RFP-1125.02 (REV. 2/98)
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ROCKY FLATS FIELD OFFICE
P.O. BOX 928
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MAR 4 1998

98-DOE-03657

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RFETS-CC

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BORMOLINI, A.M.		
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NORTH, K.		
PARKER, A.		
PHILLIPS, F.J.	X	X
RHOADES, D.W.		
RODGERS, A.D.		
RUSCITTO, D.G.		
SANDLIN, N.B.		
SPEARS, M.S.		
TILLER, R.E.		
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VOORHEIS, G.M.		
Shelton, D	X	X
Don, K	X	
COR. CONTROL	X	X
ADMIN RECORD	X	X
PATS/T130G		

Reviewed for Addressee
Corres. Control RFP
3/4/98
Date By

Ref Ltr. #

DOE ORDER # 5400.1

Mr. Steve Gunderson
RFCA Coordinator
Colorado Department of Public Health and Environment
4300 Cherry Creek Drive South
Denver, CO 80222-1530

Dear Mr. Gunderson:

Enclosed is the Sampling and Analysis Plan for soils associated with Individual Hazard Substance Sites (IHSS) 121 and 148 at Building 123. In the Colorado Department of Public Health and Environment approval letter to William Fitch dated August 25, 1997, it was requested that the subject plan be submitted prior to initiating the IHSS characterization.

If you have any questions, please call William Fitch at 966-4013.

Sincerely,

Steven W. Slaten
RFCA Project Coordinator

Enclosure

cc w/Enc:
T. Rehder, EPA
T. Howell, OCC, RFFO
J. Rampe, PLD, RFFO
D.Shelton, K-H
Administrative Record

MAR 1998
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ADMIN RECORD
B123-A-00047

cc w/o Enc:
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Rocky Mountain
Remediation Services, L.L.C.
. . . protecting the environment

RF/RMRS-97-023

Soil Sampling and Analysis Plan to Characterize Individual Hazardous Substance Sites (IHSSs) 121 and 148 at Building 123

Rocky Mountain Remediation Services, L. L. C.

REVISION 0

FEBRUARY 1998

K.A. 2/17/98

SOIL SAMPLING AND ANALYSIS PLAN TO CHARACTERIZE INDIVIDUAL HAZARDOUS SUBSTANCE SITES (IHSSs) 121 AND 148 AT BUILDING 123

REVISION 0

FEBRUARY 1998

This Sampling and Analysis Plan has been reviewed and approved by:

C.L. Guthrie, RMRS Project Manager	2/16/98 Date
Mark Brooks, RMRS Quality Assurance	2-16-98 Date
John Miller, Radiological Engineering	2-17-98 Date

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ACRONYMS

ALARA	As Low As Reasonably Achievable
Am	Americium
APO	Analytical Project Office
Be	Beryllium
BRCS	Building Radiation Cleanup Standard
BTEX	benzene, toluene, ethylbenzene, and xylenes
$C_2H_4O_2$	acetic acid
CDPHE	Colorado Department of Public Health and the Environment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
Cm	curium
DQO	Data Quality Objective
DOE	U.S. Department of Energy
EMD	Environmental Management Department
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
FID	Flame Ionization Detector
FIDLER	Field Instrument for the Detection of Low Energy Radiation
FO	Field Operations
GC/MS	Gas Chromalography/Mass Spectometry
GIS	Geographical Information System
GPS	Global Positioning System
HNO_3	nitric acid
HCl	hydrochloric acid
$HClO_4$	perchloric acid
HF	hydrofluoric acid
HPGe	high-purity germanium
H_2SO_4	sulfuric acid
IHSS	Individual Hazardous Substance Site
NaOH	sodium hydroxide
NH_4OH	ammonium hydroxide
OPWL	Original Process Waste Line
OU	Operable Unit
PAC	Potential Area of Contamination
PAM	Proposed Action Memorandum
PARCC	precision, accuracy, representativeness, completeness, and comparability
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PID	Photo Ionization Detector
Pu	plutonium
QA/QC	Quality Assurance/Quality Control
QAPD	Quality Assurance Program Description
RCRA	Resource Conservation and Recovery Act
RCT	Radiological Control Technician
RFCA	Rocky Flats Cleanup Agreement
RFETS	Rocky Flats Environmental Technology Site
RFI/RI	RCRA Facility Investigation/Remedial Investigation
RMRS	Rocky Mountain Remediation Services
RPD	Relative Percent Difference
SOPs	Standard Operating Procedures
SAP	Sampling and Analysis Plan
TAL	Target Analyte List
TCFM	trichlorofluoromethane

ACRONYMS (cont'd)

TCL	Target Compound List
TOC	total organic carbon
U	uranium
UBC	under building contamination
VOC	volatile organic compound

LIST OF APPLICABLE STANDARD OPERATING PROCEDURES (SOPs)

Identification Number	Procedure Title
2-G32-ER-ADM-08.02	*Evaluation of ERM Data for Usability in Final Reports*
2-S47-ER-ADM-05.15	*Use of Field Logbooks and Forms*
5-21000-OPS-FO.03	*General Equipment Decontamination, Section 5.3.1, Cleaning Steel or Metal Sampling Equipment Without Steam in the Field*
5-21000-OPS-FO.06	*Handling of Personal Protective Equipment*
5-21000-OPS-FO.10	*Receiving, Labeling, and Handling Environmental Containers*
5-21000-OPS-FO.13	*Containerization, Preserving, Handling and Shipping of Soil and Water Samples*
5-21000-OPS-FO.15	*Photoionization Detectors and Flame Ionization Detectors*
5-21000-ER-OPS-GT.01	*Logging Alluvial and Bedrock Material*
5-21000-ER-OPS-GT.39	*Push Subsurface Soil Sampling*
4-U50-REP-1006	*Radiological Characterization of Bulk or Volume Materials*
RM 06.02	*Records Identification, Generation and Transmittal*
RM 06.04	*Administrative Record Document Identification and Transmittal*

SOIL SAMPLING AND ANALYSIS PLAN TO CHARACTERIZE INDIVIDUAL HAZARDOUS SUBSTANCE SITES (IHSSs) 121 AND 148 AT BUILDING 123

1.0 INTRODUCTION

1.1 PURPOSE

The purpose of this document is to provide a Sampling and Analysis Plan (SAP) to determine the presence or absence of hazardous and/or radioactive contamination in the soil beneath the Building 123 concrete slab, leaks adjacent to selected sumps, process waste lines, and pits, localized spills and the general condition of the surrounding grounds. The goal of the field investigation is to determine the presence of contamination in the soil to support the decontamination and demolition of Building 123 and fulfill criteria defined by the *Proposed Action Memorandum (PAM) for the Decommissioning of Building 123* (RMRS 1997a).

The objective of the SAP is to define specific data needs, sampling and analysis requirements, data handling procedures, and associated Quality Assurance/Quality Control (QA/QC) requirements for this project. All work will be performed in accordance with the RMRS Quality Assurance Program Description (QAPD) (RMRS 1997b).

1.2 BACKGROUND

Building 123 is located on Central Avenue between Third and Fourth Streets at the Rocky Flats Environmental Technology Site (RFETS, Figure 1-1). The Building 123 Area encompasses overlapping Individual Hazardous Substance Sites (IHSSs) 121 and 148 and a portion of RCRA Unit 40 (Figure 1-2).

Four (4) associated Potential Areas of Contamination (PACs), 100-601, 100-602, 100-603, and 100-611 have been identified in the RFETS *Historical Release Report* (HRR, DOE 1992c). The PACs were established as the result of documented spill incidents.

Unconfirmed reports of contaminant spills have been indicated in interviews with building employees. In the late 1960's or early 1970's a cesium-contaminated liquid was spilled on the concrete floor in Room 109C (Figure 1-2). The floor was immediately sealed to immobilize the contamination. No further action was initiated to address consequences of the spill.

1.2.1 Individual Hazardous Substance Site (IHSS) 121

IHSS 121 consists of RCRA Unit 40 underground Original Process Waste Lines (OPWLs) P-1, P-2, and P-3, which were designated in the *Final Phase I RCRA Facility Investigation/Remedial Investigation (RFI/RI) Work Plan For Operable Unit 9* (DOE 1992a). The area has also been identified as PAC 000-121 in the HRR. The OPWL system constitutes former Operable Unit No. 9 (OU 9) and RCRA Unit 40, the plant-wide process waste system comprised of tank and underground pipelines constructed to transport and temporarily store process wastes from point of origin to on-site treatment and discharge points.

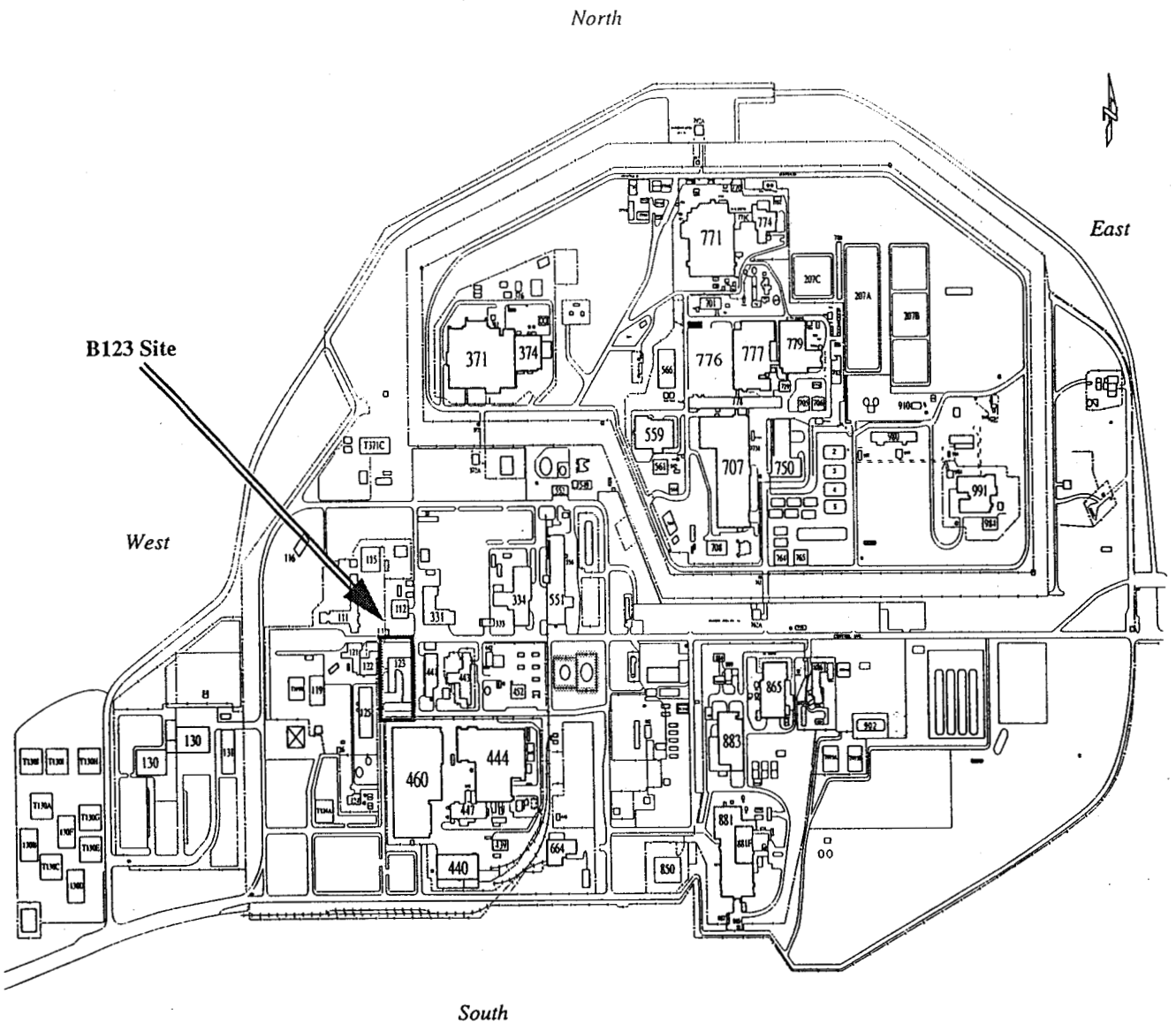

Figure 1-1 Building 123 Site Location

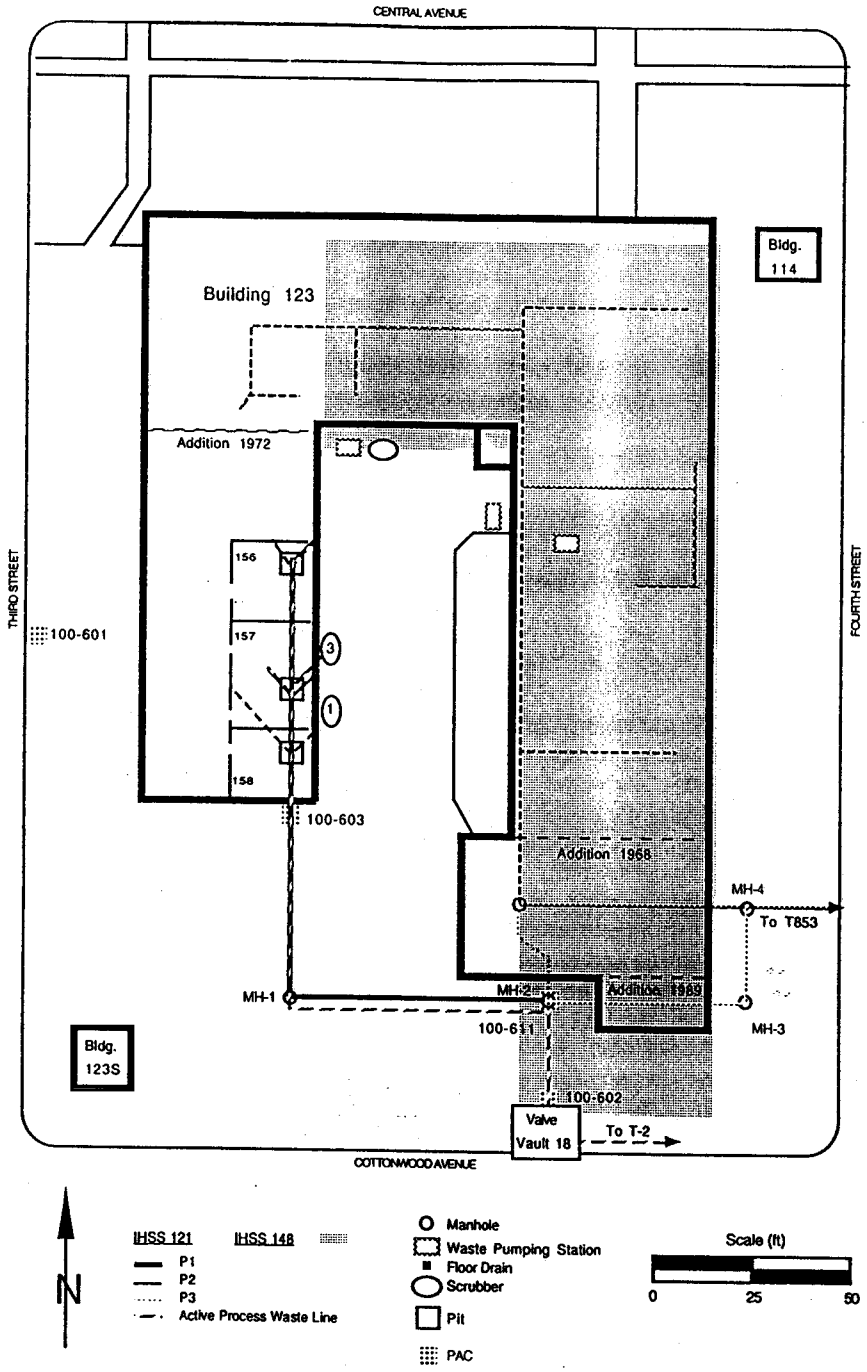

Figure 1-2 Location of Building 123 and Associated IHSSs 121 and 148

All process waste generated from 1952 to 1968 was transferred from Building 123 to Building 441 through line P-2, which ran below the west side of the east wing before exiting at the southeast corner of the building. In 1968 the east wing was extended about fifty (50) feet to the south. Prior to the building addition, two manholes (MH-2 and MH-3, Figure 1-2) were constructed and the line was extended south to MH-2, then east to MH-3, and north to MH-4, before assuming the original path at P-2. The extension was designated as P-3. One manhole was abandoned and covered by the building addition. In 1972, a west wing was constructed, extending south from the northwest corner of the original building. Prior to construction of the wing, line P-1 was installed to transfer waste to manhole MH-1, then east to a junction with P-3 at MH-2 (Figure 1-2). The lines transferred the following process waste from Building 123:

- Acids: nitric acid (HNO_3), hydrofluoric acid (HF), sulfuric acid (H_2SO_4), hydrochloric acid (HCl), acetic acid ($C_2H_4O_2$), and perchloric acid ($HClO_4$);
- Bases: ammonium hydroxide (NH_4OH) and sodium hydroxide (NaOH);
- Solvents: acetone, alcohols, cyclohexane, toluene, xylenes, triisooctomine, and ether;
- Radionuclides: various isotopes of plutonium (Pu), americium (Am), uranium (U), and curium (Cm);
- Metals: beryllium (Be) (trace amounts); and
- Others: ammonium thiocyanate, ethylene glycol, and possible trace amounts of polychlorinated biphenyls (PCBs) (DOE 1992a).

In 1982, P-2 and P-3 were abandoned and plugged with cement. In 1989 the process waste transfer system was upgraded, including removal of the east-west section of P-1 between MH-2 and MH-3. The north-south section of P-1 between Building 123 and MH-1 was converted to the new process system. Three large, interconnected concrete sump pit areas were installed in Rooms 156, 157, and 158 to accommodate process waste system backup. Pipe was installed connecting MH-1 to Valve Vault 18. A second building addition was also made to the south end of the east wing, partially overlying line P-3 (Figure 1-2).

Currently, all process waste throughout Building 123 is collected in floor sumps. Each sump collects and temporarily stores liquid waste which is then pumped through overhead lines into a main floor sump in Room 158. The waste is then gravity-fed through P-1 to Valve Vault 18, then to underground Tank T-2 (Tank 428) at Building 441, and finally to Building 374 for treatment (Figure 1-2).

1.2.2 Individual Hazardous Substance Site (IHSS) 148

A detailed characterization of former Operable Unit No. 13 (OU 13) was conducted from September 1993 to February 1995 as part of a Phase I RCRA RFI/RI. The characterization included high-purity germanium (HPGe) surveys, vertical soil profiles, surface soil sampling and soil gas surveys. The investigation identified an area of reported small spills of nitrate-bearing wastes along the east side of Building 123 and a potential for soil contamination beneath the building due to possible leaks in OPWL P-2. The area was established as IHSS 148 and detailed in the *Final Phase I RFI/RI Work Plan for Operable Unit 13* (DOE 1992b). The area has also been identified as Under Building Contamination (UBC) 123 and PAC 100-148 in the HRR.

Thirty-four (34) analytes were detected in the surface soil survey, including twenty-six (26) inorganic compounds and eight (8) radionuclides. Eleven (11) analytes exceeded background limits at a minimum of one sample location throughout IHSS 148. Constituents that exceeded minimum detection levels or activities are indicated in Table 1-2.

Table 1-2 Constituents Detected above Minimum Detection Levels or Activities in Soil Samples Collected during Surface Soil Survey at IHSS 148

Constituents Detected Above Minimum Detection Levels or Activities	Maximum Concentration	Background Limits[a]	Tier II Soil Action Levels[b]
Chromium	95.6 mg/kg [c]	24.9 mg/kg [c]	4860 mg/kg [d]
Cobalt	28.7 mg/kg	24.8 mg/kg	123,000 mg/kg
Copper	43.4 mg/kg	27.3 mg/kg	81,800 mg/kg
Lead	165 mg kg	61.4 mg/kg	1000 mg/kg
Nickel	52.4 mg/kg	26.8 mg/kg	40,900 mg/kg
Strontium	94.7 mg/kg	90.1 mg/kg	>1,000,000 mg/kg
Zinc	1,220 mg/kg	86.6 mg/kg	>1,000,000 mg/kg
Americium-241	0.197 ± 0.032 pCi/g	0.0227 pCi/g	38 pCi/g
Plutonium-239/-240	0.169 ± 0.04 pCi/g	0.066 pCi/g	252 pCi/g
Uranium-233/-234	2.04 ± 0.396 pCi/g	2.253 pCi/g	307 pCi/g
Uranium-238	2.14 ± 0.309 pCi/g	2.00 pCi/g	103 pCi/g

[a] Source: DOE 1995, *Geochemical Characterization of Background Surface Soils: Background Soils Characterization Program*, May.
[b] Source: DOE 1996, *Final Rocky Flats Cleanup Agreement*, July. Metal analyte action levels are based on office worker exposure to soil; radionuclide action levels are based on annual dose limits.
[c] Result indicates total chromium (chromium III + chromium VI).
[d] Result indicates chromium VI only. Action level for chromium III is <1,000,000 mg/kg.

The soil-gas survey was conducted on a 25-foot grid in accordance with the 0413 RFI/RF (DOE 1992b) work plan. Samples were analyzed in the field using Gas Chromatography Mass Spectrometry (GC/MS). Sixty-four (64) soil-gas locations were sampled during the survey. Thirteen (13) samples contained volatile organic compound (VOC) levels in excess of the 1 µg/ L method detection limit. Benzene, toluene, ethylbenzene, and xylene (BTEX) fuel constituents were detected in samples collected from the perimeter of Building 123 and within the west and east wings of the building. Trichlorofluoromethane (TCFM) was detected in nine samples distributed throughout the IHSS 148 area at levels up to 2.6 µg/ L. Tetrachloroethene (PCE) was detected at 1.5 µg/ L in a sample collected to the east of Building 123. The presence of organic extraction constituents is consistent with unconfirmed reports that such liquids used in radionuclide analyses were occasionally disposed onto the soil surface outside of Building 123 and allowed to evaporate. Analyses results indicate that subsurface infiltration precluded full evaporation.

1.2.3 Resource Conservation and Recovery Act (RCRA) Unit 40

The Building 123 area encompasses a portion of RCRA Unit 40, which includes all active overhead and underground and process waste lines in and around Building 123. No other RCRA unit exists within the Building 123 area. A plan for partial closure of RCRA Unit 40 will be written to characterize and manage all active OPWLs associated with Building 123, as all abandoned lines were properly decommissioned prior to implementation of RCRA regulations.

1.2.4 Potential Areas of Contamination (PACs)

Potential Areas of Contamination (PACs)100-601, 100-602, 100-603, and 100-611 were identified in the HRR, and involve potential impact to the soils surrounding Building 123. All of the four (4) PACs are located in Figure 1.2. The following outlines the nature of each PAC by describing the occurrence, constituents released, and response to the occurrence.

PAC 100-601, Phosphoric Acid Spill

On April 13, 1989, two five-gallon plastic containers of phosphoric acid, which were among other containers of waste chemicals awaiting disposal in a storage cabinet outside of Building 123, deteriorated and leaked a portion of the contents onto the paved ground surface. Approximately one gallon of 1,2 ethylhexyl phosphoric acid leaked from the containers. At the time the release was detected, approximately eight ounces of the liquid were present on the ground within the vicinity of the cabinet. The spill was contained and the remaining liquid was properly disposed. No further action was required to address consequences of the spill.

PAC 100-602, Process Waste Line Break

On April 13, 1989, Valve Vault 17, located on Cottonwood Avenue between Building 443 and 444, was found to be flooded with approximately 1,200 gallons of aqueous waste. Subsequent investigation indicated that the source of the waste was a break in the active portion of P-1 in manhole MH-1 (Figure 1-2). Leakage from the break had migrated into bedding material surrounding the pipe and ultimately reached Valve Vault 17 through either pipe bedding materials (i.e. soils) or a PVC electrical conduit. The release also migrated into a section of the OPWL network. Discharge of Building 123 process waste into the broken line was discontinued on April 18, 1989, five days after the initial detection of release at Valve Vault 17. The potentially affected area includes the active process waste line between MH-2 and Valve Vault 18; the process waste line between Valve Vault 18 and Valve Vault 17, soils surrounding Valve Vault 18 and Valve Vault 17, and OPWL P-3 between MH-2 and MH-3. In July 1989, groundwater containing blue dye used several months earlier to trace the release was observed seeping into excavations around Valve Vault 18.

The release consisted of Building 123 process waste. An estimate was made of types and quantities of materials released to the environment during the five-day period between detection of the release and diversion of Building 123 wastes from the broken line. The estimate was based on typical daily quantities of wastes discharged from Building 123.

- 25 gallons urine;
- 12.5 gallons nitric acid (concentration unknown);
- 20 gallons hydrochloric acid (concentration unknown);
- 1.5 lbs ammonium thiocyanate;
- 1.0 lbs ammonium iodide; and
- 2.5 lbs ammonium hydroxide (concentration unknown).

The above wastes would have been diluted in approximately 2,000 gallons of tap water.

Minor amounts of naturally-occurring uranium were detected in soil and water samples collected after the release. Alpha activity up to 140 pCi/L was recorded in samples of the waste from Valve Vault 17. One water sample from MH-2 also contained eight percent ethylene glycol. Soil sampling was conducted to determine the source and extent of the release (See Section 1.2.2). A temporary surface line was installed, and a replacement underground line was installed in 1989 as part of the process line upgrades. Since the affected areas were located near existing IHSSs scheduled for investigation and remediation activities, no cleanup was initiated. Water and soil samples collected for several weeks after the release indicated that contamination levels (nitrates, chlorides and pH) decreased steadily after the broken line was bypassed.

PAC 100-603, Bioassay Waste Spill

On June 9, 1989, OPWL P-1 was under excavation and replacement due to a break in the line (PAC 100-602). The excavated end of the broken line as temporarily capped with a plastic bag, and Building 123 process waste was rerouted to bypass the broken line. A pump used to reroute the waste failed and allowed the waste to overflow into the broken line. A portion of the waste leaked around the plastic bag and into the excavation. The release was confined to the excavation.

The release consisted of bioassay waste containing hydrochloric acid and nitric acid. The waste exhibited a pH of approximately 1. The waste may also have contained urine, and up to a combined total of 1.5 gallons of ammonium thiocyanate, ammonium iodide and ammonium hydroxide. The estimated maximum volume of the spill was 30 gallons. The released material commingled with rainwater in the excavation.

Potential flow from the excavation was contained with earthen berms. Approximately 100 gallons of rainwater contaminated by the spill were neutralized, pumped from the excavation, and transferred to the process system for treatment in Building 374. Samples were collected to evaluate the spread of contamination. Results indicated that contamination was restricted to the excavation within eight feet of Building 123. No further action has been initiated.

PAC 100-611, Building 123 Scrubber Solution Spill

On November 7, 1989, an inoperative pump in the Building 123 process waste transfer system caused the Building 123 Scrubbers 1 and 3 to overflow, spill scrubbing solution into a bermed area outside of the building and into three sump pits in Rooms 156, 157, and 158 (Figure 1-2). All of the spilled solution was contained within secondary containment structures, and none of the solution was believed to have impacted the environment. The pits were pumped out and the concrete liners properly sealed. The transfer pump failure was determined to be the result of blockage caused by glass filtering wool.

The scrubbing solution consisted primarily of water and was used to scrub acids and salts used in Building 123. Approximately 50 gallons were released to the bermed area, and several hundred gallons were contained in the three sump pits. Analysis indicated that the solution contained in the bermed area exhibited a pH of 1.6; the solution in the three pits indicated a pH of 6.0. All spilled materials were contained and transferred into the Building 123 process waste transfer for eventual treatment at Building 374.

1.3 GEOLOGY

The local geologic setting includes an industrial area that has been gradually developed. The natural soils have been disturbed and replaced by fill during installation of the OPWLs and covered by pavement and structures including Building 123. The soils, fill, pavement, and structures are underlain by Rocky Flats Alluvium which averages about 38 feet in thickness and is composed of poorly- to moderately-sorted clay, silt, sand, and gravel. The Cretaceous Arapahoe Formation underlies the superficial material and is mainly claystone and silty claystone with sandstone bodies present. Groundwater exists below the site at a depth of approximately 12-17 feet and flows in a generally eastward direction.

2.0 SAMPLING RATIONALE

Historical information detailed in Section 1.2 provides general indications of the types of compounds anticipated at each IHSS, and was used to develop a systematic sampling strategy for this investigation. The sampling rationale is based on historical data. Sample points were selected at biased locations and randomly at other areas. Preliminary sampling will be restricted to soils underlying and surrounding Building 123.

The following conditions were considered in the development of the sampling strategy:

- The operating history of Building 123 suggests that contaminants may have been released into the environment;
- The physical and chemical properties of the contaminants suggest a chronic presence if released into the environment; and
- Historical data indicate the presence of contaminants in quantities above the maximum background concentrations defined by Site Procedure 4-U50-REP-1006, *Radiological Characterization of Bulk or Volume Materials* and the *Background Geochemical Characterization Report* (DOE 1993).

The conceptual models of contaminant migration involve percolation downward through the vadose zone (generally less than 10 feet thick) to the water table and then in the direction of groundwater flow. Contaminants may volatilize or biodegrade before reaching the shallowest groundwater zone. Contaminant concentrations are also reduced by dispersion during migration through the porous Rocky Flats Alluvium. Paved portions of the Building 123 area provide an additional impedance to contaminant migration, as precipitation is diverted to the storm water drainage system instead of percolating through the ground surface (DOE 1992b).

3.0 DATA QUALITY OBJECTIVES (DQOs)

EPA has established a process to direct Superfund decision-making as the basis for developing DQOs. DQOs are designed to ensure that the type, quantity, and quality of environmental data used in decision making are appropriate for the intended application. Data requirements to support this project were developed and are implemented in the project using criteria established in *Guidance for the Data Quality Objective Process*, QA/G-4 (EPA 1994). When completed, the project will demonstrate compliance with the release criteria defined in Site Procedure 4-ROI-03.02, *Radiological Requirements for Unrestricted Release.*

The purpose of this investigation is to determine the presence or absence of hazardous and/or radioactive contamination in the soil beneath the Building 123 concrete slab, leaks adjacent to selected sumps, process waste lines, and pits, localized spills and the general condition of the surrounding grounds as identified in Section 4.1. The data will be compared to Tier II Office Worker Action Levels as stated in Table 1-2 and used to aid in future investigations to determine the nature and extent of contamination.

4.0 SAMPLING ACTIVITIES

4.1 Sample Location and Frequency

The sampling event will focus on the soils underlying and surrounding Building 123 as indicated in Figure 4-1. Subsurface soils will be sampled to a total depth of six (6) feet as described in Section 4.3, as historical data indicates that the presence of contaminants below this depth is unlikely (DOE 1992b). However, evaluation of sample analyses results may indicate a potential for groundwater contamination.

Forty-six (46) locations will be sampled: six (6) will be collected immediately beneath the building slab at a depth of approximately one foot; twenty (20) will be located underneath the building slab at a depth of approximately six feet; and twenty-two (22) will be located in areas surrounding Building 123 (Figure 4-1). Locations were determined with respect to underground OPWLs and paved and unpaved areas. The investigation will focus on the following areas:

- Unpaved areas along the east side of Building 123, to further characterize potential areas of volatile organic constituent contamination;
- Underground OPWLs beneath and to the south of Building 123;
- Points at which the overhead waste process lines enter the subsurface at the south end of the west wing of Building 123;
- Potential Areas of Contamination (PACs);
- Locations of process waste sumps, waste pumping stations, and OPWL junctions and elbows;
- Random samples will be used to characterize the remainder of the Building 123 area. (West side) According to *Final Phase I RFI/RI Work Plan for Operable Unit 13, 100 Area* (DOE 1992) and personnel interviews, no contaminant spills or leaks have been reported in these areas, so random sampling is appropriate.

Table 4-1 Sampling Requirements

Area of Concern	Reason	# of Samples	Depth/Interval
Unpaved Areas	Potential VOC contamination	3	6 feet
OPWLS	Potential contamination	14	6 feet
Underground Process waste lines	Potential contamination	3	1 foot
PACs	Potential contamination	3	6 feet
Sumps, pump stations, junctions, elbows	Potential contamination	10 3	6 feet 1 foot
Random sampling (west side)		10	6 feet

One soil sample will be collected at each location, which will be a composite of the entire core. Figure 4-1 indicates total depths of each core. Locations outside of Building 123 will be sampled to a total depth of six (6) feet. Locations within the Building 123 perimeter near waste pumping stations, sumps, and junctions will also be sampled to a depth of six (6) feet, as building as-built drawings indicate that the pipelines exist at a maximum depth of five (5) feet, and leaks associated with underground lines characteristically migrate downward. All remaining locations will be sampled immediately beneath the building slab (approximately one foot below slab surface) in areas near sumps and sites of historical spills to address potential migration of the process wastes through concrete.

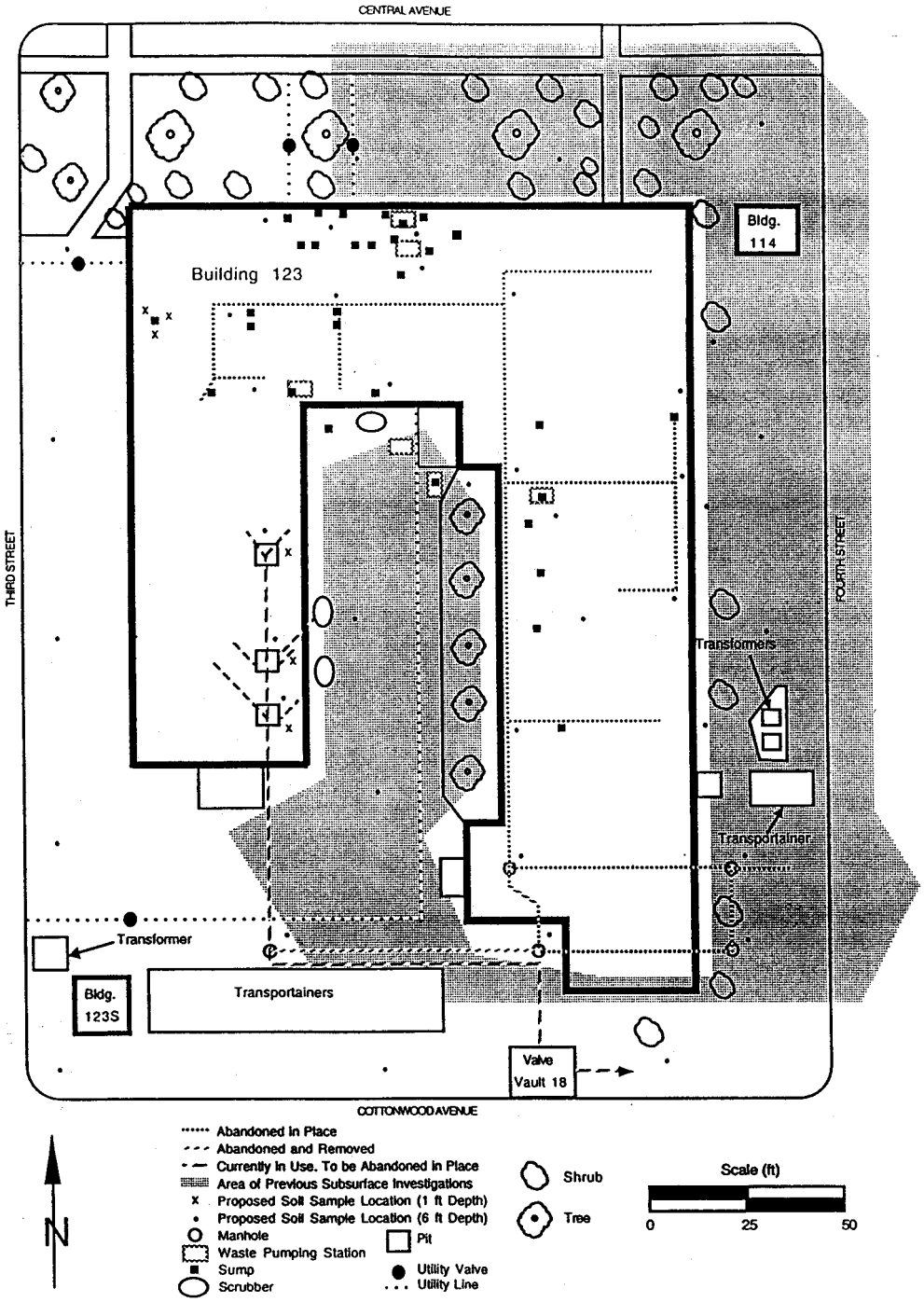

Figure 4-1 Soil Sampling Locations

4.2 SAMPLE DESIGNATION

The site standard sample numbering system will be implemented in this project. A simple, unique, alphanumeric location code will be assigned to each sample while in the field. Prior to sample collection, each sample location will be established using tape and compass. Sample locations outside Building 123 will be marked with a reference flag or stake; locations on the building slab will be marked with fluorescent spray paint. Sample numbers (i.e., 98A000X.00X.00X) will be assigned to the project by the Analytical Projects Office (APO). In preparation of the final report, a matrix will be developed to correlate the individual sample numbers to location codes.

4.3 SAMPLE COLLECTION

Sample depths will be reached using a Geoprobe© truck-mounted hydraulic ram in accordance with Site Procedure 5-21000-ER-OPS-GT.39, *Push Subsurface Soil Sampling*. Soil cores will be recovered continuously in two-foot increments using a 1-inch diameter by 24-inch long stainless steel-lined California core barrel. Recovered soil will be placed into a stainless steel bucket until the desired depth is reached, at which time the soil will be composited by hand using a stainless steel trowel. However, VOC samples will be collected as grab samples and not composited. Cores will be monitored with a Flame Ionization Detector (FID) or a Photoionization Detector (PID) in accordance with Site Procedure 5-21000-OPS-FO.15, *Photoionization Detectors and Flame Ionization Detectors* for health and safety purposes.

Locations beneath the building slab will be sampled by coring through the slab with a hand-held, rotary-type concrete corer to access the underlying soils. The procedures used for coring are outlined in RF/RMRS-97-125.UN, *Concrete Sampling and Analysis Plan to Characterize the Building 123 Slab* that procedure will be modified to describe sampling through the slab prior to sampling activities taking place. Resulting holes will be properly back-filled with granular bentonite.

A Radiological Control Technician (RCT) will scan each sample with a Field Instrument for the Detection of Low Energy Radiation (FIDLER). Equipment will also be monitored for radiological contamination during sampling activities. All sampling equipment will be decontaminated with an Alconox solution, and rinsed with deionized water, in accordance with EMD Operating Procedure 5-21000-OPS-FO.03, *General Equipment Decontamination, Section 5.3.1, Cleaning Steel or Metal Sampling Equipment Without Steam in the Field.* All other sampling equipment will include standard items such as chain of custody seals and forms, logbooks, etc. The cores will be visibly inspected for signs of contaminant staining, then visually logged by the field geologist as per Site Procedure 5-21000-ER-OPS-GT.01, *Logging Alluvial and Bedrock Material*. Additional samples will be collected if cores exhibit visible evidence (staining, odors, etc.) of contamination at shallower depths.

Three (3) field duplicates will be collected to represent at least 5% of the sample batch to provide adequate information on sample variability, as defined in *Guidance for Data Quality Objectives Process* (EPA 1994).

Sample points will be surveyed for location and elevation using Global Positioning System (GPS) equipment to ensure accuracy in data plotting.

Health and safety requirements will be specified in an addendum to the *Building 123 Decommissioning Project Health and Safety Plan* (RF/RMRS-97-022#48). Personal protective equipment (PPE) and air monitoring requirements, and hazard assessments not otherwise defined in the Building 123 PAM will be addressed in the addendum.

4.4 Sample Handling and Analysis

Samples will be handled according to *Environmental Management Department Operating Procedures Volume/ Field Operations*, OPS-FO.13, *Containerization, Preserving, Handling, and Shipping of Soil and Water Samples, Volume 1*, and OPS-FO.10, *Receiving, Labeling, and Handling of Environmental Containers.*

Table 4-4 indicates analytical requirements. Samples will be submitted to an offsite, EPA-approved laboratory for analysis under a 30-day result turnaround time.

Table 4-4 Analytical Requirements for Soil Samples

Analysis	Medium	Number of Samples	EPA Method	Container	Preservation	Holding Time
Target Analyte List (TAL) Metals	Soil	46 samples 3 duplicates 3 rinsate	EPA 6010	1 (one) 250 ml wide-mouth glass jar	Cool, 4°C	180 Days
Target Compound List (TCL) Volatiles	Soil	46 samples 3 duplicates 3 rinsate	EPA 8260A	2 (two) 125 ml wide-mouth glass teflon-lined jar	Cool, 4°C	7 days
TCL Semi-Volatiles	Soil	46 samples 3 duplicates 3 rinsate	EPA 8270B	1 (one) 250 ml wide-mouth teflon-lined jar	Cool, 4°C	7 days until extraction, 40 days after extraction
TCL PCBs	Soil	46 samples 3 duplicates 3 rinsate	EPA 8080A-8081	1 (one) 250 ml wide-mouth teflon-lined jar	Cool, 4°C	7 days until extraction, 40 days after extraction
Total Organic Carbon (TOC)	Soil	46 samples 3 duplicates 3 rinsate	EPA 415.1	1 (one) 250 ml wide-mouth teflon-lined jar	Cool, 4°C	7 days until extraction, 40 days after extraction
Nitrates	Soil	46 samples 3 duplicates 3 rinsate	EPA 300 Methods	1 (one) 250 ml glass jar	Cool, 4°C	2 days
Gross Alpha/Gross Beta	Soil	46 samples 3 duplicates 3 rinsate	EPA 9310	1 (one) 100 ml glass jar	Cool, 4°C	180 days
Isotopics ($U^{233/234}$, U^{235}, U^{238}, Am^{241}, $Pu^{239/240}$)	Soil	46 samples 3 duplicates 3 rinsate	NA[a]	1 (one) 250 ml glass jar	None	180 days
Gamma Spectroscopy	Soil	46 samples 3 duplicates 3 rinsate	NA[a]	1 (one) 250 ml glass jar	None	180 days

[a] No EPA-approved method is currently in place for isotopics analysis. However, guidance is provided in procedures defined in Environmental Monitoring Support Laboratory (EMSL)-LV 0539-17, *Radiological and Chemical Analytical Procedures for Analysis of Environmental Samples*, March 1979.

5.0 DATA MANAGEMENT

A project field logbook will be created and maintained by the project manager or designee in accordance with Site Procedure 2-S47-ER-ADM-05.15, *Use of Field Logbooks and Forms.* The logbook will include time and date of all field activities, sketch maps of sample locations, or any additional information not specifically required by the SAP. The originator will legibly sign and date each completed original hard copy of data. A peer reviewer will examine each completed original hard copy of data. Any modifications will be indicated in ink, and initialed and dated by the reviewer. Logbooks will be controlled through Document Control.

Data for this project will be collected, entered, and stored in a secure, controlled, and retrievable environment in accordance with Site Procedure RM-06.02, *Records Identification, Generation, and Transmittal.* Results will be compiled into a sampling and analysis report. Location and analytical data will be entered into and stored in the Geographical Information System (GIS) files. Documentation will be entered into the Administrative Record in accordance with Site Procedure RM-06.04, *Administrative Record Document Identification and Transmittal.*

6.0 QUALITY ASSURANCE

Analytical data collected during this sampling and analysis will be evaluated using the guidance established by the Rocky Flats Administrative Procedure 2-G32-ER-ADM-08.02, *Evaluation of ERM Data for Usability in Final Reports.* This procedure establishes the guidelines for evaluating analytical data with respect to precision, accuracy, representativeness, completeness, and comparability (PARCC) parameters. Data validation will be performed according to the RFETS APO, Analytical Services Performance Assurance Group procedures, but will be done after the data is used for its intended purpose. Analytical laboratories supporting this task have all passed regular laboratory audits by the APO.

6.1 QUALITY ASSURANCE PROGRAM

The RMRS Quality Assurance Program describes how RMRS implements the requirements of 10 CFR 830.120 through the RFETS site QA Program. Project specific organizational responsibilities must be identified.

6.2 TRAINING REQUIREMENTS

Training requirements for this project must be identified in a Training Implementation Matrix. Additional training identified will be documented through 1-31000-COOP-01 required reading Conduct of Operations and 1-31000-COOP 011, *Pre-Evolution Briefing.*

6.3 CORRECTIVE ACTION

The site Corrective Action Process (CAP) and the RMRS QA-3.1, Corrective Action procedure and the occurrence reporting systems shall be utilized to handle items, services and processes not conforming to established requirements.

6.4 DOCUMENT CONTROL

All documents must be prepared, reviewed and approved in accordance with RMRS DC-06.01, Document Control Program. If the activity is considered a CERCLA removal action, all AR records generated shall be identified, handled and submitted in accordance with the RMRS Administrative Record Document Identification and Transmittal (RM 06.04) Procedure. All non AR records shall be handled in accordance with the RMRS Records Identification, Generation and Transmittal (RM-06.02) Procedure. All activities described in project documents shall be conducted in accordance with approved and controlled instructions and procedures identified in project specific documents.

6.5 CHANGE CONTROL

Design activities are conducted in accordance with the Site's Configuration Change Control Program and the Integrated Work Control Programs, 1-454000-CSM-001. Activities are also conducted in accordance with the RMRS Conduct of Engineering Manual (COEM).

6.6 PROCUREMENT

Procurement activities are conducted in accordance the site Procedure, 1-W36-APR-111, Acquisition Procedure for Requisitioning Commodities and Services and the RMRS QAPD.

6.7 INSPECTION AND ACCEPTANCE TESTING

Inspection and Acceptance Testing is conducted in accordance with Site Procedures 1-D23-QAP-10.02, *Inspection* 1-31000-COOP 019, *Returning Systems and Equipment to Service*, 1-V51-COEM-DES-210, *Design Process Requirements* and 1-I97-ADM-12.01, *Control of Measuring and Test Equipment.*

6.8 MANAGEMENT ASSESSMENTS

Management Assessments are conducted in accordance with the RMRS QA, 9.01, RMRS Management Assessments.

6.9 INDEPENDENT ASSESSMENTS

RMRS Independent Assessments are conducted in accordance with RMRS, QA-10.01, Independent Assessment and RMRS WI, QA-10.01, *Conduct of Surveillances.*

6.10 QUALITY CONTROL (QC)

The following QC sampling requirements will be used as necessary on this project:

QC samples will be collected as part of the characterization at a frequency of 1 in 20 samples. The following types of QC samples will be collected to support characterization:

Duplicates: Duplicate (collocated) samples will be collected in the same manner and analyzed by the same analytical methods, in the same laboratory as the regular samples. These samples will be submitted blind to the laboratory. All duplicate samples will be collected using the same sampling equipment used for collection of the regular samples. Sampling equipment will be decontaminated while collecting regular and QC samples from the same location.

Equipment Rinsate Blanks: Will be prepared by collecting distilled water, poured over decontaminated sampling equipment, between collection of regular samples and collected only when sampling equipment is used. If equipment rinsate blanks will not be collected, all detections of COCs will be considered real and not attributable to cross contamination.

6.11 ANALYTICAL DATA

Analytical data collected in support of the IHSS 121 and 148 soil sampling project will be evaluated using the guidance established by the Rocky Flats Administrative Procedure 2-G32-ER-ADM-08.02, *Evaluation of ERM Data for Usability in Final Reports.* This procedure establishes the guidelines for evaluating analytical data with respect to precision, accuracy, representativeness, completeness, and comparability (PARCC) parameters. Data validation will be performed according to the RFETS APO, Analytical Services Performance Assurance Group procedures, but will be done after he data is used for its intended purpose.

6.11.1 Precision

Precision is a quantitative measure of variability that is evaluated by comparing analytical results for real samples to analytical results for corresponding duplicate samples. Analytical precision for a singe analyte is expressed as the Relative Percent Difference(RPD) between results of duplicate samples (and matrix spike duplicates) for a given analyte. RPDs indicate the degree of reproducibility of both the sampling and analysis methods. The precision criteria for these samples are specified in the respective methods. For precision, the typical relative percent difference between samples and duplicates is less than or equal to 40% for soil. Duplicates comprise at least 5% of the total sample batch.

6.11.2 Accuracy

Accuracy is a measure of the closeness of a reported concentration to the true value. Analytical accuracy is expressed as percent recovery of a spike of a known concentration that has been added to an environmental sample before analysis. The QC criterion for acceptable percent recovery is 80 percent to 120 percent for all analytes in all media. Accuracy is the responsibility of the laboratory. Comparability will be evaluated by comparing historical data with data collected during this event and will be followed in accordance to EPA regulations and Waste Acceptance Criteria, through which data will be validated. Completeness (90% of valid data) will be evaluated by comparing the SAP to the actual sampling episode. The expected percentage of characterization data validation required for the project is 25 percent.

7.0 SCHEDULE

Sample collection and analyses will be conducted in two phases. Phase I will involve collection of twenty-four (24) samples outside of Building 123, and two (2) field duplicates; Phase II will involve collection of twenty-six (26) samples within and beneath the Building 123 slab, and two (2) field duplicates. Phase I samples will be collected at least six (6) weeks before scheduled demolition of Building 123, to allow for turnaround of sample results and data review. Phase I sample results may warrant changes in Phase II sample location and frequency, at which time the SAP will be amended to accommodate such changes.

8.0 ADDITIONAL ACTIVITIES

8.1 CLOSURE OF RCRA UNIT 40

The Building 123 slab will remain in place following completion of demolition activities. Proper closure of underground, active lines will be contingent upon rinsate and soil sampling analyses results for constituents listed in Table 4-4. In the event that no contamination above Tier II action levels (RFCA, Appendix 6) is detected, the lines will be remediated in accordance with the Closure Plan. All surface openings to active lines will be capped with a plug of non-shrinking bentonite slurry, and the lines will be abandoned in place under the RCRA Unit 40 Closure Plan. Such an action will be considered a RCRA stable configuration in accordance with the Site Part B Operating Permit.

8.2 DISPOSITION OF WASTE

Remediation and closure activities may generate a combination of radioactive, hazardous and mixed wastes. Contaminated soil and pipeline material are expected to be the major sources of waste. Wastes consisting of plastic, tools, PPE, and other materials associated with remediation will also be a major source of waste. Following remediation activities, the RFETS Building Radiation Cleanup Standard (BRCS) will be utilized to determine if residual radioactive constituents contained in remaining equipment and remediation debris is compliant with RFCA guidelines and appropriate as-low-as-reasonably-achievable (ALARA) considerations. The BRCS is currently under development in coordination with the EPA, CDPHE, and DOE. Until the BRCS is approved, more conservative criteria defined in DOE Order 5400.5 and associated RFETS radiation protection procedures will be used to manage debris generated by remedial activities. Contaminated waste will be handled by qualified waste packaging technicians who will support decontamination specialists and radiation control technicians to identify and segregate hazardous or low level waste. Drums or boxes will be provided by the Waste Disposal group. Waste packaging technicians will package and label the waste and arrange for radioactive waste to be certified by the Waste Certification group. The Project Waste Coordinator will work with the certification personnel and prepare all required documentation. Liquid waste generated during decontamination of sampling and associated equipment will be collected in drums and shipped to Building 374 for processing. Solid waste will be managed by the Waste Disposal group and moved to a temporary staging area immediately adjacent to the site to be placed in roll-off containers until proper disposition is determined. Contaminated soil and pipeline material will ultimately be disposed of offsite as RCRA hazardous waste.

9.0 REFERENCES

DOE 1992a, *Final Phase I RFI/RI Work Plan for Operable Unit 9, Original Process Waste Lines*, March.

DOE 1992b, *Final Phase I RFI/RI Work Plan for Operable Unit 13, 100 Area*, October.

DOE 1992c, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO.

DOE 1993, *Background Geochemical Characterization Report*, September.

DOE 1994, *Final Phase I RFI/RI Work Plan for Operable Unit 9, Technical Memorandum No. 1, Volume IIA-Pipelines*, November.

DOE 1996, *Rocky Flats Cleanup Agreement, Final*, July.

EPA 1994, *Guidance for Data Quality Objectives Process*, EPA QA/G-4, September.

RMRS 1997a, *Proposed Action Memorandum for the Decommissioning of Building 123*, May.

RMRS 1997b, *RMRS Quality Assurance Program Description, RMRS-QAPD-001, Rev. 1*, January.

RMRS 1997c, *Final Sampling and Analysis Plan for the Pre-Remedial Investigation of the Mound Site Plume*, February.