PERMIT ATTACHMENT

APPENDIX XVII

CLOSURE ACTIVITIES SAMPLING AND ANALYSIS PLAN AND CLOSURE ACTIVITIES QUALITY ASSURANCE PROJECT PLAN

This document was not altered from the April 2016 Application.

September 2018

APPENDIX XVII

CLOSURE ACTIVITIES SAMPLING AND ANALYSIS PLAN AND CLOSURE ACTIVITIES QUALITY ASSURANCE PROJECT PLAN

FOR

SIEMENS INDUSTRY, INC.

PARKER REACTIVATION FACILITY

PARKER, ARIZONA

Revision 2
April 2012

CLOSURE ACTIVITY

SAMPLING AND ANALYSIS PLAN

Tables of Contents

List of Tables

List of Figures

List of Attachments

List of Acronyms

APC	Air Pollution Control
CRIT	Colorado River Indian Tribes
COC	Chain of Custody
CVAAS	Cold Vapor Atomic Adsorption Spectrometer
DOT	Department of Transportation
EPA	Environmental Protection Agency
IATA	International Air Transportation Association
ICP	Inductively Coupled Plasma Spectrometer
PRG	Preliminary Remediation Goal
PPE	Personal Protective Equipment
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
RFA	Request for Analysis
SW846	Test Methods for Evaluating Solid Waste, Third Edition, November 1986
VOA	Volatile Organic Analysis

1.0 SITE BACKGROUND

Siemens Industry, Inc. (SII) operates a carbon reactivation facility located in the Colorado River Indian Tribes (CRIT) Industrial Park near Parker, Arizona. The facility treats spent activated carbon that has been used by industry, state and federal government agencies, and municipalities for the removal of organic compounds from liquid and vapor phase process waste streams. The spent activated carbon is identified as both hazardous and non-hazardous waste. Spent activated carbon is stored at the facility in containers and in tanks, and is eventually treated (by thermal reactivation) in carbon reactivation unit RF-2, and was formerly managed at the facility in carbon reactivation unit RF-1.

The facility, including RF-1, began construction in 1991 and operation commenced in August 1992. The facility has treated spent activated carbon exclusively during the time of operation. The RF-1 unit was shut down, after wastes were removed, in June of 1996 to allow for the final construction phase and start up of RF-2 in July 1996 to full interim status capacity.

Currently RF-1 does not share any equipment with RF-2 although with a few exceptions, all RF-1 equipment (which includes the reactivation furnace, APC equipment/piping, and fan) remain on site.

1.1 SCOPE OF CLOSURE

Two closure plans have been prepared for the facility. One plan covers the closure of only the RF-1 unit and associated equipment, while the other closure plan covers the remainder of the facility, which includes RF-2, container storage area, waste storage tanks and associated equipment, and the containment areas for all hazardous waste management units (HWMUs). It is anticipated that since RF-1 is inactive, it may be closed prior to closure of the remainder of the facility, which is the reason a separate closure plan for the RF-1 unit was developed.

1.2 SCOPE OF SAMPLING AND ANALYSIS PLAN

The objective of this Sampling and Analysis Plan is to set into place the protocols necessary to determine that equipment cleaned during either the partial closure of the RF-1 unit, or during closure of the complete facility, meet the closure performance standards established in the Closure Plans. An additional objective is to set into place the protocols necessary to establish that the soils underlying the HWMUs meet the closure performance standards established in the RCRA Facility Closure Plan.

Where applicable, sampling and analysis will be performed on the final rinsate of decontaminated equipment and on soil samples from beneath the HWMUs, as defined in the Closure Plans.

Background samples will also be collected from soil and from un-used decontamination water. The analyses of these samples will establish background levels of designated contaminants for comparison to the actual equipment and site soil samples.

2.0 SAMPLING OBJECTIVES

The objectives the activities described in this Sampling and Analysis Plan are to determine that equipment cleaned during the partial closure of the RF-1 unit, and/or the final closure of the facility has been properly cleaned and that contaminants are not present in the final rinse water at levels exceeding the closure performance standards, and that soils underlying the HWMUs do not contain specific contaminants at levels exceeding the closure performance standards. These objectives will be met by collecting and analyzing representative samples from decontamination rinsate, and borings from concrete, asphalt and soil.

Once collected, samples will be analyzed for a list of closure compounds of concern, that covers the range of possible constituents present in the hazardous waste managed at the facility. Attachment 1 lists the closure compounds of concern.

For the assessment of soil contamination, each soil sample will be analyzed for the same group of metals identified in Attachment 1, and will also receive a full scan volatile and semivolatile organic analysis for comparison to EPA Region 9's Preliminary Remediation Goals (PRGs) for Industrial Soil.

3.0 SAMPLE LOCATION AND FREQUENCY

Two types of samples will be collected during closure activities; rinsate and soil. Rinsate samples will be collected from the unused rinse water and from the rinsate collected during the final rinse of equipment being decontaminated. The location of rinsate sampling will be at each piece or each batch of equipment being decontaminated, which include the Carbon Reactivation Unit RF-1, Carbon Reactivation Unit RF-2, Afterburner AB-1, Afterburner AB-2, RF-2 air pollution control equipment, Tank T-8, container storage area equipment, tanks and ancillary equipment. The unused rinse water sample will be collected directly from the rinse water hose.

The rinsate from each piece of equipment or equipment batch will only be sampled once unless the sample collected does not meet the closure performance standards as described in the Closure Plans. If all of the constituents indicated in Section 2 of this Sampling and Analysis Plan meet the closure performance standards, the equipment will be deemed to have been decontaminated for closure purposes. Equipment that requires additional cleaning may be recleaned in the same manner as it was originally cleaned and the final rinsate sampled and analyzed for any contaminant found exceeding the closure performance standards. All equipment not meeting the closure performance standards for any constituent may continue to be cleaned and resampled and analyzed as specified in the Closure Plan, or may be disposed as hazardous waste.

Soil samples will be collected after removal of equipment and decontamination of containment structures. The initial soil sampling locations will be from borings taken at the locations indicated on Figure 3-1, and described below:

- Container Storage Area – 3 locations, 3 depths each.
- Tanks and Ancillary Equipment Area – 7 locations, 3 depths each.
- RF-1 and RF-2 Process Area – 3 locations, 3 depths each.

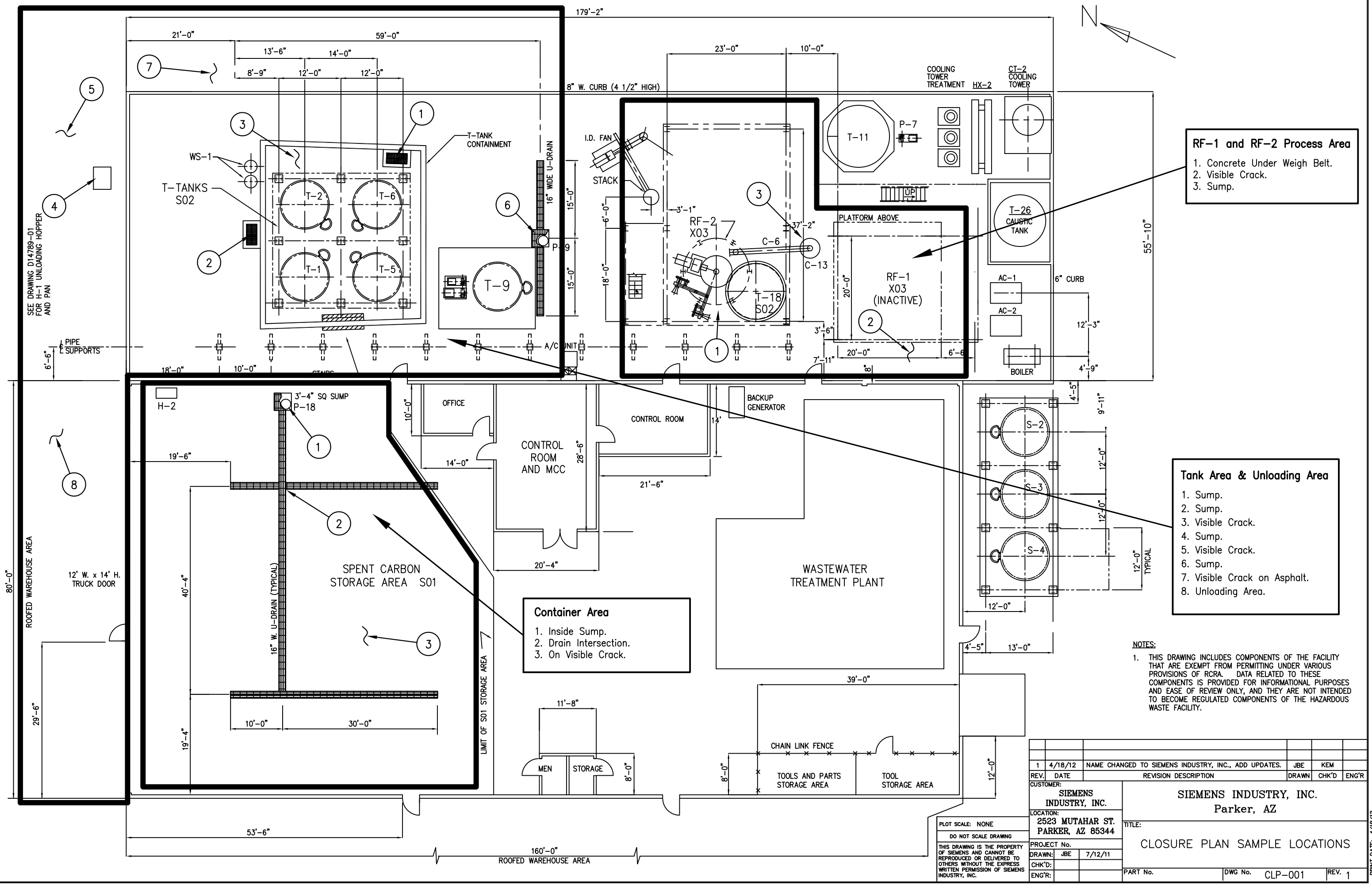
Sampling locations and depths were selected by SII and the USEPA Project Manager (Mr. Mike Zabaneh) as being representative of those areas potentially most affected by facility operations. Soil samples will be collected at a series of depths starting just below the concrete slab. Shallow samples will be collected using a Geoprobe direct push method or hand-auger, while deeper borings will be drilled with a larger sonic or hollow stem auger rig. After the samples are collected, each boring will be backfilled with grout.

Background soil samples will also be collected from three separate locations (at 3 depths each) as shown on Figure 3-2. The locations are outside of the facility's operational areas and will represent constituent concentrations that have not been impacted by site operations. The results of these soil samples will be used in the development of metals closure performance standards for the site.

Figure 3-1. Closure Plan Sample Locations

(Following Page)

DWG: CLP-001



NOTES:

1. THIS DRAWING INCLUDES COMPONENTS OF THE FACILITY THAT ARE EXEMPT FROM PERMITTING UNDER VARIOUS PROVISIONS OF RCRA. DATA RELATED TO THESE COMPONENTS IS PROVIDED FOR INFORMATIONAL PURPOSES AND EASE OF REVIEW ONLY, AND THEY ARE NOT INTENDED TO BECOME REGULATED COMPONENTS OF THE HAZARDOUS WASTE FACILITY.

REV.	DATE	REVISION DESCRIPTION	DRAWN	CHK'D	ENG'R
1	4/18/12	NAME CHANGED TO SIEMENS INDUSTRY, INC., ADD UPDATES.	JBE	KEM	

CUSTOMER: SIEMENS INDUSTRY, INC.

LOCATION: 2523 MUTAHAR ST. PARKER, AZ 85344

PROJECT No.

DRAWN:	JBE	7/12/11
CHK'D:		
ENG'R:		

PLOT SCALE: NONE

DO NOT SCALE DRAWING

SIEMENS INDUSTRY, INC.
Parker, AZ

TITLE: CLOSURE PLAN SAMPLE LOCATIONS

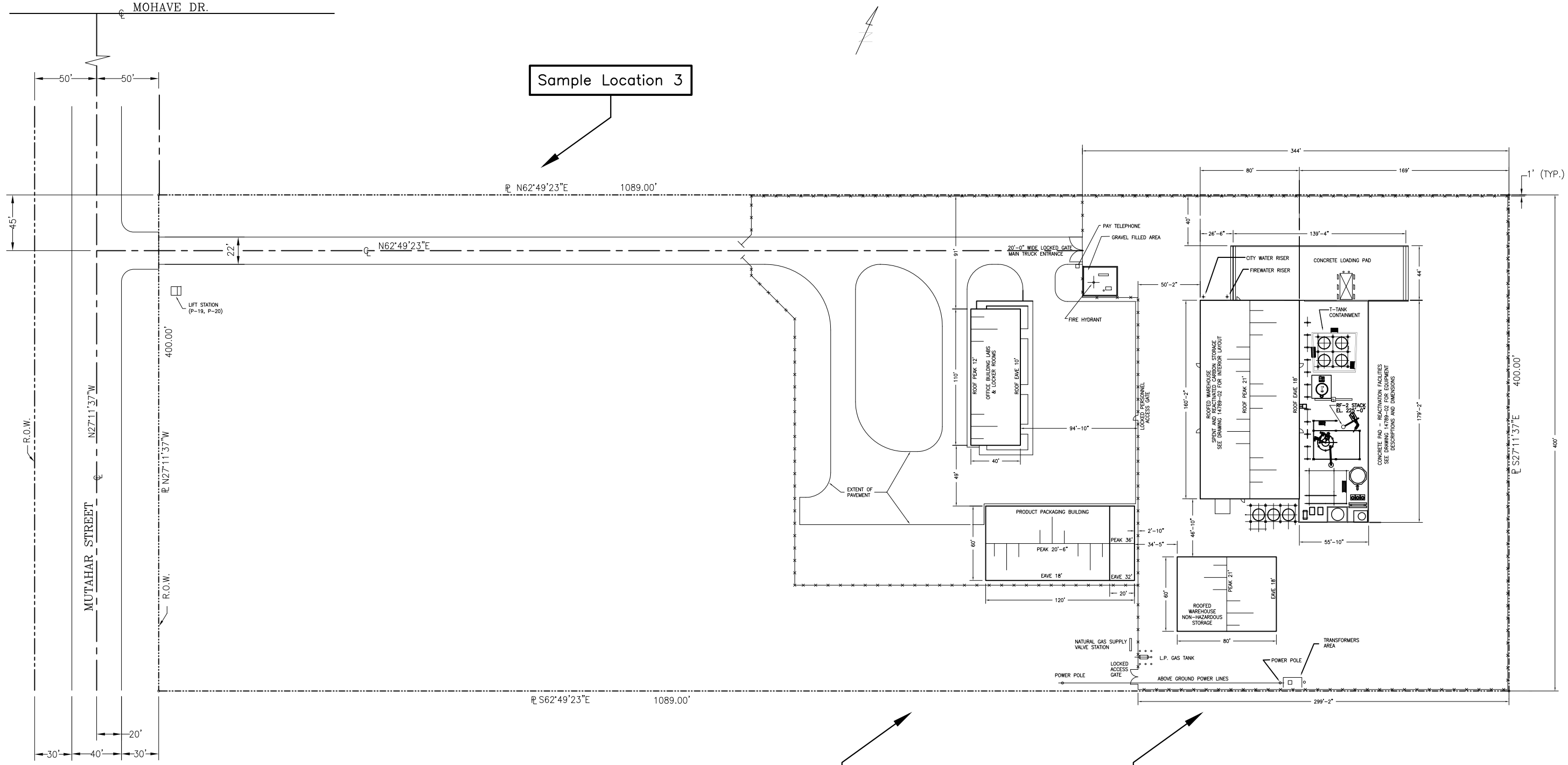
PART No. | DWG No. CLP-001 | REV. 1

PRINT DATE: 4/18/12

Figure 3-2. Closure Plan – Location of Background Soil Samples

(Following Page)

DWG: CLP-002



Sample Location 1

Sample Location 2

NOTES:

1. THIS DRAWING INCLUDES COMPONENTS OF THE FACILITY THAT ARE EXEMPT FROM PERMITTING UNDER VARIOUS PROVISIONS OF RCRA. DATA RELATED TO THESE COMPONENTS IS PROVIDED FOR INFORMATIONAL PURPOSES AND EASE OF REVIEW ONLY, AND THEY ARE NOT INTENDED TO BECOME REGULATED COMPONENTS OF THE HAZARDOUS WASTE FACILITY.

REV.	DATE	REVISION DESCRIPTION	DRAWN	CHK'D	ENG'R

CUSTOMER: SIEMENS INDUSTRY, INC.

LOCATION: 2523 MUTAHAR ST. PARKER, AZ 85344

PROJECT No.

DRAWN:	JBE	7/13/11
CHK'D:		
ENG'R:		

PLOT SCALE: 1"=40'

DO NOT SCALE DRAWING

SIEMENS INDUSTRY, INC.
Parker, AZ

TITLE:
CLOSURE PLAN – LOCATION OF BACKGROUND SOIL SAMPLES

PART No. | DWG No. CLP-002 | REV. 0

PRINT DATE: 4/19/12

4.0 SAMPLING EQUIPMENT AND PROCEDURES

4.1 SAMPLE RATIONAL

Samples for all equipment to be decontaminated will be collected using the same type of sampling equipment and the same procedures. The samples will be collected using composite sampling as allowed in the Draft of Guidance of Incinerator Closure, June 29, 1990 in the section entitled "Certification of Adequate Closure." These composite samples are also collected in accordance with the guidance provided in EPA QA/G-5S Guidance for Choosing a Sampling Design for Environmental Data Collection, December 2002.

Samples from large equipment, such as the carbon reactivation units, afterburners, and tanks, will be collected by compositing eight aliquots of the final rinse from four locations on the equipment (at 90º intervals) at two different elevations (at approximately ⅓ and ⅔ of the equipment height) within each piece of equipment (8 total samples aliquots). This will ensure that a "representative" sample is obtained. For samples from small equipment batches, eight aliquots will be collected during the course of the final rinse operation, and composited to form a single sample per equipment batch.

Samples of soils will be collected using the same type of equipment and the same procedures. Soil samples will be collected at a series of depths starting just below the concrete slab (if present), or just below the surface (if no concrete slab is present).. Shallow samples will be collected using a Geoprobe direct push method or hand-auger, while deeper borings will be drilled with a larger sonic or hollow stem auger rig.

4.2 SAMPLING EQUIPMENT

Sampling equipment will include the dedicated equipment for each piece of equipment or location being sampled. There will be no need for decontamination of the equipment since there will be no cross contamination between sample locations. Sampling equipment will include:

- 500 ml glass beaker or wide mouth glass jar;
- 1 gallon or 4 liter wide mouth amber glass jar;
- 1 liter amber glass sample bottles;
- 500 ml amber glass sample bottles;
- 40 ml VOA vials (for liquids);
- Stainless steel bowl;
- Stainless steel scoop or spoon;
- 125 ml wide mouth VOA jars (for soils); and
- Personal protective equipment (PPE) as required by the site Health and Safety Plan.

Once use of the sampling equipment is complete, the equipment, with the exception of the sample bottle transported to the laboratory for analysis, will be collected in a designated area for off-site disposal.

4.3 EQUIPMENT SAMPLING PROCEDURE

All sampling will be performed in a safe manner and will follow all applicable site Health and Safety Plan. Additionally, the samplers will follow Confined Space Entry Program requirements when sampling in a space considered a confined space by this program. The samplers will similarly follow Lock-Out/Tag-Out program requirements, as necessary.

4.3.1 Large Equipment

Large equipment is defined, for purposes of this Sampling and Analysis Plan, as equipment which can be entered to collect samples of wash water from interior surfaces. In accordance with the Closure Plans, these equipment items will be visually inspected to determine if the closure performance standards are met. Sampling of the rinsate from large equipment items is not anticipated to be necessary to demonstrate compliance with the closure performance standards, however a procedure is presented here in case visual inspection is not adequate. Sample collection from these units will commence only if a visual inspection of the unit has been completed and it has been determined that the unit requires rinsate sampling.

Eight sample aliquots will be collected in a grid fashion, following the protocol described in Figure 4-1. Four approximately 500 ml samples will be collected at ⅓ the total height of the unit at 90º intervals along the interior wall and four approximately 500 ml samples will be collected at ⅔ the total height of the unit at 90º intervals along the interior wall. These aliquots will be combined to form a single representative sample of the decontaminated surface of the unit. The sample will then be split for the various analyses to be performed.

4.3.2 Small Equipment Batches

Small equipment is defined, for purposes of this Sampling and Analysis Plan, as equipment which cannot be entered to collect samples of wash water from interior surfaces. Sample collection from these items will commence once a visual inspection of the equipment has been completed and the equipment is determined visually clean.

Eight approximately 500 ml sample aliquots will be collected as the final rinse water is being collected from the equipment decontamination batch. following the protocol described in Figure 4-1. Following sample aliquot collection, they will be combined to form a single representative sample of the decontaminated equipment. The sample will then be split for the various analyses to be performed.

4.3.3 Wash Water

A wash water sample will be collected directly from the wash water source on-site into three 1 liter amber glass sample bottles, a 500 ml amber glass sample bottle, and two VOA vials and labeled as indicated in the Quality Assurance Project Plan (QAPP).

4.4 SOIL SAMPLING PROCEDURE

All sampling will be performed in a safe manner and will follow all applicable site Health and Safety Plan. Soil samples will be collected from the sampling device (geoprobe, split spoon, etc.) and placed into a large bowl. The sampling personnel will use a stainless steel spoon to thoroughly mix the sample and then will fill 3 500 ml wide mouth jars (for metals and semivolatile organic analysis) and 2 125 ml wide mouth jars (for volatile organic analysis), according to the procedure described in Figure 4-2.

Figure 4-1. Rinse Water Composite Sampling Method

Sample name:	Final rinse water sample
Sampler:	Sample Custodian or designee
Location:	Each unit being decontaminated Carbon Reactivation Units RF-1 and RF-2 Afterburners AB-1 and AB-2 APCDs, Fans, and Stacks Tanks Unused wash water
Equipment:	500 ml glass beaker or wide mouth glass jars 1 gallon or 4 liter wide mouth amber glass jar with Teflon lined lids 1 liter amber glass bottles with Teflon lined lids 500 ml amber glass bottles with Teflon lined lids Amber glass VOA vials (40-mL) with plastic screw caps and Teflon septa Personal Protective Equipment as required
Frequency:	During final rinse
Procedure Summary:	The glass beaker or wide mouth glass jar is used to collect eight sample aliquots of the final rinse as it is being performed into a one gallon or four liter wide moth glass jar ensuring that the compositing jar is securely sealed in between the introduction of each aliquot collected. Once sampling is complete, the jar is sealed and the grab sample mixed and transferred into three 1 liter amber glass sample bottles, one 500 ml amber glass sample bottle, and two VOA vials and labeled as indicated in the Quality Assurance Project Plan. Any residual composited sample will be added to the other decontamination fluids and treated through the in-house wastewater treatment system. At the conclusion of sampling, the Sample Custodian accepts custody of the samples and record numbers and collection data in a field logbook. Samples are placed on ice (if required) in dedicated shipping containers and stored in a sample storage area separate from the container supply area.

Figure 4-2. Soil Sampling Method

Sample name:	Soil sample
Sampler:	Sample Custodian or designee
Location:	Each soil borehole (various depths)
Equipment:	Geoprobe, split spoon, etc. Large stainless steel bowl Stainless steel scoop of spoon 500 ml wide mouth glass jars with Teflon lined lids Amber glass VOA jars (125 mL) with Teflon lined lids Personal Protective Equipment as required
Frequency:	Various depths at each borehole
Procedure Summary:	As each sampling depth is reached, a Geoprobe, split spoon, or other appropriate sampling device is used to collect a soil sample of sufficient size to almost fill the large stainless steel bowl. The sampler will mix the sample in the bowl using a stainless steel spoon or scoop to ensure uniformity. Once sampling is complete, the portions are transferred into three 500 ml wide mouth amber glass sample bottles, and two 125 ml wide mouth amber glass VOA jars and labeled as indicated in the Quality Assurance Project Plan. Any residual composited sample will be added to the other borehole cuttings at the site. At the conclusion of sampling, the Sample Custodian accepts custody of the samples and record numbers and collection data in a field logbook. Samples are placed on ice (if required) in dedicated shipping containers and stored in a sample storage area separate from the container supply area.

5.0 SAMPLE HANDLING AND ANALYSIS

5.1 SAMPLE HANDLING AND CUSTODY

A sample will be considered to be in the custody of a person if it is in his or her possession, in his or her sight, or secured by that person in an approved location accessible only to authorized personnel.

The sampling contractor or laboratory will prepare sampling media, reagents, and sample containers according to the specifications of the methods as described in Section 2 and will ship them to the site in sealed containers.

During sampling and until the samples arrive at the analytical laboratory; the samples are the responsibility of the Sample Custodian. When overnight couriers are utilized, the airbill will serve to document the transfer of custody from the Sample Custodian to the courier. The courier's air bill becomes part of the chain of custody record. Upon transfer of the samples from the courier to the analytical laboratory, sample custody will be maintained by the analytical laboratory performing the analysis.

Collected samples will be shipped from the site to the laboratory in sealed containers with request for analysis (RFA) and chain-of-custody (COC) forms. Examples of acceptable RFA and COC forms are provided as Figures 5-1 and 5-2, respectively.

Upon receipt of samples at the laboratory, the receiver will accept custody for the shipment by an exchange of signatures with the delivery agent. The shipping containers will be opened by the Laboratory Analysis Coordinator or his designee and inspected. The container contents will be verified against the accompanying COC. Any damage to the contents of the shipping container or deviations from the original shipment documents will be noted on the COC and the Registered Professional Engineer overseeing the project will be notified. Transfer of custody within the laboratory is addressed in the Laboratory's QA manual. Upon completion of analysis, samples will be maintained at the laboratory under COC until they are released for proper disposal.

5.2 SAMPLE LABELING

An example sample label format is presented in Figure 5-3. Each sample container will be labeled to show the source of the sample; the project identification; sampler's initials; laboratory to which the sample will be shipped; an unique alpha-numeric sample number; date and time; sample description; test number; and run number.

Project samples will be tracked via the assigned unique alpha-numeric sample numbers. The sample number will appear on the sample label, the RFA, and the COC. The alpha-numeric system for sample identification for this project is presented in Figure 5-4. The numbering system presented will result in unique numbers being assigned to every sample.

Figure 5-1. Example Request For Analysis Form

REQUEST FOR ANALYSIS

Focus Environmental, Inc.

Client: _____ Description: _____

Location: _____ Project No.: _____

Sample Identification

T8-MET-1

Test No.: 1

Run No.: 1

Description:

Tank T8 Metals

Lab: Analytical Laboratory

Container: 500 ml amber glass

Number of Containers: 1

Requested Preparation/Analyses:

Metals – Mercury – Liquids CVAAS (SW846-7470)

Metals – Multiple (Specify) ICP (SW846-6010)

Preparation Method:

N/A

Acid Digestion – Stack Gas Multi-Metals

Preservation

None required

Hold Time

180 days/28 days for Hg

Special Instructions

Analyze for metals: Sb, As, Ba, Be, Cd, total Cr, Pb, Hg, Ni, Se, Ag, Tl, and V.

Figure 5-2. Example of Chain of Custody Form

Custody Record

Focus Environmental, Inc.

Client:

Location:

Description:

Project No.:

Note: This form is to be accompanied by a "Request for Analysis" which specifies the preparation and analysis to be performed for each sample.

Sample ID	Description	Container	No.	Grab/Comp	Date	Time	Remarks
RF-MET-1	Carbon Reactivation Unit RF-1 metals sample	500 ml amber glass bottle		Comp.	01/01/01	01:00	

Sampler: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)

Figure 5-3. Example Sample Label Format

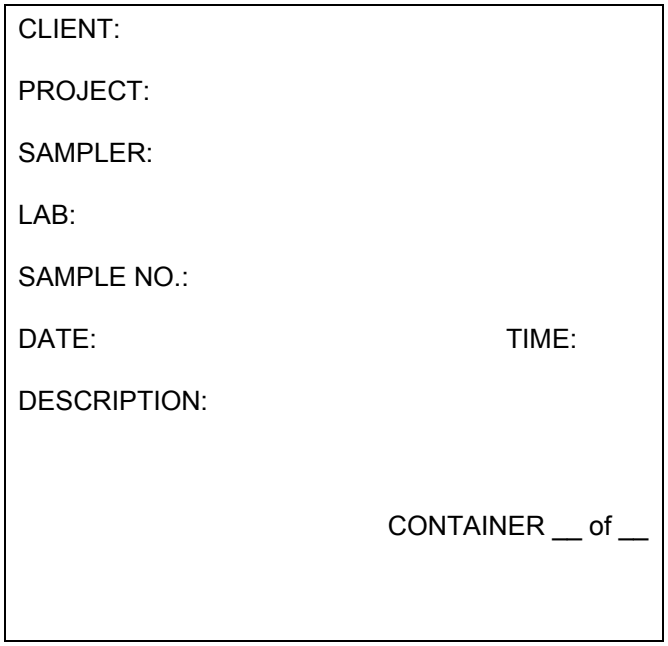
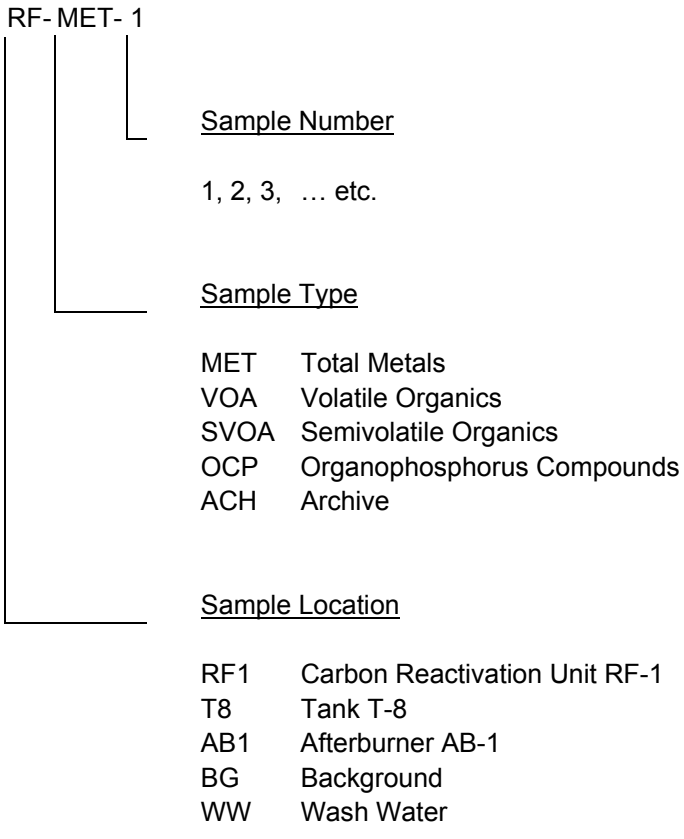


Figure 5-4. Planned Sample Identification Code



5.3 REQUEST FOR ANALYSIS/CHAIN OF CUSTODY

The Sample Custodian will complete the COC and RFA for every sample. The samples will be preserved as needed and secured by the Sample Custodian and must remain in his or her possession or secured in a location accessible only to authorized personnel until custody is transferred to a courier for delivery to the laboratory.

Each sample container will be clearly identified using standard container labels. It is imperative that information on the COC form, RFA form, and the container label match in every respect. Field samples may be transported directly to the analytical laboratory by the test management or the sampling contractor. If the samples are shipped via overnight courier, an individual trained in Federal Department of Transportation (DOT) and International Air Transportation Association (IATA) regulations will package the samples to assure compliance with the applicable portions of the regulations.

5.4 SAMPLE CONTAINERS, PRESERVATION, AND HOLDING TIMES

Table 5-1 shows the appropriate containers, preservation, and holding times for all samples to be collected during the closure activities.

Table 5-1. Sample Containers, Preservation, and Holding Times

Parameter	Sample Name	Containers	Preservation	Maximum Holding Time
Metals	Final Rinse Water	Glass bottle, Teflon lined cap	HNO_3 pH $\leq$ 2	180 days/28 days for Hg
	Soils	Glass wide mouth jar; Teflon lined lid	None	180 days/28 days for Hg
Volatile Organic Compounds	Final Rinse Water	VOA vials	Chill to 4 $\pm$2ºC	14 days
	Soils	Glass wide mouth jar; Teflon lined lid	Chill to 4 $\pm$2ºC	14 days
Organophosphorus Compounds	Final Rinse Water	Glass bottle, Teflon lined cap	Chill to 4 $\pm$2ºC	14 days to extraction and 40 days from extraction to analysis
Semivolatile Organic Compounds	Final Rinse Water	Glass bottle, Teflon lined cap	Chill to 4 $\pm$2ºC	14 days to extraction and 40 days from extraction to analysis
	Soils	Glass wide mouth jar; Teflon lined lid	Chill to 4 $\pm$2ºC	14 days to extraction and 40 days from extraction to analysis

5.5 SAMPLE ANALYSIS

Analytical procedures and methods are summarized in Table 5-2, and described in the Closure Quality Assurance Project Plan - QAPP. Individual analytical methods are described in detail in the QAPP. During the course of sampling and analysis, situations may arise that require modifying the specific sampling or analytical procedures included or referenced in the Closure Plans. The laboratory SOPs, which include a number of procedures for special circumstances, will be followed. In cases where the laboratory finds it necessary to make adjustments to the analysis methods, the changes will be documented following the corrective action procedures noted in the QAPP. The Professional Engineer must approve any such changes.

Table 5-2. Analytical Procedures and Methods

Sample Name	Analysis	Number of Samples	Preparation Method	Analytical Method[a]
Carbon Reactivation Unit RF-1 Small equipment batches	Total Metals[b]	2	Acid digestion (SW846-3010A or 3015 and 7470A)	ICP (SW846-6010B) and CVAAS (SW846-7470A)
Tank T-8	Total Metals[b]	1	Acid digestion (SW846-3010A or 3015 and 7470A)	ICP (SW846-6010B) and CVAAS (SW846-7470A)
	Volatiles[c]	1	Purge and trap	Volatile Organics (SW846-8260B)
	Organophosphorus Compounds[d]	1	Solvent extraction (SW846-3500 Series)	Organophosorus Compounds (SW846-8141A)
	Semivolatiles[e]	1	Solvent extraction (SW846-3500 Series)	Semivolatile Organics (SW846-8270C)
Carbon Reactivation Unit RF-2 Small equipment batches	Total Metals[b]	3	Acid digestion (SW846-3010A or 3015 and 7470A)	ICP (SW846-6010B) and CVAAS (SW846-7470A)

Table 5-2. Analytical Procedures and Methods (Continued)

Sample Name	Analysis	Number of Samples	Preparation Method	Analytical Method[a]
Container area equipment final rinsate	Total Metals[b]	1	Acid digestion (SW846-3010A or 3015 and 7470A)	ICP (SW846-6010B) and CVAAS (SW846-7470A)
	Volatiles[c]	1	Purge and trap	Volatile Organics (SW846-8260B)
	Organophosphorus Compounds[d]	1	Solvent extraction (SW846-3500 Series)	Organophosorus Compounds (SW846-8141A)
	Semivolatiles[e]	1	Solvent extraction (SW846-3500 Series)	Semivolatile Organics (SW846-8270C)
Tank T-1 and Ancillary Equipment	Total Metals[b]	1	Acid digestion (SW846-3010A or 3015 and 7470A)	ICP (SW846-6010B) and CVAAS (SW846-7470A)
	Volatiles[c]	1	Purge and trap	Volatile Organics (SW846-8260B)
	Organophosphorus Compounds[d]	1	Solvent extraction (SW846-3500 Series)	Organophosorus Compounds (SW846-8141A)
	Semivolatiles[e]	1	Solvent extraction (SW846-3500 Series)	Semivolatile Organics (SW846-8270C)
Tank T-2 and Ancillary Equipment	Total Metals[b]	1	Acid digestion (SW846-3010A or 3015 and 7470A)	ICP (SW846-6010B) and CVAAS (SW846-7470A)
	Volatiles[c]	1	Purge and trap	Volatile Organics (SW846-8260B)
	Organophosphorus Compounds[d]	1	Solvent extraction (SW846-3500 Series)	Organophosorus Compounds (SW846-8141A)
	Semivolatiles[e]	1	Solvent extraction (SW846-3500 Series)	Semivolatile Organics (SW846-8270C)
Tank T-5 and Ancillary Equipment	Total Metals[b]	1	Acid digestion (SW846-3010A or 3015 and 7470A)	ICP (SW846-6010B) and CVAAS (SW846-7470A)
	Volatiles[c]	1	Purge and trap	Volatile Organics (SW846-8260B)
	Organophosphorus Compounds[d]	1	Solvent extraction (SW846-3500 Series)	Organophosorus Compounds (SW846-8141A)
	Semivolatiles[e]	1	Solvent extraction (SW846-3500 Series)	Semivolatile Organics (SW846-8270C)

Tank T-6 and Ancillary Equipment	Total Metals[b]	1	Acid digestion (SW846-3010A or 3015 and 7470A)	ICP (SW846-6010B) and CVAAS (SW846-7470A)
	Volatiles[c]	1	Purge and trap	Volatile Organics (SW846-8260B)
	Organophosphorus Compounds[d]	1	Solvent extraction (SW846-3500 Series)	Organophosorus Compounds (SW846-8141A)
	Semivolatiles[e]	1	Solvent extraction (SW846-3500 Series)	Semivolatile Organics (SW846-8270C)
Tank T-18 and Ancillary Equipment	Total Metals[b]	1	Acid digestion (SW846-3010A or 3015 and 7470A)	ICP (SW846-6010B) and CVAAS (SW846-7470A)
	Volatiles[c]	1	Purge and trap	Volatile Organics (SW846-8260B)
	Organophosphorus Compounds[d]	1	Solvent extraction (SW846-3500 Series)	Organophosorus Compounds (SW846-8141A)
	Semivolatiles[e]	1	Solvent extraction (SW846-3500 Series)	Semivolatile Organics (SW846-8270C)
Wash Water (Unused)	Total Metals[b]	3	Acid digestion (SW846-3010A or 3015 and 7470A)	ICP (SW846-6010B) and CVAAS (SW846-7470A)
	Volatiles[c]	3	Purge and trap	Volatile Organics (SW846-8260B)
	Organophosphorus Compounds[d]	3	Solvent extraction (SW846-3500 Series)	Organophosorus Compounds (SW846-8141A)
	Semivolatiles[e]	3	Solvent extraction (SW846-3500 Series)	Semivolatile Organics (SW846-8270C)
Soil (Container area)	Total Metals[b]	9	Acid digestion (SW846-3010A or 3015 and 7470A)	ICP (SW846-6010B) and CVAAS (SW846-7470A)
	Volatiles[c]	9	Purge and trap	Volatile Organics (SW846-8260B)
	Organophosphorus Compounds[d]	9	Solvent extraction (SW846-3500 Series)	Organophosorus Compounds (SW846-8141A)
	Semivolatiles[e]	9	Solvent extraction (SW846-3500 Series)	Semivolatile Organics (SW846-8270C)
Soil (Tanks and ancillary equipment area)	Total Metals[b]	21	Acid digestion (SW846-3010A or 3015 and 7470A)	ICP (SW846-6010B) and CVAAS (SW846-7470A)
	Volatiles[c]	21	Purge and trap	Volatile Organics (SW846-8260B)

	Organophosphorus Compounds[d]	21	Solvent extraction (SW846-3500 Series)	Organophosorus Compounds (SW846-8141A)
	Semivolatiles[e]	21	Solvent extraction (SW846-3500 Series)	Semivolatile Organics (SW846-8270C)
Soil (RF-1/RF-2 process area)	Total Metals[b]	9	Acid digestion (SW846-3010A or 3015 and 7470A)	ICP (SW846-6010B) and CVAAS (SW846-7470A)
	Volatiles[c]	9	Purge and trap	Volatile Organics (SW846-8260B)
	Organophosphorus Compounds[d]	9	Solvent extraction (SW846-3500 Series)	Organophosorus Compounds (SW846-8141A)
	Semivolatiles[e]	9	Solvent extraction (SW846-3500 Series)	Semivolatile Organics (SW846-8270C)
Soil (Background)	Total Metals[b]	9	Acid digestion (SW846-3010A or 3015 and 7470A)	ICP (SW846-6010B) and CVAAS (SW846-7470A)
	Volatiles[c]	9	Purge and trap	Volatile Organics (SW846-8260B)
	Organophosphorus Compounds[d]	9	Solvent extraction (SW846-3500 Series)	Organophosorus Compounds (SW846-8141A)
	Semivolatiles[e]	9	Solvent extraction (SW846-3500 Series)	Semivolatile Organics (SW846-8270C)

[a] "SW846" refers to Test Methods for Evaluating Solid Waste, Third Edition, November 1986, and Updates. In all cases the most recent versions of the analytical methods will be used.

[b] Metal analytes are identified in Attachment 1.

[c] Volatile compound analytes are identified in Attachment 1.

[d] Organophosphorus compoundanalytes are identified in Attachment 1.

[e] Semivolatile Compound analytes are identified in Attachment 1.

ATTACHMENT 1

LIST OF CLOSURE COMPOUNDS OF CONCERN

List of Closure Compounds of Concern

CAS Number	Name	Description	Analysis
100-41-4	Ethylbenzene	Ethylbenzene	8260
100-42-5	Styrene	Styrene	8260
103-65-1	n-propylbenzene	n-propylbenzene	8260
105-67-9	2,4-Dimethylphenol	2,4-Dimethylphenol	8270
106-44-5	4-Methylphenol	4-Methylphenol	8270
106-46-7	1,4, -dichlorobenzene	1,4,-dichlorobenzene	8270
106-93-4	1,2,dibromoethane	Ethylene Dibromide (EDB)	8260
107-06-2	1,2,dichloroethane	EDC	8260
107-13-1	acrylonitrile	acrylonitrile	8260
108-05-4	vinyl acetate	vinyl acetate	8260
108-88-3	Toluene	Toluene	8260
108-90-7	Chlorobenzene	Chlorobenzene	8260
108-95-2	Phenol	Phenol	8270
109-99-9	tetrahydrofuran	tetrahydrofuran	8260
111-44-4	Bis(2-chloroethyl)ether	Bis(2-chloroethyl)ether	8270
117-81-7	bis (2-ethylhexyl) phthalate	bis (2-ethylhexyl) phthalate	8270
120-12-7	Anthracene	Anthracene	8270
120-82-1	1,2,4-Trichlorobenzene	1,2,4-Trichlorobenzene	8270
123-91-1	1,4-Dioxane	1,4-Dioxane	8270
124-48-1	Dibromochloromethane	Dibromochloromethane	8260
127-18-4	Tetrachloroethylene	PCE	8260
131-11-3	Demethyl phthalate	Demethyl phthalate	8270
132-64-9	Dibenzofuran	Dibenzofuran	8270
1330-20-7	Xylene	xylene	8260
1912-24-9	Atrazine	2-chloro-4-(ethylamino)-6-(isopropylamino)-	8141
121-75-5	Malathion	Malathion	8141
206-44-0	Fluoranthene	Fluoranthene	8270
208-96-8	Acenaphthylene	Acenaphthylene	8270
218-01-9	Chrysene	Chrysene	8270
309-00-2	Aldrin	Aldrin	8270
319-84-6	Alpha-BHC	Alpha-Hexachlorocyclohexane	8270
78-59-1	Isophorone	Isophorone	8270
51-28-5	2,4,Dinitrophenol	2,4,-Dinitrophenol	8270
541-73-1	1,3-dichlorobenzene	1,3-dichlorobenzene	8270
56-23-5	Carbon Tetrachloride	Carbon Tetrachloride	8260
56-55-3	Benz(a)anthracene	1	8270
57-74-9	Chlordane	Chlordane	8270
58-89-9	Lindane	Lindane	8270
591-78-6	2-Hexanone	2-Hexanone	8260
62-53-3	Aniline	Aniline	8270
67-64-1	acetone	acetone	8260
67-66-3	Chloroform	Chloroform	8260
71-43-2	Benzene	Benzene	8260
71-55-6	1,1,1trichloroethane	1,1,1trichloroethane	8260
72-20-8	Endrin	Endrin	8270
72-43-5	Methoxychlor	Methoxychlor	8270
72-54-8	4.4'-DDD		8270
7429-90-5	Aluminum	Fume or Dust Only	6010

Note: Most recent version of analytical methods will be used.

List of Closure Compounds of Concern

CAS Number	Name	Description	Analysis
7439-92-1	Lead	Lead	6010
7439-96-5	Manganese	Manganese	6010
7439-97-6	Mercury	Mercury	7470
7440-02-0	Nickel	Nickel	6010
7440-22-4	Silver	Silver	6010
7440-36-0	Antimony	Antimony	6010
7440-38-2	Arsenic	Arsenic	6010
7440-39-3	Barium	barium	6010
7440-41-7	Beryllium	Beryllium	6010
7440-43-9	Cadmium	Cadmium	6010
7440-46-4	Copper	Copper	6010
7440-47-3	Chromium	Chromium	6010
7440-48-4	Cobalt	Cobalt	6010
7440-62-2	Vanadium	Vanadium	6010
7440-66-6	Zinc	Zinc	6010
74-83-9	Bromomethane	Bromomethane	8260
74-87-3	chloromethane	methyl chloride	8260
75-00-3	chloroethane	chloroethane	8260
75-09-2	Methylene chloride	Methylene Chloride	8260
75-15-0	Carbon Disulfide	Carbon Disulfide	8260
75-25-2	Bromoform	Bromoform	8260
75-27-4	Bromodichloromethane	Bromodichloromethane	8260
75-34-3	1,1dichlorethane	1,1,dichloroethane	8260
75-35-4	1,1dichloroethene	1,1dichloroethene	8260
75-69-4	Trichlorofluoromethane		8260
75-71-8	Dichlorodifluoromethane	Dichlorodifluoromethane	8260
76-13-1	Freon 113	Freon 113	8260
129-00-0	Pyrene	Pyrene	8270
76-44-8	Heptachlor	Heptachlor	8270
78-87-5	1,2,dichloropropane	1,2,dichloropropane	8260
78-93-3	Methyl ethyl ketone	MEK	8260
79-00-5	1,1,2-Trichloroethane	1,1,2-Trichloroethane	8260
79-01-6	Trichloroethylene	TCE	8260
79-34-5	1,1,2,2,-Tetrachloroethane	1,1,2,2,-Tetrachloroethane	8260
8001-35-2	Toxaphene	Toxaphene	8270
80-62-6	Methyl methacrylate	Methyl methacrylate	8260
82870-81-3	Thallium	Thallium	6010
83-32-9	Acenaphthene	Acenaphthene	8270
84-66-2	Diethylphthalate	Diethylphthalate	8270
84-74-2	Dibutyl Phthalate	Dibutyl Phthalate	8270
85-01-8	Phenanthrene	Phenanthrene	8270
86-73-7	Fluorene	Fluorene	8270
87-68-3	1,3 - Hexachlorobutadiene	1,3-Hexachlorobutadiene	8270
87-86-5	Pentachlorophenol	PCP	8270
88-74-4	2-Nitroaniline	2-Nitroaniline	8270
91-20-3	Naphthalene		8270
91-57-6	2-Methylnaphthalene	2-Methylnaphthalene	8270
95-47-6	o-Xylene	o-Xylene	8260

Note: Most recent version of analytical methods will be used.

List of Closure Compounds of Concern

CAS Number	Name	Description	Analysis
95-48-7	2-Methylphenol	2-Methylphenol	8270
95-50-1	1,2, dichlorobenzene	1,2 dichlorobenzene	8270
95-63-6	1,2,4,trimethylbenzene	1,2,4,trimethylbenzene	8260
96-18-4	1,2,3,trichloropropane	1,2,3,trichloropropane	8260
98-86-2	Acetophenone	Acetophenone	8270
98-95-3	Nitrobenzene	Nitrobenzene	8270
99-09-2	3-Nitroaniline	3-Nitroaniline	8270

Note: Most recent version of analytical methods will be used.

CLOSURE ACTIVITIES
QUALITY ASSURANCE PROJECT PLAN

QUALITY ASSURANCE PROJECT PLAN APPROVAL FORM AND DISTRIBUTION LIST

Project: SII – Parker, Arizona: Closure for Carbon Reactivation Facility

Approved Plan Submittal Date: _____

Scheduled Closure Start Date: _____

Key Test Personnel Approvals and Distribution

Name/Function/Organization	Signature	Date
Plant Manager		
Registered Professional Engineer		
Quality Assurance Officer		
Sample Custodian		
Laboratory Analysis Coordinator – Lab 1		
Laboratory Analysis Coordinator – Lab 2		

1. The individuals above have received, read, and agreed to the appropriate information pertaining to their project responsibilities listed and provided in this QAPP.
2. The sampling and analytical methods listed in this document will be followed and conducted as referenced.

Tables of Contents

List of Tables

List of Figures

List of Attachments

List of Acronyms

AAS	Atomic Absorption Spectrometry
APC	Air pollution control
BFB	4-Bromofluorobenzene
CAR	Corrective Action Request
CCC	Calibration Check Compounds
CCV	Continuing Calibration Verification
CLP	Contract Laboratory Program
COC	Chain of Custody
CRIT	Colorado River Indian Tribes
CVAAS	Cold Vapor Atomic Adsorption Spectrometry
DOT	Department of Transportation
EPA	Environmental Protection Agency
FPD	Flame Photometric Detector
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
GFAAS	Graphite Furnace Atomic Absorption Spectrometry
IATA	International Air Transportation Association
ICB	Initial Calibration Blank
ICP	Inductively Coupled Plasma Atomic Emission Spectroscopy
ICV	Initial Calibration Verification
LAC	Laboratory Analysis Coordinator
LCS	Laboratory Control Sample
MDL	Method Detection Limit
ml	Milliliter
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NPD	Nitrogen-Phosphorus Detector

QA	Quality Assurance
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	Quality Control
RDL	Reliable Detection Limit
RFA	Request for Analysis
RPD	Relative Percent Difference
RRF	Relative Response Factor
RSD	Relative Standard Deviation
RT	Retention Time
SAP	Sampling and Analysis Plan
SOP	Standard Operating Procedure
SPCC	System Performance Check Compound
SQL	Sample Quantitation Limit
VOA	Volatile Organic Analysis

1.0 PROJECT DESCRIPTION

Siemens Industry, Inc.. (SIISII) operates a carbon reactivation facility located in the Colorado River Indian Tribes (CRIT) Industrial Park near Parker, Arizona. The facility treats spent activated carbon that has been used by industry, state and federal government agencies, and municipalities for the removal of organic compounds from liquid and vapor phase process waste streams. The spent activated carbon is identified as both hazardous and non-hazardous waste and was formerly managed at the facility in carbon reactivation unit RF-1.

The facility, including RF-1, began construction in 1991 and operation commenced in August 1992. The unit treated spent activated carbon exclusively during the time of operation. The unit was shut down, after waste were removed, in June of 1996 to allow for the final construction phase and start up of RF-2 in July 1996 to full interim status capacity.

Currently RF-1 does not share any equipment with RF-2 although with a few exceptions, all RF-1 equipment (which includes the reactivation furnace, APC equipment/piping, and fan) remain on site.

1.1 SCOPE OF CLOSURE

SII has prepared two separate closure plans. One plan covers the closure of the inactive RF-1 Carbon Reactivation Unit, and associated equipment, while the other plan addresses the closure of the remaining portions of the RCRA Facility. This QAPP, and the accompanying Sampling and Analysis Plan address the activities related to all closure activities.

1.2 SCOPE OF QUALITY ASSURANCE PROJECT PLAN

This Quality Assurance Project Plan (QAPP) presents the organization, objectives, functional activities, and specific Quality Assurance (QA) and Quality Control (QC) activities for the partial closure activities being performed at the facility. This QAPP also describes the specific protocols that will be followed for sampling, sample handling and storage, chain-of-custody, and laboratory analysis during the partial closure project.

All QA/QC procedures will be in accordance with applicable professional technical standards, government regulations and guidelines, and specific project goals and requirements. This QAPP has been prepared in accordance with all Environmental Protection Agency (EPA) guidance documents, in particular the following:

- EPA Requirements for Quality Assurance Project Plans EPA QA/R-5 (EPA/240/B-01/003; and
- EPA Guidance for Quality Assurance Project Plans EPA QA/G-5 (EPA/600/R-98/018.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

During the closure of carbon reactivation unit RF-1, the SII Plant Manager has responsibility for all activities performed at this site. As such, the Plant Manager will assign responsibilities to all of the contractors and site personnel involved with closure activities including informing all contractors of site specific requirements for health and safety (e.g., confined spaces, lock-out/tag-out, etc.). This individual will also be responsible for ensuring that the containment for the RF-1 carbon reactivation unit is inspected prior to beginning closure activities. The containment will be inspected for cracks or gaps to prevent migration of spillage, leakage, or contaminated storm water.

A project team consisting of representatives of SII and the selected contractors will implement the closure program. The Professional Engineer will be a consulting contractor who is experienced in the technical coordination and QA/QC associated with environmental projects. The Sample Custodian for this project will be a contractor or SII representative who is experienced in conducting sampling for environmental programs. Analytical services will be provided by contract laboratories experienced in the analysis of environmental test samples. The Laboratory Coordinators, Sample Custodian, and Engineer will provide QA/QC.

The Professional Engineer or his designee is responsible for the development of the Closure Plan. During closure activities, the Engineer is responsible for the overall implementation of closure activities. He/she will serve as the focal point between the contractors, SII representatives, and regulatory agencies for matters concerning closure and will coordinate activities among various project team members. The Professional Engineer or his designee will also serve as the Quality Assurance Officer (QAO) during closure activities. Specific responsibilities will include:

- Developing the Closure Plan including the QAPP and Sampling and Analysis Plan (SAP);
- Coordinating reviews of the Closure Plan including the QAPP and SAP by all participants prior to project initiation;
- Ensuring compliance with the Closure Plan including the QAPP and SAP by all project team members during the project;
- Documenting closure activities in a field logbook;
- Providing coordination between decontamination activities and sampling activities, especially regarding decisions concerning the final rinse of each piece of applicable equipment;
- Providing field review of sample collection chain of custody forms and request for analysis forms;
- Interfacing with the Laboratory Analysis Coordinators (LAC) while samples are being analyzed; and
- Certifying that partial closure activities have been completed.

QAO responsibilities will include (the QAO may be the same individual as the Professional Engineer):

- Reviewing QA/QC activities and communicating the results of those activities to the Professional Engineer or Plant manager as appropriate;
- Making recommendations to the Plant Manager, and/or Professional Engineer regarding any problems that may be detected;
- Ensuring that appropriate corrective actions are taken if problems are detected;
- Conducting or coordinating any required audits of field, office, or laboratory procedures to ensure compliance with the Closure Plan QAPP; and
- Verifying that test data are adequately recorded and maintained and that data are properly reduced, validated, and interpreted.

The Sample Custodian will have overall responsibility for the collection and handling of all samples. His/her duties will include:

- Ensuring that sampling equipment, sample containers, and shipping containers are available at the site;
- Directing and/or participating in sampling activities;
- Overseeing recovery of samples and preservation of samples in the field;
- Performing all QA activities required by the sampling method;
- Documenting sampling activities;
- Assigning and recording sample numbers;
- Preparing samples and packaging them for shipment to the laboratory;
- Preparing chain of custody and request for analysis forms for all samples; and
- Shipping samples to the laboratory.

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

- Reviewing all Data Quality Objectives (DQO) listed in the QAPP and SAP and verifying that they match those used by the laboratory and if they do not, notifying the Professional Engineer or QAO so that appropriate revisions may be made and a request for approvals submitted to the regulatory agency as necessary;
- Receiving, verifying, and documenting that incoming field samples correspond to the sample chain of custody information;
- Notifying the QAO or Professional Engineer of any discrepancies or problems in the chain of custody information, preservation, or sample condition;
- 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 and the specific analytical SOPs;
- Reviewing QC and sample data during analysis and determining if repeat samples or analyses are needed;
- Monitoring the laboratory internal notice of nonconformance procedures when implemented and notifying the QAO or Professional Engineer when a non-conformance has occurred that may impact the reliability of the test data;
- Submitting certified QC and sample analysis results and data packages to the Professional Engineer or QAO; and
- Archiving analytical data.

3.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT

The overall quality assurance objective of this project is to identify the complete set of data necessary to provide a complete quality assessment of the sample results. These data include all the quality indicators generated during the project, and the adherence of the test data to the acceptance criteria for precision and accuracy that are used to assess the data quality. The specific quality objective is to produce a complete data set that can be used to certify partial closure of the RF-1 unit.

QA/QC objectives for precision, accuracy, representativeness, completeness, and sensitivity are addressed in this section. Procedures and formulas for determining accuracy and precision are discussed in Section 11 of this document. The following definitions briefly describe the meaning of each QA/QC objective:

Precision: A measure of mutual agreement among individual measurements of the same property, usually under "prescribed similar conditions." Various measures of precision exist depending on the prescribed similar conditions. If the number of samples is less than 4, the precision is described as relative percent difference (RPD) from the average of replicate measured values for analysis of the same parameter. If the number of samples is four or greater, precision is best described in terms of relative standard deviation (RSD).

Accuracy: The degree of agreement of a measurement (or an average of measurements of the same parameter) X, with an accepted reference or true value, T. Accuracy is usually expressed as the difference between the two values, X - T, or the difference as a percentage of the reference or true value, 100 (X - T)/T, and sometimes expressed as a ratio, X/T. In some cases, accuracy is described as the percentage recovery of a known quantity of material added to a sample prior to analysis. Accuracy is a measure of the bias in a system.

Representativeness: The degree to which data accurately and precisely represent a characteristic of a population, parameter variation at a sampling point, process condition, or an environmental condition.

Completeness: A measure of the amount of valid data obtained compared to the amount expected to be collected under normal conditions. Completeness is usually expressed as a percentage.

Sensitivity: The ability of a measurement system to accurately and precisely determine a desired property within the limits needed to assess the measurement result against established criteria. For this type of program the required sensitivity is a function of assessment criteria, sample size, and analytical detection limit.

Data quality objectives for the measurement parameters associated with this project are presented in Table 3-1. Precision estimates presented in the table represent variability for replicate measurements of the same parameters, expressed in terms of relative percent difference or relative standard deviation, as appropriate. Accuracy values include components of both random error and bias, expressed as a percentage of the true value (for reference materials) or percent analyte recovery (for spiked samples).

3.1 PRECISION AND ACCURACY

A number of procedures will be used to meet the precision and accuracy objectives of the analytical program. All sampling and analytical activities will be conducted following referenced procedures. All reference materials used as calibration standards, surrogate compounds, or laboratory control samples will be of the highest purity commercially available. The calibration of instruments used during analysis will be verified each day that samples are analyzed as described in later sections of this QAPP. Assessment of data precision and accuracy will be accomplished by evaluating the results from multiple analyses of the same parameter, analysis of standards, and the analysis of spiked samples. Field and/or laboratory contamination will be assessed through the analysis of reagent or method blanks, field blanks, and trip blanks.

Precision estimates presented in Table 3-1 represent variability for replicate measurements of the same parameters, expressed in terms of RPD. For analyses of samples with detectable concentrations of the target analytes, precision is evaluated by conducting duplicate analyses of unspiked or spiked samples and assessing the RPD. If the variance in the duplicate analyses bring into question the analytical precision, additional analyses, if allowable by the method, will be performed to better determine the actual value or to evaluate the potential reason(s) for the measurement variability.

Accuracy values in Tables 3-1 and 3-2 include components of both random error and bias, expressed as a percentage of the “true” or “known” value (for reference material) or percentage analyte recovery (for spiked samples). The QA/QC program will focus upon controlling measurement error within the estimated limits of measurement uncertainty, as specified in Tables 3-1 and 3-2. It should be noted that these limits are estimates that are, in most cases, described in the referenced analytical methods or in QA/QC guidance for hazardous waste incineration. They represent that range of results that can be expected from these methods based on actual field sampling results and laboratory-based studies. Therefore it is reasonable to expect that the measurement errors associated with this project will be within the objectives shown in Table 3-1. QA/QC determinations which fall outside of the target range will be flagged and an assessment usability of the data will be made. Specifically, if Matrix Spike/Matrix Spike Duplicate (MS/MSD) percent recoveries fall outside the control limits, the Laboratory Control Samples (LCSs) and field blanks will be reviewed to determine the effect of the matrix on spike recovery.

Table 3-1. Analytical Data Quality Objectives

Sample Matrix	Test Parameters	Accuracy Objectives	Precision Objectives	Other Objectives
Decontamination Water	Total Metals	70 - 130% recoveries for each metal of concern spiked into an aliquot of one sample. The spiking level should be the greater of either 1 - 2 times the apparent concentration in the unspiked sample, or at least 10 times the detection limits. (Matrix Spike).	< 35% RPD for duplicate analyses conducted for one sample from each matrix. This criterion only applies to individual metals with an apparent concentration greater than the lowest calibration standard used in the analyses and/or < 35% RPD for duplicate analysis of the spiked sample. (Matrix Spike Duplicate).	Analysis of one method blank per sample batch, carried through all preparation and analysis steps, should be less than 20% of sample levels or below the detection limit.
Decontamination Water	Volatile Organics	Matrix Spike % recoveries as specified in Table 3-2. Surrogate % recoveries (Table 3-2) spiked onto every field sample.	< 35% RPD for duplicate preparation and analysis for one sample and/or <35% RPD for matrix spike/matrix spike duplicate analysis.	Analysis of one method blank per sample batch carried through all preparation and analysis steps. Results should be less than the lowest calibration standard.
Decontamination Water	Organophosphorus Compounds	Matrix Spike % recovery reported Surrogate % recovery reported.	< 35% RPD for duplicate preparation and analysis for one sample and/or <35% RPD for matrix spike/matrix spike duplicate analysis.	Analysis of one method blank per sample batch carried through all preparation and analysis steps. Results should be less than the lowest calibration standard.

Continued next page

Table 3-1. Analytical Data Quality Objectives (Continued)

Sample Matrix	Test Parameters	Accuracy Objectives	Precision Objectives	Other Objectives
Decontamination Water	Semivolatile Organics	Matrix Spike % recoveries as specified in Table 3-2. Surrogate % recoveries (Table 3-2) spiked onto every field sample.	< 35% RPD for duplicate preparation and analysis for one sample and/or <35% RPD for matrix spike/matrix spike duplicate analysis.	Analysis of one method blank per sample batch carried through all preparation and analysis steps. Results should be less than the lowest calibration standard.

$$\text{Relative Percent Difference (RPD)} = \frac{\text{highest value} - \text{lowest value}}{\text{average value}} \times 100$$

$$\%\ \text{Accuracy} = \frac{\text{found concentration}}{\text{actual concentration}} \times 100 \text{ (for reference materials)}$$

$$\text{Relative Standard Deviation} = \frac{\text{standard deviation}}{\text{average value}} \times 100$$

$$\%\ \text{Recovery} = \frac{\text{found - native}}{\text{amount spiked}} \times 100$$

Table 3-2. Organic Surrogate Spike and Matrix Spike Recovery Limits

Sample Matrix	QA Parameter	Spiking Compound	Recovery Limits
Decontamination Water, Soils	Volatile Organics in Organic & Aqueous Liquid Matrices and Solid Matrices		
	Surrogate Spikes	Toluene-d_8	50 – 130%
		4-Bromofluorobenzene	50 – 130%
		1,2-Dichloroethane-d_4	50 – 130%
	Matrix Spikes	Chlorobenzene	50 – 130%
		Tetrachloroethene	50 – 130%
		1,1-Dichloroethene	50 – 130%
		Trichloroethene	50 – 130%
		Benzene	50 – 130%
		Toluene	50 – 130%
	Internal Standards (area count compared to continuing calibration)	Fluorobenzene	50 – 200%
		Chlorobenzene-d_5	50 – 200%
		1,4-dichlorobenzene-d_4	50 – 200%
Decontamination Water, Soils	Semivolatile Organics in Organic & Aqueous Liquid Matrices		
	Surrogate Spikes	Nitrobenzene-d_5	23 - 120%
		2-Fluorobiphenyl	30 - 115%
		Phenol-d_5	24 - 113%
		2-Fluorophenol	25 - 121%
		2,4,6-Tribromophenol	19 - 122%
	Internal Standards (area count compared to continuing calibration)	1,4-Dichlorobenzene-d_4	50 – 200%
		Naphthalene-d_8	50 – 200%
		Acenaphthene-d_{10}	50 – 200%
		Phenanthrene-d_{10}	50 – 200%
		Chrysene-d_{12}	50 – 200%
		Perylene-d_{12}	50 – 200%

If during the course of sample analyses, an analytical result exceeds that calibrated range for an indicator constituent, or any other analytical anomalies are noted with any sample, the Professional Engineer or QAO is to be contacted by the laboratory immediately to discuss the results/issues and possible options before proceeding with the subject analyses. If ongoing QA/QC procedures reveal that a measurement's error has exceeded the established data quality limits, the source of the excessive error will be identified and corrective action will be taken, as described in Section 12. If data fall outside the acceptable range of precision and accuracy, even after corrective action has been taken, those data points will be flagged and a determination of their usability will be made. Also, alternative procedures (either sampling or analytical) may be considered and recommended if possible.

The analytical laboratory conducting the analyses of the samples will be required to have standard operating procedures (SOPs) for each analysis to be performed. The laboratory will also be required to have procedures for preparing, reviewing, modifying, and controlling distribution of analytical procedures.

3.2 DETECTION LIMITS

For all applicable analyses, the laboratory report will provide both the method detection limit (MDL) and the reliable detection limit (RDL). The laboratory will maintain on record the documentation detailing how each MDL and RDL was derived. All non-detects for indicator constituents will be reported and assessed at the laboratory-determined MDL. If an analyte is detectable at some value between the MDL and RDL, the detected value will be reported and flagged as estimated. If matrix interference(s) occurs or sample dilutions are necessary, a sample specific MDL or sample quantitation limit (SQL) may be reported. If sample specific MDL or SQL is applicable, the documentation of the serial dilutions or other measures taken to arrive at the SQL will be documented in the analytical report.

3.3 COMPLETENESS

Data completeness represents the percentage of valid data collected from the total number of valid samples collected. As it applies to this type of sampling program, data must be essentially 100 percent complete. Any sample with results that are deemed not valid will require resampling or reanalysis.

3.4 REPRESENTATIVENESS, SENSITIVITY AND COMPARABILITY

Sensitivity for this sampling event is a function of the sample matrix, the sample size, and the analytical detection limit. The sampling procedures chosen for the test are designed to be representative by using composite samples collected using a grid format. The sample sizes chosen are such that the collected sample is greater than the sample volume/mass required for each analytical method to obtain an acceptable quantitation limit for the project.

If ongoing QA/QC procedures reveal that a measurement's error has exceeded the estimated data quality limits, the source of the excessive error will be identified and corrective action will be taken, as described in Section 12. If data fall outside the acceptable range of precision and accuracy, even after corrective

action has been taken, those data points will be flagged and a determination of their usability will be made. Also, alternative procedures (either sampling or analytical) may be considered and recommended if possible. All parties before implementation would necessarily agree to any changes or additions.

The analytical laboratory conducting the analysis of the samples will be required to have standard operating procedures for each analysis to be performed. The laboratory will also be required to have procedures for preparing, reviewing, modifying, and controlling distribution of analytical procedures.

4.0 SAMPLING PROCEDURES

The objective of this test program is the collection of representative final rinse samples that demonstrate that the partial closure objectives have been met. To meet this objective requires minimizing the potential sources of sample contamination or bias imparted to the samples by the sampling equipment, ambient conditions, handling, and preservation. The test program samples will be collected using the method described in Figures 4-1 and 4-2o f the SAP. The total number of field samples expected to be generated during the test program are summarized in Table 4-1.

The analytical procedures to be used during the test program are located in Tables 4-2 through 4-6. During the course of the sampling and analysis, situations may arise that require modifying the specific sampling or analytical procedure included in these tables or referenced in this plan. In cases where the sampler or laboratory finds it necessary to make adjustments to the sampling or analytical methods, the changes will be documented following the corrective action procedures noted in Section 12. Any such changes must be approved by the Professional Engineer or Quality Assurance Officer.

All samples will be collected using dedicated sampling equipment at each sampling location, thus eliminating the potential for cross contamination from one sample to another. New sampling equipment will be used if retesting is required. After use, sampling equipment will be collected for disposal offsite.

Sample tracking is documented using unique sample numbering applied to every sample (Figure 4-1), sample labels, completed request for analysis (RFAs) forms, and completed chain of custody (COC) forms (Figures 4-2 through 4-4).

Table 4-1. Summary of Expected Field Samples

Sample	Container	Number of Samples
Carbon Reactivation Unit RF-1, Afterburner, APCD, Fan, Stack		
Total Metals	500 ml amber glass	2
Archive	500 ml amber glass	2
Subtotal		4
Carbon Reactivation Unit RF-2, Afterburner, APCD, Fan, Stack		
Total Metals	500 ml amber glass	3
Archive	500 ml amber glass	3
Subtotal		6
Tank T-8 & Ancillary Equipment		
Total Metals	500 ml amber glass	1
Volatile Organics	Two 40 ml VOA vials	1
Semivolatile Organics	1 liter amber glass	1
Organophosphorus Compounds	1 liter amber glass	1
Archive	1 liter amber glass	1
Subtotal		5
Tank T-1 & Ancillary Equipment		
Total Metals	500 ml amber glass	1
Volatile Organics	Two 40 ml VOA vials	1
Semivolatile Organics	1 liter amber glass	1
Organophosphorus Compounds	1 liter amber glass	1
Archive	1 liter amber glass	1
Subtotal		5
Tank T-2 & Ancillary Equipment		
Total Metals	500 ml amber glass	1
Volatile Organics	Two 40 ml VOA vials	1
Semivolatile Organics	1 liter amber glass	1
Organophosphorus Compounds	1 liter amber glass	1
Archive	1 liter amber glass	1
Subtotal		5
Tank T-5 & Ancillary Equipment		
Total Metals	500 ml amber glass	1
Volatile Organics	Two 40 ml VOA vials	1
Semivolatile Organics	1 liter amber glass	1
Organophosphorus Compounds	1 liter amber glass	1
Archive	1 liter amber glass	1
Subtotal		5
Tank T-6 & Ancillary Equipment		
Total Metals	500 ml amber glass	1
Volatile Organics	Two 40 ml VOA vials	1
Semivolatile Organics	1 liter amber glass	1
Organophosphorus Compounds	1 liter amber glass	1
Archive	1 liter amber glass	1
Subtotal		5

Sample	Container	Number of Samples
Tank T-18 & Ancillary Equipment		
Total Metals	500 ml amber glass	1
Volatile Organics	Two 40 ml VOA vials	1
Semivolatile Organics	1 liter amber glass	1
Organophosphorus Compounds	1 liter amber glass	1
Archive	1 liter amber glass	1
Subtotal		5
Wash Water (Unused)		
Total Metals	500 ml amber glass	3
Volatile Organics	Two 40 ml VOA vials	3
Semivolatile Organics	1 liter amber glass	3
Organophosphorus Compounds	1 liter amber glass	3
Archive	1 liter amber glass	3
Subtotal		15
Soil (Container area)		
Total Metals	500 ml amber glass	9
Volatile Organics	Two 40 ml VOA vials	9
Semivolatile Organics	1 liter amber glass	9
Organophosphorus Compounds	1 liter amber glass	9
Archive	1 liter amber glass	9
Subtotal		45
Soil (Tanks and ancillary equipment area)		
Total Metals	500 ml amber glass	21
Volatile Organics	Two 40 ml VOA vials	21
Semivolatile Organics	1 liter amber glass	21
Organophosphorus Compounds	1 liter amber glass	21
Archive	1 liter amber glass	21
Subtotal		105
Soil (RF-1 and RF-2 Process areas)		
Total Metals	500 ml amber glass	9
Volatile Organics	Two 40 ml VOA vials	9
Semivolatile Organics	1 liter amber glass	9
Organophosphorus Compounds	1 liter amber glass	9
Archive	1 liter amber glass	9
Subtotal		45
Soil (Background)		
Total Metals	500 ml amber glass	9
Volatile Organics	Two 40 ml VOA vials	9
Semivolatile Organics	1 liter amber glass	9
Organophosphorus Compounds	1 liter amber glass	9
Archive	1 liter amber glass	9
Subtotal		45
Total Samples Collected		**295**

Table 4-2. Analysis of Multiple Metals Samples Using SW-846 Method 6010 (ICP)

Matrix:	Final Rinse Water, Soils
Procedure Summary:	**SW-846 Method 6010** Before using this procedure there must be data available documenting initial demonstration of performance including the selection criteria of background correction points, analytical dynamic ranges, applicable equations, and written verification of interelement correction equations or other routines for correcting spectral interference. The analyst should follow the instructions provided by the manufacturer for operating conditions. Prior to sample analysis, the instrument must be setup with proper operating parameters as detailed in the Method and allowed to become thermally stable. To begin analysis of samples, reset the nebulizer gas flow rate to the determined optimized flow. The instrument should then be profiled and an initial calibration should be performed in accordance with the manufacture's instructions. The calibration should consist of a minimum of a blank and a standard. An analysis of an initial calibration verification sample (ICV), a calibration blank (ICB), and a continuing calibration verification sample (CCV) should immediately follow the daily calibration. An interference check sample should also be run at the beginning of each analytical run. The results of this check sample should be within $\pm$ 20% of the true value. A calibration blank and either an ICV or a CCV must be analyzed after every tenth sample and at the end of the run. The system should be rinsed between each sample. Check standards and calibration verifications must be within 10% of the calibration with relative standard deviation < 5% from replicate (minimum of two) integrations. If the calibration cannot be verified within limits, the sample analysis must be discontinued, the cause determined and the instrument recalibrated.
Quality Control:	One laboratory method blank will be analyzed for every batch of samples analyzed. The method blank is a performance control sample that is prepared in the laboratory and processed in a manner identical to the field sample. To document the effect of the matrix, a minimum of at least one matrix spike and one duplicate or one matrix spike/matrix spike duplicate pair should be analyzed. A laboratory control sample (LCS or method spike) should be included with each analytical batch. The LCS consists of an aliquot of a clean (control) matrix similar to the sample matrix and of the same weight and volume. The LCS is spiked with the same analytes at the same concentrations as the matrix spike. When the matrix spike results indicate a potential problem due to the sample matrix itself, the LCS results are used to verify that the laboratory can perform the analysis in a clean matrix.
References:	Metals analytical Methods 6010 Test Methods for Evaluating Solid Waste, SW-846, Third Edition, 1986 and updates.

Table 4-3. Analysis of Mercury Samples Using SW-846 Method 7470 (CVAA)

Matrix:	Final Rinse Water, Soils
Procedure Summary:	**SW-846 Method 7470** Prior to sample analysis, a calibration curve should be created by plotting the absorbances of standards versus micrograms of mercury. A minimum of a calibration blank and three standards should be used for this calibration. After the calibration, the curve must be verified by the use of at least a calibration blank and a calibration check standard. The check standard must be within 10% of the true value for the curve to be considered valid. If more than ten samples are analyzed, the curve must be verified by measuring a mid-range standard after every tenth sample. This calibration check value must be within 20% of the true value or the previous ten samples must be reanalyzed. To determine the absorbance of samples or standards, the circulating pump should be adjusted to 1 liter/minute and allowed to run continuously during analysis. Remove the aeration apparatus from the BOD bottle and allow the sample or standard to stand quietly without manual agitation. Attach the stopper and frit to the BOD bottle. The absorbance should reach a maximum within 30 seconds. As soon as the recorder pen levels off (approximately 1 minute), open the bypass valve and continue aeration until the absorbance returns to its minimum value. Close the bypass valve, remove the stopper and frit from the BOD bottle, and continue aeration.
Quality Control:	One laboratory method blank will be analyzed for every batch of samples analyzed. The method blank is a performance control sample that is prepared in the laboratory and processed in a manner identical to the field sample. To document the effect of the matrix, a minimum of at least one matrix spike and one duplicate or one matrix spike/matrix spike duplicate pair should be analyzed. A laboratory control sample (LCS or method spike) should be included with each analytical batch. The LCS consists of an aliquot of a clean (control) matrix similar to the sample matrix and of the same weight and volume. The LCS is spiked with the same analytes at the same concentrations as the matrix spike. When the matrix spike results indicate a potential problem due to the sample matrix itself, the LCS results are used to verify that the laboratory can perform the analysis in a clean matrix.
References:	Metals analytical Method 7470 Test Methods for Evaluating Solid Waste, SW-846, Third Edition, 1986 and updates.

Table 4-4. Analysis of Volatile Organics Using SW-846 Method 8260

Matrix:	Final Rinse Water, Soils
Procedure Summary:	**Volatile Organic Analysis – Method 8260** Prior to calibration, the system must be hardware tuned to meet the BFB criteria. Calibration of the instrument must be performed using the same introduction technique as the same. Calibration standards should be prepared from the secondary dilution standards. The initial calibration must contain at least five different calibration standards. The mean response factor (RF) and relative standard deviation (RSD) of the response factor are calibrated for each target analyte. Prior to using the calibration, the mean RF of the five system performance check compounds (SPCC) and the RSD of the six calibration check compounds (CCC) are evaluated against the method criteria. If the SPCCs do not meet the minimum assigned mean response factor or if the CCCs report an RSD greater than 30%, the curve should not be used. All target compounds must report RSDs less than 15% or one of the calibration options listed in section 7.0 of method 8000 must be applied to the compound. Calibration verification should be performed at the beginning of each twelve-hour shift. To verify the calibration, a BFB standard is introduced to the system followed by a midrange calibration standard and a method blank. If any of the standards do not meet the criterion set forth in section 7.4 of this method, corrective action must be taken prior to sample analysis. Samples will be spiked with surrogate and internal standards and introduced through to the GC/MS via a purge-and –trap unit. An inert gas is bubbled through a potion of the sample at ambient temperature transferring the volatile components from an aqueous phase to a vapor phase. The vapor is then swept into the sorbent column. The quantitative identification of compounds determined by this method is based on retention time and on comparison of the sample mass spectrum. The reference mass spectrum must be generated by the laboratory using the conditions of this method. The characteristic ions from the reference mass spectrum are defined as the three ions of greatest relative intensity, or any ions over 30% relative intensity, if less than three such ions occur in the reference spectrum. If sample concentrations exceed the calibration range, the sample should, if sufficient volume is available, be diluted and reanalyzed. If insufficient volume is available for reanalysis, the results may be flagged as extrapolated beyond the calibration range.
Quality Control:	One method blank should be analyzed with each group of 20 or less sample analyzed on the same instrument during the same shift. Field blanks and trip blanks should be prepared with the samples and taken to the field. The caps of the field blanks are removed in the field during recovery of the sample. At least one pair of field blanks and trip blanks should be included during each sampling event. Laboratory control samples (LCS) and matrix spike/matrix spike duplicates (MS/MSD) must be analyzed to determine accuracy of the analysis and should be included with each analytical batch.
References:	Method 8260, Volatile Organics by GC/MS, Test Methods for Evaluating Solid Waste, SW-846, Third Edition, November 1986, and Updates.

Table 4-5. Analysis of SVOC Using SW-846 Method 8270

Matrix:	Final Rinse Water, Soils
Procedure Summary:	**Semivolatile Organic Analysis- Method 8270** Prior to analysis, the sample extracts should be allowed to warm to room temperature and internal quantitation standards should be added. Extracts may then be cleaned up using appropriate cleanup method if necessary. An aliquot of extract is then injected into the GC/MS system using the same operating conditions as used for the calibration. Target analytes are identified and analyzed by gas chromatography/mass spectrometry according to the procedures in SW-846 Method 8270. The quantitative identification of compounds determined by this method is based on retention time and on comparison of the sample mass spectrum. The reference mass spectrum must be generated by the laboratory using the conditions of this method. The characteristic ions from the reference mass spectrum are defined as the three ions of greatest relative intensity, or any ions over 30% relative intensity, if less than three such ions occur in the reference spectrum. If the response for any quantitation ion exceeds the initial calibration range of the GC/MS system, the sample extract must be diluted and reanalyzed.
Quality Control:	One laboratory method blank will be analyzed for every batch of samples analyzed. The method blank is a performance control sample that is prepared in the laboratory and processed in a manner identical to the field sample. To document the effect of the matrix, a minimum of at least one matrix spike and one duplicate or one matrix spike/matrix spike duplicate pair should be analyzed. A laboratory control sample (LCS or method spike) should be included with each analytical batch. The LCS consists of an aliquot of a clean (control) matrix similar to the sample matrix and of the same weight and volume. The LCS is spiked with the same analytes at the same concentrations as the matrix spike. When the matrix spike results indicate a potential problem due to the sample matrix itself, the LCS results are used to verify that the laboratory can perform the analysis in a clean matrix.
References:	Method 8270, Semivolatile Organics by Gas Chromatography, Mass Spectrometry (GC/MS), Test Methods for Evaluating Solid Waste, SW-846, Third Edition, November 1986, and Updates.

Table 4-6. Analysis of Organophosphorus Compounds in Aqueous Samples Using SW-846 Method 8141A

Matrix:	Final Rinse Water
Procedure Summary:	**Organophosphorus Compounds Analysis- Method 8141A** Prior to analysis, the sample extracts should be allowed to warm to room temperature and internal quantitation standards should be added. Extracts may then be cleaned up using the appropriate cleanup method if necessary. An aliquot of extract is then injected into the GC/FPD or GC/NPD system using the same operating conditions as used for the calibration. Target analytes are identified and analyzed by gas chromatograph/flame photometric detector or gas chromatograph/nitrogen-phosphorus detector according to the procedures in SW-846 Method 8141A. The quantitative identification of compounds determined by this method is based on retention time and confirmation may be made using a comparison of the sample mass spectrum from GC/MS analysis. If the response for any sample exceeds the initial calibration range of the GC system, the sample extract must be diluted and reanalyzed.
Quality Control:	One laboratory method blank will be analyzed for every batch of samples analyzed. The method blank is a performance control sample that is prepared in the laboratory and processed in a manner identical to the field sample. To document the effect of the matrix, a minimum of at least one matrix spike and one duplicate or one matrix spike/matrix spike duplicate pair should be analyzed. A laboratory control sample (LCS or method spike) should be included with each analytical batch. The LCS consists of an aliquot of a clean (control) matrix similar to the sample matrix and of the same weight and volume. The LCS is spiked with the same analytes at the same concentrations as the matrix spike. When the matrix spike results indicate a potential problem due to the sample matrix itself, the LCS results are used to verify that the laboratory can perform the analysis in a clean matrix.
References:	Method 8141A, Organophosphorus Compounds by Gas Chromatography: Capillary Column Technique, Test Methods for Evaluating Solid Waste, SW-846, Third Edition, November 1986, and Updates.

Figure 4-1. Planned Sample Identification Code

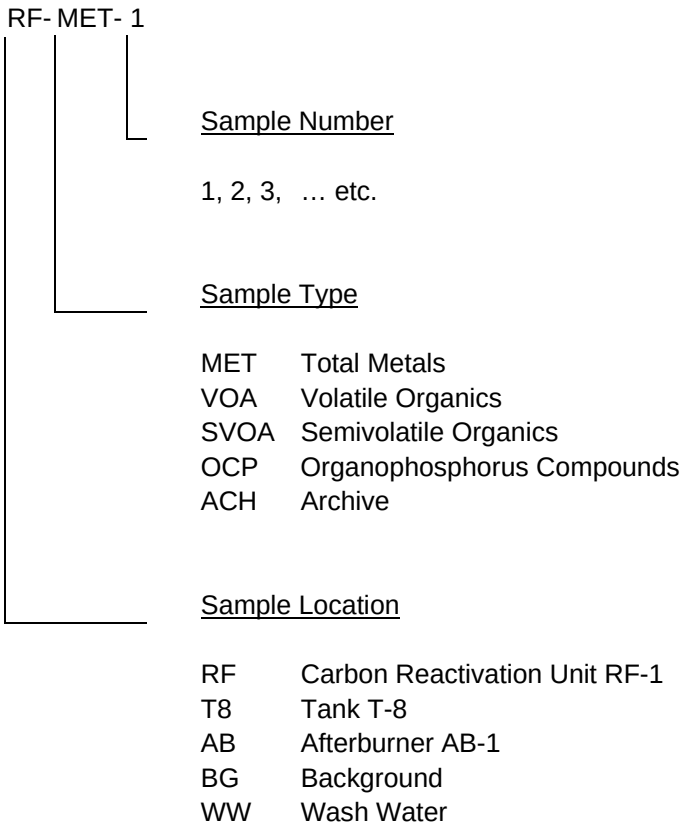


Figure 4-2. Example Sample Label Format

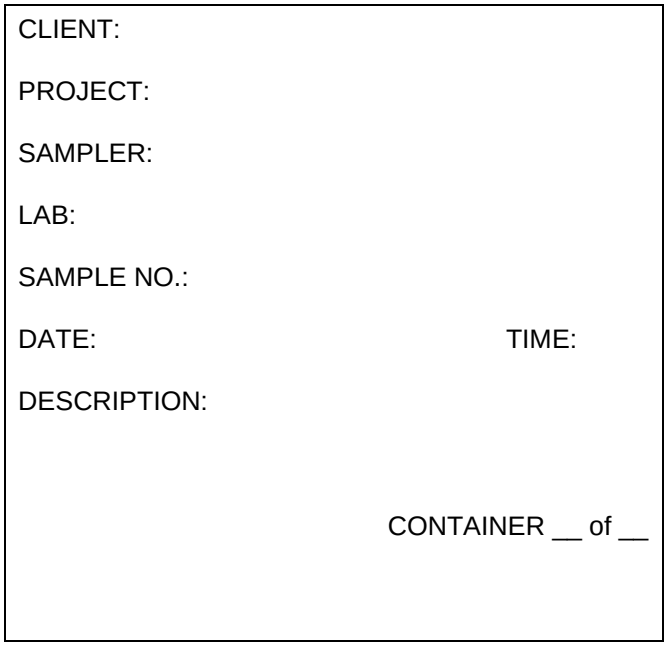


Figure 4-3. Example Request For Analysis Form

REQUEST FOR ANALYSIS

Focus Environmental, Inc.

Client: _____ Description: _____

Location: _____ Project No.: _____

Sample Identification

T8-MET-1

Test No.: 1

Run No.: 1

Description:

Tank T8 Metals

Lab: Analytical Laboratory

Container: 500 ml amber glass

Number of Containers: 1

Requested Preparation/Analyses:

Metals – Mercury – Liquids CVAAS (SW846-7470)

Metals – Multiple (Specify) ICP (SW846-6010)

Preparation Method:

N/A

Acid Digestion – Stack Gas Multi-Metals

Preservation

None required

Hold Time

180 days/28 days for Hg

Special Instructions

Analyze for metals: Sb, As, Ba, Be, Cd, total Cr, Pb, Hg, Ni, Se, Ag, Tl and V.

Figure 4-4. Example of Chain of Custody Form

Custody Record

Focus Environmental, Inc.

Client:

Location:

Description:

Project No.:

Note: This form is to be accompanied by a "Request for Analysis" which specifies the preparation and analysis to be performed for each sample.

Sample ID	Description	Container	No.	Grab/Comp	Date	Time	Remarks
RF-MET-1	Carbon Reactivation Unit RF-1 metals sample	500 ml amber glass bottle		Comp.	01/01/01	01:00	

Sampler: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)

5.0 SAMPLE HANDLING, TRACEABILITY AND HOLDING TIMES

5.1 SAMPLE HANDLING AND CUSTODY

A sample will be considered to be in the custody of a person if it is in his or her possession, in his or her sight, or secured by that person in an approved location accessible only to authorized personnel.

The sampling contractor or laboratory will prepare sampling media, reagents, and sample containers according to the specifications of the methods as described in Section 4 and will ship them to the site in sealed containers.

During sampling and until the samples arrive at the analytical laboratory; the samples are the responsibility of the Sample Custodian. When overnight couriers are utilized, the airbill will serve to document the transfer of custody from the Sample Custodian to the courier. The courier's air bill becomes part of the COC record. Upon transfer of the samples from the courier to the analytical laboratory, sample custody will be maintained by the analytical laboratory performing the analysis.

Collected samples will be shipped from the site to the laboratory in sealed containers with a COC and RFA forms. Examples of acceptable RFA and COC forms are provided as Figures 4-3 and 4-4.

Upon receipt of samples at the laboratory, the receiver will accept custody for the shipment by an exchange of signatures with the delivery agent. The shipping containers will be opened by the Laboratory Analysis Coordinator or his designee and inspected. The container contents will be verified against the accompanying COC. Any damage to the contents of the shipping container or deviations from the original shipment documents will be noted on the COC and the Professional Engineer overseeing the project will be notified. Transfer of custody within the laboratory is addressed in the Laboratory's QA manual. Upon completion of analysis, samples will be maintained at the laboratory under COC until they are released for proper disposal.

5.2 SAMPLE LABELING

An example sample label format is presented in Figure 4-2. Each sample container will be labeled to show the source of the sample; the project identification; sampler's initials; laboratory to which the sample will be shipped; an unique alphanumeric sample number; date and time; sample description; test number; and run number.

Project samples will be tracked via the assigned unique alpha-numeric sample numbers. The sample number will appear on the sample label, the RFA, and the COC. The alpha-numeric system for sample identification for this project is presented in Figure 4-1. The numbering system presented will result in unique numbers being assigned to every sample.

5.3 REQUEST FOR ANALYSIS/CHAIN OF CUSTODY

The Sample Custodian will complete the COC and RFA for every sample. The samples will be preserved as needed and secured by the Sample Custodian and must remain in his or her possession or secured in a location accessible only to authorized personnel until custody is transferred to a courier for delivery to the laboratory.

Each sample container will be clearly identified using standard container labels. It is imperative that information on the COC form, RFA form, and the container label match in every respect. Field samples may be transported directly to the analytical laboratory by the test management or the sampling contractor. If the samples are shipped via overnight courier, an individual trained in Federal Department of Transportation (DOT) and International Air Transportation Association (IATA) regulations will package the samples to assure compliance with the applicable portions of the regulations.

5.4 SAMPLE CONTAINERS, PRESERVATION, AND HOLDING TIMES

Table 5-1 shows the appropriate containers, preservation, and holding times for all samples to be collected during the project.

Table 5-1. Sample Containers, Preservation, and Holding Times

Parameter	Sample Name	Containers	Preservation	Maximum Holding Time
Metals	Final Rinse Water	Glass bottle, Teflon lined cap	HNO_3 pH $\leq$ 2	180 days/28 days for Hg
	Soil	Glass wide mouth jar; Teflon lined lid	None	180 days/28 days for Hg
Volatile Organic Compounds	Final Rinse Water	VOA vials with Teflon septa	Chill to 4 $\pm$2ºC	14 days
	Soil	Glass wide mouth jar; Teflon lined lid	Chill to 4 $\pm$2ºC	14 days
Organophosphorus Compounds	Final Rinse Water	Glass bottle, Teflon lined cap	Chill to 4 $\pm$2ºC	14 days to extraction and 40 days from extraction to analysis
Semivolatile Organic Compounds	Final Rinse Water	Glass bottle, Teflon lined cap	Chill to 4 $\pm$2ºC	14 days to extraction and 40 days from extraction to analysis
	Soil	Glass wide mouth jar; Teflon lined lid	Chill to 4 $\pm$2ºC	14 days to extraction and 40 days from extraction to analysis

6.0 CALIBRATION PROCEDURES

Calibration procedures for all analytical equipment used in the analysis of project samples will be performed in accordance with the prescribed method and the laboratory's SOPs.

7.0 ANALYTICAL PROCEDURES

Analytical procedures and methods are summarized in Table 7-1, and described in detail in Tables 4-2 through 4-6. During the course of sampling and analysis, situations may arise that require modifying the specific sampling or analytical procedures included or referenced in this Plan. The laboratory SOPs, which include a number of procedures for special circumstances, will be followed. In cases where the laboratory finds it necessary to make adjustments to the analysis methods, the changes will be documented following the corrective action procedures noted in Section 12. Any such changes must be approved by the Professional Engineer or the test-designated QAO. All analytical methods used in this test program are found in Test Methods for Evaluating Solid Waste, SW-846 (SW-846), Third Edition, November 1986 and Updates. The most recent versions of the analytical methods will be used.

Table 7-1. Analytical Procedures and Methods

Analysis	Preparation Method	Analytical Method[a]
Total Metals[b]	Acid digestion (SW846-3010A or 3015 and 7470A)	ICP (SW846-6010B) and CVAAS (SW846-7470A)
Volatiles[c]	Purge and trap	Volatile Organics (SW846-8260B)
Organophosphorus Compounds[d]	Solvent extraction (SW846-3500 Series)	Organophosorus Compounds (SW846-8141A)
Semivolatiles[e]	Solvent extraction (SW846-3500 Series)	Semivolatile Organics (SW846-8270C)

[a] "SW846" refers to Test Methods for Evaluating Solid Waste, Third Edition, November 1986, and Updates.
[b] Metal analytes are identified in Attachment 1.
[c] Volatile compound analytes are identified in Attachment 1.
[d] Organophosphorus compound analytes are identified in Attachment 1
[e] Semivolatile Compound analytes are identified in Attachment 1.

8.0 INTERNAL QUALITY CONTROL INFORMATION

8.1 DEFINITIONS

The various types of QA/QC checks that may be performed as part of the compliance test, both for sampling and analysis, are defined below. One or more of these QA/QC checks are associated with each measurement system in order to assess the compliance of the data to the DQOs established in Section 3. Table 8-1 is a summary of all the sample analyses and their associated internal quality control checks associated with this test program.

Audit Sample An audit sample is a field or alternate laboratory prepared blank spike submitted to the compliance test laboratory to assess accuracy or potential sample degradation.

Blank, Field A field blank is a sampling train or sampling component that is set up in the field but is not used for compliance test sampling. The field blank is used to assess background contamination that may affect the representativeness of the field samples.

Blank, Method A method blank is a sample of unused media that is prepared and analyzed in the compliance test laboratory to assess background contamination that may exist in the laboratory, on glassware, or in the analytical system.

Blank, Spike A blank spike is a laboratory prepared sample of blank media that is spiked with a known amount of target analyte(s) used to assess the accuracy of the analytical method.

Blank, System An aliquot of uncontaminated reagent used to clean out the analytical system after high level samples have been analyzed or before analysis begins.

Blank, Trip A trip blank is an unused sample component that is shipped to the field along with the sampling equipment/media and/or returned to the laboratory without having been exposed to field conditions. If contamination is encountered in the field blank(s), the trip blank is analyzed to assess whether or not the contamination originates in the field, is inherent in the equipment/media, or results from exposure during shipping and handling.

Calibration Check A standard solution from a source other than the calibration standards used to verify the integrity of an instrument's calibration.

Calibration Standards The laboratory will use traceable standards and submit standard preparation logs as part of the deliverables package.

Table 8-1. Summary of Laboratory Analytical Quality Control Checks, Frequencies, Acceptance Criteria, and Corrective Actions

Parameter/Method	Quality Control Check	Method of Determination	Frequency	Acceptance Criteria	Corrective Action
Metals by ICP or AAS (SW846 6010/6020 ICP and SW846 7470A CVAA)	Initial calibration	Multiple standards (AAS) or 1 standard (ICP) and a calibration blank, bracketing the expected concentrations. Critical level should be at least twice the lowest calibration standard.	Prior to sample analysis	Correlation coefficient of linear plot >0.995 (AAS). Not applicable for ICP.	Recalibrate
	Reagent blank	Analysis of blank	After every 10 samples and at end of analysis	Less than instrument detection limit (IDL)	Reanalyze if greater than the reporting limit and discuss in case narrative if greater than the IDL
	Calibration check	Analysis of independent calibration check standard	Once after initial calibration	90 - 110% of theoretical value	Reanalyze and recalibrate, if necessary
	Serial dilution	Analysis of serial dilution (DF=5)	Once per matrix for high level analytes (ICP only)	90 - 110% of undiluted sample value (ICP samples > 50 times the IDL)	Flag data; discuss in case narrative
	Post digestion spike (GFAAS only)	Analysis of post digest spike, spiked at 2 to 5 times the original sample value	Each sample analyzed by GFAAS	85 - 115% of theoretical value	Flag data; discuss in case narrative
	Calibration accuracy (ICP only)	Reanalysis of high level standard	After every initial calibration	90 - 110% of theoretical value	Recalibrate and recheck
	Interference check (ICP only)	Analysis of interference sample	After every initial calibration and at the end of each run	80 - 120% of theoretical value	Recalibrate and recheck

Continued next page

Table 8-1. Summary of Laboratory Analytical Quality Control Checks, Frequencies, Acceptance Criteria, and Corrective Actions (Cont.)

Parameter/Method	Quality Control Check	Method of Determination	Frequency	Acceptance Criteria	Corrective Action
Metals by ICP or AAS, (Continued)	Continuing calibration	Midlevel standard and blank	Beginning and end of each analysis period and after every 10 samples	AAS - Midlevel standard 80 - 120% of theoretical value; blank <50% of lowest calibration standard. ICP - Midlevel standard 90 - 110% of theoretical value; blank <50% of lowest calibration standard or within 3 SD of average blank.	Identify and correct problems; reanalyze samples run since last acceptable continuing calibration check.
Volatile organics by GC or GC/MS (SW846 8260)	Initial calibration	3 - 5 standards bracketing expected concentrations	Prior to sample analysis	Variability of average RRF less than or equal to 30% RSD for POHCs and CCCs SPCCs (chlorobenzene and 1,1,2,2-tetrachloroethane) will be $\geq$ 0.3, and SPCCs (chloromethane, 1,1-dichloroethane, and bromoform) will be $\geq$ 0.1	Recalibrate
	Continuing calibration	Midlevel standard	Prior to sample analysis, then every 12 hours or after sample set	RRF for POHCs and CCCs within 25% difference of the initial calibration average RRF. SPCCs (chlorobenzene and 1,1,2,2-tetrachloroethane) will be $\geq$ 0.3, and SPCCs (chloromethane, 1,1-dichloroethane, and bromoform) will be $\geq$ 0.1	Reanalyze standard. If second analysis does not meet criteria, recalibrate and reanalyze samples or justify acceptance of sample results since the last successful check.

Continued next page

Table 8-1. Summary of Laboratory Analytical Quality Control Checks, Frequencies, Acceptance Criteria, and Corrective Actions (Cont.)

Parameter/Method	Quality Control Check	Method of Determination	Frequency	Acceptance Criteria	Corrective Action
Volatile organics by GC or GC/MS (SW846 8260)	Consistency in chromatography	For MS methods, monitor internal standard retention time and area. For non-MS methods, monitor retention time windows for compounds of interest.	Every sample, standard, and blank	Retention time within 30 seconds of last calibration check. Area within -50 to +100% of last calibration check	Perform calibration standard check. Reanalyze sample if possible, or flag data.
	Calibration check or LCS	Analysis of independent calibration check standard	In association with each initial calibration	Within 3 std. deviations of historical mean (laboratory specific)	Recalibrate and recheck.
	Method Blank	Analysis of blank	Analyze one with each analytical batch	Result less than method detection limit	Flag data and discuss in case narrative.
Semivolatile organics GC/MS (SW846 8270C)	Initial calibration	5 standards bracketing expected concentrations. Critical level should be at least 10 times higher than lowest standard	Prior to sample analysis	Variability of average RRF less than or equal to 30% RSD for CCCs. SPCCs greater than or equal to 0.05.	Recalibrate
	Calibration verification	Midlevel standard	Prior to sample analysis, then every 12 hours or after sample set	RRF for CCCs within 30% of initial calibration average RRF. SPCCs greater than or equal to 0.05.	Reanalyze standard. If second analysis does not meet criteria, recalibrate and reanalyze samples or justify acceptance of sample results since the last successful check.
	Consistency in chromatography	For MS methods, monitor internal standard retention time and area. For non-MS methods, monitor retention time window for compounds of interest.	Every sample, standard, and blank	Retention time within 30 seconds of last calibration check. Area within -50 to +100% of last calibration check	Perform calibration standard check. Reanalyze sample if possible, or flag data.

Continued next page

Table 8-1. Summary of Laboratory Analytical Quality Control Checks, Frequencies, Acceptance Criteria, and Corrective Actions (Cont.)

Parameter/Method	Quality Control Check	Method of Determination	Frequency	Acceptance Criteria	Corrective Action
Semivolatile organics GC/MS (SW846 8270C) cont.	Calibration check	Analysis of independent calibration check standard	In association with each initial calibration	Within 3 std. deviations of historical mean (laboratory specific)	Recalibrate and recheck
	Method Blank	Analysis of blank	Analyze one with each analytical batch	Results less than method detection limit	Flag data and discuss in the case narrative.
Organophosphate GC (SW846 8141A)	Initial calibration	Minimum of 3 standards bracketing expected concentrations analyzed in duplicate	Prior to sample analysis	Laboratory specific	Recalibrate
	Calibration verification	Midlevel standard	After each set of 10 samples	Laboratory specific	Reanalyze standard. If second analysis does not meet criteria, recalibrate and reanalyze samples or justify acceptance of sample results since the last successful check.
	Calibration check	Analysis of independent calibration check standard	In association with each initial calibration	Within 3 std. deviations of historical mean (laboratory specific)	Recalibrate and recheck
	Method Blank	Analysis of blank	Analyze one with each analytical batch	Results less than method detection limit	Flag data and discuss in the case narrative

Contingency Sample An additional field sample from the same location as other field samples that is held in reserve in case of breakage or QA/QC failure during the handling or analysis of the primary sample.

Continuing Calibration Verification A midpoint standard, from the same calibration source as the initial calibration solution analyzed periodically to verify that calibration conditions have not drifted from the initial calibration.

Duplicate Analysis A duplicate is a sample that is split in the laboratory and prepared and analyzed twice. The results of the two analyses are compared as a measure of precision.

Duplicate Injection A second analysis of a single sample preparation. This QC test may be used to assess analytical QC failures, matrix interference, or as a measure of analytical system precision.

Initial Calibration A series of analyses of solutions that have known concentrations, used to establish the correspondence between the amount of an analyte present in the solution and the instrument's response across the expected analytical range of the samples. Initial calibrations also establish retention time windows for identification purposes in chromatographic methods.

Interference Check An interference check sample is analyzed, for ICP analysis only, to assess the possible error in analytical results arising from the interaction of various metals in the sample under the conditions of analysis.

Internal Standard Recovery Internal standards are non-target spikes added to samples for quantitation purposes. The percent recovery of the internal standards is checked to assess whether or not significant matrix interference may affect the accuracy and precision of analytical results.

Proficiency Test A series of blank spikes analyzed in the compliance test laboratory to demonstrate an analyst's ability to successfully perform the method with acceptable precision and accuracy.

Replicate One of a series of identical samples or splits of a single sample used to assess precision.

Serial Dilution The result of the analysis of a highly contaminated sample, run undiluted, is compared to the results for the same sample after serial dilution. The two results are expected to match to within method specified criteria. This test is a measure of the linearity of ICP calibration and the analysis technique.

Surrogates Non-target or isotopically labeled analytes spiked into field samples as a measure of method efficiency and accuracy.

8.2 SPECIFIC QUALITY CONTROL CHECKS AND ACCEPTANCE CRITERIA

A variety of QC checks are required both in the field and in the laboratory to ensure the collection of samples that accurately represent the field conditions under study, to assess compliance with data quality objectives (DQOs), and to assess biases in the measurement system.

8.2.1 Field Activities

In order to ensure the representativeness of samples collected during the compliance test, and to ensure integrity of field measurements, a variety of QC checks and controls will be implemented throughout the sampling program. These checks and controls will include:

- Standard field notebooks will be used to document field activities and for data collection.
- The strict adherence to detailed operating procedures as documented in the various projects controlling documents and related SOPs.
- Project personnel will be selected based on appropriate levels of training and experience and will receive project specific training prior to working on-site. Training will include health and safety requirements; security requirements; briefings on overall project goals, objectives, and schedules; and, specific technical training related to their assigned tasks. Training will be documented in the project files.
- Field QC samples will be submitted as required by this QAPP.

Field audits/surveillances will be performed periodically by the Professional Engineer or the QAO to assess conformance to specifications. If nonconforming conditions are noted, the corrective action provisions of the QA plan will be invoked.

8.2.2 Laboratory Activities

Standard laboratory QA procedures, required of each laboratory, provide discussions related to QA/QC checks and controls within the laboratory. Specific data quality objectives, calibration requirements, acceptance criteria, and corrective action requirements for this test program are presented in Table 3-1 and Table 8-1 of this plan.

9.0 DATA REDUCTION, REVIEW, AND REPORTING INFORMATION

9.1 DATA REDUCTION

Data reduction in the laboratory is covered in the Laboratory's QA Manual and SOPs. The laboratory's data reduction process will include at a minimum the following:

- Transcription of data results from raw data printouts to data report forms. This will include any calculations required to report the data in the required units.

Transcription of QA/QC data onto summary forms to provide the required information for evaluation of the validity of the data. The requirement for each type of data is included below in this section.

9.2 DATA REVIEW

Upon the return of the analytical results from the laboratory data will be reviewed and then further reduced to data tables. The data review will include:

- Review of QA summaries for compliance with the DQO.
- Review of field sample results to determine if field sample results were below the PCTL.

The data tables will contain the following information:

- Information identifying exactly the samples represented on the tables (e.g., sample location, matrix, etc.).
- The compounds for which the samples were tested.
- The results for each compound.

9.3 DATA REPORTING

The laboratory deliverable package is expected to include the following elements:

The following forms for all metals analyses:

- Narrative and sample identification cross reference.
- Copies of Chain of Custody documentation.
- Method summaries and references.
- Inorganic analysis data sheet (CLP Form 1 or equivalent).
- Initial and continuing calibration verification (CLP Form 2 or equivalent).
- Blanks summary (CLP Form 3 or equivalent).
- Spike sample recovery/Post digest spike sample recovery (CLP Form 5 or equivalent).
- Interference checks sample results (CLP Form 4 or equivalent).
- Serial dilution results (CLP Form 9 or equivalent).

- Duplicate results (CLP Form 6 or equivalent).
- Laboratory control sample results (CLP Form 7 or equivalent).
- Raw data sample preparation logs and, instrument run logs.
- Documentation of all nonconformances and the actions taken.
- Sample receipt information including temperature and pH information if preservation is required.
- Examples of all calculations performed.

The following forms for all organics analyses using Gas Chromatography/Mass Spectroscopy methods:

- Narrative and sample identification cross reference.
- Copies of Chain of Custody documentation.
- Method summaries and references.
- Organic analysis data sheet for samples and blanks (CLP Form 1 or equivalent).
- System monitoring compound/surrogate recoveries summary (CLP Form 2 or equivalent).
- Duplicate analysis summary (CLP Form 3 or equivalent if MS/MSD).
- QC Check Sample summary.
- Method blank summary (CLP Form 4 or equivalent) and results.
- Instrument performance check summary (CLP Form 5 or equivalent).
- Initial calibration summary (CLP Form 6 or equivalent).
- Continuing calibration check (CLP Form 7 or equivalent).
- Internal standard area and RT summary (CLP Form 8 or equivalent).
- Raw data: run logs, mass spectra, quantitation reports and chromatograms for samples.
- Sample receipt information including temperature and pH information if preservation is required.
- Documentation of all nonconformances and the actions taken.
- Examples of all calculations performed.

The following forms for all organics analyses using Gas Chromatography:

- Narrative and sample identification cross reference.
- Copies of Chain of Custody documentation.
- Method summaries and references.
- Organic analysis data sheet for samples and blanks (CLP Form 1 or equivalent).
- System monitoring compound/surrogate recoveries summary (CLP Form 2 or equivalent).
- Matrix spike/Matrix spike duplicate summary (CLP Form 3 or equivalent).
- QC Check Sample summary.

- Method blank summary and results (CLP Form 4 or equivalent).
- Initial calibration summary (CLP Form 6 or equivalent).
- Calibration verification summary (CLP Form 7 or equivalent).
- Graphic Representation of Curve Fit, with Correlation Coefficient.
- Analytical Sequence (run logs).
- Raw data: quantitation reports and chromatograms for each column in all samples, sample preparation logs and run logs.
- Sample receipt information including temperature and pH information if preservation is required.
- Documentation of all nonconformances and the actions taken.
- Examples of all calculations performed.

Upon the completion of the data review and reduction, the results will be included in the certification of closure report which will be submitted to the EPA.

10.0 ROUTINE MAINTENANCE

The laboratories perform regular maintenance on all analytical instruments. An inventory of replacement parts is kept to prevent downtime. Manufacturers' service representatives are also contracted, as required, for major instrument repairs.

Preventive and routine maintenance is covered in each of the laboratory's QA Manuals and SOPs or in accordance with manufacturer recommendations (i.e., instrument manuals). Daily maintenance (such as replacement of injector septa, etc.) is covered in instrument SOPs. Inoperative equipment is tagged as non-usable until repairs are performed. Logbooks are maintained for each instrument to record usage, maintenance, and repairs.

11.0 DATA ASSESSMENT PROCEDURES

The QA activities implemented in this study will provide a basis for assessing the accuracy and precision of the analytical measurements. Section 3 discusses the QA activities that will generate the accuracy and precision data for each sample type. The generalized forms of the equations that will be used to calculate accuracy and precision are presented below.

11.1 ACCURACY

When a reference standard material is used in the analysis, percent Accuracy (A) will be calculated as follows:

$$A = \frac{\text{Found concentration}}{\text{True concentration}} \times 100$$

Percent analyte Recovery (R) will be calculated as follows:

$$R = \frac{X - N}{S} \times 100$$

where X is the experimentally determined value, N is the amount of native material in the sample, and S is the amount of spiked material of the species being measured. Recoveries are used to determine accuracy when standards are not available.

11.2 PRECISION

When less than four analyses of the same parameter are available, precision will be calculated as a Relative Percent Difference (RPD) from the average of replicate measurements according to:

$$\text{RPD} = \frac{(X_1 - X_2)}{\text{Average } X} \times 100$$

Where X_1 and X_2 are the highest and lowest results of replicate measurements.

Where 4 or more analyses of the same parameter are available, the precision will be determined as the Relative Standard Deviation (RSD) according to:

$$\text{RSD} = \frac{\text{Standard deviation}}{\text{Average X}} \times 100$$

11.3 COMPLETENESS

Completeness of data generated from a test program is usually calculated as follows:

$$\%\,\text{Completeness} = \frac{\text{Valid data}}{\text{Expected data}} \times 100$$

Data completeness for this project requires that all field samples be judged to be valid. The completeness objective for this test program is to generate sufficient data to certify closure activities.

12.0 CORRECTIVE ACTION PROCEDURES AND PERFORMANCE AUDITING AND REPORTING

12.1 CORRECTIVE ACTION PROCEDURES

The following procedures have been established to ensure those nonconforming conditions, such as malfunctions, deficiencies, deviations and errors are promptly investigated, documented, evaluated, and corrected. Every person employed in the closure sampling activities is expected to function as a QC inspector to ensure the quality of the final product. Quality, as it relates to this project, is defined as "performing the work according to the agreed upon specifications contained in the Closure Plan and relevant SOPs or causing the specification to be changed in a controlled manner." Each individual is encouraged to identify any condition adverse to the successful completion of the work or any modification to the specifications that might result in a better end product. These improvements might be framed in terms of higher quality, greater safety, greater efficiency, and/or lower cost. However, it cannot be stressed strongly enough, that only documented and approved changes to the specifications are allowable.

12.2 FIELD

When a nonconforming condition or an opportunity for improvement is noted at the site or contractor location, the corrective action provisions of this plan will be invoked to identify the condition and recommend corrective action. Condition identification, cause, reference documents and the corrective action planned to be taken will be documented and reported at a minimum to the employee's immediate supervisor.

A Corrective Action Request (CAR), an example of which is shown in Figure 12-1, should be used to identify the adverse condition or opportunity for improvement, reference document(s) and recommended corrective action(s). The CAR is directed to the Professional Engineer. The Professional Engineer affixes his signature and the date to the corrective action block and states the cause of the condition(s) and corrective action(s) to be taken. The Professional Engineer then forwards the requested response to the QAO (if different from the Professional Engineer) for follow-up and filing. The QAO maintains the log for status control of CARs and responses confirms the adequacy of the intended corrective action(s) and verifies its implementation. The QAO will issue and distribute copies of completed CARs to the originator, Professional Engineer and the involved contractor(s) if any. CARs are transmitted to the project file for future reference.

12.3 LABORATORY

The laboratories' QA Manuals and the related SOPs, contain detailed discussions of corrective actions to be taken if established criteria fail during laboratory analysis. The laboratory has the responsibility to immediately notify the Professional Engineer and/or QAO when any analytical QC nonconformance occurs, so a mutually acceptable course of action can be pursued.

Figure 12-1. Example Corrective Action Request Form

Number:
Date:
File Name: SII

To:

You are hereby requested to take corrective actions indicated below and as otherwise determined by you (A) to resolve the noted condition and (B) to prevent it from recurring. Your written response is to be returned to the project Quality Assurance Officer or other responsible manager by:

Condition:

Reference Documents:

Recommended Corrective Actions:

_____	_____	_____	_____	_____	_____
Originator	Date	Approval	Date	Approval	Date

RESPONSE

Cause of Condition:

Resolution:

Prevention:

Affected Documents:

_____	_____	QA Follow-up on	_____
Signature	Date	Corrective Action Verified	Date

12.4 PERFORMANCE AUDITS AND QUALITY REVIEWS

This section presents information related to the procedures used by the QA staff to assess conformance of the project staff to specifications contained in the SAP and QAPP. Further auditing may be employed to assess the ability of subcontractors to successfully perform the work.

The QAO or Professional Engineer will conduct audits of the sampling at the site to ensure that work is being performed in accordance with the SAP and QAPP. He/she may also choose to audit the laboratory at any time during the course of the project.

The QAO or Professional Engineer will also review the analytical data to determine compliance with the QAPP, the referenced method and SOPs.

The QAO or Professional Engineer will document performance audits and quality reviews. These reviews will include:

- Overview of activities and significant events related to QA/QC;
- Review of corrective action request status;
- Laboratory QA/QC reports;
- Data reviews; and
- Summary of significant changes in procedures or QA/QC programs.