blank and at least three organic carbon standards. A reagent blank and a standard are analyzed after every 10 sample measurements. Each check must be within 10% of the true value.

7.4.10 Ion Chromatograph:

- The ion chromatograph is calibrated daily, before sample analysis, using a calibration blank and 3-5 standards.
- The instrument's consistency response is demonstrated through the analysis of a standard after every ten (10) samples analyzed.

- System cleanliness is demonstrated through the analysis of a deionized water blank prior to sample analysis and after every 10 samples.
- Sample response is maintained within the limits of the response of the standards.

7.4.11 **Adiabatic Calorimeter:** A benzoic acid pellet is analyzed prior to any analysis to ensure correct operation of the calorimeter. The value of the pellet must fall within the acceptable range of 2400 cal/g ± 10 cal/g. Should the value fall out of the acceptable limits, another pellet is analyzed. If the value is still unacceptable, troubleshooting and servicing may be needed.

8.0 ANALYTICAL PROCEDURES

8.1 **Field Analytical Procedures:** Conductivity, salinity, pH, dissolved oxygen, and temperature are the most common field parameters. These parameters are measured in the field according to EPA methods *(see Section 4.0)* and internal REIC SOPs.

8.2 **Laboratory Analytical Procedures:** The analytical procedures used are listed in Section 4.0. Analyses of samples will be performed in accordance with protocols and QA procedures established by the EPA.

8.2.1 Sources for Drinking Water Methods –

- Title 40 of the *"Code of Federal Regulations"* (40 CFR), Parts 141 and 143 National Primary and Secondary Drinking Water Regulations; Sampling, Monitoring, and Analytical Requirements;
- *"Methods for the Determination of Organic Compounds in Drinking Water"*, EPA/600/4-88/039, Dec. 1988; Revised July 1991; appended with "Supplement I", EPA/600/4-90/020, July 1990; and "Supplement II", EPA/600/R-92/129, Aug. 1992; and "Supplement III", EPA/600/R-95/131, August 1995. U.S. EPA.
- *"Manual for the Certification of Laboratories Analyzing Drinking Water,* Fifth Edition", EPA 815-R-05-004. January 2005. U.S. EPA.
- *"Methods for Chemical Analysis of Water and Wastes"*, EPA/600/4-79/020; March 1983, U.S. EPA.
- *"Annual Book of ASTM Standards"*, Vols. 11.01 and 11.02; http://www.astm.org
- *"18th Edition of Standard Methods for the Examination of Water and Wastewater"*, American Public Health Association, Washington, DC.
- *"Methods for the Determination of Metals in Environmental Samples"*, EPA/600/4- 91/010, June 1991; appended with "Supplement I", EPA/600/R-94/111, May 1994; U.S. EPA.
- *"Methods for the Determination of Inorganic Substances in Environmental Samples"*, EPA/600/R-93/100; Aug. 1993, U.S. EPA.
- *"Technical Notes on Drinking Water Methods"*, EPA/600/R-94/173; Oct. 1994, U.S. EPA.
- *"Microbiological Methods for Monitoring the Environment, Water and Waste"*, EPA/600/8-78/017, Dec. 1978; U.S. EPA.

8.2.2 Sources for Wastewater (NPDES) Effluent Methods –

- *"Guidelines Establishing Test Procedures for the Analysis of Pollutants"; Title 40 "Code of Federal Regulations"* (40 CFR), Part 136; Tables IA, IB, IC, ID, and IE; and Table II.
- *"Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms*, Fifth Edition", EPA-821-R-02-012, October 2002; U.S. EPA.

- *"Appendix C to Part 136 - Inductively Coupled Plasma / Atomic Emission Spectrometric Method for Trace Element Analysis of Water and Wastes, Method 200.7"*; Title 40 CFR 136.
- *"Methods for Chemical Analysis of Water and Wastes"*, EPA/600/4-79/020; March 1983, U.S. EPA.
- *"18th Edition of Standard Methods for the Examination of Water and Wastewater"*, American Public Health Association, Washington, DC.
- *"Appendix A to Part 136 - Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater"*; Title 40 CFR 136, Revised as of July1, 1995.
- *"Annual Book of ASTM Standards"*, Vols. 11.01 and 11.02; reprinted annually; American Society for Testing and Materials, Philadelphia, PA. http://www.astm.org
- *"Microbiological Methods for Monitoring the Environment, Water and Waste"*, EPA/600/8-78/017, Dec. 1978; U.S. EPA.
- *"Methods for the Determination of Metals in Environmental Samples"*, EPA/600/4- 91/010, June 1991; appended with "Supplement I", EPA/600/R-94/111, May 1994; U.S. EPA.
- *"Methods for the Determination of Inorganic Substances in Environmental Samples"*, EPA/600/R-93/100; Aug. 1993, U.S. EPA.

8.2.3 Sources for Surface Water and Groundwater Methods –

- *"Test Methods for Evaluating Solid Waste, Physical / Chemical Methods*, Third Edition, SW-846", Nov. 1986; revised by "Revision I", Dec. 1987; amended by "Update I", July 1992; "Update IIA", Aug. 1993; and "Update IIB", Sept. 1994; "Update III", December 1996. U.S. EPA. http://www.epa.gov/epaoswer/hazwaste/test/main.htm
- *"US EPA Contract Laboratory Program, Statement of Work for Inorganic Analysis"*; Document No. ILM 05.2, 2002. http://www.epa.gov/superfund/programs/clp
- *"US EPA Contract Laboratory Program, Statement of Work for Organic Analysis"*; Document Nos. OLM 04.3. March 2003. http://www.epa.gov/superfund/programs/clp
- *"Superfund Analytical Methods for Low Concentration in Water for Inorganics Analysis"*; Oct. 1991, U.S. EPA. http://www.epa.gov/superfund/programs/clp
- *"Superfund Analytical Methods for Low Concentration in Water for Organics Analysis"*; Oct. 1992, U.S. EPA. http://www.epa.gov/superfund/programs/clp

8.2.4 Sources for Solids, Sediments, and Soil Methods –

- *"Test Methods for Evaluating Solid Waste, Physical / Chemical Methods, Third Edition, SW-846"*, Nov. 1986; revised by "Revision I", Dec. 1987; Amended by "Update I", July 1992; "Update II", Aug. 1993; and "Update IIA", Sept. 1994; and Update IIB, Jan. 1995; "Update III", Revised December 1996. U.S. EPA.

http://www.epa.gov/epaoswer/hazwaste/test/main.htm

- *"US EPA Contract Laboratory Program, Statement of Work for Inorganic Analysis"*; Document No. ILM 05.2, 2002.
  http://www.epa.gov/superfund/programs/clp
- *"US EPA Contract Laboratory Program, Statement of Work for Organic Analysis"*; Document Nos. OLM 04.3. March 2003.
  http://www.epa.gov/superfund/programs/clp
- *ASTM Methods from "Annual Book of ASTM Standards", reprinted annually;* American Society for Testing and Materials, Philadelphia, PA.
  http://www.astm.org
- *"Official Methods of Analysis of the AOAC, 15th Edition"*, 1990; Association of Official Analytical Chemists, Arlington, VA.

8.2.5 Sewage Sludge (Residual) Tests for Land Use/Disposal –

- Title 40, Part 503 of the *"Code of Federal Regulations"* (40 CFR 503), for EPA Standards for the Use or Disposal of Sewage Sludge.
- *"Publicly Owned Treatment Works (POTW) Sludge Sampling and Analysis Guidance Document"*, Office of Water Permits Division; 1989; U.S. EPA.
- *"Test Methods for Evaluating Solid Waste, Physical / Chemical Methods, Third Edition, SW-846"*, Nov. 1986; revised by "Revision I", Dec. 1987; Amended by "Update I", July 1992; "Update II", Aug. 1993; and "Update IIA", Sept. 1994; and Update IIB, Jan. 1995; "Update III", Revised, December 1996. U.S. EPA.
  http://www.epa.gov/epaoswer/hazwaste/test/main.htm
- *"18th Edition of Standard Methods for the Examination of Water and Wastewater"*, American Public Health Association, Washington, DC.
- *"Methods for Chemical Analysis of Water and Wastes"*, EPA/600/4-79/020; March 1983, U.S. EPA.

8.2.6 Solid and Hazardous Waste Characterization Tests –

- *"Test Methods for Evaluating Solid Waste, Physical / Chemical Methods, Third Edition, SW-846"*, Nov. 1986; revised by "Revision I", Dec. 1987; Amended by "Update I", July 1992; "Update II", Aug. 1993; and "Update IIA", Sept. 1994; and Update IIB, Jan. 1995; "Update III", June 1996, Revised December 1996. U.S. EPA.
  http://www.epa.gov/epaoswer/hazwaste/test/main.htm
- *ASTM Methods from "Annual Book of ASTM Standards"*, reprinted annually; American Society for Testing and Materials, Philadelphia, PA.
  http://www.astm.org
- *"US EPA Contract Laboratory Program, Statement of Work for Inorganic Analysis"*; Document No. ILM 05.2, 2002.
  http://www.epa.gov/superfund/programs/clp
- *"US EPA Contract Laboratory Program, Statement of Work for Organic Analysis"*; Document Nos. OLM 04.3. March 2003.
  http://www.epa.gov/superfund/programs/clp

8.2.7 Biological Methods -

8.2.7.1 Microbiological:

- *Title 40, Part 141, Subpart C of the "Code of Federal Regulations"* (40 CFR 141.21), for Drinking Water Monitoring and Analytical Requirements, Coliform Sampling. USEPA, Washington, DC.
- *Title 40, Part 136, Table IA, of the "Code of Federal Regulations"* (40 CFR 136.3) for the List of Approved Biological Test Procedures; USEPA. Washington, DC.
- *"Microbiological Methods for Monitoring the Environment, Water and Waste"*, EPA/600/8-78/017, Dec. 1978; U.S. EPA.
- *"18th Edition of Standard Methods for the Examination of Water and Wastewater"*, American Public Health Association, Washington, DC.

8.2.7.2 Toxicity Characterization (Bioassay):

- *"Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms*, Fifth Edition", EPA-821-R-02-012, October 2002; U.S. EPA.
- *"Short-Term Methods for Estimating the Chronic Toxicity of Effluent and Receiving Waters to Freshwater Organisms, Fourth Edition"*, EPA/821-R-02-013, October 2002; U.S. EPA.

8.2.8 Modifications to Approved Methods - If a modified procedure is proposed, the client will be notified. A complete method description and associated quality control parameters (precision, accuracy, method detection limits/reporting limits) will be provided prior to or simultaneously with the sample analysis.

8.3 Laboratory Glassware Cleaning: Surface residues and soils in the glassware are removed and disposed of in the appropriate waste containers and dirty glassware is drained of solvents prior to submitting for cleaning. All laboratory glassware (volumetric flasks, separatory funnels, extraction tubes, beakers, graduated cylinders, and others) is cleaned according to the analysis/parameter group listed on the next page. Cleaned glassware is returned to the proper storage cabinets in each laboratory.

8.4 Laboratory Reagents:

- Spectroscopic Grade - stored in a cabinet designated for general storage.
- ACS Grade - stored in a secure cabinet with limited access.
- Laboratory Grade - stored in cabinets designated for storage of reactive chemicals. Each chemical is separated from any other chemical with which it can react dangerously.
- Industrial Grade - stored in the flammables only cabinets.
- Indicator - stored in a desiccators.
- Purity certified by supplier - stored in the non-flammable cabinets. Certified and tested to meet Standard Methods 20th Edition

- Standards - stored in vented cabinets for acid storage. Each acid stored separately.

FIGURE 3a:

Laboratory Glassware Cleaning Procedure	
GLASSWARE TYPE	CLEANING PROCEDURE*
Bioassay	1-3, 5, 4, 16, 12
BOD	1-3, 15, 4, 16, 12
Extractable Organics (Pesticides & Herbicides)	1-4, 5 or 6, 12, 13
Microbiology	1-4, 14
Nutrients/Classics	1-4, 8, 4
Petroleum Hydrocarbons	1-4, 6, 13
Residues	1-4, 10
Trace Metals	1-4, 9, 4, 16, 12
Volatile Organics	1-4, 7, 10

FIGURE 3b:

Key to Laboratory Glassware Cleaning Procedure	
1.	Remove all labeling from bottles and glassware.
2.	Wash with hot tap water and Alconox (Liquinox). Scrub insides of glassware and any fittings with a brush.
3.	Rinse thoroughly with hot tap water (3 times).
4.	Rinse thoroughly with deionized water.
5.	Rinse thoroughly with pesticide grade methylene chloride.
6.	Rinse thoroughly with pesticide grade hexane.
7.	Rinse with Methanol (as needed).
8.	Rinse with or soak in 1:1 HCl (as needed).
9.	Soak in 1:4 HNO3, 1:4 HCl (as needed).
10.	Bake at 180°C for 3-4 hours (as per method).
11.	After use, rinse with last solvent used.
12.	Store inverted or capped with suitable material or suitable container stopper.
13.	Rinse with solvent used in the analysis prior to use.
14.	Autoclave at 250°C for 30 minutes.
15.	Nochromix rinse.
16.	Air dry.
*Cleaning Procedures are followed in order specified.	

8.5 Laboratory Waste Disposal: Waste materials generated in the laboratory are disposed of promptly and properly. The following procedures are employed in the disposal of laboratory wastes:

8.5.1 Liquid Wastes - In general, no chemical wastes may be disposed of in the sink. Only certain dilute and neutralized acid wastes can be disposed of in the sink.

8.5.1.1 Disposal of Standards and Solutions - as standards and solutions are made, the solvents, constituents, date, and initial must be placed on the container. This information must be on the containers before it is offered for disposal. Standards containing any amount of organic solvents must not be poured into

the sink. Aqueous standards containing organic or inorganic (metals, etc.) compounds must be stored in the appropriate waste container/drum and disposed of by a qualified waste disposal company.

8.5.1.2 Disposal of Solvent Wastes - All solvents must be disposed of into the appropriate container located in the extractions laboratory. The waste container will be emptied by designated waste disposal personnel only. Waste chloroform is segregated from other solvent wastes for recycling purposes. Each is disposed of in glass bottles then into 5-gallon containers with appropriate label on the outside. Waste from TCLP extractions is collected and stored in an acceptable manner. Solvent wastes are classified /collected in waste solvent drums and disposed of by a qualified waste disposal company.

8.5.2 Solid Wastes - Solvent saturated solids and soil samples are collected and stored in an acceptable manner for disposal by a qualified waste disposal company. Vials are disposed of in the incineration glass container. Unmarked containers or unknowns cannot be disposed of until they are identified.

8.5.2.1 Sample Waste Return Policy - In general, samples are disposed of or returned to the client two weeks after a final report has been submitted.

8.5.2.2 Sample Waste Disposal - The following procedures are used to dispose of excess samples that have completed all necessary testing: Samples will be disposed of in two weeks after the final report has been submitted to the client - unless longer time is authorized by the General Manager, Laboratory Operations Director, Laboratory Manager, or the Project Manager/Coordinator. Prior to disposal, a sample disposal list will be generated by the appropriate waste disposal personnel. This list will be maintained in a logbook. Non-hazardous soil samples will be bulked into a drum for offsite disposal. Non-hazardous water samples (waste water and drinking water matrices) will be disposed of by neutralization where necessary and then disposed of by the local sanitary board. All other samples are containerized and disposed of by a qualified waste disposal company. Empty sample containers should be disposed of (after crushed) in a dumpster. Appropriate protective equipment must be worn (safety glasses, gloves, apron, etc.) when crushing empty sample containers.

9.0 DATA REDUCTION, VALIDATION, AND REPORTING

9.1 Analytical Data Reduction: Data transfer and reduction are essential functions in summarizing information from field and laboratory measurements. It is essential that data reduction processes are performed accurately, and that accepted statistical techniques are utilized. Analysts will be responsible for calculating final data and QC data from raw data recorded in the field logbooks, laboratory bench sheets, chart recordings, instrument printouts, and computer printouts.

9.1.1 Field Data - Data obtained from field instruments such as pH meters, salinity and conductivity meters, and dissolved oxygen meters, is read directly from the instrument in appropriate units. Such instruments are used after calibration has been performed according to the owner's operation manual or REIC's field standard operating procedures. Data is recorded by the field analyst into the field logbooks. Data validation in the field involves making several readings to evaluate reproducibility of a measurement. The field team leader or any other member of the field team will review the field notes daily. The initials of the reviewer and date of the review will be entered on each page of the field logbook. The field data is sent to the laboratory in the field logbooks and is reported to the client in the hard copy laboratory reports.

9.1.2 Laboratory Data - Data that is obtained directly from instruments such as conductivity meters, pH meters, and the total carbon analyzer is entered manually onto bench worksheets. Some procedures, however, require reading graduation marks on glassware, observing color changes, and performing tests in replicates. Many methods use instrumental methods of analysis, in which the instrument is connected to a microprocessor or have microprocessor data systems as integral parts of the instrument. In such cases the calculations are internally performed once the appropriate calibration standards are entered into the instrument. The instrument analyses are calibrated in appropriate units. During the analyses, instruments coupled to computer controlled systems, convert signals to raw digital data, capture raw data, integrate, generate calibration and response factors, calculate and produce results. Results are expressed in units such as: micrograms per liter (µg/L), milligrams per liter (mg/L), milligrams per kilogram (mg/kg), etc. All data generated from spectrophotometric methods of analysis is computed according to Beer's law to produce a calibration curve based on the level of concentration of standards run during the analysis. The analyst ensures that the standards bracket the sample response, and that all data is generated from the linear portions of the calibration curve. When the analysts record data onto loose bench worksheets, or into the LIMS, they verify that all data entries and date sequences are correct. Drawing a line through the incorrect entry, followed by initials, makes correction of any worksheet error. All loose sheets are kept in bound books. Periodically the sheets are removed and filed. Bound notebooks are also used for chronological sequence of data insertion. The pages are numbered and a table of contents is entered for referencing. All bench sheets, ring-binder books, and bound notebooks (logbooks) never leave the laboratory. These are a source of information for data transfer to appropriate report forms. LIMS files are backed-up daily and stored in case hardware failure is experienced within the computer system.

FIGURE 4:

INORGANIC AND ORGANIC DATA CHECK	
Inorganic Data Checks	Organics Data Check
Sample Chain of Custody (COC)	Sample Chain of Custody (COC)
Extraction & Analysis sample holding times	Extraction & Analysis sample holding times
Calibration:	Initial Calibration
Initial Calibration Verification (ICV)	Continuing Calibration Verification (CCV)
Initial Calibration Verification	Blanks
Continuing Calibration Verification (CCV)	Surrogate Recoveries
Blanks	Duplicate Samples
Laboratory Control Spike (LCS)	Matrix Spike (MS) / Matrix Spike Duplicate (MSD)
Quality Control Spike (QCS) Sample	Internal Standard Performance
Duplicate (DUP) Sample	Compound Identification
Matrix Spike (MS) Sample	Compound Quantitation and Reporting Limits
Field Duplicates	System Performance
Method Specific QC	Field Duplicates
Overall Assessment	Equipment Blanks
	Chromatogram Retention Times
	Mass Spectrometer Tuning Criteria Compliance
	Method Specific QC
	Overall Assessment

9.2 Data Validation:

9.2.1 **Responsibility of the Analyst** – The analyst will check the entry of data imported into the LIMS and calculations against the raw data. The initials of the analyst and date are entered on all data batches reviewed. The analyst must also review extraction, digestion, and instrument logs for correctness and completeness. Analysts are responsible for analyzing the appropriate type and quantity of quality control samples required for all analytical batches. Results must also meet pre-established control limits. If control limits are not met, the analyst is responsible for documenting and justifying data that is considered reportable. The analyst must also understand and document appropriate flagging of the final analytical results or associated quality control data. Results that are not compliant with method requirements or additional requirements of REIC's quality program must not be reported, except as described below. The Laboratory Supervisor and/or Laboratory Manager must be notified and the data reviewed. If re-analysis using a separate aliquot along with all associated quality control is not possible, the General Manager and/or Laboratory Operations Director must be notified and written notification must be provided to the client immediately by the assigned Project Manager/Coordinator. (Further discussions of corrective actions are described in Chapter 14 of this QA Manual.) The analyst is also responsible for assembling the data file for each batch of samples, including the raw data and summary

batch report, and forwarding the batch file to the assigned supervisor or designated data validator.

9.2.2 Responsibility of the Supervisor - The Laboratory Supervisor or designee is responsible for the review and validation of project data before reporting. These responsibilities include making sure that reported final data is correct and has been reviewed against the raw data. The Laboratory Supervisor will compare final data against previous values for any obvious errors in reported values and to ensure that all the supporting data including QC results is present.

9.2.3 Responsibility of the Quality Manager - The Quality Manager will review at least 2 data batches generated per month. The requirements to be checked in data validation are provided in the tables below for inorganic and organic data review parameters.

9.3 Data Reporting - Raw data is not normally provided in the formal report, but can be included if the client desires. Reports are reviewed and approved by the Project Managers/Coordinators who prepare a cover letter and/or case narrative explaining any details needing additional comment. Upon completion and approval, the report is sent to the client and mailing date reported in the LIMS. Each test report consists of a cover letter, a report narrative and the analytical results. On each page is included the name and/or address of the client and the unique job ID number.

9.4 Data Archiving -Copies of Chain-of-Custody forms, sample tracking worksheets, raw data, QC/QA materials, formal reports, and laboratory performance reports are kept on file by the laboratory for a minimum of five years. These files are available to the client or their approved representative(s) for review at any reasonable time within this period. All records are archived on-site under lock and key. Due to large volumes of paper and records generated, older records are archived on-site in a different building that is accessible by authorized personnel only. Access is also documented by a records log book maintained within the building. It should also be noted that all bench logbooks, instrument maintenance logs, and supplies record books are dated in consecutive order, filed, and kept indefinitely.

9.5 Document Control System – A document control system is used to ensure that all laboratory personnel have access to current policies and procedures at all times. Documents that are managed by this system include the QA Manual, SOPs, logbooks, etc. The system consists of a document review, revision and approval system, and document control and distribution. The QA Manual and SOPs are reviewed on an annual basis and updated as needed. All logbooks are numbered and a log is maintained in the QC Department of all logbooks issued and returned. The QA Manual and all SOPs are reviewed and approved by the Quality Manager, the Technical Director (Laboratory Manager and/or Laboratory Supervisor), Laboratory Operations Directors and/or the General Manager. The Quality Manual will have an effective date that is sixty (60) days from the date that the Quality Manager signs the signatory page. All SOPs will become effective on the date that the Quality Manager signs the original SOP. All quality documents are controlled by the Quality Manager. Controlled copies are provided to applicable individuals/departments in the laboratories. The Quality Manager maintains a distribution list for controlled copies and ensures that any revisions are distributed appropriately.

10.0 INTERNAL QUALITY CONTROL (QC) CHECKS

Internal quality control (QC) checks are those procedures used during all phases of the project that are designed to control the individual processes involved in data generating activities. The QA objectives of a given project and the anticipated uses of data determine the type of QC checks needed. The QC checks apply to both field and laboratory activities. The following discussion describes the various QC checks performed for field samples and laboratory activities. The following is not an all-inclusive listing. Please refer the specific method SOP for complete lists of Quality Control measures.

10.1 Field Quality Control Checks: For clients who bring sufficient volumes of samples for analysis or for projects in which REIC is responsible for field sampling, typically the field QC checks consist of equipment blanks, trip blanks (for VOAs only), and field duplicates. These field QC samples are analyzed for parameters of interest and are collected at frequencies determined by the project or according to recommendations presented in the following table. *(Although REIC will give advice on sampling, it is the sampler's ultimate responsibility to representatively sample, pack, and ship the samples to REIC Laboratory.)*

10.1.1 Travel (Trip) Blanks - Trip blanks are used to determine if any onsite atmospheric contaminants are seeping into the sample vials, or if any cross contamination of samples is occurring during shipment or storage of sample containers. Trip blanks are only analyzed for volatile organics. The trip blanks consist of sample bottles filled in the laboratory with organic-free water and any applicable preservatives. Trip blanks are sealed and placed in the ice chest. Trip blanks are sent to the sampling location with sampling kits and are returned unopened from the sampling location with the samples.

FIGURE 5:

FREQUENCY OF FIELD QC CHECK SAMPLES		
QC SAMPLES	WATERS / LIQUIDS	SOIL / SEDIMENT
Trip Blanks (for VOAs) only	2 per Cooler	NR
Equipment Blank (rinsate)*	2 per Day	1 per Day
Field Duplicates: 1-4 Samples	NR	NR
5-9 Samples	5% per Event	5% per Event
>10 Samples	10% per Event	10% per Event
Note: *All parameters must meet QC sample type and frequency requirements. Numbers calculated from percent specifications will be rounded up to nearest whole numbers*		
ABBREVIATIONS AND SPECIAL NOTES:		
NR *Not Required*		
* *For long field activities in which samples are collected daily, only samples for every other day may be analyzed. Other samples are held and analyzed only if evidence of contamination exists.*		
** *The requirement for split samples (reference duplicates) has not been defined. If split samples are needed, the frequency of collection will be provided in the site-specific quality assurance plan.*		

Trip blanks should originate at the facility providing the blank water and sample containers. It is not necessary to take an aqueous trip blank when a non-aqueous medium is being sampled.

FREQUENCY: One trip blank (2 trip blanks for Drinking Water VOCs) should accompany each cooler containing VOCs samples, should be stored at the laboratory with the samples, and analyzed by the laboratory.

FREQUENCY: One equipment blank should be collected each day samples are collected. For long drawn field sampling events, only samples from every other day may be analyzed. Other samples are held and analyzed only if evidence of contamination exists.

10.1.2 Equipment Blanks - Equipment blanks are the final analyte-free water rinse from equipment cleaning collected daily during a sampling event. Equipment blank is prepared by pouring target, analyte-free (de-ionized) water into or over the sampling equipment (bailers, tubing, soil samplers). The rinse water is collected in a sample container, preserved, and handled in the same manner as the samples.

10.1.3 Field Duplicates - A field duplicate is a replicate sample collected and analyzed to demonstrate the reproducibility of sampling technique. A field duplicate is separate from the duplicate the laboratory must run and cannot be replaced by a laboratory-generated duplicate. Field duplicates are representative of field sampling precision, whereas laboratory duplicates are a measure of analytical precision. Both pieces of information are essential in determining the quality of data generated for a project. A field duplicate is prepared at the sampling location from equal portions of sample aliquots combined to make the sample. Both the field duplicate and the sample are collected at the same time, in the same container type, preserved in the same way, and analyzed by the same laboratory as a measure of sampling precision.

FREQUENCY: Field duplicates should make up 10% of the samples collected.

10.1.4 Sample Splitting - Sample splitting is performed when two or more parties want to have a portion of the same sample. A field split or referee duplicate is prepared at the sampling location from equal portions of sample aliquots combined to make the sample. Both the field split and the sample are collected at the same time, in the same container type, preserved in the same way. The split sample is submitted to a referee laboratory for analysis to assist in evaluating inter-laboratory precision and the validation of the results.

FREQUENCY: Field splits to be determined by a client.

10.2 Laboratory Quality Control Checks - Internal laboratory control checks used by REIC are discussed in detail in each method performed. REIC will demonstrate the ability to produce acceptable results using the methods requested. The minimum QC spike requirements for organic and inorganic analyses are presented on the next page.

FIGURE 6:

LABORATORY MINIMUM SAMPLES REQUIRED							
	STANDARD MATRIX	SAMPLE MATRIX					
Analysis	Blank	Spike	Spike	Spike Dup	Spike Dup	Surrogate Spike	Filter Blank
ORGANICS							
All Analysis (Except TCLP)	5%	5%	5%	5%	NA	100%	5%
TCLP	5%	5%	+	5%	NA	NA	5%
INORGANICS							
pH	10%	NA	NA	NA	10%	NA	NA
Residues	10%	NA	NA	NA	10%	NA	NA
Turbidity	10%	NA	NA	NA	10%	NA	NA
Specific Conductivity	10%	NA	NA	NA	10%	NA	NA
Dissolved Oxygen	10%	NA	NA	NA	10%	NA	NA
TCLP	10%	10%	+	NA	NA	NA	10%
All Other Analyses	10%	10%	10%	10%	NA	NA	10%
Source: REIC List of Abbreviations: Dup – Duplicate, NA – Not Applicable, + = 5%							

10.2.1 **Holding Time** - The amount of analyte in a sample can change with time due to chemical instability, degradation, volatilization, etc. If the specified holding time is exceeded the data generated may not be valid. Those analytes detected in samples analyzed past holding time on compliance sample will be noted as "unacceptable for compliance reporting".

10.2.2 **Optimum Batch Size** - The laboratory will determine the optimum batch size. The optimum batch size is the number of samples of similar matrix, which can be processed concurrently through the entire preparation (i.e., extraction) and analysis. (Method requirements typically designate up to either 10 or 20 samples.) After the batch size is determined the QC criteria described in the following sections are followed.

10.2.3 **Calibration** - All methods are calibrated prior to sample analysis *(see Section 7.0)*. The following requirements are observed.

- **Semi-volatiles, Volatile Organics, and Pesticides/PCBs analyses**, the current EPA methods (500 series and 600 series) and SW-846 methods (8000 series) shall be used; including frequency requirements, requirements for calibration check compounds (CCCs), and system performance check compounds (SPCCs).

10.2.3.1 Tuning and performance criteria are established to ensure adequate mass resolution, proper identification of compounds, and to some extent - sufficient instrument sensitivity. These criteria are not sample specific. Instrument performance is determined using standard materials. Therefore, the mass tuning criteria must be met at all times. The tuning standard for volatile organics is bromofluorobenzene (BFB) and for semi-volatiles is

decafluorotriphenyl-phosphine (DFTPP). If the ion abundance criteria for a method are not met, all associated data must be classified as invalid (unusable).

10.2.3.2 The response factor measures the instrument's response to specific chemical compounds. The response factor for method specified compounds must be equal or greater than the limit in both the initial and continuing calibrations. A value less than the specified limit indicates a serious detection and quantitation problem (poor sensitivity) and analytes in the sample will be qualified as an estimate.

–Refer to the specific method for other appropriate guidelines.

10.2.3.3 Percent RSD is computed from the initial calibration and is used to indicate the stability of the specific compound response over increasing concentration. Also, the percent recovery D is used to compare the response factor of the continuing calibration check to the mean response factor (RRF) from the initial calibration. Percent D is a measure of the instrument's daily performance. A value outside of the method specified limits indicates potential detection and quantitation errors. For these reasons all positive results are qualified as estimated.

–Refer to the specific method for other appropriate guidelines.

10.2.3.4 For the Pesticides/PCB analysis, %RSD for aldrin, endrin, DDT, and dibutylchlorendate must not exceed 10%. Percent D must be within 15% on the primary quantitation column and 20% on the confirmation column.

See specific method for other appropriate guidelines.

OTHER METHODS OF ANALYSIS

- At least three levels of concentration standards for each analyte shall be analyzed for initial calibration.
- The correlation coefficient of the standard linear curve will be $\geq$ 0.995 (Inorganics) and $\geq$ 0.990 (Organics).
- The midlevel calibration standard will be repeated at a frequency of 10% (Inorganics) and 5% (Organics) and at the end of a run.
- Response of the control analytes must be within $\pm$ 10% (Inorganics) and $\pm$20% (Organics) of initial response.
- Detection limits for each parameter will be determined and checked annually to ensure they meet limits specified for the project.
- The calibration shall include one standard at a concentration at the level of the PQL.
- The calibration curve shall bracket all samples in the concentration range. GC/MS Calibration shall be checked every 12 hours (or 24 hours for 624/625) of operation.

- The laboratory shall use the calibration check acceptance criteria specified in the method.
- If samples are outside the calibration range, the laboratory shall appropriately perform dilution to bring the samples concentrations within the calibration range.

10.2.4 **Method Reagent Blanks** - Quality assurance (QA) blanks, i.e., trip blanks, equipment blanks, water blanks, and method (reagent) blanks, are designed to identify any contamination which may have been introduced into the samples during field activity or sample preparation. Trip blanks measure cross-contamination of samples during shipment. Equipment blanks measure cross-contamination from the sampling equipment. Method (reagent) blanks measure laboratory contamination. If the concentration of the analyte is less than the method-quantifying limit, the analytes are qualified as non-detects. A method blank is analyzed for all methods with each sample batch.

10.2.5 **Spikes and Laboratory Control Matrix Spikes (LCS)** - In methods not using surrogates (metals, anions, wet chemicals), in addition to the method blank, a blank spike or a LCS are analyzed. For pesticides/PCBs methods, surrogate compounds are employed. A method blank and Laboratory Control Matrix Spike are also analyzed with each batch as separate samples. A pesticide and/or PCB are used as spiking compounds. In methods using surrogates spiked into all samples, the blank serves as both the method blank and the blank surrogate spike.

10.2.6 **Second Column Confirmation** – For GC and HPLC methods, confirmation techniques include analysis by GC/MS, GC or HPLC data from two different detectors or dissimilar columns. Confirmation is necessary when samples are from a site of unknown historical activity or when doubt exists over the identification of a peak on the chromatogram.

10.2.7 **Surrogate Spikes** - Surrogate spiking compounds are target analyte compound substitutes. The surrogates are chemically similar to the analytes of interest, and emulate their respective instrumental response. The surrogates do not interfere with the target analytes and are not naturally occurring in the environmental samples. Surrogate spikes are performed for all methods for which surrogates are a customary procedure. Surrogate spikes monitor both the performance of the analytical system and the effectiveness of the method on the type of sample matrix. The surrogate compounds are spiked into each client sample, QC sample, standard, and method blank in a batch. Samples are spiked prior to sample preparation.

10.2.8 **Matrix Spike/Matrix Spike Duplicates (MS/MSD)** - Spiked samples are samples that have specific concentrations of analytes of interest added. Except for all Drinking Water analyses and metals, sample-specific MS/MSD are analyzed in all methods for every 20 samples of a similar matrix (either soil or water). For metals analysis only, a matrix spike is required for every 10-20 samples of similar matrix (depending on the method). However, a matrix spike duplicate may be performed at the laboratory's discretion in lieu of a laboratory duplicate.

10.2.9 **Internal Standard Performance** - Internal standard (IS) performance criteria are designed to ensure that GC-MS sensitivity and response are stable during every analysis. Specific internal standard area count criteria can be found in the method SOP. The retention time of the IS must not vary by more than 30 seconds from the associated continuing calibration standard. If data is generated outside these criteria, all positive results for compounds quantitated using that IS are qualified as estimates.

10.2.10 **Compound Identification** - For volatiles and semivolatile organics, the compounds are identified on the GC-MS by using the analyte's relative retention time window (RRT) and by comparison to mass fragmentation patterns obtained from known standards. For the results to be a positive hit, the sample peak must be within plus or minus 0.06 RRT units of the standard compound and have a mass fragmentation pattern which has a ratio of the primary and secondary m/e intensities within 20% of that in the standard compound. For pesticides, the retention times of reported compounds must fall within the calculated retention time window for the two chromatographic columns.

10.3 Demonstration of Method Capability - An initial demonstration of capability (IDC) is performed prior to acceptance and use of any methodology. This initial demonstration of method performance is performed each time there is a significant change in instrument type, personnel, or test method. The process is described in each test methods Standard Operating Procedure. A "Demonstration of Capability Certification Statement" is completed for each analyst and maintained by the Laboratory Managers and/or the Quality Manager. A copy of the documentation used for each demonstration is also included in Appendix E. For any methods or procedures that the method does not mandate an IDC or no procedure is provided (such as Turbidity, TCLP, Flash Point, etc.), the IDC will be performed by demonstrating the procedure to the Laboratory Supervisor or designee and documented with the IDC form and recorded in the personnel training records.

10.4 Microbiological Demonstration of Capability - The Demonstration of Capability for the Microbiological laboratories will be performed on an annual basis. DOCs for presence/absence methodologies will consist of each analyst analyzing a series of ten unknowns. The samples are prepared by the section supervisor and are unknown to the analyst. These samples will consist of a combination of total positive – E.coli negative, total positive – E.coli positive and total negative – E.coli negative results. To be acceptable, the analyst must achieve a 100% score on the series of 10 samples. DOCs for quantification methodologies involve the analysis of purchased performance evaluation samples. Precision and accuracy are calculated for these results and compared against established acceptance criteria. The results will be documented using a spreadsheet which will also track the rotation of microbiological section analysts performing the DOCs. All analysts will sign off on the NELAC Demonstration of Capability form which will be retained by the laboratory.

11.0 SYSTEM AND PERFORMANCE AUDITS

11.1 Systems/Internal Audits: A system audit is a qualitative evaluation of all components of a project (field and/or laboratory activities) to determine if each component is properly performed. The audits are designed to assure that systems and operational capabilities are maintained, and the study methodologies and quality control measures for the project are being followed as specified in the quality assurance project plan. The Quality Manager or appointees will conduct system audits as needed to ensure proper operational capabilities. Within a calendar year and internal/system audit will be performed on all technical areas of the laboratory. Audits of critical functions will include:

- Verification that standards, procedures, records, charts, data disks, etc., are properly maintained.
- Verification that the actual practice agrees with written instructions.
- Selection of methods that must include all phases of a laboratory's effort is monitored, to include but not be limited to sample logging, chain of custody, sample preparation, standard preparation, extract storage and analysis, and data reduction.
- Verification that QC/QA records are adequately filed and maintained so as to assure protection and retrievability.
- Walk-through the laboratory for general observations.

11.2 Performance Audits: Performance audits are quantitative evaluations of the components of a project or routine operations. Performance audits are used to evaluate the laboratory's ability to obtain accurate results in the analyses of known check samples by specific analytical methods.

11.2.1 Internal Performance Audits - Internal performance audits consists of analyses of commercially purchased QC check standards and/or in-house prepared QC check standards. Commercial suppliers give the options of confidential double blind evaluations or single blind with the certified results mailed along with standards. The stock solutions used to make in-house QC check standards are different from those used for calibration standards. The QC check samples are carried through the complete analytical preparation and analysis and the calculated values are compared to the true target values. During the analytical data review, the Quality Manager pays close attention to these recoveries and must recommend corrective action in cases of repeated poor recoveries. In addition to regular measurement of the QC check sample, the Quality Manager may introduce QC check samples for analyses with other project samples; blind to the analyst. The parameter groups are selected at random by the Quality Manager. The findings will be summarized and reported to management directly following completion of laboratory analyses.

11.2.2 Managerial Review – At least annually, the laboratory management (General Manager, Laboratory Operations Directors, and Laboratory Managers) will conduct a review of REIC's quality system to ensure continued acceptability and effectiveness. This will include introducing any necessary changes, corrective actions, or improvements in the quality control program and overall laboratory operations. The review will consider all reports from managerial and supervisory personnel, the outcome of internal audits, assessments performed by outside auditing bodies, the results of proficiency test, any changes in the volume and type of work undertaken,

feedback from clients, corrective actions and any other relevant information collected during the year in review.

11.2.3 **External Performance Audits** - Laboratory performance audits are also performed in conjunction with the performance evaluation programs and performance testing (PT) samples administered by various agencies. PT samples are introduced into the laboratory as unknowns and follow the same strict scheme of handling that all samples adhere to. Examples of programs that REIC participates in that include on-site audits are:

- State of West Virginia DEP
- State of West Virginia DHHR
- State of North Carolina DENR
- State of Virginia VELAP program (onsite for Virginia labs only)
- Florida Department of Health
- Kentucky DEP (onsite for Ashland only)

REIC maintains certifications via reciprocity agreements with the following state programs:

- State of Virginia VELAP program
- Tennessee Department of Health
- Kentucky DEP
- PADEP

It should be noted that each program requires REIC to follow specific guidelines in enrolling in PT studies, reporting PT studies and meeting acceptance criteria. Please contact us for specifics on any program REIC participates in.

11.3 Memberships, Licenses, and Certifications: The following is a list of memberships, licenses, and certifications currently held by REIC:

- American Chemical Society
- Associations of Analytical Chemists
- West Virginia Petroleum Marketers Association
- Rural Water Association
- Mining & Reclamation Association
- American Water Works Association
- The Solid Waste Association of North America
- West Virginia Manufacturers Association
- Association of West Virginia Solid Waste Authorities
- West Virginia Oil Marketers & Grocers Association
- State of West Virginia Department of Health, Office of Environmental Health Services

- State of West Virginia Department of Commerce, Labor, and Environmental Resources, Department of Environmental Protection, Water Resources Section
- Commonwealth of Virginia Department of General Services, Division of Consolidated Laboratory Services
- Commonwealth of Kentucky Natural Resources and Environmental Protection Cabinet, Department of Environmental Protection
- State of Tennessee Department of Conservation, Division of Underground Storage Tanks
- State of Tennessee Department of Health and Laboratory Services
- North Carolina DEHNR Division of Solid Waste Management
- State of Florida Health Department (NELAP)
- Pennsylvania Department of Environmental Protection, Bureau of Office System and Services

A complete listing of methods and certified parameters for the above listed programs can be provided to clients upon request. REIC's complete listing of NELAC accredited methods/parameters is summarized in Appendix H. A copy of REIC's compliance statement with the NELAC standards is also included in Appendix D.

11.4 Audit Reports: The Quality Manager shall provide an audit report comprised of summary findings to the General Manager and/or Laboratory Operations Coordinators on a periodic basis or as needed. Deviations will be noted and discussed by management. The audit findings, both compliance and non-compliance, must be documented, filed in a secure place, maintained as part of the QA documentation. Minimally, these reports should include: Periodic assessment of measurement quality indicators, i.e., data accuracy, precision, and completeness; Results of internal and/or external audits; Results of system audits; Significant QA problems and recommended solutions. (The Quality Manager may also provide reports to the General Manager on a weekly basis during the status meetings conducted by the Project Managers/Coordinators and Laboratory Managers/Supervisors.)

12.0 FACILIIES, EQUIPMENT, AND PREVENTATIVE MAINTENANCE

12.1 Facilities and Equipment – For over eighteen years, REIC has been performing environmental services and evaluations for a multitude of highly technical and demanding projects. From its inception, REIC has addressed the major environmental testing protocols and has steadily evolved incorporating the latest analytical procedures and state-of-the-art facilities and equipment. REIC's clients have learned to expect unparalleled service with uncompromising quality on a routine daily basis. All work is approached with the highest of professional ethics, personable interactions, and professional accountability.

REIC's headquarters is located ten miles south of Beckley, WV along Interstate 64, some fifty miles to the east of Charleston, WV and ninety miles west of Roanoke, VA. The parent facility houses its 20,000 square foot Analytical Chemistry Division at the Raleigh County Airport Industrial Park (See floor plan Appendix A). The Biological Division is operated from a new facility located on the main Beaver, West Virginia campus. REIC also maintains service centers and laboratories in Roanoke and Verona, Virginia, as well as in Ashland, Kentucky. (See floor plans in Appendices A1-A5).

12.2 Computers and Electronic Data Security Requirements – Electronic data security is achieved through a multi-faceted approach to data access and storage. All servers, personal computers, instrument workstations, and printers are connected via the REIC local area network (LAN). The network is a secure Microsoft Windows Server 2003 Active Directory domain. The domain controllers provide authentication services for users and supply additional authorization data, such as user group memberships. These services are used to control access to resources on the network.

Laboratory data is managed and stored in the Laboratory Information Management System (LIMS). This system is a Microsoft Access database stored on a network server and accessed by REIC personnel from client workstations. The LIMS has another level of security built in with different levels of access privileges for all REIC personnel.

Electronic data is protected from corruption via backups that are created nightly by server tape backup devices. Tapes are rotated through a two week cycle with one tape taken off-site weekly. Hard copies of raw analytical data and analytical reports are also kept on file for a period of five years.

REIC remotely maintains a web site and email server outside the LAN to minimize the security threat from incoming internet traffic. Analytical data and status information are accessible to our clients through this secure client on-line access. REIC's web address is: http://www.reiclabs.com.

12.3 Preventative Action Plan – In case of natural disaster or environmental crisis, when sample preservation or sample testing may be compromised, REIC will utilize all possible means to maintain the samples until analysis can be conducted. These will include but not limited to: use of backup generators, use of dry ice within cooler units to maintain temperatures, renting of refrigerator trucks for sample storage, subcontracting of samples, and re-sampling as necessary. All sample conditions will be monitored to determine the effect of the environmental crisis. When not effects have been noted, the sample will be handled as usual. If the sample conditions and / or preservation cannot be maintained, then re-sampling will be done at the first

available time. In some situations, the client may request that analysis be performed despite proper preservation or conditions being met. In this case, REIC will perform the analysis and footnote the conditions.

12.4 Preventative Maintenance - To ensure that instruments are operating properly at all times, REIC follows a rigorous maintenance schedule and trouble-shooting procedures. All laboratory instruments undergo regular maintenance as required in the manufacturer's operation manual for each of the instruments. Trouble shooting protocols are also performed, if needed, for instruments according to instructions in the operation manual. Manufacturer service departments or local service repair companies provide repair. In the case of downtime of specialized instruments, service contracts with the manufacturer are maintained.

In the event of excessive downtime, REIC will either acquire instrumentation to complete project work or subcontract project work to fulfill project requirements.

12.4.1 Maintenance Documentation: Maintenance service contracts or internal maintenance logs are kept for each instrument. The maintenance log is kept at the instrument, so that preventive care or repair can be recorded immediately. All maintenance and repairs are documented in the instrument's logbook. The records include the date of maintenance or repair and description of work.

Other examples of the logbook entries are: name of the person providing the service, date, time, nature of service provided, notations, etc. Also, any applicable change in operation conditions, such as sensitivity, signal drift, temperature, corrections, alignments, etc, are recorded in the instrument's maintenance log book. For solvents, reagents, or gases, examples of log entries are: charting of the gas flow readings, gas pressure of cylinders, replacement dates of gas cylinders and water deionization cartridges, replacement of solvents, etc.

12.5 Measurement Traceability – All equipment used for environmental tests shall be calibrated on a continuing basis. Balances shall be inspected and calibrated on an annual basis. All reference weights will be sent off to a NIST certified vendor for annual re-certification and replaced as necessary. Reference thermometers will have NIST certificates and will be re-certified as indicated on the certificate; typically the certificate is requested for five years. Thermometers used within the laboratory will be checked against a NIST traceable thermometer according to the SOP or program requirements.

12.6 Documentation and Labeling of Standards, Reagents, and Reference Materials – REI Consultants, will maintain copies of Certificate of Analysis or purity statements from vendors who supply our standards, reagents and reference materials. These COAs will be kept in the appropriate laboratory sections. Original containers will be labeled with a receipt date, date of opening and expiration date. This information along with a unique identification ID for reference materials will be included in the standard logbooks kept within the laboratory sections. At any given time all reference materials will be able to be traced to the original material. Any standard, reagent or reference material prepared from the original material or apportioned out into smaller quantities will carry a unique identification ID, as well as date prepared, initials of preparer, traceability to parent material and an expiration date.

12.7 Instrument Maintenance Schedules:

12.7.1 High Performance Liquid Chromatography - (HPLC)

High Performance Liquid Chromatography (HPLC)
AS NEEDED
Dismantle the detector flow cell and clean.
Replace detector lamps according to manufacturer's recommendation.
Guard column frets and packing replaced when system pressure increases.
Replace piston seals and check valves.
Check and refill solvent containers.

12.7.2 Gas Chromatograph

Gas Chromatograph			
DAILY	COLUMN CHANGE	SEMI-ANNUALLY	AS NEEDED
Replace injector septum if necessary.	Check for leaks under pressure.	Wipe check ECD (performed by contracted service group).	Bake out ECD.
Check and fill solvent rinse vials.	Check carrier gas flow through column with bubble flow meter.	Reactivate or recharge flow controller filter dryers.	Leak test all gas fittings to cylinders.
Check cylinder and regulator output pressure.			Optimize gas flows to the FID.
Inspect gas filter driers, check flow through flow controllers.	Condition column overnight and run daily check.		Clean FID and align jet if necessary.
Set and check injector, oven, and detector temperatures.	Clean injector glass liners or replace as necessary.		
Run a baseline for proper sensitivity and noise level to be used.			
Run solvent blank and standard solution, check for false peaks, bad retention times, baseline drift, poor peak shapes, and low sensitivity.			

12.7.3 Gas Chromatograph / Mass Spectrometer

Gas Chromatograph/Mass Spectrometer				
DAILY	WEEKLY	COLUMN CHANGE	SEMI ANNUALLY	AS NEEDED
Check cylinder and regulator output pressure.	Replace injector septum if necessary.	Check for leaks under pressure.	Oil Turbo molecular pump wick.	Change the guard column.
Inspect gas filter driers, check flow through flow controllers, and adjust ionization gauge controllers.		Change the septum.	Renew rough pump oil.	Auto manual tune the Mass Spectrometer.
Set and check injector, oven, and detector temperatures.	Change inlet liner as needed.	Condition column overnight and run daily check.		Recalibrate.
Check MS tuning, and run an auto/manual tune if necessary.				Clean the Detector source.
Run solvent blank and standard solution, check for false peaks, bad retention times, baseline drift, poor peak shapes, and low sensitivity.				Clean the injection port.
Check and fill solvent rinse vials.				

12.7.4 Atomic Absorption Spectroscopy (AA)

Atomic Absorption Spectrophotometer (AA)			
DAILY	WEEKLY	MONTHLY	ANNUALLY
Clean burner head/injection port.	Clean aspirator and nebulizer for deposits.	Examine O-rings in burner assembly and replace if necessary.	Schedule service visit by manufacturer to clean optics and for other maintenance.
Check water pressure.			
Check gas pressures.	Dust instrument exterior	Check cones in graphite furnace if necessary.	
Check & clean furnace optics if necessary.	Check absorbance for line/element selection.	Inspect furnace cooling lines.	
Inspect lamps for damage.	Clean furnace.	Refill spray chamber reservoir.	

12.7.5 Inductivity Coupled Plasma – Atomic Emission Spectroscopy (ICP-AES)

Inductively Coupled Plasma-Atomic Emission Spectrometer (ICP-AES)				
DAILY	MONTHLY	QUARTERLY	AS NEEDED	ANNUALLY
Check nebulizer flow rate.	Refill argon humidification reservoir.	Clean filters.	Install new power tube, when the tube wears out.	Install new mirror.
Keep ICP exterior dust free.		Change cooling water reservoir.		Manufacturer's preventive maintenance.
Clean/flush nebulizer.		Clean & inspect torch/spray chamber.	Dust/clean instrument exterior and torch box.	Change vacuum pump oil
Check vacuum pressure gauge.				
Record instrument operating parameters.			Dust off intake and exhaust.	
Record zero position and reference wavelength.				

12.7.6 Inductivity Coupled Plasma – Mass Spectroscopy (ICP-MS)

Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)				
DAILY	WEEKLY	MONTHLY	SEMI-ANNUALLY	ANNUALLY
Verify acceptable sensitivity & stability.	Perform mass calibration.	Clean extraction lens.	Examine lens stack and clean if necessary.	Replace detector (or as needed).
	Perform detector calibration	Check rotary pump oil levels.		
Record all settings and operational parameters.	Complete system tuning.	Check oil mist filters.	Examine penning gauge & clean if necessary	
	Exchange/clean glassware.	Archive all analytical data on disks & then purge the data from the computer's hard drive.		
Properly dispose of both waste reservoirs (spray chamber drain & probe rinse drain).	Check water filter & change if necessary.		Change rotary pump oil.	
	Check air filters & clean/exchange if necessary.		Examine slide valve & check operation.	
	Inspect pump tubing; replace if necessary.			
	Inspect sample/skimmer cones & clean/ exchange if necessary.			
	Inspect all tubing/lines for degradation & leaks.			
	Dust off the instrument & associated hardware.			

12.7.7 pH Meter, Conductivity Meter, Dissolved Oxygen, and Ion Specific Analyzer

12.7.7.1 pH Meter

pH Meter	
DAILY	AS NEEDED
Check the pH electrode tips for cracks.	Solution refilled in the glass electrode.
Analyze two calibration buffer standards & record results. (Aliquots of buffer standards shall be used only once.)	
Check the slope with a midrange standard buffer.	Replace the ceramic junction (Pentek pH meter).
Rinse electrode thoroughly between use and after use.	
Place the electrodes in storage buffer after use.	

12.7.7.2 Conductivity Meter

Conductivity Meter & Conductance Bridge		
DAILY	ANNUALLY	AS NEEDED
Check and record the cell constant.	Check the internal calibration with appropriate resistors (conductance bridge).	Make temperature correction.
Rinse the electrodes thoroughly between and after use.		Clean according to the manufacturer's instructions (Bridge).
Place the electrode in the storage liquid after use.		

12.7.7.3 Dissolved Oxygen Meter

Dissolved Oxygen Meter	
DAILY	AS NEEDED
Call local National Weather Service for barometric pressure.	Refurbish O_2 sensor according to the manufacturer's instructions.
Make corrections for barometric pressure and temperature.	
Record corrections and calibration results.	Replace fill-solution and membrane.
Check that the stirring device is functioning properly.	
Protect the probes between and after use.	

12.7.7.4 Ion Specific Analyzer

Ion Specific Meter	
DAILY	AS NEEDED
Check the electrode tips for cracks or scratches.	Make temperature corrections.
Calibrate with at least three standards and record results.	
Rinse electrode thoroughly between use and after use.	

12.7.8 Balances

Analytical Balance and Electronic Balance	
DAILY	AS NEEDED
Clean weighing pan after each use.	Bring in a qualified service and repair firm to service the balances.
Return dust covering over the balance after use.	Balance certifications are performed annually by a qualified service firm.
Verify functional calibrations with Class 1 certified weights for analytical balances.	

12.7.9 Purge and Trap Auto-Sampler

Purge and Trap Auto-Sampler
Check for system leaks, accumulation of dirt in purge chamber and degradation of trap. Clean or replace as needed.

12.7.10 Low Temperature Incubator

Low Temperature Incubator		
DAILY	QUARTERLY	AS NEEDED
Check and record the temperature from the digital meter.	Compare the meter to the lab thermometer traceable to NIST, and record the results.	Clean the incubator according to the manufacturer's instructions.
Prevent bacterial contamination of the incubator.		

12.7.11 Norwalk Walk-In Coolers and Study Chambers

Norwalk Walk-in Coolers and Study Chambers		
DAILY	WEEKLY	ANNUALLY
Inspect the digital temperature readout device.	Check and record that the audible alarm is functioning.	Compare the monitors to the lab thermometer traceable to NIST, and record the results.
Make sure the proper temperature is maintained.	Replace and file the (7day) wheel chart-papers.	
Check that the wheel chart needle is recording properly.	Reorganize and clean the interiors.	

12.7.12 Working Thermometers (Glass / Mercury)

Working Thermometers (Glass/Mercury)	
DAILY	ANNUALLY
Check for continuity of the liquid column.	Compare each dedicated thermometer to the lab thermometer traceable to NIST, and record the results.

12.7.13 De-Ionized (DI) Water Units

De-Ionized (DI) Water Units			
DAILY	QUARTERLY	ANNUALLY	AS NEEDED
Note the cartridge indicator reading.	Analyze for pH, Conductivity, Chlorine, and Bacteria.	Analyze for heavy metals; Pb, Cd, Cu, Cr, Ni, and Zn.	Change the cartridges when exhausted.
			Record the analyses results and any system changes.

12.7.14 Drying Ovens

Drying Ovens	
DAILY	ANNUALLY
Check and record the temperature (thermometer bulb in sand).	Compare the thermometer to the lab thermometer traceable to NIST, and record the results.
Check that the door fits properly.	
Check and prevent sample cross contamination.	

12.7.15 Muffle Furnace

Muffle Furnace	
DAILY	ANNUALLY
Check and record the temperature setting.	Compare the meter to the lab thermometer traceable to NIST, and record the results.
Check that the door fits properly.	
Check sure the fumes are properly exhausted.	

12.7.16 LECO Tube – Sulfur Analyzer

LECO Tube – Sulfur Analyzer
AS NEEDED
Calibrate with standards from a commercial supplier.
Set and check the operating temperature.
Check all tubing and the gas pressure
Check the titration vessel after use.

12.7.17 Total Organic Carbon Analyzer

Total Organic Carbon Analyzer
The injection septum is replaced every 100 (or less) injections. All pump tubes should be replaced at two-week intervals. Every two or three day's intervals check printer tape, infrared zero, and infrared span.

12.7.18 Spectrophotometer or Colorimeters

Spectrophotometer or Colorimeters	
DAILY	BI-ANNUALLY
Clean sample cells thoroughly or replace with new ones.	Verify the wavelength with a color standard or equivalent, and record results.

12.7.19 Biochemical Oxygen Demand (BOD) Incubator

Biochemical Oxygen Demand (BOD) Incubator		
DAILY	QUARTERLY	AS NEEDED
Check the digital meter and the inside thermometer.	Compare the meter to the Lab thermometer traceable to NIST.	Clean the incubator according to manufacturer's instructions.
Make sure that thermometer bulb is immersed in liquid.		
Check that the door seals properly.		
Prevent bacterial contamination of the incubator.		

13 CALCULATIONS OF DATA QUALITY INDICTORS

13.1 Precision: Precision is a measure of the degree of reproducibility of an analytical value and is used to check on the quality of the sampling and analytical procedures. Precision of the analytical method, at each stage, is determined by calculation of the relative percent difference (RPD) between duplicate analytical recoveries of sample component, relative to the average of those recoveries: Since an absolute value is used for the difference between R_1 and R_2, there is no lower control limit. These calculations are usually performed on sample matrix spikes and matrix spike duplicates and/or samples and respective sample duplicates.

$$RPD = \left\{ \frac{|(R_1 - R_2)|}{[(R_1 + R2)/2]} \right\} \quad X \quad 100$$

Where: R_1 and R_2 = concentration of Duplicates 1 and 2, respectively.

13.2 Accuracy: Accuracy is a degree to which a measurement agrees with the actual value (i.e., amount of measurement bias). Accuracy is expressed as a percent recovery of a sample's target value (known concentration of reference material). The accuracy of the analytical procedure is determined by the addition of a known amount of material (matrix spike) to a field sample matrix or a Laboratory Control matrix. A Laboratory Control matrix is made up of deionized (distilled water) or clean soil (of known physical and chemical properties). Percent recovery is calculated as follows: If RPD or R-values do not meet acceptance criteria as specified in Section 3, results reported in all samples processed as part of the same set must be labeled as suspect, and the sample analysis may need to be repeated. The laboratory Quality Manager will be notified, and the necessary corrective action will be implemented.

$$R = [(x_s - x_u)/K] \times 100$$

Where: R = % Recovery
x_s = the measured value for the spiked sample
x_u = the measured value for the unspiked sample,
K = the known value of spike in the sample.

13.3 Completeness: Completeness is a measure of the amount of data obtained from a measurement system compared to the amount that was expected to be obtained. Analytical completeness is assessed by comparing the total number of samples with valid analytical results to the number of samples collected and delivered to the laboratory. The result is calculated following data validation and reduction. Completeness (C) is determined by:

$$C = S_2/S_1$$

where: S_1 = total number of samples planned
S_2 = number of valid data points.

A value of 95% or higher is the goal. For values less than 95 percent, problems in the analytical procedures must be examined and possible solutions explored.

13.4 Detection Limits: When analytical measurements fall below the confidence level, the results are reported as "non-detects" (ND). This level can be: the Minimum quantifying level (MQL), practical quantitation limit (PQL), or method detection limit (MDL). The choice is based upon the needs of the client, objectives of the project, and requirements of the regulatory agency. The MQL is the concentration of an analyte that can be measured and reported based on the sample matrix. The MQL may be 2 to 10 times greater than the MDL. The PQL is the lowest concentration level that can be reliably achieved within the specified limits of precision and accuracy during routine laboratory operating conditions. The MDL is the minimum concentration of a substance that can be reliably recovered in a sample matrix, distinguished from the background noise level, and reported with a 99% confidence that the analyte concentration is greater than zero. For unknown or difficult matrices, REIC laboratory will either determine or use the MDL(s) provided in the EPA analytical methods being employed. When determining MDLs, the analyst uses the procedures given in 40 CFR Part 136, Appendix B. The detection limit is defined as follows for all measurements:

$$MDL = t_{(n-1,\ 1-\ =0.99)} \times S$$

where: *MDL* = *Method Detection Limit*
S = *standard deviation of the replicate analyses*
t (n-1, 1- =0.99) = *Students' t-value appropriate to a 99 percent confidence level and a standard deviation estimate with n-1 degrees of freedom*

13.5 Control Chart Procedures: For selected parameters, as precision data is accrued, parameter and matrix specific control charts are generated. The average RPD (P') and the standard deviation (Sp) of the RPD will be recalculated. In a precision control chart, the assessment is expressed as a RPD interval from zero to:

$$P' + [(3)\ S_p] = \textit{precision control level.}$$
$$P' + [(2)\ S_p] = \textit{precision warning level.}$$

For the accuracy control charts, the average percent recovery (R') and the standard deviation (S_r) of the average percent recovery will be recalculated for selected parameters and matrices. The accuracy assessment is expressed as percent recovery interval from:

$$R' + [(3)\ S_r] = \textit{upper control level.}$$
$$R' + [(2)\ S_r] = \textit{upper warning level.}$$

down to: $R' - [(2)\ S_{ir}] = \textit{lower warning level.}$
$R' - [(3)\ S_r] = \textit{lower control level.}$

The precision and accuracy control charts for selected parameters will be updated on a regular basis. After each five to ten new measurements are added, the average of the most current twenty to thirty data points and the standard deviation of the average will be updated.

14 CORRECTIVE ACTION

14.5 Field Activities: Field activities that are improper will be corrected as quickly as possible. The project field manager or designated field team leader will be responsible to see that corrective action is initiated and documented; whenever the error has the potential to compromise the quality of the data being generated or there is a chance that the error might be repeated. The Quality Manager can also make recommendations, during the field audits or field data reviews, to the field manager who can ensure immediate implementation. The corrective action report must document in detail the nature of the problem, proposed corrective action, who is responsible for executing it, and who will verify that it was carried out. Examples for frequently measured parameters in the field and limits to which they should agree (as determined by replicate measurements or prior expectations) include:

- pH determination should agree within 0.02 pH units.
- Conductivity measurements should agree within 2 numbers of the last significant digit.
- Depth to water level determinations/readings should agree within 0.01 foot. If re-measurements are not successful, then instrument calibration and operation and the field analyst technique should be evaluated.

14.6 Laboratory Activities: When the performance of analytical systems is found to be unsatisfactory, corrective action will be initiated. The General Manager, Laboratory Operations Coordinators, Laboratory Managers, Project Personnel, Laboratory Supervisor, Analyst/Technician, and Quality Officer may be involved in the corrective action depending on the extent of the correction. For corrective actions that will impact the project budget or schedule, the general manager, laboratory operations coordinators, and/or the project manager/coordinator must be closely involved. There are two kinds of corrective action:

- Immediate corrective actions are taken to correct or repair nonconforming equipment and systems. The need for such action is likely to be identified by the analyst through calibration checks and spike analyses. Immediate corrective actions are initiated by notifying the Laboratory Supervisor and/or Laboratory Manager. If re-analysis using a separate aliquot of sample along with the associated quality control is not possible, the General Manager and/or Laboratory Operations Directors must be notified and written notification must be provided to the client within one working day.
- Long-term corrective actions are taken to eliminate causes of nonconformance. The need for such a corrective action may be identified through audits. Examples of this type of corrective action include:
  - Identifying vendors to supply reagents of sufficient purity;
  - Rescheduling of field activity or laboratory routine to ensure that samples are always analyzed within the correct holding time; and
  - Personnel training or replacement.

14.7 Corrective Actions Procedures: Corrective actions may be initiated as a result a problem identified through a system or performance audit, data review, or data end user's request. The process is generally initiated by the Quality Control Manager or Laboratory Manager and documented with a system performance log by the analyst or laboratory supervisor responsible for the data. The analyst has the ultimate responsibility of evaluating the effectiveness of the

corrective actions. If the corrective action is ineffective, it is the analyst's responsibility to notify the Laboratory Supervisor and/or Laboratory Manager. Laboratory management must verify that corrective actions have been effective by performing a follow-up data review, submitting a proficiency sample or performing other internal audit activities. For either immediate or long-term corrective actions taken as a result of non-conformance in field and laboratory activities, the procedure is as follows:

- Define the problem;
- Assign the responsibility to appropriate personnel to investigate the problem;
- Find and describe the cause of the problem;
- Determine the appropriate corrective action to eliminate the problem;
- Assign and accept responsibility for implementing the corrective action;
- Establish the effectiveness of the suggested corrective action and implement the correction;
- Verify that the corrective action has achieved its goal and the problem has been eliminated, i.e., in the preparation of new standard or calibration solutions, provided the results of the old together with the new calibration standards verify that the problem has been eliminated.

Occasionally data is reported when the accompanying quality control data are not within established quality control objectives, sample hold times have been exceeded, clients request data be reported below the laboratory's established reporting limits or some other reason the data is not to standard. These instances are documented in the final analysis results by using data qualifier codes (flags) to alert the data end user to the fact that the data may only be used within limitations. Final reports may also have a parameter comment that is added by the analyst to qualify a result when the data management codes do not suffice or additional qualification is needed.

FIGURE 7:

DATA QUALIFIERS	
Qualifier	Description
B	Analyte detected in the associated Method Blank
E	Value estimated due to calibration range exceedence
H	Sample extraction/analysis holding time exceeded
J	Analyte detected at less than the PQL
R	RPD exceeds accepted recovery limits
S	Spike/Surrogate Recovery exceeds accepted recovery limits
ND	Analyte not detected at the MDL or PQL
TIC	Tentatively Identified Compound, Estimated Concentration
Specific corrective action procedures per method are further discussed in REIC's SOPs	

14.8 Non-Conforming Work: If at any time it is determined that any aspect of the analytical process has compromised the Laboratory's ability to generate defensible data the analyst must notify the Laboratory Supervisor/Manager immediately. The Laboratory Supervisor/Manager must review the data and notify the Laboratory Operations Coordinators and/or General Manager. Clients must then be notified in writing (e-mail is acceptable) of the irregularity by the Project Manager/Coordinator within the notified working day. This policy applies to

situations in which the Laboratory Supervisor/Manager and Laboratory Operations Coordinators and/or General Manager have determined that the significance of the irregularity justifies recalling work that has already been released or when the Laboratory has decided that it will not report results that are considered invalid. This policy does not apply to those situations in which a data qualifier/flag or sample note can be used to qualify the data. Corrective actions described previously in this chapter must be taken immediately to remedy the situation.

15 QUALITY ASSURANCE (QA) REPORT TO MANAGEMENT

The General Manager will be updated of the quality control procedures and results of field and laboratory operations. Oral reports will be on a weekly basis and formal detailed reports on a periodic basis (or as needed). The quality assurance report issued, as part of the report to the client, shall be retained as part of the project file and may not be available for review by any other external auditor other than the client.

Management shall also receive quality assurance reports as they are obtained from external systems or performance audits. The Quality Manager will provide a formal report to management on a periodic basis. The report may include:

- Overall over-view of the progress of the QA program.
- Changes in the project specific QA plans, training, and accomplishments.
- Summaries of field audits and laboratory quarterly audits Summaries of findings of monthly analytical data packages review.
- Significant QA/QC problems, recommended solutions, and results of corrective actions.
- Response to external audit findings and any corrective action implemented.

16 SUBCONTRACTING, SUPPORT SERVICES, AND SUPPLY PURCHASING

16.1 Subcontracting Laboratory Services – A listing is maintained of laboratories that provide subcontracted services for REIC along with copies of all associated certifications (such as NELAC, USACE, and state certifications). A Chain-of-Custody is generated by REIC prior to sending or initiating services from the subcontracted laboratory. All associated documentation provided by the subcontractor for a specific project is included as an appendix to REIC's final analysis report (Certificate of Analysis) that is submitted to the client.

16.2 Outside Support Services and Supplies – REIC only uses those outside support services and supplies that are of adequate quality to sustain confidence in the laboratory's tests. Records of all suppliers for support services or supplies required for tests are maintained by the purchasing department.

16.3 Inspection/Acceptance Requirements for Supplies and Consumables – Prior to acceptance of any supplies and consumables, the items are checked for breakage. Any discrepancies in the packing lists are noted. The packing slips are given to the purchasing department for filing. Please refer to the SOP on Purchasing Services and Supplies for more detailed information.

16.4 Customer Complaint Resolution – In its commitment to quality improvement, REIC has implemented a "Client Concerns" program to address complaints and issues regarding data quality. The program is intended to address the following areas of concern:

- Sample turnaround time
- Data quality
- Invoicing
- Customer service

Client concerns are given a unique numerical identifier and can be initiated by any REIC staff member. All concerns are reviewed by the General Manager and Laboratory Operations Directors and copies are filed with REIC's Project Managers/Coordinators. These files are available to clients for review except in the case where client confidentiality may be compromised. REIC's Client Concerns SOP further addresses how complaints are registered, documented, and brought to closure (changes is procedure, corrective action taken, etc.).

17 REFERENCES

17.1 Code of Federal Regulations; Part 136 (40 CFR 136); U.S. Government Printing Office: Washington, DC. Web Address: http://ecfr.gpoaccess.gov/cgi. (Updated daily.)

17.2 Method for the Determination of Organic Compounds in Drinking Water; EPA/600/4-88/039, Dec. 1988; Revised July 1991; appended with "Supplement I", EPA/600/4-90/020, July 1990; "Supplement II", EPA/600/R-92/129, Aug. 1992; and "Supplement III", EPA/600/R-95/131, August 1995. U.S. EPA.

17.3 Manual for the Certification of Laboratories Analyzing Drinking Water, Fifth Edition, EPA/815-R-05-004. January 2005. U.S. EPA.

17.4 Methods for Chemical Analysis of Water and Wastes; EPA/600/4-79/020; March 1983, U.S. EPA.

17.5 Annual Book of ASTM Standards, Vol. 11.01 and Vol. 11.02; American Society for Testing and Materials, Philadelphia, PA. http://www.astm.org

17.6 18th Edition of Standard Methods for the Examination of Water and Wastewater; American Public Health Association, Washington, DC.

17.7 Methods for the Determination of Metals in Environmental Samples; EPA/600/4-91/010, June 1991; appended with Supplement I, EPA/600/R-94/111, May 1994; USEPA.

17.8 Methods for the Determination of Inorganic Substances in Environmental Samples; EPA/600/R-93/100; Aug. 1993, USEPA.

17.9 Technical Notes on Drinking Water Methods; EPA/600/R-94/173; Oct. 1994, U.S. EPA.

17.10 Microbiological Methods for Monitoring the Environment, Water and Waste; EPA/600/8-78/017, Dec. 1978; U.S. EPA.

17.11 Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, Fifth Edition; EPA/-821-R-02-012, October 2002; U.S. EPA.

17.12 Test Methods for Evaluating Solid Waste, Physical / Chemical Methods, Third Edition, SW-846; Nov. 1986; revised by Revision I, Dec. 1987; amended by Update I, July 1992; Update IIA, Aug. 1993; and Update II, Sept. 1994; and Update IIB, Jan. 1995; Update III, June 1996, Revision 5, December 1996. U.S. EPA. http://www.epa.gov/epaoswer/hazwaste/test/main.htm.

17.13 Contract Laboratory Program Statement of Work for Inorganic Analysis, Multi-Media, Multi-Concentration; Document No(s). ILM 05.2, 2002; U.S. EPA.

17.14 Contract Laboratory Program Statement of Work for Organic Analysis, Multi-Media, Multi-Concentration; Document No. OLM04.3, 2003; U.S. EPA.

17.15 Superfund Analytical Methods for Low Concentration in Water for Inorganics Analysis; Oct. 1991, U.S. EPA.

17.16 Superfund Analytical Methods for Low Concentration in Water for Organics Analysis; Oct. 1992, U.S. EPA.

17.17 Code of Federal Regulations; Part 503 (40 CFR 503); for EPA Standards for the Use or Disposal of Sewage Sludge; U.S. EPA

17.18 Publicly Owned Treatment Works (POTW) Sludge Sampling and Analysis Guidance Document; Office of Water Permits Division; 1989; U.S. EPA.

17.19 Drinking Water Monitoring and Analytical Requirements, Coliform Sampling; Title 40, Part 141, Subpart C of the Code of Federal Regulations(40 CFR 141.21)

17.20 Short-Term Methods for Estimating the Chronic Toxicity of Effluent and Receiving Waters to Freshwater Organisms, 3rd Edition; EPA/600/4-91/002, July 1994; Environmental Monitoring Systems Laboratory, U.S. EPA, Cincinnati, OH.

17.21 Short-Term Methods for Estimating the Chronic Toxicity of Effluent and Receiving Waters to Marine and Estuarine Organisms, Third Edition; EPA/600/4-91/003, July 1994; Environmental Monitoring Systems Laboratory, U.S. EPA, Cincinnati, OH.

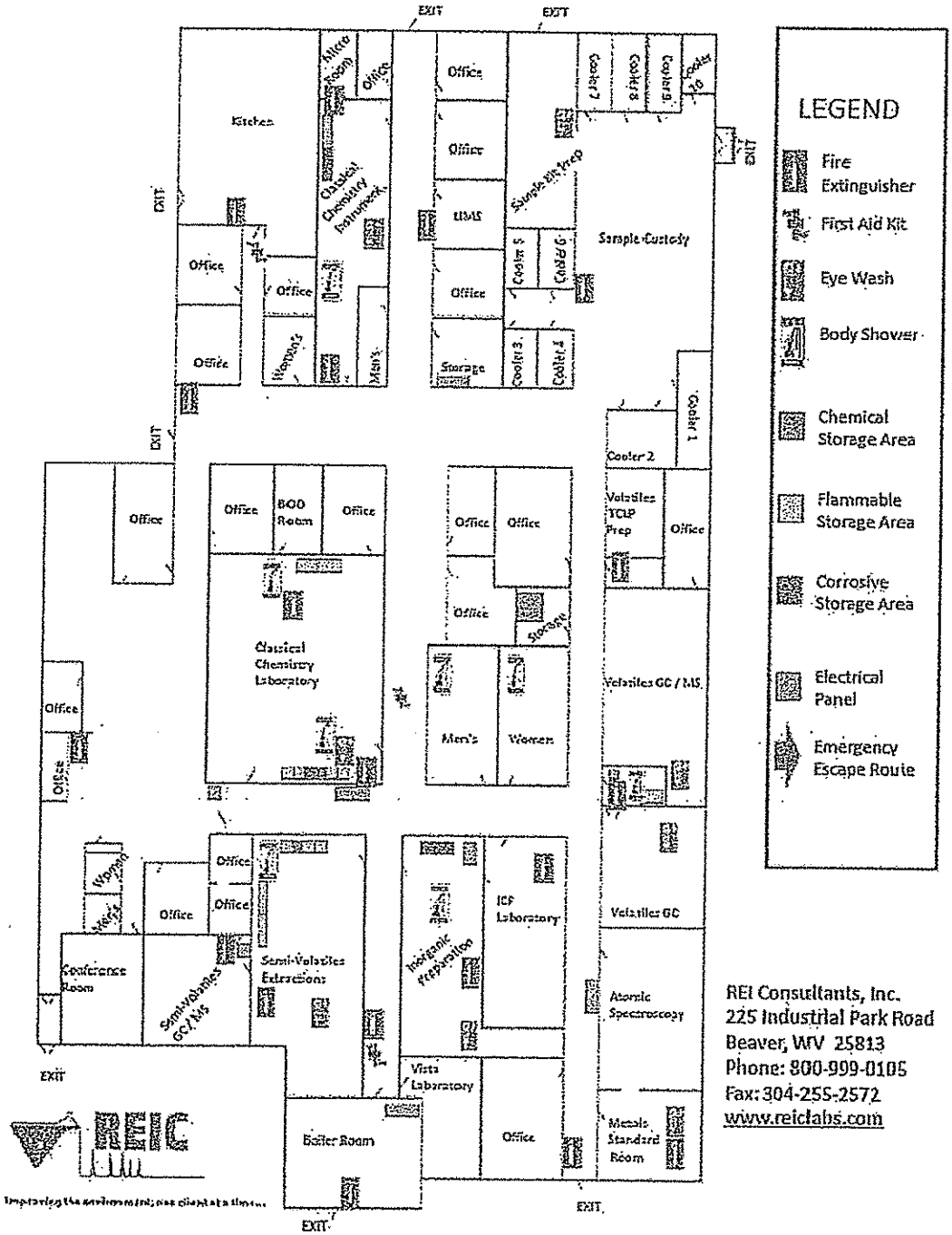
17.22 RCRA Groundwater Monitoring Technical Enforcement Guidance Document (TEGD); OSWER-9950.1, Sept. 1996; updated by RCRA Ground-Water Monitoring: Draft Technical Guidance; EPA/530/R-93/001, Nov. 1992; Office of Solid Waste, U.S. EPA.

17.23 Region II CERCLA Quality Assurance Manual; Revision 1; U.S. EPA 1989.

17.24 Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses; EPA/540/R-94/013 February 1994, Hazardous Site Evaluation Division, U.S. EPA.

17.25 Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses; EPA/540/R-94/082, Dec. 1994, Hazardous Site Evaluation Division, U.S. EPA.

APPENDIX A1: REI Consultants, Inc. – Beaver – Floor Plan



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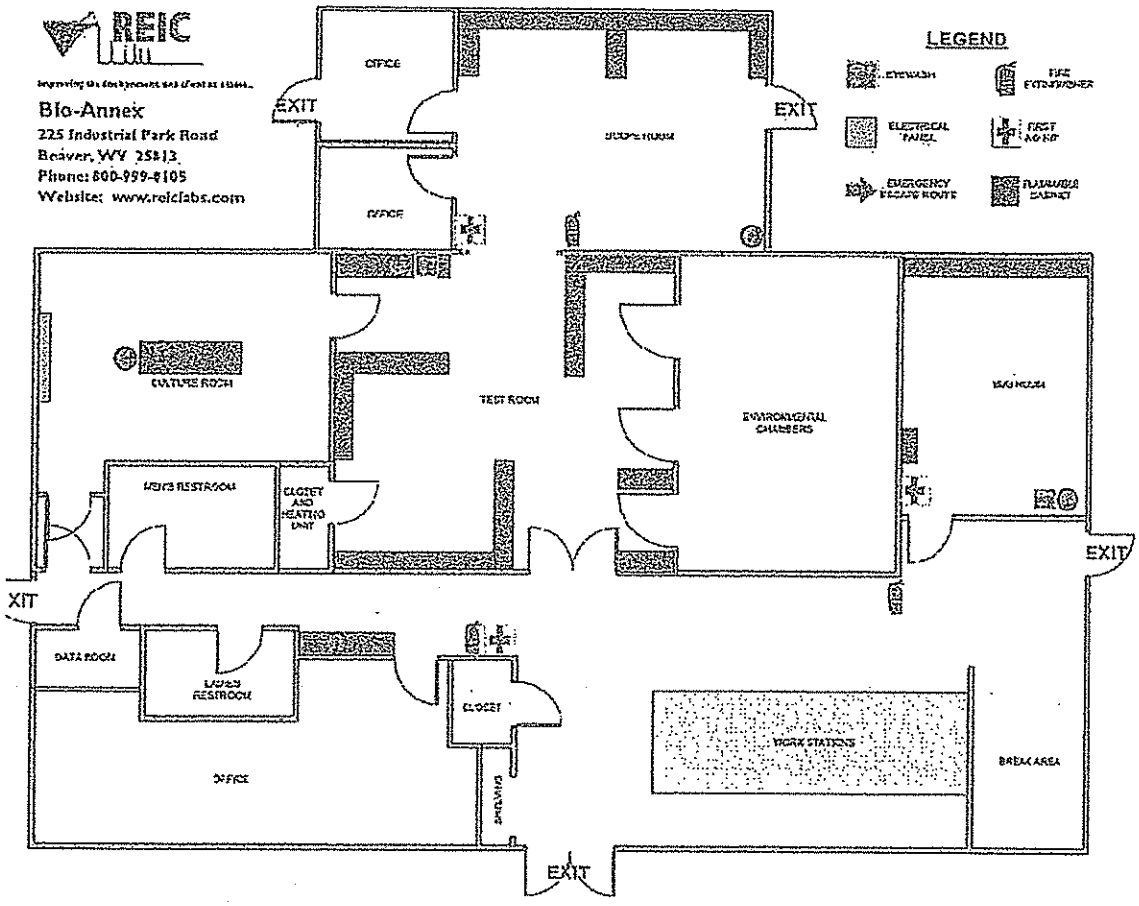
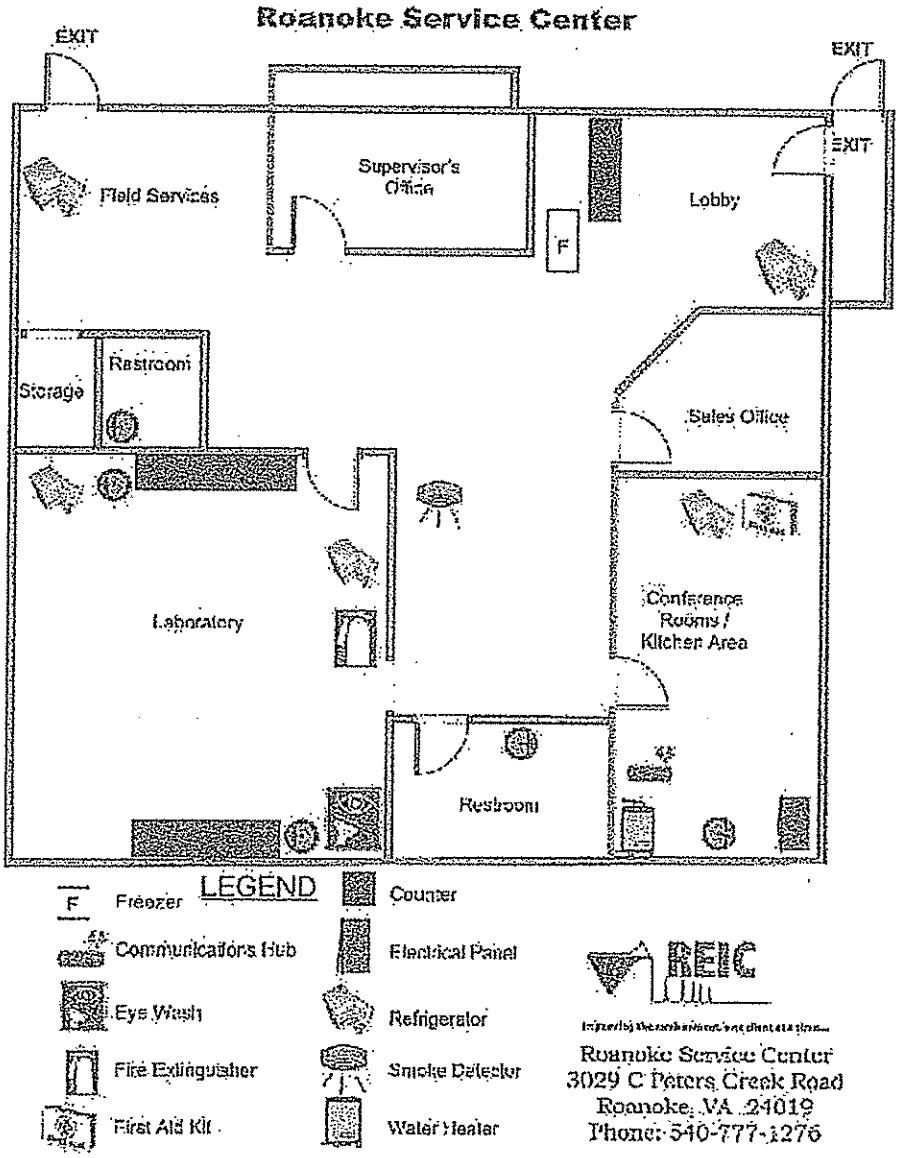
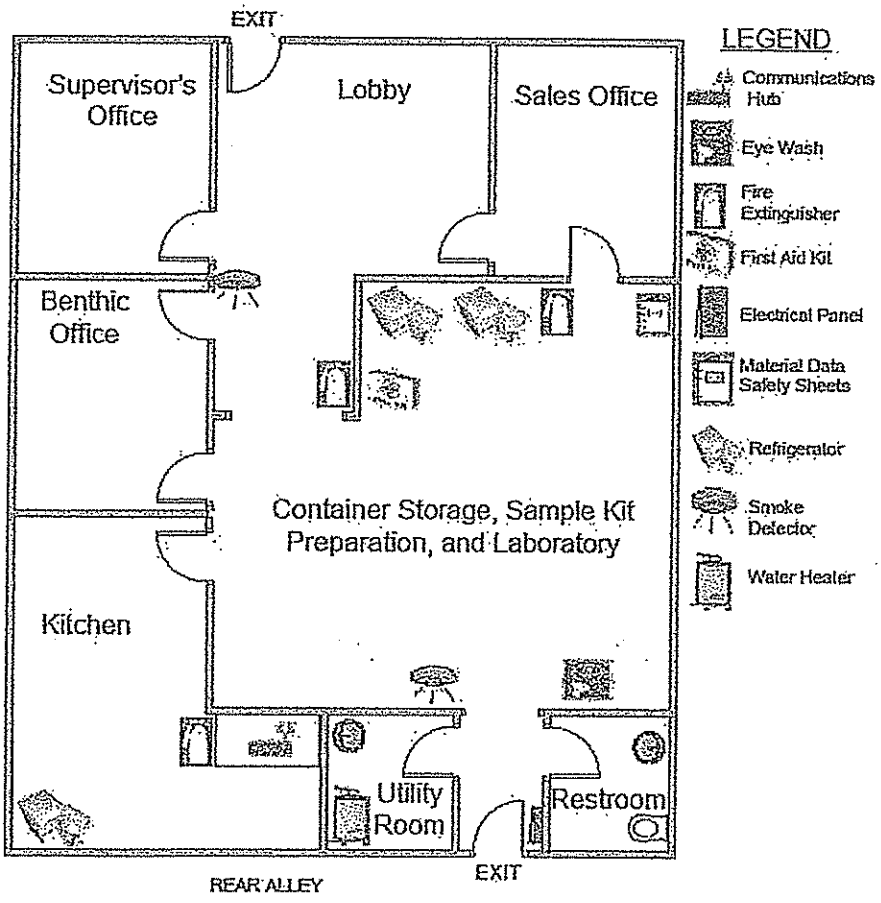
APPENDIX A2: REI Consultants, Inc. – Bioassay – Floor Plan



APPENDIX A3: REI Consultants, Inc. – Roanoke Service Center – Floor Plan

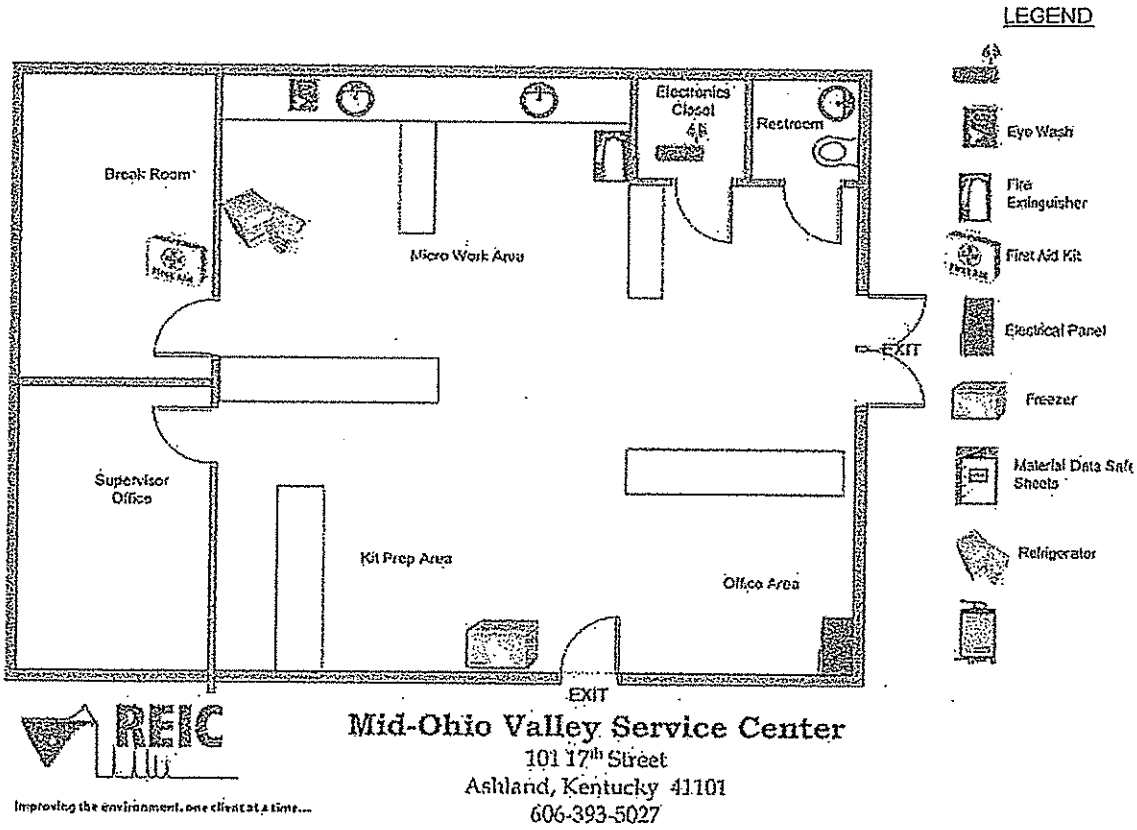


APPENDIX A4: REI Consultants, Inc. – Shenandoah Service Center – Floor Plan

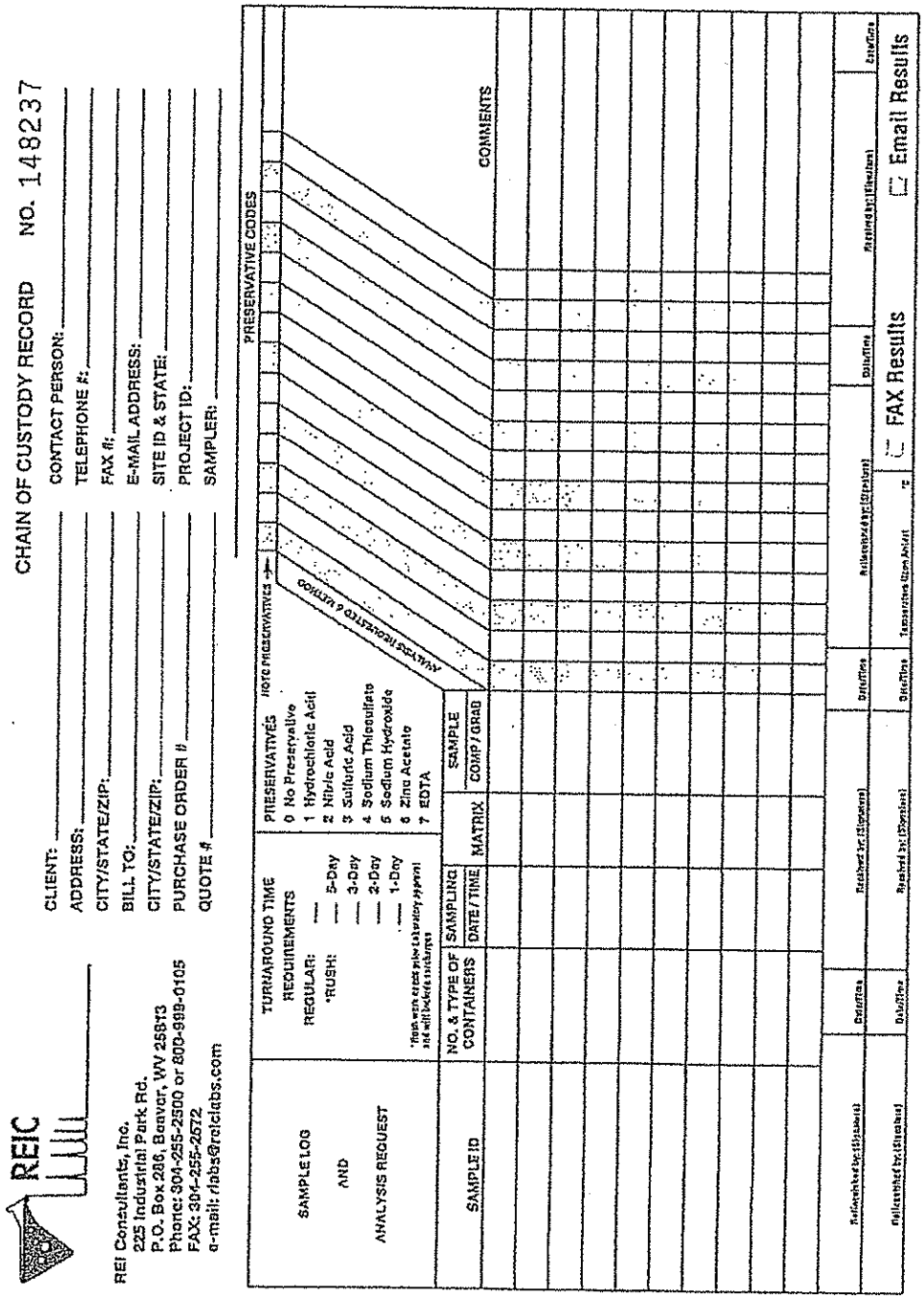


Shenandoah Service Center
1557 Commerce Road
Suite 201
Verona, VA 24482

APPENDIX A5: REI Consultants, Inc. – Mid Ohio Valley Service Center – Floor Plan



APPENDIX B1: REI Consultants, Inc. - Chain of Custody (COC)



APPENDIX B2: REI Consultants, Inc. - Chain of Custody (COC) Bioassay

REIC

RESEARCH ENVIRONMENTAL & INDUSTRIAL CONSULTANTS, INC.

225 Industrial Park Rd.
Post Office Box 286
Beaver, WV 25813
800.999.0109
304.255.2500 (p) 304.255.2572 (fax)
Website: www.reiclabs.com

TOXICITY TESTING
Chain Of Custody

Member:
American Chemical Society
Association of Official Analytical Chemists
Petroleum Marketers Association
Rural Water Association
Mining & Reclamation Association
American Water Works Association
The Solid Waste Association of North America
West Virginia Manufacturers Association
Association of West Virginia Solid Waste Authorities
West Virginia Oil Marketers & Grocers Association

This section to be completed by person collecting sample

Client's Name: _____ Purchase Order #: _____
Mailing Address: _____
Contact Person: _____ Title: _____
Phone #: _____ E-mail Address: _____
Sampler's Name: _____ Title: _____
Sample Source: _____
NPDES Permit #: _____ Outfall #: _____
Receiving Stream: _____
Sample Appearance/Odor: _____
From where and how was sample collected: _____
Flow: _____ Number of Samples: _____ Interval: _____

Sample Type

Grab: Collected: Date: _____ Time: _____

Composite: Collected From: Date: _____ Time: _____
Collected To: Date: _____ Time: _____

Please indicate Test Type and Test Species

Test Type	Test Species
___ Acute	___ Pimephales promelas (Fathead Minnow)
___ Chronic	___ Ceriodaphnia dubia
___ Screen	___ Daphnia magna
	___ Daphnia pulex

Sample Field Readings

Temp.: _____ pH: _____ Cond.: _____ D.O.: _____ Chlorine: _____
Ice Remaining: _____ Ice/Water Temperature: _____
Initials: _____ Date/Time: _____ Rain Event: _____
Volume collected: _____ Container Type: _____
Is the sample Chlorinated: _____ Dechlorinated: _____
Dechlorination Method: _____ Should REIC Dechlorinate sample?: _____
Date and Method of shipment to REIC: _____
Relinquished By: _____ Received By: _____
Relinquished By: _____ Received By: _____

For REIC Use Only

Sample ID #: _____ Received By: _____
Date and Time: _____
Sample Appearance on Arrival: _____
Temp.: _____ pH: _____ Cond.: _____ D.O.: _____ Chlorine: _____ Odor: _____
Sample storage during shipment: _____

APPENDIX B3: REI Consultants, Inc. Chain of Custody - (COC) (Roanoke)

REIC

PRIVATE DRINKING WATER BACTERIOLOGICAL REPORT No. 0001018

RESEARCH ENVIRONMENTAL & INDUSTRIAL CONSULTANTS, INC.

Roanoke Service Center:
3025-B Peters Creek Rd., Roanoke, VA 24019
540.777.1276
540.400.8508 (fax)

DRINKING WATER LAB ID: VA 00270

Name _____

Address _____

City/State/Zip _____ Phone _____

SAMPLE SOURCE: ___ WELL ___ CISTERN ___ SPRING ___ OTHER (Specify): _____

Address (City/State/Zip _____

Collection Date _____ Time _____ By _____

SPECIAL REMARKS / COMMENTS:

Relinquished By _____ DATE/TIME _____

DO NOT WRITE BELOW THIS LINE

Received By _____ Date/Time _____ Temperature upon Arrival _____

SAMPLE ANALYSIS
Date _____
Time _____
Analyst _____

LABORATORY RESULTS - Standard Methods 9223B

TOTAL COLIFORM ___ PRESENT ___ ABSENT

E. COLI ___ PRESENT ___ ABSENT

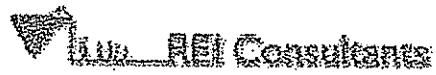
PAID _____ DATE ____ INITIALS

SPECIAL REMARKS / COMMENTS _____

APPROVED BY _____ DATE _____

LAB

APPENDIX C1: REI Consultants, Inc. - Corporate Code of Ethics



CORPORATE CODE OF ETHICS

REI CONSULTANTS, INC.
AND SUBSIDIARY COMPANIES

1. GENERAL POLICY: This Code is established to protect REI Consultants, Inc. (REIC) its clients and its employees from actual or potential conflicts of interest and unlawful acts, and to ensure that only the highest of professional ethics are incorporated in all facets of work. Every effort must be made to ensure that all business decisions, products, and interactions are initiated and completed in a manner characteristic of honest, responsible and equitable actions.
2. CLIENT PRODUCTS AND INTERACTIONS: All products, including data, reports, conclusions and communications will be carried out in a professional and responsible manner. All evaluations, data reduction, conclusions, reports and other activities relating to client projects will be performed in an objective, sound scientific manner and in accordance with Good Laboratory Practices (GLP) guidelines. Open and honest communications will be provided to approved client representatives and be available for the primary purpose of clarifications or resolving problems. All documents, information, data, reports, communications and other items of client interaction will be protected and held confidential within REIC and not be transferred or communicated to anyone outside REIC, other than to an approved client representative.
3. CONFLICTS OF INTEREST: Employees will report, through their immediate supervisor, any financial or employment interests in any business (1) which directly competes with REIC or (2) which supplies REIC with a substantial amount of goods or services or (3) which sells to REIC a substantial part of its output or (4) which is directly involved with any specific client. This does not apply to an interest as a security holder in companies whose securities are listed on any national securities exchange or traded over the counter by members of the National Association of Securities Dealers, unless it exceeds approximately 5% of voting control. This applies to the employee or any member of his/her immediate family.
4. BRIBES, PAYOFFS, KICKBACKS AND RECEIPT OF GIFTS:
   A. Employees or members of their immediate families should not enter into any agreement, arrangement or device by way of fee, rebate, loan advance, consultant agreement, legal representation or otherwise, designed or intended to reward directly or indirectly, any governmental agency or employee, official or representative thereof, or any officer, director, employer or shareholder of any customer or potential customer for decisions or actions favorable to REIC. In short, nothing in the nature of a bribe, payoff, or kick back should be paid or accepted to secure or maintain business.
   B. Employees or members of their immediate families shall not seek or accept favors, gifts, payments, loans, travel, lodging, entertainment or the equivalent from any vendor, potential vendor or other party with whom REIC does business. Promotional gifts of a nominal value motivated by commonly accepted business courtesies, such as hats, mugs and pens may be accepted, but not if acceptance of such gifts could infer prejudice toward or obligation to the donor. Providing and receiving normal business entertainment, such as lunches and dinners, is allowed provided such activities are not frequent or lavish. Other forms of entertainment, such as theater and sporting event tickets, golf dates or other outings may be accepted only if it is practical for the employee to reciprocate. If reciprocation is not possible, the employee should obtain supervisory approval. Approval of attendance of conventions and other meetings where entertainment is customary and provided on a group basis shall satisfy the requisite supervisory approval. Nothing in the nature of a bribe, payoff, or kickback will be accepted from any existing or potential vendor or other party with whom REIC does business.
5. POLITICAL CONTRIBUTIONS: No Company funds or services will be contributed, directly or indirectly, to any political campaign of any person seeking political office or expended in support of or opposition to such party or person except to the extent that REIC resources (including time of employees) may be utilized to maintain the operation of legally organized Political Action Committees as permitted by applicable law.
6. DISCLOSURE AND USE OF PROPRIETARY INFORMATION
   A. Company and client information not generally available to the public shall not be used by employees directly or indirectly, for their own personal gain, nor shall it be provided for the use of others (see Section 2). Specifically, such non-public information shall not be used in connection

with the purchase, sale or trading of Company securities. Use or dissemination of such information for these purposes can result in both civil and criminal penalties.

B. An employee shall not copy data, reports, communications, licensed or copyrighted software, or instruction manuals for personal use.

7. USE, DISPOSITION AND PROTECTION OF COMPANY ASSETS:
   A. Employees shall not knowingly cause REIC to use any funds or other assets or provide any services, for any purpose that is unlawful under the laws of the United States, any state thereof, or any jurisdiction, foreign or domestic.
   B. Employees of REIC or any subsidiary shall not use Company funds to create any undisclosed or unrecorded Company assets for any purpose.
   C. No payment on behalf of REIC or any subsidiary shall directly or indirectly be approved or made with the intention or understanding that part of such payments is to be used for any purpose other than that described by the properly approved document supporting the payment.
8. BOOKS AND RECORDS:
   A. All supervisors are responsible for enforcement of compliance by employees who are subject to this Code of Ethics, as well as to ensure such employee's knowledge and compliance therewith.
   B. Any employee having information of any violation of this Code of Ethics must report such information or knowledge promptly to the appropriate level of management within that employee's company.
   C. Appropriate disciplinary action shall be taken with respect to any violation of the Code of Ethics.

9. PROFESSIONALISM: REIC functions and communicates to clients in a manner consistent with the highest of current professional standards. Client confidentiality and privacy is maintained at all times; and responses to inquiries are approved by the client prior to verbal or written correspondence.

In cases where possible problems or errors are encountered, REIC openly discusses potential areas of concern and will readily communicate difficulties or mistakes to its clients. Open, frank and professional interactions are required for all staff and subcontractors within the REIC organization.

☐ I have read and agree to conduct all of my activities and responsibilities in conjunction with REIC's Corporate Code of Ethics.

Name

Signature Date

APPENDIX C2: REI Consultants, Inc. - Ethics and Data Integrity Agreement

REI Consultants ETHICS AND DATA INTEGRITY AGREEMENT

I. *I, _____, state that I understand the high standards of integrity required of me with regard to the duties I perform and the data I report in connection with my employment at REI Consultants.*

II. *I agree that in the performance of my duties at REI Consultants:*

a. *I shall not intentionally report data values that are not the actual values obtained;*
b. *I shall not intentionally report the dates and times of data analyses that are not the actual dates and times of data analyses; and*
c. *I shall not intentionally represent another individual's work as my own.*

III. *I agree to inform REI Consultants of any accidental reporting of non-authentic data by myself in a timely manner.*

IV. *I agree to inform REI Consultants of any accidental or intentional reporting of non-authentic data by other employees.*

_____
(Signature)

_____
(Date)

APPENDIX C3: REI Consultants, Inc. - Quality Agreement

REI Consultants QUALITY ASSURANCE AGREEMENT

I. *I, _____, state that I have read Revision 25 of the Quality Manual and completed annual training on Quality Assurance Measures as they apply to my employment with REI Consultants.*

II. *I agree that in the performance of my duties at REI Consultants:*

a. *I shall maintain complete documentation of all analyses to allow for the verification of the work performed*
b. *I shall strive for early identification of quality issues and will take the appropriate corrective action;*
c. *I shall maintain compliance with all Data Quality objectives and method criteria that are applicable to my work; and*
d. *I shall apply the same quality directives to the review and validation of other analysis work.*

III. *I agree to inform REI Consultants of any issues that would compromise the quality of my analyses.*

_____
(Signature)

_____
(Date)

APPENDIX D: REI Consultants, Inc. - NELAC Certification Statement

REI Consultants, Inc.

NELAC Certification Statement

The applicant understand and acknowledges that REI Consultants, Inc. is required to be continually in compliance with the National Environmental Laboratory Accreditation Conference (NELAC) standards, and shall be subject to suspension, revocation, and denial of accreditation as specified therein.

I hereby certify that I am authorized to sign this application on behalf of the applicant/owner and that there are no misrepresentations in my answers to the questions on this application.

Brenda J. Barnett — Brenda J. Barnett — 8-27-07
(Signature, QA Officer) (Printed Name / QA Officer) Date

C. Hail — Clarence L. Hail — 28 Aug 2007
(Signature, Laboratory Manager) (Printed Name/Laboratory Manager) Date

APPENDIX E1: Demonstration of Capability – Analyst - Volatiles

REIC

Analyst
Demonstration of Capability
Certification Statement

Department:		Analysis Date:		Batch Ref #:	
Analyst:		Analysis Date:		Batch Ref #:	
Supervisor:		Analysis Date:		Batch Ref #:	
Method / Test Code:		Analysis Date:		Batch Ref #:	
SOP #:				Revision #:	
Analytes:					

We the undersigned, CERTIFY that:

1) The analytsts identified above, using the cited test method (s), which is in use at the facility for the analysis of samples under the National Environmental Laboratory Accreditation Conference (NELAC) Program, have met the Demonstration of Capability (DOC).

2) The analyst identified on this certification performed the test method (s).

3) A copy of the test method (s) and the laboratory-specific Standard Operating Procedures (SOP) are available for all personnel on site. Standard Operating Procedures are located electronically on in the Laboratory Information Management System (LIMS).

4) The data associated with the Demonstration of Capability (DOC) are true, accurate, and complete and self-explanatory (1).

5) All raw data (including a copy of this Certification Form) necessary to reconstruct and validate these analyses have been retained at the facility, and that the associated information is well-organized and available for review by authorized assessors.

_____ Date: _____
Analyst

_____ Date: _____
Organic Laboratory Manager

_____ Date: _____
Quality Program Manager

(1): True: Consistent with Supporting Data.
Accurate: Based on good laboratory practices consistent with sound scientific principles / practices.
Complete: Includes the results of all supporting performance standing.
Self-Explanatory: Data properly labeled and stored so that the results are clear and require no additional explanations.

REI Consultants, Inc. 225 Industrial Park Road, Beaver, WV 25813 Phone: 800-999-0105 Fax: 304-255-2572
reiclabs.com

APPENDIX E2: Demonstration of Capability – Analyst – Semi - Volatiles

REIC Lab

Analyst
Demonstration of Capability
Certification Statement

Department:		Analysis Date:		Batch Ref #:	
Analyst:		Analysis Date:		Batch Ref #:	
Extractionist:		Analysis Date:		Batch Ref #:	
Supervisor:		Analysis Date:		Batch Ref #:	
Method / Test Code:		SOP #:			
Extraction Code:		Revision #:			
Analytes:					

We the undersigned, CERTIFY that:

1) The analysts identified above, using the cited test method (s), which is in use at the facility for the analysis of samples under the National Environmental Laboratory Accreditation Conference (NELAC) Program, have met the Demonstration of Capability (DOC).

2) The analyst identified on this certification performed the test method (s).

3) A copy of the test method (s) and the laboratory-specific Standard Operating Procedures (SOP) are available for all personnel on site. Standard Operating Procedures are located electronically on in the Laboratory Information Management System (LIMS).

4) The data associated with the Demonstration of Capability (DOC) are true, accurate, and complete and self-explanatory (1).

5) All raw data (including a copy of this Certification Form) necessary to reconstruct and validate these analyses have been retained at the facility, and that the associated information is well-organized and available for review by authorized assessors.

_____ _____
Analyst Date:

_____ _____
Organic Laboratory Manager Date:

_____ _____
Quality Program Manager Date:

(1): True: Consistent with supporting data.
Accurate: Based on good laboratory practices consistent with sound scientific principles / practices.
Complete: Includes the results of all supporting performance standing.
Self-Explanatory: Data properly labeled and stored so that the results are clear and require no additional explanations.

REI Consultants, Inc. 225 Industrial Park Road, Beaver, WV 25813 Phone: 800-999-0105 Fax 304-255-2572
reiclabs.com

APPENDIX E3: Demonstration of Capability –Extraction Technician

REI Labs

Extraction Technician
Demonstration of Capability
Certification Statement

Department:		Analysis Date:		Batch Ref #:	
Examination:		Analysis Date:		Batch Ref #:	
Analyst:		Analysis Date:		Batch Ref #:	
Supervisor:		Analysis Date:		Batch Ref #:	
Method / Test Code:		SOP #:			
Extraction Code:		Revision #:			

We the undersigned, CERTIFY that:

1) The analysis identified above, using the cited test method (s), which is in use at the facility for the analysis of samples under the National Environmental Laboratory Accreditation Conference (NELAC) Program, have met the Demonstration of Capability (DOC).

2) The analyst identified on this certification performed the test method (s).

3) A copy of the test method (s) and the laboratory-specific Standard Operating Procedures (SOP) are available for all personnel on site. Standard Operating Procedures are located electronically on in the Laboratory Information Management System (LIMS).

4) The data associated with the Demonstration of Capability (DOC) are true, accurate, and complete and self-explanatory(1).

5) All raw data (including a copy of this Certification Form) necessary to reconstruct and validate these analyses have been retained at the facility, and that the associated information is well-organized and available for review by authorized assessors.

_____ Date: _____

Extraction Technician

_____ Date: _____

Organic Laboratory Manager

_____ Date: _____

Quality Program Manager

(1): True: Consistent with Supporting Data.
Accurate: Based on good laboratory practices consistent with sound scientific principles / practices.
Complete: Includes the results of all supporting performance standing.
Self-Explanatory: Data properly labeled and stored so that the results are clear and require no additional explanations

REI Consultants, Inc. 225 Industrial Park Road, Beaver, WV 25813 Phone: 800-999-0105 Fax: 304-255-2572
reiclabs.com

APPENDIX E4: Demonstration of Capability – Work Cell / Group

REIC

Work Cell / Group
Demonstration of Capability
Certification Statement

Department: _____ SOPs: _____ Revision #: _____

Test Methods: _____

_____

_____

We the undersigned, CERTIFY that:

1) The analytsts identified above, using the cited test method (s), which is in use at the facility for the analysis of samples under the National Environmental Laboratory Accreditation Conference (NELAC) Program, have met the Demonstration of Capability (DOC).

2) The analyst identified on this certification performed the test method (s).

3) A copy of the test method (s) and the laboratory-specific Standard Operating Procedures (SOP) are available for all personnel on site. Standard Operating Procedures are located electronically on in the Laboratory Information Management System (LIMS).

4) The data associated with the Demonstration of Capability (DOC) are true, accurate, and complete and self-explanatory [1].

5) All raw data (including a copy of this Certification Form) necessary to reconstruct and validate these analyses have been retained at the facility, and that the associated information is well-organized and available for review by authorized assessors.

_____ Date	_____ Date
Analyst	Analyst
_____ Date	_____ Date
Analyst	Analyst
_____ Date	_____ Date
Analyst	Laboratory Supervisor
_____ Date	_____ Date
Laboratory Manager	Quality Program Manager

(1): True: Consistent with Supporting Data.
Accurate: Based on good laboratory practices consistent with sound scientific principles / practices.
Complete: Includes the results of all supporting performance standing.
Self-Explanatory: Data properly labeled and stored so that the results are clear and require no additional explanations.

REI Consultants, Inc. PO Box 268, Beaver WV 25813 Phone: 800-985-0105 Fax: 304-255-2572 reiclabs.com
REI Consultants, Inc. 1281 Mt. View Road, Cool Ridge, WV 25825 Phone: 800-999-0105 Fax: 304-787-3700 reiclabs.com
REI Consultants, Inc. 3025-B Peters Creek Road, Roanoke, VA 24019 Phone: 540-777-1276 Fax: 540-400-5508 reiclabs.com

APPENDIX E5: Demonstration of Capability – Microbiological - Roanoke

REI

Microbiological
Demonstration of Capability
Certification Statement

Department:		Analysis Date:		Batch Ref#:	
Analyst:		Analysis Date:		Batch Ref#:	
Supervisor:		Analysis Date:		Batch Ref#:	
Method / Test Code:		Analysis Date:		Batch Ref#:	
SOP #:				Revision #:	
Analytes:					

We the undersigned, CERTIFY that:

1) The analysts identified above, using the cited test method (s), which is in use at the facility for the analysis of samples under the National Environmental Laboratory Accreditation Conference (NELAC) Program, have met the Demonstration of Capability (DOC).

2) The analyst identified on this certification performed the test method (s).

3) A copy of the test method (s) and the laboratory-specific Standard Operating Procedures (SOP) are available for all personnel on site. Standard Operating Procedures are located electronically on in the Laboratory Information Management System (LIMS).

4) The data associated with the Demonstration of Capability (DOC) are true, accurate, and complete and self explanatory [1].

5) All raw data (including a copy of this Certification Form) necessary to reconstruct and validate these analyses have been retained at the facility, and that the associated information is well-organized and available for review by authorized assessors.

Analyst	Date:
Laboratory Supervisor	Date:
Quality Program Manager	Date

[1] *True*: Consistent with supporting Data.
Accurate: Based on good laboratory practices consistent with sound scientific principles / practices.
Complete: Includes the results of all supporting performance standards.
Self-explanatory: Uses properly labeled and stored so that the results are clear and require no additional explanation.

REI Consultants, Inc. 3625-B Peters Creek Road, Roanoke, VA 24019 Phone: 540-777-2276 Fax: 540-400-8508
reiclabs.com

APPENDIX F1: Sample Containers, Preservation and Hold Times SDWA Samples

Sample Containers, Preservations and Holding Times: SDWA Samples						
Parameter/Method	Method	Preservative	Sample Holding Time	Extract Holding Time and Storage Conditions	Suggested Sample Size	Type of Container
Alkalinity	SM2320B	4^0 C	14 days		250 mL	Plastic or Glass
Asbestos	100.1/100.2	4^0C	48 hours		1L	Glass
Chloride	300	None	28 days		250 mL	Plastic or Glass
Chlorine, residual	SM4500Cl-G SM9222B	None	Immediately		250 mL	Plastic or Glass
Coliforms	SM9223B SM9222D SM9223-QT	Sodium Thiosulfate	6 hours		125 mL	Plastic, sterile
Color	SM2120B	4^0C	48 hours		250 mL	Plastic or Glass
Conductivity	SM2510B	4^0C	28 days		250 mL	Plastic or Glass
Cyanide	335.4	4^0C pH>12 w/ NaOH Ascorbic acid if chlorinated	14 days		250 mL	Plastic or Glass
Fluoride	300	None	1 month		250 mL	Plastic or Glass
Mercury	245.1	pH<2, HNO3	28 days		250 mL	Plastic or Glass
Metals (except Mercury)	200.7 200.8 200.9	pH<2, HNO3	6 months		500 mL	Plastic or Glass
Nitrate (chlorinated)	300	4^0C	14 days		250 mL	Plastic or Glass
Nitrate (non-chlorinated)	300	4^0C	48 hours		250 mL	Plastic or Glass
Nitrite	300	4^0C	48 hours		250 mL	Plastic or Glass
Nitrate + Nitrite	300	pH<2 H2SO4	28 days		250 mL	Plastic or Glass
Odor	SM2150B	4^0C	24 hours		500 mL	Glass
pH	SM4500H^+-B	None	Immediately		250 mL	Plastic or Glass
o-Phosphate	300	4^0C	48 hours		250 mL	Plastic or Glass
Silica	200.7	4^0C, pH<2, HNO3	28 days		250 mL	Plastic
Solids (Total Dissolved Solids)	SM2540C	4^0C	7 days		500 mL	Plastic or Glass
Specific Ultraviolet Absorbency (SUVA)	SM5910B SM5310C	4^0C	ASAP		250 mL	Amber glass
Sulfate	300	4^0C	28 days		250 mL	Plastic or Glass
Sulfide	SM4500S-E	4^0C Zinc Acetate, NaOH pH>12	7 days if preserved Same day if unpreserved		500 mL	Plastic or Glass
Temperature	SM2550B	None	Immediately		1L	Plastic or Glass

Sample Containers, Preservations and Holding Times: SDWA Samples						
Parameter/Method	Method	Preservative	Sample Holding Time	Extract Holding Time and Storage Conditions	Suggested Sample Size	Type of Container
Turbidity	SM2130B	4°C	48 hours		250 mL	Plastic or Glass
Base Neutral Acids and Pesticides	525.2	4°C dark pH<2 HCl Sodium Sulfite	14 days	30 days 4°C	1 L	Amber glass with PTFE lined cap
Carbamates	531.1	4°C pH<3 Sodium Thiosulfate, Monochloro-acetic Acid	28 days		60 mL X 2	Glass with PTFE lined cap
Chlorinated Acid (Herbicides)	515.1	4°C dark Sodium Thiosulfate	14 days	28 days 4°C , dark	1 L	Amber glass with PTFE lined cap
Chlorinated Pesticides/PCBs	508	4°C dark Sodium Thiosulfate	7 days	14 days 4°C , dark	1 L	Glass with PTFE lined cap
Diquat/Paraquat	549.2	4°C dark Sodium Thiosulfate (pH<2 H2SO4 if biologically active)	7 days	21 days	500 mL	Amber PVC high density plastic with PTFE lined cap
EDB/DBCP	504.1	4°C Sodium Thiosulfate	14 days	24 hours 4°C	40 mL X 2	Glass with PTFE lined cap
Endothall	548.1	4°C Dark Sodium Thiosulfate (pH 1.5-2 w/ HCl if biologically active)	7 Days	13 days 4°C	40 mL X 2	Amber glass with PTFE lined cap
Glyphosate	547	4°C Sodium Thiosulfate	14 days (18 months if frozen)		1 L	Amber glass with PTFE lined cap
Haloacetic Acids	552.2	4°C dark Ammonium chloride	14 days	7 days 40C , dark 14 days 100°C	60 mL X 2	Amber glass with PTFE lined cap
Nitrogen/Phosphorus Pesticides	507	4°C dark Sodium Thiosulfate	14 days	14 days 4°C , dark	1 L	Amber glass with PTFE lined cap
PCBs	508A	4°C	14 days	30 days	1 L	Amber glass with PTFE lined cap
Polynuclear Aromatic Hydrocarbons (PAHs)	550	4°C Sodium Thiosulfate pH<2 HCl	7 days	30 days 4°C , dark	1250 mL	Amber glass with PTFE lined cap
Volatile Organic Compounds	502.2 524.2	4°C Ascorbic Acid pH<2 HCl	14 days		40 mL X 4	Glass with PTFE lined cap

Sample Containers, Preservations and Holding Times – SDWA Samples						
Parameter/Method	Method	Preservative	Sample Holding Time	Extract Holding Time and Storage Conditions	Suggested Sample Size	Type of Container
Pesticides	505	4°C Sodium Thiosulfate	14 days – Heptachlor 7 days	24 hours 4°C	40 mL X 2	Glass with PTFE lined cap

APPENDIX F2: Sample Containers, Preservation and Hold Times NPDES and Waste Water Samples

Sample Containers, Preservations and Holding Times - NPDES and Waste Water Samples						
Parameter/Method	Method	Preservative	Sample Holding Time	Extract Holding Time and Storage Conditions	Suggested Sample Size	Type of Container
Acidity	SM2310B	4º C	14 days		250 mL	Plastic or Glass
Alkalinity	SM2320B	4ºC	14 days		250 mL	Plastic or Glass
Ammonia Nitrogen	EPA350.1 SM4500NH3-E SM4500NH3-I	4ºC pH<2 H2SO4	28 days		500 mL	Plastic or Glass
BOD	SM5210B	4ºC	48 hours		1 L	Plastic or Glass
Bromide	EPA300.0	None	28 days		250 mL	Plastic or Glass
CBOD	SM5210B EPA405.1	4ºC	48 hours		1 L	Plastic or Glass
Chloride	EPA300.0	None	28 days		250 mL	Plastic or Glass
Chlorine, demand	SM2350B	4ºC	Immediately to 24 hours		250 mL	Plastic or Glass
Chlorine Dioxide	SM4500ClO2-D	4ºC	ASAP		250 mL	Plastic or Glass
Chlorine, residual	SMSM4500Cl-G	None	Immediately		250 mL	Plastic or Glass
Chlorophyll	SM10200-H	4ºC, protect from light	48 hours, 28 days if filtered and collected solids & filter frozen		1L	Plastic or Glass, opaque
Chromium,hexavalent	SM3500Cr-D	4ºC pH 9.3-9.7	24 hours		500 mL	Plastic or Glass
COD	EPA410.4	4ºC pH<2 H2SO4	28 days		125 mL	Plastic or Glass
Color (ADMI)	SM2120E	4ºC	48 hours		250 mL	Plastic or Glass
Color (APHA)	SM2120B	4ºC	48 hours		250 mL	Plastic or Glass
Conductivity	SM2510B	4ºC	28 days		250 mL	Plastic or Glass
Cyanide, total & amenable	EPA335.4 SM4500CN	4ºC pH>12 w/ NaOH Ascorbic acid if chlorinated	14 days		250 mL	Plastic or Glass
Fluoride	EPA300.0 SM4500	None	28 days		250 mL	Plastic or Glass
Hardness, Calcium & total	SM2340B	pH<2 HNO3	6 months		500 mL	Plastic or Glass
Iron, Ferric & Ferrous	SM3500Fe-D	4ºC	Immediately or ASAP		250 mL	Plastic
Mercury	245.1	pH<2, HNO3	28 days		250 mL	Plastic or Glass
Metals (except Mercury)	200.7 200.8 200.9	pH<2, HNO3	6 months		500 mL	Plastic or Glass
Nitrate (chlorinated)	300	4ºC	14 days		250 mL	Plastic or Glass
Nitrate (non-chlorinated)	300	4ºC	48 hours		250 mL	Plastic or Glass

Sample Containers, Preservations and Holding Times: NPDES and Waste Water Samples						
Parameter/Method	Method	Preservative	Sample Holding Time	Extract Holding Time and Storage Conditions	Suggested Sample Size	Type of Container
Nitrite	300	4ºC	48 hours		250 mL	Plastic or Glass
Nitrate + Nitrite	300	pH<2 H2SO4	28 days		250 mL	Plastic or Glass
Oxygen, dissolved (probe)	SM4500O SM4500G	None	15 minute or ASAP		300 mL BOD bottle, overfill	Plastic or Glass
Oxygen, dissolved (Winkler)	SM4500O SM4500G	MnSO4; alkali-iodide-azide reagent; H2SO4	15 minute or ASAP		300 mL BOD bottle, overfill	Plastic or Glass
pH	SM4500H-B	None	Immediately		250 mL	Plastic or Glass
o-Phosphate	300	4ºC	48 hours		250 mL	Plastic or Glass
Phenolics, total	EPA420.1	4ºC pH<2 H2SO4	28 days		250 mL	Glass
Phosphorus, total	SM4500P-E	4ºC pH<2 H2SO4	28 days		250 mL	Plastic or Glass
Solids, settable	SM2540F	4ºC	48 hours		1 L	Plastic or Glass
Solids, suspended	SM2540D	4ºC	7 days		1 L	Plastic or Glass
Solids, total	SM2540B	4ºC	7 days		1 L	Plastic or Glass
Solids , total dissolved	SM2540C	4ºC	7 days		500 mL	Plastic or Glass
Solids , total fixed & volatile	SM2540E	4ºC	7 days		500 mL	Plastic or Glass
Specific gravity	SM2710F	4ºC	None		250 mL	Plastic or Glass
Sulfate	300	4ºC	28 days		250 mL	Plastic or Glass
Sulfide	SM4500S-E.	4ºC Zinc Acetate, NaOH pH>12	7 days if preserved Same day if unpreserved		250 mL	Plastic or Glass
Sulfite	SM4500SO3-B	4ºC, EDTA	ASAP		250 mL	Plastic or Glass
Surfactants	SM5540C	4ºC	48 hours		500 mL	Plastic or Glass
Temperature	SM2550B	None	Immediately		1L	Plastic or Glass
Thiocyanate	SM4500CN-M	4ºC pH<2 Mineral Acid	14 days		250 mL	Plastic or Glass
TKN & Total Nitrogen	SM4500N_{org}	4ºC pH<2 H2SO4	28 days		500 mL	Plastic or Glass
TOC	SM5310C	4ºC pH<2 H2SO4	28 days		250 mL	Amber glass
Turbidity	180.1 SM2130B	4ºC	48 hours		250 mL	Plastic or Glass
Aromatic & Halogenated Volatiles	EPA 601/602	4ºC dark Sodium Thiosulfate	14 days		40 mL	Amber glass with PTFE lined cap
Acrylonitrile & Acrolein	EPA603	4ºC Sodium Thiosulfate	14 days		40 mL	Glass with PTFE lined cap

Sample Containers, Preservations and Holding Times: NPDES and Waste Water Samples						
Parameter/Method	Method	Preservative	Sample Holding Time	Extract Holding Time and Storage Conditions	Suggested Sample Size	Type of Container
Base Neutral, Acid & Pesticides	EPA 625	Conc. Waste – None Aqueous – 4°C Aqueous w/chlorination-4°C Sodium Thiosulfate	14 days- Conc. Waste 7 days – Aqueous	40 days – all	1L	Glass with PTFE lined cap
Chlorinated Pesticides/PCBs	EPA608	Conc. Waste – None Aqueous– 4° C Aqueous w/chlorination – 4° C Na2S2O3	14 days – Conc. Waste 7 days – Aqueous PCBs by E608 – 1 year	40 days – all	1 L	Glass with PTFE lined cap
Phenols	EPA604	Conc. Waste – None Aqueous – 4 °C Aqueous w/chlorination 4° C $Na_2S_2O_3$	14 days – Conc. Waste 7 days – Aqueous	40 days – all	1 L	Glass with PTFE lined cap
Polynuclear Aromatic Hydrocarbons (PAHs)	EPA610	Conc. Waste – None Aqueous-4° C Aqueous w/chlorination 4° C, dark, $Na_2S_2O_3$	14 days – Conc. Waste 7 days – Aqueous	40 days – Conc. Waste, Aqueous	1 L	Glass with PTFE lined cap
Purgeables	EPA624	Conc. Waste – None Aqueous - 4° C pH<2 HCl, $Na_2S_2O_3$	14 days		40 mL	Glass with PTFE lined cap

APPENDIX F3: Sample Containers, Preservation and Hold Times Solid Waste Samples

Sample Containers, Preservation and Holding Times: Solid Waste Samples						
Parameter/Method	Method	Preservative	Sample Holding Time	Extract Holding Time and Storage Conditions	Suggested Sample Size	Type of Container
Bromide	SW9056	None	28 days		250 mL	Plastic or Glass
Cation exchange capacity of soils	SW9081	None	None		4 oz	Plastic or Glass
Chloride	SW9056	None	28 days		250 mL	Plastic or Glass
Chromium, hexavalent	SW7196A	4ºC pH 9.3-9.7	24 hours		500 mL	Plastic or Glass
Cyanide, total & amenable	SW9010B/9014	4ºC pH>12 w/ NaOH	14 days		250 mL	Plastic or Glass
Cyanide, reactive	Chapter 7.3.3.2	4ºC	ASAP		125 mL 4 oz	Plastic or Glass
Fluoride	SW9056	None	28 days		250 mL	Plastic or Glass
Mercury	SW7470/7471A	pH<2, HNO3 soils - None	28 days		500 mL	Plastic or Glass
Metals (except Mercury)	SW6010B/6020 7041/7060A 7131A/7191 7421/7740 7841	pH<2, HNO3 Soils - None	6 months		500 mL	Plastic or Glass
Metals, TCLP	SW1311	None	6 months		100 g	Plastic or Glass
Nitrate (chlorinated)	SW9056	4ºC	28 days		250 mL	Plastic or Glass
Nitrate (non-chlorinated)	SW9056	4ºC	48 hours		250 mL	Plastic or Glass
Nitrite	SW9056	4ºC	48 hours		250 mL	Plastic or Glass
Nitrate + Nitrite	SW9056	4ºC pH<2 H2SO4	28 days		250 mL	Plastic or Glass
Paint Filter	SW9095A	None	None		250 mL 100 g	Plastic or Glass
pH/Corrosivity	SW9040C SW9045D	None	Immediately		250 mL 4 oz	Plastic or Glass
o-Phosphate	SW9056	4ºC	48 hours		250 mL	Plastic or Glass
Phenolics, total	SW9065	4ºC pH<2 H2SO4	28 days		250 mL	Glass
Soil Macro Nutrients	SW6010B	None	6 months		4 oz	Plastic or Glass
Sulfate	SW9056	4ºC	28 days		250 mL	Plastic or Glass
Sulfide	SW9034	4ºC Zinc Acetate, NaOH pH>12	7 days if preserved Same day if unpreserved		500 mL	Plastic or Glass
Sulfide, solids	SW9030B/9034	4ºC Zinc Acetate, NaOH pH>12	7 days if preserved Same day if unpreserved		250 mL	Plastic or Glass

Sample Containers, Preservation and Holding Times: Solid Waste Samples						
Parameter/Method	Method	Preservative	Sample Holding Time	Extract Holding Time and Storage Conditions	Suggested Sample Size	Type of Container
Sulfide, Reactive	Chapter 7.3.4.2	4ºC	ASAP		250 mL 4 oz	Plastic or Glass
TOC	SW9060	4ºC pH<2 H2SO4	28 days		250 mL	Amber glass
TOC	Lloyd Kahn	4ºC	None		100 g	Plastic or Glass
Total Halogens	SW5050-9056	4ºC Conc. Waste – 4ºC	28 days		250 mL	Glass
Aromatic & Halogenated Volatiles	SW8021B SW5035	Aqueous w/chlorination – 4º C Aqueous – 4 C pH<2 Solids – None	14 days		40 mL 4 oz.	Glass, Teflon lined cap Glass w/septum and stir bar
Acrylamide	SW8032	Conc. Waste – None Aqueous w/chlorination – 4º C Aqueous& Solids – 4º C	14 days- Conc. Waste 7 days – Aqueous 14 days – Solids	40 days – all	1 L	Glass with PTFE lined cap
Base Neutrals & Acids	SW8270D	Conc. Waste – None Aqueous w/chlorination-4ºC Aqueous & Solids– 4ºC	14 days- Conc. Waste & Solids 7 days – Aqueous	40 days – all	1L 4 oz	Glass with PTFE lined cap
Chlorinated Acids	SW8151A	Conc. Waste – None Aqueous & Solids – 4º C Aqueous w/chlorination – 4º C	14 days – Conc. Waste & Solids 7 days – Aqueous	40 days – all	1 L 4 oz	Glass with PTFE lined cap
Chlorinated Hydrocarbons	SW8121	Conc. Waste – None Aqueous & Solids – 4º C Aqueous w/chlorination – 4º C	14 days – Conc. Waste & Solids 7 days – Aqueous	40 days – all	1 L 4 oz	Glass with PTFE lined cap
Chlorinated Pesticides/PCBs	SW8081A/8082	Conc. Waste – None Aqueous & Solids– 4º C Aqueous w/chlorination – 4º C	14 days – Conc. Waste & Solids 7 days – Aqueous	40 days – all	1 L 4 oz	Glass with PTFE lined cap
DRO/GRO/KRO	SW8015B	Conc. Waste – None Aqueous w/chlorination – 4º C Aqueous & Solids – 4º C	14 days – Conc. Waste 7 days – Aqueous 14 days – Solids	40 days – all	1 L 4 oz	Glass, Teflon lined cap

Sample Containers, Preservation and Holding Times: Solid Waste Samples						
Parameter/Method	Method	Preservative	Sample Holding Time	Extract Holding Time and Storage Conditions	Suggested Sample Size	Type of Container
EDB/DBCP/TCP	SW8011	Conc. Waste – None Aqueous & Solids – 4° C	14 days – Conc. Waste & Solids 7 days – Aqueous	40 days – all	40 mL 4 oz	Glass, Teflon lined cap
GRO	SW8015B	Conc. Waste & Solids – 4° C Aqueous w/chlorination- 4° C pH<2 Aqueous – 4° C pH<2	14 days		30 mL 4 oz.	Glass, Teflon lined cap
Nitroaromatics	SW8330	Conc. Waste – None Aqueous & Solids – 4° C Aqueous w/chlorination 4° C	14 days – Conc. Waste & Solids 7 days – Aqueous	40 days – all	1 L 4 oz	Glass with PTFE lined cap
Nitroglycerin	SW8332	Conc. Waste – None Aqueous w/chlorination- 4° C Aqueous & Solids – 4° C	14 days – Conc. Waste & Solids 7 days – Aqueous	40 days – all	1 L 4 oz	Glass, Teflon lined cap
Phenols	SW8041	Conc. Waste – None Aqueous & Solids – 4 °C Aqueous w/chlorination 4° C	14 days – Conc. Waste & Solids 7 days – Aqueous	40 days – all	1 L 4 oz	Glass with PTFE lined cap
Polynuclear Aromatic Hydrocarbons (PAHs)	SW8100	Conc. Waste – None Aqueous & Solids-4° C Aqueous w/chlorination 4° C, dark	14 days – Conc. Waste & Solids 7 days – Aqueous	40 days – Conc. Waste, Aqueous	1 L 4 oz	Glass with PTFE lined cap
Purgeables	SW8260C	Conc. Waste – None Aqueous w.chlorination - 4° C pH<2 HCl Aqueous- 4° C pH<2 HCl, Solids – 4° C	14 days		40 mL 4 oz	Glass with PTFE lined cap
TCLP Organics	SW1311	None	14 days	Semi-Volatiles – 40 days Volatiles – 14 days	100 g	Glass with PTFE lined cap

APPENDIX F4: Sample Containers, Preservation and Hold Times Microbiological Samples

Sample Containers, Preservation and Holding Times: Microbiological Samples						
Parameter/Method	Method	Preservative	Sample Holding Time	Extract Holding Time and Storage Conditions	Suggested Sample Size	Type of Container
Coliform, Fecal as EColi-MF M-Coli Blue	SM9222D	<10ºC, Na2S2O3	30 hours- DW 6 hours – WW		125 mL	Plastic, sterile
Coliform, Total by MF	SM9222B	<10ºC, Na2S2O3	30 hours – compliance 48 hours – others		125 mL	Plastic, sterile
Coliforms, Total/Fecal (presence/absence)	SM9223B	<10ºC, Na2S2O3	30 hours - DW		125 mL	Plastic, sterile
Fecal in Sludge	SM9230C-3B	<10ºC, Na2S2O3	24 hours		125 mL	Plastic, sterile
Fecal streptococci	SM9230C-3B	<10ºC, Na2S2O3	6 hours		125 mL	Plastic, sterile
Heterotrophic Plate Count & Hydrogen Degrading Bacteria	SM9215A SM9215B	4ºC pH<2 HCl	24 hours		125 mL	Plastic, sterile
Iron Related Bacteria	Hach IRB-BART	<10ºC, Na2S2O3	ASAP		125 mL	Plastic, sterile
MPN Total Coliform/EColi	SM9223B-QT	<10ºC, Na2S2O3	30 hours- DW 6 hours – WW		125 mL	Plastic, sterile
Sulfate Reducing Bacteria	Hach-SRB-BART	<10ºC, Na2S2O3	ASAP		125 mL	Plastic, sterile

APPENDIX F5: Sample Containers, Preservation and Hold Times Miscellaneous Samples

Sample Containers, Preservations and Holding Times: Miscellaneous Samples						
Parameter/Method	Method	Preservative	Sample Holding Time	Extract Holding Time and Storage Conditions	Suggested Sample Size	Type of Container
Ash, percent	SM2540E ASTM D482-91	None	None			
BTU	ASTM D284-87	None	None			
Calcium carbonate equivalent and % Lime	ASTM C25-99.33	None	None			Plastic or Glass
Fluoride – particulate/gaseous	EMTIC NSPS 13A, 13B and 14A	None	None			Client specific
Formaldehyde	NIOSH 3500	4°C	None		250 mL	Plastic or Glass
LIME Index	ASTM C25-99.28	4°C	None		4 oz	Plastic or Glass
Oil and Grease	SM 2530C-M	4°C HCl or H_2SO_4	28 Days		1 Liter	Glass
Viscosity	ASTM D1212	None	None		500 mL	Plastic or Glass

APPENDIX G1: REI Consultants, Inc. - Major Equipment Listing Field Services

Quantity	Instrument Type	Make	Model	Serial Number
2	pH / Conductivity / TDS / °C /°F Meter	OAKTON	300 Series - pH / Con	356648
				432280
2	Turbidimeter	OAKTON	T-100	363545
				280218
2	Traceable Thermometer	Control Company	4372CC	80341956
				80341946
1	Control Box	Well Wizard	3013	15375
1	Compressor Pump	Thomas	SGH-E1010B	S80235
1	Frame	QED Environmental Systems, Inc.		15379
1	Pocket Colorimeter II	HACH	58700-00	A4061-040200011528
1	Handheld Dissolved Oxygen and Temperature System	YSI	550	02A1104 - AL
1	Flow-Mate Portable Flowmeter	Marsh – McBirney	2000	2000296
1	Multi-Gas Monitor	Industrial Scientific	M40 – 1810-5437	07040065-123
1	Manometer – Digital	Dwyer	475-5 – Mark III	N141
1	100 Feet – Water Level Meter	Solinst	101	33597
2	300 Feet – Water Level Meter	Solinst	101	47862
				34509
1	650 Feet – Water Level Meter	Solinst	101	38950
1	Cordage Length Meter	Olympic	1450	81188
2	Control and Power Pack – Micro Purge	Micro Purge Basics QED	MP15	MP15-1369
				MP15-1370
2	Flow Cell Meter	Micro Purge Basics QED	MP20	QD02988
				QD03129
2	Flow Cell Sonde	Micro Purge Basics QED	MP20 - 004508	060500105558
				061000107752
1	Controller	Micro Purge Basics QED	MP10H	MP10H-1001
1	Portable MicroPurge Pump	Sample Pro QED	MP-SP-4P	10477
1	Sampler GLS	ISCO	602954001	207L00586
2	Sampler - 60-3704-001	ISCO	3700	06794-140
				07911-160
1	Rechargeable Power Pack -60-1684-088	ISCO SuperSpeed Pump Water	117V S.S.-PowerPack	06994-068
2	Rechargeable Battery – 601684040	ISCO Nickel Cadmium	934 Ni-Cad Battery – 12 VDC 4.0 Ampere Hour	208HG8984
				207LG5347

APPENDIX G2: REI Consultants, Inc. - Major Equipment Listing
Inorganics - Classical Chemistry

Inorganics - Classical Chemistry

Instrument ID	Make	Model	Serial Number	Type	Analysis	Service Date
DX120	Dionex	DX-120	99070575/ 98093279	IC	300.0/9056	Aug. 1998
ICS2000	Dionex	ICS2000	06060369	IC	300.0/9056	Aug. 2006
LECO	LECO	SC-444	4000/3950/3543	Carbon/Sulfur Analyzer	Carbon and Sulfur	2010
Auto Titrator Systems (2)	Schott	TWAIPH2	441895/441894	Titrator	pH/Alkalinity Forms/ Acidity Forms	Jan. 2002
Technicon	Bran Luebbe	Auto Analyzer 3	9521803 5449246 9523576 54503545 950100	Auto Analyzer	Cyanide/Ammonia	Nov. 2001
Oil and Grease (2)	Horizon	SPE-DEX 3000 XL	05-2017 1004/052017	Oil and Grease Extractor	Oil and Grease, 1664	March 2005 July 2000
TOC	Tekman Dohrmann	Phoenix 8000	US01249002/ 190J1368	TOC Analyzer	TOC	Oct. 2001
Metrohm 761	Metrohm	761 Compact IC	1761002022178	IC	300.0/9056	2009
Metrohm 761	Metrohm	761 Compact IC	17610020/06114	IC	300.0/9056	2009
SmartChem	Westco	200	W0902153	Discrete Analyzer	350.1 / 353.4 / 351.2	July 2009
ICS-2100	Dionex	ICS-2100	10091293	IC	300.0/9056	Jan 2011

APPENDIX G3: REI Consultants, Inc. - Major Equipment Listing
Inorganics - Metals

Inorganics - Metals

Instrument ID	Make	Model	Serial Number	Type	Analysis	Service Date
X7	Thermo Elemental	X7	X0303	ICPMS	200.8/6020	Nov. 2003
220Z_1	Varian	SpectrAA-220 Zeeman	EL99073382	GFAAS	200/7000 Series	Sept. 1999
220Z_2	Varian	SpectrAA-220 Zeeman	EL99073385	GFAAS	200/7000 Series	Sept. 1999
M6000A	CETAC	M-6000A	09004MAS	Mercury Analyzer	245.1/7470A/7471A	Oct. 2000
M7500	CETAC	M-7500	Pending	Mercury Analyzer	245.1/7470A/7471A	June 2011
Vista	Varian	Vista Pro	EL05093961	Solid State Axial ICP-AES	200.7/6010B	Oct. 2005
Arcos	Spectro	Arcos EOP	125949/08	Solid Sate Axial ICP-AES	200.7/6010C	Sept. 2008
Excalibur	PS Analytical	Millennium Excalibur	231/4749A12769	HGAF	SW7742	April 2008

APPENDIX G4: REI Consultants, Inc. - Major Equipment Listing Inorganics - Microbiological

Inorganics - Microbiological

Instrument ID	Make	Model	Serial Number	Type	Analysis	Service Date
Quanti-Tray Sealer	IDEXX	2x	02223			
Microscope	Swift Instrument	M23	892493			
Darkfield Colony Counter	Reichert – Jung	3325	11223-1			
UV Light	UVP, Inc.	UVL-56				
Hot Water Bath	VWF Scientific	1131	916107			
Autoclave	Market Forge	Sterilmatic				
Incubator 1	Thelco					
Incubator 2	Thermo					
Refrigerator 1	Kenmore					
Lab Balance	Ohaus	Scout Pro	7129520741			
pH Meter	Orion	720A	44584			
Incubator, BT Sure	Barnstead / Thermolyne	DB10415	IC41000107179			

APPENDIX G5: REI Consultants, Inc. - Major Equipment Listing
Semi-Volatiles

Semi-Volatile Organics

Gas Chromatograph System (GC)

Instrument ID	Make	GC Model	Detector Model	Serial Number(s) (GC/Tray)	Analysis	Service Date
SVGC1	Hewlett-Packard	6890+	Dual Micro ECD	US00024533/US91805195	8081A/8082/ 608	June 1998
SVGC2	Agilent	6890N	Dual Micro ECD	CN10431060/US83901937	552	Aug. 2004
SVGC3	Hewlett-Packard	5890 Series II	Dual FID	3223A43710/3237A29810	8100/8041/604/ 610	Aug. 1990
SVGC4	Hewlett-Packard	5890 Series II+	Dual ECD	3310A47808/3310A31507	8151/515.1	Aug. 1992
SVGC5	Hewlett-Packard	5890 Series II	Dual ECD	3019A28629/3106A24711	8032	April 1990
SVGC6	Agilent	6890+	Dual Micro ECD	US00043338/3530A39376	504/505/508	2009
SVGC7	Hewlett-Packard	5890 Series II	Dual FID	3133A37645/3137A26195	Glycol	April 1996
SVGC8	Hewlett-Packard	5890 Series II	Dual FID	3308A46965/3137A26178	8015B (DRO/ORO)	Nov. 1992

Gas Chromatograph/Mass Spectrometry System (GC/MS)

Instrument ID	Make	GC Model	Detector Model	Serial Number(s) (GC/MS)	Analysis	Service Date
SVGCMS1	Hewlett-Packard	6890+	5973	US00028664/US91922554	525.2/8270D/625/8270-SIM	July 1999
SVGCMS2	Agilent	6890N	5973N	US00037590/US72010542	525.2/8270D/625/8270-SIM	Sept. 2003
SVGCMS3	Hewlett-Packard	6890+	5973	Moved to Volatiles		
SVGCMS4	Hewlett-Packard	7890A	5975C	CN10844060 / US80638426	525.2/8270D/625/8270-SIM	July 2009

High Performance Liquid Chromatography (HPLC)

Instrument ID	Make	Model	Detector Type	Serial Number(s) (detector/pump/autosampler/ solvent cabinet)	Analysis	Service Date
SVHPLC1	Hewlett-Packard	1050	1046A Fluorescence	3137G02412/3404A00591/3514A037 96/3114A00324 HPLC1 detector UV-VIS: 3334J03564	531.1/218.6	Oct. 1993
			Post Column Derivatizer	Model PCX5200 - SN0799206		
SVHPLC2	Hewlett-Packard	1050	79853C UV	3334J04149/3210A01306/ 3019A00490/3114A02633	8330/8332/550	May 2004
			Online degasser	3227J01763		

- SVHPLC Includes Pickering Post-Column Carbamate System

APPENDIX G6: REI Consultants, Inc. - Major Equipment Listing
Volatiles

Volatiles Organics

Gas Chromatograph System (GC)						
Instrument ID	Make	GC Model	Detector Model	Serial Number(s) (GC/ Auto Sampler / Concentrator)	Analysis	Service Date
VOGC1	Hewlett-Packard	5890 Series II	5320 ELCD 4430 PID	3535A44098/91224005/ ARCHON1934-596A	8021B/502.2	Feb. 1993
VOGC2	Hewlett-Packard	5890 Series II	TCD	GC: 3336A53082	8810	May 2000
VOGC3	Hewlett-Packard	5890 Series II	4430 PID 4410 FID	3303A33205/90080047/ 92261018	8021B/8015C/603	May 1991
VOGC4	Hewlett-Packard	5890 Series II	4430 PID 4410 FID	PID 91-1007	8021B/8015C	Oct. 1999
VOGC5	Hewlett-Packard	5890 Series II	4430 PID 4410 FID	ARCHON Autosampler #1279 3000 Concentrator – 95158009 GC: 3336a55673	8021B/8015C	Apr. 2009
VOGC6	Hewlett-Packard	5890 Series II	4430 PID 4410 FID	3336A58707/12723/9123/ 90080024/90-403 PID control	8021B/8015C	Feb. 1991
VOGC7	Agilent	6890	4410 FID 4430 PID	11917-496A Concentrator: 91224005	8021B/8015C	May 2002

Gas Chromatograph / Mass Spectrometry System (GC/MS)						
Instrument ID	Make	GC Model	Detector Model	Serial Number(s) (GC/MS/AutoSampler/ Concentrator)	Analysis	Service Date
VOGCMS1	Hewlett-Packard	6890	5973	ARCHON 12202 GC: 4500020797 MS: 93187002	524.2/8260B/624	
VOGCMS2	Agilent	6890	5973	GC: US00038210 MS: US03340487 11934-596A ARCHON DY-505220-16	524.2/8260B/624	July 2001
VOGCMS3	Hewlett-Packard	5890 Series II	5972	3336A55398/Not Listed/ 12179/ CONC: 3424A00103 ARCHON J4102	524.2/8260B/624	Sept 1994
VOGCMS4 w/Tekmar 3000 and Archon autosampler	Hewlett-Packard	5890 Series II	5971A	3133A37795/3188A02802/ 3425A30105/3424A00102 Tekmar – 3424-A-00102	524.2/8260B/624	April 1996
VOGCMS5	Agilent	6890N	5973N	GC: CN10403035 MS: US35110132/ ARCHON 1414J ENCON: 329020204P	524.2/8260B/624	Feb. 2004

APPENDIX G7: REI Consultants, Inc. – Laboratory Equipment Listing Bioassay

Bioassay

Biological Laboratory Equipment				
Equipment Type	Make	Equipment Model	Serial Number(s)	Total Quantity
Fiber Optic Light	Lumina	Model FO-150		8
Fiber Optic Light	Fiberoptic Specialties	Model LS587/110		1
Fiber Optic Light	Fiberoptic Specialties	Model LS589/100		1
Walk-In Environmental Chamber	Norlake Scientific	Model 20049	03031111	2
Walk-In Cooler	Norlake Scientific			1
Freezerator	Whirlpool Gladiator	GAFZ21XXMK		1
Low Temperature Incubator	Precision	Model 815		1
Refrigerator	Marvel	Model 4570100	14338	
pH Meter	Oakton	WD-35615	209463	1
Conductivity Meter	Orion	Model 105	1129	1
Chlorine Meter	Hanna		HI96781	1
Dissolved Oxygen Meter	YSI	Model 57 – 89L	01006B	1
Stereo Microscope	Motic	Model M400	34019 8-2084 8-2246 8-2521 8-2212 E0709-d814-001	8
Stereo Microscope	Wesco	Model VU3000	0950027	1
Scientific Microscope	Westover		W501-13-1079	1
Oven	Blue M	Model OV-12A	B3704-O	1
Analytical Balance	A & D	Model ER 182A	4705192	1
Balance	A & D	Model FX 3200	5308135	1
Water System	Millipore	Milli-Q	04640-C	1
Stir Plate	Barnstead / Thermolyne Cimorec	Model 5130815	1308050893440	1
Stir Plate	Barnstead / Thermolyne	Model 5466415	1068991192920	1

APPENDIX G8: REIC – Field Equipment Listing – Field Services
Bioassay

Bioassay

Boating Equipment			
Equipment Type	Make	Equipment Model	Serial Number(s)
Electro-fishing Boat	OMC/Lowes Sea Nymph (17')	Model G/L/R1752V/SPL	OMCL265BG697
	Evin Rude – 25HP Engine	Model E25EJEUB	G04264927
	Side Console		
	Steering Kit, Controls, Cables		
	Trailer		IMPEDBN15VA882852
Benthic Boat	Lowes Sea Nymph (16')	Model 16 Big John	LWN06007F990
	Johnson – 25HP Engine	Model J25RESB	JR08554205
	Trailer		GBC1613LB000294
Pram Boat	Lowes Aluminum Jon Boat (12')		OMCL0603A000
	Brunswick Trolling Motor	130 Power	04047151

APPENDIX G9: REI Consultants, Inc. – Boating Equipment - Accessory Listing – Field Services - Bioassay

Bioassay

Other Boating Equipment / Accessories				
Equipment Type	Type	Equipment Model	Serial Number(s)	Quantity
Batteries	Deep Cell			6
Pumps	Bilge			2
	Hand Bilge			2
Cushions				5
Vests				6
Lights	Work Lights for Boat			
	Halogen Shocking Lights			
	Flood / Spot Lamps for Boats			
Railing System for Shockboat				
Secchi Disc				
Gill Nets				
Rope				
Block Anchors				
Wash Buckets				
Electro-Shocker	Coffelt	Model VVP-15		
Boom and Sphere				
Foot pedals and Cables				
Dip Nets				3
Generator	Honda 5000 Watt	Model B50	A-3i0020-3125912	
Gill Net Tubs				10
Balance	A & D	12 Kg – 1.0 g		
		SV-610 Balance		
	OHAUS	Small Balance		2
		Scout II Balance		
Fish Measuring Board				2
Benthic Tubs				8
Balance Wind Shield				
Waders				5
Flow Meter	Marsh-McBirney			3
Flow Pole	Adjustable			3

Bioassay

Other Boating Equipment / Accessories				
Equipment Type	Type	Equipment Model	Serial Number(s)	Quantity
LDO Meter	HACH	HQ 30D		3
pH Conductivity Meter	OAKTON			3
DO Meter	YSI			2
Transit	David White			
Hip Chains	Field Ranger	6500		2
Hydrolab	Surveyor 4	Surveyor 4		
Square Kicknets				4
Stream Bottom Samplers	Surber			3

APPENDIX G10: REI Consultants, Inc. – Field Services
Field Sampling Equipment Listing - Bioassay

Sampling Equipment -Bioassay

Fish Electro-Shock Equipment

Equipment Type	Make	Equipment Model	Serial Number(s)	Quantity
Generator	Honda EB 5000 – Watt			
Electro- Shocker	Coffelt (Includes Boom)	Model VVP-15		
Shock Wand	Pram Electro- Shock Wand			
Compact Balance	A & D	Model EK-12 kg		
		Model SU-610		
Portable Balance	OHAUS	Scout 2		
	A & D	Model SU-610		
Fish Measuring Board	Wildco	Model 118		8
Dip Net				8
Electro-Fisher Backpack	Smith Root	Model 12-B		

Benthic Sampling Equipment

Equipment Type	Make	Equipment Model	Serial Number(s)	Quantity
Stream Bottom Sampling	Surber			3
	Pibs			
	Kick Net			3
Sieve	USA Standard			
Wash Bucket for Litteral Samples	Wildco	Model 190-E20		
Disk	Secchi			
Grab Dredge Sampler	Ponar (Includes Crane and Winch)			
Kicknets	D Frame			2
Digital Camera	Sony	Model MVC-FD85		
Flow Meter	Marsh-McBirney	Model 2000		2
GPS	Garmin	III Plus		
		V		
Flow Rod	Marsh-McBirney	.5 Top Setting		
Dissolved Oxygen Meter	YSI	Model 55		2
		Model 550		1
pH Conductivity Meter	Oakton	300 Series		2
Backpack	Kelty			3
Hydrolab Meter	Surveyor 4	Surveyor 4		

APPENDIX G11: REI Consultants, Inc. – Field Services
Other Field Equipment Listing - Bioassay

Other Equipment – Bioassay

Stream Restoration Equipment				
Equipment Type	Make	Equipment Model	Serial Number(s)	Quantity
Transit	David White	LT8-800 / LT8-300P		
Transit Tripod	David White	Mode 9015		
Measuring Tape	Cam Line			
Wetland Determination and Delineation				
Equipment Type	Make	Equipment Model	Serial Number(s)	Quantity
Soil Sampler				
Additional Equipment				
Equipment Type	Make	Equipment Model	Serial Number(s)	Quantity
Mesh Gill Net	Straight			8
	Experimental			8
Mesh Seines	Small			4
Block Nets				

APPENDIX G12: REI Consultants, Inc. – Laboratory Equipment Listing
Roanoke Service Center – Roanoke, Virginia

Equipment Listing – Roanoke, VA

Laboratory Equipment				
Equipment Type	Make	Equipment Model	Serial Number(s)	Quantity
Autoclave	Market Forge	Sterilmatic	MEA 109-85 000415	1
Incubator	Thelco	Precision	600061440	3
	Thelco	Precision	699040272	
	Labline	Equatherm	07930229	
Refrigerator	Frigidaire	(1) FRT18L4FW3	BA74400442	4
	White-Westinghouse	(1) RT17INCW1	BA21900397	
	Frigidaire	(2) FRT17LSFW2	BA83632239	
	Haier	(3) Mini Fridge	0906000054	
Microscope	Micromaster	Model CIC	LR33310	1
Conductivity Meter	Oakton	CON 400 Series	374436	1
Balance	A&D	EW-1500i	EP1700099	1
pH Meter	Oakton	pH 11	1589272	1
Vacuum Pump with Tube	GAST	DOA-P704-AA	1105625367	1
Spore Ampule Incubator	Barnstead	DB104115	104103035180	1
UV Light	Entela	UVGL-55	UL3101-I	1
Chlorine Meter	Hach	Pocket Colorimeter II	06060d050299	1
Infrared Thermometer	Oakton	TempTstr IR	BUKR00036646	1
Hot Plate / Stirrer	Barnstead	Cimarec SP-131325	1313050902094	1
Spectrometer	Barnstead Thermolyne	Model 390	905980709774	1
Sealer	IDEXX	QuantiTray Sealer Model 2X	5904	1
DI System	Aqua Solution Type II	2618S2		1
Thermometers	NIST	-50 – 150° C	90952653	1
		18 – 50° C	15940	1
		18 – 50° C	15234	1

		18 – 50° C	15390	1
Thermometers cont'd		34.5 – 46° C	10707	1
		-5 – 15° C	27537	1
		-5 – 15° C	4799	1
		-5 – 15° C	3070	1
		-5 – 15° C	9579	1
		80-135° C	7244	1

APPENDIX G13: REI Consultants, Inc. – Field Services Equipment Listing
Roanoke Service Center – Roanoke, Virginia

Equipment Listing – Roanoke, VA

Field Services Equipment				
Equipment Type	Make	Equipment Model	Serial Number(s)	Quantity
pH Meters	Oakton	Con10 Series	455544	2
		Con300 Series	313878	1
		Con10 Series	510537	1
Traceable Thermometers	Control Company		80533474	2
			80533473	
Auto Samplers	Iscos	6712	203M00952	5
		6712	203M00970	
		3710	208J00140	
		3710	208J00136	
		3710	208J00138	
		3700	07911-16C	
		GLC	210C00163	1
	Signus	1350	F04649882	3
Turbidity Meter	Forston Lab	Lab Navigator	10007535	1
pH Meter	Forston Lab	Lab Navigator	10007535	1
Conductivity	Forston Lab	Lab Navigator	10007535	1

APPENDIX G14: REI Consultants, Inc. – Laboratory Equipment Listing
Shenandoah Service Center – Verona, Virginia

Equipment Listing – Verona, VA

Laboratory Equipment				
Equipment Type	Make	Equipment Model	Serial Number(s)	Quantity
Autoclave	NAPCO	9000D	9206-025	1
Portable Chlorine Meter	Hach	Pocket Colorimeter II/5953000	09120EJ40281	1
Incubator	Thermo Laboratory	3508	103169-20	1
Quanti-Tray Sealer	IDEXX	2x/89-10894-04	6395	1
UV Lamp	UVP,LLC	95-0005-05	Jan-10	1
Portable pH meter	Oakton	11	1579784	1
Conductivity & pH Meter (Bench model)	Oakton	pH/CON 510	1556630	1
Hotplate Stirrer	Corning	PC-620D	133810033208	1
BT Sure Hotblock	Barnstead/Thermolyne	DB104115	1041010762642	1
BT Sure Hotblock (backup)	Barnstead/Thermolyne	DB104115	1041000964016	1
Infrared Thermometer	Oakton	TempTestR	BUKR000041398	1
Autoclave	National Appliance/Napco	9000D	9206-025	1
DI System	Aqua Solution Type II	2618S2	09076-18S2	1
NIST traceable Thermometer (-50-300° C)	Control Company	4354 CC	90765577	1
BT Sure Hotblock Thermometer (20-130° C)	ThermoFisher Scientific	OV-070 S	29480	1
Digital Thermometer (-50 – 150° C)	Control Company	4052	90952645	1
Incubator Thermometer-Top shelf (18-50° C)	ThermoFisher Scientific	1-030-1R	16678	1
Incubator Thermometer – bottom shelf (18-50° C)	ThermoFisher Scientific	1-030-1R	16542	1
Refrigerator Thermometer –sample storage (-5 – 15° C)	ThermoFisher Scientific	R-020-1SR	12419	1
Refrigerator Thermometer – media storage (-5 – 15° C)	ThermoFisher Scientific	R-020-1SR	14642	1
Max Autoclave Thermometer (80 – 135° C)	ThermoFisher Scientific	80135-I	7255	1

Max Autoclave Thermometer – backup (80 – 135° C)	ThermoFisher Scientific	1531-C	641783	1
Incubator Thermometer – backup (0 – 50° C)	ERTCO	637-1	9552	1
Incubator Thermometer – backup (0 – 50° C)	ERTCO	637-1	9536	1
Balance	Ohaus	Scout-Pro SP402	7131172383	1
Mini Alarm Timer/Stopwatch	Control Company	5020CC	101328475	1

APPENDIX G15: REI Consultants, Inc. – Laboratory Equipment Listing
Mid Ohio Valley Service Center – Ashland, Kentucky

Equipment Listing – Ashland, KY

Laboratory Equipment				
Equipment Type	Make	Equipment Model	Serial Number(s)	Quantity
Portable Chlorine Meter	Hauna	HI 701 Free Chlorine	90-2619-01	1
Portable pH meter	Oakton	11	1533722/1596444	1
Conductivity/DO multi-meter	Hach	HQ40d	10040041452	1
Conductivity probe	Hach	CDC40103	101112581023	1
LDO probe	Hach	LDO10103	101242592005	1
Probe pH/temp	Oakton	03-2011	35811-71	1
Electrode pH/temp all in one	Oakton	35811-71	V20	2
Autoclave	Tuttnauer	2540M	1006109	1
Autoclave (w/3 trays)	Tuttnauer	1730M	2910554	1
Autoclave thermometer		14-5930-17	3895-3911	4
Lab Oil less Diaphragm Vacuum pump & compressor	GAST manufacturing, Inc	DOA-P704-AA	210610686	1
Balance	A&D	EJ-410	5A2800491	1
DI Water System	AQUA Solutions	2618S2	10247-18S2	1
Coliform Incubator Thermometer		14-5930-15	06908/07028	2
Refrigerator Thermometer	ThermoScientific	R-020-1S	15167	1
Freezer Thermometer	ThermoScientific	F-010-1S	19266	1
DispensMate Dispenser	Dragon Labs	DZ7440505	JY01177/JY01174/JY01184/JY01181	4
UV Lamp	UVP	95-0005-05		1
Blak-Ray Longwave UV Measuring Meter	UVP	J-221	47099	1
Bioview Incubator	North Bay Bioscience	1401	10031358	1
Chromate Vue Cabinet	UVP	CC-10	95-0072-01	1
Bioview Incubator Thermometer	NIST compliant		4724	1

Alarm Timer/Stopwatch	Control Company	5020CC	101710406	1
Thermometer – NIST	Control Company	4052	101504075	1
Refrigerator Thermometer	Thermco Products, Inc	ACCRO201BLST	4214	1
Refrigerator Thermometer	Thermco Products, Inc	ACCRO201BLST	4611	1
Quantitray Sealer	IDEXX	89-10894-04	10-217-06764	1
Air Incubator	Thermo Scientific	Precision 6868	108967-10	1
Coliform Incubator Bath	Thermo Electron Corp	Precision 2860	202051-185	1
Refrigerator	Frigidaire	FRU17G4JW17	WA94200968	1
Dessiccator Jar & Lid	Scheibler	12-1096-74	682-3	1
Dessiccator plate	Nalgene	90-6374-73	5312	1

APPENDIX H1: REI Consultants, Inc. - NELAC Method Listing
Classical Chemistry

Classical Chemistry Analysis

Parameter	Matrix	Method
BOD	NPW	SM5210B
COD	NPW	EPA 410.4
TOC	NPW	SM5310C
Fluoride	DW/NPW	EPA 300.0
Alkalinity as CaCO3	NPW	SM2320B
Chloride	DW/NPW	EPA 300.0
Conductivity	DW/NPW	SM2510B
Sulfate	DW/NPW	EPA 300.0
Nitrite as N	NPW	EPA 300.0
Ammonia Nitrogen as Nitrogen	NPW	EPA 350.1
Nitrate N	NPW	EPA 300.0
Orthophosphate as Phosphorus	DW/NPW	EPA 300.0
TKN	NPW	EPA 351.2 and SW4500-NH3 E
Total Phosphorus as Phosphorus	NPW	SM4500-P E
Oil and Grease	NPW	EPA 1664A
pH	DW/NPW	SM4500-H+-B
TDS	DW/NPW	SM2540C
TS	NPW	SM2540B
TSS	NPW	SM2540D
Total Cyanide	NPW	EPA 335.4
Total Phenolics	NPW	EPA 420.1
pH	SCM	SM 9045
Turbidity	DW/NPW	EPA 180.1
Hardness	DW/NPW	SM2340B

Total Nitrate-Nitrite	NPW	EPA 300.0 and SM4110B

APPENDIX H2: REI Consultants, Inc. - NELAC Method Listing
Metals

Metals Analysis

Parameter	Matrix	Method
Aluminum, Boron, Calcium, Iron, Magnesium, Nickel, Potassium, Silver, Sodium, Vanadium and Zinc	DW	EPA 200.7
Manganese, Molybdenum, Nickel, Silver, Vanadium and Zinc	DW	EPA 200.8
Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Molybdenum, Nickel, Selenium, Silver, Strontium, Thallium, Tin Titanium, Vanadium, and Zinc	NPW	EPA 200.8/SW6020
Aluminum, Antimony, Arsenic, Barium, Beryllium, Boron, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Potassium, Selenium, Silver, Sodium, Strontium, Thallium, Tin, Titanium, Vanadium, and Zinc	NPW	EPA 200.7/SW6010
Aluminum, Antimony, Arsenic, Barium, Beryllium, Boron, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Potassium, Selenium, Silica as SiO2, Silver, Sodium, Strontium, Thallium, Tin, Titanium, Vanadium, and Zinc	SCM	SW6010
Arsenic	NPW	EPA 200.9
Cadmium	NPW	EPA 200.9
Chromium	NPW	EPA 200.9
Lead	NPW	EPA 200.9
Mercury	NPW	EPA 245.1/SW7470
Mercury	SCM	SW7471
Selenium	NPW	EPA 200.9 and REIC MET-043 (Hydride–Atomic Fluorescence)
Thallium	NPW	EPA 200.9

APPENDIX H3: REI Consultants, Inc. - NELAC Method Listing
Microbiological

Microbiological

Parameter	Matrix	Method
Escherichia coli	NPW	SM9223B-quanti tray
Fecal coliform	NPW	SM9222D
Total coliforms	NPW	SM9223B-quanti tray
HPC	NPW	SimPlate

APPENDIX H4: REI Consultants, Inc. - NELAC Method Listing
Organics

Organic Analysis

Parameter/Group	Matrix	Method
BNAs	SCM and NPW	SW8270 / EPA 625
Aromatic Hydrocarbons	NPW	SW8260/EPA 624 and SW8021/EPA 602
BTEX and MTBE	SCM and NPW	SW8021 / EPA 602
Herbicides	SCM and NPW	SW8151
PCBs	SCM and NPW	SW8082 / EPA 608
Pesticides including Toxaphene and Chlordane	SCM and NPW	SW8081 / EPA 608
TPH (DRO)	SCM and NPW	SW8015
TPH (GRO)	SCM and NPW	SW8015
Volatiles	NPW	SW8260 / EPA 624 and SW8021 / EPA 601 and EPA 602
Volatiles High and Low Level	SCM	SW8260 / EPA 624 and SW8021 / EPA 601 and EPA 602
Flash Point	SCM and NPW	SW1010
Explosives	SCM and NPW	SW8330
PAHs	SCM and NPW	SW8310/EPA 610

APPENDIX H5: REI Consultants, Inc. - NELAC Method Listing
Bioassay

Toxicity Analysis

Parameter	Matrix	Method
Ceriodaphnia dubia (acute)	NPW	EPA 2002
Daphnia pulex (acute)	NPW	EPA 2021
Daphnia magna (acute)	NPW	EPA 2021
Pimephales promelas (acute)	NPW	EPA 2000
Pimephales promelas (chronic)	NPW	EPA 1000
Ceriodaphnia dubia (chronic)	NPW	EPA 1002

APPENDIX H6: REI Consultants, Inc. - NELAC Method Listing
Roanoke Service Center – Roanoke, VA

Roanoke Service Center

Parameter	Matrix	Method
Escherichia coli	NPW	SM9223B-quanti tray
Fecal coliforms	NPW	SM9222D
Total coliforms	NPW	SM9223B-quanti tray
Chromium VI	NPW	Hach 8023
Chromium VI	NPW	SM3500Cr-B

APPENDIX II: REI Consultants, Inc. - Standard Operating Procedure (SOP)
Field Services

2011 – Standard Operating Procedure Listing

REI Consultants, Inc. – Beaver, WV
Field Services

SOP #	Method	Title	Revision Number	Revision Date
SOP-FS-001	CHLORINE	Measurement of Chlorine in Wastewater and Drinking Water	2	1-21-2011
SOP-FS-002	TURBIDITY	Field Measurement of Turbidity	4	1-21-2011
SOP-FS-003	CONDUCTIVITY	Field Measurement of Conductivity	3	1-21-2011
SOP-FS-004	DISSOLVED OXYGEN	Measurement of Dissolved Oxygen using the YSI550	2	1-21-2011

APPENDIX I2: REI Consultants, Inc. - Standard Operating Procedure (SOP)
Inorganics – Classical Chemistry

2011 – Standard Operating Procedure Listing

REI Consultants, Inc. – Beaver, WV
Inorganics – Classical Chemistry

SOP.#	Method	Title	Revision Number	Revision Date
SOP-INO-001	410.4/ 5220D	Chemical Oxygen Demand by Methods EPA 410.4 and SM5220D	19	3-29-2011
SOP-INO-002	5210	Biological Oxygen Demand, BOD, and Carbonaceous BOD, CBOD by SM5210B	20	3-29-2011
SOP-INO-003	300.0/9056 /4110B -	Anions by Ion Chromatography by EPA 300.0, SW9056 and SM4110B	18	5-20-2011
SOP-INO-004	4500N_{org}C/ 4500NH_3B & E	TKN and Organic Nitrogen by Titration using SM4500N_{org}C and SM4500NH_3B & E	18	3-29-2011
SOP-INO-005	4500NH_3B & E	Ammonia Nitrogen Distillation / Titration by Method SM4500NH_3B & E.	18	3-29-2011
SOP-INO-006A	4500CN-C/ 9010B	Cyanide Distillation (MIDI and Macro) by SM4500CN-C and SW9010B	17	3-29-2011
SOP-INO-007	4500CN-I	Weak and Dissociable Cyanide by SM4500CN-I	17	3-29-2011
SOP-INO-008	SW846 – 7.3.3.2 and 7.3.4.2	Reactivity as Cyanide and Reactivity as Sulfide	15	3-29-2011
SOP-INO-010	4500S^{2-}E/ 9034B	Sulfide by SM4500S^{2-}E and SW9034B	18	3-29-2011
SOP-INO-011	420.1/ 9065 Phenolics	EPA 420.1 / SW 9065 - Phenolics (Distillation with Manual Colorimetric Analysis)	14	3-29-2011
SOP-INO-013	2540B	Total Solids by SM2540B	17	3-29-2011
SOP-INO-014	2540D	Total Suspended Solids By SM2540D	18	3-29-2011
SOP-INO-015	2540C	Total Dissolved Solids by SM2540C	19	3-29-2011
SOP-INO-016	2510B & 9050A	Conductivity by SM2510B & SW9050A	20	3-29-2011
SOP-INO-017	9045C	pH in Soil and Corrosivity by SW9045C	19	3-29-2011
SOP-INO-018	2320B/2310B/4500H^+ & 9040B	Alkalinity and Acidity Forms by Sm2320B, 2310B, 4500H^+ and SW9040B	17	3-29-2011
SOP-INO-019	2130B & 180.1	SM 2130B / EPA 180.1 - Turbidity	19	3-29-2011
SOP-INO-020	4500O-C	Dissolved Oxygen by SM4500O-C	18	3-29-2011
SOP-INO-021	5540C	Anionic Surfactants as Methylene Blue Active Substance (MBAs) using SM5540C	17	3-29-2011
SOP-INO-022	2350B	Chlorine Demand by SM2350B	12	3-29-2011
SOP-INO-023	4500P-B5 & E	Phosphorus Forms by SM4500P-B5 and E	19	3-29-2011

2011 – Standard Operating Procedure Listing

REI Consultants, Inc. – Beaver, WV

Inorganics – Classical Chemistry

SOP #	Method	Title	Revision Number	Revision Date
SOP-INO-024	4500Cl-G/4500-ClO_2-D	Residual Chlorine and Forms by SM4500Cl-G, and Chlorine Dioxide by SM 4500-ClO_2-D	19	3-29-2011
SOP-INO-025	3500	Formaldehyde	19	3-29-2011
SOP-INO-026	4500F-C	Fluoride by Ion Selective Electrode using SM4500F-C	19	3-29-2011
SOP-INO-027	4500CN-G and 9010B/9012A	Cyanide Amenable to Chlorination by SM4500CN-G and SW9010B/9012A	19	3-29-2011
SOP-INO-028	2710F	Specific Gravity	13	3-29-2011
SOP-INO-029	2540E & 160.4	SM 2540E / EPA 160.4 - Total Volatile and Total Fixed Solids, Volatile Suspended Solids, and Fixed Suspended Solids	15	3-29-2011
SOP-INO-030	2540F	Settleable Solids by SM2540F	16	3-29-2011
SOP-INO-031	4500-CN-M	SM 4500-CN-M - Thiocyanate	14	3-29-2011
SOP-INO-033	1664	Hexane Extractable Material by EPA Method 1664	14	3-29-2011
SOP-INO-034	4500SO_3-B	Sulfite by SM4500SO_3-B	15	3-29-2011
SOP-INO-035	4500H+-B & 9040B	pH in Water by SM4500H+-B and SW9040B and Corrosivity by SW9040B	17	3-29-2011
SOP-INO-037	2540E and 482-91	Standard Method 2540E & ASTM D482-91 - Percent Ash	12	3-29-2011
SOP-INO-038	TOC - KAHN	TOC By Lloyd Kahn	12	3-29-2011
SOP-INO-039	9030B	Sulfide (Distillation)	12	3-29-2011
SOP-INO-041	5050/ 9056	SW 5050 / 9056 - Total Halogens	13	3-29-2011
SOP-INO-044	9060/ 5310C	TOC by SW9060 and SM5310C	18	3-29-2011
SOP-INO-049	ASTM C 25-99.33	ASTM C 25-99.33 - Calcium Carbonate Equivalent (CCE) and Percent Lime	12	3-29-2011
SOP-INO-050	QEC CONTAINERS	Inorganic Analysis of QEC Containers	13	3-29-2011
SOP-INO-051	2120B	Color by SM2120B	12	3-29-2011
SOP-INO-052	2150B	SM 2150B - Odor	11	3-29-2011
SOP-INO-053	TITRATION ACIDS AND BASES	Standardization of Titration Acids and Bases	10	3-29-2011
SOP-INO-054	ASTM D 4212	ASTM D 4212 - Viscosity (ZAHN CUP - TYPE)	13	3-29-2011
SOP-INO-055	5910B / 5310C	Specific Ultraviolet Absorbency (SUVA) by SM5910B/5310C	11	3-29-2011
SOP-INO-056	2120E	ADMI Color by SM2120E	10	3-29-2011

2011 – Standard Operating Procedure Listing

REI Consultants, Inc. – Beaver, WV

Inorganics - Classical Chemistry

SOP #	Method	Title	Revision Number	Revision Date
SOP-INO-057	AMST C 25-99.28	AMST C 25-99.28 - Available Lime Index	10	3-29-2011
SOP-INO-058	PIPETTE WASHING	Pipette Washing Instructions	12	3-29-2011
SOP-INO-059	10200-H.c	Chlorophyll by SM10200-H.c (Trichromatic Method)	11	3-29-2011
SOP-INO-060	2530C-M	SM 2530C-M - Floatable Oil and Grease	8	3-29-2011
SOP-INO-061	DISSOLVED OXYGEN	Luminescence Measurement (LDO) HACH Method 10360 - Dissolved Oxygen in Water and Wastewater	5	3-29-2011
SOP-INO-062	351.2	EPA Method 351.2 - TKN using the SmartChem 200	3	3-29-2011
SOP-INO-063	350.1	EPA Method 350.1 – Ammonia using the SmartChem 200	3	3-29-2011
SOP-INO-064	335.4/9012A	EPA Method 335.4 and SW9012A –Cyanide using the SmartChem 200	3	3-29-2011
SOP-INO-065	NA	Calibration of Eppendorf Pipette	2	3-29-2011
SOP-INO-066	SM2710B	Specific Oxygen Uptake Rate (SOUR)	1	3-29-2011

APPENDIX I3: REI Consultants, Inc. - Standard Operating Procedure (SOP) Inorganics - Metals

2011 – Standard Operating Procedure Listing

REI Consultants, Inc. – Beaver, WV

Inorganics – Metals

SOP #	Method	Title	Revision Number	Revision Date
SOP-TCLP-001	1311	Toxicity Characteristic Leaching Procedure for Metals and Semi-Volatile Organics	15	3-28-2011
SOP-MET-002	3010A	Acid Digestion of Aqueous Samples and Extracts for Total Metals Analysis by FAA or ICP Spectroscopy using SW3010A	16	3-28-2011
SOP-MET-003	3020A	Acid Digestion of Aqueous Samples and Extracts for Total Metals Analysis by GFAA Spectroscopy using SW3020A	16	3-28-2011
SOP-MET-004	3050B	Digestion of Sediments, Sludges and Soils by SW3050B	18	3-28-2011
SOP-MET-006	COLD VAPOR MERCURY	Sample Preparation and Digestion Procedure for Cold Vapor Mercury Analysis (using the Hot Block)	20	3-28-2011
SOP-MET-012	7010	Analysis of Metallic Analytes by GFAA using SW7010	17	3-30-2011
SOP-MET-016	MACRO NUTRIENT	Determination of Available Soil Macro Nutrients Ca, Mg, K and P	15	3-28-2011
SOP-MET-018	LIME REQUIREMENTS	Determination of Lime Requirements	13	3-28-2011
SOP-MET-019	QEC CONTAINERS	Metal Analysis of QEC Containers	12	3-28-2011
SOP-MET-020	EPPENDORF PIPETTE	Calibration of Eppendorf Pipette	12	3-28-2011
SOP-MET-021	GLASSWARE WASHING	Glassware Washing (Metals)	13	3-28-2011
SOP-MET-022	9081	Cation - Exchange Capacity of Soils	12	3-28-2011
SOP-MET-024	7196A /3500-Cr-D	Methods SW7196A / SM3500-Cr-D - Determination of Dissolved Hexavalent Chromium (Colorimetric Method)	13	3-28-2011
SOP-MET-025	1796	ASTM D1796 - Determination of Water and Sediment in Fuel Oils by the Centrifuge Method	12	3-28-2011
SOP-MET-026	FUSION	Sample Preparation by Fusion	12	3-28-2011
SOP-MET-031	3500-Fe-D	SM 3500-Fe-D - Determination of Ferrous and Ferric Iron	13	3-28-2011
SOP-MET-032	245.1/ 7470A/7471A	Analysis of Mercury by the Automated Cold Vapor Technique using CETAC M6000-A Auto Analyzer by EPA 245.1, SW7470A, and SW7471A	14	3-28-2011
SOP-MET-034	DRINKING WATER PREP	Preparation of Drinking Water Samples for Metal Analysis	11	3-28-2011
SOP-MET-035	200.2	Method EPA 200.2 - Sample Preparation Procedure for Spectrochemical Determination of Total Recoverable Metals	13	3-28-2011

2011 – Standard Operating Procedure Listing

REI Consultants, Inc. – Beaver, WV

Inorganics – Metals

SOP #	Method	Title	Revision Number	Revision Date
SOP-MET-036	200.9	Determination of Trace Elements by Stabilized Temperature GFAA using EPA Method 200.9	12	3-30-2011
SOP-MET-037	3060A/7196A	Method SW3060 / 7196A - Determination of Hexavalent Chromium in Solids (Alkaline Digestion followed by Colorimetric Quantification)	10	3-30-2011
SOP-MET-038	200.8/6020	Determination of Trace Elements in Waters and Wastes by ICP-MS (X7) by EPA 200.8 and SW6020	10	3-30-2011
SOP-MET-039	WASTE DISPOSAL	Waste Disposal in the Metals Analysis Laboratory	8	3-30-2011
SOP-MET-040	9095A	Paint Filter Liquids Test - SW9095A	11	3-30-2011
SOP-MET-041	200.7/ 6010B VISTA PRO	Determination of Metals and Trace Elements by ICP-AES (Varian Vista Pro) by EPA 200.7 and SW6010B	8	3-30-2011
SOP-MET-042	7742-PREP	Method SW7742-Prep: Preparation of Samples for Analysis of Selenium via Hydride Generation Atomic Fluorescence Spectroscopy	5	3-30-2011
SOP-MET-043	7742	Method SW7742: Analysis of Selenium via Hydride Generation Atomic Fluorescence Spectroscopy	5	3-30-2011
SOP-MET-044	200.7/6010C	Determination of Metals and Trace Elements by ICP-AES	3	3-30-2011
SOP-MET-045	ASTM 3987-85	Modified TCLP Leaching Procedure or ASTM Leaching Procedure	1	5-18-11

APPENDIX I4: REI Consultants, Inc. - Standard Operating Procedure (SOP) Inorganics – Microbiological

2011 – Standard Operating Procedure Listing

REI Consultants, Inc. – Beaver, WV

Inorganics - Microbiological

SOP #	Method	Title	Revision Number	Revision Date
SOP-MICRO-001	9223B	Standard Method 9223B - Total Coliform	15	3-30-2011
SOP-MICRO-002	9223B	Total Coliform (Presence / Absence) by SM9223B	14	3-30-2011
SOP-MICRO-003	9222D	Fecal Coliform by SM9222D	16	3-30-2011
SOP-MICRO-004	9215A & B	Heterotrophic Plate Count and Hydrocarbon Degrading Bacteria by SM9215A & B	14	3-30-2011
SOP-MICRO-005	TOTAL BACTERIA	FDA Methods C & D from IBWA Manual - Total Bacteria (Caps and Containers)	10	3-30-2011
SOP-MICRO-006	9223B-QT	Total Coliform / E Coli by SM9223B-QT (Quanti-Tray)	13	3-30-2011
SOP-MICRO-007	QUALITY CONTROL	Microbiological Quality Control	11	3-30-2011
SOP-MICRO-008	MARKET FORGE AUTOCLAVE	Operation and Maintenance of the Market Forge Sterilmatic Autoclave	9	3-30-2011
SOP-MICRO-010	9230C.3B	SM 9230C.3b - Fecal Streptococci	9	3-30-2011
SOP-MICRO-011	IRB	Iron Related Bacteria (IRB) by HACH IRB-BART	5	3-30-2011
SOP-MICRO-012	SRB	Sulfate Reducing Bacteria (SRB) by HACH SRB-BART	6	3-30-2011
SOP-MICRO-013	10029	Method 10029 - E-Coli	7	3-30-2011
SOP-MICRO-014	LT2 MICRO	Procedures for LT2 Microbiological Sampling	3	6-8-2009
SOP-MICRO-015	9215E	SM9215E – Heterotrophic Plate Count (HPC) and Hydrocarbon Degrading Bacteria By SimPlate	3	3-30-2011

APPENDIX I5: REI Consultants, Inc. - Standard Operating Procedure (SOP) Organics - Semi-Volatiles

2011 – Standard Operating Procedure Listing

REI Consultants, Inc. – Beaver, WV

Organics – Semi-Volatiles

SOP #	Method	Title	Revision Number	Revision Date
NITRO-001	8330 EXPLOSIVES	Nitroaromatics and Nitramines by High Performance Liquid Chromatography (HPLC)	11	3-1-2011
ORGEXT-003	3535	Solid Phase Extraction (SPE)	3	3-2-2011
ORGEXT-004	3580A	Waste Dilution	3	2-25-2011
ORGGLASS-001-	GLASSWARE CLEANING	Cleaning of Glassware for Volatiles / Semi-Volatiles	13	3-1-2011
SOP-TCLP-001	1311	Toxicity Characteristic Leaching Procedure for Metals and Semi-Volatile Organics	15	3-10-11
SV0-001	504 / 8011	Determination of 1,2-Dibromoethane (EDB) and 1,2-Dibromo-3-chloropropane (DBCP) in Water by GC	14	3-2-2011
SVO-003	515.1 / 8151A	Determination of Chlorinated Acids in Water by GC	12	4-12-2011
SVO-004	531.1	n_Methylcarbomoyloximes and n-Methylcarbamates in Water by Direct Aqueous Injection HPLC with Post Column Derivatization	11	4-25-2011
SVO-005	508	Method 508, Revision 3.1 – Determination of Chlorinated Pesticides in water by GC/ECD	10	4-12-2011
SVO-006	552.2	Determination of Haloacetic Acids in Drinking Water by Liquid - Liquid Extraction, Derivatization and Gas Chromatography with Electron Capture Detection	10	3-2-211
SV-008	8082	Polychlorinated Biphenyls (PCBs) by Gas Chromatography	12	4-11-2011
SVO-009	8081B	Organochlorine Pesticides by Gas Chromatography	12	4-11-2011
SVO-010	625	GC / MS for Semi-Volatile Organics in Waste Water	13	4-4-2011
SVO-012	608	Method 608: Organochlorine Pesticides and PCBs	11	4-11-2011
SVO-014	525	GC / MS for Semi-Volatile Organics in Drinking Water	7	4-27-2011
SVO-015	610 / 8100	Method 610 and 8100: Polynuclear Aromatic Hydrocarbons (PAH) by Gas Chromatography and Flame Ionization Detector (FID)	7	2-25-2011
SVO-016	604 / 8041A	Phenols By GC	9	2-25-2011
SVO-017	8270	Semi-Volatile Compounds by GC/MS (SW-846 Method 8270)	15	4-20-2011
SVO-018	550	Measurement of PAHs by HPLC	8	3-1-2011
SVO-019	8332	Method 8332: Nitroglycerine by High Performance Liquid Chromatography	10	3-7-2011
SVO-021	9071	Oil and Grease Extractions (Solids) Method EPA 9071	13	3-1-2011

2011 – Standard Operating Procedure Listing

REI Consultants, Inc. – Beaver, WV

Organics – Semi-Volatiles

SOP #	Method	Title	Revision Number	Revision Date
SVO-022	8270 SIM	PAHs by Selective Ion Mass Spectrometry (SIM) by GC/MS (SW-846 Method 8270D)	4	4-20-2011
SVO-023	8032	Acrylamide by Gas Chromatography	3	3-2-2011
SVO-048	1010	Pensky-Martins Closed-Cup for Determining Ignitability	5	3-2-2011
SVO-049	1010	Cleveland Open-Cup for Determining Ignitability - Method 1010	4	3-2-2011
SVO-050	Lipids	Lipid Content	3	2-25-2011
SVO-051	505	Method 505: Analysis of Organohalide Pesticides and Commercial Polychlorinated Biphenyl (PCB) Products in water by Micro-Extraction and Gas Chromatography	3	4-11-2011
SVO-052	3550B	Ultrasonic Extraction	6	2-25-2011
SVO-053	3510C	Separatory Funnel Liquid - Liquid Extraction	11	3-8-2011
SVO-054	8015C	Glycols	5	3-7-2011
TPHDRO-001	8015C DRO	TPH - Diesel Range Organics	12	3-7-2011
TPHHC-001	8015C	Hydrocarbon Characterization	4	3-1-2011

APPENDIX 16: REI Consultants, Inc. - Standard Operating Procedure (SOP Organics - Volatiles

2011 – Standard Operating Procedure Listing

REI Consultants, Inc. – Beaver, WV

Organics – Volatiles

SOP #	Method	Title	Revision Number	Revision Date
ORGGLASS-002	GLASSWARE CLEANING	Cleaning of Glassware for Volatiles	6	2-15-2011
TPHGRO-001	8015C GRO	Total Petroleum Hydrocarbons Gasoline Range Organics	18	2-15-2011
VOA-001	524.2	Measurement of Purgeable Organic Compounds in Water by Capillary Gas Chromatography / Mass Spectrometry	12	2-15-2011
VOA-002	502.2	Volatile Organic Compounds in Water by Purge-and-Trap Capillary Column Gas Chromatography with Photoionization and Electrolytic Conductivity Detectors in Series	13	2-15-2011
VOA-003	8021B	Aromatic and Halogenated Volatiles by Gas Chromatography using Photoionization and / or Electrolytic Conductivity Detectors	10	3-22-2011
VOA-004	8260B	Volatile Organic Compounds by GC/MS by Capillary Column	12	3-2-2011
VOA-005	5030B	Purge and Trap for Aqueous Samples	12	2-15-2011
VOA-006	5035	Closed-System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste Samples	8	3-22-2011
VOA-007	603	Acrolein and Acrylonitrile	10	2-15-2011
VOA-008	601	Purgeable Halocarbons	10	3-22-2011
VOA-009	602	Purgeable Aromatics	12	2-16-2011
VOA-010	1311	Volatile Toxicity Characteristic Leaching Procedure	13	3-23-2011
VOA-011	624	Purgeable Volatile Compounds	13	3-2-2011
VOA-012	VOC By GC-TCD	Volatile Organic Compounds by GC-TCD	8	2-15-2011
VOA-013	COMPOSITING	Volatile Sample Compositing Procedure	7	2-15-2011
VOA-014	VOC for GAS	Selected Volatile Organic for Gas Analysis	10	3-2-2011

2011 – Standard Operating Procedure Listing

REI Consultants, Inc. – Beaver, WV

Organics – Volatiles

SOP #	Method	Title	Revision Number	Revision Date
VOA-015	8015C	Non-halogenated Organics using GC-FID	8	2-15-2011
VOA-017	CHEM HYGIENE	Chemical Hygiene Plan for Volatiles Laboratory	7	2-15-2011
VOA-018	3810M	Volatile Organic Compound Headspace Extraction by Method 3810M	8	2-15-2011

APPENDIX I7: REI Consultants, Inc. - Standard Operating Procedure (SOP) Quality Control

2011 – Standard Operating Procedure Listing

REI Consultants, Inc. – Beaver, WV

Quality Control

SOP #	Method	Title	Revision Number	Revision Date
QC-CC-001	CLIENT COMPLAINTS	Standard Operating Procedure for Documenting and Resolving Client Complaints	3	3-7-2011
QC-CON-001	CONTRACT	Review of Requests, Tenders, and Contracts	2	3-7-2011
QC-CORR-002	CORRECTION	Procedure for Making Corrections to Laboratory Data, Logbooks, and Notebooks	6	3-30-2011
SOP-MI-001	MANUAL INTEGRRATION	Standard Operating Procedure for Performing and Documenting Manual Integration	4	3-24-2011
SOP-QCPE-001	PERFORMANCE EVALUATION SAMPLES	Standard Operating Procedure for Analyzing Performance Evaluation Samples	4	3-18-2011
SOP-QC-001	PREPARING SOP	Procedure for Preparing Standard Operating Procedure	6	3-22-2011
QC-SubSamp-008	SUB-SAMPLING	Standard Operating Procedure for Sub-Sampling	3	3-24-2011
SOP-QC-002	MEASUREMENT UNCERTAINTY	Estimation of Analytical Measurement Uncertainty	1	4-29-2009
QC-SR-001	SAMPLE ACCEPTANCE	Standard Operating Procedure for Sample Acceptance Criteria	3	3-15-2011
SOP-QC-003	MDLs	Definition and Procedure for Determination of Method Detection Limits (MDLs)	2	3-18-2011
QC-003	Recovery Limits	Updating Recovery Limits	1	3-8-2011

APPENDIX I8: REI Consultants, Inc. - Standard Operating Procedure (SOP) Sample Custody

2011 – Standard Operating Procedure Listing

REI Consultants, Inc. – Beaver, WV

Sample Custody

SOP #	Method	Title	Revision Number	Revision Date
QC-SR-001	SAMPLE ACCEPTANCE	Standard Operating Procedure for Sample Acceptance Criteria	3	3-15-2011
SOP-SAMPCUST-004	INFRARED THERMOMETER	Infrared Thermometer Operation	4	2-25-2011
SOP-SAMPCUST-005	CONTAINER PACKING AND SHIPPING	Container Packing and Shipping	4	3-3-2011
SOP-SAMPCUST-006	SAMPLE STORAGE AND DISPOSAL	Sample Storage and Disposal	4	2-16-2011
SOP-SAMPCUST-010	CHAIN OF CUSTODY	Filling Out a Chain of Custody (COC)	4	3-11-2011
SOP-SAMPCUST-012	SAMPLE LOG IN USING LIMS	Sample Log In into Laboratory Information Management System (LIMS)	1	3-3-2011

APPENDIX I9: REI Consultants, Inc. - Standard Operating Procedure (SOP) Bioassay – Beaver, WV

2011 – Standard Operating Procedure Listing

REI Consultants, Inc. – Beaver, WV Bioassay

SOP #	Method	Title	Revision Number	Revision Date
BIOASSAY-TOX-001	TOXICITY	Manual of Standard Operating Procedure for Acute and Chronic Toxicity Testing for State of West Virginia	2	4-26-2011
BIOASSAY-TOXOH-001	TOXICITY	Manual of Standard Operating Procedure for Acute and Chronic Toxicity Testing for State of Ohio	1	4-26-2011
BIOASSAY-TOXMD-001	TOXOCITY	Manual of Standard Operating Procedure for Acute and Chronic Toxicity Testing for State of Maryland	1	4-26-2011
BIOASSAY-VATOX-001	TOXICITY	Manual of Standard Operating Procedure for Acute and Chronic Toxicity Testing for Commonwealth of Virginia	2	4-26-2011

APPENDIX I10: REI Consultants, Inc. - Standard Operating Procedure (SOP) Roanoke Service Center – Roanoke, Virginia

2011 – Standard Operating Procedure Listing

Roanoke Service Center – Roanoke, Virginia

SOP #	Method	Title	Revision Number	Revision Date
RSC-MICRO-002	SW9223B	Total Coliform Bacteria – Presence and Absence	2	2-15-2011
RSC-MICRO-003	SM9222D	Fecal Coliform	5	2-15-2011
RSC-MICRO-006	SW9223B-QT – Colilert	State of Virginia – SM9223-QT – Total Coliform / E.Coli (Colilert Medium)	2	4-4-2011
RSC-MICRO-006A	SW9223B-QT – Colisure	State of Virginia – SM9223-QT – Total Coliform / E.Coli (Colisure Medium)	3	4-4-2011
RSC-MICRO-007	QC	Microbiological Quality Control	11	4-4-2011
RSC-MICRO-008	AUTOCLAVE	Operating and Maintenance of Market Forge Sterilmatic Autoclave	3	2-15-2011
RSC-MICRO-011	IRB	Iron Reducing Bacteria by HACH IRB-BART	1	1-6-2010
RSC-MICRO-012	SRB	Sulfate Reducing Bacteria by HACH SRB-BART	1	1-6-2010
RSC-MET-024	SM3500-Cr-B	Determination of Dissolved Hexavalent Chromium – Colorimetric Method HACH-8023	5	2-16-2011
RSC-SR-012	Sample Log In	Sample Log In using Laboratory Information Management System (LIMS)	2	2-15-2011
RSC-SAMPCUST-004	INFRARED	Infrared Thermometer Operation	2	2-15-2011
RSC-SAMPCUST-006	SAMPLE STORAGE	Sample Storage and Disposal	2	2-15-2011
RSC-INO-017	pH and TEMP	pH and Temperature in Aqueous Solution	2	2-15-2011
RSC-FS-001	Chlorine	Measurement of Chlorine in Waste Water and Drinking Water	2	2-15-2011
RSC-FS-002	Turbidity	Field Measurements of Turbidity	2	2-15-2011
SOP-RSC-FS-003	Conductivity	Field Measurements of Conductivity	2	2-15-2011
RSC-FS-004	Chlorine by ISE	Orion Research 97-70 (1977) Determination of Chlorine Using Iodometric Electrode Technique	0	3-23-2011
SOP-RSC-017A	pH in Soil	SW9045D pH in Soil	1	2-18-2011
RSC-FS-INO-017	Field pH & Temp	pH and Temp in Aqueous Solution - Field	0	1-5-2011

APPENDIX III: REI Consultants, Inc. - Standard Operating Procedure (SOP) Shenandoah Service Center – Verona, Virginia

2011 – Standard Operating Procedure Listing

Shenandoah Service Center – Verona, Virginia

SOP #	Method	Title	Revision Number	Revision Date
SSC-MICRO-006	SM9223B-QT	Standard Method 9223B-QT (Quanti-Tray Method) – Total Coliform/E.Coli (Colilert)	3	5-20-2011
SSC-MICRO-007	MICRO QC	Microbiological Quality Control	4	5-20-2011
SSC-MICRO-008	AUTOCLAVE	Operation and Maintenance of the NAPCO Autoclave	1	4-1-2011
SSC-MICRO-002	SM9223B	Standard Method 9223B- Total Coliform (Presence/Absence)	5	5-20-2011
SSC-MICRO-006A	SM9223B-QT	Standard Method 9223B-QT (Colilert) for Virginia Drinking Water	3	5-20-2011
SSC-INOR-001	Chlorine	Measurement of Chlorine in Waste Water and Drinking Water	3	5-5-2011
SSC-INO-002	Conductivity	SM2510B and SW9050A-Conductivity	1	5-20-2011
SSC-INO-017	pH	pH and Temperature in Aqueous Solutions	2	4-1-2011

APPENDIX I12: REI Consultants, Inc. - Standard Operating Procedure (SOP)
Mid Ohio Valley Service Center – Ashland, Kentucky

2011 – Standard Operating Procedure Listing

Mid Ohio Valley Service Center – Ashland, KY				
SOP #	Method	Title	Revision Number	Revision Date
MOV-INO-001	pH	pH and Temperature in Aqueous Solutions	0	4-4-2011
MOV-INO-002	CONDUCTIVITY	Measurement of Conductivity	0	4-4-2011
MOV-INO-003	CHLORINE	Measurement of Chlorine	0	4-4-2011
MOV-MICRO-001	P/A	SM9223B – Total Coliform Bacteria (P/A) – Colilert	1	5-24-2011
MOV-MICRO-002	AUTOCLAVE	Operation and Maintenance of Tuttnauer 2540M Autoclave – Steam Sterilizer	0	4-4-2011
MOV-MICRO-003	GLASSWARE WASHING	Glassware Washing	0	4-4-2011
MOV-MICRO-004	SIMPLATE	Standard Method 9215E:Heterotrophic Plate Count (HPC) and Hydrocarbon degrading Bacteria by SimPlate	1	5-24-2011
MOV-MICRO-005	TOTAL COLIFORME COLI	SM9223B-QT (Quanti-Tray Method) – Total Coliform/Ecoli	1	5-24-2011
MOV-MICRO-006	REPORTING POSITIVES	Reporting Positive Total Coliform Bacteria Presence - Absence or MPN	0	4-8-2011
MOV-QC-001	MICROBIOLOGICAL QC	Microbiological Quality Control	1	5-24-2011

APPENDIX J: Referenced Websites

www.astm.org

www.ecfr.gpoaccess.gov/cgi

www.epa.gov/epaoswer/hazwaste/test/main.htm

www.epa.gov/superfund/programs.clp

http://www.reiclabs.com/

APPENDIX K: Commonly Used Acronyms'

Acronym	Meaning
%R	Percent Recovery
%RSD	Percent Relative Standard Deviation
µg/L	Micrograms per Liter
AA	Atomic Absorption
ABS	Absorbance
ACS	American Chemical Society
ADMI	American Dye Manufacturers Institute
AES	Atomic Emission Spectroscopy
AMU	Atomic Mass Units
ANA	Analysis Not Available
APHA	American Public Health Administration
ASAP	As Soon As Possible
ASTM	American Society for Testing Materials
BFB	Bromofluorobenzene
BNA	Base/Neutral/Acid
BOD	Biochemical Oxygen Demand
BTEX	Benzene – Toluene – Ethylbenzene – Xylene
BTU	British Thermal Unit
$CaCO_3$	Calcium Carbonate
CBOD	Carbonaceous Biochemical Oxygen Demand
CCB	Continuing Calibration Blank
CCC	Calibration Check Compounds
CCD	Charge Coupling Device
CCE	Calcium Carbonate Equivalent
CCV	Continuing Calibration Verification
Cd	Cadmium
CFR	Code of Federal Regulation
CID	Charge Injection Device
CLP	Contract Laboratory Program
COC	Chain of Custody
COD	Chemical Oxygen Demand
Conc.	Concentration
Cr	Chromium
CRQL	Contract Required Quantitation Limit
CU	Color Units

Acronym	Meaning
Cu	Copper
CVAA	Cold Vapor Atomic Absorption
DBCP	1,2-Dibromo-3-Chloropropane
DDT	Dichlorodiphenyltrichloroethane
DEHNR	Department of Environment, Health & Natural Resources
DENR	Department of Environment and Natural Resources
DEP	Department of Environmental Protection
DF	Dilution Factor
DFTPP	Decafluorotriphenyl-phosphine
DHHR	Department of Health and Human Resources
DI	De-Ionized
DMR	Discharge Monitoring Report
DMRQA	Discharge Monitoring and Reporting Quality Assurance
DO	Dissolved Oxygen
DOC	Demonstration of Capability
DRO	Diesel Range Organics
DUP	Duplicate
DW	Drinking Water
E.Coli	Escherichia Coli
ECD	Electron Capture Detector
EDB	Ethylene Dibromide
EDTA	Ethylene Diamine Triacetic Acid
ELCD	Electrolytic Conductivity Detector
EPA	Environmental Protection Agency
EPTOX	Extraction Procedure Toxicity Test
FAAS	Flame Atomic Absorption Spectroscopy
FID	Flame Ion Detector
FV	Final Volume
GC	Gas Chromatograph
GC/MS	Gas Chromatograph / Mass Spectrometer
GED	General Education Diploma
GFAAS	Graphite Furnace Atomic Absorption Spectrometry
GGA	Glucose-Glutamic Acid Standard
GLP	Good Laboratory Practices
GLS	Gas Liquid Separator
GM	General Manager
GPS	Global Positioning System

Acronym	Meaning
GRO	Gasoline Range Organics
GTA	Graphite Tube Atomizer
H_2SO_4	Sulfuric Acid
HCL	Hallow Cathode Lam
HCl	Hydrochloric Acid
HEM	Hexane Extractable Material
HG/AFS	Hydride Generation Atomic Fluorescence Spectrometry
HNO_3	Nitric Acid
HPC	Heterotrophic Plate Count
HPLC	High Performance Liquid Chromatography
HTRW	Hazardous, Toxic and Radioactive Waste
IBWA	International Bottled Water Association
IC	Ion Chromatograph
ICB	Initial Calibration Blank
ICP	Inductivity Coupled Plasma
ICP - AES	Inductivity Coupled Plasma / Atomic Emission Spectroscopy
ICP-MS	Inductivity Coupled Plasma / Mass Spectroscopy
ICV	Initial Calibration Verification
ID	Identification
IDC	Initial Demonstration of Capability
IDL	Instrument Detection Limit
IEC	Inter-Element Correction
IR	Infrared
IRB-BART	Iron Related Bacteria - Biological Activity Reaction Test
IS	Internal Standard
ISE	Ion Selective Electrode
K	Potassium
KCl	Potassium Chloride
KRO	Kerosene Range Organics
LAN	Local Area Network
LAS	Linear Alkylbenzene Sulfonate
LCS	Laboratory Control Spike
LCSD	Laboratory Control Spike Duplicate
LDO	Luminescence Dissolved Oxygen
LDR	Linear Dynamic Range
LIMS	Laboratory Information Management System

Acronym	Meaning
MB	Method Blank
MBAs	Methylene Blue Active Substances; Surfactants
MBLK	Method Blank
MCL	Maximum Contamination Limit
MDL	Method Detection Limit
MeOH	Methanol
MF	Membrane Filter
mg/kg	Milligrams per kilogram
mg/L	Milligrams per Liter
MIDI	Mini Distillation
$MnSO_4$	Manganese Sulfate
MPN	Most Probable Number
MQL	Method Quantitation Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
MSDS	Material Data Safety Sheet
MSI	Insoluble Matrix Spike
MSS	Soluble Matrix Spike
MTBA	Methyl-Tert-Butyl-Alcohol
NA	Not Applicable
$Na_2S_2O_3$	Sodium Thiosulfate
NaOH	Sodium Hydroxide
ND	Non-Detect
NELAC	National Laboratory Environmental Laboratory Accreditation Conference
NELAP	National Environmental Laboratory Accreditation Program
Ni	Nickel
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Standards and Technology
NPDES	National Pollutant and Discharge Elimination System
NR	Not Required
NTU	Nephelometric Turbidity Units
O2	Molecular Oxygen
ORO	Oil Range Organics
OSHA	Occupational Safety and Health Administration
P & A	Precision and Accuracy
PAHs	Polynuclear Aromatic Hydrocarbons

Acronym	Meaning
Pb	Lead
PCBs	Polychlorinated Biphenyls
PDS	Post Digestion Spike
PE	Performance Evaluation
PID	Photoionization Ion Detector
PM	Project Manager
PMT	Photo Multiplier Tube
POC	Purgeable Organic Carbon
POTW	Public Owned Treatment Works
ppb	Parts Per Billion
PPE	Personal Protective Equipment
ppm	Parts Per Million
PQL	Practical Quantitation Limit
PT	Proficiency Testing
PTFE	Polytetrafluoroethylene
PVC	Polyvinyl Chloride
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
QCS	Quality Control Spike
QT	Quanti-Tray
RCRA	Resource Conservation & Recovery Act
REIC	REI Consultants, Inc.
RPD	Relative Percent Deviation
RRF	Relative Response Factor
RRT	Relative Retention Time
RSD	Relative Standard Deviation
R-Values	Relative-Values
S-Dev	Standard Deviation
SGT-HEM	Silica Gel Treated – Hexane Extractable Material
SIM	Selected Ion Monitoring
SM	Standard Method
SOP	Standard Operating Procedure
SPCC	System Performance Check Compounds
SPE	Solid Phase Extraction
Spec	Spectrophotometer
SPLP	Synthetic Precipitation Leaching Procedure

Acronym	Meaning
SRB - BART	Sulfate Related Bacteria - Biological Activity Reaction Test
SRLT	Synthetic Rainwater Leaching Test
SU	Standard Units – Units of pH Measurements
SUVA	Specific Ultraviolet Absorbency
SVGC	Semi-Volatile Gas Chromatograph
SVGCHPLC	Semi-Volatile Gas Chromatograph High Performance Liquid Chromatograph
SVGCMS	Semi-Volatile Gas Chromatograph Mass Spectrometer
SW	Solid Waste
TB	Trip Blank
TBA	Tertiary Butyl Alcohol
TC	Total Carbon
TCD	Thermal Conductivity Detector
TCLP	Toxic Characteristic Leaching Procedure
TDS	Total Dissolved Solids
TEGD	Technical Enforcement Guidance Document
TFS	Total Fixed Solids
THMs	Trihalomethanes
TIC	Tentatively Identified Compounds
TKN	Total Kjeldahl Nitrogen
TOC	Total Organic Carbon
TON	Threshold Odor Number – Units of Odor Measurement
TOX	Total Organic Halogens or Total Organic Halides
TS	Total Solids
TSS	Total Suspended Solids
TVS	Total Volatile Solids
UPS	United Parcel Service
US	United States
USACE	United States Army Corp of Engineers
USPS	United States Postal Service
UV	Ultraviolet
UV-VIS	Ultraviolet-Visible Spectrophotometry
VOA	Volatile Organic Aromatic
VOC	Volatile Organic Compound
VOGC	Volatile Organics Gas Chromatograph
VOGCMS	Volatile Organics Gas Chromatograph Mass Spectrometer

Acronym	Meaning
WP	Water Pollution
WS	Water Supply
WW	Waste Water
Zn	Zinc

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APPENDIX L: Revision Acknowledgement

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Revision 28:

Includes:

Section 1.6 expanded
Section 1.8 expanded
Section 6.2.4 added
Section 9.3 expanded
Section 12.5 and 12.6 added
All references to 'Cool Ridge' were removed and changed to 'Bioassay'
Floor plan for RSC was updated
Floor plan for MOVSC was added
Floor plan for Bioassay was updated

By signing below I have acknowledged the major revisions and changes to the Comprehensive Quality Assurance / or QA Manual.

DEPARTMENT			
Name	Date	Name	Date