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Delivery Order No 0016
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Restoration Contract
DACA31-95-D-0083

Sampling and Analysis Plan for Remedial Activities

SOUTHERN MARYLAND WOOD TREATING SITE
HOLLYWOOD, MARYLAND

FINAL DOCUMENT, REVISION 1

June 1998

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SAMPLING AND ANALYSIS PLAN FOR REMEDIAL ACTIVITIES
SOUTHERN MARYLAND WOOD TREATING SITE
HOLLYWOOD, MARYLAND

FINAL DOCUMENT

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SAMPLING AND ANALYSIS PLAN FOR REMEDIAL ACTIVITIES

Table of Contents

Section 1	Field Sampling Plan
Section 2	Quality Assurance Project Plan
Appendix A	Statements of Qualifications for ICF Kaiser Personnel
Appendix B	Standard Operating Procedures
Appendix C 1	Off site Laboratory (Paragon Analytics) QA Plan
Appendix C 2	Paragon Analytics Addendum Letter and Fax and MRD Certification
Appendix C 3	Paragon Analytics Subcontractor SOPs
Appendix D	On site Laboratory (On site Environmental) QA Plan
Appendix E	Summa Canister Analysis Laboratory (Core Laboratories) QA Plan
Appendix F	Stack Sample Analysis Laboratory (On site Environmental) QA Plan
Appendix G	Off site Laboratory (Environmental Chemical Corporation) QA Plan
Appendix H	ECC s Dioxin Subcontractor (Triangle Laboratory) QA Plan

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Field Sampling Plan for
Remedial Activities

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TABLE OF CONTENTS

Section	Page
1 0 PROJECT DESCRIPTION	**1 1**
1 1 SITE CONDITIONS	1 1
1 1 1 Topography	1 1
1 1 2 Geology	1 1
1 1 3 Hydrogeology	1 1
1 2 SITE HISTORY	1 2
1 3 PREVIOUS INVESTIGATIONS	1 5
1 4 NATURE AND EXTENT OF CONTAMINATION	1 6
1 4 1 Land Treatment Area Pit 1	1 6
1 4 2 Spray Irrigation Upper Site Process and Northeast Tank Areas Pits 2 3 5	1 6
1 4 3 Containment Area -- Pit 4	1 7
1 4 4 East and West Tributaries	1 7
1 4 5 Contaminants of Concern	1 9
2 0 SCOPE AND OBJECTIVES	**2 1**
3 0 FIELD ACTIVITIES	**3 1**
3 1 PERIMETER AIR MONITORING	3 1
3 1 1 Baseline Perimeter Monitoring	3 3
3 1 2 Perimeter Monitoring During Proof of Performance	3 3
3 1 3 Perimeter Monitoring During Full Scale Operations	3 3
3 2 SOIL AND SEDIMENT EXCAVATION	3 5
3 2 1 Pits	3 5
3 2 2 Excavation in the West Tributary	3 15
3 3 THERMAL DESORPTION	3 18
3 3 1 Proof Of Performance	3 20
3 3 2 TDU Operational Sampling	3 26
3 4 WASTEWATER TREATMENT	3 27
3 4 1 Existing Water Treatment Plant	3 28
3 4 2 New Water Treatment Plant	3 29
3 5 GROUNDWATER SAMPLING	3 30
3 5 1 Quarterly Groundwater Monitoring	3 30
3 5 2 Pre Construction Groundwater Sampling	3 30
3 5 3 Proposed Post Construction Groundwater Sampling	3 35
4 0 DECONTAMINATION REQUIREMENTS	**4 1**
4 1 REFURBISHING THE DECONTAMINATION FACILITY	4 1
4 2 SOURCE WATER	4 1
4 3 HEAVY EQUIPMENT AND VEHICLES	4 1
4 4 SAMPLING EQUIPMENT	4 2
4 5 PERSONNEL	4 2
4 6 DISPOSAL OF DECONTAMINATION WASTE	4 2
5 0 INVESTIGATION DERIVED WASTE	**5 1**
5 1 ON SITE DISPOSAL	5 1
5 1 1 Waste Source and Receptacle	5 1
5 1 2 Waste Transport and Storage	5 1
5 2 OFF SITE DISPOSAL	5 1
5 2 1 Waste Source and Receptacle	5 1
5 2 2 Waste Storage and Transport	5 3

ORIGINAL Red

LIST OF FIGURES

Figure		Page
1 1	Site Location Map	1 3
1 2	Historical Site Layout	1 8
2 1	Flow Chart of Site Activities	2 2
3 1	Contaminated Materials Treatment	3 2
3 2	Summary of Sampling Process During Excavation and Verification of Pits	3 6
3 3	Pit 1 Verification and Confirmation Samples	3 8
3 4	Pit 2 Verification and Confirmation Samples	3 9
3 5	Pit 3 Verification and Confirmation Samples	3 10
3 6	Pit 4 Verification and Confirmation Samples	3 11
3 7	Pit 5 Verification and Confirmation Samples	3 12
3 8	West Tributary Sediment Samples	3 17
3 9	TDU Selection Process	3 21
3 10	Water Treatment Plant Sampling Ports	3 32
3 11	Site Plan Showing Abandoned and Remaining Wells	3 36

LIST OF TABLES

Table		
1 1	Chronology of Historical Action	1 4
1 2	Soil and Sediment Contamination Summary	1 5
1 3	Risk Assessment Chemicals of Concern	1 9
3 1	Sampling and Analysis for Air Monitoring	3 4
3 2	Risk Based Concentration for Ambient Air Resident Child	3 4
3 3	B(a)P Equivalence Scaling Factors	3 5
3 4	Excavation and Verification Sample Locations and Rationale	3 16
3 5	Sampling and Analysis for TDU Proof of Performance Preparation	3 20
3 6	Sampling and Analysis for TDU Proof of Performance Test	3 22
3 7	Sampling and Analysis for TDU Continuous Monitoring	3 27
3 8	Wastewater Treatment Plant Process Overview	3 31
3 9	Wastewater Treatment Plant Acceptance Test Sampling Program	3 33
3 10	Wastewater Treatment Plant Sampling Program Operation and Maintenance	3 34
3 11	Groundwater Monitoring Sampling Locations and Rationale	3 37
4 1	Summary of Decontamination Samples	4 1
5 1	On Site Treatment Objectives for IDW	5 2
5 2	Off Site Disposal Objectives for IDW	5 3

LIST OF ACRONYMS

ACM	asbestos-containing material
B(a)P	benzo(a)pyrene
bgs	below ground surface
BTDU	batch thermal desorption unit
CTDU	continuous thermal desorption unit
CPAH	carcinogenic polynuclear aromatic hydrocarbon
CFR	Code of Federal Regulations
COMAR	Code of Maryland Regulations
cy	cubic yard
DAF	dilution attenuation factor
DIUF	de-ionized ultra filtered
DNAPL	dense non aqueous phase liquid
DO	dissolved oxygen
DOT	Department of Transportation
FFS	Focused Feasibility Study
FID	Flame Ionization Detector
EPA	Environmental Protection Agency
FSP	field sampling plan
gr	grain
gpm	gallons per minute
HCl	Hydrochloric Acid
HW	hazardous waste
ICF KE	ICF Kaiser Engineers
IDW	Investigation Derived Waste
KMnO4	potassium permanganate
LNAPL	low density non aqueous phase liquid
MDE	Maryland Department of the Environment
MW	monitoring well
NaOH	Sodium Hydroxide
NAPL	non aqueous phase liquid
NESHAP	National Emission Standards for Hazardous Air Pollutants
NPL	National Priority List
PAH	polynuclear aromatic hydrocarbon
PCP	pentachlorophenol
PID	Photoionization Detector
POP	Proof of Performance
ppb	parts per billion
PPE	Personal Protective Equipment
ppm	parts per million
PRP	potentially responsible party
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
RA	Remedial Action
RBC	risk based concentration
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision,
SCFD	standard cubic feet per day
SMWT	Southern Maryland Wood Treating Site
SOP	Standard Operating Procedures
SSWP	Site Specific Work Plan
SVOC	semi volatile organic compound

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TAP	Toxic Air Pollutants
TCLP	Toxicity Characteristic Leachate Procedure
TDU	Thermal Desorption Unit
TLV	Threshold Limit Value
TPAH	total polynuclear aromatic hydrocarbon
TSS	Total Suspended Solids
UCL	Upper Confidence Limit
USACE	U S Army Corps of Engineer
USEPA	U S Environmental Protection Agency
UV	ultra violet
VOC	volatile organic compound
WTP	water treatment plant

1 0 PROJECT DESCRIPTION

The Southern Maryland Wood Treating Site (SMWT) approximately 25 acres in size is located just west of Maryland Route 235 on a 96 acre parcel of land approximately 1 mile north of Hollywood Maryland in St Mary s County (Figure 1 1) The site is bounded by residential agricultural and wooded tracts of land There are several subdivisions and numerous houses within an approximate 2 mile radius of the site The operation of a pressure treated wood preservation facility on the site for many years resulted in contamination of soil groundwater surface water and stream sediment with wood preserving chemicals

1 1 SITE CONDITIONS

1 1 1 Topography

Topographic relief across the site is about 35 feet with elevations ranging between 119 to 154 feet above mean sea level The site slopes steeply from the northern side down to a pond on the southern side The site lies on a drainage divide such that runoff discharges to tributaries that straddle the site to the east and west Both of these tributaries discharge to the Potomac River via Brooks Run and McIntosh Run Regionally the site is located close to the drainage divide between the Potomac and Patuxent Basins

1 1 2 Geology

The site lies within the Atlantic Coastal Plain physiographic province which is composed of unconsolidated gravels sands silts and clays Soil borings indicate that on site soil is composed primarily of silty and clayey sand that extends to a maximum depth of approximately 40 feet below ground surface (bgs) These Upland Deposits are located within the uppermost water bearing zone located in the shallow water table aquifer It is assumed that a large portion of the surface and near surface soil has been disturbed and reworked by past disposal operations associated with lagoons and land treatment and by remedial activities associated with excavation and backfilling

The Upland Deposits are separated from the next sandy geological unit the Chesapeake Group by a low permeability dense blue clay which varies in thickness from 4 to 23 feet in the area of the site Although there are some domestic wells in the vicinity of the site that obtain water from the Upland Deposits drinking water supplies in the area are primarily obtained from the confined Aquia and Piney Point Nanjemoy aquifers These water bearing units are located approximately 285 to 600 feet bgs and are separated from the Upland Deposits by several layers of alternating sands and clays

A survey of available well logs in the area of the site was conducted during the May 1988 Remedial Investigation (CDM 1988) One abandoned on site production well and six groundwater supply wells are screened in the Aquia Piney Point Nanjemoy aquifers Two residential wells located approximately 200 yards northwest and 400 yards north of the site are within the shallow water table Based on the groundwater flow in the water table these wells are upgradient of the site

1 1 3 Hydrogeology

The groundwater flow pattern in the shallow water table aquifer (Upland Deposits) above the first blue clay encountered beneath the site has been altered by the installation of the sheet pile wall in 1990 (USEPA 1995) The shallow groundwater flow in this area is toward the pond and stream indicating that they act as groundwater discharge points

Groundwater elevations in most wells within the Containment Area have significantly decreased since the installation of the sheet pile wall The decline in groundwater elevations and changes in the flow patterns indicate a decrease in the groundwater flow from outside into the Containment Area The rise in the groundwater level in the eastern portion of the Containment Area is attributed to the groundwater infiltration trapped by the sheet pile wall Groundwater flow in this stratum is to the southeast

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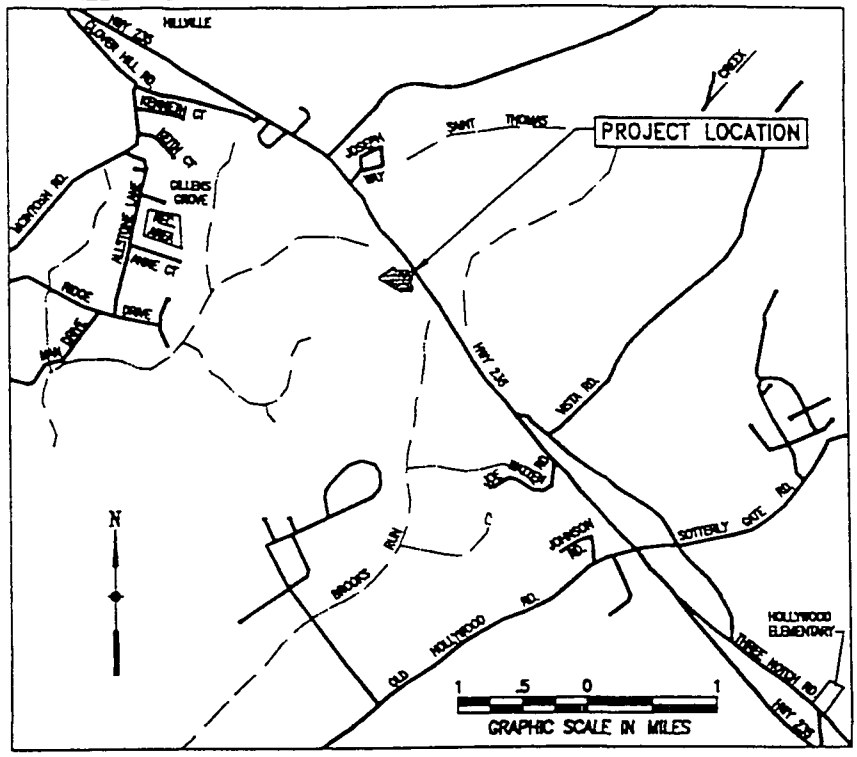
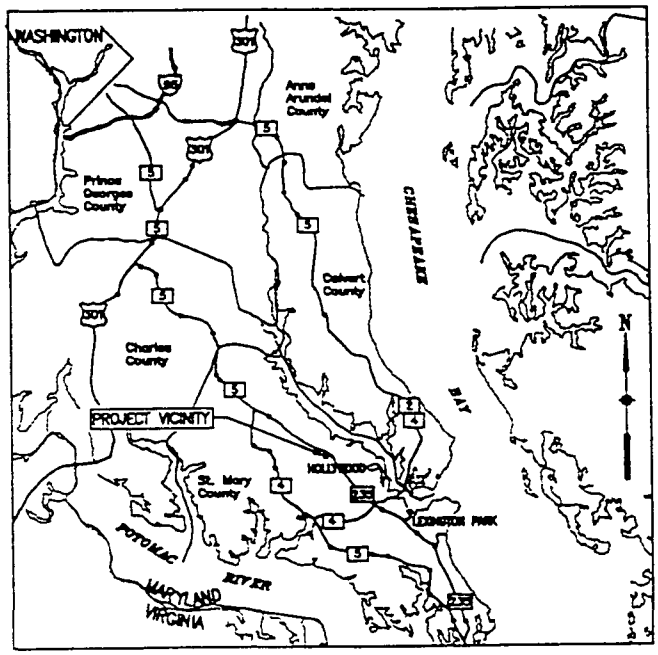
1 2 SITE HISTORY

A chronology of site events including previous investigations and remedial actions is presented in Table 1 1 The original process building which has been demolished housed the wood pressure treatment operations including two treatment vessels Wood and chemical preservatives were introduced into the vessels which were subsequently pressurized to treat the wood Several large vertical tanks previously located next to the process building contained the chemical preservatives pentachlorophenol (PCP) and creosote which were used in the wood treating process Currently the only building structure left on site that was once associated with the wood preservation business is a pole barn previously used for wood storage No wood treating activities are currently performed on site

Figure1 1





VICINITY MAP

16 8 0 16
GRAPHIC SCALE IN MILES

FILE: SOLMD_WOOD\FIG1 1 PLOT 12 11 97

U.S. ARMY ENGINEER DISTRICT BALTIMORE CORPS OF ENGINEERS BALTIMORE, MARYLAND		FIGURE 1-1
ICF KAISER 2113 Emmorton Park Drive Suite 100 Edgewood, Maryland 21040 (410) 612-4350		SITE LOCATION MAP
PREPARED BY PMH	TASK NO- 66716	SOUTHERN MARYLAND WOOD TREATMENT SITE HOLLYWOOD MARYLAND
CHECKED- L. HASS	ICF DWG NO- FIG1-1	
DATE 12-11-97		

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Table 1 1
Chronology of Historical Action

Date	Action
1965 1978	Site operated as pressure treated wood preservation business
early 1970 s	Operators at facility submitted application for construction of new on site well St Mary s County Department of Environmental Hygiene found evidence of possible contamination and refused the permit The County instituted a program of sampling and inspection
1978	Site owner/operator applied for bankruptcy and ceased operations
November 1980	St Mary s County Court issued Consent Decree requiring a complete restoration of the Site
1982	Site owner began initial cleanup using land treatment Liquid from lagoons was sprayed into the woods (Spray Irrigation Area) and sludge was composted and spread (Land Treatment Area) Both areas became contaminated due to these actions
October 19 1984	The Site was proposed for inclusion on the National Priority List (NPL)
1985	1400 cubic yards (CY) of sediment was removed from a pond in the lagoon/process area stabilized with cement kiln dust and encapsulated on site with an impermeable synthetic liner
June 1 1986	The Site was listed on the NPL
1988	USEPA concluded an Remedial Investigation/Feasibility Study (RI/FS) at the Site
June 6 1988	USEPA issued Special Notice Letters to Potentially Responsible Parties (PRP) No response was received and USEPA determined that none of the PRPs was financially viable
June 29 1988	Based on the RI/FS USEPA issued the Record of Decision (ROD) MDE concurred with the ROD as long as the cost could be substantially reduced during design
November 1990	Phase I remedial work was completed including the installation of a sheet pile barrier wall around the lagoon and process areas (the Containment Area)
May 1992	Design of the incinerator and groundwater treatment components reached 95% stage Substantial cost reduction was not achieved and the State could not fund 10% of the project USEPA proposed a Focused Feasibility Study (FFS) to reevaluate the remedy
July 21 1993	A removal action was initiated to address immediate threats including demolition of several decrepit buildings off site disposal of liquid and solid waste in numerous tanks and retorts off site disposal of over 50 drums of Investigation Derived Waste (IDW) and construction of a water treatment facility to treat runoff water from the Containment Area prior to its discharge to the West Tributary
February 1995	Final FFS was issued to the public
March 22 1995	Proposed Remedial Action Plan was issued to the public
September 8 1995	A new ROD was issued for thermal desorption

1 3 PREVIOUS INVESTIGATIONS

The site has been the subject of numerous investigative activities in support of a Remedial Investigation/Feasibility Study (which included a risk assessment) which lead to a Record of Decision (ROD) promulgated by the USEPA in September 1995 (USEPA 1995) A summary of soil and sediment contamination is presented in Table 1 2 The primary contaminants of concern are carcinogenic polynuclear aromatic hydrocarbons (PAHs) PCP creosote and benzene Dioxins and furans were also detected in the various media sampled but at concentrations low enough that they did not significantly add to the risks resulting from the presence of the other contaminants of concern

Table 1 2
Soil and Sediment Contamination Summary

Site Area	Contaminants	Summary of Contamination
Upper Site Area (Pit 5 and TDU area)	PAH	Surface soil contamination 0 2 ft exceeded cleanup levels with benzo (a) pyrene (B(a)P) equivalence concentrations up to 10 1 mg/kg
Northeast Tank Area (Pit 3)	PAH	Surface soil contamination 0 2 ft exceeded cleanup levels with B(a)P equivalence concentrations up to 11 1 mg/kg Subsurface soil did not contain B(a)P equivalence concentrations above cleanup levels
Containment Area	PAH PCP	Surface and subsurface soil exceeded cleanup levels with B(a)P equivalence concentrations up to 80 8 mg/kg in soil from surface down to clay PCP was detected in surface soil up to 79 mg/kg
Process Area (north side of Containment Area)	PAH	Surface soil contamination 0 2 ft exceeded cleanup levels with B(a)P equivalence concentrations up to 4 9 mg/kg
Land Treatment Area (Pit 1)	PAH PCP	Surface and subsurface soil exceeded cleanup levels with B(a)P equivalence concentrations up to 98 4 mg/kg in shallow soils (0 2 ft) and less in deeper soils PCP contamination was detected in several borings at concentrations up to 80 mg/kg
Spray Irrigation Area (outside of Containment Area inside fence line)	PAH	Surface soil contamination from 0 1 5 ft exceeded cleanup level with B(a)P equivalence concentrations up to 4 9 mg/kg
Spray Irrigation Area (outside fence line)	None	No samples contained carcinogenic PAH in excess of cleanup levels
Sediment west tributary	PAH PCP	Stream sediments exceeding cleanup levels all along west tributary extending to confluence of east and west tributaries up to carcinogenic PAH concentrations of 7 78 mg/kg including individual compound concentrations above cleanup levels PCP was detected above cleanup levels in sediments in west tributary up to 11 0 mg/kg
Sediment gully leading to east tributary (Pit 2)	PCP	PCP was detected above cleanup levels in sediments in gully leading to east tributary up to 1 3 mg/kg PCP within fenced area

Hazardous Waste Remedial Action Predesign Report (Dames & Moore 1992)

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1 4 NATURE AND EXTENT OF CONTAMINATION

At SMWT the typical wood treating preservatives creosote and PCP were used Creosote contains several thousand different compounds and is a substance that is composed of 85 90% PAHs 10% phenolic hydrocarbons and 5% N S and O heterocyclics Of the many compounds in creosote only a few are present in the amounts of 1% or more The volatiles are single ring compounds and the semi volatiles are two to six ring compounds Creosote is an oily brown to black liquid that is denser than water and practically insoluble

PCP also called pentachlorophenate and 2 3 4 5 6 pentachlorophenol is a mixture of chlorinated ethers dioxins and furans Used as a wood preservative PCP is also used in the manufacturing of algaecides herbicides and fungicides It is solid white to brown in color and has negligible solubility in water (14 mg/L at 20°C) It is relatively non reactive and stable but is classified as a hazardous waste (#U242) because it is acutely and chronically toxic by inhalation ingestion and absorption PCP and several of the PAHs are classified as probable human carcinogens

Wood treatment at the site produced sludge wastes and significant quantities of process wastewater that were discharged in six unlined on site lagoons (Figure 1 2) As a result on site soils and groundwater beneath the lagoons became contaminated Non aqueous phase liquids (NAPLs) both light (LNAPLs) and dense (DNAPLs) were found in the subsurface beneath the lagoons and above the underlying clay layer Additionally due to groundwater discharge to the pond from the lagoon area surface water and sediment in the on site pond and sediment in the West Tributary became contaminated Sediments in the East Tributary were also contaminated most likely due to surface water runoff from contaminated soils on site Storage of treated wood on site resulted in surface soil contamination in the Upper Site and Northeast Tank Areas Initial cleanup began in 1982 Liquids from the lagoons were sprayed into the woods behind the Site (Spray Irrigation Area) The sludge from the lagoons was excavated and mixed with wood chips composted sewage sludge and topsoil then spread in a previously uncontaminated area on the southeastern section of the property in an attempt to bioremediate the contaminants The excavated lagoons were backfilled and graded This attempt at land treatment of the sludge was unsuccessful and resulted in the contamination of several additional acres of the property now referred to as the Land Treatment Area These areas are shown in Figure 1 2 The process related contamination in each area is discussed below

1 4 1 Land Treatment Area -- Pit 1

Water and sediment were removed from the former lagoon area water was sprayed into the Spray Irrigation Area and sediment was excavated and composted in the Land Treatment Area These attempts at remediation resulted in the following contamination

Soil The stratigraphy of the Land Treatment Area indicates approximately 1 5 feet of sandy soil underlain by 6 8 inches of composted lagoon sludge left from the attempt at land treatment underlain by contaminated soils to a maximum depth of approximately 5 7 feet bgs According to previous investigations contamination in the upper two feet bgs consists primarily of PAHs in the thousand parts per million (ppm) range and PCP in the hundred ppm range At 5 7 feet bgs the maximum PAH concentration was approximately 77 ppm and no contamination was detected below 5 7 feet bgs

Groundwater Groundwater in the Land Treatment Area is not significantly impacted and exhibits trace levels of semi volatile organic compounds which include the PAHs and various phenolic compounds There was no detection of volatile organic compounds (VOCs) in groundwater in this area

1 4 2 Spray Irrigation Upper Site Process and Northeast Tank Areas -- Pits 2 3 5

In the Spray Irrigation Area total PAHs (TPAHs) of 3 ppm (1 5 ppm carcinogenic PAHs (CPAHs)) are found in the surface soil In a few other locations TPAHs occur in the 100 ppb range Beyond the fence line contamination is found at less than 1 ppm in surface soil Surface soil in portions of the Upper Site Process and Northeast Tank Areas are contaminated with PAHs No volatile compounds were detected in these areas

1 4 3 Containment Area – Pit 4

Soil Soil within the Containment Area is heavily contaminated with PAHs at depths ranging from surface (0 2 feet bgs) to the top of the clay layer underlying the site particularly in the area where the lagoons were located (Figure 1 2) The depth to clay varies in the Containment Area It ranges from about 8 feet near the pond to 40 feet at the upper portion of the site This variance is due to the change in surface topography PAH concentrations range from ten to thousand ppms The pond sediment excavated during the first removal action in 1985 remained covered with plastic The sediment is contaminated with PAHs at concentrations greater than 1 000 ppm There was no PCP detected in the sediment The soil within the Containment Area is considered a principal threat because it is highly contaminated and may act as a continuing source of contamination to groundwater and surface water

Groundwater and Non Aqueous Phase Liquids Groundwater within the Containment Area is heavily contaminated with semi volatile organic compounds (SVOCs) and VOCs Both LNAPLs and DNAPLs are found in monitoring wells with this area where the wastewater lagoons were previously located DNAPL thickness ranges from 1 to 4 feet in monitoring wells MW 28 MW 30 and MW 31

LNAPL is most likely associated with the carrier oil in the creosote and PCP formulations used at the site and tends to float on top of the water table The NAPLs within the Containment Area are considered a principal threat because they are highly contaminated with wood treating waste and act as a continuing source of contamination to groundwater and surface water

Because DNAPL is denser than water its movement in the subsurface is largely dependent on gravity and pressure gradients rather than on hydrodynamic factors It is estimated that the DNAPL has migrated through the subsurface from the original source (wastewater lagoons) and rests on the blue clay layer

The clay layer ranges in thickness from 19 to 23 feet (with some areas being as thin as 4 feet thick) is laterally extensive in the vicinity of the wells borings and sheet pilings of the Containment Area and has very low vertical permeability This clay layer acts as a low permeability barrier to vertical migration of groundwater and DNAPL During excavation the operators will take care to leave this clay barrier intact especially near MW 4 where the clay layer is approximately 4 feet thick DNAPL will not move from this position unless the pressure gradient of a pool or potentially mobile (continuous) fraction is disturbed

Surface Water Surface water samples collected from the on site pond exhibit higher levels of contamination (ppm PAHs) in the upper reaches of the pond than in the lower section of the pond (parts per billion (ppb) PAHs) The upper section of the pond receives contamination from groundwater discharge from the Containment Area The lower section of the pond is separated from the upper section by an earthen dam Surface water samples collected from the West Tributary (USEPA 1994) indicated that under normal weather conditions trace levels of contamination are flowing from the pond via surface water due to the underflow dam Contamination levels detected downstream were lower Surface water from the pond is currently being pumped and treated in the on site water treatment system before being discharged to the West Tributary

Sediment Stream sediment samples collected along the West Tributary (CDM 1988) were contaminated with total PAHs in the concentration range of 10 ppm at distances up to 1 900 feet downstream of the on site pond Along the East Tributary sediment contamination ranged from non detect to approximately 2 ppm in a sample collected near the confluence of the East and West Tributaries Contaminants detected in sediments were similar to those detected in on site surface soil

1 4 4 East and West Tributaries

Both the East and West Tributaries were re sampled during the Pre Design Study (Dames and Moore 1992) with the most recent round of sampling conducted in February 1992 Concentrations of total PAHs up to 266 ppm and CPAHs up to 218 ppm were detected approximately 1 500 feet from the site in the West Tributary CPAHs were only as high as 6 ppm in a gully that leads from the Northeast Tank Area to the East Tributary Samples collected in Old Tom s Run beyond the confluence of the East and West Tributaries did not contain any SVOCs

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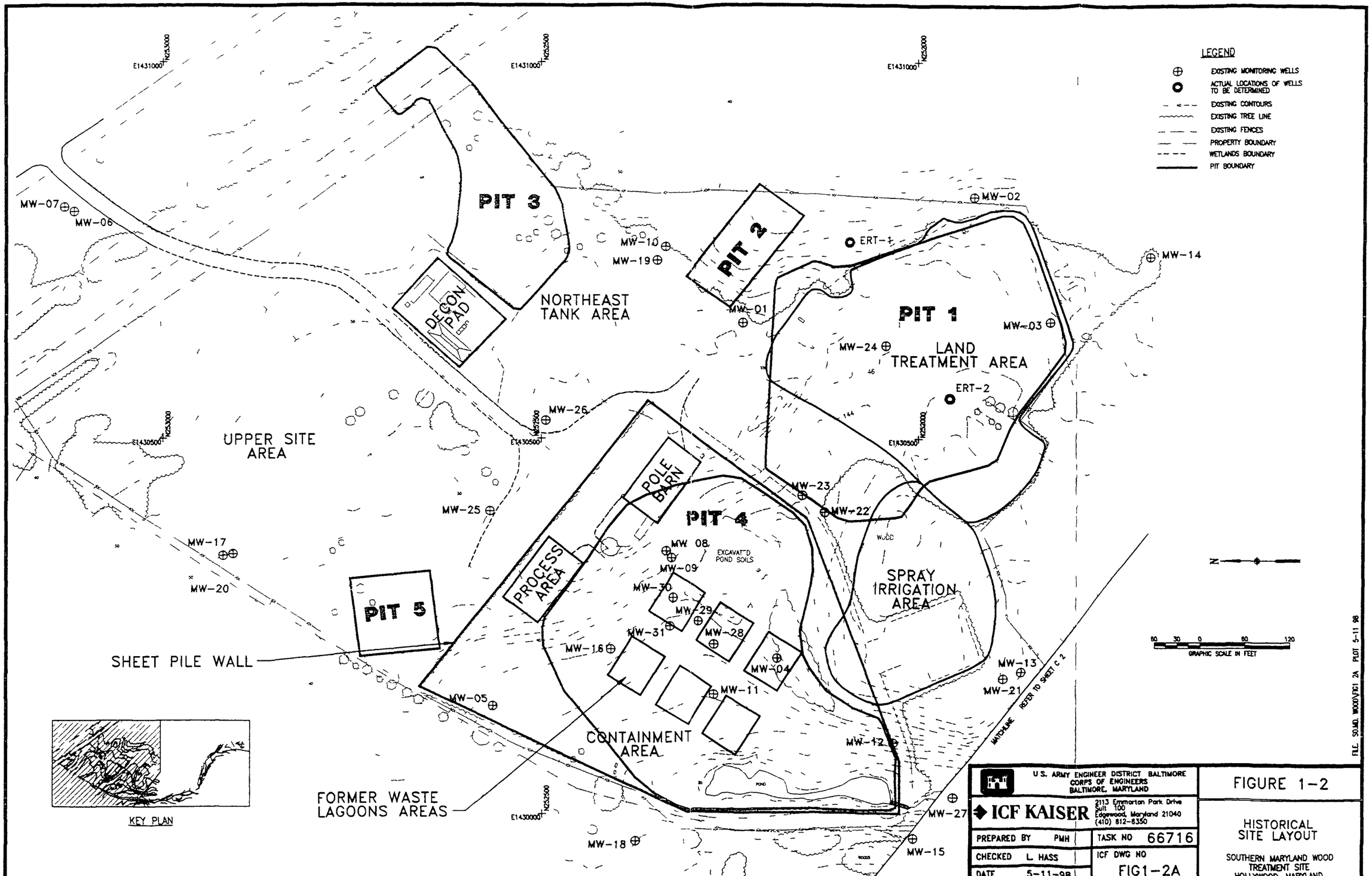

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1 4 5 Contaminants of Concern

During the baseline risk assessment (CDM 1988) chemicals most likely to contribute to risks were selected as chemicals of concern and summarized in the ROD and are included in Table 1 3 Because inorganic chemicals were not associated with wood treatment activities and were not detected above site background levels inorganics were not selected as chemicals of concern

Table 1 3
Risk Assessment Chemicals of Concern

Carcinogenic PAHs	Non Carcinogenic PAHs	SVOC	VOCs
Benzo[a]anthracene Chrysene Benzo[b]fluoranthene Benzo[a]pyrene Indeno[1 2 3 cd]pyrene Dibenzo[a h]anthracene	Naphthalene 2 Methylnaphthalene Acenaphthylene Acenaphthene Fluorene Phenanthrene Fluoranthene Pyrene Benzo[g h i] perylene	Pentachlorophenol	Ethylbenzene Benzene Toluene Styrene Total Xylenes

Transport of creosote is dependent on bulk flow mixing sorption reduction pressure and concentration gradients in groundwater along with hydrogeologic structure PAHs tend to accumulate in significant amounts in the groundwater and soil of an upper aquifer This area sometimes serves as a drinking water source and provides water to vegetation and surface water bodies

DNAPLs tend to migrate downward until they reach an impermeable layer Creosote can therefore be a long term source of contamination It is also found that the more soluble compounds such as benzene and phenolics are quickly depleted from sandy soils when they come into contact with water while the less soluble compounds (i e PAHs) are more persistent

2 0 SCOPE AND OBJECTIVES

The remedial actions already performed have removed a large volume of waste contained drums retorts tanks and buildings on site The remaining sources of contamination as well as contaminated groundwater and surface water will be removed during this phase of the remediation Remaining sources include NAPLs in the subsurface in the Containment Area lagoon sludge in the Land Treatment Area and contaminated soil and sediment in the Containment Northeast Tank Upper Site and Land Treatment Areas and the Tributaries

The goal of this cleanup action is to ensure that future residents and ecological receptors will not be exposed to an unacceptable risk posed by site soil and groundwater In addition this action will prevent future risk to ecological receptors posed by exposure to contaminated surface water and sediment The general scope of the remedial action is to remove all contamination sources and treat them on site where possible Figure 2 1 illustrates the activities that will occur on site and the flow of contaminated materials in the remediation activities Definable features of work required to address project objectives include the following

Air Monitoring VOCs and particulates will be monitored to establish and periodically evaluate air quality at the SMWT fenceline Upwind and downwind locations will be selected based on meteorological data obtained on the day of evaluation Prior to remedial activities baseline air monitoring will be conducted to establish fenceline air quality Perimeter monitoring will be conducted during remedial activities to demonstrate the adequacy of engineering controls designed to maintain fenceline air quality

Excavation Activities Soil and sediment that exhibit contaminant concentrations in excess of the cleanup criteria will be excavated for on site treatment Areas to be excavated include the Land Treatment Area a drainage swale leading to the East Tributary the Northeastern Tank Area the Containment Area the Untreated Soil Stockpile Area and the West Tributary Excavation limits will be determined in the field based on previous sampling and analysis on site screening and verification sampling and analysis

Thermal Desorption Excavated soil and sediment that contain contaminant concentrations in excess of cleanup criteria will be treated on site by low temperature indirect fired thermal desorption This process will not be applicable for grossly contaminated materials defined as not amenable to this treatment process Grossly contaminated materials will be disposed off site The Proof of Performance (POP) test will be conducted to verify the capability of each type of Thermal Desorption Unit (TDU) on site to meet the cleanup and delisting criteria established in the ROD for treated soil Additionally performance criteria associated with TDU air emissions and condensate water discharge will be verified Stack sampling will be conducted to ensure that TDU stack emissions are compliant with State of Maryland air emission requirements Perimeter monitoring will be conducted to document that ambient air quality is safe A Water Treatment Plant (WTP) sampling event will be conducted to verify the effectiveness of the WTP in treating condensate discharge water to State of Maryland criteria Continuous TDU operations will be monitored to ensure that concentrations of constituents remaining in the treated soil are compliant with soil performance criteria

Water Treatment Plant When the construction of the WTP is completed an acceptance test will be conducted during which various internal operations will be monitored by effluent sampling During routine WTP operation long term monitoring will be conducted through the collection and analysis of various process samples and regulatory effluent sampling

Groundwater Sampling Quarterly sampling in five monitoring wells will be conducted to determine if there is any migration of contamination from the contaminated aquifer to the deeper aquifer (to verify that the confining clay layer between the upper and lower aquifer has not been compromised) and to monitor the nature and magnitude of contamination downgradient of the site Pre construction sampling in most site wells will be conducted to evaluate groundwater throughout the site Post construction sampling in all site wells will be conducted to ensure that the soil remediation has sufficiently reduced contaminants in the groundwater to ensure protection of human health and the environment and to allow the shallow aquifer to be used as a potential drinking water supply

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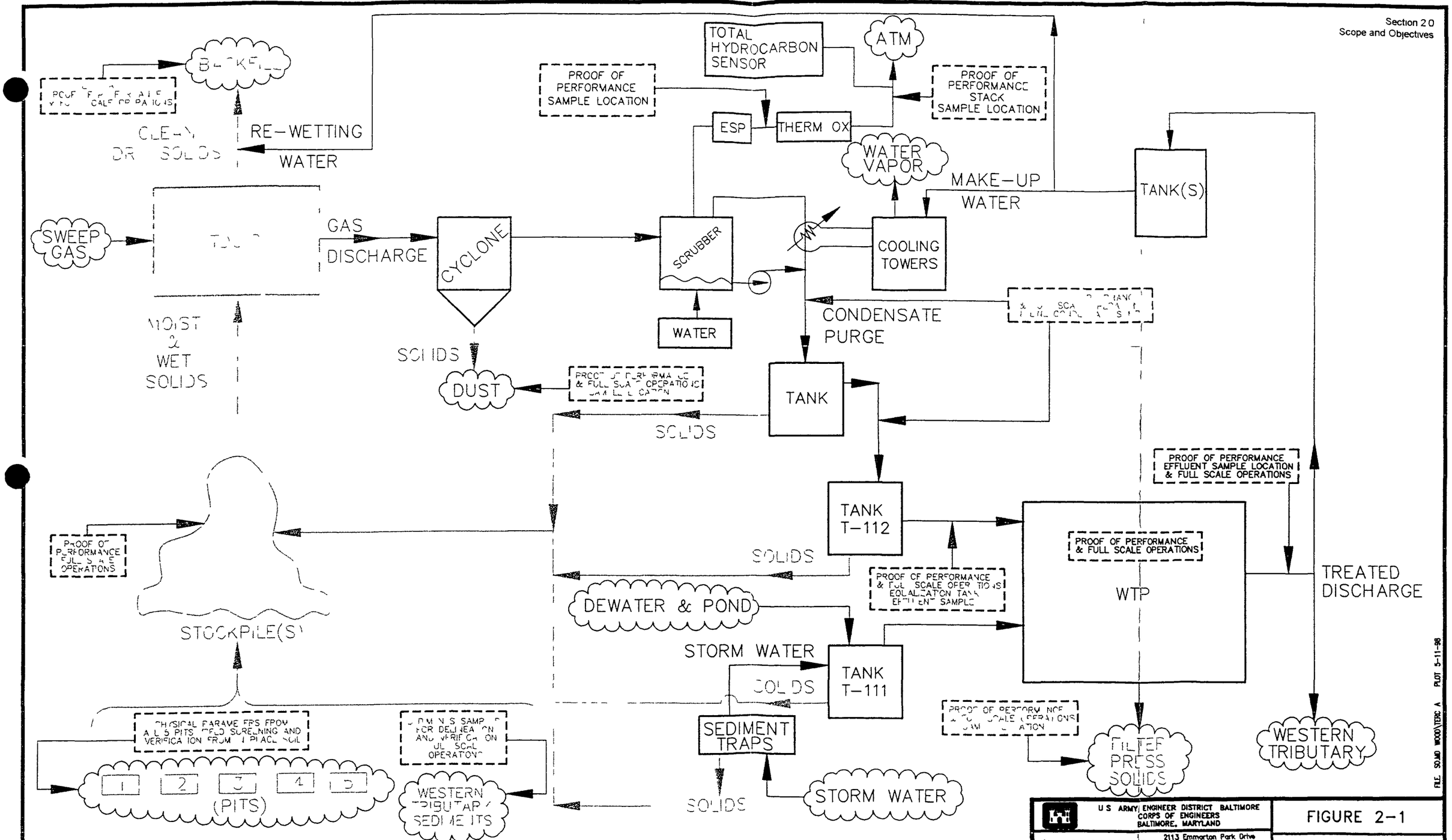

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FIGURE 2-1

FLOWCHART OF SITE ACTIVITIES & SAMPLING LOCATIONS

SOUTHERN MARYLAND WOOD TREATMENT SITE
HOLLYWOOD MARYLAND

FILE: SOMD WOOD\TERC A PLOT 5-11-98

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3 0 FIELD ACTIVITIES

Field sampling will be performed to evaluate the effectiveness of remedial actions Definable features of work include excavation and verification of contaminated soil and sediment treatment of contaminated soil and sediment through thermal desorption treatment of contaminated thermal desorption condensate runoff and groundwater at on site water treatment plants and groundwater monitoring Field sampling activities associated with these definable features of work include surface soil subsurface soil sediment surface water groundwater and air sampling In accordance with the project objective to treat all sources of contamination on site where possible minimal off site disposal will occur Figure 3 1 is a flow chart illustrating the treatment of contaminated materials on site

3 1 PERIMETER AIR MONITORING

Air monitoring will be conducted throughout the remedial action to ensure that emissions produced as a result of excavation and materials handling activities are at acceptable levels at the perimeter of the site Table 3 1 presents the approximate number and type of perimeter air monitoring samples that will be collected Perimeter air monitoring will be conducted as follows

- Prior to remedial action to establish a baseline
- During proof of performance testing
- During full scale operations

Based on the types of contaminants found at the site creosote and pentachlorophenol (PCP) the most likely sources of airborne contaminants resulting from remedial activities would be volatile organic compounds (VOCs) released from the soil directly into the air and semi volatile organic compounds (SVOCs) sorbed to particulate matter or dust that might become airborne Therefore the perimeter air monitoring program has been designed to address these two possible off site emissions sources and will include monitoring for VOCs and particulate matter

A meteorological survey will be used to design the air monitoring network to take into account local wind patterns Wind direction will be checked each morning and if/when major weather fronts occur during the test Because topographic relief across the site is approximately 35 feet three wind socks will be placed on site to ensure a representative measurement of wind direction is obtained Additional meteorological information (i e wind speed wind direction temperature barometric pressure and relative humidity) will be obtained from an on site weather station prior to monitoring activities One upgradient and three downgradient sample locations will be established each day based on the observed wind direction

VOC monitoring will be conducted on an 8 hour time weighted basis using summa canisters VOC samples will be collected at each sampling location following the procedures outlined in Standard Operating Procedure (SOP) 30 6 A flow regulator will be attached to each canister the valve will be opened (flow will be preset at the laboratory for 12 6 ml/min) and the pressure will be recorded in the logbook and compared to the pre shipment reading Each canister will be hung from a sturdy hook on the fence at approximately 6 feet above ground level

Particulate monitoring will target the respirable dust fraction (i e particles less than 10 microns in size) of total dust generated Particulates will be monitored for 8 hours at each sampling location using a Dust monitor following the procedures outlined in SOP 30 5 Instantaneous readings will be taken three times per day The shift average will be read at the end of the 8 hour period

Perimeter air monitoring measurements for VOCs and particulates will be compared to human health risk based action levels developed by the USEPA Because risk based concentrations (RBCs) are derived using a 30 year assumption action levels have been adjusted to a 2 year exposure for a child The adjusted RBC calculations including the input parameters are presented in Table 3 2 For VOCs the adjusted RBC will be the action level For particulates the adjusted RBC will be used in combination with an evaluation of soil contaminant concentrations to develop the action level

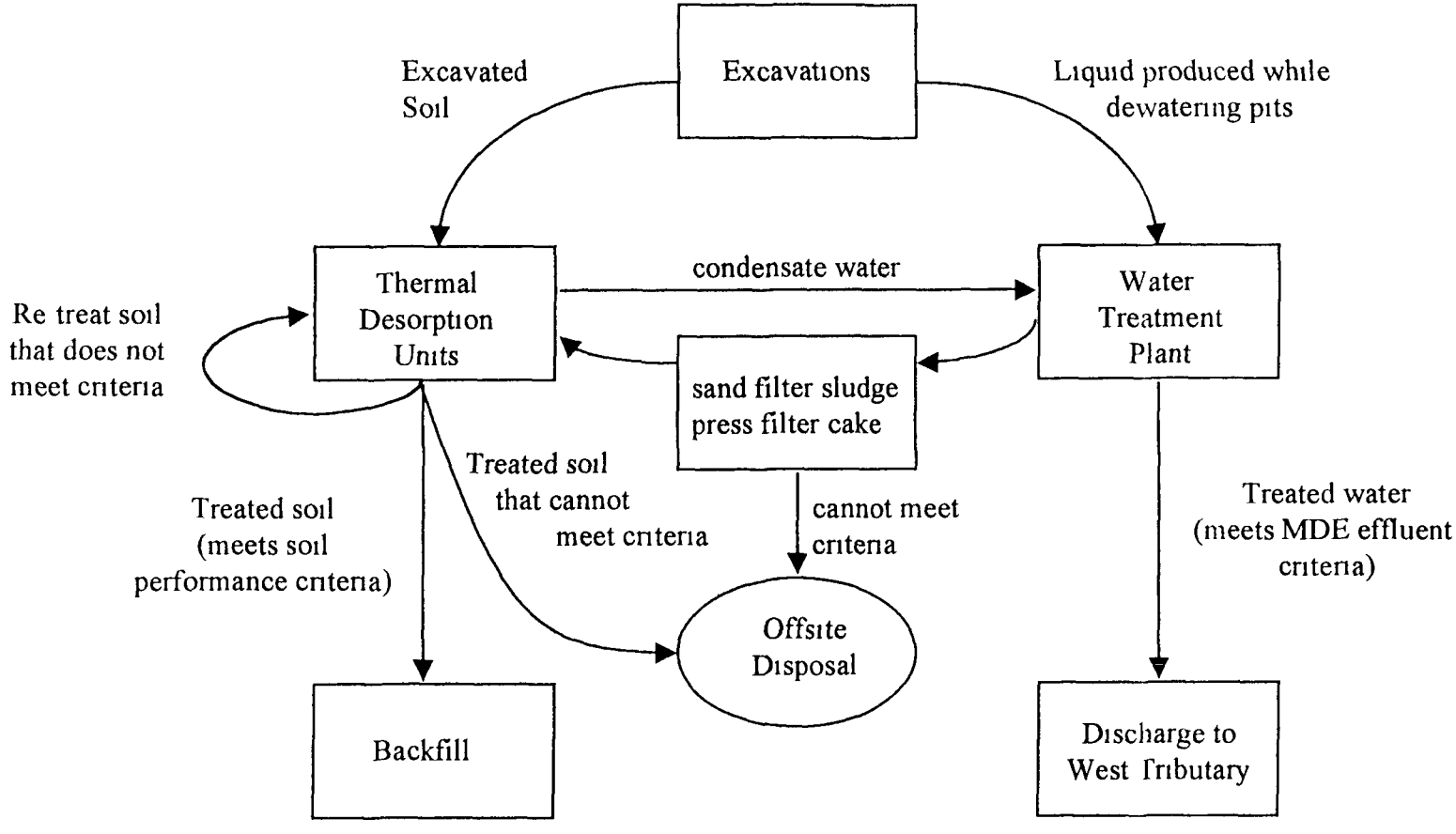

Figure 3-1 Contaminated Materials Treatment

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For VOCs benzene has been selected as the preliminary target compound because of its presence in the soil volatility and toxicity relative to other VOCs present at the site The action level for benzene is 1 57 µg/m based on a 2 year exposure for a child representing the most sensitive population that could be affected by activities at the site Initial sampling and analysis will include all VOCs to determine if benzene is the appropriate target compound If necessary a new target compound will be selected and an action level developed

For particulates the action level was developed based on the assumption that benzo(a)pyrene [B(a)P] is the most toxic SVOC present on site and that it is found in the highest concentrations relative to other SVOCs The action level is 2 750 µg soil/m^3 air The action level was developed by dividing the RBC (0 01 µg B(a)P/m^3 air) by the 95% upper confidence limit (UCL) concentration (3 640 µg B(a)P/kg soil) in the containment area where concentrations are highest on the site This approach is very conservative in that it assumes that all the particulates captured in the monitoring device contain this high concentration of B(a)P The methodology used for determining the 95% UCL can be found in Appendix H of the *Low Temperature Thermal Desorption Units Proof of Performance / Summary of Full Scale Operations*

If an action level is exceeded during site activities appropriate engineering controls will be initiated to reduce emissions Engineering controls may include limiting the size of the open excavation spraying water covering sources of dust and reducing vehicle speed on access roads on site In the event engineering controls are not adequate particulate sampling and analysis will be performed to determine the actual concentrations of contaminants associated with the particulates Particulates would be sampled and analyzed for SVOCs using methods approved by USEPA and MDE Using the sampling results for particulate matter a new action level would be calculated in the same manner discussed above and subsequently approved by USEPA and MDE The action level may then be adjusted according to the results

3 1 1 Baseline Perimeter Monitoring

Baseline perimeter monitoring will be conducted prior to any remedial activities to represent background air concentrations VOCs and particulates will be monitored for an 8 hour period (approximately 8 a m to 4 p m) during each of three days Particulates will be read at each location 3 times each day

3 1 2 Perimeter Monitoring During Proof of Performance

VOCs and particulates will be monitored for an 8 hour period (approximately 8 a m to 4 p m) during each of seven days of proof of performance testing Particulates will be read at each location 3 times each day

3 1 3 Perimeter Monitoring During Full Scale Operations

Perimeter monitoring will be performed during project operations to assure the community that air quality will not be adversely impacted by remedial activities VOCs will be monitored on a monthly basis and will coincide with start of excavations in contaminated areas Additionally depending on the operational variability daily VOC monitoring may be conducted for discretionary days in the 15 month time period of remediation activities Particulates will be monitored for an 8 hour period (approximately 8 a m to 4 p m) each day of project operations to demonstrate appropriate engineering controls have been effected to preclude adverse air quality Particulates will be read at each location 3 times each day Time weighted average will be recorded at the end of the eight hour period Particulates will not be monitored on rainy days

Air monitoring locations are shown in Figure 3 1B

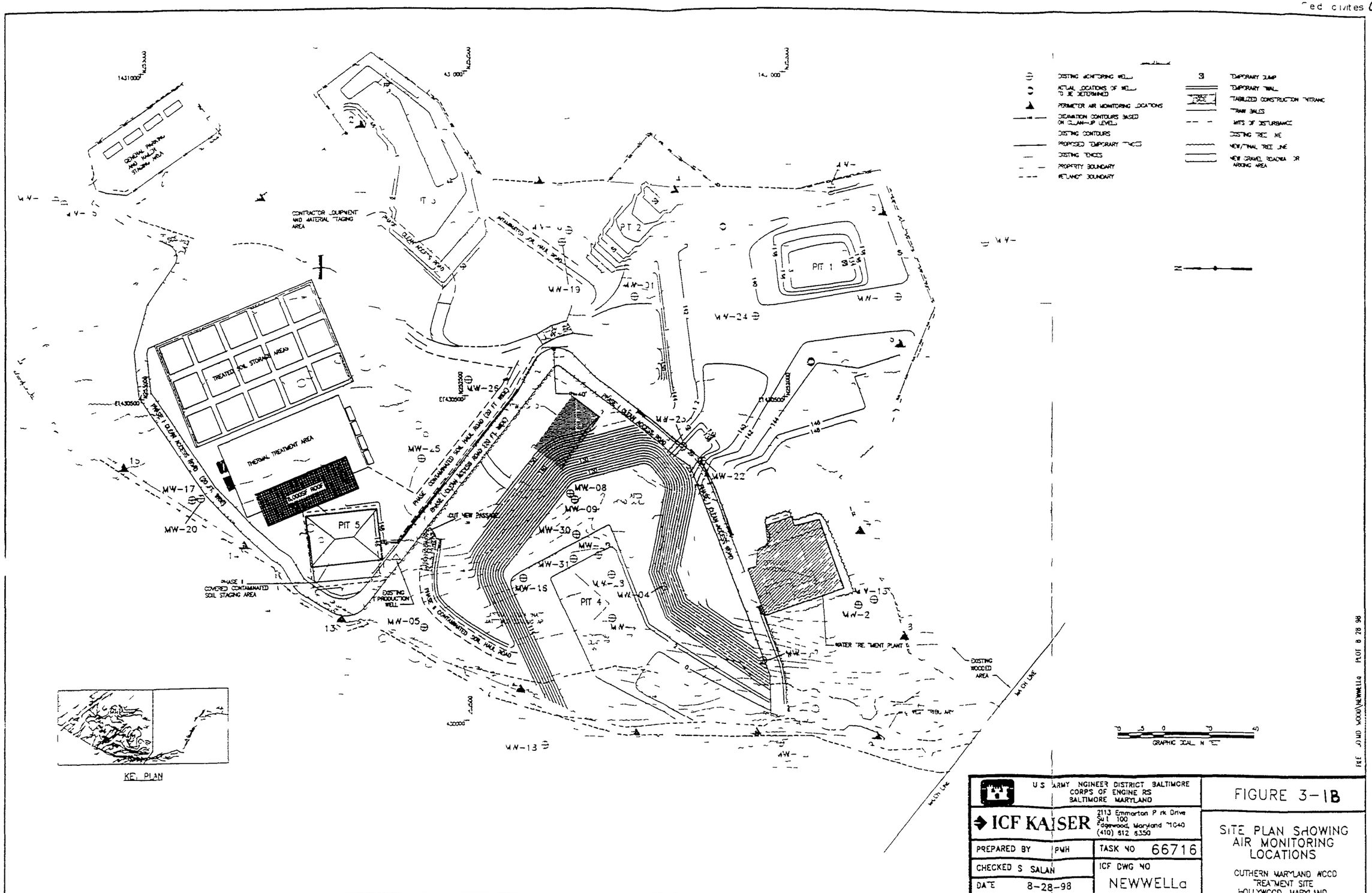

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FIGURE 3-1B

SITE PLAN SHOWING AIR MONITORING LOCATIONS

SOUTHERN MARYLAND WOOD TREATMENT SITE
HOLLYWOOD MARYLAND

ORIGINAL Red

Table 3 1
Sampling and Analysis for Perimeter Air Monitoring

Sample Description	Days of Sampling	Analytical Method	Sample Type	Approximate Number of Samples
Baseline M3 Validation (VOCs Only)	3 days	VOCs TO 14	summa canisters 8 hour time weighted	12
		Particulates	grab	36
		dust monitor	8 hour shift average	12
Proof of Performance M3 Validation (VOCs Only)	7 days (includes one preparation day)	VOCs TO 14	summa canisters 8 hour time weighted	28
		Particulates	grab	84
		dust monitor	8 hour shift average	28
Full Scale Operations M3 Validation (VOCs Only)	25 days	VOCs TO 14	summa canisters 8 hour time weighted	100
	450 days (15 months)	Particulates	grab	5400
		dust monitor	8 hour shift average	1800

Table 3 2
Risk Based Concentration for Ambient Air Resident Child

CHEMICAL	CSFi (kg x day/mg)	RfDi (mg/kg/day)	Adjusted RBC carcinogenic (µg/m^3)	Adjusted RBC non carcinogenic (µg/m^3)
benzo(a)pyrene	3 1	not applicable	**0 01**	not applicable
pentachlorophenol	1 2E 01	3E 02	**0 38**	39 11
benzene	2 9E 02	1 7E 03	**1 57**	2 23

Adjusted RBC Carcinogenic = (TR x BW x ATc x 1000 ug/mg)(IR x EF x ED x CSFi)
Adjusted RBC Non Carcinogenic = (THQ X RfDi X BW x Atn x 1000 ug/mg)(IR x EF X ED)

where	
TR = target risk (unitless)	1E 06
THQ = target hazard quotient	1 0
BW = body weight (kg)	15
ATc = carcinogenic averaging time	25550
Atn = non carcinogenic averaging time (days)	730
IR = inhalation rate (m3/day)	12
EF = exposure frequency (days/year)	350
ED = exposure duration (years)	2
CSFi = Inhalation carcinogenic slope factor (kg x day/mg)	chemical specific
RfDi = inhalation reference dose (mg/kg/day)	chemical specific

Note For benzo(a)pyrene and benzene toxicity criteria CSFi and RfDi respectively were not available in EPA s Integrated Risk Information System (IRIS) However USEPA National Center for Environmental Assessment (NCEA) has developed provisional values which are provided in this table and considered in these calculations

Inhalation toxicity criteria are not available for pentachlorophenol Instead for the sake of calculations oral criteria are applied

Bold print in the table denotes the most stringent RBC value (carcinogenic vs non-carcinogenic) for a given chemical The respective values highlighted by bold print could represent ambient air action levels during remediation All of the selected RBC values are for carcinogenic endpoints and protect a a level of 1E-05 which is the mos s ringen end of USEPA s acceptable risk range

3 2 SOIL AND SEDIMENT EXCAVATION

Soil and sediment that exceed acceptable criteria will be excavated and transported to the thermal desorption units (TDUs) where they will be treated to remove contamination from the solids Areas to be excavated include five pits and the West Tributary The five pits are

- Pit 1 Land Treatment Area
- Pit 2 Drainage Swale to East Tributary
- Pit 3 Northeast Tank Area
- Pit 4 Containment Area
- Pit 5 Contaminated Soil Stockpile Area

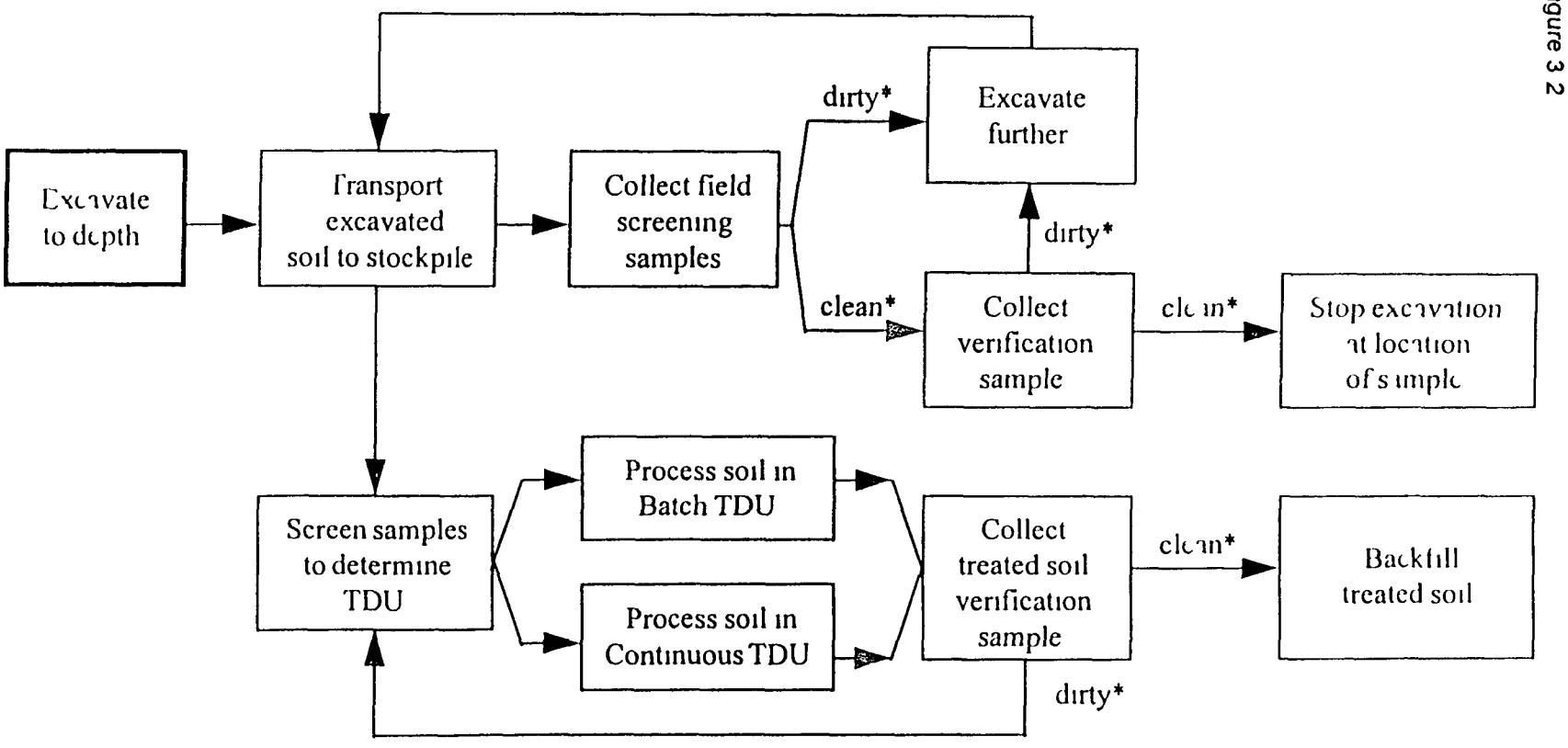
3 2 1 Pits

Soil that exhibits contaminant concentrations in excess of the established action levels will be excavated for on site treatment All surface soil (0 2 ft bgs) exhibiting greater than 0 1 ppm B(a)P equivalence will be excavated All subsurface soil (greater than 2 feet bgs) exhibiting greater than 1 0 ppm B(a)P equivalence will be excavated The extent of excavation necessary to remove contaminated soil from the pits was estimated during remediation design based on the results of previous sampling Contour maps were created to illustrate the extent of excavation required These contour maps were then used to estimate the scope of work including the volume of soil to be excavated the surface area of the pits the location of sampling points and the number of samples required to provide sufficient coverage within each pit Figure 3 2 summarizes the excavation verification process

To calculate B(a)P equivalent concentrations eight compounds are used The concentration obtained from laboratory analysis for each compound is multiplied by a scaling factor to obtain a scaled concentration The eight compounds and their scaling factors are shown in Table 3 3 If the sum of the eight scaled concentrations exceeds 0 1 mg/kg then the action level is exceeded for surface soil If the sum of the eight scaled concentrations exceeds 1 0 mg/kg then the action level is exceeded for subsurface soil

Table 3 3
B(a)P Equivalence Scaling Factors

Compound	Benzo(a)pyrene Scaling Factor
benzo(a)anthracene	0 1
benzo(b)fluoranthene	0 1
benzo(k)fluoranthene	0 01
benzo(a)pyrene	1 0
chrysene	0 001
dibenzo(a h)anthracene	1 0
indeno(1 2 3 cd)pyrene	0 1
carbazole	0 003



	Surface Soil	Subsurface Soil
dirty* clean*	B[a]P > 0 1 ppm B[a]P < 0 1 ppm	B[a]P > 1 0 ppm B[a]P < 1 0 ppm

Figure 3 2 Summary of Sampling Process During Excavation and Verification of Pits

3 2 1 1 Rationale for Excavation Pit Sampling

Sampling within the excavation pits will occur in phases Soil will be observed and sc eened using a handheld photoionization detector (PID) at the excavation boundaries prescribed by the analytical results from previous investigations These boundaries were delineated to be the limits where contaminant concentrations are below action levels If no signs of contamination are present samples will be collected and analyzed for polynuclear aromatic hydrocarbons (PAHs) and carbazole by the on site laboratory If screening samples show concentrations over the action levels excavation will continue When screening samples show that contaminant concentrations at the limits of the excavation are below action levels verification samples will be collected and sent to an off site laboratory for confirmation

Sufficient samples will be collected to assess the extent of the contamination and to address possible migration of the release due to environmental transport after the excavation boundaries were delineated A specific factor that will influence the configuration of contamination is the nature of the geology under the site The subsurface geology is heterogeneous and may have induced heterogeneities in contaminant migration based on soil chemistry and particle size Selection of a particular sampling approach depends on the level of knowledge regarding the release (USEPA 1989) A combination of systematic and judgmental sampling will be used in the pits for the following reasons

- A systematic approach involves taking samples from locations established by a predetermined scheme such as a grid The advantage of systematic grid sampling is that it allows the collection of a set of unbiased samples across the area of concern A possible limitation of systematic grid sampling is that if contaminants are distributed in a regular pattern the sampling points could all lie within the clean areas
- Judgmental sampling will be used to fill in the gaps left by the systematic grid Judgmental sampling involves selection of sampling locations based on existing knowledge of the release configuration (e g visual evidence or air monitoring) Judgmental sampling is appropriate when specific information exists on the potential configuration of the release In this case the lateral and vertical extent of contamination in each excavation area has been estimated based on the results of previous investigations of subsurface conditions and an excavation plan has been drafted accordingly Judgmental sampling will generally bias the data obtained toward higher contaminant concentrations For example samples taken only from areas of suspected contamination would generally be biased toward higher concentrations This is desirable in this scenario

For screening samples a judgmental approach is appropriate so that areas of suspected or potential contamination will be sampled For verification sampling a systematic sampling approach is appropriate and a 100 foot grid system has been established to delineate sampling locations and to describe and record sampling locations accurately The size of the grid is based on site specific factors such as the nature of the contaminant source and the subsurface geology In the field a combination of systematic and judgmental approaches may prove optimal for screening and verification sampling For example during screening sampling there may be areas in a pit where there is no observable basis for judgmental sampling locations Then a systematic approach should be applied with a grid adapted to fit the area

3 2 1 2 Excavation Procedures and Soil Screening

The purpose of excavation is to remove all soil with contaminant concentrations that exceed action levels The size and depth of each excavation pit have been estimated using analytical results from previous investigations The excavation limit for each pit is shown in Figures 3 3 through 3 7 Pits will be excavated in two foot increments After excavation soil will be screened (visual observation and the use of a handheld PID) by the Sampling Supervisor and sampled if no signs of contamination are present If the soil does appear contaminated the excavation will be extended another two feet When preliminary screening shows signs of contamination soil from the exposed bottom and sidewall surfaces will be analytically screened by the on site laboratory to determine whether all soil exceeding action levels has been removed

No

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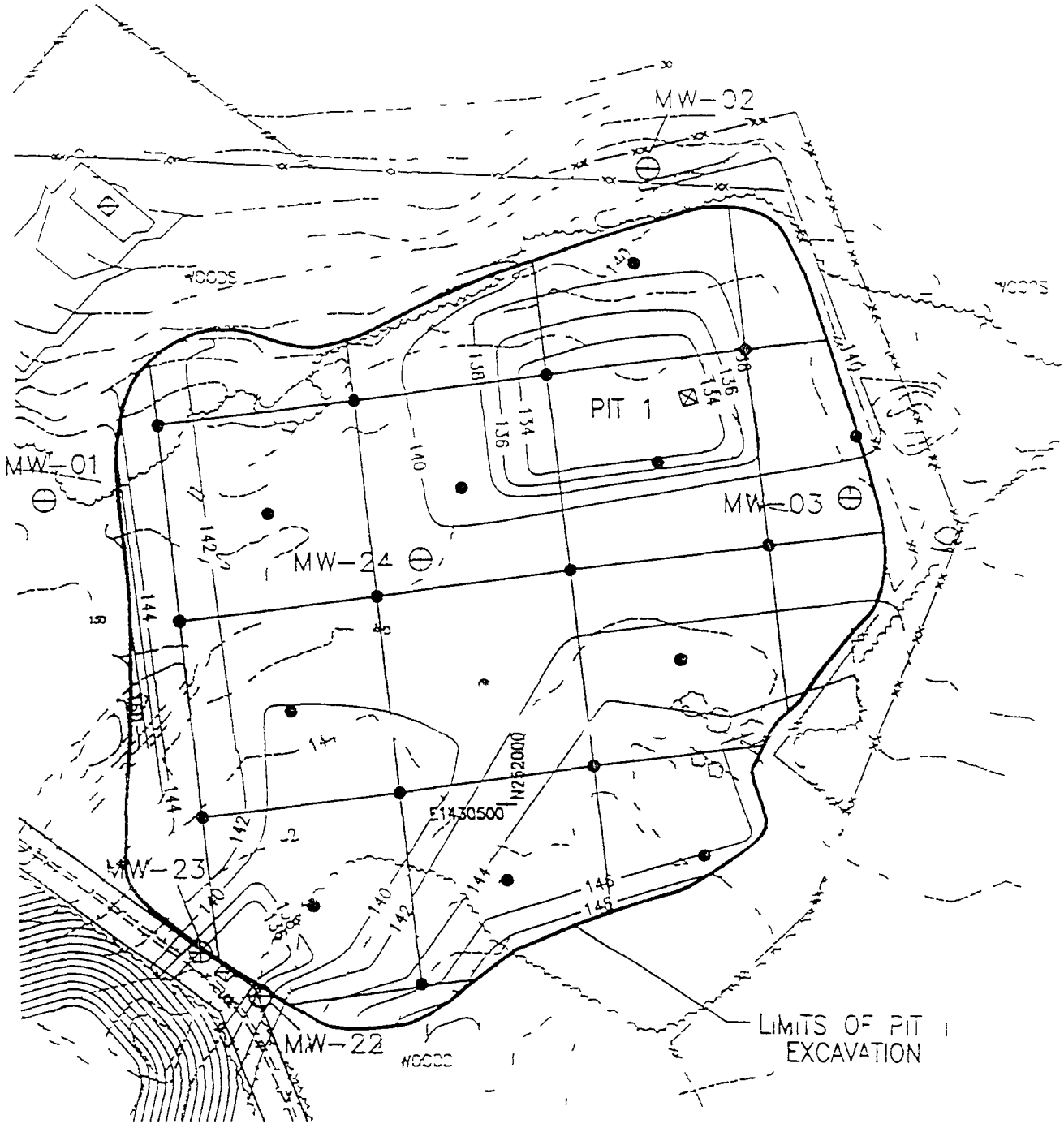

LEGEND

- PROPOSED SOIL SAMPLING LOCATIONS
- EXISTING MONITORING WELLS
- EXCAVATION CONTOURS BASED ON CLEAN-UP LEVELS
- EXISTING CONTOURS
- PROPOSED TEMPORARY FENCES
- EXISTING FENCES
- TEMPORARY SUMP
- EXISTING TREE LINE
- NEW GRAVEL ROADWAY OR PARKING AREA

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FIGURE 3-3

PIT 1
VERIFICATION AND
CONFIRMATION SAMPLES

SOUTHERN MARYLAND WOOD
TREATMENT SITE
HOLLYWOOD, MARYLAND

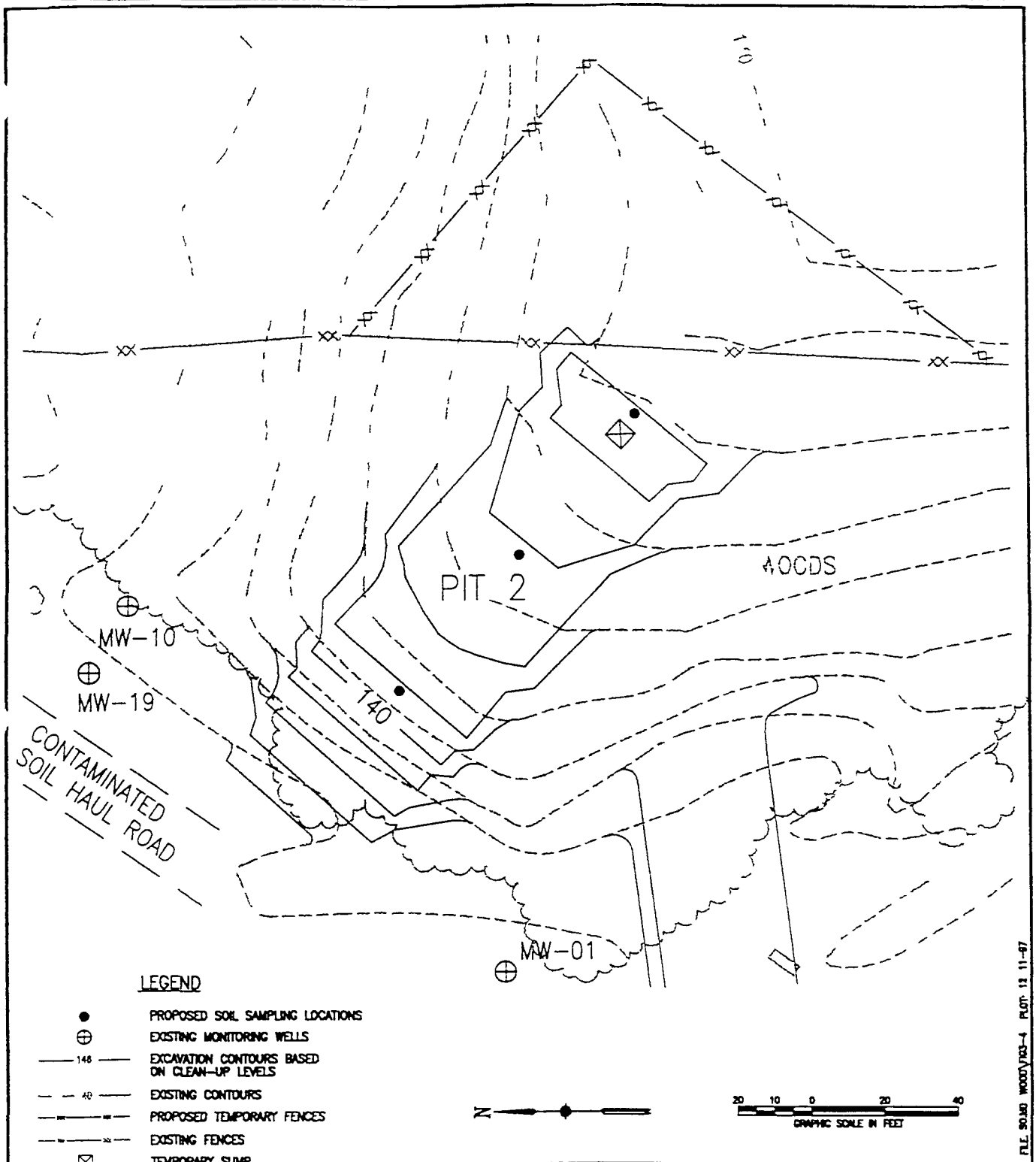

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FIGURE 3-4

PIT 2
VERIFICATION AND CONFIRMATION SAMPLES

SOUTHERN MARYLAND WOOD TREATMENT SITE
HOLLYWOOD MARYLAND

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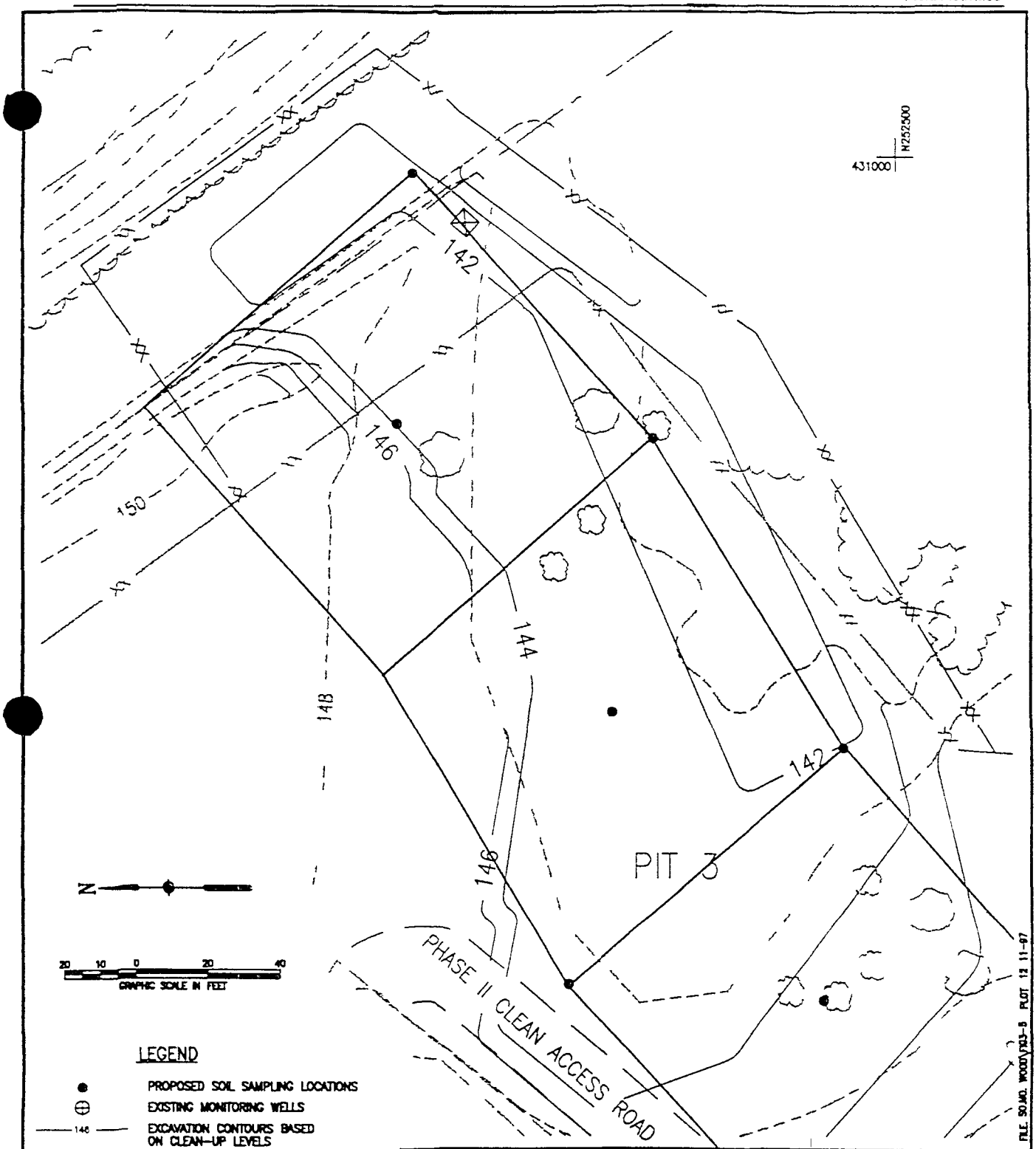

LEGEND

- PROPOSED SOIL SAMPLING LOCATIONS
- EXISTING MONITORING WELLS
- 146 — EXCAVATION CONTOURS BASED ON CLEAN-UP LEVELS
- 4 — EXISTING CONTOURS
- PROPOSED TEMPORARY FENCES
- EXISTING FENCES
- TEMPORARY SUMP
- EXISTING TREE LINE

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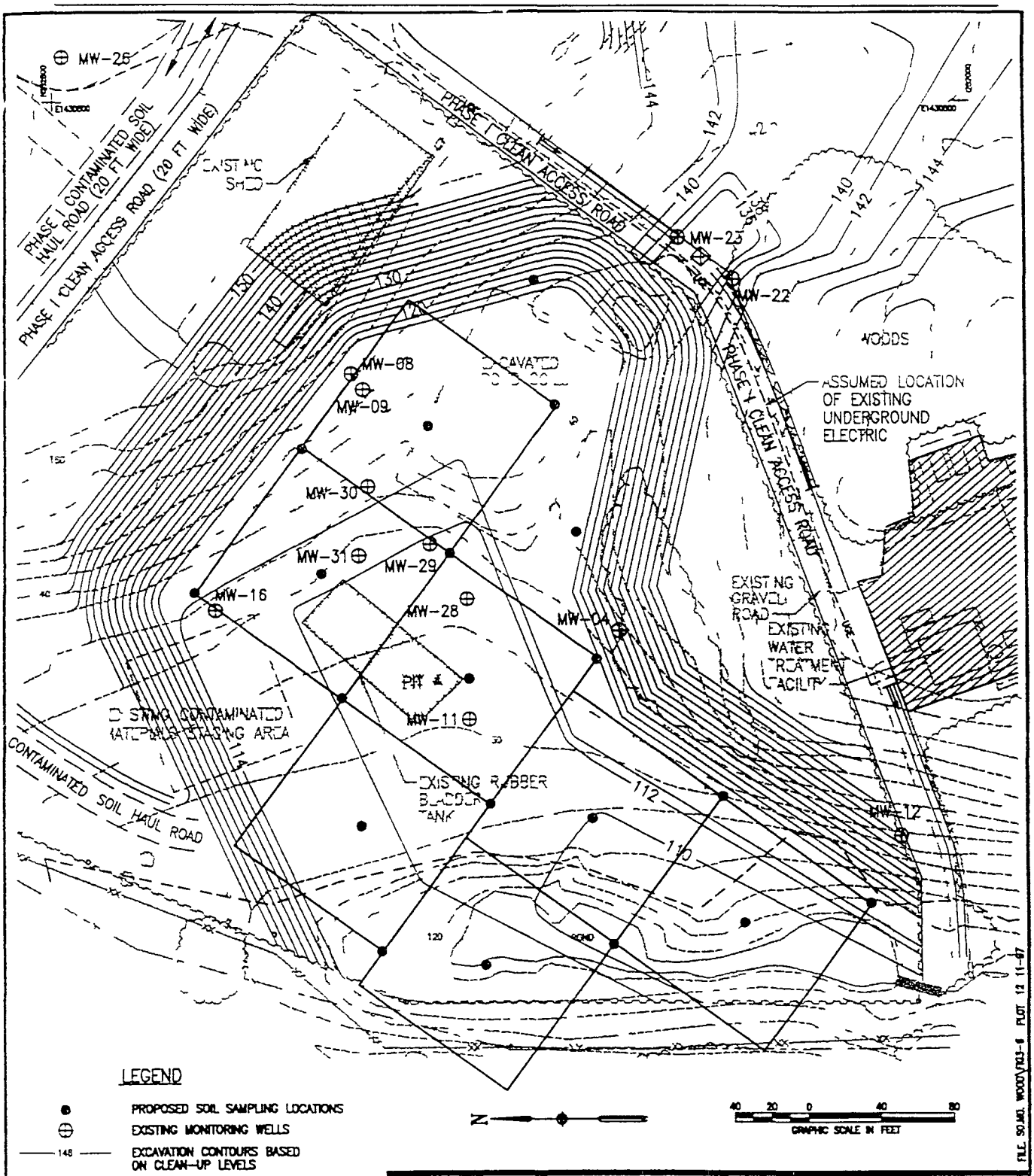
FIGURE 3-5

PIT 3
VERIFICATION AND
CONFIRMATION SAMPLES

SOUTHERN MARYLAND WOOD
TREATMENT SITE
HOLLYWOOD MARYLAND



LEGEND

- PROPOSED SOIL SAMPLING LOCATIONS
- EXISTING MONITORING WELLS
- EXCAVATION CONTOURS BASED ON CLEAN-UP LEVELS
- EXISTING CONTOURS
- PROPOSED TEMPORARY FENCES
- EXISTING FENCES
- TEMPORARY SUMP
- EXISTING TREE LINE
- NEW/FINAL TREE LINE
- NEW GRAVEL ROADWAY OR PARKING AREA

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FIGURE 3-6

PIT 4
VERIFICATION AND
CONFIRMATION SAMPLES

SOUTHERN MARYLAND WOOD
TREATMENT SITE
HOLLYWOOD MARYLAND

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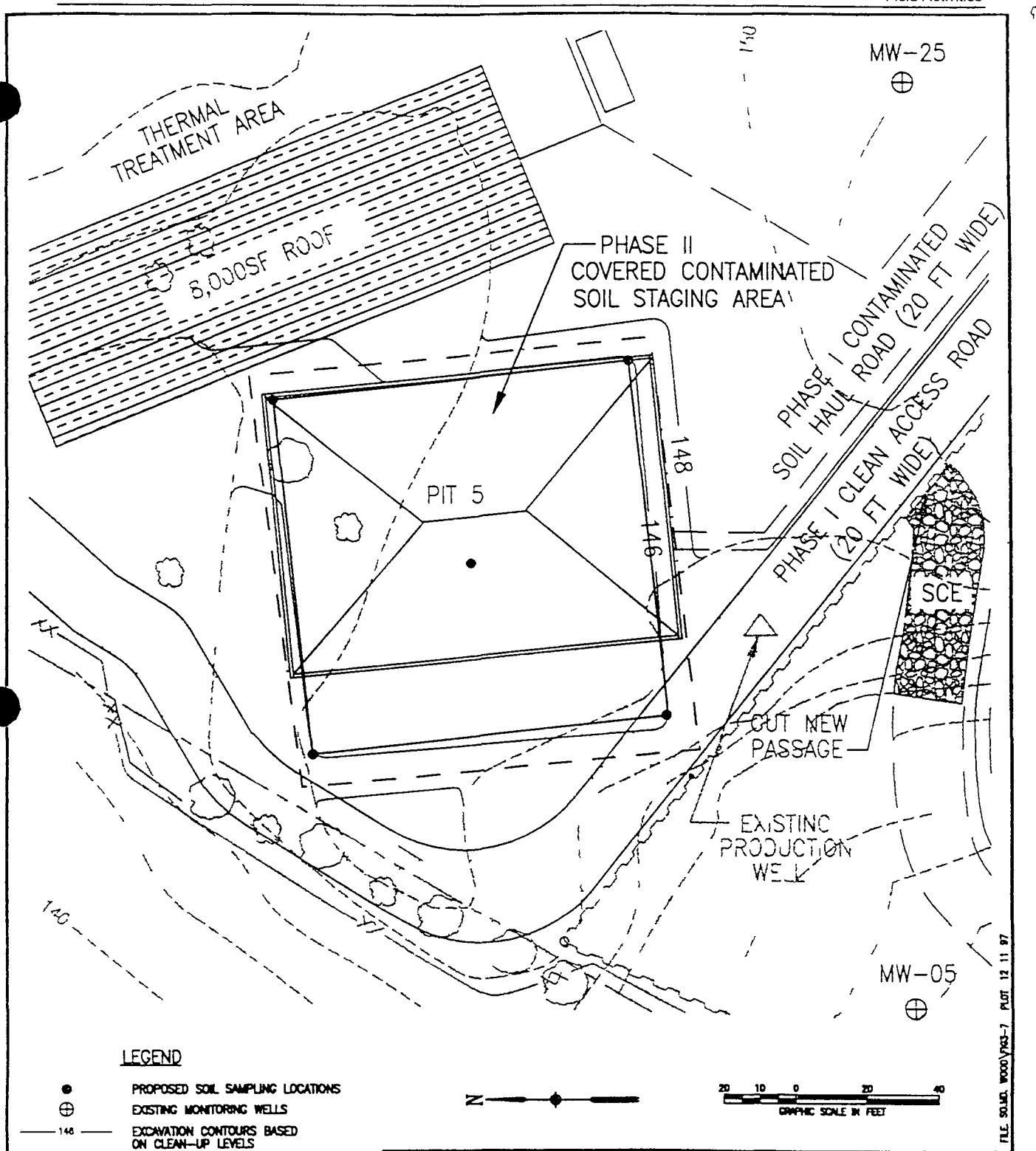

LEGEND

- PROPOSED SOIL SAMPLING LOCATIONS
- EXISTING MONITORING WELLS
- 146 — EXCAVATION CONTOURS BASED ON CLEAN-UP LEVELS
- 140 — EXISTING CONTOURS
- SHEET PILE WALL
- NEW GRAVEL ROADWAY OR PARKING AREA

N

20 10 0 20 40
GRAPHIC SCALE IN FEET

U.S. ARMY ENGINEER DISTRICT BALTIMORE CORPS OF ENGINEERS BALTIMORE, MARYLAND		FIGURE 3-7
ICF KAISER 2113 Emmorton Park Drive Suite 100 Edgewood, Maryland 21040 (410) 612-6350		PIT 5 VERIFICATION AND CONFIRMATION SAMPLES
PREPARED BY PMH	TASK NO- 66716	
CHECKED- L. HASS	ICF DWG NO- FIG3-7	SOUTHERN MARYLAND WOOD TREATMENT SITE HOLLYWOOD MARYLAND
DATE. 12-11-97		

Limited sampling done in this area
We don't have same track record as with treated soil

Need to show it meets all delisting, HW criteria to be able to backfill

During excavation the Sampling Supervisor will periodically inspect the excavated soil It is certain that some soil in the pits will be far more contaminated than other soil For example the soil at the bottom of Pit 4 will be very highly contaminated with dense non aqueous phase liquid (DNAPL) It is possible that some soil within the boundaries of the excavations may not be contaminated above the action levels but will still need to be removed in order to reach more contaminated soil below During his inspection the Sampling Supervisor may segregate uncontaminated or less contaminated soil as it is being excavated

Segregated uncontaminated soil must be taken to a temporary stockpile and analyzed One screening sample must be collected for every 1000 tons of soil and analyzed on site for B(a)P equivalence If results are below regulatory levels then one sample must be collected for every 2500 tons of soil and analyzed off site like treated feed soil (Section 3 3 2 2) If the soil passes the analysis it may be stockpiled with other treated feed soil and used as backfill and if it does not pass the analysis it must be sent to the TDUs for treatment Less contaminated soil may be blended with more contaminated material to produce moisture and contaminant concentrations acceptable for treatment in the continuous TDUs Treatment at the continuous TDUs is advantageous over treatment at the batch TDUs because the continuous units have shorter residence times larger capacities and lower operating costs

Excavation will be performed by a mechanical excavator such as a backhoe For excavations deeper than four feet soil monitoring inspection and sampling will be performed on soil in the excavator bucket following procedures outlined in SOP 30 1 At no time should samplers enter excavations deeper than four feet In Pit 4 care should be taken during excavation and sampling to ensure that the clay layer which acts as the bottom of the water table aquifer is not penetrated so that the aquiclude remains intact The Site Manager will be informed prior to any excavation into the clay so that actions can be taken to ensure the clay barrier is not compromised

Screening frequency and screening locations will be determined by field observations of the subsurface conditions using a judgmental sampling approach Screening will be conducted at any location where contamination is suspected due to soil appearance subsurface conditions observed during excavation or other factors Such factors may include subsurface heterogeneities such as sandy lithology which may have acted as a contaminant channel or perched water pockets The samplers will have access to previous analytical results which may provide assistance in such cases Special attention is due at the southeast side of Pit 4 where sampling locations during previous investigations were sparse Screening sample frequency may be an order of magnitude greater than verification sample frequency

Preliminary screening will be performed by field personnel to eliminate observably contaminated materials from further analysis Preliminary screening includes the following steps

- Passing a photoionization detector (PID) or flame ionization detector (FID) over a fresh bucket of soil to determine whether measurable concentrations of organics are present
- Examining soil in the excavator bucket for visual signs of contamination

In areas where materials unambiguously prove to be contaminated during preliminary screening excavation will continue If preliminary screening gives no indication of contamination or if the results are ambiguous that area of the excavation will be sampled for analytical sc eening by the on site laboratory In cases of potential contamination the sampler will provide the on site laboratory with likely concentrations based on observations and existing data Soil screening with the on site laboratory will be used as a cost and time effective tool to make initial determination of the vertical and horizontal extent of excavations Field personnel will collect a screening sample using the following steps

- Remove any large soil clumps attached to the excavator bucket with a shovel or similar scraping tool

  Instruct the excavator operator to collect soil from the location that is suspected to be above action levels

ORIGINAL Red)

Collect soil samples from the backhoe bucket according to SOP 30 1 Collect only soil that has not touched the sides of the bucket Sampling tools used to collect the soil must be free of contamination from previous samples

Immediately following sample collection the sample will be taken to the on site laboratory for PAH and carbazole analyses (Table 3 4) The on site laboratory will deliver sample results within 48 hours The laboratory will report results in three formats (1) PAH and carbazole concentrations in ppm (2) PAH and carbazole concentrations scaled to B(a)P equivalent concentrations for relevant compounds in mg/kg and (3) the sum of B(a)P equivalent concentrations for relevant compounds in mg/kg If the number in (3) exceeds 0 1 mg/kg the action level is exceeded for surface soil and if it exceeds 1 0 mg/kg the action level is exceeded for subsurface soil

If results from screening are within 10% of action levels a sample will be collected for off site soil verification sampling If screening results are greater than 10% of action levels the excavation will be advanced to an extent that will be based on field observations This screening process will be used for both horizontal and vertical directions of excavation

3 2 1 3 Verification Sampling

When the excavation limit of the entire pit has been determined through on site screening the soil will be sampled for off site analysis to verify that the vertical and horizontal extent of the excavation leaves no soil contamination in excess of the established action levels Verification samples will be collected on the bottom and sidewalls of the excavation for PAH and carbazole analyses (Table 3 4) Bottom and sidewall verification sample locations will be surveyed for both vertical and horizontal control

Verification samples for horizontal verification will be collected from the sidewalls of each pit at 100 foot intervals These sampling locations are not shown on Figures 3 3 through 3 7 because they will be estimated in the field The depth of the excavation will determine how many samples will be collected at each interval as follows

- In excavations that are 2 feet or shallower one soil sample will be collected from the sidewall at each sampling location
- In excavations that are 10 feet or shallower two soil samples will be collected from the sidewall at each sampling location One sample will be collected from the sidewall at 0 2 feet bgs and one from two feet bgs to the bottom of the excavation
- Three soil samples will be collected from the sidewall in excavations that exceed 10 feet total depth One sample will be collected from 0 2 feet bgs and the remaining two samples will be collected based on two criteria
  1. If there is a lithology change in the sidewall both lithologies will be sampled separately
  2. If there is not a lithology change the sidewall from two feet bgs to the bottom of the excavation will be divided in half and a sample will be collected from each half

When sample screening indicates that the total depth of the excavation has been reached verification sampling will take place on the floor of the excavation Sample locations are located on the nodes and the centers of a 100 foot grid as shown in Figures 3 3 through 3 7 Whereas the locations of the grid nodes will remain fixed the center samples may be collected from any location within a grid box and should be preferentially located so as to sample potentially contaminated material In addition if two soil lithologies are identified within a 100 foot grid both will be sampled Field personnel will collect verification samples using the following steps

- Decontaminate the excavator bucket following the procedures described in Section 4 0 before the collection of each individual verification sample If any contamination is encountered during verification sampling the limits of the excavation must be expanded to remove the contaminated area
- Instruct the excavator operator to collect soil from the grid node or from a location within the grid

- Collect soil samples from the backhoe bucket according to SOP 30 1 using decontaminated sampling tools

If verification sample results exceed action levels the process will revert to the initial excavation and screening process discussed in Section 3 2 1 2 Excavation Procedures and Soil Screening

3 2 2 Excavation in the West Tributary

Sediment in the West Tributary that contains concentrations of contaminants in excess of the established criteria will be considered contaminated and will be excavated for on site treatment in the Batch TDU Sediment criteria include

- Sum of low molecular weight PAHs less than 3 2 ppm (including but not limited to acenaphthene acenaphthylene anthracene fluorene 2 methyl naphthalene naphthalene and phenanthrene)
- Sum of high molecular weight PAHs less than 9 6 ppm (including but not limited to benzo[a] anthracene benzo[a]pyrene chrysene dibenzo[a h]anthracene fluoranthene and pyrene)
- PCP less than 0 4 ppm

3 2 2 1 Rationale for Sediment Sampling

Numerous sediment samples were collected from the West Tributary during previous investigations and analyzed for PAHs and PCPs Results for many of these samples show PAH and PCP concentrations over the sediment criteria (Figure 3 8) The reliability of the previously collected sediment data for proposed remediation work in the West Tributary is questionable because sediment transport in the stream may have modified the location of contamination Therefore before excavation areas can be delineated additional screening will be performed to determine the locations of contaminated sediment in the stream Excavation will proceed based on the screening results After excavation samples will be collected around the excavation areas to verify that all contaminated sediments have been removed Sampling and analysis requirements for the West Tributary are presented in Table 3 4

Sampling within the West Tributary will occur in two phases Samples will be collected following SOP 30 4 The first phase will involve collecting screening samples at potentially contaminated areas These areas include previous sampling locations depositional areas and areas of discoloration Screening samples will be analyzed for PAHs and PCPs at the on site laboratory If screening samples show concentrations over the action levels that location within the Tributary will be excavated The second sampling phase will occur after excavation to show that contaminant concentrations in the sediment under and around the excavated area do not exceed action levels These verification samples will be sent to a off site laboratory for confirmation

3 2 2 2 Screening to Delineate Contamination Boundaries

Screening sample locations will be carefully marked and documented so that excavation locations will be accurate Sampling locations will be chosen in the following areas

- Previous sampling locations in the Western Tributary that yielded contaminant concentrations in excess of the cleanup criteria will be sampled A composite sample will be collected from the center of the streambed and immediately (2 3 ft away) upstream and downstream of the sampling point Based on the existing data 15 locations will be sampled
- Depositional areas along the stream will be sampled based on a site inspection A composite sample of the materials will be collected consisting of samples from two different locations within the depositional area and one immediately downgradient from the depositional area The total number of locations that will be sampled will depend on the number of depositional areas in the stream
- Areas of discoloration will be sampled A composite sample will be collected from sediments throughout each identified area The total number of locations that will be sampled will depend on the number of discolored areas in the stream

Table 3-4
Excavation and Verification Sample Locations and Rationale

Sample Description	Estimated Frequency	Sample Location/Type Data Validation	Chemical Analyses	Sample Rationale
		Excavation Pits		
Pit 1 Soil Screening	34+	Grab Samples will be collected at areas where preliminary screening gives no indication of contamination or if the results are ambiguous Soil screening sampling locations should be more frequent than verification sampling locations M1 Validation	On site PAHs and Carbazole 3550M/ 8270C	On site screening for PAHs to delineate contamination bou dary The on site lab will report PAH concentrations in actual ppm s and B[a]P equivalent ppms If contaminant concentrations exceed excavation criteria continue excavating if not stop excavating and take verification samples
Pit 2 Soil Screening	6+			
Pit 3 Soil Screening	13+			
Pit 4 Soil Screening	53+			
Pit 5 Soil Screening	9+			
Pit 1 Verification Sampling	23 bottom 41 sidewall	Grab samples from floor of excavation at 100 foot sampling grid nodes and centers (Figures 3 3 through 3 7) and 100 linear feet along excavation walls at depths 2 to 10 10 to bottom and 33 linear feet along excavation walls at depths 0 to 2 M3 Validation	Off site PAHs 3540C/8310 Carbazole 8270C	Soil samples will be collected from the bottom and sidew lls for laboratory confirmation that all contamin ted soil has been removed
Pit 2 Verification Sampling	3 bottom 11 sidewall			
Pit 3 Verification Sampling	7 bottom 32 sidewall			
Pit 4 Verification Sampling	20 bottom 49 sidewall			
Pit 5 Verification Sampling	5 bottom 14 sidewall			
		West Tributary		
Delineation Sampling at Previously Contaminated Locations	15	Resample at locations in Pre Design Report (D&M 1992) where PAHs or PCP exceeded clean up criteria SE 04 SE 15 SE 16 SE 17 SE 18 SE 19 SE 20 SE 21 SE 22 SE 23 SE 24 SE 25 SE 26 SE 27 SE 28 M1 Validation	On site PAHs and PCP 3550M/ 8270C	To determine whether contamination is present at previously contaminated locations Previous sample results need to be verified before excavation because the samples were collected in 1992 and sediments may have migrated in the interim shifting the location of contamination Each sample will be a compo ite of sediments from center stream and from 2 ft upstream and 2 ft downstream If analytical results indicate contamination over the sediment criteria the stream will be excavated to a depth of 6 inches from 2 ft upstream to 2 ft downstream of sample
Delineation Sampli g at Depositional Areas	approx 15 or as required by conditions	Depositional areas identified by sediment sizes ranging from fine to coarse grained may tend to be located on the inside bends in the stream bed or where the current slows due to wider banks M1 Validation	On site PAHs and PCP 3550M/ 8270C	PAHs and PCPs are relatively insoluble in water and would tend to sorb to soils Depositional areas may contain a high concentration of particulates with sorbed contamina its If analytical results indicate contamination over the sediment criteria the stream will be excavated to a depth of 6 inches from 2 ft upstream to 2 ft downstream of sample
Delineation Sampling at Discolored Areas	approx 15 or as required by conditions	Darker areas also identified by sheen on sediments or thick or sticky texture M1 Validation	On site PAHs and PCP 3550M/ 8270C	Discoloration of the sediments may be a visible indication of contamination Note that some areas contain natural staining (e g iron hydroxide staining and sheen caused by bacteria) If analytical results indicate contamination over the sediment criteria the stream will be excavated to a depth of 6 inches from 2 ft upstream to 2 ft downstream of sample
Ex avation Verificati n	approx 45 or as required by the analytical sults fro n sampl s	Excavation will occur where delineation sampling indicates contamination exceeds cleanup criteria After excavation a composite sediment sample will be collected upstream downstream and below the e cavation M3 Validation	Off site PAHs 3540C/8310 PCP 8270C	After sediment excavation samples will be collected to verify that contamination has been removed

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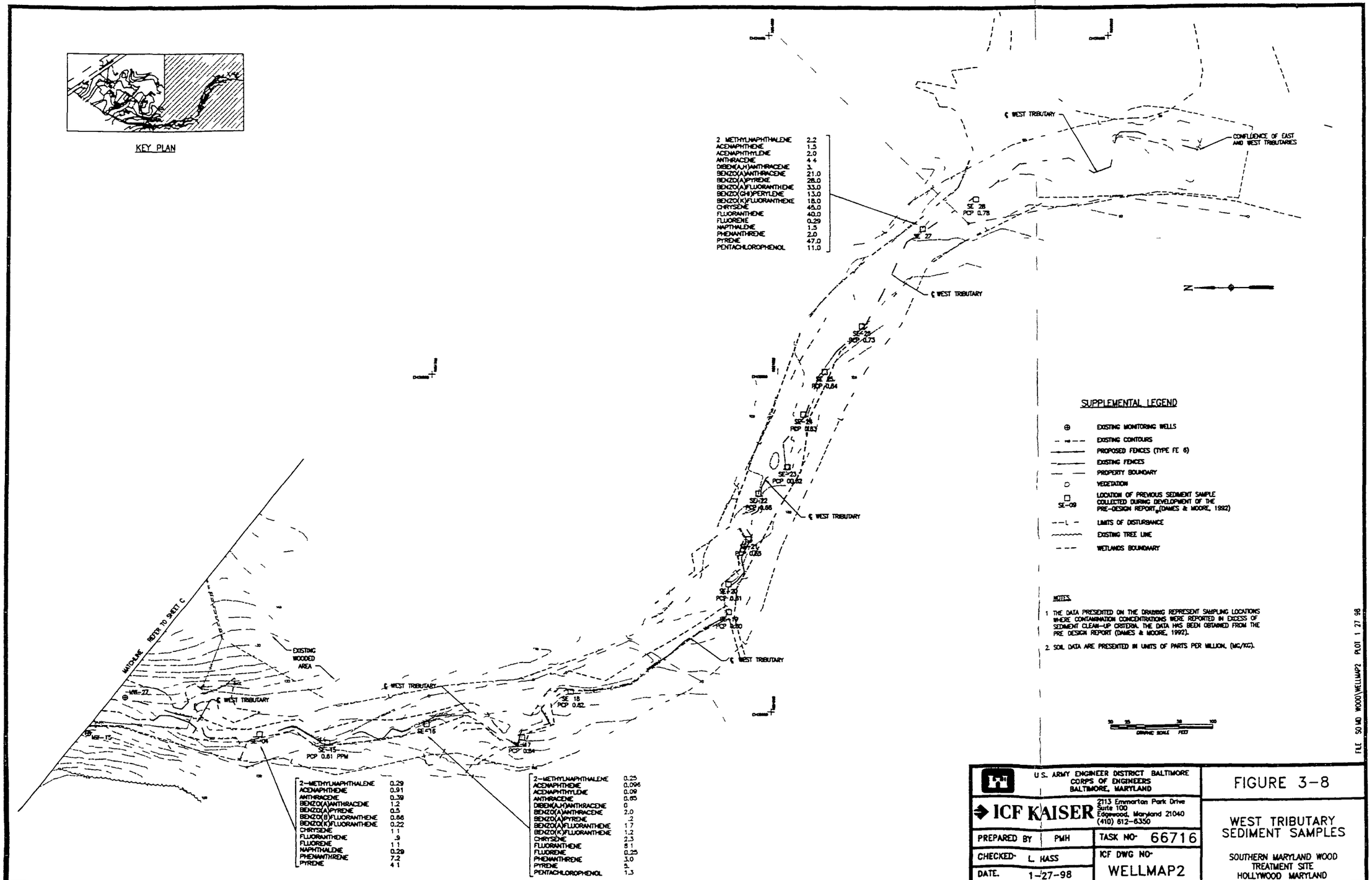

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3 2 2 3 Sampling to Verify Excavation

Surface sediments will be excavated to a depth of 6 inches over the width of the stream bed (high water levels of side banks shall define the width of the stream bed) from 2 feet upstream of the contaminated sample location to 2 feet downstream of the contaminated sample The average width of the stream is estimated to be 4 feet At all times during sampling and excavation activities in the West Tributary all efforts will be made to minimize avoidable impact to the aquatic resources of the stream To accomplish this the following approach will be followed during stream remediation

- The use of heavy equipment and facilitated access (e g construction of temporary access roads) should be minimized
- The required temporary access roads should be constructed using wood chips (instead of stone) Wood chips generated from demolition debris and from on site buildings should not be used in order to prevent new contaminants from entering the stream
- Trees should not be removed if they can be avoided
- Hand labor and shovels should be used as feasible
- No stockpiling of excavated stream sediment should occur along the West Tributary area (e g no stockpiling in the woods adjacent to the stream channel) Excavated stream sediment shall be placed directly in vehicles for transfer to the TDUs
- Low ground pressure tracked equipment should be used *in lieu* of rubber tired equipment
- Sediment should be removed from the bottom of the stream only no stream bank excavation should occur
- Areas of the stream bank disturbed by excavation and tree root removal should be repaired but no import of rip-rap or other materials is desired and
- No disturbed plant material should be removed from the stream vicinity and a record of all tree damage and removal necessitated by the project should be filed each day with the intent to perform replacement following project completion if excess tree removal is determined to have occurred as a result of this project

Following excavation of contaminated sediments verification sampling will be conducted for PAHs and PCPs to confirm that contaminated sediments have been excavated One composite sediment sample will be collected upstream downstream and below the excavation If this verification sample indicates the presence of contamination the excavation will be expanded

3 3 THERMAL DESORPTION

Excavated soil sediment and sludge that contain levels of contaminants in excess of cleanup criteria will be treated on site by low temperature indirect fired thermal desorption The material will be transported to the Contaminated Soil Stockpile Area via the waste hauling roads Contaminated material will remain on site in the designated stockpile until it is loaded to the TDU

Approximately 145 000 tons of material will be treated to vaporize volatile and semi volatile contaminants to the following performance specifications

- B(a)P equivalent surface soil < 0 1 ppm subsurface soil < 1 0 ppm
- Delisting criteria carcinogenic PAHs non carcinogenic PAHs SVOCs VOCs and
- Hazardous Waste Characteristics ignitability reactivity corrosivity toxicity

Two batch and two continuous mobile TDUs will be constructed on site The units operate at a temperature of 900 F with an average residence time of 8 to 12 hours for the batch unit and approximately 12 minutes for the continuous unit It is estimated that under optimum conditions up to 350 tons (approximately 245 CY) of material can be treated per day when all four units are operational

The batch units are designed to process soil sediment and sludge that tend to be more difficult to treat such as highly contaminated materials or loads which include more cohesive materials The continuous units are designed to treat the majority of the contaminated materials on site under normal operating conditions

The thermal desorption process will be equipped with a vapor phase treatment train for condensation and recovery of contaminants The vapor emissions from the air pollution control system will be designed to attain applicable federal and state air pollution control regulations A permit is not required but substantive portions of the regulations will be met (Refer to Appendix B of the *Low Temperature Thermal Desorption Units Proof of Performance/Summary of Full Scale Operations* for a more detailed discussion of regulatory requirements) An overview of applicable air regulatory requirements and compliance test methods for the SMWT site are as follows

- **Visible Emissions** COMAR 26 11 06 02 General Emission Standard This standard applies to the oxidizer stacks at the batch and continuous treatment systems **Applicable Standards/Requirements** COMAR 26 11 06 02(C) Stack emissions shall not exceed 20% opacity (general emission standard for St Mary s County Maryland Region V) **Compliance Stack Test Method** 40 CFR 60 Appendix A USEPA Test Method 9

- **Particulate Matter** COMAR 26 11 06 03 General Emission Standards This standard applies to the oxidizer stacks at the batch and continuous treatment systems **Applicable Standards/Requirements** COMAR 26 11 06 03(B) Stack emissions shall not exceed 0 05 gr/SCFD of particulate matter (general emissions standard for confined source installations constructed after 1972) COMAR 26 11 06 03(D) Reasonable precautions such as application of water on dirt roads stockpiles etc should be taken to prevent particulate matter from becoming airborne **Compliance Stack Test Method** 40 CFR 60 Appendix A USEPA Test Method 5

- **Volatile Organic** COMAR 26 11 06 06 General Emission Standards Volatile Organic Compounds 40 CFR 264 Subpart BB Air Emission Standards for Equipment Leaks 40 CFR 264 Subpart AA Closed Vent Systems and Control Devices **Applicable Standards/Requirements** None under COMAR 26 11 06 06 40 CFR 264 Subpart BB Section 264 1050 applies to hazardous waste streams whose total organic concentration exceeds 10% by weight Since the only process streams expected to exceed 10% are in the gas phase and since a gas phase is not considered a hazardous waste then the Subpart BB standards have no impact on the TDU operations 40 CFR 264 Subpart AA Sec 264 1032 and 1033 apply to the emission control systems at the batch and continuous systems **Compliance Stack Test Method** SW846 Method 30

- **Toxic Air Pollutants** COMAR 26 11 15 These standards/requirements apply to oxidizer stacks from continuous and batch operations **Applicable Standards/Requirements** COMAR 26 11 15 04 Emissions of each of the Toxic Air Pollutants (TAPs) shall be quantified COMAR 26 11 15 05 T Best Available Control Technology should be installed on sources emitting Class I TAPs COMAR 26 11 15 06 Demonstration to the MDE that the total allowable emissions will not unreasonably endanger human health is required COMAR 26 11 15 07 Screening analysis or second tier analysis may be used to demonstrate compliance with COMAR 26 11 15 06 For Class I TAPs to assess carcinogenic effects screening analysis needs to show that total allowable emissions from the premises will not cause increases in ambient levels that exceed risk based screening levels for the TAP For Class I or Class II TAPs to assess potential toxic effects other than cancer by a screening analysis showing that total allowable emissions from the premises will not cause increase in ambient levels that exceed applicable Threshold Limit Value (TLV) based or special screening levels **Compliance Stack Test Method** SW846 Methods 10 and 30 40 CFR 60 Appendix A USEPA Test Method 23

- **Nuisance** COMAR 26 11 06 08 **Applicable Standard/Requirement** Facility operations should not create nuisance or air pollution

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Prior to proof of performance testing a statistical method of checking the accuracy and precision of a single grab sample to characterize the moisture content and grain size of an untreated feed soil pile will be conducted following procedures outlined in SOP 30.3. The range or variation in measured moisture content within 12 grab samples will provide an indication of the accuracy and precision with which a single grab sample can characterize the moisture content and grain size of the feed soils.

A proof of performance test will be conducted on soil and air emissions to verify the capability of each TDU type (i.e. batch, continuous) in attaining regulatory cleanup and delisting criteria established in the SMWT ROD (QAPP Section 7.0). In addition, WTP will be sampled to ensure the water treatment plant (WTP) is capable of treating the TDU condensate wastewater. Sampling and analysis of untreated and treated feed material will be conducted during the Proof of Performance (POP) and throughout the remedial activities to verify material characteristics, optimize the operation of the thermal desorption equipment and verify continuous attainment of regulatory criteria. A guide for TDU type selection will be based on the chemical and physical characteristics of the feed material is depicted in Figure 3.9.

During TDU operations, treated material will be sampled and analyzed at a frequency of every other day to demonstrate attainment of soil performance criteria. Material that does not conform to specifications will be reprocessed, and backfill or disposal options will be evaluated. Condensate that has too much oil to treat in the WTP will be sent off site for disposal. Tables 3.5, 3.6 and 3.7 present the estimated number of samples associated with preparation, POP and continuous TDU operation.

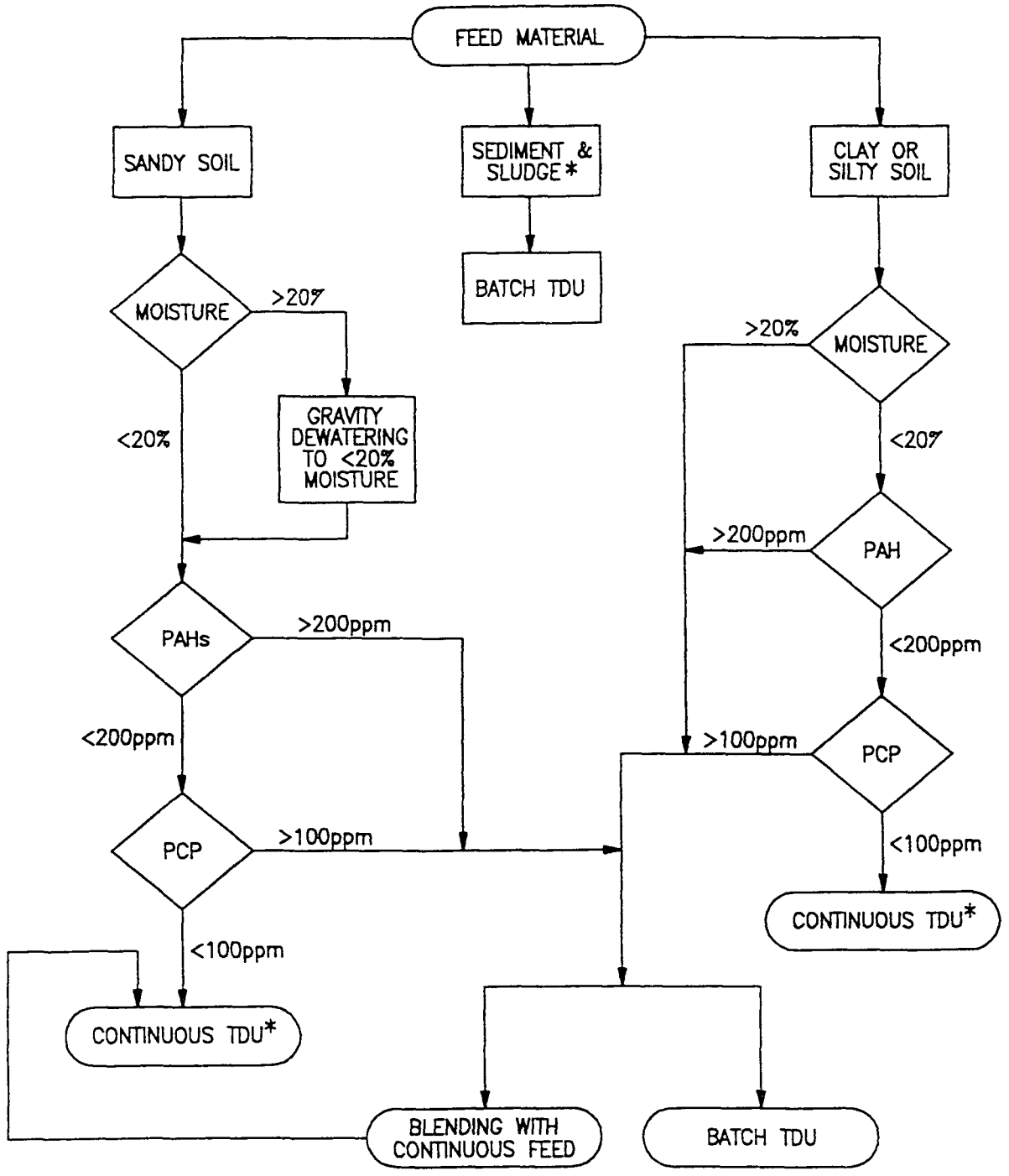
3.3.1 Proof Of Performance

During POP testing, one batch and one continuous TDU will be tested to demonstrate attainment of soil performance, wastewater treatment plant discharge and air emission standards. Three replicate tests will be conducted for each type of TDU. Each test will be performed during a 6 to 12 hour period.

Performance of the batch TDU (BTDU) will be evidenced through the processing of excavated pond sediment located in the containment area. This material is expected to be highly contaminated and should provide a representative model for BTDU applications. Contaminated soil from Pit #1 is considered representative of the majority of material that will be encountered at the site and will be used to evaluate the continuous TDU (CTDU). Material will be sampled in accordance with SOP 30.7 and analyzed for PAHs using USEPA method SW 846 3550M and 8270C and moisture content using ASTM.

Table 3-5 Sampling and Analysis for TDU Proof of Performance Preparation

Sample Description	Data Use	Sampling Strategy	Sample Type	Preparation/ Analytical Method(s)	Estimated Samples
Statistical Method	Provide an indication of the accuracy and precision with which a single grab sample can characterize the feed soils	One small pile (3 x 3 x 3) will be sampled from twelve locations	Grab	% Moisture (on site) ASTM D2216	2
				Grain size (off site)	12
Verify Feed Material	Verify that feed material to be used for POP test is representative of what is expected to be encountered on site during operation	One composite sample will be collected from each source pile BTDU excavated pond sediment CTDU Pit #1	Composite	PAHs (on site) 3550M/ 8270C	2
				% Moisture (on site) ASTM D2216	2
CTDU Ramp Up	Determine optimum feed rate/retention time for POP tests	One pile of feed soil (untreated)	Composite	PAHs (on site) 3550M/ 8270C	1
			Grab	VOCs (off site) 5030AA/8260B	–
		One composite per each feed rate (6)	Composite	PAHs (on site) 3550M/ 8270C	–
	Ambient air quality confirmation	3 downgradient 1 upgradient	Composite	VOCs summa canisters TO 14	–
			Composite	Particulates dust monitor	–
			Grab		2



* NOTE WHENEVER POSSIBLE, SOIL WILL BE TREATED IN THE CONTINUOUS UNITS IN ORDER TO EXPEDITE SOIL PROCESSING

FILE: SOLMD. WOOD\FIG3-9 PLOT 1 27-98

U.S. ARMY ENGINEER DISTRICT BALTIMORE CORPS OF ENGINEERS BALTIMORE, MARYLAND		FIGURE 3-9
ICF KAISER 2113 Emmorton Park Drive Suite 100 Edgewood, Maryland 21040 (410) 612-6350		TDU SELECTION PROCESS
PREPARED BY PMH	TASK NO- 66716	
CHECKED- LH	ICF DWG NO- FIG3-9	SOUTHERN MARYLAND WOOD TREATMENT SITE HOLLYWOOD MARYLAND
DATE 1-27-98		

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Table 3-6
Sampling and Analysis for TDU Proof of Performance Test

Sample Description	Data Use	Sampling Strategy	Sample Type	Preparation/ Analytical Method(s)	Estimated Samples
Untreated Soil	Waste feed characteristics M1 Validation	Each stockpile for the Batch and Continuous TDU units will be sampled from 10 locations and composited into one sample with the exception of VOCs where grab samples will be collected from four locations per POP test	Composite	PAH 3540C/8310	6
				PCP 8151A	6
				SVOCs 3540C/8270C	6
				Dioxins/Furans 8290	6
				Total Chlorides 5050/9056	6
				Metals 6010B/7471A	6
				Moisture % ASTM D 2216	6
				Density ASTM D 1557	6
			Grab	VOCs 5030A/8260B	24
Treated Soil Hot Cyclones and Batch Impinger Sludge	Compliance with soil performance standards M3 Validation	Each stockpile for the Batch and Continuous TDU units will be sampled from 10 locations and composited into one sample with the exception of VOCs where grab samples will be collected from four locations per POP test	Composite *B(a)P Equiv*	PAH 3540C/8310	15
			Composite *B(a)P Equiv*	SVOCs (Carbazole) 3540C/8270C	15
			Composite *Delisting*	PCP 1311/8151A	15
			Grab *Delisting*	VOCs 1311/5030A/8260B	33
			Composite *Delisting*	PAH 1311/3520C/8310	15
			Composite *Delisting*	SVOCs 1311/3520C/8270C	15
			Composite *Mass Balance*	Dioxins/Furans 8290	15
			Composite *HW Char*	Pesticide 1311/3520C/8081A	15
			Composite *HW Char*	Herbicides 1311/8151A	15
			Composite *HW Char*	Metals 1311/3005A/6010B/7470A	15
			Composite *HW Char*	Ignitability	15
			Composite *HW Char*	Corrosivity	15
			Composite *HW Char*	Reactive Cyanide and Sulfide	15

Table 3 6
Sampling and Analysis for TDU Proof of Performance Test (continued)

Sample Description	Data Use	Sampling Strategy	Sample Type	Preparation/ Analytical Method(s)	Estimated Samples
Air Stack Sampling	Compliance with State air regulations M3 Validation	Continuous and Batch TDU stack emission samples	Grab	VOCs 40 CFR 60 Method 30 SW846 8260	6
				Temperature 40CFR60 Method 1/2	6
				Moisture 40CFR60 Method 4	6
				SVOCs 40 CFR 60 Method 23/10 SW846 8270A	6
				HCl 40CFR60 Method 26A/5	6
				Metals 40CFR60 Method 29 SW 846 6010/7471	6
				Flow 40CFR60 Method 1/2	6
				Dioxin/Furan 40CFR60 Method 23 SW 846 8290	6
				Particulates 40CFR60 Method 5	6
				Opacity 40CFR60 Method 9	6
Air Pre thermal Oxidizer	Effectiveness of oxidizer M1 Validation	Interim air sample before oxidizer	Grab	VOCs 40 CFR 60 Method 30 SW846 8260	6
				Temperature 40CFR60 Method 1/2	6
				Moisture 40CFR60 Method 4	6
				SVOCs 40 CFR 60 Method 23/10 SW846 8270A	6
				HCl 40CFR60 Method 26A/5	6
				Dioxin/Furan 40CFR60 Method 23 SW 846 8290	6
Air Perimeter monitoring	Ambient air quality confirmation (6 days) M3 Validation	3 downgradient 1 upgradient	Composite	VOCs summa canisters TO 14	24
			Composite	Particulates dust monitor	24
			Grab		72

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Table 3 6
Sampling and Analysis for TDU Proof of Performance Test (continued)

Sample Description	Data Use	Sampling Strategy	Sample Type	Preparation/ Analytical Method(s)	Estimated Samples
Condensate Water	Evaluate scrubber condensate M1 Validation	One in line Batch and Continuous TDU water sample before entry to TDU condensate tank	Grab	PAH 3520C/8310	6
				SVOCs 3520C/8270C	6
				PCP 8151A	6
				VOCs 5030A/8260B	6
				Dioxins/Furans 8290	6
				TSS 160 2	6
TDU Tank Discharge	Total suspended solids loading M1 Validation	One sample from second vertical condensate tank modular tank (if used) and Tank 112	Grab	TSS 160 2	18
Water Treatment Plant	Effectiveness of WTP during POP M3 Validation	Influent	Grab	All parameters listed in Table 7 4 of QAPP	1
		Effluent	Grab	All parameters listed in Table 7 4 of QAPP	1
		Mid Carbon	Grab	VOCs 5030A/8260B	1
				SVOCs 3520C/8270C	1
				Phenols 420 2	1
				TSS 160 2	1

method D 2216 on site to verify that it is representative of material to be treated in the units In the event that the material is not representative then another source of contaminated soil will be identified based on historical sample results

In order to determine the optimum throughput rate for the CTDU during the POP tests a ramp up test will be conducted prior to the POP tests Treated samples will be collected and analyzed from several different feed rates/retention times Results will be compared with soil performance standards and the optimum rate will be determined Table 3 5 contains the sampling and analysis requirements for POP test preparation

Table 3 6 presents the approximate number and type of samples that will be collected and analyzed during the POP test to form a baseline of the contaminant levels obtain other critical parameters associated with the thermal desorption process and demonstrate attainment of standards

3 3 1 1 Untreated Feed Material

Chemical and physical analyses will be performed on the untreated feed to assess feed characteristics and provide physical data for unit optimization Additionally this information will be used to evaluate handling methods and requirements before and after treatment For the ramp up one stockpile will be created and sampled following the procedure in SOP 30 7 One composite sample from ten locations will be analyzed on site for PAHs using USEPA method SW 846 3550M and 8270C and four grab samples will be sent off site and analyzed for VOCs using USEPA method SW 846 5030A/8260B

For each test run two soil stockpiles will be created one for the batch unit and one for the continuous unit Since there will be three test runs per unit a total of six untreated stockpiles will be sampled The soil will be properly screened to remove particles over 2 inches in diameter or as specified by the equipment operator Larger clumps of soil will be broken up as practical Larger stones that cannot be passed through the thermal desorption system will be disposed off site with other contaminated materials or may be stored in a designated area for later decontamination and back filling on site Untreated feed material will be stockpiled sampled (see SOP 30 7) and analyzed for PAHs PCP SVOCs VOCs dioxin/furans total chlorides metals percent moisture and density Ten locations from each stockpile will be selected so that representative soil types and contaminant concentrations are sampled Soil from the ten locations will be collected and homogenized in a stainless steel bowl using a stainless steel trowel before being placed in the appropriate sampling container with the exception of samples requiring VOC analysis Four VOC samples will be collected directly into sample jars at four locations using a stainless steel spatula

3 3 1 2 Treated Material

During the ramp up one composite sample per each feed rate/retention time will be collected following procedures outlined in SOP 30 7 and analyzed on site for PAHs using USEPA method SW 846 3550M and 8270C This data will be compared with soil performance standards and used to determine the optimum throughput rate for the POP tests The ability of the TDUs to produce material compliant with soil performance standards listed below will be demonstrated during the POP tests

- B(a)P equivalent surface soil < 0 1 ppm subsurface soil < 1 0 ppm
- Delisting criteria carcinogenic PAHs non carcinogenic PAHs SVOCs VOCs and
- Hazardous Waste Characteristics ignitability reactivity corrosivity toxicity

For each test run the conveyor from the continuous system will deposit treated material creating five stockpiles A composite sample will be collected from ten sampling locations two in each stockpile (see SOP 30 7) For the batch system a treated soil sample will be collected for each test run from ten locations in the stockpile (see SOP 30 7)

Care should be taken in handling the soil because temperatures may remain elevated within the stockpile Four VOC samples will be collected from four locations directly into sample jars using a stainless steel spatula The remaining soil (non VOC) will be collected from the ten locations and homogenized in a stainless steel bowl using a stainless steel trowel before being placed in the appropriate sampling container Table 3 6 contains the sampling and analysis requirements for treated soil

3 3 1 3 Hot Cyclone

Particulates from the hot cyclones in the batch and continuous systems will be segregated and stockpiled during the POP tests and sampled separately for soil performance criteria in accordance with SOP 30 7 Each stockpile will be sampled and homogenized for all parameters listed in Table 3 6 with the exception of VOCs Four samples will be collected directly into sample containers for VOC analysis If results during the POP tests demonstrate that hot cyclone solids meet the soil performance standards these materials may then be blended with treated soil and back filled on site

3 3 1 4 Batch Impinger Sludge

Sludge from BTDU#1 will be segregated and stockpiled during POP testing and sampled separately for soil performance criteria in accordance with SOP 30 7 The stockpile will be sampled and homogenized for all parameters listed in Table 3 6 with the exception of VOCs Four samples will be collected directly into sample containers for VOC analysis If results during the POP test demonstrate that impinger sludge meets the soil performance standards these materials may be blended with treated soil and back filled on site

3 3 1 5 BTDU and CTDU Condensate Water

Condensate water generated by the thermal desorption process that is not recycled will be transported to the on site wastewater treatment facility for treatment Condensate that has too much oil

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to treat in the WTP will be sent off site for disposal The liquid product will be temporarily stored in vertical condensate tanks prior to transportation to the on site wastewater treatment facility Approximately 10 000 gallons of condensate water is anticipated from each test For each test run a grab sample will be collected from both the batch and continuous lines to the condensate tank (see SOP 30 8) and analyzed for PAHs PCP VOCs, SVOCs, dioxin/furans and total suspended solids (TSS)

3 3 1 6 Condensate Tank Discharge

Total suspended solid loading on the WTP will be evaluated for each test run through the analysis of discharge from the second vertical condensate tank the modular tank (if used) and the horizontal holding tank (T 112) Approximately eighteen samples will be collected (see SOP 30 8) and analyzed for TSS during the POP tests

3 3 1 7 Wastewater Treatment Plant

In order to evaluate system performance and the ability of the plant to achieve the requirements of the discharge during the proof of performance samples of the influent effluent and mid carbon will be collected in accordance with SOP 30 9 Grab samples will be collected during the first day that condensate from POP testing is received at the plant These grab samples will be analyzed for the compounds listed in Table 3 6

3 3 1 8 Air Process Monitoring

Stack emission tests will be conducted during the POP test to verify that TDU emissions do not exceed established federal and state action levels off site Air samples will also be collected before the thermal oxidizers to monitor the effectiveness of the oxidizer Three replicate stack tests will be conducted for each TDU type batch and continuous The stack sampling data collected during the POP tests will be compared to the allowable stack emissions determined by the air dispersion modeling and other applicable regulations Appendix D of the *Low Temperature Thermal Desorption Units Proof of Performance / Summary of Full Scale Operations* provides an explanation of the model including inputs and resultant stack emission limits Table 3 6 contains the sampling and analysis requirements for air samples During the ramp up period and throughout the remainder of the POP test air flow will also be monitored with a flame ionizing detector before and after the thermal oxidizer in the CTDU Air sampling protocol is presented SOP 30 10 located in Appendix B

3 3 1 9 Air Perimeter Monitoring

VOCs and particulates will be monitored following procedures outlined in Section 3 1 and SOPs 30 5 and 30 6 for an 8 hour period (approximately 8 a m to 4 p m) during each of six days of proof of performance testing

3 3 2 TDU Operational Sampling

3 3 2 1 Untreated Feed Material

Untreated feed material will be collected following SOP 30 7 and analyzed on a monthly basis to continuously assess feed characteristics and optimize TDU system performance Daily sampling and on site analysis of percent moisture will occur Chemical and physical analyses will be performed as specified in Table 3 7

3 3 2 2 Treated Soil

Provide explanation for changing sampling frequency and parameters

Sampling and analysis of treated material will be conducted to verify the continuous attainment of soil performance criteria Based on the anticipated soil throughput rate of the four TDUs (approximately 350 tons per day) and assuming a loose density of 1 4 tons per cubic yard approximately 245 CY of soil will be treated each day One composite sample will be collected every bin not to exceed 700 tons SOP 30 7 and analyzed Table 3 7 presents the sampling and analysis requirements for the treated feed soil On November 23rd 1998, under the authorization of the government this frequency was modified for soil originating from Pits #1 #2 and #3 so that each bin is sampled for PAH and carbazole (B(a)P equivalence) only and one out of ten bins is sampled for analyses listed in Table 3 7

3 3 2 3 Hot Cyclone

Once hot cyclone solids have been demonstrated to be uncontaminated these materials will be stockpiled together and sampled following SOP 30 7 and analyzed on a monthly basis for the soil performance criteria listed in Table 3 7 If continuous conformance to soil performance criteria is demonstrated these solids will be blended with treated soil and used as site backfill

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Table 3 7
Sampling and Analysis for TDU Continuous Monitoring

Sample Description	Data Use	Sampling Strategy	Sample Type	Analytical Method(s)	Estimated Samples
Untreated stockpile	Continuous characterization No Validation	One sample per month	Grab	VOCs 5030A/8260B	20
			Composite	SVOCs 3540B/8270C	20
				% Moisture ASTM D2216	20
				Density ASTM D1557	20
Treated Soil Stockpile	Site backfill and disposal decisions M3 Validation	One sample every bin NTE 700 tons for these only One sample every ten bins for all parameters	Composite	PAH 3540C/8310	300
				SVOCs (Carbazole) 3540C 8270C	300
				TCLP PAH 1311/3520C/8310	300
				TCLP SVOCs/PCP 1311/3520C/8270C	300
				TCLP Metals 1311/3005A/6010B/7470A	300
				Total Cyanide and Sulfide	300
Hot Cyclones	Blend decision for treated soil M3 Validation	One sample each month from combined continuous cyclones	Composite	PAH 3540C/8310	15
				SVOCs (Carbazole) 3540C/8270C	15
				TCLP PAH 1311/3520C/8310	15
				TCLP SVOCs/PCP 1311/3520C/8270C	15
				TCLP Metals 1311/3005A/6010B/7470A	15
				Total Cyanide and Sulfide	15
Perimeter Air Monitoring	Ambient air quality confirmation M3 Validation	3 downgradient 1 upgradient	Composite 8 hour	VOCs TO 14 summa canisters	100
			8 hour shift average	Part c l te Dust monitor	1800
			grab		5400

just do + tals?

should be able to eliminate

3 4 WASTEWATER TREATMENT

The wastewater treatment system at the SMWT site will comprise two systems the existing surface water treatment system and the new wastewater treatment system The existing system will function as the treatment system facility for the stormwater pond located within the Containment Area The new WTP will provide treatment of the water from the Containment Area the condensate from the thermal desorption system and the stormwater pond effluent as necessary

Water treatment samples will be collected following procedures outlined in SOP 30 9 Both on site and off site laboratory analyses will be performed to address WTP data quality objectives Analyses requiring quick turnaround time will generally be performed on site and include pH temperature dissolved oxygen total suspended solids hexavalent chromium and dissolved iron

3 4 1 Existing Water Treatment Plant (WTP 1)

The existing treatment system consists of the following unit processes

- Oil/water separation with a tank settling basin and oil absorbing pads
- Iron and manganese precipitation through caustic pH adjustment
- Potassium permanganate oxidation and flocculation through polymer addition
- Clarification pressure sand filtration
- Carbon adsorption and
- Acid pH adjustment to discharge standards

The system will treat collected runoff to meet MDE discharge standards (refer to QAPP Section 7 0) Sludge generated during the treatment process will be partially dewatered by filtration through a fabric media with filter backwash returning to the on site pond for subsequent treatment

3 4 2 New Water Treatment Plant (WTP 2)

The new WTP will be designed to meet MDE discharge standards Table 3 8 presents an overview of the new wastewater treatment process (A more detailed discussion of wastewater specifications are contained in the Wastewater Treatment Plant Design Plan) The new WTP is designed to operate as a continuous process comprised of the following sub-elements

- Non aqueous phase liquid (NAPL) separation from the extracted wastewater and on site NAPL storage until removal for disposal
- Chemical oxidation and removal of high metals concentration and the reduction of suspended solids
- Sludge dewatering for potential treatment through the on site thermal desorption unit
- Removal of organic compounds using an ultra violet (UV) oxidation process
- Carbon adsorption for final polishing of organics in the groundwater and
- Aeration for dissolved oxygen transfer prior to discharge to the west tributary

Following treatment plant construction system start up and prove out will be in accordance with the following specifications

- A hydraulic test will be performed using treated water from WTP 1 This is a static pressure test followed by operation at design pressures to check for leaks and equipment operability
- After baker tanks (T 111 and T 112) are emptied during hydraulic test and they are re filled with pond water acceptance test will begin
- Acceptance test requires operation for 24 hr/day for 7 days Test will be at design (70 gpm) or available flows Daily flow at design flow rate is 100 800 gal/day Volume of pond is approximately 135 000 gal (3 feet deep 300 feet long 20 feet wide) and volume of the two baker tanks is 40 000 gal Based on this information the entire volume in the pond and baker tanks will be treated in less than 2 days at design flow
- On day one of acceptance test samples will be collected within the first 5 hours of operation to catch the maximum concentration of contaminants from the baker tanks before those tanks start filling up with cleaner water
- Treated water from WTP 2 will be discharged back to the pond because sample results will not be back for one week
- After day two of test contaminated water from nearby french drain system will be added Also nearby polyethylene tanks contain approximately 5 000 gal of pond water collected in Fall 1997 and will be added to the pond Based on Table 6 of the ROD and 1997 monthly sample results from WTP 1 contamination levels from the french drain is expected to be typically twice as high as levels in the pond Flow from these sources is not expected to

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exceed 1/10th the flow of clean water back to the pond Therefore the pond is not expected to contain contaminant levels any higher than normal during the test

- If there is rainfall during the test WTP 1 will be run to keep the pond level from getting too high

Table 3 9 presents the analytical requirements and sample collection frequency for the seven day acceptance program Figure 3 10 illustrates the locations of treatment plant sampling ports Upon successful completion of the Acceptance Test operation and maintenance activities will require the collection and analysis of process samples to evaluate system performance and the ability of the plant to achieve substantive requirements of the discharge permit If WTP 1 is not run during a given month collection of samples from WTP 1 will not be required for that month Minimum sampling and analysis requirements associated with the estimated 20 month operation are presented in Table 3 10

3 5 GROUNDWATER SAMPLING

Groundwater sampling procedures are described in SOP 30 2 Purge water will disposed of at the water treatment plant Decontamination water will be disposed of at the containment structure at the decontamination facility (and ultimately to the groundwater treatment plant) or directly to the water treatment plant Table 3 11 contains the sampling and analysis requirements for groundwater Well locations are shown in Figure 3 11

3 5 1 Quarterly Groundwater Monitoring

The objective of quarterly monitoring the groundwater is to determine if there is any migration from the contaminated aquifer to the deeper uncontaminated aquifer (to verify that the confining clay layer between the upper and lower aquifer has not been compromised) and to monitor the nature and magnitude of contamination downgradient of the site Five wells will be sampled quarterly for VOC and SVOC analyses These five wells were sampled during previous investigations (Weston 1995) The wells to be sampled are outside the containment wall which is believed to be limiting the horizontal migration of the contaminants Four of these wells (MW 19 MW 20 MW 21 and MW 22) sample the lower aquifer below the clay layer They are sampled to ensure that no contamination has penetrated the clay layer MW 27 is a downgradient well that has been found to contain contamination in the past and is sampled to ensure that contamination has not migrated outside the sheet pile containment wall

3 5 2 Pre Construction Groundwater Sampling

Groundwater sampling will be conducted prior to commencement of excavation activities at the site Groundwater samples will be collected from all site wells that will not be abandoned during excavation and construction Groundwater samples will also be collected from a representative number of wells to be abandoned during excavation and construction activities This sampling event will help evaluate groundwater throughout the site Groundwater contamination outside of the containment area is expected to be very low Conversely inside the containment area groundwater contamination is expected to exceed the cleanup criteria Both light non aqueous phase liquid (LNAPL) and dense non aqueous phase liquid (DNAPL) have been found in monitoring wells within the containment areas

A total of 26 wells will be sampled prior to excavation activities for SVOC and VOC analyses Five wells (MW 19 MW 20 MW 21 MW 22 MW 27) will be sampled during the regularly scheduled quarterly sampling event Three (MW 9 MW 11 MW 16) of the ten wells located within the containment area and scheduled to be abandoned during the excavation activities will be sampled Five other wells within construction or excavation areas but outside the containment area (MW 2 MW 3 MW 22 MW 23 MW 24 ERT 2) will also be sampled An attempt will be made to protect these five wells during site activities so that they may continue to be used after remediation activities However if the integrity of well cannot be maintained it is possible that some or all of these wells will need to be abandoned The remaining 18 wells (MW 1 MW 5 MW 6 MW 7 MW 10 MW 13 MW 14 MW 15 MW 17 MW 18 MW 19 MW 20 MW 21 MW 25 MW 26 MW 27 ERT 1) will not be affected by site remediation activities

Table 3 8
Wastewater Treatment Plant Process Overview

Process Operation	Purpose	Influent	Mechanism	Effluent
Equalization Tank	Retention tank to allow for stratification of the NAPL and efficient separation in the oil/water separator	Containment area extracted groundwater TDU condensate stormwater	Physical separation	Pumped to oil/water separator
Oil/Water Separator	Removes LNAPL and DNAPL in extracted groundwater	Equalization tank	LNAPLs flow by gravity to free product storage tank DNAPLs pumped to free product storage tank using air powered diaphragm pump	Gravity feed to mix reactor tank
Mix Reactor Tank	Process waste storage and vessel for the initial metal oxidation reactions	Oil/water separator decant tank and sand filter recycle water sump water stormwater pond	KMnO4 oxidation pH 7 5 maintained using NaOH	Pumped to inclined plate separator
Inclined Plate Separator	Precipitate flocculation and removal	Mix/reactor tank	Polymers mechanically mixed with process flow to flocculate metals Metal separation in plate separator Metal hydroxide sludge pumped to sludge holding tank	Gravity feed to continuous backwash sand filter
Sand Filter	Remove remaining precipitated metal and suspended solids	Inclined plate separator	Sand polishing	Discharged to advanced oxidation process
UV/Oxidation Process	Remove phenolic and volatile organic compounds	Sand filter	Oxidative reaction	Discharged to liquid phase carbon process
Liquid Phase Carbon	Clarify water	UV/Oxidation effluent	Carbon adsorption	Discharge from plant
Filter Press	Dewater sludge from holding tank prior to on site treatment	Sludge holding tank	Recessed chamber filter press	
Decant Tank	Storage of filter press effluent water and holding tank sludge as necessary	Filter press effluent		Pumped to the mix reactor tank
Aeration	Increase DO concentration above 5 0 mg/L	Treatment plant effluent	Discharge to seven step cascade	Surface stream

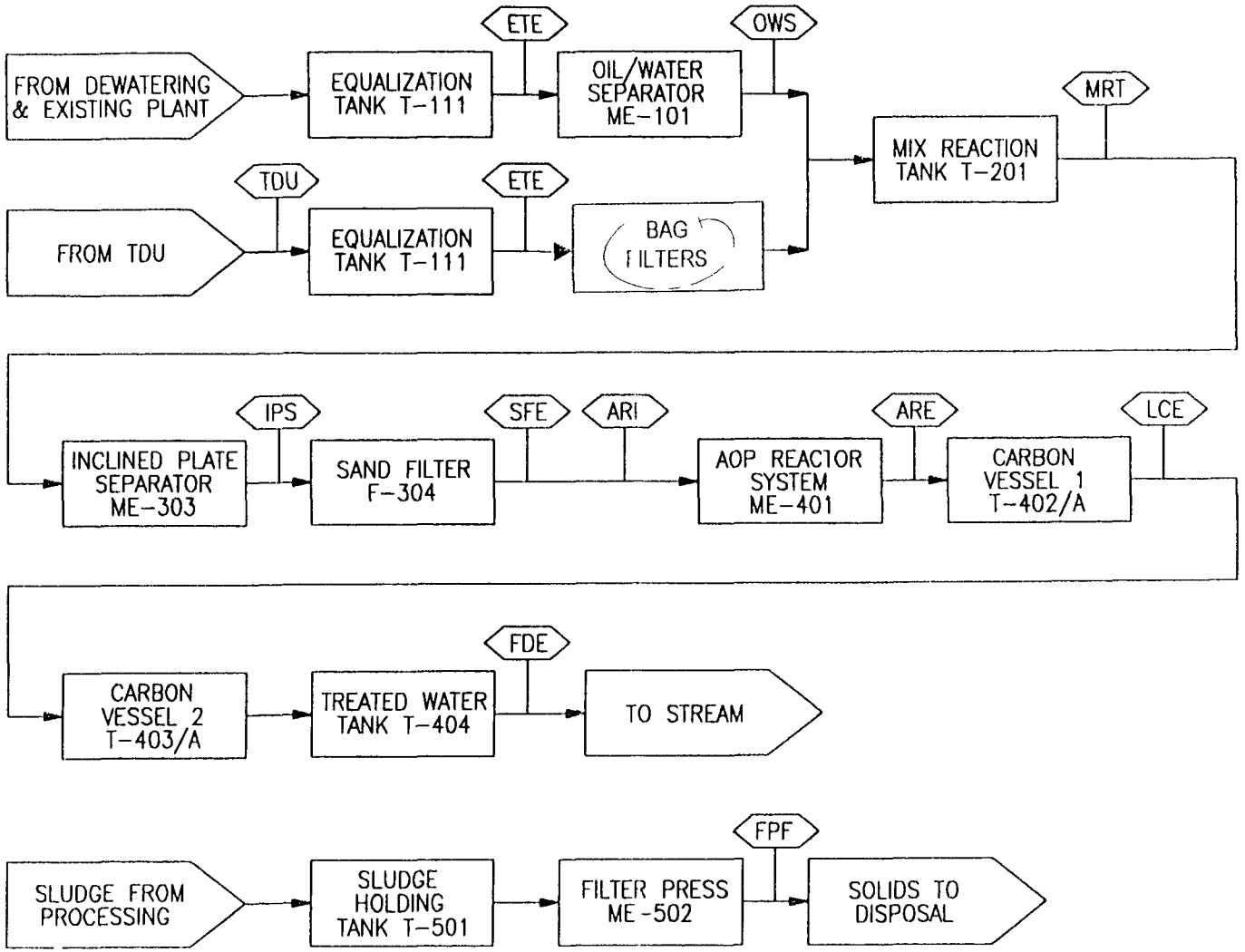

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FIGURE 3-10

WATER TREATMENT PLANT SAMPLING PORTS

SOUTHERN MARYLAND WOOD TREATMENT SITE
HOLLYWOOD MARYLAND

FIL SOLMD WOOD\FIG3-10A PLOT 1-5 -98

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Table 3 9
SMWT Water Treatment Plant Acceptance Test Sampling Program
(1 sample /24 hours/7 days)

Parameter	Validation Level	Method	Sampling Locations: Equilization Tank (T111 or T112) Effluent	Oil/water Separator Effluent	Mix Reaction Tank Effluent	Inclined Plate Separator Effluent	Sand Filter Effluent	AOP Reactor Influent	AOP Reactor Effluent	1st Carbon Effluent	Final Discharge at Treatment Water Tank (T404) Effluent	Filter Press Solids	Daily	Seven Day
			ETE	OWS	MRT	IPS	SFE	ARI	ARE	LCE	FDE	FPF		
Liquid Process														
VOCs	M3	5030A/8260B	1							1	1		3	21
SVOCs	M3	3520C/8270C	1							1	1		3	21
Phenolics	IM1	420 2	1					1	1	1	1		5	35
PAH	M3	3520C/8310	1								1		2	14
TPH	IM1	8015M	1	1							1		3	21
Metals	M3	3005A/6010B/7470A	1								1		2	14
Arsenic 3	IM1	BR0021	1								1		2	14
Cyanide	M3	9010B	1								1		2	14
TKN	IM1	351 2	1								1		2	14
Fluoride	IM1	340 2	1								1		2	14
Phosphorus	IM1	365 2	1								1		2	14
Ammonia	IM1	350 3	1								1		2	14
Turbidity (on site)	IM1	180 1	1								1		2	14
BOD_5 (on site)	IM1	405 1	1								1		2	14
Iron (on site)	IM1	8008	1			1	1				1		4	28
TSS (on site)	IM1	160 2	1			1	1				1		4	28
Chromium VI (n site)	IM1	8023	1								1		2	14
pH (on site)	IM1	9040B	1		1			1	1		1		5	35
Temperature (on site)	IM1	170 1									1		1	7
DO (on site)	IM1	DO4500 OG	1		1			1			1		4	28
Residuals														
TCLP												1		1
/ solids												1		1
Daily Total			19	1	2	2	2	3	2	3	20	0		
Seven Day Tot l			133	7	14	14	14	21	14	21	140	2		
												TOTAL	54	380

Dat a is used to evaluate system performance and the ability of the plant(s) to achieve substantive discharge requirements

Table 3-10
SMWT Water Treatment Plant Sampling Program
Operation and Maintenance

Parameter	Validation Level	Method	Equilization Tank (T111) Effluent ETE1	Equilization Tank (T112) Effluent ETE2	Oil/water Separator Effluent OWS	Mix Reaction Tank Effluent MRT	Inclined Plate Separator Effluent IPS	Sand Filter Effluent SFE	AOP Reactor Influent ARI	AOP Reactor Effluent ARE	1st Carbon Effluent LCE	Final Discharge (T404) Effluent FDE	Existing Plant 1st Carbon Effluent EPC	Existing Plant Effluent EPE	Daily Total	Monthly Total
VOCs	M3	5030B/8260B	1/m	1/m							1/m	1/m	1/m	1/m		6
SVOCs	M3	3510C/8270C	1/m	1/m					1/m	1/m	1/m	1/m	1/m	1/m		8
PAH	M3	3510C/8310										1/m		1/m		2
TPH GRO	IM1	8015M	1/m	1/m	1/m							1/m		1/m		5
TPH DRO	IM1	8015M	1/m	1/m	1/m							1/m		1/m		5
Metals	M3	3010A/6010A/7470	1/m	1/m								1/m		1/m		4
Arsenic 3+	IM1	BR0021	1/m	1/m								1/m		1/m		4
Cyanide	M3	9012A	1/m	1/m								1/m		1/m		4
TKN	IM1	351 3										1/m		1/m		4
Fluoride	IM1	340 2										1/m		1/m		2
Phosphorus	IM1	365 2										1/m		1/m		2
Ammonia	IM1	350 3										1/m		1/m		2
Turbidity (on site)	IM1	180 1										1/m		1/m		2
BOD_5 (on site)	IM1	405 1										1/m		1/m		2
Iron (on site)	IM1	8008				1/d	1/d	1/d							3	
TSS (on site)	IM1	160 2	1/m	1/d		1/d	1/d	1/d				1/m		1/m	4	3
Chromium VI (on site)	IM1	8023										1/m		1/m		2
pH (on site)	IM1	9040B	1/m	1/m								1/m		1/m		4
Temperature (on site)	IM1	170 1	1/m	1/m								1/m		1/m		4
DO (on site)	IM1	DO4500 OG	1/m	1/m								1/m		1/m		4
Monthly Totals			12	11	2				1	1	2	19	2	19		
Daily Totals				1		2	2	2								
													TOTAL		6	69

3 5 3 Proposed Post-Construction Groundwater Sampling

The government will evaluate post construction groundwater monitoring to determine final post construction groundwater monitoring requirements Following remediation groundwater in the shallow aquifer will be monitored to assure that the soil remediation has sufficiently reduced contaminants in the groundwater This will ensure protection of human health and the environment and to allow the shallow groundwater to be used as a potential drinking water supply In addition the deep wells on site will continue to be monitored to verify that contaminants are not migrating through the clay

As a preliminary step in the post construction monitoring process a series of up to 30 direct push probes will be performed in order to determine the most suitable locations for new monitoring wells The probes will be used to collect soil and groundwater samples from various locations around the site At each location both soil and groundwater samples will be collected at several depths to the top of the clay layer This will help determine the impact of the soil remediation at the site

Based on the results of the soil and groundwater sampling the groundwater monitoring network will be reevaluated Upon government review and concurrence new monitoring wells can be installed to close gaps in the network if necessary The new monitoring wells will be installed in accordance with Maryland requirements for well construction and personnel qualifications (COMAR 26 04 04 and 26 05 01 respectively)

After installation of the new wells groundwater samples will be collected from all site monitoring wells The groundwater results will be evaluated and statistically analyzed to determine if Resource Conservation and Recovery Act (RCRA) clean closure requirements have been achieved and to verify that contaminant concentrations do not exceed Safe Drinking Water Act Maximum Concentration Levels (MCLs) (40CFR 141 11 12 and 141 61 62) non zero MCL goals (40 CFR 141 50 51) or if necessary other risk based chemical specific guidelines that are available at that time Groundwater monitoring will be conducted until USEPA in consultation with MDE determines that MCLs or other risk based chemical specific Applicable or Relevant and Appropriate Requirements (ARARs) have been achieved

Table 3 11
Groundwater Monitoring Sampling Locations and Rationale

Sample Event	Sample Location	Analytical Methods	Sample Rationale
Quarterly Monitoring	MW 19 MW 20 MW 21 MW 22 MW 27	VOCs 524 2 SVOCs 3520/525 2	To ensure that contamination has not migrated through the clay layer or migrated outside the sheet pile containment wall M3 Validation
Pre Construction	26 Wells (all existing wells except MW 08 MW 04 MW 30 MW 29 MW 28 MW 31 MW 12)	VOCs 5030B/8260B SVOCs 3510C/8270C	To evaluate groundwater throughout the site M3 Validation
Post Construction (direct push investigation)	TBD 60 soil samples TBD 30 water samples	VOCs 5030B/8260B SVOCs 3510C/8270C VOCs 5030A/8260B SVOCs 3520C/8270C	To determine the most suitable locations for new monitoring wells M3 Validation
Proposed Post Construction (groundwater monitoring)	23+ wells (all wells determined to be appropriate will be evaluated at end of remediation)	VOCs 5030B/8260B SVOCs 3510C/8270C	To ensure that the soil remediation has sufficiently reduced contaminants in the groundwater to ensure protection of human health and the environment and to allow the shallow aquifer to be used as a potential drinking water supply M3 Validation

4 0 DECONTAMINATION REQUIREMENTS

Equipment materials and personnel coming in contact with site contaminants may be contaminated prior to exiting to the Exclusion Zone Sampling equipment used within the Exclusion Zone will be decontaminated prior to collection of each sample to prevent cross contamination of samples A summary of samples associated with decontamination is presented in Table 4 1 Decontamination procedures and sampling rationale are discussed further in the following sections

Table 4 1
Summary of Decontamination Samples

SAMPLING SCOPE	RATIONALE	CHEMICAL ANALYSES
1 source water sample	Collected at the beginning of the project for QA/QC reasons	All chemicals of concern for the project VOCs SVOCs PAHs PCPs Dioxins/Furans
The following samples are contingent on the visual observation of gross contamination		
1 solid/sludge sample from collection structure	Waste characterization required for disposal off site as a hazardous material	Analyze for waste characterization TCLP reactivity ignitability and corrosivity
1 liquid sample from collection structure	Waste characterization required for disposal off site as a hazardous material	Analyze for waste characterization TCLP reactivity ignitability and corrosivity

4 1 REFURBISHING THE DECONTAMINATION FACILITY

The existing decontamination facility will be repaired and used for decontamination activities at the site Repairs that may be necessary to return the facility to operating condition include clearing grass weeds and shrubs from the area importing gravel for surfacing and repairing or replacing existing equipment New equipment and materials used to refurbish the existing facility should be similar to and compatible with existing equipment and materials An aboveground storage tank of sufficient volume to store water for use in the decontamination facility will be installed at the facility A submersible pump will be installed in the collection structure Equipment and materials associated with the use of the decontamination facility such as scrub brushes and high pressure low volume pressure washers also must be provided and restocked as necessary The decontamination facility will be completed prior to the start of work

4 2 SOURCE WATER

The water used for decontamination of large equipment and gross wash and rinse of sampling equipment may be treated water from the groundwater treatment plant It will be stored at the facility in an aboveground storage tank in quantities sufficient for daily operations This water will be sampled at the commencement of decontamination activities for all chemicals of concern for the project including VOCs SVOCs PAHs PCPs and Dioxins/Furans If water from a different source is used at any time during the project a sample of the new water will be sent for analysis The source water sample is collected for QA/QC reasons to ensure that the decontamination procedure is not re introducing contamination to the equipment

De ionized ultra filtered (DIUF) water must be used in the final rinse of sampling equipment (SOP 60 1) DIUF water will be purchased from a field supplier

4 3 HEAVY EQUIPMENT AND VEHICLES

Equipment and vehicles leaving the Exclusion Zone will pass through the decontamination facility for the removal of soil or other materials that may be contaminated The equipment and material will be washed down on the designated wash pad at the existing facility using high pressure low volume

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pressure washers Decontamination of large pieces will take place on metal sawhorses to prevent contact with the decontamination pad Materials washed off of the equipment and vehicles will be collected in the existing solid and liquid collection structure for temporary storage

All earth moving equipment in the Exclusion Zone will be classified as contaminated or uncontaminated and will handle only materials with the same classification Potentially contaminated materials will be treated as contaminated until determination is obtained Hauling routes within the Exclusion Zone classified as contaminated and uncontaminated will be observed by vehicles at all times during the project

4 4 SAMPLING EQUIPMENT

Sampling equipment will be decontaminated prior to use to prevent cross contamination between sampling locations and to obtain accurate analytical results This decontamination may take place at the site of sampling using a mobile decontamination station consisting of polyethylene tubs All equipment brushes and polyethylene tubs needed for decontamination procedures will be underlain by polyethylene sheeting All water used during the decontamination process will be transferred to the decontamination pad Sampling equipment that will be decontaminated includes but may not be limited to the following submersible pumps and hoses water level indicators bailers various groundwater measurement probes hand augers and extensions and bowls and trowels Decontamination is a wash and double rinse procedure but the specific decontamination procedures depend on the composition of the sampling device

4 5 PERSONNEL

Decontamination of personnel may include wash down of outer clothing and boots with a high pressure water source or disposal of throw away type coveralls gloves and boot covers Disposable materials will be stored at the decontamination facility in plastic bags in sealed drums awaiting off site disposal Drums will be clearly dated and labeled as containing Personal Protective Equipment (PPE)

4 6 DISPOSAL OF DECONTAMINATION WASTE

The decontamination pad will be washed down at the completion of each day of work Decontamination activities will be conducted such that all water used and all soil removed falls onto the pad and is captured by the trench drain Soil clumps captured by the trench drain will be removed daily and transported as contaminated material to the thermal desorption unit for treatment

The liquid waste collected in the existing collection structure will be pumped out regularly and inspected for gross contamination The collection structure will be inspected daily to monitor solid and liquid content and ensure pump operation At the beginning of each work day the decontamination technician will gage the depth of solids in the collection structure If the depth of solids in the structure reaches 1 5 feet the solids will be removed in a manner so as to minimize the moisture content of the solids removed The solid waste will be inspected for gross contamination If gross contamination is present in either the solid or liquid waste the material will be containerized in DOT approved drums sampled for waste characteristics (Table 4 1) and stored for disposal off site as hazardous material (Section 5 0) If gross contamination is not present the solid materials will be transported to the on site thermal desorption unit for treatment and the liquid waste will be transported to the on site groundwater treatment facility for treatment Other solid waste such as disposable coveralls or worn out brushes which cannot be treated by thermal desorption should be disposed of off site as appropriate (Section 5 0)

5 0 INVESTIGATION DERIVED WASTE

Any waste materials produced as a result of investigation or remediation activities are defined here as investigation derived waste (IDW) Excavated soil and sediment to be treated in the TDU and groundwater and surface water to be treated in the WTP are not discussed here as IDW because they have an inherent role in the remediation scheme as discussed in detail in Section 3 0

This section discusses IDW and in terms of on site treatment or off site disposal The discussion of treatment and disposal scenarios include the source and receptacle of the waste and appropriate storage and transport for the waste

Samples collected from grossly contaminated soil or water will be disposed off site as a hazardous material The samples will be analyzed for waste characteristics and may include Toxicity Characteristic Leachate Procedure (TCLP) reactivity corrosivity and ignitability

5 1 ON-SITE DISPOSAL

The waste disposal objective is to minimize off site disposal by utilizing the on site treatment options All IDW will be treated as contaminated material with exceptions noted (Table 5 1)

5 1 1 Waste Source and Receptacle

IDW soil and water that can be treated in the TDU and WTP respectively will join the treatable waste stream as described in Section 3 0 of this FSP Solid IDW that is treatable in the TDU includes sludge from the decontamination pad and soil collected from sample borings during excavation and verification Liquid IDW that is treatable in the WTP includes water from the decontamination pad monitoring well purge water and water condensate collected from the TDU If gross contamination is visible the sample will be disposed off site (Section 5 2)

Vegetation collected during clearing and grubbing operations will be chipped and shredded It will be considered non contaminated material and used as backfill material It will be temporarily staged in the confirmed clean storage area

5 1 2 Waste Transport and Storage

All IDW to be disposed on site will remain on site in designated stockpiles Contaminated materials will be transported in specified vehicles and will be transported only on haul roads specified as contaminated Non contaminated materials will be transported in specified vehicles and will be transported using clean haul roads

5 2 OFF-SITE DISPOSAL

Materials to be disposed off site fit one of the following categories (1) hazardous materials not treatable on site (2) hazardous and non hazardous materials that cannot be backfilled and (3) demolition debris All materials to be disposed off site will be handled and stored according to their waste characteristics (Table 5 2)

5 2 1 Waste Source and Receptacle

Grossly contaminated materials not treatable on site include free product obtained from the pond or groundwater during dewatering and grossly contaminated soil where the concentration of contamination exceeds the levels treatable by the TDU Some solid material cannot be backfilled and therefore must be disposed off site Hazardous material that cannot be backfilled includes decontamination rags brushes and used PPE Non hazardous material that cannot be backfilled includes non contaminated materials from the support area and vegetation from clearing and grubbing that is too large to be chipped or shredded

Friable asbestos was not found at the site during the December 1991 asbestos survey provided as part of the Dames and Moore design report Chrysotile bulk asbestos was identified in the floor tile and the MDE Asbestos Division agreed that it could remain with the building and be placed directly into the roll off container

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The MDE registered lead testing service determined that interior and exterior door and windows frames tested positive for lead contamination Lead contaminated door and window forms will be disposed off site

Table 5 1
On-Site Treatment Objectives for IDW

Treatment Option	Source of Waste Material	Comments	Sample Collection
TDU	Sludge from decontamination pad	Removed from the decontamination pad regularly as needed	Stockpile and sample as part of feed characterization
	Dewatered sludge from WTP	Collected in sludge hopper at WTP Treatment/disposal options (including TDU) are still being developed	Stockpile and sample
	Soil cuttings from sample borings	Classification determined from respective soil sample results	No sampling required
WTP	Decontaminatio n water	Removed from the decontamination pad regularly as needed	Sample as part of influent characterization
	Purge water from monitoring wells	Collected during groundwater sampling Classification determined from respective groundwater sample results	No sampling required
	Condensate from TDU	Collected from TDU	Sample for TSS as part of influent characterization

Table 5 2
Off-Site Disposal Objectives for IDW

Disposal Destination	Source of Waste Material	Comments	Sample Collection
Hazardous	Decontamination rags and brushes	Decontamination equipment disposed and replaced as needed	None
	Free product from dewatering	NAPL or DNAPL from groundwater or surface water	
	Grossly contaminated soils or sludge		Full suite TCLP
Non Hazardous	Personal Protective Equipment (PPE)	Bagged and stored at decontamination facility	None
	Non-contaminated materials from support area	Incidental waste including but not limited to office waste food packaging and related wastes concrete formwork material and equipment packaging crates and pallets miscellaneous steel scrap containers and wasted concrete Dispose as Solid Municipal Waste (SMW) or as appropriate to material	None
	Vegetation from clearing and grubbing large	Vegetation too large to be chipped and shredded will be disposed off site as yard waste	None
Hazardous	Window and door frames	Lead contamination	None
Non Hazardous	Demolition debris	Non hazardous determined from lead sample collected from pulverized and homogenized debris	None

5 2 2 Waste Storage and Transport

All wastes scheduled for off site disposal will be temporarily stored on site analyzed when required and treatment standards determined in preparation for shipment in accordance with Resource Conservation Recovery Act (RCRA) Land Disposal Regulations (40 CFR Parts 268 7 268 9 and 268 50) Manifests will be prepared for transportation and disposal Southern Maryland will be listed on the manifest as the generator and an appointed representative will sign the manifests for off site disposal

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Delivery Order No 0016
Total Environmental
Restoration Contract
DACA31-95-D-0083

SOUTHERN MARYLAND WOOD TREATING SITE
HOLLYWOOD, MARYLAND

Quality Assurance Project Plan

FINAL DOCUMENT

JUNE 1998

TABLE OF CONTENTS

Section	*Page*
1 0 INTRODUCTION	**1 1**
1 1 PLAN DESCRIPTION	1 1
1 2 PROJECT SCOPE	1 1
2 0 PROJECT ORGANIZATION AND RESPONSIBILITIES	**2 1**
2 1 RESPONSIBILITIES	2 1
2 2 QUALIFICATIONS OF CHEMICAL QUALITY MANAGEMENT PERSONNEL	2 3
2 3 LINES OF AUTHORITY	2 3
2 4 SUBCONTRACTORS AND KEY POINTS OF CONTACT	2 3
3 0 DATA QUALITY OBJECTIVES	**3 1**
3 1 SAMPLE AND CRITERIA SPECIFICATIONS	3 1
3 1 1 Perimeter Air Monitoring	3 1
3 1 2 Excavations	3 1
3 1 3 Thermal Desorption	3 13
3 1 4 Water Treatment	3 14
1 5 Groundwater Monitoring	14
3 2 DQO COMPONENTS	3 14
3 3 CHEMICAL DATA MEASUREMENT	3 15
3 3 1 Accuracy	3 15
3 3 2 Precision	3 15
3 3 3 Representativeness	3 16
3 3 4 Completeness	3 16
3 3 5 Comparability	3 16
3 3 6 Sensitivity	3 16
4 0 SAMPLE MANAGEMENT	**4 1**
4 1 SAMPLE NUMBER AND TYPE	4 1
4 2 SAMPLE CONTAINERS	4 1
4 3 SAMPLE PRESERVATIVES	4 1
4 4 HOLDING TIMES	4 1
4 5 SAMPLE IDENTIFICATION	4 1
4 6 DOCUMENTATION REQUIREMENTS	4-6
4 7 PACKAGING AND CHAIN OF CUSTODY REQUIREMENTS	4 7
4 7 1 Chain-of Custody	4 7
4 7 2 Sample Packaging and Shipment	4 8
4 7 3 Sample Receipt	4 8
5 0 ANALYTICAL PROCEDURES	**5 1**
5 1 LABORATORY PROCEDURES FOR SOIL AND WATER	5 1
5 1 1 Volatile Organic Compounds (VOCs)	5 1
5 1 2 Semivolatile Organic Compounds (SVOCs)	5 1
5 1 3 Polynuclear Aromatic Hydrocarbons (PAHs)	5 1
5 1 4 Herbicides and Pentachlorophenol (PCP)	5 1
5 1 5 Dioxin/Furan	5 1
1 6 Inorganics	5-4
5 1 7 Toxicity Characteristic Leaching Procedure (TCLP) Reactivity Corrosivity and Ignitability	5-4
5 1 8 Percent Moisture	5 5
5 1 9 Density	5 5
5 2 STACK SAMPLING AIR METHODS	5 5

ORIGINAL Red

5.2.1 Volatile Organic Compounds 5-5
5.2.2 Dibenzo p-Dioxins and Polychlorinated Dibenzofurans
5.2.3 Hydrogen Chloride 5-5
5.2.4 Metals 5-6
5.2.5 SVOCs 5-6
5.2.6 Flow 5-6
5.2.7 Moisture Content 5-6
5.2.8 Opacity 5-6
5.2.9 Particulates 5-6
5.3 PERIMETER AIR MONITORING 5-6
5.4 LABORATORY CALIBRATION 5-6
5.5 METHOD DETECTION LIMITS 5-7
5.6 FIELD TESTING SCREENING AND CALIBRATION 5-7

6.0 INTERNAL QUALITY CONTROL CHECKS 6-1

6.1 LABORATORY QUALITY CONTROL ELEMENTS 6-1
6.1.1 USEPA QC Samples 6-1
6.1.2 USACE QA Samples 6-2
6.2 FIELD QUALITY CONTROL 6-2
6.2.1 Source Water 6-5
6.2.2 Rinse/Equipment Blanks 6-5
6.2.3 Trip Blanks 6-7
6.2.4 Temperature Blanks 6-5
6.2.5 Duplicate Samples 6-5

7.0 DATA REDUCTION, VALIDATION, AND REPORTING 7-1

7.1 DATA COLLECTION 7-1
7.2 DATA REDUCTION 7-1
7.2.1 Gas Chromatography/Mass Spectrometry Results 7-1
7.2.2 Gas Chromatographic Results 7-2
7.2.3 Cold Vapor Atomic Absorption Results 7-3
7.3 REPORTING 7-4
7.3.1 Reporting Limits 7-4
7.3.2 Rounding Rules 7-4
7.3.3 Chemical Data 7-4
7.3.4 Geotechnical Data 7-4
7.4 DATA VALIDATION 7-12
7.5 DATA MANAGEMENT SCHEME 7-12
7.6 BLANK CONTAMINATION ASSESSMENT 7-13
7.6.1 Field Blanks 7-1
7.6.2 Method Blanks 7-14
7.6.3 Assessment Process 7-14
7.6.4 Data Usability Guidelines 7-14

8.0 CORRECTIVE ACTION 8-1

8.1 ROUTINE CORRECTIVE ACTION 8-1
8.2 NON ROUTINE CORRECTIVE ACTION 8-1
8.3 QUALITY IMPROVEMENT 8-5
8.4 PROBLEM PREVENTION 8-5
8.5 STOP WORK PROTOCOLS 8-5
8.6 CORRECTIVE ACTION FOR SPECIFIC RA ACTIVITIES 8-5
8.6.1 Air Monitoring 8-5
8.6.2 Excavation 8-5

8 6 3 Thermal Desorption 8-6
8 6 4 Water Treatment 8-6

9 0 QUALITY ASSESSMENTS 9 1

9 1 DOCUMENT REVIEW 9 1
9 2 DOCUMENT CONTROL 9 1
9 3 DOCUMENT REVISION 9 3
9 4 PRE FIELD OPERATIONS CHECKLIST 9 3
9 5 PREPARATORY PHASE CHECKLIST 9 3
9 6 INITIAL PHASE CHECKLIST 9 14
9 7 THREE PHASE INSPECTION PROCESS 9 41
9 8 LABORATORY SYSTEM AUDITS 9-41
9 8 1 Pre Field Operations/Preparatory Phase Inspection 9 41
9 8 2 Preparatory Phase Inspection 9 42
9 8 3 Follow up Phase Inspection 9-42
9 8 4 Additional Inspections 9-42
9 9 FIELD PERFORMANCE AUDITS 9-42
9 10 DAILY QUALITY CONTROL REPORTS 9-43
9 11 EXTERNAL FIELD SYSTEM AUDITS 9-44
9 12 OUT OF CONTROL CONDITIONS 9-44

10 0 QUALITY REPORTS TO MANAGEMENT 10 1

10 1 DAILY QUALITY CONTROL REPORTS 10 1
10 2 MONTHLY QC REPORTS 10 1
10 2 1 Wastewater Treatment Plant Effluent Regulatory Report 10 1
10 2 2 Internal QC Reports 10 1

11 0 REFERENCES 11 1

ORIGINAL
Red

LIST OF FIGURES

Figure		*Page*
8 1	Corrective Action Request	8 2
8 2	Corrective Action Plan	8 3
8 3	Deficiency Tracking Log	8 4
9 1	Document Review Record	9 2
9 3	Document Revision Form	9 4
9 4	Preparatory Phase Checklist	9 15
9 5	Initial Phase Checklist	9 28
9 6	Example Template for the Daily Quality Control Reports	9 39

LIST OF TABLES

Table		
2 1	ICF Kaiser Subcontractors and Key Points of Contact	2 2
3 1	Air Monitoring Data Quality Objectives	3 2
3 2	Excavation Data Quality Objectives	3 3
3 3	Proof of Performance Preparation Data Quality Objectives	3 4
3 4	TDU Proof of Performance Test Data Quality Objectives	3 5
3 5	TDU Continuous Monitoring Data Quality Objectives	3 8
3-6	Water Treatment Plant Acceptance Test Data Quality Objectives	3 10
3 7	Water Treatment Plant Operation and Maintenance Data Quality Objectives	3 11
3 8	Groundwater Monitoring Data Quality Objectives	3 12
4 1	Method. Parameter Container and Preservation Requirements	4 2
5 1	Analytical Methodology Parameter List	5 2
5 2	Quality Control Method Criteria for Volatile Organic Compounds	5 8
5 3	Quality Control Method Criteria for Semivolatile Organic Compounds	5 9
5 4	Quality Control Method Criteria for Pesticides	5 10
5 5	Quality Control Method Criteria for Herbicides and Pentachlorophenol	5 11
5 6	Quality Control Method Criteria for Polynuclear Aromatic Hydrocarbons	5 12
5 7	Quality Control Method Criteria for Metals	5 13
5 8	Quality Control Method Criteria for Dioxin/Furans	5 14
5 9	Quality Control for Precision and Accuracy for SMWT Remedial Action Activities	5 15
5 10	Field Equipment List and Calibration and Maintenance	5 19
6 1	Analytical Quality Control Elements of a Quality Assurance Program	6 1
6 2	Scheduled Quality Control Samples Criteria and Corrective Action	6 2
6 3	Types of Field Quality Control Samples	6 2
6-4	Field QC Elements of a QA Program	6 3
7 1	Sediment Excavation Criteria	7 5
7 2	Soil Excavation and Performance Criteria	7 5
7 3	Soil Performance Criteria	7 6
7 4	SMWT Discharge Limits for Treated Water	7 9
7 5	SMWT Emission Limits for Stack Air	7 11
7-6	SMWT Ambient Air Quality Limits	7 11
7 7	Electronic Data Deliverable	7 12

ORIGINAL
9 of

LIST OF ACRONYMS

ASTM	American Society Of Testing Material
B(a)P	benzo(a)pyrene
BOD	biochemical oxygen demand
CCC	continuing calibration curve
CCV	Continuing Calibration Verification
CERCLA	Comprehensive Environmental Response Compensation And Liability Act Of 1980
CIH	Certified Industrial Hygienist
CLP	Contract Laboratory Program
COC	Chain-Of Custody
COR	Contracting Officer s Representative
CRCL	contract required quantitation limits
CQC	contract quality control
CVAA	Cold Vapor Atomic Adsorption
%D	percent difference
D O	Dissolved Oxygen
DOT	Department Of Transportation
DQCR	Daily Quality Control Report
DQO	Data Quality Objective
DRO	diesel range organics
ECD	Electron Capture Detector
EICP	extracted ion current profiles
EPA	Environmental Protection Agency
FID	Flame Ionization Detector
FOC	field operations checklist
FSP	field sampling plan
GC	Gas Chromatography
GC/ECD	Gas Chromatography With Electron Capture Detector
GC/FID	Gas Chromatograph/Flame Ionization Detector
GC/MS	Gas Chromatograph/Mass Spectrometer
GFAA	Graphite Furnace Atomic Adsorption
gr	grain
GRO	gasoline range organics
HASP	Health And Safety Plan
HPLC	High Performance Liquid Chromatography
HR	high resolution
HRGC	high resolution gas chromatography
HRMS	high resolution mass spectrometer
HTRW	hazardous toxic and radioactive waste
HW	hazardous waste
ICAP	inductively coupled argon plasma
ICF KE	ICF Kaiser Engineers Inc
ICP	Inductively Coupled Argon Plasma
IDL	Instrument Detection Limit
LCS	Laboratory Control Sample
LEL	lower explosive limit
LOC	level of concern
MB	method blank
MCX	mandatory center of expertise
MDE	Maryland Department of the Environment
MDL	Method Detection Limit

MRD	Missouri River District
MS	Mass Spectrometer
MS/MSD	Matrix Spikes And Matrix Spike Duplicates
m/z	primary ion mass to charge ratio
NFG	National Functional Guideline
OSHA	Occupational Safety And Health Administration
PAH	Polynuclear Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PCP	pentachlorophenol
PID	Photoionization Detector
POP	proof of performance
ppb	Part Per Billion
PPC	preparation phase checklist
ppm	part per million
PQL	practical quantitation limit
%Rec	Percent Recovery
QA	Quality Assurance
QAP	quality assurance plan
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
QIP	quality improvement process
r	linear correlation coefficient
RA	remedial action
RF	Response Factor
RI/FS	Remedial Investigation/Feasibility Study
RL	Reporting Limit
ROD	record of decision
RPD	Relative Percent Difference
RRF	relative response factor
RRT	Relative Retention Time
RSD	Relative Standard Deviation
SAP	sampling and analysis plan
SCFD	standard cubic feet per day
SD	standard deviation
SMWT	Southern Maryland Wood Treatment Site
SOP	Standard Operating Procedure
SOW	Statement Of Work
SVOC	Semivolatile Organic Compound
TAP	toxic air pollutant
TCLP	Toxicity Characteristic Leaching Procedure
TDU	thermal desorption unit
TERC	Total Environmental Restoration Contract
TKN	Total Kjeldahl Nitrogen
TLV	threshold limit value
TPH	Total Petroleum Hydrocarbon
TSS	Total Suspended Solids
USACE	U S Army Corps of Engineers
USATHAMA	U S Army Toxic And Hazardous Materials Agency
USEPA	U S Environmental Protection Agency
USGS	United States Geological Survey
UST	underground storage tank
UV	Ultraviolet
VOC	Volatile Organic Compound
VOH	volatile organic hydrocarbon

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1 0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) establishes function specific responsibilities and authorities for data quality and defines procedures that will ensure that Remedial Action (RA) activities will result in the generation of reliable data It is specifically designed to address the major definable features of work contained in the Field Sampling Plan (FSP) associated with air monitoring excavation and thermal desorption of organics from contaminated soils wastewater treatment and groundwater monitoring activities

Inherent in the QA program is the verification that established quality control measures are implemented and maintained These quality control measures provide assurance that the monitoring of quality related events has occurred, and that the data gathered in support of the project are complete accurate and precise Implementation of the QAPP will help ensure the validity of the data collected and will establish a firm foundation for decisions regarding the investigation activities at Southern Maryland Wood Treatment Site This QAPP was developed in accordance with specifications contained in the US Army Corps of Engineers EM 200 1) *Requirements for the Preparation of Sampling and Analysis Plans* June 1994

1 1 PLAN DESCRIPTION

This QAPP is divided into 11 sections covering various quality assurance/quality control (QA/QC) elements required to assure the integrity of RA activities specified in the FSP These sections include

- Section 1 0 provides a general introduction and project scope addressed in the QAPP
- Section 2 0 contains the project organization responsibilities lines of authority and key contacts for implementing the major defineable features of work in the FSP Section 3 0
- Section 3 0 lists the project data quality objectives (DQOs) to assure the reliability of data produced The DQO topics include peformance criteria chemical data measurements (accuracy precision representativeness completeness comparability sensitivity) data use and sampling strategy
- Section 4 0 discusses sample management activities for the samples collected in support of defineable features of work Topics discussed include sample preservation holding times sample identification documentation and custody requirements
- Section 5 0 addresses the field and laboratory analytical programs
- Section 6 0 discusses the internal QC checks for Remedial Action (RA) activities
- Section 7 0 addresses blank contamination assessment data collection reduction validation and reporting requirements including the requisite levels of data review
- Section 8 0 outlines the corrective action procedures A description of the corrective action process is discussed, including specific corrective actions for RA activities in FSP Section 3 0
- Section 9 0 discusses quality assessments including document review control and revision and the USACE three phase control process Laboratory and field audits and daily quality control reports are also addressed
- Section 10 0 presents information on quality reporting requirements
- Section 11 0 contains a listing of references

1 2 PROJECT SCOPE

The remedial actions already performed have removed a large volume of waste contained in drums retorts tanks and buildings on site The remaining sources of contamination as well as contaminated groundwater and surface water will be removed during this phase of the remediation Remaining sources include NAPLs in the subsurface in the Containment Area lagoon sludge in the Land Treatment Area and contaminated soil and sediment in the Containment Northeast Tank, Upper Site and Land Treatment Areas and the Tributaries

The goal of this cleanup action is to ensure that future residents and ecological receptors will not be exposed to an unacceptable risk posed by site soil and groundwater In addition this action will prevent future risk

to ecological receptors posed by exposure to contaminated surface water and sediment The general scope of the remedial action is to remove all contamination sources and treat them on site where possible Definable features of work required to address project objectives include the following

Air Monitoring VOCs and particulates will be monitored to establish and periodically evaluate air quality at the SMWT fenceline Upwind and downwind locations will be selected based on meteorological data obtained on the day of evaluation Prior to remedial activities baseline air monitoring will be conducted to establish fenceline air quality Perimeter monitoring will be conducted during remedial activities to demonstrate the adequacy of engineering controls designed to maintain fenceline air quality ICF KE personnel will monitor particulates on site using a dust monitor and collect VOC samples in summa canisters Summa canisters will be analyzed off site at Core Laboratories or Air Toxics

Excavation Activities Soil and sediment that exhibit contaminant concentrations in excess of the cleanup criteria will be excavated for on site treatment Areas to be excavated include the Land Treatment Area a drainage swale leading to the East Tributary the Northeastern Tank Area the Containment Area the Untreated Soil Stockpile Area and the West Tributary Excavation limits will be determined in the field based on previous sampling and analysis preliminary screening (PID reading and visual observation) on site screening (On site Environmental) and off site verification sampling and analysis (Paragon Analytics or Environmental Chemical Corporation/ECC)

Thermal Desorption Excavated soil and sediment that contain contaminant concentrations in excess of cleanup criteria will be treated on site by low temperature indirect fired thermal desorption This process will not be applicable for grossly contaminated materials defined as not amenable to this treatment process Grossly contaminated materials will be disposed off site The Proof of Performance (POP) test will be conducted to verify the capability of each type of Thermal Desorption Unit (TDU) on site to meet the cleanup and delisting criteria established in the ROD for treated soil Samples will be sent off site to Paragon Analytics or ECC and their subcontractors for analysis Additionally performance criteria associated with TDU air emissions and condensate water discharge will be verified Stack sampling will be conducted to ensure that TDU stack emissions are compliant with State of Maryland air emission requirements Stack samples will be collected by Air Recon and analyzed off site by On site Environmental Perimeter monitoring will be conducted as described above to document that ambient air quality is safe A Water Treatment Plant (WTP) sampling event will be conducted as described below to verify the effectiveness of the WTP in treating condensate discharge water to State of Maryland criteria Continuous TDU operations will be monitored to ensure that concentrations of constituents remaining in the treated soil are compliant with soil performance criteria Samples will be sent off site to Paragon Analytics or ECC and their subcontractors for analysis

Water Treatment Plant When the construction of the WTP is completed, an acceptance test will be conducted during which various internal operations will be monitored by effluent sampling During routine WTP operation long term monitoring will be conducted through the collection and analysis of various process samples and regulatory effluent sampling Samples requiring parameters with short holding times will be analyzed on site by On site Environmental while all other samples will be sent off site to Paragon Analytics or ECC and their subcontractors for analysis

Groundwater Sampling Quarterly sampling in five monitoring wells will be conducted to determine if there is any migration of contamination from the contaminated aquifer to the deeper aquifer (to verify that the confining clay layer between the upper and lower aquifer has not been compromised) and to monitor the nature and magnitude of contamination downgradient of the site Pre construction sampling in most site wells will be conducted to evaluate groundwater throughout the site Post-construction sampling in all site wells will be conducted to ensure that the soil remediation has sufficiently reduced contaminants in the groundwater to ensure protection of human health and the environment and to allow the shallow aquifer to be used as a potential drinking water supply

Project activities will be performed under the direction of a Professional Engineer Sample collection will be performed in accordance with established standard operating procedures (SOPs) designed to ensure the collection of representative samples Table 1 1 presents the laboratories used for this project and their associated parameters

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Table 1-1 Laboratories Used for Sample Analysis

Paragon Analytics (LQAP 4/97 Rev 3 & Addendum letter 5/20/98 & Fax 5/20/98 & MRD Cert 4/22/98 does not include SOPs located in Appendices C 1 and 2)

Parameter	Extraction (aqueous/solid)	Method (aqueous/solid)
VOC	5030A	8260B
SVOC	3520C/3540C	8270C
Metals	3005A	6010B
Mercury	3005A	7470A/7471A
Polynuclear Aromatic Hydrocarbons	3520C/3540C	8310
TPH (DRO and GRO)		8015
Herbicides/Pentachlorophenol		8151A
Pesticides		8081A
Total Cyanide		9010B/
Ammonia		350 3/
Phosphorous		365 2/
Fluoride		340 2/
Chloride		/9056
Total Releasable Cyanide		/Chapter 7
Total Releasable Sulfide		/Chapter 7
Ignitability		/1010
Corrosivity		/9045C

Paragon's Subcontractors (Paragon s LQAP with specific SOPs located in Appendix C 3)

Parameter (SOP date)	Method (aqueous/solid)	Company
TCLP PAH	1311/3510/8310	Core Texas
BOD5 (1/20/98)	405 1/	Core Houston
Turbidity (1/1/89)	180 1/	Core Houston
Phenolics (2/25/98)	420 2/	Core Houston
TKN (2/17/98)	351 2/	Core Houston
Trivalent Arsenic	BR0021/	Brooks Rand
Density	/ASTM D 1557	Core Houston
Dioxin/Furan	8290	Core Indiana

On site Environmental Laboratory On site Analysis (LQAP includes SOPs 1/98 Rev 1 located in Appendix D)

Parameter	Extraction (aqueous/solid)	Method (aqueous/solid)
SVOC	/3550 M	/8270C
Percent Moisture		/ASTM D 2216
Hexavalent Chromium		Hach 8023
BOD5		405 1
Dissolved Oxygen		DO4500 OG
Temperature		170 1
pH//		9040B
Turbidity		180 2
Total Suspended Solids		160 2
Iron		Hach 8008

Core Summa Canister Analysis (LQAP includes SOP 4/98 located in Appendix E)

Parameter	Method
VOC	TO 14

On site Environmental Stack Sample Analysis (LQAP does not include SOPs 5/98 Rev 1 located in App F)

Parameter	Collection*	Analysis
Temperature & Flow	EPA 1/2	None
Moisture	EPA 4	None
Particulates	EPA 5	None
HCl	EPA 5/26A	None
Metal	EPA 29	6010/7471
SVOC	EPA 23/10	8270A
Dioxin	EPA 23	8290
VOC	EPA 30	8260
Opacity	EPA 9	None

***Air Recon** stack sampling SOP 30 10 in Appendix B (5/98 Draft)

Environmental Chemical Corporation (LQAP 1/98 & MRD Cert 8/21/96 located in Appendix G)

Parameter	Extraction (aqueous/solid)	Method (aqueous/solid)
VOC	5030B	8260B
SVOC	3510C/3540C	8270C
Metals	3010A	6010A/7000
Polynuclear Aromatic Hydrocarbons	3510C/3540C	8310
TPH (DRO and GRO)		8015M
Herbicides/Pentachlorophenol		8151A
Pesticides		8081
Total Cyanide		9012A/
Ammonia		350 3/
Phosphorous		365 2/
Fluoride		340 2/--
Chloride		/9056
Total Releasable Cyanide		/9012A
Total Releasable Sulfide		/9030A
Ignitability		/1010
Phenolics (2/25/98)		9065/
TKN (2/17/98)		351 2/
Density		/ATTM D 1557
Corrosivity		/9045

Environmental Chemical Corporation's Subcontractors (Triangle s LQAP located in Appendix H)

Parameter (SOP date)	Method (aqueous/solid)	Company
Trivalent Arsenic	BR0021/	Brooks Rand
Mercury	1631	Brooks Rand
Dioxin/Furan	8290	Triangle

Air Toxics Summa Canister Analysis (LQAP located in Appendix I)

Parameter	Method
VOC	TO 14

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2 0 PROJECT ORGANIZATION AND RESPONSIBILITIES

SMWT quality assurance requirements will be achieved through proper planning organization review communication of objectives auditing reporting and corrective action The QA Program will be directed by ICF Kaiser personnel knowledgeable in QA theory and practice Facilities equipment and services that affect data quality or integrity will be routinely inspected and maintained, as required by SOPs

Implementation of the QAPP requires that the project staff maintain an awareness of contractual procedures and goals It is the policy of ICF Kaiser to provide a QA program to ensure that all information produced by its employees and subcontractors is valid and of known quality QA program requirements cover all activities that generate environmental measurement data These requirements include statements of completeness comparability representativeness precision and accuracy where applicable

Field methods and procedures used in measurement and monitoring efforts will conform to USEPA and USACE approved methodologies Field team members will possess the appropriate qualifications and training prior to collecting environmental samples completing site screening procedures and performing remedial action tasks They will review and understand all SOPs and document all measurements and field observations The intended use of the data and the associated acceptance criteria for data quality will be determined and documented before the data collection effort begins Data processing procedures will be documented, reviewed, and revised by the QA Manager as required to meet USEPA and USACE data quality requirements

2 1 RESPONSIBILITIES

Responsibilities for the implementation of the project QA program in accordance with QA/QC contractual obligation lies principally with the ICF Kaiser project staff and subcontractors Table 2 1 presents names addresses and phone numbers of the identified key individuals Statements of Qualifications of the ICF Kaiser staff are given in Appendix A.

Program Manager, Bruce Howard, P E , has complete management authority and responsibility for all work performed under the TERC contract The Program Manager directs the program management organization as a central resource for management continuity and control of all TERC program activities The centralized program management is organized to facilitate communication with and reporting to USACE and to expedite and support project execution The Program Manager has total authority responsibility and accountability for managing the contract He will be involved in the decision making process document review and oversight of the technical management of the project

Project Manager Kirk Ticknor, is responsible for ensuring that all activities are conducted in accordance with contractual specifications and approved work plans The Project Manager will also provide technical coordination with the USACE Project Officer The Project Manager is responsible for management of all operations conducted for this project He will ensure that all personnel assigned to this project including subcontractors have reviewed the technical plans before any task associated with the project is initiated The Project Manager will monitor the project budget and schedule and ensure availability of necessary personnel equipment subcontractors and services He will participate in the development of the field program evaluation of data development of conclusions and recommendations and reporting Specifically the ICF Kaiser Project Manager is responsible for the following activities

- Identifying project specific personnel qualification requirements and work functions requiring special skills including security clearance licenses certifications and registrations
- Verifying that project staff demonstrate and maintain the required skills clearances certifications and/or registrations to perform their assigned work

  Verifying the qualifications of suppliers and subcontractors relative to project objectives and in accordance with specified requirements

  Advising staff and subcontractors of their roles and responsibilities in achieving project objectives
- Ensuring that staff and subcontractors are cognizant of and compliant with contractual and regulatory requirements (e g DOT regulations CERCLA)

Table 2 1
ICF Kaiser Subcontractors and Key Points of Contact

ICF Kaiser	Key Point of Contact
Bruce Howard Program Manager	9300 Lee Highway Fairfax VA 22031 Phone (703) 934 3396 Fax (703) 218 2690
Kirk Ticknor Project Manager	25202 Three Notch Road Hollywood MD 20636 Phone (301) 373 5834 Fax (301) 373 5975
Bill Simpson Site Operations Manager	25202 Three Notch Road Hollywood MD 20636 Phone (301) 373 5834 Fax (301) 373 5975
Davida Trumbo TERC QC Supervisor	9300 Lee Highway Fairfax VA 22031 Phone (703) 934 3996 Fax (703) 934 3611
Joe Kelleher CQC System Manager	25202 Three Notch Road Hollywood MD 20636 Phone (301) 373 5834 Fax (301) 373 5975
Brian Roebuck On Site Health and Safety Manager	25202 Three Notch Road Hollywood MD 20636 Phone (301) 373 5834 Fax (301) 373 5975
Wendy Werkheiser Project Chemist	25202 Three Notch Road Hollywood MD 20636 Phone (301) 373 2104 Fax (301) 373 5975
Eric Malerick Data Validation Manager	2113 Emmerton Park Road Suite 100 Edgewood MD 21040 Phone (410) 612-6442 Fax (410) 612 6351
Wayne Davis Sampling Supervisor	25202 Three Notch Road Hollywood MD 20636 Phone (301) 373 5834 Fax (301) 373 5975
John Mueck Jr Thermal Desorption Unit Manager	ETG 16 Hagerty Boulevard West Chester PA 19382 7594 Phone (610) 431 9100 Fax (610) 431 9140
David Root Health & Safety Manager	1600 West Carson Street Pittsburgh PA 15219 1031 Phone (412) 497 2056 Fax (412) 497 2212
Mike Flaherty Water Treatment Plant Manager	25202 Three Notch Road Hollywood MD 20636 Phone (301) 373 5834 Fax (301) 373 5975
Kristie Music Project Manager	Environmental Chemical Corporation ECC 3235 Omni Drive Cincinnati OH 45245 Phone (513)752 2950 Fax (513)752 2261

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Table 2 1 (Continued)
ICF Kaiser Subcontractors and Key Points of Contact

Subcontractor	Key Point of Contact
Ed Weinberg	OHM Remediation Services Corporation 200 Horizon Center Blvd Trenton NJ 08691 Phone (609) 588-6302 Fax (609) 588 6399
Steve Detwiler Vice President	ETG Environmental Inc 16 Hagerty Blvd West Chester PA 19382 Phone (610) 431 9100 Fax (610) 431 9140
Ken Campbell Laboratory Project Manager	Paragon Analytics 225 Commerce Drive Fort Collins CO 80524 Phone 1 800-443 1511 Fax (970) 490 1522
Randall Wright Project Manager	Core Laboratories (Paragon subcontractor and summa canister analysis) 6310 Rothway Houston TX 77040 Phone (713) 690-4444 Fax (713) 690 5646
Rebecca Wood Project Manager	Brooks Rand Laboratory (Paragon and ECC subcontractor) 3950 6th Avenue NW Seattle WA 98107 Phone (206) 632-6206 Fax (206) 632-6017
John Hawkins Project Manager	On Site Environmental Labs (on site laboratory and stack sample analysis) 1st Street Building 82 Picatinny Arsenal Dover NJ 07801 Phone (973) 361 2225 Fax (973) 361 2245
Robin Goebel Project Manager	Air Toxics Ltd 180 Blue Ravine Road Suite B Folsom CA 95630 Phone (916) 985 1000 Fax (916) 985 1020
Marv MacDonald Project Manager	Triangle Laboratories 801 Capitola Drive Durham NC 27713 Phone (919) 544 5729 Fax (919) 544 5491
Mick Mayze Project Manager	Core Indiana 7726 Moller Road Indianapolis IN 46268 Phone (317) 875 5894 Fax (317) 862 6189
Tom Brown Project Manager	Air Recon (stack sample collection) 5 Johnson Drive P O Box 150 Raritan NJ 08869-0130 Phone (908) 526 1000 Fax (908) 526 7886

Site Operations Manager Bill Simpson will provide management of the field activities during the RA. He is responsible for ensuring that technical matters pertaining to the field program are addressed. He will participate extensively in data interpretation, report writing, and preparation of deliverables and will ensure that work is being conducted as specified in the technical plans. In addition, he is responsible for all field QA/QC procedures and for safety related issues. Before field activities are initiated, he will conduct a field staff orientation and briefing to acquaint project personnel with the site and assign field responsibilities. He will be responsible for coordinating on site activities performed by ICF Kaiser personnel and by subcontractors present on site. Specific responsibilities of the Site Manager in conjunction with the CQC System Manager include the following:

- Ensure that sampling and analysis activities are consistent with the approach defined in this SAP
- Ensure that QC measures for the remedial activities, including site screening, are being implemented and maintained
- Ensure that all SOPs pertinent to site characterization, sampling activities, and field screening are reviewed and understood
- Ensure that all records and logs are documented and maintained in a retrievable manner
- Ensure that the data is reviewed and understood for applications towards site characterizations
- Provide to the TERC QC Supervisor the components of the Daily Quality Control Report (DQCR) as defined in Section 9.0 of the document, and
- Ensure conditions requiring corrective actions are identified and addressed

TERC QC Supervisor, Davida Trumbo, CQE is responsible for ensuring that the QA procedures and objectives in the project specific FSP are met, providing a focal point for QA activities, and implementing the QC Program. With the assistance of the CQC System Manager and Project Chemist, the TERC QC Supervisor will be responsible for the review, evaluation, and validation of all analytical data for the project and will participate in interpreting and presenting the analytical data.

Corporate Health and Safety Manager, David Root, CSH/CSP, will review and internally approve the Health and Safety Plan (HASP), which will be tailored to the specific needs of this project. In consultation with the Project Manager, he will ensure that appropriate Health and Safety requirements are defined in the HASP. Gerald Joy, CIH, will review the HASP for compliance with applicable standards.

Contract Quality Control (CQC) System Manager, Joe Kelleher is responsible for daily QC oversight of field operations and for the management of all aspects of on site samples, sample containers, and regulatory compliance. He will also provide oversight for any subcontracted field collection in accordance with the subcontractors sampling protocols. The CQC System Manager will coordinate the sampling event with the on site laboratory to ensure the accuracy of the field and analytical services. The specific responsibilities include:

- Ensure that the QC requirements established for the three phase control process are maintained throughout the sampling event
- Generate the SMWT DQCR
- Ensure that all data and documentation that is on site is maintained in a retrievable manner and ensure all data and documentation are archived and entered into document control
- Ensure that the remedial actions are performed in accordance with QC guidelines

On Site Health and Safety Manager Brian Roebuck will be responsible for implementing the on site health and safety program, maintaining health and safety documentation, and daily input to the CQC system manager for inclusion into the DQCR. The On site Health and Safety Manager will ensure that an adequate level of personal protection is worn for anticipated potential hazards for all field personnel. The On site Health and

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Safety Manager will work in coordination with the Project Manager and the Corporate Health and Safety Manager to ensure compliance of project activities with health and safety requirements as outlined in the HASP

Project Chemist Wendy Werkheiser will be responsible for sample tracking data management laboratory coordination, data interpretation and report writing The Project Chemist will assist the TERC QC Supervisor to ensure that the work performed is in accordance with this QAPP the SOPs and other pertinent analytical procedures The Project Chemist is responsible for the management of the database generated as a result of field operations at SMWT The chemist will also be responsible for ensuring all analytical data is validated at the level required by the DQOs The chemist is responsible for ensuring fully validated data is provided in a tabular format and the data is qualified accordingly as a result of the validation

Data Validation Manager, Eric Malarek, will be responsible for the validation of data in accordance with DQOs The Validation Manager will be independent of project management and will report directly to the CQC System Manager Specific responsibilities include coordination of data validation activities interaction with off site laboratory to resolve data completeness issues interacting with the Project Chemist to ensure data processing schedules are consistent with project milestones and reporting of activities to the TERC QC Supervisor and CQC Manager

Off Site Laboratories (Paragon Analytics, ECC, Core Texas, Brooks Rand Air Toxics Triangle Core Indiana) Project Managers, Ken Campbell, Kristie Music, Randall Wright, Rebecca Wood, Robin Goebel, Mary MacDonald, Mick Mayze, will be responsible for the technical quality of the laboratory adherence to the Laboratory Quality Assurance Program laboratory personnel management cost control and strict adherence to project schedules The overall QA management responsibilities in the RA are the satisfactory analysis of all samples with complete data documentation The off site laboratory will analyze environmental samples for parameters of interest Laboratory activities will be monitored by the Project Chemist Specific responsibilities will be included in the off site laboratory QAPP

On Site Laboratory (On Site Environmental) Project Manager, John Hawkins, will be responsible for the technical quality of the laboratory adherence to the on site Laboratory Quality Assurance Program laboratory personnel management cost control and strict adherence to project schedules The overall QA management responsibilities in the RA are the satisfactory analysis of all samples with complete data documentation The on site laboratory will analyze environmental samples for parameters of interest Laboratory activities will be monitored by the Project Chemist Specific responsibilities will be included in the off site laboratory QAPP

Sampling Supervisor Wayne Davis, is responsible for management of all aspects of on site sample collection sample custody and sample containers covering groundwater soil screening and sampling parameters Specific responsibilities include

- Maintaining the inventory of sample containers
- Ensuring field activities are performed in accordance with field SOPs and
- Providing a daily field sample summary table of samples collected for the DCQR

Thermal Desorption Unit (TDU) Manager John Mueck, Jr , will be responsible for the 24 hour operation of the TDU Specific responsibilities include seeing that the TDU is constructed to design specifications coordinating with the ICF Kaiser Site Manager to ensure sufficient volume of soil in feed stockpile and ensuring that the Proof of Performance (POP) criteria are met

Water Treatment Plant Manager, Mike Flaherty, will be responsible for the operations at the water treatment plants Specific responsibilities include seeing that the water treatment plant is operating in accordance with design specifications and ensuring that the Acceptance Test criteria and effluent standards are met

2 2 QUALIFICATIONS OF CHEMICAL QUALITY MANAGEMENT PERSONNEL

The laboratory QC officer and bench chemists will have a baccalaureate in chemistry and 1 year of experience in environmental sample preparation testing and analysis The GC/MS Special Interpretation Expert will have at least 3 years experience and the Gas Chromatograph Analytical expert will have at least 2 years

experience Technicians will have a minimum of high school chemistry and will work under the supervision of a chemist Technicians will be used primarily for sample preparation

2 3 LINES OF AUTHORITY

The lines of authority for technical direction and communication for the project may be determined from the organizational chart The technical direction is communicated along the organizational structure Communication of project objectives is typically provided to project staff through meetings reporting and reviews

2 4 SUBCONTRACTORS AND KEY POINTS OF CONTACT

Table 2 1 lists the key points of contact for ICF Kaiser and subcontractors

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3 0 DATA QUALITY OBJECTIVES

Quality assurance (QA) is defined as the overall system of activities for assuring the reliability of data produced The system integrates the quality planning assessment and corrective actions of various groups in the organization to provide the independent QA program necessary to establish and maintain an effective system for collection and analysis of environmental samples and related activities The program encompasses the generation of complete data with its subsequent review validation and documentation

The overall QA objective is to develop and implement procedures for sample and data collection sample shipment and reporting that will allow QA reviewers to determine whether the field and laboratory data collected during the RA activities at SMWT meet the criteria and endpoints established in the data quality objectives (DQOs) DQOs are qualitative and quantitative statements that outline the decision making process and specify the data required to support the RA DQOs specify the level of uncertainty that will be accepted in results derived from environmental data

The QA objective will be achieved through the implementation of specific procedures for sampling field data collection. chain-of-custody calibration internal quality control audits preventive maintenance and corrective actions as described in this QAPP The purpose of this section is to characterize ~~critical~~ samples define RA performance criteria and identify DQO indicators and assessment criteria for chemical measurements

Field inspections performed by the contractor quality control (CQC) System Manager will be used to ensure requirement compliance identify specification variances and effect appropriate corrective action for process deficiencies Additionally QA review of field documentation QA audits and monthly reporting will be used to establish that protocols for sampling and measurement are consistent with specifications contained in this QAPP

3 1 SAMPLE AND CRITERIA SPECIFICATIONS

Samples collected in support of SMWT RA activities will be used to make RA decisions and therefore require data of known and documented quality Samples to be collected during RA activities have been evaluated for data quality requirements Specific analytes are contained in Tables 3 1 through 3 8

3 1 1 Perimeter Air Monitoring

Perimeter monitoring will be conducted to confirm that safe breathing conditions are maintained at the site boundary Action levels for VOCs and particulates at the site boundaries are 1 57 ug/m3 benzene and 2 750 ug/m3 particulates See Table 3 1 for appropriate analytical methods and level of validation Failure to attain the action levels for VOCs or particulates will immediately trigger the implementation of more stringent engineering controls

3 1 2 Excavations

Soil and sediment samples will be collected during excavation activities to demonstrate that appropriate cleanup levels have been achieved See Table 3 2 for appropriate analytical methods and level of validation Performance standards for excavated soil and sediment as established in the SMWT ROD are as follows

3 1 2 1 Soil

B(a)P equivalence will be used to demonstrated that all soils with contaminant concentrations above performance standards have been excavated To prevent ingestion and or direct contact with surface soils that contain in excess of 0 1 B(a)P equivalence all surface soils containing greater than 0 1 ppm B(a)P equivalence are to be removed Additionally to protect groundwater as a current or a potential drinking water supply subsurface soils greater than 1 0 ppm B(a)P equivalence will be excavated from the site All soil cleanup levels are on a dry weight basis

B(a)P equivalence is calculated by taking the analytical results multiplying by the appropriate toxicity equivalency factor and summing the results for the carcinogenic PAHs The laboratory will report sample results in both B(a)P equivalence and PAH speciated values

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B(a)P equivalence is calculated by taking the analytical results multiplying by the appropriate toxicity equivalency factor and summing the results for the carcinogenic PAHs

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Table 3 1
Air Monitoring Data Quality Objectives

Sample Description	Days of Sampling	Analytical Method	Sample Type	Approximate Number of Samples
Baseline M3 Validation (VOCs Only)	3 days	VOCs TO 14	summa canisters 8 hour time weighted	12
		Particulates dust monitor	grab	36
			8 hour shift average	12
Proof of Performance M3 Validation (VOCs Only)	7 days (includes one preparation day)	VOCs TO 14	summa canisters 8 hour time weighted	28
		Particulates dust monitor	grab	84
			8 hour shift average	28
Full Scale Operations M3 Validation (VOCs Only)	25 days	VOCs TO 14	summa canisters 8 hour time weighted	100
	450 days (15 months)	Particulates dust monitor	grab	5400
			8 hour shift average	1800

Table 3 2
Excavation Data Quality Objectives

Sample Description	Estimated Frequency	Sample Location/Type Data Validation	Chemical Analyses	Sample Rationale
		Excavation Pits		
Pit 1 Soil Screening	34+	Grab Samples will be collected at areas where preliminary screening gives no indication of contamination or if the results are ambiguous Soil screening sampling locations should be more frequent than verification sampling locations M1 Validation	On site PAHs and Carbazole 3550M/ 8270C	On site screening for PAHs to delineate contamination boundary The on site lab will report PAH concentrations in actual ppms and B[a]P equivalent ppms If contaminant concentrations exceed excavation criteria continue excavating if not stop excavating and take verification samples
Pit 2 Soil Screening	6+			
Pit 3 Soil Screening	13+			
Pit 4 Soil Screening	53+			
Pit 5 Soil Screening	9+			
Pit 1 Verification Sampling	23 bottom 41 sidewall	Grab samples from floor of excavation at 100 foot sampling grid nodes and centers (Figures 3 3 through 3 7) and 100 linear feet along excavation walls at depths 2 to 10 10 to bottom and 33 linear feet along excavation walls at depths 0 to 2 M3 Validation	Off site PAHs 3540C/8310 Carbazole 8270C	Soil samples will be collected from the bottom and sidewalls for laboratory confirmation that all contaminated soil has been removed
Pit 2 Verification Sampling	3 bottom 11 sidewall			
Pit 3 Verification Sampling	7 bottom 32 sidewall			
Pit 4 Verification Sampling	20 bottom 49 sidewall			
Pit 5 Verification Sampling	5 bottom 14 sidewall			
		West Tributary		
Delineation Sampling at Previously Contaminated Locations	15	Resample at locations in Pre Design Report (D&M 1992) where PAHs or PCP exceeded clean up criteria SE 04 SE 15 SE 16 SE 17 SE 18 SE 19 SE 20 SE 21 SE 22 SE 23 SE 24 SE 25 SE 26 SE 27 SE 28 M1 Validation	On site PAHs and PCP 3550M/ 8270C	To determine whether contamination is present at previously contaminated locations Previous sample results need to be verified before excavation because the samples were collected in 1992 and sediments may have migrated in the interim shifting the location of contamination Each sample will be a composite of sediments from center stream and from 2 ft upstream and 2 ft downstream If analytical results indicate contamination over the sediment criteria the stream will be excavated to a depth of 6 inches from 2 ft upstream to 2 ft downstream of sample
Delineation Sampling at Depositional Areas	approx 15 or as required by conditions	Depositional areas identified by sediment sizes ranging from fine to coarse grained may tend to be located on the inside bends in the stream bed or where the current slows due to wider banks M1 Validation	On site PAHs and PCP 3550M/ 8270C	PAHs and PCPs are relatively insoluble in water and would tend to sorb to soils Depositional areas may contain a high concentration of particulates with sorbed contaminants If analytical results indicate contamination over the sediment criteria the stream will be excavated to a depth of 6 inches from 2 ft upstream to 2 ft downstream of sample
Delineation Sampling at Discolored Areas	approx 15 or as required by conditions	Darker areas also identified by sheen on sediments or thick or sticky texture M1 Validation	On site PAHs and PCP 3550M/ 8270C	Discoloration of the sediments may be a visible indication of contamination Note that some areas contain natural staining (e g iron hydroxide staining and sheen caused by bacteria) If analytical results indicate contamination over the sediment criteria the stream will be excavated to a depth of 6 inches from 2 ft upstream to 2 ft downstream of sample
Excavation Verification	approx 45 or as required by the analytical results from samples	Excavation will occur where delineation sampling indicates contamination exceeds cleanup criteria After excavation a composite sediment sample will be collected upstream downstream and below the excavation M3 Validation	Off site PAHs 3540C/8310 PCP 8270C	After sediment excavation samples will be collected to verify that contamination has been removed

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Table 3 3
Proof of Performance Preparation Data Quality Objectives

Sample Description	Data Use	Sampling Strategy	Sample Type	Preparation/ Analytical Method(s)	Estimated Samples
Statistical Method	Provide an indication of the accuracy and precision with which a single grab sample can characterize the feed soils	One small pile (3 x 3 x 3) will be sampled from twelve locations	Grab	% Moisture (on site) ASTM D2216	12
				Grain size (off site)	12
Verify Feed Material	Verify that feed material to be used for POP test is representative of what is expected to be encountered on site during operation	One composite sample will be collected from each source pile BTDU excavated pond sediment CTDU Pit #1	Composite	PAHs (on site) 3550M/ 8270C	2
				% Moisture (on site) ASTM D2216	2
CTDU Ramp Up	Determine optimum feed rate/retention time for POP tests	One pile of feed soil (untreated)	Composite	PAHs (on site) 3550M/ 8270C	1
			Grab	VOCs (off site) 5030A /8260B	4
		One composite per each feed rate (6)	Composite	PAHs (on site) 3550M/ 8270C	6
	Ambient air quality confirmation	3 downgradient, 1 upgradient	Composite	VOCs summa canisters TO 14	4
			Composite	Particulates dust monitor	4
			Grab		12

Table 3 4
TDU Proof of Performance Test Data Quality Objectives

Sample Description	Data Use	Sampling Strategy	Sample Type	Preparation/ Analytical Method(s)	Estimated Samples
Untreated Soil	Waste feed characteristics M1 Validation	Each stockpile for the Batch and Continuous TDU units will be sampled from 10 locations and composited into one sample with the exception of VOCs where grab samples will be collected from four locations per POP test	Composite	PAH 3540C/8310	6
				PCP 8151A	6
				SVOC 3540C/8270C	6
				Dioxins/Furans 8290	6
				Total Chlorinds 5050/9056	6
				Metals 6010B/7471A	6
				Moisture / ASTM D 2216	6
				Density ASTM D 1557	6
			Grab	VOC 5030A/8260B	24
Treated Soil, Hot Cyclones and Batch Impinger Sludge	Compliance with soil performance standards M3 Validation	Each stockpile for the Batch and Continuous TDU units will be sampled from 10 locations and composited into one sample with the exception of VOCs where grab samples will be collected from four locations per POP test	Composite *B(a)P Equiv*	PAH 3540C/8310	15
			Composite *B(a)P Equiv*	SVOCs (Carbazole) 3540C/8270C	15
			Composite *Delisting*	PCP 1311/8151A	15
			Grab *Delisting*	VOC 1311/5030A/8260B	33
			Composite *Delisting*	PAH 1311/3520C/8310	15
			Composite *Delisting*	SVOC 1311/3520C/8270C	15
			Composite *Mass Balance*	Dioxins/Furans 8290	15
			Composite *HW Char*	Pesticide 1311/3520C/8081A	15
			Composite *HW Char*	Herbicides 1311/8151A	15
			Composite *HW Char*	Metals 1311/3005A/6010B/7470A	15
			Composite *HW Char*	Ignitability	15
			Composite *HW Char*	Corrosivity	15
			Composite *HW Char*	Reactive Cyanide and Sulfide	15

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Table 3-4
TDU Proof of Performance Test Data Quality Objectives (continued)

Sample Description	Data Use	Sampling Strategy	Sample Type	Preparation/ Analytical Method(s)	Estimated Samples
Air Stack Sampling	Compliance with State air regulations M3 Validation	Continuous and Batch TDU stack emission samples	Grab	VOC 40 CFR 60 Meth d 30\SW 846 8260	6
				T mp tur 40CFR60 M th d 1/2	6
				M tur 40CFR60 M th d 4	6
				SVOCs 40 CFR 60 M th d 23/10 SW 846 8270A	6
				HCl 40CFR60 M th d 26A/5	6
				M tals 40CFR60 M thod 29 SW 846 6010 7471	6
				Fl w 40CFR60 M thod 1/2	6
				D xin/Furan 40CFR60 M th d 23 SW 846 8290	6
				P rt cul tes 40CFR60 M th d 5	6
				Op ity 40CFR60 M th d 9	6
Air Pre-thermal Oxidizer	Effectiveness of oxidizer M1 Validation	Interim air sample before oxidizer	Grab	VOC 40 CFR 60 Meth d 30\SW 846 8260	6
				Temperature 40CFR60 M thod 1 2	6
				M istur 40CFR60 Meth d 4	6
				SVOC 40 CFR 60 M th d 2 /10 SW846 8270A	6
				HCl 40CFR60 Method 26A/5	6
				Dioxin/Furan 40CFR60 Meth d 23 SW 846 8290	6
Air Perimeter monitoring	Ambient air quality confirmation (6 days) M3 Validation	3 downgradient 1 upgradient	Composite	VOC umm nisters TO 14	24
			Composite	Part ul t dust m n t	24
			Grab		72

Table 3-4
TDU Proof of Performance Test Data Quality Objectives (continued)

Sample Description	Data Use	Sampling Strategy	Sample Type	Preparation/ Analytical Method(s)	Estimated Samples
Condensate Water	Evaluate scrubber condensate M1 Validation	One in line Batch and Continuous TDU water sample before entry to TDU condensate tank	Grab	PAH 3520C/8310	6
				SVOCs 520C/8270C	6
				PCP 8151A	6
				VOCs 5030A/8260B	6
				D xins/Furans 8290	6
				TSS 160 2	6
TDU Tank Discharge	Total suspended solids loading M1 Validation	One sample from second vertical condensate tank, modular tank (if used) and Tank 112	Grab	TSS 160 2	18
Water Treatment Plant	Effectiveness of WTP during POP M3 Validation	Influent	Grab	All param ters list d in Tabl 7 4 f QAPP	1
		Effluent	Grab	All p ameters listed in T bl 7 4 f QAPP	1
		Mid Carbon	Grab	VOCs 5030A/8260B	1
				SVOC 3520C/8270C	1
				Phen ls 420 2	1
				TSS 160 2	1

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Table 3 5
TDU Continuous Monitoring Data Quality Objectives

Sample Description	Data Use	Sampling Strategy	Sample Type	Analytical Method(s)	Estimated Samples
Untreated stockpile	Continuous characterization No Validation	One sample per month	Grab	VOCs 5030A/8260B	20
			Composite	SVOCs 3540B/8270C	20
				% Moisture ASTM D2216	20
				Density ASTM D1557	20
Treated Soil Stockpile	Site backfill and disposal decisions M3 Validation	One sample every bin NTE 700 tons	Composite	PAH 3540C/8310	300
				SVOC (Carbazole) 3540C/8270C	300
				TCLP PAH 1311/3520C/8310	300
				TCLP SVOCs/PCP 1311/3520C/8270C	300
				TCLP Metal 1311/3005A/6010B/7470A	300
				Total Cyanide and Sulfide	300
Hot Cyclones	Blend decision for treated soil M3 Validation	One sample each month from combined continuous cyclones	Composite	PAH 3540C/8310	15
				SVOC (Carbazole) 3540C/8270C	15
				TCLP PAH 1311/3520C/8310	15
				TCLP SVOCs/PCP 1311/3520C/8270C	15
				TCLP Metals 1311/3005A/6010B/7470A	15
				Total Cyanide and Sulfide	15

Table 3 5
TDU Continuous Monitoring Data Quality Objectives (continued)

Sample Description	Data Use	Sampling Strategy	Sample Type	Analytical Method(s)	Estimated Samples
Perimeter Air Monitoring	Ambient air quality confirmation	3 downgradient 1 upgradient	Composite 8 hour	VOCs TO 14 umma canisters	100
	M3 Validation		8 hour shift average	Part cul t Dust mon t	1800
			grab		5400

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Table 3-6
Water Treatment Plant Acceptance Test
Data Quality Objectives

Parameter	Validation Level	Method	Sampling Locations: Equilization Tank (T111 or T112) Effluent (ETE)	Oil/water Separator Effluent (OWS)	Mix Reaction Tank Effluent (MRT)	Inclined Plate Separator Effluent (IPS)	Sand Filter Effluent (SFE)	AOP Reactor Influent (ARI)	AOP Reactor Effluent (ARE)	ist Carbon Effluent (LCE)	Final Discharge at Treatment Water Tank (T404) Effluent (FDE)	Filter Press Solids (FPF)	Daily	Seve Day
Liquid Process														
VOCs	M3	5030A/8260B	1							1	1		3	21
SVOCs	M3	3520C/8270C	1							1	1		3	21
Phenolics	IM1	420 2	1					1	1	1	1		5	35
PAH	M3	3520C/8310	1								1		2	14
TPH	IM1	8015M	1	1							1		3	21
Metals	M3	3005A/6010B/7470A	1								1		2	14
rsenic 3+	IM1	BR0021	1								1		2	14
Cyanide	M3	9010B	1								1		2	14
TKN	IM1	351 2	1								1		2	14
Fluoride	IM1	340 2	1								1		2	14
Phosphorus	IM1	365 2	1								1		2	14
Ammonia	IM1	350 3	1								1		2	14
Turbidity (on-site)	IM1	180 1	1								1		2	14
BOD_5 (on site)	IM1	405 1	1								1		2	14
Iron (on-site)	IM1	8008	1			1	1				1		4	28
TSS (on site)	IM1	160 2	1			1	1				1		4	28
Chromium VI (on site)	IM1	8023	1								1		2	14
pH (on site)	IM1	9040B	1		1			1	1		1		5	35
Temperature (on site)	IM1	170 1									1		1	7
DO (on site)	IM1	DO4500-OG	1		1			1			1		4	28
Residuals														
TCLP												1		1
% solids												1		1
Daily Total			19	1	2	2	2	3	2	3	20	0		
Seven Day Total			133	7	14	14	14	21	14	21	140	2		
												TOTAL	54	380

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Table 3 7
Water Treatment Plant Sampling Program Operation and Maintenance
Data Quality Objectives

Parameter	Validation Level	Method	Equilization Tank (T111) Effluent ETE1	Equilization Tank (T112) Effluent ETE2	Oil/water Separator Effluent OWS	Mix Reaction Tank Effluent MRT	Inclined Plate Separator Effluent IPS	Sand Filter Effluent SFE	AOP Reactor Influent ARI	AOP Reactor Effluent ARE	1st Carbon Effluent LCE	Final Discharge (T404) Effluent FDE	Existing Plant 1st Carbon Effluent EPC	Existing Plant Effluent EPE	Daily Total	Monthly Total
VOCs	M3	5030B/8260B	1/m	1/m	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1/m	1/m	1/m	1/m		6
SVOCs	M3	3510C/8270C	1/m	1/m	[illegible]	[illegible]	[illegible]	[illegible]	1/m	1/m	1/m	1/m	1/m	1/m		8
PAH	M3	3510C/8310		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1/m		1/m		2
TPH GRO	IM1	8015M	1/m	1/m	1/m	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1/m	[illegible]	1/m	[illegible]	5
TPH DRO	IM1	8015M	1/m	1/m	1/m	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1/m	[illegible]	1/m		5
Metals	M3	3010A/6010A/7470	1/m	1/m		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1/m	[illegible]	1/m		4
Arsenic 3+	IM1	BR0021	1/m	1/m	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1/m	[illegible]	1/m		4
Cyanide	M3	9012A	1/m	1/m	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1/m	[illegible]	1/m		4
TKN	IM1	351 3	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1/m	[illegible]	1/m		4
Fluoride	IM1	340 2		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1/m	[illegible]	1/m		2
Phosphorus	IM1	365 2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1/m	[illegible]	1/m		2
Ammonia	IM1	350 3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1/m	[illegible]	1/m		2
Turbidity (on site)	IM1	180 1		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1/m	[illegible]	1/m		2
BOD_5 (on site)	IM1	405 1		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		1/m	[illegible]	1/m		2
Iron (on site)	IM1	8008				1/d	1/d	1/d	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		3	
TSS (on site)	IM1	160 2	1/m	1/d		1/d	1/d	1/d	[illegible]	[illegible]	[illegible]	1/m	[illegible]	1/m	4	3
Chromium VI (on site)	IM1	8023			[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1/m	[illegible]	1/m		2
pH (on site)	IM1	9040B	1/m	1/m			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1/m		1/m		4
Temperature (on site)	IM1	170 1	1/m	1/m	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	1/m	[illegible]	1/m	[illegible]	4
DO (on site)	IM1	DO4500 OG	1/m	1/m			[illegible]	[illegible]	[illegible]	[illegible]		1/m	[illegible]	1/m	[illegible]	4
Monthly Totals			12	11	2			[illegible]	1	1	2	19	2	19		
Daily Totals				1		2	2	2	[illegible]	[illegible]						
													TOTAL		6	69

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Table 3 8 Groundwater Monitoring Data Quality Objectives

Sample Event	Sample Location	Analytical Methods	Sample Rationale
Quarterly Monitoring	MW 19 MW 20 MW 21 MW 22 MW 27	VOCs 5030B/8260B SVOCs 3510C/8270C	To ensure that contamination has not migrated through the clay layer or migrated outside the sheet pile containment wall M3 Validation
Pre Construction	26 Wells (all existing wells except MW 08 MW 04 MW 30 MW 29 MW 28 MW 31 MW 12)	VOCs 524 2 SVOCs 3520/525 2	To evaluate groundwater throughout the site M3 Validation
Post Construction (direct push investigation)	TBD 60 soil samples TBD 30 water samples	VOCs 5030A/8260B SVOCs 3540C/8270C VOCs 5030B/8260B SVOCs 3510C/8270C	To determine the most suitable locations for new monitoring wells M3 Validation
Proposed Post Construction (groundwater monitoring)	23+ wells (all wells determined to be appropriate will be evaluated at end of remediation)	VOCs 5030B/8260B SVOCs 3510C/8270C	To ensure that the soil remediation has sufficiently reduced contaminants in the groundwater to ensure protection of human health and the environment and to allow the shallow aquifer to be used as a potential drinking water supply M3 Validation

Screening soil samples will be collected in accordance with FSP Section 3 0 These samples will be analyzed by the on site laboratory for B(a)P equivalence Results will be used to determine when verification samples are to be submitted to the off site laboratory Initially the trigger for verification samples is when the on site B(a)P results are within 20% of performance criteria Once a correlation has been made between on site and off site laboratory results a refined trigger will be developed to ensure verification samples adequately represent the contamination boundary

3 1 2 2 Sediment

Cleanup levels for the West Tributary sediments were established in the ROD to ensure protection of aquatic life Sediments with concentrations greater than 3 2 ppm low molecular weight polynuclear aromatic hydrocarbons (PAH) 9 6 ppm high molecular weight PAHs and 0 4 ppm pentachlorophenol (PCP) will be removed All sediment cleanup levels are on a dry weight basis

Low molecular weight compounds include but are not limited to acenaphthalene acenaphthylene anthracene fluorene 2 methyl naphthalene naphthalene and phenanthrene High molecular weight PAHs include but are not limited to benzo(a)anthracene benzo(a)pyrene chrysene dibenzo(a h)anthracene fluoranthene and pyrene

Screening sediment samples will be collected in accordance with FSP Section 3 0 These samples will be analyzed by the on site laboratory for PAHs and PCP Results will be used to determine when verification samples are to be submitted to the off site laboratory Initially the trigger for verification samples is when the on site PAH results are within 20% of performance criteria Once a correlation has been made between on site and off site laboratory results a refined trigger will be developed to ensure verification samples adequately represent the contamination boundary

3 1 3 Thermal Desorption

RA activities associated with thermal desorption requirements include preparation POP and full scale operation activities See Tables 3 3 3-4 and 3 5 for appropriate analytical methods and level of validation Treated soil must comply with soil performance criteria prior to backfilling Stack emissions must meet MDE emission standards as detailed in FSP Section 3 1 and Appendix D of the POP Plan Water generated in the treatment process that is not recycled in the process will be treated in the on site water treatment system prior to discharge Water treatment requirements are contained in Section 3 1 4

3 1 3 1 Soil Performance Criteria

Excavated soil and sediment will be treated by thermal desorption to achieve the following cleanup criteria established in the ROD

- Treated material used for backfill as subsurface soil must be less than 1 0 ppm B(a)P equivalence and that treated soil used as backfill for surface soil contain less than 0 1 ppm B(a)P equivalence
- Treated sediments may not be placed back in the tributary
- Treated material used as backfill must meet health based delisting levels as presented in Table 7 3 and
- Treated material used as backfill on site must not exhibit any hazardous waste characteristics including Toxicity Characteristic Leaching Procedure (TCLP) toxicity (Table 7 3)

Treated soil and sediment samples will be submitted to the off site laboratory for verification of soil performance Materials compliant with soil performance criteria will be used as site backfill Decisions concerning non compliant materials will be made on a case by-case basis contingent upon analytical results Non compliant materials will either be retreated or sent off site

3 1 3 2 Air Emissions

Air emissions from the TDUs must be in compliance with substantive requirements of MDE governing air pollutants and air pollutants and air quality for the following

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- Visible Emissions Stack emissions shall not exceed 20% opacity
- Particulate Matter Stack emissions shall not exceed 0 05 gr/SCFD of particulate matter
- Toxic Air Pollutants (TAPs) To assess carcinogenic effects for Class I TAPs screening analysis needs to show that total allowable emissions from the premises will not cause increases in ambient levels that exceed risk based screening levels for the TAP For Class I or Class II TAPs to assess potential toxic effects other than cancer by a screening analysis showing that total allowable emissions from the premises will not cause increase in ambient levels that exceed applicable threshold limit value (TLV) based or special screening levels
- Nuisance Facility operations should not create nuisance or air pollution

3 1 4 Water Treatment

When the construction of the WTP is completed, an acceptance test will be conducted during which various internal operations will be monitored by effluent sampling During routine WTP operation long term monitoring will be conducted through the collection and analysis of various process samples and regulatory effluent sampling Samples requiring parameters with short holding times will be analyzed on site while all other samples will be sent off site Water discharged from the existing and new water treatment plants must be compliant with MDE effluent discharge criteria as specified in Section 7 4 See Tables 3 6 and 3 7 for appropriate analytical methods and level of validation

3 1 5 Groundwater Monitoring

The groundwater monitoring program will be implemented before during and after remediation activities to evaluate the effectiveness of soil remediation Groundwater will be sampled prior to the start of remediation to establish a contamination concentration baseline Following remediation, groundwater in the shallow aquifer will be monitored to assure that soil remediation effectively reduced groundwater contamination to ensure protection of human health and the environment Additionally the monitoring will demonstrate attainment of clean closure specifications See Table 3 8 for appropriate analytical methods and level of validation

3 2 DQO COMPONENTS

Specific DQOs for the site are defined by area in Tables 3 1 through 3 8 The following factors were considered in determining DQOs

- The purpose of collecting data from the media associated with each field activity
- The data types required to meet analytical chemical and physical objectives Included is the estimated number of data or samples that will be collected to meet the data objective
- A description of the sampling method being employed for each type of data
- The use of the data being collected
- The data validation specifications consistent with EPA Region III Innovative Strategies for Data Validation
- The analytical method that will be employed to analyze samples and
- The types and numbers of quality control samples that will be collected in association with each sampling event/media

An integral part of the identification of Data Quality Objectives is the development of analyte lists and the determination of Levels of Concern (LOC) The analyte lists and LOCs for the various media at the Site were developed to meet the requirements of the Record of Decision (ROD) MDE requirements and guidance from USEPA Region III The LOCs selected as DQOs are developed to ensure that the chosen analytical methods have detection limits sensitive enough to achieve RA specific objectives The LOCs are compared with analytical method reporting limits to ensure the method is capable of addressing project DQOs to preclude occurrence of false negative issues and to assess best available technology limitations

3 3 CHEMICAL DATA MEASUREMENT

The DQO process will be used to ensure chemical data will be of known defensible quality appropriate to achieving project objectives Project data needs will be defined in terms of quantitative uncertainties and qualitative assessment of requirements expressed as accuracy precision representativeness completeness comparability and sensitivity QC elements for sampling and analytical activities associated with these indicators are contained in Section 5 0 of this QAPP

3 3 1 Accuracy

Accuracy is a measure of system bias and is difficult to measure for the entire data collection activity It is quantitatively measured as 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 as specified in the equation

$$\% R = \frac{\text{test value}}{\text{true value}} * 100$$

Sources of error include the sampling process field contamination and sample preparation and analysis procedures The accuracy of RA activities will be qualitatively controlled through the use of standard operating procedures (SOPs) that have been developed to standardize sample collection field measurements and laboratory analysis activities

Field documentation will be used to evidence that protocols for field sampling and measurement activities are compliant with SOPs presented in Appendix B Field inspections performed by the CQC System Manager will be used to identify deviations and execute corrective actions (see Section 9 0) Consistent and proper calibration of equipment throughout the field exercises as described in this QAPP will ensure measurement accuracy Sampling accuracy will be by evaluated through the review of field (rinse and trip) blanks The information obtained from this review will be used in assessing potential concentration contributions from error sources

Analytical accuracy will be assessed quantitatively through the review and evaluation of matrix spikes surrogate spikes laboratory control samples and laboratory blanks Method QC criteria is contained in Tables 5 1 through 5 6 and includes QC procedures frequency of procedures and associated corrective action Table 5 7 presents accuracy and precision QC requirements for analytical procedures that will be used on the SMWT project

3 3 2 Precision

Precision refers to the level of agreement among repeated measurements of the same parameter It is usually stated in terms of standard deviation relative standard deviation relative percent difference range or relative range The overall precision of data is a mixture of sampling and analytical factors and is affected by the natural variation of the matrix field and/or laboratory handling errors and SOP deviations Sampling precision is unique to each site making it harder to control and quantify Duplicate samples will be collected at a frequency of 10% (one duplicate sample for every 10 samples) for critical samples and 5% for non critical samples Precision will be evaluated by calculating the relative percent difference (RPD) as follows

$$RPD (\%) = \frac{(XA - XB)}{XM} \quad 100$$

where

XA and XB are duplicate analyses and XM is the mean value of duplicate analyses (XA + XB)/2

XM is the mean value of duplicate analyses (XA + XB)/2 The analytical precision is easier to control and quantify because the laboratory is a controlled and therefore measurable environment Precision goals are included in Table 5 7

The RPD will be calculated for each analytical parameter that was detected in an environmental sample It is expected that the duplicates for aqueous matrices will have a RPD less than 50% and solid matrices will have

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a RPD less than 100% If these criteria are not met a careful examination of the sampling techniques sample media and analytical procedure will be conducted to identify the cause of the high RPD and the usefulness of the data

Instrument performance during initial calibration activities will be assessed through the evaluation of relative standard deviation according to the formula

$$\text{RSD (\%)} = \sum_{i=1}^{n} \frac{(x_i - x)^2}{(n-1)}$$

The goals for each factor are presented in Table 5 7 If these criteria are not met an examination of the data will be conducted to determine the cause of the variability and usefulness of the data

3 3 3 Representativeness

Representativeness is a measure of the degree to which the measured results accurately reflect the medium being sampled It is a qualitative parameter that is addressed through the proper design of the sampling program in terms of sample location number of samples and actual material collected as a sample of the whole

Sampling protocols have been developed to assure that samples collected are representative of the media Field handling protocols (e g storage handling in the field. and shipping) have also been designed to protect the representativeness of the collected samples Proper field documentation and QC inspections will be used to establish that protocols have been followed and that sample identification and integrity have been maintained

3 3 4 Completeness

Completeness is a measure of the amount of information that must be collected during the field investigation to allow for successful achievement of the objectives An adequate amount and type of data must be collected for conclusions to be valid Missing data may reduce the precision of estimates or introduce bias thus lowering the confidence level of the conclusions While completeness has been historically presented as a percentage of the data that is considered valid. this does not take into account critical sample locations or critical analytical parameters

The amount and type of data that may be lost due to sampling or analytical error cannot be predicted or evaluated in advance The importance of any lost or suspect data will be evaluated in terms of the sample location analytical parameter nature of the problem decision to be made and the consequence of an erroneous decision Critical locations or parameters for which data is determined to be inadequate will either be re sampled and reanalyzed or the data will be appropriately qualified based on the decision of the Project Officer The completeness goal percentage of valid data is set at 98 $\pm$ 2% for the RA

Completeness will be calculated using the following equation

$$\text{\% Completeness} = \frac{\text{Number of Useable Data}}{\text{Number of Requested Analyses}}$$

3 3 5 Comparability

Comparability is the confidence with which one data set can be compared to another Comparability will be controlled through the use of SOPs that have been developed to standardize the collection of measurements and samples and approved analytical technique with defined QC criteria Consistent and proper calibration of equipment throughout the field exercises as described in this QAPP will assist in the comparability of measurements Field documentation and QA audits will be used to establish that protocols for sampling and measurement follow appropriate SOPs

3 3 6 Sensitivity

Sensitivity requirements are expressed differently for various methods The instrument detection limits (IDL) the method detection limits (MDL) and the practical quantitation limits (PQL) published within USEPA methods are based upon a reagent water matrix and are not reflective of typical sample matrices therefore care

will be taken in establishing limits for laboratory analysis The published limits may not be achievable for environmental samples but they should compare reasonably with control samples This compliance will be verified during data validation Contract Required Quantitation Limits (CRQLs) will be used for CLP SOW analyses The target analytes detected above the IDL or MDL but less than the PQL limits will be reported as estimated values Target analytes detected above the upper calibration standard will also be reported as estimated values In this case the sample will be diluted and rerun

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4 0 SAMPLE MANAGEMENT

4 1 SAMPLE NUMBER AND TYPE

The sample matrices for the environmental and quality control samples to be collected during the remedial activities include water soil air and sediment Samples will be collected according to the frequencies presented in Tables 3 1 to 3 8 Quality control samples are discussed in Section 6 0

Sample collection, preservation, handling, storage packaging, and shipping will be performed in a manner that minimizes damage loss deterioration, and artifacts Procedures described are designed to eliminate external contamination and to ensure data quality through the use of approved standardized sampling procedures Specific methods of collection are detailed in SOPs provided in Appendix B

4 2 SAMPLE CONTAINERS

The off site and on site laboratories will provide certified pre-cleaned sample bottles for chemical analyses Sample container requirements for various analyses are provided in Table 4 1

4 3 SAMPLE PRESERVATIVES

Preservatives will be used, as applicable to retard hydrolysis of chemical compounds and complexes to reduce volatility of constituents and to retard biological action during transit and storage prior to laboratory analysis All containers will be pre-preserved. Preservation requirements for samples collected during this project are contained in Table 4 1 In addition to chemical preservatives samples for chemical analysis will be transported to the off site laboratory in temperature-controlled coolers Double bagged ice will be used to maintain the internal cooler temperature of 4±2°C A temperature blank will be included in each shipping container to monitor the internal temperature

4 4 HOLDING TIMES

Sample holding time is defined as the interval between sample collection to sample extraction and analysis such that a sample may be considered valid and representative of the sample matrix The allowable holding times for samples are summarized in Tables 4 1 The laboratory QA program will be responsible for ensuring the adequacy of the sample tracking system in precluding holding time deficiencies

4 5 SAMPLE IDENTIFICATION

The sample identification number consists of an alpha numeric designation related to the investigation area, media type and sequential collection order according to the following convention

- Location Code

  SS = Soil Screening
  SV = Soil Verification
  SE = Sediment
  PP = Proof of Performance (US TS HC IS and B or C should follow this prefix)
  US = Untreated Soil
  TS = Treated Soil
  HC = Hot Cyclone
  IS = Impinger Sludge
  CIB = 2nd hot cyclone and impinger sludge from batch unit
  B = Batch
  C = Continuous
  AR = Air
  ETE = Equalization Tank Effluent
  OWS = Oil/water Separator Effluent
  MRT = Mix Reactor Tank Effluent
  IPS = Inclined Plate Separator Effluent

Table 4-1
Method, Parameter, Container, and Preservation Requirements

Parameter	Method	Sample Container (Solid)	Sample Container (Aqueous)	Preservation Requirement	Holding Times
VOCs	SW 846 5030A/8260B	120 ml wide mouth glass with Teflon septum	4 oz glass with Teflon septum	HCl to pH<2 for Aq Cool 4 ± 2 C	14 days
SVOCs	SW 846 3520C aq 3540C solid 3550M on site solid 8270C	4 oz wide mouth glass with Teflon cap	2 1 L amber glass with Teflon lined cap	Cool 4 ± 2 C	Aqueous Extraction 7 days Analysis 40 days Solid Extraction 14 days Analysis 40 days
Metals Mercury	SW 846 3005A/ 6010B SW 846 3005A 7470A aq 7471A solid	4 oz wide mouth glass with Teflon cap	1 L glass or polyethylene	HNO3 to pH<2 for Aq Cool 4 ± 2 C	180 days except mercury at 28 days
Hexavalent Chromium	Hach 8023	N/A	500 ml glass or polyethylene	Cool 4 ± 2 C	24 hours (on site)
Iron	Hach 8008	N/A	500 ml glass or polyethylene	Cool 4 ± 2 C	24 hours (on site)
Cyanide (Total and Amenable to Chlorination)	SW 846 9010B	4 oz wide mouth glass with Teflon cap	1 L glass or polyethylene	NaOH to pH>12 for Aq Cool 4 ± 2 C	14 days
BOD5	USEPA 405.1	N/A	1 L glass or polyethylene	Cool 4 ± 2 C	48 hours (on site)
Ammonia	USEPA 350.3	N/A	250 ml glass or polyethylene	H2SO4 to pH<2 Cool 4 ± 2 C	28 days

Table 4 1 (Continued)
Method, Parameter, Container, and Preservation Requirements

Parameter	Method	Sample Container (Solid)	Sample Container (Aqueous)	Preservation Requirement	Holding Times
Dissolved Oxygen	DO 4500 OC	N/A	4 oz glass or polyethylene	None Required	Analyze immediately (on site)
Temperature	USEPA 170 1	N/A	4 oz glass or polyethylene	None Required	Analyze immediately (on site)
pH	SW 846 9040B	N/A	4 oz glass or polyethylene	None Required	Analyze immediately (on site)
Turbidity	USEPA 180 1	N/A	4 oz glass or polyethylene	Cool 4 ± 2 C	48 hours (on site)
EPH DRO	SW 846 8015M	4 oz wide mouth glass with Teflon cap	2 1 L amber glass with Teflon lined cap	Cool 4 ± 2 C	Aqueous Extraction 7 days Analysis 40 days Solid Extraction 14 days Analysis 40 days
EPH GRO	SW 846 8015M	4 oz wide mouth glass with Teflon cap	4 oz glass with Teflon septum	HCl to pH<2 for Aq Cool 4 ± 2 C	14 days
Phenolics	USEPA 420 2	N/A	1 L glass or polyethylene	H2SO4 to pH<2 Cool 4 ± 2 C	28 days
Total Phosphorus	USEPA 365 2	N/A	250 ml glass or polyethylene	H2SO4 to pH<2 Cool 4 ± 2 C	28 days
TSS	USEPA 160 2	N/A	250 ml glass or polyethylene	Cool 4 ± 2 C	7 days (on site)
Fluoride	USEPA 340 2	N/A	250 ml glass or polyethylene	Cool 4 ± 2 C	28 days
Chloride	SW 846 9056	4 oz wide mouth glass with Teflon cap	250 ml glass or polyethylene	Cool 4 ± 2 C	28 days

Table 4-1 (Continued)
Method, Parameter, Container, and Preservation Requirements

Parameter	Method	Sample Container (Solid)	Sample Container (Aqueous)	Preservation Requirement	Holding Times
TCE	SW 846 8151A	4 oz wide mouth glass with Teflon cap	2 1 L amber glass with Teflon lined cap	Cool 4 ± 2 C	Aqueous Extraction 7 days Analysis 40 days Solid Extraction 14 days Analysis 40 days
PAHs	SW 846 3520C aq/ 3540C sol/ 8310	4 oz wide mouth glass with Teflon cap	2 1 L amber glass with Teflon lined cap	Cool 4 ± 2 C	Aqueous Extraction 7 days Analysis 40 days Solid Extraction 14 days Analysis 40 days
Percent Moisture	ASTM D 2216	1 L glass jar	N/A	Bottle lid wrapped with Teflon tape to seal in moisture	None (on site)
Trivalent Arsenic	BR0021	N/A	500 ml glass or polyethylene	Cool 4 ± 2 C	Analyze as soon as possible
Density	ASTM D 1557	1 L glass jar	N/A	None	None
Dioxins/ furans	SW 846 8290	4 oz wide mouth glass with Teflon cap	2 1 L amber glass with Teflon lined cap	Cool 4 ± 2 C	Aqueous Extraction 30 days Analysis 40 days Solid Extraction 30 days Analysis 40 days
Reactive Cyanide	SW 846 Chapter 7	500 ml wide mouth glass with Teflon cap	N/A	NaOH pH > 12 Cool 4 ± 2 C	14 days
Reactive Sulfide	SW 846 Chapter 7	500 ml wide mouth glass with Teflon cap	N/A	NaOH pH > 12 Zinc Acetate Cool 4 ± 2 C	7 days
Ignitability	SW 846 1010	500 ml wide mouth glass with Teflon cap	N/A	Cool 4 ± 2 C	28 days

Table 4 1 (Continued)
Method Parameter, Container, and Preservation Requirements

Parameter	Method	Sample Container (Solid)	Sample Container (Aqueous)	Preservation Requirement	Holding Times
TKN	USEPA 351 2	N/A	250 ml glass or polyethylene	H2SO4 to pH<2 Cool 4 ± 2 C	28 days
Corrosivity	SW 846 9045C	500 ml wide mouth glass with Teflon cap	N/A	Cool 4 ± 2 C	28 days
TCLP Inorganics	SW 846 1311/ 3005A/6010B/ 7470A	500 ml wide mouth glass with Teflon cap	N/A	Cool 4 ± 2 C	Leaching 6 months 28 days for Hg Analysis 6 months 28 days for Hg
TCLP Organics	SW 846 1311/3520C 8260B/ 8270C/ 8081A/ 8151A	500 ml wide mouth glass with Teflon cap	N/A	Cool 4 ± 2 C	Leaching 14 days Extraction 7 days Analysis 40 days

Parameter	Method	Sample Container (Air)	Preservation Requirement	Holding Times
VOCs	40CFR60 Method 30 SW846 8260	Tenax Tube Tenax/Charcoal Tube 40 ml condensate VOA vial	Cool 4 ± 2 C	28 days
SVOCs	40CFR60 Method 23/10 SW846 8270A	1 liter amber (probe rinse) 1 liter amber (impinger) XAD 2 quartz filter	Cool 4 ± 2 C	14 days
HCl	40CFR60 Method 26A/5	impingers	Cool 4 ± 2 C	7 days
Metals	40CFR60 Method 29 SW 846 6010/7471	1 liter amber (probe rinse) filter impingers (16 oz plastic)	Cool 4 ± 2 C HNO3 for impingers	7 days
Dioxin/Furan	40CFR60 Method 23 SW 846 8290	1 liter amber (probe rinse) 1 liter amber (impinger) XAD 2 quartz filter	Cool 4 ± 2 C	7 days
Perimeter VOCs	TO 14	Summa canister	Cool 25 ± 2 C	14 days

SFE	=	Sand Filter Effluent
ARI	=	AOP Reactor Influent
ARE	=	AOP Reactor Effluent
LCE	=	Liquid Phase Carbon Effluent
FPC	=	Filter Press Cake
FPI	=	Filter Press Influent
FPF	=	Filter Press Filtrate
WC	=	Waste Carbon
FDE	=	Final Discharge Effluent
TDU	=	TDU Effluent (B or C)
VE	=	vertical tank effluent
ME	=	modular tank effluent
ST	=	Stack sample
PO	=	Pre thermal oxidizer

- Sequential Collection Order This consists of three digits such as 001 002 003 and so on
- Quality Control Samples Four quality control types that will be collected during remedial activities include

  TB = Trip Blank
  DP = Duplicate sample
  RB = Rinse Blank
  FB = Field Blank

- Sample Depth (if applicable) Soil samples that are to be collected at different depths from the same location shall be designated

  A = Shallow
  B = Medium
  C = Deep

Quality control samples will be labeled with the date and the type of quality control sample and sequential number For example the first rinse blank collected on November 9 1997 would be labeled 971109RB001

4 6 DOCUMENTATION REQUIREMENTS

Information pertinent to the sampling effort will be recorded in a bound field logbook with sequentially numbered pages The field logbook is identified by the Site Name (SMWT) Sampling Event and the Volume Number of the logbook within the sampling event The Sampling Event is also the basis for a defined feature of work (e g surface soil sampling) This logbook is cross referenced to other logbooks by the sampling event titles volume number of the logbook and page number within the logbook During field operations the logbook will remain with field personnel at all times All entries will be made in indelible ink on consecutively numbered pages and corrections will consist of line-out deletions that are initialed and dated

At a minimum required field logbook entries include

- Time and date of sample collection

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- Sampler identification
- Sample identification number
- Sample type
- Analytical request
- Sampling methodology (grab and composite sample)
- Preservation used
- Associated QA/QC samples
- Physical field measurements
- Signature and date of personnel responsible for observations

Each sample will be assigned a unique sequential number at the time of sampling which will be permanently affixed to the sample container with polyethylene tape to prevent the loss of the label during shipment An example of a sample label for this RA is given in SOP 50 1 in Appendix B The sample label will be filled out using indelible ink and will include the following information

- Project name
- Project number
- Sample location/site ID
- Sampling date and time
- Analyses to be performed
- Preservative
- Sampler name

In addition to the sample description in the field logbook, each sample will be recorded on a pre printed chain of custody form (COC)

If photographs are to be taken during the RA, a photo log journal will be kept This journal will have each picture numbered and identified by location Each row should also be numbered, have a title and be initialed by the photographer

4 7 PACKAGING AND CHAIN OF CUSTODY REQUIREMENTS

Sample coolers will be shipped to arrive at the laboratory the morning after sampling (priority overnight) or will be sent by a courier to arrive the same day The laboratory will be notified of the sample shipment and the estimated date of arrival

4 7 1 Chain of Custody

Sampling will be evidenced through the completion of a COC form which accompanies the samples containers in the field, during transit to the laboratory and upon receipt by the laboratory The COC will be annotated to indicate the time and date that samples were relinquished In addition shipping containers will be affixed with custody seals or evidence tape across the cooler opening in two locations to ensure the integrity of the samples during shipment A copy of the COC is provided in SOP 10 2 in Appendix B

The COC will be filled out using indelible ink and will include the following information

- Project name and number
- The signatures of the sampling personnel

- The site code and sample number
- Sampling dates locations and sampling times (military format)
- List of the chemical analysis container volume and any preservatives used
- Type of sample i e grab or composite
- The total number of containers per location
- The custody seal number
- Sample relinquish date and time
- Courier or carrier airbill number and analytical laboratory

4 7 2 Sample Packaging and Shipment

Samples will be transferred to the off site laboratory for analysis via waterproof plastic coolers Each cooler will be packed in the following manner

1 Ensure sample lids are tight

2 Place about 3 inches of inert cushioning material such as vermiculite in bottom of the cooler

3 Wrap environmental samples and associated QC samples in bubble wrap and place in a water tight plastic bag

4 Fill cooler with enough packing material to prevent breakage of glass bottles

5 Place sufficient ice in cooler to maintain the internal temperature at 4±2°C during transport The ice will be double bagged to prevent contact of the melt water with the samples

6 Place associated COCs in a water proof plastic bag and tape it with masking tape to the inside lid of the cooler and

7 Seal coolers at a minimum of two locations with signed custody seals or evidence tape before being transferred off site Attach completed shipping label to top of the cooler Place This Side Up labels on all four sides and Fragile labels on at least two sides Cover seals with wide clear tape and continue around the cooler

4 7 3 Sample Receipt

Samples delivered to the lab will be accepted by the laboratory technician Samples can be accepted Monday through Friday Special arrangements will be required if Saturday or Sunday delivery is necessitated

The integrity of the samples received should be verified by completion of the sample receipt verification form as part of the laboratory s QA program This checklist will be included in the data quality control report (DQCR)

Once the sample has been received by the laboratory the following sequence of events will occur

- The samples are recorded on the Sample Log In Form to summarize all the information pertaining to the sample/order to instruct the laboratory on the proper analysis and reporting of samples
- After the samples are logged in they are assigned to the appropriate locked storage refrigerator
- All transfers of samples into and out of storage are documented
- Samples remain in secured storage until removed for sample preparation or analysis
- A refrigeration log must be generated by laboratory personnel to ensure refrigerators/freezers are operating at the appropriate temperature The log must indicate the ambient internal temperature as well as the initials of the person recording the reading and the date Should the temperature fluctuate outside of the specified holding range corrective action must be taken immediately

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5 0 ANALYTICAL PROCEDURES

This section is inclusive of the general analytical procedures at SMWT and provides the general baseline analytical procedures The laboratories reporting limits for each analyte are provided in Section 7 0 A copy of the off site laboratories Missouri River District (MRD) certification are provided in Appendix C 2 and G The on site laboratory s SOPs and facility will be inspected by a USACE chemist In addition this section contains a discussion on sensitivity specifically the conditions for limits of quantitation and detection

5 1 LABORATORY PROCEDURES FOR SOIL AND WATER

Analytical protocols will be in accordance with USEPA approved methods and include metals cyanide VOCs and SVOCs PAHs dioxins/furans TCLP analyses physical analyses general water quality parameters herbicides and PCP The following sections briefly describe the analytical methodologies to be used during the RA Specific laboratory QA/QC activities (e g calibration and preventative maintenance) are identified in more detail in the laboratory s QA Plan (refer to Appendices C through I) and SOPs The analyte listing for methods used on this project is contained in Table 5 1

5 1 1 Volatile Organic Compounds (VOCs)

Aqueous and solid VOC samples will be analyzed using SW 846 8260B using purge and trap technology Initially the extract should be screened on a gas chromatograph/flame ionization detector (GC/FID) to determine the approximate concentration of organic constituents in the sample An inert gas is bubbled through a mixture of reagent water and soil sample or through either a 5 mL (surface water) or a 25 mL (groundwater) sample contained in a specifically designed purging chamber at 40 C for soil and ambient temperature for water The vapor is swept through a sorbent column where the purgeable compounds are trapped Following purging the sorbent column is heated and backflushed with the inert gas to desorb the purgeable compounds onto a gas chromatography programmed to separate the compounds which are then detected with a mass spectrometer (MS)

5 1 2 Semivolatile Organic Compounds (SVOCs)

Aqueous and solid samples for SVOCs will be analyzed using SW 846 8270C Solid samples are prepared using Soxhlet extraction (sonication for contaminated samples) aqueous samples are prepared for analysis using continuous liquid/liquid extraction techniques Soil samples will be screened to determine the appropriate analytical level Gel Permeation Chromatography will be used to clean soil samples The extract is injected onto a gas chromatograph programmed to separate the purgeable compounds that are then detected with a MS

5 1 3 Polynuclear Aromatic Hydrocarbons (PAHs)

Aqueous and solid samples for PAHs will be analyzed using SW 846 8310 Solid samples are prepared using Soxhlet extraction aqueous samples are prepared for analysis using continuous liquid/liquid extraction techniques The extracts are then analyzed using high performance liquid chromatography A 5 to 25 µl aliquot of the extract is injected into an High Performance Liquid Chromatography (HPLC) and compounds in the effluent are detected by ultraviolet (UV) and fluorescence detectors

5 1 4 Herbicides and Pentachlorophenol (PCP)

Aqueous and solid samples are analyzed according to USEPA SW 846 Method 8151A Samples are extracted with diethyl ether and then esterified with either diazomethane or pentafluorobenzyl bromide The derivatives are determined by gas chromatography with an electron capture detector (GC/ECD) The results are reported as acid equivalents Soil and waste samples are extracted and esterified with diazomethane or pentafluorobenzyl bromide only

5 1 5 Dioxin/Furan

The analytical method used for the analysis of approximately 17 dioxins and furans USEPA SW 846 Method 8290 calls for the use of high resolution gas chromatography and high resolution MS (HRGC/HRMS) on purified sample extracts This method is specific for the analysis of 2 3 7 8 tetrachlorinated dibenzofuran (2 3 7 8 TCDD) substituted penta hexa hepta and octachlorinated dibenzo p-dioxins (PCDDs) and dibenzofurans in water soil and waste samples of various media Measurements of toxicity are required for the analysis

Table 5 1
Analytical Methodology Parameter List

Polynuclear Aromatic Hydrocarbons (PAHs) by HPLC SW 846 3520C or 3510C/3540C/8310

Acenaphthene
Acenaphthylene
Anthracene
Benzo[a]anthracene
Benzo[b]fluoranthene
Benzo[k]fluoranthene
Benzo[a]pyrene
Chrysene
Dibenzo[a h]anthracene
Fluoranthene
Fluorene
Indeno[1 2 3-cd]pyrene
Naphthalene
2 Methylnaphthalene
Phenanthrene
Pyrene

Semivolatile Organic Compounds by GC/MS SW 846 3520C or 3510C/3540C/8270C (3550B/M for on site)
*** on site parameter list is included in Appendix D 8270C SOP**

4 Chloro 3 methylphenol (p-Chloro m-cresol)
2 Chlorophenol
2 4 Dimethylphenol
2 4 Dinitrophenol
Carbazole
Phenol
2 3 4 6 Tetrachlorophenol
1 4 Dichlorobenzene
2 4 Dinitrotoluene
Hexachlorobenzene
Hexachlorobutadiene
Hexachloroethane
2 Methylphenol
3 Methylphenol
4 Methylphenol
Nitrobenzene
Pyridine
2 4 5 Trichlorophenol
2 4 6 Trichlorophenol

Pesticides GC/ECD SW 846 8081 or 8081A

γ BHC (Lindane)
Chlordane
Endrin
Heptachlor (and its oxides)
Methoxychlor
Toxaphene

ORIGINAL R-01

Table 5 1 (Continued) Analytical Methodology Parameter List

Volatile Organic Compounds by GC/MS SW 846 5030A or B/8260B
- Benzene
- 2 Butanone (MEK)
- Carbon tetrachloride
- Chlorobenzene
- Chloroform
- 1 2 Dichloroethane
- 1 1 Dichloroethene
- Tetrachloroethene
- Trichloroethene
- Ethylbenzene
- Styrene
- Xylene
- Vinyl chloride

Herbicides and Pentachlorophenol by GC/ECD SW 846 8151A
- 2 4 D
- 2 4 5 TP
- Pentachlorophenol

Ignitability SW-846 1010 (Chapter 7)
Corrosivity SW 846 9045 or 9045C
Total Releasable Cyanide SW 846 (Chapter 7)/9012A
Total Releasable Sulfide SW 846 (Chapter 7)/9030A
BOD5 by USEPA 405 1 (on site and off site)
TKN by USEPA 351 2
TPH by GC SW 846 8015BM
TSS by USEPA 160 2 (on site)
pH by Probe SW 846 9040B (on site)
Temperature by Probe USEPA 170 1 (on site)
Turbidity by Nephelometric USEPA 180 1 (on site and off site)
Total Phosphorus by USEPA 365 2
Dissolved Oxygen by DO 4500 OG (on site)
Fluoride by USEPA 340 2
Phenolics by 4AAP USEPA 420 2 or 9065
Ammonia by USEPA 350 3
Dioxin/furans – SW 846 8290
Chlorides – SW 846 5050/9252A
Metals by ICP SW 846 3005A or 3010A/6010A or B or 7000
- Arsenic (total)
- Barium
- Cadmium
- Chromium
- Copper
- Iron
- Lead
- Nickel
- Selenium
- Silver
- Zinc

Mercury by Cold Vapor SW 846 3005A/7470A/7471A or 1631
Hexavalent Chromium by colorimetric Hach 8023 (on site)
Iron by colorimetric Hach 8008 (on site)
Trivalent Arsenic by – BR0021
Cyanide Amenable to Chlorination by SW 846 9010B or 9012A

5 1 6 Inorganics

Samples will be analyzed for inorganic metals and cyanide using a combination of the following methodologies to achieve project DQOs (1) cold vapor atomic absorption (CVAA) by SW 846 7000 (2) inductively coupled plasma emission spectroscopy (ICP) by SW 846 6010A or B and (3) Cyanide will be processed using a colorimetric technique SW 846 9010B or 9012A

The ICP method involves the simultaneous or sequential multi-element determination of trace elements in solution The basis of the method is the measurement of atomic emission by optical spectrometry Samples are nebulized and the aerosol that is produced is transported to the plasma torch where excitation occurs Characteristic atomic line emission spectra are produced by a radio frequency inductively coupled plasma A background correction technique is utilized to compensate for variable background contribution to the determination of trace elements

Mercury will be analyzed using CVAA A sample aliquot is initially digested with nitric acid to free any combined mercury The mercury is then reduced to its elemental state and aerated from the solution into a closed system The mercury vapor is passed through a cell positioned in the path of a mercury light source and the measured absorbance is proportional to the concentration of mercury in the sample

Samples that will be analyzed for their general chemistry parameters will use a combination of methodologies to achieve project DQOs The methods primarily range from direct probe readings to colorimetric and nephelometric determinations They include

- BOD5 will be analyzed by USEPA 405 1
- Ammonia by USEPA 350 3
- Total Kjeldahl Nitrogen (TKN) by USEPA 351 2
- Turbidity by USEPA 180 1
- TPH by SW 846 8015M.
- Phenolics by USEPA 420 2 or 9065
- Total phosphorus by USEPA 365 2
- TSS by 160 2
- Chlorides by SW 846 5050/9252A.
- Fluoride by USEPA 340 2 and
- Trivalent arsenic by BR0021

5 1 7 Toxicity Characteristic Leaching Procedure (TCLP) Reactivity, Corrosivity, and Ignitability

Samples requiring waste characterization will be TCLP extracted and then analyzed for the full TCLP parameters as well as for reactive cyanide and sulfide and ignitability The methodology references include

- TCLP Metals by SW 846 1311/3005A or 3010A/6010a or B/7000
- TCLP pesticides by SW 846 1311/8081 or 8081A
- TCLP SVOCs by SW 846 1311/3520C or 3510C/8270
- TCLP herbicides by SW 846 1311/8151A
- TCLP VOCs by SW 846 1311/5030A or B/8260B
- Reactive cyanide/sulfide by SW 846 Chapter 7/9012A/9030A
- Ignitability by SW 846 1010 and

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- Corrosivity by SW 846 9045C

5 1 8 Percent Moisture

Percent moisture in soil will be determined on site using ASTM Method D 2216 (ASTM 1991a) This method involves the determination of the percent water mass in a known mass of undried soil by weighing the soil before and after drying in an oven controlled at 110 C The water content of a material is defined as the ratio expressed as a percentage of the mass of pore or free water in a given mass of material to the mass of the solid particles

5 1 9 Density

Density in soil will be determined using ASTM Method D 1557 (ASTM. 1991a) This method involves the determination of the relationship between water content and dry unit weight of soils A soil at a selected water content is placed in five layers into a mold of given dimensions with each layer compacted by 25 or 26 blows of a 10 lb hammer dropped from a distance of 18 in The resulting dry weight is determined The procedure is repeated for a sufficient number of water contents to establish a relationship between the dry unit weight and the water content for the soil

5 2 STACK SAMPLING AIR METHODS

Stack emissions will be sampled and analyzed during POP activities in accordance with specifications contained in EPA Title 40 Part 60 Appendix A. *Standards of Performance for New Stationary Sources* The stack emissions will be sampled for

- VOCs by 40 CFR 60 Method 30/ SW 846 8240
- Temperature by Method 1 and 2
- Moisture by Method 4
- SVOCs by 40 CFR 60 Method 10 and 23/ SW 846 8270
- HCl by Method 26A/5
- Metals by 40 CFR 60 Method 29/ SW 846 7421/7470
- Particulates by Method 5
- Opacity by Method 9
- Flow by Method 1 and 2 and
- Dioxin/Furans by 40 CFR 60 Method 23/ SW 846 8290

5 2 1 VOCs

Method 30 will be used to determine VOC concentrations from the oxidizer and TDU stack emissions Samples will be collected using a VOST sampling train Recovered condensate will be placed in glass vials and filled with distilled water until no headspace exists Samples will be analyzed for the volatiles by thermal desorption purge and trap and gas chromatography/mass spectrometry (GC/MS)

5 2 2 Dibenzo-p Dioxins and Polychlorinated Dibenzofurans

Method 23 will be used to analyze dioxins and furans from the oxidizer and TDU stack emissions A sample will be withdrawn from the gas stream isokinetically and collected in the sample probe on a glass fiber filter and on a packed column of adsorbent material

5 2 3 Hydrogen Chloride

Method 5/26A will be used to determine hydrogen chloride from the oxidizer and stack samples A stack sample will be passed through a prepurged heated probe and filter into dilute sulfuric acid and dilute sodium

hydroxide solutions which collect the gaseous hydrogen chloride Hydrogen chloride is solubilized in the acidic solution to form ions which are subsequently tested using ion chromatography

5 2 4 Metals

Method 29 is applicable to the determination of antimony arsenic barium beryllium cadmium chromium cobalt copper lead manganese mercury nickel phosphorus selenium silver thallium and zinc This method may also be used to determine particulate emissions An isokinetic stack sample is withdrawn particulate emissions are collected in the probe and on a heated filter gaseous emissions are then collected in an aqueous acidic solution of hydrogen peroxide (analyzed for all metals including mercury) and an aqueous acidic solution of potassium permanganate (analyzed for mercury only) The recovered samples are digested and appropriate fractions are analyzed for mercury by CVAA and other analytes by ICAP Lead can be analyzed by GFAA if greater analytical sensitivity is needed

5 2 5 SVOCs

Methods 10 and 23 will be used to determine SVOC concentrations from the oxidizer and TDU stack emissions Samples will be collected on a filter and solid sorbent trap and in aqueous impinger reagents Recovered samples will be extracted and analyzed by GC/MS

5 2 6 Flow

Determination of stack gas flow will be determined using either Method 1 Sample and Velocity Traverses for Stationary Sources or Method 2 Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pilot Tube) Method 1 is applicable to flowing gas streams and cannot be used when the flow is cyclonic or swirling Method 2 determines stack gas velocity uses the gas density and from the measurement of the average gas velocity head with a Type S (Stausscheibe or reverse type) pilot tube

5 2 7 Moisture Content

Method 4 *Determination of Moisture Content in Stack Gases* will be used to determine moisture content from the stack during proof of performance A gas sample is extracted at constant rate from the source Moisture is removed from the sample stream and determined either volumetrically or gravimetrically

5 2 8 Opacity

Method 9 will be used to determine plume opacity from the TDUs during the POP In addition to the determination of plume opacity this method also specifies training and certification requirements for observers

5 2 9 Particulates

Particulate matter is withdrawn isokenetically from the stack and collected on a glass fiber filter maintained at a temperature in the general range of 120±14 C in accordance with Method 5

5 3 PERIMETER AIR MONITORING

The perimeter monitoring samples will be tested for

- VOCs with method TO 14 and
- Particulates by dust monitor

5 4 LABORATORY CALIBRATION

Prior to sample analysis chemical calibration of each target analyte/compound must be performed to ensure analytical instrumentation is functioning within the established sensitivity range Specific information on procedures for method validation initial and continuing calibration external and internal calibration and MS/MSD may be found in the laboratories QAPs (Appendices C D E and F) Method QC criteria for water and soil analyses are summarized in Tables 5 2 to 5 8 Soil and water sample spiking criteria for precision and accuracy may be found in Table 5 9 Method QC and sample spiking criteria for perimeter and stack air analyses can be found in Appendices E and F respectively Additional details concerning laboratory calibration and method QC requirements may be found in the laboratories QAPs and SOPs

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5 5 METHOD DETECTION LIMITS

The method detection limit is the minimum concentration of an analyte that can be measured and reported with a 99% confidence that the analyte is above zero and is determined from analysis of a sample in a given matrix containing the analyte The method detection limits are derived by the method based upon 40 CFR Chapter 136 The method detection limit determined using this procedure is used to assess the importance of the measurement of a future sample

5 6 FIELD TESTING, SCREENING AND CALIBRATION

During the environmental sample collection activities conducted at SMWT selected physical and chemical parameters will be measured at the site For example specific conductance pH temperature redox potential and dissolved oxygen measurements will be collected in conjunction with the chemical data for groundwater and surface water characterization Standard operating procedures used in field analyses are contained in Appendix B Because field instrumentation and analytical methodology are continually being updated, field personnel are required to consult the manufacturer s instruction manual of each piece of equipment for operating procedures

The proper calibration and documentation of field equipment are designed to assure that the field equipment is functioning optimally A listing of the field equipment manufacturer model and field equipment calibration may be found in Table 5 10 Measurements will be documented in the field logbook or on a separate calibration log form by the field personnel performing the calibration Equipment logbooks are required to record usage maintenance calibration, and repair The field equipment calibration includes the following elements for each instrument

- Measurement objectives
- Frequency of field calibration
- Calibration procedure and standards and
- Instrument specific maintenance

Table 5 2 Quality Control Method Criteria for Volatile Organic Compounds by SW 846 8260B

Procedure	Frequency	Acceptance Criteria			Corrective Action
Initial calibration curve 5 pt curv	Set up major maintenance and quarterly	RRF 0 01 (Advisory) RRF > 0 10 for SPCC except chlorobenzene and 1 1 2 2 TCA >0 30 RSD ≤ 15 RSD ≤ 30 for CCCs response factor Lab may use first or higher order regression fit (r ≥ 0 99) if RSD ≥ 15			If RSD of the average RRF for calibration check compounds > 30 the initial calibration must be repeated Data reviewer should review and judge all of the target compounds against the acceptance criteria
Continuing calibration check	Every 12 hours	/Difference for RF of CCC of continuing calibration compounds ±20 from initial calibration RRF > 0 01 (Advisory) RRF > 0 10 for SPCCs except chlorobenzene and 1 1 2 2 TCA >0 30			Samples cannot begin until this criterion is met Data reviewer should review and judge all of the target compounds against the acceptance criteria
Method blank	Every 12 hours	No target analytes			Document source of contamination
Tuning BFB	Prior to calibration	Must meet tuning criteria			Re tune re calibrate
LCS	Every batch	Specified QC limits			Qualify associated data biased high or biased low as appropriate
Internal standards	Every sample	Standards bromochloromethane 1 4 difluorobenzene chlorobenzene	Retention time ±30 seconds of last CC Area changes by a factor of two (50 to +100)		Inspect for malfunction Demonstrate that system is functioning properly Reanalyze samples with standards outside criteria
Surrogate	Every sample	Standards 4 bromofluorobenzene 1 2 dichloroethane d_4 toluene d_8	Solid (/Rec) 74 113 70 121 84 117	Aqueous (Rec) 86 115 70 114 88 110	If any surrogate compounds do not meet criteria there should be a re analysis to confirm that the non compliance is due to the sample matrix effects rather than laboratory deficiencies
Matrix spike and matrix spike duplicate (MS/MSD)	1 per 20 samples per matrix (Advisory Limit)	Standard 1 1 dichloroethane trichloroethene benzene toluene chlorobenzene	Solid Rec /RPD 59 172 ≤22 62 137 ≤24 66 142 ≤21 59 139 ≤21 60 133 ≤21	Aqueous Rec /RPD 61 146 ≤14 71 120 ≤14 70 127 ≤11 70 125 ≤13 75 130 ≤13	If MS/MSD results do not meet criteria the reviewer should review the data in conjunction with other QC results to determine if the problem is specific to the QC samples or systematic

Table 5 3 Quality Control Method Criteria for Semivolatile Organic Compounds by SW 846 8270C

Procedure	Frequency	Acceptance Criteria			Corrective Action
Initial alibration curve (5 pt curve)	Set up maj r maintenan e	RRI 0 01 (Advisory) RRF > 0 05 f r SPCCs RSD ≤ 15 RSD ≤30 for CCC comp unds I ab may u e first or higher order regressi n fit (r ≥ 0 99) if RSD ≥ 15			Must meet crit ria pri r t sampl analy is Dat r view r h ul l review and judge all of the target c mp unds against the ccept m crit ria
C ntinuing calibrati n heck	Every 12 hours	RRI 0 01 (Advisory) RRF > 0 05 f r SPCCs The percent difference for CCC must be ≤20 If riteri are met the relative response factors f all compounds are calculated			If criteria are not met reanalyze the daily standard If the daily standard fails a second time calibration must be repeated Data reviewer should review and judge all of the target c mp unds against the acceptance criteria
Int rnal standards	Every sample	Retention time ±30 seconds of last CC Area changes by a factor of two (50 to +100)			Inspect f r malfunction Demonstrate that ystem is functioning properly Reanalyze samples with standards out ide criteria
Tuning DI 11 P	12 hours	Must meet tuning criteria			Re-tune re calibrate
M th d blanks	Per extraction batch	No target analytes			Document source of contamination
I CS	Every batch	Specified QC I mits			Qualify a sociated data biased high r biased low a appropriate
Surr gate	Every sample	Standards	Aqueous (Rec)	Solid (Rec)	If any two base/neutral or acid surr gates are out f specification or if any one base/neutral or acid extractable urrogate has a recovery f less than 10 then there should be a r analysis to c nfirm that the non compliance is due t sample matrix effects rather than laborat ry d ficiencies
		nitrobenzene d	35 114	23 120	
		2 fluorobiphenyl	43 116	30 115	
		p terphenyl d14	33 141	18 137	
		phenol d6	10 94	24 113	
		2 fluoroprophenol	21 100	25 121	
		2 4 6 tribrom phenol	10 123	19 122	
		2 chlorophenol (adv ry)	33 110	20 130	
		1 2 dichlorobenzene (adv ry)	16 110	20 130	
MS/MSD	1 per 20 samples p r matrix (Advisory I mits)	Standards	Aqueous Rec / RPD	Solid Rec / RPD	If MS/MSD results d not meet criteria the review r h uld review the data in c nju tn n with other QC r ults t d termine if the pr blem pecific t the QC amples r system ti
		Phenol	2 110 / ≤42	26 90 / ≤35	
		2 chlorophenol	27 123 / ≤40	25 102 / ≤50	
		1 4 dichlorobenzene	36 97 / ≤28	28 104 / ≤27	
		n nitr o di n pr pylamine	41 116 / ≤38	41 126 / ≤38	
		1 2 4 tri hlor benzene	39 98 / ≤28	38 107 / ≤23	
		4 chloro 3 methylphenol	23 97 / ≤42	20 103 / ≤33	
		a enaphthene	46 118 / ≤31	31 137 / ≤19	
		4 nitrophenol	10 80 / ≤50	11 114 / ≤50	
		2 4 dinitr t luene	24 90 / ≤38	28 89 / ≤47	
		pentachlorophenol	9 103 / ≤50	17 109 / <47	
		pyren	20 127 / ≤31	35 142 / ≤30	

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Table 5 4 Quality Control Method Criteria for Pesticides by SW 846 8081A

Procedure	Frequency of QC Procedure	Acceptance Criteria			Corrective Action
Initial calibration curve Single multi component (5pt)	Set up major maintenance	RSD<20 of the response factor from the initial curve			Must meet criteria prior to sample analy is
Daily calibration standard	12 hour	D recovery ± 15 of th response factor from the initial curve			If criteria are not met reanalyze th daily standard If th daily standard fail a second time initial calibration must be repeated
Independent reference standard (calibration ch k)	Weekly	Recovery + 25 /			Initiate investigation and document actions taken
Performance evaluation mixture	12 hours after analytical run	endrin/4 4 DDT degradation < 20 /			If criterion is not met system must be deactivated and the affected sample reanalyzed if endrin or 4 4 DDT or their degradation products are detected in the samples
Instrument blank	12 hours after analytical run and highly contaminated samples	No target analytes			Demonstrated clean Affected sample will b reanalyzed
Method blanks	Per extraction batch	No target analytes			Document source of contamination
Resolution Check Mixture	12 hours	Resolution between compounds is ≥60 / The depth of the valley between two adjacent peaks must be ≥ 60 / of the height of the shorter peak			Detected target compounds not adequately resolved should be qualified J Qualitative identifications may be questionable if coelution exist Non detect with retention times in the region of coelution may not be valid Professional judgement should be used to determine the need to qualify data as unusable
Surrogate	Every sampl	Surrogate	Aqueous / Rec	Solid Rec	Investigate to determine cause and document actions taken data are acceptable
		Dibutylchlorendate	60 150	60 150	
		2 4 5 6 Tetrachloro m xylene	60 150	60 150	
MS/MSD	1 per 20 samples per matrix (Advisory Limits)	Standards	Aqueous Rec / RPD	Solid Rec / RPD	Data reviewer may use the MS and MSD results in conjunction with ther QC sampl results to determine the need for some qualification of the data
		gamma BHC heptachlor	56 123 / 15	46 127 / 50	
		aldrin	40 131 / 20	35 130 / 31	
		dieldrin	40 120 / 22	34 132 / 43	
		endrin	52 126 / 18	31 134 / 38	
		4 4 DDT	56 121 / 21	42 139 / 45	
			38 127 / 27	23 132 / 50	

Table 5 5 Quality Control Method Criteria for Herbicides and Pentachlorophenol by SW 846 8151A

Procedure	Frequency	Acceptance Criteria	Corrective Action
Initial calibration curve 5 point	Beginning of analytical run	Initial calibration RSD for all target analytes <20 or r ≥ 0 995 where r is the linear correlation coefficient for RSD 20%	Must meet criteria prior to sample analysis
Continuing calibration check	Every 20 samples or at end of run (whichever is more frequent)	D Recovery ± 15	1 If continuing calibration failure analyze the standard 2 If continuing calibration still fails verify std prep and recalibrate Reanalyze samples back to last passing CCV in run sequence Document all actions taken
Method blank	Per extraction batch	No target analytes Concentration is less than CRQL	1 Determine source of contamination 2 Take appropriate action and document 3 If preparation error re prep sample If samples cannot be re prepared qualify the sample Document action taken
LCS	Every batch	All target compound values are within three SD of mean historical values or method control limits of precision and accuracy Acceptance criteria in Table 5 9	1 Validate instrument parameters sensitivity and linearity Correct problem and document 2 Validate standard and LCS preparation Correct any problems and document 3 Evaluate against project specific DQOs and report data if there is not an impact on data usability 4 If data is unusable re-prepare and reanalyze the method blank LCS and all samples in the batch If re preparation of samples is not possible qualify the data 5 Document all actions taken in the report narrative and Nonconformance Record
Surrogate	Every sample	Spikes/surrogates will be spiked into all samples to observe the recovery effects in the environmental matrix Acceptance criteria in Table 5 9	1 Examine all QC (LCS MB ICV CCV) If surrogate is out for the QC samples check quantitation then reanalyze (if still out of control) If QC passes qualify samples after checking preparation step 2 If re analysis of original extracts is out of control re extract and reanalyze samples Follow step 1 If still out of control or samples cannot be re extracted qualify data
MS/MSD	1 per 20 samples per matrix (Advisory Limits)	All target compounds values are within three SD of mean historical values or method control limits of precision and accuracy Acceptance criteria in Table 5 9	Data reviewer may use the MS and MSD results in conjunction with other QC sample results to determine the need for some qualification of the data

Table 5 6 Quality Control Method Criteria for Polynuclear Aromatic Hydrocarbons by SW 846 8310

Procedure	Frequency of QC Procedure	Acceptance Criteria					Corrective Action
Initial calibration curve 5 pt curve	Set up maintenance	RSD 20 of the response factor from the initial curve					Must meet criteria prior to sample analysis
Continuing calibration check	Daily	Drift recovery 15 of the response factor from the initial curve					If criteria are not met reanalyze the daily standard If the daily standard fails a second time initial calibration must be repeated
LCS	Every batch	Specified QC Limits					Qualify associated data biased high or biased low as appropriate
Method blank	Per extraction batch	No target analytes					Document source of contamination
Surrogate	Every sample	Standards	Aqueous Rec		Solid Rec		If any surrogate compounds do not meet criteria there should be a re analysis to confirm that the non compliance is due to the sample matrix effects rather than laboratory deficiencies
		p Terphenyl	50 110		30 124		
MS/MSD	1 per 20 samples per matrix (Advisory Limits)	Standards	Aqueous Rec	RPD	Solid Rec	RPD	Data reviewer may use the MS and MSD results in conjunction with other QC sample results to determine the need for some qualification of the data
		acenaphthene	49 109	≤30	0 124	≤50	
		acenaphthylene	53 103	≤25	0 139	≤50	
		anthracene	44 124	≤40	0 126	≤50	
		benzo(a)pyrene	45 121	≤38	27 151	≤62	
		benzo(k)fluoranthene	41 123	≤41	22 132	≤55	
		fluorene	40 110	≤35	25 123	≤49	
		naphthalene	21 117	≤48	0 122	≤50	
		phenanthrene	52 116	≤32	0 155	≤50	

Table 5 7 Quality Control Method Criteria for Metals by SW 846 6010B/7470A/7471A

Procedure	Frequency of QC Procedure	Acceptance Criteria	Corrective Action
Initial calibration curve (3 pt curve Hg) (1 pt curve ICP)	Daily or major maintenance instrument modification replacement of the torch replacement of the mirror	r > 0 995 for all element	If r < 0 995 for any element the standards for that element must be prepared again and/or the lower/upper range standard must be used
Continuing calibration verification (CCV)	Every 10 samples or 2 per 8 hr and end of run	Recovery ±10 of true value for ICP Recovery ±20 of true value for Hg	Reanalyze CCV If the CCV fails second time the analysis must be terminated the problem corrected the instrument re calibrated and the calibration re-verified prior to continuing sample analyses
Highest mixed standard	Before sample analysis	Recovery ±5 % of true value for ICP NA for Hg	If criteria are not met reanalyze the daily standard. If the daily standard fails a second time initial calibration must be repeated
Interference check	Beginning and end of each sample analytical run or 2 per 8 hr	Recovery ±20 % of true value	Terminate the analysis correct the problem re calibrate re verify the calibration and reanalyze the samples
Continuing calibration blank (CCB)	Every 10 samples end of analytical run	Concentration < 3x background mean (ICP) No target analytes	If the average is not within criteria terminate the analysis correct the problem re calibrate and reanalyze all samples analyzed since the last acceptable CCB
Serial Dilution (ICP)	1 per 20 samples per matrix for samples 10x IDL	Difference between diluted and undiluted sample <10	Chemical or physical interference should be suspected Investigate to determine cause
Preparation blank	1 per batch per matrix	No target analytes	Documented source of contamination
LCS	1 per 20 samples	90 ≤ Rec ≤110	Qualify associated data biased high or biased low as appropriate
MS MSD	1 per 20 samples per matrix (Advisory Limits)	75 ≤ Rec ≤125 RPD 20 If spike(s) outside of limits analyze PDS	If matrix spike recovery does not meet criteria (except Ag) a post digestion spike is required for all method except CFAA Qualify results in accordance with Regional criteria

Table 5 8 Quality Control Method Criteria for Dioxin/Furans by SW 8290

Procedure	Frequency	Acceptance Criteria			Corrective Action
Initial calibration curv (5 pt urve)	Set up maj r maintenance	RSD ±20 for standard compounds RSD ±30 for referen e comp unds Is topic ratio must b within the established c ntr l limits The signal to n ise ratio mu t b ≥2 5 for each s le t d ion current pr file			Must meet riteria pr r to s mple analysi Data reviewer sh uld review and judge all of the t rget c mp unds against the accepton e criteria
Continuing calibration check	12 h urs	The percent diff rence must be ±20 for each standard c mp unds and ±30 / for reference compound			If criteria are not met reanalyze the daily standard If the daily standard fails a second time calibration must be repeated Data reviewer should review and judge all of the target compounds against the acceptance criteria
Int rnal standards	I very mple	Retention time ±30 sec nds c f last CC Area changes by a fact r of two (50 to +100)			Inspect for malfunction Demonstrate that system i functioning properly Reanalyze samples with standards outside criteria
Tuning I FK	12 h urs	Must meet tuning crit ria with resolving power c f ≥ 10000			Re tune re calibrate
Method blanks	Per extracti n batch	No target analytes			Document source of contaminati n
I CS	I very b tch	Specified QC I mits			Qualify associated data biased high or biased low as appropriate
Surr gate spik s	I very sampl	Specified QC I mits			Investigate to determine ause and document action taken data are acceptable
Matrix pike and duplicate	1 per 20 samples per matrix (Adv ry I mits)	Standards	Aqueous R c RPD	Solid Rec RPD	If MS/MSD results do not meet criteria the review r hould review the data in c nj nct n with c ther QC results t determine if the problem i sp cific t the QC mples r ystemati
		2 3 7 8 TCDD	70 130 ≤20	70 130 / ≤20	
		2 3 7 8 TCDF	70 130 / ≤20	70 130 / ≤20	
		1 2 3 4 TCDD	70 130 ≤20	70 130 ≤20	
		1 2 3 7 8 PeCDD	70 130 / ≤20	70 130 ≤20	
		1 2 3 7 8 PeCDF	70 130 / ≤20	70 130 / ≤20	
		1 2 3 6 7 8 HxCDD	70 130 / ≤20	70 130 / ≤20	
		1 2 3 4 7 8 HxCDD	70 130 / ≤20	70 130 / ≤20	
		1 2 3 7 8 9 HxCDD	70 130 ≤20	70 130 ≤20	
		1 2 3 6 7 8 HxCDF	70 130 / ≤20	70 130 ≤20	
		1 2 3 4 7 8 HxCDF	70 130 / ≤20	70 130 ≤20	
		1 2 3 7 8 9 HxCDF	70 130 / ≤20	70 130 ≤20	
		2 3 4 6 7 8 HxCDF	70 130 ≤20	70 130 ≤20	
		1 2 3 4 6 7 8 HpCDD	70 130 / ≤20	70 130 ≤20	
		1 2 3 4 6 7 8 HpCDF	70 130 ≤20	70 130 ≤20	
		1 2 3 4 7 8 9 HpCDF	70 130 ≤20	70 130 ≤20	
		OCDD	70 130 ≤20	70 130 ≤20	
		OCDF	70 130 ≤20	70 130 / ≤20	

Table 5 9
Quality Control for Precision and Accuracy for Southern Maryland Wood Treating Remedial Action Activities

		Spike Concentration		Accuracy (%R)(a)		Precision(b)	
QC Parameter	**Spiking Compounds**	**Water (ug/L)**	**Soil (mg/kg)**	**Water**	**Soil**	**Water**	**Soil**
TCLP Leachate SW 846 8151A Chlorinated Herbicides and Pentachlorophenol (PCP) GC/ECD							
LCS/MS/MSD	2 4 D	200		51 116		<40	
	2 4 5 TP	40		56 111		<34	
	Pentachlorophenol	20		40 150		<25	
Surrogate Spike	DCAA	20		50 130			
Water Sediments, and Soils SW-846 8151A Pentachlorophenol (PCP) GC/ECD							
LCS/MS/MSD	Pentachlorophenol	2 0	0 04	40 150		<25	<35
Surrogate Spike	DCAA	2 0	0 04	40 150			
Water Sediments, and Soils SW 846 3520C(aq)/3540C(sol)/8310 PAHs HPLC							
LCS/MS/MSD	Benzo(a)anthracene	0 64	0 0213	59 117	48 129	<36	<50
	Benzo(b)fluoranthene	1 28	0 0427	67 119	61 125	<32	<40
	Benzo(k)fluoranthene	0 64	0 0213	69 124	68 128	<34	<37
	Benzo(a)pyrene	0 64	0 0213	52 123	41 142	<44	<37
	Chrysene	0 64	0 0213	58 117	44 129	<36	<53
	Dibenzo(a h)anthracene	1 28	0 0427	60 127	54 135	<41	<50
	Indeno(1 2 3 cd)pyrene	0 64	0 0213	50 116	55 120	<40	<40
Surrogate Spike	Benzo(a)pyrene	5 0	0 267	40 120	30 150		
	4 4 Dibromooctafluorobiphenyl	8 0	0 427	30 120	25 150		
	p Terphenyl	7 5	0 250	30 150	30 150		

(a) Laboratory Control Sample (LCS) limits are based on historical performance data and are updated annually
(b) Precision listed for the LCS value is calculated as the moving range for successive LCS recoveries

ORIGINAL
8-01

Table 5 9 (Continued)
Quality Control for Precision and Accuracy for Southern Maryland Wood Treating Remedial Action Activities

		Spike Concentration		Accuracy (%R)(a)		Precision(b)	
QC Parameter	**Spiking Compounds**	**Water (ug/L)**	**Soil (mg/kg)**	**Water**	**Soil**	**Water**	**Soil**
Water Sediments, and Soils SW 846 5030/8260B Volatile Organic Compounds GC/MS							
LCS/MS/MSD	Benzene	50	50	77 124	78 119	<29	<25
	Toluene	50	50	71 142	73 130	<44	<35
	Chlorobenzene	50	50	70 145	69 139	<46	<43
	1 1 Dichloroethene	50	50	73 125	74 128	<32	<33
	Trichloroethene	50	50	65 131	72 122	<41	<31
Surrogate Spike	1 2 Dichloroethane d4	50	50	76 114	70 121		
	4 Bromofluorobenzene (BFB)	50	50	86 115	74 121		
	Toluene d8	50	50	88 110	81 117		
Water, Sediments, and Soils SW 846 3520C(aq)/3540C(sol)/ 8270C Semivolatile Organic Compounds GC/MS							
LCS/MS/MSD	Phenol	200	6 7	38 91	35 97	<33	<38
	2 Chlorophenol	200	6 7	42 94	39 98	<32	<36
	1 4 Dichlorobenzene	100	3 3	28 90	39 102	<38	<39
	N Nitroso di n propylamine	100	3 3	53 115	51 115	<38	<39
	1 2 4 Trichlorobenzene	100	3 3	44 94	50 104	<38	<33
	4 Chloro 3 methylphenol	200	6 7	45 97	51 96	<32	<28
	Acenaphthene	100	3 3	49 103	51 109	<33	<36
	4 Nitrophenol	200	6 7	52 117	50 120	<40	<43
	2 4 Dinitrotoluene	100	3 3	57 115	54 126	<35	<45

(a) Laboratory Control Sample (LCS) limits are based on historical performance data and are updated annually
(b) Precision listed for the LCS value is calculated as the moving range for successive LCS recoveries

Table 5 9 (Continued)
Quality Control for Precision and Accuracy for Southern Maryland Wood Treating Remedial Action Activities

		Spike Concentration		Accuracy (%R)(a)		Precision(b)	
QC Parameter	**Spiking Compounds**	**Water (ug/L)**	**Soil (mg/kg)**	**Water**	**Soil**	**Water**	**Soil**
Water Sediments, and Soils SW 846 3520C(aq)/3540C(sol)/8270C Semivolatile Organic Compounds by GC/MS (continued)							
LCS/MS/MSD	Pentachlorophenol	200	6 7	38 119	16 119	<50	<63
	Pyrene	100	3 3	52 114	44 119	<43	<46
Surrogate Spike	Nitrobenzene d5	100	3 3	35 114	23 120		
	2 Fluorobiphenyl	100	3 3	43 116	30 115		
	Terphenyl d14	100	3 3	33 141	18 137		
	2 Fluorophenol	200	6 7	21 100	25 121		
	Phenol d5	200	6 7	10 94	24 113		
	2 4 6 Tribromophenol	200	6 7	10 123	19 122		
Water Sediments, and Soils SW 846 8290 Dioxins and Furans HR/GC/MS							
LCS/MS/MSD	tetra octa Dioxins and Furans	0 0002 0 002	0 00002 0 0002	50 150	50 150	<50	<50
TCLP Leachate SW 846 8081A Chlorinated Pesticides GC/ECD							
LCS/MS/MSD	gamma BHC (Lindane)	2 5		56 125		<42	
	Heptachlor	2 5		25 128		<63	
	Aldrin	2 5		25 136		<68	
	Dieldrin	5 0		63 113		<31	
	Endrin	5 0		69 125		<34	
	4 4 DDT	5 0		56 139		<51	

(a) Laboratory Control Sample (LCS) limits are based on historical performance data and are updated annually
(b) Precision listed for the LCS value is calculated as the moving range for successive LCS recoveries

Table 5 9 (Continued)
Quality Control for Precision and Accuracy for Southern Maryland Wood Treating Remedial Action Activities

		Spike Concentration		Accuracy (%R) (a)		Precision(b)	
QC Parameter	Spiking Compounds	Water (ug/L)	Soil (mg/kg)	Water	Soil	Water	Soil
Surrogate Spike	DCB	1 0		30 150			
	TCX	1 0		30 150			
Water, Sediments and Soils SW 846 3005A/7470A/7471A Mercury Cold Vapor Atomic Absorption							
LCS/MS/MSD	Mercury	4	2	90 119	45 156	<18	<15
Water Sediments and Soils SW 846 3005A6010B Metals ICP							
LCS/MS/MSD	Arsenic	2000		85 108	49 149	<15	<15
	Barium	2000		87 109	70 131	<13	<15
	Cadmium	50		84 101	57 144	<10	<15
	Chromium	200		90 105	54 141	<10	<15
	Lead	500		81 105	88 119	<15	<15
	Selenium	50		72 99	52 148	<17	<15
	Silver	500		87 107	50 146	<12	<15

(a) Laboratory Control Sample (LCS) limits are based on historical performance data and are updated annually
(b) Precision listed for the LCS value is calculated as the moving range for successive LCS recoveries

ORIGINAL

Table 5 10
Field Equipment List and Calibration and Maintenance

			Field Equipment Calibration and Maintenance			
Equipment Type	**Manufacturer**	**Model**	**Measurement Objectives**	**Calibration Frequency**	**Procedure and Standards (1)**	**Instrument Specific Maintenance (1)**
PID	HNU Systems Inc	P1 101	Trace organic gases in the atmosphere	Once per day	Calibrated in accordance with manufacturer s SOPs against the requisite span gas Carbon filters used to distinguish between VOHs and methane Background correction made for measured responses for soil borings or split spoon samples in ambient air PID calibrated against an FID for UST work	Monthly 1) Clean UV lamp 2) Clean ion chamber 3) Check electronic sensors
LEL (H2S Combustible Gases Oxygen)	Industrial Scientific	HMX 271	Ambient oxygen hydrogen sulfide and combustible gases	Beginning and end of day	Calibrated in accordance with manufacturer s specifications and SOPs	Monthly 1) Clean Screen 2) Recharge battery 3) Check electronic sensors
Water Quality (pH temperature dissolved oxygen and depth)	Hydrolab	Scout 2	pH temperature dissolved oxygen (DO) and depth	Beginning of day	pH calibrated with 7 0 & 4 0 or 10 0 buffers & checked with the third std (more frequently if the change of temperature is ≥ 5°C) temperature calibrated annually against NIST thermometer DO calibrated against sat air or Winkler	Daily 1) Check Batteries 2) Check probe for cracks 3) Check filling solution 4) Clean electrode 5) Check reference junction 6) Check response time 7) Check DO membrane for deterioration 8) Check thermometer for cracks and gaps in mercury Quarterly 1) Replace DO screen 2) Check battery pack 3) Check sensor electronics
Aerosol Monitor	MINIRAM MIE Inc	PDM 3	Airborne particulates	Factory calibrated	Zeroed at the beginning of each day	1) Clean sensor chamber & windows 2) Battery Pack Replacement 3) Battery Charging

(1) Consult the owners manual for further details on calibration procedures and instrument specific maintenance

6 0 INTERNAL QUALITY CONTROL CHECKS

This section discusses the internal quality control components that will be used by ICF Kaiser during operations at SMWT This section presents the SMWT quality control measures designed to address USEPA and USACE control specifications Corrective action and quality assessment requirements are presented in Sections 8 0 and 9 0 respectively

6 1 LABORATORY QUALITY CONTROL ELEMENTS

Laboratory analytical goals are summarized in Section 5 0 and Table 6 1 for SMWT parameters of concern Specific laboratory QC protocols are contained in the laboratories QAPs (Appendices C D E and F)

Table 6 1
Analytical Quality Control Elements of a Quality Assurance Program

Item	DQO	Parameter	Frequency of Association	Criteria Requirement
Analytical Method	C	All	Each analysis	Method analysis based on USEPA standard methods
Chemical Data Packages	A P C	All	Each lot/batch	Pass peer review and formal QA/QC check
Quarterly Laboratory Internal Audit Reports	R	All	Per Lab QAPP	No deficiencies
Laboratory Chain of Custody	R	All	All sample containers	No deficiencies
Laboratory System Controls	R	All	During laboratory operations	Custody of sample within laboratory fully accounted for and [illegible]
Holding Time	A P R	All	Each analysis	[illegible] Modifications)
Method Blanks	A	All	Each lot/batch	No target analytes detected in the method blanks
Matrix Spikes and duplicates	A P	All	Each lot/batch	Must meet USEPA criteria as defined in Table 5 2 to Table 5 9
Surrogates	A	All	Organic fractions including QC samples	Required to meet the stricter of the USEPA criteria
Serial dilution	A	Metals	Each lot/batch	Must meet USEPA criteria as defined in Table 5 7
Resolution Check Measures	A	Pesticides/PCBs	Each lot/batch	Must meet USEPA criteria as defined in Table 5 4

Legend
C=Comparability A=Accuracy
R=Representativeness
P=Precision

6 1 1 USEPA QC Samples

USEPA QC samples will be prepared in accordance with analytical methodology specifications Quality control samples must be analyzed to provide quantitative data to determine the performance of the method Control samples are samples introduced into the train of environmental samples to monitor the performance of the analytical method The following QC samples will generally be included in each analytical lot

- Instrument calibration
- Continuing calibration
- Method blank
- Matrix spikes and duplicates

In addition every organic sample will be spiked with a surrogate spike Method specific QC measures will be enforced for the RA Table 6 2 presents an overview of the scheduled QC samples criteria and corrective action

Table 6 2
Scheduled QC Samples Criteria and Corrective Action

Procedure	Frequency of QC Procedure	General Acceptance Criteria	Corrective Action
Initial Calibration	Set up major maintenance and quarterly	Performed at the method specified frequency	Estimate detected data Non-detects are not qualified
Daily Calibration Standard	1 per batch	%RSD vary by <50%	Estimate data
Continuing Calibration Check	Minimum of 5% (1/20 samples)	%D < 25%	Estimate data
Method Blanks	1 per batch	No target analytes	Identify source of contamination
Surrogate	every sample including QC samples	± 50%	Estimate data
Matrix Spike and Duplicates	1 per 20 samples	± 25%	Estimate data

6 1 2 USACE QA Samples

QA oversight of analytical data may be provided by the USACE through the review and evaluation of split samples Approximately 10% of the environmental samples collected for the RA will be shipped to the USACE laboratory ITS Environmental for analysis The point of contact is Chris Kelley at (802) 655 1205 The address is 55 South Park Drive Colchester VT 05446 No split samples will be collected from the untreated soil hot cyclone dust perimeter air monitoring or soil screening Splits of pit verification samples will be collected at a frequency of 10% with a minimum of 2 split samples from each pit Splits of treated soil samples will be collected at a frequency of 1 each week for the first month (or first 10 000 CY processed) After the first month split sampling will be reduced to 1 split every 2 months with approval At the opening of each pit split sampling will be increased back to 1 each week for the first two weeks

6 2 FIELD QUALITY CONTROL

Various field QC samples will be employed throughout the sampling phase of the RA to demonstrate the integrity of data used for decision making purposes QC samples include decontamination source water field (rinse and trip) blanks duplicates and temperature blanks Table 6 3 provides an overview of QC samples that will be used on this project Table 6 4 summarizes the Field QC elements discussed in this QAPP

Table 6 3
Types of Field Quality Control Samples

Type of Control	Purpose of Sample	Collection Frequency
Duplicate Sample	to ensure precision in sample homogeneity during collection and analysis	10 of field samples per matrix
Rinse Blank	to ensure the decontamination of sampling equipment has been adequately performed to assess cross contamination and/or incidental contamination to the sample container	1 per 20 samples or 1 per day
Temperature Blank	to verify sample cooler temperature during transport	1 temperature blank per cooler
Trip Blank	to determine if cross contamination occurs during shipment or storage with VOC samples	1 trip blank per cooler of VOC samples
Source Water	to confirm a decontaminated water source on site	1 per site

ORIGIN (Red)

Table 6 4
Field QC Elements of a QA Program

Item	DQO	Parameter	Frequency of Association	Criteria Requirement
Source Water	R, A	All	per project	Less than USACL reporting limit or if detected approved by USACE
Field Duplicates	P	All	1 per 10 samples	RPD ≤ 35
Trip Blank	R, A	Volatiles in water	1 per cooler with volatiles	No target analytes
Rinse Blank	R, A	All	1 per 20 samples per matrix per equipment type	No target analytes
Chain of Custody	R	All	every sample	No target analytes
Field Logbook	R	All	every sample	Filled out correctly
Field Instrument Calibration Logs	A	All	every measurement	All measurements must have associated calibration reference

Legend
A=Accuracy
R=Representativeness
P=Precision

6 2 1 Source Water

The characteristics of water used for gross decontamination will be determined prior to use to ensure contamination contributions are adequately distributed and accounted for during data validation Water from an approved source will be tested once unless a different source designation is required Analytes should not be detected in the source water above the regulatory limits established for performance criteria

6 2 2 Rinse/Equipment Blanks

The rinse blank determines whether decontamination procedures have been adequately performed and that there is no cross-contamination of samples between sampling events Rinse blanks will be collected at a rate of one per type of equipment per decontamination event not to exceed five percent for critical samples A consistent volume of analyte free water will be poured over the equipment and collected in a sample container Rinse blanks will be preserved and handled identically to aqueous environmental samples Rinse blanks will be analyzed for all parameters associated with the decontamination event

6 2 3 Trip Blanks

Trip blanks are used to determine if any on site atmospheric contaminants are seeping into the sample vials or if any cross contamination of samples is occurring during shipment or storage of samples containers Trip blanks will be provided by the off site laboratory and will be included with each shipment of samples requiring VOC water analysis The trip blank will be contained in a 40 mL teflon lined septum vial comprised of analyte free water preserved with 1 1 HCl to pH <2

6 2 4 Temperature Blanks

Temperature blanks will be used to demonstrate samples are stored at 4±2 C during transit to the laboratory Off site laboratories will provide the temperature blank and will measure its temperature upon sample receipt

6 2 5 Duplicate Samples

Field duplicates are analyzed to ensure precision in sample homogeneity during collection and analysis activities Duplicate samples will generally be collected from areas known or suspected to be contaminated or at a regulatory point Duplicates will be collected at a frequency of one per 10 samples or 10%

7 0 DATA REDUCTION, VALIDATION, AND REPORTING

The intended use of the data and the associated acceptance criteria for data quality will be determined before the data collection effort begins Reported data will include when appropriate statements of precision accuracy representativeness completeness and comparability Data processing procedures will be documented. reviewed. and corrected as required to meet USEPA Region III data quality requirements The laboratory QA Manager will be responsible for data

7 1 DATA COLLECTION

Data are initially collected. converted to standard reporting units (e g mg/kg for solid media µg/L for aqueous media µg/m3 for perimeter air and ng for stack air) and recorded in standard formats by the off site laboratory The laboratory Chemist conducts preliminary data analyses using a variety of methods and procedures Because many analytical instruments are microprocessor controlled. some of the requisite analyses can be performed directly in the instrument s operating or outputting mode Those instruments interfaced.to stand alone computers or microprocessors often permit data analysis programs to be written and modified to produce data formats specifically suited to end user requirements Data requiring manual recording integration and/or analysis may be converted to a more appropriate format prior to subsequent analyses Through all stages and aspects of data processing the data are checked for translation or transcription errors The laboratory QA Manager or other designated individual not directly involved in the analysis will review the data for acceptability prior to transmission to ICF Kaiser

7 2 DATA REDUCTION

Data reduction frequently includes computation of analytical results from raw instrument data and summary statistics including standard errors confidence intervals test of hypotheses relative to the parameters and model validation Data reduction procedures address the reliability of computations and the overall accuracy of the data reduction The numerical transformation algorithms used for data reduction will be verified against a known problem set to ensure that the reduction methods are correct The equations and the typical calculation sequence that should be followed to reduce the data to the acceptable format are instrument and method specific Where standard methods are modified. data reduction techniques will be described in a report accompanying the data

7 2 1 Gas Chromatography/Mass Spectrometry Results

Qualitative identification will be determined by obtaining extracted ion current profiles (EICPs) for the primary ion mass to charge ratio (m/z) and the secondary masses for each compound Positive identification will be based on the following criteria

- The intensity of the three characteristic masses of each compound must maximize in the same ratio (± 20 percent) within one scan of each other
- The relative retention time must fall within 30 seconds of the retention time of the authentic compound and
- The relative peak heights of the three characteristic masses in the EICPs must fall within 20 percent of the relative intensities of these masses in a reference mass spectrum (e g standard analysis or reference library)

Structural isomers to be listed as separate compounds must have acceptable resolution Acceptable resolution is achieved if in a standard mix the baseline to valley height between the isomers is less than 25 percent of the sum of the two peak heights Otherwise structural isomers will be identified as isomeric pairs

The calculation for the concentration for the suspect peak will be made using the average response factor (RF) for each compound which was obtained from the daily calibration

ORIGINAL

7 2 1 1 Water

$$C\ (\mu g/L) = \frac{(A\ )(C_{is})(V_t)}{(A_{is})(RF)(V\ )(V\ )}(D)$$

where

C	=	Compound concentration (µg/L)
A_u	=	Peak area of characteristic in m/z for the compound to be measured
A	=	Peak area of characteristic in m/z for the internal standard
C	=	Concentration of the internal standard (µg)
V_t	=	Final volume of total extract (µL) used in SVOC analyses
V	=	Volume of water (L) extracted or purged
V	=	Volume of extract injected for SVOC analyses (µL)
D	=	Dilution factor and
RF	=	Compound response factor calculated from the following equation

$$RF = \frac{(A\ )(C\ )}{(A\ )(C\ )}$$

where

A_s	=	Area of the characteristic ion for the compound being measured
A_{is}	=	Area of the characteristic ion for the specific internal standard
C_{is}	=	Concentration of the specific internal standard and
C	=	Concentration of the compound being measured

7 2 1 2 Soil

$$C\ (\mu g/g) = \frac{(A\ )(C_{is})(V_t)}{(A_{is})(RF)(V\ )(W\ )}(D)$$

where

C	=	Compound concentration in the soil sample (µg/g)
A_u	=	Area of the characteristic ion for the compound being measured
C_{is}	=	Internal standard concentration (µg)
A	=	Area of characteristic ion for the specific internal standard
V_t	=	Volume of total extract (µL)
V	=	Volume of extract injected (µL)
W	=	Mass of sample extracted or purged (g)
D	=	Dilution factor and
RF	=	Compound response factor calculated from the calibration curve using the same equation as that used for water samples

7 2 2 Gas Chromatographic Results

Calculations will be performed for each compound after it is identified Identification will be based on the relative retention time (RRT) ratio of the suspect peak compared to the internal standard as compared to the number RRT calculated from the calibration curve The concentration of the compound will be determined by comparing the relative response factors calculated from the calibration curve and the peak area of the compound using the following equation

7 2 2 1 Water

$$C \ (\mu g / L) = \frac{(A \ )(C \ )}{(A \ )(RF)(V \ )}(D)$$

where

- C_w = Concentration of the compound in the sample (µg/L)
- A_u = Compound peak area
- C = Internal standard (µg)
- A_{is} = Internal standard peak area
- V = Volume of water extracted (L)
- D = Dilution factor and
- RF = Compound response factor calculated from the following equation

$$RF = \frac{(A \ )(C \ )}{(A \ )(C \ )}$$

where

- A_s = Compound response measured in area counts from the calibration curve
- A_{is} = Internal standard response measured in area counts from the calibration curve
- C_{is} = Internal standard concentration and
- C = Compound concentration from the calibration curve

7 2 2 2 Soil

$$C \ (\mu g / g) = \frac{(A \ )(C_{is})}{(A_{is})(RF)(W \ )}(D)$$

where

- C = Compound concentration in the soil sample (µg/g)
- A_u = Compound response measured in area counts
- C_{is} = Internal standard concentration (µg)
- A_{is} = Internal standard response measured in area counts
- W = Mass of sample extracted (g)
- D = Dilution factor and
- RF = Compound response factor calculated from the calibration curve using the same equation as that used for water samples

7 2 3 Cold Vapor Atomic Absorption Results

Photometric absorbance is governed by the relationship

$$Absorbance = \log \frac{100}{\%T} = 2 \quad \log \%T$$

where

%T = 100 % absorption

ORIGINAL (Red)

Percent absorption is based on the amount of light of a particular wavelength absorbed by a specific metal Its calculation is based on the loss of light after a beam of light of a particular wavelength is passed through a flame into which a solution containing metals of interest has been aspirated

Calibration curves establishing the absorbance relationship with concentration will be generated at various concentrations From these curves a comparison will be made with absorbance from sample measurement Since absorbance is directly related to concentration a plot of the two parameters will be linear within operable ranges and will allow for determination of unknown concentrations in solutions (direct samples or extracts) after measurement of absorbencies

7 3 REPORTING

7 3 1 Reporting Limits

Aqueous and toxicity characteristic leachate procedure (TCLP) sample results will be reported in µg/L Solid samples will be reported on a dry weight basis in units of mg/kg Air will be reported in units of ppbv Tables 7 1A and 7 1B present sediment excavation requirements for Paragon and ECC respectively Table 7 2A and 7 2B present soil excavation requirements and performance criteria (PAHs and carbazole only) for Paragon and ECC respectively Additional soil and sediment performance criteria are presented in Tables 7 3A and 7 3B for Paragon and ECC respectively Water treatment effluent criteria for the SMWT discharge samples are contained in Tables 7-4A and 7-4B for Paragon and ECC respectively Stack emission and ambient air quality criteria for Air Recon. Core Texas and Air Toxics are presented in Tables 7 5 7-6A and 7 6B respectively Tables 7 1 through 7 6 also present laboratory reporting limits

7 3 2 Rounding Rules

The following rules will be used for the purpose of rounding in data validation and reporting

- If the figure following those to be retained is less than five the figure is dropped. and the retained figures are left unchanged
- If the figure following those to be retained is greater than five the figure is dropped and the last figure is raised by one For example 1 26 is rounded off to 1 3
- If the figure following those to be retained is five and if there are no figures other than the zeros beyond the five the figure five is dropped. and the last place figure is increased by one if it is an odd number or it is kept if it is an even number For example 1 45 is rounded off to 1 4 while 1 55 is rounded off to 1 6

7 3 3 Chemical Data

Electronic and hard copy chemistry data will be provided to ICF Kaiser by the laboratory Method blank data will generally be reported as less than the reporting limit for each analyte Values detected above the reporting limit will be reported as determined values below the reporting limit but above the IDL (for inorganic) and MDL (for organic) will be reported and qualified as estimated Table 7 7 outlines the electronic data deliverable format to be incorporated into an Excel spreadsheet The file should be ASCII delimited (CSV format) The character strings should be capitalized except for ANALYTE field All null fields require a place holder indicated by two adjacent commas

7 3 4 Geotechnical Data

Geotechnical data collected in support of SMWT RA activities include percent moisture and density TDU selection will be based on the percent moisture and chemical characteristics of the untreated feed Density will be used to estimate the pounds per cubic yard of soil excavated

Table 7 1A (Paragon)
Sediment Excavation Criteria

Parameter	On site Reporting Limit (mg/kg) (1)	Reporting Limit (mg/kg) (1)	Criteria
Polynuclear Aromatic Hydrocarbons by SW 846 3540C/8310 (3550M/8270 on site)			
High Molecular weight PAHs			
Benzo[a]anthracene	0 208	0 003	Sum less than 9 6 mg/kg
Benzo[b]fluoranthene	0 193	0 003	
Benzo[k]fluoranthene	0 249	0 002	
Benzo[a]pyrene	0 179	0 003	
Chrysene	0 161	0 002	
Dibenzo[a h]anthracene	0 209	0 003	
Fluoranthene	0 139	0 003	
Indeno[1 2 3 cd]pyrene	0 211	0 002	
Pyrene	0 229	0 002	
Low Molecular weight PAHs			
Acenaphthene	0 096	0 020	Sum less than 3 2 mg/kg
Acenaphthylene	0 103	0 030	
Anthracene	0 147	0 002	
Fluorene	0 109	0 003	
Naphthalene	0 139	0 015	
2 Methylnaphthalene	0 330	0 020	
Phenanthrene	0 119	0 002	
Pentachlorophenol by SW 846 8151A (3550M/8270 on site)			
Pentachlorophenol	0 374	0 004	0 4 mg/kg

Table 7 2A (Paragon)
Soil Excavation and Performance Criteria

Parameter	On site Reporting Limit (mg/kg) (1)	Reporting Limit (mg/kg) (1)	B(a)P Equivalence Factor	Criteria
Polynuclear Aromatic Hydrocarbons by SW 846 3540C/8310 (3550M/8270 on site)				surface soil 0 1 ppm B[a]P equivalence subsurface soil 1 0 ppm B[a]P equivalence
Benzo[a]anthracene	0 208	0 003	0 1	
Benzo[b]fluoranthene	0 193	0 003	0 1	
Benzo[k]fluoranthene	0 249	0 002	0 01	
Benzo[a]pyrene	0 179	0 003	1 0	
Chrysene	0 161	0 002	0 001	
Dibenzo[a h]anthracene	0 209	0 003	1 0	
Indeno[1 2 3-cd]pyrene	0 211	0 002	0 1	
Semivolatile Organic Compounds by SW 846 3540C/8270C (3550M/8270 on site)				
Carbazole	0 145	0 330	0 003	

(1) Laboratories have established Reporting Limits (RLs) as laboratory quantitation levels These are the minimum concentrations to be reported for routine laboratory analyses in clean environmental matrices The RLs are values believed to provide greater than 50 probability of avoiding a false negative

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Table 7 1 B (ECC)
Sediment Excavation Criteria

Parameter	Reporting Limit (mg/kg)	Criteria (mg/kg)
PAHs by 3540C/8310		
Benzo[a]anthracene	0 007	Sum less than 9 6
Benzo[b]fluoranthene	0 017	
Benzo[k]fluoranthene	0 007	
Benzo[a]pyrene	0 007	
Chrysene	0 017	
Dibenzo[a h]anthracene	0 007	
Fluoranthene	0 007	
Indeno[1 2 3 cd]pyrene	0 007	
Pyrene	0 007	
Acenaphthene	0 007	Sum less than 3 2
Acenaphthylene	0 007	
Anthracene	0 007	
Fluorene	0 007	
Naphthalene	0 007	
2 Methylnaphthalene	0 007	
Phenanthrene	0 007	
PCP by 3540C/8270C		
Pentachlorophenol	0 167	0 4

7 2B (ECC)
Soil Performance Criteria (Excavation and Treated)

Parameter	Reporting Limit (mg/kg)	B(a)P Equivalence Factor	Criteria
PAHs by 3540C/8310 and SVOCs by 3540C/8270C*			
Benzo[a]anthracene	0 007	0 1	surface soil 0 1 ppm B[a]P equivalence subsurface soil 1 0 ppm B[a]P equivalence
Benzo[b]fluoranthene	0 017	0 1	
Benzo[k]fluoranthene	0 007	0 01	
Benzo[a]pyrene	0 007	1 0	
Chrysene	0 017	0 001	
Dibenzo[a h]anthracene	0 007	1 0	
Indeno[1 2 3-cd]pyrene	0 007	0 1	
Carbazole*	0 167	0 003	

Table 7 3A (Paragon)
Soil Performance Criteria

Parameter	Reporting Limit (ug/L) (1)	HW Char/Toxicity Regulatory Level (ug/L)	Delisting Criteria (ug/L) (2)
Polynuclear Aromatic Hydrocarbons by HPLC SW 846 1311/3520C/8310			
Acenaphthene	10		100000
Acenaphthylene	10		
Anthracene	1		600000
Benz[a]anthracene	0 5		0 2
Benzo[b]fluoranthene	1		6
Benzo[k]fluoranthene	0 5		200
Benzo[a]pyrene	1		10
Chrysene	0 5		60
Dibenzo[a h]anthracene	1		0 1
Fluoranthene	1		60000
Fluorene	1		
Indeno[1 2 3 cd]pyrene	1		6
Naphthalene	5		60000
2 Methylnaphthalene	20		
Phenanthrene	0 5		100
Pyrene	0 5		60000
Total PAHs	NA		
Semivolatile Organic Compounds by GC/MS SW 846 1311/3520C/8270C			
4 Chloro 3 methylphenol (p Chloro m cresol)	100		10000
2 Chlorophenol	100		10000
2 4 Dimethylphenol	100		40000
2 4 Dinitrophenol	500		4000
Carbazole	100		200
Phenol	100		1000000
2 3 4 6 Tetrachlorophenol	100		60000
1 4 Dichlorobenzene	100	7500	
2 4 Dinitrotoluene	100	130	
Hexachlorobenzene	100	130	
Hexachlorobutadiene	100	500	
Hexachloroethane	100	3000	
2 Methylphenol	100	200000	
3 Methylphenol	100	200000	
4 Methylphenol	100	200000	
Nitrobenzene	100	2000	
Pyridine	100	5000	
2 4 5 Trichlorophenol	500	400000	200000
2 4 6 Trichlorophenol	100	2000	500

(1) Laboratories have established Reporting Limits (RLs) as laboratory quantitation levels These are the minimum concentrations to be reported for routine laboratory analyses in clean environmental matrices The RLs are values believed to provide greater than 50 probability of avoiding a false negative
(2) As identified in the ROD

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7 3B (ECC)
Soil Performance Criteria (Treated Only)

Parameter	Reporting Limit (ug/L)	Criteria (ug/L)
TCLP PAHs by 1311/3510C/8310		
Acenaphthene	1	100000
Acenaphthylene	1	
Anthracene	1	600000
Benzo[a]anthracene	0 2	0 2
Benzo[b]fluoranthene	1	6
Benzo[k]fluoranthene	1	200
Benzo[a]pyrene	1	10
Chrysene	1	60
Dibenzo[a h]anthracene	0 1	0 1
Fluoranthene	1	60000
Fluorene	1	
Indeno[1 2 3 cd]pyrene	1	6
Naphthalene	1	60000
2 Methylnaphthalene	1	
Phenanthrene	1	100
Pyrene	1	60000
TCLP SVOCs by 1311/3510C/8270C		
4 Chloro 3 methylphenol	10	10000
2 Chlorophenol	10	10000
2 4 Dimethylphenol	10	40000
2 4 Dinitrophenol	10	4000
Carbazole	10	200
Phenol	10	1000000
2 3 4 6 Tetrachlorophenol	10	60000
1 4 Dichlorobenzene	10	7500
2 4 Dinitrotoluene	10	130
Hexachlorobenzene	10	130
Hexachlorobutadiene	10	500
Hexachloroethane	10	3000
2 Methylphenol	10	200000
3 Methylphenol	20	200000
4 Methylphenol	20	200000
Nitrobenzene	10	2000
Pyridine	10	5000
2 4 5 Trichlorophenol	10	200000
2 4 6 Trichlorophenol	10	500

Table 7 3A (Paragon Continued)
Soil Performance Criteria

Parameter	Reporting Limit (ug/L) (1)	HW Char/Toxicity Regulatory Level (ug/L)	Delisting Criteria (ug/L) (2)
Pesticides GC/ECD SW 846 1311/8081A			
γ BHC (Lindane)	1	400	
Chlordane	10	30	
Endrin	2	20	
Heptachlor (and its oxides)	2	8	
Methoxychlor	10	10000	
Toxaphene	100	500	
Volatile Organic Compounds by GC/MS – SW 846 1311/5030/8260B			
Benzene	25	500	300
2 Butanone (MEK)	100	200000	
Carbon tetrachloride	25	500	
Chlorobenzene	25	100000	
Chloroform	25	6000	
1 2 Dichloroethane	25	500	
1 1 Dichloroethene	25	700	
Tetrachloroethene	25	700	
Trichloroethene	25	500	
Ethylbenzene	25		40000
Styrene	25		6000
Xylene	100		600000
Vinyl chloride	50	200	
Herbicides and Pentachlorophenol by GC/ECD SW 846 1311/8151A			
2 4 D	10	10000	
2 4 5 TP	1	1000	
Pentachlorophenol	10	100000	60
Metals by Cold Vapor SW 846 1311/3005A/7470A			
Mercury	2	200	
Metals by ICP SW 846 1311/3005A/6010B			
Arsenic	50	5000	
Barium	1000	100000	
Cadmium	50	1000	
Chromium	100	5000	
Lead	30	5000	
Selenium	50	1000	
Silver	100	5000	

(1) Laboratories have established Reporting Limits (RLs) as laboratory quantitation levels These are the minimum concentrations to be reported for routine laboratory analyses in clean environmental matrices The RLs are values believed to provide greater than 50% probability of avoiding a false negative
(2) As identified in the ROD

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7 3B (ECC, continued)
Soil Performance Criteria (Treated Only)

Parameter	Reporting Limit (ug/L)	Criteria (ug/L)
TCLP Pesticides by 1311/8081		
γ BHC (Lindane)	0 2	400
Chlordane	1 6	30
Endrin	0 4	20
Heptachlor (and its oxides)	0 4	8
Methoxychlor	2	10000
Toxaphene	8	500
TCLP VOCs by 1311/5030B/8260B		
Benzene	10	300
2 Butanone (MEK)	100	200000
Carbon tetrachloride	10	500
Chlorobenzene	10	100000
Chloroform	10	6000
1 2 Dichloroethane	10	500
1 1 Dichloroethene	10	700
Tetrachloroethene	10	700
Trichloroethene	10	500
Ethylbenzene	10	40000
Styrene	10	6000
Xylene	30	600000
Vinyl chloride	10	200
TCLP Herbicides and Pentachlorophenol by 1311/8151A		
2 4 D	10	10000
2 4 5 TP	10	1000
Pentachlorophenol	2	60
TCLP Metals by 1311/3010A/6010A or 3020A/7000 where noted		
Arsenic	250	5000
Barium	10	100000
Cadmium	25	1000
Chromium	50	5000
Lead	250	5000
Mercury (7470A)	1	200
Selenium (7740)	20	1000
Silver	50	5000

Parameter	Reporting Limit	Criteria
Ignitability by 1010 (flashpoint)	190°F	>140°F
Corrosivity by 9045 (pH)	±0 1	2 12 5
Total Reactive Cyanide by 9012A	0 5 mg/kg	250 mg/kg
Total Reactive Sulfide by 9030A	4 mg/kg	500 mg/kg

Table 7 3A (Paragon, Continued)
Soil Performance Criteria

Parameter	Reporting Limit (1)	HW Char Regulatory Level	Delisting Criteria (2)
Ignitability SW 846 1010 (Chapter 7)			
Flashpoint	±1 (°F)	140 (F)	
Corrosivity SW 846 9045			
pH	±0 01	2 12 5	
Total Releasable Cyanide SW 846 (Chapter 7)			
Releasable Cyanide	0 5 (mg/kg)	250 (mg/kg)	
Total Releasable Sulfide SW-846 (Chapter 7)			
Releasable Sulfide	50 (mg/kg)	500 (mg/kg)	

(1) Laboratories have established Reporting Limits (RLs) as laboratory quantitation levels These are the minimum concentrations to be reported for routine laboratory analyses in clean environmental matrices The RLs are values believed to provide greater than 50 probability of avoiding a false negative
(2) As identified in the ROD

ORIGINAL Red)

Table 7 4A (Paragon)
SMWT Discharge Limits for Treated Water

Parameter	Reporting Limit (ug/L)	Average Discharge Limit (ug/L) (1)	Maximum Discharge Limit (ug/L) (1)
Polynuclear Aromatic Hydrocarbons (PAHs) by HPLC SW 846 3520C/ 8310			
Acenaphthene	1	22	59
Acenaphthylene	1	22	59
Anthracene	0 1	22	59
Benzo(a)anthracene	0 05	22	59
Benzo(b)fluoranthene	0 1		
Benzo(k)fluoranthene	0 05	22	59
Benzo(a)pyrene	0 1	23	61
Chrysene	0 05	22	59
Dibenzo(a h)anthracene	0 1		
Fluoranthene	0 1	25	68
Fluorene	0 1	22	59
Indeno(1 2 3 cd)pyrene	0 1		
Naphthalene	0 5	22	59
Phenanthrene	0 05	22	9
Pyrene	0 05	25	67
Semivolatile Organic Compounds by GC/MS SW 846 3520C/8270C			
Carbazole	10		
Bis (2 ethylhexyl)phthalate	10	103	279
Di n butyl phthalate	10	27	57
Diethyl phthalate	10	81	203
Dimethyl phthalate	10	19	47
Phenol	10	15	26
2 Methylphenol	10		
4 Methylphenol	10		
2 4 Dimethylphenol	10	18	36
Pentachlorophenol	10*	13	20
Volatile Organic Compounds by GC/MS – SW 846 5030A/8260B			
Toluene	5	26	80
Chloroform	5	21	46
Methylene chloride	5	32	89
Benzene	5	37	136
Ethylbenzene	5	32	108
Styrene	5		
Xylenes (total)	10		
Total Purgeables			100
BOD5 by USEPA 405 1			
BOD5 (field)	3000	5000	10000
TKN by USEPA 351 2			
TKN	200		20000
TPH by GC SW 846 8015M			
TPH	1000		15000
TSS by USEPA 160 2			
TSS (field)	200	30000	45000

* if run by method SW 846 8151A reporting limit is 0 1 ug/L

7 4B (ECC)
SMWT Discharge Limits for Treated Water

Parameter	Reporting Limit (ug/L)	Average Discharge Limit (ug/L)	Maximum Discharge Limit (ug/L)
PAHs by 3510C/ 8310			
Acenaphthene	0 2	22	59
Acenaphthylene	0 2	22	59
Anthracene	0 2	22	59
Benzo(a)anthracene	0 2	22	59
Benzo(b)fluoranthene	0 2		
Benzo(k)fluoranthene	0 2	22	59
Benzo(a)pyrene	0 2	23	61
Chrysene	0 2	22	59
Dibenzo(a h)anthracene	0 3		
Fluoranthene	0 2	25	68
Fluorene	0 2	22	59
Indeno(1 2 3-cd)pyrene	0 3		
Naphthalene	0 2	22	59
Phenanthrene	0 2	22	59
Pyrene	0 2	25	67
SVOCs by 3510C/8270C			
Carbazole	5		
Bis (2-ethylhexyl)phthalate	5	103	279
Di n butyl phthalate	5	27	57
Diethyl phthalate	5	81	203
Dimethyl phthalate	5	19	47
Phenol	5	15	26
2 Methylphenol	5		
4 Methylphenol	10		
2 4 Dimethylphenol	5	18	36
Pentachlorophenol	5	13	20
VOCs by 5030B/8260B			
Toluene	1	26	80
Chloroform	1	21	46
Methylene chloride	1	32	89
Benzene	1	37	136
Ethybenzene	1	32	108
Styrene	1		
Xylenes (total)	3		
Total Purgeables			100

7 4B (ECC, continued)
SMWT Discharge Limits for Treated Water

Parameter	Reporting Limit (ug/L)	Average Discharge Limit (ug/L)	Maximum Discharge Limit (ug/L)
Metals by 3010A/6010A or 3050B/7000 where noted			
Arsenic (total)	50	200	400
Barium	2	1000	2000
Cadmium (7131A)	0 2	1 1	3 9
Chromium	10	500	1000
Copper	7	12	18
Iron	75	1500	3000
Lead (7421)	2	3 2	82
Nickel	15	160	1400
Selenium (7740)	4	5 0	20
Silver (7761)	1		4 1
Zinc	10	110	120
Total Phosphorus by 365 2	100	500	1000
Fluoride by 340 2	100	10000	20000
Phenolics by 420 2	50		
TKN by 351 2	200		20000
TPH GRO by 8015M	50		15000
TPH DRO by 8015M	300		15000
Ammonia by 350 3	20	1200 @ pH = 7 760 @ pH = 8	18900 @ pH = 7 5600 @ pH = 8
Trivalent Arsenic by BR0021	2	190	360
Mercury by 1631	0 0005	0 012	2 4
Cyanide by 9012A	10	7 3	31 3

Table 7 5 SMWT Emission Limits for Stack Air

Parameter	Batch TDU Limits (g/s)		Continuous TDU Limits (g/s)		
	Emission	Reporting	Emission 1	Emission 2	Reporting
Volatile Organic Compounds by SW-846 8260					
Benzene	2 53E 03	4 64E 08	6 33E 03	6 33E 03	1 16E 07
Chlorobenzene	1 10E 01	4 64E-08	2 75E-01	2 75E 01	1 16E 07
1 1 Dichloroethene	4 78E 02	4 64E 08	1 20E-01	1 20E 01	1 16E 07
Tetrachloroethene	4 07E 01	4 64E 08	1 02	1 02	1 16E 07
Ethylbenzene	9 09E 01	4 64E 08	2 27	2 27	1 16E 07
Styrene	2 03E 01	4 64E 08	5 08E 01	5 08E 01	1 16E 07
Toluene	4 50E-01	4 64E 08	1 12	1 12	1 16E 07
Xylenes (Total)	1 04	4 64E 08	2 6	2 6	1 16E 07
Vinyl Chloride	2 45E 04	4 64E 08	6 12E 04	6 12E 04	1 16E 07
1 1 1 Trichloroethane	4 12	4 64E 08	1 03	1 03	1 16E 07
1 4 Dichlorobenzene	3 05E 03	4 64E 08	7 64E 03	7 64E 03	1 16E 07
Bromomethane	9 33E 03	4 64E 08	2 33E 02	2 33E 02	1 16E 07
Carbon Disulfide	7 41E 02	4 64E 08	1 85E 01	1 85E 01	1 16E 07
Chloroethane	6 22E 04	4 64E 08	1 56E 03	1 56E 03	1 16E 07
Chloromethane	2 51E 02	4 64E 08	6 28E 02	6 28E 02	1 16E 07
Semi volatile Organic Compounds by SW-846 8270A					
Acenapthene	4 78E 04	1 75E 06	1 20E 03	1 20E 03	4 39E 06
Acenapthylene	5 88E 03	1 75E 06	1 47E 02	1 47E 02	4 39E 06
Anthracene	4 78E 04	1 75E 06	1 20E 03	1 20E 03	4 39E 06
Benzo(a)anthracene	1 20E 04	1 75E 06	3 01E 04	3 01E 04	4 39E 06
Benzo(a)pyrene	1 00E 03	1 75E 06	2 50E 05	2 50E 05	4 39E 06
Benzo(b)fluoranthene	1 20E 04	1 75E 06	3 01E 04	3 01E 04	4 39E 06
Benzo(k)fluoranthene	1 20E 04	1 75E 06	3 01E 04	3 01E 04	4 39E 06
Chrysene	4 78E 04	1 75E 06	1 20E 03	1 20E 03	4 39E 06
Dibenzo(a h)anthracene	1 20E 04	1 75E 06	3 01E 04	3 01E 04	4 39E-06
Fluoranthene	1 96E 02	1 75E 06	4 91E 02	4 91E 02	4 39E 06
Fluorene	4 78E 04	1 75E 06	1 20E 03	1 20E 03	4 39E 06
Indeno(1 2 3 cd)pyrene	1 20E 04	1 75E 06	3 01E-04	3 01E 04	4 39E-06
Napthalene	1 24E 01	1 75E 06	3 11E 01	3 11E 01	4 39E 06
Phenanthrene	2 34E 03	1 75E 06	5 86E 03	5 86E 03	4 39E 06
Pyrene	4 78E 04	1 75E 06	1 20E 03	1 20E 03	4 39E 06
Carbazole	1 34E 03	1 75E 06	3 35E 03	3 35E 03	4 39E 06
Bis (2 Ethylhexyl)phthalate	4 83E 02	1 75E 06	1 21E 01	1 21E 01	4 39E 06
Phenol	4 54E 02	1 75E 06	1 14E 01	1 14E 01	4 39E 06
2 4 Dimethylphenol	3 14E 02	1 75E 06	7 85E-02	7 85E 02	4 39E 06
2 Methylphenol	5 26E 02	1 75E 06	1 32E 01	1 32E 01	4 39E 06
4 Methylphenol	5 26E 02	1 75E 06	1 32E 01	1 32E 01	4 39E 06
Pentachlorophenol	1 20E 03	1 75E 06	2 99E 03	2 99E 03	4 39E 06
1 2 Dichlorobenzene	3 59E 01	1 75E-06	8 97E 01	8 97E 01	4 39E 06
Nitrobenzene	1 20E 02	1 75E 06	2 99E 02	2 99E 02	4 39E 06

(1) Limit obtained by the product of emission limit (g/s) as presented in Appendix D of the POP Plan divided by the sampling flow rate (10 800s)

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Table 7-6A (Core Texas)
SMWT Ambient Air Quality Limits

Parameter	Reporting Limit (ppbv)	Maximum Discharge Limit (ppbv) (1)
VOCs by TO 14		
Benzene	0 058	0 502 (1 57 ug/m3)

(1) Limit btain d fr m 2 year exposur f r hild adjusted risk based concentrati n

Table 7-6B (Air Toxics)
SMWT Ambient Air Quality Limits

Parameter	Reporting Limit (ppbv)	Maximum Discharge Limit (ppbv) (1)
VOCs by TO 14		
Benzene	0 1	0 502 (1 57 ug/m3)

(1) Limit bt in d fr m 2 y xp ur f h ld djust d risk bas d conc trat

Table 7 7
Electronic Data Deliverable

Order	Sort Order	Field Name	Field Type (size)	Remarks
1		SITE	CHAR(20)	SMWTP
2		LOCATION	CHAR(20)	(Normally left blank by lab as place holder)
3		DEPTH	CHAR(10)	2 4
4		LABNAME	CHAR(10)	ABC LABS
5		SDG	CHAR(10)	SDG 010
6	1	FIELDID	CHAR(30)	WTUSE01
7		MATRIX	CHAR(2)	SS SB SW' etc
8	3	LABSAMPLEID	CHAR(20)	9712001 1A
9	2	METHOD	CHAR(20)	SW 846 6010B
10		SAMPLEDATE	DATE	12/01/97
11		RECEIVEDATE	DATE	12/02/97
12		EXTRACTIONDATE	DATE	12/03/97
13	4	ANALYSISDATE	DATE	12/04/97
14		CAS	CHAR(15)	71 43 2
15		ANALYTE	CHAR(50)	Aluminum
16		RESULT	NUMBER	485 (If non detect Do not use BDL ND NA report sample quantitation limit here)
17		UNITS	CHAR(10)	UG/L UG/KG etc
18		DILUTION	NUMBER	10 0
19		DETECTIONLIMIT	NUMBER	100
20		LABQUALIFIER	CHAR(5)	U' B J UJ' etc
21		SURROGATE	CHAR(1)	Y' if yes if no

7 4 DATA VALIDATION

Data validation is the process whereby data are determined to be of acceptable or unacceptable quality based on a set of pre-defined criteria by ICF Kaiser Engineers These criteria depend upon the type(s) of data involved and the purpose for which data are collected

ICF Kaiser will coordinate the review of the data Data packages will be validated to ensure compliance with specified analytical QA, and data reduction procedures data reporting requirements and required accuracy precision and completeness criteria as defined in the USEPA Region III Modifications to the National Functional Guidelines (NFGs) Data generated will be assessed for accuracy precision and completeness

7 5 DATA MANAGEMENT SCHEME

The levels of review are based on USACE guidance for data reduction review validation and reporting as given in USACE Requirements for the Preparation of Sampling and Analysis Plans (September 1994) (EM 200 1 3) The levels of review include data reduction data review (Technical Quality Control Administrative) and data validation using USEPA Region III data validation guidance Innovative Strategies for Data Validation June 1995 As referenced from EM 200 1 3 the components of the review levels are as follows

- Data Review The analyst who generates the analytical data has the prime responsibility for the correctness and completeness of that data Each step of this review process involves evaluation of data quality based on both the results of the QC data and the professional judgement of those conducting the review This application of technical knowledge and experience to the evaluation of data is essential in ensuring that data of quality are generated consistently All data generated and reduced shall follow well documented in house protocols This data review process is applicable to the generation of analytical data as well as the generation of all field parameter data

- Technical Review Analysts review the quality of their work based on an established set of guidelines Review criteria as established in each method, in this instruction and as stated within the off site

ORIGINAL
Red

laboratory Quality Management Manual shall be used The review shall at a minimum ensure that (1) sample preparation information is correct and complete (2) analysis information is correct and complete (3) appropriate SOPs have been followed (4) analytical results are correct and complete (5) QC samples are within established control limits (6) blanks and laboratory control samples are within appropriate QC limits (7) special sample preparation and analytical requirements have been met and (8) documentation is complete (any anomalies have been documented and forms completed. holding times documented. etc) Technical review is applicable to both laboratory and field operations All ICF Kaiser personnel and subcontractors are responsible for reviewing all field generated data to ensure that all work is completed in accordance with QC specifications

- Quality Control Quality control review shall be performed by a supervisor or data review specialist whose function is to provide an independent review of the data package This review shall also be conducted according to an established set of guidelines and is structured to ensure that (1) all appropriate laboratory SOPs have been followed (2) calibration data are scientifically sound. appropriate to the method. and completely documented (3) QC samples are within established guidelines (4) qualitative identification of sample components is correct (5) quantitative results are correct (6) documentation is complete and accurate (any anomalies have been documented and forms completed holding times documented. etc) (7) data are ready for incorporation into the final report and (8) the data package is complete and ready for data archive If no problems are found with the data package the review is complete If any problems are found with the data package an additional 10 percent of the sample results should be checked back to the sample preparatory and analytical bench sheets This cycle then repeats until either no errors are found in the data set checked or all data have been checked

- Administrative Data Review This review is performed by the quality assurance officer or the program administrator at the contractor laboratory This review should be similar to the review as provided in Level 2 except that it should provide a total overview of the data package to ensure its consistency and compliance with this instruction All errors noted will be corrected and documented Administrative data review is applicable to field operations through the review of all geotechnical data data validation deliverables analytical data deliverables and integrated field parameter and analytical data

- Data Validation Validation of the data will be performed by personnel independent of the laboratory generating the data as directed by ICF Kaiser Data will be validated in accordance with USEPA Region III Innovative Approaches for Validation of Organic and Inorganic Data (USEPA. 1995) Cleanup verification samples will be validated in accordance with M3 criteria Other samples will be validated in accordance with M1 specifications

7 6 BLANK CONTAMINATION ASSESSMENT

Blank contamination assessment will be performed to determine the impact of field sampling and laboratory analysis environments on data quality Field and laboratory QC blanks will be collected and processed at the frequency specified in section 6 0 Field and laboratory QC blank data will be reviewed in accordance with laboratory SOPs and methodologies and USEPA Region III Innovative Approaches for Validation of Organic and Inorganic Data (USEPA. 1995)

7 6 1 Field Blanks

Trip Blanks Potential contamination during sample collection and shipment and in the laboratory will be assessed through the evaluation of trip blanks for volatile contamination Volatile contaminants detected in a trip blank and the associated samples will be flagged appropriately

Rinse Blanks The integrity of decontamination events and sample cross-contamination will be evaluated by the rinse blank Samples associated with rinse blanks excursions will be qualified accordingly

Temperature Blanks – Potential volatilization of parameters during shipment will be assessed through the evaluation of temperature blanks Samples associated with temperature blanks excursions will be qualified accordingly except volatiles which may be rejected

7 6 2 Method Blanks

Method blanks will be used to determine the potential contamination from the laboratory environment and analytical method used to process the sample Method blanks will be processed at the beginning of each analytical run by the laboratory to determine whether the internal laboratory environment reagents used during analyses analytical techniques or the instrumentation system are sources of contamination that could affect the integrity of the sample

7 6 3 Assessment Process

The criterion for the evaluation of blank contamination applies to any blank associated with the samples and states that no contamination should be in the blank If contamination is detected. data associated with the blank will be carefully evaluated to determine if there is an inherent variability in the data for the lot or if the problem is an isolated occurrence not affecting all samples in the lot Examples of USEPA criteria by which the blanks will be reviewed include

Inorganic

- Any analyte detected in the environmental sample at less than five times the concentration in the associated blank will be qualified B

Organic

- The sample result is qualified B when the compound concentration is greater than the reporting limit but less than ten times the amount in any blank for common laboratory contaminants (i e methylene chloride acetone 2 butanone and common phthalate esters)
- The sample results for other contaminants are qualified B when the sample concentration is greater than the reporting limit but less than five times the amount detected in the associated blank.

In cases where more than one blank is associated with a given sample qualification will be based upon a comparison with the associated blank having the highest concentration of the contaminant The mean concentrations and standard deviation will be provided as a reference point Blank qualification will be added to the data validation and the ICF Kaiser Project Manager will assess data usefulness based on the project DQOs The Project Manager will make project decisions (use qualified data re sample re analyze) based upon the analytical limitations of the data Contamination assessment results will be presented in the RA Report

7 6 4 Data Usability Guidelines

Data points will be evaluated to determine whether the information can be used as the basis for remedial action decisions This evaluation will be conducted according to the guidelines and specifications described in the October 1990 EPA document *Guidance for Data Usability in Risk Assessment* (USEPA. 1990b) and the following

- Review USEPA data qualifiers applied to the sample data Assessment of the impact of the qualifiers on the usability of the data
- Reconciliation of all data received with that proposed in the RA and the analyses requested on the chain of custody documentation Compilation of all missing data points rejected data points and notification of the ICF Kaiser Project Manager and Laboratory QA Manager
- Calculation of RPD values from concentrations of compounds or elements in the field replicate pairs as well as compilation of all blank contamination Assessment of the impact of quality control data on data quality
- Closure of all corrective action directives
- Assessment of project DQOs
- Calculations of project completeness

ORIGINAL Red

8 0 CORRECTIVE ACTION

The Field Operations Manager and the on site CQC System Manager are responsible for identifying procedural non conformances and potential problems and for implementing corrective action to ensure that the established DQOs specifications and SOPs are maintained In addition if a clarification or adjustment to the SOPs is required. the CQC System Manager is responsible for revising SOPs and ensuring that the SOPs are reviewed and approved by the USACE state and federal regulatory agencies

Corrective action will be initiated through the development and implementation of routine internal quality control checks Specific limits beyond which corrective action is required will be established for each system and are referenced within the sections associated with those activities Corrective action requirements will be implemented in response to deficiencies encountered during system inspections

A closed loop corrective action system will be used to address system and data quality issues Steps comprising a closed loop corrective action system include

- Defining the problem
- Assigning responsibility for problem investigation
- Investigating and determining the cause of the problem
- Assigning responsibility for problem resolution
- Verifying that the resolution has corrected the problem

Corrective actions will be categorized as either routine or non routine and will require short term or long term action A communication path will be maintained between the person initiating the corrective action and the QA staff Results of implemented corrective actions will be reviewed by the CQC Systems Manager during management system reviews and technical system audits

8 1 ROUTINE CORRECTIVE ACTION

Work Plans and SOPs will establish technical procedures and the associated QC requirements Where possible the SOP will include specific criteria for determining the expected quality Routine corrective action will involve either short term action for sporadic problems or long term action for more chronic problems Corrective action initiated at the project level will be reported to the CQC Systems Manager to ensure corrective action is implemented and the problem is resolved

8 2 NON ROUTINE CORRECTIVE ACTION

Activities that are not covered by a specific SOP require an iterative process whereby the systems and QC specifications are estimated prior to the activity and adjustments are made as needed. during the course of the activity The ICF Kaiser demonstrated experience has shown that a structured problem solving process is very effective in the elimination of root causes

Documentation on the corrective action requirements the assignment of responsibility for corrective action due dates for completion of corrective action and validation of completion will be maintained Such documentation will be reviewed during system inspections Attached to the end of this section are the corrective action forms The corrective action forms consist of a Corrective Action Request (Figure 8 1) Corrective Action Plan (Figure 8 2) and Deficiency Tracking Log (Figure 8 3)

The Corrective Action Request is completed by the individual notifying a specific deficiency It is important to document the problem description and location references and requirements affected structures and activities and whether a corrective action plan is required If so the Project Manager or designee completes the Corrective Action Plan as to the planned actions responsibility and time frame The CQC System Manager reviews and may comment on the corrective action plan A deficiency tracking log should be kept for QA purposes

Figure 8 1 Corrective Action Request

ICF KAISER

CAR NUMBER		
PRIORITY	[ ] HIGH	[ ] NORMAL
ISSUED	CLOSED	

TYPE II CORRECTIVE ACTION REQUEST

PART A NOTICE OF DEFICIENCY

PROJECT	
PROJECT MANAGER	CQC SYSTEM MANAGER
ISSUED TO (NAME & ORGANIZATION)	
REQUIREMENT & REFERENCE	
PROBLEM DESCRIPTION & LOCATION	
AFFECTED STRUCTURES & ACTIVITIES	
CORRECTIVE ACTION PLAN APPROVAL REQUIRED?	[ ] NO [ ] YES DUE DATE
ISSUED BY (PRINTED NAME & TITLE) SIGNATURE	DATE

PART B CORRECTIVE ACTION PLAN APPROVAL

VERSION DATE	DISPOSITION & DATE

PART C CORRECTIVE ACTION VERIFICATION

VERIFICATION INSPECTION PERFORMED BY	DATE
CAP DISPOSITION (CHECK ONLY ONE & EXPLAIN WHERE NEEDED) [ ] APPROVED FOR CLOSURE WITHOUT STIPULATIONS [ ] APPROVED FOR CLOSURE WITH STIPULATIONS [ ] CLOSURE DELAYED FURTHER ACTION REQUIRED AUTHORIZED BY (PRINTED NAME & TITLE) SIGNATURE	DATE

ORIGINAL Red)

Figure 8 2 Corrective Action Plan

ICF KAISER

CAP NUMBER	
[ ] FYI	[ ] QC APPROVAL

CORRECTIVE ACTION PLAN

1 CAP number is only or lowest corresponding CAR number Designate revisions with original CAP number followed by appropriate letter
2 Attach clarifications and additional information as needed Identify attached material in appropriate section of the CAP

PART A TO BE COMPLETED BY PROJECT MANAGER DESIGNEE

PROJECT		
PROJECT MANAGER	CQC SYSTEM MANAGER	
CAR NO(S) & DATE(S) ISSUED		
DEFICIENCY DESCRIPTION & LOCATION		
PLANNED ACTIONS	ASSIGNED RESPONSIBILITY	COMPLETION DUE DATE
PROJECT MANAGER SIGNATURE	DATE	

PART B TO BE COMPLETED BY CQC SYSTEM MANAGER DESIGNEE

CAP REVIEWED BY	DATE
REVIEWER COMMENTS	
CAP DISPOSITION (CHECK ONLY ONE & EXPLAIN WHERE NEEDED) [ ] APPROVED WITHOUT STIPULATIONS [ ] APPROVED WITH STIPULATIONS [ ] APPROVAL DELAYED FURTHER PLANNING REQUIRED	
CQC SYSTEM MANAGER SIGNATURE	DATE

Figure 8 3 Deficiency Tracking Log

TYPE II DEFICIENCY TRACKING LOG

PROJECT	
PROJECT MANAGER	CQC SYSTEM MANAGER

CAR NO	ISSUED TO	DATE ISSUED	DATE CAP RECD	DATE (S) REVISIONS RECD	DATE CAP APPROVED	DATE CLOSED	STATUS

ORIGINAL (Red)

Documentation and monitoring of the corrective action are the responsibility of the CQC Systems Manager while the collection of data to support monitoring will be at the level where the corrective action is implemented The CQC Systems Manager will monitor the corrective action until remediation of the problem has been verified or it is clear that alternate actions are required Results of implemented corrective actions will be reviewed by the CQC Systems Manager during management system reviews and technical system audits In addition non routine corrective action will be reported to the TERC QC Supervisor in the QA report

Problems identified by assessment procedures will be resolved at the level it occurred with support from upper management Problems that cannot be resolved at this level will be reported to the TERC QC Supervisor for resolution who will determine at which management level the problem can best be resolved and will notify the appropriate manager

8 3 QUALITY IMPROVEMENT

Continuous development and improvement of the quality system are to be initiated through the quality improvement process The ICF Kaiser quality improvement process (QIP) is based on problem prevention resolution and corrective action QIP goals include the timely identification and resolution of the quality problems in manner that minimizes their impact on work products and prevents their reoccurrence

8 4 PROBLEM PREVENTION

The preventive action program is intended to identify problems before they are adverse to quality Inspections self assessments and peer review are examples of the tools that will be used by the project staff to identify potential quality problems

Input regarding project operations will be regularly sought from clients subcontractors and staff The Project Manager will foster a no fault attitude for problem identification and staff are encouraged to identify process improvement opportunities problems and solutions

8 5 STOP WORK PROTOCOLS

The ICF Kaiser Program Manager Project Manager and TERC QC Supervisor have the authority to issue a stop work order A stop work order will be issued under conditions such that the quality of work jeopardizes the attainment of the project objectives A stop work order must not create an operational safety public health or environmental hazard

Under a stop work order work may not be conducted within affected activities until the responsible manager acknowledges the implementation of a corrective action in accordance with the resolution criteria of the order Immediate notification of work stoppage will be made to the USACE

8 6 CORRECTIVE ACTION FOR SPECIFIC RA ACTIVITIES

DQOs contained in Section 5 0 of this QAPP specify the performance criteria for each major definable feature of work This section will discuss corrective actions that will be implemented in the event the criteria are not attained

8 6 1 Air Monitoring

Failure to attain the action levels for VOCs and particulates identified in Section 3 of the FSP will result in implementation of more stringent engineering controls In the event that the more stringent engineering controls fail to achieve the established particulate level criterion the criterion will be reconsidered based on site specific analysis of SVOCs in collected particulates It is understood that the particulate criterion has been established based on conservative assumptions and that a more realistic criterion can be developed if necessary It is currently anticipated that standard engineering controls can achieve the respective action levels

8 6 2 Excavation

Soil and sediment samples will initially be screened within ± 10% of the excavation performance criteria Verification samples will be submitted to the contract laboratory for verification Should the excavation boundary not be confirmed the following action will be taken

- Extend excavation
- Retest

8 6 3 Thermal Desorption

Failure to attain air emission standards during the POP will result in the total reevaluation of the system Corrective action requirements will be discussed with USACE and USEPA to ensure implementation of appropriate engineering controls

Information collected during the POP will be used to establish a baseline correlation between soil feed characteristics and the resultant treated soil Corrective actions generally associated with full scale operation include

- Reprocessing of soil
- Reassessment of feed material characteristics
- Recalibration of TDUs
- Reduction in operation rates (e g slow down process)

8 6 4 Water Treatment

Water treatment process activities will be assessed on a daily weekly and monthly basis to ensure the system is capable of attaining effluent criteria The plant is scheduled for effluent sampling once a month with verbal results to be furnished by the contract laboratory within 14 days The effluent will generally be sampled at the beginning of the month to allow for additional sampling in the event the effluent criteria is exceeded It is Notification will be provided to the USACE EPA and MDE and the cause of the excursion will be determined Discharge will not continue until the problem has been corrected and the effluent criteria are met

ORIGINAL Red)

9 0 QUALITY ASSESSMENTS

This section discusses the inspection program used to monitor the total measurement system and to evaluate the quality of operation in the field and at the on site laboratory A performance inspection is a planned independent check of the operation of a system to obtain a quantitative measure of the quality of data generated, and involves the use of standard reference samples or materials that are certified as to their chemical composition or physical characteristics Systems inspection is of a qualitative nature and consists of on site review of a system s quality assurance system and physical facilities for sampling/analysis calibration and measurement

Quality assessment encompasses ongoing surveillance of field operations with the basic objective of ensuring that ongoing work is completed in accordance with the objectives and associated specifications as established in the SAP and QAPP The elements of quality assessment presented in this section include

- Performance/System Audits performed at the laboratory and field operations
- Follow up Phase of ICF Kaiser s Contractor Quality Control as presented in the DQCR and
- Internal Quality Control procedures associated with laboratory operations

Corrective action as a result of quality assessment is presented in Section 8 0 of this document

9 1 DOCUMENT REVIEW

Project plans will be reviewed and approved prior to implementation The Project Manager and TERC QC Supervisor will provide a qualitative self-evaluation for establishing whether the prevailing management structure polices practices and procedures are adequate to ensuring that the results needed are obtained The Program Manager will provide an independent qualitative evaluation of a particular program operation and/or organization to establish whether the prevailing management structure policies practices and procedures are adequate for ensuring that the results needed are obtained

9 2 DOCUMENT CONTROL

The goal of ICF Kaiser s Document Control Program is to ensure that the project documents issued or generated will be accounted for upon completion of the project The program includes a numerical document control system document inventory procedure and a central filing system with a designated person(s) responsible for its maintenance Documents used or generated during the course of the project are accounted for and become a part of the project files upon completion of the task These may include but are not limited to the following

- Project Deliverables
- Investigation Requirements
- Reports and correspondence material
- Contract Documents

For example the QAPP will contain a control header located in the footer to include

- Document title
- Revision number
- Contract number
- Effective date (Month Year)

A distribution list of controlled documents will be maintained CQC System Manager within the project QA files This system will ensure that revisions are distributed to the addressees After technical work on a task has been completed, the accountable documents generated or used for the task work will be assembled, inventoried, and placed in a secure storage location Accountable task documentation will then be inventoried by the TERC QC Supervisor or he designee Figure 9 1 is an example of a Document Review Form

Figure 9 1 Document Review Record

DOCUMENT REVIEW RECORD		
PROJECT NAME	PROJECT NO	CLIENT
DOCUMENT NAME/DATE		
DRAFT_____ FINAL_____ REVISION NO _____ DRAFT FINAL___		
AUTHOR		
TECHNICAL REVIEWER		
MANAGEMENT REVIEWER		
HEALTH & SAFETY REVIEWER		
ENGINEERING REVIEWER		
OTHER REVIEWER		
NUMBER OF COPIES/DISTRIBUTION _____		
RETURN REVIEW COPIES TO AUTHOR BY		
DUE DATE/TIME	DATE IN/TIME	

THE APPROPRIATE SIGNATURE(S) MUST BE COMPLETED AND DATED BEFORE RELEASE OF THE PROJECT DOCUMENT		
REVIEWER SIGNATURE	DATE	INITIAL IF N/A
TECHNICAL OK		
MANAGEMENT OK		
ENGINEERING OK		
HEALTH & SAFETY OK		
OTHER SPECIALIST*		
OTHER SPECIALIST*		

* SPECIALIST TO BE WRITTEN IN AS REQUIRED

ORIGINAL Red)

9 3 DOCUMENT REVISION

Revisions to approved project plans calculations designs and equipment specifications (including specifications of computer systems) must undergo the same review process as the original document In all instances the USACE Contracting Officer will be notified of changes through the submissions of the DQCR

Field changes will be documented in the field logbook and on a Document Revision Form Field changes must be approved by the Field Operations Manager Project Manager and the CQC Systems Manager prior to implementation Figure 9 2 is an example of the Document Revision Form Completed Document Revision Forms will be maintained in the project files Document Revision Forms will be attached to the submitted DQCR

Revised documents will be provided to each person on the distribution list Use of the most recent copies of project plans will be checked during the readiness reviews It will be the responsibility of the recipient to destroy or dispose of superseded documents The recipient will be notified of their responsibility by internal memorandum Copies of superseded documents in the project files will be identified as such by writing obsolete on the cover

9 4 PRE FIELD OPERATIONS CHECKLIST

The Pre Field Operations Checklist (Pre FOC) is intended to be the basis for documenting the kick off meeting prior to the starting field work This meeting should include the client the USACE project officer and chemist ICF Kaiser Field Operations Manager CQC System Manager and subcontractors contributing to the field operations Within the scope of the meeting, the specific subtasks and associated sampling events will be discussed in relation to the DQOs documentation requirements and required equipment for completing the sampling events

The equipment needs of each Standard Operating Procedure will be checked against inventoried equipment on site Any equipment needs will be discussed and documented in the Pre FOC The status of the equipment needs will be reviewed and addressed for each sampling event in the Preparatory and Initial Checklists

The status of submittals will be documented within this checklist If any submittals are in regulatory review this will be clearly stated. In addition the submission requirements for subcontractors will be evaluated to ensure that all submittals are complete and approved prior to the sampling event Ultimately the Pre FOC will set the baseline of expectations for the Level of Workmanship and ensure that any misinterpretations of expectations are resolved and documented The Pre Field Operations Checklist to be used for SMWT is given in Figure 9 3

9 5 PREPARATORY PHASE CHECKLIST

The Preparatory Phase Checklist (PPC) is intended to be the basis for documenting the kick-off meeting prior to the starting of a specific task or sampling event within the scope of field operations at SMWT Sampling events include but are not limited to surface soil/subsurface soil sampling surface water/sediment sampling groundwater and wastewater sampling and monitoring and air monitoring This meeting should include the prime contractor s ICF Kaiser Project Manager and Field Operations Manager The following individuals must attend the meeting Site Manager Sampling Supervisor and the designated On Site CQC System Manager In addition the manager responsible for analytical subcontractors involved in the sampling event must attend If necessary the sampling event subcontractors can attend through a conference call In addition the Laboratory Project Manager should attend through a conference call The USACE Project Manager and Project Chemist should be notified of the meeting and may attend at their discretion In addition any USACE individual completing ongoing monitoring of the project should attend the meeting Within the scope of the meeting the following will be discussed

- Summary of all individuals present at the meeting with associated title of the individual phone number and internet address (if available)
- The status of all submittals including the baseline submittals (i e FSP SAP Health and Safety Plan and site specific Work Plans If the baseline submittals are not final the USACE Project Program Manager will be notified through submission of this checklist The ICF Kaiser CQC System Manager would request permission to move forward with the sampling event In addition the ICF Kaiser TERC QC Supervisor would also have to be notified and permission requested

Figure 9 2 Document Revision Form

REQUESTER		DATE
PROJECT NAME		PROJECT NO
CLIENT		
ITEM REQUIRING REVISION		
DOCUMENT		
SECTION	PAGE	PARAGRAPH
EXISTING TEXT OR DESCRIPTION		
REQUIRED REVISION AND RATIONALE		
CLIENT CONTACTED YES NO DATE		
APPROVALS Operations Manager (Signature) _____ Date QA Manager (Signature) _____ Date Project Manager (Signature) _____ Date		

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Figure 9 3 Pre field Operations Checklist

Site SMWT Date _____

Client Notified _____ Hours in Advance

USACE Design Manager Notified _____ Hours in Advance

Off Site Laboratory Program Manager Notified _____ Hours in Advance

If applicable Prime Subcontractor Notified _____ Hours in Advance

If applicable Prime Subcontractor Notified _____ Hours in Advance

Contract Number _____ ICF Kaiser Project Number _____

Pre Field Operation Checklist ID _____

Subtasks encompassed within Field Operations _____

_____

_____

_____

_____

_____

I Personnel Present
Client USACE Project Manager USACE Project Chemist and Off Site Laboratory Program Manager should attend SMWT Field Operations Manager **SMWT QUALITY ASSURANCE MANAGER (CQC REPRESENTATIVE)** and **SMWT PROGRAM MANAGER** must attend
Attachment I

II Submittals Include Prime and Subcontractor Submittals
Attachment II

III Equipment
Attachment III SOP Summary

Figure 9 3 Pre field Operations Checklist (Continued)

1 Review Equipment Requirements for Field Operations

Does any equipment need to be purchased in support of Field Operations? YES _____ NO _____

If YES list _____

_____

_____

2 Will SOPs need to be generated for purchased equipment? YES _____ NO _____

If YES list _____

_____

_____

3 If applicable will a storage area and associated support roads need to be established for equipment? YES _____ NO _____

If YES discuss action to be taken _____

_____

_____

IV Data Quality Objectives

1 Discuss the Data Quality Objectives of each subtask composing Field Operations

_____

_____

_____

2 Do all subcontractors have in their possession required documents containing approved specifications for establishing required Level of Workmanship? YES _____ NO _____

If NO complete Attachment III

V Level of Workmanship

Discuss the baseline of expectations for the Level of Workmanship for Field Operations YES _____ NO _____

Issues Discussed _____

_____

_____

_____

Resolution of Differences _____

_____

_____

_____

Figure 9 3 Pre field Operations Checklist (Continued)

Attachment I
Personnel Present Pre Field Operations

	NAME	POSITION	PHONE NUMBER	INTERNET ADDRESS
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

Figure 9 3 Pre field Operations Checklist (Continued)

Attachment II
Status of Submittals

1 SAP _____

Revision _____ Document Review Form Completed by ICF Kaiser? YES _____ NO _____

Document Reviewed and Approved by Client? YES _____ NO _____

Document Reviewed and Approved by USACE? YES _____ NO _____

Comment _____

_____

Document Reviewed and Approved by USEPA Region III? YES _____ NO _____

Comment _____

_____

Document Reviewed and Approved by Maryland Department of the Environment? YES _____ NO _____

Comment _____

_____

2 Work Plan _____

Revision _____ Document Review Form Completed by ICF Kaiser? YES _____ NO _____

Document Reviewed and Approved by Client? YES _____ NO _____

Document Reviewed and Approved by USACE? YES _____ NO _____

Comment _____

_____

Document Reviewed and Approved by USEPA Region III? YES _____ NO _____

Comment _____

_____

Figure 9 3 Pre field Operations Checklist (Continued)

Attachment II
Status of Submittals (Continued)

3 Health and Safety Plan _____

Revision _____ Document Review Form Completed by ICF Kaiser? YES _____ NO _____

Document Reviewed and Approved by Client? YES _____ NO _____

Document Reviewed and Approved by USACE? YES _____ NO _____

Comment _____

_____

Document Reviewed and Approved by USEPA Region III? YES _____ NO _____

Comment _____

_____

4 _____

5 _____

6 _____

7 _____

Figure 9-3 Pre-field Operations Checklist (Continued)

Attachment III

Required Specifications Submittals to Subcontractors For Completion of Work

	NAME	POSITION	PHONE NUMBER	INTERNET ADDRESS
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				

Figure 9 3 Pre field Operations Checklist (Continued)

SOP NUMBER	SOP TITLE	REQUIRED	IF NO, LIST EQUIPMENT
DOCUMENTATION AND SAMPLE SHIPPING			
SOP A 1	Sample Labels	YES____ NO____	_____
SOP A 2	Chain of Custody Form	YES____ NO____	_____
SOP A 3	Field Logbook	YES____ NO____	_____
SOP A 4	Field Parameter Forms	YES____ NO____	_____
SOP A 5	Sample Preservation	YES____ NO____	_____
SOP A 6	Sample Packing and Shipping	YES____ NO____	_____
FIELD MEASUREMENTS			
SOP B 1	Photoionization Detector (HNu Model PI 101)	YES____ NO____	_____
SOP B 2	Flame Ionization Detector (Photovac MicroFID® and Heath Detecto Pak III®)	YES____ NO____	_____
SOP B 4	Combustible Gas/Oxygen/Hydrogen Sulfide Monitor	YES____ NO____	_____
SOP B 5	Aerosol Meter (Miniram Model PDM 3®)	YES____ NO____	_____
SOP B 6	Hydrolab® H 0 Multiprobe	YES____ NO____	_____
SOIL SAMPLING			
SOP D 1	Soil Sampling	YES____ NO____	_____
SURFACE WATER/SEDIMENT SAMPLING			
SOP E 1	Surface Water Sampling	YES____ NO____	_____
SOP E 2	Sediment Sampling	YES____ NO____	_____

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Figure 9 3 Pre field Operations Checklist (Continued)

SOP NUMBER	SOP TITLE	REQUIRED	IF NO, LIST EQUIPMENT
HYDROGEOLOGIC INVESTIGATION			
SOP F 1	Monitoring Well Installation and Development	YES___ NO___	_____
SOP F 2	Collection of Groundwater Samples with Teflon® Bailers	YES___ NO___	_____
SOP F 3	Low Flow Groundwater Sampling	YES___ NO___	_____
SOP F 4	Hydropunch® Groundwater Sampling	YES___ NO___	_____
SOP F 5	Collection of Groundwater Samples Using Geoprobe®	YES___ NO___	_____
OTHER FIELD ACTIVITIES			
SOP H 1	Collection of Ambient Air with Adsorbent Cartridges	YES___ NO___	_____
SOP H 2	Collection of Ambient Air with Summa Steel Canisters	YES___ NO___	_____
SOP H 3	Test Pit and Trench Sampling	YES___ NO___	_____
SOP H 4	Waste Pile Sampling	YES___ NO___	_____
DECONTAMINATION AND MANAGEMENT OF IDW			
SOP I 1	Decontamination	YES___ NO___	_____
SOP I 2	Management of Investigation Derived Waste	YES___ NO___	_____

ORIGINAL (Red)

Figure 9 3 Pre field Operations Checklist (Continued)

IV Signatures

Client

Signature _____ Print _____

USACE Project Manager

Signature _____ Print _____

USACE Project Chemist

Signature _____ Print _____

Off Site Laboratory Program Manager

Signature _____ Print _____

Prime Subcontractor

Signature _____ Print _____

Prime Subcontractor

Signature _____ Print _____

ICF Kaiser Program Manager

Signature _____ Print _____

ICF Kaiser Operations Manager

Signature _____ Print _____

ICF Kaiser Quality Assurance Manager (CQC Representative)

Signature _____ Print _____

- The status of all SOPs (both analytical and field) including SOPs required for the sampling event In addition identification of a new SOPs needed as a result of new or special equipment
- A discussion of the specific data quality objectives and specifications for the sampling events
- Identification for secured area access subsurface utility clearance and permits for remediation activities
- Status of Health and Safety as it relates to the sampling event
- Identification of specific sampling sites and conditions for collection of the samples and
- USACE comments of the meeting

Figure 9-4 presents the format for the Preparatory Phase Checklist to be used at SMWT

9 6 INITIAL PHASE CHECKLIST

The Initial Phase Checklist (IPC) is confirmation that QC elements are in place for initiation of the Remedial Activities event Sampling events include but are not limited to surface soil/subsurface soil sampling surface water/sediment sampling wastewater sampling and monitoring and air monitoring The following individuals must attend the meeting Field Operations Manager Sampling Task Manager SMWT Quality Assurance Manager (CQC Representative) the designated on site CQC System Manager and the sampling technicians completing the sampling event In addition the Sampling Supervisor for any subcontractor involved in the sampling event as well as any subcontractor sampling technicians must attend If necessary the SMWT Quality Assurance Manager (CQC Representative) can attend through a conference call The USACE Project Manager and Project Chemist should be notified of the meeting but typically would not attend In addition, any USACE individual completing ongoing monitoring of the project should attend the meeting Within the scope of the meeting, the following will be discussed

- A summary of all individuals present at the meeting with associated title of the individual phone number and internet address (if available)
- Verification that all submittals including the baseline submittals (i e FSP SAP Health and Safety Plan, and the site specific Work Plan) are final
- Verification that all SOPs adequately define Level of Workmanship and have been reviewed by the sampling technicians If revisions for clarification to the SOP have occurred, verification of the final SOP revision
- Verification that all sampling equipment is on site and calibrated equipment is ready
- A discussion of the specific data quality objectives and specifications for the sampling events
- Verification that analytical support (including analytical SOPs) is ready for sample receipt
- Review of system for numbering samples
- Review of conditions and frequency for collection of associated field QC samples as well as volume requirements for laboratory QC samples
- Formal Health and Safety briefing for site specific concerns for the sampling event
- Verification of specific sampling sites and conditions for collection of the samples and
- Defining Level of Workmanship through existing work or demonstration

Figure 9 5 presents the format for the Initial Phase Checklist to be used at SMWT

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Figure 9-4 Preparatory Phase Checklist

Site SMWT Date _____

USACE Project Manager Notified _____ Hours in Advance

USACE Project Chemist Notified _____ Hours in Advance

Contract Number _____ ICF Kaiser Project Number _____

Sampling Event _____

Preparatory Phase Checklist ID _____

Associated Pre Field Operation Checklist ID _____

I Personnel Present
SMWT Project Manager and SMWT Field Operations Manager should attend Sampling Task manager SMWT Quality Assurance Manager (CQC Representative) designated on site CQC Representative and Off Site Laboratory Program Manager (conference call) must attend
Attachment I

II Submittals Include Prime and Subcontractor Submittals
Status of Submittals
Attachment II

III Equipment

1 RI/FS Component

Is All Sampling Equipment On Site as Required by SOPs YES _____ NO _____

If NO List Missing Equipment _____

_____

_____

_____

Action Taken

_____

_____

_____

Are All Equipment and Materials Stored Properly? YES _____ NO _____

Figure 9-4 Preparatory Phase Checklist (Continued)

If NO Action Taken _____

_____

_____

_____

2 Remediation Component

Does This Apply? YES _____ NO _____ If YES Continue

Is All Remediation Equipment On Site as required by Work Plan? YES _____ NO _____

If NO List Missing Equipment _____

_____

_____

_____

Is All Remediation Equipment to Specifications? YES _____ NO _____

If NO List Deficient Equipment _____

_____

_____

_____

Action Taken _____

_____

_____

_____

Are All Equipment and Materials Stored Properly? YES _____ NO _____

If NO Action Taken _____

_____

_____

ORIGINAL Redj

Figure 9-4 Preparatory Phase Checklist (Continued)

Summarize Maintenance Cycles on Critical Equipment _____

_____

_____

_____

List Maintenance Deficiencies of Critical Equipment _____

_____

_____

_____

_____

_____

_____

_____

Action Taken on Maintenance Deficiencies _____

_____

_____

_____

_____

_____

_____

_____

Figure 9 4 Preparatory Phase Checklist (Continued)

Attachment I
Personnel Present Preparatory Phase

	NAME	POSITION	PHONE NUMBER	INTERNET ADDRESS
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

Figure 9 4 Preparatory Phase Checklist (Continued)

Attachment II
Status of Submittals

1 SAP _____

Revision _____ Document Review Form Completed by ICF Kaiser?

Document Reviewed and Approved by Client? YES _____ NO _____

Document Reviewed and Approved by USACE? YES _____ NO _____

Comment _____

_____

Document Reviewed and Approved by USEPA Region III? YES _____ NO _____

Comment _____

_____

Document Reviewed and Approved by Maryland Department of the Environment? YES _____ NO _____

Comment _____

_____

2 Work Plan _____

Revision _____ Document Review Form Completed by ICF Kaiser?

Document Reviewed and Approved by Client? YES _____ NO _____

Document Reviewed and Approved by USACE? YES _____ NO _____

Comment _____

_____

Document Reviewed and Approved by USEPA Region III? YES _____ NO _____

Comment _____

_____

Figure 9 4 Preparatory Phase Checklist (Continued)

Attachment II

Status of Submittals (continued)

3 Health and Safety Plan _____

Revision _____ Document Review Form Completed by ICF Kaiser? _____

Document Reviewed and Approved by Client? YES _____ NO _____

Document Reviewed and Approved by USACE? YES _____ NO _____

Comment _____

_____

Document Reviewed and Approved by USEPA Region III? YES _____ NO _____

Comment _____

_____

4 _____

5 _____

6 _____

7 _____

ORIGINAL Red)

Figure 9 4 Preparatory Phase Checklist (Continued)

IV Data Quality Objectives/Specifications

1 Discuss the Data Quality Objectives of the Sampling Event/Remediation

_____

_____

_____

2 Discuss Specifications for Sampling Event/Remediation
List subcontractors Completing or Contributing to Field Operation

a _____ ICF KE Oversight _____
b _____ ICF KE Oversight _____
c _____ ICF KE Oversight _____

Are Monitoring Wells Being Installed? YES _____ NO _____

If YES Are Installation Specifications Discussed? YES _____ NO _____

Comments for Monitoring Well Installation _____

_____

_____

Comments for Sampling Event/Remediation Specifications _____

_____

_____

Clarifications of Any Differences _____

_____

_____

V Preliminary Work and Permits

1 If necessary has access been obtained to secured areas? YES____ NO____ NA____

If not action taken _____

_____

_____

2 If necessary has UXO clearance support been obtained? YES____ NO____ NA____

Figure 9 4 Preparatory Phase Checklist (Continued)

If not action taken _____

_____

_____

3 If necessary has subsurface utility clearance been obtained? YES____ NO____ NA____

If not action taken _____

_____

_____

4 If necessary have permits for remediation activities been obtained? YES_____ NO_____ NA_____

If not action taken _____

_____

_____

VI Testing

1 List Prime Laboratories Providing Analytical Support to this Sampling Event

a Laboratory _____ Point of Contact _____

Phone Number _____

b Laboratory _____ Point of Contact _____

Phone Number _____

2 Analytical Support Status

a QAPP List the following Analyte List SOP number and USACE Validation Date When Applicable

i)_____

ii)_____

iii)_____

iv)_____

v)_____

vi)_____

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Figure 9 4 Preparatory Phase Checklist (Continued)

vii)_____
viii)_____
ix)_____
x)_____
xi)_____
xii)_____
xiii)_____
xiv)_____
xv)_____
xvi)_____
xvii)_____
xviii)_____
xix)_____
xx)_____

Are all required analytical SOPs Ready? YES _____ NO _____

If not action taken _____

_____

_____

b SAP List Sampling Methods and SOPs for Sampling Event

i)_____
ii)_____
iii)_____
iv)_____
v)_____
vi)_____
vii)_____
viii)_____
ix)_____
x)_____

Are all required SOPs available? YES _____ NO _____

If NO action taken _____

_____

_____

Figure 9-4 Preparatory Phase Checklist (Continued)

c Site Specific Work Plan List the cross reference to all tables providing sampling requirements

i)_____

ii)_____

iii)_____

Are sampling location number of samples analytical parameters per sample and number and frequency of Field QC Samples understood? YES _____ NO _____

If NO action taken _____

_____

_____

Are working copies provided to the individuals completing the work? YES _____ NO _____

If NO action taken _____

_____

_____

d Site Specific Work Plan List the cross references to all figures providing sampling locations

i)_____

ii)_____

iii)_____

Are sampling locations clearly understood? YES _____ NO _____

If NO action taken _____

_____

_____

Are working copies provided to the individuals completing the work? YES _____ NO _____

If NO action taken _____

_____

_____

Have sample locations coordinates (and elevation when required) been determined? YES _____ NO _____

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Figure 9-4 Preparatory Phase Checklist (Continued)

If NO action taken _____

_____

_____

VII Safety

1 Is the Health and Safety Plan approved and on site? YES_____ NO_____

If not action taken _____

_____

_____

2 Have subcontractors completing work under this sampling event read the Health and Safety Plan?
YES _____ NO _____

If not action taken _____

_____

_____

3 Are all individuals completing work under this sampling event OSHA 40 hour Health and Safety Plan?
YES_____ NO_____

If not action taken _____

_____

_____

4 Identify the 8 hour trained Health and Safety Supervisor(s)?

Name _____ Phone Number _____
Name _____ Phone Number _____

If no one is identified, action taken _____

_____

_____

Figure 9-4 Preparatory Phase Checklist (Continued)

5 Comments on Sampling Event On Site Health and Safety including equipment

_____

_____

_____

_____

_____

_____

Have deficiencies been identified? YES _____ NO _____

If YES action taken _____

_____

_____

_____

VIII Corps of Engineers comments during meeting

_____

_____

_____

_____

_____

_____

_____

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Figure 9 4 Preparatory Phase Checklist (Continued)

VIX Signatures

Field Operations Manager

Signature _____ Print _____

Sampling Task Manager

Signature _____ Print _____

SMWT

Signature _____ Print _____

CQC Representative On Site

Signature _____ Print _____

Prime Subcontractor Representative

Signature _____ Print _____

Prime Subcontractor Representative

Signature _____ Print _____

Figure 9 5 Initial Phase Checklist

Site SMWT Date _____

USACE Project Manager Notified _____ Hours in Advance

USACE Project Chemist Notified _____ Hours in Advance

Contract Number _____ ICF Kaiser Project Number _____

Sampling Event _____

Associated Pre Field Operation Checklist ID _____

Preparatory Phase Checklist ID _____

Initial Phase Checklist ID _____

I Personnel Present note individuals completing sampling must be identified
Field Operations Manager Should Attend Sampling Task Manager SMWT Quality Assurance Manager (CQC Representative) On Site CQC Representative Sampling Technicians and Subcontractor Sampling Task Manager Must Attend
Attachment I

II Submittals Include Prime and Subcontractor Submittals
Status of Submittals
Attachment II

III Equipment

1 Are all deficiencies with sampling equipment that were identified on Preparatory Checklist corrected?
YES _____ NO _____

If NO Action Taken _____

_____

_____

_____

2 Are all deficiencies with remediation sampling equipment that were identified on the Preparatory Checklist corrected?
YES____ NO____ NA____

If NO Action Taken _____

_____

_____

Figure 9 5 Initial Phase Checklist (Continued)

Attachment I
Personnel Present Initial Phase Meeting

	NAME	POSITION	PHONE NUMBER	INTERNET ADDRESS
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

Figure 9 5 Initial Phase Checklist (Continued)

Attachment II
Status of Submittals

1 SAP _____

Revision _____ Document Review Form Completed by ICF Kaiser?

Document Reviewed and Approved by Client? YES _____ NO _____

Document Reviewed and Approved by USACE? YES _____ NO _____

Comment _____

_____

Document Reviewed and Approved by USEPA Region III? YES _____ NO _____

Comment _____

_____

Document Reviewed and Approved by Maryland Department of the Environment? YES _____ NO _____

Comment _____

_____

2 Work Plan _____

Revision _____ Document Review Form Completed by ICF Kaiser?

Document Reviewed and Approved by Client? YES _____ NO _____

Document Reviewed and Approved by USACE? YES _____ NO _____

Comment _____

_____

Document Reviewed and Approved by USEPA Region III? YES _____ NO _____

Comment _____

_____

Figure 9 5 Initial Phase Checklist (Continued)

Attachment II

Status of Submittals (continued)

3 Health and Safety Plan _____

Revision _____ Document Review Form Completed by ICF Kaiser?

Document Reviewed and Approved by Client? YES _____ NO _____

Document Reviewed and Approved by USACE? YES _____ NO _____

Comment _____

_____

Document Reviewed and Approved by USEPA Region III? YES _____ NO _____

Comment _____

_____

4 _____

5 _____

6 _____

7 _____

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8-01

Figure 9 5 Initial Phase Checklist (Continued)

IV Data Quality Objectives/Specifications

1 Discuss the Data Quality Objectives of the Sampling Event/Remediation

_____

_____

_____

2 Discuss Specifications for Sampling Event/Remediation
List subcontractors Completing or Contributing to Field Operation

a _____ ICF KE Oversight _____
b _____ ICF KE Oversight _____
c _____ ICF KE Oversight _____

Are Monitoring Wells Being Installed? YES _____ NO _____

If YES Are Installation Specifications Discussed? YES _____ NO _____

Comments for Monitoring Well Installation _____

_____

_____

Comments for Sampling Event/Remediation Specifications _____

_____

_____

Clarifications of Any Differences _____

_____

_____

V Preliminary Work and Permits

1 Have all deficiencies during the Preparatory Phase been addressed? YES _____ NO _____

Comments _____

_____

_____

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Figure 9 5 Initial Phase Checklist (Continued)

VI Testing

1 Have all deficiencies for analytical SOPs identified during the Preparatory Phase been addressed?
YES_____ NO_____

Comments _____

_____

_____

_____

2 Have all deficiencies for sampling SOPs identified during the Preparatory Phase been addressed?
YES_____ NO_____

Comments _____

_____

_____

_____

3 Have the Sampling Task Manager and sampling technicians reviewed pertinent SOPs? YES_____ NO_____

Comments _____

_____

_____

4 Have all deficiencies for the Site Specific Work Plan been addressed? YES_____ NO_____

Comments _____

_____

_____

5 Have the Sampling Task Manager and sampling technicians reviewed sampling locations?YES_____ NO_____

Comments _____

_____

_____

Figure 9 5 Initial Phase Checklist (Continued)

VII Safety

1 Have all deficiencies identified during the Preparatory Phase been addressed? YES_____ NO_____

Comments _____

_____

_____

2 Has a site specific Health and Safety briefing been completed? YES_____ NO_____

Comments _____

_____

_____

VIII Level of Workmanship

1 Has the level of workmanship been established from a previous sampling event at SMWTP? YES_____ NO_____

If YES sampling event is to be referenced for established Level of Workmanship?

Referenced Sampling Event _____

_____

_____

Are there any corrective actions or adjustments to Sampling Event? YES_____ NO_____

If YES discuss _____

_____

_____

If YES sampling personnel must clearly understand the adjusted Level of Workmanship

Discuss _____

_____

_____

Provide list of revised SOPs as a result of adjustment

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Figure 9 5 Initial Phase Checklist (Continued)

2 Level of workmanship is not established from Previous Sampling Event

Will any SOPs be demonstrated prior to initiation of sampling operations? YES_____ NO_____

Will initial work be considered a sample for Level of Workmanship? YES_____ NO_____

If YES CQC Representative or a designated representative will evaluate initial work to verify that Level of Workmanship has been established

Comments _____

_____

_____

Figure 9 5 Initial Phase Checklist (Continued)

Attachment III
Revised SOPs as a Result of Adjustment in Level of Workmanship

	SOP	SOP TITLE	NEW REVISION NUMBER	OLD REVISION NUMBER
1				
2				
3				
4				
5				
6				
7				
8				

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Figure 9 5 Initial Phase Checklist (Continued)

VIX Signatures

Field Operations Manager

Signature _____ Print _____

Sampling Task Manager

Signature _____ Print _____

Sampling Technicians

Signature _____ Print _____

Signature _____ Print _____

Signature _____ Print _____

Signature _____ Print _____

CQC REPRESENTATIVE, SMWT QUALITY ASSURANCE MANAGER

Signature _____ Print _____

CQC Representative On Site

Signature _____ Print _____

Prime Subcontractor Representative

Signature _____ Print _____

Figure 9 5 Initial Phase Checklist (Continued)

VIX Signatures

Subcontractor Technicians

Signature _____ Print _____

Signature _____ Print _____

Signature _____ Print _____

Signature _____ Print _____

Signature _____ Print _____

Signature _____ Print _____

Signature _____ Print _____

Signature _____ Print _____

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Figure 9 6 Example Template for the Daily Quality Control Reports

A-E DAILY QUALITY CONTROL REPORT

DATE_____

DAY

S	M	T	W	TH	F	S

USACE PROJECT MANAGER_____
PROJECT_____
DELIVERY ORDER NO _____
CONTRACT NO _____

WEATHER	B ght S	Cl	Ov ast	Ra	S ow
TEMP	T 32	32 50	50-70	70-85	85 p
WIND	Still	Mod rate	H gh	R port N	
HUMIDITY	Dry	Mod te	H gh		

SUB CONTRACTORS ON SITE
EQUIPMENT ON SITE
WORK PERFORMED (INCLUDING SAMPLING)

SHEET____ OF___

Figure 9-6 Example Template for the Daily Quality Control Reports (Continued)

A E Daily Quality Control Report (Continued)

PROJECT_____ REPORT NO _____

DELIVERY ORDER NO _____ DATE_____

QUALITY CONTROL ACTIVITIES (INCLUDING FIELD CALIBRATIONS)
HEALTH AND SAFETY LEVELS AND ACTIVITIES
PROBLEMS ENCOUNTERED/CORRECTION ACTION TAKEN
SPECIAL NOTES
TOMORROW S EXPECTATIONS

BY_____ TITLE_____

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9 7 THREE PHASE INSPECTION PROCESS

Documented readiness reviews will be performed by the CQC System Manager at the beginning of the work schedule start date and in the event of a quality related stop work order The readiness review will be performed to verify the following elements

- Work Plans are approved
- Personnel have been suitably trained and qualified
- The proper resources are available

Work prerequisites for remedial investigation include ensuring that necessary permits and licenses have been obtained ICF Kaiser will be responsible for site approvals and preparation. coordinating with for the extension of utilities to the study site and regulatory compliance (e g obtaining necessary permits to install monitoring wells) Once site preparation is complete and permits are obtained. ICF Kaiser will be responsible for monitoring these facilities and determining compliance with permit requirements

During the readiness review actions will be taken as necessary by the CQC System Manager to ensure that field activities are conducted in accordance with the QAPP The CQC System Manager will document deficiencies encountered during the readiness review and actions taken in the field to correct potential problems Results of readiness reviews and corrective actions will be presented as a memorandum issued to the ICF Kaiser Project Manager defining deficiencies noted during the inspection in order to implement actions necessary to meet the QA requirements as defined by this QAPP

9 8 LABORATORY SYSTEM AUDITS

Laboratory activities performed under contract to ICF Kaiser shall meet applicable contractual and project requirements This is to be ensured and verified by the QA Manager and his staff through implementation of the 3 phase control process for each definable feature of work performed by the contract laboratory Each control phase is important for obtaining a quality product However the Pre Field Operations inspection is particularly invaluable in preventing problems Production work is not to be performed on a definable feature of work until a successful Pre Field Operations/Preparatory Phase inspection has been completed Within the scope of laboratory system audits definable features of work include baseline analytical support for soil sediment wastewater groundwater analysis air analysis or any specialized analytical support not encompassed within the previous three areas

9 8 1 Pre Field Operations/Preparatory Phase Inspection

Prior to the submittal of project samples to the laboratory the CQC System Manager and Project Chemist are to verify that technical requirements have been planned and work pre requisites have been identified and met At a minimum the CQC Manager or Project Chemist are to verify that the requisite MRD validations have been achieved the Laboratory Quality Assurance Plan has been reviewed and accepted by ICF Kaiser and the COR laboratory equipment is of appropriate type sensitivity and quantity for its intended use facilities are appropriate for the expected sample load responsibilities are assigned and communicated laboratory staff are qualified to perform their jobs subcontracting restrictions have not been violated and approved procedures and controls are in place Discrepancies between actual conditions and approved plans or procedures are to be resolved. and corrective actions for unsatisfactory and non-conforming conditions are to be verified by the TERC QC Supervisor prior to granting approval to begin work.

The off site laboratory will be evaluated by the Project Chemist and associated qualified personnel prior to the beginning of each definable feature of work The items to be monitored include but are not limited to the following

- Size and appearance of the facility
- Quantity age availability scheduled maintenance and performance of instrumentation
- Availability appropriateness and utilization of SOPs
- Staff qualifications experience and personnel training programs

- Reagents standards and sample storage facilities
- Standard preparation logbooks and raw data
- Bench sheets and analytical logbook maintenance and review and
- Review of the laboratory s sample analysis/data package inspection procedures

A formal audit report will be provided through the DQCR Results of on site audit will be documented and maintained as part of the QA documentation

9 8 2 Preparatory Phase Inspection

Preparatory Phase Inspections are based on the same format as Pre Field Operation Inspections with an emphasis of targeting the specific area of analytical support (e g air analysis) All laboratory support elements including the specific instrumentation standards SOPs and data reduction associated with each new definable feature of work will be evaluated

9 8 3 Follow up Phase Inspection

The SMWT QA Manager and associated qualified Project Chemist may perform on site follow up inspections to verify continued compliance by the laboratory at their discretion This frequency may be adjusted based on laboratory performance and with the approval of the COR. The SMWT QA Manager is to document the follow up activities in a report that is attached to the DQCR Discrepancies between actual practices and approved plans/procedures are to be resolved and corrective actions for unsatisfactory and non-conforming conditions or practices are to be verified by the QA Manager prior to granting approval to continue work

9 8 4 Additional Inspections

Additional inspections may be required at the discretion of the COR or the TERC QC Supervisor with approval by the COR Additional preparatory and initial inspections are generally warranted under any of the following conditions unsatisfactory work, as determined by ICF Kaiser or the client changes in key personnel resumption of work after a substantial period of inactivity (e g 2 weeks or more) and changes to the project scope of work/specifications Results are to be documented in the QC log and summarized in the Daily QC Report

A summary of inspections in relation to definable features of work is summarized as follows

- Pre Field Operations inspection of all laboratories for all anticipated areas of analytical support prior to receipt of samples
- Preparatory Phase Inspection of each laboratory for each definable feature of work (e g soil/sediment/groundwater analytical support)
- Preparatory Phase Inspection for each new definable feature of work (e g air) Follow up Phase Inspection for existing analytical support (soil/sediment/groundwater) and
- Subsequent Preparatory Phase Inspections and USACE requested inspections in conjunction with Follow up Phase Inspections of any ongoing areas analytical support

It should be noted that the overlap between different inspection phases will not occur when analytical support is provided by different laboratories In this case additional audit trips would be required to meet Pre Field Operations Preparatory and Follow up Inspection requirements

9 9 FIELD PERFORMANCE AUDITS

A field audit of site activities will be accomplished by an inspection of all field site activities by an ICF Kaiser technical audit team During this audit the audit team will compare current field practices with procedures outlined in the project work plans (i e WP QAPP and EM 1110 1 4000 *Monitor Well Design Installation and Documentation at Hazardous and/or Toxic Waste Sites* August 1994 The following elements will be evaluated during Southern Maryland investigations

- Overall level of organization and professionalism

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- Project activities
- Document control and management
- Level of QC conducted per each field team
- Task specific activities

After audit completion, deficiencies will be discussed with the field staff and corrections will be identified If any of these deficiencies could affect the data integrity the audit team will inform the Project Manager so corrections can be implemented immediately Corrective action procedures are outlined in Section 8 0

9 10 DAILY QUALITY CONTROL REPORTS

Within the scope of the USACE 3 phase QC Program the Follow up phase for field operations is implemented through the following basic elements

- Correction of deficiencies identified and documented during Pre Field Operation Preparatory and Initial Meetings
- Ongoing evaluation of Field Operations by the On Site CQC Representative to ensure compliance with the established protocols requirements and DQOs of the field sampling program and
- Ongoing audits of field and laboratory operations to provide an independent assessment of compliance with established protocols and DQOs

In order to ensure that all elements of the Follow up Phase are evaluated, Daily Quality Control Reports (DQCR) are completed and submitted to the USACE Program Manager This reports include the general areas of field sampling operations on site laboratory operations and off site laboratory operations The components as they occur for the DQCR will include the following

- Summary of sampling events which are the basis for which the 3 phase program is defined
- The sampling task manager and associated sampling personnel for the sampling event
- Sampling summary to include associated field QC samples
- Summary of Chain-of Custodies (COC) generated with copies attached
- Summary of Phase Checklists (Pre Field Operations Preparatory Initial and Follow up) generated with cross reference to the associated sampling event
- Summary of Corrective Action Reports issued with copies attached.
- Summary of all audit reports completed with copies attached
- Notification of revisions to field sampling SOPs
- Notification of revisions to analytical SOPs
- Laboratory sample status with a summary form for the status of in house samples attached
- Health and Safety status including violations corrective instructions given and corrective actions taken
- Communication summary (primarily between the client MDE USACE and ICF Kaiser) which would have a impact on existing protocols SOPs or DQOs and
- Documentation of conflicts on site with respect to interpretation of protocols and specifications as well as action taken

Figure 9-6 presents a basic example template for the Daily Quality Control Reports (DQCR) that would be submitted for operations involving remediation As stated in the scope of this document the SMWT SAP will be amended by section to include specific requirements for a remediation operation

9 11 EXTERNAL FIELD SYSTEM AUDITS

External audits may be completed by regulatory agencies with oversight of operations at SMWT These agencies include U S Environmental Protection Agency Region III and the Maryland Department of Environment Oversight may include but is not limited to the following

- Audit of field operations and
- Audit of off site laboratory operations to include possible analysis of PE samples

Audit reports and PE sample results will be included in the DQCR when available

9 12 OUT OF CONTROL CONDITIONS

Situations arising from failure to adhere to standard operating procedures policies and protocols delineated in the SAP have the potential to adversely affect data quality and affect investigation and/or corrective action Out-of-control situations for project aspects will be investigated, documented, and appropriate corrective actions instituted Areas in which operator error is normally associated with out-of-control conditions include

- Failure to achieve calibration
- Record keeping omissions
- Improper sampling techniques
- Improper sample storage and preservation and
- Poor analytical protocols

The detection of out-of-control conditions warrants some type of corrective action Section 9 0 provides protocols for documenting corrective action

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10 0 QUALITY REPORTS TO MANAGEMENT

Quality project status and program effectiveness will be evaluated through the assessment of quality reports generated during SMWT RA activities Reports designed to provide management assessment tools for quality decision making purposes include

- Daily Quality Control Reports
- Monthly Wastewater Treatment Effluent Regulatory Report
- Internal QC Reports

10 1 DAILY QUALITY CONTROL REPORTS

The Project Manager will be responsible for ensuring the preparation and submission of Daily QC Reports (DQCR) to USACE Copies of the DQCR with attachments will generally be submitted on the first work day following the date covered by the report unless directed otherwise

The DQCR will be completed by the CQC Systems Manager and will provide an overview of QC activities performed each day including subcontractor activities The DQCR will present an accurate and complete picture of QC activities including conforming and deficient conditions health and safety monitoring, and RA operations performed that day Copies of supporting documentation, such as checklists and inspection reports will be attached to the report The DQCR will be provided to the USACE Design Engineer who will be responsible for providing copies of relevant sections to USEPA and MDE

10 2 MONTHLY QC REPORTS

10 2 1 Wastewater Treatment Plant Effluent Regulatory Report

Effluent regulatory reports will be generated for both the existing and new wastewater treatment plant These reports will document compliance to permit specifications and present analytical results for samples collected at the designated regulatory points Process activities will be reported for the prior month and will include any problems non routine corrective action and data result trends Copies of the report will be distributed to USACE USEPA, and MDE

10 2 2 Internal QC Reports

Monthly reports will be provided to the TERC QC Supervisor by the CQC Systems Manager that specify the project status performance and system audits and inspections results and significant quality control problems and recommended solutions The TERC QC Supervisor will use these reports in conjunction with routine site inspections to evaluate the compliance status to primary QC program elements including corrective action program document control process control data management and subcontractor operations Relevant portion of the report will be distributed to USACE USEPA, and MDE

11 0 REFERENCES

American Public Health Association (APHA) American Water Works Association (AWWA) and Water Pollution Control Federation (WPCF) 1989b Method 9222E Delayed Incubation Fecal Coliform Procedure Standard Methods for the Examination of Water and Wastewater 17th Edition APHA AWWA WPCF Washington D C

American Society for Testing and Materials (ASTM) 1991a ASTM D 442 63 Standard Method for Particle Size Analysis of Soils Annual Book of ASTM Standards Philadelphia PA

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United States Army Corps of Engineers EM 200 1 3 *Requirements for the Preparation of Sampling and Analysis Plans* June 1994

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United States Environmental Protection Agency (EPA) 1979b Methods for Chemical Analysis of Water and Wastes EPA-600/4 79 020 Environmental Monitoring and Support Laboratory Cincinnati OH

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United States Environmental Protection Agency (EPA) 1984a Characterization of Hazardous Waste Sites A Methods Manual Volume II Available Sampling Methods Second Edition EPA-600/4 84 076 Environmental Monitoring Systems Laboratory Las Vegas NV

United States Environmental Protection Agency (EPA) 1984b Characterization of Hazardous Waste Sites A Methods Manual Volume III Available Laboratory Analytical Methods EPA 600/4 84 038 Environmental Monitoring Systems Laboratory Las Vegas NV

United States Environmental Protection Agency (EPA) 1984c Procedures Manual for the Evidence Audit of Enforcement Investigations by Contractor Evidence Audit Teams EPA 330/9 8/-003 R. National Enforcement Investigations Center Denver CO

United States Environmental Protection Agency (EPA) 1984d Soil Sampling Quality Assurance User s Guide EPA-600/4 84-043 Environmental Monitoring Systems Laboratory Las Vegas NV

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United States Environmental Protection Agency (EPA) 1989 Region II CERCLA Quality Assurance Manual Final Version. Revision 1 October 1989

United States Geological Survey (USGS) 1977 and subsequent revisions National Handbook of Recommended Methods for Water Data Acquisition Office of Water Data Coordination Reston VA

United States Environmental Protection Agency (EPA) 1995 Region III Innovative Approaches to Data Validation June 1995

Viar and Company 1988a Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses Sample Management Office July 1 1988

Viar and Company 1988b Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses Sample Management Office February 1 1988

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APPENDIX A

STATEMENT OF QUALIFICATIONS

STATEMENT OF QUALIFICATIONS

Ralph Buckles is a cost engineer with ICF Kaiser Engineers He has over 15 years of experience in managing environmental projects project estimating and project budgeting/scheduling of labor material and subcontractors He has been involved in conceptual estimating for incineration technologies conceptual estimate for industrial wastewater treatment plants estimate of groundwater extraction/treatment plant construction operations and maintenance and spill containment conceptual and detailed estimates of building decontamination and remedial action The clients include USATHAMA, Corps of Engineers federal state and county agencies and various industrial clients Mr Buckles has a B S degree in electrical engineering

Wayne Davis is a biologist with ICF Kaiser Engineers He has been involved in the environmental and biology field for the past three years His academic and occupational background includes a strong emphasis on both wildlife and fisheries research Mr Davis is also skilled in the areas of technical report writing collecting ground water surface water sediment soil and surface water sampling water quality analysis collecting freshwater fishes and trapping wildlife Mr Davis holds a B S in Wildlife/Fisheries Management

Bruce Howard is the ICF KE Program Manager for the TERC contract He is a vice president with ICF KE and has over 25 years of experience His educational experience includes a BS in Chemistry and an MS in Environmental Engineering Mr Howard is an internationally experienced engineer and has served as project manager for several complex environmental remediation projects He has also lead and coordinated the development of facility wide safety and environmental programs Before joining ICF KE Mr Howard gained extensive managerial experience with the U S Army Corp of Engineers where he was selected to lead a team of engineers in the construction of a permanent bridge which was to span the Sava River from Croatia to Bosnia Mr Howard commanded a Waterways Experiment Station and provided the overall direction and program guidance to engineers and scientists in the execution of a $300 million research and development program He led and coordinated the operation and training of all aspects of the installation to include the safety and environmental programs Mr Howard is also responsible for the development of key technologies in the environmental remediation field including the patenting and licensing of the Peroxone Oxidation System to remediate contaminated ground water Throughout his career he has gained a reputation as an innovative responsible excellence oriented leader who is known to produce quality results under challenging conditions

Joe Kelleher, joined ICF KE as an Environmental Engineer in 1996 At ICF KE Mr Kelleher currently serves as the Contractor Quality Control (CQC) Manager for the Ft Dix UST Upgrade Program under the Baltimore TERC contract Mr Kelleher has also performed the role of CQC System Manager with ICF KE on the Camp Kilmer UST Removal Program As a CQC Manager he is responsible for project oversight quality control and health and safety Project activities at Ft Dix include the removal of over 70 USTs varying in size from 250 to 20000 gallons and the installation of 34 ASTs In addition Mr Kelleher is responsible for ensuring compliance with all New Jersey State required sampling too be included in the Site Closure report submitted to the state Mr Kelleher has over five years experience in Hazardous Toxic and Radioactive Waste Environmental Corporation on several projects valued between $200 000 and $1,000 000 Project activities included environmental restoration of several sites involving RCRA, TSCA, and NRC characteristic waste removal Chemical Warfare Material screening and unexploded ordinance clearance Site related work included writing and implementing multimedia Sampling Plans and site assessments OSHA Health and Safety Plans waste characterization and waste packaging and cost estimating Mr Kelleher was a Quality Control Engineer as well as a member of the Technical Assistance Team serving USEPA Region III Activities included providing technical support with respect to CERCLA, RCRA, OPA, OSHA, and DOT regulations, conducting intrusive site assessments conducting project scheduling EDMs and total stations Mr Kelleher s educational background includes a B S degree in Civil Engineering from Villanova University College of Engineering

Chris Riley is a Chemical Engineer with ICF Kaiser Engineers Mr Riley has more than 29 years of diverse experience in environmental consulting design construction and industrial system operations with direct experience in the chemical oil production refining, natural gas and coal conversion industries With this background Mr Riley offers clients comprehensive expertise in solid and hazardous waste management and industrial

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facility engineering Mr Riley serves in senior technical and management roles or in a review capacity on a broad range of activities including feasibility studies engineering designs and construction services under CERCLA and RCRA authority Specific experience has included development and negotiation of remedial strategies performance of numerous feasibility studies and designs including ground water extraction/treatment industrial waste water treatment water supply biological treatment soil treatment soil vapor extraction and air emission control systems Mr Riley holds a B Tech and M S in Chemical Engineering

Kirk W Ticknor serves as a Project Manager for ICF KE Mr Ticknor manages the Lexington Park Maryland field office for ICF Kaiser s Consulting Group Mr Ticknor oversees a staff of environmental professionals They develop and implement environmental planning and compliance programs for the Navy s Office of Operational Environmental Planning Mr Ticknor has overall responsibility for a multi million dollar annual budget and delivery of environmental services and products for the Patuxent River Naval Air Station He handles issues such as noise air and water quality threatened and endangered species safety and socioeconomic impacts This includes preparation of NEPA documents implementation of environmental mitigation procedures and tracking and creation of an ISO 14000 compliance system on Lotus Notes Mr Ticknor has developed implemented and audited several multi media environmental and safety compliance programs and was the lead engineer at the Rocky Flats Plant in Colorado for RCRA Permitting Mr Ticknor also implemented a RCRA Organic Air Emissions Program for hazardous tank systems which included hands on field work use of portable sampling instruments record keeping procedure development and training He has twelve years experience in Environmental Project Management Engineering and Compliance He has managed environmental compliance and permitting projects for Navy and Department of Energy facilities He holds a M S Environmental Engineering a B S Chemical Engineering and is a professional engineer in Maryland, Virginia and Colorado

Davida Trumbo, CQE CQA, is a TERC QC Supervisor with 16 years of quality assurance/quality control experience associated with installation restoration hazardous waste characterization and management remedial investigation and feasibility studies chemical analyses data validation and development and validation of analytical methodologies Ms Trumbo has directed quality assurance program activities in support of the Department of Defense (AEC AFCEE NEESA) Environmental Protection Agency (OERR OGWDW OPP) Department of Energy (HQ) state and private clients Additionally Ms Trumbo has planned coordinated and managed financial and human resources for AEC Base Realignment and Closure (BRAC) projects Work assignments included defining the nature magnitude and extent of environmental contamination developing sufficient information to adequately assess health and environmental risks associated with closure and transfer of Army real property for other uses determining the necessity for remedial actions and developing and evaluating remedial action alternatives to the level necessary for the Army to make rational decisions regarding preparation of real property for release

Wendy Werkheiser is the site chemist for ICF KE She has experience in site investigation and remediation of hazardous waste sites She also has extensive experience in the environmental field and is competent with field sampling techniques data analysis technical report writing and laboratory procedures Before her employment with ICF KE Ms Werkheiser gained experience by serving as the lead for multiple concurrent environmental projects as well as by serving as a field chemist where she was responsible for overseeing drilling mobile laboratory operations and soil gas surveys She was also responsible for writing several technical reports that were submitted to the Department of Environmental Quality Ms Werkheiser received a BS in Biology from Towson State University and an MS in Soil Science and Environmental Toxicology from Michigan State University

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Appendix B
SOP Classification Series

SOP SERIES	TITLE
10 0	**DOCUMENTATION**
10 1	Field Logbook
10 2	Chain of Custody Forms
30 0	**SAMPLING**
30 1	Soil Excavation Sampling
30 2	Groundwater Sampling
30 3	Percent Moisture Soil Sampling
30 4	Sampling Sediment
30 5	Particulate Monitoring Using Miniram
30 6	Collection of Ambient Air with Summa Steel Canisters
30 7	Thermal Desorption Unit Soil Sampling
30 8	Water Sampling during the TDU Proof of Performance
30 9	Sampling for the Water Treatment Plant
30 10	TDU Stack Sampling Protocol
40 0	**FIELD EVALUATION**
40 1	Hydrolab Multiparameter Water Quality Monitoring Instrument
40 2	Water Level and Well Depth Measurements
50 0	**SAMPLE MANAGEMENT**
50 1	Sample Labels
50 2	Sample Packaging
50 3	Sample Preservation and Container Requirements
70 0	**INVESTIGATIVE DERIVED WASTE**
70 1	Investigative Derived Waste
80 0	**DECONTAMINATION**
80 1	Decontamination
90 0	**AIR MONITORING EQUIPMENT**
90 1	Photoionization Detector (HNu Model HW 101)
90 2	Photoionization Detector (Microtip HL 200)

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STANDARD OPERATING PROCEDURE 10 1
FIELD LOGBOOK

1 0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to delineate protocols for recording daily site investigation activities

Records should contain sufficient information so that anyone can reconstruct the sampling activity without relying on the collector's memory

2 0 MATERIALS

- Field Logbook

  Indelible ink pen

3 0 PROCEDURE

Information pertinent to site investigations will be recorded in a bound logbook. Each page/form will be consecutively numbered, dated, and signed All entries will be made in indelible ink and all corrections will consist of line-out deletions that are initialed and dated. If only part of a page is used, the remainder of the page should have an X drawn across it. At a minimum, entries in the logbook will include but not be limited to the following

- A general description of the field activity
- Project number

  Name and affiliation of personnel on site
- Unique sequential field sample number
- Location description and each sampling point.
- Details of the sample site

  Name and address of field contact
- Documentation of procedures for preparation of reagents or supplies which become an integral part of the sample
- Identification of sample crew members

  Weather conditions

  Sample matrix (for example groundwater or surface water)

  Sample number and volume

  Analytical request

  Sampling methodology

  Sample preservation

  Date and time of collection

  Associated QA/QC samples
- Sample shipment
- Field observations

  Field measurements
- Signature and date by the personnel responsible for observations

4 0 MAINTENANCE

Not applicable.

5 0 PRECAUTIONS

None

6 0 REFERENCES

USEPA. 1990 *Sampler s Guide to the Contract Laboratory Program* EPA/540/P 90/006 Directive 9240 0 06 Office of Emergency and Remedial Response Washington D C December 1990

USEPA 1991 *User s Guide to the Contract Laboratory Program* EPA/540/O 91/002 Directive 9240 0 01D Office of Emergency and Remedial Response January 1991

USEPA 1980 *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans* QAMS 005/80

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STANDARD OPERATING PROCEDURE 10 2
CHAIN-OF-CUSTODY FORM

1 0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to delineate protocols for use of the chain of custody form An example is provided as part of this SOP Other formats with similar levels of detail are acceptable

2 0 MATERIALS

Chain of custody form

Indelible ink pen

3 0 PROCEDURE

1 Give the site name and project name/number

2 Enter the sample identification code

3 Indicate the sampling dates for all samples

4 List the sampling times (military format) for all samples

5 Indicate grab or composite sample with an X

6 Specify the sample location

7 Enter the total number of containers per cooler

8 List the analyses/container volume

9 State the carrier service and airbill number analytical laboratory and custody seal numbers

10 Sign date and time the relinquished by section

11 Upon completion of the form r ain he shippe ory and plac the forms and the othe copies in a zip seal bag to protect from moisture Affix he zip seal bag o the inside of the sample cooler to be sent to the designated laboratory

4 0 MAINTENANCE

Not applicable

5 0 PRECAUTIONS

None

6 0 REFERENCES

USEPA 1990 *Sampler s Guide to the Contract Laboratory Program* EPA/540/P 90/006 Directive 9240 0 06 Office of Emergency and Remedial Response Washington D C December 1990

USEPA. 1991 *User s Guide to the Contract Laboratory Program* EPA/540/O 91/002 Directive 9240 0 01D Office of Emergency and Remedial Response January 1991

USEPA 1980 *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans* QAMS 005/80

FIGURE 10 4 a
LXAMPLE CHAIN OF CUSTODY FORM

Project Number	Site Name				Number of Containers										LAB
															AIRBILL No
Samplers															Courier
Date	Time	Comp	Grab	Field Sample No											REMARKS
				TOTAL											

Relinquished by	Date/ time	Received by	Relinquished by	Date/ Time	Received by
Relinquished by	Date/ time	Received by (for lab)	Date/Time	Remarks	

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STANDARD OPERATING PROCEDURE 30 1
SOIL EXCAVATION SAMPLING

1 0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to define procedures for collecting soil screening and verification samples during soil excavation

2 0 MATERIALS

- Certified clean sample containers
- Photoizonation detector (PID) or Flame ionization detector (FID)
- Stainless steel trowel
- Chemical resistant gloves
- Field logbook
- Coolers
- Ice

3 0 PROCEDURE

3 1 *Soil Screening Samples*

1 Soils will be visually examined and screened with a PID or FID to determine if measurable concentrations of organics are present

2 If any indication of contamination is detected the excavation boundary will be extended

3 When no indication of contamination is detected either a sample will be collected using a trowel in excavations less than four feet deep or the sampler will instruct an excavator operator to scrape soil from the surface (approximately six inches deep)

4 If using an excavator the soil toward the center of the bucket will be homogenized using a sampling device A sample will be collected making sure the soil has not touched the sides of the bucket

5 Any vegetative matter rocks or pebbles will be removed

6 Samples will be assigned an identification number and sent to the on site laboratory for analysis

7 After collecting each soil screening sample the sampling equipment and excavator bucket will be decontaminated

3 2 *Soil Verification Sampling*

If on site laboratory results from screening are within 10 % of action levels a sample will be collected for off site soil verification sampling

1 The same procedures listed above will be used to collect the verification samples except

   a Soil will be homogenized in the bucket and placed into appropriate containers
   b Samples will be packaged and shipped accordance with SOPs 50 1 50 2 and 50 3
   c Samples will be analyzed off site

- If the excavation is ten feet or shallower two samples will be collected from the sidewalls at each sampling location One at 0 2 bgs and one from two feet bgs to the bottom of the excavation
- If the excavation exceeds ten feet three samples will be collected from the sidewalls at each sampling location One at 0 2 bgs The other two samples depend upon the following criteria
    - a) If there is a lithology change in the sidewalls both lithologies will be sampled separately or
    - b) If there is no lithology change the sidewall from two feet bgs to the bottom of the excavation will be divided in half and a sample will be collected from the top and bottom half

4 0 MAINTENANCE

Not Applicable

5 0 PRECAUTIONS

1 Avoid dermal contact with soil
2 Remove organic material rocks or pebbles
3 Change gloves between samples
4 At no time should samplers enter excavations deeper than four feet

6 0 REFERENCES

USACE 1998 Sampling and Analysis Plan for Remedial Activities for Southern Maryland Wood Treatment Site Draft Final

USACE 1998 Quality Assurance Plan for Remedial Activities for Southern Maryland Wood Treatment Site Draft Final

STANDARD OPERATING PROCEDURE 30 2
GROUNDWATER SAMPLING

1 0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to delineate protocols for the collection of groundwater samples from monitoring wells

2.0 MATERIALS

- Hydrolab (refer to SOP 40 1)
- Water level indicator
- Transparent bailer with a double check valve
- PVC bailer (purging only)
- Stainless steel bailer (purging and sampling)
- Polytetrafluoroethelyne (PTFE) bailer with PTFE coated stainless steel cable, double check valve top and controlled flow bottom discharge attachment for VOC sampling (40-mL vials) and top discharge at tachment for collecting larger samples (1 L bottles) (purging and sampling)
- Polypropylene rope
- Submersible pump and hose (for purging only)
- Variable speed, low flow submersible pump (*e.g* Grundfos MP1 ground-water sampling pump) (for purging and sampling)
- Sample bottles and labels
- Logbook or field parameter forms
- Generator
- Tygon tubing
- Plastic sheeting
- Photoionization detector (PID)

3 0 PROCEDURE

3 1 GENERAL

Groundwater sampling will follow these general steps.

- Arrive on site
- Set up apparatus (generators pumps etc)
- Don PPE
- Perform organic vapor check, water level and well depth measurements
- Sample NAPLs (as required)
- Begin purge procedure
  - ⇒ If using bailer to purge and sample see 3 6
  - ⇒ If using bladder or low flow pump to purge and sample see 3 7
- Decon/reglove
- Take samples
  - ⇒ If with bailer see 3 6
  - ⇒ If with bladder or low flow pumps see 3 7
- Decon/dispose of wastes move equipment to next site

3 2 GENERAL RULES FOR GROUNDWATER FIELD PARAMETER LOGBOOK

- Only information for one site or installation per log book. The same book maybe used for more than one sampling event.
- The first five pages will be reserved for index, general notes etc Sign and date each entry
- Fill in the forms
- Duplicate copies index pages and calibration sheets remain intact.

3 3 GROUNDWATER SAMPLING GENERAL RULES

- Groundwater samples will be collected from the least contaminated wells first, progressing to the most contaminated.
- Upon arrival at the well site, immediately set up and organize the purging, sampling, and filtration equipment. If needed, due to muddy or contaminated ground, remoteness from sampling vehicle, and\or for placement of hose(s) and\or power cord if a pump is used, place clean plastic sheeting at, or around the well, to serve as a clean staging area for purging and sampling equipment, as conditions warrant. Care must be exercised not to step on plastic sheeting
- If the well is remote from the sampling vehicle set up the filtration equipment and place rope wrapped bailer and pre-labeled sample containers on the plastic sheet, uphill from the well.
- When a pump is to be used situate the portable generator on level ground approximately 15 feet away from and downwind from the well All generator maintenance (oil and fueling) is to be performed off site If the hose(s) and/or power cord of the pump are not on a reel, place the pump with its hose and power cord on the plastic sheeting downhill from the well

- Cove Check well headspace for organic vapor which may pose a health and safety hazard and indicate the presence of NAPL Measure depth(s) to and thickness(es) of NAPL(s) as appropriate Measure the depth to water and depth of well From the water depth, well diameter sand pack length, etc calculate the equivalent volume (1 EV) of water in the well

  1 EV = volume in casing + volume in saturated sand pack Therefore if the **water table lies below the top of the sandpack**, use the following equation

  $$1\ EV = (pR_w\ h_w) + (0\ 30p(R^2\ R_w)h_w) \quad (0\ 0043)$$

  If the **water table lies above the top of the sand pack** use this equation

  $$1\ EV = [(pR_w^2 h_w) + (0\ 30p(R^2\ R_w)h)] \quad (0\ 0043)$$

  where R_s = radius of sandpack in inches
  R_w = radius of well casing in inches
  h_s = height of sandpack in inches
  h_w = water depth in inches

  0 0043 gal/m^3
  Assumed filter pack porosity = 30%

Tables and graphs showing equivalent volumes for typical well constructions are available.

- Samples will always be collected in order of decreasing volatility (*i e.* the samples to be analyzed for the volatile constituents should be collected first.) Deliver the VOC sample to the vial by allowing the water to trickle down the inside wall of the vial at a rate no greater than approximately 100 ml/min. Other samples may be delivered at a faster rate Sampling rates will at no time exceed 1 L/min.

- When collecting samples for volatile analysis care should be taken to prevent analyte loss by volatilization. The following procedures should be adhered to when collecting these samples

  ⇒ Avoid excessive aeration and agitation of sample

  ⇒ Fill vial so that a reverse meniscus is present by adjusting the flow rate from the sampling device

  ⇒ Place septum on vial so that the PTFE side is in contact with the sample After the cap is on the bottle check for air bubbles in the sample If air bubbles are present, properly dispose of that sample and recollect the sample in the same vial

  ⇒ Make sure vial is labeled and immediately transfer the vial to the cooler with ice

- Unfiltered samples will be collected by slowly pouring the sample water into the appropriate sample container being careful not to agitate or cause bubbles to form Do not overfill bottles Make sure sample bottle is labeled and the cap is on tightly Then place the sample in cooler with ice immediately

Samples will be delivered to the laboratory as soon as possible If possible samples will be shipped on the same day as they are collected If samples must be retained due to weekend sampling (Sunday) the lab shall be notified as to the time sensitive nature of the samples

3 4 SAMPLING OF NON AQUEOUS PHASE LIQUIDS

If NAPLs are detected in the well, a sample from all layers must be collected prior to any purging activities Non aqueous phase liquids (NAPLs) may be indicated by the presence of volatiles in the well head space and confirmed by the oil/water interface probe

Collecting LNAPLs will be accomplished using a transparent bailer with a double check valve This bailer will be slowly lowered until the bottom of the bailer is 1 2 in. below the LNAPL-water interface as determined in SOP 010 then slowly withdrawn. Verify that the interface was sampled by visual inspection of the bailer contents through the side of the bailer Measure the thickness of the LNAPL in the bailer and note in the Field Notebook. Sample for laboratory analysis An additional field verification may be performed by decanting the remainder of the contents of the bailer into a glass jar adding a hydrophobic dye such as Sudan IV or Redoil, shaking the sample and looking for coloration of NAPL Alternate field tests are examine the sample under ultra violet light (many fluoresce) or allow the sample to stand overnight, and examine for interface and/or volatiles in the headspace the following day Refer to following sections on purging and sample collection for set up and general operation.

- Collecting dense non-aqueous phase liquids (DNAPLs) will be accomplished using a transparent bailer with a double check valve The bailer must be lowered very slowly to the bottom of the well and raised slowly out of the well in a controlled fashion Sample for analysis as above The same field check described above may be employed for DNAPL Refer to following sections on purging and sample collection for set up and general operation.

  If NAPLs are present in the well, **and** a low flow pump is to be used for purging and sampling, the well will be allowed to re-equilibrate prior to purging and sampling This will be accomplished by allowing the well to stand undisturbed for at least 8 hours prior to purging and sample collection.

3 5 WELL PURGING

Water within the casing of a well will stagnate, degas lose volatiles possibly precipitate metals due to changes in redox potential, and may react with the screen and/or casing material It is therefore necessary to purge a sufficient volume of this stagnant water from the well and/or casing to ensure that a representative sample of formation water can be obtained.

Traditionally the volume of water to be purged was arbitrarily set at 3 to 5 equivalent volumes Recent advances in sampling technologies have caused a re-thinking of such arbitrary purge volumes It is for this reason that Monitoring of selected chemical and physical properties of the sample medium will be used instead of strict volumes to determine when a representative sample may be taken from a well

Acceptable purge/sampling devices include bailer and variable speed, low flow pumps which include both submersible pumps (purge and sample) and dedicated bladder pumps (purge and sampling) It is recommended to purge and sample at similar rates with one type device per well

Peristaltic gas-lift, and centrifugal pumps can cause volatilization, produce high pressure differentials and can result in variability in the analysis of some analytes of interest. These types of pumps shall not be used to purge or sample wells

To prevent ground water from cascading down the sides of the screen in to an open hole thereby aerating the sample purge rates will closely match recharge rates If the static water level is within the casing, the initial purge rates may be set high enough to lower the water level to the top of the screen, then reduced to maintain that level

- Purging will be accomplished with either a submersible pump a low flow (submersible or bladder) pump or bailer The choice of bailer or pump will be based on depth to water table, volume to be purged, and permeability of the aquifer If the well recharges rapidly and/or has greater than 20 gallons (estimated EV) to be purged, water may be removed with a submersible pump or a low flow pump If the well recharges slowly and/or has less than 20 gallons to be purged, water will be removed with a bailer or a low flow pump

  Purging will be accomplished with as minimal disturbance to the surrounding formation as possible

- Purge water will be containerized and disposed at the on site water treatment plant.

- If the water level is within the screened interval and the well recharge rate is less than 0 1 L/min purge the well using a low flow pump as follows

  ⇒ Draw the water down to within 1 foot of the top of the pump

  ⇒ Allow the well to recover

  ⇒ Check and record field parameters

  ⇒ Repeat first three steps then collect samples

3 6 PURGING AND SAMPLING WITH BAILERS

1 Bailers may be used for both purging and sampling wells if a) the well recharge rate is less than 4 L/min, b) depth to the water table is less than 0 ft and less than 20 gal are to be purged (EV < 0)

- When purging with a bailer either a PVC or stainless steel bailer may be used. The bailer will be attached to either a spool of PTFE-coated stainless steel cable or polypropylene rope If using cable attach it to the bailer using stainless steel cable clamps Thoroughly decon the cable after each use prior to rewinding cable onto spool Cable clamps and raw cable ends may serve to trap contamination. Exercise particular caution in decontaminating these areas If using rope attach the rope to the bailer using a bow line knot, dispense the needed length (a few feet more than the well depth) and cut the remainder away then, at the end opposite the bailer make a slip knot and place it around the well casing or protective posts to prevent losing the bailer and rope down the well The polypropylene rope will be not reused, it will be properly disposed of Either type of bailer will be repeatedly lowered gently into the well until it fills with water removed, and the water will be discharged into an appropriate container until purging is complete Care must be taken not to unduly agitate the water as this tends to aerate the sample increase turbidity makes stabilization of required parameters (3 6 3) difficult to achieve and generally prolongs purging

3 After purging 2 EV obtain a sample of groundwater and measure the following stabilization parameters temperature conductivity pH, turbidity redox potential (Eh) and dissolved oxygen level using hydrolab (SOP 40 1) at each successive half well volume When three of these stabilization parameters are in agreement within approximately 10% in three consecutive half well volume samples sufficient water has been purged from the well. The results of these tests should be recorded in the sampling logbook. Should these parameters not reach agreement, no more than five well volumes will be purged.

4 Immediately upon completion of purging collect samples for laboratory analysis using a PTFE bailer on a PTFE-coated stainless steel cable The bailer will be equipped with double check valve top and controlled flow bottom discharge attachments for VOC sampling (40-mL vials) and top discharge attachment for collecting larger samples (1 L bottles)

5 Slowly so as not to agitate the water lower the bailer into the well using a spool of PTFE-coated cable Allow bailer to fill withdraw smoothly Refill bailer as needed

  ⇒ If the controlled flow bottom discharge attachment is used for VOC sampling, attach it to the bottom of the bailer Using the stopcock valve on the bailer to control the flow and fill sample vials

⇒ Remove the valve stop and pour under a sample into inorganic sample bottles

6 Decontaminate bailer and cable in accordance with SOP 80 1

3 7 PURGING AND SAMPLING WITH LOW FLOW PUMP

To obtain representative samples, subsurface disturbances should be kept to a minimum, thereby preventing sample alteration due to sampling actions The reasoning behind the use of low-flow pumps to purge and sample monitoring wells is that these pumps minimize physical disturbance (turbulence) at the sampling point and chemical changes (aeration) in the medium. For these reasons the low flow pump is the preferred method for both purging and sampling in most cases For the purposes of this SOP "low flow pumps are defined as either dedicated bladder pumps or variable speed submersible pumps Practical operational flow rates for these sampling devices range from 0 1 L/min to 30 L/min.

- Low flow pumps may be used for purging and sampling any well having recharge greater than 0 1 L/min, which is the practical lower limit of pump performance Below that pumping rate pump inefficiencies and/or overheating may alter the physical and chemical properties of the sample If the pump is continuously operated at sampling rates higher than the well recharge rate, the water level will be lowered in the well, possibly allowing aeration of the sample which is unacceptable sampling procedure Low flow pumps are suitable for sampling wells with recharge rates lower than 0 1 L/min if precautions are taken to avoid aeration of the sample.

- Low flow submersible pumps will be used as follows

  ⇒ Lower the pump into the well slowly so as to not agitate the water until the pump is at the mid point of the screened interval or the mid point of the water column if the static water table lies below the top of the screen.

  ⇒ Attach the pump s umbilical cord (which will consist of power cord and sampling tubing) to the protective casing, or lock the cord spool so that the pump cannot move vertically in the well during sampling

  ⇒ Lower the water level probe into the well behind the pump until it just touches water This will allow the sampler to monitor the water level while purging and sampling, and prevent the inadvertent drying of the well

  ⇒ Begin purging at the pump s lowest setting, then gradually increase rate until the pumping rate matches the aquifer recharge rate **If the water level is above the top of the screen**, the pumping rate may be allowed to slightly exceed recharge rate lowering the water level to no less than 1 foot above the screen, then reduced until it matches recharge rate and pumping continued **If the water level is below the top of the screen** always keep the purge rate lower than well s recharge rate

  ⇒ Monitor stabilization parameters using an in line monitoring system. Record parameters regularly at a rate of one set of parameters per each 1 5 liters of water removed from the well When these parameters stabilize to within 10 % over 3 consecutive readings reduce flow rate to 0 1 L/min (if needed) and begin collecting VOC samples directly from the discharge line

  ⇒ If the well recharges at a rate less than 0 1 L/min, purge until the water level is even with the top of the screen, allow the well to recover and sample immediately

  ⇒ Remove and decon water level probe and pump (SOP 80 1)

- The length of tubing used in conjunction with the low flow pump will be appropriate to the depth of the well (*i e.* A 100-ft roll of tubing may not be used in sampling a 30 ft well A 50 ft roll would be used instead, thereby generating less decon solution, and providing less opportunity for physical and chemical changes in the sample due to contact with the spooled tubing This means that the contractor will have on hand. a) spools of varying length (*e.g* 25- 50- 75 and 100-ft spools) or b) several short *e.g* 10 ft lengths of tubing with a secure means of connecting them end to-end.

- When a sampling event occurs during summer months in full sun, shade will be provided for the spooled tubing. Otherwise the tubing will be an effective water heater warming the groundwater sample creating the potential for volatilization of organics

- Spooled tubing will be monitored to ensure that no air bubbles are trapped at the top of a coil Trapped air bubbles can enhance volatilization of organics

4 0 MAINTENANCE

Refer to manufacturer's requirements for maintenance of pumps and generators

5 0 PRECAUTIONS

- Although use of a controlled flow bottom discharge valve is historically preferred, use of such a device can cause aeration of the sample

- First round samples are to be collected from upgradient wells first, moving to downgradient wells under the assumption that upgradient wells will be less contaminated than downgradient wells Results of

first round analysis may mandate a change in sampling sequence

- These numbers are based on the following assumptions 1) In purging, it is preferable to remove water at approximately the recharge rate 2) Four L/min is estimated as the approximate maximum rate at which water can be removed with a bailer from depths of 20-50 feet. 3) Twenty gallons is estimated to be at the limit of the sampler's endurance at which point fatigue and sloppiness of technique begin.

6 0 REFERENCES

Gass, Taylor E Barker James F Dickhout, R. Fyfe J S 1991 *Test Results of the Grundfos Ground water Sampling Pump* From. "Proceedings of the Fifth National Symposium on Aquifer Restoration and Ground Water Monitoring

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Puls Robert W Eychaner James H. and Powell, Robert M. 1990 *Colloidal Facilitated Transport of Organic Contaminants in Ground Water Part I Sampling Considerations* In "EPA Environmental Research Brief" EPA/600/M 90/023 December 1990

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ORIGINAL

STANDARD OPERATING PROCEDURE 30 3
PERCENT MOISTURE SOIL SAMPLING

1 0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to define procedures for collecting percent moisture soil samples Prior to full scale operations a statistical method will be used to determine the variation in measured moisture content within a grab sample set This will provide an indication of the accuracy and precision with which a single grab sample can characterize the moisture content of feed soils Samples will be collected for grain size analysis to determine if there is a correlation between grain size and percent moisture

2 0 MATERIALS

- Certified clean sample containers
- Stainless steel hand trowel
- Field logbook
- Chemical resistant gloves

3 0 PROCEDURES

Statistical Testing

A 3 x 3 x 3 pile of site representative soil will be stockpiled The samples shall contain no obvious heterogeneities Twelve samples will be collected from the pile for percent moisture and grain size analyses

1 A grab sample will be collected using a disposable or stainless steel trowel

2 The sample will be placed directly into the appropriate size sample jar

3 Samples will be taken from the pile at twelve random locations (The same locations will be used to collect both % moisture and grain size samples)

4 Samples will be analyzed on site for percent moisture and grain size

Full Scale Operations

One grab sample will be collected and analyzed for percent moisture from the feed soil piles for the batch and continuous units each day following the procedures 1 2 and 4 above

4 0 MAINTENANCE

Not Applicable

5 0 PRECAUTIONS

1 Avoid dermal contact with soil

2 Remove organic material rocks or pebbles

6 0 REFERENCES

USACE 1998 Sampling and Analysis Plan for Remedial Activities for Southern Maryland Wood Treatment Site Draft Final

USACE 1998 Quality Assurance Plan for Remedial Activities for Southern Maryland Wood Treatment Site Draft Final

ORIGINAL (Red)

STANDARD OPERATING PROCEDURE 30 4 FOR SAMPLING SEDIMENT

1 0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to define procedures for representative sediment sampling Sediment include solid matter derived from rocks or biological materials which are suspended in or settled from water

2 0 MATERIALS

- Stainless steel bowl
- Stainless steel trowel
- PVC pipe 2 in diameter
- Certified clean sample containers
- Chemical resistant gloves
- Field logbook
- Coolers
- Ice
- Photoionization Detector

3 0 PROCEDURE

Sampling will occur in two phases The first phase will involve collecting delineation samples at potentially contaminated areas These areas include previous sampling locations deposition areas and areas of discoloration Delineation samples will be analyzed for PAHs and PCPs at the on-site laboratory The second sampling phase will occur after excavation and will verify that the contaminant concentrations are below the action levels These verification samples will be sent to the off site laboratory for conformation

Delineation Samples

1 Personal Protective Equipment will be donned in accordance with the site health and safety plan

2 The equipment will be set up and organize downstream from sampling points

3 Two or three feet upstream and downstream from a potentially contaminated area a grab sample will be collected with trowel and placed in a bowl

4 Several grab samples will then be collected at the potentially contaminated area (locations may be throughout the width of the stream at discolored areas or any other location that the sampler deems appropriate)

5 Samples will be homogenized and placed in appropriate sample container

6 Sample will be labeled in accordance with SOP 50 1

7 Sample will then be taken to on site laboratory for analysis

Soil Verification

After excavation of delineated contaminated areas soil verification samples will be collected using the same methods listed above Samples will be packed and labeled according to SOPs 50 1 50 2 and 50 3

4 0 MAINTENANCE

Not Applicable

5 0 PRECAUTIONS

1 Avoid dermal contact with sediment

2 Remove rocks pebbles and large organic matter from sample

6 0 REFERENCES

USACE 1998 Sampling and Analysis Plan for Remedial Activities for Southern Maryland Wood Treatment Site Draft Final

USACE 1998 Quality Assurance Project Plan for Remedial Activities for Southern Maryland Wood Treatment Site Draft Final

ORIGINAL (Red)

STANDARD OPERATING PROCEDURE 30 5
PARTICULATE MONITORING USING DUST MONITOR

1 0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to define procedures for particulate monitoring Semi volatile organic compounds (SVOCs) will be indirectly measured with a dust monitor using the assumption that all dust captured in the monitoring device contains 3 640 µg B(a)P/kg dust (the calculated 95% upper confidence limit concentration of B(a)P soil from the containment area) Dividing this by the limit gives an action level of 2 750 ug/kg dust

2 0 MATERIALS

- Dust Monitor
- Field logbook
- Calibration logbook

3 0 PROCEDURE

1 Dust monitor will be calibrated following manufacturer's instructions

2 Sixteen potential sampling points relatively equidistant along the perimeter will be identified prior to monitoring activities This way all potential wind directions will be represented These locations will be chosen to obtain the most favorable areas (height access etc) depending on the wind direction(s) on any given day

3 Prior to daily sampling a meteorological survey will be used to design the air monitoring network so that it takes into account local wind patterns This may be obtained from an on site weather station and wind socks weather radio or local airport and will include wind direction (if not steady a range of directions) wind speed and humidity

4 After wind direction is determined three sample points downwind and one sample point upwind will be determined to best represent air concentrations Downwind points do not have to be in series if wind directions would be better represented by non sequential points

5 Readings will be taken directly from the readout screen three times a day (approximately zero four and eight hours after set up or as conditions warrant) Time location (with rationale) and reading will be recorded in the logbook

6 At the end of the day the Shift Average button will be pressed and the reading recorded

4 0 PRECAUTIONS

- Monitor wind directions frequently to note any directional change

5 0 REFERENCES

USACE 1998 Quality Assurance Project Plan for Remedial Activities for Southern Maryland Wood Treatment Site Draft Final

USACE 1998 Sampling and Analysis Plan for Remedial Activities for Southern Maryland Wood Treatment Site Draft Final

STANDARD OPERATING PROCEDURE 30 6
COLLECTION OF AMBIENT AIR WITH SUMMA STEEL CANISTERS

1 0 SCOPE AND APPLICATION

This purpose of this Standard Operating Procedure (SOP) is to establish the procedure for collecting ambient air samples with summa stainless-steel canisters

Volatile organic compounds (VOCs) in ambient air are collected as whole air samples in passivated summa stainless-steel canisters The VOCs are subsequently separated by gas chromatography (GC) and measured by a mass-selective detector This SOP describes procedures for sampling with canisters at final pressures both above atmospheric pressure (referred to as pressurized sampling) and below atmospheric pressure (referred to as subatmospheric pressure sampling)

Numerous VOCs are amenable to collection and analysis using summa canisters A list of these analytes is available from USEPA Method TO14 Compounds may be added to the list if the compound has been performance demonstrated using ICF KE SOPs H2 *Collection of Ambient Air With Summa Canisters* and H.1 *Analysis of Ambient Air collected with Adsorbent Cartridges and/or Summa Canisters.*

This SOP is based on the technical requirements described in the NJDEP guidance document "Field Sampling Procedures Manual (May 1992) and the New Jersey "Technical Requirements for Site Remediation (N.J.A.C 7.26E, May 1997) Use of this SOP will provide Level III analytical data for site characterizations and Level IV analytical data for risk assessments. This SOP can also provide data for evaluation of remediation alternatives, engineering design of remediation activities and support during implementation of remediation activities.

2.0 MATERIALS

2 1 SUBATMOSPHERIC PRESSURE SAMPLING

a VOC canister sampler Whole air sampler capable of filling an initially evacuated canister by action of flow control from near 30 inches of mercury (Hg) vacuum to near atmospheric pressure

2 2 PRESSURIZED SAMPLING

a VOC canister sampler Whole air sampler capable of filling an initially evacuated canister by action of the flow controller and pump from near 30 inches Hg vacuum to 15 20 psig atmospheric pressure

2 3 BOTH SAMPLING METHODS

a Sampling inlet line Stainless-steel, teflon, or tygon tubing to connect the sampler to the sample inlet

b Sample canister Leak free stainless-steel pressure vessels of desired volume with valve and summa passivated interior surfaces

c Breathing Zone Stand Capable of supporting a particulate matter filter at a height of approximately 5 feet.

d Flow meter A rotameter or other flow rate metering device capable of quantifying flow rates of 1 to 200 cm3/min.

e Particulate matter filter A 2 1m sintered stainless steel in line filter

f Tubing and fittings for interconnections Tubing and fittings should be composed of tygon, teflon, or stainless-steel

g Fixed orifice capillary or adjustable micrometering valve used in lieu of the electronic flow controller/ sample pump for grab samples or short duration time integrated samples

h. Stop Watch. Capable of measuring to the nearest second.

i Thermometer Capable of measuring to the nearest 0 10C

j Crescent Wrenches Sufficient to adjust fittings and interconnections

k. Tube Cutter Capable of cutting all tubing to be used.

l Small Slotted Screwdriver Of sufficient size to adjust flow restrictive and metering devices

m. Photoionization Detector (PID)

n. Combustible Gas Indicator (CGI)

o Field logbook

3 0 PROCEDURE

Prior to sample collection, record the following information in the field logbook.

a Name and title of author date and time of entry and physical/environmental conditions during the activity

b Purpose of the field activity

c Location of the sampling activity

d Name and title of the field crew

e Level of personal safety protection used for the field activity

f Name and title of any visitors to the site

g Sample collection method

h Number and volume of sample(s) collected

i Date and time of collection.

j Sample identification number(s)

k Summa canister lab ID number

l Field measurements including temperature barometric pressure cloud cover wind speed/ direction, PID reading, and CGI reading

m Summary of procedure for sample collection, documentation of SOP deviations and scope of work changes

n Description of any photographs taken, including film roll number

o All entries shall be signed at the end of the day

Make and attach a label to the summa canister recording the following information.

a Name and title of author

b Sample collection method.

c Date and time of collection

d Sample identification number(s)

e Summa canister lab ID number

3 1 Subatmospheric Pressure Sampling

Secure sample inlet tube to the breathing zone stand and extend to approximately 5 feet. If necessary attach air filter to the sample inlet tube to prevent dust from entering the sampling system.

Attach the sample inlet tube to the canister and tighten the valve

Open a canister which is evacuated to 28-30 inches Hg at sea level and fitted with a flow restricting device, to the atmosphere containing the VOCs to be sampled. The pressure differential causes the sample to flow into the canister

This technique may be used to collect grab samples (duration of 10 to 30 seconds) or time-integrated samples (duration of 12 to 24 hours) Sampling duration depends on the degree to which the flow is restricted. The flow will remain constant until the vacuum reads approximately 11 inches Hg. When this occurs control the flow either manually or automatically to achieve constant flow

When sample collection is complete move the sample canister control valve to the closed position.

3 2 PRESSURIZED SAMPLING

Use a digital time-programmer to pre-select sample duration, and pump start and stop times

Secure sample inlet tube to the breathing zone stand and extend to approximately 5 feet. If necessary attach air filter to the sample inlet tube to prevent dust from entering the sampling system.

Attach the sample inlet tube to the canister and tighten the valve

Open a canister which is evacuated to 28-30 inches Hg at sea level and connected in line with the sampler to the atmosphere containing the VOCs to be sampled.

Using a sample pump in conjunction with a flow controller a volume of air sample is collected from the inlet tube The initially evacuated canister is filled by action of the flow controlled pump to a positive pressure not to exceed 25 psig

When sample collection is complete, move the sample canister control valve to the closed position.

3 3 SAMPLE PRESERVATION

Samples collected in canisters should be sent to the analytical laboratory with the canister valve closed and the sampling port capped. Samples must be accompanied by a chain-of-custody (COC) indicating sampling locations sample numbers date collected, sample matrix, and sample volumes. The COC should agree with the information on the summa canister label, and discrepancies must be noted on the COC at the time of receipt by the laboratory In addition, any obvious physical damage or contamination (e g. punctures) must also be recorded on the COC

3 4 SAMPLE HANDLING AND STORAGE

Summa canister samples do not need any refrigeration or special handling until they are analyzed. USEPA Method TO14 does not specify a holding time for summa canister samples.

3.5 CALCULATIONS

A flow control device maintains a constant flow into the canister over the desired sample period. This flow rate is determined so that the canister is filled over the desired sampling period to 2 5 inches Hg vacuum for subatmospheric pressure sampling, or to about one atmosphere (15 psi) above ambient pressure for pressurized sampling.

3 5 1 Subatmospheric Pressure Sampling

For subatmospheric sampling, the volume of the sample must be calculated before the flow rate can be determined. The sample volume can be calculated by

$$S = V - \left(\frac{V * E}{I}\right) 1$$

Where
S = sample volume (cm^3)
V = volume of the canister (cm^3)
I = initial canister vacuum (in. Hg)
E = estimated final vacuum (in Hg)

For example, to calculate the sample volume of a 6-L canister with an initial canister vacuum of 28 inches Hg and an estimated final vacuum of 5 inches Hg.

$$S = 6\,000 - \left(\frac{6\,000 * 5}{28}\right) 2$$

S = 4 929 cm^3

The flow rate can be calculated by

$$F = \left(\frac{S}{T * 60}\right)$$

Where

F = flow rate (cm^3/min or Ml/min)

S = sample volume (cm^3)

T = sample period (hours)

Using a 24-hour sampling period for the above sample volume the flow rate can be calculated by

$$F = \left(\frac{4\,929}{24 * 60}\right) 4$$

F = 3 42 cm^3/min

3 5 2 Pressurized Sampling

For pressurized sampling, only the flow rate has to be calculated. For example, if a 6-L canister is to be filled with 12 L of sample at 2 atmospheres absolute pressure (near 30 psig) in 24 hours the flow rate can be calculated by

$$F = \left(\frac{12\,000}{24 * 60}\right) 5$$

F = 8 3 cm^3/min

If the canister pressure is increased for analysis a dilution factor (DF) is calculated and recorded on the canister label and in the field logbook. After sample analysis, detected VOC concentrations are multiplied by the dilution factor to determine concentration in the sampled air Dilution factor can be calculated by

$$DF = \left(\frac{P_f}{P}\right) 6$$

Where

P_f = canister pressure (psig) after pressurization

P_i = canister pressure (psig) before pressurization

3 5 3 General

Depending upon available gauges and instrumentation, it may be necessary to perform unit conversions Common unit conversions may be performed by

Inches of Hg	to atmospheres	mult by 0 0333
Inches of Hg	to psi	mult by 0 490
psi	to atmospheres	mult. by 0 0680
psi	to Inches of Hg	mult. by 2 04
psig	to total psi	add 14 7

3 6 QUALITY ASSURANCE QUALITY CONTROL (QA/QC)

3 6 1 QA/QC Samples

A field duplicate sample is collected at the same time, in the same location, and under the same conditions as the sample One field duplicate sample shall be collected for every ten samples collected. Evaluation of duplicate information shall be made by calculation of the relative percent difference (RPD) The equation is stated below

$$RPD = \left(\frac{X1 - X2}{X1 + X2}\right) * 200\ 7$$

Where

X1 = sample value

X2 = duplicate sample value

A field replicate sample is collected in the same location, and under the same sample set up conditions as the sample with one exception, the replicate sample is collected on a different day This SOP does not set forth specific replicate frequency requirements, however work plans may incorporate their use

3 6 2 QA/QC Procedures

All data must be documented on standard chain-of-custody forms and within field logbooks

All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer unless otherwise specified in the work plan. Equipment checkout and calibration activities must occur prior to sampling/ operation, and they must be documented.

4 0 MAINTENANCE

Contamination may occur in the sampling system if canisters are not properly cleaned before use. Therefore when procuring summa canisters from the contracted analytical laboratory proof of summa canister decontamination shall be supplied with the canister Additionally all other sampling equipment (e g. pump flow controllers, tubing) should be kept clean or returned to the contracted laboratory for decontamination.

All sampling equipment and sampling media shall be protected from contact with any potentially contaminated surface soil or water Sampling equipment shall be stored in clean areas and protected from dirt and water during transportation. Equipment may be periodically wiped clean with a clean cloth, but decontamination using solvents or liquids is to be avoided. Avoid contaminating sampling equipment or media with tape or marker fumes, snoop or bare hands. Use new tygon or teflon tubing as appropriate for each sample event.

5.0 PRECAUTIONS

Care must be taken not to exceed 40 psig in the canisters. Canisters are under pressure, usually 20-30 psig, and should not be dented or punctured. They should be stored in a cool dry place and always be placed in their plastic shipping boxes during transport and storage.

6.0 REFERENCES

Air Toxins, 1993 Canisters and Tedlar Bags" Volume 1 of Air Toxins Guide to Air Sampling and Analysis. 2nd Edition, April 1993

USEPA, 1992 Summa Canister Sampling, SOP #1704 USEPA, Office of Emergency and Remedial Response (PB92-963406)

USEPA, 1989 "Determination of Volatile Organic Compounds in Ambient Air Using SUMMA Passivated Canister Sampling and Gas Chromatographic Analysis." Compendium of Methods for Determination of Toxic Organic Compounds in Ambient Air.

STANDARD OPERATING PROCEDURE 30 7
THERMAL DESORPTION UNIT SOIL SAMPLING

1 0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to define procedures for thermal desorption unit (TDU) soil sampling

2 0 MATERIALS

- Certified clean sample containers
- Photoizonation detector (PID)
- Stainless steel bowl and trowel
- Chemical resistant gloves
- Field logbook
- Coolers
- Ice

3 0 PROCEDURE

3 1 Sampling Treated Soils during Operation

Samples will be collected every two operating days during operation from the stockpile created from the discharge of the four TDUs The sampler will dig from the surface toward the center of pile one to two feet at ten locations Locations will be selected based on highest PID readings If no readings above background are found locations will be randomly selected At each of the ten locations a small volume of soil (approximately 1/10th the size of the combined volume of the remaining containers) will be placed into a stainless steel bowl The sample will be homogenized and transferred to appropriate sample containers The remaining sample will be discarded back into the stockpiled soil At four locations four grab samples will be collected for VOC analysis with a stainless steel trowel Samples will be labeled cooled with ice or refrigeration and packaged in accordance with SOPs 50 1 50 2 and 50 3 Samples will be sent off site for analysis

3 2 Sampling Treated Soils during Proof of Performance

The sampling procedures during POP will be the same as mentioned in Section 3 1 except the stockpiles will be separated into individual piles from their respective units During Proof of Performance soils will be collected from six stockpiles (three test runs for both the batch and continuous units) The batch unit will have one stockpile per test and four samples will be collected for VOC analysis and ten random samples will be collected and composited for the remaining analyses from the stockpile From the continuous unit five separate soil piles will be made per test From these piles four VOC samples will be collected and ten samples (two from each pile) will be collected and composited as one sample for the remaining analyses

3 3 Sampling Untreated Soils during Operation

The sampling procedures for untreated soil will be the same as mentioned in Section 3 1 except that a sample will be collected once a month and no cooling will be necessary This monthly sampling will begin after the month in which the POP was performed

3 4 Sampling Untreated Soils during Proof of Performance

The sampling procedures for untreated soil during the Proof of Performance will be the same as mentioned in Section 3 1 except soils will not require cooling and will be collected from six feed piles (three tests two unit types batch and continuous) Samples will be sent to off site for analysis

3 5 Verification of Feed Material

The sampling procedures for verification of feed material will be the same as mentioned in Section 3 1 except samples will be collected one time prior to the proof of performance test from stockpiles removed from the pond sediment and Pit #1 Samples will be analyzed on site for PAHs (3550M/8270C) and percent moisture (ASTM D 2216)

3 6 Sampling the Hot Cyclone Soils and Batch Impinger Sludge during Proof of Performance

A small volume of soil or sludge (1 to 2 cubic feet) will be produced from each Hot Cyclone (batch and continuous) and the Batch Impinger

For each test

1 For VOCs one grab sample will be collected using a stainless trowel

2 For other parameters a trowel will be used to fill a stainless steel bowl The soil will be homogenized and put in appropriate sample containers

3 Samples will be labeled and packaged in accordance with SOPs 50 1 50 2 and 50 3

4 Samples will be sent off site for analysis

4 0 MAINTENANCE

Not Applicable

5 0 PRECAUTIONS

1 Avoid dermal contact with soil

2 Remove organic material rocks and pebbles

3 Change gloves between samples

4 Soils may be extremely hot

5 Sampler will wear modified level D personal protective equipment during untreated soil sampling

6 0 REFERENCES

USACE 1998 Sampling and Analysis Plan for Remedial Activities for Southern Maryland Wood Treatment Site Draft Final

USACE 1998 Quality Assurance Project Plan for Southern Maryland Wood Treatment Site Draft Final

ORIGINAL (Red)

STANDARD OPERATING PROCEDURE 30 8
WATER SAMPLING DURING THE TDU PROOF OF PERFORMANCE

1 0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to define procedures for water sampling during the TDU Proof of Performance (POP)

2 0 MATERIALS

- Certified clean sample containers
- Coolers
- Ice
- Chemical resistant gloves
- Field logbook
- Five gallon bucket

3 0 PROCEDURE

Sampling of condensate water will occur once per day of POP test The test will run for six days

1 Begin sampling three hours after the TDU startup This ensures that water has circulated through the system

2 Water will be purged from each sample port as needed (approximately 2 gallons) prior to collecting samples This will remove stagnant water and settled solids from the sample port The water shall be purged into a 5-gal bucket or similar container Purged water will be disposed at the treatment plant

3 A grab sample will be collected from the batch and continuous lines to the condensate tank for all parameters by opening the sample port valve and purging directly into the sample jars

4 Samples will then be taken from the condensate tank effluent modular tank effluent (if being used) and Baker tank effluent for TSS using the same procedure as mentioned in 3 3

5 Water treatment plant (#2) will be sampled on the first day condensate from POP testing is received a the plant following SOP 30 9

6 Samples will be collected in decreasing order of volatility (VOCs SVOCs etc)

7 Samples will then be prepared packed and shipped as per SOPs 50 1 50 2 and 50 3

4 0 MAINTENANCE

Not Applicable

5 0 PRECAUTIONS

- Sampler will wear Tyvek coveralls chemical resistant gloves safety glasses and hard hat
- Assistant will wear chemical resistant gloves safety glasses and hard hat
- Change gloves between samples

6 0 REFERENCES

USACE 1998 Quality Assurance Project Plan for Remedial Activities for Southern Maryland Wood Treatment Site Draft Final

USACE 1998 Sampling and Analysis Plan for Remedial Activities for Southern Maryland Wood Treatment Site Draft Final

STANDARD OPERATING PROCEDURE 30 9
SAMPLING FOR THE WATER TREATMENT PLANT

1 0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to define procedures for the sampling of the water treatment plant

2 0 MATERIALS

- 4-Liter certified clean composite containers
- Field logbook
- Certified clean sample containers
- Chemical resistant gloves
- Coolers
- Ice
- Clean funnels
- Five gallon bucket

3 0 PROCEDURE

3 1 Monthly

1 Sampling locations and frequency are shown in Figure 3-10 and Table 3-9 of the Field Sampling Plan
2 A logbook shall be kept and used to record all pertinent sampling times and relevant information
3 Water will be purged from each sample port as needed (approximately 2 gallons) prior to collecting samples This will remove stagnant water and settled solids from the sample port The water shall be purged into a 5-gallon bucket or similar container Purged water will be poured into the floor drain to be treated by the Water Treatment Plant
4 The samples will be collected in the following order Equalization Tank Effluent (ETE) Oil Water Separator Effluent (OWS) Mix Reaction Tank Effluent (MRT) Inclined Plate Separator Effluent (IPS) Sand Filter Effluent (SFE) AOP Reactor Influent (ARI) AOP Reactor Effluent (ARE) First Carbon Effluent (LCE) and Final Discharge at Treated Water Tank Effluent (FDE)
5 Each sampling container will be filled from the appropriate sample port. Containers will be labeled packed and shipped following the SOPs 50 1 50 2 and 50 3

3 2 Acceptance Test

The sampling procedures during the acceptance test will be the same as mentioned in Section 3 1 with the following exceptions

1 Sampling locations and frequency are shown in Table 3-8 of the Field Sampling and Analysis
2 Plan
3 The first sampling event will begin no earlier than three hours and no later than six hours after plant startup
4 Each sample except for VOC samples will be comprised of four grab samples which will be composited A grab sample from each sample location will be collected approximately every half hour A sampling container (4 liter amber certified clean) will be filled approximately one quarter full during each event until four grab samples are collected After each grab sample collection the sample containers will be placed in a cooler on ice
5 A VOC sample will be collected during the collection of the second round of grab samples The sample for VOC will not be composited
6 Upon completion of collecting the fourth grab sample from each sample location the samples will be poured into individual sample jars
7 This procedure shall be repeated once every 24 hours for six days

3 3 Proof of Performance

The sampling procedures during the proof of performance will be the same as mentioned in Section 3 1 with the following exceptions

1 Sampling locations and frequency are shown in Table 3-3 of the Field Sampling Plan
2 The water treatment plant will be sampled on the first day condensate is received from the proof of performance test

4 0 MAINTENANCE

Not Applicable

5 0 PRECAUTIONS

- Sampler will wear a Tyvek coverall chemical resistant gloves safety glasses and hard hat
- Assistant will wear chemical resistant gloves safety glasses and hard hat
- Change gloves between samples

6 0 REFERENCES

USACE 1998 Sampling and Analysis Plan for Remedial Activities for Southern Maryland Wood Treatment Site Draft Final

USACE 1998 Quality Assurance Project Plan for Southern Maryland Wood Treatment Site Draft Final

ORIGINAL
Red

Standard Operating Procedure 30 10

TDU Stack Sampling Protocol

ORIGINAL (Red)

DRAFT

PROOF OF PERFORMANCE TEST PROTOCOL

FOR THE BATCH AND CONTINUOUS
THERMAL DESORPTION UNIT OXIDIZERS
@ THE SOUTHERN MARYLAND
WOOD TREATMENT SUPERFUND SITE
25202 THREE NOTCH ROAD
HOLLYWOOD MD 20636

Prepared for
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AirRECON Project 311-81454

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TABLE OF CONTENTS

1 0	INTRODUCTION	1
1 1	JOB SITE	1
1 2	PLANT INFORMATION	1
1 3	PLANT SAFETY REQUIREMENTS	1
2 0	PROCESS INFORMATION	2
2 1	SOURCE DESCRIPTION	2
2 2	CONTROL DEVICE	2
2 3	CONTINUOUS EMISSION MONITORS	2
3 0	SAMPLING LOCATIONS	3
3 1	BATCH TDU	3
3 2	CONTINUOUS TDU	3
4 0	TEST METHODOLOGIES	4
5 0	SAMPLING PROCEDURES	5
5 1	BATCH TDU FLOW RATE & SAMPLE EXTRACTION	5
5 2	DIOXINS/FURANS SVOC PAH	5
5 3	PARTICULATE AND HYDROGEN CHLORIDE	9
5 4	VOLATILES / VOST	10
5 5	LEAD AND MERCURY	12
6 0	QUALITY ASSURANCE	15
6 1	SAMPLE PRESERVATION	15
6 2	SAMPLE HANDLING	15
6 3	CHAIN OF CUSTODY	15
6 4	CALIBRATION DATA	15
6 5	CALIBRATION PROCEDURES	16
6 6	FINAL REPORT	17
TABLE 1	SAMPLING OUTLINE	4
FIGURE 1	ANALYTICAL SCHEME	8
ATTACHMENTS		
1	PROOF OF PERFORMANCE PLAN	
2	SAMPLE LOCATION DIAGRAMS	
3	TARGET ORGANIC COMPOUNDS	

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1 0 INTRODUCTION

ICF KAISER Engineers will manage a site remediation project at the Southern Maryland Wood Treatment Superfund Site in Hollywood MD Soil at the site is contaminated with organic compounds from a former wood treatment plant. Remediation will be performed through thermal desorption /oxidation.

To demonstrate the effectiveness of and environmental emissions from the remediation process ICF KAISER will conduct a *Proof Of Performance* (POP) test, which will include stack emission sampling ICF KAISER contracted AirRECON a division of Levine Fricke Recon (LFR) to perform the stack emission testing

This protocol provides a detailed description of stack sampling procedures A detailed description of the site the remediation process and other POP-related activities can be found in the *Proof-of-Performance Plan* developed by ICF KAISER, dated April 1998 A copy of the plan is found in Attachment 1

1 1 JOB-SITE

Southern Maryland Wood Treatment Superfund Site
25202 Three Notch Road
Hollywood MD 20636

Contact Kirk Ticknor PE Site Manager
Phone 301-373-5834
Fax 301-373 5975

1 2 PLANT INFORMATION

Source Batch TDU Oxidizer Continuous TDU Oxidizer
Contract No DACA31-95-D-0083, Task No 16

1 3 PLANT SAFETY REQUIREMENTS

The plant safety policy requires personnel working onsite to have current 40 hour OSHA Hazardous Worker Training and to wear a hard hat, safety glasses and safety boots

2 0 PROCESS INFORMATION

Part of the POP test will be a determination of the maximum soil throughput that will result in adequately cleaned soil from the TDUs This ramp-up test will be performed prior to stack sampling Stack sampling will be performed during periods of maximum soil throughput.

A detailed description of the process operating parameters that will be monitored during the stack test are detailed in section 7 0 of the POP Plan.

2 1 SOURCE DESCRIPTION

A detailed description of the TDU processes and control devices is provided in Section 2 0 of the POP Plan. Both continuous TDUs (CTDUs) and batch TDUs (BTDUs) will be used for soil remediation.

In summary contaminated soil is heated in a contained environment that vaporizes the organic contamination. An air/nitrogen sweep is used to carry the vaporized organic compounds from the TDU to the pollution control equipment.

2 2 CONTROL DEVICE

Continuous TDU Air emissions are cleaned in series by a hot cyclone quencher/scrubber electrostatic precipitator (ESP) and a flameless thermal oxidizer

Batch TDU Air emissions are reduced in series by a hot cyclone two impingers another cyclone condensers and a thermal oxidizer

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3 0 SAMPLING LOCATIONS

Sample diagrams of the test locations are in Attachment 2 All measurements will be field-verified and conform to EPA Reference Method 1 (or 1A) A description of the sample location(s) follow

3 1 BATCH TDU

Outlet Measurement will take place in a circular stack having an inside diameter of 4 inches Several sample ports are available on the stack as per the attached diagrams Because of the small duct diameter flow measurements will take place down-stream of the sample extraction ports

Inlet Measurement will take place in a circular stack having an inside diameter of 4 inches Several sample ports are available on the stack as per the attached diagrams Because of the small duct diameter flow measurements will take place down-stream of the sample extraction ports

3 2 CONTINUOUS TDU

Outlet Measurement will take place in a circular stack having an inside diameter of 8 inches The test ports are located 48 inches downstream (EPA Distance B = 6 duct diameters) and >16 inches upstream (EPA Distance A = 2 duct diameters) of flow disturbances 16 traverse points (8 points/port) will be measured

Inlet Measurement will take place in a circular stack having an inside diameter of 8 inches The test ports are located 24 inches downstream (EPA Distance B = 3 duct diameters) and 12 inches upstream (EPA Distance A = 1 5 duct diameters) of flow disturbances 24 traverse points (12 points/port) will be measured

4 0 SAMPLING OUTLINE

Key features of the sampling program are summarized in Table 1 Detection limits are based on the outlet flow rate of the continuous TDU which is approximately four times greater at dry standard conditions than that of the Batch TDU Hence the Batch TDU detection limits will be approximately one quarter of those listed in the table

Table 1 Sampling Outline

Parameter	Sample Locations	Sample Methods	Analytical Method	Sample Duration	Sample volume	Detection limit
Velocity temperature	CTDU inlet/outlet	EPA 1 / 2	N/A	As needed	N/A	100 DSCFM
Velocity temperature	BTDU	EPA 1A/2A	N/A	As needed	N/A	10 DSCFM (inlet) 50 DSCFM (outlet)
Gas composition	All	EPA 3	EPA 3 (orsat)	As needed	2 ft^3	0 1% CO_2/O_2 by volume
Moisture	All	EPA 4	EPA 4 (gravimetric)	1 hr min	35 ft^3	0 5% H_2O by volume
Particulate	Outlets	EPA 5	EPA 5 (gravimetric)	1 hr	35 ft^3	6E 4 lb/hr
HCl	All	EPA 5/26A	EPA 26 (ion chromatography)	1 hr	35 ft^3	0 012 lb/hr
Lead mercury	Outlets	EPA 29	Pb SW846 7421 (GFAA) Hg SW846 7470 (CVAA)	2 hr	70 ft^3	2 3E 5 lb/hr 9 2E 7 lb/hr
SVOC PAH	All	EPA23/0010	LRGC (SW846 8270)	3 4 hrs	106 ft^3	5E 6 3E 5 lb/hr for SVOC 5E 6 1E 5 lb/hr for PAH
Dioxins/furans	All	EPA 23	HRGC/MS (SW846 8290)	3 4 hrs	106 ft^3	2E 11 lb/hr as 2378 TCDD
VOC	All	EPA 0030	GC/MS (SW846 8240)	3 4 hrs	2 ft^3	2E 6 2E 4

5 0 SAMPLING PROCEDURES

5 1 BATCH TDU FLOW RATE & SAMPLE EXTRACTION

The Batch TDU has a 2 inlet pipe which is unsuitable for isokinetic sampling because of its small diameter A standard pitot tube will be fixed at the centroid of the pipe to measure gas velocity Sample will be extracted at a constant rate upstream of the pitot tube at a single point at the center of the pipe

The batch TDU outlet is 4 in diameter A standard pitot will be used to traverse the stack downstream of the sample extraction ports Sample will be extracted from the centroid of the stack. Sample rate (except VOST) will be set for isokinetic conditions based on the average stack velocity found with the traverse VOST sampling will be at a constant rate

5 2 DIOXINS/FURANS SEMI VOLATILES PAHs

SUMMARY Stack gas will be sampled isokinetically for dioxin/furan emissions in accordance USEPA Method 23 *Determination of polychlorinated dibenzo-p-dioxin and polychlorinated Dibenzofurans from Stationary Sources*

Dioxins and furans in sample gas will be collected on a filter and solid sorbent trap The procedure will be enhanced for the collection of semi-volatile organic compounds (SVOC) and polynuclear aromatic hydrocarbons (PAHs) in accordance with EPA SW846 Method 0010

SVOC and PAH also will be collected in aqueous impinger reagents Recovered samples will be extracted and analyzed by gas chromatography and mass spectroscopy (GC/MS) for dioxins/furans PAH, and SVOC The full list of SVOC compounds is presented in Attachment 3

Key sample train components will include

- A sized, tapered-edge glass button hook' sample nozzle
- A stainless steel sample probe with a heated glass liner S type or standard pitot tube and thermocouple
- A heated glass filter holder with a glass fiber filter supported by a Teflon frit
- A glass condenser and coolant circulation system
- A solid glass sorbent trap packed with field-spiked XAD-2
- A condenser system consisting of Greenburg Smith glass impingers and connecting pieces

- A sample control/metering system consisting of a vacuum pump dry gas meter sample flow controls sample rate manometer stack gas velocity manometer temperature indicator and heat controllers

PREPARATIONS Sampling glassware and sample containers will be cleaned prior to sampling in the following sequence

1 Soap and water wash
2 Four-hour soak in 10% HNO_3
3 Water rinse
4 Triplicate distilled de-ionized water rinse
5 Acetone rinse
6 Hexane rinse

The condenser will consist of Greenburg-Smith impingers that are interconnected with glass U-bends Reagent charging and stem configurations will be as follows

- Impinger 1 Special bottle empty
- Impinger 3 Restricted tip with 100 mls distilled water
- Impinger 4 Unrestricted tip with 100 mls distilled water
- Impinger 5 Restricted tip empty
- Impinger 7 Unrestricted tip silica gel.

All impingers will be weighed prior to sampling to the nearest 0 5 grams

The sorbent cartridge will be oriented vertically and sit directly on the special condensate collection bottle during sampling Sample will pass directly from the condenser outlet to the sorbent cartridge inlet.

SAMPLING Completion of each test run will include the following key procedures

- A pre-test leak check of the entire sample train at a vacuum greater than that anticipated for the test run. A leak rate of no greater than 0 02 CFM will be achieved prior to run commencement.
- Each sample point will be sampled for an equal duration. Filter holder hot box temperature will be maintained at 250 $\pm$/- 25 °F
- Probe heat will be maintained to prevent internal moisture condensation
- Ice will be maintained in the impinger ice bath.
- All necessary temperature and sample rate adjustments (to maintain isokinetic sampling) will be made at each sample point. Condenser outlet temperature will be maintained at less than 68°F during sampling

- A post-test leak check will be performed on the entire sample train at a vacuum equal or greater than the highest vacuum achieved during the test run. If the leak rate is greater than 0 02 CFM, the run will either be voided/repeated or kept and corrected for the leak rate (at the discretion of the administrator)
- All necessary data for each sample point and test run will be recorded on appropriate data forms

SAMPLE RECOVERY Sample recovery will be performed at the site in a sheltered area. Samples will be recovered as follows

Stack Samples

- Each impinger will be weighed to 0 5 gm
- The particulate filter and loose particulate will be transferred to container 1 a glass petri dish
- With a Teflon brush, the probe nozzle and front-half of the filter holder will be rinsed and brushed three times with acetone into container 2 (250 ml amber glass)
- Into container 2 the back half of the filter holder condenser and connecting pieces will be rinsed with acetone
- All train components from the sample nozzle up to the sorbent cartridge will be rinsed three times with methlyene chloride into container 2
- All train components from the sample nozzle up to the sorbent cartridge will be rinsed three times with toluene into container 3 (250 ml amber glass)
- The impinger catch will be transferred to one or more (depending on liquid volume) large amber glass jars containers 4A, B C etc
- A rinse of the impinger train with a 50%/50% v/v mixture of methylene chloride and methanol will be collected in container 5 (250 ml amber glass)
- The sorbent trap will be sealed with Teflon tape and returned to its shipping material.

BLANKS The following blanks samples will be recovered. Liquid volumes will be similar to those used for stack sample recovery

- Container 1 Glass petri dish with an unused filter
- Container 2 250 ml amber glass jar containing acetone and methylene chloride
- Container 3 250 ml amber glass jar containing toluene
- Container 4 500 ml amber glass jar containing 200 mls distilled water
- Container 5 250 ml amber glass jar containing 50%/50% v/v methylene chloride and methanol
- An unused trap will be recovered as a blank

SAMPLE ANALYSIS Sample preparation and analysis will be performed in general accordance with the schematic diagram in Figure 1 which is on the following page

Analytical Scheme for SVOCs, PAHs, and PCDD/PCDF in the Combined EPA Method 0010/23 Sampling Train

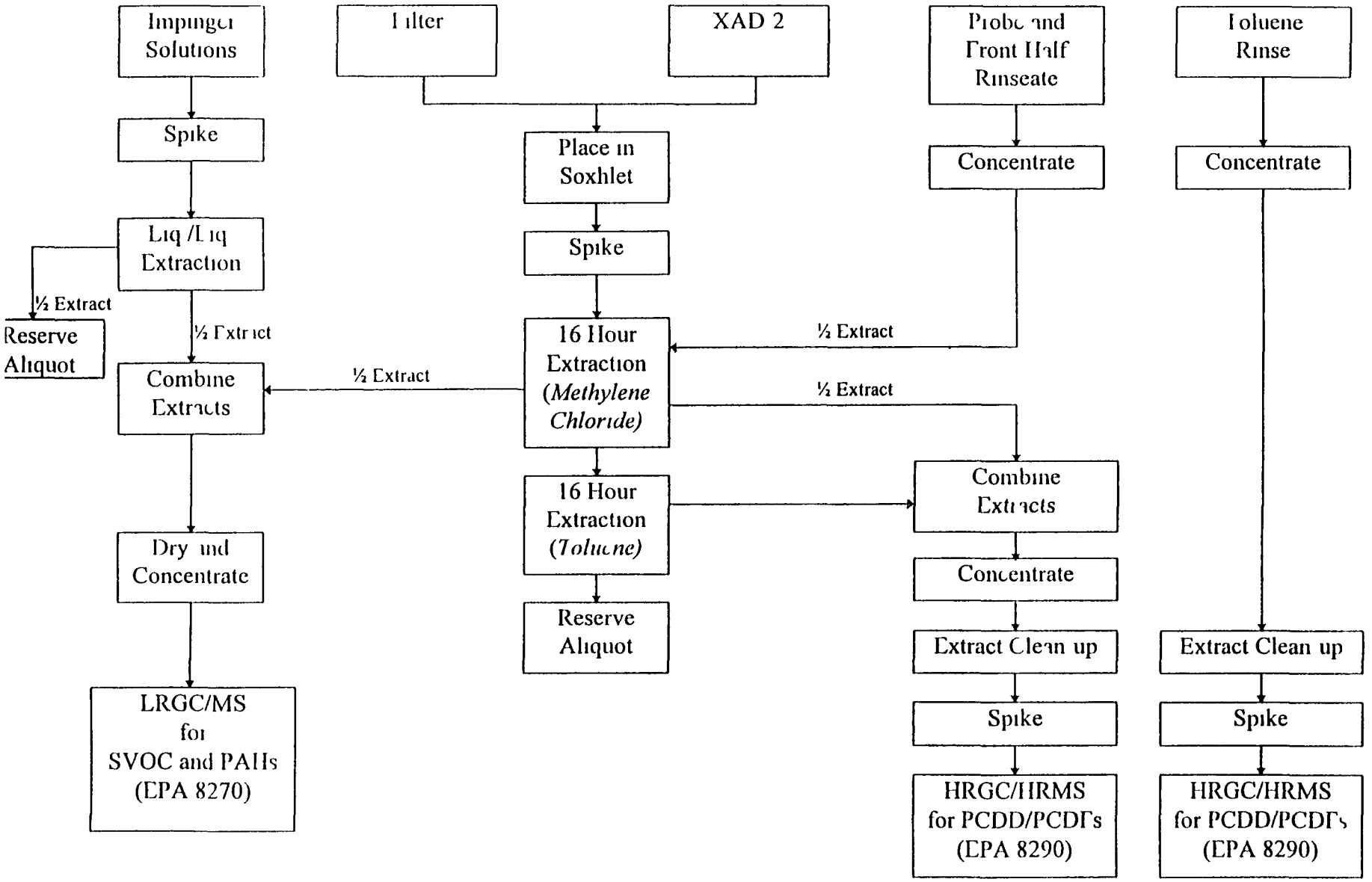

FIGURE 1

5 3 PARTICULATES and HYDROGEN CHLORIDE

SUMMARY Stack gas will be sampled isokinetically for suspended (filterable) particulate and hydrogen chloride emissions in accordance with EPA Method 5 *Determination of Particulate Emissions From Stationary Sources* Particulate in the sampled gas will be collected in the sample train on a heated filter

The sample procedure will be enhanced for the collection of hydrogen chloride by EPA Method 26A *Determination of Hydrogen Halide Emissions from Stationary Sources* Recovered samples will then be analyzed for particulate matter in accordance with EPA Method 5 and for hydrogen chloride in accordance with EPA Method 26 Inlet particulate samples will not be recovered since inlet particulate sampling is not required.

Key sample train components will include

- A sized, tapered edge stainless steel "button hook" sample nozzle
- A stainless steel sample probe with a heated glass liner and thermocouple
- A heated glass filter holder with a tared Teflon filter supported by a Teflon frit
- A condenser system consisting of Greenburg Smith glass impingers and connecting pieces
- A sample control/metering system consisting of a vacuum pump dry gas meter sample flow controls sample rate manometer stack gas velocity manometer temperature indicator and heat controllers

PREPARATIONS Sampling glassware and sample containers will be cleaned prior to sampling in the following sequence

- Soap and water wash and rinse
- Triplicate rinse with distilled, de-ionized water (probe nozzle and filter holder)
- Acetone rinse (probe nozzle and filter holder)

The condenser will consist of five impingers All impingers (except the third) will be a Greenburg Smith, modified with unrestricted impinger tubes Impinger 3 will be a standard Greenburg Smith impinger Each impinger will be charged for sampling as follows

- Impinger 1 & 2 100 mls 0 1N H_2SO_4 in each
- Impinger 3 & 4 100 mls 0 1 N NaOH in each
- Impinger 5 silica gel

All impingers will be weighed prior to sampling

SAMPLING Completion of each test run will include the following key procedures

- A pre-test leak check of the entire sample train at a vacuum greater than that anticipated for the test run. A leak rate of no greater than 0 02 CFM will be achieved prior to run commencement. Each sample point will be sampled for an equal duration.
- The filter holder hot box temperature will be maintained at 250F +/- 25F
- The sample probe will be heated enough to prevent internal moisture condensation.
- Ice will be maintained in the impinger ice bath.
- All necessary temperature and sample rate adjustments (to maintain isokinetic sampling) will be made at each sample point.
- A post test leak check will be performed on the entire sample train at a vacuum equal or greater than the highest vacuum achieved during the test run. If the leak rate is greater than 0 02 CFM, the run will either be voided/repeated or kept and corrected for the leak-rate (at the discretion of the administrator)
- All necessary data for each sample point and test run will be recorded on appropriate data forms

SAMPLE RECOVERY Sample recovery will be performed in the field in a sheltered area. ***Stack samples*** will be recovered as follows

- Each impinger will be weighed to 0 5 gm.
- The particulate filter and loose particulate will be transferred (with plastic tweezers) to a plastic petri dish.
- The probe nozzle and front-half of the filter holder will be rinsed and brushed three times with acetone into a cleaned glass bottle
- Impinger 1 & 2 contents will be transferred to an HDPE bottle
- Impinger 1 & 2 will be rinsed with 100 mls distilled water into the HDPE bottle
- Impinger 3 & 4 contents will be discarded.

Blanks will be recovered as follows

- A cleaned glass jar containing 100 200 grams of acetone
- An HDPE bottle containing 200 mls 0 1N H_2SO_4 and 100 mls distilled water

5 4 VOLATILES / VOST

SUMMARY Sampling for the possible presence of the volatile organics listed in Schedule 1 will be performed using US EPA Solid Waste Method 0030 (VOST)

This method is applicable for the determination of volatile organic compounds It is commonly called a VOST train. Because some of the volatiles on the list have boiling points below 35°C the train will sample one-half the normal sample rate (SLO VOST) Samples will be analyzed for the volatiles by thermal desorption, purge-and trap and gas chromatography/mass spectrometry (GC/MS) The list of target VOCs is presented in Attachment 2

Key components of the VOST sampling train are

- A stainless steel probe with a borosilicate glass lining that is electrically heated to maintain sample temperature above 130°C (266°F)
- A glass bore isolation valve with sliding Teflon plug
- Two glass sorbent tubes Sample first passes through a Tenax packed tube and then a Tenax/charcoal tube
- A condensation system consisting of two glass condensers through which ice water is circulated. The first condenser is located between the sample probe and first sorbent tube and the second is located between the first and second sample tube Condensate is collected in flasks
- Thermocouples to monitor the temperature of sample gas upstream of each resin trap to prevent thermal breakthrough of analytes
- A metering system consisting of a pump dry gas meter capable of measuring volume as low as 0 005 liters a calibrated rotameter to monitor gas flow rate a 10-channel temperature monitor and timer

PREPARATIONS Sample glassware is ultrasonically cleansed in a non-ionic detergent, rinsed with distilled water and oven dried

SAMPLING Completion of each test run will include the following key procedures

- The sampling train will be assembled and checked for leaks at the site prior to sampling The leak check is performed by closing the valve upstream of the condenser and pulling a vacuum 10 inches higher than normal operating pressures Any potential leak rates will be less than 0 1 inch Hg after 1 minute

- Four pairs of tubes will be sampled per test run. Three will be analyzed, one will be a spare
- Each tube pair will be sampled for 40 minutes at 0 5 liters per minute
- Key sample data will be recorded every ten minutes on an appropriate data form

SAMPLE RECOVERY Recovered condensate will be placed in glass vials and filled with distilled water until no head space exists All spent sample tubes will be returned to their original containers for shipment Individual cartridges will not be recovered until analysis Three pairs of cartridges will be used for blanks

These blanks will be transported to the sampling site and the caps taken off for the length of time required to change a pair of cartridges on the sampling train. The second pair of cartridges are the trip blanks These blanks are also transported to the site and treated like all other cartridges except the caps are not removed.

ANALYTICAL PROCEDURES The field and trip blanks will determine contamination in the field and storage The third blank pair of cartridges remain in the laboratory These blanks are only analyzed if the contamination level of the other blanks are 2 ng or higher of a particular compound.

Each pair of sample tubes will be analyzed in tandem. Contaminants if any are present, are eluded by thermal desorption. Contaminants if any are present, are eluded from the condensate by a purge and trap procedure Volatiles are analyzed by GC/MS in accordance with EPA SW 846 Method 8240

5 5 - LEAD and MERCURY

SUMMARY Stack gas will be sampled isokinetically for metal emissions in accordance USEPA Method 29 *Determination of Metals Emissions from Stationary Sources*

Metals in the sample gas will be collected in the sample train on a filter and in acidic impinger reagents Recovered samples will then be digested and analyzed lead (Pb) and mercury (Hg) in accordance with Method 29

Key sample train components will include

- A sized, tapered-edge glass 'button-hook sample nozzle
- A stainless steel sample probe with a heated glass liner S type pitot tube and thermocouple
- A heated glass filter holder with a low metal quartz fiber filter supported by a Teflon frit
- A condenser system consisting of Greenburg Smith glass impingers and connecting pieces
- A sample control/metering system consisting of a vacuum pump dry gas meter sample flow controls sample rate manometer stack gas velocity manometer temperature indicator and heat controllers

PREPARATIONS Sampling glassware and sample containers will be cleaned prior to sampling in the following sequence

1 Soap and water wash
2 A four-hour soak in 10% HNO (plastic ware will be rinsed only)
3 Triplicate rinse with distilled de ionized water

The condenser will consist of Greenburg Smith impingers interconnected with glass U bends Reagent charging and stem configurations will be as follows

- Impinger 1 / (optional) Empty short-stem
- Impinger 2 Restricted tip with 5% HNO_3/10% H_2O_2
- Impinger 3 Unrestricted tip with 100 mls 5% HNO_3/10% H_2O_2
- Impinger 4 Unrestricted tip empty
- Impinger 5 Restricted tip with 100 mls 4% $KMNO_4$/10% H_2SO_4
- Impinger 6 Unrestricted tip with 100 mls 4% $KMNO_4$/10% H_2SO_4 each
- Impinger 7 Unrestricted tip silica gel.

All impingers will be weighed prior to sampling to 0 5 grams 5% HNO_3/10% H_2O_2 will be used within one month of preparation and 4% $KMNO_4$/10% H_2SO_4 will be used within 24 hours of preparation.

SAMPLING Completion of each test run will include the following key procedures

- A pre-test leak check of the entire sample train at a vacuum greater than that anticipated for the test run. A leak rate of no greater than 0 02 CFM will be achieved prior to run commencement.
- Each sample point will be sampled for an equal duration.
- Filter holder hot box temperature will be maintained at 250 +/- 25 °F
- Probe heat will be maintained to prevent internal moisture condensation
- Ice will be maintained in the impinger ice bath.
- All necessary temperature and sample rate adjustments (to maintain isokinetic sampling) will be made at each sample point.
- A post-test leak check will be performed on the entire sample train at a vacuum equal or greater than the highest vacuum achieved during the test run. If the leak rate is greater than 0 02 CFM, the run will either be voided/repeated or kept and corrected for the leak rate (at the discretion of the administrator)
- All necessary data for each sample point and test run will be recorded on appropriate data forms

SAMPLE RECOVERY Sample recovery will be performed in the field in a sheltered area. ***Stack samples*** will recovered as follows

- Each impinger will be weighed to 0 5 gm.
- The particulate filter and loose particulate will be transferred to container 1 a plastic petri dish.
- With a non metallic brush the probe nozzle and front half of the filter holder will be rinsed and brushed three times with a total of 100 ml of 0 1N HNO_3 into container 2 (high density polyethylene HDPE)

- The contents of the knock-out impinger (if used) and the impingers charged with $HNO_3/H2O_2$ will be transferred to container 3 (HDPE)
- Then, the knock-out impinger (if used) HNO_3/H_2O_2 impingers filter holder back-half, frit and connecting glassware will all be rinsed three times with a total of 100 ml 0 1N HNO_3 into container 3
- The contents of the impinger in between the HNO_3/H_2O_2 and $KMNO_4$ impingers will be transferred to container 4 (HDPE) Then it will be rinsed three times with a total of 100 ml of 0 1N HNO_3 into container 4 (HDPE)
- The contents of the $KMNO_4$ impingers will be transferred into container 5 (amber glass)
- The $KMNO_4$ impingers and connecting glassware will then be rinsed three times first with a total of 100 ml of fresh 4% $KMNO_4$/10% H_2SO_4 and then a total of 100 ml of distilled water into container 5
- 200 ml of distilled water will be placed in container 6 (HDPE) Then the $KMNO_4$ impingers will be rinsed with a total of 25 ml 8N HCl into container 6

BLANKS Blanks will be collected as follows

- An unused filter will be placed in a plastic petri dish (container 1)
- An HDPE jar containing 100 ml 0 1N HNO_3 will be recovered as a front-half blank (container 2)
- An HDPE jar containing 200 ml 5% HNO_3/10% H_2SO_4 and 100 ml 0 1 N HNO_3 will be recovered as a back-half blank (container 3)
- An HDPE jar containing 100 ml 0 1N HNO_3 will be recovered as a blank for the impinger in between the HNO_3/H_2O_2 and $KMNO_4$ impingers (container 4)
- A glass jar containing 300 ml of 4% $KMNO_4$/10% H_2SO_4 and 100 ml of distilled water will be recovered a $KMNO_4$ impinger blank (container 5)
- An HDPE jar containing 200 ml distilled water and 25 ml 8N HCl will be recovered as a $KMNO_4$ impinger HCl rinse blank (container 6)

6 0 QUALITY ASSURANCE

The protocol was developed in accordance with the principles and recommendations outlined in the EPA Quality Assurance Handbook for Air Pollution Measurement Systems

6 1 SAMPLE PRESERVATION

All dioxin/furan, SVOC PAH, and VOC sample fractions will be preserved with ice from the time of sample recovery until sample analysis preparation.

Remaining samples are preserved by their own matrices

6 2 SAMPLE HANDLING

All sampling and sample recovery will be performed by AirRECON personnel. All samples will be labeled by project name sample date sample fraction, sample location and run number

Recovered samples will be shipped to a laboratory furnished by ICF Kaiser

6 3 CHAIN-OF-CUSTODY

Each sample will be recorded on a chain of-custody (COC)/request for- analysis form. The COC is completed to ensure the integrity of the samples collected. Before relinquishing the sample the project manager must complete a COC listing his/her name the name of the person receiving the results the AIRRECON project number the sample description (media) the sample date and who performed the sampling

The COC must also identify the source of the sample describe the container holding the sample and the preservative (if any) Additional comments or notes can be placed at the bottom of the page

6 4 CALIBRATION DATA

All pre-test calibration data for sampling and equipment will be made available onsite at the time of testing to any regulatory representatives Copies of all calibration data will be included in the final report

6 5 CALIBRATION PROCEDURES

PITOT TUBES All standard pitot tubes are given a baseline coefficient of 0 99 A standard pitot tube design shall conform to EPA Reference Method 2 sections 2 7 1-2 7 5

All S Type pitot tubes are initially provided by the manufacturer in accordance with the specifications listed in USEPA Reference Method 2 1

Before each use a visual inspection of the pitot tube is made to verify that the face openings are in alignment within the specifications shown in Figure 2-2 and 2-3 of USEPA Method 2 All pitot tubes are calibrated annually in accordance with Sections 4 1 3 through 4 1 5 of Method 2

An identification number is assigned to a calibrated pitot tube If the pitot tube is not marked, a baseline coefficient of 0 84 is assigned.

DRY GAS METERS A dry gas meter is used as the calibration standard, in accordance with EPA Reference Method 5 Section 5 3 The calibration meter kept in the laboratory solely for the purpose of calibrating the dry gas meters used in the field, is re-calibrated annually against a bell prover

The dry gas meter is calibrated before and after each use If the dry gas meter coefficient obtained before and after the test series differ by more than five percent, the calculations for the test series will be performed using the coefficient that gives the lower value of sample volume

NOZZLE Each probe nozzle is visually inspected before being used in the field. The nozzle's internal diameter is calibrated using USEPA Method 5 1 When the nozzle becomes out-of-round, chipped, or corroded, it will be reshaped, sharpened and re calibrated before use Each nozzle is permanently identified

THERMOCOUPLES Thermocouples are calibrated by immersing them side by side with a reference mercury-in-glass thermometer The thermocouples are consecutively immersed in an ice bath, boiling water and a hot oil bath

If the absolute temperature reading between the thermocouple and the reference thermometer agree within ±1 5% at all three calibration points the actual thermocouple reading is considered acceptable

6 6 FINAL REPORT

Emissions of each pollutant will be reported in mg/M_3 grams/second and pounds/hour
Emissions of CO_2 and O_2 will be reported as a percent by volume

AirRECON s final test report for this project will include the following items

- Summary
- Personnel and Certifications
- Sampling location diagrams
- Velocity and flow rate data
- Cyclonic flow data
- Gas composition data
- Emissions data
- Process information
- Procedures checklist
- Selected nomenclature & laboratory information sheet
- Approved test protocol
- Equipment calibration data
- Original test data
- Calculations
- Laboratory data

Submitted by

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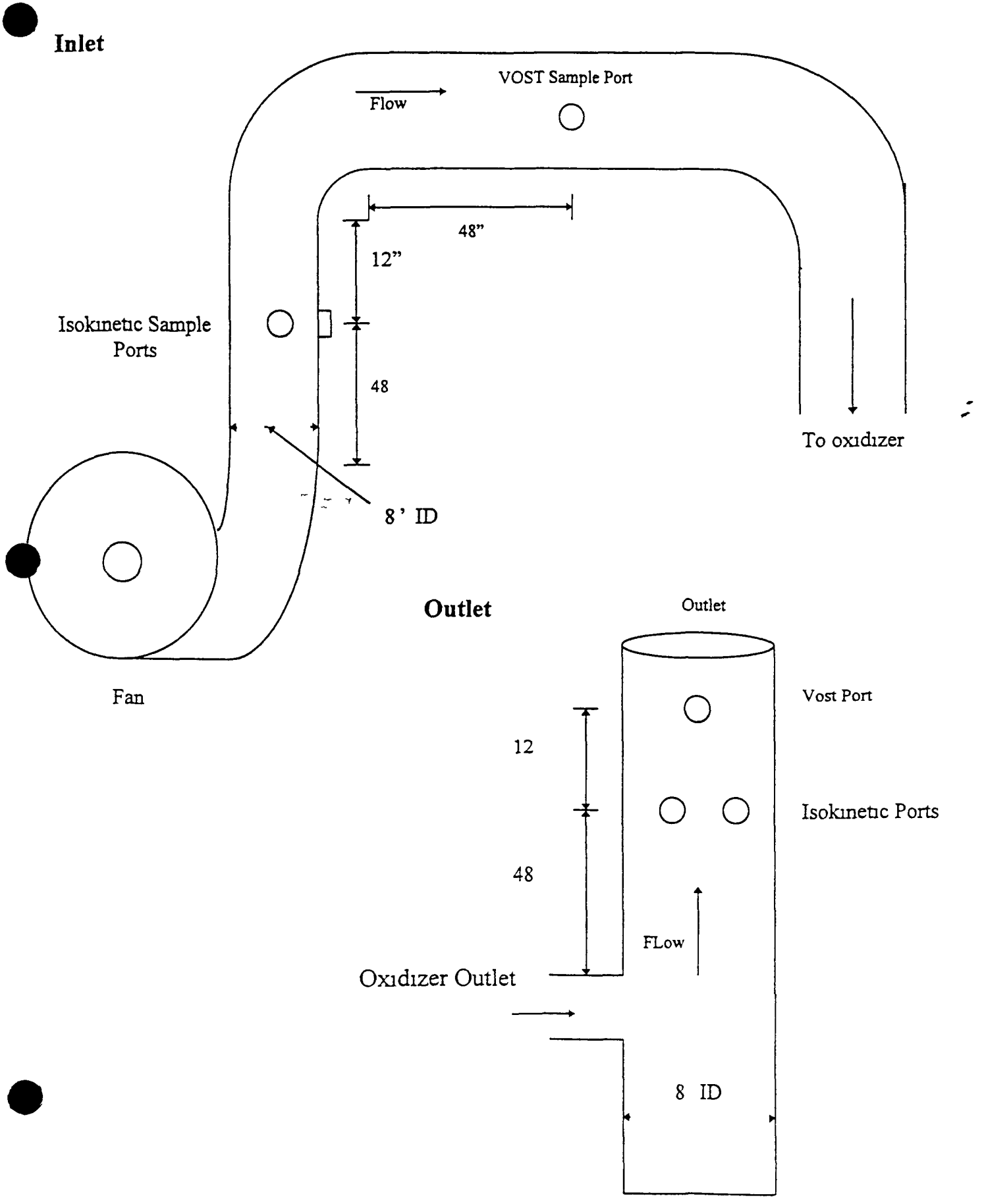
TFM/prh (H \AIRRECON\PROTOCOL 98\1454 P DOC)

ATTACHMENT 2

SAMPLE LOCATION DIAGRAMS

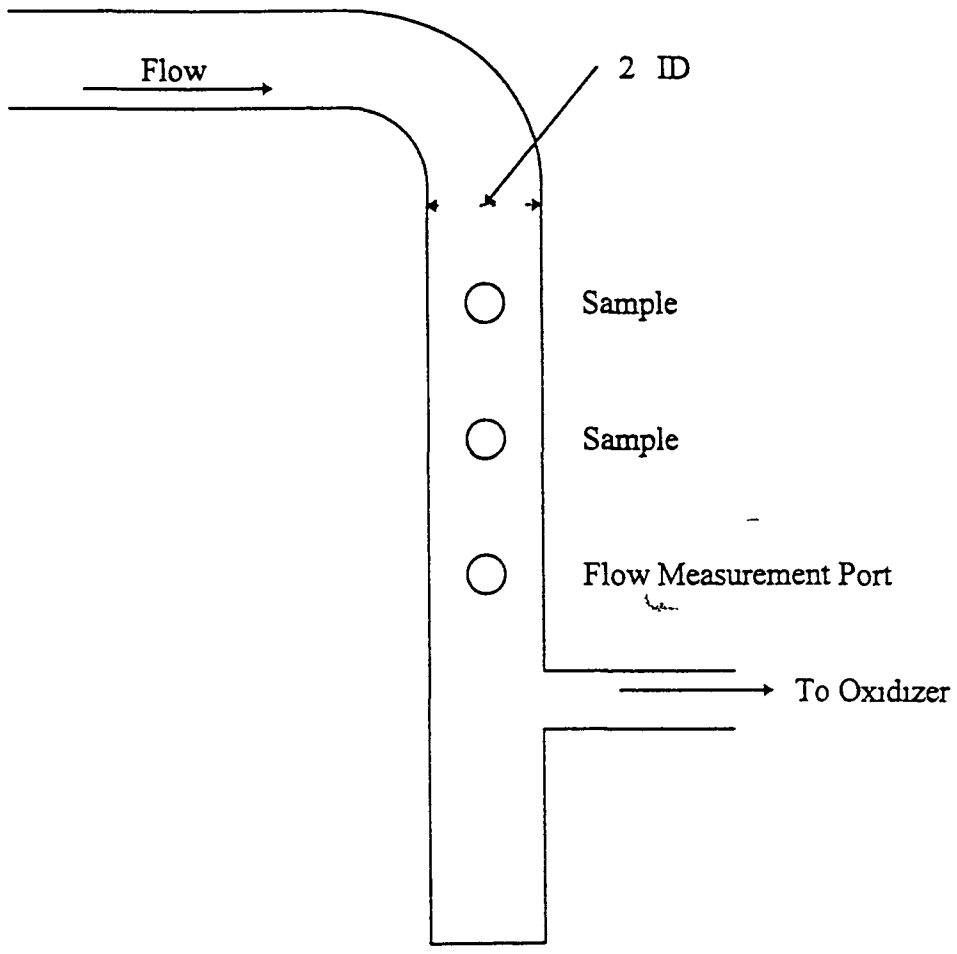
ORIGINAL (Red)

ICF Kaiser / Southern Maryland Wood Treatment Superfund Site, Hollywood MD
Continuous TDU Sample Locations

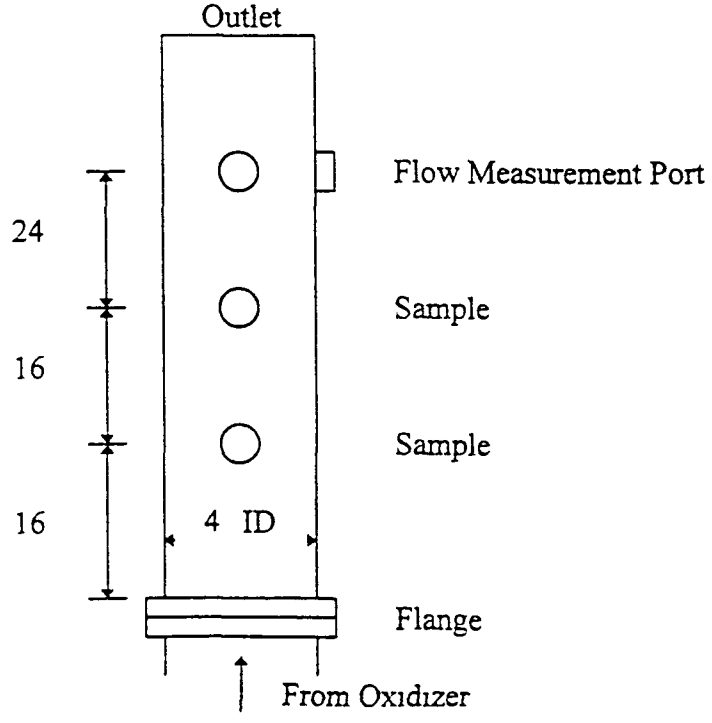


ICF Kaiser / Southern Maryland Wood Treatment Superfund Site, Hollywood, Maryland
Batch TDU Sample Locations

Inlet



Outlet



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ATTACHMENT 3

TARGET ORGANIC COMPOUNDS

SVOCs

1,2-Dichlorobenzene	95 50 1
1,2,4-Trichlorobenzene	120 82 1
1,3-Dichlorobenzene	
1 4-Dichlorobenzene	
2-Chloronaphthalene	
2-Chlorophenol	
2-Methylnaphthalene	
2 Methylphenol	
2-Nitroaniline	
2 Nitrophenol	
2,4-Dichlorophenol	
2,4-Dimethylphenol	
2,4-Dinitrophenol	
2,4-Dinitrotoluene	
2,4,5-Trichlorophenol	
2,4,6-Trichlorophenol	
2,6-Dinitrotoluene	
3-Nitroaniline	
3,3' Dichlorobenzidine	
4-Bromophenyl-phenylether	
4-Chloro-3-methylphenol	
4-Chloroaniline	
4-Chlorophenyl-phenylether	
4-Methylphenol	
4-Nitroaniline	
4-Nitrophenol	
4 6-Dinitro-2-methylphenol	
Acenaphthylene	
Acenaphthene	
Anthracene	
Benzo[a]anthracene	
Benzo[b]fluoranthene	
Benzo[a]pyrene	
Benzo[g,h,i]pyrene	
Benzo[k]fluoranthene	
bis(2-Chloroethoxy)methane	
bis(2-Chloroethyl)ether	
bis(2-Chloroisopropyl)ether	
bis(2-ethylhexyl)phthalate	
Butyl benzyl phthalate	
Carbazole	
Chrysene	
Di-n-butylphthalate	
Di-n-octylphthalate	
Dibenz[a,h]anthracene	
Dibenzofuran	
Diethylphthalate	
Dimethylphthalate	
Fluoranthene	
Fluorene	
Hexachlorobenzene	
Hexachlorobutadiene	
Hexachlorocyclopentadiene	
Hexachloroethane	
Indeno[1,2,3-cd]pyrene	
Isophorone	
N Nitroso-di-n-propylamine	
N Nitrosodiphenylamine	
Naphthalene	
Nitrobenzene	
Pentachlorophenol	
Phenanthrene	
Phenol	
Pyrene	

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VOC

Acetone
Benzene
Bromodichloromethane
Bromoform
Bromomethane
2-Butanone
Carbon disulfide
Carbon tetrachloride
Chlorobenzene
Chloroethane
Chloroform
Chloromethane
Dibromochloromethane
1 1-Dichloroethane
1,2-Dichloroethane
1 1 Dichloroethene
cis-1,2 Dichloroethene
trans-1,2-Dichloroethene
1,2-Dichloropropane
cis 1,3-Dichloropropene
trans 1,3-Dichloropropene
Ethylbenzene
2-Hexanone
4-Methyl-2 pentanone
Methylene chloride
Styrene
1 1,2,2 Tetrachloroethane
Tetrachloroethene
Toluene
1 1 1-Trichloroethane
1 1,2-Trichloroethane
Trichloroethene
Vinyl chloride
Xylene (total)

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STANDARD OPERATING PROCEDURE 40 1
HYDROLAB MULTIPARAMETER WATER QUALITY MONITORING INSTRUMENT

1 0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to delineate protocols for field operation with the multiparame ter water quality logging system (H20 data sonde and SCOUT 2 receiver) The System can monitor up to eight basic pa rameters including dissolved oxygen percent saturation temperature pH specific conductance resistivity salinity total dissolved solids redox level and depth

2 0 MATERIALS

SCOUT 2 Display

H20 Water Quality Data Transmitter

Underwater Cables

Logbook

3 0 PROCEDURE

3 1 CALIBRATION

Calibration will be performed in the field daily before use as follows

temperature none required

specific conductance KCl or seawater standards

- pH pH 7 buffer plus a slope buffer

dissolved oxygen saturated air or saturated water

- redox quinhydrone or tranosfer

depth set zero in air

level set zero in air

- salinity uses calibration for specific conductance
- Press the blue Calibrate button

Enter th value of the standa d

- Accept the new calibration number

3 2 OPERATION

1 Attach the Cable to the Transmitter

2 Connect the other end of the cable to the display

3 Press the On/Off key on the display s panel Allow a few seconds for the Transmitter to start sending data to the Display screen

4 Calibrate the transmitter as shown in Section 1 5

5 Deploy the sensor over the side of the vessel in a minimum of 4 of water

6 Write data values displayed on the display screen in the appropriate field logbook

7 Retrieve sensor

8 Move to the next sampling location If travel time is great, turn off display by pressing On/Off key Check condition of probes after each deployment

9 Disconnect the transmitter when finished sampling for the day

4 0 MAINTENANCE

Maintenance according to maufacturer s specifications

5 0 PRECAUTIONS

- Check condition of probes frequently between sam pling

Don t force pins into the connectors note the keying sequence

6 0 REFERENCES

Hydrolab Scout 2 Reference Manual December 1991

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STANDARD OPERATING PROCEDURE 40 2
WATER LEVEL AND WELL DEPTH MEASUREMENTS

1 0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to delineate protocols for measuring water level and well depth This procedure is applicable to the sampling of monitoring wells and must be performed prior to any activities which may disturb the water level such as purging or aquifer testing

2 0 MATERIALS

Electric Water Level Indicator (dipmeter) with cable measured at 0 01 foot increments weighted steel tape and chalk

Oil water interface probe (if non aqueous phase liquid [NAPLs] are suspected to be present)

Plastic Sheeting

Photoionization detector (PID) or intrinsically safe flame ionization detector (FID)

- Logbook

3 0 PROCEDURE

3 1 PRELIMINARY STEPS

1 Locate the well and verify its position on the site map Record whether positive identification was obtained including the well number and any identifying marks or codes contained on the well casing or protective casing Gain access to the top of the well casing

2 Locate the permanent reference mark at the top of the casing This reference point will be scribed, notched or otherwise noted on the top of the casing If no such marks are present, measure to the top of the highest point of the well casing and so note this fact in field logbook Determine from the records and record in the notebook the elevation of this point

3 Record any observations and remarks regarding the completion characteristics and well condition such as evidence of cracked casing or surface seals security of the well (locked cap) and evidence of tampering

4 Keep all equipment and supplies protected from gross contamination use clean plastic sheeting Keep the water level indicator probe in its protective case when not in use

3 2 OPERATION

1 Sample the air in the well head for gross organic vapors by lifting the well cap only high enough for an organic vapor meter (PID or FID) probe to be entered into the well casing This will indicate the presence of gross volatile contaminants as well as indicating potential sampler exposure

2 Remove cap Allow well to vent for 60 to 90 seconds Resample headspace Record both readings If the second reading is lower than the first use the second reading to determining whether respiratory protection will be required during subsequent water level and well depth determinations and sampling

3 Note that all headspace sampling must be performed at arm s length and from the upwind side of the well if possible

4 If NAPL contamination is suspected use an interface probe to determine the existence and thickness of NAPLs

- Open the probe housing turn the probe on and test the alarm Slowly lower the probe into the well until the alarm sounds A continuous alarm indicates a NAPL while an intermittent alarm indicates water If a NAPL is detected record the initial level (first alarm) Mark the spot by grasping the cable with the thumb and forefingers at the top of the casing If a mark is present on the casing, use the mark as the reference point. If no mark is present, use the highest point on the casing as the reference point Withdraw the cable sufficiently to record the depth

- Continue to slowly lower the probe until it passes into the water phase Slowly retract the probe until the NAPL alarm sounds and record that level in the manner as described above

  Record the thickness of the LNAPL (see section 3 3 1)

  Continue to slowly lower the interface probe through the water column to check for the presence of DNAPL

  Measure and record the thickness of the DNAPL layer (if any) as described above

- Slowly raise the interface probe recording the depth to each interface as the probe is withdrawn If there is a discrepancy in depths clean the probe sensors and re check the depths

  NOTE Air/liquid interface depth is more reliable if probe is lowered into liquid NAPL water depths are more accurate if probe is moved from water into NAPL

  Always lower and raise interface probe slowly to prevent undue mixing of media

Always perform NAPL check in wells installed in ar as with suspected NAPL contamination Always perform NAPL check if headspace test reveals presence of volatiles Always perform NAPL check the first time a well is sampled If a well has been sampled previously and no NAPLs were present and none of the preceeding conditions are met the NAPL check may be omitted

5 If no NAPL is present use an electronic water level detector as follows

Remove the water level indicator probe from the case turn on the sounder and test check the battery and sensitivity scale by pushing the red button Adjust the sensitivity scale until you can hear the buzzer

Slowly lower the probe and cable into the well allowing the cable reel to unwind Continue lowering until the meter buzzes Very slowly raise and lower the probe until the point is reached where the meter just buzzes Marking the spot by grasping the cable with the thumb and forefingers at the top of the casing If a mark is present on the casing, use the mark as the reference point If no mark is present, use the highest point on the casing as the reference point Withdraw the cable and record the depth

6 Alternatively use a steel tape with an attached weight if aquifer gradients are lower than 0 05 ft/ft Due to the possibility of adding unknown contaminants from chalk colorants only white chalk is permitted

Rub chalk onto the first 1 foot of the steel tape and slowly lower the chalked end into the well until the weighted end is below the water surface (A small splash can be heard when the weighted end hits the water surface)

Using the method described above read and record the length from the steel tape

Remove the steel tape The chalk will be wet or absent where the tape was below the water surface Locate read and record this length Subtract wetted length from total length and record the difference This is the depth to water table

7 To measure the well depth lower electric water level indicator probe or tape until slack is noted Very slowly raise and lower the cable until the exact bottom of the well is felt Measure (cable) or read the length (tape) and record the depth

8 Note that if the electric water level indicator is used to determine depth of well the offset distance between the tip of the probe and the electrode must be added to the reading to determine actual depth

9 Withdraw the probe or tape

10 Decontaminate the probe(s) and cable(s)

3 3 DATA RECORDING AND MANIPULATION

Record the following computations

- date and time

  weather

  method of measurement

  casing elevation

  NAPL surface elevation = casing elevation depth to NAPL

  LNAPL thickness = depth to bottom of NAPL depth to top of NAPL

  water level elevation = casing elevation depth to water

  well bottom elevation = casing elevation depth to bottom (or read directly from tape)

4 0 CALIBRATION

No calibration is required Ensure operability of electric water level indicator by testing sounder prior to use

5 0 PRECAUTIONS

Depending upon the device used correction factors may be required for some measurements

- Check instrument batteries prior to each use

  Exercise care not to break the seals at the top of the electric water level indicator probe

- Interface probes will be used in all wells for first round sampling regardless of site history If no NAPLs are detected during the first round of sampling this step may be omitted during subsequent sampling events unless conditions such as site history or headspace vapors would indicate otherwise

6 0 REFERENCES

McAlary T A and Barker J F 1987 Volitalization Losses of Organics During Ground Water Sampling from Low Permeability Materials in *Ground Water Monitoring Review* Fall 1987

Thornhill Jerry T 1989 *Accuracy of Depth to Ground water Measurements* In EPA Superfund Ground Water Issue EPA/540/4 89/002

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STANDARD OPERATING PROCEDURE 50 1
SAMPLE LABELS

1 0 SCOPE AND APPLICATION

Every sample will have a sample label uniquely identifying the sampling point and analysis parameters The purpose of this standard operating procedure (SOP) is to delineate pro tocols for the use of sample labels An example label is in cluded as Figure 50 1 A Other formats with similar levels of detail are acceptable

2 0 MATERIALS

- Sample label
- Indelible marker

3 0 PROCEDURE

The use of preprinted sample labels is encouraged and should be requested from the analytical support laboratory during planning activities

As each sample is collected fill out a sample label ensuring the following information has been collected

- Project Name
- Project Number
- Location/Site I D enter the well number or surface water sampling number and other pertinent informa tion concerning where the sample was taken
- Date of Sample Collection

  Time of Sample Collection

  Analyses to be Performed (Note due to number of analytes details of analysis should be arranged with lab *a priori*)

  Whether Filtered or Unfiltered (water samples only)

  Preservatives (water samples only)

Double check the label information to make sure it is correct Detach the label remove the backing and apply the label to the sample container Cover the label with clear tape ensur ing that the tape completely encircles the container

Record the Sample Number and designated sampling point in the field logbook, along with the following sample informa tion

Time of sample collection (each logbook page should be dated)

The location of the sample

Organic vapor meter or photoionization meter readings for the sample (when appropriate)

Any unusual or pertinent observations (oily sheen on groundwater sample incidental odors soil color grain size plasticity etc)

Number of containers required for each sample

- Whether the sample is a QA sample (split, duplicate or blank)

A typical logbook entry might look like this

7 35 AM Sample No MW 3 PID = 35 PPM
Petroleum odor present. Sample designated MW 3 001

The suffix duplicate will be added to Sample ID for duplicat ing samples

4 0 MAINTENANCE

Not Applicable

5 0 PRECAUTIONS

Note that although incidental odors should be noted in the logbook, it is unwise from a health and safety standpoint to routinely sniff test samples for contaminants

6 0 REFERENCES

USEPA 1980 *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans* QAMS 005/80

FIGURE 50 1-A
SAMPLE LABEL

PROJECT NAME _____ PROJECT NUMBER _____

SAMPLE LOCATION/SITE ID _____

DATE ___/___/___ TIME ____ ____

ANALYTES VOC SVOC P/P METALS CN

PAH D/F HERBs ANIONS TPH

FILTERED [NO] [YES] ALK TSS

PRESERVATIVE [HCl] [HNO_3] [NaOH] [H_2SO_4]

SAMPLER _____

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STANDARD OPERATING PROCEDURE 50 2
SAMPLE PACKAGING

1 0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to delineate protocols for the packing and shipping of samples to the laboratory for analysis

2 0 MATERIALS

Waterproof coolers (hard plastic or metal)

Metal cans with friction seal lids (e g paint cans)

Chain of custody forms

Chain-of custody seals (optional)

Packing material

Sample documentation

ice

Plastic garbage bags

- Clear Tape
- Zip seal plastic bags

3 0 PROCEDURE

1 Place samples directly on ice to bring temperature down

2 Check cap tightness and verify that clear tape covers label and encircles container

3 Wrap sample container in bubble wrap or closed cell foam sheets Samples may be enclosed in a secondary container consisting of a clear zip seal plastic bag

4 Place several layers of bubble wrap or at least 1 of vermiculite on the bottom of the cooler Line cooler with open garbage bag place all the samples upright inside the garbage bag and tie

5 Double bag and seal loose ice to prevent melting ice from soaking the packing material Place the ice outside the garbage bags containing the samples

6 Pack shipping containers with packing material (closed cell foam vermiculite or bubble wrap) Place this packing material around the sample bottles or metal cans to avoid breakage during shipment

7 Enclose all sample documentation (i e Field Parameter Forms Chain-of Custody forms) in a waterproof plastic bag and tape the bag to the underside of the cooler lid If more than one cooler is being used each cooler will have its own documentation Add the total number of shipping containers included in each shipment on the chain of-custody form

8 If required seal the coolers with signed and dated custody seals so that if the cooler were opened the custody seal would be broken Place clear tape over the custody seal to prevent damage to the seal

9 Tape the cooler shut with packing tape over the hinges and place tape over the cooler drain

10 Ship all samples via overnight delivery on the same day they are collected if possible

4 0 MAINTENANCE

Not Applicable

5 0 PRECAUTIONS

5 1 PERMISSIBLE PACKAGING MATERIALS

Non absorbent

bubble wrap

closed cell foam packing sheets

- Absorbent
  - Vermiculite

5 2 NON PERMISSIBLE PACKAGING MATERIALS

- Paper

  Wood shavings (excelsior)
- Cornstarch peanuts

6 0 REFERENCES

USEPA 1990 *Sampler s Guide to the Contract Laboratory Program* EPA/540/P 90/006 Directive 9240 0 06 Office of Emergency and Remedial Respons Washington D C December 1990

USEPA 1991 *User s Guide to the Contract Laboratory Program* EPA/ 40/O 91/002 Directive 9240 0 01D Office of Emergency and Remedial Response January 1991

USEPA 1980 *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans* QAMS 005/80

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STANDARD OPERATING PROCEDURE 50 3
SAMPLE PRESERVATION AND CONTAINER REQUIREMENTS

1 0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to define the preservatives and techniques to be employed in preserving environmental samples between collection and analysis

2 0 MATERIALS

2 1 SAMPLE CONTAINERS

2 1 1 40 mL Glass Vial 24 mm Neck Finish

- **Closure** White polypropylene or black phenolic open top screw cap 15 mm opening 24-400 size

  Septum 24 mm disc of 0 005 in PTFE bonded to 0 120 in silicon for total thickness of 0 125 in

2 1 2 1 L High Density Polyethylene Cylinder Round Bottle 28-mm Neck Finish

Closure White polyethylene cap white ribbed, 28 410 size F217 polyethylene liner

2 1.3 120 mL Wide Mouth Glass Vial 48 mm Neck Finish

Closure White polyethylene cap 40-480 size 0 015 mm PTFE liner

2 1 4 250-mL Boston Round Glass Bottle

Closure White polypropylene or black phenolic open top screw cap

Septum Disc of 0 005 in PTFE bonded to 0 120 in silicon for total thickness of 0 125 in

2 1 5 8 oz Short Wide Mouth Straight Sided Flint Glass Jar 70 mm Neck Finish

Closure White polypropylene or black phenolic baked polyethylene cap 48-400 size 0 050 mm PTFE liner

2 1 6 4 oz Tall Wide Mouth Straight Sided Flint Glass Jar 48 mm Neck Finish

Closure White polypropylene or black phenolic baked polyethylene cap 48-400 size 0 015 mm PTFE liner

2 1 7 1 L amber Boston Round Glass Bottle 33 mm Pour Out Neck Finish

Closure White polypropylene or black phenolic baked polyethylene cap 33 430 size 0 015 mm PTFE liner

2 1 8 500 mL High Density Polyethylene Cylinder Bottle 28-mm Neck Finish

Closure White polypropylene white ribbed 28-410 size F217 polyethylene liner

2 2 SAMPLE PRESERVATIVES

HCl

HNO_3

H_2SO_4

NaOH

- Ice

3 0 PROCEDURE

Containers must be certified clean with copies of laboratory certification furnished to the contracting officer's representative (COR)

Water samples will be collected according to procedures detailed in SOPs 30 2 and 30 3 and placed in containers appropriate to the intended analyte as given in Table 50 3 A

- Samples taken for volatile organic compound (VOC) analysis will generally be collected in pre preserved VOC vials Sufficient HCl should have been added to the vial prior to the addition of the sample such that the pH<2

- Samples collected for metals analysis will be acidified in the field to a pH < 2 by the addition of HNO_3 Filtered samples will be acidified after filtration After acidifying the sample the container should be lightly capped, then swirled to thoroughly mix the sample The cap will then be loosened to release any excess pressure this operation may have generated

  Samples collected for cyanide will be alkalized to a pH > 12 by the addition of NaOH

  Samples not requiring chemical preservation will be placed on ice and cooled to 4 C (e g semivolatile organic compounds explosives)

  Soil and sediment, samples will be collected according to procedures detailed in SOPs 30 1 and 30 4 into containers appropriate to the intended analyte as given in Table 50 3 B

  No chemical preservatives will be added to soil or sediment samples These samples will be immediately placed on ice and cooled to 4 C

4 0 MAINTENANCE

Not applicable

5 0 PRECAUTIONS

Note that acidifying a sample containing cyanide may liber ate HCN gas

Avoid breathing any fumes emanating from acidified samples

Acidify samples only in the open rather than in closed spaces such as a vehicle

See the HSP for other safety measures

6 0 REFERENCES

Test Methods for Evaluating Solid Waste SW 845 (USEPA, 1986)

A Compendium of Superfund Field Operations Methods EPA 540 P87 001

A Compendium of ERT Soil Sampling and Surface Geophysics Procedures (USEPA, 1991)

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Table 50 3-A
Summary of Sample Containment and Sample Preservation for Aqueous Samples

Parameter	Sample Container Quantity	Sample Container Type	Preservation Methods	Holding Times
		Groundwater		
Volatile Organic Compounds	3	40 mL amber glass vials Teflon® lined septum cap	HCl to pH<2 Cool 4±2 C	7 days
Semivolatile Organic Compounds	2	1 liter narrow mouth amber glass Teflon®-lined cap	Cool 4±2 C	Extraction 7 days Analysis 40 days
Pesticides/PCBs	2	1 liter narrow mouth amber glass Teflon®-lined cap	Cool 4±2 C	Extraction 7 days Analysis 40 days
Explosives	1	1 liter narrow mouth amber glass, Teflon®-lined cap	Cool 4±2 C	Extraction 7 days Analysis 40 days
Dioxin/Furans	1	1 liter narrow mouth amber glass Teflon®-lined cap	Cool 4±2 C	Extraction 7 days Analysis 40 days
Herbicides	1	1 liter narrow mouth amber glass, Teflon® lined cap	Cool 4±2 C	Extraction 7 days Analysis 40 days
Common Anions Chloride fluoride bromide sulfate	1	1 liter polyethylene bottle	Cool 4±2 C	28 days
Nitrate Nitrite	1	1 liter polyethylene bottle	H_2SO_4 to pH<2 Cool 4±2 C	28 days
Total phosphate	1	1 liter polyethylene bottle	H_2SO_4 to pH<2 Cool, 4±2 C	28 days
Total Petroleum Hydrocarbons	1	250 mL amber glass, Teflon®-lined cap	H_2SO_4 to pH<2 Cool, 4±2 C	Extraction 7 days Analysis 40 days
Metals	1	1 liter polyethylene bottle	HNO_3 to pH<2 Cool 4±2 C	6 months
Mercury				28 days
Cyanide	1	1 liter polyethylene bottle	NaOH to pH>12 Cool 4±2 C	14 days

*The Hexachloro-compounds include the following hexachlorobenzene hexachloroethane hexachlorocyclopentadiene and hexachlorobutadiene

Table 50.3 B
Summary of Sample Containment and Sample Preservation for Solid Samples

Parameter	Sample Container		Preservation Methods	Holding Times	
	Quantity	Type			
Volatile Organic Compounds	2	120 mL amber glass vials Teflon®-lined cap	Cool to 4±2 C		7 days
Semivolatile Organic Compounds	1	500 mL amber glass bottle Teflon®-lined cap	Cool to 4±2 C	Extraction Analysis	7 days 40 days
Explosives	1	500 mL amber glass bottle Teflon®-lined cap	Cool to 4±2 C	Extraction Analysis	7 days 40 days
Pesticides/PCBs	1	500-mL amber glass bottle Teflon®-lined cap	Cool to 4±2 C	Extraction Analysis	7 days 40 days
Metals					
Metals	1[b]	500-mL amber glass bottle Teflon®-lined cap	Cool to 4±2 C	6 months	
Mercury				28 days	
Cyanide	1[b]	500-mL amber glass bottle Teflon®-lined cap	Cool to 4±2 C		14 days
TCL Dioxin/furans	1	500 mL amber glass bottle Teflon®-lined cap	Cool to 4±2 C	Extraction Analysis	7 days 40 days
Herbicides	1	500 mL amber glass bottle Teflon®-lined cap	Cool to 4±2 C	Extraction Analysis	7 days 40 days
Total Petroleum Hydrocarbons	1	500 mL amber glass bottle, Teflon®-lined cap	Cool to 4±2 C		28 days
Hyallela azteca	1	1 L polyethylene	Cool to 4±2 C	Not applicable	
Petroleum Fuels	1	Resealable container	Cool to 4±2 C	48 hours	

b SVOCs PAHs pesticides/PCBs herbicides and TPH sample fractions will be combined into one 500 mL bottle
Metal and cyanide sample fractions will be combined into one 500 mL bottle
Samples will be tested on site for Petroleum fuels using the Ensys PETRO SOIL SamplePro Rapid Detection Kit

Not applicable Samples will be analyzed for these parameters using the referenced USEPA method

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Table 50 3 C
Summary of Sample Containment and Sample Preservation for Solid IDW Samples

Parameter	Sample Container		Preservation Methods	Holding Times	
	Quantity	Type			
TCLP VOCs	1	500 mL wide mouth amber glass Teflon®-lined cap	Cool 4±2 C	Leaching Analysis	14 days 14 days
TCLP SVOCs	1	500 mL wide mouth amber glass Teflon® lined cap	Cool 4±2 C	Leaching Extraction Analysis	14 days 7 days 40 days
TCLP Pesticides	1	500 mL wide mouth amber glass Teflon® lined cap	Cool 4±2 C	Leaching Extraction Analysis	14 days 7 days 40 days
TCLP Herbicides	1	500 mL wide mouth amber glass Teflon® lined cap	Cool 4±2 C	Leaching Extraction Analysis	14 days 7 days 40 days
TCLP Metals	1	500 mL wide mouth amber glass, Teflon®-lined cap	Cool 4±2 C	Leaching Analysis Mercury analysis	14 days 6 months 28 days

SVOC Semivolatile Organic Compound
TCLP Toxicity Characteristic Leachate Procedure
VOC Volatile Organic Compound

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STANDARD OPERATING PROCEDURE 70 1
INVESTIGATION DERIVED WASTE

1 0 SCOPE AND APPLICATION

Management of investigation derived waste minimizes the potential for the spread of hazardous waste on site or off site through investigation activities The purpose of this standard operating procedure (SOP) is to provide instructions for the proper management of contaminated materials derived from the field investigations

2 0 INTRODUCTION

Materials that are known or suspected to be contaminated with hazardous substances through the a tions of sample collection or personnel and equipment decontamination are said to be investigation derived wastes These wastes include decontamination solutions, disposable equipment, drill cuttings and fluids, and groundwater monitoring well development and purge waters To the extent possible the site manager will attempt to minimize the generation of these wastes through careful design of decontamination schemes and groundwater sampling programs Testing conducted on soil and water investigation derived wastes will show if they are also hazardous wastes as defined by RCRA This will determine the proper handling and ultimate disposal requirements

The criteria for designating a substance as hazardous waste according to RCRA is provided in 40 CFR 261 3 If investigation derived wastes meet these criteria, RCRA requirements must be followed for packaging, labeling transporting storing and record keeping as described in 40 CFR 262 34 Those wastes judged to potentially meet the criteria for hazardous wastes will be stored in DOT approved 55 gallon steel drums

Investigation derived waste is assumed to be RCRA hazardous waste unless analytical evidence indicates otherwise Nonhazardous waste will be disposed of in accordance with installation approved procedures

3 0 INVESTIGATION DERIVED WASTE MANAGEMENT

Procedures that minimize potential for the spread of hazardous waste include minimizing the volume of waste generated waste segregation appropriate storage and disposal according to RCRA requirements

3 1 WASTE MINIMIZATION

In the development of the investigation work plan each aspe of the investigation is to be reviewed to identify areas wh r excess wast generation can be eliminated Gen ral proc dures that will eliminat wast in lud voldan e of unn ssary xposu o m t i s o hazardous wast an coordination of sampling schedules to avoid repetitious purging of wells and use of sampling equipment

3 2 WASTE SEGREGATION

Waste storage and handling procedures to be used depend upon the type of generated waste For this reason investigation derived hazardous wastes described below are segregated into separate 55 gallon storage drums Waste materials that are known to be free of hazardous waste contamination (such as broken sample bottles or equipment containers and wrappings) must be collected separately for disposal to municipal systems Large plastic garbage or lawn and leaf bags are useful for collecting this trash Even clean sample bottles or tyvek should be disposed with care Even though they are not legally a problem if they are discovered by the public they may cause tremendous panic Therefore items that are known to be free from contamination but are also known to represent hazardous or toxic waste to the public must not be disposed into any public dumpster such as found at your hotel or park. Items free from contamination may be freely transported in your vehicle until an appropriate disposal site is found

3 2 1 Decontamination Solutions

Solutions considered investigation derived wastes range from detergents, organic solvents and acids used to decontaminate small hand samplers to steam cleaning rinsate used to wash drill rigs and other large equipment. These solutions are to be stored in 55 gallon drums with bolt sealed lids

3 2 2 Soil Cuttings and Drilling Muds

Soil cuttings are solid to semisolid soils generated during trenching activities or drilling for the collection of subsurface soil samples or the installation of monitoring wells Depending on the type of drilling drilling fluids known as muds may be used to remove soil cuttings Drilling fluids flushed from the borehole must be directed into a settling section of a mud pit This allows reuse of the decanted fluids after removal of the settled sediments Drill cuttings whether generated with or without drilling fluids are to be removed with a flat bottomed shovel and stored in 55 gallon drums with bolt sealed lids

3 2 3 Well Development and Purge Waters

Well development and purge waters are groundwaters removed from monitoring wells to repair damage to he aquifer following well installation obtain characteristic aquifer groundwater samples or measure aquife hydraulic properties The volume of groundwate to be g nerated will determine the appropriate storage procedure Well purgin and well development will generate approximately two to t n well casing volumes of groundwater This volume car stored in allon drums Measurem nt o aquif prop ti through pump t sts can e nerate significantly gr ater

volumes of groundwate depending on the well yield and the duration of the test Use of the large volume portable tanks such as Baker Tanks should be considered for temporary storage pending results of groundwater analysis

3 2 4 Disposable Equipment

Disposable equipment includes used personal protective gear such as tyvek coveralls gloves booties and APR cartridges and some inexpensive sampling equipment such as trowels or disposable bailers This equipment is assumed to be contaminated if it is used at a hazardous waste site because it is impractical to submit these items for analysis These materials are to be stored on site in 55 gallon drums pending final disposal

3 3 WASTE STORAGE

The wastes that are accumulated through investigations must be stored on site prior to disposal An on site waste staging area should be designated to provide a secure and controlled storage for the drums Per RCRA requirements storage cannot exceed 90 days for materials presumed or shown to be RCRA-designated hazardous wastes waste which is known not to be RCRA-designated wastes should be promptly disposed to municipal waste systems

3.3 1 Storage Containers

Containers will be DOT approved (DOT 17H 18/16GA OH unlined) open head steel drums The lids should lift completely off the drum, and be secured by a bolt ring Order enough drums to store all anticipated purge water (at least five times the well casing volume) plus extra drums for solid waste and decontamination water Solid and liquid wastes are not to be mixed in the drums A typical decontamination line uses approximately 30 gallons of water

Pallets are often required to allow transport of filled drums to the staging area with a forklift. Normal pallets are 3 x 4 and will hold two to three 55 gallon drums depending on the filled weight. If pallets are required for drum transport or storage field personnel are responsible for ensuring that the empty drums are placed on pallets before they are filled and that the lids are sealed on with the bolt tighten ring after the drums are filled Because the weight of one drum can exceed 500 pounds under no circumstances should personnel attempt to move the drums by hand Removal of drums to the staging area is normally the responsibility of the client, unless other arrangements have been made

3 3 2 Drum Labeling

Each drum that is used will be assigned a unique number which will remain with that drum for the life of the drum This number will be written in permanent marker on the drum itself do not label drum lids Drum labels will contain the following information

- waste accumulation start date
- well number or boring number if applicable
- drum number
- contents matrix (soil water slurry etc)
- project name

4 0 WASTE DISPOSAL

Responsibility for the final disposal of investigation derived waste will be determined before field activities are begun and will be described in the investigation work plan Disposal or long term storage (over 90 days) of RCRA-designated hazardous wastes requires procedures which are beyond the scope of this SOP

5 0 PRECAUTIONS

- Only qualified personnel are authorized to handle equipment.
- Adhere to health and safety procedures.

6 0 REFERENCES

Safety Rules for Contractors and Subcontractors Alliant Techsystems Incorporated Radford Army Ammunition Plant, 1995

ORIGINAL
Red)

STANDARD OPERATING PROCEDURE 80 1
DECONTAMINATION

1 0 SCOPE AND APPLICATION

All personnel or equipment involved in intrusive sampling, or enter a hazardous waste site during intrusive sampling must be thoroughly decontaminated prior to leaving the site to minimize the spread of contamination and prevent adverse health effects Equipment must be decontaminated between sites to preclude cross-contamination. This standard operating procedure (SOP) describes the decontamination requirements for sampling equipment and site personnel.

2 0 MATERIALS

- Plastic sheeting buckets
- Installation-approved decontamination water source
- Deionized ultrafilter water (DIUF)
- Non phosphate laboratory detergent
- Aluminum foil or clean plastic sheeting
- Pressure sprayer rinse bottles brushes
- Plastic garbage bags

3 0 PROCEDURE

3 1 SAMPLE BOTTLES

At the completion of each sampling activity the exterior surfaces of the sample bottles must be decontaminated as follows

- Be sure that the bottle lids are on tight
- Wipe the outside of the bottle with a paper towel to remove gross contamination.

3 2 PERSONNEL DECONTAMINATION

Review the project Health and Safety Plan (HSP) for the appropriate decontamination procedures.

3 3 EQUIPMENT DECONTAMINATION

3 3 1 Water Samplers

3 3 1 1 Bailers

After each use Polytetrafluoroethelyne (PTFE) double check valve bailers used for groundwater sampling will be decontaminated as follows

1 Discard all lanyards in properly marked sealable container or as directed by the HSP Note no tubing is to be used in conjunction with a bailer in collecting samples

2 Scrub the bailer to remove gross (visible) contamination, using appropriate brush(es) approved water and non phosphate detergent

3 Rinse off detergent with approved water

4 Rinse bailer with approved decontamination water

5 Rinse bailer with 0 10N Nitric Acid solution

6 Rinse bailer with DIUF grade water

7 Rinse bailers used to collect organic samples with pesticide grade methanol

8 Wrap bailer in aluminum foil or clean plastic sheeting, or store in a clean, dedicated PVC or PTFE storage container

9 Dispose of used decontamination solutions with drummed purge water

3 3 1 2 Submersible Pumps

1 Scrub the exterior of the pump to remove gross (visible) contamination, using appropriate brushes approved water and non phosphate detergent (Steam cleaning may be substituted for detergent scrub)

2 Calculate the volume of pump plus any tubing which is not disposable and not dedicated to a single well Pump 10 gallons of non phosphate laboratory detergent solution to purge and clean the interior of the pump

3 Rinse by pumping no less than 10 gallons of approved water to rinse

4 Rinse pump exterior with approved decontamination water

5 Rinse pump exterior with DIUF water

6 Rinse pumps used to collect organic samples with pesticide grade methanol

7 Wrap pump in aluminum foil or clean plastic sheeting, or store in a clean, dedicated PVC or PTFE storage container

3 3 1 3 Dip samplers

All dip samplers whether bucket, long-handled, or short handled (see SOP 30 3 *Surface Water Sampling*) will be decontaminated in the same manner as bailers

3 3 1 4 Field glassware

Field glassware such as beakers used to hold samples for field measurements will be decontaminated according to the procedures listed for bailers

3 3 1 5 Water Level Indicators

Electric water level indicators weighted measuring tapes or piezometers used in the determination of water levels, well depths and/or non-aqueous phase liquid (NAPL) levels will be decontaminated in the same manner as bailers Clean labo-

ratory wipes may be substituted for brushes Tapes, probes and piezometers should be wiped dry with clean laboratory wipes and coiled on spools or clean plastic sheeting.

3 3 2 Solid materials samplers

Solid materials samplers include soil sampling probes augers trowels shovels, sludge samplers, and sediment samplers Equipment will be decontaminated as follows:

1 Scrub the sampler to remove gross(visible) contamination, using appropriate brush(es) approved water and non phosphate laboratory detergent.

2 Rinse off detergent with approved decontamination water

3 Rinse sampler with DIUF water

4 Rinse samplers used to collect organic samples with pesticide grade methanol.

5 Wrap sampler in aluminum foil, clean plastic sheeting, or store in a new zip-seal bag (size permitting) or clean, dedicated PVC or PTFE storage container

6 Dispose used decontamination solutions properly according to the site HSP

3 3 3 Other sampling and measurement probes

Temperature, pH, conductivity Redox, and dissolved oxygen probes will be decontaminated according to manufacturer's specifications. If no such specifications exist, remove gross contaminant and triple rinse probe with DIUF water Rinse probes used to collect organic samples with pesticide grade methanol.

3 3 4 Drilling Rigs and Excavators

Drilling rigs excavators and associated equipment such as augers, drill casing, rods, samplers, tools, recirculation tank, and water tank (inside and out) will be decontaminated prior to site entry after over-the-road mobilization and immediately upon departure from a site after drilling a hole Supplementary cleaning will be performed prior to site entry There is a likelihood that contamination has accumulated on tires and as spatter or dust enroute from one site to the next.

1 Place contaminated equipment in an enclosure designed to contain all decontamination residues (water sludge etc)

2 Steam clean equipment until all dirt, mud, grease asphaltic bituminous or other encrusting coating materials (with the exception of manufacturer-applied paint) have been removed.

3 Water used will be taken from an approved source

4 Containerize sample characterize and dispose of all decontamination residues properly

4 0 PRECAUTIONS

- Dispose of all wash water rinse water rinsates and other sampling wastes (tubing, plastic sheeting, etc) in properly marked, sealable containers or as directed by the HSP
- Do not eat, smoke or drink on site.

5 0 REFERENCES

Site-specific HSP

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STANDARD OPERATING PROCEDURE 90 1
PHOTOIONIZATION DETECTOR (HNu Model PI-101 and HW-101)

1 0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to delineate protocols for field operations with a photoionization detector (HNu Systems Model PI 101 or HW 101) The photoionization detector (PID) detects total ionizables hence it is used to monitor both organic and inorganic vapors and gases to determine relative concentrations of air contaminants This information is used to establish level of protection and other control measures such as action levels The PID cannot effectively detect compounds having ionization potentials above the photon energy level of the lamp used therefore methane which has an ionization potential of 12 98 eV is undetectable by PIDs whose lamps are capable of producing 9 5 10 2 or 11 7 eV

Use of brand names in this SOP is in not intended as an endorsement or mandate that a given brand be used Alternate equivalent brands of detectors, sensors, meters, etc are acceptable If alternate equipment is to be used, the contractor shall provide applicable and comparable SOPs for the maintenance and calibration of same

2 0 MATERIALS

HNu Systems Model PI 101 or HW 101 survey probe with 9 5 10 2 or 11 7 eV lamp

Lead acid gel cell battery

Calibration Gas (*e g* isobutylene 101 ppm) w/regulator

Tygon tubing

Tedlar bag (optional)

Instrument logbook

3 0 PROCEDURE

These procedures are to be followed when using the HNu in the field

3 1 START UP

1 Before attaching the probe check the function switch on the control panel to ensure that it is in the off position Attach the probe by plugging it into the interface on the top of the readout module

2 Turn the function switch to the battery check position The needle on the meter should read within or above the green battery arc on the scale If not, recharge the battery If the red indicator light comes on the battery needs recharging or service may be indicated

3 Turn the function switch to any range setting Listen for the hum of the fan motor Check the function by holding a solvent based marker pen near the sample intake If there is no needle deflection look briefly into the end of the probe (no more than one or two seconds) to see if the lamp is on If it is on it will give a purple glow Do not stare into the probe any longer than two seconds Long term exposure to UV light can damage the eyes (See also note 5 4)

4 To ZERO the instrument turn the function switch to the span position and rotate the zero adjustment until the meter reads zero A calibration gas is not needed since this is an electronic zero adjustment If the span adjustment setting is changed after the zero is set, the zero should be rechecked and adjusted, if necessary Allow the instrument to warm up for 3 5 minutes to ensure that the zero reading is stable If necessary readjust the zero

3 2 OPERATIONAL CHECK

Follow the start up procedure in section 3 1

With the instrument set on the 0-20 range hold a solvent based magic marker near the probe tip If the meter deflects upscale, the instrument is working

3.3 FIELD CALIBRATION PROCEDURE

1 Follow the start up procedures in section 3 1 and the operational check in section 3 2

2 Set the function switch to the range setting for the concentration of the calibration gas

3 Attach a regulator HNu P/N 101 351 or equivalent (flow = 200 to 300 ml/min) to a disposable cylinder of isobutylene (HNu 101 351 or equivalent) Connect the regulator to the probe of the HNu with a piece of clean Tygon tubing Turn on the valve of the regulator

4 After five seconds adjust the span dial until the meter reading equals the benzene concentration of the calibration gas used corrected to its equivalence which should be marked on the canister (Isobutylene ~0 7X benzene)

5 Record in the field log the instrument ID No serial number the initial and final span settings the date time location concentration and type of calibration gas used and the signature of the person who calibrated the instrument

6 If the HNu does not function check out or calibrate properly the project equipment manager is to be notified as soon as possible Under no circumstances is work requiring monitoring with a PI 101 or HW 101 to be done with a malfunctioning instrument

3 4 CALIBRATION TO A GAS OTHER THAN ISOBUTYLENE

The HNu may be calibrated to any certified calibration gas However after calibration all subsequent instrument readings will be relative to the calibration gas used General procedures include

1 Calibrate according to procedure 3 3

2 Partially fill and flush to two times a gas bag (Tedlar recommended) with the certified National Institute of Standards and Technology (NIST) (formerly NBS) traceable calibration gas Then fill the bag with one to three liters of the calibration gas If the gas is toxi this must be done in a fume hood

3 Feed the calibration gas into the probe with the range set for the value of the gas After five seconds adjust the span control until the meter reads the value of the calibration gas

4 Record the results of the calibration on the calibration/maintenance log and attach a new calibration sticker (if available) or correct the existing sticker to reflect the new calibration data. All subsequent readings will be relative to the new calibration gas

3 5 OPERATION

1 Follow the start up procedure operational check, and calibration check (refer to 3 1).

2 Set the function switch to the appropriate range If the concentration of gases of vapors is unknown set the function switch to 0-20 ppm range Adjust if necessary

3 While taking care not to permit the HNu to be exposed to excessive moisture dirt, or contaminants monitor the work activity as specified in the Site Health and Safety Plan

4 When the activity is completed or at the end of the day carefully clean the outside of the HNu with a damp disposable towel to remove all visible dirt R turn the HNu to a secure area and place on charge Place the instrument on charge after each use the lead acid batteries cannot be ruined by over charging

5 With the exception of the probe s inlet and exhaust the HNu can be wrapped in clear plastic to prevent it from becoming contaminated and to prevent water from getting inside in the event of precipitation If the instrument becomes contaminated make sure to take necessary steps to decontaminate it Call the Equipment Administrator if necessary under no circumstances should an instrument be returned from the field in a contaminated condition

4 0 MAINTENANCE

Calibration/maintenance logs are to be filled in completely whenever a PI 101 or HW 101 receives servicing This is true of both contractor-owned and rental instruments

The equipment manager should be called to arrange for a fresh instrument when necessary The contractor's equipment facility is responsible for arranging all repairs which cannot be performed by the project equipment manager

4 1 ROUTINE SERVICE

The PID s performance is affected by a number of factors These include but are not limited to the decay of the UV lamp output over time and the accumulation of dust and other particulate material and contaminates on the lamp and in the ion chamber Because of these factors, the PID should not be left in the field for a period of more than two weeks before being replaced with a fresh instrument. If a site is going to be inactive for a period of more than a week, all monitoring instruments are to be returned to the project equipment manager or his trained designee for servicing and/or reassignment. The following procedures are to be performed at the designated intervals for routine service

Procedure	Frequency
Operational Check	Prior to use and at instrument return
Field Calibration	Prior to use and at instrument return
Full Calibration	Bi weekly (return instrument to equipment manager for replacement with a fresh unit)
Clean UV Lamp and Ion Chamber	Bi weekly or as needed
Replace UV Lamp	As needed

4 1 1 UV Lamp and Ion Chamber Cleaning

During periods of analyzer operation, dust and other foreign materials are drawn into the probe forming deposits on the surface of the UV lamp and in the ion chamber This condition is indicated by meter readings that are low erratic unstable non repeatable drifting and which show apparent moisture sensitivity These deposits interfere with the ionization process and cause erroneous readings Check for this condition regularly to insure that the HNu is functioning properly If the instrument is malfunctioning call your respective equipment manager to arrange to have a fresh replacement

4 1 2 Lamp eV Change

If different applications for the analyzer would require different eV lamps separate probes each with its own eV lamp must be used A single readout assembly will serve for any of the probes (9 10 2 and 11 7 eV) A change in probe will require resetting of the zero control and recalibrating the

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instrument. The 11 7 eV lamp will detect more compounds than either of the two lower eV lamps However the 11 7 eV probe needs more frequent calibration it burns out much faster than the lower eV lamps

5 0 PRECAUTIONS

- The HNu PI 101 and HW 101 are designed to sample air or vapors only DO NOT allow any liquids or low boiling vapors to get into the probe or meter assem bly

  High concentrations of any gas can cause erroneous readings High humidity can also cause the instru ment readings to vary significantly from the actual concentration of gases or vapors present This is true even through the HNu cannot react to water vapor

- High humidity dust, and exposure to concentrations of low boiling vapors will contaminate the ion cham ber causing a steady decrease in sensitivity

- Continued exposure to ultraviolet light generated by the light source can be harmful to eyesight. If a visual check of the UV lamp is performed Do not look at the light source from a distance closer than 6 inches with unprotected eyes Use eye protection (UV blocking sunglasses or safety glasses) Only look briefly never more than about 2 seconds

  Place the instrument on charge after each use the lead batteries cannot be ruined by over charging

  If at any time the instrument does not check out or calibrate properly in the field the equipment manager is to be notified immediately and a replacement pro vided for the malfunctioning instrument Under no circumstances should field work requiring continuous air monitoring for organic vapors and/or gases be done with a malfunctioning HNu without a HNu or an approved comparable instrument.

6 0 REFERENCES

Manufacturer's Equipment Manual

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STANDARD OPERATING PROCEDURE 90 2
PHOTOIONIZATION DETECTOR (MICROTIP HL-200)

1 0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to delineate protocols for field operations with the photoioniza tion detector (Microtip HL 200) The photoionization detec tor (PID) uses an ultraviolet emitting lamp designed to detect measure and display the total concentration of airborne ionizable gases and vapors This information is used to de termine control measures such as protection and a tion lev els

Use of brand names in this SOP is in no way intended as endorsement or mandate that a given brand be used Al nate equivalent brands of detectors sensors meters, etc are acceptable If alternate equipment is to be used, the contrac tor shall provide applicable and comparable SOPs for the maintenance and calibration of same

2 0 MATERIALS

- Microtip
- Battery Pack

  Calibration Gas (100ppm Isobutylene)

  Tedlar Bag

  Tygon Tubing

  Regulator

3 0 PROCEDURE

3 1 GENERAL

1 Turn the instrument on by pressing the back of the power switch located on the handle of the Microtip

2 The message Warming up now please wait will be displayed for up to three minutes After normal dis play appears the Microtip is ready for calibration

3 Fill a tedlar bag with the desired calibration gas (usually 100ppm Isobutylene)

4 Press SETUP button and select the desired Cal Mem ory using the arrow keys (normally set to 200ppm) Press EXIT button to leave setup function

5 Press CAL button and expose Microtip to Zero Gas (Usually clean outdoor air will be suitable If any doubt exists as to the cleanliness of th background air a comm rcial sourc of zero gas should be used)

6 The Microtip then asks for the Span Gas concentra tion Enter the known span gas concentration and then connect the tedlar bag containing the Span Gas

7 Press enter and the Microtip sets its sensitivity Once the display reverts to normal the Microtip is calibrated and ready for use Remove the Span Gas from the in let probe The instrument should be calibrated at least once a day

3 2 BATTERY CHARGING

1 Ensure Microtip is off

2 Set the voltage selector switch on the bottom of the battery charger to the appropriate AC line voltage

3 Press the release button on the bottom of the Microtip and remove the battery pack by sliding it backwards

4 Plug charger into the battery pack and then into an AC outlet and allow the battery to charge for at least 8 hours

5 After charging, remove the charger first from the outlet then from the battery pack, and slide the battery pack back onto the Microtip

4 0 PRECAUTIONS

- Microtip does not carry an Intrinsic Safety Rating and must not be used in a hazardous location where flam mable concentrations of gases or vapors are constantly present.

  All calibration maintenance and servicing of this device including battery charging must be performed in a safe area away from hazardous locations

  Do not open or mutilate battery cells

  Do not defeat proper polarity orientation between the battery pack and battery charger

- Substitution of components may affect safety rating

NOTE The span gas concentration is dependent upon both the concentration of the span gas used and the rating of the UV lamp in the microtip at time of calibration If using 100 ppm isobutylene and the standard 10 6 eV lamp the span gas concentration will be 56 ppm

5 0 REFERENCE

Microtip HL 200 User's Manual February 1990

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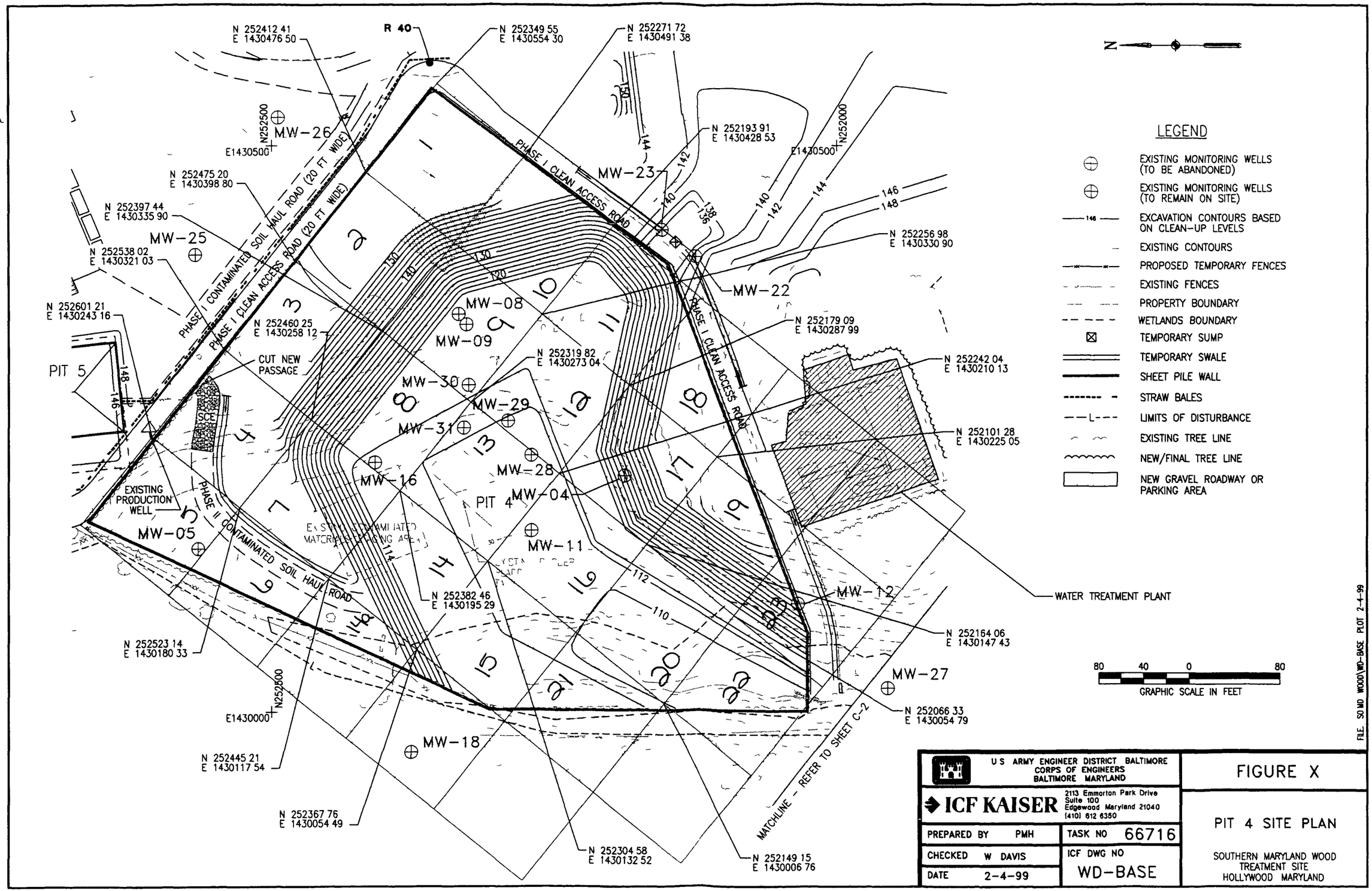

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CHECKED	W DAVIS	ICF DWG NO	WD-BASE
DATE	2-4-99		

FIGURE X

PIT 4 SITE PLAN

SOUTHERN MARYLAND WOOD TREATMENT SITE
HOLLYWOOD MARYLAND

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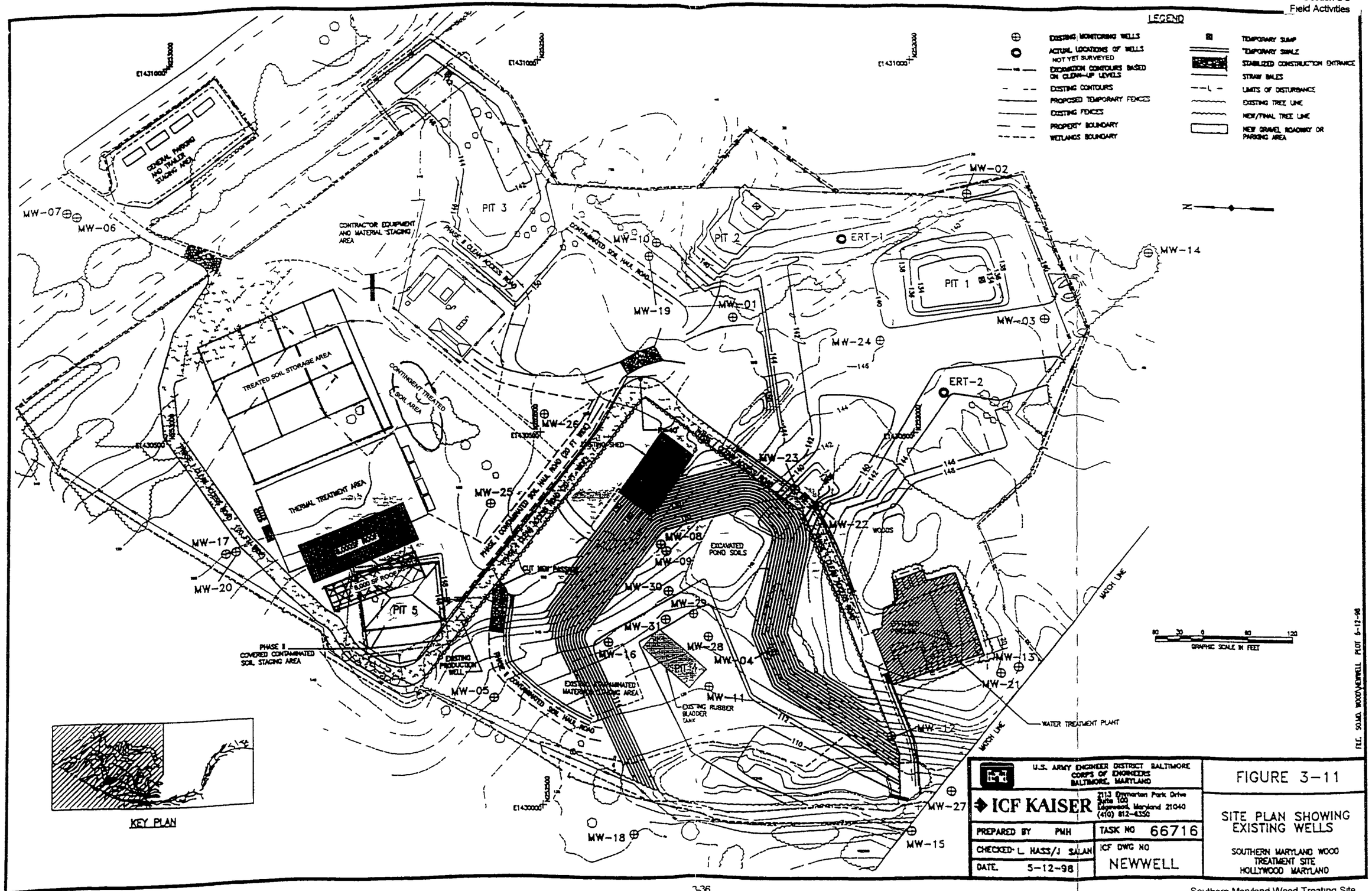
LEGEND
EXISTING MONITORING WELLS
ACTUAL LOCATIONS OF WELLS NOT YET SURVEYED
EXCAVATION CONTOURS BASED ON CLEAN-UP LEVELS
EXISTING CONTOURS
PROPOSED TEMPORARY FENCES
EXISTING FENCES
PROPERTY BOUNDARY
WETLANDS BOUNDARY
TEMPORARY SUMP
TEMPORARY SWALE
STABILIZED CONSTRUCTION ENTRANCE
STRAW BALES
LIMITS OF DISTURBANCE
EXISTING TREE LINE
NEW/FINAL TREE LINE
NEW GRAVEL ROADWAY OR PARKING AREA
GENERAL PARKING AND TRAILER STAGING AREA
CONTRACTOR EQUIPMENT AND MATERIAL STAGING AREA
PHASE II CLEAN ACCESS ROAD
CONTAMINATED SOIL HAUL ROAD
TREATED SOIL STORAGE AREA
CONTINGENT TREATED SOIL AREA
THERMAL TREATMENT AREA
PHASE I CLEAN ACCESS ROAD
PHASE I CONTAMINATED SOIL HAUL ROAD
CUT WAY ACCESS
PHASE II COVERED CONTAMINATED SOIL STAGING AREA
EXISTING PRODUCTION WELL
EXISTING CONTAMINATED MATERIAL STAGING AREA
EXISTING RUBBER BLADDER TANK
EXCAVATED POND SOILS
WOODS
WATER TREATMENT PLANT
MATCH LINE
PIT 1
PIT 2
PIT 3
PIT 4
PIT 5
ERT-1
ERT-2
MW-01
MW-02
MW-03
MW-04
MW-05
MW-06
MW-07
MW-08
MW-09
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MW-28
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MW-30
MW-31
GRAPHIC SCALE IN FEET
KEY PLAN
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PREPARED BY PMH
CHECKED L. HASS/J. SALAN
DATE 5-12-98
TASK NO 66716
ICF DWG NO
NEWWELL
FIGURE 3-11
SITE PLAN SHOWING EXISTING WELLS
SOUTHERN MARYLAND WOOD TREATMENT SITE
HOLLYWOOD MARYLAND
FILE: SOLID WOOD/NEWWELL PLOT 5-12-98