#150300

PERFORMANCE DEMONSTRATION PLAN
FIELDS BROOK SUPERFUND SITE
ASHTABULA, OHIO

SUBMITTED TO:

de maximis, inc.
450 MONTBROOK LANE
KNOXVILLE, TN 37919

April 9, 2001

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PROJECT NO. 1078

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Submitted To:

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March 2001
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1.0 INTRODUCTION

As part of a Remedial Action being performed by de maximis, Inc. and SoilPure, Inc. under contract for the Fields Brook Superfund Site, Ashtabula, Ohio, to perform on-site remediation of approximately 25,000 tons of soils primarily contaminated with organic compounds. The project will be conducted using the SoilPure, Inc thermal remediation system.

A *Remedial Action Work Plan* will be prepared by SoilPure, Inc. that describes the proposed plan for executing the entire project. This performance demonstration plan has been prepared by SoilPure, Inc. to describe the performance demonstration test objectives, process equipment design features, process operating parameters, sampling procedures, analysis procedures, monitoring procedures, and quality assurance/quality control procedures that will be used during the performance demonstration program.

The soils are primarily contaminated with DNAPL (the highest concentrations of which are hexachloroethane and trichloroethene as well as other volatile organic compounds and semi volatile compounds.

The major mechanical components of the remediation system consist of a soil pretreatment system, soil feed system, a rotary dryer soil treatment unit, treated soil handling system, baghouse, induced draft (ID) fan, cooler, scrubber, auxiliary fuel supply system, thermal oxidizer, and a process control, monitoring, and interlock system.

Following mobilization and erection of the remediation system, the unit will undergo a shakedown period to confirm the proper operation of all-mechanical, electrical, and instrument systems and to establish appropriate operating parameters. The system will initially be started using clean soils until the proper operation of all system components are confirmed.

After proper mechanical, electrical, instrument, and process operations are confirmed, the system will initiate processing of contaminated materials. The objective of this phase of the startup will be to establish the optimum process conditions for treating the contaminated materials. In order to control the amount of soil treated prior to the performance demonstration, the system will be limited to treating no more than one-third of the contaminated soils during the shakedown and performance demonstration period. The treatment of "no more than one-third" of the contaminated soils is the typical limit established by EPA at other Superfund or similar remediation sites. Approximately 350 to 500 tons of soil will be treated during the Demonstration Test.

Following the shakedown period, a performance demonstration will be conducted which will consist of three replicate sampling runs. The goals of the performance demonstration are to demonstrate the ability of the Remediation System to reduce the concentrations of DNAPL contaminants in the soil, to adequately destroy hazardous organic compounds, and to meet applicable air emission control requirements. The performance demonstration will be deemed successful if the requirements outlined below are met:

- Stack gas emission with selected Principle Organic Hazardous Compounds (POHCs), (hexachloroethane and trichloroethene) are introduced into the Remediation System to obtain a destruction and removal efficiency (DRE) of 99.99%, in accordance with the following formula from CFR 264.343(a)(1). The DRE is defined; with W_{in} the POHC mass flow rate into the system and W_{out} the POHC mass flow rate leaving in the remediation exhaust to atmosphere, as follows:

$$DRE=\{W_{in} - W_{out})/W_{in}\}*100$$

Where:

W_{in} = mass of each POHC entering the Remediation System

W_{out} = mass of each POHC exiting the stack

- Modeled ground level concentrations of stack gas emissions of emitted compounds shall meet OEPA Threshold Limit Values (ACGIH) divided by 70.

- The concentration of particulates in the stack gas is less than 0.08 grains per dry standard cubic foot (gr/dscf), corrected to 7 percent oxygen.

- The emission rate of hydrogen chloride (HCL) in the stack gas is less than or equal to 4 lbs/hr.

- The emission of metals in the stack gas shall not exceed the ambient air impact guidelines described in the Boilers and Industrial Furnaces (BIF) guidelines of 40 CFR 266.107.

- The concentration of carbon monoxide (CO) in the stack exhaust gas is less than 100 ppm_v, corrected to 7% oxygen, based on a 60 minute rolling average.

In addition to the above requirements, the stack gas will be sampled and analyzed for total hydrocarbons (THC), sulfur dioxide (SO_2), nitrogen oxides (NO_X), and total tetra- through octa-chlorinated dibenzo-p-dioxins and dibenzofurans (PCDDs/PCDFs).

The performance demonstration will consist of three replicate sampling runs conducted under one set of operating conditions. Each sampling run is expected to last 3 to 4 hours. During the test, soil feed and operating conditions are designed to achieve the following goals:

- Establish maximum soil mass feed rate (target 40 tons/hr)

- Demonstrate minimum soil exit temperature (target 500° to 800°F)

- Demonstrate minimum thermal oxidizer exit gas temperature (target 1600°F)

- Demonstrate maximum baghouse exit gas flow rate used as an indicator of combustion gas velocity

- Establish other control limits for the Remediation System and Air Pollution Control (APC) system operating parameters.

Stack sampling protocols for the performance demonstration are summarized as follows:

- Particulates and CHL/CL_2 by EPA Method 0050 (M0050)
- Semi volatile organics and PCDD/PCDF by EPA Method 0023 (M0023).
- Volatile organics by VOST
- Metals by EPA Multiple Metals Train (MMT)
- Continuous emissions monitoring (CEM) for CO, CO_2, O_2, THC, SO_2, and NO_X.

During remediation activities, the noise levels from the Remediation System will not exceed 60 dB at 200 feet from the Remediation System, nor 10 dB above background at any property boundary.

Specific references used in preparing the performance demonstration plan include:

- USEPA, "Guidance on Setting Permit Conditions and Reporting Trial Burn Results", EPA/625/6-8-/019, January 1989.
- USEPA "Quality Assurance/Quality Control (QA/QC) Procedures for Hazardous Waste Incineration", EPA625/6-89/023, January 1990.
- USEPA, "Methods Manual for Compliance with the BIF Regulations", EPA/530-SW-91-010, December 1990.
- USEPA, "Standards for Miscellaneous Treatment Units", Subpart X, 40 CFR 264.
- USEPA, "New Source Performance Standards. Test Methods and Procedures", Appendix A, 40 CFR 60.
- USEPA, "Test Methods for Evaluating Solid Waste", W-846, Third Edition, 1986, revised 1990.
- American Society for Testing and Materials, "Annual Book of ASTM Standards", latest annual edition (2000).

Appendix A presents the Performance Demonstration Quality Assurance Project Plan. Sampling and analytical calculations are presented in Appendix B.

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2.0 PROJECT ORGANIZATION

The remedial activities at Fields Brook Superfund Site, Ashtabula, Ohio are being performed under the oversight of USEPA Region V and the Ohio Environmental Protection Agency (OEPA). The Remedial Project Manager (RPM) or his/her representative will be on-site during the performance demonstration test. Other regulatory observers, technical assistance groups, and oversight contractors may also be at the site during the performance demonstration test.

The performance demonstration test program will be performed by a project team consisting of representatives of de maximis, SoilPure, and a group of subcontractors. A subcontractor who is experienced in the testing of thermal treatment systems will conduct the stack testing for this project. One or more analytical laboratory subcontractors will provide analytical services. A performance testing consultant will serve as the Performance Test Manager (PTM). The overall project organization and lines of responsibility are shown in Figure 2-1.

The de maximis Project Manager has overall responsibility for the implementation of remedial actions and providing contractor oversight, under contract to the Fields Brooks Superfund Site. The de maximis Project Manager serves as the key technical interface with USEPA and Ohio EPA.

The de maximis Project Superintendent has overall responsibility for coordinating site activities. He or she will have oversight responsibilities for SPI's operations during the Remediation System performance demonstration testing.

The SPI Principal in Charge is a corporate officer with overall responsibility for the financial, operational, and health and safety aspects of the project. The Principal in Charge interacts with the client, regulatory agencies, and the SPI Project Manager as required.

The SPI Project Manager is responsible for coordinating Remediation Systems operations with the test team and providing liaison with the Remedial Project Manager (RPM), de maximis and (potentially) any regulatory agencies that need onsite direction. Some of his or her responsibilities include:

- Working with the PTM in planning and implementing the Performance Demonstration Plan
- Preparing the Remediation System for testing
- Calibrating instruments prior to the test
- Testing automatic waste feed cutoff (AWFCO) prior to the test

- Operating the Remediation System at planned test conditions
- Recording Remediation System process data required by the test plans
- Coordinating Remediation System operational activities with the Stack Testing Manager through communication with the PTM
- Certifying sections of the Performance Demonstration Report that document the process operations.

The Performance Test Manager will be responsible for the development of the Performance Demonstration Plan and Performance Demonstration Report and for coordinating activities among various project team members. Specific responsibilities will include:

- Developing the Performance Demonstration Plan
- Coordinating reviews of the Performance Demonstration Plan and QAPP by all performance test participants prior to the performance test
- Ensuring compliance with the Performance Demonstration Plan and the QAPP by all project team members during the performance test
- Assisting the SPI Project Manager in interfacing with the RPM and other regulatory observers/oversight contractors during the performance test
- Providing coordination between the SPI Project Manager and the Stack Sampling Coordinator during the performance test
- Providing field review of process operating logs, Performance Test Sample Collection Sheets, stack sampling logs, sample traceability forms, and request for analysis forms
- Interfacing with the laboratory Analysis Coordinators while samples are being analyzed
- Interfacing with the Stack Sampling Coordinator while the performance stack test sampling data is being reduced
- Supervising production of the Performance Demonstration Report
- Certifying the overall performance test results and Performance Demonstration Report

- Coordinating review of the Performance Demonstration Report with regulatory agency personnel.

A Quality Assurance Officer (QAO) who reports to the SPI Principal in Charge will also be appointed whose responsibilities will include:

- Reviewing QA/QC activities and communicating the results of those activities to the appropriate personnel
- Making recommendations to the de maximis Project Superintendent, SPI Principal in Charge, and Performance Test Manager if problems are detected
- Ensuring that appropriate corrective actions are taken if problems are detected
- Conducting or coordinating any required audits of field or laboratory procedures to ensure compliance with the Performance Demonstration Plan and QAPP
- Verifying that test data are adequately recorded and maintained and that raw data are properly recorded validated and interpreted.

A Process Sampling Coordinator (PSC) will be appointed who will have the following responsibilities:

- Preparing and shipping soil sampling equipment, soil sample containers, and shipping containers to the test site
- Assigning and recording soil sample numbers
- Reviewing and approving Performance Test Sample Collection Sheets
- Documenting soil sampling activities in a field logbook
- Directing and/or participating in soil sampling activities
- Preparing soil samples and packaging them for shipment to the laboratory
- Preparing traceability and request for analysis forms for soil samples
- Shipping soil samples to the laboratory.

A Stack Sampling Coordinator (SSC) will be appointed who will have the following responsibilities:

- Preparing and shipping stack sampling equipment, stack sample containers, and stack sample-shipping container to the test site.
- Assigning and recording stack sample numbers
- Preparing and calibrating stack sampling equipment
- Directing stack sampling activities
- Recording field test data required by the Performance Demonstration Plan or stack sampling methods
- Reviewing and approving all field data sheets
- Completing traceability forms and request for analysis forms for stack samples
- Overseeing preservation of stack samples in the field
- Labeling stack samples and preparing them for shipment to the laboratory
- Shipping stack samples to the analytical laboratory
- Reducing stack sampling data and performing all calculations and QA activities required by the sampling methods
- Preparing a draft and final report of stack sampling activities.

One Laboratory Analysis Coordinator (LAC) will be appointed for each laboratory that provides analytical services for the project. His/her responsibilities will include:

- Receiving, verifying, and documenting that incoming field samples correspond to the sample traceability information
- Maintaining records of incoming samples
- Tracking samples through processing, analysis, and disposal
- Preparing QC samples for analysis during the project
- Verifying that personnel are trained and qualified in specified laboratory QC and analytical procedures
- Verifying that laboratory QC and analytical procedures are being followed as specified in the QA/QC Plan

- Reviewing the QC and sample data during analysis and determining if repeat samples or analyses are needed

- Submitting certified QC and sample analysis results and data packages to the PTM

- Archiving analytical data.

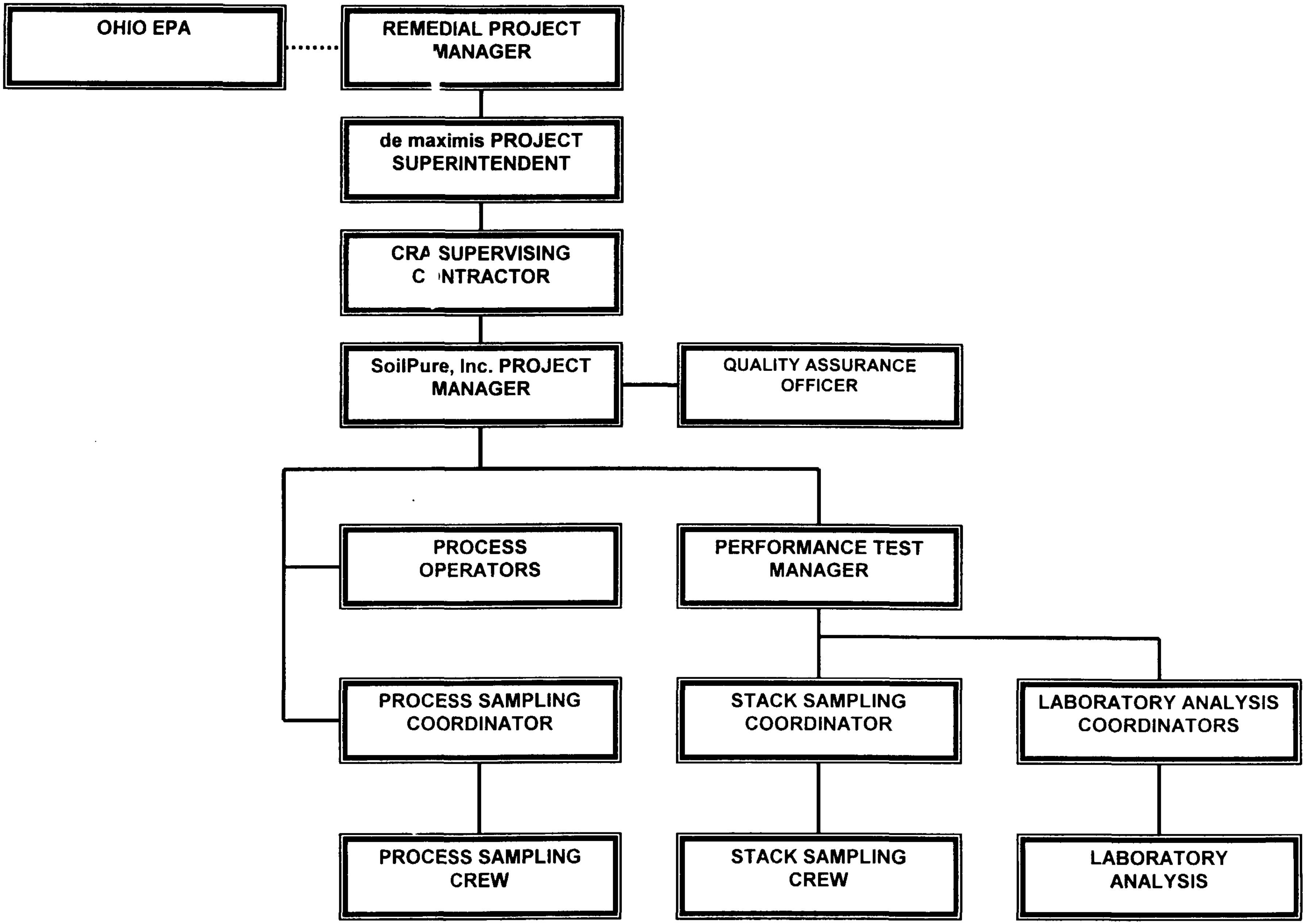

Figure 2 -1 Performance Demonstration Test Project Organization and Responsibility

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3.0 WASTE ANALYSIS and POHC SELECTION

3.1 Background

3.1.1 Site Description

Fields Brook site, located approximately 55 miles east of Cleveland in the city and county of Ashtabula, Ohio, is a six square-mile watershed of a Brook where from 1940 to the present, up to 19 separate facilities operated. Activities range from metals-fabrication to chemicals production. Fields Brook flows into the Ashtabula River, which flows into Lake Erie approximately 1-1/2 miles downstream of the site. Sediments of Fields Brook and soils of the Fields Brook floodplain/wetlands area are contaminated with a wide variety of contaminants including polychlorinated biphenyls (PCBs), chlorinated solvents and metals. Several industrial properties surrounding Fields Brook are potentially re-contaminating Fields Brook sediment, which has contaminated Ashtabula River sediments. Approximately 23,000 people live within one mile of the site in the city of Ashtabula.

3.1.2 Threats and Contaminants

Sediments taken from the Ashtabula River are contaminated with PCBs, volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), heavy metals, and phthalates. VOCs and heavy metals including mercury, lead, zinc, and cadmium have been detected in surface water from Fields Brook tributary. Contaminated sediments threaten drinking water intakes in Lake Erie. Contaminants detected in fish include VOCs and PCBs. The site poses a potential health risk to individuals who accidentally ingest or come into direct contact with contaminated water from Fields Brook and the Ashtabula River. Ingesting contaminated fish or sediments also may cause adverse health effects.

3.2 Waste Analysis

The organic concentrations are shown in Table 3-1. This data is a summary of soil sampling and analytical results provided by Conestoga-Rovers and Associates based on site investigation work. Detailed soil sampling and analytical results are presented in Appendix C, these are dated October 2000.

Table 3-1. Soil Characterization Data (Maximum Concentrations)

Semivolatile Organic Contaminates by Method 8270C	**Soil Concentration (ug/kg)**
1,2,4-Trichlorobenzene	500,000
Hexachlorobenzene	6,000,000
Hexachlorobutadiene	15,000,000
Hexachloroethane	50,000,000
Pentachlorobenzene	2,800,000
Pentachloroethane	3,800,000
Volatile Organic Contaminates by Method 8260B	**Soil Concentration (ug/kg)**
1,1,2,2-Tetrachloroethane	14,000,000
Tetrachloroethene	27,000,000
Trichloroethene	45,000,000

The performance demonstration test will be conducted using soil that is contaminated with the highest level of organic compounds based on pretest sampling and analysis of soil stockpiled at the site. The selection of this soil for testing should subject the Remediation System to the worst case treatment conditions at the site. Since the soil feed, the treated soil, and the stack gas will be sampled and analyzed for volatile organics (VOC scan), semi-volatile organics (semi-volatile scan), and PCDDs/PCDFs to determine if any products of incomplete combustion are being formed in the Remediation System.

During the test, two organic compounds, one volatile and one semi-volatile, present in the soils at the site, and at sufficient levels, will be fed into the plant and those soils will allow a demonstration of at least 99.99% destruction and removal efficiency (DRE). Contaminant levels from the soil boring data shows high enough concentration to allow demonstration without spiking the feed soil.

Based on the performance of baghouses in other soil treatment operations, the stack gas particulate concentration for the SPI Remediation System should be significantly less than 0.08 gr/dscf.

Based on the wet scrub efficiency the reported concentrations of chlorinated organics in the site soil, the 4.0 lbs/hour emission rate limit for HCL will not be exceeded.

3.3 Selection of PHOC

The two compounds selected as POHCs for DRE performance demonstration are hexachloroethane and trichloroethene. The selection of these compounds is based upon the following factors:

- Both compounds are as difficult to destroy as any constituent found in the soil, one is semivolatile and the other is a volatile organic.
- Both compounds are present on the site in quantities so as spiking will be mitigated and DRE can be readily shown.
- Hexchloroethane; 50,000 mg/kg
- Trichloroethene; 45,000 mg/kg

Table 3.2. Clean Up Goals
FIELDS BROOK SITE
ASTABULA, OHIO

Chemical of Concern	**Residential** (mg/kg)	**Occupational** (mg/kg)
1,1,1- Trichloroethane	393,451.00	766,500.00
1,1,2,2-Tetrachloroethane	51.00	119.00
1,1,2- Trichloroethane	179.00	418.00
1,1,2-Dichloroethene	17.00	40.00
1,2,4-Trichlorobenzene	43,717.00	85,167.00
1,2-Dichlorobenzene	393,451.00	766,500.00
1,2- Dichloroethene (trans)	87,433.00	170,333.00
1,4- Dichlorobenzene	425.00	994.00
2-Chlorophenol	21,858.00	42,583.00
Acenaphthene	262,300.00	511,000.00
Anthracene	1,311,502.00	2,555,000.00
Antimony	1,749.00	3,407.00
Arsenic*	5.80	14.00
Benzene	352.00	822.00
Benzidine	0.04	0.10
Benzo(a)anthracene	13.97	33.00
Benzo(a)Pyrene	1.40	3.30
Benzo(b)fluoranthene	13.97	33.00
Benzo(k)fluoranthene	13.97	33.00
Beryllium	2.40	5.50
Alpha-BHC	1.60	3.80
Gama BHC (Lindane)	7.80	18.00

Chemical of Concern	**Residential** (mg/kg)	**Occupational** (mg/kg)
Bis(2-ethylhexyl)phthalate	729.00	1,703.00
Cadmium	2,186.00	4,258.00
Chlorobenzene	87,433.00	170,333.00
Chloroform	1,672.00	3,909.00
Chromium III	4,371,673.00	8,516,667.00
Chromium VI	21,858.00	42,583.00
Chrysene	139.73	327.00
Copper	161,752.00	315,117.00
Cyanide	87,433.00	170,333.00
Di-n-butylphthalate	437,167.00	851,667.00
Di-n-octylphthalate	87,433.00	170,333.00
Dibenz(a,h)anthracene	1.40	3.30
Diethyl phthalate	3,497,338.00	6,813,333.00
Dimethyl phthalate	437,167.00	851,667.00
Ethylbenzene	437,167.00	851,667.00
Fluoranthene	174,867.00	340,667.00
Fluorene	174,867.00	340,667.00
Heptachlor	2.30	5.30
Hexachlorobenzene (p)	6.38	15.00
Hexachlorobenzene (s)	6.38	15.00
Hexachlorobutadiene	131.00	306.00
Hexachloroethane	729.00	1,703.00
Indeno(1,2,3-cd)pyrene	14.00	33.00
Isophorone	10,737.00	25,102.00
Lead	500.00	500.00
Mercury	1,312.00	2,555.00
Methylene chloride	1,360.00	3,180.00
N-nitrosodiphenylamine	2,081.00	4,867.00
Naphthalene	174,867.00	340,667.00
Nickel	87,433.00	170,333.00
Nitrobenzene	2,186.00	4,258.00
Total PCB	1.30	3.10
Phenol	2,623,004.00	5,110,000.00
Pyrene	1,311,502.00	2,555,000.00
Selenium	21,858.00	42,583.00
Tetrachloroethene	196.00	459.00
Thallium	262.00	511.00
Toluene	874,335.00	1,703,333.00
Trichloroethene	927.00	2,168.00
Vinyl Chloride	5.40	13.00
Zinc	847,335.00	1,703,333.00

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4.0 PROCESS DESCRIPTION

4.1 Overview

The SoilPure, Inc. (SPI) soil remediation unit is designed to remediate soil contaminated with non recycled distillate petroleum hydrocarbons, including gasoline, jet fuel, diesel oil, polynuclear aromatic hydrocarbons as well as solvents by rapidly volatilizing these products from the soil, then thermally destructing them in the air pollution control system. The major mechanical components of the unit consist of; a control house, soil feed system including a weigh scale, a rotary drum desorber, a treated soil handling system (which includes; an auger mixer/cooler and stacking conveyor), a baghouse filtration system, a thermal oxidizer and wet scrub air pollution control system. Auxiliary systems include fuel, air and water delivery systems and a process control, monitoring and interlock system.

A generic site plan (Figure 4-1-1), process flow diagram (Figure 4-1), and system specifications of the SPI soil remediation unit are provided. An engineering description of the unit is provided in the following sections

4.2 Soil Feed System

Contaminated soil in need of treatment is transported to the unit with a front end loader from the contaminated soil staging area and is passed through a grizzly into a hopper. The soil is conveyed to an incline conveyor. The incline belt conveys the soil to a final 2" minus screening device and onto a belt weigh scale. The belt scale provides soil feed rate and totalized weights to the unit's control system. The feed belt feeds the contaminated soil into a stainless steel counter flow rotary drum desorber.

4.3 Rotary Drum Desorber

The primary thermal treatment component of the SPI remediation unit is an 8'x32' counter-current rotary drum stainless steel desorber with stainless steel internal flights. Soil is fed into the rotary desorber where the internal flights lift and veil the soil through the hot gas stream produced by the direct-fired primary burner. Soil flows counter-currently to the airflow in the desorber. The burner is located outside of the soil discharge end of the desorber. The soil discharges the desorber at temperatures of approximately 350° F. to 900° F depending on engineering specifications and regulatory objectives.

Soil residence time in the rotary drum desorber is variable and is a function of the desorber rotation speed and depth of fill desired in the system. At a feed rate of 40 tons per hour, the soil residence time will be approximately 8 to 10 minutes.

4.4 Primary Fuel System

Heated air is supplied to the rotary desorber through a liquid propane fired burner.

The rotary desorber burner is direct fired with a capacity of 50 MM BTU/hour. A centrifugal blower supplies combustion air to the burner.

4.5 Treated Soil Handling System

The heated, dry soil from the thermal desorber is discharged into an enclosed auger system. The remediated soil and dust mixture is then augured to the mixer cooler where it is cooled with a water spray. Water is used in the treated soil handling system at a rate dependent on the temperature of the treated soil entering the mixer/cooler, and the desired final material moisture content. The treated soil is discharged from the discharge screw onto a stacking conveyor. The stacking conveyor discharges the treated material to a temporary stockpile. The final soil temperature will be 150° F. to 200° F. and will have a moisture content of 4% to 8%.

4.6 Baghouse Operation

The evaporated organics and water, along with dust released by the desorption process are carried with the rotary drum exhaust gases into a knockout chamber where larger particles drop out of the gas stream. The gas stream then flows to the baghouse. Dust collected from the baghouse is dropped into the slat conveyor system, which conveys the fines to an auger for transport back to the desorber prior to discharging to the mixer cooler. The baghouse includes 504 filter media P-84 bags, a single drag chain bottom slat conveyor with airlock and auger. The baghouse utilizes P-84 filter media that are capable of handling the desorber exit gas. Typical desorber exit gas temperature ranges from 300° F. to 475° F. The baghouse filter elements are rated for continuous service at temperatures up to 475° F. Dust removal from the baghouse filter media is assisted by compressed air pulsation.

4.7 Induction Fan

Conditioned off-gas exits the baghouse and is discharged to the induction (ID) fan. The ID fan produces a negative pressure throughout the system and has a capacity of 18,000 scfm at 12" of static pressure. The fan is equipped with a 75 horsepower motor. The gas from the ID fan is discharged to the thermal oxidizer.

4.8 Thermal Oxidizer

The gas stream output from the baghouse is routed through the ID fan into a modular thermal oxidizer, which reduces the hydrocarbon content of the gas stream with a destructive removal efficiency (DRE) capable of up to 99.99%

depending on contaminate concentrations. The thermal oxidizer consists of a refractory lined combustion chamber utilizing a 47 MMBTU direct fired burner with a design operating temperature of 2,200°F. @ 2.0 seconds retention time. The unit has a removable insulated crossover duct connecting to the final APC.

4.9 Air Pollution Control System

Off gases from the thermal oxidizer are transferred to the APC system. The oxidizer off-gas enters a quench / wet scrubber which removes the bulk of the heat, organic compounds and water vapor from the stream. Fresh and re-circulated water is injected into the wet scrubber through a series of nozzles, dropping the temperature of the vapor stream to slightly above ambient temperature. The constituents of concern (COC's) HCL which may be present in the off-gas from the rotary desorber have boiling points above 340°F. and will condense into the water stream of the scrubber. The resulting liquids at the bottom of the scrubber will flow to the water-cooling tanks / heat exchanger. Any particulate that passes through the baghouse, will be settled out from the water stream in the cooling tanks / heat exchanger.

The water stream will be transferred by the recycle pump from the primary cooling tank / heat exchanger #1 to cooling tank / heat exchanger #2 to cool the water stream before reuse as scrubber water. Before entering the wet scrubber, the pH of the stream will be adjusted by chemicals, (if needed) to control any acid that may have been formed in the thermal oxidizer.

To control the water balance within the APC system, a slip stream will be diverted from the scrubber water recycle stream and discharged to the on-site water treatment plant or holding tanks. The volume of this slip stream is dependent on the volume of water that enter the system from the feed soil.

The vapor stream from the scrubber is discharged to the atmosphere through a vertical air stack 39' above grade with a 99% removal efficiency.

4.10 Construction Materials

The materials of construction for the major components of the SPI soil remediation unit are provided in Table 4-1.

4.11 Continuous Emissions Monitoring

The air stream exiting the scrubber stack will be continuously monitored for oxygen and carbon monoxide with read out and alarms in the control house.

4.12 Controls, Monitoring and Interlocks System

4.12.1 Control Systems

The SPI Remediation Unit control center is composed of a central control system containing controls, indicators, and recorders of flow, temperature and pressure measurements in the soil feed system, rotary drum desorber, treated soil handling system, baghouse, thermal oxidizer, wet scrub and auxiliary systems. An operator in the control house monitors the control center and overall process. The control house is located adjacent to the soil feed system. It is continuously monitored.

A Chessel Data Logger is employed and continuously records to a 3.5" disk which can be printed or reviewed in a Lotus 123 or Excel spreadsheet format. The following information will be recorded;

- Drier negative pressure
- Soil discharge temperature
- Baghouse differential pressure
- Baghouse air influent temperature
- Baghouse exit gas flow rate
- Tons of material treated per hour
- Oxygen level in stack
- Carbon monoxide levels from the stack
- Thermal oxidizer temperature
- HCL level in wet scrub water

4.12.2 Monitoring System

An SPI panel operator monitors critical parameters to ensure the soil remediation unit is operated in compliance with regulatory and other process operating limits. During minor process upsets the SPI control room operator will manually adjust process conditions to keep the system within allowable limits.

Key operating parameters are interlocked with the soil feed system to automatically cut off soil feed if parameters are outside of allowable limits. During the start-up and shutdown of the SPI soil remediation unit or during critical process upsets, the interlock system automatically stops the soil feed system and prevents restart until the SPI unit is at proper operating conditions and the upset is cleared.

Table 4-1 Materials of Construction of Major Equipment

Component	Construction Material
Rotary Dryer	Stainless Steel
Wet Scrubber	Carbon Steel
Baghouse	Carbon Steel
Thermal Oxidizer	Carbon Steel / Refractory Insulation
ID Fan	Carbon Steel
Stack	Carbon Steel

4.12.3 Interlocks System

The table (Table 4-2) presents a summary of the automatic waste feed cut off (AWFCO) parameters, target cut off set points, and cut off time periods. Certain interlocks are initiated based on an instantaneous process value, some are initiated after a time delay, and others are based on rolling averages generated by the control system. For values based on rolling averages, the system computes the arithmetic average of all 1-minute values for the permitted time period. Therefore, a new rolling average data point is computed each minute. The process parameters that are interlocked with the automatic waste feed cut off system are as described in the following paragraphs. Planned operating conditions, which will establish the automatic waste feed cutoff set-points are discussed in Section 5.0. Table 4-2 presents the anticipated automatic waste feed cutoff set points that could result from the successful completion of the performance demonstration test.

Table 4-2. Automatic Waste Feed Cut Off Conditions

Control Parameters	Cutoff Condition	Comments
Soil feed rate (ton/hr)	High	1-minute rolling average AWFCO
Rotary dryer pressure (inches w.c.)	High	15-second time delay before AWFCO
Rotary dryer exit soil temperature (°F)	Low	1-minute rolling average AWFCO
Thermal oxidizer exit gas temperature (°F)	Low	1-minute rolling average AWFCO
Baghouse exit gas flow rate (ft^3/min)	High	1-minute rolling average AWFCO
Stack gas carbon monoxide (ppm_v)	High	60-minute rolling average AWFCO
Baghouse differential pressure (inches w.c.)	Low	Instantaneous AWFCO

Control Parameters	**Cutoff Condition**	**Comments**
ID Fan failure	--	Instantaneous AWFCO
Burner system failure	(a)	Instantaneous AWFCO
Power failure	--	Instantaneous AWFCO

Note: [a] Burner management system flame out indication

4.12.3.1 Rotary Desorber Soil Feed Rate High

The soil feed rate is continuously monitored and recorded. Soil feed will be shut off if the maximum allowable feed rate is exceeded, based on a one minute rolling average.

4.12.3.2 Rotary Desorber Pressure High

The pressure in the rotary desorber is monitored and maintained at a slightly negative value to control fugitive emissions. Soil feed will be automatically shut off if the rotary desorber pressure exceeds the high set point. A 15 second time delay will be incorporated into the high-pressure soil feed cut off interlock.

4.12.3.3 Treated Soil Exit Temperature Low

Removal of organics from the soil is controlled by the temperature and residence time of the soil in the rotary desorber. The removal efficiency will decrease if the soil temperature falls below a minimum value. The soil feed will be shut off if the temperature falls below the low set-point, based on a one minute rolling average.

4.12.3.4 Baghouse Differential Pressure

The baghouse differential pressure is an indication of proper filter operation in the baghouse. If filter media ruptures in the baghouse it will be indicated by a low differential pressure across the baghouse. Soil feed will be instantaneously shut off if the differential pressure falls below the low set-point value.

4.12.3.5 Minimum Thermal Oxidizer Temperature

A thermocouple in the thermal oxidizer stack senses the exit gas temperature. If the exit gas temperature drops below its set point, the soil feed will be shut off. The thermal oxidizer exit gas temperature set point will be based on a one minute rolling average.

4.12.3.6 Maximum Baghouse Exit Gas Flow Rate

The baghouse exit gas flow rate will be monitored by an annubar gas flow indicator and will be used in conjunction with the thermal oxidizer inlet duct dimensions to determine the combustion gas velocity. The baghouse exit gas flow rate is a function of the soil treatment rate, combustion air requirements in the rotary desorber, and some air leakage. The maximum baghouse exit gas flow rate (and hence combustion gas velocity) will correspond to a maximum feed condition since the maximum remediation unit's thermal input will occur at the maximum soil feed rate.

4.12.3.7 Stack Gas CO Analyzer

The CO analyzer measures the concentration of CO in the gas stream exiting the thermal oxidizer. The soil feed will be automatically stopped if the 60 minute rolling average stack gas CO concentration exceeds 100 ppmv, corrected to 7% oxygen (dry basis).

4.12.3.8 ID Fan Failure

In the event of an ID fan failure, soil feed and fuel are immediately shut off.

4.12.3.9 Burner Failure

A burner management system flame out indication will trigger an immediate automatic soil feed cutoff.

4.12.3.10 Power Failure

In the unlikely event of a power failure, soil feed and fuel are immediately shut off. This is accomplished by providing the feed system with instrumentation that positions controls in a "safe" (closed or off) position.

4.13 Stack Gas Monitoring

The continuous emissions monitoring (CEM) system consists of sample probes, a sample delivery and conditioning apparatus, and gas analyzers. Continuous monitoring of the stack gas emissions is conducted for CO, CO_2, and O_2. Carbon monoxide concentration is measured by a non-dispersive infrared detector as well as carbon dioxide concentration, which is also measured by a non-dispersive infrared detector. A fuel cell detector measures O2 concentration.

4.15 Location and Description of Temperature, Pressure, and Flow Indicating and Control Devices

The SPI control center is equipped with instrumentation to monitor process flows, temperatures, and pressures and transmit signals to the central control system. The instrumentation system has the capability to control valves, motors, fans, and dampers as well as initiating soil feed cutoff interlocks if process conditions deviate from acceptable ranges.

Table 4-3 summaries the major process instrumentation on the SPI system, including pressure, temperature, and flow monitoring devices, as well as other important instrumentation. Figure 4-1 is an instrumentation location diagram showing the approximate location of the major process instrumentation and monitoring devices. The following discussion describes the monitoring instruments of regulatory concern. Instrument tag number references refer to Figure 4-2. Each of the major process instruments listed in Table 4-3 is recorded via a digital process recorder. The digital process recorder is a Model 4100G, Eurotherm Chessell Data Logger and Analyzer. The digital process recorder contains a 3.5" floppy disk for continuous monitoring and recording of process data and a data logger that records discrete data values for each process parameter being monitored.

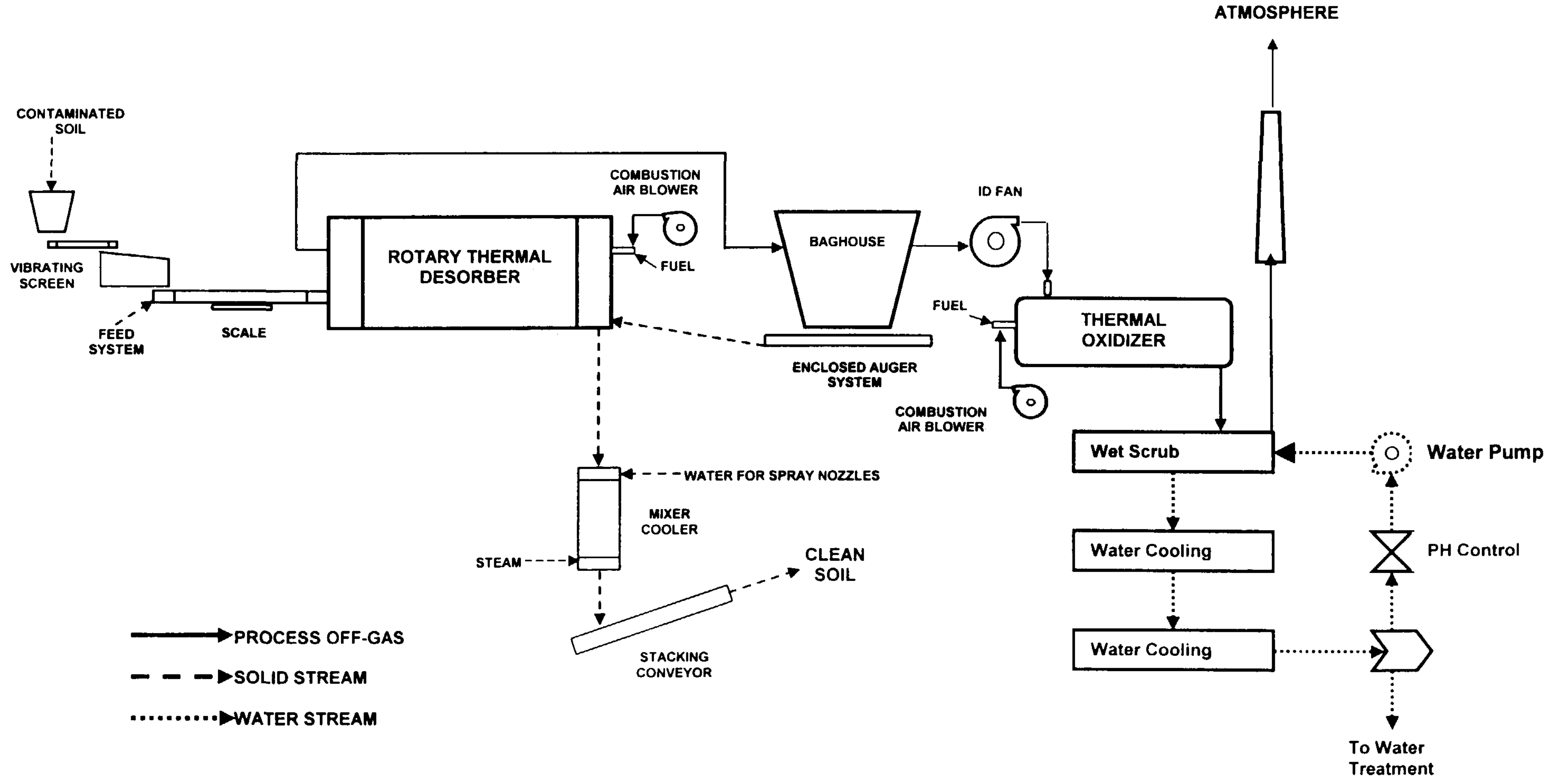

Figure 4 - 1 Low Temperature Thermal Desorption System Block Flow Diagram

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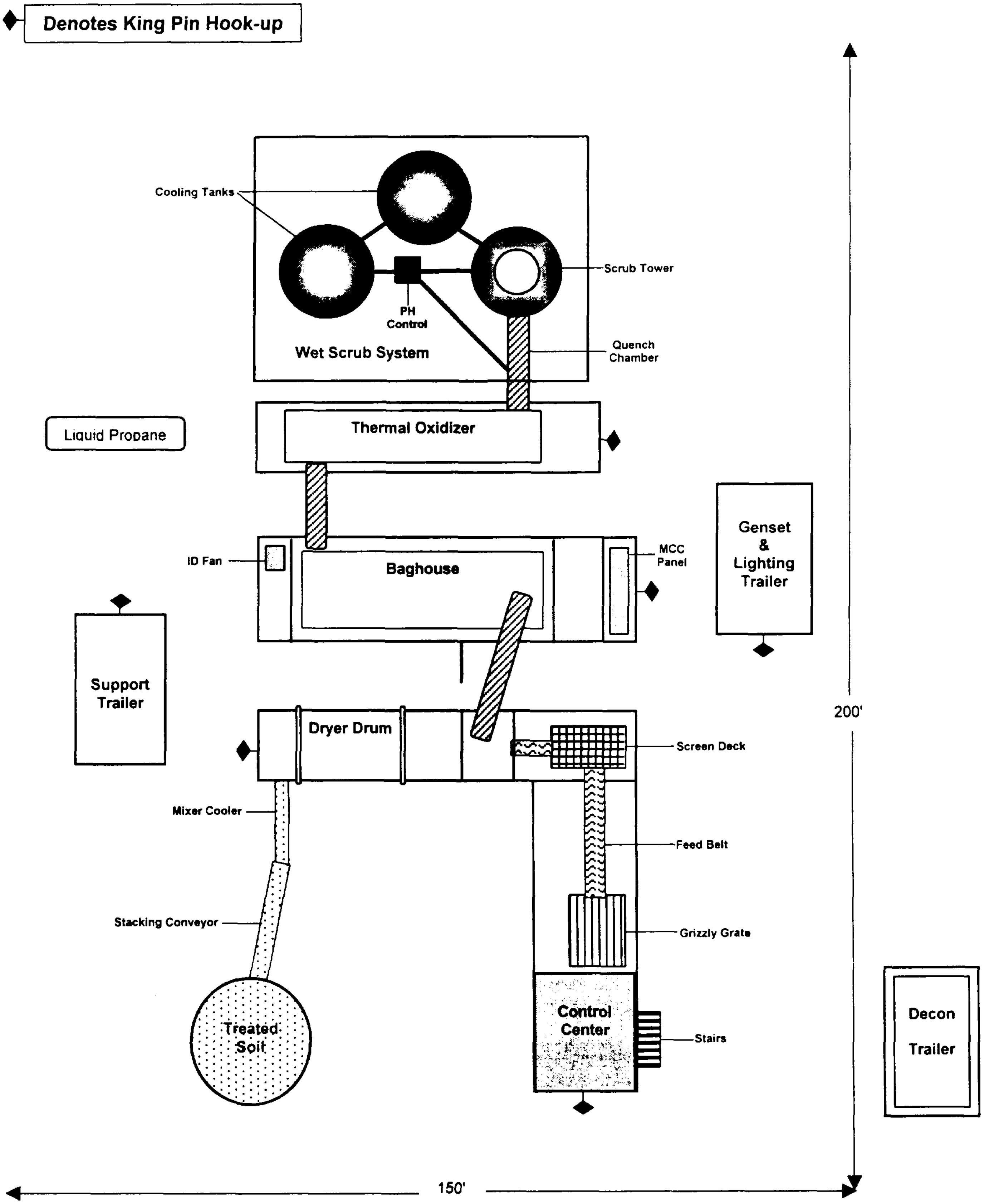

Figure 4 - 1 -1 Site Plan NOT TO SCALE

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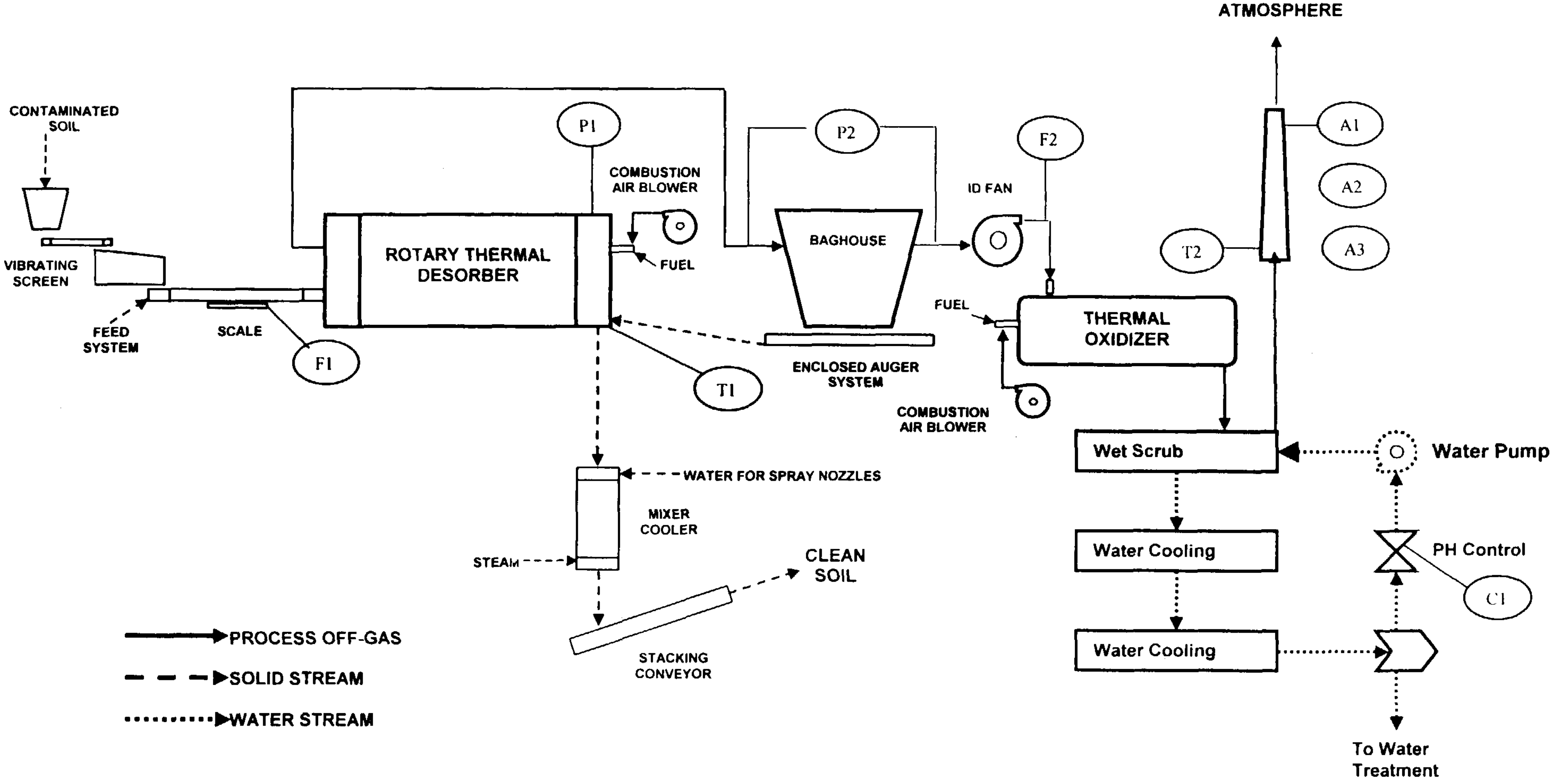

Figure 4 - 2 Locations of Major Process Instruments

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Table 4-3. Major Process Instruments

Monitored Parameter (Location)	Measuring Device	Measurement Frequency	Recording Frequency	Calibration Frequency	Testing Frequency
Rotary Dryer					
Soil feed rate	Weigh cell	Continuous	Continuous	Monthly	Monthly
Rotary dryer pressure	Pressure sensor	Continuous	Continuous	Quarterly	Monthly
Rotary dryer exit soil temperature	Thermocouple	Continuous	Continuous	Annual	Monthly
Thermal Oxidizer					
Thermal oxidizer exit gas temperature	Thermocouple	Continuous	Continuous	Annual	Monthly
APC System					
Baghouse differential pressure	Pressure sensor	Continuous	Continuous	Quarterly	Monthly
Caustic injection system	HCL probe	Continuous	Continuous	Daily/Quarterly	Monthly
Combustion Gas					
Baghouse exit gas flow rate	Annubar	Continuous	Continuous	Annual	Monthly
Stack gas CEM					
Carbon Monoxide	Non-Dispersive Infrared Analyzer	Continuous	Continuous	Daily/Quarterly	Monthly
Carbon Dioxide	Non-Dispersive Infrared Analyzer	Continuous	Continuous	Daily/Quarterly	Monthly
Oxygen	Fuel Cell Analyzer	Continuous	Continuous	Daily/Quarterly	Monthly

4.15.1 Rotary Desorber Soil Feed Rate (F-1)

A weigh cell located on the feed conveyor belt measures the soil feed rate to the rotary desorber. The feed rate is continuously recorded.

4.15.2 Rotary Desorber Pressure (P-1)

A pressure sensor located in the rotary desorber constantly monitors the off gas pressure. A negative pressure is always maintained whenever soil is being fed in order to control fugitive emissions. Rotary desorber pressure is continuously recorded in the control center.

4.15.3 Rotary Desorber Treated Soil Exit Temperature (T-1)

The temperature of the treated soil is continuously measured with a thermocouple at the inlet to the treated soil discharge auger. This temperature is continuously recorded in the control center.

4.15.4 Baghouse Differential Pressure (P-2)

A pressure sensor continuously monitors the differential pressure across the baghouse. If a low differential pressure event occurs, the system is automatically shut down and the event is recorded. The baghouse differential pressure is continuously recorded in the control center.

4.15.5 Caustic Injection System (C-1)

The HCL of the scrubber water is continuously monitored. The system is designed to continuously measure the acid concentrations and correct to neutral. The acid concentrations are continuously recorded in the control center.

4.15.6 Thermal Oxidizer Exit Gas Temperature (T-2)

The temperature of the gas exiting the thermal oxidizer is continuously measured with a thermocouple at the thermal oxidizer discharge. This temperature is continuously recorded in the control center.

4.15.7 Baghouse Exit Gas Flow Rate (F-2)

The flow rate of the combustion gases exiting the baghouse is measured directly using an annubar flow sensor. This baghouse exit gas flow rate is continuously recorded in the control center.

4.15.8 Stack Gas CO CEMS (A-1)

Continuous emissions monitoring system is provided for CO. A sample of stack gas is continuously withdrawn from a port in the stack, passed through a sample extraction and conditioning system, and transported to the analyzer. The CO analyzer is a non-dispersive infrared analyzer. The concentration of CO is continuously recorded.

4.15.9 Stack Gas CO_2 and CEMS (A-2)

Continuous emissions monitoring system is provided for CO_2. A sample of stack gas is continuously withdrawn from a port in the stack, passed through a sample extraction and conditioning system, and transported to the analyzer. The CO_2 analyzer is a non-dispersive infrared analyzer. The concentration of CO_2 is continuously recorded.

4.15.10 Stack Gas O2 CEMS (A-3)

Continuous emissions monitoring system is provided for O_2. A sample of stack gas is continuously withdrawn from a port in the stack, and transported to the analyzer. The O_2 analyzer utilizes a fuel cell to detect varying concentrations of O_2. The concentration of O_2 is continuously recorded.

5

5.0 OPERATING PLAN

The operating plan during the performance demonstration test is designed to develop and test those operating conditions that are "worst case". Process operating and emission parameter data from the test may then be used to establish the operating limits and procedures that will be in effect during the remainder of the site cleanup operations. These operating limits will assure process performance that meets the criteria of this demonstration plan.

5.1 Demonstration Test Protocol and Operating Conditions.

The performance demonstration test will be conducted to demonstrate the Remediation System's treatment capabilities. The performance demonstration protocol has been developed to optimize the testing that will demonstrate all critical parameters anticipated as the allowable operating limits.

Critical operating limits to be established include those listed in Table 5-1. This table summarizes the planned operating conditions (temperatures, flow rates, pressures, etc.) for the performance demonstration. The table presents anticipated ranges, maximum, or low conditions planned for the testing. It is anticipated that some degree of fluctuation will occur during the performance demonstration just as in normal operation.

5.1.1 Remediation System Temperature

The planned performance demonstration test operating temperatures for the rotary desorber and thermal oxidizer are listed in Table 5-1. Since some degree of fluctuation will occur during operations, it is anticipated that operating temperature conditions will be established based on rolling averages. A 1-minute rolling average will be used for the rotary dryer soil temperature, and a 1-minute rolling average will be used for the thermal oxidizer exit gas temperature.

5.1.2 Soil Feed Rates

A contaminated soil feed rate of approximately 42 tons an hour is planned for the Remediation System. The feed rate is in part dependent on the moisture content, soil type, and other soil characteristics, which affect the handling of the contaminated soil. The maximum feed rate will be established during shakedown and confirmed during the performance demonstration. Soil feed rate will be measured on a 1-minute rolling average basis.

Table 5-1 Planned Performance Test Operating Conditions

Parameter	Test Conditions [a]
Soil Feed rate (ton/hour)	38-42
Propane (scfh)	As required
Rotary dryer treated soil exit temperature (°F)	500-800
Rotary dryer draft (inches w.c.)	>.01
Baghouse differential pressure (inches w.c.)	>1.5
Thermal oxidizer gas outlet temperature (°F)	1500-1700°F
CEMs carbon monoxide (ppm_v@7% oxygen)	<100
Baghouse exit flow rate (scfm)	14000-18000

[a] All values are estimated ranges. Final values will be determined from the performance test results.

5.1.3 Operating Conditions for the Emissions Control Equipment

The baghouse and wet scrub are the only emission control equipment not addressed as part of the combustion system. The baghouse pressure differential is used as an indicator of proper operation, with a low pressure differential indicating that bags may have failed. During the performance test and normal operation, the baghouse pressure differential will fluctuate over some range as solids accumulate on the bags and are intermittently removed by compressed air pulses. The expected operating range is shown in Table 5-1.

5.2 Performance Test Objectives

The objectives of the performance demonstration test are to show that the SPI Remediation System is capable of meeting the following requirements:

- Treatment of soils to a level that meets the cleanup requirements established by the USEPA and the OEPA (see Section 3, Table 3-2).
- 99.99% DRE or greater for POHC.
- Particulate matter emissions less than or equal to 0.08 gr/dscf, corrected to 7% oxygen (dry basis).
- Hydrogen chloride emissions of less than 4 lb/hr.

- Metals emissions less than or equal to the ambient air impact guidelines (Tier III) as described in 40 CFR 266.107.

- Stack gas carbon monoxide concentration less than or equal to 100 ppmv, corrected to 7% oxygen (dry basis)

- The Maximum Ground Level Concentration (MGLC) of identified organics/inorganics in the stack gas emissions do not exceed the ACGIH Threshold Limit Value divided by 70.

In addition to these performance and emissions demonstrations, the test will develop certain operating limits that will be used to indicate that the SPI Remediation System continues to maintain adequate performance throughout the remediation project.

If the required stack emissions and soil treatment performance standard are achieved, SPI requests that operating parameter limits be established as described in this section of the plan.

Table 5-2 summarizes the expected operating control limits resulting from a successful test. The following sections present a discussion of each anticipated operating parameter.

5.2.1 Control Parameter Categories

SPI anticipates that allowable operating limits will be established for a number of process control parameters based on the process conditions demonstrated during the performance test, and on design information for the Remediation System equipment. Control parameters are grouped into three categories.

- Group A parameters are continuously monitored and recorded, and are interlocked with the automatic soil feed shut off system. Interruption of soil feed will be automatic if Group A limits are exceeded. Because these parameters may fluctuate during normal operation, time delays or rolling averages are used in triggering the soil feed shut off interlocks. The time delays and rolling averages are used to prevent unnecessary interruption of system operations and minimize short-term fluctuations in system performance.

  Most Group A parameter limits will be established from the performance demonstration test operating data, and will be used to ensure that the Remediation System operating conditions are not significantly less rigorous than those demonstrated during the performance demonstration test. These parameters are called Group A-1 parameters. During the testing periods, interlocks from Group A-a parameters will be set at lower or higher values than those listed in Table 5-2 to allow for a sufficient operating range during the performance demonstration test.

For the other Group A parameters, allowable operating limits are established based on operational safety and good operating practice considerations rather than on the performance demonstration operating conditions. These parameters are referred to as Group A-2 parameters. An example of a Group A-2 parameter is the minimum baghouse pressure differential.

In the discussion of each operating control parameter below, an indication is given of the appropriate control parameter category. The discussion also defines how the limit for each parameter will be established.

Table 5-2 Anticipated Allowable Operating Conditions

Control Parameters [a]	**Value**	**Comments** [b]
Group A1 Parameters		
Maximum rotary dryer soil feed rate (tons/hr)	>42	1-minute rolling average AWFCO
Minimum rotary dryer exit soil temperature (°F)	<500	1-minute rolling average AWFCO
Minimum thermal oxidizer exit gas temperature (°F)	<1500	1-minute rolling average AWFCO
Baghouse exit gas flow rate (ft^3/min, actual)	>18000	1-minute rolling average AWFCO
Group A2 Parameters		
Minimum rotary dryer draft (inches w.c.)	0.01	15-second delay before AWFCO
Minimum baghouse differential pressure (inches w.c.)	1.5	Instantaneous AWFCO
Maximum stack gas carbon monoxide (ppm_v)	100	60-minute rolling average AWFCO
I.D. Fan failure	--	Instantaneous AWFCO
Burner system failure	--	Instantaneous AWFCO
Power failure	--	Instantaneous AWFCO

[a] Group A parameters are continuously monitored and are interlocked with the automatic waste feed cut off system.

Group A1 parameters are established from the performance test results.

Group A2 parameters are based on safety and/or good operating practice considerations.

[b] AWFCO = Automatic Waste Feed Cut Off.

5.2.2 Group A-1 Parameters

5.2.2.1 Maximum Soil Feed Rate

The feed rate of soil will be approximately equal during each replicate test run. Soil feed rate will be measured on a 1-minute rolling average basis. The maximum allowable soil mass feed rate will be determined from the average of the 1-minue rolling average soil feed rate values demonstrated during each performance demonstration test run. During normal production operation, soil feed will be automatically stopped if the 1-minute rolling average soil fee rate value is exceeded.

5.2.2.2 Minimum Rotary Desorber Exit Soil Temperature

The temperature of the soil exiting the thermal desorber will be measured on a 1-minute rolling average basis. Based on successful completion of the performance testing, the allowable operating limits should specify a minimum rotary desorber exit soil temperature equal to the average of the 1-minute rolling average temperatures demonstrated during each test run. Soil feed will be automatically stopped if the 1-minute rolling average rotary desorber exit soil temperature falls below the minimum allow value.

5.2.2.3 Minimum Thermal Oxidizer Exit Gas Temperature

The destruction efficiency of organics in the stack gas is a function of the temperature of the combustion gases in the thermal oxidizer. The thermal oxidizer exit gas temperature will be monitored on a 1-minute rolling average basis. Therefore, it is planned to set the minimum thermal oxidizer temperature at the average of the 1-minute rolling average temperatures measured during each of the three runs. The soil feed to the remediation system will be automatically stopped if the 1-minute rolling average thermal oxidizer temperature falls below the established minimum value.

5.2.2.4 Maximum Baghouse Exit Gas Flow Rate

SPI will monitor the combustion gas flow rate at the exit of the baghouse as an indicator of process gas velocity. The maximum baghouse exit gas flow rate will be demonstrated during the performance demonstration test. The gas flow rate will be monitored on a 1-minute rolling average basis. Therefore, it is planned to set the maximum baghouse exit gas flow rate at the average of the 1-minute rolling average flow rate measured during each of the three runs. The soil feed to the remediation system will be automatically stopped if the 1-minute rolling average baghouse exit gas flow rate exceeds the established maximum value.

5.2.3 Group A-2 Parameters

5.2.3.1 Rotary Desorber Pressure High

The rotary desorber will be maintained below atmospheric pressure at any time soil is being fed into the system, in order to control fugitive emissions. SPI anticipates a minimum allowable limit on the rotary desorber draft of 0.01 inches of water column (w.c.). This condition will not necessarily be demonstrated during the performance demonstration, but should be set based on good operating practice. Soil feed will be automatically shut off if the rotary desorber draft drops below 0.01 inches of water column for 15 seconds.

5.2.3.2 Minimum Baghouse Differential Pressure

A low baghouse differential pressure during normal operation may be an indication of bag failure. If bag failure occurs, there is potential of fouling downstream equipment with entrained particulates, and for elevated particulate emissions. A low baghouse differential pressure should be set based on the bag manufacturer's anticipated pressure differential using clean bags. This value is 1.5 inches of water column.

5.2.3.3 Maximum Stack Gas Carbon Monoxide Concentration

The soil feed will automatically be stopped if the 60-minute rolling average stack gas CO concentration exceeds 100 ppm_v, corrected to 7% oxygen (dry basis). This value is based on USEPA guidance for efficient combustion in hazardous waste remediation systems and is anticipated as an operating limit regardless of the CO values during the performance demonstration. The remediation unit will operate with a CO concentration below 100 ppm_v, corrected to 7% oxygen (dry basis) during the performance demonstration.

5.2.3.4 Burner System Failure

The burner system is continuously monitored during normal operations. A burner system failure indicated at the burner management system will automatically shut off the soil feed system.

5.2.3.5 ID Fan Failure

ID Fan failure is indicated by a low amperage and will automatically shut off the soil feed and all auxiliary fuel to the rotary desorber instantly.

5.2.3.6 Power Failure

In the unlikely event of a total power failure, the soil feed system will automatically be shut off. All auxiliary fuel to the Remediation System will be shut off instantly and the event will be recorded.

5.3 Operating Procedures

Operating procedures for SPI's Remediation System during the performance test will be consistent with those required by SPI's Operations Procedures Manual. A copy of this manual will be available at the site during the Performance Demonstration Test.

5.4 Residuals Mangement

The remediation operation and associated tasks will generate the following residual streams:

- Oversized debris too large for treatment >2 inches
- Treated soil
- Potentially contaminated scrub water

5.4.1 Oversized Debris

Oversized debris is material generated during excavation and feed preparation activities that is not suitable for treatment in the remediation system. This material will be segregated and stockpiled.

Oversize material will be stockpiled for disposal at the onsite or EPA approved landfill. The oversized material and debris will be manifested and tracked through shipment to landfill. Weigh scale receipts of final destination will be recorded.

5.4.2 Treated Soil Prior to Laboratory Confirmation

Material processed within any given 24 hour period including that generated during the demonstration test will be placed in a treated soils verification holding bin and covered pending analysis as specified in *Sampling, Monitoring & Analysis Plan* section of this Performance Demonstration Plan. Soils will be scheduled for re-treatment or staged for backfill depending on test results.

5.4.3 Scrub Water

Water generated from the scrub will be neutralized then sent to the on site water treatment facility. The neutralized water will be treated and analyzed per the water treatment facilities standard operating procedures.

5.5 Startup

The following startup procedures will be followed to establish steady state operation of the remediation system before contaminated soil is introduced to the system. The major tasks involved in the initial startup following mobilization include:

1. Prepare for startup.
2. Verify that utilities are connected and operational.
3. Verify that instrumentation and control systems are operation:
    - Check motor rotation
    - Check interlock system
    - Check manual override
    - Check CEM system
4. Verify operability of all system components.

Once the systems operability has been verified, the tasks involved in the startup (normal startup) are as follows:

1. Start the ID fan and combustion air fans.

2. Start discharge conveyors and rotary desorber rotation.
3. Start rotary desorber and thermal oxidizer burners and set the burners on low fire.
4. Start water pumps.
5. Start bringing rotary desorber and thermal oxidizer operating temperatures up to normal values following heat up schedule. Raise temperature in automatic control mode. Non-contaminated soil feed will be stared as the system approaches normal operating temperatures.
6. Verify normal operation of air pollution control system.
7. When remediation system temperatures are in normal range, verify that all interlocks are clear for contaminated soil feed.

Initiation of contaminated soil feed to the rotary desorber following an automatic waste feed cut off (AWFCO) involves repeating steps 4 through 7 above.

5.6 Emergency Shutdown

Certain situations may occur where timely actions are required to insure safety, protect equipment, or prevent the feeding of contaminated materials. The automatic waste feed cutoff inter-lock system, described earlier, and should stop the soil feed under all conditions that are outside the allowable limits established for operation. In addition, the remediation system is equipped with safety interlocks for burner management and to prevent severe over-temperature conditions. These systems operate to prevent an "emergency" shutdown from becoming necessary since they are designed to be activated automatically, well before "emergency" conditions develop.

In the event that a true "emergency" condition does arise, or if the process operator believes that the system needs to be immediately shut down, the remediation system operator may stop the operation at any time by pressing the emergency stop button. This action stops the soil feed, stops all fuel feed, and stops the ID fan, resulting in a complete shutdown of the system.

In the case of an emergency shutdown, the soils left in the rotary desorber at the time of shut down will be retreated. Prior to startup procedures the system will be run dry, all soil will be collected by a front end loader and fed into the plant again for treatment.

6

6.0 SAMPLING, MONITORING, AND ANALYSIS PLAN

The Performance Demonstration will consist of three replicate sampling runs conducted under one set of operating conditions. This section addresses the sampling, monitoring, and analyses to be conducted during the Performance Demonstration.

6.1 Sampling Locations and Procedures

The locations where performance test samples are collected from the remediation system are shown schematically in Figure 6-1.

The sampling equipment and the procedures for collecting samples at each location are summarized in Table 6-1. Sampling frequency and reference methods are also included in the table. Additional details regarding each sampling location are discussed below. The numbers following each heading refer to the sampling locations shown in Figure 6-1 and in Table 6-1. A summary of sample containers, preservation, and holding times is presented in the QAPP (Appendix A).

Feed soil (1)

The feed soil sample will be collected from the conveyor belt entering the remediation unit. Feed soil sampling procedures are described in Table 6-2.

Treated Soil (2)

Treated soil samples will be collected from the stacking conveyor. Treated soil sampling procedures are described in Table 6-3.

Stack Gases (3)

Stack sampling will be conducted at the stack during each performance test run. The exhaust stack is designed for isokinetic sampling. Figure 6-2 shows the planned stack configuration and sampling point locations. The following sampling systems will be used during the performance test:

- An EPA Method 0050 sampling train (M0050, Figure 6-3) will be used to collect particulates, HCL and Cl_2. Details of the sampling method are presented in Table 6-4.
- An EPA Volatile Organic Sampling Train (VOST, Figure 7-4) will be used to collect the volatile POHC and other volatile organics. Details of the sampling method are presented in Table 6-5.
- An EPA Method 0023 sampling train (M0023, Figure 7-5) will be used to collect PCDDs/PCDFs, the semivolatile POHC, and other

semivolatile organics. Details of the sampling method are presented in Table 6-6.

- An EPA Multiple Metals sampling train (MMT, Figure 6-6) will be used to collect metals. Details of the sampling method are presented in Table 6-7.

All stack sampling activities will be performed simultaneously during each test run.

Continuous Emissions Monitor (4)

Continuous monitoring of the stack gases will be conducted during the performance test for carbon monoxide (CO), carbon dioxide (CO_2), oxygen (O_2), total hydrocarbons (THC), sulfur dioxide (SO_2), and nitrogen oxides (NO_X). The continuous monitoring system used for CO, CO_2 and O_2 will be installed on the remediation system for use during the performance test and during continuing operation. The monitoring system used for THC, SO_2, and NO_X will be used only during the performance test. Table 6-8 briefly discusses the stack gas continuous emissions monitoring procedures.

6.2 Analytical Procedures

The analyses planned for each performance test sample are listed in Table 6-9. The analytical procedures and reference methods for these analyses are summarized In Table 6-10. Detailed procedures for preparing and analyzing the collected samples are presented in Tables 6-11 through 6-25.

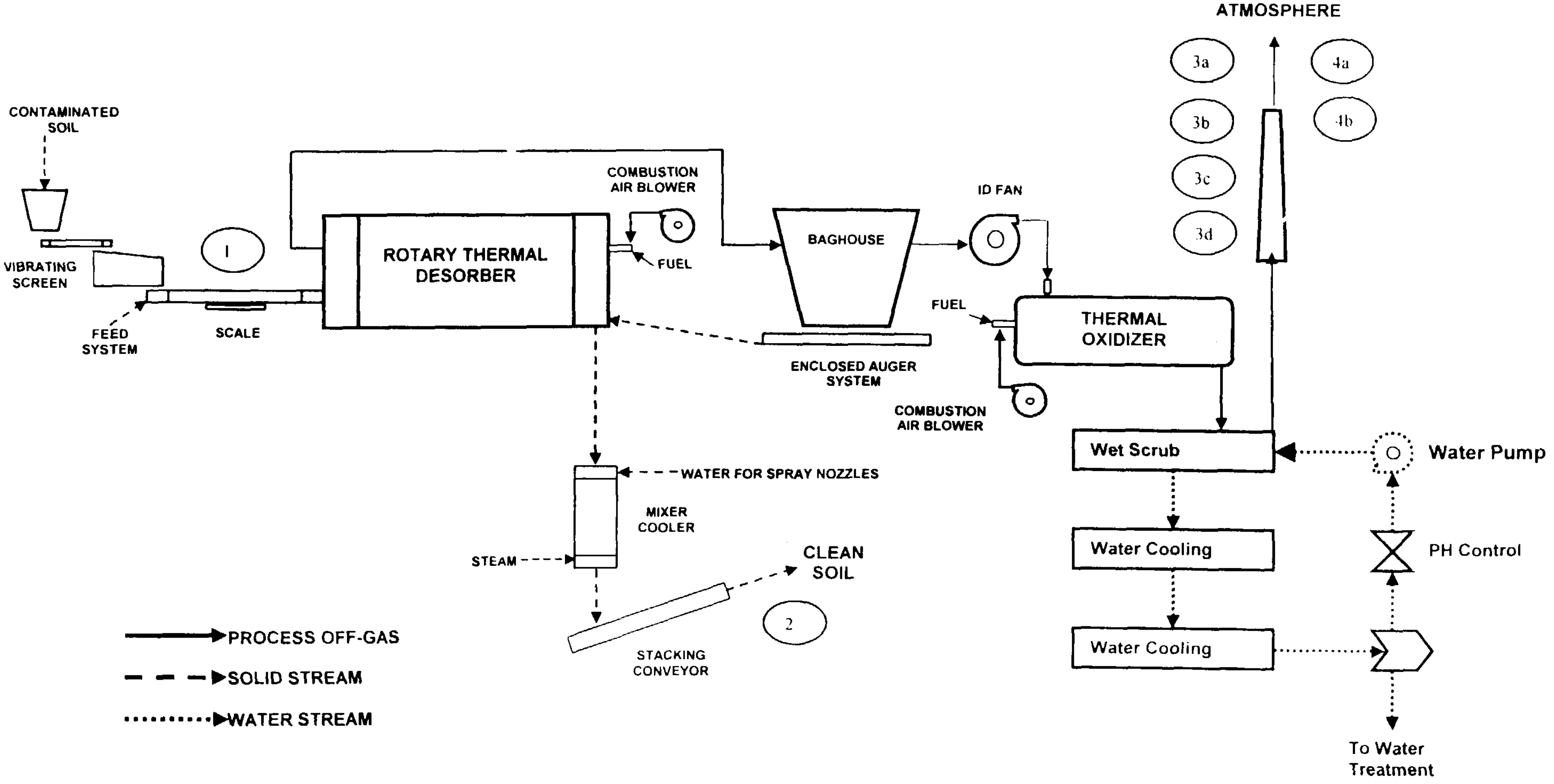

Figure 6 - 1 Performance Demonstration Test Sampling Locations

Table 6-1 Performance Test Sample Collection Locations, Equipment and Methods

Location	Sample Name	Sampling Location	Sampling Equipment	Sample Size	General Procedure/ Frequency	Reference * / Method
1	Feed soil (volatile organics)	Feed Conveyor	8-ounce scoops, 4-ounce wide mouth jars with Teflon septa	4-ounce (2 per grab)	Grab sample every 30 minutes; split into 2 samples. Collect individual samples at each time interval.	Table 6-2 (SW-846, Chapter 9)
1	Feed soil (metals, semivolatile, organics)	Feed Conveyor	4-ounce scoops, 2-gallon bucket, 4 wide mouth 8-ounce glass jars with lids, ceramic pestle.	8-ounce (2 metals) (2 semivolatile organics)	Grab sample every 30 minutes and place in 2 separate 2-gallon bucket; fill two 8-ounce glass jars from each well mixed composite in the 2-gallon buckets at the end of each run.	Table 6-1 (SW-856, Chapter 9)
1	Feed soil (physical characteristics)	Feed Conveyor	32-ounce scoop, 5-gallon bucket	25 pounds	Grab sample every 30 minutes; composite sample of all runs.	Table 6-1 (SW-846, Chapter 9)
2	Treated soil (volatile organics)	Stacking Conveyor	8-ounce scoops, 4-ounce wide mouth jars	4-ounce (2 per grab)	Grab sample every 30 minutes; split into 2 samples. Collect individual samples at each time interval.	Table 6-1 (SW-846)
2	Treated soil (metals, semivolatile organics)	Stacking conveyor	4-ounce scoops, 2-gallon bucket, 6 wide mouth 8-ounce glass jars with lids, ceramic pestle.	8-ounce (2 metals) 2 TCLP metals) (2 semivolatile organics) (2 PCBs)	Grab sample every 30 minutes and place in separate 2-gallon bucket; fill two 8-ounce glass jars from each well mixed composite in the 2-gallon buckets at the end of each run.	Table 6-1 (SW-846, Chapter 9)
3a	Stack gas M0050	Stack Port	EPA M0050 sampling train	60 – 100 dry standard cubic feet	Collect integrated sample for particulates, HCL/Cl_2, and moisture; measure stack gas velocity, pressure and temperature, collect bag samples for oxygen and carbon dioxide.	Table 6-1 EPA Methods 1 through 5; SW-846 Method 0050
3b	Stack gas VOST	Stack Port	EPA VOST sampling train	At least 20 minutes per tube pair at selected sampling rate.	Collect four pairs of sorbent tubes for volatile organics during each run.	Table 6-1 SW-846 Method 0030
3c	Stack gas Moo10	Stack Port	EPA M0023 sampling train	100 110 dry	Collect integrated sample for PCDDs/PCDFs, semivolatile organics,	Table 6-1 EPA Methods

Location	Sample Name	Sampling Location	Sampling Equipment	Sample Size	General Procedure/ Frequency	Reference * / Method
				standard cubic feet	and moisture: measure stack gas velocity, pressure and temperature: collect bag samples for oxygen and carbon dioxide.	1 through 4 and Method 23, SW-846 Method 0023
3d	Stack gas MMT	Stack Port	EPA multi-metals sampling train	60 100 dry standard cubic feet	Collect integrated sample for metals and moisture: measure stack gas velocity, pressure and temperature: collect bag samples for oxygen and carbon dioxide.	Table 6-1 EPA Methods 1 through 4: BIF Guidance
4a	Stack gas CEMS (permanent)	Stack Port	Continuous emissions monitoring system	Continuous	Continuously monitor stack gas for carbon monoxide.	Table 6-1 EPA Method 10 BIF Guidance
					Continuously monitor stack gas for oxygen.	Table 6-1 EPA Method 3A BIF Guidance
					Continuously monitor stack gas for carbon dioxide.	Table 6-1 EPA Method 3A
4b	Stack gas CEMS (test only)	Stack Port	Continuous emissions monitoring system	Continuous	Continuously monitor stack gas for sulfur dioxide.	Table 6-1 EPA Method 6C
					Continuously monitor stack gas for nitrogen oxides.	Table 6-1 EPA Method 7E
					Continuously monitor stack gas for hydrocarbons	Table 6-1 EPA Method 25A BIF Guidance

* "EPA Method" refers to New Source Performance Standards, Test Methods and Procedures, Appendix A, 40 CFR 60.
"SW-846" refers to Test Methods for Evaluating Solid Waste, Third Edition, 1986, and updates.
"BIF Guidance" refers to Methods Manual for Compliance with BIF Regulations, EPA/530-SE-91-010, December 1990.

Table 6-2. Feed Soil Sampling Procedure

Sample name:	Feed soil
Sampler:	Process sampling team
Locations:	Feed conveyor belt
Equipment:	4-ounce scoops 8-ounce scoops 32-ounce scoop 2-gallon buckets with lids 5-gallon bucket with lid Ceramic pestle Large spoon Large rectangular pan 8-ounce glass jars with lids (6) 4-ounce glass jars with Teflon lined septa (2 per sampling period) Gloves, eye protection, hardhat, respirator (if needed per H&S)
Frequency:	30-minute intervals
Procedures:	Composite Samples (metals and semivolatile organics) Collect an equal quantity of soil from the feed conveyor belt at each time interval with a 4-ounce scoop and transfer the grab sample to the 2-gallon bucket. Each time a grab sample is taken, record the sampling time.

At the end of the performance test run, crush the soil in the bucket using the ceramic pestle. Transfer the soil from the bucket to the large rectangular pan. Divide the material into quarters on the pan, mix each individual quarter, then roll together by hand using the large spoon. Use a 4-ounce scoop to transfer the sample from the rectangular pan to the four 8-ounce jars. Record the time the composite sample is taken.

Label two jars for metals analysis, and two jars for semivolatile organic analysis. Mark each jar with the sample name, sample number, date, time, and test-run number.

Composite Samples (physical characteristics)
Collect an equal quantity of soil from the feed conveyor belt at each time interval with the 32-ounce scoop and transfer the grab sample to the 5-gallon bucket. Each time a grab sample is taken, record the sampling time.

The composite samples will be collected for each sample period for all three runs in the same 5-gallon bucket. A minimum of 25 lbs. of soil is required for physical analyses. At the end of the last performance test run, put the lid on the bucket and seal with tape, attach sample number, label with time, date, sample name and test-run numbers.

Grab Samples (volatile organics)
Collect soil from the feed conveyor belt at each time interval with an 8-ounce scoop and transfer the grab sample to the two 4-ounce glass jars. Jars should be tapped slightly as they are filled to eliminate as much free space as possible.

Attach sample numbers to the teflon septa lined closed jars and label with time, date, sample name, and test-run number.

Composite and Grab Samples
Process Sampling Coordinator accepts custody of samples and records sample numbers and collection data in field log book.

Samples are placed on Ice in a shipping container, which is stored in the sample holding area separate from the container supply area.

Shipment of volatile organic samples to the laboratory will be made within 24 hours whenever possible. When there is a potential, delay, (e.g., weekends and holidays), the sample will be maintained at or below 4°C.

References: Test Methods for Evaluating Solid Waste, SW-846, Third Edition, 1986 and updates.

Table 6-3. Treated Soil Sampling Procedure

Sample name:	Treated soil
Sampler:	Process sampling team
Locations:	Stacking conveyor
Equipment:	4-ounce scoops 2-gallon buckets Ceramic pestle Large spoon Ladle 3 foot long, 1 -inch diameter dowel rod Large rectangular pan 8-ounce wide-mouth glass jars with lids (8) 32-ounce wide-mouth glass jars with lids (2) 4-ounce glass jars with Teflon lined septa (2 per sampling period) Gloves, eye protection, hard hat
Frequency:	30-minute intervals
Procedures:	Soil on the stacking conveyor is hot and emits steam and should be sampled with ***caution***. Use duct tape to tape the ladle to the dowel rod to make a long handled sample collection device.

Composite Samples (metals and semivolatile)
Collect an equal quantity of soil from the stacking conveyor belt at each time interval with the ladle. Use a 4-ounce scoop and transfer a portion of the grab sample from the ladle to a 2-gallon bucket. Each time a grab sample is taken, record the sampling time.

At the end of the performance test run, crush the soil in the bucket using the ceramic pestle. Transfer the soil from the bucket to the large rectangular pan. Divide the material into quarters on the pan, mix each individual quarter, then roll together by hand using the large spoon. Use a 4-ounce scoop to transfer the sample from the rectangular pan to the six 8-ounce jars. Return unused soil to the treated soil pile.

Label two jars for total metals analysis, two jars for TCLP metals analysis, and two jars for semivolatile organic analysis. Mark each jar with the sample name, sample number, date, time, and test-run number.

Grab Samples (volatile organics)
Collect soil from the stacking conveyor belt at each time interval with the ladle. Using the 8-ounce scoop, transfer a portion of the grab sample from the ladle to the two 4-ounce

glass jars. Jars should be tapped slightly as they are filled to eliminate as much free space as possible.

Attach sample numbers to jars and label with time, date, sample name, and test run number.

Composite and Grab Samples
Process Sampling Coordinator accepts custody of samples and records sample numbers and collection data in field log book.

Samples are placed on ice in a shipping container which is stored in the sample holding area separate from the container supply area.

Shipment of volatile organic samples to the laboratory will be made within 24 hours whenever possible. When there is a potential delay, (e.g., weekends and holidays), the sample will be maintained at or below 4°C.

References: Test methods for Evaluating Solid Waste, SW846, Third Edition, 1986 and updates.

NOTE:
CEM SAMPLING PORT S LOCATED AT LOWER STACK ELEVATION AND IS NOT SHOWN.

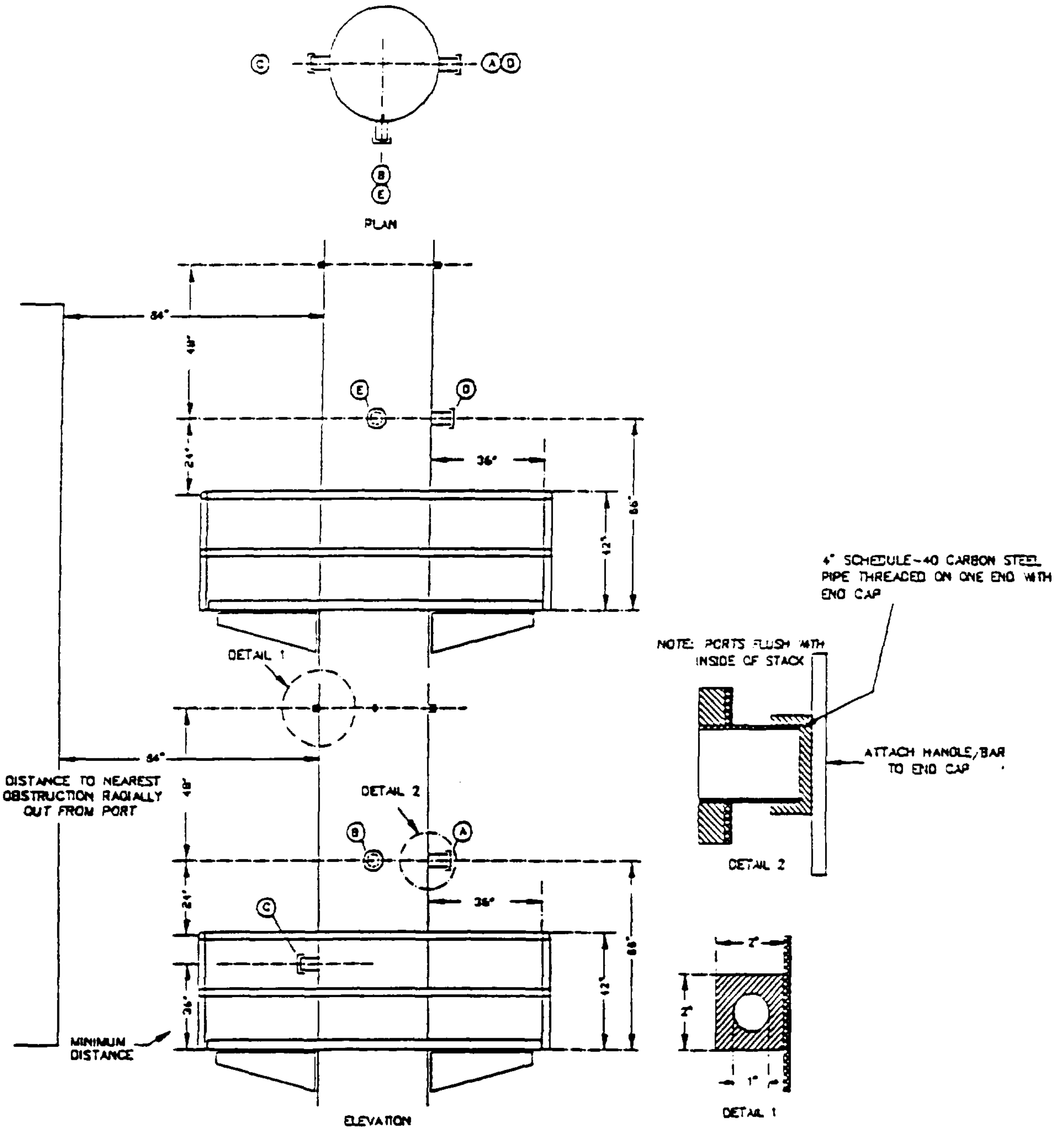

Figure 6 - 2 Stack Sampling Location Details

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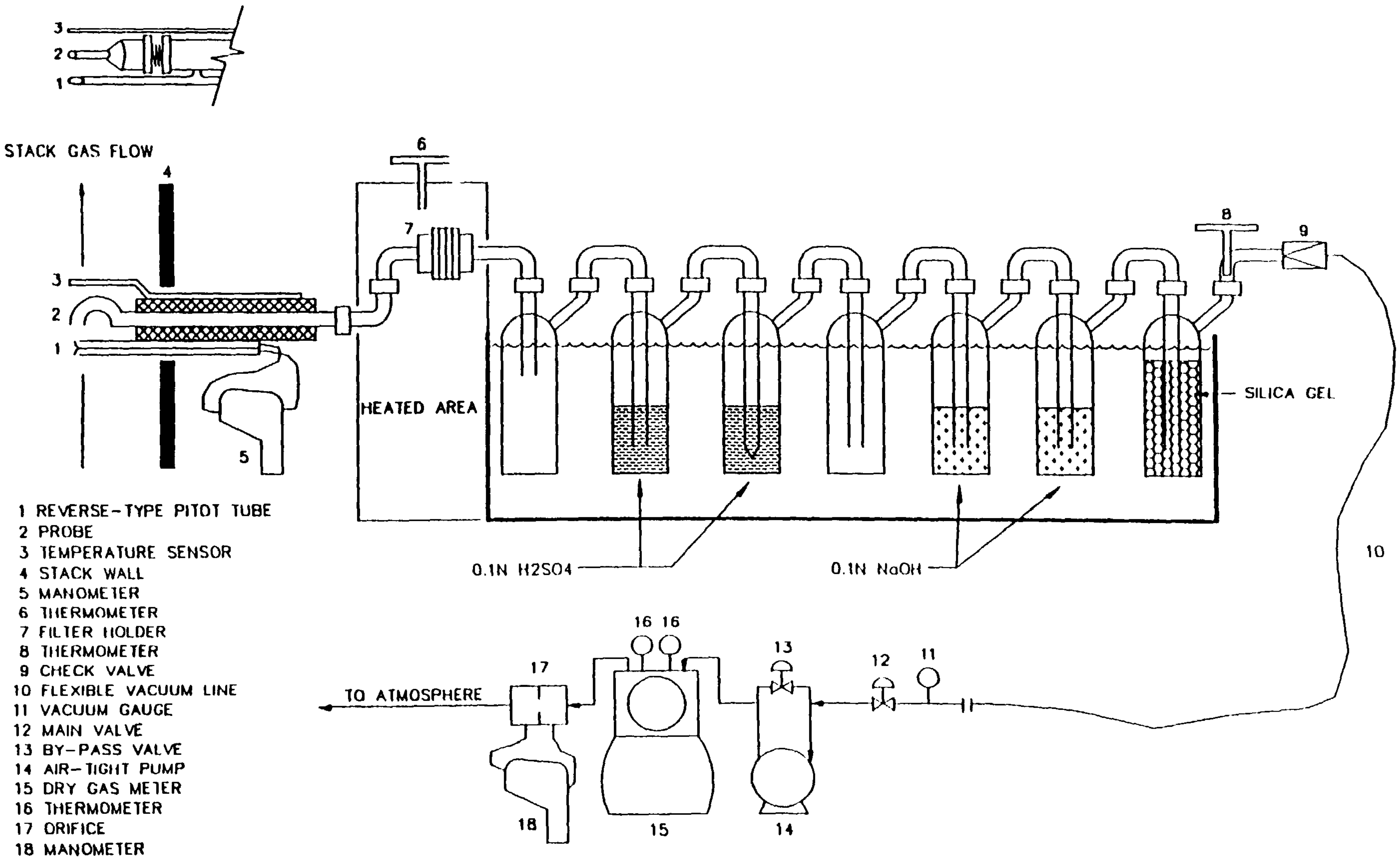

1 REVERSE-TYPE PITOT TUBE
2 PROBE
3 TEMPERATURE SENSOR
4 STACK WALL
5 MANOMETER
6 THERMOMETER
7 FILTER HOLDER
8 THERMOMETER
9 CHECK VALVE
10 FLEXIBLE VACUUM LINE
11 VACUUM GAUGE
12 MAIN VALVE
13 BY-PASS VALVE
14 AIR-TIGHT PUMP
15 DRY GAS METER
16 THERMOMETER
17 ORIFICE
18 MANOMETER

Figure 6 - 3 EPA Method 0050 Sampling Train (M0050)

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Table 6-4. Stack Gas Particulate, Hydrogen Chloride, and Chlorine Sampling Procedure

Sample name: Stack gas M0050

Sampler: Stack sampling team

Locations: Stack

Equipment: USEPA Method 5 sampling train modified for the collection of acid gases; petri dish with tared particulate filter; glass sample jars with lids, graduated cylinder balance.

Frequency: Continuous during a test run; three runs to complete test. A minimum sampling time of two hours will be used during each run.

Procedures: Stack gases will be isokinetically sampled to collect particulate matter on a filter, and to collect hydrogen chloride and chlorine in absorbing solutions. The particulate weight will be determined gravimetrically, and the chloride content of the absorbing solutions will be quantitatively determined by ion chromatography.

Sample point locations are determined in accordance with USEPA Method 1. An initial traverse Is made with a pitot tube at each sample point following USEPA Method 2 to establish stack gas velocity profile, temperature, and flow rate, and to check for cyclonic flow (cyclonic flow will be checked only on the first day of testing). USEPA Method 3, employing an Orsat analyzer, will be used to determine stack gas oxygen, carbon dioxide, and dry molecular weight. USEPA Method 4 will be followed to determine the stack gas moisture content. USEPA Method 5 procedures are followed for pretest and post-test leak checks, isokinetic sampling rate, filter change-outs (if needed), and data recording.

The sampling train utilizes a heated particulate filter and a series of seven chilled impingers. Impinger 1 will be empty and will serve as a moisture knockout trap; impingers 2 and 3 will each contain 1 00 ml of a 0. 1 N sulfuric acid solution; impinger 4 will be empty and will serve as a buffer to collect any carryover from impingers 2 and 3; impingers 5 and 6 will each contain 100 ml of a 0.1 N sodium hydroxide solution; impinger 7 will contain 200 to 300 g of indicating silica gel, weighed to within 0.5 g.

After sampling, the probe will be removed from the stack and the nozzle will be covered. External particulate matter will be wiped off the probe. It will then be disconnected from the train and both ends capped. The probe, filter and impinger assembly are transported to the sample recovery area. The samples are recovered as follows:

Particulate Filter -- The particulate filter is removed from its holder and placed into it's original petri dish (Container No. 1) which is sealed with tape and placed in a plastic bag.

Front Half Rinse -- The internal surfaces of the nozzle, probe, cyclone (ff used), and front half of the filter holder are cleaned by rinsing, brushing, and final rinsing with acetone into a separate sample jar (Container No. 2).

Acid Impinger Liquid -- The liquid contents of impingers 1, 2, and 3 are measured to the nearest milliliter or weighed to the nearest 0.5 g and placed into a sample bottle (Container No. 3). Each acid impinger and all connecting glassware, including the back half of the filter holder, is rinsed with deionized water, and the rinse is added to Container No. 3.

Alkaline Impinger Liquid - The liquid contents of impingers 4 and 5 are measured to the nearest milliliter or weighed to the nearest 0.5 g and placed into a sample bottle (Container No. 4). Each impinger and all connecting glassware is rinsed with deionized water, and the rinse is added to Container No. 4.

- Silica Gel -- The silica gel contents of impinger 6 are weighed to the nearest 0.5 g.
- Samples of the deionized water, acetone, sulfuric acid solution, and sodium hydroxide solution are taken for reagent blanks.

All of the sample containers will be assigned numbers and labeled with date and test-run number. The samples will be turned over to the sample coordinator who will record the appropriate data In the field logbook and pack the samples In shipping containers. Samples will be stored In the sample holding area separate from the container supply area.

References:

- USEPA Methods 1, 2, 31 4, and 5, Appendix A, Test Methods and Procedures, New Source Performance Standards, 40 CFR 60.
- Methods Manual for Complying with the BIF Regulations, USEPA/530-SW-91 - 01 0, Method 0050, December, 1990.

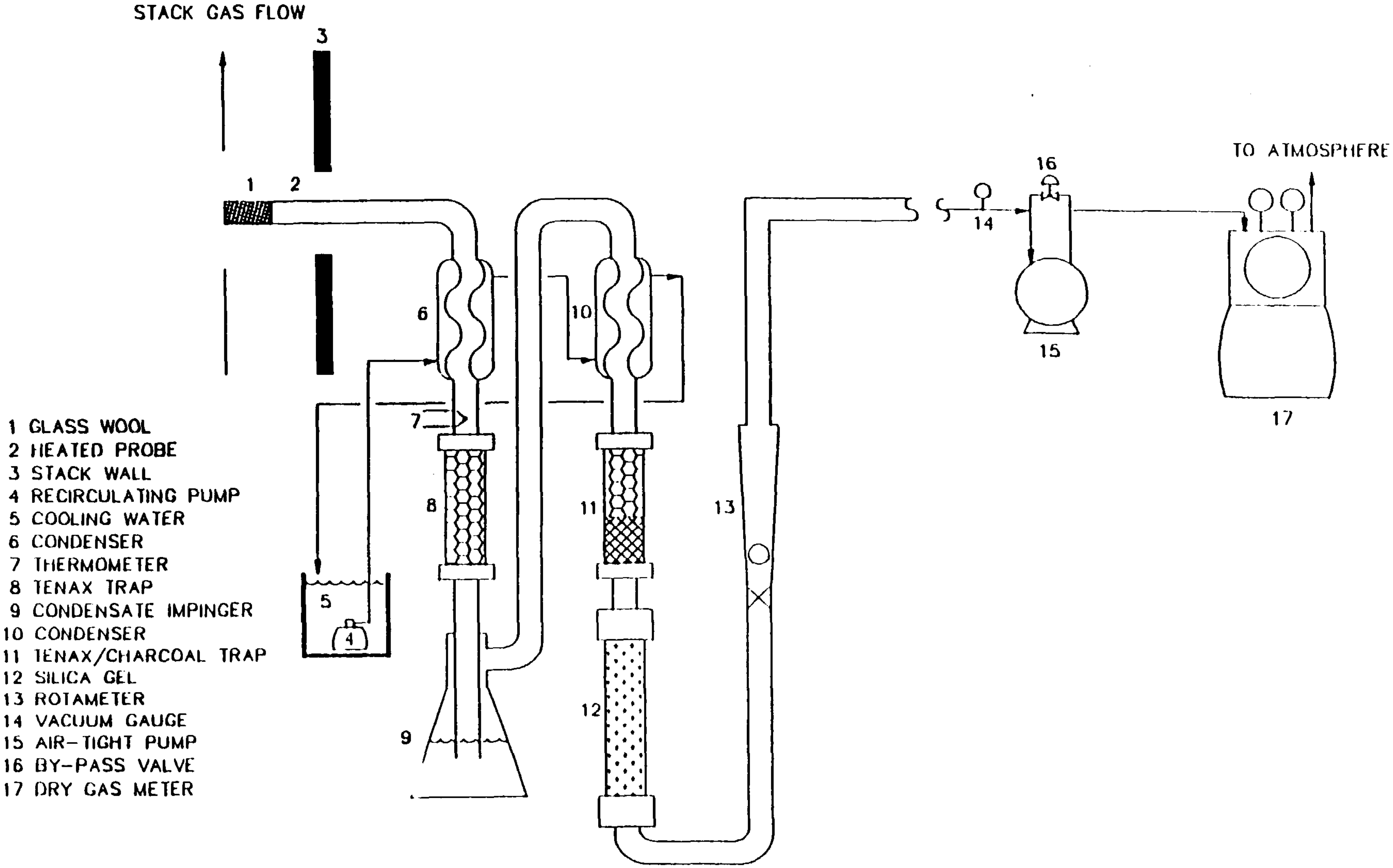


Figure 6 - 4 EPA Volatile Organic Sampling Train (VOST)

Table 6-5. Stack Gas Volatile Organics Sampling Procedure

Sample name:	Stack gas VOST
Sampler:	Stack sampling team
Locations:	Exhaust stack
Equipment:	Volatile organic sampling train (VOST): sorbent tubes, glass culture tubes with Teflon lined screw caps, aluminum foil, glass VOA vials (40 ml) with plastic screw caps, screw capped glass container.
Frequency:	Continuous with replacement of sorbent tube pairs every 20 to 40 minutes depending on selected sample flow rate.
Procedures:	Stack gases will be sampled at a controlled rate to collect volatile organic compounds on adsorbent resin.

The sampling train utilizes a glass-lined probe followed by an isolation valve, a water cooled glass condenser, a sorbent tube containing Tenax resin, an empty impinger for condensate collection, a second water-cooled glass condenser, a second sorbent tube containing Tenax resin and petroleum-based charcoal, a silica drying tube, a rotameter, sampling pump, and dry gas meter.

Sorbent Tube Preparation -- The procedures for preparing, storing, and analyzing the tubes will be those described in Method 0030 referenced below. As described in the method, sorbent material (Tenax resin and charcoal) will be soxhlet extracted, vacuum dried, thermally conditioned with organic-free nitrogen, and loaded into tubes. Each sorbent tube will be labeled with an identification number.

The sorbent tubes will be protected from contamination by placing them in culture tubes that contain clean charcoal. The tubes will be stored in a cooler at 4 0 C in an area free from sources of organic contamination. The tubes will be packed separately and kept cold in insulated containers during transfer to the test site.

At the test site, the tubes are stored cold until needed for a test.

Before each replicate sampling run, the sample coordinator will supply the resin tubes, including a field blank, to a stack sampling team member conducting the VOST sampling. At the end of each run, the sample coordinator will recover the tubes along with the sample collection sheet. The samples will be replaced in cold storage for return shipment and the sample coordinator will make the appropriate notations in the field log book.

VOST Operation -- The sample collection procedures will be as described in the EPA protocol referenced below. As described in the protocol, the dry gas meter will be calibrated before arriving at the test site, and the sample train will be cleaned and assembled before installing the resin tubes. The caps to the tubes will be stored in a clean glass jar while the tubes are in the train. The train will then be leak tested at 10" Hg in such a manner as to prevent exposure of the train components to the ambient air.

Before sampling, ice water will be circulated through the condensers and the probe will be purged of ambient air and inserted into the stack. The probe will be heated to 130 to 150°C (266 to 302° F). The train will be operated under "SLOW-VOST" conditions, i.e., at a reduced sample flow rate as discussed in the protocol. Four pairs of tubes will be collected during each test run.

After collecting the samples, the tube pair will be removed from the VOST; end caps replaced; labeled, returned to the culture tubes, and returned to cold storage. Samples of the condensate water will be collected in VOA vials with no headspace. If there is not enough condensate to fill a VOA vial, enough organic-free water will be added to fill the container.

Quality control samples for the VOST are collected as follows:

- One tube pair will be collected during each sampling run as a field blank
- One tube pair will be collected with each shipment of tubes to the laboratory as a trip blank
- One tube pair will remain in the laboratory as a laboratory blank.

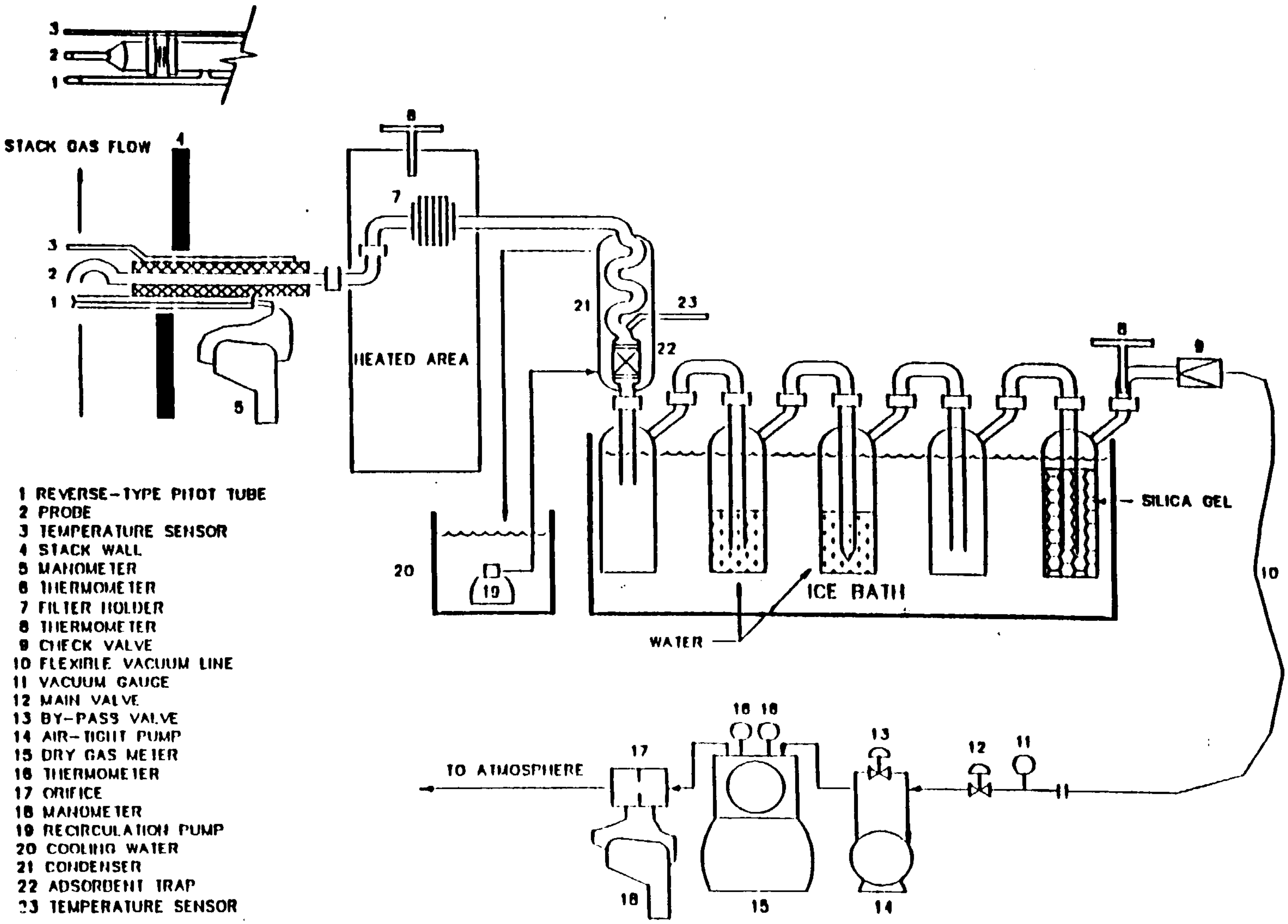
During the sampling run, the end caps from the field blank tubes will be removed to simulate the handling of the test tubes. The ends will remain open for approximately 10 minutes.

Samples will be stored at or below 4° C in shipping packages, which will be kept in an area away from other high concentration samples. If shipped by truck, the samples will be stored away from other chemicals or from where automotive exhaust fumes could become concentrated.

The sample collection data shown in the reference method will be recorded for each tube pair.

References:

- Test Methods for Evaluating Solid Wastes. Method 0030, SW-846, Third Edition, November 1986, and updates.



1 REVERSE-TYPE PITOT TUBE
2 PROBE
3 TEMPERATURE SENSOR
4 STACK WALL
5 MANOMETER
6 THERMOMETER
7 FILTER HOLDER
8 THERMOMETER
9 CHECK VALVE
10 FLEXIBLE VACUUM LINE
11 VACUUM GAUGE
12 MAIN VALVE
13 BY-PASS VALVE
14 AIR-TIGHT PUMP
15 DRY GAS METER
16 THERMOMETER
17 ORIFICE
18 MANOMETER
19 RECIRCULATION PUMP
20 COOLING WATER
21 CONDENSER
22 ADSORBENT TRAP
23 TEMPERATURE SENSOR

Figure 6 - 5 EPA Method 0023 Sampling Train (M0023)

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Table 6-6. Stack Gas PCDDs/PCDFs, and Semivolatile Organics Sampling Procedure

Sample name:	Stack Gas M0023
Sampler:	Stack sampling team
Locations:	Exhaust stack
Equipment:	USEPA Method 0023 sampling train, five impingers; one XAD-2 adsorbent resin trap; aluminum foil; glass jars with Teflon lined lids; petri dish with tared particulate filter; balance, glass graduated cylinder.
Frequency:	Continuous during a test run: three runs to complete test. A minimum of 106 dry standard cubic feet of sample will be collected during each run.
Procedures:	Stack gases will be sampled isokinetically to collect semivolatile organics on a particulate filter, in the impinger solutions, and on the XAD-2 adsorbent resin trap. The mass of semivolatile organics collected will be quantitatively determined by GC/MS analysis of the samples recovered from the train components.

Stack sampling point locations are determined in accordance with USEPA Method 1. An initial traverse is made with a pitot tube at each sample point following USEPA Method 2 to establish stack gas velocity profile, temperature, and flow rate, and to check for cyclonic flow (cyclonic flow will be checked only on the first day of testing). USEPA Method 3, employing an Orsat analyzer, will be used to determine stack gas oxygen, carbon dioxide, and dry molecular weight. USEPA Method 4 will be followed to determine the stack gas moisture content. USEPA Method 5 procedures are followed for pretest and post-test leak checks, isokinetic sampling rate, filter change outs (if needed), and data recording. During leak checks, an activated charcoal filter will be placed on the end of the sample probe to ensure that no ambient contaminants are allowed to enter the train.

The Method 0023 train utilizes a heated probe and particulate filter, a condenser, a XAD-2 adsorbent resin trap, a condensate knockout impinger, two deionized water impingers, an empty impinger, and a silica gel impinger. The condenser is cooled by a re-circulating water system that controls the temperature of the gas entering the XAD-2 adsorbent resin trap and the impingers. All five impingers are placed in an ice bath.

All train components, reagents, and cleaning solutions will be specially prepared, according to the procedures specified in the methods referenced below, to prevent contamination and ensure that representative samples are obtained. The following is a brief description of the preparation of the adsorbent resin:

> XAD-2 resin will be cleaned by water rinses followed by soxhlet extractions with water, methanol, and methylene chloride. Next, the XAD-2 resin will be dried using a flow of inert gas. An extract from a portion of the prepared XAD-2 resin will be analyzed to confirm that ft is free of significant background contamination. The adsorbent traps will then be loaded with approximately 35 g of the XAD-2 resin, packed with glass wool, and charged with 100 □l of an isotopically labeled PCDD/PCDF surrogate standard solution to ensure accurate quantitative measurements. The ends of the adsorbent trap will be capped, wrapped in aluminum foil, sealed in a zip lock bag, and packed in an insulated cold chest.

All glass parts of the sampling train, including the adsorbent trap glassware, will be Pre-cleaned prior to sampling according to the following procedure:

- Soak all glassware in hot soapy water (Alconox or equivalent) at 50°C or higher
- Rinse three times with hot water Rinse three times with distilled/deionized water
- Rinse three times with pesticide grade acetone
- Rinse three times with pesticide grade methanol/nethylene chloride (1:1, v/v)
- Bake at 450° F for 2 hours.

Clean glassware will be capped with pre-cleaned foil or glass plugs until sample train assembly. Following sample recovery, the glassware will be reused at the same sampling location.

Field assembly of the sampling train will take place in an area free from organic contaminants. Train components will be handled so that exposure to ambient conditions will be minimized. No sealant grease will be used in assembling the train.

A clean and inspected filter will be placed in the filter holder. Impingers 1 and 4 will be empty; impingers 2 and 3 will each contain 100 ml of organic free deionized water; and impinger 5 will be loaded with 200 to 300 g of pre-weighed silica gel. Before each sampling run, the Stack Sampling Coordinator will supply the XAD-2 adsorbent resin trap to the stack sampling team for installation into the train. The condenser recirculation pump will be turned on and proper XAD-2 adsorbent resin trap gas entry temperature (maximum 680□F) will be assured before sampling begins.

During sampling operations, flue gas is pulled from the stack through the probe nozzle and a borosilicate glass-lined and heated probe. Particulate matter is removed from the gas stream by means of a glass fiber filter housed in a glass filter holder maintained at 248 + - 25° F. The sample gas passes through a water-cooled condenser and into the XAD-2 adsorbent trap for removal of the organic constituents. The condenser cools the gas to a maximum of 68° F and the XAD-2 trapis mounted vertically to minimize gas channeling and to allow any condensate to drain into the trap. A chilled impinger train is used to remove water from the flue gas, and a dry gas meter is used to measure the sample gas flow.

The sample train will be operating according to SW-846, Method 0023 procedures. Special attention will be given to the following Quality Control checks:

- The entire sample train will be leak tested to ensure that leakage does not exceed the lesser of a) 4% of the average sampling rate, or b) 0.02 acfm.
- The probe exit temperature and the filter compartment will be maintained at 248 +/- 25° F during sampling.
- Gas entering the sorbent module will be maintained at or below 68° F.
- Isokinetic sampling rate will be maintained within a range of 90% to 110%.
- Stored resin will be kept below 120° F at all times.

After sampling, the probe will be removed from the stack and the nozzle will be sealed with aluminum foil. External particulate matter will be wiped off the probe.

It will then be disconnected from the train and both ends capped. The probe and impinger assembly will be transported to the sample recovery area. The samples will be recovered as follows:

- Particulate Filter - The particulate filter Is removed from its holder and placed Into its original petri dish (Container No 1) which is sewed with tape and placed in a plastic bag.
- XAD-2 Adsorbent Resin Trap - The XAD-2 adsorbent resin trap is removed from the train, and both ends of the trap are capped. The trap is then labeled, covered with aluminum foil, sealed in a plastic bag and stored in an insulated cold chest.
- Front Half Rinse - The internal surfaces of the nozzle, probe, front half of the filter holder, and any connecting tubing or glassware is brushed and rinsed three times with acetone, and then rinsed three more times methylene chloride. All rinses are placed into an amber glass sample bottle with a Teflon4ined lid (Container No. 2).
- Back Half Rinse - The back half of the filter holder, the condenser, and the connecting line between the holder and the condenser are rinsed three times with methanol/methylene chloride (1:1, v/v), and then soaked in methanol/methylene chloride (1:1, v/v) for five minutes. The condensate knockout impinger (impinger 1) is rinsed with methanol/methylene chloride (1:1, v/v). The rinses and soaking solutions are then placed into an amber glass sample bottle with a Teflon4ined lid (Container No. 3).
- Condensate Knockout Impinger - Measure the condensate collected in impinger 1 to the nearest milliliter or weigh to the nearest 0.5 g. Transfer this liquid into an amber glass bottle with a Teflon-lined lid (Container No. 4). also inspect the back half of the particulate filter holder for condensate from the filter holder and measure the volume and/or weight as described above.

Add this liquid to the glass sample bottle containing condensate (Container No. 4).

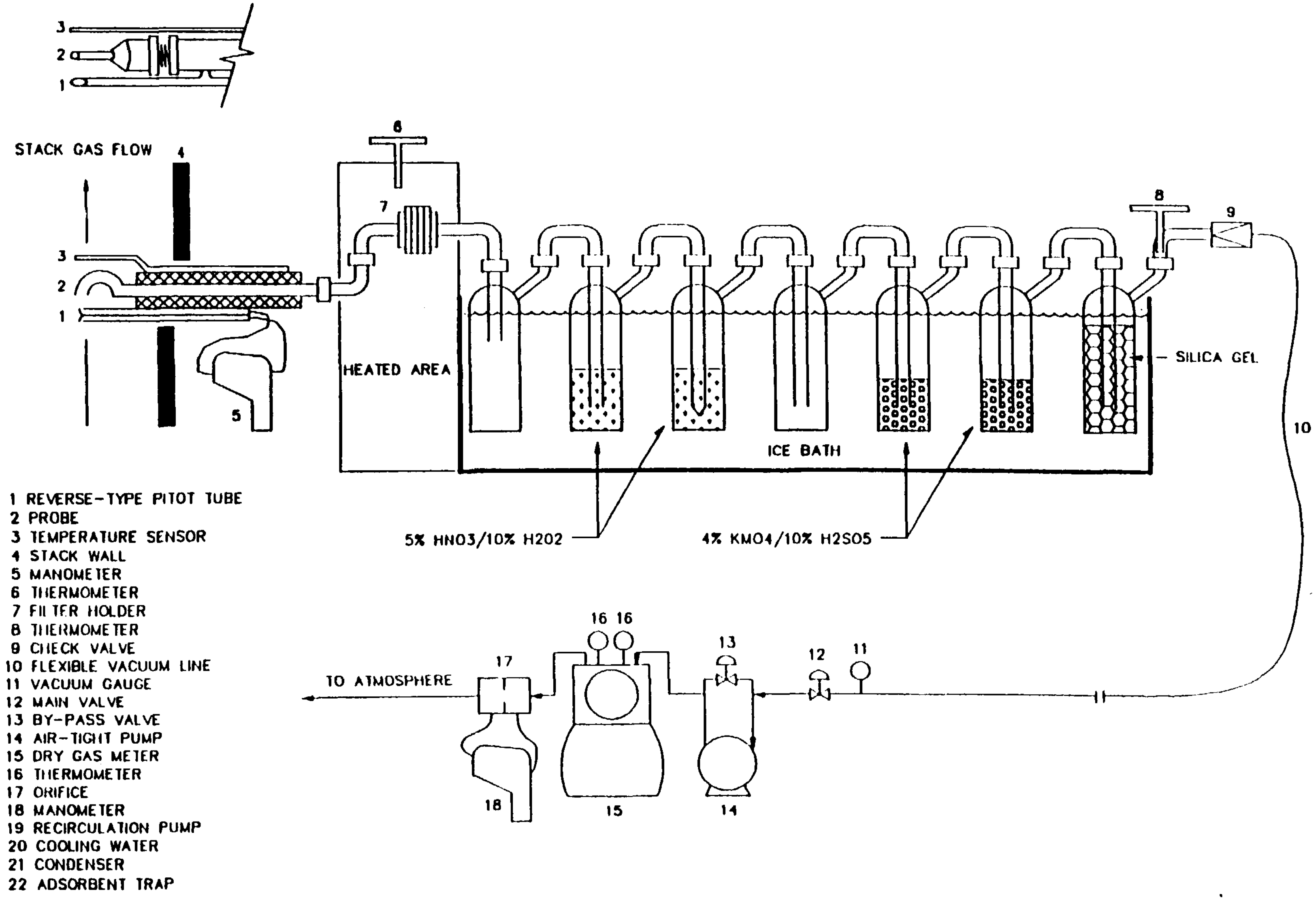
- Impinger water - The contents of impingers 2, 3, and 4 are measured to the nearest milliliter or weighed to the nearest 0.5 g and is then discarded.
- Silica Gel - The Silica gel contents of impinger 5 are weighed to the nearest 0.5 g.

Once during the test program, a blank train will be prepared, set up at the sampling location, and leak tested at the beginning and end of one of the runs. The particulate filter holder and probe will be heated for the duration of the sampling period, but no gas will pass through the train. The nozzle will be capped with aluminum foil and the exit end of the last impinger will be sealed with a ground glass cap. The train will remain assembled at the sampling location for a period equivalent to one test run. The blank train samples will be recovered using the procedures described above. Samples of the methanol/methylene chloride are collected once during the test as a reagent blank. A blank filter and XAD-2 resin trap will also be collected once during the test.

All of the sample containers will be assigned numbers and labeled with the date and test-run number. The samples will be turned over to the Stack Sampling Coordinator who will record the appropriate data in the field logbook and pack the samples In Insulated cold chests. Samples will be stored in the sample holding area separate from the container supply area.

References:

- USEPA Methods 1, 21 39 49 5, Appendix A., Test Methods and Procedures. New Source performance Standards, 40 CFR 60.
- EPA Method 23, Test Methods and Procedures, New Source Performance Standards, 40 CFR 60.
- Test Methods for Evaluating Solid Wastes, Method 0023, SW4346, Third Edition, November 1986, and updates.



1 REVERSE-TYPE PITOT TUBE
2 PROBE
3 TEMPERATURE SENSOR
4 STACK WALL
5 MANOMETER
6 THERMOMETER
7 FILTER HOLDER
8 THERMOMETER
9 CHECK VALVE
10 FLEXIBLE VACUUM LINE
11 VACUUM GAUGE
12 MAIN VALVE
13 BY-PASS VALVE
14 AIR-TIGHT PUMP
15 DRY GAS METER
16 THERMOMETER
17 ORIFICE
18 MANOMETER
19 RECIRCULATION PUMP
20 COOLING WATER
21 CONDENSER
22 ADSORBENT TRAP

Figure 6 - 6 EPA Multi-Metals Sampling Train (MMT)

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Table 6-7. Stack Gas Metals Sampling Procedure

Sample name:	Stack gas MMT
Sampler:	Stack sampling team
Locations:	Stack
Equipment:	USEPA Multiple Metals sampling train; petri dish with particulate filter; glass and polyethylene sample jars with Teflon-lined lids, graduated cylinder, balance.
Frequency:	Continuous during a test run; three runs to complete test. A minimum of 60 dry standard cubic feet of sample will be collected.
Procedures:	Stack gases will be isokinetically sampled to collect metals on a filter and in absorbing solutions.

Sample point locations are determined in accordance with USEPA Method 1. An initial traverse is made with a pitot tube at each sample point following USEPA Method 2 to establish stack gas velocity profile, temperature, and flow rate, and to check for cyclonic flow (Cyclonic flow will be checked only on the first day of testing). USEPA Method 3, employing an Orsat analyzer, will be used to determine stack gas oxygen, carbon dioxide and dry molecular weight. USEPA Method 4 will be followed to determine the stack gas moisture content. USEPA Method 5 procedures are followed for pretest and post test leak checks, isokinetic sampling rate, filter change outs (if needed), and data recording.

The sampling train utilizes a heated, low metals content filter and a series of chilled impingers. The first impinger is an optional condensate trap. If the condensate trap is used, it will initially be empty. Impingers 2 and 3 will each contain 100 ml of a 5% nitric acid/10% hydrogen peroxide (5% HNO_3/10% H_2O_2) solution; impinger 4 will be empty; impingers 5 and 6 will each contain 100 ml of a 4% potassium permanganate/10% sulfuric acid (4% $KMnO_4$/10% H_2SO_4) solution; and impinger 7 will contain 200 to 300 g of indicating silica gel weighed to the nearest 0.5 g.

After sampling, the probe will be removed from the stack and the nozzle will be covered. External particulate matter will be wiped off the probe. It will then be disconnected from the train and both ends capped. The probe and the filter and impinger assembly are transported to the sample recovery area. The samples are recovered as follows:

- Particulate Filter -- The particulate filter is removed from its holder and placed into its original peti dish, which is sealed with tape and placed in a plastic bag (Container No. 1).

- Probe Rinse -- The internal surfaces of the nozzle, probe, and front half of the holder are cleaned by rinsing, brushing and final rinsing with exactly 100 ml of 1.2 N nitric acid into a separate sample jar (Container No. 2).
- Impingers 1, 2 and 3 -- The liquid contents of impingers 1, 2, and 3 are volumetrically measured to the nearest 0.5 ml or weighed to the nearest 0.5 g and placed into a separate sample bottle (Container No. 3). The impingers, the filter support, the back half of the filter housing, and connecting glassware are then rinsed with exactly 100 ml of O.1N nitric acid solution and the rinse is added to the sample bottle.

Impingers 4, 5, and 6 -- The liquid contents of impinger 4 are measured to the nearest 0.5 ml and placed into a separate container (Container No. 4a). Impinger No. 4 is then rinsed with exactly 100 ml of O.1N nitric acid solution and the rinse is added to Container No. 4a. The liquid contents of impingers 5 and 6 are measured to the nearest 0.5 ml and placed into a separate container (Container No. 4b). Impingers 5 and 6 and any connecting glassware are then rinsed a minimum of three times using a total of exactly 100 ml of fresh acidified potassium permanganate solution, and the rinses are added to Container No. 4b, being careful to also transfer any loose precipitate materials into the container. Triple rinsing of impingers 5 and 6 is then repeated using a total of exactly 100 ml of water. The water rinses are also placed into Container No. 4b. If visible deposits remain in impingers 5 or 6 following the water rinses, they are rinsed with 25 ml of 8 N hydrochloric acid, and the rinse is placed into a separate container (Container No. 4c) which, contains 200 mil of water.

- Silica Gel - The silica gel contents of the fourth impinger are weighed to the nearest 0.5 g.
- The following blank samples will be collected once during the test program: 300 ml of the O.lN nitric acid solution; 100 ml of the water used in sample recovery; 200 ml of the nitric acid/hydrogen peroxide reagent solution; 100 ml of the acidified potassium permanganate solution; and three unused particulate filters. If impingers 5 and 6 are rinsed with HCI, then a 25 ml blank sample of the 8 N HCL solution is also collected and added to 200 ml of water in a separate container.

All of the sample containers will be assigned numbers and labeled with date and test-run number. The samples will be turned over to the Sample Coordinator who will record the appropriate data in the field log book and pack the samples in shipping containers. Samples will be stored in the sample holding area separate from the container supply area.

References:

- USEPA Methods 1, 2, 3, 4, and 5, Appendix A, Test Methods and Procedures, New Source Performance Standards, 40 CFR 60.
- "Methodology for the Determination of Metals Emissions in Exhaust Gases from Hazardous Waste Incineration and Similar Combustion Processes." EPA Methods Manual for Compliance with the BIF Regulations, USEPA/530-SW-91 -'10, December 1990.

Table 6-8. Stack Gas Continuous Emissions Monitoring Procedure

Sample name:	Stack gas CEMS
Sampler:	Monitoring system operator
Components:	Probe, sample conditioning system, analyzer
Location:	Stack
Frequency:	Continuous during each sampling run; three runs to complete each test.

Procedures: Continuously monitor the following stack gas constituents:

- Carbon monoxide by non-dispersive infrared (NDIR) analyzer (USEPA Method 10 and BIF Guidance)
- Total hydrocarbons by flame ionization detector (FID) (USEPA Method 25A, and SIF Guidance)
- Oxygen by paramagnetic technology (USEPA Method 3A, and BIF Guidance)
- Carbon dioxide by non-dispersive infrared (NDIR) analyzer (USEPA Method 3A)
- Sulfur dioxide by ultraviolet, non-dispersive infrared, or fluorescence analyzer (USEPA Method 6C)
- Nitrogen oxides by chemiluminescence analyzer (USEPA Method 7E)

References:

- USEPA Performance Specifications 2, 3, and 4, Appendix B, Test Methods and Procedures, New Source Performance Standards, 40 CFR 60.
- USEPA Methods 3A, 6C, 7E, and 10, Appendix A, Test Methods and Procedures, New Source Performance Standards, 40 CFR 60.
- "Performance Specifications for Continuous Monitoring of Carbon Monoxide and Oxygen for Incinerators, Boilers, and Industrial Furnaces Burning Hazardous Waste", 40 CFR 2661 Appendix IX.
- “Performance Specifications for Continuous Monitoring of Hydrocarbons for Incinerators, Boilers, and Industrial Furnaces Burning Hazardous Waste", 40 CFR 266, Appendix IX.

Table 6-9. Analyses Planned for Performance Test Samples

Sample Name	Analyses
Feed soil	Hexachloroethane and trichloroethene and the physical characteristics (moisture content, chlorine content, heating value).
Treated soil	Hexachloroethane and trichloroethene and the physical characteristics (moisture content, chlorine content, heating value).
Stack gas M0050	Particulate, HCl, Cl_2 moisture, oxygen, carbon dioxide, temperature, flow rate
Stack gas VOST	Trichloroethene and other volatile organics
Stack gas M0023	Hexachloroethane and other semivolatile organics, moisture, oxygen, carbon dioxide, temperature, flow rate
Stack gas MMT	Metals stack gases will be isokinetically sampled to collect metals on a filter and in absorbing solutions.
Stack gas CEMS *	Carbon monoxide, total hydrocarbons, oxygen, carbon dioxide, sulfur dioxide, nitrogen oxides

* Continuous monitors for CO, $C0_2$, and 0_2 used during the performance test are permanently installed monitors that will be used throughout normal operation. Continuous monitors for THC, $S0_2$, and NO_X will be used only during the performance demonstration test.

Table 6-10. Summary of Analytical Procedures and Methods

Sample Name	Analysis	Preparation Method *	Analytical Method *	Analytical Responsibility
Feed Soil	Volatile organics	Solvent extraction (SW846-3500 series)	GC/MS (SW846-8260B)	Waste Stream Technologies
Feed Soil	Semivolatile organics	Solvent extraction (SW846-3500 series)	GC/MS (SW846-8270)	Waste Stream Technologies
Feed Soil	Total Metals	Acid Digestion (SW846-3050 or 3051)	ICP (SW846-6010). GFAAS (SW846-7000 series and CVAAS (SW846-8270)	Waste Stream Technologies
Feed Soil	Moisture content	NA	Controlled heating (EPA 160.3)	Waste Stream Technologies
Feed Soil	Chlorine content	NA	Dexsill L2000	Waste Stream Technologies
Feed Soil	Heating Value	NA	Bomb calorimeter (ASTM D2015)	Waste Stream Technologies
Treated Soil	Volatile organics	Solvent extraction (SW846-3500 series)	GC/MS (SW846-8260B)	Waste Stream Technologies
Treated Soil	Semivolatile organics	Solvent extraction (SW846-3500 series)	GC/ECD (SW846-8270C)	Waste Stream Technologies
Treated Soil	Total Metals	Acid Digestion (SW845-3050 or 3051)	ICP (SW846-6010). GFAAS (SW846-7000 series) and CVAAS (SW846-7471) as needed	Waste Stream Technologies
Treated Soil	TCLP metals	Digestion (SW846-1311)	ICP (SW846-6010)	Waste Stream Technologies
Stack gas M0050	Particulate	Evaporate/ Dessicate	Gravimetric (EPA Method 5)	TBD
Stack gas M0050	HCl/Cl_2	NA	Ion Chromatography (Method 9057 BIF Guidance)	TBD
Stack gas M0050	Moisture	NA	Volumetric or Gravimetric (EPA Method 5)	TBD
Stack gas	Temperature	NA	Thermocouple (EPA Method 5)	TBD

Sample Name	Analysis *	Preparation Method *	Analytical Method *	Analytical Responsibility
M0050				
Stack gas M0050	Velocity	NA	Pitot tube (EPA Method 5)	TBD
Stack gas M0050	Oxygen, carbon dioxide	NA	Orsat (EPA Method 3)	TBD
Stack gas VOST	Toluene, other volatile organics	Thermal desorption, trap (SW846-5040)	GC/MS (SW846-5040)	TBD
Stack gas M0100	PCDDs and PCDFs	Solvent extraction (EPA Method 23)	GC/MS (EPA Method 8290)	TBD
Stack gas M0023	Naphthalene, other semivolatile organics	Solvent extraction (SW846-3500 series)	GC/MS (SW846-8270)	TBD
Stack gas M0023	Moisture	NA	Volumetric or Gravimetric (EPA Method 5)	TBD
Stack gas M0023	Temperature	NA	Thermocouple (EPA Method 5)	TBD
Stack gas M0023	Velocity	NA	Pitot tube (EPA Method 5)	TBD
Stack gas M0023	Oxygen, carbon dioxide	NA	Orsat (EPA Method 3)	TBD
Stack gas MMT	Metals	Acid Digestion (BIF Guidance)	ICP (SW846-6010), GFAAS (SW846-7000 series) and CVAAS (SW846-7471) as needed	TBD
Stack gas MMT	Moisture	NA	Volumetric or Gravimetric (EPA Method 5)	TBD
Stack gas MMT	Temperature	NA	Thermocouple (EPA Method 5)	TBD
Stack gas MMT	Velocity	NA	Pitot tube (EPA Method 5)	TBD

Sample Name	Analysis	Preparation Method*	Analytical Method*	Analytical Responsibility
Stack gas MMT	Oxygen, carbon dioxide	NA	Orsat (EPA Method 3)	TBD
Stack gas CEMs	Carbon monoxide	NA	Continuous NDIR (EPA Method 10)	SPI
Stack Gas CEMs	Oxygen	NA	Continous paramagnetic technology (EPA Method 3A)	SPI
Stack Gas CEMS	Carbon dioxide	NA	Continuous NDIR (EPA Method 3A)	SPI
Stack Gas CEMS	Total hydrocarbons	NA	Continuous FID (EPA Method 25A)	SPI
Stack Gas CEMS	Sulfur dioxide	NA	Continuous ultraviolet, NDIR, or fluorescence (EPA Method 6C)	TBD
Stack Gas CEMS	Nitrogen oxides	NA	Continuous chemiluminescence (EPA Method 7E)	TBD

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* "ASTM" refers to American Society for Testing and Materials, Annual Book of ASTM Standards, Annual Series.
"SW846" refers to Test Methods for Evaluating Solid Waste, Third Edition, 1986 and updates.
"EPA Method" refers to New Source Performance Standards, Test Methods and Procedures, Appendix A, 40 CFR 60.
"BIF Method" refers to Methods Manual for Compliance with the BIF Regulations – Burning Hazardous Waste, EPA/530-SW-91-010.

Table 6-11. Determination of Soil Moisture Content

Matrices:	Feed Soil
Procedures:	Moisture is determined by establishing the loss in weight of the sample when heated under rigidly controlled conditions of temperature, time, atmosphere, sample weight, and equipment specifications. A portion of the sample is placed into a pre-weighed porcelain crucible, weighed, and dried in an oven at 103 - 115° C. The crucible is then re-weighed at 1-hour intervals until a constant weight is obtained. EPA Method 160.3 procedures are used.

References:

- Method 160.3, Total Residues, Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020, revised March 1983.

Table 6-12. Measurement of Soil Density

Soil Density Is Not Being Performed As Part Of The Performance Demonstration Test

Table 6-13. Determination of Soil Heating Value

Matrices:	Feed Soil
Procedures:	Samples will be thoroughly mixed and a weighed aliquot will be combusted in an adiabatic bomb calorimeter per ASTM method D-2015. Quartz liners and lids will be used in the bomb to minimize chloride attack. Special handling procedures will be used to minimize volatile losses from the samples.
References:	Method D-2015, American Society of Testing and Materials, Annual Book of ASTM Standards, Volume 4.08.

Laboratory SOPS, Attachment 3 of the QAAP (Appendix A)

Table 6-14. Analysis of Soil Chlorine Content

Matrices:	Feed Soil
Procedures:	The sample is combusted in an oxygen bomb according to SW-846 Method 5050, and the rinse solution is analyzed for chloride using ion chromatography according to SW-M Method 9056.

References:

- Method 5050 and 9056, Test Methods for Evaluating Solid Waste, SW-846, Third Edition, November 1986, and updates.

Laboratory SOPS, Attachment 3 of the QAAP (Appendix A)

Table 6-15. Analysis of Volatile Organics in Soil

Matrices: Feed soil
Treated soil

Holding Time: 14 days

Procedures: Extract sample using SW-M Method 3540 or 3550 as appropriate. Add internal standards and surrogates. Process through cleanup as necessary and proceed with GC/MS analysis per SW-846 Method 8260B for feed and treated soil.

References:

- Method 8260B, Volatile Organics by GC/MS, SW-846,3rd ed., 1986 and updates.
- Method 3540, Soxhlet Extraction, SW-846, 3rd ed., 1986 and updates.
- Method 3550, Ultrasonic Extraction, SW-846, 3rd., 1986 and updates.
- Laboratory SOPS, Attachment 3 of the QAAP (Appendix A)

Table 6-16. Analysis of Semi-Volatile Organics in Soil

Matrices:	Feed soil Treated soil
Holding Time:	14 days
Procedures:	Extract sample using SW-846 Method 3540 or 3550 as appropriate. Add internal standards and surrogates. Process through cleanup as necessary and proceed with GC/MS analysis per SW-M Method 8270 for feed and treated soil.

References:

- Method 8270, Semi-Volatile Organics by GC/MS, SW-846,3rd ed., 1986 and updates.
- Method 3540, Soxhlet Extraction, SW-846, 3rd ed., 1986 and updates.
- Method 3550, Ultrasonic Extraction, SW-846, 3rd.1 1986 and updates.
- Laboratory SOPS, Attachment 3 of the QAAP (Appendix A)

Table 6-17. Analysis of Total Metals in Soil

Matrices:	Feed soil Treated soil
Holding Time:	40 days
Procedures:	Feed and treated soil samples will be acid digested according to SW4346 Method 3050. As an alternate, microwave-assisted acid digestion may be used according to SW-846 Method 3051. The digestion solutions will be analyzed for Sb, As, Ba, Be, Cd, Cr, Pb, Ag, and TI by Inductively coupled argon plasma emission spectroscopy (ICP) using SW-846 Method 6010. If individual metals are found at concentrations below approximately 2ug/ml, the digestion solutions will be analyzed by graphite furnace atomic absorption (GFAA) spectroscopy according to SW-846 7000-series methods referenced below. The digestion solutions will be analyzed for Hg by manual cold vapor atomic absorption spectroscopy (CVAAS) according to SW-846 Method 7471.

References:

- Methods 3050, 3051, 6010, and 7000-series, Test Methods for Evaluating Solid Waste, SW846, Third Edition, November 1986, and Updates.
- Laboratory SOPS, Attachment 3 of the QAAP (Appendix A)

Table 6-18. Analysis of TCLP Metals In Soil

Matrices:	Feed soil Treated soil
Holding Time:	40 days
Procedures:	Samples will be extracted according to the Toxicity Characteristic Leaching Procedure (SW4146 Method 1311). The extraction solution will be analyzed by inductively coupled argon plasma emission spectroscopy (ICP) using SW-846 Method 601 0.

References:

- Methods 1311 and 6010, Test Methods for Evaluating Solid Waste, SW-846, Third Edition, November 1986, and Updates.
- Laboratory SOPS, Attachment 3 of the OAAP (Appendix A)

Table 6-19. Analysis of Particulates in M0050 Samples

Matrices:	Particulate filter (glass fiber) Front Half Rinse (acetone)
Holding Time:	40 days
Procedures:	The M0050 train front half rinse will be evaporated to dryness at ambient temperature and pressure, desiccated for 24 hours, and the residue weight determined to the nearest 0.1 mg. The particulate filter will be oven dried at 105°C (220° F) until a constant weight is determined to the nearest 0.1 mg.
References:	▪ EPA Method 5, Appendix A, Test Methods and Procedures, New Source Performance Standards, 40 CFR 60. ▪ Laboratory SOPS, Attachment 3 of the QAAP (Appendix A)

Table 6-20. Analysis of Hydrogen Chloride and Chlorine in Stack Gas Samples

Matrices:	Acid impinger liquid - Sulfuric acid solution Alkaline impinger liquid - Sodium hydroxide solution
Holding Time:	28 days
Procedure:	Hydrogen chloride and chlorine will be determined by analyzing the M0050 impinger samples for chloride using ion chromatography.
Reference:	

- Method 300.0, The Determination of Inorganic Anions in Water by Ion Chromatography, EPA-600/4-849 017, March 1984.
- Protocol for Analysis of Samples from HCl/Cl_2 Emission Sampling Trains (Method 9057), Methods Manual for Compliance with the BIF Regulations, EPA/530-SW-91-010, December 1990.
- Laboratory SOPS, Attachment 3 of the QAAP (Appendix A)

Table 6-21. Determination of Stack Gas Moisture Content

Matrices:	Impinger water Silica gel trap
Holding Time:	None, perform upon collection
Procedures:	Increase in volume of impinger water will be measured by weighing to the nearest 0.5 g. Increase in weight of silica gel will be measured to the nearest 0.5g. Stack gas moisture content will be calculated using equations provided in method referenced below.
References:	

- EPA Methods 4 and 5, Appendix A, Test Methods and Procedures, New Source Performance Standards, 40 CFR 60.

Table 6-22. Analysis of Volatile Organics in VOST Samples

Matrices:	VOST sorbent resins (charcoal/Tenax) VOST condensate (water)
Holding Time:	14 days
Quantitation:	10 ng/sample
Procedures:	VOST tubes will be analyzed separately. VOST tube contents will be spiked with the appropriate internal standard, thermally desorbed, bubbled through organic-free water, and trapped on an analytical absorbent trap. Analysis will be completed following SW-846 Method 5040 for volatile organics. Condensate samples will be analyzed directly using a purge-and-trap device following SW846 method 8260B.

References:

- Method 5040, Protocol for Analysis of Sorbent Cartridges from Volatile Organic Sampling Train, SW-846, Third Edition, November 1986, and Updates.
- Protocol Collection and Analysis of Volatile POHCs Using VOST, EPA-600/8-84-007, March 1984
- Method 8260B, Volatile Organics by GC/MS, SW-846, Third Edition, November 1986, and Updates.
- Laboratory SOPS, Attachment 3 of the QAAP (Appendix A)

Table 6-23. Analysis of Semi-Volatile Organics, and PCODs/PCDFs in M0023 Samples

Matrices:	Filter (glass fiber) - Container No. 1 Front half rinses (methanol/methylene chloride) - Container No. 2 Back half rinse (methanol/methylene chloride) - Container No. 3 Condensate knockout impinger water - Container No. 4 Adsorbent resin (XAD-2 resin)/glass wool
Holding Time:	7 days from collection to extraction, 40 days from collection to analysis.

Procedures:

The M0023 train front and back half rinses, particulate filter, and adsorbent resin/glass wool are combined, spiked with internal and alternate standards, and soxhlet extracted with methylene chloride, and are then extracted with toluene. The stack gas condensate is spiked with internal and alternate standards and extracted with methylene chloride in a separatory funnel.

The methylene chloride extracts are combined. and spilt into two potions and used as follows:

- Extract 1: Semi-Volatile organics
- Extract 2: Dioxins/furans

The extracts are analyzed as follows:

- Extract 1: Semi-Volatile Organics. Extract 1 is used for semivolatile organic analysis using GC/MS according to SW-846 Method 8270. Internal quantification standards are added to the sample just prior to analysis.
- Extract 2: Dioxin/Furan Quantification. The second portion of the methylene chloride extract is used for PCDD/PCDF analysis.

The toluene extract from the sampling train is spilt into two portions, and used as follows:

- One portion is held as an archive.
- The other portion is combined with the PCDD/PCDF portion of the methylene chloride extract, concentrated in a rotary evaporator and Kuderna-Danish apparatus, solvent exchanged with hexane, processed through cleanup using multiple cleanup columns, and further concentrated in a rotary evaporator to final sample volume. Recovery standards are added, and the

sample is analyzed for PCDD/PCDF using HRGC/HRMS according to SW-846 Method 8290. Procedures in EPA Method 23 are considered in the analysis as appropriate.

References:

- Methods 3540, and 8270, Test Methods for Evaluating Solid Waste, SW-846, 3rd ed., 1986 revised 1990.
- EPA Method 23, New Source Performance Standards, Test Methods and Procedures, Appendix A, 40 CFR 60.
- Method 8290, Polychlorinated Dibenzodioxin (PCDDS) and Polychlorinated Dibenzofurans (PCDFS) by High-Resolution Gas Chromatography, High-Resolution Mass Spectrometry (HRGC/HRMS), Test Methods for Evaluating Solid Waste, SW-846, Third Edition, November 1986, and Updates.
- Method 8270C, Test Methods for Evaluating Solid Waste, SW-846, 3rd ed., 1986 revised 1990.
- Laboratory SOPS, Attachment 3 of the QAAP (Appendix A)

Table 6-24. Analysis of Stack Gas Metals Samples

Matrices:

Particulate filter - Container No. 1
Probe rinse (nitric acid) - Container No. 2
Nitric acid/hydrogen peroxide impinger solution - Container No. 3
Pottasium permaganate/sulfuric acid solution - Containers No. 4a, 4b, and 4c

Holding Time:

40 days

Procedures:

The sampling train probe rinse, particulate filter, nitric acid/hydrogen peroxide impinger solution, and their rinses will be digested separately according to methods referenced below.

The probe rinse digestion solution, filter digestion solution, and nitric acid/hydrogen peroxide digestion solution will be analyzed for Sb, As, Ba, Be, Cd, total Cr, Pb, Ag, and Tl by inductively coupled argon plasma emission spectroscopy (ICAP) according to SW-846 Method 6010. If individual metals are found at concentrations below approximately 2 ug/ml, the digestion solutions may be analyzed by graphite furnace atomic absorption (GFAA) spectroscopy according to the SW-846 7000-series methods referenced below.

An aliquot of the nitric acid/hydrogen peroxide impinger solution and the potassium permaganate/sulfuric acid solution will be analyzed separately for Hg by manual cold vapor atomic absorption (CVAA) according to SW-846 Method 7471.

The results of the component analyses will be summed to give the metals content in the gas sample.

References:

- Methods 3010, 6010, and 7000-series, Test Methods for Evaluating Solid Waste, SW-846, Third Edition, November 1986, and Updates.
- "Methodology for the Determination of Metal Emissions in Exhaust Gases from Hazardous Waste Incineration and Similar Combustion Processes." EPA Methods Manual for Compliance with the BIF Regulations, EPA/530-SW-91 -01 0, December 1990.
- Laboratory SOPS, Attachment 3 of the QAAP (Appendix A)

7

7.0 ANALYTICAL SENSITIVITY

In order to demonstrate compliance with the performance standards specified for the test, it is important that the analytical sensitivity, sample volume, and the POHC feed rates are sufficient for definite conclusions to be drawn from the performance demonstration test results.

Appendix B presents calculations showing that the anticipated analytical detection limits, sample volumes, and POHC feed rates are expected to be adequate for the purposes of the performance demonstration. Separate calculations are provided for treated soil, stack gas POHCs, and stack gas metals.

8

8.0 DATA REPORTING

All available performance demonstration data will be submitted within 7 days after completion of the performance demonstration, subject to timely receipt of laboratory analyses. A final performance demonstration report containing the results of the performance demonstration will be submitted to de maximis within 60 days after completion of the performance demonstration. The performance demonstration report will contain the following information:

- Concentration of hexachloroethane and trichloroethene in the feed and treated soils
- Concentration and mass emission rates of hexachloroethane and trichloroethene in the stack gas
- Computation of the destruction and removal efficiency of hexachloroethane and trichloroethene
- Concentration of total PCDDs/PCDFs (tetra-through octa- chlorinated congeners) in the stack gas
- Concentration and mass emission rate of identified volatile and semi-volatile organics in the stack gas
- Concentration of total metals (antimony, barium, lead, mercury, silver, thallium, arsenic, cadmium, chromium, and beryllium) in the feed and treated soil
- Concentration of metals (antimony, barium, lead, mercury, silver, thallium, arsenic, cadmium, chromium, and beryllium) in the TCLP extract from the treated soil
- Mass emission rates of metals (antimony, barium, lead, mercury, silver, thallium, arsenic, cadmium, chromium, and beryllium) in the stack gas
- Concentration of total chlorine in the feed
- Computation of particulate, HCl and Cl_2 emissions from the stack
- Rotary desorber exit soil temperatures
- Thermal oxidizer exit gas temperatures
- Soil mass feed rate records
- Stack gas flow rate (used as the indicator of combustion gas velocity)

- Continuous emission monitoring results for stack gas including: oxygen, carbon monoxide, carbon dioxide, total hydrocarbons, sulfur dioxide and nitrogen oxide concentrations

- Other information specified in the performance demonstration plan.

9

9.0 MISCELLANEOUS TEST

9.1 OPERATIONAL READINESS

The system will have been tested for operational readiness by completing startup and shakedown operating periods prior to commencing with the Performance Demonstration Test. In addition, all process instrumentation to be used for data measurement will have been calibrated, consistent with equipment specifications, prior to the performance demonstration test.

9.1.1 Remediation System Startup

During the startup period, all remediation system subsystems will be thoroughly tested to verify that all operating criteria are met and that each subsystem, and the unit as a whole, will perform in a consistent and predictable manner. Also, during this period, the Remediation System will be tested to determine various performance parameters in preparation for conducting the performance demonstration test. The startup period will take approximately seven (7) to ten (10) days.

9.1.2 Remediation System Shakedown

Following the startup phase, a two-phase shakedown of the Remediation System operation will be conducted. In the first phase, uncontaminated soils will be fed into the Remediation System to evaluate system performance. When performance is deemed acceptable by SPI and de maximis, the second phase of the shakedown will commence. Contaminated soils will be fed to bring the Remediation System to a point of readiness for the performance demonstration test.

Note: Shakedown Conditions

The anticipated Remediation System shakedown operating conditions are listed in Table 9-1. Treated soil will be sampled and analyzed to meet the cleanup goals as described in Section 1.

9.1.3 Process Instrument Calibration

Process instrument calibration records showing calibration according to the frequency listed in Table 4-3 (Major Process

Instruments) will be available at the site. Procedures for calibration of process instrumentation are summarized in the Performance Demonstration Test Quality Assurance Project Plan (Appendix A).

Table 9-1. Planned Performance Test Operating Conditions

Parameter	**Test Conditions** *
Soil feed rate (ton/hr)	38-42
Propane feed rate (scfh)	As required
Rotary dryer treated soil exit temperature (° F)	500 - 800
Rotary dryer draft (inches w.c.)	> 0.01
Baghouse differential pressure (inches w.c.)	> 1.5
Thermal oxidizer gas outlet temperature (°F)	1,500 - 1,700
CEMs carbon monoxide (ppm_v @7% oxygen)	< 100
Stack gas flow rate (acfm)	14,000 – 18,000

* All values are estimated ranges. Final values will be determined from the performance test results.

Automatic Waste Feed Cutoff and Interlocks

Instrumentation is provided to monitor process conditions, to provide data for assuring compliance with regulatory requirements, and to assure appropriate process response, control, operations flexibility, safety interlocks, and shutdown features. The safety interlocks and shutdown features comprise a major portion of the control system.

The conditions under which the Automatic Waste Feed Cut Off (AWFCO) system operates are noted in Table 4-2.

The AWFCO interlocks will be tested just prior to the performance demonstration, and will be tested monthly during continuing operation. Each test of the AWFCO interlocks will be documented and will become part of the operating record for the site.

9.3 Feed Conveyor Belt Weigh Scale Calibration

Calibration of the weigh cell prior to the performance demonstration test will be performed based upon the following procedure within one week prior to the demonstration test.

9.3.1 Zero Calibration

The empty weight belt is run for a specified period of time and the electronic signal processor averages the readings and inputs the value as zero for all future weight calculations until zero calibrations is re-performed.

9.3.2 Calibration Span

A static, pre-measured weight is placed on the weight belt and the belt is run for a specified period of time. The electronic signal processor compares the weight belt output signal with the know weight and adjusts the span such that the know weight equals the measured weight.

The zero calibration will be performed daily during the performance demonstration test.

9.4 CEM Calibration

The CEM system will be subjected to a Performance Specification Test (PST) according to the procedures specified in 40 CFR 266 Appendix IX, prior to the performance demonstration test.

During routine operation, the CEM system will receive daily calibration checks. The criteria for these daily calibration checks are 40 CFR 266 Appendix IX.

10

10.0 TEST SCHEDULE

10.1 Schedule

A general schedule for the test is shown in Table 10-1. As the time approaches to conduct the actual performance demonstration test, a more detailed schedule will be developed. SPI will notify de maximis at least 5 days prior to commencement of the performance demonstration.

10.2 Duration Of Each Performance Test

One performance demonstration test is planned, consisting of three replicate sampling runs. Each sampling run is expected to last about 3 to 4 hours. Prior to the actual sampling time, the remediation system will be fed contaminated soil for a period of about 1 hour. This will establish steady operation at process test conditions. For planning purposes, an additional 2 hours of operating time have been added to each test as a contingency for unanticipated delays during test execution. A total time of 5 to 7 hours is planned for each test run.

Based on experience with similar test programs, it is anticipated that the testing will require three days. Day one will be dedicated to settling up the stack sampling equipment, taking preliminary velocity traverse measurements, briefing all test participants on the activities to take place during the performance demonstration test. The three test runs will be performed over the next two days. Depending on weather conditions and operational readiness, day two will encompass one or two test runs. Day three will encompass the remaining test run(s). A fourth day has been scheduled as a contingency in case a run needs to be repeated or if it is not possible to conduct more than one run per day.

According to the schedule outlined above, it is planned to conduct testing over a three to four day period. However, unanticipated mechanical problems with the Remediation System or sampling equipment could extend this period.

10.3 Quantity Of Soil To Be Treated

The amount of soil treated during the shakedown period and performance demonstration will be limited to a maximum of one-third of the contaminated site soils. At a feed rate of 40 tons per hour, each test run is expected to consume 250 to 300 tons of contaminated soil, for a total of 800 to 900 tons for the entire test.

Table 10-1. Demonstration Plan Task Schedule

Day	Time	Events
Day one (1)	0800	Sampling & blending contractors on-site
	0815	Coordination meeting Review Plan operational schedule Communication coordination
	1000	Survey of site; mobilization of sampling and blending equipment
	1300	Sampling and blending equipment checkout and testing Proof of AWFCo's
Day two (2)	0800	Arrival at site
	0815	Sampling and operation coordination meeting CEM calibration Weigh scale calibration SPI initiates startup of LTTD System Sampling/operating personnel checkout equipment
	1000	SPI LTTD System achieves steady state of operation Test Run 1 begins
	1400	Test Run 1 stops Post test equipment checks Samples labeled and stored/shipped as appropriate; chain of custodies and field logs documented, reviewed, and signed Operation log sheets reviewed and signed
	1600	Decon and prepare sampling equipment appropriately for next run
Day three (3)	0800	Arrival at site
	0815	Sampling and operation coordination meeting CEM calibration Weigh scale calibration SPI initiates startup of LTTD System Sampling/operating personnel checkout equipment
	1000	SPI LTTD System achieves steady state of operation Test Run 2 begins
	1400	Test Run 2 stops Post test equipment checks Samples labeled and stored/shipped as appropriate; chain of custodies and field logs documented, reviewed, and signed Operation log sheets reviewed and signed
	1600	Decon and prepare sampling equipment appropriately for next run
Day four (4)	0800	Arrival at site
	0815	Sampling and operation coordination meeting CEM calibration Weigh scale calibration SPI initiates startup of LTTD System Sampling/operating personnel checkout equipment
	1000	SPI LTTD System achieves steady state of operation Test Run 3 begins

Day	Time	Events
	1400	Test Run 3 stops Post test equipment checks Samples labeled and stored/shipped as appropriate; chain of custodies and field logs documented, reviewed, and signed Operation log sheets reviewed and signed
	1600	Post-test coordination meeting Equipment deconned and packed Review of all pertinent operating and sampling field documentation and signatures
Day five (5)		Contingency day

11

11.0 QUALITY ASSURANCE

The following is a brief discussion of the quality assurance and quality control procedures that will be performed by SPI in conjunction with de maximis, Inc. Appendix A illustrates by way of a table of contents the exact quality of a project specific "Performance Demonstration Test Quality Assurance Project Plan".

De maximis will implement a stringent Construction and Remedial Activity Quality Control Plan (CRACP) on every project. The CRACP addresses all on-site and off-site construction operations. The following items are the fundamental aspects of the plan. Each item is briefly outlined for your review:

11.1 BASIS

The basis of the CRACP will be nationally recognized standards published by the American Society for Testing and Materials (ASTM) and the State Department of Transportation (DOT) as applicable. In addition, specifications within the CRACP reflect the experience gained by Sevenson in completing a variety of remedial construction similar to what is required at a facility.

11.2 IMPLEMENTATION

The Quality Control Manager (QCM) will be responsible for controlling the CRACP to ensure that good quality materials are provided for the proposed construction and that good workmanship is provided. The QCM will report directly to de maximis's Corporate Project Manager and will complete daily site inspections to ensure compliance with the quality control specifications. The QCM will complete daily reports for all field testing and material manufacturer specifications which will be submitted to the Contracting Officer or owner's representative on a daily basis.

11.3 REPORTING

The QCM will record his daily quality control activities within a log book maintained on-site at all times. All site activities, site inspections, submittals made by material suppliers and field testing of materials will be recorded along with any unacceptable site occurrences on a daily basis. Each daily entry into the log will be signed by the QCM as verification to its correctness.

In addition to the QCM's daily log book, a "Daily Construction Quality Control Report" will be submitted to the Contracting Officer or owner's representative. The Daily Construction Quality Control Report will be signed by the QCM and reviewed by the QCM and Contracting Officer at the completion of each workday.

11.4 INSPECTIONS

To ensure that all construction activities completed on-site comply with the project specifications, the QCM will complete, in conjunction with the Contracting Officer or owner's representative, three phases of site inspections which include the following:

11.4.1 Preparatory Inspection

This will be performed prior to beginning any work on any definable feature of the work. It will include a review of contract requirements; a check to ensure that all materials and/or equipment have been tested, submitted, and approved; a check to ensure that provisions have been made to provide required control testing; examination of the work area to ascertain that all preliminary work has been completed; and a physical examination of materials, equipment, and sample work to ensure that they conform to approved shop drawings or submittal data and that all materials and/or equipment are on hand. The Contracting Officer or owner's representative will be notified at least 24 hours in advance of the preparatory inspection. Subsequent to the preparatory inspection and prior to commencement of work, Sevenson will instruct each applicable worker as to the acceptable level of workmanship required in order to meet contract specifications.

11.4.2 Initial Inspection

This will be performed as soon as a representative portion of the particular feature of work has been accomplished and will include examination of the quality of workmanship and a review of control testing for compliance with contract requirements, use of defective or damaged materials, omissions, and dimensional requirements. The Contracting Officer or owner's representative will be notified at least 24 hours in advance of the initial inspection.

11.4.3 Follow-Up Inspection

These will be performed daily to ensure continuing compliance with contract requirements, including control testing, until completion of the particular feature of work. Final follow-up inspections will be conducted and test deficiencies corrected prior to the addition of new features of work.

The QCM will notify the Contracting Officer or owner's representative at least 24 hours in advance of any inspections. Notification will be recorded in the Daily Contractor Quality Control Report which will be submitted to the Contracting Officer or owner's representative at the end of each workday.

11.5 TESTING

Testing will be performed as required and at the frequency specified for each phase of the construction. All testing for materials supplied, such as aggregates, borrow material, and backfill, and all compaction testing, will be performed by an approved testing firm who will be designated by de maximis's prior to commencing site work. Material supplied with suppliers' specifications may be tested to verify specifications if determined necessary by the QCM. The need for additional testing will be determined by the QCM following a detailed review of the suppliers' specification and material inspection.

11.6 DOCUMENTATION

All testing results will be recorded on the Daily Contractor Quality Control Report. Any concerns or deviations from the required material specifications and the actions taken to correct the problems will be noted on the report.

Information recorded on the Daily Contractor Quality Control Report will include the following:

- **types and number of tests performed,**
- **results of testing,**
- **nature of defects or cause for rejection,**
- **proposed remedial action, and**
- **corrective action taken.**

11.7 REVISIONS TO WORK

The QCM will be responsible to ensure total compliance of the field work to the project specifications. Should de maximis require modifications or revisions to the specifications, the QCM will make the request in writing to the Contracting Officer or owner's representative. The QCM must receive approval from the Contracting Officer or owner's representative prior to allowing the modifications or revisions to occur in the field. The QCM will record all such requests in his daily log and on the Daily Contractor Quality Control Report.

APPENDIX A

APPENDIX A: TABLE OF CONTENTS

Note: This table of contents is for reference purposes only. This is a sample of the site specific plan that can be prepared for this project.

PROJECT TITLE AND PLAN APPROVALS

INTRODUCTION

ATTACHMENTS

TABLES

FIGURES

Figure

Follows

Page

APPENDIX B

SoilPure, Inc.
Startup Procedures

March 2001

Table of Contents

1.0 Mobilization

Some of the unit components are oversize and require special permits to travel over the road. Mobilization will take anywhere from 4 to 8 days. They are subject to certain routes and times of the day when they can be transported and thus the variation in time.

2.0 Assemble / Erect the Thermal Treatment Unit as Follows:

2.1 Operations Pad

Make sure the site and operations pad has been prepared and is able to support and receive equipment.

2.2 Final Grade

Refer to the approved plant and profile drawings and verify that the grade under the unit is correct before towing the unit into the approximate operating location. Make sure the grade is at proper elevation and that is level in both directions.

2.3 Move Equipment

Tow the units into the location shown on the plant drawing; thermal oxidizer, wet scrub, baghouse, primary treatment unit, control house feed trailer, generator trailer. Do not start the erection procedure until it has been verified that the centerline on the unit matches the location shown on the plant drawing.

2.4 Final Inspection

Remove any loose items from the storage areas on the Thermal Treatment unit before it is raised into the operating position.

2.5 Drop Trailers

With the truck tractor attached to the Thermal Treatment units lower the rear support pads by instructing the operator to move the correct levers that control the two rear erection cylinders.

Force the support pads onto the supporting base material to a point at which all the weight is taken off the rear axle assembly of the Thermal/Treatment unit. Stop the erection procedure for a few moments and allow the weight to rest on the rear support pad. Make sure that the rear support pad is level in both directions. Retract the rear erection cylinders and lift the rear support pad off the supporting base are underneath it. If the pad appears to be resting on high spots, the area must be leveled with the use of hand tools before proceeding. If the rear support pad still does not come into total contract with the ground surface, the above procedure must be redone after the base material under the pad has been releveled.

2.6 Inspect Supports

Instruct the controls operator to engage the proper levers to force the front support pad onto the ground surface. Keep the truck tractor attached to the Dryer frame and apply adequate pressure to raise the entire weight of the unit off the tractor. Lift the rear axles of the truck tractor to a point where virtually all the weight is removed from the rear axle assembly. Do not raise the tires of the truck tractor off the ground.

Allow the weight to sit on the support pads for a few moments and follow the exact procedure that was set forth for establishing surface contact with the rear support pad. Make sure the front support pad is level in both directions and that is in full contact with the ground surface before proceeding with the erection process.

2.7 Position Unit

Instruct the controls operator to start the actual positioning of the unit by lowering the rear support pads to a point where most of the load is taken off the tires. Tire contact with the ground is maintained to add stability to the trailer.

2.8 Lower Front Supports

Instruct the controls operator to lower the front support pad with adequate force to raise the front of the unit off the tractor to a point where it can be disconnected and pulled of from under the Thermal Treatment unit.

2.9 Level

Instruct the control operator to raise the front of the unit until level. Make sure the trailer remains level across its width.

2.10 Adjust Rear

Instruct the controls operator to adjust the rear end of the unit to the proper elevation. Make sure the unit has been raised to an adequate height to allow installation of the support pads.

DO NOT operate the controls or attempt to change the location of the Thermal Treatment unit during the period of time that the assistants are installing the structural supports

NOTE: Unit should only be raised enough to permit assembly of the discharge auger under the discharge chute and allow adequate sealing between discharge chute and discharge auger.

3.0 Set Portable Fuel Tank

Liquid propane will be used to operate burners. It is recommended that liquid propane tank be installed to the rear of the plant for an area out of the way of normal plant daily operations.

4.0 Install Portable Power and Control Cords

In the portable mode, the entire Soil Remediation plant is furnished with portable power and control cable. Control cables are equipped with quick disconnect receptacles and all power cables have up to 100 AMP capacity.

CAUTION: Cables and/or receptacles that have been damaged must be repaired and/or replaced on a priority basis.

Each person charged with the responsibility of uncoiling and pulling the power cables must inspect the cables and receptacles for damage.

All primary components are equipped with storage brackets and/or storage areas for the power and control cables. The cables must be properly grouped in neat coils whenever the components are in storage.

5.0 Grounding Procedure

Primary components should be grounded essentially at the time they are erected.

The risk of damage to electrical/electronic components will increase substantially if each individual primary components is not properly grounded.

CAUTION: Do not attempt to check out, calibrate and/or run the plant until each primary component has been properly grounded.

6.0 Daily Startup Procedures

6.1 Arrival to the site

1. All employees sign-in on daily sign-in sheet
2. All employees participate in daily safety meeting.
3. Sign daily safety sheet
4. Safety meeting covers necessary safety procedures and /or PPE needed on a day to day basis.

6.2 Start Generator

1. Check fluid levels.
2. Visually inspect all controls and cables.
3. Start the generator.

6.3 Daily Maintenance

1. Check hoses and fuel lines.
2. Check hydraulic line and loader fluids.
3. Visually check crossover duct work, auger, screens etc.

6.4 Start Thermal Treatment Unit

1. Open fuel valves to the burners (including pilot tanks).
2. Open cover to the afterburner stack.
3. Hookup to or turn on water.
4. Locate all plant personnel & inform them startup will commence immediately.
5. Position personnel at various positions to verify equipment is operating (discharge auger, both burners and dust auger).
6. Turn on breakers.
7. Start the air compressor from the panel.
8. Check and insure the fire door is open.
9. Turn on the burner control panels.
10. Adjust air damper as needed
11. Start exhaust fan.
12. Wait for amp gauge to "Level Off".
13. Start thermal oxidizer fan.
14. Wait for amp gauge to "Level Off".
15. Start liquid propane pump & wait for purge complete light on panel.
16. Ignite oxidizer pilot.

17. Start oxidizer main flame.
18. Adjust burner as needed for warm up.
19. Start other components;
    - stacking conveyor
    - mixer cooler
    - rotary drum
    - drum conveyor
20. Turn on liquid propane atomizing blower to drum dryer burner.
21. Verify blower operation.
22. Depress “Reset” button on the dryer burner control panel.
23. Wait for purged, panel control light to indicate “Ready to Start” start burner.
24. Adjust burner as needed, keep low until baghouse has reached 215°F.
25. Turn on hydraulic feed conveyor and final shaker screen.
26. Check and start Continuous Emissions Monitoring System.
27. Insert 3.5” diskette into the Chessel Data Acquisition System and begin recording data.
28. Feed soil into hopper begin full scale operations.

6.4 Start Scrub

1. Visually inspect tanks.
2. Open water valves
3. Visually inspect hoses and water lines..
4. Turn on pumps
5. Visually inspect pumps and water flow.

7.0 Daily Shutdown Procedures

1. Stop shaker screen and feed belts.
2. Turn main fire switch off on the primary burner. Main fire will go out while the low fire remains on.
3. Depress stop button and burner will go off. After purge period, ready light comes on, indicating system is ready for re-ignition.
4. Allow the plant to run for 10 minutes for cool down.
5. Turnoff the afterburner switch on the burner, main fire light goes off and the low fire comes on.
6. Depress stop button on the afterburner control and low fire will go out. After purge period, ready light comes on.
7. Let the exhaust fan and drum discharge system run at least 30 minutes to allow cooling.
8. Turn off air compressor.
9. After the drum has cooled down, and discharge system has cooled stop drum.
10. Stop the exhaust fan.
11. Turn off the data recorder.

12. Turn off liquid propane pump.
13. Turn off water pumps.
14. Close fuel valves to the burners.
15. Turn off water.
16. Drain lines (cold weather)
17. Turn off data recorder.
18. Remove 3.5” diskette.
19. Turn off generator main power.
20. Employees sign out, lock and secure control house.

APPENDIX C

CONESTOGA-ROVERS
& ASSOCIATES

651 Colby Drive, Waterloo, Ontario, Canada N2V 1C2
Telephone: (519) 884-0510 Fax: (519) 884-0525
www.CRAworld.com

FACSIMILE

DATE:	December 1, 2000	**REFERENCE NO.:**	11676-10
TO:	Kirk Shellum	**FACSIMILE NO.:**	952-928-0200
FROM:	Sheila Rogers		

Total Pages (Including Cover Page) 14

☒ **Facsimile is Receiver's Original**

Original Will Follow By:

☐ Mail
☐ Overnight Courier
☐ E-mail

MESSAGE

As requested by Bob Rule, please find attached a summary table of DNAPL results as well as the DNAPL laboratory analytical data for the Fields Brook Superfund Site in Ashtabula, Ohio.

Should you have any questions or require further information, please do not hesitate to contact us.

THIS FAX TRANSMISSION IS INTENDED ONLY FOR THE ADDRESSEE(S) SHOWN ON THIS FORM AND MAY CONTAIN CONFIDENTIAL OR PRIVILEGED INFORMATION FROM CONESTOGA-ROVERS & ASSOCIATES (CRA). ANY DISCLOSURE, COPYING, DISTRIBUTION, OR USE OF THE CONTENTS OF THIS FAX, WITHOUT THE CONSENT OF CRA, IS PROHIBITED. IF YOU HAVE RECEIVED THIS TRANSMISSION IN ERROR, PLEASE NOTIFY US IMMEDIATELY BY TELEPHONE (COLLECT).

REGISTERED COMPANY FOR
ISO 9001
ENGINEERING DESIGN

TABLE 2.1

CONCENTRATION OF DETECTED COMPOUNDS
FIELDS BROOK SUPERFUND SITE AND DETREX CORP.
ASHTABULA, OHIO

	Detrex DNAPL Characterization Data		*Fields Brook DNAPL Characterization Data*	
Unit of Concentration	***mg/kg***	***%***	***mg/kg***	***%***
bis(2-ethylhexyl) phthalate	0.002	0.0000002	ND (990)	--
chlorobenzene	--	--	ND (1,300)	--
chloroform	680	0.068	ND (1,300)	--
1,2-dichlorobenzene	430	0.043	ND (1,300)	--
1,1-dichloroethene	480	0.048	ND (1,300)	--
hexachlorobenzene	4,600	0.46	6000*	0.6*
hexachlorobutadiene	8,500	0.85	15000*	1.5*
hexachloroethane	2,000	0.2	50,000	5
methylene chloride	440	0.044	ND (1,300)	--
Pentachlorobenzene	--	--	2600*	0.26*
Pentachloroethane	--	--	3800*	0.38*
1,1,2,2-tetrachloroethane	260,000	26	14,000	1.4
tetrachloroethene	45,000	4.5	27,000	2.7
1,2-transdichloroethene	13,000	1.3	ND (13,000)	--
1,2,4-trichlorobenzene	0.022	0.0000022	ND (1,300)	--
1,1,2 trichloroethane	150	0.015	ND (13,000)	--
trichloroethene	290,000	29	45,000	4.5
vinyl chloride	1.2	0.00012	ND (25,000)	--
Total PCB's	--	--	--	--

Notes:
* Estimated value between the Method Detection Limit and Reporting Limit

SPL®

HOUSTON LABORATORY
[illegible] INTERCHANGE DRIVE
HOUSTON, TEXAS [illegible]
(713) [illegible]

Conestoga-Rovers & Associates

Certificate of Analysis Number:

00100473

Report To:
Conestoga-Rovers & Associates
Paul Wiseman
11100 Metro Airport Center Drive
Suite 160
Romulus
MI
48174-
ph: (734) 942-0909 fax: (734) 942-3080

Fax To:
Conestoga-Rovers & Associates
Paul Wiseman *fax: (734) 942-3080*

Project Name: #11676, DNAPL/Fieldbrook Super Fun
Site: #11676, DNAPL/Fieldbrook Super Fun
Site Address:

PO Number: 40-013283-0
State: Michigan
State Cert. No.:
Date Reported: 10/20/00

Client Sample ID	Lab Sample ID	Matrix	Date Collected	Date Received	COC ID	HOLD
376-101700-JD-001	00100473-01	Sludge	10/17/00 3:30:00 PM	10/18/00 10:00:00 AM	107	☐

REC'D CRA
OCT 23 2000

Sonia West
West, Sonia
Senior Project Manager

10/20/00
Date

Joel Grice
Laboratory Director

Ted Yen
Quality Assurance Officer

Client Sample ID L-11676-101700-JD-001 **Collected:** 10/17/00 3:30:00 **SPL Sample ID:** 00100473-01

Site: **#11676, DNAPL/Fieldbrook Super Fund Site**

Analyses/Method	Result	Rep.Limit	Dil. Factor	QUAL	Date Analyzed	Analyst	Seq. #
SEMIVOLATILE ORGANICS BY METHOD 8270C			**MCL**	**SW8270C**	**Units: ug/Kg**		
1,2,4,5-Tetrachlorobenzene	J ND	990000	3000		10/18/00 13:58	WW	438652
1,2,4-Trichlorobenzene	J 500000	990000	3000		10/18/00 13:58	WW	438652
1,2-Dichlorobenzene	ND	990000	3000		10/18/00 13:58	WW	438652
1,2-Diphenylhydrazine	ND	990000	3000		10/18/00 13:58	WW	438652
1,3-Dichlorobenzene	ND	990000	3000		10/18/00 13:58	WW	438652
1,3-Dinitrobenzene	ND	990000	3000		10/18/00 13:58	WW	438652
1,4-Dichlorobenzene	ND	990000	3000		10/18/00 13:58	WW	438652
1,4-Dinitrobenzene	ND	990000	3000		10/18/00 13:58	WW	438652
1,4-Napthoquinone	J ND	4800000	3000		10/18/00 13:58	WW	438652
1-Methylnaphthalene	ND	990000	3000		10/18/00 13:58	WW	438652
1-Naphthylamine	J ND	990000	3000		10/18/00 13:58	WW	438652
1-Nitropyrene	J ND	990000	3000		10/18/00 13:58	WW	438652
2,3,4,6-Tetrachlorophenol	J ND	990000	3000		10/18/00 13:58	WW	438652
2,4,5-Trichlorophenol	ND	2400000	3000		10/18/00 13:58	WW	438652
2,4,6-Trichlorophenol	ND	990000	3000		10/18/00 13:58	WW	438652
2,4-Dichlorophenol	ND	990000	3000		10/18/00 13:58	WW	438652
2,4-Dimethylphenol	ND	990000	3000		10/18/00 13:58	WW	438652
2,4-Dinitrophenol	ND	2400000	3000		10/18/00 13:58	WW	438652
2,4-Dinitrotoluene	ND	990000	3000		10/18/00 13:58	WW	438652
2,6-Dichlorophenol	ND	990000	3000		10/18/00 13:58	WW	438652
2,6-Dimethylphenol	ND	990000	3000		10/18/00 13:58	WW	438652
2,6-Dinitrotoluene	ND	990000	3000		10/18/00 13:58	WW	438652
2-Acetylaminofluorene	J ND	2000000	3000		10/18/00 13:58	WW	438652
2-Chloronaphthalene	ND	990000	3000		10/18/00 13:58	WW	438652
2-Chlorophenol	ND	990000	3000		10/18/00 13:58	WW	438652
2-Methylfluoranthene	J ND	990000	3000		10/18/00 13:58	WW	438652
2-Methylnaphthalene	ND	990000	3000		10/18/00 13:58	WW	438652
2-Naphthylamine	J ND	990000	3000		10/18/00 13:58	WW	438652
2-Nitroaniline	ND	2400000	3000		10/18/00 13:58	WW	438652
2-Nitrophenol	ND	990000	3000		10/18/00 13:58	WW	438652
2-Picoline	J ND	990000	3000		10/18/00 13:58	WW	438652
2-sec-Butyl-4,6-dinitrophenol	J ND	990000	3000		10/18/00 13:58	WW	438652
3,3'-Dichlorobenzidine	ND	990000	3000		10/18/00 13:58	WW	438652
3-Methylcholanthrene	J ND	990000	3000		10/18/00 13:58	WW	438652
3-Nitroaniline	ND	2400000	3000		10/18/00 13:58	WW	438652
4,4'-Methylenebis(2-chloroaniline)	J ND	990000	3000		10/18/00 13:58	WW	438652
4,6-Dinitro-2-methylphenol	ND	2400000	3000		10/18/00 13:58	WW	438652
4-Aminobiphenyl	J ND	990000	3000		10/18/00 13:58	WW	438652
4-Bromophenyl phenyl ether	ND	990000	3000		10/18/00 13:58	WW	438652

Qualifiers:

ND/U - Not Detected at the Reporting Limit
B - Analyte detected in the associated Method Blank
* - Surrogate Recovery Outside Advisable QC Limits
J - Estimated Value between MDL and PQL
>MCL - Result Over Maximum Contamination Limit(MCL)
D - Surrogate Recovery Unreportable due to Dilution
MI - Matrix Interference

Client Sample ID L-11676-101700-JD-001 **Collected:** 10/17/00 3:30:00 **SPL Sample ID:** 00100473-01

Site: **#11676, DNAPL/Fieldbrook Super Fund Site**

Analyses/Method	Result	Rep.Limit	Dil. Factor	QUAL	Date Analyzed	Analyst	Seq. #
4-Chloro-3-methylphenol	ND	990000	3000		10/18/00 13:58	WW	438652
4-Chloroaniline	ND	990000	3000		10/18/00 13:58	WW	438652
4-Chlorophenyl phenyl ether	ND	990000	3000		10/18/00 13:58	WW	438652
4-Nitroaniline	ND	2400000	3000		10/18/00 13:58	WW	438652
4-Nitrophenol	ND	2400000	3000		10/18/00 13:58	WW	438652
5-Nitro-o-toluidine	J ND	990000	3000		10/18/00 13:58	WW	438652
7,12-Dimethylbenz(a)anthracene	J ND	990000	3000		10/18/00 13:58	WW	438652
7H-Dibenzo (c,g) carbazole	J ND	990000	3000		10/18/00 13:58	WW	438652
Acenaphthene	ND	990000	3000		10/18/00 13:58	WW	438652
Acenaphthylene	ND	990000	3000		10/18/00 13:58	WW	438652
Acetophenone	J ND	990000	3000		10/18/00 13:58	WW	438652
Aniline	ND	990000	3000		10/18/00 13:58	WW	438652
Anthracene	ND	990000	3000		10/18/00 13:58	WW	438652
Aramite	J ND	4800000	3000		10/18/00 13:58	WW	438652
Benz(a)anthracene	ND	990000	3000		10/18/00 13:58	WW	438652
Benzal Chloride	J ND	990000	3000		10/18/00 13:58	WW	438652
Benzidine	ND	990000	3000		10/18/00 13:58	WW	438652
Benzo (j) fluoranthene	J ND	990000	3000		10/18/00 13:58	WW	438652
Benzo (a) phenanthrene	J ND	990000	3000		10/18/00 13:58	WW	438652
Benzo (rst) pentaphene	J ND	990000	3000		10/18/00 13:58	WW	438652
Benzo(a)pyrene	ND	990000	3000		10/18/00 13:58	WW	438652
Benzo(b)fluoranthene	ND	990000	3000		10/18/00 13:58	WW	438652
Benzo(g,h,i)perylene	ND	990000	3000		10/18/00 13:58	WW	438652
Benzo(k)fluoranthene	ND	990000	3000		10/18/00 13:58	WW	438652
Benzoic acid	ND	4800000	3000		10/18/00 13:58	WW	438652
Benzyl alcohol	ND	990000	3000		10/18/00 13:58	WW	438652
Biphenyl	J ND	990000	3000		10/18/00 13:58	WW	438652
Bis(2-chloroethoxy)methane	ND	990000	3000		10/18/00 13:58	WW	438652
Bis(2-chloroethyl)ether	ND	990000	3000		10/18/00 13:58	WW	438652
Bis(2-chloroisopropyl)ether	ND	990000	3000		10/18/00 13:58	WW	438652
Bis(2-ethylhexyl)phthalate	ND	990000	3000		10/18/00 13:58	WW	438652
Butyl benzyl phthalate	ND	990000	3000		10/18/00 13:58	WW	438652
Carbazole	ND	990000	3000		10/18/00 13:58	WW	438652
Chlorobenzilate	J ND	2400000	3000		10/18/00 13:58	WW	438652
Chrysene	ND	990000	3000		10/18/00 13:58	WW	438652
Cyclopenta-c,d-pyrene	J ND	990000	3000		10/18/00 13:58	WW	438652
Di-n-butyl phthalate	ND	990000	3000		10/18/00 13:58	WW	438652
Di-n-octyl phthalate	ND	990000	3000		10/18/00 13:58	WW	438652
Dibenz(a,c)anthracene	J ND	900000	3000		10/18/00 13:58	WW	438652
Dibenz(a,h)acridine	J ND	2000000	3000		10/18/00 13:58	WW	438652

Qualifiers:

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J - Estimated Value between MDL and PQL
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MI - Matrix Interference

Client Sample ID L-11676-101700-JD-001 **Collected:** 10/17/00 3:30:00 **SPL Sample ID:** 00100473-01

Site: **#11676, DNAPL/Fieldbrook Super Fund Site**

Analyses/Method	Result	Rep.Limit	Dil. Factor	QUAL	Date Analyzed	Analyst	Seq. #
Dibenz(a,h)anthracene	ND	990000	3000		10/18/00 13:58	WW	438652
Dibenz(a,j)acridine	J ND	2000000	3000		10/18/00 13:58	WW	438652
Dibenz(a,j)anthracene	J ND	990000	3000		10/18/00 13:58	WW	438652
Dibenzo (a,l) pyrene	J ND	990000	3000		10/18/00 13:58	WW	438652
Dibenzo(a,e)fluoranthene	J ND	990000	3000		10/18/00 13:58	WW	438652
Dibenzo(a,e)pyrene	J ND	990000	3000		10/18/00 13:58	WW	438652
Dibenzo(a,h)pyrene	J ND	990000	3000		10/18/00 13:58	WW	438652
Dibenzo(a,i)pyrene	J ND	990000	3000		10/18/00 13:58	WW	438652
Dibenzofuran	ND	990000	3000		10/18/00 13:58	WW	438652
Diethyl phthalate	ND	990000	3000		10/18/00 13:58	WW	438652
Dimethyl phthalate	ND	990000	3000		10/18/00 13:58	WW	438652
Diphenyl oxide	J ND	990000	3000		10/18/00 13:58	WW	438652
Diphenylamine	J ND	990000	3000		10/18/00 13:58	WW	438652
Ethyl methanesulfonate	J ND	990000	3000		10/18/00 13:58	WW	438652
Famphur	J ND	2400000	3000		10/18/00 13:58	WW	438652
Fluoranthene	ND	990000	3000		10/18/00 13:58	WW	438652
Fluorene	ND	990000	3000		10/18/00 13:58	WW	438652
Hexachlorobenzene	J 6000000	20000000	60000		10/18/00 16:23	WW	438657
Hexachlorobutadiene	J 15000000	20000000	60000		10/18/00 16:23	WW	438657
Hexachlorocyclopentadiene	ND	990000	3000		10/18/00 13:58	WW	438652
Hexachloroethane	50000000	20000000	60000		10/18/00 16:23	WW	438657
Hexachloropropene	J ND	990000	3000		10/18/00 13:58	WW	438652
Indene	J ND	990000	3000		10/18/00 13:58	WW	438652
Indeno(1,2,3-cd)pyrene	ND	990000	3000		10/18/00 13:58	WW	438652
Isodrin	J ND	990000	3000		10/18/00 13:58	WW	438652
Isophorone	J ND	990000	3000		10/18/00 13:58	WW	438652
Isosafrole	J ND	990000	3000		10/18/00 13:58	WW	438652
Kepone	J ND	2400000	3000		10/18/00 13:58	WW	438652
Methapyrilene	J ND	990000	3000		10/18/00 13:58	WW	438652
Methyl methanesulfonate	J ND	2000000	3000		10/18/00 13:58	WW	438652
Methylchrysene	J ND	990000	3000		10/18/00 13:58	WW	438652
N-Nitroso-di-n-butylamine	J ND	990000	3000		10/18/00 13:58	WW	438652
N-Nitrosodi-n-propylamine	ND	990000	3000		10/18/00 13:58	WW	438652
N-Nitrosodiethylamine	J ND	990000	3000		10/18/00 13:58	WW	438652
N-Nitrosodimethylamine	ND	990000	3000		10/18/00 13:58	WW	438652
N-Nitrosodiphenylamine	ND	990000	3000		10/18/00 13:58	WW	438652
N-Nitrosomethylethylamine	J ND	990000	3000		10/18/00 13:58	WW	438652
N-Nitrosomorpholine	J ND	990000	3000		10/18/00 13:58	WW	438652
N-Nitrosopiperidine	J ND	990000	3000		10/18/00 13:58	WW	438652
N-Nitrosopyrrolidine	J ND	990000	3000		10/18/00 13:58	WW	438652

Qualifiers:

ND/U - Not Detected at the Reporting Limit
B - Analyte detected in the associated Method Blank
* - Surrogate Recovery Outside Advisable QC Limits
J - Estimated Value between MDL and PQL
>MCL - Result Over Maximum Contamination Limit(MCL)
D - Surrogate Recovery Unreportable due to Dilution
MI - Matrix Interference

Client Sample ID L-11676-101700-JD-001 **Collected:** 10/17/00 3:30:00 **SPL Sample ID:** 00100473-01

Site: **#11676, DNAPL/Fieldbrook Super Fund Site**

Analyses/Method	Result		Rep.Limit	Dil. Factor	QUAL	Date Analyzed	Analyst	Seq. #
Naphthalene	ND		990000	3000		10/18/00 13:58	WW	438652
Nitrobenzene	ND		990000	3000		10/18/00 13:58	WW	438652
o-Toluidine	J ND		2400000	3000		10/18/00 13:58	WW	438652
p-Dimethylaminoazobenzene	J ND		4800000	3000		10/18/00 13:58	WW	438652
Pentachlorobenzene	J 2800000		990000	3000		10/18/00 13:58	WW	438652
Pentachloroethane	J 3800000		990000	3000		10/18/00 13:58	WW	438652
Pentachloronitrobenzene	J ND		990000	3000		10/18/00 13:58	WW	438652
Pentachlorophenol	ND		2400000	3000		10/18/00 13:58	WW	438652
Phenacetin	J ND		990000	3000		10/18/00 13:58	WW	438652
Phenanthrene	ND		990000	3000		10/18/00 13:58	WW	438652
Phenol	ND		990000	3000		10/18/00 13:58	WW	438652
Phorate	J ND		2400000	3000		10/18/00 13:58	WW	438652
Phthalic Acid	J ND		990000	3000		10/18/00 13:58	WW	438652
Phthalic anhydride	J ND		990000	3000		10/18/00 13:58	WW	438652
Pronamide	J ND		990000	3000		10/18/00 13:58	WW	438652
Pyrene	ND		990000	3000		10/18/00 13:58	WW	438652
Pyridine	ND		990000	3000		10/18/00 13:58	WW	438652
Quinoline	J ND		2400000	3000		10/18/00 13:58	WW	438652
Safrole	J ND		990000	3000		10/18/00 13:58	WW	438652
Thiophenol	J ND		990000	3000		10/18/00 13:58	WW	438652
Tris(2,3-dibromopropyl) phosphate	J ND		990000	3000		10/18/00 13:58	WW	438652
2-Methylphenol	ND		990000	3000		10/18/00 13:58	WW	438652
3 & 4-Methylphenol	ND		990000	3000		10/18/00 13:58	WW	438652
Cresols, Total	ND		990000	3000		10/18/00 13:58	WW	438652
Surr: 2,4,6-Tribromophenol	D	%	19-122	60000	*	10/18/00 16:23	WW	438657
Surr: 2,4,6-Tribromophenol	D	%	19-122	3000	*	10/18/00 13:58	WW	438652
Surr: 2-Fluorobiphenyl	D	%	30-115	3000	*	10/18/00 13:58	WW	438652
Surr: 2-Fluorobiphenyl	D	%	30-115	60000	*	10/18/00 16:23	WW	438657
Surr: 2-Fluorophenol	D	%	25-121	3000	*	10/18/00 13:58	WW	438652
Surr: 2-Fluorophenol	D	%	25-121	60000	*	10/18/00 16:23	WW	438657
Surr: Nitrobenzene-d5	D	%	23-120	3000	*	10/18/00 13:58	WW	438652
Surr: Nitrobenzene-d5	D	%	23-120	60000	*	10/18/00 16:23	WW	438657
Surr: Phenol-d5	D	%	24-113	3000	*	10/18/00 13:58	WW	438652
Surr: Phenol-d5	D	%	24-113	60000	*	10/18/00 16:23	WW	438657
Surr: Terphenyl-d14	D	%	18-137	60000	*	10/18/00 16:23	WW	438657
Surr: Terphenyl-d14	D	%	18-137	3000	*	10/18/00 13:58	WW	438652

Qualifiers:

ND/U - Not Detected at the Reporting Limit
B - Analyte detected in the associated Method Blank
* - Surrogate Recovery Outside Advisable QC Limits
J - Estimated Value between MDL and PQL
>MCL - Result Over Maximum Contamination Limit(MCL)
D - Surrogate Recovery Unreportable due to Dilution
MI - Matrix Interference

Client Sample ID L-11676-101700-JD-001 **Collected:** 10/17/00 3:30:00 **SPL Sample ID:** 00100473-01

Site: **#11676, DNAPL/Fieldbrook Super Fund Site**

Analyses/Method **Result** **Rep.Limit** **Dil. Factor** **QUAL** **Date Analyzed** **Analyst** **Seq. #**

Run ID/Seq #: H_001018A-438652

Prep Method	Prep Date	Prep Initials
SW3580A	10/18/2000 11:41	J_L

Run ID/Seq #: H_001018A-438657

Prep Method	Prep Date	Prep Initials
SW3580A	10/18/2000 11:41	J_L

Qualifiers:

ND/U - Not Detected at the Reporting Limit
B - Analyte detected in the associated Method Blank
* - Surrogate Recovery Outside Advisable QC Limits
J - Estimated Value between MDL and PQL
>MCL - Result Over Maximum Contamination Limit(MCL)
D - Surrogate Recovery Unreportable due to Dilution
MI - Matrix Interference

Data File: /chem/h.i/h001018.b/h292s08.d

Report Date: 19-Oct-2000 12:08

Thru-Put Systems, Inc.

TENTATIVELY IDENTIFIED COMPOUNDS

Client Name:
Lab Smp Id: SAMP 00100473-01A
Operator : WW (1G-10ML,DX=10)
Sample Location:
Sample Matrix: SOIL
Analysis Type: SV

Client SDG: h001018
Sample Date:
Sample Point:
Date Received:
Level: LOW

Number TICs found: 24

CONCENTRATION UNITS:
(ug/L or ug/KG) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1. 58679-08-6	1,2-Butadiene, 1,1,4-trichl	4.095	450000	NJ
2. 460-12-8	1,3-Butadiyne	4.140	800000	NJ
3. 42769-38-0	1,3-Butadiene, 1,1,3,4-tetr	5.980	43000000	NJ
4. 98-56-6	Benzene, 1-chloro-4-(triflu	6.025	1000000	NJ
5. 55880-77-8	1,3-Butadiene, pentachloro-	6.398	48000000	NJ
6. 56631-01-7	Butene, hexachloro-	6.849	7000000	NJ
7. 74421-52-6	Benzene, trichloro[(trichlo	6.962	3800000	NJ
8. 20589-85-9	1-Propene, 1,2,3,3-tetrachl	7.233	2200000	NJ
9. 34973-39-2	1-Butene, 1,1,3,3,4,4-hexac	7.594	44000000	NJ
10. 97985-58-5	1,5-Hexadiene, 1,1,2,4,4,5-	7.639	3000000	NJ
11.	Unknown	7.820	21000000	J
12. 10436-39-2	1-Propene, 1,1,2,3-tetrachl	8.452	67000000	NJ
13. 6262-51-7	Cyclopropane, pentachloro-	8.678	1700000	NJ
14. 319-84-6	.alpha.-Lindane	10.078	350000	NJ
15. 642-04-6	Pyrazine, tetraphenyl-	10.213	970000	NJ
16. 1888-71-7	1-Propene, 1,1,2,3,3,3-hexa	10.631	1200000	NJ
17. 20524-86-1	Methane, oxybis[dichloro-	10.811	8600000	NJ
18. 0-00-0	Methyl(3,3-difluoro-2-prope	11.274	290000	NJ
19. 69102-77-8	1-Propene, pentachloro-	11.353	6000000	NJ
20. 72101-09-8	Pentadiene, hexachlorodiflu	11.658	210000	NJ
21. 98141-62-9	1,5-Hexadiene, 1,1,2,5,6,6-	12.110	760000	NJ
22. 10436-39-2	1-Propene, 1,1,2,3-tetrachl	12.166	250000	NJ
23. 29082-74-4	Benzene, pentachloro(trichl	13.351	520000	NJ
24. 6298-72-2	2,5-Bis(chloromethyl)-p-xyl	13.566	280000	NJ

Data File: /chem/h.i/h001018.b/h292s09.d

Report Date: 19-Oct-2000 12:07

Thru-Put Systems, Inc.

TENTATIVELY IDENTIFIED COMPOUNDS

Client Name:
Lab Smp Id: SAMP 00100473-01A
Operator : WW (1g-10ml,dX=200)
Sample Location:
Sample Matrix: SOIL
Analysis Type: SV

Client SDG: h001018
Sample Date:
Sample Point:
Date Received:
Level: LOW

Number TICs found: 10

CONCENTRATION UNITS:
(ug/L or ug/KG) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1. 42769-38-0	1,3-Butadiene, 1,1,3,4-tetr	5.951	34000000	NJ
2. 55880-77-8	1,3-Butadiene, pentachloro-	6.369	43000000	NJ
3. 20589-85-9	1-Propene, 1,2,3,3-tetrachl	6.640	7700000	NJ
4. 98141-62-9	1,5-Hexadiene, 1,1,2,5,6,6-	6.673	13000000	NJ
5. 56631-01-7	Butene, hexachloro-	6.831	6700000	NJ
6. 34973-39-2	1-Butene, 1,1,3,3,4,4-hexac	7.565	34000000	NJ
7. 10436-39-2	1-Propene, 1,1,2,3-tetrachl	8.107	190000000	NJ
8. 98141-62-9	1,5-Hexadiene, 1,1,2,5,6,6-	8.367	46000000	NJ
9. 20524-86-1	Methane, oxybis[dichloro-	10.794	7300000	NJ
10. 69102-77-8	1-Propene, pentachloro-	11.347	4400000	NJ

Client Sample ID L-11676-101700-JD-001 **Collected:** 10/17/00 3:30:00 **SPL Sample ID:** 00100473-01

Site: #11676, DNAPL/Fieldbrook Super Fund Site

VOLATILE ORGANICS BY METHOD 8260B MCL SW8260B **Units: ug/Kg**

Analyses/Method	Result	Rep.Limit	Dil. Factor	QUAL	Date Analyzed	Analyst	Seq. #
1,1,1,2-Tetrachloroethane	ND	1300000	250000		10/19/00 11:29	JC	439296
1,1,1-Trichloroethane	ND	1300000	250000		10/19/00 11:29	JC	439296
1,1,2,2-Tetrachloroethane	14000000	1300000	250000		10/19/00 11:29	JC	439296
1,1,2-Trichloroethane	ND	1300000	250000		10/19/00 11:29	JC	439296
1,1-Dichloroethane	ND	1300000	250000		10/19/00 11:29	JC	439296
1,1-Dichloroethene	ND	1300000	250000		10/19/00 11:29	JC	439296
1,1-Dichloropropene	ND	1300000	250000		10/19/00 11:29	JC	439296
1,2,3-Trichlorobenzene	ND	1300000	250000		10/19/00 11:29	JC	439296
1,2,3-Trichloropropane	ND	1300000	250000		10/19/00 11:29	JC	439296
1,2,4-Trichlorobenzene	ND	1300000	250000		10/19/00 11:29	JC	439296
1,2,4-Trimethylbenzene	ND	1300000	250000		10/19/00 11:29	JC	439296
1,2-Dibromo-3-chloropropane	ND	1300000	250000		10/19/00 11:29	JC	439296
1,2-Dibromoethane	ND	1300000	250000		10/19/00 11:29	JC	439296
1,2-Dichlorobenzene	ND	1300000	250000		10/19/00 11:29	JC	439296
1,2-Dichloroethane	ND	1300000	250000		10/19/00 11:29	JC	439296
1,2-Dichloropropane	ND	1300000	250000		10/19/00 11:29	JC	439296
1,3,5-Trimethylbenzene	ND	1300000	250000		10/19/00 11:29	JC	439296
1,3-Butadiene	ND	2500000	250000		10/19/00 11:29	JC	439296
1,3-Dichlorobenzene	ND	1300000	250000		10/19/00 11:29	JC	439296
1,3-Dichloropropane	ND	1300000	250000		10/19/00 11:29	JC	439296
1,4-Dichlorobenzene	ND	1300000	250000		10/19/00 11:29	JC	439296
1,4-Dioxane	ND	120000000	250000		10/19/00 11:29	JC	439296
2,2,4-Trimethylpentane	ND	1300000	250000		10/19/00 11:29	JC	439296
2,2-Dichloropropane	ND	1300000	250000		10/19/00 11:29	JC	439296
2-Butanone	ND	5000000	250000		10/19/00 11:29	JC	439296
2-Chloro-1,3-butadiene	ND	12000000	250000		10/19/00 11:29	JC	439296
2-Chloroethyl vinyl ether	ND	2500000	250000		10/19/00 11:29	JC	439296
2-Chlorotoluene	ND	1300000	250000		10/19/00 11:29	JC	439296
2-Hexanone	ND	2500000	250000		10/19/00 11:29	JC	439296
2-Methylnaphthalene	ND	1300000	250000		10/19/00 11:29	JC	439296
2-Nitropropane	ND	5000000	250000		10/19/00 11:29	JC	439296
4-Chlorotoluene	ND	1300000	250000		10/19/00 11:29	JC	439296
4-Isopropyltoluene	ND	1300000	250000		10/19/00 11:29	JC	439296
4-Methyl-2-pentanone	ND	2500000	250000		10/19/00 11:29	JC	439296
Acetone	ND	25000000	250000		10/19/00 11:29	JC	439296
Acetonitrile	ND	25000000	250000		10/19/00 11:29	JC	439296
Acrolein	ND	12000000	250000		10/19/00 11:29	JC	439296
Acrylonitrile	ND	12000000	250000		10/19/00 11:29	JC	439296
Allyl chloride	ND	2500000	250000		10/19/00 11:29	JC	439296

Qualifiers:

ND/U - Not Detected at the Reporting Limit
B - Analyte detected in the associated Method Blank
* - Surrogate Recovery Outside Advisable QC Limits
J - Estimated Value between MDL and PQL
>MCL - Result Over Maximum Contamination Limit(MCL)
D - Surrogate Recovery Unreportable due to Dilution
MI - Matrix Interference

Client Sample ID [illegible]-11676-101700-JD-001 **Collected:** 10/17/00 3:30:00 **SPL Sample ID:** 00100473-01

Site: **#11676, DNAPL/Fieldbrook Super Fund Site**

Analyses/Method	Result	Rep.Limit	Dil. Factor	QUAL	Date Analyzed	Analyst	Seq. #
Benzene	ND	1300000	250000		10/19/00 11:29	JC	439296
Benzyl chloride	ND	12000000	250000		10/19/00 11:29	JC	439296
Bis (chloromethyl) ether	ND	12000000	250000		10/19/00 11:29	JC	439296
Bromobenzene	ND	1300000	250000		10/19/00 11:29	JC	439296
Bromochloromethane	ND	1300000	250000		10/19/00 11:29	JC	439296
Bromodichloromethane	ND	1300000	250000		10/19/00 11:29	JC	439296
Bromoform	ND	1300000	250000		10/19/00 11:29	JC	439296
Bromomethane	ND	2500000	250000		10/19/00 11:29	JC	439296
Carbon disulfide	ND	1300000	250000		10/19/00 11:29	JC	439296
Carbon tetrachloride	ND	1300000	250000		10/19/00 11:29	JC	439296
Chlorobenzene	ND	1300000	250000		10/19/00 11:29	JC	439296
Chloroethane	ND	2500000	250000		10/19/00 11:29	JC	439296
Chloroform	ND	1300000	250000		10/19/00 11:29	JC	439296
Chloromethane	ND	2500000	250000		10/19/00 11:29	JC	439296
Crotonaldehyde	ND	250000000	250000		10/19/00 11:29	JC	439296
Cyclohexane	ND	1300000	250000		10/19/00 11:29	JC	439296
Dibromochloromethane	ND	1300000	250000		10/19/00 11:29	JC	439296
Dibromomethane	ND	1300000	250000		10/19/00 11:29	JC	439296
Dichlorodifluoromethane	ND	2500000	250000		10/19/00 11:29	JC	439296
Dicyclopentadiene	ND	2500000	250000		10/19/00 11:29	JC	439296
Diisopropyl ether	ND	2500000	250000		10/19/00 11:29	JC	439296
Ethyl Acetate	ND	120000000	250000		10/19/00 11:29	JC	439296
Ethyl Cyanide	ND	12000000	250000		10/19/00 11:29	JC	439296
Ethyl Ether	ND	5000000	250000		10/19/00 11:29	JC	439296
Ethyl methacrylate	ND	5000000	250000		10/19/00 11:29	JC	439296
Ethylbenzene	ND	1300000	250000		10/19/00 11:29	JC	439296
Ethylene oxide	ND	50000000	250000		10/19/00 11:29	JC	439296
Freon-113	ND	2500000	250000		10/19/00 11:29	JC	439296
Hexachlorobutadiene	10000000	1300000	250000		10/19/00 11:29	JC	439296
Hexane	ND	1300000	250000		10/19/00 11:29	JC	439296
Iodomethane	ND	2500000	250000		10/19/00 11:29	JC	439296
Isobutyl alcohol	ND	120000000	250000		10/19/00 11:29	JC	439296
Isopropylbenzene	ND	1300000	250000		10/19/00 11:29	JC	439296
Methacrylonitrile	ND	5000000	250000		10/19/00 11:29	JC	439296
Methyl acetate	ND	1300000	250000		10/19/00 11:29	JC	439296
Methyl methacrylate	ND	5000000	250000		10/19/00 11:29	JC	439296
Methyl tert-butyl ether	ND	1300000	250000		10/19/00 11:29	JC	439296
Methylcyclohexane	ND	2500000	250000		10/19/00 11:29	JC	439296
Methylene chloride	ND	1300000	250000		10/19/00 11:29	JC	439296
n-Butanol	ND	120000000	250000		10/19/00 11:29	JC	439296

Qualifiers:

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B - Analyte detected in the associated Method Blank
* - Surrogate Recovery Outside Advisable QC Limits
J - Estimated Value between MDL and PQL

>MCL - Result Over Maximum Contamination Limit(MCL)
D - Surrogate Recovery Unreportable due to Dilution
MI - Matrix Interference

Client Sample ID L-11676-101700-JD-001 **Collected:** 10/17/00 3:30:00 **SPL Sample ID:** 00100473-01

Site: #11676, DNAPL/Fieldbrook Super Fund Site

Analyses/Method	Result	Rep.Limit	Dil. Factor	QUAL	Date Analyzed	Analyst	Seq. #
n-Butylbenzene	ND	1300000	250000		10/19/00 11:29	JC	439296
n-Propylbenzene	ND	1300000	250000		10/19/00 11:29	JC	439296
Naphthalene	ND	1300000	250000		10/19/00 11:29	JC	439296
sec-Butylbenzene	ND	1300000	250000		10/19/00 11:29	JC	439296
Styrene	ND	1300000	250000		10/19/00 11:29	JC	439296
t-Butyl alcohol	ND	120000000	250000		10/19/00 11:29	JC	439296
tert-Amyl methyl ether	ND	1300000	250000		10/19/00 11:29	JC	439296
tert-Butyl ethyl ether	ND	1300000	250000		10/19/00 11:29	JC	439296
tert-Butylbenzene	ND	1300000	250000		10/19/00 11:29	JC	439296
Tetrachloroethene	27000000	1300000	250000		10/19/00 11:29	JC	439296
Toluene	ND	1300000	250000		10/19/00 11:29	JC	439296
trans-1,3-Dichloropropene	ND	1300000	250000		10/19/00 11:29	JC	439296
trans-1,4-Dichloro-2-Butene	ND	25000000	250000		10/19/00 11:29	JC	439296
Trichloroethene	45000000	1300000	250000		10/19/00 11:29	JC	439296
Trichlorofluoromethane	ND	1300000	250000		10/19/00 11:29	JC	439296
Vinyl acetate	ND	2500000	250000		10/19/00 11:29	JC	439296
Vinyl chloride	ND	2500000	250000		10/19/00 11:29	JC	439296
cis-1,2-Dichloroethene	ND	1300000	250000		10/19/00 11:29	JC	439296
cis-1,3-Dichloropropene	ND	1300000	250000		10/19/00 11:29	JC	439296
m,p-Xylene	ND	1300000	250000		10/19/00 11:29	JC	439296
o-Xylene	ND	1300000	250000		10/19/00 11:29	JC	439296
trans-1,2-Dichloroethene	ND	1300000	250000		10/19/00 11:29	JC	439296
Xylenes,Total	ND	1300000	250000		10/19/00 11:29	JC	439296
1,2-Dichloroethene (total)	ND	1300000	250000		10/19/00 11:29	JC	439296
Surr: Toluene-d8	104 %	80-140	250000		10/19/00 11:29	JC	439296
Surr: 1,2-Dichloroethane-d4	112 %	70-120	250000		10/19/00 11:29	JC	439296
Surr: 4-Bromofluorobenzene	104 %	74-130	250000		10/19/00 11:29	JC	439296

Qualifiers:

ND/U - Not Detected at the Reporting Limit
B - Analyte detected in the associated Method Blank
* - Surrogate Recovery Outside Advisable QC Limits
J - Estimated Value between MDL and PQL
>MCL - Result Over Maximum Contamination Limit(MCL)
D - Surrogate Recovery Unreportable due to Dilution
MI - Matrix Interference

SPL Houston Labs

TENTATIVELY IDENTIFIED COMPOUNDS

Client Name:	Client SDG: n001019
Lab Smp Id: SAMP 00100473-01A	
Operator : LT	Sample Date:
Sample Location:	Sample Point:
Sample Matrix: SOIL	Date Received:
Analysis Type: VOA	Level: LOW

Number TICs found: 9

CONCENTRATION UNITS:
(ug/L or ug/KG) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1. 42769-38-0	1,3-Butadiene, 1,1,3,4-tetr	15.696	3200000	NJ
2. 42769-38-0	1,3-Butadiene, 1,1,3,4-tetr	15.822	15000000	NJ
3. 42769-38-0	1,3-Butadiene, 1,1,3,4-tetr	16.119	4800000	NJ
4. 42769-38-0	1,3-Butadiene, 1,1,3,4-tetr	16.473	13000000	NJ
5. 55880-77-8	1,3-Butadiene, pentachloro-	16.518	5200000	NJ
6. 55880-77-8	1,3-Butadiene, pentachloro-	16.827	8800000	NJ
7. 55880-77-8	1,3-Butadiene, pentachloro-	16.895	17000000	NJ
8. 460-12-8	1,3-Butadiyne	17.124	4700000	NJ
9. 56631-01-7	Butene, hexachloro-	17.831	5600000	NJ

APPENDIX D

APPENDIX D: Acronyms

ACRONYMS

ACGIH - *American Conference of Governmental Hygienists*
AOC - *Area of Concern*
APC - *Air Pollution Control*
ARCS - *Assessment and Remediation of Contaminated Sediments*
ASRI - *Alternative Specific Remedial Investigation*
AWFCO - *Automatic Waste Feed Cut Off*
BIF - *Boilers and Industrial Furnaces*
BTEX - *Benzene, Toluene, Ethylbenzene and Xylene*
BTU - *British Thermal Unit*
CDF - *Confined Disposal Facility*
CEM - *Continuous Emissions Monitoring*
CERCLA - *Comprehensive Environmental Response, Compensation, and Liability Act*
CFS - *Cubic Feet Per Second*
COC - *Contaminates of Concern*
CPAH - *Carcinogenic Polynuclear Aromatic Hydrocarbons*
CSF - *Cancer Slope Risk Factor*
CSO - *Combined Sewer Overflow*
CTF - *Confined Treatment Facility*
CWA - *Clean Water Act*
DRE - *Destruction Removal Efficiency*
DRO - *Diesel Range Organics*
HCL - *Hydrogen Chloride*
IAG - *Interagency Agreement*
ID - *Induced draft or inside diameter (depending on context)*
IJC - *International Joint Commission*
LAC - *Laboratory Analysis Coordinator*
M0050 - *USEAP Method 0050*
MCD - *Modified Consent Decree*
MDEQ - *Michigan Department of Environmental Quality*
MDNR - *Michigan Department of Natural Resources*
MM BTU - *Million British Thermal Units*
MMT - *Multiple Metals Train*
MMT - *Multiple metals sampling train*
MPCA - *Minnesota Pollution Control Agency*
NPDES - *National Pollution Discharge Elimination System*
NPL - *National Priorities List*
NYSDEC - *New York State Department of Environmental Conservation*
OEPA - *Ohio Environmental Protection Agency*
PAH - *Polynuclear Aromatic Hydrocarbons*

PBB - *Polybrominated Biphenyl*
PCDD - *Polychlorinated dibenzo-p-dioxin*
PCDF - *Polychlorinated dibenzofurans*
PCS - *Process Sampling Coordinator*
POHC - *Principal Organic Hazardous Compounds*
PPB - *Parts Per Billion*
PPM - *Parts Per Million*
PRP - *Potentially Responsible Party(ies)*
PTM - *Performance Test Manager*
QAAP - *Quality Assurance and Project Plan*
RAP - *Remedial Action Plan*
RCRA - *Resource Conservation and Recovery Act*
RI/FS - *Remedial Investigation/Feasibility Study*
ROD - *Record of Decision*
RRT - *Requisite Remedial Technology*
SPI - *SoilPure, Inc.*
SSC - *Stack Sampling Coordinator*
THC - *Total Hydrocarbons Content*
TSCA - *Toxic Substances Control Act*
TSDF - *Treatment, Storage and Disposal Facility*
TVL - *Threshold Value Limits*
USACE - *U.S. Army Corps of Engineers*
USEPA - *U.S. Environmental Protection Agency*
USFWS - *U.S. Fish and Wildlife Service*
USGS - *U.S. Geological Service*
VOC - *Volatile Organic Compound*
VOST - *Volatile Organic Sampling Train*
WDNR - *Wisconsin Department of Natural Resources*

APPENDIX E

WASTE STREAM TECHNOLOGY INC.
ANALYTICAL LABORATORY
QUALITY ASSURANCE
AND
QUALITY CONTROL PLAN

Revision Number: 9
Effective Date: 6/23/99
Serial Number: QA-86

Prepared by:

Waste Stream Technology Inc.
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Laboratory Director: Brian S. Schepart, Ph.D.
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POLICY STATEMENT

The goal of the analytical laboratory of Waste Stream Technology (WST) is to provide reliable data to our clients in a manner that will facilitate the problem solving and decision making processes. Because we are aware that this data must be of the highest quality, we are committed to an intensive and comprehensive program for quality assurance and quality control.

In order to provide reliable data of the highest quality on a continuing and consistent basis, WST has implemented an internal Quality Assurance and Quality Control Program. The quality assurance guidelines of WST incorporate the requirements of the US EPA Superfund Contract Laboratory Program (CLP) and are in compliance with the recommended guidelines published in the US EPA Manual, "Handbook for Analytical Quality Control for Water and Wastewater Laboratories."

This Quality Assurance and Quality Control establishes and documents the procedures and practices that are routinely implemented to ensure the integrity and validity of the data generated by WST. The main objectives of this program are to:

1. Establish protocols for measuring the quality of each system through the use of internal audits.
2. Recognize and define deficiencies that affect the quality of data.
3. Provide a system of checks and balances to correct and document out-of-control conditions in a timely manner.
4. Define and document the limitations on the quality of the data to further enhance its utility for problem solving, decision making and reporting.
5. Provide a rational, well-defined format with credible, traceable documentation to assist in the internal and external evaluation of the overall program.

The purpose of this Quality Assurance/Quality Control Plan is to establish internal protocols, procedures and guidelines to define and document the validity of the data produced. In this way we engender a system dedicated to excellence, in which we and our clients can have the utmost confidence.

Edward M. Oddo
Vice-President and CFO
Waste Stream Technology Inc.

Brian S. Schepart, Ph.D.
Laboratory Director
Waste Stream Technology Inc.

INTRODUCTION

1.1 General Description

Waste Stream Technology Inc. (WST) was founded in 1986 as a bioremediation company to address the need for alternative technologies to remediate water and soils contaminated with petroleum hydrocarbon products. In 1987, WST established its analytical laboratory to support its bioremediation processes and in July 1989, WST became a wholly owned subsidiary of Sevenson Environmental Services Inc. (SES) of Niagara Falls, New York. Since that time, the WST analytical laboratory has expanded and it soon became apparent that a certified public environmental laboratory could substantially benefit both WST's and SES's clients, as wells as the Western New York area.

1.2 Objectives

The objective of this manual is to present the Quality Assurance and Quality Control Plan used within WST's analytical laboratory to maintain the production of the highest quality data at all times. Specifically, this manual will address the areas of:

- Organization and responsibilities of WST's personnel
- Sample custody and tracking
- Analytical procedures and the associated quality assurance and quality control
- Data handling
- Corrective actions

1.3 Implementation

All WST laboratory employees, and those whose job functions relate to the laboratory, will have access to copies of this manual for reference. Copies of the referenced SOP's will also be available for reference and guidance. It is the joint responsibility of the Laboratory Director, Assistant Laboratory Director, and the QA/QC Department to see that the operating criteria set forth are carried out to their satisfaction. Employees who, either willfully or through negligence, attempt to circumvent the QA/QC procedures will be reprimanded. Persistent violations may result in termination. Upper management levels will be routinely advised of the status, accomplishments, and success of the program through executive summaries.

1.4 Amendments and Revisions

Amendments and/or revisions to this manual will be made in a timely fashion dependent on the urgency and impact of any changes. Changes in procedures or protocols by regulatory agencies at the federal, state, or local level that affect the content of this manual will be made immediately. In addition, changes in methodology or instrumentation that affect Quality Control (QC) limits will be made as soon as the effects of these changes can be measured, documented, and verified. The incorporation of new or additional analytical capabilities into the laboratory program will also be dealt with immediately.

The QC limits will be reviewed at least annually and updated should the data indicate a change. Editorial revisions will be made annually.

Responsibility for changes will be shared by the QA/QC Department, Laboratory Director, Assistant Laboratory Director, and any other technical/professional employees as they deem necessary to the process.

ORGANIZATION AND RESPONSIBILITIES

2.1 Organizational Chart

The organizational chart of Waste Stream Technology's analytical laboratory is depicted in Figure 2-2. Although WST has a small staff, it is logically arranged and the high degree of quality assurance can be maintained due to the ability and experience of each staff member (See Section 7.0 for Biographies of Laboratory Personnel. Figure 2-1 shows the corporate organizational chart for WST.

2.2 Responsibilities

The responsibilities of each position within WST's analytical laboratory are clearly defined and understood by each individual staff member. Each person is constantly aware that each task is performed carefully and attentively during the work day so that the highest quality data can be generated.

The specific responsibilities of each staff member are as follows:

The Laboratory Director has the overall responsibility for the performance of the laboratory staff and the quality of the data generated. He/she must also be sure that all laboratory personnel meet the requisite qualifications for their position in the laboratory. The Laboratory Director, or a designee, must also review and approve all outgoing reports and serve as a link for communication and liaison with clients. The Assistant Lab Director act as delegates for the Laboratory Director in his/her absence.

The Assistant Laboratory Director is responsible for the day-to-day operation of the laboratory, including, but not limited to: the scheduling of sample extraction and analysis in conjunction with the laboratory staff; reviewing analytic data; assuring that all staff members are familiar with the Quality Assurance and Quality Control Plan (QA/QC) and maintenance of the QA/QC Plan; training of new staff; reviewing and approving outgoing reports as a designee of the Laboratory Director; evaluation of analytic procedures, both current and new; the inventory and ordering of supplies, chemicals, and standards; and preventive maintenance contracts and the performance of scheduled preventive maintenance.

The QA/QC Officer coordinates all quality assurance responsibilities. The QA/QC Officer reports to the Laboratory Director for daily activities but is responsible to the Vice-President for reporting non-conformance with the QA/QC criteria if corrective actions are not undertaken in a timely manner. In order to maintain the integrity, independence and objectivity of the QA/QC program, the QA/QC Officer is independent of the analytical process. The primary responsibilities of the QA/QC Officer are to review data and reports submitted by the Analyst prior to release, to carry out system audits, initiate corrective actions, and ensure compliance with the QA/QC manual and Standard Operating Procedures (SOP). The QA/QC Officer has the authority to perform audits, submit blind control samples, access data files and notebooks, and reject data/reports for non-compliance with accepted standards.

The Radiation Safety Officer (RSO) is ultimately responsible for the implementation of this manual and its incorporated Radiation Protection Policy. The responsibilities include but are not limited to the following:

1) General surveillance over all activities involving radioactive material, including routine monitoring and special surveys of all areas in which radioactive material is used.
2) Determining compliance with rules and regulations, licence conditions, and the conditions of project approval specified by radiation safety committee.
3) Monitoring and maintaining filter systems associated with the use, storage or disposal of radioactive material. This includes the laboratory heating, ventilation and cooling system, and fume hoods.
4) Furnishing consulting services on all aspects of radiation safety to personnel at all levels of responsibility.
5) Receiving, delivering and opening all shipments of radioactive material arriving at the company and receiving, packaging and shipping all radioactive material being shipped out.
6) Distributing and processing personnel monitoring equipment, determining the need for bioassays, keeping personnel exposure and bioassay records, and notifying individuals and their supervisors of exposures approaching ALARA levels and recommending appropriate remedial action.
7) Instructing personnel in the proper procedures for the use of radioactive material prior to use, annually (refresher training), and as required by changes in procedures, equipment, regulations, etc. This may also be contracted (e.g. University of Buffalo Toxicology Research Center).

8) Supervising and coordinating the radioactive waste disposal program, including keeping waste storage and disposal records.
9) Storing and accounting for all radioactive materials not in current use, including wastes.
10) Performing semi-annual leak tests on all sealed sources.
11) Maintaining an inventory of all radioisotopes and limiting the quantity of radionuclides to the amounts authorized by the license. The inventory will include the name of the person submitting the sample or custodian of the radioactive material for each aliquot of radioactive material, where it will be used or stored, and the date the material was sampled and/or received at Waste Stream Technology. Also, items removed from inventory will be tracked by departure date, contact person and destination.
12) The authority to terminate immediately a project that is found to be a threat to health or property.
13) Maintaining receipt, transfer, survey and similar records not specifically designated above.
14) Informing management of any contemplated changes or alterations to any equipment, facility, or procedure having a direct or indirect impact on radiological safety.
15) Ensuring that all surveys, sampling, and monitoring required by license or regulation are performed and reported in a timely, concise, and accurate fashion, and all records of such requirements are maintained as prescribed by license or regulation.
16) Continuously reviewing procedures and survey data for trends that could have a negative impact on the Radiation Protection Policy.

The Analyst is responsible for the operation and maintenance of their instrument. Each of the analysts has a specific analytical area and is familiar with the full range of duties in his/her respective area. Therefore, each analyst serves as his/her own area supervisor. Under this particular circumstance, each analyst, in conjunction with the Assistant Lab Director and Lab Director, is able to organize his/her own time and schedule each analysis independently. As area supervisors, they are also responsible for: implementing data verification procedures through analysis and review of tuning standard criteria (for the GC/MS), continuing calibration check standards, method and, if necessary, reagent blanks, and other QC samples; preparing data packages for review by the QA/QC Officer; evaluation and documentation of instrument performance; and correcting problems which result in a decline in data quality.

The Data Coordinator is responsible for the generation of final result reports for review by the Lab Director or his/her designee; the filing and storage of chain-of-custody forms, hard copies of organic and inorganic analysis data, and hard copies of final result reports sent to the client; and distribution of signed off analytical reports to the client via facsimile, next day air or by mail.

The Extraction Supervisor is responsible for the supervision of the Extraction Technicians and, in conjunction with the Assistant Lab Director and Lab Director, scheduling of samples to be extracted, exclusive of radiologic samples. Supervision of reagent preparation, cleaning of glassware, and monitoring of consumable supplies, as well as the maintenance of the QC plan for all wet chemistry analyses and sample extraction procedures, exclusive of radiologic procedures, are also the responsibilities of the Extraction Supervisor.

The Samples Custodian is responsible for receiving the samples, excluding radiologic samples, upon their arrival at the laboratory. Detailed responsibilities of the Sample Custodian are described in Section 3.0, Sample Custody.

2.3 Training of Laboratory Personnel

The training of personnel is covered in a separate SOP. This SOP includes guidelines that define the positions within the laboratory and the minimum required qualifications for each position. It also identifies the appropriate SOP's to be read and understood by the new employee as well as the hands-on procedures used in the laboratory during training. Certification of the trainee is provided through the analysis of quality control reference samples. The SOP outlines the documentation required to prove the employee was properly trained and the documentation required to show that current laboratory personnel are qualified for the position they hold.

Figure 2-1

WASTE STREAM TECHNOLOGY INC.
ABBREVIATED ORGANIZATION CHART

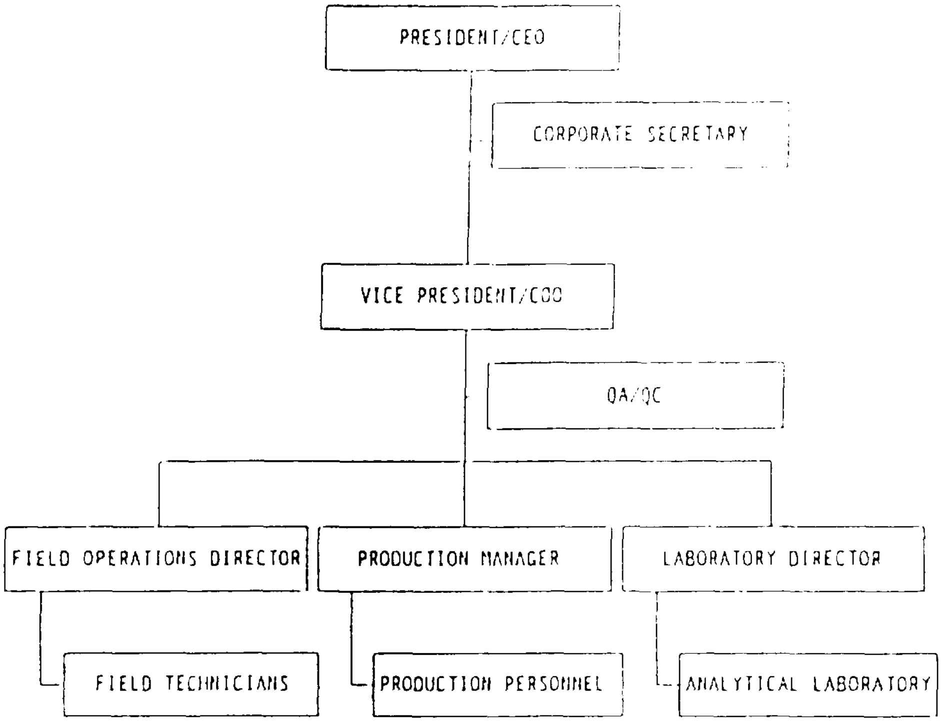
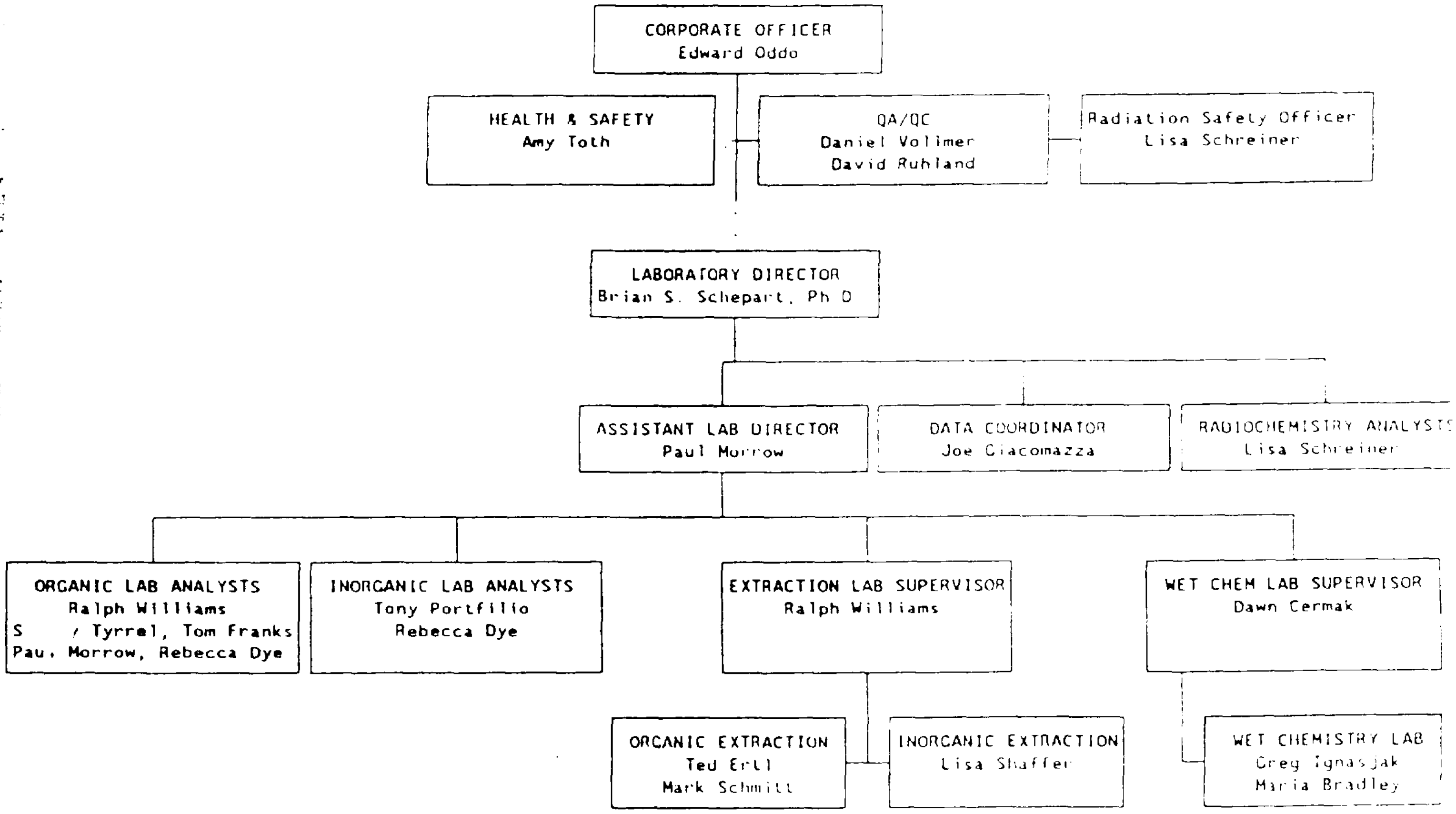


Figure 2-2

WASTE STREAM TECHNOLOGY INC.
ANALYTICAL LABORATORY
ORGANIZATION CHART



SAMPLE CUSTODY

It is essential that documentation is provided for all samples received at WST's laboratory which traces each sample, in a legally defensible manner, from sample collection, to the laboratory, and through the analytical procedures to disposal. Samples enter the WST analytical process in one of two ways; either from collection by WST Field Technicians or from collection by the client or agency other than WST. This section will address the chain of custody procedures used both outside and inside the laboratory. (Detailed procedures can be found in the Sample Custody SOP).

3.1 Field Collection by WST Field Personnel

When WST is contracted by a client to collect samples for analytic testing, and the types of analyses required are determined, the Sample Custodian will assemble the appropriate sample and shipping containers, and add the appropriate preservatives, if necessary. Table 3-1 lists the appropriate containers, preservatives, sample sizes, and holding times for the various analytical parameters tested by WST's laboratory. For all samples, the containers used will be new and pre-cleaned, from an approved vendor.

After the sample is collected, the Field Technician will label the sample containers with the following information: (A sample label is shown in Figure 3-5).

1. Site name and Client name
2. Location from where the sample was taken
3. Date and time of sampling
4. Whether the sample is a composite or a grab
5. Preservatives added, if appropriate
6. Name of the sampler

When all the appropriate samples have been taken and the sample containers have been properly labeled, the Sample Technician will complete a Chain of Custody Form (See Figure 3-1) by filling in all of the information listed in 1 through 6 above as well as the types of analyses to be performed. The samples will then be packed securely to prevent breakage and with cold packs when required to keep samples cold during shipment or delivery to the WST laboratory. The sampler will then sign the Chain of Custody (COC) Form and retain the pink copy for his/her records. The white, blue and yellow copies will accompany the samples throughout transportation. Each person handling the samples will sign the COC Form and record the time and date of transfer, both when receiving and relinquishing custody of the samples.

3.2 Collection from an Outside Agency

When a client or agency contacts WST to perform analytical testing, and the types of analyses to be performed are decided, the contact person at WST will fill out an Analytical Services Request Form (See Figure 3-2) and submit it to the Assistant Lab Director for review and scheduling. The Assistant Director will then forward the Request to the Sample Custodian to inform him/her of the samples impending arrival. If WST is to provide the sample containers, the WST contact person will also complete a Sample Container Request Form (See Figure 3-3) and submit it to the Sample Custodian. After comparing the Sample Container Request Form with the Analytical Services Request Form, the Sample Custodian will then collect the appropriate type and size containers, and, if required, add preservatives. The containers will then be securely packed into a cooler with a COC Form, and shipped to the location requested by the client.

3.3 Sample Receipt

When the samples arrive at the WST laboratory, whether or not they were sampled by WST Field Technicians, custody is transferred to the Sample Custodian, or in the case of radiologic samples, the Radiation Safety Officer (RSO), who will be the last person to sign the COC. The Sample Custodian or Radiation Safety Officer (RSO) will then open the shipping container under a fume hood, wearing appropriate gloves, and perform the following:

1. Check each sample container to see if breakage, cracking, external corrosion, or leaking has occurred.
2. A gamma radiation screen shall be performed on all samples to determine if special handling is required. Measure exposure rate at 3 ft. from package surface and record.
    A. Any samples with readings greater than background at the surface are labeled with a "radioactive" sticker listing the surface and 3 inch distance meter readings.
    B. Any sample that has a count equal to or greater than 300 counts per minute (cpm) or 100 microrems (ur)/hour shall be counted by spectroscopy for inventory purposes.
    C. If any sample has a count rate greater than 7200 cpm or 2400 ur/hour at 3 inches, the RSO, Laboratory Director or designee must be notified immediately. Sample login must only occur if authorized by the RSO, Laboratory Director or designee. Storage and/or manipulation of samples exceeding the above limits shall be permitted in those locations

set up as controlled areas, with disposable bench coverings or other contamination-limiting methods or devices.

3. Check the temperature inside the shipping container to assure that the samples were kept cool.
4. Check the pH of the non-volatile water samples that were to be preserved and make sure that they were properly preserved.
5. Inventory the samples shipped to see if the number of samples received and the description on each sample label correspond to information on the COC.
6. Complete a Sample Shipment Checklist Form (See Figure 3-4).

If irregularities are noted during the inspection of the samples, the Sample Custodian or RSO will submit the Sample Shipment Checklist to the QA/QC Officer or Laboaratory Project Manager, who in turn, will contact the client and/or Field Technician. The fate of the sample shipment will then be determined through discussion with the client. A record of this conversation with the client's representative is entered on the Sample Shipment Checklist, including the name of the contact, time and date of the conversation, and the resolutions reached on irregularities.

3.4 Custody in the Laboratory

After the samples are inventoried and the Sample Shipment Checklist is finalized, each sample is individually logged into the Master Log Book for General Laboratory samples, or into the Master Log Book for Radiochemistry samples, listing the following information:

1. A unique sequenced WST sample number assigned only to that sample;
2. Client name or name of agency representing the client;
3. Site name;
4. Client/Site Sample location or description;
5. Date received and date sampled;
6. Container size and number of containers;
7. Analytical tests to be performed;
8. Any comments/notes regarding the sample;
9. Sample group number; each group of samples received from a site will be assigned its own group number which is used to track the samples as a group;
10. Laboratory Information Management System (LIMS) login number for General Laboratory or Radiochemistry Laboratory;
11. Initials of the person logging in the samples (usually the Sample Custodian, or RSO).

The sample ID numbers are then recorded onto the label of each container associated with each of the samples and the sample containers are then placed into a sample storage refrigerator or room temperature storage area in a specific location designated by the Sample Custodian or RSO. This location is then recorded onto the COC. Every time a subsample is taken from these samples for extraction, the samples will be returned to this designated location (See Section 3.6). The sequential WST sample numbers are also recorded on the COC adjacent to the corresponding client/site sample location or description. The sample group number is then recorded on the COC for tracking purposes. The Sample Shipment Checklist is then attached to the white copy of the COC.

The Sample Custodian, or in the case of Radiochemistry samples the RSO or designee, will then log the samples into the LIMS Labworks database. The following information is entered for each sample in the group:

1. The unique WST sample ID number assigned to the sample;
2. Date and time the sample was collected;
3. Date the sample was received (submitted);
4. Name of the client and the site;
5. The client/site sample description or location;
6. Date the analytical report is due;
7. Analyses required on the samples. Each analysis performed in the laboratory has a designated analysis code. The code for each analysis required on the sample will be assigned to the sample.
8. Any comments/notes regarding the sample;
9. Date on which the sample will have exceeded its holding time;
10. The sample group number.

The COC and Sample Shipment Checklist are then submitted to the Data Coordinator for reporting and filing.

The Labworks LIMS system will be used to track the samples and all the data generated from the analytical tests performed on these samples throughout the analytical process. Each analytical section has access to the LIMS system and, on a daily basis, they generate a backlog report that shows them which samples require what analyses, when the results are due and when the sample holding time expires. The backlog report is then used by the technicians and/or analysts, in conjunction with the Extraction Lab Supervisor, Radiochemistry Analyst and/or RSO, and/or Assistant Lab Director to prioritize sample extraction and analysis.

When an analysis on a sample has been completed, the analyst will enter the results, either manually or by automatic computer file transfer, into the LIMS system under the appropriate analysis code for that sample. The data is then submitted to the QA/QC Department for review.

3.5 Sample Disposal

Unless specifically requested by the client, samples are usually held for 30 days after the issuance of the final report. The prospect of additional analyses on a sample must be viewed in the context of the recommended holding times.

Sample disposal occurs in one of two ways. The samples will either be sent back to the point of origination (i.e.,client or site) or eliminated as waste. Samples that are returned to the point of origin will be packed securely in a cooler. A list of the WST sample ID numbers contained within the cooler will be generated, signed and dated by the Sample Custodian or RSO. A photocopy of the signed and dated list will be placed in the cooler and the cooler shipped back to the site. The original copy will be placed into the Sample Custodian's or RSO's disposal file. The date of return will be noted for each sample in the Sample Disposal Logbook

Samples which are eliminated as waste will be disposed of in appropriate, clearly labeled waste containers, based on the samples' matrix and the characteristics and properties of the waste. These characteristics and properties will be determined by a review of the analytical data and history of the samples. Care must be exercised in sample disposal so chemically incompatible wastes are not mixed together. Each disposal container is labeled to identify, in general terms, the type of material that was placed in each container. When disposal is complete, the person disposing of the containers will sign and date the drum labels. Samples that were found to be innocuous will be disposed of as either non-hazardous waste, or if aqueous, by pouring down the drain. When a sample is disposed the date of laboratory disposal will be recorded in the Sample Disposal Log Book.

3.6 Sample Security

In order to maintain the integrity and validity of the sample(s) within the laboratory, all samples are maintained under locked storage or in limited access areas under the jurisdiction of the Sample Custodian and/or Radiation Safety Officer. Release of samples to laboratory personnel necessitates internal chain of custody procedures. Internal chain-of-custody is tracked by the Sample Custodian via a notebook. Entered into the notebook is WST sample ID number, the date and time the sample is relinquished, the name of the person to whom the sample was given (responsible party), the date and time the sample is returned, and the Sample Custodian's initials. The responsible party is required to maintain the sample(s) in their physical possession or view at all times. The Sample Custodian, RSO, Assistant Lab Director, or QA/QC Officer may confiscate unattended samples, return them to storage, notify the appropriate supervisor, and reprimand the responsible party.

WASTE STREAM
TECHNOLOGY

302 GROTE STREET
BUFFALO NY 14207
(716) 876-5290

CHAIN OF CUSTODY RECORD

PROJECT NO: SITE NAME:

SAMPLERS (SIGNATURE):

SAMPLE NO.	DATE	TIME	COMP	GRAB	MATRIX	SAMPLE LOCATION	SIZE & NO OF CONTAINERS								PRESERVATIVES	REMARKS

RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)
RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)

SPECIAL INSTRUCTIONS:

TURNAROUND TIME ______________

LAB I REFRIGERATOR # __________ SHELF # ______ GROUP # ______________________________ DUE DATE ______

Figure 3-2

WASTE STREAM TECHNOLOGY

Waste Stream Technology Inc.
302 Grote Street
Buffalo, NY 14207

ANALYTICAL SERVICES REQUEST FORM

Request Taken By ______________________ Date Requested ______________

Client ______________________ Telephone ______________

Client Contact ______________________ Fax ______________

Address ____

____

Start Date ______________________ P.O. # ______________

Lab/P.O. #	Number of Samples	Matrix	Analytical Parameters	Turnaround Time (Days)	Quoted Price

Sample Containers Required?

________ NO ________ YES (Please Complete Sample Container Request Form)

Special Instructions ____

Laboratory Use Only: Sample Group # ______________________________

Figure 3-3

WASTE STREAM TECHNOLOGY INC.
SAMPLE CONTAINER REQUEST FORM

Requested by: Date requested:

Job number:

Shipping address:

Attention to:

Date needed by:

Amount	Type	Size	Preservation	Analytic Test	Expected Sampling date

Type: Glass or HDPE

WST received:
Date sent/initials:
Courier/Shipping No.:

WASTE STREAM TECHNOLOGY INC
SAMPLE SHIPMENT CHECKLIST

Client:
Client Contact:
Telephone
Checked By:
Number of Shipping Containers(Coolers)

Date Shipped:
Date Received:
Shipped Via:

Container ID	Custody Tape Present ?	Intact ?	Temperature (C)	Number of Sample Containers	Agree with COC?

Sample Description:

Matrix

pH Preservation Check

Visual Observations

Irregularities:

Sample ID and Description	Irregularity

Checker Signature

Date

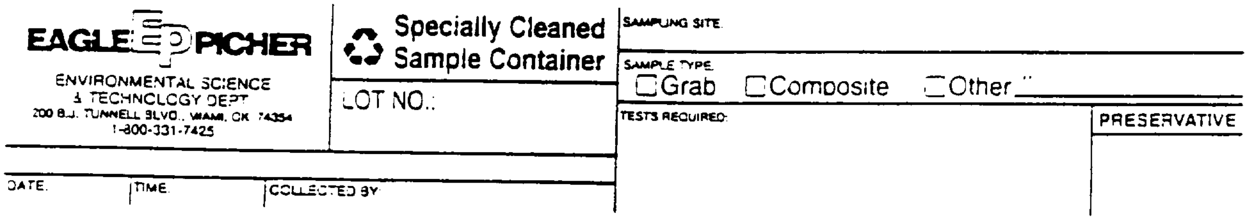
RESOLUTION OF IRREGULARITIES WITH CLIENT

Client Rep.
Date/Time
Decision

WST Rep.
Written Follow Up?/date

Figure 3-5

Sample Label



EAGLE-PICHER
ENVIRONMENTAL SCIENCE
& TECHNOLOGY DEPT
200 B.J. TUNNELL BLVD., MIAMI, OK 74354
1-800-331-7425

Specially Cleaned Sample Container

LOT NO.:

SAMPLING SITE:

SAMPLE TYPE:
☐ Grab ☐ Composite ☐ Other:

TESTS REQUIRED:

PRESERVATIVE

DATE:

TIME:

COLLECTED BY:

TABLE 3-1.1
SAMPLE CONTAINERS/PRESERVATIVES/HOLDING TIMES for WATER & SOLID/WASTE SAMPLES

ANALYSIS	SAMPLE VOLUME/CONTAINER	HOLDING TIME	PRESERVATIVE
<u>VOCs</u> water soil TCLP	2, 40 mL GT 1, 2 oz GT 3-4, 1 L GT	14 days 14 days 14 d to Extraction;14 d to Analysis	Cool 4°C (6 drops HCl for Aqueous)
<u>SVOCs</u> water soil TCLP	1, 1 L AG 1, 8 oz G 3-4, 1 L G	7d Extraction;40d Anal 14d Extraction;40d Anal 14d to TCLP;7d to prep Extraction; 40d to Anal	Cool 4°C (10% thiosulfate for water samples with residual chlorine)
<u>Metals</u> water soil TCLP, except Hg Mercury - water/soil Chromium VI- water/soil	1, 16 oz P,G 1, 16 oz P,G 1, 16 oz P,G 1, 16 oz P,G 500 mL P/ 4 oz G	180d to Extraction 180d to Extraction 180d Extraction;180d Anal 28d for water & soil 24 hours	Cool 4°C (HNO$_3$ pH <2 for Aqueous) Cool 4°C
<u>PCBs</u> water soil	1, 1 L AG 1, 8 oz G	7 d to Extraction;40 d to Analysis	Cool 4°C
<u>Pesticides</u> water soil TCLP	1, 1 L AG 1, 8 oz G 1, 1 L AG	7d Extraction;40d Anal 14d Extraction;40d Anal 7-14d TCLP;7d prep Extraction;40d to Anal	Cool 4°C (pH 5-9, 0.008% Na$_2$S$_2$O$_3$ for Aqueous samples)
<u>Herbicides</u> water soil TCLP	1, 1 L AG 1, 8 oz G 1, 1 L AG	7d Extraction;40d Anal 14d Extraction;40d Anal 7-14d TCLP;7d prep Extract; 40d to Analysis	Cool 4°C (0.008% Na$_2$S$_2$O$_3$ for Aqueous samples)
<u>RCRA Char</u> Ignitability Corrosivity Reactivity	1, 16 oz P,G 1, 16 oz P,G 1, 8 oz P,G	7 Days	NaOH; pH>12 Cool 4°C Cool 4°C

G = Clear Glass; AG= Amber Glass; P = Plastic; T = Teflon Lined Lid/SEPTA

TABLE 3-1.2
SAMPLE CONTAINERS/PRESERVATIVES

ANALYSIS	SAMPLE	HOLDING TIME	PRESERVATIVE
Acidity & Alkalinity	1, 250 mL P	14 days	Cool 4°C
Ammonia	1, 1 L P	28 days	Cool 4°C; pH <2 H_2SO_4
Biochemical Oxygen Demand	1, 1 L P	48 hours	Cool 4°C
Chemical Oxygen Demand	1, 125 mL P	28 days	Cool 4°C; pH <2 H_2SO_4
Chloride	1, 125 mL P	28 days	None
Cyanide (Total & Amenable)	1, 1 L P	14 days	Cool 4°C; pH>12 NaOH & 0.6 gm Ascorbic acid
Hardness	1, 250 mL P	6 months	pH<2 HNO_3/H_2SO_4
pH water soil	 1, 40 mL G,P 1, 2 oz G	Immediate	None
Nitrate & Nitrite water soil	 1, 250 mL P 1, 4 oz G	 48 hours 48 hours	 Cool 4°C Cool 4°C
Oil & Grease and TPH water soil	 1, 1 L G 1, 8 oz G	 28 days 28 days	Cool 4°C (1:1 Conc HCl:to pH<2 for Aqueous)
Phenols	1, 1 L G	28 days	Cool 4°C; pH <2 H_2SO_4
Phosphorous	1, 125 mL P	28 days	Cool 4°C; pH <2 H_2SO_4
Residue total filterable nonfilt/settleable	1, 1 L G,P	7 days	Cool 4°C
Sulfate	1, 125 mL P	28 days	Cool 4°C
Coliform, Fecal & Total	1, 125 mL P	6 hours	Cool to 4°C

G = Clear Glass; AG= Amber Glass; P = Plastic; T = Teflon Lined Lid/SEPTA

ANALYTICAL PROCEDURES

4.1 Statement of Procedures

All analyses performed at Waste Stream Technology Inc. are approved methods taken from the following sources: (A complete listing of reference methods is found in Table 4-5).

EPA-600/4-79-020, "Method for Chemical Analyses of Water and Wastes", Revised March 1983.

Federal Register, EPA 40 CFR Part 136, "Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act", Revised July, 1991.

Federal Register, EPA 40 CFR Part 268, Appendix I, Revised June 1990.

EPA SW-846, "Test Methods for Evaluating Solid Wastes", 3rd Edition, through Update III, December, 1996.

Handbook of Analytical Procedures, RMO-3008, J.N. Latimer, et. al., USAEC Grand Junction Office, Analytical Laboratory, February, 1970.

Standard Methods for the Examination of Water and Wastewater, 20th edition.

Eastern Environmental Radiation Facility, Radiation Procedures Manual, EPA 520/5-84-006, June, 1984.

4.2 Quality Assurance Objectives

The objective of the Quality Assurance and Quality Control plan at the WST laboratory is to generate analytical data of known, documented quality that is in compliance with established regulatory guidelines and protocols. This is accomplished through a system of statistical measurement and documentation of accuracy, precision, and comparability of each analytical assay performed. These three parameters are established through a Quality Control (QC) program, a system of operations undertaken in the laboratory to ensure that the data produced is generated within known probability limits of accuracy and precision, and a Quality Assurance (QA) program, a system whereby the laboratory can assure clients, government agencies, and accrediting bodies, that the laboratory is generating data of proven and known quality. The latter system is accomplished through the QC program, by the analysis of external quality control and proficiency test samples, through the use of accepted analytical testing procedures and through external laboratory audits.

deviation of the twenty RPD's will be used to develop a precision control chart for each analyte. Subsequent duplicate analyses will then be assessed for acceptability based on these precision control chart parameters. (Figure 4-2; Precision Control Chart).

It should be noted that accuracy and precision are determined using the entire analytical procedure including extraction of the analytes from the sample matrix. Many methods use the same mode of analysis but have multiple extraction procedures depending on the matrix and/or the concentration of the analytes expected to be found in the matrix. In these cases, accuracy and precision must be established for each type of extraction procedure.

4.2.3 Comparability

Analytical results of the tests on a given compound must be comparable to test results performed by a different laboratory on like compounds. To obtain this goal, precision and accuracy of each analytical procedure must be compared to and fall within the acceptable limits prescribed by the EPA in their methodologies and protocols.

Comparability is also accomplished through that analysis of external QC samples and proficiency test samples, since the results from the analyses of these samples are assessed through inter-laboratory comparison.

4.2.4 Completeness

Completeness is a measure of the amount of data obtained from an analytical system compared to the total amount expected to be obtained under normal conditions. A ninety-five percent completeness figure is usually required for a particular analysis and overall project objective.

4.2.5 Reagents, Solvents, Water Glassware, and Gases

All reagents used within the laboratory for sample and standard preparation meet the American Chemical Society (analytical reagent grade) standards or better, if the procedure requires a higher grade of purity. Solvents used for sample extraction and standard preparation are of gas chromatographic quality. All chemicals, when received by the laboratory, will be labeled with the date of receipt, the date the container was opened and the initials of who opened it. A chemical logbook is maintained which lists the reagent, source, lot number, and date in service.

Reagents, when prepared, will be labeled as to the date of preparation and expiration, the composition and concentration of the reagent, the reagent ID number and the initials of the preparer. This information will also be recorded in a reagent preparation notebook. In addition to analyzing reagent and method blanks to check for reagent and solvent contamination, reagents and solvents are continuously observed for signs of degradation such as change of color, precipitation, or mold formation.

All water used in the laboratory for preparation of reagents and rinsing of glassware is ASTM Type II water. This is produced by passing tap water through two mixed bed deionization tanks and then passing the deionized water upward through a high capacity activated carbon filter. In addition, 18 megaohm water is produced through a Milli-Q high purity water system. The conductivity of this system is measured and recorded daily.

Disposable glassware will be used whenever possible within an analytical procedure to reduce the possibility of sample cross-contamination. When non-disposable glassware is used, it will be thoroughly cleaned and baked using a cleaning protocol established by WST (refer to WST Standard Operating Procedure M-CLEAN-01-XX).

Gases which are used in sample concentration and gas chromatography analyses are of high and ultrahigh purity and they are further purified by the use of in-line gas filtration units.

4.3 Quality Assurance and Quality Control

4.3.1 Standard Preparation

Every assay will require, at a minimum, a calibration standard or a quality control check standard. Other analyses will require initial calibration, continuing calibration and reference sample standards, and still others will also require matrix spike, surrogate and internal standards.

A calibration standard is made by the appropriate dilution of a pure substance, the purity of which is traceable to a primary standard. Because of the high sensitivity of many analytical instruments, the calibration standard is an extremely dilute version of the pure compound. Because of the high dilution required, in order to be within the linear range of the instrument, the preparation of the calibration standard is frequently made by serial dilution rather than in a single step. In order to provide standard solutions at sufficiently low concentrations, a minuscule amount of the pure substance will be required, the measurement of which is subject to extreme error. Thus, it is preferable to deal with dilution errors, rather than with the large error associated with the measurement of a small amount of pure substance.

The initial pure standard is usually obtained as either a pure material or already in solution prepared as a certified solution of a given concentration of the pure compound or compounds. In preparing stock solutions and working solutions of the calibration standard, great care must be exercised in measuring weights and volumes as accurately as possible, since all analyses following the calibration will be based on the accuracy of the calibration, and the accuracy of any subsequent data ultimately cannot be any better than that of the calibration curve.

Each standard also has a definite lifetime in which it can be used. Standard holding times are listed in Table 4-1 and it is the responsibility of the analyst to assure that all standards used are within the standard solution holding time. It should be noted, however, that the holding times for stock standard solutions should only be used as a guide and that in preparing or using working standard solutions, the analyst must compare each standard run with the previous standard runs to assure that response factors fall within the historically accepted range.

For each standard solution that is prepared, accurate records will be kept in the standard preparation log for the analysis in which the standard will be used. The following information will be entered in the log, and on the Standard storage container, at the time of stock standard preparation:

1. Date of preparation
2. Date of expiration (See holding time guide)
3. For each compound or solution of compounds, the supplier and the lot number of the primary standard, the ID number of the primary standard and the amount taken in the case of pre-prepared standard solutions
4. The solvent identification (compound, supplier, lot number)
5. Final volume of the stock standard
6. Identification number assigned to the newly prepared stock standard
7. Name of the analyst preparing the standard.

When preparing Secondary Stock solutions (i.e., calibration, continuing calibration, matrix spike, and surrogate standards) it will be the analyst's responsibility to make sure the Primary Stock solution is still viable. The preparation of these standards will also be documented in the Standard Preparation Log. The following information will be recorded:

1. Date of preparation
2. Date of expiration
3. Standard identification number of the primary or secondary stock standard used to prepare the working standard
4. Final volume of the diluted standard
5. Volume, lot# and manufacturer of solvent used to prepare the diluted standard
6. Final concentration of each compound in the diluted standard
7. Identification number assigned to the newly prepared diluted standard
8. Name of the analyst preparing the standard.

All standards and standard solutions will be maintained in appropriate containers as stated in the method SOP.

Storage of standards and standard solutions will typically be kept in the refrigerator at 4°C, or freezer at -10°C, however specific storage details will be listed in the SOP for the analysis in which the standard is to be used (e.g. standards for metal analysis, including radioisotopes, are stored at room temperature). Standards and standard solutions will also be stored in an area not used for storage of samples and sample extracts to prevent any possibility of cross-contamination.

4.3.2 Determination of Detection and Quantitation Limits

Most of the assays employed by WST require knowledge of detection limits in order to be able to bracket analytical results that are obtained. Several such limits exist, and since these limits can be defined in various ways, the definition and determination which we will use is given below.

4.3.2.1 Instrument Detection Limit

In simple terms, the instrument detection limit (IDL) is the smallest quantity of material the instrument can reliably detect. The manner in which the IDL is determined is instrument dependent. For GC and GC/MS analyses, the IDL is determined by the analysis of seven replicate standards at a concentration of 3 times to 5 times a concentration that yields a definitive, measurable signal. The IDL is calculated by multiplying by 3, the standard deviation obtained from the seven replicate measurements.

For ICP analysis, the IDL is the concentration equivalent to the analyte signal which is equal to 3 times the standard deviation of a series of ten replicate measurements of the calibration blank signal at the same wavelength.

For radiochemical parameters, detection limits will be determined according to EPA Method 600/4-80-032 (NIPDWR). Detection limits may also be conducted according to the Nuclear Regulatory Commission (NRC) Method 4.14 or American National Standard Institute (ANSI) 13.30.

The calculation for standard deviation is shown below:

$$SD = \text{Square Root} \quad \frac{\Sigma \, [\, x\ (i) - X\ (m) \,]^2}{(n-1)}$$

where, x (i) = The value of the i'th reading of the set of replicate measurements

X (m) = The mean value of the replicates

n = The number of replicate measurements

The mean, X (m), is determined as follows:

$$X\ (m) = \frac{\Sigma \, x\ (i)}{n}$$

In order for the results to be useful, the standard chosen to obtain the detection limit should be such that the mean of its reading, X (m), is slightly greater than 3SD. This may require some trial and error initially when an IDL is determined for the first time on an instrument.

The IDL will be determined on an annual basis, and whenever the instrument has undergone extensive maintenance. Records of performing the IDL will be maintained in the analysis notebook, and values of the IDL will be updated each time that the IDL is determined.

4.3.2.2 Method Detection Limit

The method detection limit is obtained in a manner very similar to that of the IDL. The principle difference is that in determining the method detection limit (MDL), the analyte(s) is subjected to the entire analytical protocol for the specific method that is being employed. This includes every step, from extraction to final analysis.

To determine the MDL, seven replicates of the appropriate volume of extraction solvent or Type II water are spiked with a known amount of the analyte(s). The amount that is being added is the same for all seven replicates, and should be at least two to three times greater than the previously determined IDL. The seven replicates are subject to the same extraction and analytical procedures as a sample would be, and the concentrations of the analytes of interest are measured. The MDL is defined as the standard deviation of seven readings multiplied by the student t-test at a 99%, single-sided confidence interval (t99) using n-1 degrees of freedom (df). The calculation of the MDL should be done in units of weight of the analyte. In this fashion, such variables as injection volume in chromatographic techniques or pathlength in spectrophotometric techniques are eliminated.

The equation that applies to the calculation of the MDL is:

$$MDL = SD\,(t99[1\text{-sided}];df=6);\ \text{or}\ SD \times 3.143$$

where;

MDL = Method detection limit, in units of weight (i.e.,ng,μg) for those methods dependent upon absolute quantity, and in concentration units for those dependent on concentration (refer to 40 CFR, Part 136, Appendix B)

SD = The standard deviation of the seven readings from the mean, in units of weight or concentration

The MDL determination will be considered acceptable as long as it falls within the range calculated as follows:

$$MDL = [S]\ \text{to}\ [S]/5,\ \text{or}\ MDL = 0.2[S]\ \text{to}\ [S]$$

where,

[S] = average found for the replicate measurements.

The method detection limit will be determined for all analytes associated with the method on at least an annual basis.

It will be determined immediately after when the instrument undergoes a major repair or modification and if the IDL shows a significant departure from the previously determined IDL. If the IDL has remained substantially unchanged after the repair or modification, there is no need to run the MDL again.

The method detection limits must also be determined whenever the sample preparation or extraction method is modified.

4.3.2.3 Quantitation Limits

The quantitation limit is determined at the same time as the MDL and from the same runs. The quantitation limit (QL) is defined as five times the MDL. Thus,

$$QL = 5 \times MDL$$

4.3.2.4 Conversion of Detection Limits to Minimum Detectable Concentration

The conversion of the detection limit to minimum detectable concentration is calculated as follows:

$$DLS = \frac{DL}{v(i)} \times \frac{v(j)}{S}$$

where;

DLS = Detection limit in sample units of weight per unit weight or per unit volume

DL = Either MDL or QL as defined in the preceding sections

v(i) = Volume of prepared sample taken for analysis (such as the volume of extract injected into a GC), in ml

v(j) = Volume of the prepared extract (such as the final volume of extract), in ml

S = The sample size that was taken to produce sample volume v (j). Sample size is normally measured in liters in aqueous samples and in grams, dry weight, for solid samples.

4.3.2.5 Documentation of Detection Limits

Whenever IDLs, MDLs, and QLs are determined, the results will be maintained by the analyst based on the method used for determining the analytes of interest. The results must include the date of determination, the type of detection limit, the value for each analyte in terms of weight or concentration units, and the initials of the analyst who performed the determination.

A copy of all detection limit determinations will also be submitted to the QA/QC Department for review and approval.

4.3.3 Instrument Calibration

Instrument and equipment calibration must be rigorously and routinely performed in order to provide reasonable assurances that the data generated is valid and acceptable.

Two principle types of calibration are performed. The first is initial calibration, which determines the linear range of the instrument and its response factor. The second is verification or continuing calibration, which serves, during the course of running samples, to ascertain that the instrument calibration has not drifted unacceptably. The frequencies of performing the different types of calibration are listed in Table 4-2. In addition, laboratory control samples, or reference samples, are run on a routine basis for additional verification as indicated in Table 4-5.

4.3.3.1 Initial Calibration

All instrumental methods of analysis are subjected to an initial calibration, consisting of the measurement of 3 to 5 different standard solutions of the analytes of interest. The standard solution of the lowest concentration should have a concentration of the analytes of interest at or near the concentration that corresponds to the MDL or QL; and the standard solution of the highest concentration should have a concentration of the analytes of interest at or near the upper end of the linear range of the detector.

In performing the analyses of standards to determine the response factor and linear range, the standard solutions are prepared as mentioned in Section 4.3.1, and the surrogates and internal standards are added to it when appropriate. This information must be documented in the analysis records and placed in the method file for future reference. Listed should be working standard ID numbers used for calibration, the date the calibration was performed, and the name of the analyst performing the calibration.

When the standard analyses are completed, the calibration curve of each analyte is generated either one of two ways. For GC/MS analyses, the response factor (RF) for each calibration level is determined as follows;

$$RF = (A_x C_{is}) / (A_{is} C_x)$$

where:
A_x = area of compound being measured
A_{is} = area of specific internal standard
C_x = concentration of compound being measured
C_{is} = concentration of specific internal standard

The average response factor (RF_{avg}) and the standard deviation of the response factors is then calculated and the percent relative standard deviation (%RSD) is determined by:

$$\%RSD = \frac{SD}{RF_{avg}} \times 100$$

If the %RSD falls within the criteria specified in the method, then the curve is considered linear and the average response factor can be used to quantitate results.

All other instrument calibration curves are generated using a straight line linear regression equation in the form: $y = mx + b$ (or $y = ax$, and the line is forced through zero), where y = the measured response (area units, absorbance etc.); x = the known concentration of analyte; m = the slope of the curve, and b = the y intercept.

In addition to determining the values of m and b, the correlation coefficient is determined as a measure of how closely the five points are to a straight line. The correlation coefficient is determined by the equation:

$$r = \frac{n \Sigma (x\ y) - \Sigma (x)\ \Sigma (y)}{\text{Sq. Root } [n \Sigma x^2 - (\Sigma x)^2]\ [n \Sigma y^2 - (\Sigma y^2)]}$$

where, r = Correlation coefficient, x = The known amount of analyte, y = The measured response, and n = The number of standards run to obtain the calibration curve.

In order for the curve to be valid, r must be 0.995 or higher, and the absolute ratio b/m should be no greater than the method detection limit. If r is <0.995 it usually implies that either the lowest or highest concentration of standard is outside the linear range. To correct this, the analyst should rerun the highest standard and also another high standard which is a slightly lower concentration than the initially used high standard. Then r can be calculated again using the response from the lower of the two standards. Similarly, the effect of slightly increasing the concentration of the lowest standard should be examined.

If the ratio b/m criterion is not met, the problem may be with contamination in the system or change in noise level of the instrument. To correct for this, the instrument detection limit should be checked first. If it has in fact changed, the ratio should be compared to the newly determined noise level, in order to see if the criterion is met.

Certifiable standards are used in the preparation of solutions for calibration as much as possible. However, it is always possible that the manufacturer made a mistake. To circumvent this possibility of error due to a mistake in the manufactured primary standard, a QC check standard will be analyzed whenever an initial calibration curve is constructed. The QC check standard will consist of a solution of analytes of interest, and at a known concentration, but obtained and prepared by a different source than the calibration standards. When the analyte concentrations in the check standard are calculated, they should meet the continuing calibration criteria set forth by the method (e.g. GC within 15%, GC/MS within 20%, and ICP within 10% of the known concentration). If the criteria is not met, a determination of the source of inaccuracy will be performed.

After the calibration curve has been validated, a dated and initialized hard copy of the calibration table listing five response factors, the average response factor, the SD, and the %RSD for each analyte is placed in the method file for future reference. If the curve was generated using linear regression then a hard copy of the curve listing the x values used, the corresponding y values generated, the slope and intercept of the curve and the correlation coefficient for each analyte will be placed in the analysis file for future reference.

4.3.3.2 Continuing Calibration

Continuing calibrations serve to ensure that the instrument, during the course of running samples, is remaining sufficiently stable so the response factor calculated in the initial calibration remains valid.

In performing a continuing calibration, a midrange standard containing the analytes of interest, and internal and surrogate compounds, if applicable, is analyzed. For GC/MS analysis, the response factor for each analyte is determined from the continuing calibration analysis (Some methods specify that the RFs be determined for specific continuing calibration check compounds). The percent difference (%D) of the continuing calibration response factor from the average response factor of the calibration curve is then calculated by:

$$\%D = \frac{(RF_{avg} - RF_{ccc}) \times 100}{RF_{avg}}$$

If the percent differences from the continuing calibration analysis are within the acceptable criteria, as specified in the method, the instrument is considered to be within calibration, and analysis may continue using the curve. If the response factor is determined to be outside the acceptance range, the instrument must be recalibrated by using the initial calibration process. Samples that have been analyzed since the last acceptable calibration will also need to be reanalyzed after the instrument has been recalibrated. Generally, the acceptable criteria for GC/MS is between 20% to 30%.

For linear regression curves, the concentration of each analyte in the midrange standard analysis, which has been calculated from the current calibration curve, is compared with the expected value of each analyte in the standard and a percent true value (%TV) is determined by dividing the value found by the expected value times 100%. The %TV must be within the method criteria for the calibration curve to still be considered acceptable (e.g. GC 85-115%; ICP 90-110%).

Each time a continuing calibration analysis is performed, it must be documented and placed in the method files to track the validity of the calibration curve over time. Recorded will be the analytes, the average response factor, the response factor from the continuing calibration analysis, and the percent difference of the response. For the liner regression curves, the analytes, the concentration found, the expected concentration and the %TV will be recorded. Frequencies for continuing calibration can be found in Table 4-2.

In performing continuing daily calibrations for ICP, the high level standard is analyzed immediately after the initial calibration is performed and the results of the analyses must be within 5% of the true value. Also, a midrange continuing calibration verification standard will be analyzed after every ten samples analyzed and at the end of the analysis sequence. The results must be within 20% of true value for SW-846, and within 10% of true value for 200 series methods, or else re-calibration must be performed.

4.3.4 Analysis of Quality Control Samples

Routine quality control samples are analyzed to assure that the operation is within control as established for the laboratory on the basis of historical data. The routine quality control consists of blanks, spiked blanks or reference samples, spiked samples, duplicate samples, and in some cases, external check samples analyses. These are discussed in the following sections.

4.3.4.1 Blanks

There are two types of blanks associated with internal quality control. They are the solvent blank and method blank.

4.3.4.1.1 Solvent Blank

The solvent blank is the reagent(s) and/or solvent(s) that are normally used for sample preparation, but without going through any of the preparation steps. The solvent blank is normally not analyzed, unless the method blank (See section 4.3.4.1.2 below) shows the presence of contamination which may have arisen from the reagent and/or solvent.

4.3.4.1.2 Method Blank

The method blank is a known amount of the reagent or solvent which is carried through the all of the preparatory steps of a method prior to its analysis, adding internal and surrogate standards if appropriate for the method. The method blank is prepared with every batch of samples that is being prepared at the same time, provided the batch is no greater than twenty samples. For batches which are greater than twenty samples, a method blank will be prepared for every sub-batch of twenty samples.

The instrument background count for radiological analyses, a count of a planchet or vial containing no sample, is another form of laboratory blank. The instrument blank confirms that the counting instrument is contamination-free. The instrument blank may be used as a background correction factor subtracted from the sample count in the calculation of radiological concentration. For most analyses, an instrument background count is collected for each day that radiological samples are counted. They are run at a frequency of 10% for radiochemical parameters, corresponding to analytic batches of 10 or less samples.

In addition, a method blank is prepared whenever the lot number of any reagent is changed. The preparation log will then indicate which samples are associated with the new lot number of reagent(s). The method blank is analyzed and the data is reviewed prior to the analysis of samples. **The following criteria shall be used to evaluate the acceptability of the method blank data if project DQOs do not specify otherwise: The concentration of all target analytes shall be below approximately two times MDL concentration for each target analyte, or less than 5 percent of the regulatory limit associated with that analyte, or less than 5 percent of the sample result for the same analyte, whichever is greater for the MB to be acceptable. When this criterion is exceeded, corrective action should be taken to find/reduce/eliminate the source of this contamination in the method blank. However, sample corrective action may be limited to qualification for blank contamination (i.e., B-flag). When the concentrations of any target analytes within the MB are above the MDL check sample for the majority of target analytes or above the MQL for target analytes known to be common laboratory contaminants, assess the effect this may have had on the samples. If an analyte is found only in the method blank, but not in any batch samples, no further corrective action may be necessary. Steps shall be taken to find/reduce/eliminate the source of this contamination in the method blank. The case narrative should also discuss the situation. If an analyte is found in the method blank and some, or all, of the other batch samples, additional corrective action is required to reanalyze the method blank, and any samples containing the same contaminant. If the contamination remains, the contaminated samples of the batch would be reprepared and reanalyzed with a new method blank and batch specific QC samples. Sporadic cases of contamination may be difficult to control, however, daily contamination would not be acceptable.**

4.3.4.2 Spiked Blank (Laboratory Control Sample, LCS)

The spiked blank, or reference sample or LCS, serves as a measure of accuracy of the analytical procedure independent of matrix effects. The spiked blank is prepared by adding known amounts of specific analytes to the appropriate volume of reagent grade water or extraction solvent and subjecting the spiked sample to the entire extraction procedure. For radiologic analyses, NIST traceable standards or equivalent will be used.

One spiked blank is prepared for every ten samples of the same matrix that are subjected to sample preparation at the same time. The spike contains all the analytes which are specified in the method of analysis to be performed.

Preparation of the spiking mixture is done in the same manner as the preparation of standard solutions for calibration except that it will be prepared from a source independent of that used for the calibration standard preparation. The preparation of the mix will be recorded in the Standard Preparation Logbook and assigned a standard ID number (per Section 4.3.1).

The spiked blank is then carried throughout the entire extraction and analytical procedure, and the concentrations of the spiked analytes determined. These results will be compared to pre-established acceptance criteria (See Section 4.2) to determine the degree of accuracy of the data in the laboratory. If the spiked blank does not meet the established criteria, it is assumed that the sample preparation or analysis have been faulty, and the batch of samples associated with the spiked blank will be re-prepared and/or re-analyzed after the reason for failure has been determined.

4.3.4.3 Spiked Sample

Spiked samples, or matrix spike samples, serve to identify whether the sample matrix provides certain effects which preclude the ability to recover analytes through the prescribed method.

Thus the spiked sample is used to determine the accuracy of a method based on the matrix being analyzed.

One sample per every twenty samples of the same matrix will be selected at random and two aliquots of this sample will be extracted and analyzed, one spiked with the appropriate spiking solution and one without. The recovery of the spiked analytes will then be determined. After the analysis of twenty spiked samples of each matrix and/or each extraction method has been performed, a control chart of each of the spiked compounds will be generated to express the upper and lower control limits of recovery. All subsequent analyses of spiked samples will then be compared to the control chart appropriate for the matrix and/or extraction method.

4.3.4.4 Duplicate Sample

One sample for every twenty samples of the same matrix will be selected at random, and two aliquots of this sample will be extracted and analyzed to track the precision of the analytical procedure. The results of the two analyses will be compared and the relative percent difference (RPD) between each analyte detected in the duplicate analyses will be calculated and compared to the previously established acceptance criteria (See Section 4.2.2), or per the duplicate error ratio (DER) for low-level radiological results (Science Applications International Corporation (SAIC). December 1992. Laboratory Data Validation Guidelines for Evaluating Radionuclide Analyses. U.S. Department of Energy. November 1990. Environmental Measurements Laboratory Procedures Manual, 27th ed. HASL-300).

4.3.4.5 Matrix Spike Duplicate Sample

In some instances, a matrix spike duplicate sample (e.g. for GC and GC/MS analyses) is analyzed as opposed to a duplicate sample (e.g. for metals and various wet chemistry analyses). Typically the matrix spike (MS) and matrix spike duplicate (MSD) are extracted and/or analyzed as a set, one set for every twenty samples of the same matrix. The recovery of the spiked analytes from both the MS and MSD are determined and used to assess the method accuracy as it relates to the specific matrix. Also, the

RPDs between the concentration found for each spiked analyte in the MS/MSD analyses will be calculated to assess the precision of the method based on the matrix being tested. Control charts will be generated after a minimum of 20 analyses to establish acceptable limits of recovery and RPDs for the MS and MSD analyses.

It should be noted that in some instances, as in GC/MS methods, where there are a large number of compounds being analyzed, it is not always practical to produce recoveries and RPDs for every analyte. In these cases, selected analytes, usually project or site-specific target compounds, will be spiked into the MS/MSD samples and the recoveries and RPDs of these analytes will be used to assess accuracy and precision.

4.3.4.6 Documentation of Quality Control Analyses

The analysis of quality control samples must be recorded and submitted with the sample data for review. The results are compared to the established acceptance criteria so as to document that the extraction and analysis scheme was in control when the site samples were analyzed. This is necessary for final approval and release of the analytic results of any site sample.

4.3.5 Establishment of Acceptance Criteria

The establishment of acceptance criteria is necessary in order to be able to determine regularly whether or not quantitative data generated by the laboratory is within control limits. The following section discusses the parameters for which acceptance criteria must be established.

4.3.5.1 Method Blanks

Method blanks are used to establish a known baseline level of contamination which may be contributed from four principal sources, namely:

1. The environment the analysis is performed in;
2. The reagents used in the analysis;
3. The apparatus used;
4. The analyst performing the analysis.

A method blank which results in any analyte concentration above the quantitation limit will be deemed unacceptable unless the concentration of the analyte found in the sample is less than the quantitation limit (<MDL; <5%RL; <5%[C]).

4.3.5.2 Recovery of Spiked Blank Samples

Spiked blank samples are used to establish the accuracy of the method as previously discussed in Section 4.2.1. Initially four replicate spiked blank samples are prepared. They are then extracted and analyzed following precisely the appropriate protocol, and the concentrations of the analytes are determined. From these values, the mean and standard deviation for the recovery of each analyte are determined. The deviation of the mean from the known spiked amount is a measure of accuracy of the method and is expressed as percent recovery of the analyte. The percent recovery is calculated as follows:

$$R = 100 \times \frac{C(m) - C(b)}{C(s)}$$

Where, R = Percent recovery of the analyte

C (m) = The measured concentration of the analyte

C (b) = The background concentration of the analyte in the sample (For spiked blank samples C (b) = 0)

C (s) = The actual concentration of analyte spiked into the sample

The mean and standard deviations of the recoveries of each analyte are then calculated and compared to the criteria found in the appropriate EPA method. Upon meeting EPA criteria, control charts for each analyte will be generated from the recoveries of twenty spiked blank sample analyses.

For gas chromatography methods, the appropriate internal and surrogate spike standards should be added to all spiked reagent blanks and samples. Again, acceptable recovery limits should be compared to the recoveries listed in the QA/QC section of the appropriate EPA method.

4.3.5.3 Duplicate Analyses

Non-spiked samples or matrix spike samples will be extracted in duplicate and the resultant concentrations for each analyte will be used to establish the precision of the method. Once again, precision is defined as a measure of the differences from the mean of repetitive measurements. Thus the standard deviation will be used as a measure of precision. More frequently, the relative percent difference will be used because at best, measurements are performed in duplicate. The relative percent difference is determined by the equation:

$$\%\ RPD = 100 \times \frac{x(1) - x(2)}{x(m)}$$

where, x (1) = High value for the analyte

x (2) = Low value for the analyte

$x(m)$ = Mean value for the analyte = $\frac{x(1) + x(2)}{2}$

The results of the determinations of relative percent differences will be plotted, in the form of a control chart, indicating the upper control limit of acceptance and the upper warning limit. The control charts will be kept in the method file for reference and future data will be considered acceptable if the relative percent differences of duplicates fall within the acceptance criteria.

4.3.5.4 Spiked Sample Analyses

Samples will be spiked with a known amount of the appropriate analytes. The resultant recoveries of each analyte will be used to establish the accuracy of the method based on the matrix being analyzed. From these values the mean and standard deviation for the recovery of each analyte added to the matrix will be determined. The recoveries will be calculated using the same equation used for spiked blank samples (Section 4.3.5.2). When the recoveries of twenty spiked samples of the same matrix have been determined, the mean and standard deviation will be calculated and a control chart will be generated for each spiked analyte. Future data will be considered acceptable if the recoveries of the spiked analytes fall within the acceptance criteria.

4.3.5.5 Use of Surrogates

Surrogates are compounds that are expected to behave analytically in a manner similar to target analytes, but are not naturally found in the environment. The surrogates are added into the sample prior to extraction and their recoveries are a measure of the efficiency of the extraction.

The use of surrogates in organic analysis serves as an additional measure of the acceptability of the results. The significant advantage of the use of surrogates is in measuring recovery against the historically established acceptance range in the performance of each analysis. Thus, data does not depend solely on the spiked blank sample to assess the quality of each analytical run.

The acceptable ranges of surrogate recoveries are established based on the recoveries of thirty sample analyses. The mean and standard deviations from these thirty surrogate recoveries are used to determine the upper and lower acceptable limits of surrogate recoveries as previously discussed (See Section 4.2.1). Surrogate recoveries also need to be established based on the type of matrix and the method of extraction. All subsequent surrogate recoveries will be considered acceptable if the recoveries fall within these established acceptance ranges (i.e. defined by method limits).

NOTE: Acceptance criteria must be established for each method of extraction and for each matrix type. Recoveries from soil are not expected to be within the acceptance limits as determined for water, and recoveries from sonication extraction may not show the same recovery as would a soxhlet extraction. Thus, acceptance criteria must be determined matrix by matrix and method by method.

4.3.5.6 Retention Times in Gas Chromatography Methods

While accuracy and precision form the backbone of quantitative data, qualitative identification in GC methods is more difficult to translate into quantitative measures. The principle criterion for chromatographic analysis is the retention time, or relative retention time. Relative retention time is used in those methods employing internal standards. It is a more reliable measure because it is less dependent on such physical parameters as the length of the column. In all cases, the relative retention time for each analyte will be based on the data obtained from the nearest standard.

To determine the acceptance window for retention times, the continuing calibration data will be employed. For each compound, the retention times obtained in performing the continuing calibrations over a 72 hour (minimum) period will be averaged and their standard deviations determined (See Figure 4-3). The acceptance window will consist of three standard deviations from the mean retention time for each compound. The retention time acceptance windows will be redetermined whenever the chromatographic column is changed or the chromatographic conditions are altered. It is the responsibility of the analyst to maintain the records for retention time criteria. These records are kept in the method file for future reference. In mass spectrometric analysis, in addition to retention time, the mass spectral match of the compound to the standard will be used to verify its identity.

4.3.6 Standard Operating Procedures

All standard laboratory and analytical procedures will be written as Standard Operating Procedures (SOP's). SOPs will be available in the laboratory for the analysts and will serve as a comprehensive source of reference. General laboratory procedures covered by SOP's will include:

1. External Chain of Custody procedures
2. Internal Chain of Custody procedures
3. Samples shipping/receipt procedures
4. Sample storage procedures
5. Sample destruction/waste disposal procedures

6. Cleaning procedures for sample containers and laboratory glassware
7. A laboratory health and safety plan
8. Balance calibration
9. Data review

Analytical SOP's should include:

1. Scope and Application
2. Method Summary
3. Method Validation
4. Safety Precautions
5. Interferences
6. Apparatus and Materials
7. Reagents and Standards
8. Sample Preservation and Storage
9. Holding Times
10. Operating Conditions and Calibration
11. Sample Preparation
12. Sample Analysis
13. QA/QC Requirements
14. Reporting Limits
15. Qualitative Identification Information
16. Recovery Limits
17. Data Deliverables
18. Preventative Maintenance
19. Method Flow Chart
20. References and Associated SOPs

4.4 QA/QC Schedules

As stated in Sections 4.3.3 and 4.3.4, most analyses will require calibration and the analysis of QC samples. Listed below are the QA/QC schedules of the various types of analyses performed in the WST laboratories. See Table 4-5.

4.4.1 Non-instrumental Wet Chemistry Analyses

Total Suspended Solids is an example of this type of analysis. The QA/QC required for these analyses are: a method blank and a duplicate analysis for every batch of twenty or fewer samples; and, if available, external QC sample analysis. For analyses which require an analytical balance, the balance will be checked daily for accuracy with two ASTM Type I weights near the weight range applicable to the method.

4.4.2 Instrumental Analyses

4.4.2.1 Non-GC Instrumental Analyses

Total petroleum hydrocarbon determination by infrared spectrophotometry is an example of this type of analysis. Requirements for this type of analysis are: initial calibration; daily continuing calibration; reference samples, one for every ten samples analyzed; method blank and duplicate analyses, one per batch of twenty samples or less; and when available, external QC samples. For metals analysis, some wet chemistry analyses, and radiochemical analyses, matrix spike and, in some instances MSD, will also be performed.

4.4.2.2 GC and GC/MS Analyses

GC and GC/MS analyses require the following: initial calibration; daily continuing calibration (GC: one per ten samples and at the end of each batch; GC/MS one every 12 hours); reference samples, one per ten samples; method blanks, one per batch of twenty or fewer samples; matrix spike and matrix spike duplicate samples, one for twenty samples of the same matrix; surrogates and internal standards (when applicable), added to each standard and sample analysis; and external QC samples. Matrix spikes and matrix spike duplicates may also be analyzed according to project specific requirements.

The QA/QC requirements for each analysis are detailed in the corresponding analytical SOP.

4.5 Instrumentation

Table 4-3 lists the instrumentation and equipment available at Waste Stream Technology's Analytical Laboratory.

4.6 Audits

WST employs four types of audits to measure performance, define problem areas, and ensure conformance and compliance with formalized certification programs.

4.6.1 External Audits

External audits are performed by certifying agencies or clients through the use of performance evaluation samples and/or on-site inspections. Potential clients are welcome to audit the WST laboratory and submit evaluation samples as necessary.

4.6.2 System Audits

System audits are primary responsibility of the QA/QC Officer. System audits evaluate the procedures and documentation in the laboratory. A system audit checks for conformity to the QA plan and the SOP criteria for an analysis. Items covered include, but are not limited to, sample custody procedures, calibration frequency and checking, quality control, data reduction and validation, method validation (startup QC), and record keeping and retention. The entire range of analyses performed by the laboratory is reviewed as least annually by the QA/QC Officer. Quarterly audits are conducted by the QA/QC Officer in the company of the Laboratory Director and Assistant Lab Director.

4.6.3 Report Audit

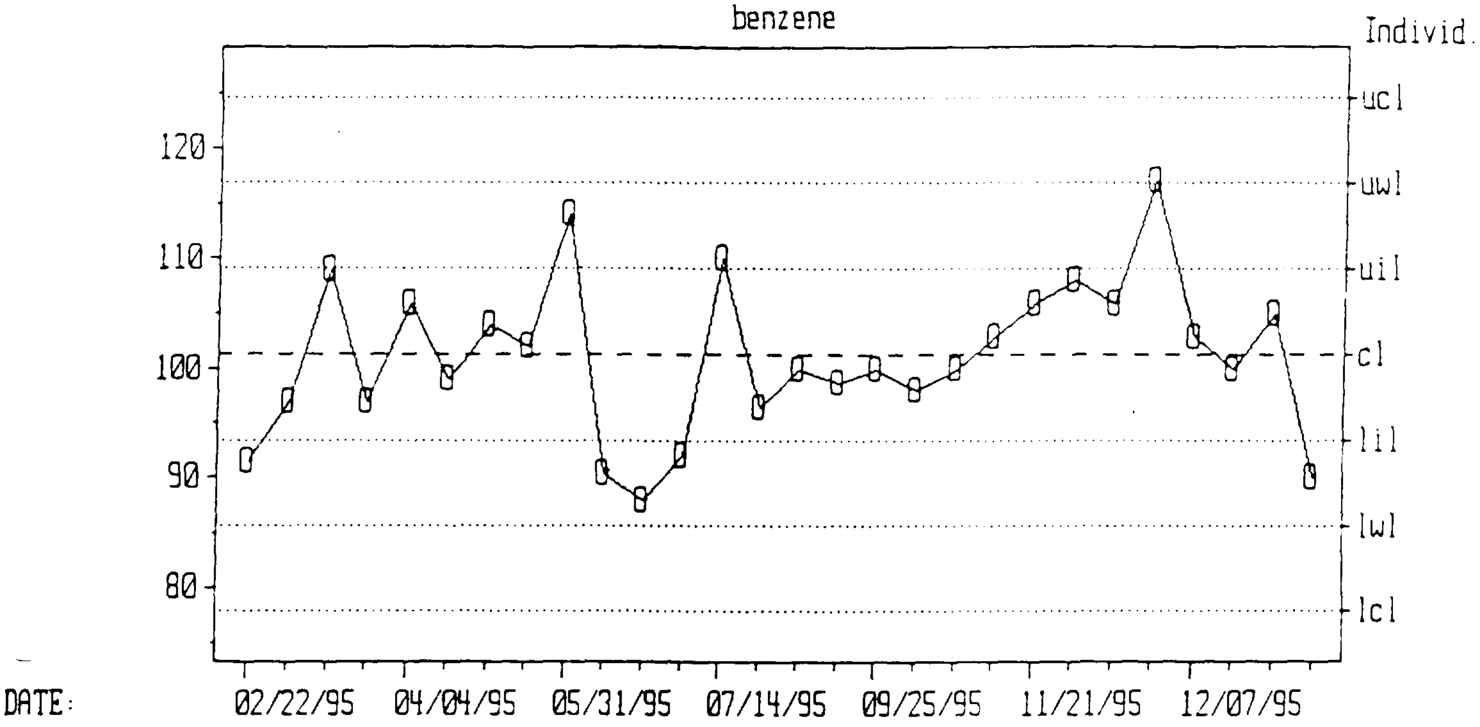
Report audits evaluate the correctness and appearance of the laboratory reports and are performed routinely by the QA/QC Officer. The report audit assures that the data reported is of consistent quality and content.

4.6.4 Blind Sample Audit

Blind sample audits are conducted by submitting samples of known concentrations through ordinary sample handling procedures and comparing the reported concentrations with the known values. Blind sample audits are carried out annually.

Figure 4-1

Method 8240 Water MS/MSD Recovery Charts
benzene



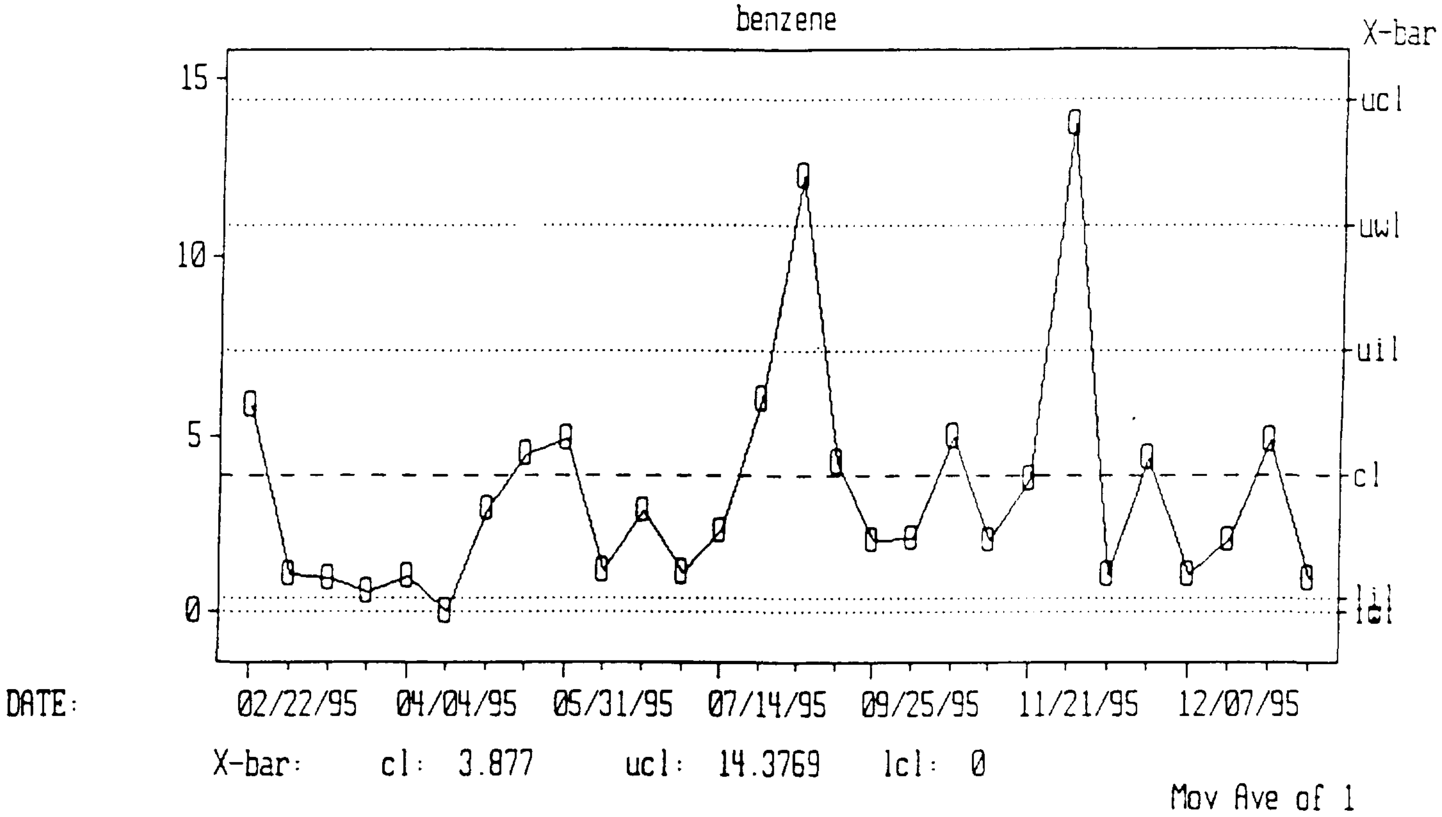
Individ.: cl: 101.28 ucl: 124.593 lcl: 77.9665

Subgrp Size 1

Figure 4-2

Method 8240 Water MS/MSD RPD Charts

benzene



Method 8021 Relative Retention Time Window Calculation Sheet

Compound	R.T.-1	RRT-1	R.T.-2	RRT-2	R.T.-3	RRT-3	Avg. RRT	SD RRT	3 X SD Window
fluorobenzene IS	14.645		14.645		14.655				
MTBE	7.724	6.921	7.731	6.914	7.746	6.909	6.915	0.00603	0.018
benzene	14.018	0.627	14.023	0.622	14.034	0.621	0.623	0.00321	0.010
a,a,a-TFT SS	16.003	1.358	16.006	1.361	16.015	1.360	1.360	0.00153	0.005
toluene	19.395	4.750	19.400	4.755	19.407	4.752	4.752	0.00252	0.008
ethylbenzene	23.500	8.855	23.505	8.860	23.511	8.856	8.857	0.00265	0.008
m,p-xylene	23.709	9.064	23.711	9.066	23.717	9.062	9.064	0.0020	0.006
o-xylene	24.841	10.196	24.845	10.200	24.850	10.195	10.197	0.00265	0.008
isopropylbenzene	25.795	11.150	25.798	11.153	25.804	11.149	11.151	0.00208	0.006
n-propylbenzene	26.836	12.191	26.840	12.195	26.845	12.190	12.192	0.00265	0.008
1,3,5-trimethylbenzene	27.248	12.603	27.252	12.607	27.256	12.601	12.604	0.00306	0.009
tert-butylbenzene	28.224	13.579	28.185	13.540	28.185	13.530	13.550	0.02589	0.078
1,2,4-trimethylbenzene	28.248	13.603	28.252	13.607	28.258	13.603	13.604	0.00231	0.007
sec-butylbenzene	28.717	14.072	28.721	14.076	28.726	14.071	14.073	0.00265	0.008
p-isopropyltoluene	29.071	14.426	29.075	14.430	29.080	14.425	14.427	0.00265	0.008
n-butylbenzene	30.119	15.474	30.124	15.479	30.128	15.473	15.475	0.00321	0.010
naphthalene	35.356	20.711	35.361	20.716	35.366	20.711	20.713	0.00289	0.009

Comments:
R.T.-1 from CCC analysis on 7/11/95
R.T.-2 from CCC analysis on 7/13/95
R.T.-3 from CCC analysis on 7/14/95

R.T. denotes Retention Time
R.R.T. denotes Relative Retention Time

Figure 4-3

Table 4-1
STANDARD and SOLUTION HOLDING TIMES

MATERIAL	HOLDING TIME 1°Stock Sol'n	HOLDING TIME 2°Stock Sol'n	HOLDING TIME Working Sol'n
Volatiles GC & GC/MS	1 month @-10°C[a]	1 week @-10°C	24 hr @-10°C
Semivolatiles GC & GC/MS	1 year @-10°C	6 months @4°C	1 week @4°C
TPH for IR	6 months @4°C	3 months @4°C	1 week @4°C
TPH for GC	6 months@-10°C	3 months @-10°C	1 week @-10°C
Metals for ICP & GFAA	1 year[b]	3 months[b]	2 weeks (ICP) Daily (GFAA)[c]
Radioisotopes	1 year	3 months	Daily

a Pre-prepared standard in an unopened ampule: expiration date on ampule @ -10°C. Opened ampules: 1 mo @ -10°C. For gases: 1 week after opening.

b 10% HNO_3 for ICP; 2% HNO_3 for GFAA.

c Working continuing calibration solution.

Table 4-2
Calibration Frequencies

Instrument	Application	Initial Cal.	Continuing
GC/MS	Volatiles	Once/Month	Every twelve hours
GC/MS	Semivolatiles	Once/Month[*]	Every twelve hours
GC	Volatiles	Once/Month[*]	At the beginning and at the end of a sequence of runs, and after every 20 samples.
GC	Extracts	Once/Month[*]	At the beginning and at the end of a sequence of runs, and after every 10 samples.
ICP	Metals	Daily	At the beginning and at the end, and after every 10 samples.
GFAA	Metals	Daily	
Mercury	Metals	Daily	
Alpha Spectrometry	Alpha Isotopes	Annually	Daily[***]
Eberline Survey Meters	Alpha/Beta Gamma Isotopes	Annually	Daily[***]
Gas Proportional Counter	Alpha/Beta Isotopes	Annually	Daily[****]
pH Meter	All pHs	Daily	Every ten tests at the end of a test sequence
Spectrophotometer	Various Wet Chemistry	Once/6 Month	Every run of samples
IR	TPH	Once/6 months	Every run of samples
Balances:			
Analytical	Weighing of samples & stds	Weekly[**]	Daily
Top-loader	Weighing of samples & stds	Monthly[**]	Daily

[*] After repair, column change, or failure on continuing calibration check and/or quality control check standard. As long as continuing calibration analyses and reference sample recoveries pass criteria, initial calibration will remain acceptable.

[**] Performed by WST; performed annually by manufacturer representative.

[***] Weekly Energy Calibration Check & Efficiency Check; Daily Pulser Check; Monthly Background.

[****] Self-Absorption Annually; Daily Source Check & Background.

Table 4-3.1
INSTRUMENT AND EQUIPMENT LIST

GC/MS:

Hewlett-Packard Model 5890 Series II GC with capillary split/splitless injector, Model 5972 Mass Selective Detector (MSD), HP Windows NT Chemstation for complete operation of GC/MS, Tekmar Model LSC 3000 Purge and Trap Concentrator, and Tekmar Model 2016 Purge and Trap Autosampler.

Hewlett-Packard Model 5890 Series II GC with packed column injector with jet separator, Model 5971A Mass Selective Detector (MSD), HP Windows 95 Chemstation, Tekmar Model LSC 2000 Purge and Trap Concentrator, Tekmar Model 2016 Purge and Trap Autosampler.

Hewlett-Packard Model 5890 Series II GC with capillary split/splitless injector, Model 5972 Mass Selective Detector (MSD) with direct capillary interface, HP Windows NT Chemstation, Model 7376A Autosampler.

Hewlett-Packard Model 5890 Series II GC with capillary split/splitless injector, Model 5972 Mass Selective Detector (MSD), HP Window NT Chemstation, Model 7376B Autosampler.

GC:

Perkin-Elmer Model Autosystem Gas Chromatograph with Autosampler, Capillary Columns, PID Detector, Dual split/splitless injector ports, Tekmar Model LCS 2000 Purge and Trap Concentrator, Tekmar Model LCS 2016 16 Place Autosampler.

Perkin-Elmer Model 8500 Dual Channel GC with single packed column injector with purge and trap interface, Perkin-Elmer Model 2600 PC Integrator, Tekmar Model LSC 2000 Purge and Trap Concentrator, Tekmar Model ALS 2016 16 Place Autosampler.

Hewlett-Packard Model 5890 Series II GC with Dual capillary split/splitless injectors, Model 7673B Autosampler, Dual ECD detectors, with PE Nelson Turbochrome Software.

Perkin-Elmer Model Autosystem Gas Chromatograph with Autosampler, Capillary Columns, Dual ECD Detectors, Dual split/splitless injector ports.

Perkin-Elmer Model Autosystem Gas Chromatograph with Autosampler, Capillary Columns, FID Detector, Dual split/splitless injector ports, Tekmar Model 2000 Purge and Trap Concentrator.

Table 4-3.2

IR:

Perkin-Elmer Model 1310 Dispersive Infrared Spectrophotometer with:

- scan range of 4000 to 600 cm - 1 wavenumbers
- fixed or variable wavelength

Metals Analysis:

Perkin-Elmer Model 4100ZL Atomic Absorption Spectrometer with Transversely Heated Graphite Atomizer (THGA)

Perkin-Elmer Optima 3300 XL Spectrometer with AS-90 Autosampler

Leeman AP200 Automated Mercury Preparation System

Leeman PS200 Automated Mercury Analyzer

Buck Scientific Atomic Absorption/Emission Spectrophotometer.

Buck Scientific Model-420 Hydride Continuous Flow Analyzer.

CEM Model MDS-2100 Microwave Sample Preparation System

Radiochemical Analysis:

Oxford S5XLB Series 5 Automatic Low Background Computer Assisted Alpha/Beta Counting System.

Canberra 7200-12 Chamber System Alpha Analyst.

Eberline Smart Alpha/Beta Survey Meter: SHP380AB Smart Alpha/Beta Probe, CA-100-60 Smart Probe Cable, E600 Smart Portable, E600OPT & Windows Program for E-600.

Eberline Micro R Survey Meter: ASP-2/SPA-8 with NaI scintillator. Range: 0-10,000 uR/h.

EG&G ORTEC GEM Series High Purity Germanium (Photopeak Efficiency >45%) Coaxial Detector; DSPec DSP-Based Gamma-Ray Spectrometer with GammaVision-32 Gamma-Ray Analysis Software.

Eberline Ion Chamber Survey Meter: RO-20.
Range: 0-5 mR/h, 0-50 mR/h, 0-500 mR/h; 0-5R/h, 0-50 R/h.

Table 4-3.3

Spectrophotometers:

Beckman Model 25 UV/Vis Spectrophotometer and Chart Recorder
Milton Roy Spectronic 20-D
Milton Roy Spectronic 20-D Plus

TCLP Equipment:
Associated Design and Manufacturing Model 3740-6-BRE Six Place Rotary Agitator
(2) 24 Place Rotary Agitators
(1) 18 Place Rotary Agitator

Extractors/Concentrators:

Soxhlet Extraction Apparatus including:
- Neslab Model CFT-75 Refrigerated Recirculator
- Precision 6 unit Heater
- Electromantle Model EM 250/C Heating Mantle (12 units; 6 for soxhlet extractors and 6 for distillation)
- Soxhlet Extractors and Condensers (13 sets)

Tecator Soxtec System HT Model 1046 Service Unit with:
- (2) Tecator Soxtec System HT2 Model 1045 Extraction Units

Heat Systems Model W-385 & Model XL2020 Ultrasonic Processors

Millipore Zero Headspace Extractors

Zymark Model ZW 640-3 TurboVap Automated Nitrogen Evaporator/Concentrator

Kuderna-Danish concentration glassware

Gel Permeation Chromatography Equipment:
Zymark BenchMate Workstation, Scientific Systems Model 300 LC Pump, Jordi Associates Stainless Steel Column, Foxy 200 Fraction Collector, Isco UA-6 UV/Vis Detector.

Anion Analyzer (300 series):

Dionex DX-120 Ion Chromatograph with Windows 95 Peaknet vs.5.0 software.

Flashpoint Tester:
Pensky-Martins Closed Cup Flashpoint Tester.

Balances:
Mettler Model H33 Analytical Balance, 160g capacity at 0.0001g readability.

Mettler Model PN323 Top Loading Balance, 320g capacity at 0.001g readability.

Table 4-3.4

Fisher Model XD4000 Top Loading Balance, 400g/100g capacity at 0.01g/0.001g readability (3)

Fisher Model XD800 Top Loading Balance, 800g capacity at 0.01 readability (2)

Centrifuges:

Sharples ARE 15MV Super Centrifuge, Vaportite Design

Jouan Model CR4-11 Bench Top Refrigerated Centrifuge

Sorvall RC2-B Super Speed Centrifuge, Refrigerated Floor Model

Fisher Microcentrifuge

pH Meters:

Markson Model 93 Portable pH meter, 0.0 to 12.0 range at 0.01 readability

Soiltest Model 425-500 pH meter, 0.0 to 14.0 range at 0.01 readability

Cole Parmer Model L-01489-30 Conductivity Meter

Ovens/Incubators:

Fisher Model 349 Isotemp Oven

Fisher Model 630F Isotemp Oven

Fisher Model 655F Isotemp Oven

AC-Lab 15 cu.ft. Incubator

Water Purification Equipment:

Deionized Pre-treatment System fed into a D8904 High Capacity Activated Carbon Filter or into a Milli-Q Water Purification System

Laboratory Information Management System (LIMS):

LABWORKS Laboratory Information Management System (LIMS), Analytical Automation Specialists; Novell Network with 25 work stations.

Table 4-3.5

Freezers, Freeze-Driers & Refrigerators:

- So-Low Environmental Chest Freezer (to-150°C)
- Labconco Freeze Dry-5 Lyophilizer
- 18 cu.ft. Refrigerator Freezers (5)
- Fisher Isotemp Refrigerator Circulator
- Scienceware Frigimat Dry Ice Maker
- 14 cu.ft. Freezers (3)
- 216 cu. ft. Walk-in Coldrooms (2)

Laminar Flow Hoods:

- Flow Laboratories Gel Aire AIRONE Hoods (3)
- Laminar Flow Hoods (9)

Autoclave - All American Electric Pressure Steam Sterilizer

Table 4-4

ANALYTICAL METHODS

The procedures employed by WST for the analysis of samples are taken from a variety of references. These analytical methods are condensed in the SOP's used in the laboratory. Specific method reference materials are also included.

Analytical procedures employed are based on the following:

1. Methods for Chemical Analysis of Water and Wastes. EPA 600/4-79-020, March 1979, Revised 1983, U.S. Environmental Monitoring and Support Laboratory, Cincinnati, Ohio 45268.
2. Federal Register, 40 CFR Part 136: Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act. Revised July 1991.
3. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. Third Edition, Revised December, 1996 United States EPA SW-846.
4. Superfund Contract Laboratory Program. U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory, Las Vegas, Nevada. SOW for Inorganic and Organic Analysis #ILM03.0 and #OLM03.0.
5. Annual Book of ASTM Standards, Volume II. ASTM, 1916 Race Street, Philadelphia, Pennsylvania 19103.
6. Standard Methods for the Examination of Water and Wastewater. (20th Edition). American Public Health Association, 1105 18th Street, NW, Washington, D.C. 20036.
7. Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater. EPA 600/4-82-057, July 1982, U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory, Cincinnati, Ohio 45268.
8. Verification of PCB Spill Cleanup by Sampling and Analysis. EPA 560/5-85-026, August, 1985, U.S. Environmental Protection Agency, Office of Toxic Substances, Washington, D.C.
9. Handbook of Analytical Procedures, RMO-3008, J.N. Latimer, et. al., USAEC Grand Junction Office, Analytical Laboratory, February, 1970.
10. Eastern Environmental Radiation Facility, Radiation Procedures Manual, EPA 520/5-84-006, June, 1984.

Table 4-5
Schedule of Analysis for Quality Control Samples

Analysis	**Method**	**Method Blanks**	**Dupli- cate**	**Matrix Spike**	**Surro- gates**	**Ref. (LCS)**
GC-Purge	601-602	**PB/5%**	5%*	10%	100%	Daily
GCMS-Purge	624	**PB/5%**	5%*	5%	100%	Daily
GC-Pest/PCB	608	**PB/5%**	5%*	5%	100%	10%**
Semivols.	625	**PB/5%**	5%*	5%	100%	10%**
Oil&Grease	1664	**PB/5%**	5%*	5%	N/A	10%
Pet. Hydro	418.1	**PB/5%**	5%	5%	N/A	10%
GC-Purge	8021	**PB/5%**	PB/5%*	PB/5%	100%	PB/10%
GCMS-Purge	8260	**PB/5%**	PB/5%*	PB/5%	100%	PB/10%
GC-Pest GC-PCBs	8081 8082	**PB/5%**	PB/5%*	PB/5%	100%	PB/10%
GCMS-Semivols	8270	**PB/5%**	PB/5%*	PB/5%	100%	PB/10%
Pet.Hydro.	3550 418.1 SM503 8015	**PB/5%**	PB/5%	PB/5%	N/A; 100%#	PB5%
Radium 226/228	Ra-05 SM 7500	**PB/5%**	PB/5%	PB/5%	N/A	PB/5%
Isotopic Thorium	RMO-3008	**PB/5%**	PB/5%	PB/5%	N/A	PB/5%
Total Uranium	SM 7500-U B.	**PB/5%**	PB/5%	PB/5%	N/A	PB/5%
Gross Alpha/Beta	900,9310 SM 7110	**PB/5%**	PB/5%	PB/5%	N/A	PB/5%
Metals	200 Series	**PB/5%**	PB/5%*	PB/5%	NA	PB/10%
Metals	6000 7000	**PB/5%**	PB/5%*	PB5%	NA	PB/10%

PB/5% - one QC sample per analytical batch or 5%, whichever is greater
PB/10% - one QC sample per analytical batch or 10%, whichever is greater
* Duplicate matrix spikes may replace duplicate samples
**Reference Samples (Laboratory Control Samples) will also be analyzed after every matrix spike outside control limits.
8015 (modified)
N/A - Not Applicable

DATA HANDLING

Since the objective of Waste Stream Technology's Analytical Laboratory is the production of data of known, documented quality, it is of the utmost importance that all the data regarding each sample is recorded and reduced in an accurate and precise manner. The greatest responsibilities to the production of this data are with the individual extraction technicians and analysts. They are, after all, the producers of the data. This section will address the procedures of handling the data. This section will also deal with the procedures used by the extraction technicians and the analysts for record keeping and ultimately, the traceability of the data within the laboratory. This section will then be followed by a brief discussion of data reduction, validation, review, and final reporting.

5.1 Record Keeping in the Laboratory

As mentioned in Section 3.4, Sample Custody in the Laboratory, the samples are logged into the Labworks LIMS database which is then used to track the progress of the samples throughout the analytical process. The traceability of a sample or group of samples which require extraction prior to analysis begins with the sample preparation logbook.

5.1.1 Sample Preparation Logbooks

The sample preparation logbooks are hard covered and bound notebooks with pre-numbered pages. The following information must be recorded into these logbooks:

1. The date of extraction and the initials of the technician performing the extraction.
2. The identification numbers of the surrogate, internal and reference sample standards used in the extraction.
3. The method of extraction used and the subsequent method of analysis to be performed.
4. The QA/QC Batch Number. This alphanumeric number is used to track all the samples associated with the corresponding method blank, spiked blank, duplicate sample, and matrix spike samples which were extracted with this group of samples. The number consists of the method number of the analysis to be performed on the sample extract followed by: the date of extraction, in the form ddmmyr (year written as 4 digits); the initials of the extraction technician; the method number of extraction used; and then a -1, -2, -3, etcetera for the first, second, or third batch of samples extracted for that method of

analysis on the same day. PCB and pesticide analyses will use the Julian Calendar date for identifying the QA/QC batch. This number is extremely important since it will be use to identify the QA/QC sample associated with the site samples extracted within the same sample batch.

5. The WST sample ID number of each sample extracted and the weight or volume of sample extracted.
6. The final volume of extract.
7. The volume of reference sample standard added to the spiked blank sample and the volume of surrogate and/or internal standard added to each sample or sample extract.
8. The WST sample ID number of the sample selected for matrix spike analysis, the volume of matrix spike added, and ID number of the matrix spike standard used.
9. Any comments or observations on occurrences during the extraction procedure, especially if they may effect the results of the data generated.
10. The lot number and manufacturer of the solvents used to extract the samples and the ID number of each reagent used.

Upon completion of the extraction, the extracts and a photocopy of the sample preparation logbook will be given to the appropriate analyst. The copy of the preparation logbook will then be submitted by the analyst as part of the data package for review.

5.1.2 Wet Chemistry Logbooks

Since the preparation of samples for wet chemistry analyses is typically not as involved as the extraction of samples for organic, radiochemical, or metals analyses, the preparation and analysis data for wet chemistry analyses will be recorded in the same logbook. Each wet chemistry analysis will have its own individual logbook designed to record all the data pertinent to that analysis, including, the date of analysis, the initials of the technician performing the analysis, the WST sample ID numbers being analyzed, the final results obtained for each sample analyzed, the results of all QC sample analyses, and the lot number or ID number of the reagents and standards used for the analysis. Some of the other records kept in association with the wet chemistry analyses, such as reagent preparation, may be maintained in separate notebooks.

All notebooks used to record wet chemistry data are bound with hard covers and have pre-numbered pages. They are issued to the analysts by the QA/QC Officer. The QA/QC Officer assigns each notebook a number and records the date of issuance, the notebook title and the name of the analyst to whom the notebook was issued alongside of this number on a Notebook Distribution Sheet which he/she maintains.

Users of the notebook will maintain good laboratory practices in their use. All entries will be made with indelible ink. No pages will be torn out of the notebook. Corrections will be made by marking a single horizontal line through the mistake, followed by initializing and dating the correction. Tape or liquid paper will not be permitted when making corrections.

5.1.3 Record Keeping In Instrumental Analysis

The analysis of samples by GC, GC/MS, ICP, graphite furnace AA, Alpha Spectrometer, and Gas Proportional Counter will be documented using an analysis sequence log. The sequence log may be in the form of a notebook or a computer generated log sheet that is filed in an analysis sequence binder. In either case, the analysis log must contain, at a minimum, the following information;

1. The date of the analysis.
2. The WST sample ID numbers analyzed.
3. The ID of the instrument used for the analysis. Each instrument will have its own analysis sequence log.
4. The ID numbers of the initial, continuing or QC check standards used through out the analysis sequence. In the case of GC/MS analyses, the tune standard ID number must also be recorded.
5. The ID numbers of the QC samples analyzed in the sequence.
6. The dilution factor, if the sample required dilution prior to analysis.
7. The name of the data file associated with each analysis of the sequence (For ICP and graphite furnace AA there is only one date file name for the entire analysis sequence).

The analysis log must show the sequence in which the samples standards and QC samples were analyzed. The log may also contain data used in the reduction of data to obtain final results such as sample weights or volumes and final extraction volumes.

For GC/MS analyses, the analysis logbook also contains the retention time, area found and the percent area recovery for all of the internal standards as well as the recovery of each surrogate compound added to the analyses.

Upon completion of the analysis, the analyst will enter the sample results into the Labworks database using the appropriate analysis code. Data entry is performed either manually or by computer file transfer. The analyst will also enter the results of method blank, reference sample, matrix spike, and duplicate or matrix spike duplicate sample analyses into Labworks for review.

A copy of the analysis log or notebook will be submitted as part of the data package for review. The data package will also include a copy of the preparation log, the hard copy print outs of all continuing calibration standard, QC sample and site sample analyses and, for soils, a copy of the percent solids log. A copy of the Labworks backlog report that indicates which samples are contained within the data package will also be submitted.

5.2 Data Reduction

Reducing the data to a reportable form is the responsibility of the analyst performing the analysis. It is of utmost importance that the analyst pay close attention to the data being reduced by him or her since the data is only spot checked beyond analysis. In reducing the data generated by an analysis, the analyst must review the following:

1. The continuing calibration analysis to assess the validity of the current calibration.
2. The method blank analysis to assure that no analyte concentrations are above the method detection limit.
3. The recoveries of each of the analytes from the reference sample analysis to assure that they meet acceptable criteria.
4. The concentration of each integrated analyte to assess if the concentration has exceeded the upper linear range, making further dilution of the sample or sample extract necessary, or if the concentrations are below the detection limit.

For GC and GC/MS analyses the following must also be reviewed:

1. The retention times of each of the integrated analytes to assure that they are within the acceptable windows and that the analyte peaks were correctly identified.
2. The integration of each analyte peak.
3. For GC/MS analyses, the tuning standard must be reviewed to assure that it meets acceptable criteria.
4. For GC/MS analyses, the spectrum of each identified peak must be verified to assure that it meets acceptable criteria.

For Radiochemical analyses the following must also be reviewed:

1. For Alpha Spectrometry, daily Pulser check, weekly Energy Calibration and Efficiency checks, and monthly background checks.
2. For Gas Proportional Counting, daily source and background checks, and annual Self-Absorption check.

When the above reviews are completed and satisfactory, the concentration of each analyte in the sample can be determined using the following calculation:

$$C = \frac{I}{RF} \times \frac{1}{Vi} \times \frac{Ve}{As} \times DF$$

where, C = Concentration of the analyte in the sample, in appropriate units [μg/L (ppb), mg/L (ppm), or μg/Kg (ppb), mg/Kg (ppm)]

I = Signal size, in units appropriate to the method

RF = The response factor, in units of signal size per unit weight of the analyte. This response factor is essentially a mean response factor determined through regression of the initial calibration curve.

Vi = The aliquot size of the prepared sample taken for analysis, in units of ml. For some analyses this value is 1 since the same volume is used for initial calibration and for sample analyses.

Ve = The total volume of the prepared sample in ml.

As = The amount of sample taken for preparation. For liquid samples, the volume in liters is used; for solid samples, use the weight in Kg. If the results are to be determined on the basis of dry weight, use the following to determine sample size:

$$As\ (dry) = As\ (wet) \times \frac{\%\ Solids}{100}$$

DF = Dilution factor. The dilution factor is 1 for samples that are prepared exactly as prescribed in the protocol. If the soil or water extract required dilution, then the dilution factor differs from unity. For example, if an extract is diluted from 1 ml to 10 ml, the dilution factor becomes 10.

In most instrumental analyses, a computer is used that will automatically calculate the ratio I/RF for each analyte from the current calibration table or linear regression curve based on the initial calibration. The I/RF ratio is given in units of weight for each of the analytes found in the volume of sample analyzed. These weights are then either used manually or entered into a second computer program along with the values for Vi, Ve, As (usually dry weight for soils), and DF obtained from the preparation and analysis logs, to calculate C for each analyte found in the sample.

Although computerized data reduction alleviates the need for extensive manual data reduction, the results from each batch of results will be checked by the analyst, QA/QC Officer, and Laboratory Director during data review, using manual calculations to verify that the data was correctly reduced. These calculations will be signed and dated as proof of the review.

5.3 Data Validation

Before data from an analytic batch can be incorporated into reports, it must be validated by the QA/QC Officers through the review of all the data associated with the analytic batch. The QA/QC Officers check each batch for completeness, accuracy, and precision.

Although it is not the responsibility of the QA/QC Officers to check and verify every value generated and reported from the analyses, he or she will check the items listed below, using a checklist to document the review. Figure 5-1 shows the form which is used for the review of organic analysis data, Figure 5-2 for metals analysis data, and Figure 5-3 for radioisotopes.

1. Is the batch complete?
2. Have all the analyses been performed within the holding times of the samples?
3. Is there a valid continuing calibration for each analyte associated with the analyses of the individual samples within the batch?
4. For metals analyses, is there a valid initial calibration curve for each analyte and were initial calibration verification, interference check and quality control check standards analyzed where appropriate?
5. For GC/MS analyses, is there a valid tune analysis associated with the sample batch?
6. Is the sequence of runs in which the samples were analyzed proper for the method? Were method blanks, continuing calibrations, duplicates, matrix spikes, and spiked blanks run within the frequency listed in the method?

7. For GC and GC/MS analyses, are the surrogate recoveries from the samples within established control limits for the sample matrix analyzed? If not, has the sample preparation and analysis been repeated, and have recoveries been acceptable in the repeated analysis?
8. Is the recovery of spiked compounds in the reference sample acceptable?
9. Is the recovery of the spiked compounds in the matrix spike sample acceptable? If not, has there been an acceptable explanation or a repeat of the analysis?
10. Do duplicate analyses in the run sequence exhibit precision within the control limits?
11. Is the documentation in order? Are dates, QA/QC Batch Numbers, standard ID numbers, and reagent information complete?

If the answer to all of the above questions is "yes", the QA/QC Officer can release the data for reporting. The QA/QC Officer will also check the results for each sample in the Labworks database to assure that it is correct since the results from Labworks will be used to generate the finalized result report.

If the answer to any of the above questions is "no", corrective actions will be initiated by the QA/QC Officer in association with the analyst. If, after implementation of corrective actions, all criteria are met, the data can then be released for reporting. If some criteria are not met, the batch can be released, depending on what is not met and if there is sufficient explanation. However, regardless of the rationale, data will not be released if the following conditions exist:

1. GC/MS did not meet tuning criteria
2. Continuing calibration was not performed or did not meet acceptance criteria.
3. Reference sample analysis (spiked blanks) did not meet acceptance criteria.
4. The data set was not complete.

Corrective actions for these situations will be addressed in Section 6.0, Corrective Actions.

Once the QA/QC Officer reviews and approves the data, he or she will sign off on the checklist, attach it to the data package and submit the data to the Data Coordinator.

5.4 Final Reporting

After all of the analyses on a sample or group of samples is completed and reviewed for accuracy, a final analytical result report is generated by the Data Coordinator. The data from the Labworks database is exported into a database which contains all of the report forms used to produce a final result report.

The final reports generated by the Data Coordinator are then submitted to the Laboratory Director or a designee for final review. The reviewer will sign off on the report and return it to the Data Coordinator. A copy of the report is made and filed according to client and/or site and the original copy is sent to the client or the client's agent.

5.5 QA Records

Records for QA documentation are retained according to the schedule shown in Table 5-1.

FIGURE 5-1
DATA VALIDATION CHECKLIST

Date : ____________ Checked By: ____________

Sample Group Number(s) : ____________

Sample Number(s): ____________

Method: ____________ Analyst: ____________

QA/QC Batch #: ____________ Ext Tech: ____________

REPORT FORMS

- ___ Analytical Work Form
- ___ Waste Dilution Log
- ___ Continuing Calibration
- ___ Surrogate Recovery
- ___ Internal Standard Sum.
- ___ Results Report
- ___ Soil/Water Extraction Log
- ___ Analysis Log (Injection)
- ___ Reference Sample Recovery
- ___ MS/MSD Recovery
- ___ GC/MS Tune Report
- ___ Batch complete?

QC DATA REVIEW

1. Sample holding time summary:
   Date sampled: ____________ Date received: ____________
   Date extracted: ____________ Date analyzed: ____________
   Extracted w/i holding time ____ Analyzed w/i hold time ____
2. Method blank summary:
   MB extracted w/batch? ____ MB analysis acceptable? ____
3. Analysis log complete? ____ Proper sequence followed? ____
4. Extraction Log complete? ____ matrix ______ level _____
5. Continuing calibration check:
   ____ C.C.C. ran for a _____ sample sequence
   Percent difference of CCC _____ acceptable ____ unacceptable
6. Reference (laboratory control) sample recovery:
   % recovery acceptable _____ recoveries not acceptable ____________
7. Surrogate recovery summary: % recovery acceptable _____
   Recoveries not in range ____________
8. Spike recovery summary: acceptable MS ____ acceptable MSD ___
   RPD of MS/MSD acceptable _____
   Unacceptable results comments ____________
9. Duplicate analysis summary: RPD of duplicates acceptable _____
10. Internal standard area summary:
    Internal std acceptable ____ Sample Int. stds acceptable ___
    unacceptable results comments ____________
11. GC/MS tune results acceptable _____
    samples analyzed w/i 12 hour tune period _____
12. Date of last initial calibration ____________
13. Pesticides; Endrin/DDT degradation analysis acceptable _____
14. Pesticides; injection port primer analysis performed _____
15. Data collection check performed _____; WST ID(s) ____________

DATA VALIDATION SUMMARY

Table 5-1

QUALITY ASSURANCE RECORDS

Records	Location	Retention
Analysis Report Hardcopy	Client File	3 years
Audit Reports	QA File	7 years
Certification Records	QA File	4 years
Correspondence		
Project-related	Project File	Project Specific
Non-project-related	QA File	1 year
Instrument/Equipment Calibration and Maintenance Records	QA File	5 years
Methods Manual, Revisions, Transmittal Records	QA File	7 years
Quality Assurance Manual, Revisions, Transmittal Records	QA File	7 years
Non-conformance/Corrective Action Reports	QA File	5 years
Procurement Documents	Procurement Log	1 year
Quality Control Acceptance Criteria, Control Charts, and Current Data	QA File	5 years
Quality Control Reports	QA File	1 year
Raw Data Notebooks, Discs, Printouts, Recorder Tracings	Laboratory Files	5 years
QA Project Plans	Project File	Project Specific
Standard Curves	Laboratory Files	5 years
Training Records	QA Files	5 years

FIGURE 5-2
DATA VALIDATION CHECKLIST - METALS ANALYSIS

____________ Date Reviewed
____________ Reviewed By
____________ Analytical Method
____________ Analyst
____________ Extracted By
____________ TCLP Date
____________ Date Digested
____________ Date Analyzed
____________ W/I Holding Time?

Sample ID Number(s) Analyzed:

QC Criteria NA (Not Applicable)	Analyzed Y/N	Acceptable Y/N	Comments
____1) Initial Calibration			
____2) Initial Cal. Verif.			
____3) QC Check Standard			
____4) ICP Interference Chk.			
____5) Reference Sample (LCS)			
____6) Preparation Blank			
____7) Calibration Blank			
____8) Continuing Calibration			
____9) Duplicate Sample (RPD)			
____10) Matrix Spike (%R)			
____11) Matrix Spike Dup. (%R)			
____12) MS/MSD RPD			
____13) GFAA Post-Dig. Spike			

Validation Summary

Acceptable: YES / NO / Comments X

Comments X:

Corrective Action:

Reviewer Signature & Date:

FIGURE 5-3
DATA VALIDATION CHECKLIST - RADIOISOTOPE ANALYSIS

____________ Date Reviewed
____________ Reviewed By
____________ Analytical Method
____________ Analyst
____________ Extracted By
____________ Date Extracted
____________ Date Analyzed
____________ Count Time (min.)
____________ W/I Holding Time?

Sample ID Number(s) Analyzed:

QC Criteria NA (Not Applicable)	Analyzed Y/N	Acceptable Y/N	Comments
___1) Initial Calibration			
___2) Source Check			
___3) Background Check			
___4) Pulser Check			
___5) Reference Sample (LCS)			
___6) Preparation Blank			
___7) Efficiency Check			
___8) Continuing Calibration			
___9) Duplicate Sample (RPD)			
___10) Matrix Spike (%R)			
___11) Matrix Spike Dup. (%R)			
___12) MS/MSD RPD			
___13) Energy Cal. Check			
___14) Self-Absorption Check			

Validation Summary

Acceptable: YES / NO / Comments X

Comments X:

Corrective Action:

Reviewer Signature & Date:

CORRECTIVE ACTIONS, PREVENTIVE MAINTENANCE, AND INSTRUMENT MAINTENANCE LOGS

6.1 Identification and Documentation of Problems

There are many areas throughout an analysis where corrective actions may be required. The decision to undertake corrective actions and ensuing actions must be documented so that traceability can be maintained. Corrective actions can be initiated by both the analyst and the QA/QC Officer. However, the QA/QC Officer is more likely to initiate corrective actions since he/she is the most exposed to malfunctions of the laboratory as they reflect upon the data produced. Any actions taken that affect the quality of the data must be documented and become part of the laboratory's permanent record.

During the course of data review, the QA/QC Officer may make an observation that will prompt a decision to pursue corrective actions. The QA/QC Officer is responsible for informing the analyst that a problem appears to exist. The types of problems that are observed usually fall into three categories; procedural problems, sample matrix effects, and equipment or instrument problems. All three categories may prompt the QA/QC Officer to request that a sample or group of samples be re-extracted and/or re-analyzed. When this situation arises, the QA/QC Officer will initiate the corrective action by filling out a Sample Re-extraction/Re-Analysis Form (Figure 6-1). The following information will be entered on the form;

1. The date of the request.
2. The Request Number. This number is assigned by the QA/QC Officer for purposes of tracking the distribution of request forms. When a request form is distributed, the QA/QC Officer records the request number in the tracking logbook. When the request form is returned the logbook is checked to indicate the return.
3. The ID number(s) of the sample(s) to be re-analyzed.
4. The analysis method to be performed and whether the sample(s) requires re-extraction and re-analysis or just re-analysis.
5. The reason for the request. This entry will detail the problem encountered and the corrective actions required prior to re-extraction or re-analysis of the sample(s).
6. The person to whom the request was submitted and the corresponding laboratory department.
7. The date by which the corrective actions and sample re-analysis must be completed.

Upon completion of the re-analysis, the analyst will return the Request Form to the QA/QC Officer along with all of the data pertinent to the required corrective action and subsequent sample re-analysis. The QA/QC Officer will review the data and record any comments regarding the review. When the review is completed, he/she will sign and date the form. A copy of the form will be attached to the data package and the original will be placed in a 3 ring binder as part of the QA/QC Officer's files.

Other corrective actions may be required that do not involve sample re-analysis. In these cases, the QA/QC Officer will notify the analyst or technician of a problem through a QC Memo. The memo will list the date of distribution, the name of the QA/QC Officer writing the memo, the person(s) to whom the memo was given, the memo reference number used by the QA/QC Officer for tracking memos that have been distributed, a detailed description of the problem and the corrective action(s) to be taken, and the date by which the actions need to be completed. If the problem identified by the QA/QC Officer is sufficient enough to significantly impact the quality of the data, the QA/QC Officer may stop the analysis of any additional samples until the problem is resolved. The analyst or technician must then record onto the memo a description of the corrective action(s) taken and the date it was performed. The analyst will then return the memo to the QA/QC Officer for review. If the QA/QC Officer is satisfied that the corrective action has mitigated the problem, analysis of samples can be resumed. If not, he/she may issue another memo detailing the additional actions that need to be taken in order to resolve the problem.

If, upon repeated attempts, the QA/QC Officer feels that the actions taken have not satisfactorily corrected the problem, he/she will inform the appropriate corporate officer of the problem. The problem will then be resolved through a joint effort between the laboratory management, the QA/QC Officer, and the corporate officers.

In some situations, the need to correct an operation is apparent to the analyst and does not originate from the data validation process. For example, instrumental failures are determined by the analyst and corrective action is taken by repairing the instrument, either through a service call or through laboratory personnel. In this case, the corrective action must be recorded in the Instrument Maintenance Log (See Section 6.4) of the effected instrument.

6.2 Problems and Actions (See Figure 6-2)

6.2.1 Continuing Calibration Outside Acceptance Limits

When the continuing calibration is outside the acceptable range, the problem should be identified by the analyst and corrected before any sample analysis is undertaken. On some occasions, the non-acceptability of the continuing calibration will not be determined by the analyst. In these cases, the QA/QC Officer will notify the appropriate analyst that a new initial calibration curve must be prepared or the continuing calibration standard should be checked.

The data on all the samples that have been analyzed following the last time that the calibration was within specification, will be rejected by the analyst or the QA/QC Officer, depending on the stage of the process at which the non-acceptability of the calibration curve was determined. The samples will be reanalyzed after a new initial calibration has been performed.

6.2.2 Calibration Standards Exceeding the Permitted Holding Time

If calibration standards have been continuously used beyond their permitted shelf-life, the QA/QC Officer will inform the responsible analyst. The analyst will then be responsible for preparing fresh calibration standards and the instrument will be checked against the new standards. If the previous runs performed with the expired standards meet the acceptance criteria based on the new standards, the data generated will be considered valid, in spite of the use of expired standards. This data will be flagged.

If the calibration performed with the expired standards do not meet the acceptance criteria when measured against the new standards, the samples that have been analyzed against the expired standards will be re-analyzed.

6.2.3 Laboratory Method Blanks Exceed Method Detection but Are Below Quantitation Limit

When laboratory blanks exhibit the presence of target analytes at a level exceeding the method detection limit, but still below the quantitation limit, the QA/QC Officer will notify the responsible analyst. The analyst will then check the reagent blanks that have been retained at the time the reagents were first used, in order to determine if contamination or interferences are due to impurities in the reagents. If this is the case, the reagent batch will be discarded and new reagents from fresh containers will be used. If the reagents appear to be sufficiently pure, the cleanliness in the laboratory will be inspected and reinforced to establish if the source of the problem may have been contamination of the apparatus. The data .

associated with the blank will be reviewed. If the analytes detected in the method blank are detected in the samples, the results reported for that analyte will be flagged.

6.2.4. Laboratory Method Blank Exceeds Quantitation Limits

When the laboratory method blank exceeds the quantitation limit, the QA/QC Officer will immediately notify the responsible analyst. Once again, the analyst will check the reagents and apparatus for potential contamination. If reagents are contaminated, the existing batch will be rejected and a fresh batch from a new container will be prepared

If the problem arose from the apparatus, whether glassware or instrumental, the problem will be corrected by the analyst and/or extraction technician. The corrective action will be documented before any further analyses can be undertaken. The analyst will then notify the QA/QC Officer of the corrective action.

The data associated with the failed method blank will be rejected. The samples will be re-extracted and re-analyzed to produce acceptable data. However, in instances where the analyte found in the blank is not detected or detected below the quantitation limit in the samples associated with the blank, the data may be accepted. If re-extraction or re-analysis of a sample is not an option (e.g. sample holding is exceeded or not enough sample available) the sample data will be flagged.

6.2.5 Reference Sample (Spiked Blank) Exhibits Recoveries Outside the Acceptance Limits

When the reference sample recoveries do not meet the acceptance criteria, the samples in the batch associated with the failed reference sample will be re-analyzed and the original data will be rejected.

Before repeating the re-preparations of samples, the calibration of the instrument shall be checked by analyzing a continuing calibration check standard. If the instrument is within calibration, the samples will be re-prepared and re-analyzed.

If the instrument calibration has drifted, re-calibration will be performed and the samples will be re-analyzed.

6.2.6 Surrogates and Sample Spikes Exhibit Recoveries Outside the Acceptance Limits

When recoveries of surrogates and/or spiked analytes are outside the acceptance limits, but the laboratory spiked blank is within acceptance limits, the apparent poor or enhanced recovery may be due to matrix effect. The sample exhibiting the unacceptable recovery may be re-prepared and re-analyzed. If the same phenomenon is observed, it will be assumed that the failure to meet recovery criteria was in fact a matrix effect. This information will be included in the report to the client and the original data will then be reported.

If, upon re-analysis, the recovery of the surrogates or spiked analytes fall within acceptable limits, the results of the re-analysis will be reported and the original analysis results rejected due to a potential procedural problem.

In some instances it may be obvious from the data produced or from the observations made during the preparation process that the sample matrix is causing the unacceptable recoveries. In these cases, the sample will not be re-prepared or re-analyzed. The observations made will be included in the report to the client, and the data will be flagged.

If the surrogate recovery in a method blank or reference sample is outside the acceptance limits (but the analytes in the reference sample are within acceptance limits), the analyst may need to analyze the surrogate standard solution to check for degradation or contamination. If the standard solution is determined to be the problem the analyst will immediately prepare a new standard and the affected samples will be re-extracted and re-analyzed. It is also possible that the calibration of the surrogate compound has drifted, in which case the analyst should re-calibrate the system, and re-analyze the affected samples.

6.2.7 Control Chart Exhibits a Regular Trend

The control chart is used to assess the acceptability of recovery data on the basis of historical data. Since the individual points that make up a control chart for any analyte vary randomly about a mean value, a regular trend can warn the analyst that some consistent problem or deviation in the method may be occurring.

When five successive points on the control chart form a steady pattern, either regularly increasing or regularly decreasing, they may imply that some change is occurring in the analytical scheme. Even if the points are within the control limits, a warning will be issued by the QA/QC Officer to the responsible analyst to investigate the cause of the pattern. If in fact a change has occurred in the method, and if the change indicates an improvement in recoveries (an improvement is defined as approaching complete recovery, not necessarily an upward trend), then a new control chart will be established and subsequent data will be compared to the new control chart limits. If a change has occurred that worsens the recovery, it will be the responsibility of the analyst to assure that a return to the previous technique is made.

6.3 Preventive Maintenance

Preventive maintenance is necessary in order to keep the system operating properly. Not all preventive maintenance measures need to be documented, except those that are considered a repair or a replacement. These types of preventive maintenance will be documented in the Instrument Maintenance Log of the affected instrument. Each instrument will have a preventive maintenance schedule which can be found in the analytical SOP. The schedule may also include preventive maintenance performed by the manufacturer as per the terms of the service contract, which is purchased for laboratory instruments.

Routinely scheduled preventive maintenance consists of the following:

1. General
    - a. Maintenance logs are maintained for each major instrument (See Section 6.4).
    - b. Room temperature and humidity are maintained according to the manufacturers' specifications.

2. Gas Chromatograph and Gas Chromatograph/ Mass Spectrometer (GC and GC/MS)

    Daily Procedures
    - a. Purge traps are baked out. Changes of the traps are logged.
    - b. Columns are baked out.
    - c. Volume of gas cylinders is checked.

    As Required Procedures
    - a. Teflon ferrules are replaced.
    - b. Injection port liners are cleaned or replaced.
    - c. GC septa are changed after 50 injections.
    - d. Detectors are baked out.

    Quarterly Procedures
    - a. Instrument electronics are visually inspected and cleaned.
    - b. Detectors are cleaned on a schedule recommended by the manufacturer or more frequently as needed.

    Annual Procedures
    - a. Electron capture detectors are wipe tested.
    - b. Preventive maintenance performed by manufacturer as per service contract terms

    Spare Parts
    - a. Septa
    - b. Purge and trap sparger
    - c. Purge and trap traps
    - d. Tubing and fittings
    - e. Thermal conductivity leak detector
    - f. Column ferrules
    - g. U.V. lamp for PID detectors

h. Nickel catalyst tubes for ELCD detectors
i. Syringes for spiking
j. Mass spectrometer source filaments
k. Jet separator
l. Pump oil
m. Analytical columns
n. Flow meter bubble solution
o. Flow meters
p. Spare guard columns
q. Injection port liners

3. Infrared Spectrometer
   Daily Procedures or After Each Use
      a. Clean IR cells, store in desiccator

   Weekly Procedures
      a. Run spectrum of polystyrene.

   Spare Parts - IR cells, chart paper & pens

4. Inductively Coupled Plasma Spectrometer (ICP)
   Daily Procedures
      a. Check gases before operation
      b. Monitor detector response and instrument performance through calibration and verification.

   Procedures as Needed
      a. Clean nebulizer and spray chamber
      b. Replace peristaltic pump tubing
      c. Clean plasma torch assembly when discoloration is evident or after analyzing high dissolved solids.

   Spare Parts - Spare plasma torch, argon chamber and pump tubing

5. AA/Graphite Furnace
   Daily Procedures
      a. Warm up AA lamp for 15 minutes prior to analysis
      b. check and align source lamp
      c. Check autosampler alignment and deposition

   Procedure as Needed
      a. Change graphite contact rings
      b. Change background correction lamp
      c. Clean furnace housing and injector tip
      d. Replace pyrollytic graphite furnace tubes as indicated by instrument performance

   Spare parts- Contact rings, furnace tube assemblies, lamps

6. Gas Proportional Counter
    Daily Procedures
        a. Check gas flow

    Weekly Procedures
        a. Clean sample tray

    Monthly Procedures
        a. Check bubbler oil level

7. Alpha Spectroscopy
    Every 6 months
        a. Change vacuum pump oil

    Procedure as needed
        a. Clean sample holder

6.4 Instrument Maintenance Logs

All instrument repair and maintenance which will effect the steady state of the analytical system must be documented in the Instrument Maintenance Log. A description of the problem and the corrective actions taken to remedy the problem will be recorded.

If a service representative is called in to make the repair, a copy of the Field Service Report, if available, is filed into the Instrument Maintenance Log. The corrective actions explanation will reference the number of the Field Service Report.

When a major repair is performed or when the column is replaced, the instrument detection limit should be determined to see if it has changed significantly. If it has, new method detection limits need to be established and documented. If the IDL has not changed, the MDL and QL need not be performed.

6.5 Handling Complaints

Procedures for receiving, reviewing, and evaluation of complaints are necessary. This ensures that all complaints are processed in a uniform and timely manner. They must be documented so that traceability can be maintained.

Customer complaints can be received by the Project Manager, QA/QC Officer, or Laboratory Director. These designated personnel initiate corrective actions since they are the client contacts, are the most exposed when it comes to the functions of the laboratory, and have the ability to prioritize laboratory activities to respond to the needs of the complainant.

Any actions taken must be documented and become part of the laboratory's permanent record.

Upon verbal or written receipt of a complaint, the complainant's information is recorded on a Complaint Form Figure 6-4) and complaintive actions taken. The person who receives the complaint is responsible for investigating the nature and details of the complaint, identifying personnel that will be involved in its resolution, and following through with its corrective actions.

Figure 6-1

Sample Re-Extraction/Re-Analysis Request Form

Date __________ Request Number ______________

Requested By __________________________

Sample ID # ____________

Analysis Method Requested ________________________________

_____ Re-extract and re-analyze

_____ Re-analyze only

Reason for Request _______________________________________

____

____

____

Request Submitted To : ___________________________________

Department : ___________________________________

Submit Results By (Date) _________________________________

===

Return this form along with a copy of the re-analysis results to the person listed at the top of this form. If re-extraction was required, and if the sample extract is to be analyzed by a different person or department, submit this form along with the extract to the appropriate analyst. The analyst must then submit this form along with the results of the re-analysis.

===

Re-analysis Results Reviewed By :

__________________________________ Date ______________

Comments: ____

____

____

Figure 6-2

DATA REVIEW AND CORRECTIVE ACTIONS

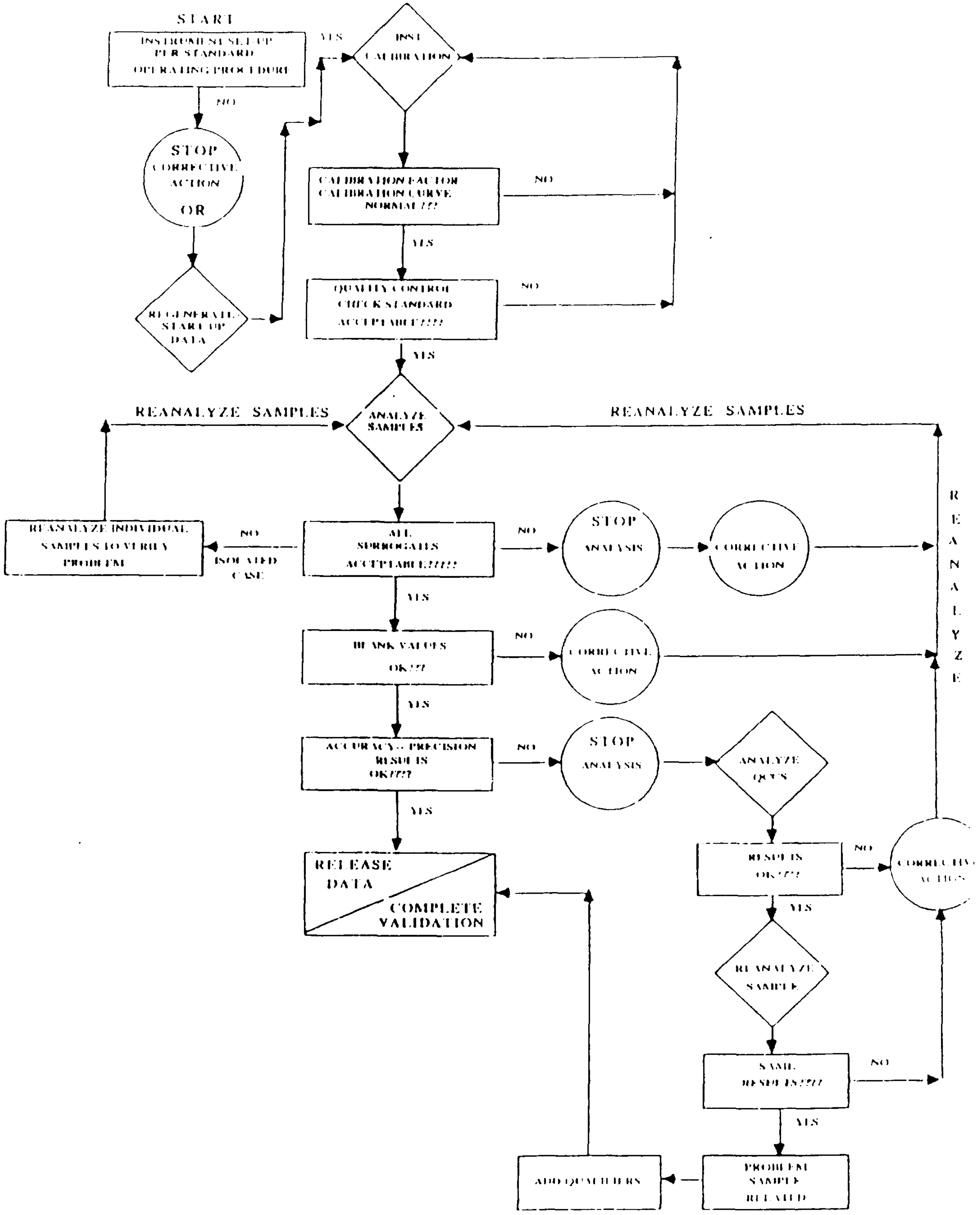


Figure 6-3
Complaint Form

Date ______________ Request Number ______________

Requested By __________________________

Sample ID #(s) ____

Name of Complainant ____________________________________

Address ____

Phone ___________________ FAX ___________________ E-mail __________________

Nature & Details of Complaint

____

____

Date & Results of Investigation

____

____

____

Corrective Actions

____

____

Reply to Complainant

____

____

Name________________________ Signature _______________________ Date _________

= =

Return this form along with a copy to the QA/QC Officer

BIOGRAPHIES OF KEY PERSONNEL

Dr. Brian S. Schepart   Laboratory Director

Dr. Schepart received his B.A. in Biology from Clark University in 1977, and his Ph.D. in Experimental Pathology from the State University of New York at Buffalo in February of 1983, and his B.S. Pharmacy from the State University of New York at Buffalo in 1994. He was a Damon Runyon - Walter Winchell Fellow at the University of North Carolina at Chapel Hill and an Instructor of Microbiology at Duke University. Since 1986, Dr. Schepart has been an Assistant Professor of Microbiology and Immunology at Allegheny University of the Health Sciences, where he presently retains an adjunct position. While at Allegheny, he directed and managed a team of seven researchers whose work was supported by extramural funds. To his credit, Dr. Schepart has authored over thirty peer-reviewed publications and has received numerous awards and grants, from both public and private agencies. He is the Chairman of ASTM F20.24, a subcommittee within Spill Response F20 since 1991. He joined Waste Stream Technology in 1989.

Daniel W. Vollmer   QA/QC Officer

Mr. Vollmer graduated from the State University of New York at Buffalo with a B.A. in Biology. Since his graduation, he has gained extensive experience in analytical chemistry as a laboratory technician, a GC, GC/MS, and HPLC analyst, and a laboratory supervisor. Since 1989, in conjunction with Dr. Schepart, he has been responsible for setting up WST's analytical laboratory and establishing the current laboratory protocol. In doing so, he has obtained extensive experience in US EPA methodologies, including the requirements necessary for maintaining good Quality Assurance and Quality Control.

Paul Morrow   Assistant Laboratory Director

Mr. Morrow has a B.A. in Biochemistry from Canisius College, as well as an M.B.A., where he received the Edna Galvin Zeeman Award. Mr. Morrow has more than 10 years experience in GC and GC/MS methodologies for the generation of data according to NYSDEC and USEPA CLP protocols. His experience as an Accounts Manager and GC/MS Analyst reinforces his knowledge of the environmental testing laboratory.

Ralph Williams   Laboratory Manager

Mr. Williams received his A.A.S. in Chemical Technology from Erie Community College, and his B.A. in Chemistry from State University College at Buffalo. He joined Waste Stream in 1993 after more than 10 years experience as a GC operator and analyst of PCBs, pesticides, and herbicides. He has also been a GC/MS Volatiles Analyst since 1996.

Anthony Portfilio   Senior Metals Analyst

Mr. Portfilio received his B.S. in Recombinant DNA Technology at the State University of New York at Fredonia. He joined WST in 1993 with 4 years experience in operation and interpretation of metals analysis by Inductively Coupled Plasma Spectrophotometry, Flame Atomic Absorption Spectrophotometry and Graphite Furnace Atomic Absorption Spectrophotometry. In addition, he operates a Hydride Continuous Flow Analyzer for low level analysis of metals.

Dawn Cermak   Chemistry Lab Supervisor

Ms. Cermak received her B.S. in Environmental Studies from the State University of New York at Buffalo. She joined WST in 1991, and has been responsible for supervising the Wet Chemistry laboratory, as well as Sample Disposal. She supervises the Wet Chemistry laboratory in procedures according to USEPA, ASTM, and Standard Methodologies.

Sidney Tyrrell   Organics Analyst

Mr. Tyrrell received his A.S. in Chemistry from Erie Community College in 1983. He joined WST after 10 years of experience as a GC and GC/MS Analyst. Since joining WST in February, 1994, he has established analyses for drinking water and continues to provide expertise in GC and GC/MS volatile organics and semi-volatile organics.

David Ruhland   QA/QC Officer

Mr. Ruhland received his B.S. in Environmental Studies from the State University of New York at Buffalo. He then joined Waste Stream in 1995 as a Data Manager, responsible for accurate and timely delivery of analytic data. In 1997 he became a QA Officer responsible for maintaining good Quality Assurance and Quality Control.

Joe Giacomazza   Data Coordinator

Mr. Giacomazza received his B.S. in Earth Science from the Buffalo State College. He interned at Waste Stream in 1997, and was subsequently hired as a Data Manager, responsible for accurate and timely delivery of analytic data.

Rebecca Dye   Inorganics and Organics Analyst

Ms. Dye received her B.S. in Chemistry from Baldwin-Wallace College in 1993. She joined WST in 1996 after working for three years as an industrial chemist, responsible for formulation of precious metal anode coatings, product inspection, instrument maintenance and calibration, environmental wastewater monitoring, and technical support. She is currently a Metals Analyst, and GC/MS Analyst.

Thomas Franks Organics Analyst

Mr. Franks received his B.A. in Chemistry from Buffalo State College in 1993. He then joined WST first as an extraction chemist then as a GC Analyst. He is responsible for the analysis of environmental samples for the determination of PCBs/Pesticides and Herbicides using standard and innovative techniques.

Daniel J. Mackney Radiochemistry Laboratory Manager

Dan received his B.S. in 1983 from SUNY at Albany. He also served for 6 years in the U.S. Navy, with his highest post as Leading Engineering Laboratory Technician for nuclear submarines. Prior to joining Waste Stream Technology in 1999 as a Radiochemistry Laboratory Manager, Dan was the Chemical Manager for Perry Nuclear Power Plant and Shoreham Nuclear Station over an 8 year period. For more than 12 years he served as a private consultant for commercial nuclear DOE, DOD, and AFCEE facilities. He also was an Instructor at SUNY at Buffalo, teaching 40-hour HAZWOPER and Radiation Safety Training, and an Instructor for Radiochemistry, Health Physics, Radioactive Waste Shipping and Handling, and Emergency Preparedness. He also served as a faculty member on the 9th Annual Health Physics Society Summer School on External Radiochemistry Dosimetry at Pennsylvania State University. His experience includes sampling and analysis of groundwater, surface water, fallout, air, soil and sediment for radioisotopes. His expertises include the operation of alpha, beta, and gamma radiological testing equipment, radiological and chemical data interpretation and validation, technical preparation of environmental monitoring reports, and radiological health and safety.

APPENDICES

SAFETY

Safety requires an open attitude and a knowledgeable awareness of potential hazards. Safety is a collective effort and requires the full cooperation of management, supervisors, and employees. This cooperation means that everyone should adhere to the established procedures of the company which are incorporated into the laboratory's "Chemical Hygiene Plan," "Hazard Communication Standard," and the "Waste Stream Technology Safety Manual", and ""Waste Stream Radiation Control Standard Operating Procedure (SOP)."

Briefly, these manuals include guidelines, procedures, and suggestions for the following areas:

1. Personal protective equipment
2. Training
3. Emergency action
4. Chemical and Radiation hazards
5. Chemical storage
6. Fume hood monitoring program
7. Accident reporting
8. Established work rules

Personal Protective Equipment

Eye protection is required at all times in the laboratory and where chemicals are stored and handled. Appropriate clothing must be worn, including a protective lab coat. Open-toed shoes or sandals are not permitted. Gloves of the proper material should be selected to provide sufficient protection to minimize the chance of skin contact. Respirators should be worn as needed.

Training

Adequate training will be provided by management and the Health and Safety Department. Employees are expected to adhere to all safety rules as well as to seek advice and guidance whenever they have doubts about safety procedures or potential hazards. The training incorporates chemical and radiation hazards, evacuation, use of fire extinguishers, and use of the eye wash and other protective equipment. The employees are also instructed on signs and symptoms of over-exposure, OSHA permissible exposure limits (PEL's), location of Material Safety Data Sheets (MSDS), and how to read MSDS and reagent labeling. Employees are also instructed in proper respirator selection and use including fit testing.

Emergency Action

Employees are instructed on emergency action procedures which include spills/release, evacuation, and reporting. Routine drills are conducted throughout the entire company. An emergency action plan is provided and used in the training of all laboratory personnel. Escape routes are mapped out throughout the building. Fire alarms, fire extinguishers, and a sprinkler system are in place and inspected every other month. The Buffalo Fire Department is located approximately 300 feet from the facility at the intersection of Grote Street, Great Arrow Drive, and Elmwood Avenue.

Chemical and Radiological Hazards

All employees who may be exposed to chemicals and radioisotopes which may present a hazard, are fully informed of potential hazards and proper handling that is required to avoid exposure. This is accomplished through reagent labeling and MSDS's. Each employee is instructed on how to decipher a MSDS Sheet, providing the employee with special instructions on personal protective equipment, storage requirements, and associated health hazards. Special precautions and labeling are required for toxic, carcinogenic, or mutagenic compounds.

When there has been a spill of radioactive material which may have produced contamination of the person or clothing, both the person and the clothing shall be monitored. Personnel contamination shall be removed as soon as possible.

Personnel External Exposure Monitoring Program

Personnel monitoring devices shall be provided for individuals in accordance the following criteria:

1) Personnel who handle millicurie quantities of photon or energetic beta emitting radionuclides on a regular basis* shall be supplies with a film or TLD finger monitor.
2) Personnel who handle millicuries quantities of energetic photon emitting radioactive materials on a regular basis* shall be supplied with film or TLD whole body monitors.
3) Personnel who are occupationally exposed to radiation on an occasional basis, need not be monitored if the requirements of 38.24 do not apply.

*This refers to personnel such as laboratory workers who handle millicurie quantities either routinely or as stock quantities.

Storage

Chemicals are arranged so only compatible chemical families are stored together. Flammable liquids are stored in minimum quantities within the laboratory, while additional storage is provided on the first level of the facility in a non-flammable, fire resistant cabinet. Radiological samples and sources are stored in a containment area and a locked safe in the containment area, respectively, accessible to Radiological Laboratory personnel only.

Medical Surveillance

Employees have the option to receive medical attention whenever any of the following occur:

1. Employees develop signs or symptoms associated with hazardous chemicals.
2. Exposure levels routinely exceed the action levels.
3. There is a spill, leak, or release into the working environment.

Reporting of Injury or Illness

Employees must report all work-related injuries or illnesses. This will ensure that the appropriate medical treatment or follow-up is obtained. This will also alert management to unsafe work practices or conditions so corrective actions can be taken.

Established Work Rules

The following is a list of established safety rules which everyone must abide by:

1. Consumption, preparation, and storage of food and beverages, and application of cosmetics, are prohibited in the laboratory.
2. Laboratory glassware will not be used to contain food or beverages.
3. Smoking is prohibited in the laboratory and in the facility.
4. Safety glasses or goggles are required in the laboratory.
5. All visitors to the laboratory must follow the safety regulations.
6. Chemicals are not allowed in offices.
7. Horseplay and other acts of mischief are prohibited.
8. Unauthorized experiments are prohibited.
9. Work surfaces and personnel should be monitored after working with radioactive materials, and decontaminated if necessary.
10. Pipetting of radioactive solutions by mouth is prohibited.
11. Do not store food, drink, or personal effects with radioactive material.
12. Always transport radioactive materials in appropriately shielded containers, and other laboratory reagents in appropriate containers.

WASTE DISPOSAL

Procedures for the disposal of waste and virgin chemicals are outlined in the Waste Disposal SOP. Workers should follow this program with care to avoid any safety hazards or damage to the environment.

In general, WST has incorporated four routes of disposal into the Waste Disposal SOP. They are:

1. If possible, samples received for laboratory analyses are returned to the client or site upon completion.
2. Solvents are recovered/recycled through distillation.
3. Certain highly diluted, water soluble chemicals may be disposed of in small quantities in the sanitary sewer system.
4. The remaining waste will be separated and drummed for incineration or landfill by an appropriately licensed vendor.

Waste is segregated based upon its chemical properties. Liquids are packaged separately from solids. Reactive waste is isolated from non-reactive waste. Radioactive waste is isolated form non-radioactive waste. In general, the Waste Coordinator will assist in the segregation of waste.

Laboratory wastes will be stored in 5 gallon poly-buckets in the laboratory until full when they will be dumped into appropriate drums. Samples containing PCB material will be held separately. Samples that are sent back to the client are recorded on a type

All waste is stored in the posted waste storage area until disposal. Lab pack Disposal drums require DOT approved containers. All inside lab pack containers must be compatible for that waste. The maximum internal lab pack size is one gallon for metal, plastic, and glass containers. The chemical name and type/size of container should be recorded onto the side of the drum.
written sheet and relinquished to a transporter or directly to a client. These completed forms are maintained by Sample Control and are filed in a three ring bound notebook. The forms are maintained for seven years after disposal.

The small containers that are packed in drums are separated based upon DOT hazard classes. In decreasing hazard order, they are:

- Radioactive
- Poison A
- Flammable gas
- Non-flammable gas
- Flammable liquid
- Oxidizer
- Flammable solid
- Corrosive (liquid)
- Poison B
- Corrosive (solid)
- Irritating agent
- ORM-B
- ORM-A
- Combustible liquid
- ORM-E

The Waste Coordinator prepares the waste manifest, shipping inventory and drum labels. The drums are labeled according to DOT requirements. Records of the disposal are maintained and filed with the Waste Coordinator for seven years.

RADIOACTIVE WASTE DISPOSAL

Radioactive Waste is classified as Class A, Class B, or Class C in accordance with the requirements of SRPAR and 10 CFR61.

The concentration of a radionuclide in the waste stream may be determined by indirect methods such as the use of scaling factors, which relate the inferred concentration of one radionuclide to another that is measured; or radionuclide material accountability if there is reasonable assurance that the indirect methods can be correlated with actual measurements. The concentration of a radionuclide may be averaged over the volume of the waste or weight of the waste (if the units are expressed as nanocuries per gram). Since our waste consists only of thorium (natural), radium (natural), and small amounts of uranium (natural) all waste streams from our facility will be classified as Class A.

The intention is to return all samples to the site of origin for subsequent disposal. This will be contracted prior to acceptance of the samples. In addition, laboratory waste associated with those samples will be sent to the site of sample origin. For rare instances where samples or laboratory waste cannot be cannot be returned to the site, a commercial low level radioactive waste disposal facility will be used. At the present time there are at least two commercial waste sites available for disposal of the radioactive waste generated at our facility. One is the Southeast Compact Disposal Facility at Barnwell, South Carolina, and the second is Envirocare located in Utah. Since each site has its own waste acceptance criteria (WAC) we will not attempt to specify the requirements the waste form must meet. We will however insure that all waste being shipped is prepared and packaged in accordance with all current regulations and the WAC of the site being utilized.

In an effort to minimize the volume of material that must be disposed of as radioactive waste, several volume reduction techniques will be utilized.

Each package of waste must be clearly labeled to identify it as a Class A, B, or C waste. Solid radioactive wastes are controlled to minimize the volume generated and handled in a manner which ensures safe storage and transportation to our radioactive waste processor and/or waste disposal contractor. Our radioactive wastes are stored in a manner which minimizes exposure, prevents deterioration of containers, and prevents the spread of contamination.

SECURITY

There are three main areas to be considered when dealing with security. They are:

1. Laboratories
2. Offices
3. Sample storage areas

Security for the facility is provided by restricted admission through a main entrance during standard working hours. Key personnel are allowed access to the facility during non-standard hours using a computer-linked individualized numeric access code.

The integrity of the facility is monitored at key points using motion and audio sensors in addition to strategically placed door switches. Twenty-four hour monitoring of the system includes:

1. Computer link-up
2. Audio monitoring
3. 911 and hold-up protection
4. Perimeter security
5. Secure check-in/check-out
6. Monthly reports on check-in/check out

In addition to the electronic security system, the samples are stored in a secured area. All cabinets and refrigerators are kept locked at all times. The Sample Custodian is in charge of access and all samples removed or returned must be logged out.

EXECUTIVE QUALITY ASSURANCE SUMMARY

A general QA report which summarizes problems encountered throughout the laboratory effort, including sample custody, analyses, and reporting, is provided every other month to laboratory management by the QA/QC Officer. This report identifies areas of concern and possible resolutions in an effort to ensure data quality.

Upon completion of a project sampling effort, analytical and QC data may be included in a comprehensive report that summarizes the work and provides a data evaluation. A discussion of the validity of the results in the context of QA/QC procedures may be made, as well as a summation of all QA/QC activity.

Serious analytical problems will be reported to the client. Time and type of corrective action, if needed, will depend on the severity of the problem and relative overall project importance. Corrective actions may include altering procedures in the field, conducting an audit, or modifying laboratory protocol. All corrective action will be implemented after notification and approval of the client.

Laboratory Certifications

1. **New York State Department of Health**
2. **New Jersey Department of Environmental Protection and Energy**
3. **U.S. Army Corps of Engineers**
4. **Florida Department of Health**

NEW YORK STATE DEPARTMENT OF HEALTH

ANTONIA C. NOVELLO, M.D., M.P.H. Commissioner

Expires 12:01 AM June 30, 2000
ISSUED April 1, 1999
REVISED March 24, 2000

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

Lab ID No.: 11179

Director: DR. BRIAN SCHEPART
Lab Name: WASTE STREAM TECHNOLOGY
Address : 302 GROTE STREET
BUFFALO NY 14207

is hereby APPROVED as an Environmental Laboratory for the category

ENVIRONMENTAL ANALYSES NON POTABLE WATER

All approved subcategories and/or analytes are listed below:

tewater Miscellaneous :
  Cyanide, Total
  Color
  Phenols
  & Grease Total Recoverable
  ogen Ion (pH)
  ulfide (as S)
  Surfactant (MBAS)
  Organic Carbon, Total
tewater Metals I (ALL)
ynuclear Aromatics (ALL)
rgeable Aromatics (ALL)

Wastewater Metals III :
  Gold, Total
  Cobalt, Total
  Molybdenum, Total
  Palladium, Total
  Platinum, Total
  Thallium, Total
Benzidines (ALL)
Chlorinated Hydrocarbons (ALL)
Wastewater Metals II (ALL)
Polychlorinated Biphenyls (ALL)
Purgeable Halocarbons (ALL)

Mineral :
  Acidity
  Alkalinity
  Chloride
  Fluoride, Total
  Sulfate (as SO4)
  Hardness, Total
Chlorophenoxy Acid Pesticides (ALL)
Demand (ALL)
Nitroaromatics and Isophorone (ALL)
Phthalate Esters (ALL)
Residue (ALL)

Nutrient :
  Ammonia (as N)
  Nitrate (as N)
  Orthophosphate (as P)
  Phosphorus, Total
Wastewater Bacteriology :
  Standard Plate Count
Chlor. Hydrocarbon Pesticides (ALL)
Haloethers (ALL)
Nitrosoamines (ALL)
Priority Pollutant Phenols (ALL)
TCLP Additional Compounds (ALL)

erial No.: 106492

Wadsworth Center

Property of the New York State Department of Health. Valid only at the address shown.
Must be conspicuously posted. Valid certificate has a red serial number.

DOH-3317 (3/97)

NEW YORK STATE DEPARTMENT OF HEALTH

ANTONIA C. NOVELLO, M.D., M.P.H. Commissioner

Expires 12:01 AM April 1, 2000
ISSUED April 1, 1999
REVISED August 26, 1999

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

Lab ID No.: 11179

Director: DR. BRIAN SCHEPART
Lab Name: WASTE STREAM TECHNOLOGY
Address : 302 GROTE STREET
BUFFALO NY 14207

Is hereby APPROVED as an Environmental Laboratory for the category

ENVIRONMENTAL ANALYSES/ POTABLE WATER

All approved subcategories and/or analytes are listed below:

nking Water Non-Metals :
Cyanide

Drinking Water Metals I (ALL)
Volatile Halocarbons (ALL)

Drinking Water Metals II (ALL)

Volatile Aromatics (ALL)

Serial No.: 105693

Wadsworth Center

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DOH-3317 (3/97)

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Director: DR. BRIAN SCHEPART
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Address : 302 GROTE STREET
BUFFALO NY 14207

is hereby APPROVED as an Environmental Laboratory for the category

ENVIRONMENTAL ANALYSES NON POTABLE WATER

All approved subcategories and/or analytes are listed below:

tewater Miscellaneous :
  Cyanide, Total
  Color
  Phenols
  Oil & Grease Total Recoverable
  gen Ion (pH)
  ide (as S)
  Surfactant (MBAS)
rinated Hydrocarbons (ALL)
tewater Metals II (ALL)
ychlorinated Biphenyls (ALL)
geable Halocarbons (ALL)

Wastewater Metals III :
  Gold, Total
  Cobalt, Total
  Molybdenum, Total
  Palladium, Total
  Platinum, Total
  Thallium, Total
Benzidines (ALL)
Demand (ALL)
Nitroaromatics and Isophorone (ALL)
Phthalate Esters (ALL)
Residue (ALL)

Mineral :
  Acidity
  Alkalinity
  Chloride
  Fluoride, Total
  Sulfate (as SO4)
  Hardness, Total
Chlorophenoxy Acid Pesticides (ALL)
Haloethers (ALL)
Nitrosoamines (ALL)
Priority Pollutant Phenols (ALL)
TCLP Additional Compounds (ALL)

Nutrient :
  Ammonia (as N)
  Nitrate (as N)
  Orthophosphate (as P)
  Phosphorus, Total
Wastewater Bacteriology :
  Standard Plate Count
Chlor. Hydrocarbon Pesticides (ALL)
Wastewater Metals I (ALL)
Polynuclear Aromatics (ALL)
Purgeable Aromatics (ALL)

rial No.: 105692

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DOH-3317 (3/97)

State of New Jersey

Department of Environmental Protection

Certifies Th[illegible]

WASTE STR[illegible] LO[illegible] [illegible]RPORATED
LA[illegible] IFICA[illegible]7

[illegible] he requ[illegible]

Reg[illegible] Th[illegible] Of
Laboratories And [illegible] [illegible].A.C. 7:18 et. seq

is hereby ap[illegible]

State Ce[illegible] Enviro[illegible]ratory

To perform the ana[illegible]s as indicated on th[illegible]d Parameter List
which m[illegible] accompany this ce[illegible] valid

Expira[illegible] 2001

Joseph F. Aiello

Joseph F. Aiello, Chief
Office of Quality Assurance

THIS CERTIFICATE IS TO BE CONSPICUOUSLY DISPLAYED AT THE LABORATORY WITH THE ANNUAL CERTIFIED PARAMETER LIST IN A LOCATION ON THE PREMISES VISIBLE TO THE PUBLIC.

New Jersey Department of Environmental Protection
Environmental Laboratory Certification Program
Annual Certified Parameter List and Current Status

WASTE STREAM TECHNOLOGY INC
302 GROTE STREET
BUFFALO, NY 14207
Lab ID 73977

Effective Date: 07/01/00 Expiration Date: 06/30/01

Status	Code	Parameter	EPA	ASTM	SM18	USGS	SW846	Other
C	SDW02.1500	CYANIDE						
C	SDW04.0600	ANTIMONY	200.9					
C	SDW04.1000	ARSENIC	200.9					
C	SDW04.1600	BARIUM	200.7					
C	SDW04.2300	CADMIUM	200.9					
C	SDW04.2400	CADMIUM	200.7					
C	SDW04.2800	CHROMIUM	200.7					
C	SDW04.3300	COPPER	200.7					
C	SDW04.3800	LEAD						
A	SDW04.3900	LEAD	200.9					
C	SDW04.4600	MERCURY	245.1					
C	SDW04.4700	MERCURY	245.2					
C	SDW04.5100	NICKEL	200.9					
C	SDW04.5200	NICKEL	200.7					
C	SDW04.5600	SELENIUM	200.9					
C	SDW04.6100	SILVER	200.9					
C	SDW04.6200	SILVER	200.7					
C	SDW04.6400	THALLIUM	200.9					
C	SDW06.0101	BROMOFORM	524.2					
C	SDW06.0102	CHLOROFORM	524.2					
C	SDW06.0103	DIBROMOCHLOROMETHANE	524.2					
C	SDW06.0104	DICHLOROBROMOMETHANE	524.2					
C	SDW06.0201	BENZENE	524.2					
C	SDW06.0202	CARBON TETRACHLORIDE	524.2					
C	SDW06.0203	CHLOROBENZENE	524.2					
C	SDW06.0204	1,2-DICHLOROBENZENE	524.2					

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C	SDW06.0205	1,3-DICHLOROBENZENE	524.2					
C	SDW06.0206	1,4-DICHLOROBENZENE	524.2					
C	SDW06.0207	1,1-DICHLOROETHANE	524.2					
C	SDW06.0208	1,2-DICHLOROETHANE	524.2					
C	SDW06.0209	cis-1,2-DICHLOROETHYLENE	524.2					
C	SDW06.0210	trans-1,2-DICHLOROETHYLENE	524.2					
C	SDW06.0211	DICHLOROMETHANE (methylene chloride)	524.2					
C	SDW06.0212	1,2-DICHLOROPROPANE	524.2					
C	SDW06.0213	ETHYLBENZENE	524.2					
C	SDW06.0214	METHYL-TERT-BUTYL-ETHER	524.2					
C	SDW06.0215	NAPHTHALENE	524.2					
C	SDW06.0216	STYRENE	524.2					
C	SDW06.0217	1,1,2,2-TETRACHLOROETHANE	524.2					
C	SDW06.0218	TETRACHLOROETHYLENE	524.2					
C	SDW06.0219	1,1,1-TRICHLOROETHANE	524.2					
C	SDW06.0220	TRICHLOROETHYLENE	524.2					
C	SDW06.0221	TOLUENE	524.2					
C	SDW06.0222	1,2,4-TRICHLOROBENZENE	524.2					
C	SDW06.0223	1,1-DICHLOROETHYLENE	524.2					
C	SDW06.0224	1,1,2-TRICHLOROETHANE	524.2					
C	SDW06.0225	VINYL CHLORIDE	524.2					
C	SDW06.0226	XYLENES (TOTAL)	524.2					
C	SDW06.0300	VOLATILE ORGANIC CHEMICALS(UNREG)	524.2					
C	SDW06.0302	BROMOCHLOROMETHANE	524.2					
C	SDW06.0303	BROMOMETHANE	524.2					
C	SDW06.0304	n-BUTYLBENZENE	524.2					

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C	SDW06.0305	sec-BUTYLBENZENE	524.2					
C	SDW06.0306	tert-BUTYLBENZENE	524.2					
C	SDW06.0307	CHLOROETHANE	524.2					
C	SDW06.0308	CHLOROMETHANE	524.2					
C	SDW06.0309	o-CHLOROTOLUENE	524.2					
C	SDW06.0310	p-CHLOROTOLUENE	524.2					
C	SDW06.0311	1,2-DIBROMO-3-CHLOROPROPANE	524.2					
C	SDW06.0312	1,2-DIBROMOETHANE	524.2					
C	SDW06.0313	DIBROMOMETHANE	524.2					
C	SDW06.0314	DICHLORODIFLUOROMETHANE	524.2					
C	SDW06.0315	1,3-DICHLOROPROPANE	524.2					
C	SDW06.0316	2,2-DICHLOROPROPANE	524.2					
C	SDW06.0317	1,1-DICHLOROPROPENE	524.2					
C	SDW06.0318	cis-1,3-DICHLOROPROPENE	524.2					
C	SDW06.0319	trans-1,3-DICHLOROPROPENE	524.2					
C	SDW06.0320	HEXACHLOROBUTADIENE	524.2					
C	SDW06.0321	ISOPROPYLBENZENE	524.2					
C	SDW06.0322	p-ISOPROPYLTOLUENE	524.2					
C	SDW06.0323	n-PROPYLBENZENE	524.2					
C	SDW06.0324	1,1,1,2-TETRACHLOROETHANE	524.2					
C	SDW06.0325	1,2,3-TRICHLOROBENZENE	524.2					
C	SDW06.0326	TRICHLOROFLUOROMETHANE	524.2					
C	SDW06.0327	1,2,3-TRICHLOROPROPANE	524.2					
C	SDW06.0328	1,2,4-TRIMETHYLBENZENE	524.2					
C	SDW06.0330	1,3,5-TRIMETHYLBENZENE	524.2					
C	SDW06.0331	NITROBENZENE	524.2					

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C	SDW06.0341	ACETONE	524.2					
C	SDW06.0342	ACRYLONITRILE	524.2					
C	SDW06.0343	ALLYL CHLORIDE	524.2					
C	SDW06.0344	2-BUTANONE	524.2					
C	SDW06.0345	CARBON DISULFIDE	524.2					
C	SDW06.0346	CHLOROACETONITRILE	524.2					
C	SDW06.0347	1-CHLOROBUTANE	524.2					
C	SDW06.0348	t-1,2-DICHLORO-2-BUTENE	524.2					
C	SDW06.0349	1,1-DICHLOROPROPANONE	524.2					
C	SDW06.0350	DIETHYL ETHER	524.2					
C	SDW06.0351	ETHYL METHACRYLATE	524.2					
C	SDW06.0352	HEXACHLOROETHANE	524.2					
C	SDW06.0353	2-HEXANONE	524.2					
C	SDW06.0354	METHACRYLONITRILE	524.2					
C	SDW06.0355	METHYLACRYLATE	524.2					
C	SDW06.0356	METHYL IODIDE	524.2					
C	SDW06.0357	METHYLMETHACRYLATE	524.2					
C	SDW06.0358	4-METHYL-2-PENTANONE	524.2					
C	SDW06.0359	NITROPROPANE	524.2					
C	SDW06.0360	PENTACHLOROETHANE	524.2					
C	SDW06.0361	PROPIONITRILE	524.2					
C	SDW06.0362	TETRAHYDROFURAN	524.2					
C	SDW06.0363	1,2,3-TRICHLOROBENZENE	524.2					
A	SDW07.0100	GROSS ALPHA-BETA	900.0		7110B			
A	SDW07.0400	RADIUM-226	903.1		7500-Ra C			
A	SDW07.0410	RADIUM-228	904.0		7500-Ra D			

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A	SDW07.0500	RADIUM,TOTAL			7500-Ra B			
A	SDW07.0800	URANIUM			7500-U C SM17th			
C	SHW02.0100	IGNITABILITY					1010 REV 0, 9/86	
C	SHW02.0300	CORROSIVITY, pH WASTE, >20% WATER					9040B, REV 2, 1/95	
C	SHW02.0500	REACTIVITY					7.3.3.2, REV 3, 12/96	
C	SHW02.0600	REACTIVITY					7.3.4.2, REV 3, 12/96	
A	SHW02.0690	VOLATILE ORGANICS					1311, REV 0, 7/92	
C	SHW02.0700	METALS/SEMI VOLATILE ORGANICS					1311, REV 0, 7/92	
C	SHW02.0710	METALS/ORGANICS					1310A, REV 1, 7/92	
C	SHW02.0800	METALS/ORGANICS					1312, REV 0, 9/94	
C	SHW02.0900	METALS/ORGANICS					1320, REV 0, 9/86	
C	SHW02.1000	METALS/OILY WASTE					1330A, REV 1, 7/92	
C	SHW04.0100	METALS, TOTAL REC. + DISSOLVED					3005A, REV 1, 7/92	
C	SHW04.0150	METALS, TOTAL					3010A, REV 1, 7/92	
C	SHW04.0200	METALS					3020A, REV 1, 7/92	
C	SHW04.0210	METALS					3015, REV 0, 9/94,	
C	SHW04.0250	METALS					3040A, REV 1, 12/96	
C	SHW04.0300	METALS					3050B, REV 2, 12/96	
C	SHW04.0350	METALS					3051, REV 0, 9/94	
C	SHW04.0500	ALUMINUM					6010B REV 2, 12/96	
A	SHW04.0650	ANTIMONY					6010B, REV 2, 12/96	
C	SHW04.0800	ANTIMONY					7041, REV 0, 9/86	
A	SHW04.0900	ARSENIC					6010B, REV 2, 12/96	
C	SHW04.1100	ARSENIC					7062, REV 0, 9/94	
A	SHW04.1110	ARSENIC					7060A, REV 0, 9/94	

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tatus	Code	Parameter	EPA	ASTM	SM18	USGS	SW846	Other
C	SHW04.1150	BARIUM					6010B, REV 2, 12/96	
C	SHW04.1350	BERYLLIUM					6010B, REV 2, 12/96	
C	SHW04.1550	CADMIUM					6010B, REV 2, 12/96	
C	SHW04.1700	CADMIUM					7131A, REV 1, 9/94	
A	SHW04.1750	CALCIUM					6010B, REV 2, 12/96	
C	SHW04.1850	CHROMIUM					6010B, REV 2, 12/96	
C	SHW04.2100	CHROMIUM (VI)					7196A, REV 1, 7/92	
C	SHW04.2250	COBALT					6010B, REV 2, 12/96	
C	SHW04.2400	COBALT					7201, REV 0, 9/86	
C	SHW04.2450	COPPER					6010B, REV 2, 12/96	
C	SHW04.2600	IRON					6010B, REV 2, 12/96	
C	SHW04.2750	LEAD					6010B, REV 2, 12/96	
C	SHW04.2900	LEAD					7421, REV 0, 9/86	
C	SHW04.3050	MAGNESIUM					6010B, REV 2, 12/96	
C	SHW04.3150	MANGANESE					6010B, REV 2, 12/96	
C	SHW04.3300	MERCURY, LIQUID WASTE					7470A, REV 1, 9/94	
C	SHW04.3350	MERCURY, SOLID WASTE					7471A, REV 1, 9/94	
C	SHW04.3400	MOLYBDENUM					6010B, REV 2, 12/96	
C	SHW04.3500	MOLYBDENUM					7481, REV 0, 9/86	
C	SHW04.3550	NICKEL					6010B, REV 2, 12/96	
C	SHW04.3800	POTASSIUM					6010B, REV 2, 12/96	
A	SHW04.3900	SELENIUM					6010B, REV 2, 12/96	
C	SHW04.3950	SELENIUM					7740, REV 0, 9/86	
C	SHW04.4100	SILVER					6010B, REV 2, 12/96	
C	SHW04.4250	SILVER					7761, REV 0, 7/92	
C	SHW04.4300	SODIUM					6010B, REV 2, 12/96	

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Status	Code	Parameter	EPA	ASTM	SM18	USGS	SW846	Other
A	SHW04.4500	THALLIUM					6010B, REV 2, 12/96	
C	SHW04.4650	THALLIUM					7841, REV 0, 9/86	
C	SHW04.4750	VANADIUM					6010B, REV 2, 12/96	
C	SHW04.4900	ZINC					6010B, REV 2, 12/96	
C	SHW05.0000	ORGANIC EXTRACTION					3500B, REV 2, 12/96	
C	SHW05.0100	SEMIVOLATILE ORGANICS					3510C, REV 3, 12/96	
C	SHW05.0200	SEMIVOLATILE ORGANICS					3520C, REV 3, 12/96	
C	SHW05.0300	SEMIVOLATILE ORGANICS					3540C, REV 3, 12/96	
A	SHW05.0400	SEMIVOLATILE ORGANICS					3541, REV 0, 9/94	
C	SHW05.0500	SEMIVOLATILE ORGANICS					3550B, REV 2, 12/96	
C	SHW05.0600	ORGANICS					3580A, REV 1, 7/92	
C	SHW05.0700	VOLATILE ORGANICS					5030B, REV 2, 12/96	
C	SHW05.1200	SEMIVOLATILE ORGANICS					3620B, REV 2, 12/96	
C	SHW05.1300	SEMIVOLATILE ORGANICS					3630C, REV 3, 12/96	
C	SHW05.1400	SEMIVOLATILE ORGANICS					3640A, REV 1, 9/94	
C	SHW05.1600	SEMIVOLATILE ORGANICS					3660, REV 2, 12/96	
C	SHW05.1700	SEMIVOLATILE ORGANICS					3665A, REV 1, 12/96	
C	SHW06.0500	VOLATILE ORGANICS					8021B, REV 2, 12/96	
C	SHW06.0501	BENZENE					8021B, REV 2, 12/96	
C	SHW06.0502	CHLOROBENZENE					8021B, REV 2, 12/96	
C	SHW06.0503	1,2-DICHLOROBENZENE					8021B, REV 2, 12/96	
C	SHW06.0504	1,3-DICHLOROBENZENE					8021B, REV 2, 12/96	
C	SHW06.0505	1,4-DICHLOROBENZENE					8021B, REV 2, 12/96	
C	SHW06.0506	ETHYLBENZENE					8021B, REV 2, 12/96	
C	SHW06.0507	TOLUENE					8021B, REV 2, 12/96	
C	SHW06.0508	O-XYLENE					8021B, REV 2, 12/96	

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C	SHW06.0509	M-XYLENE					8021B, REV 2, 12/96	
C	SHW06.0510	P-XYLENE					8021B, REV 2, 12/96	
C	SHW06.0536	METHYL-TERT-BUTYL ETHER					8021B, REV 2, 12/96	
C	SHW06.1200	ORGANOCHLOROPESTICIDES					8081A, REV 1, 12/96	
C	SHW06.1201	ALDRIN					8081A, REV 1, 12/96	
C	SHW06.1202	ALPHA-BHC					8081A, REV 1, 12/96	
C	SHW06.1203	BETA-BHC					8081A, REV 1, 12/96	
C	SHW06.1204	DELTA-BHC					8081A, REV 1, 12/96	
C	SHW06.1205	GAMMA-BHC (LINDANE)					8081A, REV 1, 12/96	
C	SHW06.1206	CHLORDANE (TECHNICAL)					8081A, REV 1, 12/96	
C	SHW06.1209	4,4'-DDD					8081A, REV 1, 12/96	
C	SHW06.1210	4,4'-DDE					8081A, REV 1, 12/96	
C	SHW06.1211	4,4'-DDT					8081A, REV 1, 12/96	
C	SHW06.1212	DIELDRIN					8081A, REV 1, 12/96	
C	SHW06.1213	ENDOSULFAN I					8081A, REV 1, 12/96	
C	SHW06.1214	ENDOSULFAN II					8081A, REV 1, 12/96	
C	SHW06.1215	ENDOSULFAN SULFATE					8081A, REV 1, 12/96	
C	SHW06.1216	ENDRIN					8081A, REV 1, 12/96	
C	SHW06.1217	ENDRIN ALDEHYDE					8081A, REV 1, 12/96	
C	SHW06.1218	ENDRIN KETONE					8081A, REV 1, 12/96	
C	SHW06.1219	HEPTACHLOR					8081A, REV 1, 12/96	
C	SHW06.1220	HEPTACHLOR EPOXIDE					8081A, REV 1, 12/96	
C	SHW06.1221	METHOXYCHLOR					8081A, REV 1, 12/96	
C	SHW06.1222	TOXAPHENE					8081A, REV 1, 12/96	
C	SHW06.1310	PCB's					8082, REV 0, 12/96	
C	SHW06.1311	PCB-1016					8082, REV 0, 12/96	

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C	SHW06.1312	PCB-1221					8082, REV 0, 12/96	
C	SHW06.1313	PCB-1232					8082, REV 0, 12/96	
C	SHW06.1314	PCB-1242					8082, REV 0, 12/96	
C	SHW06.1315	PCB-1248					8082, REV 0, 12/96	
C	SHW06.1316	PCB-1254					8082, REV 0, 12/96	
C	SHW06.1317	PCB-1260					8082, REV 0, 12/96	
C	SHW06.2300	CHLOROHERBICIDES					8151A, REV 1, 9/96	
C	SHW06.2301	DALAPON					8151A, REV 1, 9/96	
C	SHW06.2302	DICAMBA					8151A, REV 1, 9/96	
C	SHW06.2303	DINOSEB					8151A, REV 1, 9/96	
C	SHW06.2304	2,4-D					8151A, REV 1, 9/96	
C	SHW06.2305	2,4,5-T					8151A, REV 1, 9/96	
C	SHW06.2306	2,4,5-TP					8151A, REV 1, 9/96	
C	SHW06.2400	CHLOROHERBICIDES (TCLP ONLY)					8151A, REV 1, 9/96	
C	SHW06.2401	2,4,5-TP (SILVEX)					8151A, REV 1, 9/96	
A	SHW06.2402	2,4-D					8151A, REV 1, 9/96	
C	SHW07.0400	VOLATILE ORGANICS					8260B, REV 2, 12/96	
C	SHW07.0401	BENZENE					8260B, REV 2, 12/96	
C	SHW07.0402	CHLOROBENZENE					8260B, REV 2, 12/96	
C	SHW07.0403	1,2-DICHLOROBENZENE					8260B, REV 2, 12/96	
C	SHW07.0404	1,3-DICHLOROBENZENE					8260B, REV 2, 12/96	
C	SHW07.0405	1,4-DICHLOROBENZENE					8260B, REV 2, 12/96	
C	SHW07.0406	ETHYLBENZENE					8260B, REV 2, 12/96	
C	SHW07.0407	TOLUENE					8260B, REV 2, 12/96	
C	SHW07.0408	TOTAL XYLENES					8260B, REV 2, 12/96	
C	SHW07.0409	BROMODICHLOROMETHANE					8260B, REV 2, 12/96	

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C	SHW07.0410	BROMOFORM					8260B, REV 2, 12/96	
C	SHW07.0411	BROMOMETHANE					8260B, REV 2, 12/96	
C	SHW07.0412	CARBON TETRACHLORIDE					8260B, REV 2, 12/96	
C	SHW07.0413	CHLOROETHANE					8260B, REV 2, 12/96	
C	SHW07.0414	CHLOROETHYLVINYL ETHER					8260B, REV 2, 12/96	
C	SHW07.0415	CHLOROFORM					8260B, REV 2, 12/96	
C	SHW07.0416	CHLOROMETHANE					8260B, REV 2, 12/96	
C	SHW07.0417	TRANS, 3-DICHLOROPROPENE					8260B, REV 2, 12/96	
C	SHW07.0418	DIBROMOCHLOROMETHANE					8260B, REV 2, 12/96	
C	SHW07.0419	DICHLORODIFLUOROMETHANE					8260B, REV 2, 12/96	
C	SHW07.0420	1,1-DICHLOROETHANE					8260B, REV 2, 12/96	
C	SHW07.0421	1,2-DICHLOROETHANE					8260B, REV 2, 12/96	
C	SHW07.0422	1,1-DICHLOROETHENE					8260B, REV 2, 12/96	
C	SHW07.0423	1,2-DICHLOROETHENE (TOTAL)					8260B, REV 2, 12/96	
C	SHW07.0424	1,2-DICHLOROPROPANE					8260B, REV 2, 12/96	
C	SHW07.0425	CIS 1,3-DICHLOROPROPENE					8260B, REV 2, 12/96	
C	SHW07.0426	METHYLENE CHLORIDE					8260B, REV 2, 12/96	
C	SHW07.0427	1,1,2,2-TETRACHLOROETHANE					8260B, REV 2, 12/96	
C	SHW07.0428	TETRACHLOROETHENE					8260B, REV 2, 12/96	
C	SHW07.0429	1,1,1-TRICHLOROETHANE					8260B, REV 2, 12/96	
C	SHW07.0430	1,1,2-TRICHLOROETHANE					8260B, REV 2, 12/96	
C	SHW07.0431	TRICHLOROETHENE					8260B, REV 2, 12/96	
C	SHW07.0432	TRICHLOROFLUOROMETHANE					8260B, REV 2, 12/96	
C	SHW07.0433	VINYL CHLORIDE					8260B, REV 2, 12/96	
C	SHW07.0434	ACETONE					8260B, REV 2, 12/96	
C	SHW07.0435	CARBON DISULFIDE					8260B, REV 2, 12/96	

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C	SHW07.0436	2-BUTANONE					8260B, REV 2, 12/96	
C	SHW07.0437	2-HEXANONE					8260B, REV 2, 12/96	
C	SHW07.0438	4-METHYL-2-PENTANONE					8260B, REV 2, 12/96	
C	SHW07.0439	METHYL-TERT-BUTYL ETHER					8260B, REV 2, 12/96	
A	SHW07.0440	ACROLEIN					8260B, REV 2, 12/96	
A	SHW07.0441	ACRYLONITRILE					8260B, REV 2, 12/96	
C	SHW07.0450	HEXACHLOROBUTADIENE					8260B, REV 2, 12/96	
C	SHW07.0453	HEXACHLOROETHANE					8260B, REV 2, 12/96	
C	SHW07.0454	NAPTHALENE					8270C, REV 2, 12/96	
C	SHW07.0455	STYRENE					8260B, REV 2, 12/96	
C	SHW07.0456	1,1,1,2-TETRACHLOROETHANE					8260B, REV 2, 12/96	
C	SHW07.0457	1,2,4-TRICHLOROBENZENE					8260B, REV 2, 12/96	
C	SHW07.0458	NITROBENZENE					8260B, REV 2, 12/96	
C	SHW07.0500	SEMIVOLATILE ORGANICS					8270C, REV 3, 12/96	
C	SHW07.0501	N-NITROSODIPHENYLAMINE					8270C, REV 3, 12/96	
C	SHW07.0503	CARBAZOLE					8270C, REV 3, 12/96	
C	SHW07.0504	3,3'-DICHLOROBENZIDINE					8270C, REV 3, 12/96	
C	SHW07.0505	4-CHLORANILINE					8270C, REV 3, 12/96	
C	SHW07.0506	2-NITROANILINE					8270C, REV 3, 12/96	
C	SHW07.0507	2-CHLORONAPHTHALENE					8270C, REV 3, 12/96	
C	SHW07.0508	HEXACHLOROBENZENE					8270C, REV 3, 12/96	
C	SHW07.0509	HEXACHLOROBUTADIENE					8270C, REV 3, 12/96	
C	SHW07.0510	HEXACHLOROCYCLOPENTADIENE					8270C, REV 3, 12/96	
C	SHW07.0511	HEXACHLOROETHANE					8270C, REV 3, 12/96	
C	SHW07.0512	1,2,4-TRICHLOROBENZENE					8270C, REV 3, 12/96	
C	SHW07.0513	BIS (2-CHLOROETHOXY) METHANE					8270C, REV 3, 12/96	

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C	SHW07.0514	BIS (2-CHLOROISOPROPYL) ETHER (2,2-OXYBIS) (1-CHLOROPROPANE)					8270C, REV 3, 12/96	
C	SHW07.0515	4-CHLOROPHENYL-PHENYLETHER					8270C, REV 3, 12/96	
C	SHW07.0516	4-BROMOPHENYL-PHENYLETHER					8270C, REV 3, 12/96	
C	SHW07.0517	2,4-DINITROTOLUENE					8270C, REV 3, 12/96	
C	SHW07.0518	2,6-DINITROTOLUENE					8270C, REV 3, 12/96	
C	SHW07.0519	ISOPHORONE					8270C, REV 3, 12/96	
C	SHW07.0520	NITROBENZENE					8270C, REV 3, 12/96	
C	SHW07.0521	BUTYL BENZYL PHTHALATE					8270C, REV 3, 12/96	
C	SHW07.0522	BIS (2-ETHYLHEXYL) PHTHALATE					8270C, REV 3, 12/96	
C	SHW07.0523	DIETHYL PHTHALATE					8270C, REV 3, 12/96	
C	SHW07.0524	DIMETHYL PHTHALATE					8270C, REV 3, 12/96	
C	SHW07.0525	DI-N-BUTYL PHTHALATE					8270C, REV 3, 12/96	
C	SHW07.0526	DI-N-OCTYL PHTHALATE					8270C, REV 3, 12/96	
C	SHW07.0527	ACENAPHTHENE					8270C, REV 3, 12/96	
C	SHW07.0528	ANTHRACENE					8270C, REV 3, 12/96	
C	SHW07.0529	ACENAPHTHYLENE					8270C, REV 3, 12/96	
C	SHW07.0530	BENZO(A)ANTHRACENE					8270C, REV 3, 12/96	
C	SHW07.0531	BENZO(A)PYRENE					8270C, REV 3, 12/96	
C	SHW07.0532	BENZO(B)FLUORANTHENE					8270C, REV 3, 12/96	
C	SHW07.0533	BENZO(GHI)PERYLENE					8270C, REV 3, 12/96	
C	SHW07.0534	BENZO(K)FLUORANTHENE					8270C, REV 3, 12/96	
C	SHW07.0535	CHRYSENE					8270C, REV 3, 12/96	
C	SHW07.0536	DIBENZO(A,H)ANTHRACENE					8270C, REV 3, 12/96	
C	SHW07.0537	FLUORANTHENE					8270C, REV 3, 12/96	
C	SHW07.0538	FLUORENE					8270C, REV 3, 12/96	

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C	SHW07.0539	INDENO(1,2,3-CD)PYRENE					8270C, REV 3, 12/96	
C	SHW07.0540	2-METHYLNAPHTHALENE					8270C, REV 3, 12/96	
C	SHW07.0541	NAPHTHALENE					8270C, REV 3, 12/96	
C	SHW07.0542	PHENANTHRENE					8270C, REV 3, 12/96	
C	SHW07.0543	PYRENE					8270C, REV 3, 12/96	
C	SHW07.0544	4-CHLORO-3-METHYL-PHENOL					8270C, REV 3, 12/96	
C	SHW07.0545	2-CHLOROPHENOL					8270C, REV 3, 12/96	
C	SHW07.0546	2,4-DICHLOROPHENOL					8270C, REV 3, 12/96	
C	SHW07.0547	2,4-DIMETHYLPHENOL					8270C, REV 3, 12/96	
C	SHW07.0548	2,4-DINITROPHENOL					8270C, REV 3, 12/96	
C	SHW07.0549	2-METHYL-4,6-DINITROPHENOL					8270C, REV 3, 12/96	
C	SHW07.0550	2-METHYLPHENOL					8270C, REV 3, 12/96	
C	SHW07.0551	4-METHYLPHENOL					8270C, REV 3, 12/96	
C	SHW07.0552	2-NITROPHENOL					8270C, REV 3, 12/96	
C	SHW07.0553	4-NITROPHENOL					8270C, REV 3, 12/96	
C	SHW07.0554	PENTACHLOROPHENOL					8270C, REV 3, 12/96	
C	SHW07.0555	PHENOL					8270C, REV 3, 12/96	
C	SHW07.0556	2,4,5-TRICHLOROPHENOL					8270C, REV 3, 12/96	
C	SHW07.0557	2,4,6-TRICHLOROPHENOL					8270C, REV 3, 12/96	
C	SHW07.0559	3-METHYLPHENOL					8270C, REV 3, 12/96	
C	SHW07.0560	DIBENZOFURAN					8270C, REV 3, 12/96	
C	SHW07.0570	1,4-DICHLOROBENZENE					8270C, REV 3, 12/96	
C	SHW07.0575	PYRIDINE					8270C, REV 3 12/96	
C	SHW09.0100	TOTAL REC. PETROL. HYDROCARBONS					8440, REV 0, 12/96	
C	SHW09.0200	CYANIDE TOTAL					9010B, REV 2, 12/96	
C	SHW09.0200	CYANIDE TOTAL					9010B, REV 2, 12/96	

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C	SHW09.0300	CYANIDE TOTAL, AMENABLE TO Cl2					9010B, REV 2, 12/96	
C	SHW09.0300	CYANIDE TOTAL, AMENABLE TO Cl2					9010B, REV 2, 12/96	
C	SHW09.0900	SULFIDES, ACID SOL. & INSOLUBLES					9030B, REV 2, 12/96	
C	SHW09.1010	SULFIDES, ACID SOL. & INSOL.					9034, REV 0, 12/96	
C	SHW09.1400	pH, WASTE, >20% WATER					9040B, REV 2, 1/95	
C	SHW09.1600	pH, SOIL AND WASTE					9045C, REV 3, 1/95	
C	SHW09.2100	PHENOLICS(PHENOLS)					9065, REV 0, 9/86	
A	SHW09.2400	OIL & GREASE TOTAL					9070, REV 0, 9/86	
A	SHW09.2500	OIL & GREASE, SLUDGE-HEM					9071B, REV 2, 5/99	
C	SHW09.2900	FREE LIQUID					9095, REV 0, 9/86	
A	SHW09.3400	CHLORIDE					9253, REV 0, 9/94	
A	WPP02.0100	ACIDITY as CaCO3	305.1					
C	WPP02.0150	ALKALINITY as CaCO3	310.1					
C	WPP02.0350	AMMONIA	350.2+ .3					
C	WPP02.0500	BIOCHEMICAL OXYGEN DEMAND	405.1					
A	WPP02.0600	BORON-TOTAL	200.7					
C	WPP02.0800	CALCIUM-TOTAL	200.7					
C	WPP02.1050	CHEMICAL OXYGEN DEMAND	410.4					
C	WPP02.1100	CHLORIDE						
C	WPP02.1500	CYANIDE	335.2					
A	WPP02.1600	CYANIDE AMENABLE TO Cl2	335.1					
A	WPP02.1650	FLUORIDE-TOTAL	340.2					
C	WPP02.1900	HARDNESS-TOTAL as CaCO3	130.2					
C	WPP02.2400	MAGNESIUM - TOTAL	200.7					
A	WPP02.2650	NITRATE-NITRITE	353.3					

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C	WPP02.2900	OIL & GREASE--TOTAL RECOV	413.1					
A	WPP02.2910	OIL & GREASE-HEM-LL	1664A					
C	WPP02.3150	ORTHOPHOSPHATE	365.2					
A	WPP02.3250	PHENOLS	420.1					
C	WPP02.3400	PHOSPHORUS(TOTAL)	365.2 + .3					
C	WPP02.3650	POTASSIUM	200.7					
C	WPP02.3800	RESIDUE-TOTAL	160.3					
C	WPP02.3850	RESIDUE-FILTERABLE(TDS)	160.1					
C	WPP02.3900	RESIDUE-NONFILTERABLE(TSS)	160.2					
A	WPP02.3950	RESIDUE-SETTLEABLE	160.5					
A	WPP02.4000	RESIDUE-VOLATILE	160.4					
A	WPP02.4250	SILICA-DISSOLVED	200.7					
C	WPP02.4400	SODIUM	200.7					
C	WPP02.4650	SULFATE	375.4					
A	WPP02.4750	SULFIDE-S	376.1					
C	WPP04.0200	ALUMINUM--TOTAL	200.7					
C	WPP04.0400	ANTIMONY--TOTAL	204.2					
C	WPP04.0500	ARSENIC--TOTAL	206.5 + .2					
C	WPP04.0800	BARIUM--TOTAL	200.7					
C	WPP04.1100	BERYLLIUM--TOTAL	200.7					
C	WPP04.1200	CADMIUM--TOTAL	213.2					
C	WPP04.1350	CADMIUM--TOTAL	200.7					
A	WPP04.1500	CHROMIUM VI DISSOLVED						
C	WPP04.1800	CHROMIUM-TOTAL	200.7					

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C	WPP04.1900	COBALT-TOTAL	219.2					
C	WPP04.1950	COBALT-TOTAL						
C	WPP04.2150	COPPER-TOTAL	200.7					
A	WPP04.2650	IRON-TOTAL	200.7					
C	WPP04.2750	LEAD-TOTAL	239.2					
C	WPP04.2800	LEAD-TOTAL	200.7					
C	WPP04.3100	MANGANESE-TOTAL	200.7					
C	WPP04.3300	MERCURY-TOTAL	245.1					
C	WPP04.3350	MERCURY-TOTAL	245.2					
C	WPP04.3450	MOLYBDENUM-TOTAL	246.2					
C	WPP04.3500	MOLYBDENUM-TOTAL	200.7					
C	WPP04.3700	NICKEL-TOTAL	249.2					
C	WPP04.3750	NICKEL-TOTAL	200.7					
C	WPP04.4500	SELENIUM-TOTAL	270.2					
C	WPP04.4700	SILVER-TOTAL	272.2					
C	WPP04.4800	SILVER-TOTAL	200.7					
C	WPP04.4950	THALLIUM-TOTAL	279.2					
C	WPP04.5000	THALLIUM-TOTAL	200.7					
C	WPP04.5400	VANADIUM-TOTAL	200.7					
C	WPP04.5600	ZINC-TOTAL	289.2					
C	WPP04.5650	ZINC-TOTAL	200.7					
C	WPP05.0200	PURGEABLE AROMATICS	602					
C	WPP05.0201	BENZENE	602					
C	WPP05.0202	CHLOROBENZENE	602					
C	WPP05.0203	1,2-DICHLOROBENZENE	602					
C	WPP05.0204	1,3-DICHLOROBENZENE	602					

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C	WPP05.0205	1,4-DICHLOROBENZENE	602					
C	WPP05.0206	ETHYLBENZENE	602					
C	WPP05.0207	TOLUENE	602					
C	WPP05.0900	ORGANOCHLORINE PESTICEDES	608					
C	WPP05.0901	ALDRIN	608					
C	WPP05.0902	ALPHA-BHC	608					
C	WPP05.0903	BETA-BHC	608					
C	WPP05.0904	DELTA-BHC	608					
C	WPP05.0905	GAMMA-BHC	608					
C	WPP05.0906	CHLORDANE	608					
C	WPP05.0907	4,4'-DDD	608					
C	WPP05.0908	4,4'-DDE	608					
C	WPP05.0909	4,4'-DDT	608					
C	WPP05.0910	DIELDRIN	608					
C	WPP05.0911	ENDOSULFAN I	608					
C	WPP05.0912	ENDOSULFAN II	608					
C	WPP05.0913	ENDOSULFAN SULFATE	608					
C	WPP05.0914	ENDRIN	608					
C	WPP05.0915	ENDRIN ALDEHYDE	608					
C	WPP05.0916	ENDRIN KETONE	608					
C	WPP05.0917	HEPTACHLOR	608					
C	WPP05.0918	HEPTACHLOR EPOXIDE	608					
C	WPP05.0919	METHOXYCHLOR	608					
C	WPP05.0920	TOXAPHENE	608					
C	WPP05.1101	PCB-1016	608					
C	WPP05.1102	PCB-1221	608					

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Status	Code	Parameter	EPA	ASTM	SM18	USGS	SW846	Other
C	WPP05.1103	PCB-1232	608					
C	WPP05.1104	PCB-1242	608					
C	WPP05.1105	PCB-1248	608					
C	WPP05.1106	PCB-1254	608					
C	WPP05.1107	PCB-1260	608					
C	WPP06.0200	VOLATILE ORGANICS	624					
C	WPP06.0201	BENZENE	624					
C	WPP06.0202	BROMODICHLOROMETHANE	624					
C	WPP06.0203	BROMOFORM	624					
C	WPP06.0204	BROMOMETHANE	624					
C	WPP06.0205	CARBON TETRACHLORIDE	624					
C	WPP06.0206	CHLOROBENZENE	624					
C	WPP06.0207	CHLOROETHANE	624					
C	WPP06.0208	2-CHLOROETHYLVINYL ETHER	624					
C	WPP06.0209	CHLOROFORM	624					
C	WPP06.0210	CHLOROMETHANE	624					
C	WPP06.0211	DIBROMOCHLOROMETHANE	624					
C	WPP06.0212	1,2-DICHLOROBENZENE	624					
C	WPP06.0213	1,3-DICHLOROBENZENE	624					
C	WPP06.0214	1,4-DICHLOROBENZENE	624					
C	WPP06.0215	1,1-DICHLOROETHANE	624					
C	WPP06.0216	1,2-DICHLOROETHANE	624					
C	WPP06.0217	1,1-DICHLOROETHENE	624					
C	WPP06.0218	TRANS-1,2-DICHLOROETHENE	624					
C	WPP06.0219	1,2-DICHLOROPROPANE	624					
C	WPP06.0220	CIS-1,3-DICHLOROPROPENE	624					

New Jersey Department of Environmental Protection
Environmental Laboratory Certification Program
Annual Certified Parameter List and Current Status

WASTE STREAM TECHNOLOGY INC
302 GROTE STREET
BUFFALO, NY 14207
Lab ID 73977

Effective Date: 07/01/00 Expiration Date: 06/30/01

Status	Code	Parameter	EPA	ASTM	SM18	USGS	SW846	Other
C	WPP06.0221	TRANS-1,3-DICHLOROPROPENE	624					
C	WPP06.0222	ETHYLBENZENE	624					
C	WPP06.0223	METHYLENE CHLORIDE	624					
C	WPP06.0224	1,1,2,2-TETRACHLOROETHANE	624					
C	WPP06.0225	TETRACHLOROETHENE	624					
C	WPP06.0226	TOLUENE	624					
C	WPP06.0227	1,1,1-TRICHLOROETHANE	624					
C	WPP06.0228	1,1,2-TRICHLOROETHANE	624					
C	WPP06.0229	TRICHLOROETHENE	624					
C	WPP06.0230	TRICHLOROFLUOROMETHANE	624					
C	WPP06.0231	VINYL CHLORIDE	624					
C	WPP06.0300	BASE/NEUTRALS AND ACIDS	625					
C	WPP06.0301	ACENAPHTHENE	625					
C	WPP06.0302	ACENAPHTHYLENE	625					
C	WPP06.0303	ANTHRACENE	625					
C	WPP06.0304	BENZO(A)ANTHRACENE	625					
C	WPP06.0305	BENZO(B)FLUORANTHENE	625					
C	WPP06.0306	BENZO(K)FLUORANTHENE	625					
C	WPP06.0307	BENZO(K)PYRENE	625					
C	WPP06.0308	BENZO(GHI)PERYLENE	625					
C	WPP06.0309	BUTYL BENZYL PHTHALATE	625					
C	WPP06.0310	BIS (2-CHLOROETHYL) ETHER	625					
C	WPP06.0311	BIS (2-CHLOROETHOXY)METHANE	625					
C	WPP06.0312	BIS (2-ETHYLHEXYL) PHTHALATE	625					
C	WPP06.0313	BIS (2-CHLOROISOPROPYL) ETHER	625					
C	WPP06.0314	4-BROMOPHENYL-PHENYL ETHER	625					

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Status	Code	Parameter	EPA	ASTM	SM18	USGS	SW846	Other
C	WPP06.0315	2-CHLORONAPHTHALENE	625					
C	WPP06.0316	4-CHLOROPHENYL-PHENYL ETHER	625					
C	WPP06.0317	CHRYSENE	625					
C	WPP06.0318	DIBENZO(A,H)ANTHRACENE	625					
C	WPP06.0319	DI-N-BUTYL PHTHALATE	625					
C	WPP06.0320	1,3-DICHLOROBENZENE	625					
C	WPP06.0321	1,2-DICHLOROBENZENE	625					
C	WPP06.0322	1,4-DICHLOROBENZENE	625					
C	WPP06.0323	3,3'-DICHLOROBENZIDINE	625					
C	WPP06.0324	DIETHYL PHTHALATE	625					
C	WPP06.0325	DIMETHYL PHTHALATE	625					
C	WPP06.0326	2,4-DINITROTOLUENE	625					
C	WPP06.0327	2,6-DINITROTOLUENE	625					
C	WPP06.0328	DI-N-OCTYL PHTHALATE	625					
C	WPP06.0329	FLUORANTHENE	625					
C	WPP06.0330	FLUORENE	625					
C	WPP06.0331	HEXACHLOROBENZENE	625					
C	WPP06.0332	HEXACHLOROBUTADIENE	625					
C	WPP06.0333	HEXACHLOROETHANE	625					
C	WPP06.0334	INDENO(1,2,3-CD)PYRENE	625					
C	WPP06.0335	ISOPHORONE	625					
C	WPP06.0336	NAPHTHALENE	625					
C	WPP06.0337	NITROBENZENE	625					
C	WPP06.0338	N-NITROSODI-N-PROPYLAMINE	625					
C	WPP06.0339	PHENANTHRENE	625					
C	WPP06.0340	PYRENE	625					

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Status	Code	Parameter	EPA	ASTM	SM18	USGS	SW846	Other
C	WPP06.0341	1,2,4-TRICHLOROBENZENE	625					
C	WPP06.0342	4-CHLORO-3-METHYL-PHENOL	625					
C	WPP06.0343	2-CHLOROPHENOL	625					
C	WPP06.0344	2,4-DICHLOROPHENOL	625					
C	WPP06.0345	2,4-DIMETHYLPHENOL	625					
C	WPP06.0346	2,4-DINITROPHENOL	625					
C	WPP06.0347	2-METHYL-4,6-DINITROPHENOL	625					
C	WPP06.0348	2-NITROPHENOL	625					
C	WPP06.0349	4-NITROPHENOL	625					
C	WPP06.0350	PENTACHLOROPHENOL	625					
C	WPP06.0351	PHENOL	625					
C	WPP06.0352	2,4,6-TRICHLOROPHENOL	625					
C	WPP06.0353	BENZOIC ACID	625					
C	WPP06.0354	P-CRESOL	625					
C	WPP06.0355	ACETOPHENONE	625					
C	WPP06.0356	ALPHA-TERPINEOL	625					
C	WPP06.0357	ANILINE	625					
C	WPP06.0358	BENZIDINE	625					
C	WPP06.0359	CARBAZOLE	625					
C	WPP06.0360	2,3-DICHLOROANILINE	625					
C	WPP06.0362	N-DECANE	625					
C	WPP06.0363	N-DOCOSANE	625					
C	WPP06.0364	N-DODECANE	625					
C	WPP06.0365	N-EICOSANE	625					
C	WPP06.0366	HEXACHLOROCYCLOPENTADIENE	625					
C	WPP06.0367	N-HEXADECANE	625					

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Effective Date: 07/01/00 Expiration Date: 06/30/01

Status	Code	Parameter	EPA	ASTM	SM18	USGS	SW846	Other
C	WPP06.0368	N-NITROSODIMETHYLAMINE	625					
C	WPP06.0369	N-NITROSODIPHENYLAMINE	625					
C	WPP06.0370	N-OCTADECANE	625					
C	WPP06.0371	N-TETRADECANE	625					
C	WPP06.0372	PYRIDINE	625					
C	WPP06.0373	1-METHYLPHENANTHRENE	625					
A	WPP09.0100	ALPHA-TOTAL			7110B			
A	WPP09.0200	ALPHA-COUNTING ERROR			7110B			
A	WPP09.0300	BETA-TOTAL			7110B			
A	WPP09.0400	BETA-COUNTING ERROR			7110B			
A	WPP09.0500	RADIUM-TOTAL			7500Ra B			
A	WPP09.0600	RADIUM-226			7500Ra C			

Key: A Applied, C Certified, D Dropped by Lab, S Suspended, T Temporary Certification

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
HTRW CENTER OF EXPERTISE
12565 WEST CENTER ROAD
OMAHA, NEBRASKA 68144-3869

REPLY TO
ATTENTION OF

RECEIVED
MAR 13 2000

March 9, 2000

Hazardous, Toxic and Radioactive Waste
Center of Expertise

Waste Stream Technology Inc.
303 Grote Street
Buffalo, NY 14207-2496

Gentlemen:

This correspondence addresses the ongoing validation status of Waste Stream Technology Inc. of Buffalo, NY for the U.S. Army Corps of Engineers (USACE) for chemical analysis in support of the USACE Hazardous, Toxic and Radioactive Waste Program.

Waste Stream Technology Inc. is now validated for the parameters listed below:

METHOD	PARAMETERS	MATRIX(1)
300 series	Anions(4)	Water(2)
9010B/9012A	Cyanide	Water(2)
9013	Cyanide	Solids
8151A	Herbicides	Water(2)
8151A	Herbicides	Solids
1664	Oil & Grease	Water
1664	Oil & Grease	Solids
8081A	Organochlorine Pesticides	Water(2)
8081A	Organochlorine Pesticides	Solids
8082	Polychlorinated Biphenyls	Water(2)
8082	Polychlorinated Biphenyls	Solids(2)
8270C	Semivolatile Organics	Water(2)
8270C	Semivolatile Organics	Solids(2)
SW-846	TAL Metals(3)	Water(2)
SW-846	TAL Metals(3)	Solids(2)
Mod 8015	Total Petroleum Hydrocarbons - DRO(5)	Water
Mod 8015	Total Petroleum Hydrocarbons - DRO(5)	Solids
9060	Total Organic Carbon	Water(2)
418.1	TRPH(5)	Water
418.1/9071	TRPH(5)	Solids
8021B	Volatile Organics(6)	Water(2)
8021B	Volatile Organics(6)	Solids
8260B	Volatile Organics	Water(2)
8260B	Volatile Organics(7)	Solids(2)

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M-URT-00-XX	Standard Operating Procedure for Measuring Total Uranium by Alpha Spectroscopy(5)	Water
M-URT-00-XX	Standard Operating Procedure for Measuring Total Uranium by Alpha Spectroscopy(5)	Solids
M-RA228-01-XX	Standard Operating Procedure for Measuring Radium-228 using Method Ra-05 and SM 7500-Ra D(5)	Water
M-RA228-01-XX	Standard Operating Procedure for Measuring Radium-228 using Method Ra-05 and SM 7500-Ra D(5)	Solids
M-AB-00-XX	Standard Operating Procedure for Measuring Gross Alpha & Gross Beta Using Standard Method 7110 B & Method DOE/EM-0089T(5)	Water
M-AB-00-XX	Standard Operating Procedure for Measuring Gross Alpha & Gross Beta Using Standard Method 7110 B & Method DOE/EM-0089T(5)	Solids
M-TH-01-XX	Standard Operating Procedure for Measuring Isotopic Thorium using Method USAEC RM-3008(5)	Water
M-TH-01-XX	Standard Operating Procedure for Measuring Isotopic Thorium using Method USAEC RM-3008(5)	Solids
M-RA226-02-XX	Standard Operating Procedure for Measuring Radium-226 using Methods Ra-05 and SM 7500-Ra B(5)	Water
M-RA226-02-XX	Standard Operating Procedure for Measuring Radium-226 using Methods Ra-05 and SM 7500-Ra B(5)	Solids

Remarks: 1) 'Solids' includes soils, sediments, and solid waste.

2) The laboratory has successfully analyzed a performance evaluation sample for this method/matrix.

3) TAL Metals: Aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc.

4) Anions: Chloride, fluoride, sulfate, nitrate, nitrite, and ortho-phosphate.

5) Approval for this parameter is based on review of SOPs only.

6) Approval for this parameter is a for a limited project specific list.

7) Laboratory does not perform Method 5035 for soil samples. Approval is for soil samples for this project only, which does not require Method 5035 for soil samples.

Based on the recent successful analysis for TOC in Water by EPA 90760, your laboratory will continue to be validated for sample analysis by the methods listed above. The period of validation for all parameters has been previously established and expires on July 20, 2001.

The USACE reserves the right to conduct additional laboratory inspections or to suspend validation status for any or all of the listed parameters if deemed necessary. It should be noted that your laboratory may not subcontract USACE analytical work to any other laboratory location without the approval of this office. This laboratory validation does not guarantee the delivery of any analytical samples from a USACE Contracting Officer Representative.

Any questions or comments can be directed to Richard Kissinger at (404) 697-2569. General questions regarding laboratory validation may be directed to the Laboratory Validation Coordinator at (402) 697-2574.

Sincerely,

Marcia C. Davies

Marcia C. Davies, Ph.D.
Director, USACE Hazardous,
Toxic and Radioactive Waste
Center of Expertise

1999 - 2000

FLORIDA DEPARTMENT OF HEALTH

State of Florida, Department of Health,
Bureau of Laboratories, Environmental Water

This is to certify that

E87581
Waste Stream Technology, Inc.
302 Grote Street
Buffalo, NY 14207

has complied with Florida Administrative Code 64E-1, Part II, for the examination of environmental water in the following categories:

Metals, Extractable Organics (GC,GC/MS), General Category I, General Category II, Pesticides/Herbicides/PCB's (GC), Purgeable Organics (GC,GC/MS), Hazardous Waste Characterization ****************

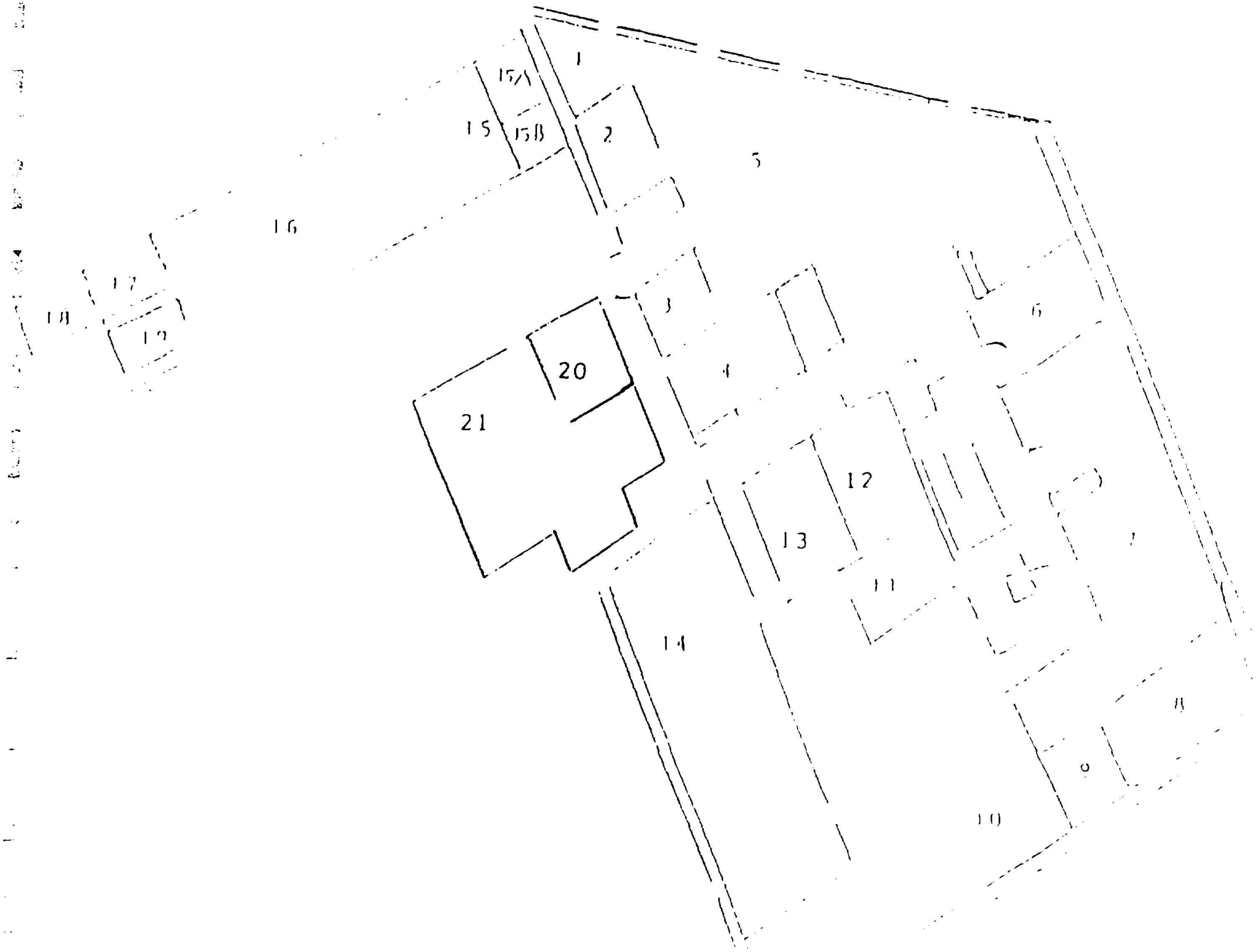
Specific methods, parameters, and analytes certified are on file at the Bureau of Laboratories, P. O. Box 210, Jacksonville, Florida 32231

EFFECTIVE JULY 1, 1999 **THROUGH JUNE 30, 2000**

Ming S. Chan, Ph.D.
Acting Bureau Chief, Bureau of Laboratories
Florida Department of Health
DH Form 1697, 3/98
NON-TRANSFERABLE ENV99329

WASTE STREAM TECHNOLOGY INC.
LABORATORIES

1. Office-QA/QC Officer
2. Office-Laboratory Director
3. Office-Assistant Lab Director
4. Office-Reporting, QA/QC & Analysts
5. Organics Analysis Instrumentation
6. Office-Chemistry Lab Supervisor & Chemists
7. General Prep Laboratory
8. Organics Extraction Laboratory
9. ZHE, BTU, TCLP Laboratory
10. Coldroom Storage Area
11. Sample Archive Room
12. TCLP/SPLP Extraction Room
13. Sample Receipt Room
14. Archive Room
15. Metals Analysis Instrumentation Area
15A. Inorganics Extraction Laboratory
15B. Inorganics Extraction Laboratory
16. R&D Laboratory
17. Office-Lab Technicians
18. Office-Analysts
19. Office-R&D Director
20. Office-Radiochemistry Lab Manager
21. Radiochemistry Laboratory



Quality Control Sample Acceptance Criteria

Waste Stream Technology Inc.

QC Acceptance Criteria for Metals

Analyte	Reference Sample QC Limits		RPD QC Limits	Matrix Spike QC Limits	
	Soil	Water		Soil	Water
Zinc	85 - 115	85 - 115	25	75 - 125	75 - 125
Lead	85 - 115	85 - 115	25	75 - 125	75 - 125
Cadmium	85 - 115	85 - 115	25	75 - 125	75 - 125
Cobalt	85 - 115	85 - 115	25	75 - 125	75 - 125
Nickel	85 - 115	85 - 115	25	75 - 125	75 - 125
Barium	85 - 115	85 - 115	25	75 - 125	75 - 125
Manganese	85 - 115	85 - 115	25	75 - 125	75 - 125
Iron	85 - 115	85 - 115	25	75 - 125	75 - 125
Chromium	85 - 115	85 - 115	25	75 - 125	75 - 125
Magnesium	85 - 115	85 - 115	25	75 - 125	75 - 125
Vanadium	85 - 115	85 - 115	25	75 - 125	75 - 125
Aluminum	85 - 115	85 - 115	25	75 - 125	75 - 125
Beryllium	85 - 115	85 - 115	25	75 - 125	75 - 125
Calcium	85 - 115	85 - 115	25	75 - 125	75 - 125
Copper	85 - 115	85 - 115	25	75 - 125	75 - 125
Silver	85 - 115	85 - 115	25	75 - 125	75 - 125
Potassium	85 - 115	85 - 115	25	75 - 125	75 - 125
Sodium	85 - 115	85 - 115	25	75 - 125	75 - 125
Arsenic	85 - 115	85 - 115	25	75 - 125	75 - 125
Antimony	85 - 115	85 - 115	25	75 - 125	75 - 125
Selenium	85 - 115	85 - 115	25	75 - 125	75 - 125
Thallium	85 - 115	85 - 115	25	75 - 125	75 - 125
Mercury	80 - 120	80 - 120	25	75 - 125	75 - 125

Waste Stream Technology Inc.
QC Acceptance Criteria for Semi-volatile Organics (GC/MS)

Compound	Reference Sample QC Limits (%)	
	Solid	Water
phenol	40 - 130	14 - 52
bis (2-chloroethyl) ether	34 - 131	31 - 145
2-chlorophenol	40 - 125	37 - 94
1,3-dichlorobenzene	35 - 121	34 - 102
1,4-dichlorobenzene	35 - 121	37 - 101
benzyl alcohol	47 - 130	42 - 87
1,2-dichlorobenzene	38 - 120	37 - 102
2-methylphenol	48 - 139	39 - 96
bis (2-chloroisopropyl) ether	55 - 149	52 - 135
3 & 4-methylphenol	48 - 139	37 - 86
N-nitrosodi-n-propylamine	48 - 132	61 - 108
hexachloroethane	37 - 125	41 - 102
nitrobenzene	44 - 131	47 - 114
isophorone	54 - 139	60 - 115
2-nitrophenol	47 - 130	49 - 109
2,4-dimethylphenol	50 - 141	47 - 105
bis(2-chloroethoxy)methane	50 - 140	56 - 121
benzoic acid	8 - 167	D-105
2,4-dichlorophenol	50 - 124	53 - 108
1,2,4-trichlorobenzene	43 - 122	44 - 101
naphthalene	45 - 129	47 - 109
4-chloroaniline	12 - 158	51 - 113
hexachlorobutadiene	47 - 135	49 - 111
4-chloro-3-methylphenol	56 - 138	59 - 106
2-methylnaphthalene	49 - 126	50 - 107
hexachlorocyclopentadiene	15 - 137	42 - 87
2,4,6-trichlorophenol	53 - 133	52 - 115
2,4,5-trichlorophenol	49 - 135	47 - 120
2-chloronaphthalene	50 - 127	50 - 107
2-nitroaniline	47 - 151	58 - 129
dimethylphthalate	53 - 134	54 - 118
acenaphthylene	56 - 143	61 - 120
3-nitroaniline	50 - 142	56 - 118
2,6-dinitrotoluene	54 - 138	58 - 122
acenaphthene	53 - 138	58 - 117
2,4-dinitrophenol	20 - 133	39 - 106
4-nitrophenol	26 - 150	10 - 51
dibenzofuran	51 - 130	51 - 114

D denotes compound result must be greater than zero.

Waste Stream Technology Inc.
QC Acceptance Criteria for Semi-volatile Organics (GC/MS)

Compound	Reference Sample QC Limits (%)	
	Solid	Water
2,4-dinitrotoluene	50 - 140	55 - 120
diethylphthalate	51 - 140	50 - 131
fluorene	54 - 146	66 - 126
4-nitroaniline	41 - 149	47 - 125
4-chlorophenylphenylether	49 - 136	50 - 121
4,6-dinitro 2-methylphenol	21 - 159	42 - 131
n-nitrosodiphenylamine	45 - 184	44 - 157
4-bromophenylphenylether	50 - 126	53 - 110
hexachlorobenzene	55 - 138	59 - 119
pentachlorophenol	35 - 150	55 - 118
phenanthrene	48 - 144	50 - 121
anthracene	51 - 139	53 - 121
carbazole	51 - 134	98 - 126
di-n-butylphthalate	48 - 141	44 - 129
fluoranthene	50 - 137	51 - 120
benzidine	D - 228	D - 66
pyrene	45 - 151	23 - 154
butylbenzylphthalate	42 - 160	20 - 161
3,3'-dichlorobenzidine	32 - 142	48 - 117
benzo (a) anthracene	51 - 142	50 - 122
chrysene	55 - 140	56 - 121
bis (2-ethylhexyl) phthalate	30 - 175	33 - 154
di-n-octylphthalate	13 - 199	24 - 164
benzo (b) fluoranthene	51 - 141	43 - 129
benzo (k) fluoranthene	57 - 147	59 - 131
benzo (a) pyrene	54 - 136	52 - 121
indeno (1,2,3-cd) pyrene	16 - 173	31 - 135
dibenzo (a,h) anthracene	29 - 153	33 - 127
benzo (g,h,i) perylene	15 - 167	14 - 149

D denotes compound result must be greater than zero.

Waste Stream Technology Inc.

QC Acceptance Criteria for Semi-volatile Organics (GC/MS)

Matrix Spike Recovery and Duplicate RPDs

Compound	Recovery Limits (%)		RPD Limits (%)	
	Solid	Water	Solid	Water
phenol	26 - 90	12 - 89	35	42
2-chlorophenol	25 - 102	27 - 123	50	40
1,4-dichlorobenzene	28 - 104	36 - 97	27	28
N-nitroso-di-n-propylamine	41 - 126	41 - 116	38	38
1,2,4-trichlorobenzene	38 - 107	39 - 98	23	28
4-chloro-3-methylphenol	26 - 103	23 - 97	33	42
acenaphthane	31 - 137	46 - 118	19	31
4 [illegible]rophenol	11 - 114	10 - 80	50	50
2,4-dinitrotoluene	28 - 89	24 - 96	47	38
pentachlorophenol	17 - 109	9 - 103	47	50
pyrene	35 - 142	26 - 127	36	31

Surrogate Spike Recovery Limits

Surrogate Compound	Recovery Limits (%)		
	Solid	Water	TCLP
2-fluorophenol	25 - 121	21 - 100	21 - 100
phenol-d6	24 - 113	10 - 94	10 - 94
nitrobenzene-d5	23 - 120	35 - 114	35 - 114
2-fluorobiphenyl	30 - 115	43 - 116	43 - 116
2,4,6-tribromophenol	19 - 122	10 - 123	10 - 123
p-terphenyl-d14	18 - 137	33 - 141	33 - 141

Waste Stream Technology Inc.

QC Acceptance Criteria for Volatile Organics (GC/MS)

Compound	Reference Sample QC Limits (%) Water	Reference Sample QC Limits (%) Soil
chloromethane	20 - 139	1 - 195
bromomethane	32 - 129	25 - 157
vinyl chloride	45 - 151	54 - 142
chloroethane	65 - 162	22 - 174
methylene chloride	2 - 230	19 - 196
acetone	13 - 251	28 - 209
carbon disulfide	68 - 160	58 - 174
1,1-dichloroethene	83 - 152	72 - 160
1,1-dichloroethane	83 - 148	81 - 148
trans-1,2-dichloroethene	80 - 141	83 - 142
chloroform	80 - 135	71 - 145
2-butanone	29 - 188	30 - 215
1,2-dichloroethane	77 - 139	78 - 141
1,1,1-trichloroethane	79 - 135	84 - 136
carbon tetrachloride	81 - 139	73 - 147
vinyl acetate	5 - 194	D - 276
bromodichloromethane	80 - 140	87 - 129
1,2-dichloropropane	76 - 136	80 - 125
cis-1,3-dichloropropene	81 - 135	89 - 135
trichloroethene	82 - 137	90 - 125
benzene	79 - 134	86 - 135
dibromochloromethane	79 - 136	88 - 125
trans-1,3-dichloropropene	78 - 134	89 - 122
1,1,2-trichloroethane	82 - 136	90 - 124
2-chloroethylvinyl ether	56 - 140	22 - 185
bromoform	76 - 130	82 - 130
4-methyl-2-pentanone	59 - 166	68 - 145
2-hexanone	13 - 202	65 - 154
1,1,2,2-tetrachloroethane	65 - 150	79 - 133
tetrachloroethene	83 - 140	88 - 134
toluene	80 - 139	91 - 130
chlorobenzene	88 - 130	95 - 119
ethylbenzene	89 - 129	95 - 126
styrene	88 - 126	87 - 126
m,p-xylene	91 - 135	98 - 126
o-xylene	87 - 131	95 - 125

D denotes compound result must be greater than zero.

Waste Stream Technology Inc.

QC Acceptance Criteria for Volatile Organics (GC/MS)

Matrix Spike Recovery and Duplicate RPD Limits

Compound	Matrix Spike Recovery (%)		RPD Limits (%)	
	Water	Soil	Water	Soil
1,1-dichloroethene	61 - 145	59 - 172	14	22
trichloroethene	71 - 120	62 - 137	14	24
benzene	76 - 127	66 - 142	11	21
toluene	76 - 125	59 - 139	13	21
chlorobenzene	75 - 130	60 - 133	13	21

Surrogate Spike Recovery Limits

Surrogate Compound	Recovery Limits (%)		
	Water	Soil	TCLP
bromofluorobenzene	86 - 115	74 - 121	74 - 121
1,2-dichloroethane-d4	76 - 114	70 - 121	70 - 121
toluene-d8	88 - 110	81 - 117	81 - 117

WASTE STREAM TECHNOLOGY

QC Acceptance Criteria for Volatile Organics (8021*)

	Accuracy Limits (%)	
Compound	**Water**	**Soil**
Methyl-tert-butylether	77-129	74 - 134
Benzene	74-122	77 - 119
Toluene	78-131	84 - 124
Ethylbenzene	74-124	77 - 114
m,p- Xylene	80-127	83 - 122
ylene	80-128	85 - 121
Isopropylbenzene	81-118	81 - 116
n-Propylbenzene	81-122	82 - 118
1,3,5-Trimethylbenzene	83-124	85 - 122
tert-Butylbenzene	82-120	76 - 123
1,2,4-Trimethylbenzene	79-122	83 - 119
sec-Butylbenzene	72-139	80 - 121
Isopropyltoluene	80-129	82 - 121
n-Butylbenzene	78-126	76 - 126
Naphthalene	69-120	71 - 146

* NYSDEC Petroleum Contaminated Water/Soil Compound List.

(a) Low Level Soils

(b) For benzene the PQL for water and TCLP is 0.7 ug/L and 1.0 ug/Kg for soil.

	MS and MSD Recovery Limits (%)		**MS/MSD RPD Limits (%)**	
Compound	**Water**	**Soil**	**Water**	**Soil**
Benzene	67-132	75-122	15	25
o-xylene	65-148	62-132	15	25
1,3,5-Trimethylbenzene	68-137	54-129	15	25
n-Butylbenzene	63-134	35-113	15	25
Naphthalene	27-178	24-146	15	25

Surrogate Recovery	**% Recovery Limits**		
Matrix	**Water**	**Soil**	**TCLP**
a,a-Trifluorotoluene	78 - 128	83 - 130	91 - 149

Waste Stream Technology Inc.

QC Acceptance Criteria for Pesticide & PCB Analyses

Compound	Reference Sample QC Limits (%)	
	Solid	Water
alpha-BHC	62 - 123	46 - 144
beta-BHC	68 - 121	62 - 128
gamma-BHC (Lindane)	60 - 125	54 - 134
delta-BHC	62 - 125	53 - 140
Heptachlor	55 - 137	59 - 147
Aldrin	66 - 116	58 - 125
Heptachlor Epoxide	66 - 121	60 - 128
Endosulfan I	66 - 121	62 - 116
Dieldrin	52 - 136	63 - 123
4,4'-DDE	72 - 117	55 - 134
Endrin	60 - 133	64 - 141
Endosulfan II	66 - 123	58 - 132
4,4' - DDD	56 - 140	62 - 133
Endrin Aldehyde	44 - 133	54 - 138
Endosulfan Sulfate	59 - 138	58 - 140
4,4' - DDT	36 - 176	68 - 144
Endrin Ketone	54 - 153	54 - 147
Methoxychlor	49 - 158	74 - 150
Chlordane	70 - 130	70 - 130
Toxaphene	70 - 130	70 - 130
Aroclor 1016	54 - 148	66 - 126
Aroclor 1221	15-178	60 - 140
Aroclor 1232	57-133	60 - 140
Aroclor 1242	44-130	60 - 140
Aroclor 1248	42-147	60 - 140
Aroclor 1254	63-144	60 - 140
Aroclor 1260	64 - 129	61 - 118

Waste Stream Technology Inc.
QC Acceptance Criteria for PCBs & Pesticides

Matrix Spike Recovery and Duplicate RPDs

Compound	Recovery Limits (%)		RPD Limits (%)	
	Water	**Solid**	**Water**	**Solid**
gamma-BHC (Lindane)	56-123	46-127	15	50
Heptachlor	40-131	35-130	20	31
Aldrin	40-120	34-132	22	43
Dieldrin	52-126	31-134	18	38
Endrin	56-121	42-139	21	45
4,4' - DDT	38-127	23-134	27	50
Aroclor 1016	60-140	46-168	25	35
Aroclor 1260	60-140	62-153	25	35

Surrogate Spike Recovery

Surrogate Compound	Recovery Limits (%) Solid & Water
Decachlorobiphenyl	60-150
Tetrachloro-m-xylene	60-150