CLOSEOUT REPORT
FOR IHSS GROUPS 100-4
(UBC 123, IHSS 148, PAC 100-611)
AND 100-5 (PAC 100-609)

March 2003

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(UBC 123, IHSS 148, PAC 100-611)
AND 100-5 (PAC 100-609)

Approval received from the Colorado Department of Public Health and Environment

(April 22, 2003)

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March 2003

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ACRONYMS

ACM	asbestos containing material
AL	action level
AOC	Area of Concern
AR	Administrative Record
CAB	cost advantage box
CAD/ROD	Corrective Action Decision/Record of Decision
CEARP	Comprehensive Environmental Assessment and Response Program
CDPHE	Colorado Department of Public Health and Environment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	contaminant of concern
CMS	Corrective Measure Study
CPIR	Contingency Plan Implementation Report
CRA	Comprehensive Risk Assessment
D&D	Deactivation and Decommissioning
DL	detection limit
DOE	U.S. Department of Energy
DQA	Data Quality Assessment
DQO	Data Quality Objective
EDD	electronic data deliverable
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
ER RSOP	Environmental Restoration RFCA Standard Operating Protocol
FS	Feasibility Study
GPS	Global Positioning System
HDD	Horizontal Directional Drilling
HPGe	High Purity Germanium
HRR	Historical Release Report
IA	Industrial Area
IASAP	Industrial Area Sampling and Analysis Plan
IHSS	Individual Hazardous Substance Site
K-H	Kaiser-Hill Company L.L.C.
lbs	pounds
LCS	laboratory control sample
LD	laboratory duplicate
LLMW	low-level mixed waste
LLW	low-level waste
MDA	minimum detectable activity
MDL	method detection limit
mg/kg	milligrams per kilogram
MH	manhole
MS	matrix spike
MSD	matrix spike duplicate
NA	not applicable
NCR	no carbon required
ND	not detected
NFA	No Further Action

NLR	No Longer Representative
NPWL	New Process Waste Lines
NTS	Nevada Test Site
OPWL	Original Process Waste Lines
OU	Operable Unit
PAC	Potential Area of Concern
PAM	Proposed Action Memorandum
PARCCS	precision, accuracy, representativeness, completeness, comparability, and sensitivity
PCB	polychlorinated biphenyl
pCi/g	picocuries per gram
PCOC	potential contaminant of concern
pg/g	picograms per gram
ppb	parts per billion
ppt	parts per trillion
QC	Quality Control
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RFCA	Rocky Flats Cleanup Agreement
RFETS	Rocky Flats Environmental Technology Site
RI	Remedial Investigation
RISS	Remediation, Industrial D&D, & Site Services
RL	Recoverable Limit
RMRS	Rocky Mountain Remediation Services
RPD	relative percent difference
RQL	required quantitation limit
RSOP	RFCA Standard Operating Protocol
SAP	Sampling and Analysis Plan
Site	Rocky Flats Environmental Technology Site
SOP	standard operating procedure
SOR	Sum of Ratio
SU	Standard Unit
SVOC	semivolatile organic compound
TCLP	Toxicity Characteristic Leaching Procedure
TEF	toxicity equivalent factor
TEQ	toxicity equivalents
UBC	Under Building Contamination
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
VOC	volatile organic compound
V&V	verification and validation
WRW	Wildlife Refuge Worker

EXECUTIVE SUMMARY

This closeout report summarizes accelerated action activities conducted at Individual Hazardous Substance Site (IHSS) Groups 100-4 and 100-5, which is located at the Rocky Flats Environmental Technology Site. Activities were planned and executed in accordance with the Industrial Area (IA) Sampling and Analysis Plan, the IASAP Addendum #IA-02-01, and the Environmental Restoration (ER) Rocky Flats Cleanup Agreement (RFCA) Standard Operating Protocol for Routine Soil Remediation (ER RSOP). Notification of the planned characterization and removal activities was provided in ER RSOP Notification #02-01.

IHSS Group 100-4 includes Under Building Contamination Site (UBC) 123 (Radiological Health Physics Laboratory), IHSS 100-48 (Waste Leaks), Potential Area of Concern (PAC) 100-603 (Bioassay Waste Spill), and PAC 100-611 (Building 123 Scrubber Solution Spill). The Area of Concern (AOC) and associated remedial action objectives were determined based on data collected during the characterization of UBC 123 and data collected during previous studies of the area. Accelerated action activities were conducted from February 5, 2002 through April 19, 2002. During this time, the Building 123 slab was removed, as were belowgrade features, including the building footers, source pits, manholes, sumps, and process waste lines regulated under the Resource Conservation and Recover Act (RCRA). In addition, soils contaminated with lead and semi-volatile organic compounds (SVOCs) were removed and confirmation samples were collected verify cleanup levels. Confirmation sampling results indicated that all contaminant concentrations were less than RFCA Tier I Action Levels (ALs) and proposed Wildlife Refuge Worker (WRW) and ecological ALs. The data were verified and validated in accordance with the Data Quality Objective/Data Quality Assessment (DQO/DQA), as described in the IASAP. Waste from IHSS Group 100-4 included concrete, pipeline, asphalt, and soil. Clean concrete was segregated and recycled in accordance with the RSOP for Recycling Concrete. Other wastes were managed in accordance with the ER Waste Management Plan. Excavated areas were backfilled and the entire area was rough-graded before topsoil was distributed and the area was seeded with Canada Bluegrass.

IHSS Group 100-4 removal activities were consistent with and contributed to the ER RSOP overall long-term remedial action objectives for RFETS soil. The removal of concrete items, including sumps and tanks, and portions of the OPWL and NPWL, and the disruption of remaining lines contributed to the protection of human health and the environment, because potential sources of contamination were removed or isolated. These actions also minimized the need for long-term maintenance and institutional or engineering controls because potential sources of contamination were removed or isolated. In addition, best management practices were used during the accelerated action to prevent the spread of contamination during the accelerated action (e.g., erosion and duct controls). Air monitoring data during the accelerated action did not indicate any exceedances.

Even though some process waste lines remain, no Group-specific, near-term management techniques are required. Remaining lines have been isolated (grouted). Excavation at the site will continue to be controlled through the Site Soil Disturbance Permit process. Fencing and signs restricting access will be posted to minimize disturbance to newly-revegetated areas. Site access and security controls and the Soil Disturbance Permit process will remain in place pending implementation of long-term controls.

IHSS Group 100-5 consists of PAC 100-609 (Building 121 Security Incinerator). The AOC and associated remedial action objectives were determined based on sampling performed in accordance with the IASAP. Accelerated action activities were conducted on March 6, 2002. At that time, the Building 121 slabs were removed and managed in accordance with the RSOP for Recycling Concrete. No soil was removed because analytical results indicated that dioxin and furan congener concentrations were below the EPA cleanup guidelines and PCBs were less than RFCA Tier II ALs. PCBs concentrations were also less than proposed WRW ALs. There are no proposed WRW ALs for dioxin and furan congeners. The data were verified and validated in accordance with the DQO/DQA, as described in the IASAP.

IHSS Group 100-5 removal activities were consistent with and contributed to the ER RSOP overall long-term remedial action objectives for RFETS soil. The removal of the concrete slab contributed to the protection of human health and the environment, because potential sources of contamination were removed or isolated. These actions also minimized the need for long-term maintenance and institutional or engineering controls because potential sources of contamination were removed or isolated. In addition, best management practices were used during the accelerated action to prevent the spread of contamination during the accelerated action (e.g., erosion and duct controls). Air monitoring data during the accelerated action did not indicate any exceedances.

No Group-specific, near-term management techniques are required. Excavation at the site will continue to be controlled through the Site Soil Disturbance Permit process. Fencing and signs restricting access will be posted to minimize disturbance to newly-revegetated areas. Site access and security controls and the Soil Disturbance Permit process will remain in place pending implementation of long-term controls.

The presence of residual contamination in soil will be analyzed in the Site Wide Comprehensive Risk Assessment, which is part of the RCRA Facility Investigation/Remedial Investigation (RFI/RI) and Corrective Measures Study/Feasibility Study (CMS/FS) that will be conducted for the Site. The need for and extent of any, more general, long-term stewardship activities will also be analyzed in the RFI/RI and CMS/FS and will be proposed as part of the preferred alternative in the Proposed Plan for the Site. Institutional controls and other long-term stewardship requirements for Rocky Flats will ultimately be contained in the Corrective Action Decision/Record of Decision, in any post-closure Colorado Hazardous Waste Act permit that may be required, and in any post-RFCA agreement.

No long-term stewardship activities are recommended for IHSS Groups 100-4 or 100-5 beyond the generally applicable Site requirements that may be imposed on this area in the future, which are dependent upon the final remedy selected. Institutional controls that will be used as appropriate for this area include prohibitions on construction of buildings in the IA, restrictions on excavation or other soil disturbance, or prohibitions on groundwater pumping in the area of IHSS Groups 100-4 and 100-5. No specific engineered controls or environmental monitoring are anticipated as a result of the conditions remaining in IHSS Groups 100-4 and 100-5.

This closeout report and associated documentation will be retained as part of the Rocky Flats administrative record file. These specific long-term stewardship recommendations will also be summarized in the Rocky Flats *Long-Term Stewardship Strategy*.

1.0 INTRODUCTION

This closeout report summarizes characterization and accelerated action activities conducted at Individual Hazardous Substance Site (IHSS) Group 100-4 (UBC 123, IHSS 148, PAC 100-611 and IHSS Group 100-5 (PAC 100-609) at the Rocky Flats Environmental Technology Site (RFETS or Site) in Golden, Colorado. Accelerated action activities were planned and executed in accordance with the Industrial Area (IA) Sampling and Analysis Plan (SAP) (DOE 2001a), IASAP Addendum #IA-02-01 (DOE 2001b), and the Environmental Restoration (ER) Rocky Flats Cleanup Agreement (RFCA) Standard Operating Protocol (RSOP) for Routine Soil Remediation (ER RSOP) (DOE 2002a). Notification of the planned activities was provided in ER RSOP Notification #02-01 (DOE 2002b), which was approved by the Colorado Department of Public Health and Environment (CDPHE) on January 16, 2002 (CDPHE 2002).

Approval of this Closeout Report constitutes regulatory agency concurrence that these IHSS Groups are No Further Accelerated Actions (NFAAs). This information and NFAA determination will be documented in the FY03 Historical Release Report (HRR).

This report contains the information necessary to demonstrate attainment of cleanup objectives and final closure of IHSS Groups 100-4 and 100-5. This information includes:

- Site Characterization Information
  - Description of site characterization activities, and
  - Site characterization data, including data tables and maps;
- Site Accelerated Action Information
  - Description of the accelerated action, including the rationale for the action and map of the target remediation area,
  - Map of the actual remediation area, including bounds of the excavation, and dates and durations of specific remedial activities,
  - Photographs documenting site characterization, remediation, and reclamation activities;
- Confirmation sampling data, including data tables and location maps, as well as a comparison of the confirmation data to applicable cleanup goals;
- Description of Resource Conservation and Recovery Act (RCRA) unit closure activities;
- Description of deviations from the ER RSOP;
- Description of near-term stewardship actions and long-term stewardship recommendations;
- Description of site condition after remediation, including a map of residual contamination above background plus two standard deviations, method detection limits (MDLs), and Tier II Action Levels (ALs);
- Disposition of wastes;
- Site reclamation;

- Table of No Longer Representative (NLR) locations and sample numbers that have been remediated. These data will be used to mark database records so they are not used in the Comprehensive Risk Assessment (CRA) or other Site analyses; and

- Data quality assessment (DQA), including comparison of confirmation data with project data quality objectives (DQOs).

2.0 IHSS GROUP 100-4 ACTIVITIES

IHSS Group 100-4 consists of the following IHSSs, Under Building Contamination (UBC) sites, and Potential Areas of Concern (PACs):

- UBC 123, Radiological Health Physics Laboratory;
- IHSS 100-148, Waste Leaks;
- PAC 100-603, Bioassay Waste Spill; and
- PAC 100-611, Building 123 Scrubber Solution Spill.

The location of IHSS Group 100-4 is shown on Figure 1, and the IHSSs, PACs, and UBC sites are shown on Figure 2.

2.1 Site Characterization

IHSS Group 100-4 characterization information consists of historical knowledge and previously collected analytical data. Historical information for each IHSS, PAC, and UBC is presented below. IHSS Group 100-4 analytical data are presented in Section 2.1.5.

2.1.1 UBC 123, Radiological Health Physics Laboratory

Building 123 was located on Central Avenue, between Third and Fourth Streets. The original building was constructed in 1953, with additions completed in 1968, 1972, and 1974. Building 123 housed the Site's Radiological Health Physics Laboratory, where water, biological materials, soil, air, and filter samples were analyzed for the presence of plutonium; americium; uranium; alpha, beta, and gamma radiation; tritium; beryllium; and organic constituents. In addition, personnel radiation badges were counted and repaired in Building 123. Radioactive sources, including cesium, were stored in a below-grade concrete pit. Low-level liquid and chemical wastes were generated and transferred to onsite treatment systems via the process waste transfer and collection system (DOE 1992). Portions of RCRA Unit 40, including sumps and pipes, were part of UBC 123. Some of the underground process waste lines associated with Building 123 were abandoned in place and plugged with cement in 1982 (i.e., Original Process Waste Lines [OPWL]), while others remained in active use until laboratory operations were suspended in preparation for facility decommissioning (e.g., New Process Waste Lines [NPWL]). The process waste lines are shown on Figure 2.

Building 123 was decommissioned in 1998 in accordance with the Proposed Action Memorandum (PAM) for the Decommissioning of Building 123 (RMRS 1998a). At that time, the building structure and aboveground portions of the process waste system were removed, and the floor slab was sampled to assess areas of potential contamination. Contaminated portions of the slab that could not be decontaminated to meet the applicable unrestricted release criteria were encapsulated with epoxy paint to fix removable contamination and covered with steel plate. In addition, the underground sumps, pipe chases, and the process waste lines that ran from Room 156, through Rooms 157 and 158, to Valve Vault 18, were clean closed in place in accordance with the Closure Plan for the Building 123 Components of RCRA

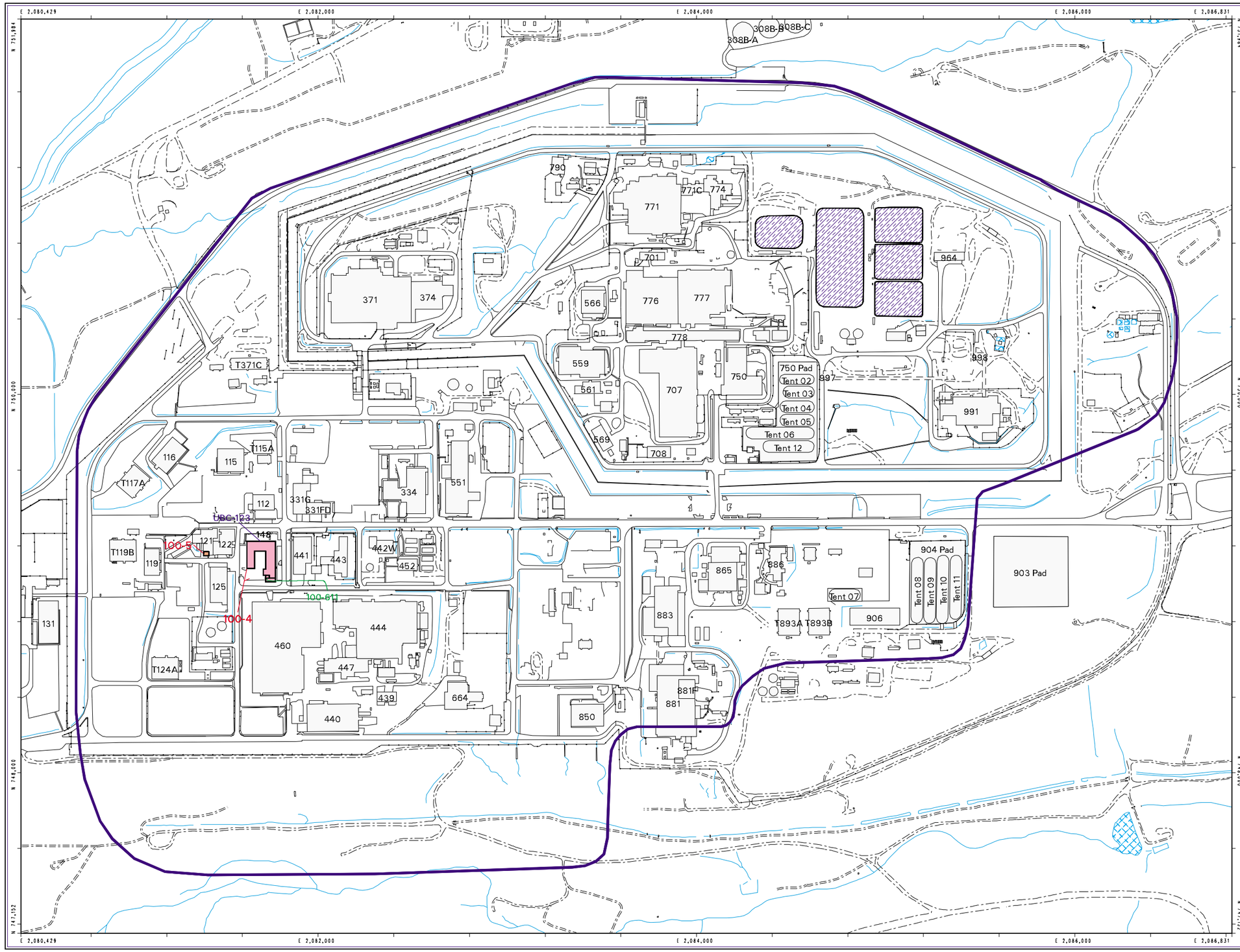

Figure 1

IA Groups Location Map

EXPLANATION

IHSS Groupings

- 100-4
- 100-5

Standard Map Features

- Buildings and other structures
- Solar Evaporation Ponds (SEPs)
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Paved roads
- Dirt roads
- Industrial Area Operable Unit Boundary

DATA SOURCE BASE FEATURES:
PACs
Historical Release Report (HRR)
2nd Annual Update
Sept. 30, 1997
Individual Hazardous Substance Sites (IHSS)
DOE, 1992, HRR Report and Subsequent Updates.
Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas.
Digitized from the orthophotographs. 1/95

Scale = 1 : 6240
1 inch represents 520 feet

200 0 400 800ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

Prepared by: DynCorp

Prepared for: Kaiser-Hill

MAP ID: 02-0121

January 07, 2002

NT_Svr w:/projects/fy2002/02-0121/fa-100-4-5-bsize-fig1.aml

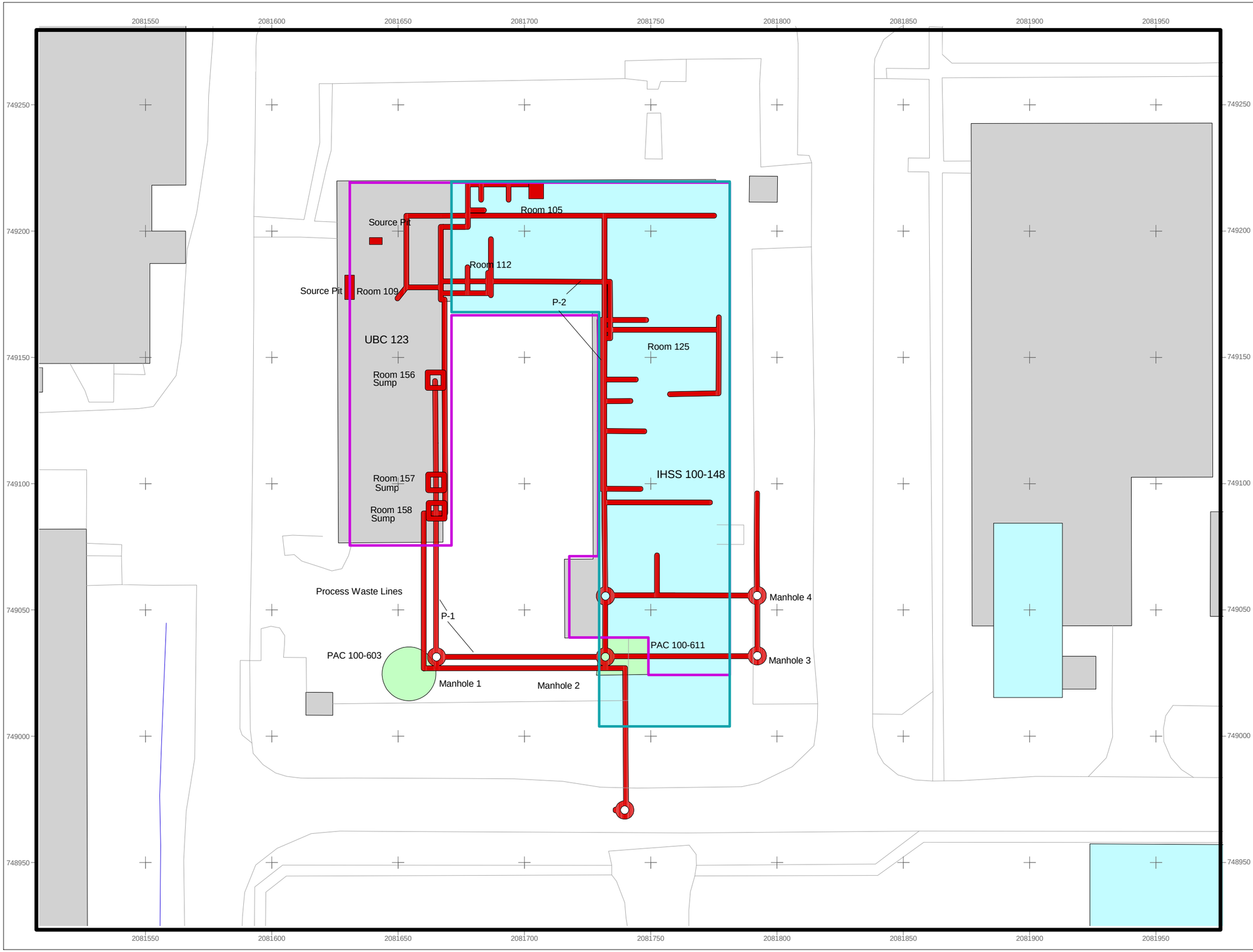

Figure 2
IHSS Group 100-4

KEY

- FY 2002 IHSS locations
- FY 2002 PAC locations
- Buildings and other structures
- Process Waste Line
- Paved areas
- Dirt roads
- Streams, ditches, or other drainage features

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N

Scale = 1:450

20 0 20 40 Feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared by:

KAISER•HILL COMPANY

w/projects/2002/100-4/100-4basesps1-28-03.apr

January 2003

Unit 40 (RMRS 1997). Partial closure was certified by a Colorado-registered professional engineer on May 28, 1998 (RMRS 1998b). A contaminated sump, located in Room 125, was removed during decommissioning. Final disposition of the building slab, underground sumps, process waste lines (including the abandoned lines), and source pits was deferred to the ER Program.

2.1.2 IHSS 100-148–Waste Leaks

The eastern wing of Building 123 is encompassed by IHSS 148. Persons interviewed for the Comprehensive Environmental Assessment and Response Program (CEARP) Phase 1 document indicated that several small spills of nitrate-bearing wastes occurred around the outside of Building 123. These wastes may have contained radionuclides. Additionally, interviewees indicated that there were potential releases of nitrate-bearing wastes from the OPWL buried beneath Building 123. This pipeline was in use from the start of operations in Building 123 until the OPWL were replaced by the NPWL.

Building 123 was serviced by a 4-inch-diameter process waste line (P-1) buried beneath the north and east wings of the building. The main process waste line drained from west to east in the north wing, and from north to south in the east wing. The pipe was sloped at 1 percent. A number of connections were made to the main pipe, some of which consisted of headers servicing process waste drains in the building. The pipe was probably constructed of a type of iron called "Duriron." The OPWL piping from Building 123 led to an underground tank system behind Building 441 that collected wastes generated by both Buildings 123 and 441. From this tank system, the process waste materials were pumped out for treatment in the process waste system (DOE 1992).

The OPWL drain was not double-contained, and it varied in depth from approximately 0.5 to 3.0 feet beneath the concrete floor of Building 123. The line came out from beneath the southern end of the east wing of the building, with an invert elevation of approximately 6,032.5 feet. Interviewees have stated that this line may have leaked without personnel being aware of it. The types of waste consisted of laboratory wastes from analysis of urine, fecal, and other bioassay samples. Nitrates and low levels of radionuclides were associated with the wastes carried in the OPWL. The NPWL that replaced the OPWL consisted of either double-contained underground or overhead lines (DOE 2000b).

Surface soil samples were collected and analyzed as part of the Operable Unit (OU 13) RCRA Facility Investigation/Remedial Investigation (RFI/RI). Thirty-four analytes were detected in the surface soil samples, including 26 inorganic compounds and 8 radionuclides. Eleven analytes exceeded background concentrations at a minimum of one sampling location throughout IHSS 148. Constituents that exceeded background concentrations were chromium, cobalt, copper, lead, nickel, strontium, zinc, americium-241, plutonium-239/240, uranium-233/234, and uranium-238. These data are available in the IA Data Summary Report (DOE 2000b).

Previously, a soil gas survey was conducted on a 25-foot grid and samples were analyzed in the field using gas chromatography/mass spectrometry. Sixty-four soil gas locations were sampled, and 13 samples contained volatile organic compound (VOC) levels in excess of the 1 microgram per liter (µg/L) MDL. Benzene, toluene, ethylbenzene, xylene, and fuel constituents were detected in samples collected from the perimeter of Building 123 and within the east and west wings of the building. Trichlorofluoromethane was detected in nine samples distributed throughout the IHSS 148 area at levels up to 2.6 µg/L. Tetrachloroethene was detected at 1.5 µg/L in a sample collected east of Building 123.

Unconfirmed reports of contaminant spills were indicated in interviews with building employees. In the late 1960s or early 1970s, a cesium-contaminated liquid was reportedly spilled on the concrete floor in Room 109. The floor was immediately sealed to immobilize the contamination. Room 109 also contained source storage pits. Undocumented thorium research was performed in Room 105. Scoping surveys conducted in May through July 1997 revealed elevated levels of radioactivity in both Rooms 105 and 109. In-situ gamma spectroscopy measurements performed in August 1997 indicated the presence of cesium-137 and thorium-232 in Rooms 109 and 105, respectively (RMRS 1998c).

2.1.3 PAC 100-603–Bioassay Waste Spill

PAC 100-603 was approved as a NFA site in 2002 (CDPHE 2002). A description of this PAC is contained in the Annual Update for the Historical Release Report (DOE 2001c).

2.1.4 PAC 100-611–Building 123 Scrubber Solution Spill

An inoperative pump in the Building 123 process waste transfer system caused the Building 123 scrubber system to overflow, spilling scrubbing solution into a bermed area outside of the building and into three pits beneath the floor of the building. Also, approximately 5 gallons of liquid were present in and around a nearby storm water drainage ditch that served the Building 123 parking lot. It was speculated that this liquid leaked from the berm wall interface with the underlying asphalt. The 5 gallons of liquid in the parking lot drainage ditch did not react when sodium bicarbonate was applied, indicating it was not acidic and therefore, was not the scrubbing solution. All of the spilled solution was contained within secondary containment structures, and none of the solution was believed to have impacted the environment (DOE 1992).

Under normal operating conditions, the scrubbing solution drained into the process waste system when the scrubbing process was completed. The source of the problem was waste pump switches that were in the wrong position, as well as the influent valve that was blocked by glass filtering wool from Building 123. The scrubbing solution consisted primarily of water, which was used to scrub nitric acid, hydrofluoric acid, and hydrochloric acid used in Building 123.

Approximately 50 gallons were released to the bermed area, and several hundred gallons were contained in the three pits beneath the Building 123 floor. Analyses showed the solution in the bermed area had a pH of 1.6, while the solution in the three pits had a pH of 6.0 (DOE 1992).

Normal scrubbing solution drainage was restored when the glass wool material was cleared and the inoperative process waste pump was restarted. A submersible pump was used to transfer the scrubbing solution from the bermed area to process waste drains in Building 123. Measures were proposed to prevent subsequent buildup of glass wool in the process waste system. A RCRA Contingency Plan Implementation Report (CPIR) (89-019) was written (DOE 1992).

2.1.5 Analytical Data – UBC 123 and IHSS 148

As described in IASAP Addendum #IA-02-01 (DOE 2001b), potential contaminants of concern (PCOCs) at UBC 123 and IHSS 148 were determined based on data collected during the characterization of UBC 123, as summarized in the Final Data Summary Report for the Characterization of UBCs 123 and 886 (DOE 2001d), and data collected during previous studies (DOE 2001a, DOE 2000a). These pre-accelerated action data, greater than background plus two standard deviations or MDLs, along with RFCA Tier I and Tier II AL values are shown on Figures 3 and 4. Because a sufficient number of samples were collected during previous studies to characterize UBC 123 and IHSS 148, additional characterization was not required at these

sites. Results from previous sampling and analysis of surface and subsurface soils at UBC 123 and IHSS 148 indicated that:

- Lead was detected in subsurface soils above the Tier I AL at one location;
- The organics 2-4 dinitrotoluene and n-nitroso-di-n-propylamine, were detected above the RFCA Tier I Sum of Ratios (SORs) in surface soil at one location;
- Radionuclides and metals were detected at concentrations above background plus two standard deviations at UBC 123 and IHSS 148;
- Arsenic exceeding the Tier II AL but below background was detected at one location in surface soil;
- Beryllium exceeding the Tier II AL was detected at one location in surface soil; and
- Methylene chloride was detected in subsurface soil at levels slightly above the RFCA Tier II AL.

2.1.6 Analytical Data–PAC 100-611–Building 123 Scrubber Solution Spill

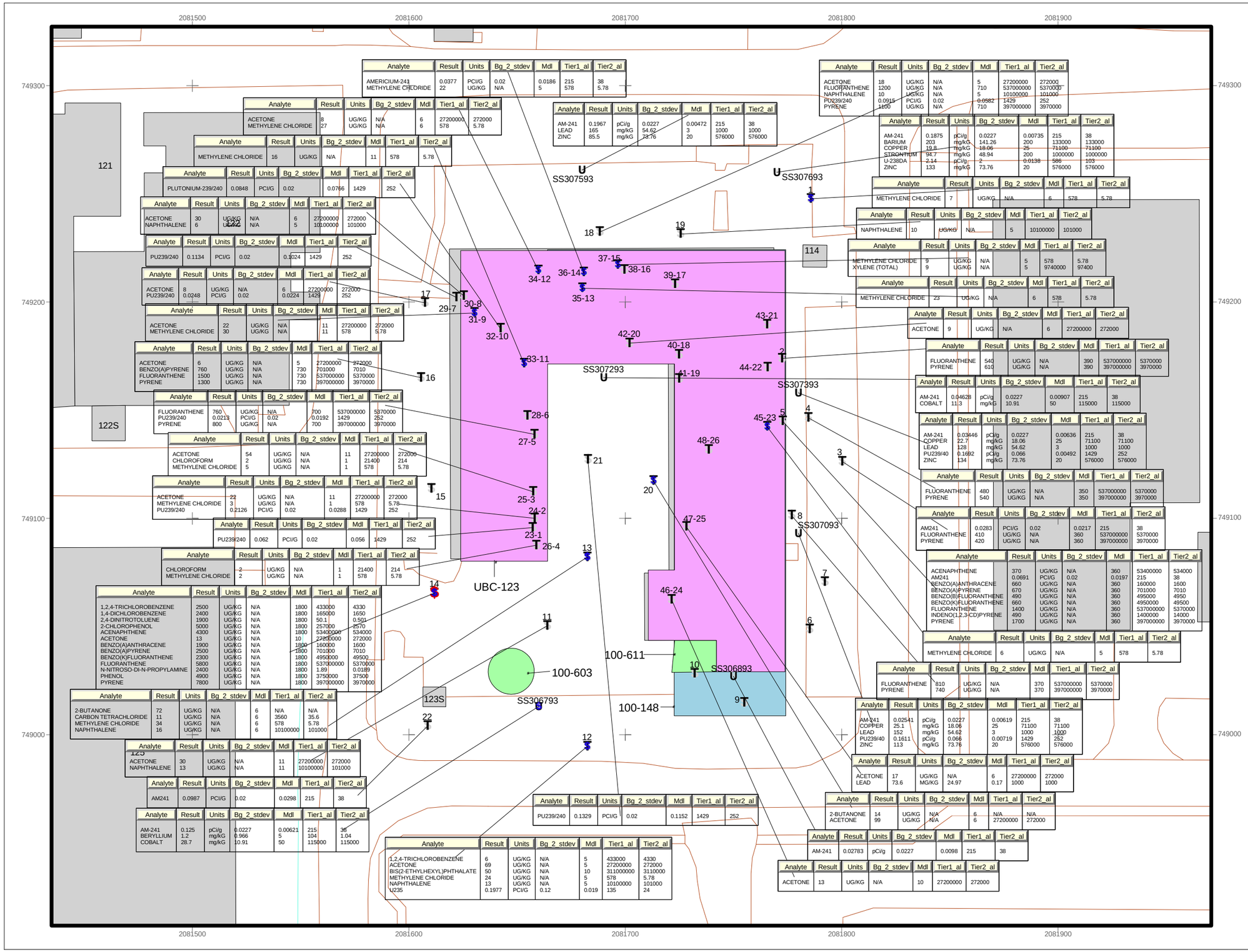
PAC 100-611 was not characterized prior to this accelerated action. Characterization sampling locations and specifications for PAC 100-611 were described in IASAP Addendum #IA-02-01 (DOE 2001b). The sampling specifications for the five characterization samples collected and analyzed for pH are listed in Table 1. The location of these samples and analytical results are shown on Figure 5. Analytical results are presented in Table 2.

2.2 Accelerated Action Description

Accelerated action activities including a description of the Area of Concern (AOC) and removal activities are described below.

2.2.1 Area of Concern

The AOC, shown on Figure 6, was determined based on analytical results from pre-accelerated action studies (Figures 3 and 4) (DOE 2000a, DOE 2001a, and DOE 2001c) described in Section 2.1.5. The AOC is defined as the area, not individual points, with a concentration of contaminants greater than background mean plus two standard deviations or MDLs. The AOC map also illustrates the limits of RFCA Tier II and Tier I exceedances. As shown on Figure 6 the Tier I SOR was exceeded (was greater than 1) at two locations. At the first location, near the north-central portion of the slab, subsurface soil lead concentrations were elevated at approximately one foot beneath the slab. At the second location, adjacent to the southwest corner of the slab, surface soil semivolatile organic compound (SVOC) concentrations were elevated.



Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
AMERICIUM-241	0.0377	PCI/G	0.02	0.0186	215	38
METHYLENE CHLORIDE	22	UG/KG	N/A	5	578	5.78

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
ACETONE	8	UG/KG	N/A	6	27200000	272000
METHYLENE CHLORIDE	27	UG/KG	N/A	6	578	5.78

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
METHYLENE CHLORIDE	16	UG/KG	N/A	11	578	5.78

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
PLUTONIUM-239/240	0.0848	PCI/G	0.02	0.0766	1429	252

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
ACETONE	30	UG/KG	N/A	6	27200000	272000
NAPHTHALENE	6	UG/KG	N/A	5	10100000	101000

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
PU239/240	0.1134	PCI/G	0.02	0.1024	1429	252

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
ACETONE	8	UG/KG	N/A	6	27200000	272000
PU239/240	0.0248	PCI/G	0.02	0.0224	1429	252

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
ACETONE	22	UG/KG	N/A	11	27200000	272000
METHYLENE CHLORIDE	30	UG/KG	N/A	11	578	5.78

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
ACETONE	6	UG/KG	N/A	5	27200000	272000
BENZO(A)PYRENE	760	UG/KG	N/A	730	701000	7010
FLUORANTHENE	1500	UG/KG	N/A	730	537000000	5370000
PYRENE	1300	UG/KG	N/A	730	397000000	3970000

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
FLUORANTHENE	760	UG/KG	N/A	700	537000000	5370000
PU239/240	0.0213	PCI/G	0.02	0.0192	1429	252
PYRENE	800	UG/KG	N/A	700	397000000	3970000

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
ACETONE	54	UG/KG	N/A	11	27200000	272000
CHLOROFORM	2	UG/KG	N/A	1	21400	214
METHYLENE CHLORIDE	5	UG/KG	N/A	1	578	5.78

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
ACETONE	22	UG/KG	N/A	11	27200000	272000
METHYLENE CHLORIDE	3	UG/KG	N/A	1	578	5.78
PU239/240	0.2126	PCI/G	0.02	0.0288	1429	252

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
PU239/240	0.062	PCI/G	0.02	0.056	1429	252

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
CHLOROFORM	2	UG/KG	N/A	1	21400	214
METHYLENE CHLORIDE	2	UG/KG	N/A	1	578	5.78

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
1,2,4-TRICHLOROBENZENE	2500	UG/KG	N/A	1800	433000	4330
1,4-DICHLOROBENZENE	2400	UG/KG	N/A	1800	165000	1650
2,4-DINITROTOLUENE	1900	UG/KG	N/A	1800	50.1	0.501
2-CHLOROPHENOL	5000	UG/KG	N/A	1800	257000	2570
ACENAPHTHENE	4300	UG/KG	N/A	1800	53400000	534000
ACETONE	13	UG/KG	N/A	10	27200000	272000
BENZO(A)ANTHRACENE	1900	UG/KG	N/A	1800	160000	1600
BENZO(A)PYRENE	2500	UG/KG	N/A	1800	701000	7010
BENZO(K)FLUORANTHENE	2300	UG/KG	N/A	1800	4950000	49500
FLUORANTHENE	5800	UG/KG	N/A	1800	537000000	5370000
N-NITROSO-DI-N-PROPYLAMINE	2400	UG/KG	N/A	1800	1.89	0.0189
PHENOL	4900	UG/KG	N/A	1800	3750000	37500
PYRENE	7800	UG/KG	N/A	1800	397000000	3970000

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
2-BUTANONE	72	UG/KG	N/A	6	N/A	N/A
CARBON TETRACHLORIDE	11	UG/KG	N/A	6	3560	35.6
METHYLENE CHLORIDE	34	UG/KG	N/A	6	578	5.78
NAPHTHALENE	16	UG/KG	N/A	6	10100000	101000

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
ACETONE	30	UG/KG	N/A	11	27200000	272000
NAPHTHALENE	13	UG/KG	N/A	11	10100000	101000

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
AM241	0.0987	PCI/G	0.02	0.0298	215	38

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
AM-241	0.125	pCi/g	0.0227	0.00621	215	38
BERYLLIUM	1.2	mg/KG	0.966	5	104	1.04
COBALT	28.7	mg/KG	10.91	50	115000	115000

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
AM-241	0.1967	pCi/g	0.0227	0.00472	215	38
LEAD	165	mg/KG	54.62	3	1000	1000
ZINC	85.5	mg/KG	73.76	20	576000	576000

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
PU239/240	0.1329	PCI/G	0.02	0.1152	1429	252

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
1,2,4-TRICHLOROBENZENE	6	UG/KG	N/A	5	433000	4330
ACETONE	69	UG/KG	N/A	5	27200000	272000
BIS(2-ETHYLHEXYL)PHTHALATE	50	UG/KG	N/A	10	311000000	3110000
METHYLENE CHLORIDE	24	UG/KG	N/A	5	578	5.78
NAPHTHALENE	13	UG/KG	N/A	5	10100000	101000
U235	0.1977	PCI/G	0.12	0.019	135	24

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
ACETONE	18	UG/KG	N/A	5	27200000	272000
FLUORANTHENE	1200	UG/KG	N/A	710	537000000	5370000
NAPHTHALENE	10	UG/KG	N/A	5	10100000	101000
PU239/240	0.0915	PCI/G	0.02	0.0582	1429	252
PYRENE	1100	UG/KG	N/A	710	397000000	3970000

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
AM-241	0.1875	pCi/g	0.0227	0.00735	215	38
BARIUM	203	mg/KG	141.26	200	133000	133000
COPPER	19.8	mg/KG	18.06	25	71100	71100
STRONTIUM	94.7	mg/KG	48.94	200	1000000	1000000
U-238DA	2.14	pCi/g	2	0.0138	586	103
ZINC	133	mg/KG	73.76	20	576000	576000

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
METHYLENE CHLORIDE	7	UG/KG	N/A	6	578	5.78

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
NAPHTHALENE	10	UG/KG	N/A	5	10100000	101000

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
METHYLENE CHLORIDE	9	UG/KG	N/A	5	578	5.78
XYLENE (TOTAL)	9	UG/KG	N/A	5	9740000	97400

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
METHYLENE CHLORIDE	23	UG/KG	N/A	6	578	5.78

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
ACETONE	9	UG/KG	N/A	6	27200000	272000

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
FLUORANTHENE	540	UG/KG	N/A	390	537000000	5370000
PYRENE	610	UG/KG	N/A	390	397000000	3970000

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
AM-241	0.04628	pCi/g	0.0227	0.00907	215	38
COBALT	11.3	mg/KG	10.91	50	115000	115000

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
AM-241	0.03446	pCi/g	0.0227	0.00636	215	38
COPPER	22.7	mg/KG	18.06	25	71100	71100
LEAD	128	mg/KG	54.62	3	1000	1000
PU239/40	0.1692	pCi/g	0.066	0.00492	1429	252
ZINC	134	mg/KG	73.76	20	576000	576000

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
FLUORANTHENE	480	UG/KG	N/A	350	537000000	5370000
PYRENE	540	UG/KG	N/A	350	397000000	3970000

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
AM241	0.0283	PCI/G	0.02	0.0217	215	38
FLUORANTHENE	410	UG/KG	N/A	360	537000000	5370000
PYRENE	420	UG/KG	N/A	360	397000000	3970000

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
ACENAPHTHENE	370	UG/KG	N/A	360	53400000	534000
AM241	0.0691	PCI/G	0.02	0.0197	215	38
BENZO(A)ANTHRACENE	660	UG/KG	N/A	360	160000	1600
BENZO(A)PYRENE	670	UG/KG	N/A	360	701000	7010
BENZO(B)FLUORANTHENE	490	UG/KG	N/A	360	495000	4950
BENZO(K)FLUORANTHENE	660	UG/KG	N/A	360	4950000	49500
FLUORANTHENE	1400	UG/KG	N/A	360	537000000	5370000
INDENO(1,2,3-CD)PYRENE	490	UG/KG	N/A	360	1400000	14000
PYRENE	1700	UG/KG	N/A	360	397000000	3970000

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
METHYLENE CHLORIDE	6	UG/KG	N/A	5	578	5.78

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
FLUORANTHENE	810	UG/KG	N/A	370	537000000	5370000
PYRENE	740	UG/KG	N/A	370	397000000	3970000

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
AM-241	0.02541	pCi/g	0.0227	0.00619	215	38
COPPER	25.1	mg/KG	18.06	25	71100	71100
LEAD	152	mg/KG	54.62	3	1000	1000
PU239/40	0.1611	pCi/g	0.066	0.00719	1429	252
ZINC	113	mg/KG	73.76	20	576000	576000

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
ACETONE	17	UG/KG	N/A	6	27200000	272000
LEAD	73.6	MG/KG	24.97	0.17	1000	1000

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
2-BUTANONE	14	UG/KG	N/A	6	N/A	N/A
ACETONE	99	UG/KG	N/A	6	27200000	272000

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
AM-241	0.02783	pCi/g	0.0227	0.0098	215	38

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
ACETONE	13	UG/KG	N/A	10	27200000	272000

Figure 3
Location of Pre-Accelerated Action Sample Results Above Detection Limits or Background Levels for IA Group 100-4 (100-148, 100-603, 100-611, and UBC 123)

KEY

- FY 2002 IHSS location
- FY 2002 PAC location
- FY 2002 UBC location
- Building/structure
- Paved area
- Dirt road
- Stream, ditch, or other drainage feature

Existing soil sampling locations

- W — Both subsurface and surface soil
- T — Subsurface soil
- U — Surface soil

N

Scale = 1:525

40 0 40 Feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared by: Waterstone Environmental Hydrology and Engineering, Inc.

Prepared for: Kaiser-Hill Company

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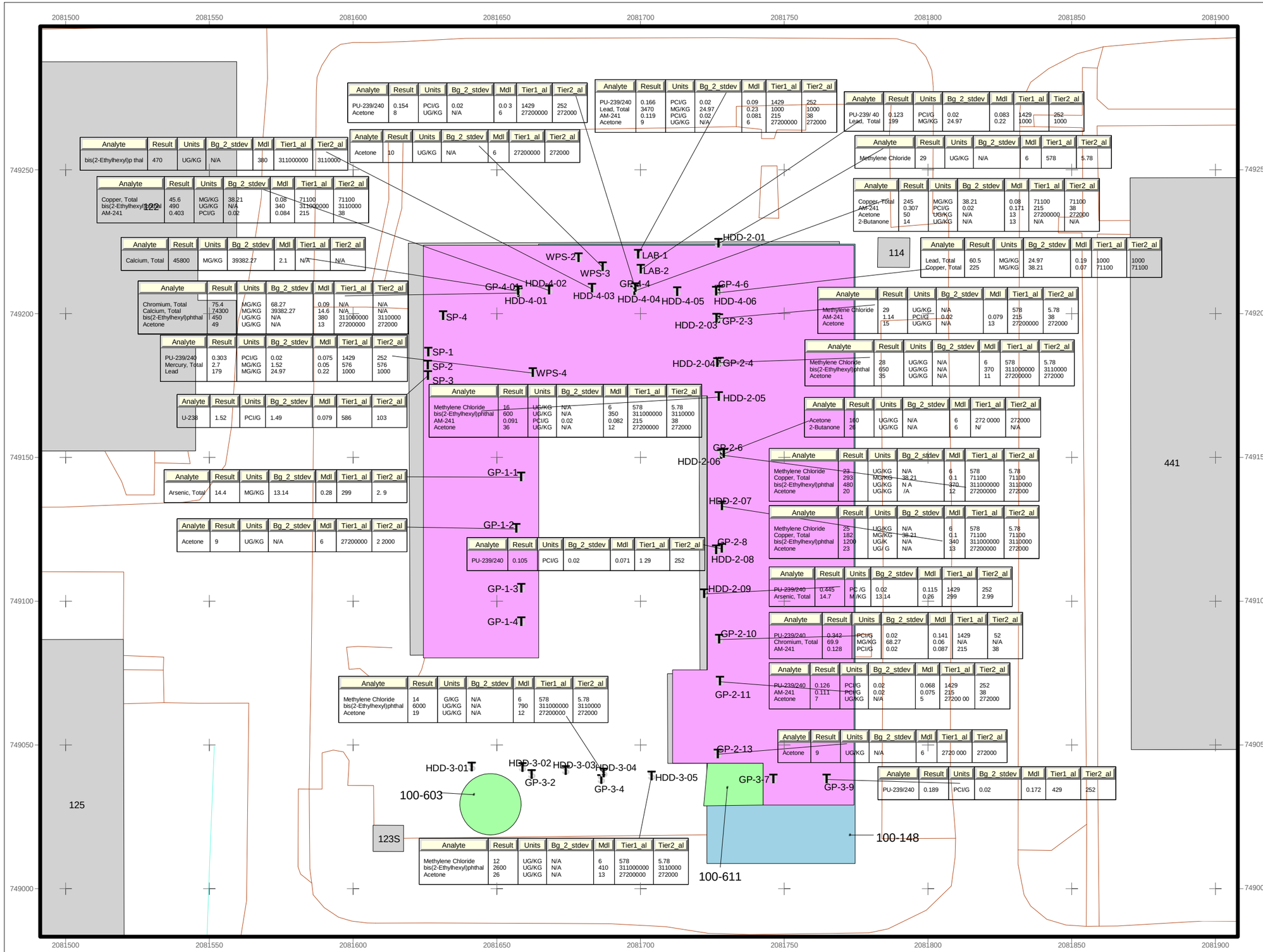
September 2002



Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
PU-239/240	0.154	PCI/G	0.02	0.0 3	1429	252
Acetone	8	UG/KG	N/A	6	27200000	272000

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
PU-239/240	0.166	PCI/G	0.02	0.09	1429	252
Lead, Total	3470	MG/KG	24.97	0.23	1000	1000
AM-241	0.119	PCI/G	0.02	0.081	215	38
Acetone	9	UG/KG	N/A	6	27200000	272000

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
PU-239/ 40	0.123	PCI/G	0.02	0.083	1429	252
Lead, Total	199	MG/KG	24.97	0.22	1000	1000

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
bis(2-Ethylhexyl)p thal	470	UG/KG	N/A	380	311000000	3110000

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
Acetone	10	UG/KG	N/A	6	27200000	272000

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
Methylene Chloride	29	UG/KG	N/A	6	578	5.78

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
Copper, Total	45.6	MG/KG	38.21	0.08	71100	71100
bis(2-Ethylhexyl)phthal	490	UG/KG	N/A	340	311000000	3110000
AM-241	0.403	PCI/G	0.02	0.084	215	38

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
Copper, Total	245	MG/KG	38.21	0.08	71100	71100
AM-241	0.307	PCI/G	0.02	0.171	215	38
Acetone	50	UG/KG	N/A	13	27200000	272000
2-Butanone	14	UG/KG	N/A	13	N/A	N/A

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
Calcium, Total	45800	MG/KG	39382.27	2.1	N/A	N/A

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
Lead, Total	60.5	MG/KG	24.97	0.19	1000	1000
Copper, Total	225	MG/KG	38.21	0.07	71100	71100

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
Chromium, Total	75.4	MG/KG	68.27	0.09	N/A	N/A
Calcium, Total	74300	MG/KG	39382.27	14.6	N/A	N/A
bis(2-Ethylhexyl)phthal	450	UG/KG	N/A	380	311000000	3110000
Acetone	49	UG/KG	N/A	13	27200000	272000

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
Methylene Chloride	29	UG/KG	N/A		578	5.78
AM-241	1.14	PCI/G	0.02	0.079	215	38
Acetone	15	UG/KG	N/A	13	27200000	272000

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
PU-239/240	0.303	PCI/G	0.02	0.075	1429	252
Mercury, Total	2.7	MG/KG	1.52	0.05	576	576
Lead	179	MG/KG	24.97	0.22	1000	1000

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
Methylene Chloride	28	UG/KG	N/A	6	578	5.78
bis(2-Ethylhexyl)phthal	650	UG/KG	N/A	370	311000000	3110000
Acetone	35	UG/KG	N/A	11	27200000	272000

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
U-238	1.52	PCI/G	1.49	0.079	586	103

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
Methylene Chloride	16	UG/KG	N/A	6	578	5.78
bis(2-Ethylhexyl)phthal	600	UG/KG	N/A	350	311000000	3110000
AM-241	0.091	PCI/G	0.02	0.082	215	38
Acetone	36	UG/KG	N/A	12	27200000	272000

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
Acetone	160	UG/KG	N/A	6	272 0000	272000
2-Butanone	26	UG/KG	N/A	6	N/	N/A

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
Arsenic, Total	14.4	MG/KG	13.14	0.28	299	2. 9

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
Methylene Chloride	23	UG/KG	N/A	6	578	5.78
Copper, Total	293	MG/KG	38.21	0.1	71100	71100
bis(2-Ethylhexyl)phthal	480	UG/KG	N A	370	311000000	3110000
Acetone	20	UG/KG	/A	12	27200000	272000

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
Acetone	9	UG/KG	N/A	6	27200000	2 2000

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
Methylene Chloride	25	UG/KG	N/A	6	578	5.78
Copper, Total	182	MG/KG	38.21	0.1	71100	71100
bis(2-Ethylhexyl)phthal	1200	UG/K	N/A	340	311000000	3110000
Acetone	23	UG/ G	N/A	13	27200000	272000

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
PU-239/240	0.105	PCI/G	0.02	0.071	1 29	252

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
PU-239/240	0.445	PC /G	0.02	0.115	1429	252
Arsenic, Total	14.7	M /KG	13.14	0.26	299	2.99

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
PU-239/240	0.342	PCI/G	0.02	0.141	1429	52
Chromium, Total	69.9	MG/KG	68.27	0.06	N/A	N/A
AM-241	0.128	PCI/G	0.02	0.087	215	38

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
Methylene Chloride	14	G/KG	N/A	6	578	5.78
bis(2-Ethylhexyl)phthal	6000	UG/KG	N/A	790	311000000	3110000
Acetone	19	UG/KG	N/A	12	27200000	272000

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
PU-239/240	0.126	PCI/G	0.02	0.068	1429	252
AM-241	0.111	PCI/G	0.02	0.075	215	38
Acetone	7	UG/KG	N/A	5	27200 00	272000

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
Acetone	9	UG/KG	N/A	6	2720 000	272000

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
PU-239/240	0.189	PCI/G	0.02	0.172	429	252

Analyte	Result	Units	Bg_2_stdev	Mdl	Tier1_al	Tier2_al
Methylene Chloride	12	UG/KG	N/A	6	578	5.78
bis(2-Ethylhexyl)phthal	2600	UG/KG	N/A	410	311000000	3110000
Acetone	26	UG/KG	N/A	13	27200000	272000

Figure 4
Location of Pre-Accelerated Sample Results Above Detection Limits or Background Levels Collected at UBC 123 (IA Group 100-4) in November 2000

KEY

- FY 2002 IHSS location
- FY 2002 PAC location
- FY 2002 UBC location
- Building/structure
- Paved area
- Dirt road
- Stream, ditch, or other drainage feature

Existing soil sampling locations

- W — Both subsurface and surface soil
- T — Subsurface soil
- U — Surface soil

N

Scale = 1:400

10 0 10 20 30 Feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared by: WATERSTONE

Prepared for: KAISER•HILL COMPANY

postings-02 susan 12-03-01hrr.apr

16 November 2001

Table 1
PAC 100-611–Characterization Sampling Specifications

IHSS Group	IHSS/PAC/UBC Site	Location Code	Easting	Northing	Medium	Depth Interval (ft)	Analyte	Laboratory Method
100-4	PAC 100-611 – Building 123 Scrubber Solution Spill	BU38-0010	2081738.50	749033.50	Surface Soil	0'-.5'	pH	9045
		BU38-0012	2081723.92	749042.34	Surface Soil	0'-.5'	pH	9045
		BU38-0013	2081731.33	749042.66	Surface Soil	0'-.5'	pH	9045
		BU38-0014	2081727.14	749039.11	Surface Soil	0'-.5'	pH	9045
		BU38-0015	2081723.59	749036.53	Surface Soil	0'-.5'	pH	9045

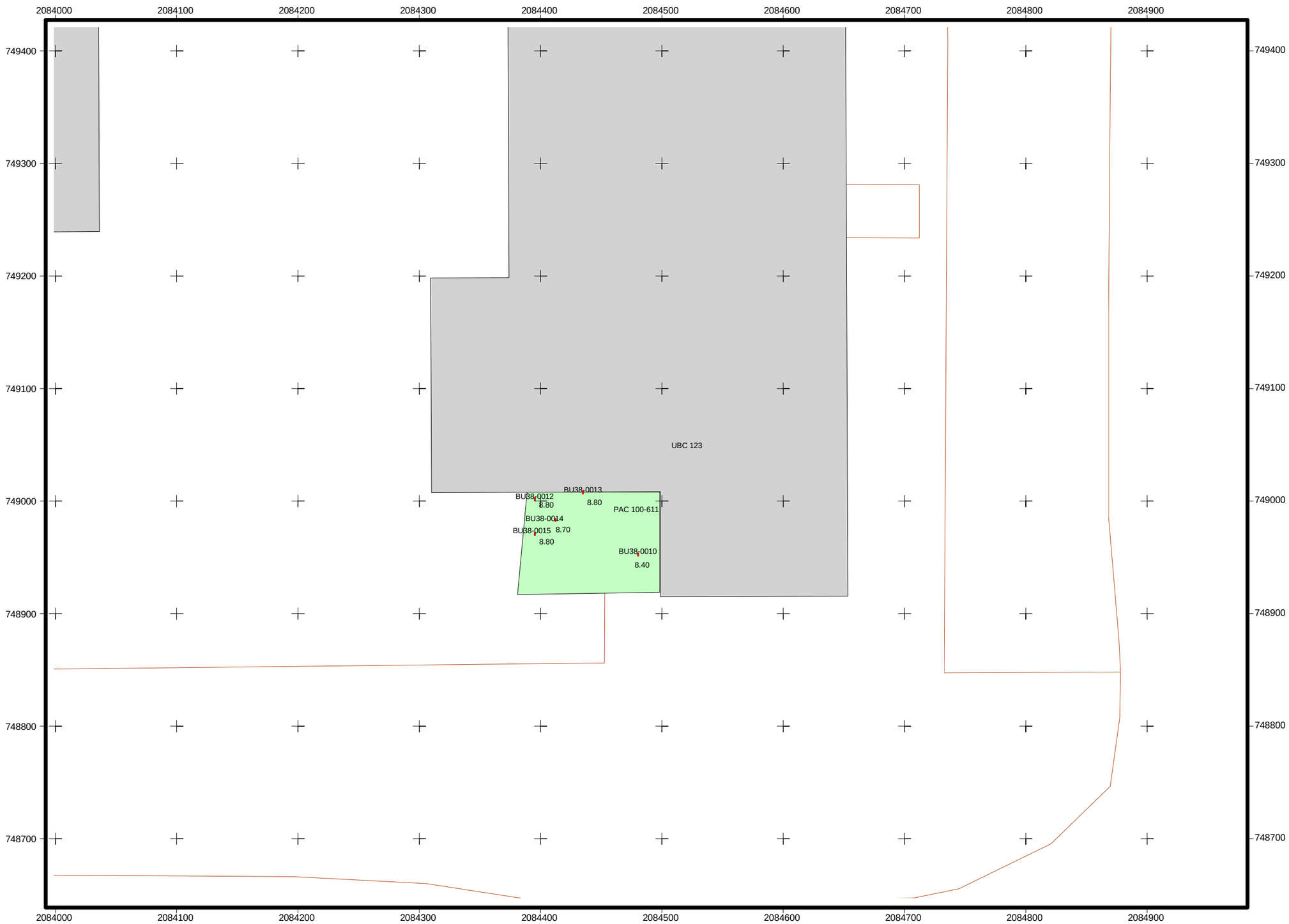


Figure 5
Characterization Sampling Locations and Results at PAC 100-611

Key

- Sampling Locations
- 100-611
- Buildings and other structures
- Paved areas
- Dirt roads
- Drainage Features

pH Results
Reported in Standard Units

N

Scale = 1:100

2 0 2 4 Feet

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Table 2
PAC 100-611–Characterization Data

IHSS Group	IHSS/PAC/UBC Site	Location Code	Analyte	Result (SU)	MDL	Background Plus Two Standard Deviations	Tier II AL	Tier I AL
100-4	PAC 100-611 – Building 123 Scrubber Solution Spill	BU38-0010	pH	8.4	NA	NA	NA	NA
		BU38-0012	pH	8.8	NA	NA	NA	NA
		BU38-0013	pH	8.8	NA	NA	NA	NA
		BU38-0014	pH	8.7	NA	NA	NA	NA
		BU38-0015	pH	8.8	NA	NA	NA	NA

NA Not Applicable
SU Standard Unit

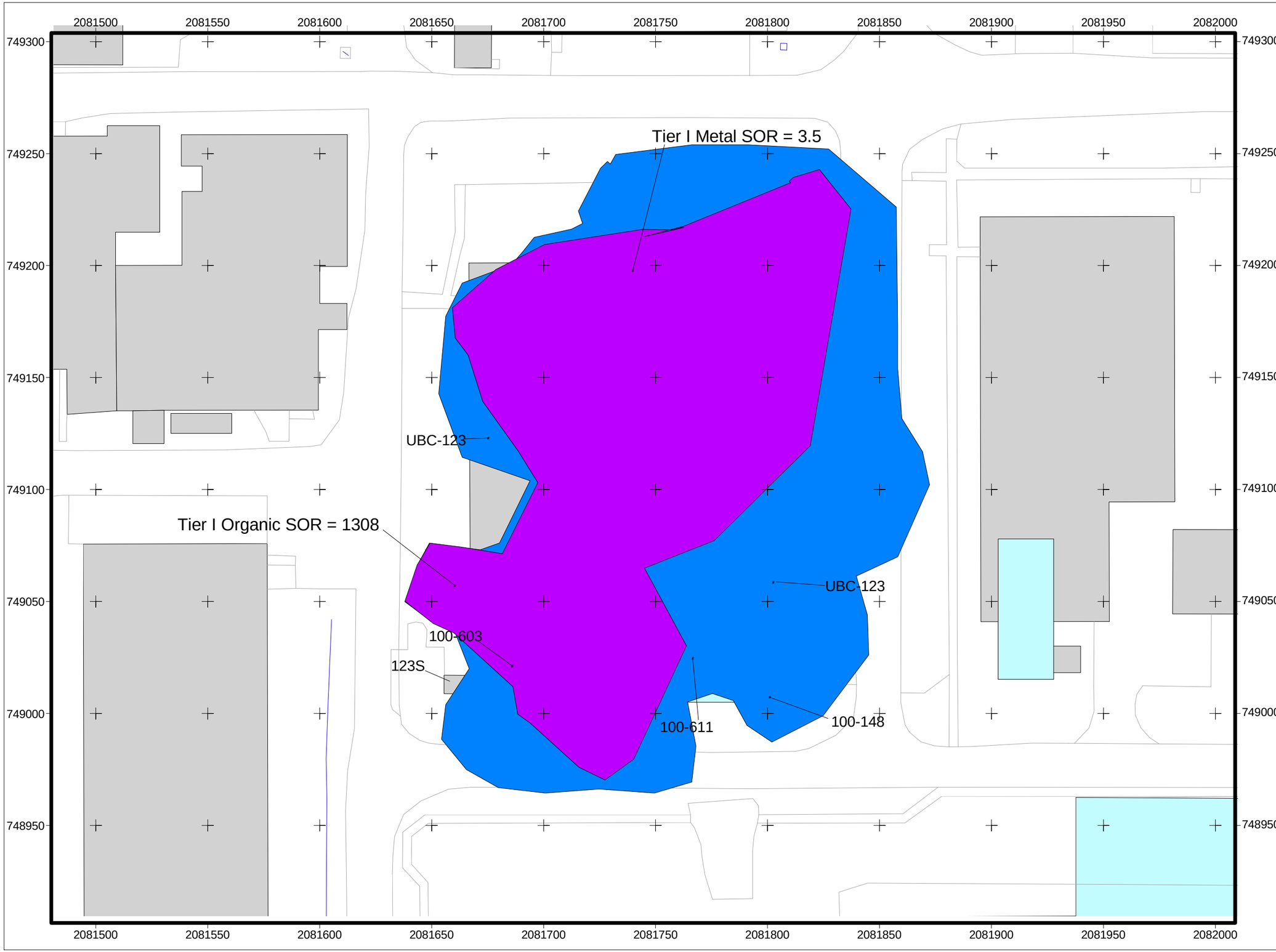

Figure 6
IHSS Group 100-4
Area of Concern

KEY

- Area of Concern
- Tier II
- Tier I
- Buildings and other structures
- Paved areas
- Dirt roads
- Streams, ditches, or other drainage features

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N

Scale = 1:550

30 0 30 Feet

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Based on these data, accelerated action objectives were developed and described in ER RSOP Notification #02-01 (DOE 2002b). The accelerated action objectives for IHSS Group 100-4 included the following:

- Remove the Building 123 slab, footers, source pits, and manholes and, if appropriate, recycle in accordance with the RSOP for Recycling Concrete (DOE 1999a);
- Remove the below-grade sumps and process waste lines to Valve Vault 18;
- Remove soil with contaminant concentrations greater than RFCA Tier I ALs; and
- Collect confirmation samples in accordance with the IASAP (DOE 2001a).

Remediation activities were conducted between January 29 and April 18, 2002. Start and end dates of significant activities are listed in Table 3.

Table 3
Dates of Accelerated Action Activities

Activity	Start Date	End Date	Duration
Characterization Sampling at PAC 100-611	February 5, 2002	February 5, 2002	1 Day
Removal Activities	January 31, 2002	April 2, 2002	61 Days
Backfill Excavations	February 15, 2002	April 4, 2002	49 Days
Reseed	April 18, 2002	April 18, 2002	1 Day

Photographs of site activities are provided in Appendix A.

2.2.2 Removal Activities

ER RSOP Notification #02-01 accelerated action project objectives were achieved through the following:

- Removal of the concrete slab and associated structures;
- Removal of below-grade sumps and process waste lines; and
- Removal of soil with contaminant concentrations greater than RFCA Tier I ALs.

These removal activities are described below.

Building 123 Slab, Footers, Source Pits, and Manholes

The Building 123 slab was broken up and removed using an excavator with a hydraulic hammer and bucket/thumb attachment (Photograph 1, Appendix A). As the concrete slab was excavated, the underneath side of the concrete was scanned with an NE Electra to determine if radionuclides were present. Concrete with fixed contamination covered with steel plates was cut out of the slab using a concrete saw. The cut concrete was then removed from the slab using the excavator with bucket/thumb attachment. Additionally eight samples were collected from the concrete for waste characterization. Analytical results are presented in the Section 2.6. Concrete that was not contaminated was recycled in accordance with the RSOP for Recycling Concrete (DOE 1999a).

Concrete that was determined contaminated or with known fixed contamination was removed and will be transported to the Nevada Test Site (NTS) for disposal as low-level waste (LLW).

Concrete building footers (Photograph 2, Appendix A) were excavated and scanned with an NE Electra to determine if radionuclides were present. Concrete was recycled in accordance with the RSOP for Recycling Concrete (DOE 1999a).

The 18-foot-long cesium-137 source well (Photographs 3 and 4, Appendix A) was removed. The source well piping consisted of 18-inch diameter corrugated steel pipe with a slightly smaller diameter stainless steel liner pipe. A stainless steel bottom was welded to the bottom of the corrugated pipe. The source well appeared to be filled with concrete. It was excavated in one piece and no significant corrosion was observed on the corrugated pipe surface. No contamination was observed on the pipe surface or on the bottom of the pipe. Positive analytical results are presented in Section 2.6 and all analytical data are presented in Appendix B. Groundwater was observed approximately 5 feet below the top of the pipe. This groundwater was not sampled. The source well was packaged and will be transported to NTS for disposal as LLW.

Once removed, samples were collected from soil beneath the bottom of the source well pipe and from soil adhered to the bottom of the pipe for radionuclide analyses. All results were less than RFCA Tier II ALs. The source well was backfilled with the excavated sand (Photograph 5, Appendix A). Samples were also collected from the stockpile of sand removed from around the pipe. Because of the depth of the source well excavation (approximately 20 feet) and associated hazards and weather issues, the excavation was immediately backfilled following sampling of the excavation (Appendix A, Photograph 5).

Manhole (MH)-1 and MH-2 (Appendix A, Photograph 6), and the approximately 5'x5' concrete slabs beneath the manholes were excavated. Soil samples were collected from beneath the manhole slab and are presented in Section 2.3, Confirmation Sampling. The concrete manholes and slabs were packaged and will be transported to NTS for disposal as LLW.

Sumps And Process Waste Lines

Sumps, OPWL, and NPWL in IHSS Group 100-4 are shown on Figure 2 and Photographs 8 through 12 in Appendix A. Accelerated action objectives were to remove all sumps and process waste lines within the AOC. Sumps located in the former Rooms 156, 157, and 158 were removed along with more than 1 foot of soil around and beneath the sumps. Pipelines between former Rooms 156 and 157 sump locations and more than 1 foot of soil around and beneath the pipelines were excavated. Additionally, approximately 40 feet of associated 4-inch-diameter stainless steel pipeline was excavated. Contamination was not detected on sumps or associated pipeline. Confirmation samples were collected from beneath each sump location, and one confirmation sample was collected in the pipeline trench between the Room 156 and 157 sump locations. Sumps were packaged and will be transported to NTS for disposal as LLW.

Most OPWL and NPWL in IHSS Group 100-4 were excavated and removed. Figure 7 shows the extent of pipeline removed, pipeline left in place, and pipeline not found. Two pipeline segments

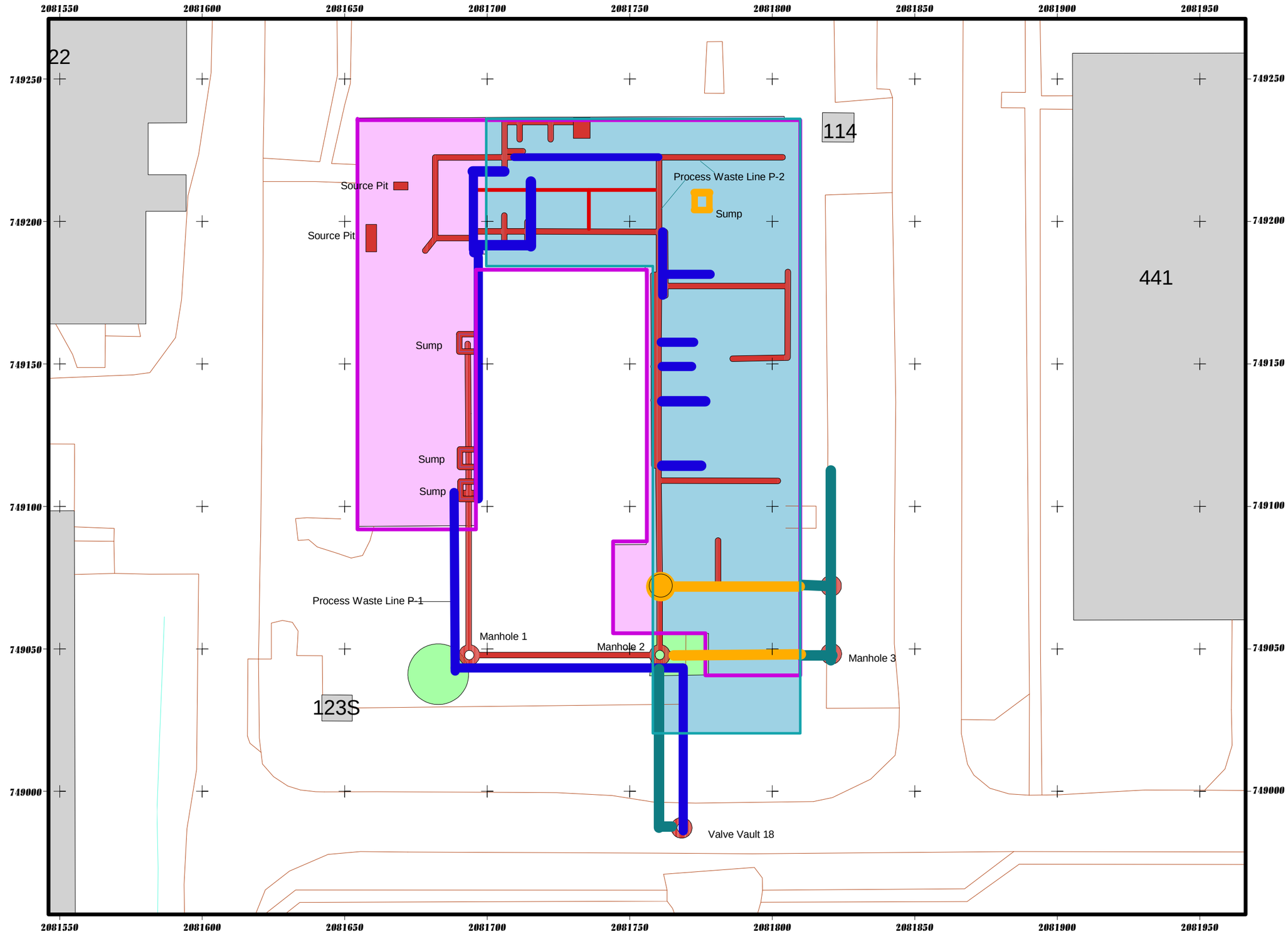

Figure 7
IHSS Group 100-4
Process Waste Lines

KEY

- Underground Process Waste Line - Removed
- Above Ground Process Waste Line - Removed (D&D)
- Process Waste Line - Left in Place
- Process Waste Line - Not Found
- FY 2002 IHSS locations
- FY 2002 PAC locations
- FY 2002 UBC locations
- Buildings and other structures
- Paved areas
- Dirt roads
- Streams, ditches, or other drainage features

N

Scale = 1:400

25 0 25 Feet

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were left in place because of logistical constraints. One to the south of UBC123 and one to the east. The pipeline ends were grouted with Sika Grout 212. These pipelines will be addressed when IHSS 121 (OPWL) and PAC 000-504 (NPWL) are addressed. Removed pipelines were packaged and will be transported to NTS for disposal as LLW.

Overburden was excavated and stockpiled near the pipeline excavations. Figure 8 shows the location of soil piles. As pipeline was removed, it was evaluated to determine whether there were cracks or other evidence of potential leaks.

While pipeline removal was routine, there were several unexpected events.

- At the time of removal, liquid drained from a 4-foot section of the east-west section of P-2, located beneath the former Room 112 (northwestern section of Building 123). The liquid was released when the cast iron pipe broke during removal. The excavation was stopped in this area, and samples of the liquid and soil beneath the liquid were collected. No contamination was detected on the removed pipe or in the liquid. Approximately 1 gallon of liquid was standing in the sand bedding beneath the pipe (Photograph 13, Appendix A). No other liquid was encountered during removal of the east-west section of P-2 pipe.

- Excavation of overburden soil above approximately 35 feet in length of the B123 P-1 process waste pipe extending east from MH-1 was stopped when it was determined that, if continued, the trench would be in close proximity to a known underground communications line in this area. Excavation was continued after evaluation determined it was safe to proceed.

- Two 10-foot sections of steam piping with asbestos-containing insulation were found beneath the northeastern section of the slab, removed, and packaged by an asbestos abatement contractor.

- Unanticipated pipeline was found beneath the northern section of the slab, south of the sumps and removed.

- A sheet of lead (about 2' x 3' x 1/8" thick) was encountered beneath an 8-inch diameter drain located approximately 5 feet south of the lead-contaminated soil location. The lead sheet, observed approximately 3 inches beneath the drain, was removed.

During process waste line removal, pipelines were evaluated to determine the condition of the pipeline. Table 4 summarizes the pipelines and their condition. Confirmation sampling analytical data are presented in Section 2.3.

<u>*Contaminated Soil*</u>

An approximately 4’ x 4’ x 4’ section of subsurface lead-contaminated soil (Figure 6 and Photographs 16 and 17 in Appendix A) was excavated. An approximately 5’x 5’ x 3’ section of SVOC-contaminated soil (Figure 6) was excavated. Soil was packaged and will be shipped to Envirocare as low-level mixed waste (LLMW).

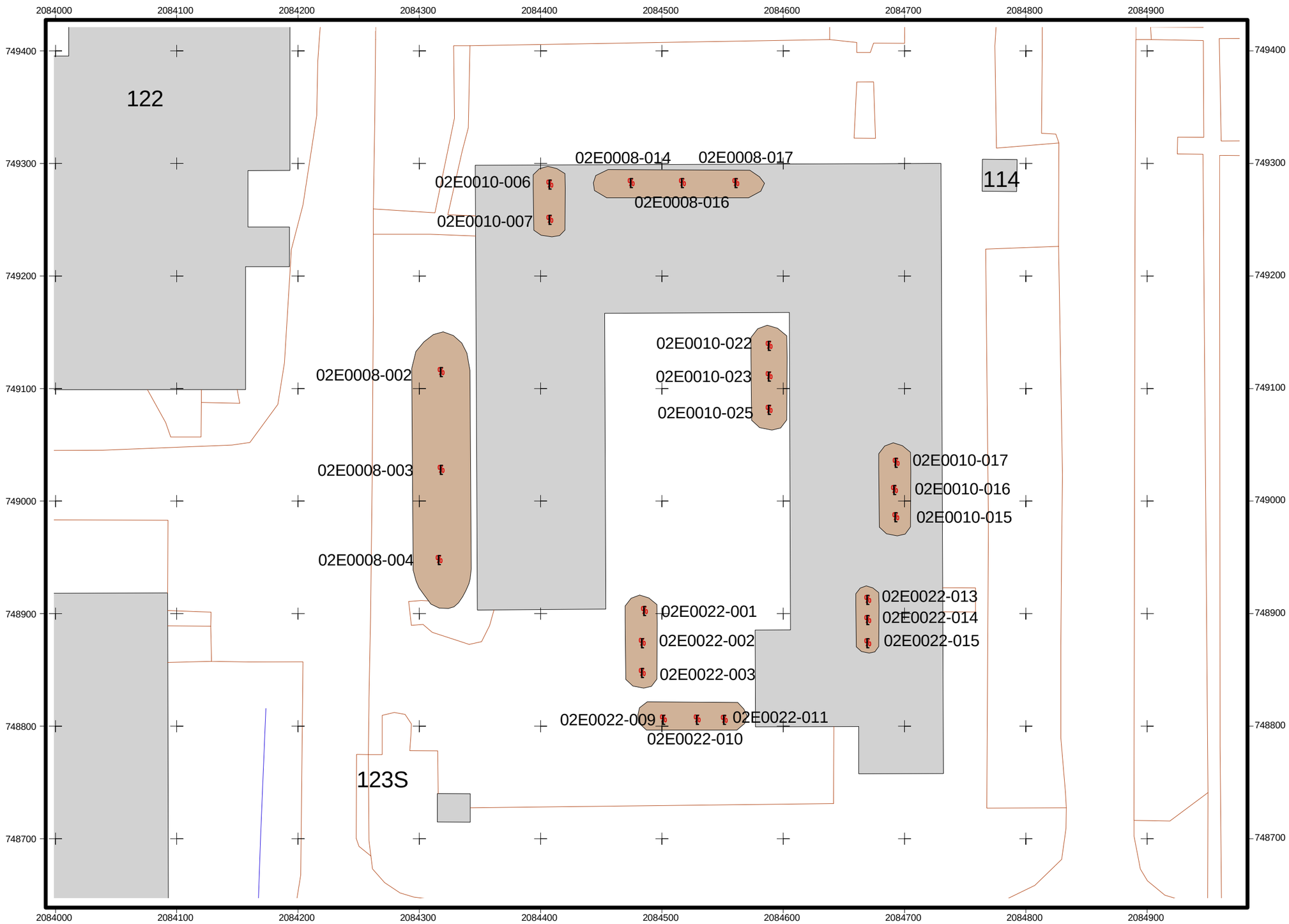

Figure 8
Location of Soil Stock Piles

Key

- Stock Pile Samples
- Waste Piles
- Paved areas
- Dirt roads
- Drainage Features
- Buildings and other structures

N

Scale = 1:500

10 0 10 20 Feet

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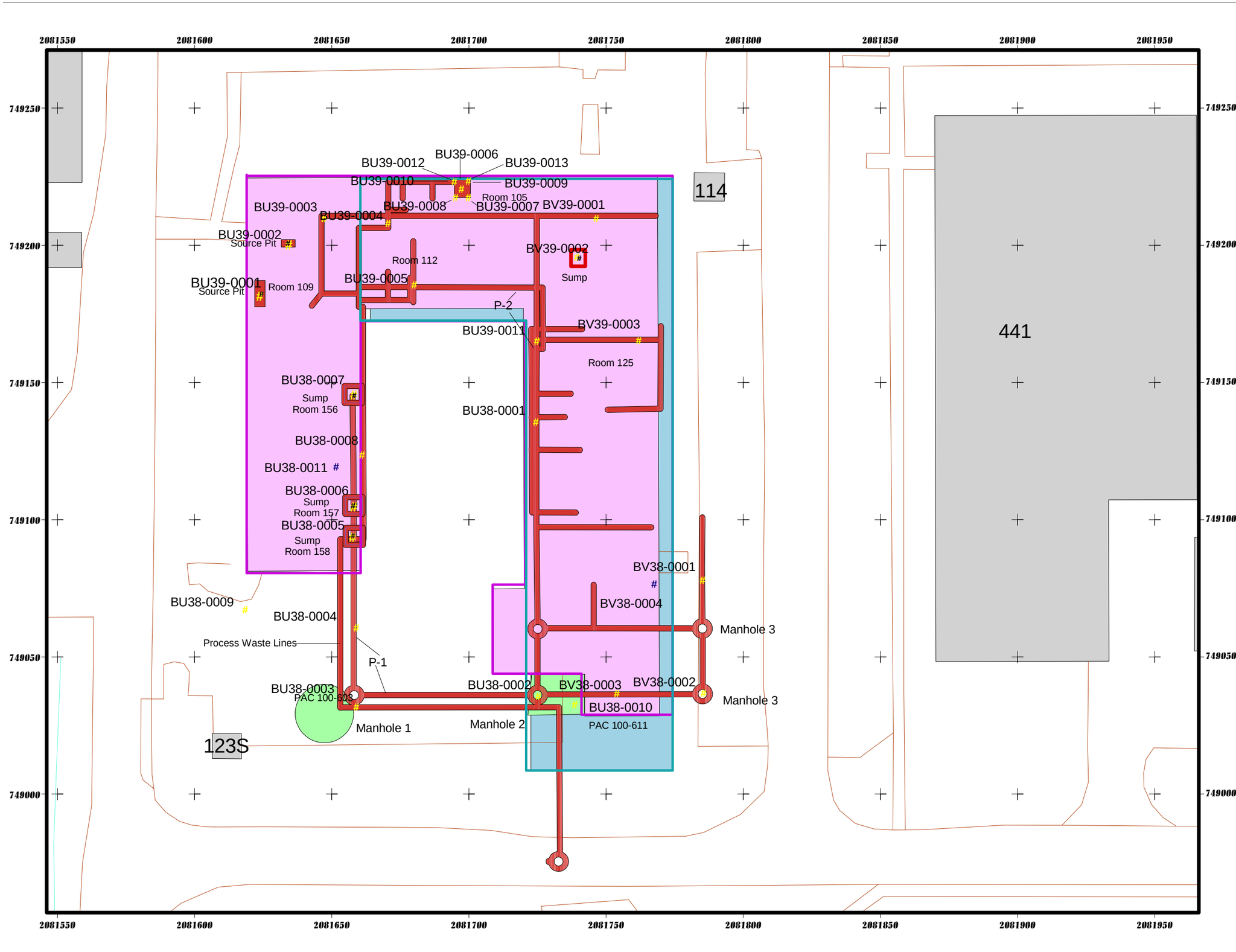

Figure 9
IHSS Group 100-4
Planned Confirmation Sampling Locations

KEY

Process Waste Lines

Confirmation Sampling Location

HPGe Sampling Location

FY 2002 IHSS locations

FY 2002 PAC locations

FY 2002 UBC locations

Buildings and other structures

Paved areas

Dirt roads

Streams, ditches, or other drainage features

N

Scale = 1:400

25 0 25 Feet

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Table 4
Process Waste Line Summary

Pipeline Number	Composition	Leaks/Breaks	Approximate Depth (feet)	Type and Location of Seal	Photograph Number (Appendix A)
P-1 NPWL (1989)	Fiber Reinforced	No breaks, leaks, or staining	5	NA	14
P-1 OPWL (1972)	Stainless Steel	No breaks, leaks, or staining	5	NA	14
P-2 (1952)	Cast Iron	No breaks, leaks, or staining	4 to 6	Grouted with Sika Grout 212 at Manhole 2	7 and 15
P-2 pipe chases	Cast Metal	No breaks, leaks, or staining	0.5 to 1	NA	
Unanticipated P-2 pipeline found at Sample Locations BU39-0004 and Northern Process Line	Cast Iron	No breaks, leaks, or staining	5	Grouted with Sika Grout 212 at Manholes 3 and 4	NA

2.3 Confirmation Sampling

Confirmation sampling and analysis was conducted, after excavation and before backfilling, to verify accelerated action goals. Planned confirmation sampling locations were developed as part of the consultative process and are shown on Figure 9. Locations of collected confirmation samples are shown on Figure 10. Several confirmation sampling locations were changed because of the following:

- Pipeline was not found at that location; and
- Pipeline was found at locations not previously mapped.

Table 5 summarizes the analytes that were obtained from each sampling location. Only one location, BU38-0009, was sampled for organics. This location corresponds to the area where the RFCA Tier I SOR for SVOCs was greater than 1 in surface soil. Metals were analyzed at locations BU39-0006, -0007, -0008, -0012, and -0013 where lead concentrations were greater than RFCA Tier I ALs. Radionuclides were analyzed at all other locations associated with the process waste lines, sump, and source pit excavations.

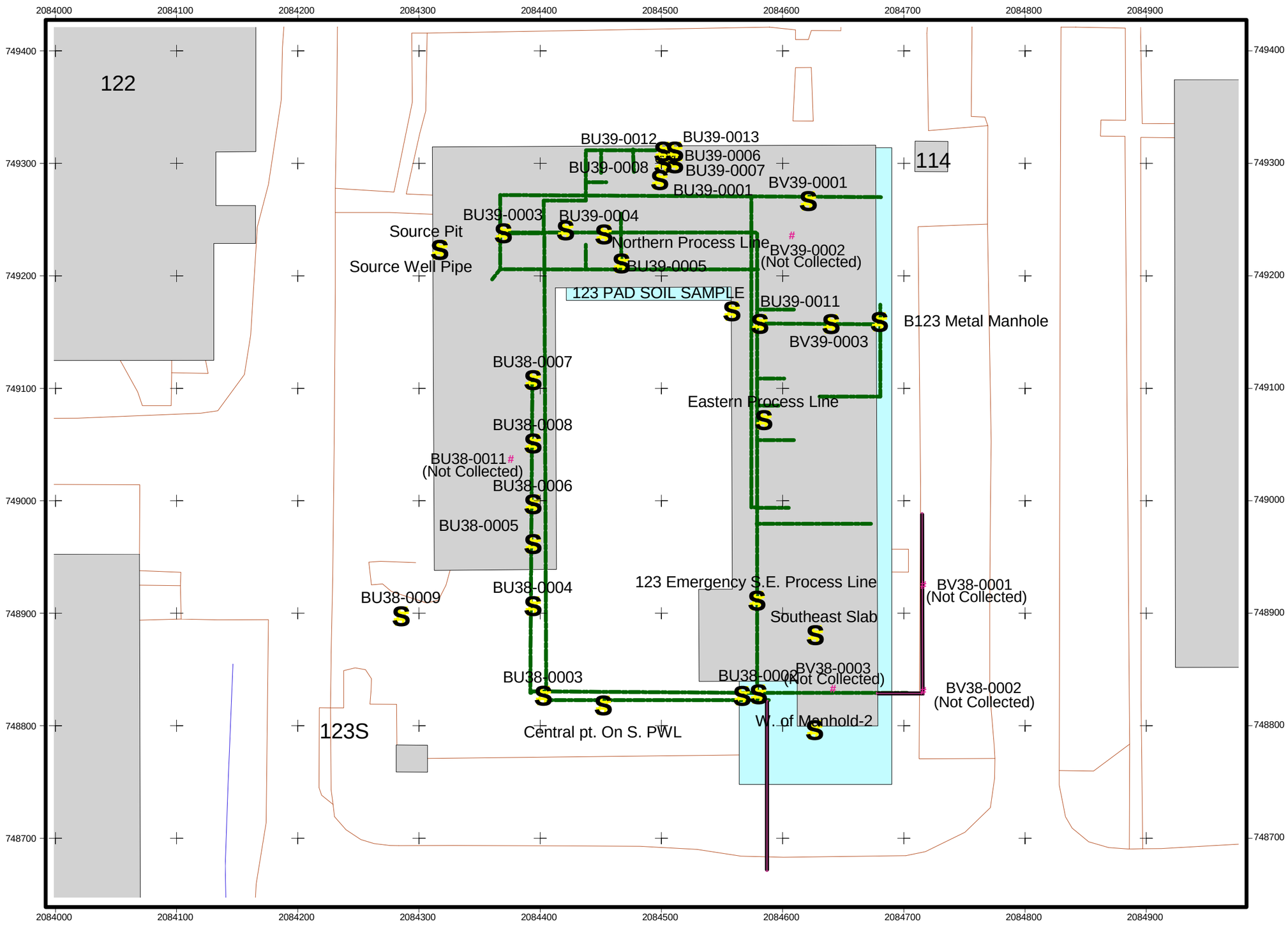

Figure 10
IHSS Group 100-4
Actual Confirmation Sampling Locations

Key

- S — Confirmation Samples
- # — Samples Not Collected
- Process Waste Lines Left In Place
- Process Waste Lines Removed
- % — Pits-as-built
- Buildings and other structures
- IHSS 148
- Paved areas
- Dirt roads
- Drainage Features

N

Scale = 1:500

10 0 10 20 Feet

State Plane Coordinate Projection
Colorado Central Zone
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Table 5
IHSS Group 100-4–Confirmation Sampling Specifications

IHSS Group	IHSS/PAC/UBC Site	Sampling Location	Easting	Northing	Media	Depth Interval (feet)	Analyte	Laboratory Method	Comments
100-4	UBC 123 – Radiological Health Physics Laboratory IHSS 100-148 – Waste Leaks	BU38-0002	2081729.02	749039.10	Subsurface Soil	8.0	Radionulcides	Alpha Spec	Manhole 2
		BU38-0003	2081656.21	749038.61	Subsurface Soil	7.0	Radionuclides	Alpha Spec	
		BU38-0004	2081652.69	749068.93	Subsurface Soil	5.0	Radionulcides	Gamma Spec Alpha Spec	
		BU38-0005	2081653.59	749089.94	Subsurface Soil	5.0	Radionuclides	Alpha Spec	Southwestern Sump
		BU38-0006	2081653.59	749103.45	Subsurface Soil	5.0	Radionuclides	Alpha Spec	Western Sump
		BU38-0007	2081653.59	749145.41	Subsurface Soil	5.0	Radionuclides	Alpha Spec	Northern Sump on Western Side
		BU38-0008	2081653.59	749124.00	Subsurface Soil	5.0	Radionuclides	Alpha Spec	West Process Line
		BU38-0009	2081608.1	749065.5	Subsurface Soil	2.0	SVOCs	8270	
		BU39-0001	2081695.58	749213.15	Surface Soil	0.0–0.5	Radionulcides	Alpha Spec	
		BU39-0003	2081642.68	749195.15	Subsurface Soil	2.0	Radionulcides	Alpha Spec	West Point Northern Pad Process Line
		BU39-0004	2081676.72	749194.75	Subsurface Soil	2.0	Radionulcides	Alpha Spec	Center Process Line on Northern Pad
		BU39-0005	2081682.58	749184.90	Subsurface Soil	2.0	Radionulcides	Alpha Spec	Southern Process Line on Northern Pad
		BU39-0006	2081698.67	749220.80	Subsurface Soil	4.0	Metals	6010	Lead Area Excavation Bottom Center
		BU39-0007	2081700.67	749218.80	Subsurface Soil	4.0	Metals	6010	Lead Area Excavation East Side Wall
		BU39-0008	2081696.67	749218.80	Subsurface Soil	4.0	Metals	6010	Lead Area Excavation South Side Wall
		BU39-0011	2081729.47	749164.49	Subsurface Soil	2.0	Radionulcides	Gamma Spec Alpha Spec	Northern Trench on Eastern Slab, West Side of Trench
		BU39-0012	2081696.67	749222.80	Subsurface Soil	4.0	Metals	6010	Lead Area Excavation West Side Wall

IHSS Group	IHSS/PAC/UBC Site	Sampling Location	Easting	Northing	Media	Depth Interval (feet)	Analyte	Laboratory Method	Comments
		BU39-0013	2081731.33	749042.66	Subsurface Soil	4.0	Metals	6010	Lead Area Excavation North Side Wall
		BV39-0003	2081753.57	749164.40	Subsurface Soil	2.0	Radionulcides	Gamma Spec Alpha Spec	Northern Trench on East Slab, East Side of Trench
		Central pt. on S. PWL	2081676.505	749035.331	Subsurface Soil	5.0	Metals Radionulcides	6010 Alpha Spec	
		Eastern Process Line (BU38-0001)	2081730.80	749131.89	Subsurface Soil	5.0 (approximate)	Radionulcides	Alpha Spec	
		Northern Process Line	In-Process Sample	In-Process Sample	Subsurface Soil	0.0-1.5	Metals Radionulcides	6010 Alpha Spec	
		Source Pit (BU39-0002)	2081621.13 (estimated)	749189.52 (estimated)	Subsurface Soil	18.0	Metals Radionulcides	6010 Alpha Spec	
		Southeast Slab	2081748.236	749059.106	Concrete	0.0	Radionuclides	Gamma Spec	

Confirmation sampling results indicate that all contaminant concentrations are less than RFCA Tier II ALs. Results of the confirmation sampling are shown on Figure 11 and detailed in Table 6. Figure 11 and Table 6 present confirmation sampling results that are greater than background plus two standard deviations or MDLs along with RFCA Tier I and Tier II ALs for reference. Confirmation sampling contaminant concentrations were below the proposed Wildlife Refuge Worker (WRW) ALs. Residual lead concentrations were greater than the proposed ecological ALs. The complete data set is in Appendix B.

SOR calculations were based on the following list of contaminants of concern (COCs):

- Radionuclides (americium-241, plutonium-239/240, uranium-234, uranium-235, and uranium-238);
- Metals (arsenic, copper, mercury, lead); and
- Organics (SVOCs).

The COCs are based on characterization data that exceed background plus two standard deviations or MDLs. Metals and organics were grouped together for nonradionuclide SOR calculations. Plutonium, americium, and uranium were grouped together for radionuclide SOR calculations. Tier II SOR calculations for radionuclides and nonradionuclides are presented on Figures 12 and 13, respectively. As shown, all locations are less than the threshold value of 1. Table 7 lists the confirmation sampling RFCA Tier II SORs.

2.4 RCRA Unit Closure

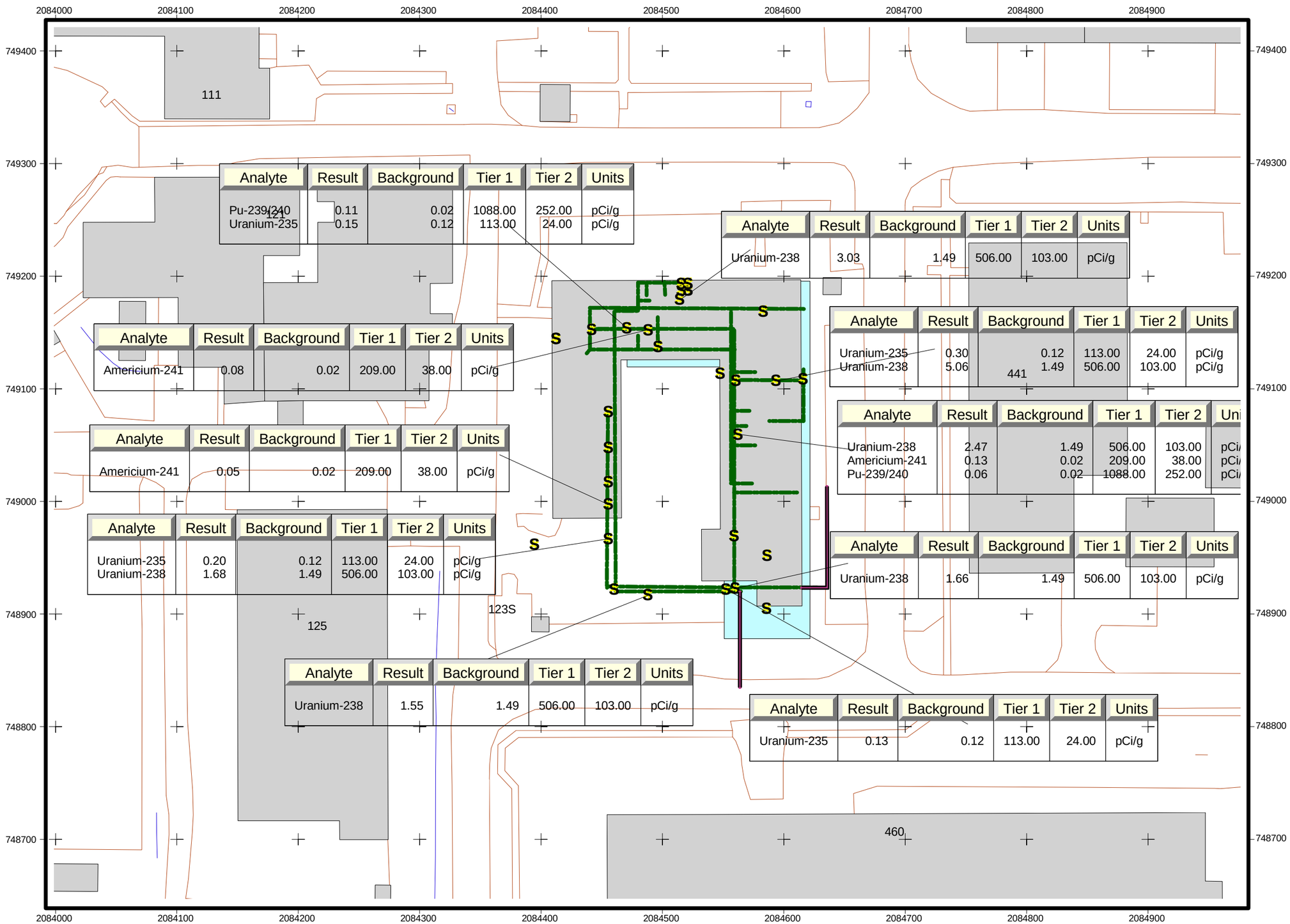
During decommissioning the pipe chases and sumps in Rooms 156, 157, and 158, shown on Figure 14, were closed in accordance with the Closure Plan for Building 123 Components of RCRA Unit 40 (DOE 1997) but were not removed. Closure of the sump in Room 125 and the underground pipe from Room 158 did not meet the closure performance standards (RMRS 1998b) and were deferred to ER remediation. RCRA COCs at this location were metals and radionuclides.

RCRA closure accelerated action objectives were to remove all sumps and process waste lines associated with RCRA Unit 40, shown in Figure 14, within the IHSS Group 100-4 AOC. Sumps located in the former Rooms 156, 157, and 158 were removed along with more than 1 foot of soil around and beneath the sumps. Pipelines between former Rooms 156 and 157 sump locations and more than 1 foot of soil around and beneath the pipelines was excavated. Additionally, approximately 40 feet of associated 4-inch diameter stainless steel pipeline was excavated. Contamination was not detected on sumps or associated pipeline.

Confirmation samples were collected from the soil beneath each sump location, and one was collected in the pipeline trench between the Room 156 and 157 sump locations. Confirmation sampling locations are BU38-0002, BU38-0003, BU38-0004, BU38-0005, BU38-0006, BU38-0007, BU38-0008 and the Central Point of Southern PWL. Soil samples were analyzed for radionculides only because they could be used as an indication of sump or pipeline leaks.

Table 6
Confirmation Sampling Results Greater Than Background Plus Two Standard Deviations or Method Detection Limits

IHSS Group	IHSS/PAC/UBC Site	Location Code	Analyte	Result (pCi/g)	Background Plus Two Standard Deviations (pCi/g)	Tier I AL (pCi/g)	Tier II AL (pCi/g)
100-4	UBC 123 – Radiological Health Physics Laboratory IHSS 100-148 – Waste Leaks	BU38-0002	Uranium-238	1.66	1.49	506.00	103.00
		BU38-0002	Uranium-238	1.66	1.49	506.00	103.00
		BU38-0004	Uranium-235	0.20	0.12	113.00	24.00
			Uranium-238	1.68	1.49	506.00	103.00
		BU38-0005	Americium-241	0.05	0.02	209.00	38.00
		BU39-0001	Uranium-238	3.03	1.49	506.00	103.00
		BU39-0004	Americium-241	0.08	0.02	209.00	38.00
		BU39-0011	Uranium-238	3.09	1.49	506.00	103.00
		BV39-0003	Uranium-235	0.30	0.12	113.00	24.00
			Uranium-235	0.23	0.12	113.00	24.00
			Uranium-238	3.70	1.49	506.00	103.00
			Uranium-238	5.06	1.49	506.00	103.00
		Central Point on Southern PWL	Uranium-238	1.55	1.49	506.00	103.00
		Eastern Process Line	Americium-241	0.13	0.02	209.00	38.00
			Plutonium-239/240	0.06	0.02	1,088.00	252.00
			Uranium-238	2.47	1.49	506.00	103.00
		Northern Process Line	Plutonium-239/240	0.11	0.02	1,088.00	252.00
			Uranium-235	0.15	0.12	113.00	24.00



Analyte	Result	Background	Tier 1	Tier 2	Units
Pu-239/240	0.11	0.02	1088.00	252.00	pCi/g
Uranium-235	0.15	0.12	113.00	24.00	pCi/g

Analyte	Result	Background	Tier 1	Tier 2	Units
Uranium-238	3.03	1.49	506.00	103.00	pCi/g

Analyte	Result	Background	Tier 1	Tier 2	Units
Americium-241	0.08	0.02	209.00	38.00	pCi/g

Analyte	Result	Background	Tier 1	Tier 2	Units
Uranium-235	0.30	0.12	113.00	24.00	pCi/g
Uranium-238	5.06	1.49	506.00	103.00	pCi/g

Analyte	Result	Background	Tier 1	Tier 2	Units
Americium-241	0.05	0.02	209.00	38.00	pCi/g

Analyte	Result	Background	Tier 1	Tier 2	Uni
Uranium-238	2.47	1.49	506.00	103.00	pCi/
Americium-241	0.13	0.02	209.00	38.00	pCi/
Pu-239/240	0.06	0.02	1088.00	252.00	pCi/

Analyte	Result	Background	Tier 1	Tier 2	Units
Uranium-235	0.20	0.12	113.00	24.00	pCi/g
Uranium-238	1.68	1.49	506.00	103.00	pCi/g

Analyte	Result	Background	Tier 1	Tier 2	Units
Uranium-238	1.66	1.49	506.00	103.00	pCi/g

Analyte	Result	Background	Tier 1	Tier 2	Units
Uranium-238	1.55	1.49	506.00	103.00	pCi/g

Analyte	Result	Background	Tier 1	Tier 2	Units
Uranium-235	0.13	0.12	113.00	24.00	pCi/g

Figure 11
Confirmation Sampling Results Greater Than Background Plus Two Standrd Deviations or Method Detection Limits

Key

- Process Waste Lines Left In Place
- S Confirmation Samples
- Process Waste Lines Removed
- % Pits-as-built
- Buildings and other structures
- IHSS 148
- Paved areas
- Dirt roads
- Drainage Features

N

Scale = 1:700

30 0 30 Feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

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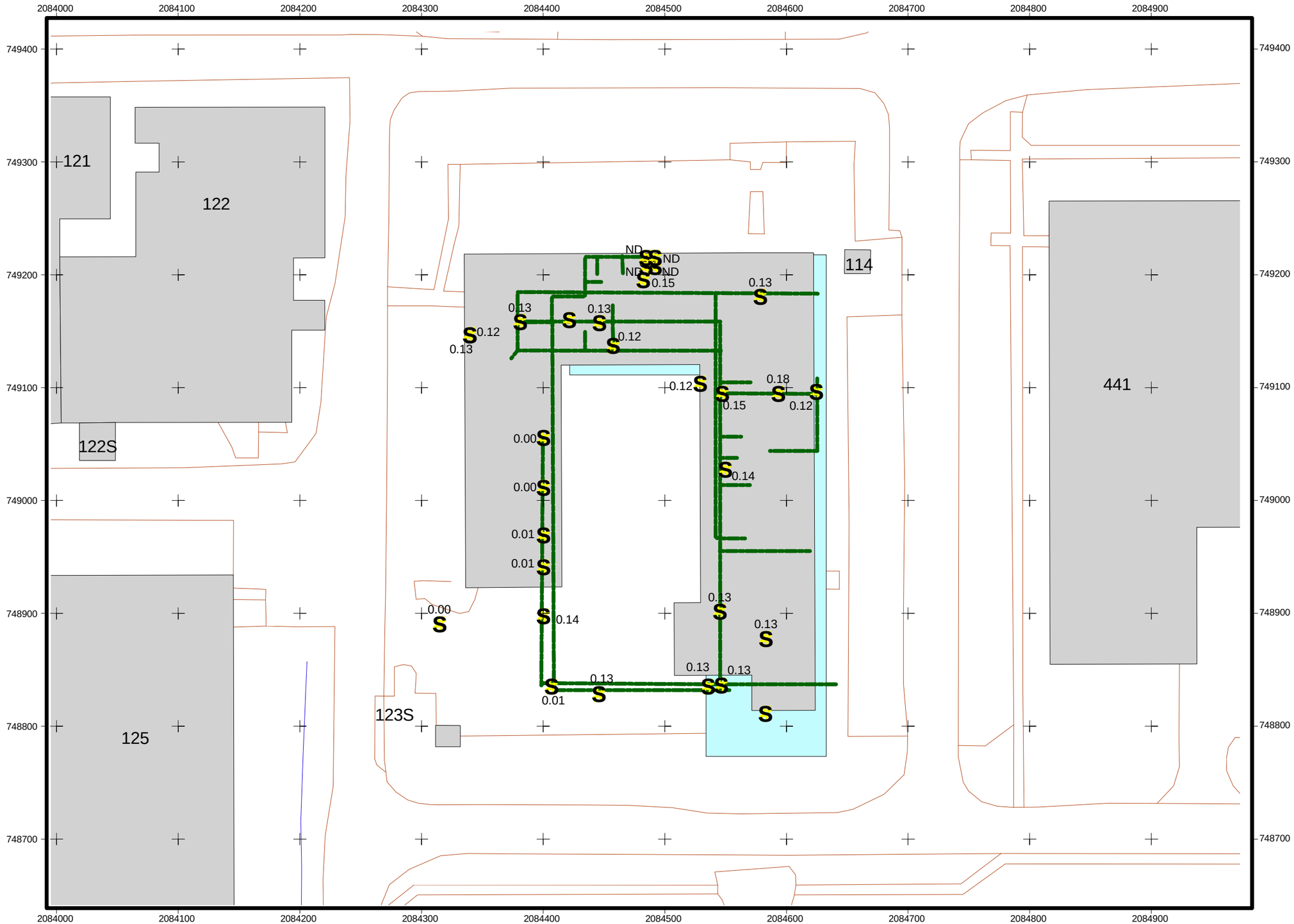

Figure 12
RFCA Tier II Radionuclide Sum of Ratios

Key

- S Confirmation Samples
- Process Waste Lines
- Buildings and other structures
- IHSS 148
- Paved areas
- Dirt roads
- Drainage Features

ND No Data

N

Scale = 1:500

10 0 10 20 30 Feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental
Technology Site

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100-4100-5drr

2003

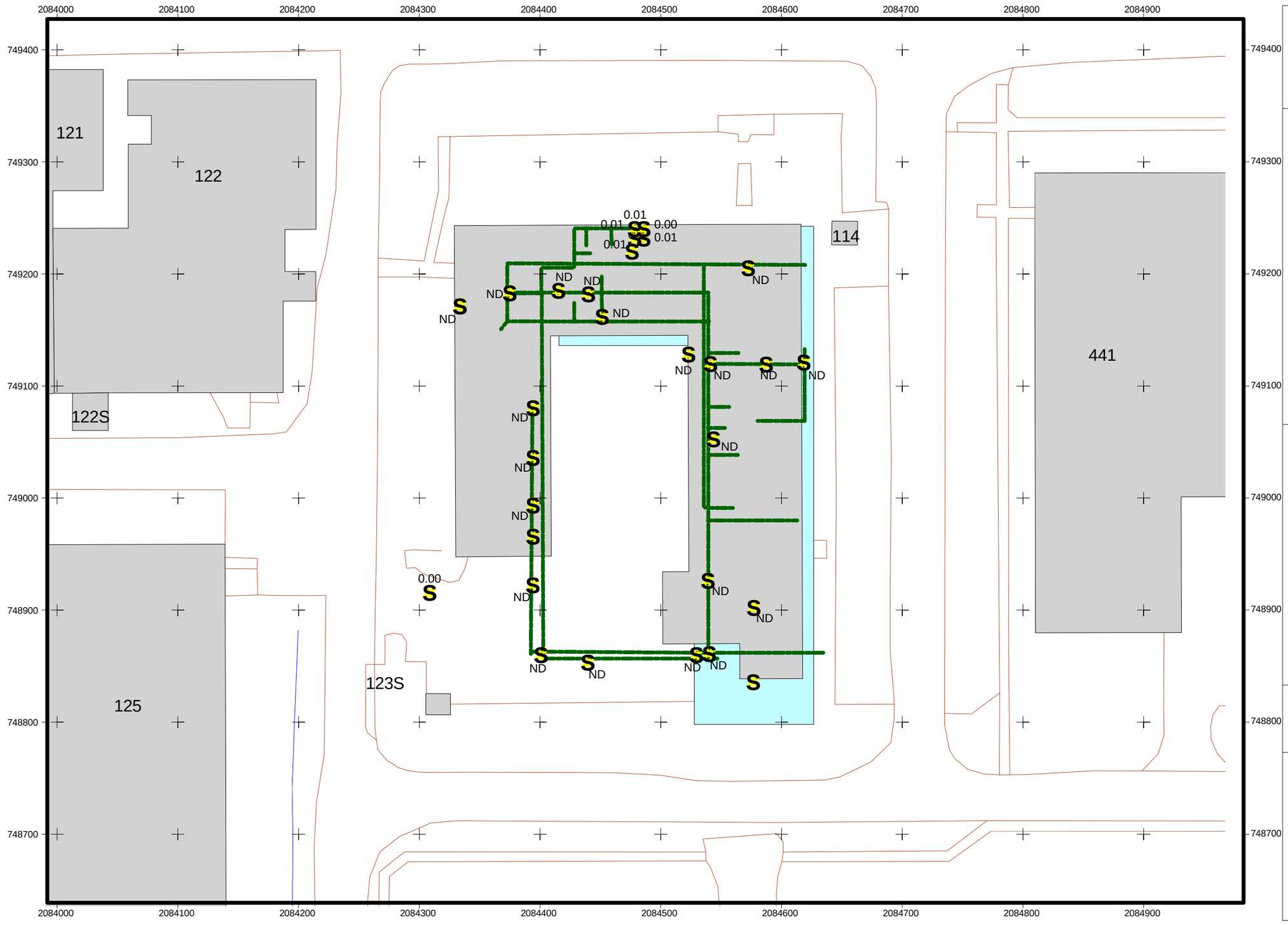

Figure 13
RFCA Tier II Nonradionuclide Sum of Ratios

Key

- S Confirmation Samples
- Process Waste Lines
- Buildings and other structures
- IHSS 148
- Paved areas
- Dirt roads
- Drainage Features

ND No Data

N

Scale = 1:500

10 0 10 20 30 40 Feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

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Rocky Flats Environmental
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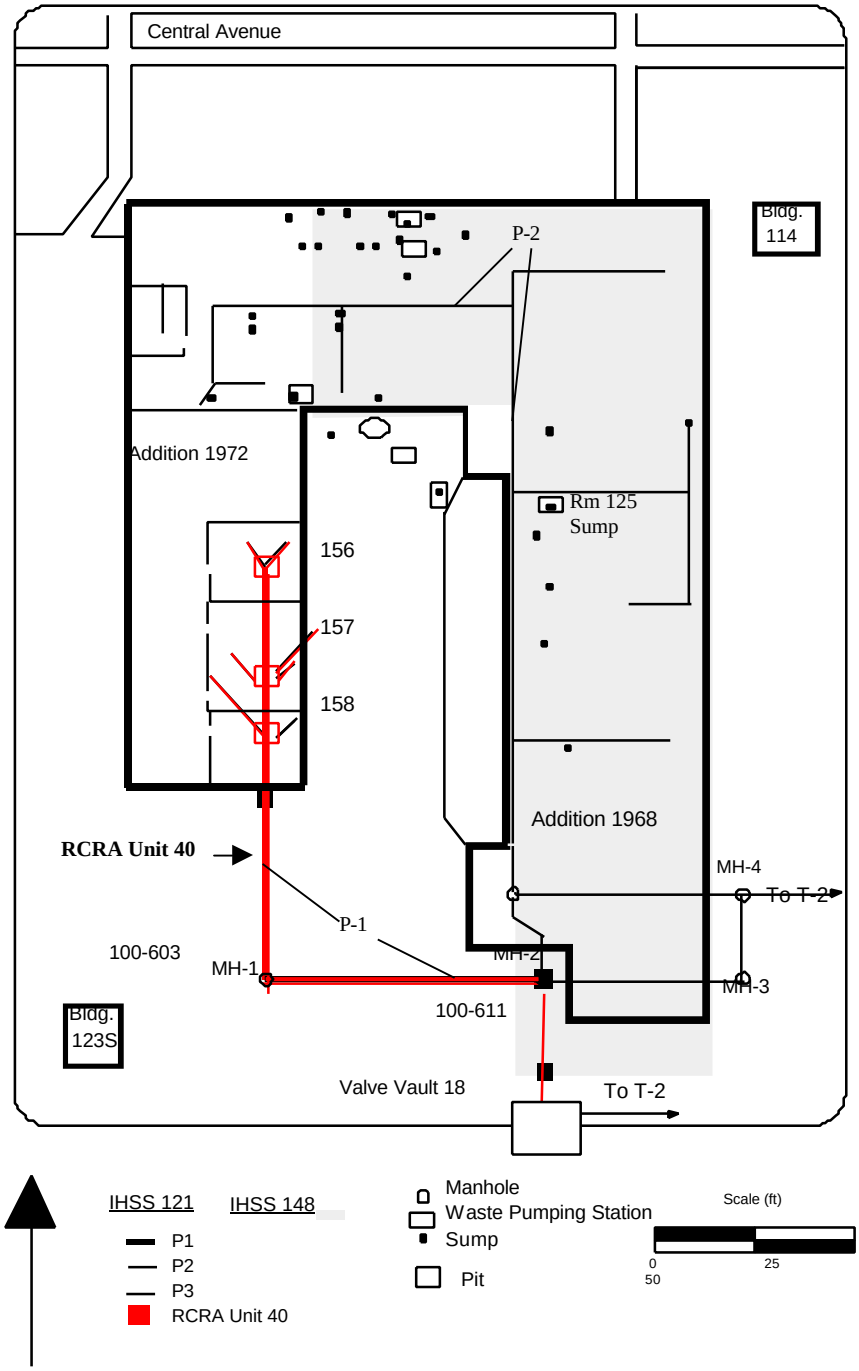
2003

Table 7
RFCA Tier II Sum of Ratios

Location	Tier II SOR Radionuclides	Tier II SOR Nonradionuclides
BU38-0002	0.13	NA
BU38-0003	0.01	NA
BU38-0004	0.14	NA
BU38-0005	0.01	NA
BU38-0006	0.01	NA
BU38-0007	0.00	NA
BU38-0008	0.00	NA
BU38-0009	NA	0.00
BU39-0001	0.15	NA
BU39-0003	0.13	NA
BU39-0004	0.13	NA
BU39-0005	0.12	NA
BU39-0006	NA	0.01
BU39-0007	NA	0.00
BU39-0008	NA	0.01
BU39-0012	NA	0.01
BU39-0013	NA	0.01
BV39-0001	0.13	NA
BV39-0003	0.18	NA
123 Emergency Southeastern Process Line	0.13	NA
123 Pad Soil Sample	0.12	NA
B123 Metal Manhole	0.12	NA
Source Well Pipe	0.13	NA
West of Manhole 2	0.01	NA
Central Point on Southern PWL	0.13	NA
Eastern Process Line	0.14	NA
Northern Process Line	0.13	NA
Source Pit	0.12	NA
Southeast Slab	0.13	NA

NA Not applicable because sample was not analyzed for specific constituents.

Figure 14
UBC 123 RCRA Unit 40



If elevated radionuclides were detected, additional analyses for metals could be required. As indicated in Table 6, americium-241 is slightly greater than background plus two standard deviations at one location, uranium-235 is slightly greater than background plus two standard deviations at one location, and uranium-238 is slightly greater than background plus two standard deviations in two locations. These data indicate that the sumps and pipelines had not leaked. Results for analytes greater than background plus two standard deviations are shown on Figure 11 and summarized in Table 6. The full data set is presented in Appendix B

RCRA Unit 40 process waste lines were excavated and removed from the sumps to MH-2. The remaining pipeline south of MH-2 to Valve Vault 18 could not be removed because of infrastructure constraints. The location of this pipeline is shown on Figure 15. The sump (waste pumping station), reported to be in Room 125, was not found. The following portions of RCRA Unit 40 were removed:

- Sumps in former Rooms 156, 157, and 158, and associated pipelines; and
- Process waste line from the sumps to MH-2.

2.5 Deviations from the ER RSOP

Deviations from the ER RSOP include the following:

- Actual confirmation sampling locations differed slightly from planned locations in most cases and several planned confirmation samples were not collected. A comparison of planned versus actual sampling locations is presented in Table 8.
- Several confirmation sampling locations were not measured but were hand plotted and estimated as noted on Table 5; and
- Process waste line removal stopped at the steamlines because of worker safety issues. Remaining NPWL and OPWL will be dispositioned with IHSS Group 000-4, PAC 000-504 and IHSS Group 000-2, IHSS 000-121 respectively.

Table 8
Planned Versus Actual Sampling Locations

Sampling Location	Planned Easting	Planned Northing	Acutal Easting	Actual Northing	Comments
BU38-0001	2081723.239	749136.392	2081730.80	749131.89	No significant change
BU38-0002	2081724.613	749036.094	2081729.02	749039.10	No significant change
BU38-0003	2081657.748	749031.973	2081656.21	749038.61	No significant change
BU38-0004	2081658.206	749063.573	2081652.69	749068.93	No significant change
BU38-0005	2081657.290	749093.800	2081653.59	749089.94	No significant change
BU38-0006	2081657.748	749105.249	2081653.59	749103.45	No significant change
BU38-0007	2081657.290	749146.925	2081653.59	749145.41	No significant change
BU38-0008	2081661.870	749125.400	2081653.59	749124.00	No significant change
BU38-0009	2081695.303	749218.828	2081608.1	749065.5	No significant change
BU38-0011	NA	NA	In-Process Sample	In-Process Sample	In process sample, not sampled

Sampling Location	Planned Easting	Planned Northing	Acutal Easting	Actual Northing	Comments
BU39-0001	2081623.858	749182.647	2081695.58	749213.15	No significant change
BU38-0010	2081757.588	749036.094	NA	NA	Not sampled, pipeline not found
BU39-0001	NA	NA	NA	NA	Waste sample
BU39-0002	2081633.934	749200.051	2081621.13 (estimated)	749189.52 (estimated)	No significant change
BU39-0003	2081647.215	749210.126	2081642.68	749195.15	No significant change
BU39-0004	2081670.572	749206.920	2081676.72	749194.75	No significant change
BU39-0005	2081679.731	749184.479	2081682.58	749184.90	No significant change
BU39-0006	2081697.593	749221.118	2081698.67	749220.80	No significant change
BU39-0007	2081699.882	749218.370	2081700.67	749218.80	No significant change
BU39-0008	2081695.303	749218.828	2081696.67	749218.80	No significant change
BU39-0009	2081699.424	749224.323	NA	NA	Same location as BU39-0013
BU39-0010	2081695.761	749224.323	NA	NA	Same Location as BU39-002
BU39-0011	2081722.781	749165.244	2081729.47	749164.49	No significant change
BU39-0012	2081785.066	749036.552	2081696.67	749222.80	No significant change
BU39-0013	2081757.588	749036.094	2081731.33	749042.66	No significant change
BV39-0003	2081754.382	749166.160	2081753.57	749164.40	No significant change
BV38-0001	2081784.608	749079.144	NA	NA	Not sampled, pipeline not removed
BV38-0002	2081785.066	749036.552	NA	NA	Not sampled, pipeline not removed
BV38-0004	NA	NA	NA	NA	Waste sample
BV39-0001	2081752.092	749210.584	NA	NA	Waste sample
BV39-0002	2081746.138	749195.471	NA	NA	Not sampled, sump not found
Central point on Southern. PWL	NA	NA	2081676.505	749035.331	Sampled, but not planned
Northern Process Line	NA	NA	In-Process Sample	In-Process Sample	In Process Sample
Southeast Slab	NA	NA	2081748.236	749059.106	Concrete sampled instead of soil at BV38-0004

2.6 Waste Management

Waste from the IHSS Group 100-4 accelerated action consisted of concrete, asphalt, soil, and pipeline. Clean concrete was segregated and recycled in accordance with the RSOP for Recycling Concrete (DOE 1999a). Contaminated concrete was loaded into metal waste boxes for disposal as LLW. Pipeline was placed in metal waste containers for disposal as low-level mixed waste (LLMW) along with the lead liner found inside the concrete. In addition, two 10-foot sections of steam piping with asbestos-containing insulation were removed and packaged, and removed from the Site by an asbestos abatement contractor. Asphalt was removed for disposal as sanitary waste. More than 2,484, pounds (lbs) of sanitary waste, 25,620 lbs of LLW, 120,026 lbs of LLMW, and 15 lbs of asbestos-containing material (ACM) was generated during this accelerated action. Waste types, volumes, and disposition are presented in Table 9.

Figure 15
RCRA Unit 40 Pipeline Removed and Left in Place

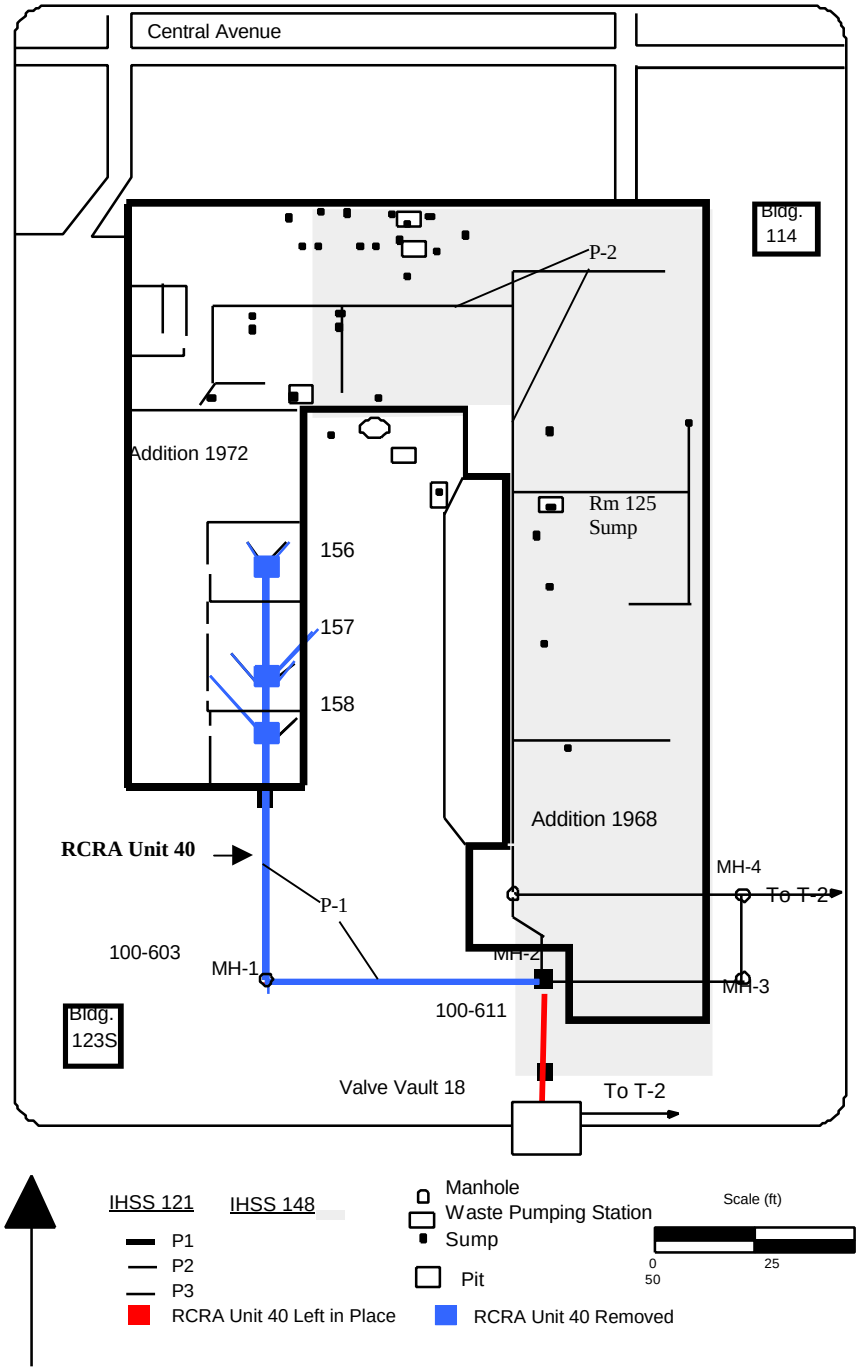


Table 9
Waste Characterization Summary

Container Number	Extended Number	Container Type	Volume (cu.ft.)	Waste Type	Gross Weight (lbs.)	Status	Notes	IDC	Waste Codes	Disposition
B02192	123P-00020	CAB	96	LLMW	6,420	Full and sealed	Soil from beneath room 105	324	D008	Transported to 904 Pad 5/30/02; will be shipped to Envirocare
B02193	123P-00015	CAB	96	LLMW	4,120	Full and sealed	Process waste piping, with lead	324/5001	D008	Transported to 904 Pad 5/30/02; will be shipped to Envirocare
B02228	123P-00019	CAB	96	LLMW	4,080	Full and sealed	Process waste pipe, with lead	324/5001	D008	Transported to 904 Pad 5/30/02, will be shipped to Envirocare
B02229	123P-00016	CAB	96	LLMW	3,340	Full and sealed	Process waste pipe, with lead	324/5001	D008	Transported to 904 Pad 5/30/02; will be shipped to Envirocare
B02188	123P-00023	CAB	96	LLMW	7,660	Full and sealed	Soil from beneath room 105	324	D008	Transported to 904 Pad 5/30/02; will be shipped to Envirocare
B02189	123P-00008	CAB	96	LLW	2,920	Foamed and sealed	Concrete from room 109	5001/323	NA	Transported to 904 Pad 5/30/02; will be shipped to NTS
B02190	123P-00009	CAB	96	LLW	4,540	Foamed and sealed	Concrete from room 125	5001/323	NA	Transported to 904 Pad 5/30/02; will be shipped to NTS
B02191	123P-00010	CAB	96	LLW	3,480	Foamed and sealed	Concrete from room 109	5001/323	NA	Transported to 904 Pad 5/30/02; will be shipped to NTS
B02194	123P-00011	CAB	96	LLW	3,480	Foamed and sealed	Concrete and metal, from room 109	5001/323	NA	Transported to 904 Pad 5/30/02; will be shipped to NTS
B02195	123P-00012	CAB	96	LLW	3,020	Foamed and sealed	Concrete and metal, room 125	5001/323	NA	Transported to 904 Pad 5/30/02; will be shipped to NTS
B02196	123P-00013	CAB	96	LLW	3,820	Foamed and sealed	Crushed concrete and metal from room 109	5001/323	NA	Transported to 904 Pad 5/30/02; will be shipped to NTS
B02197	123P-00014	CAB	96	LLW	1,240	Full and sealed	Crushed concrete	5001	NA	Transported to 904 Pad 5/30/02; will be shipped to NTS
B02230	123P-00017	CAB	96	LLW	5,600	Full and sealed	Soil	323	NA	Transported to 904 Pad 5/30/02; will be shipped to NTS
X29337	123P-00037	ST Cargo	1,280	LLW	29,580	In process, sampled for	Concrete vault, piping; load for shipment to NTS	323/5001	NA	Shipped to NTS 6/4/02

Container Number	Extended Number	Container Type	Volume (cu.ft.)	Waste Type	Gross Weight (lbs.)	Status	Notes	IDC	Waste Codes	Disposition
						hazardous constituents	5/22/02			
X29522	123P-00022	ST Cargo	1,280	LLW	4,386	Foamed and sealed	NCR for hole in side of cargo, 2 concrete vaults, plastic, Styrofoam	323/5001	NA	Awaiting NTS profile modification and approval prior to shipment
X29537	123P-00021	ST Cargo	1,280	LLW	34,740	Foamed and sealed	Concrete vault and piping	323/5001	NA	Awaiting NTS profile modification and approval prior to shipment
L00857	123P-00025	Lift Liner	258	LLW	6,480	Sealed	Concrete rubble	323/5001	NA	Awaiting NTS profile modification and approval prior to shipment
L00858	123P-00026	Lift Liner	258	LLW	16,740	Sealed	Concrete rubble	323/5001	NA	Awaiting NTS profile modification and approval prior to shipment
X29848	NA	Bag	90	ACM	15	Full	Dispositioned in B779 Roll-off		NA	Dispositioned with B779 ACM wastes
47	123 Recycle	End dumps	18,898	Sanitary	1,984,244	Full	Concrete	NA	NA	Recycled onsite
20	20809	R23	636	Sanitary	unknown	Full	Metal Debris–Consists of electrical conduit, rebar with small amounts of concrete, and electrical wire	0323	NA	Shipped to Front Range Landfill
21	20809	R23	636	Sanitary	55,613	Full	Debris–consists of electric conduit, rebar with small amounts of concrete, electrical wire, asphalt (123 pad & 121 pad), and wood chip board.	0323	NA	Shipped to Front Range Landfill
22	20809	R23	636	Sanitary	55,613	Full	Asphalt	0323	NA	Shipped to Front Range Landfill
25	30340	R23	636	Sanitary	55,613	Full	Asphalt	0323	NA	Shipped to Front Range Landfill

Container Number	Extended Number	Container Type	Volume (cu.ft.)	Waste Type	Gross Weight (lbs.)	Status	Notes	IDC	Waste Codes	Disposition
26	30340	R23	636	Sanitary	55,613	Full	Asphalt	0323	NA	Shipped to Front Range Landfill
27	20809	R23	636	Sanitary	55,613	Full	Asphalt	0323	NA	Shipped to Front Range Landfill
28	30340	R23	636	Sanitary	55,613	Full	Asphalt	0323	NA	Shipped to Front Range Landfill
29	20809	R23	636	Sanitary	55,613	Full	Asphalt	0323	NA	Shipped to Front Range Landfill
30	30340	R23	636	Sanitary	55,613	Full	Asphalt and plastic	0323	NA	Shipped to Front Range Landfill
31	20809	R23	636	Sanitary	55,613	Full	Asphalt	0323	NA	Shipped to Front Range Landfill
32	NA	End Dump	1,942	Sanitary	Unknown	Full	Asphalt, electrical conduit and rebar with concrete; no container number (used end dump #9); probably represents several loads.	0323	NA	Shipped to Front Range Landfill

CAB cost advantage box

Excavated soil was temporarily stockpiled near the excavations (Figure 8). Samples were collected from the soil stockpiles to determine the final disposition of the excavated soil. Because analytical results from soil stockpile samples did not exceed RFCA Tier II subsurface soil ALs (Table 10), this soil was placed back into the excavations.

2.7 Site Reclamation

All excavated areas were backfilled and revegetated after confirmation sampling results were received and discussed with regulatory agencies through the consultative process. Excavated soil with radionuclide concentrations less than RFCA Tier II ALs was used as backfill in the trench that it was removed from. Additionally, 32 end-dump loads of topsoil from offsite sources were used to bring excavated areas up to grade.

The IHSS Group 100-4 area was rough graded before the topsoil was distributed over the site. The topsoil was graded, then scarified, and a seed mix consisting of Canada bluegrass was spread over the site using broadcast seeding methods. Hydromulch was applied to conserve moisture and prevent seed erosion.

2.8 Accelerated Action Goals

ER RSOP Notification #02-01 accelerated action project objectives were achieved through the following:

- Removal of the concrete slab and associated structures;
- Removal of below-grade sumps and process waste lines to MH-1; and
- Removal of all soil with contaminant concentrations greater than RFCA Tier I ALs.

Removal activities were consistent with and contributed to the ER RSOP overall long-term remedial action objectives (RAOs) for RFETS soil. This contribution is described below.

RAO 1: Provide a remedy consistent with the RFETS goal of protection of human health and the environment. Removal of the UBC 123 slab, all structures and pipelines to MH-1, all soil with contaminant concentrations greater than RFCA Tier I ALs contributed to the protection of human health and the environment because potential sources of contamination were removed.

RAO 2: Provide a remedy that minimizes the need for long-term maintenance and institutional or engineering controls. Removal of the UBC 123 slab, all structures and pipelines to MH-1, and all soil with contaminant concentrations greater than RFCA Tier I ALs minimizes the need for long-term maintenance and institutional or engineering controls because potential sources of contamination were removed.

RAO 3: Minimize the spread of contaminants during implementation of accelerated actions. Best management practices were used to prevent the spread of contaminants during the accelerated action. Air monitoring data during the accelerated action did not indicate any exceedances.

Table 10
Waste Characterization Data Summary–Detected Analytes

Matrix Type	Analyte	Maximum	Number Samples	Detection Frequency %	Tier I AL	Tier II AL	Units
Concrete	Americium-241	0.05	3	100	NA	NA	pCi/g
Concrete	Curium	0.13	3	100	NA	NA	pCi/g
Concrete	Uranium-234	1.36	3	100	NA	NA	pCi/g
Concrete	Uranium-235	0.16	3	100	113	24	pCi/g
Concrete	Uranium-238	1.09	3	100	NA	NA	pCi/g
Concrete	Actinium	1.34	3	100	NA	NA	pCi/g
Concrete	Antimony-125	0.01	3	100	NA	NA	pCi/g
Concrete	Cerium-144	0.02	3	100	NA	NA	pCi/g
Concrete	Cesium-137	8.68	3	100	NA	NA	pCi/g
Concrete	Cobalt-60	0.02	3	100	NA	NA	pCi/g
Concrete	Europium-152	0.03	3	100	NA	NA	pCi/g
Concrete	Europium-154	-0.01	3	100	NA	NA	pCi/g
Concrete	Europium-155	0.03	3	100	NA	NA	pCi/g
Concrete	Lead	1.41	3	100	NA	NA	pCi/g
Concrete	Potassium	38.70	3	100	NA	NA	pCi/g
Concrete	Promethium	0.00	3	100	NA	NA	pCi/g
Concrete	Promethium-146	0.0204	3	100	NA	NA	pCi/g
Concrete	Rutheunium-106	0.05	3	100	NA	NA	pCi/g
Concrete	Thorium-234	1.27	3	100	NA	NA	pCi/g
Concrete	Uranium-235	0.17	3	33	NA	NA	pCi/g
Concrete	Uranium-238	1.27	3	100	NA	NA	pCi/g
Concrete	Yttrium-88	0.0108	3	100	NA	NA	pCi/g
Pipe Scale	2-Butanone	8.6	1	100	NA	NA	µg/kg
Pipe Scale	2-Ethyl-1-hexanol	85	1	100	NA	NA	µg/kg
Pipe Scale	4-Isopropyltoluene	2.6	1	100	NA	NA	µg/kg
Pipe Scale	Acetone	25	1	100	27,200,000	272,000	µg/kg
Pipe Scale	Benzene 1,2,3,5-tetramethyl	9.9	1	100	NA	NA	µg/kg
Pipe Scale	Benzene 1,2,4-trimethyl	2	1	100	NA	NA	µg/kg
Pipe Scale	Ethylbenzene	1.9	1	100	932,000	9,320	µg/kg
Pipe Scale	Hexanol	12	1	100	NA	NA	µg/kg
Pipe Scale	Methlylene chloride	1.6	1	100	578	5.78	µg/kg
Pipe Scale	Naphthalene	8.8	1	100	10,100,000	101,000	µg/kg
Pipe Scale	Styrene	3	1	100	274,000	2,740	µg/kg
Pipe Scale	Toluene	4.4	1	100	707,000	7,070	µg/kg
Pipe Scale	Xylenes (total)	18	1	100	9,740,000	97,400	µg/kg
Waste Soil	4-Nitrophenol	140.00	1	100	NA	NA	µg/kg
Waste Soil	Methylene chloride	2.50	1	100	578	5.78	µg/kg
Waste Soil	Pyrene	62.00	1	100	397,000,000	3,970,000	µg/kg
Waste Soil	Actinium	2.01	30	100	NA	NA	pCi/g
Waste Soil	Americium-241	4.43	29	15	209	38	pCi/g
Waste Soil	Uranium-234	1.00	13	100	1,627	307	pCi/g
Waste Soil	Uranium-235	0.31	29	17	113	24	pCi/g
Waste Soil	Uranium-238	3.46	29	100	506	103	pCi/g
Waste Soil	Actinium-228	2.01	29	100	NA	NA	pCi/g

Matrix Type	Analyte	Maximum	Number Samples	Detection Frequency %	Tier I AL	Tier II AL	Units
Waste Soil	Americium-241	4.43	28	100	209	38	pCi/g
Waste Soil	Bismuth-212	2.21	29	100	NA	NA	pCi/g
Waste Soil	Bismuth-214	0.866	29	100	NA	NA	pCi/g
Waste Soil	Cesium-134	0.00	26	100	NA	NA	pCi/g
Waste Soil	Potassium-40	26.5	29	100	NA	NA	pCi/g
Waste Soil	Lead-212	1.86	29	100	NA	NA	pCi/g
Waste Soil	Lead-214	1.01	29	100	NA	NA	pCi/g
Waste Soil	Polonium-210	6,820.00	29	100	NA	NA	pCi/g
Waste Soil	Radium bromide	3.71	29	100	NA	NA	pCi/g
Waste Soil	Thalium-208	0.577	29	100	NA	NA	pCi/g
Waste Soil	Uranium-235	0.31	27	100	113	24	pCi/g
Waste Soil	Uranium-238	3.46	28	100	506	103	pCi/g

2.9 No Longer Representative Sampling Locations

The map and listing of NLR sampling locations is shown in Table 11 and on Figure 16.

Table 11
No Longer Representative Sampling Locations

B123 D&D Project Sampling Locations		UBC 123 HDD Project Sampling Locations		
2	33-11	GP-1-1	GP3-7	HDD-3-05
5	34-12	GP-1-2	GP3-9	HDD-4-01
10	35-13	GP-1-3	GP-4-4	HDD-4-02
11	36-14	GP-1-4	GP-4-6	HDD-4-03
14	37-15	GP-2-3	HDD-2-01	HDD-4-4
23-1	38-16	GP-2-4	HDD-2-02	HDD-4-06
24-2	39-17	GP-2-6	HDD-2-03	LAB1
25-3	40-18	GP-2-8	HDD-2-04	LAB2
26-4	42-20	GP-2-10	HDD-2-05	SP1
27-5	44-22	GP-2-11	HDD-2-06	SP2
28-6	45-23	GP-2-13	HDD-2-07	SP3
29-7	46-25	GP3-2	HDD-2-08	SP4
30-8	47-25	GP-3-4	HDD-3-02	WPS-2
31-9	48-26	HDD-4-05	HDD-3-03	WPS-3
32-10			HDD-3-04	WPS-4

HDD Horizontal Directional Drilling
D&D Deactivation and Decommissioning

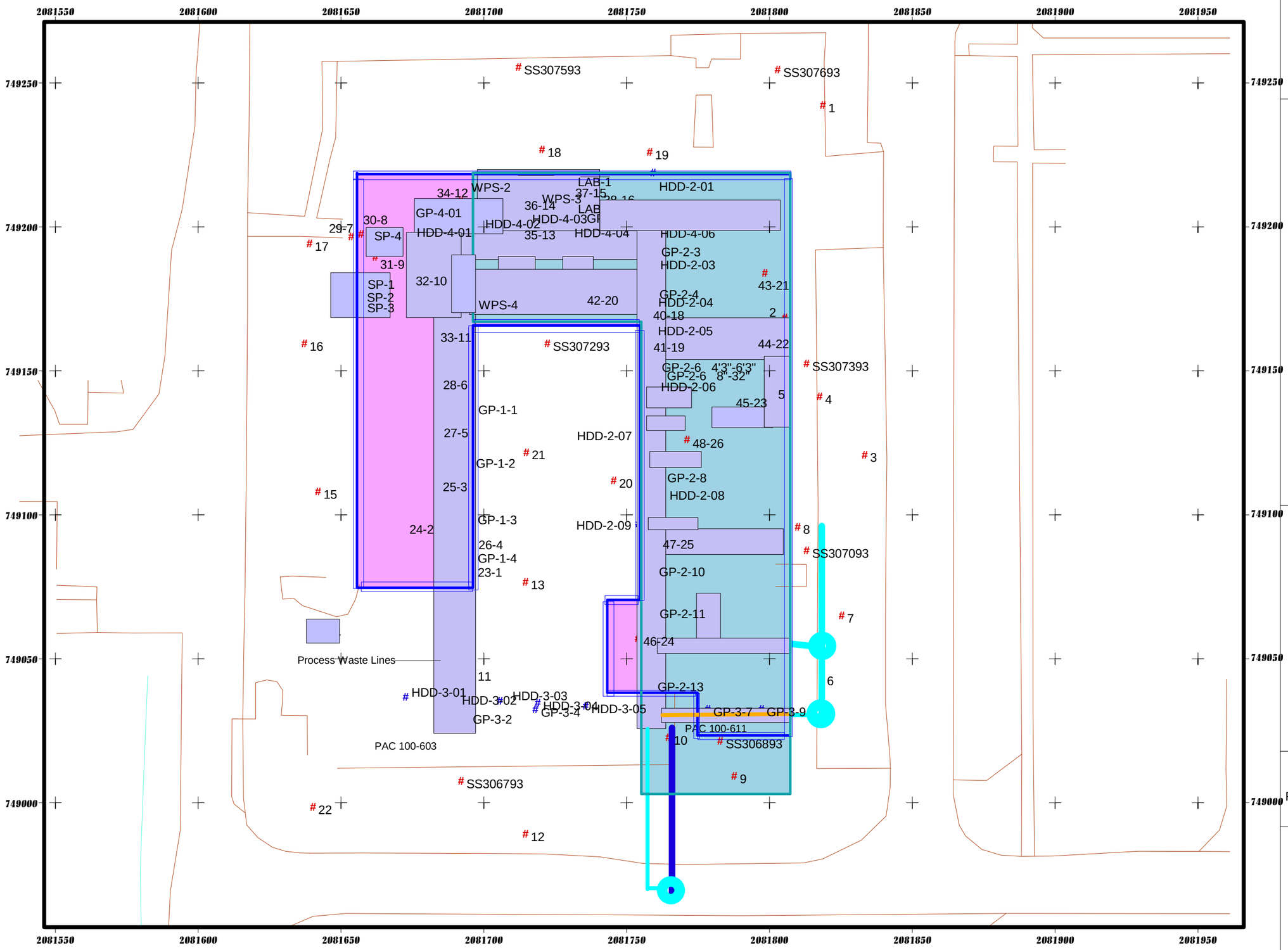


Figure 16
IHSS Group 100-4
No Longer Representative Samples

KEY

- Excavation Area (Approximate)
- FY 2002 IHSS locations
- FY 2002 PAC locations
- FY 2002 UBC locations
- Buildings and other structures
- Paved areas
- Dirt roads
- Streams, ditches, or other drainage features

N

Scale = 1:350

25 0 25 Feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared by:

KAISER•HILL COMPANY

w/projects/2002/100-4/123remediationarea.apr
April 2002

3.0 POST-REMEDIATION CONDITIONS

Post remediation conditions for each IHSS, PAC, and UBC at IHSS Group 100-4 are described below.

3.1.1 UBC 123, Radiological Health Physics Laboratory

Building 123 slab, footers, source pit, and manholes were excavated and packaged for disposal or if appropriate, recycled in accordance with the RSOP for Recycling Concrete (DOE 1999a). Sumps and process waste lines were excavated and packaged for disposal. Confirmation sampling results from the soil beneath the slab, footers, source pit, manholes, sumps and process waste lines indicated that all contaminant concentrations were less than RFCA Tier II ALs and proposed WRW ALs.

3.1.2 IHSS 100-148, Waste Leaks

Sumps and process waste lines within IHSS 100-148 were excavated and packaged for disposal. Confirmation sampling results from the soil beneath the sumps and process waste lines indicated that all contaminant concentrations were less than RFCA Tier II ALs and proposed WRW ALs.

3.1.3 PAC 100-603, Bioassay Waste Spill

PAC 100-603 was approved as a No Further Action (NFA) site in 2002. A description of this PAC is contained in the Annual Update for the Historical Release Report (DOE 2001c).

3.1.4 PAC 100-611, Building 123 Scrubber Solution Spill

Five surface soil samples were collected and analyzed for pH at PAC 100-611. Sampling results indicated that remediation was not required.

3.1.5 Residual Contamination

Residual contaminant concentrations greater than background plus two standard deviations or MDLs, consisting of confirmation sampling locations, backfill, and pre-accelerated action sampling locations that were not remediated, at IHSS Group 100-4 are presented on Table 12 and shown on Figure 17. Figure 17 also presents the surface and subsurface soil AOCs and RFCA Tier II exceedances. Table 13 presents the survey data, depth, and additional soil cover information for locations with residual contamination.

Pipelines that were not removed during the accelerated action are shown on Figure 18. The pipeline extending east and then north from MH-3 was not removed. This cast iron pipeline, part of P-2, is approximately 5 feet below the surface. The pipeline end was sealed with Sika Grout 212. The pipeline extending south from MH-2 was not removed. This cast iron pipeline, part of P-1, is approximately 5 feet below the surface. The pipeline end was sealed with Sika Grout 212. This pipeline extends through PAC 100-602 to Valve Vault 18.

Additional removal actions beyond ER RSOP Notification #IA-02-01 accelerated action goals (DOE 2002b) were not required at IHSS 100-4 because of the following:

- Residual radionuclide activities in subsurface soil were less than RFCA Tier II ALs, proposed WRW ALs, and only slightly greater than background plus two standard deviations

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Table 12
Residual Contamination at IHSS Group 100-4

Location	Analyte	Media	Residual Concentration	Units	Background Plus Two Standard Deviations	MDL
BU38-0005	Americium-241	Subsurface Soil	0.05	pCi/g	0.02	NA
BU39-0004	Americium-241	Subsurface Soil	0.08	pCi/g	0.02	NA
Eastern Process Line	Americium-241	Subsurface Soil	0.13	pCi/g	0.02	NA
Eastern Process Line	Plutonium-239/24	Subsurface Soil	0.06	pCi/g	0.02	NA
Northern Process Line	Plutonium-239/24	Subsurface Soil	0.11	pCi/g	0.02	NA
SS306893	Americium-241	Surface Soil	0.03	pCi/g	0.02	NA
SS306793	Americium-241	Surface Soil	0.12	pCi/g	0.02	NA
	Beryllium	Surface Soil	1.20	mg/kg	0.97	NA
	Cobalt	Surface Soil	28.70	mg/kg	10.91	NA
SS307093	Americium-241	Surface Soil	0.03	pCi/g	0.02	NA
	Copper	Surface Soil	25.10	mg/kg	18.06	NA
	Lead	Surface Soil	152.00	mg/kg	54.62	NA
	Plutonium-239/240	Surface Soil	0.16	pCi/g	0.02	NA
	Zinc	Surface Soil	113.00	mg/kg	73.76	NA
SS307293	Cobalt	Surface Soil	11.30	mg/kg	10.91	NA
	Americium-241	Surface Soil	0.05	pCi/g	0.02	NA
SS307393	Americium-241	Surface Soil	0.03	pCi/g	0.02	NA
	Copper	Surface Soil	22.70	mg/kg	18.06	NA
	Lead	Surface Soil	128.00	mg/kg	54.62	NA
	Plutonium-239/240	Surface Soil	0.17	pCi/g	0.02	NA
	Zinc	Surface Soil	134.00	mg/kg	73.76	NA
SS307593	Americium-241	Surface Soil	0.02	pCi/g	0.02	NA
	Lead	Surface Soil	165.00	mg/kg	54.62	NA
	Zinc	Surface Soil	85.50	mg/kg	73.76	NA
SS307693	Americium-241	Surface Soil	0.19	pCi/g	0.02	NA
	Barium	Surface Soil	203.00	mg/kg	141.26	NA
	Copper	Surface Soil	19.80	mg/kg	18.06	NA
	Strontium	Surface Soil	94.70	mg/kg	48.94	NA
	Uranium-238	Surface Soil	2.14	pCi/g	2.00	NA
	Zinc	Surface Soil	133.00	mg/kg	73.76	NA

Location	Analyte	Media	Residual Concentration	Units	Background Plus Two Standard Deviations	MDL
HDD-2-07	Acetone	Subsurface Soil	23	µg/kg	NA	13
	Methylene Chloride	Subsurface Soil	25	µg/kg	NA	6
	bis(2-Ethylhexyl)phthalate	Subsurface Soil	1200	µg/kg	NA	340
	Copper, Total	Subsurface Soil	182	µg/kg	38.21	0.10
1	Methylene Chloride	Subsurface Soil	7.00	µg/kg	NA	6
11	Acetone	Subsurface Soil	30.00	µg/kg	NA	13
	Napthalene	Subsurface Soil	13.00	µg/kg	NA	11
12	1,2,4-Trichlorobenzene	Subsurface Soil	6.00	µg/kg	NA	5
	Acetone	Subsurface Soil	69.00	µg/kg	NA	5
	Bis(2-Ethylhexyl)phthalate	Subsurface Soil	50.00	µg/kg	NA	10
	Methylene Chloride	Subsurface Soil	34.00	µg/kg	NA	5
	Napthalene	Subsurface Soil	13.00	µg/kg	NA	11
	Uranium-235	Subsurface Soil	0.20	pCi/g	0.12	NA
13	Carbon Tetrachloride	Subsurface Soil	11.00	µg/kg	NA	6
	Methylene Chloride	Subsurface Soil	34.00	µg/kg	NA	5
	Napthalene	Subsurface Soil	16.00	µg/kg	NA	11
16	Acetone	Subsurface Soil	6.00	µg/kg	NA	5
	Benzo(a)pyrene	Subsurface Soil	760.00	µg/kg	NA	730
	Fluoranthene	Subsurface Soil	1500.00	µg/kg	NA	730
	Pyrene	Subsurface Soil	1300.00	µg/kg	NA	730
17	Acetone	Subsurface Soil	8.00	µg/kg	NA	6
	Plutonium-239/240	Subsurface Soil	0.03	pCi/g	0.02	NA
18	Acetone	Subsurface Soil	18.00	µg/kg	NA	5
	Fluoranthene	Subsurface Soil	1200.00	µg/kg	NA	710
	Napthalene	Subsurface Soil	10.00	µg/kg	NA	5
	Plutonium-239/240	Subsurface Soil	0.09	pCi/g	0.02	NA
	Pyrene	Subsurface Soil	1100.00	µg/kg	NA	710
19	Napthalene	Subsurface Soil	10.00	µg/kg	NA	5
20	Acetone	Subsurface Soil	99.00	µg/kg	NA	6
21	Plutonium-239/240	Subsurface Soil	0.13	pCi/g	0.02	NA
22	Americium-241	Subsurface Soil	0.10	pCi/g	0.02	NA
3	Americium-241	Subsurface Soil	0.10	pCi/g	0.02	NA

Location	Analyte	Media	Residual Concentration	Units	Background Plus Two Standard Deviations	MDL
	Fluoranthene	Subsurface Soil	410.00	µg/kg	NA	360
	Pyrene	Subsurface Soil	420.00	µg/kg	NA	360
4	Fluoranthene	Subsurface Soil	480.00	µg/kg	NA	350
	Pyrene	Subsurface Soil	540.00	µg/kg	NA	350
8	Fluoranthene	Subsurface Soil	810.00	µg/kg	NA	370
	Pyrene	Subsurface Soil	740.00	µg/kg	NA	370
02E0022-002	Uranium-235	Subsurface Soil	0.11	pCi/g	0.09	NA
02E0008-014	Americium-241	Subsurface Soil	0.04	pCi/g	0.02	0.03
02E0008-017	Americium-241	Subsurface Soil	0.06	pCi/g	0.02	0.06
02E0010-007	Americium-241	Subsurface Soil	0.07	pCi/g	0.02	0.06
02E0022-003	Uranium-235	Subsurface Soil	0.15	pCi/g	0.09	NA
02E0022-003	Uranium-238	Subsurface Soil	2.14	pCi/g	2.00	NA

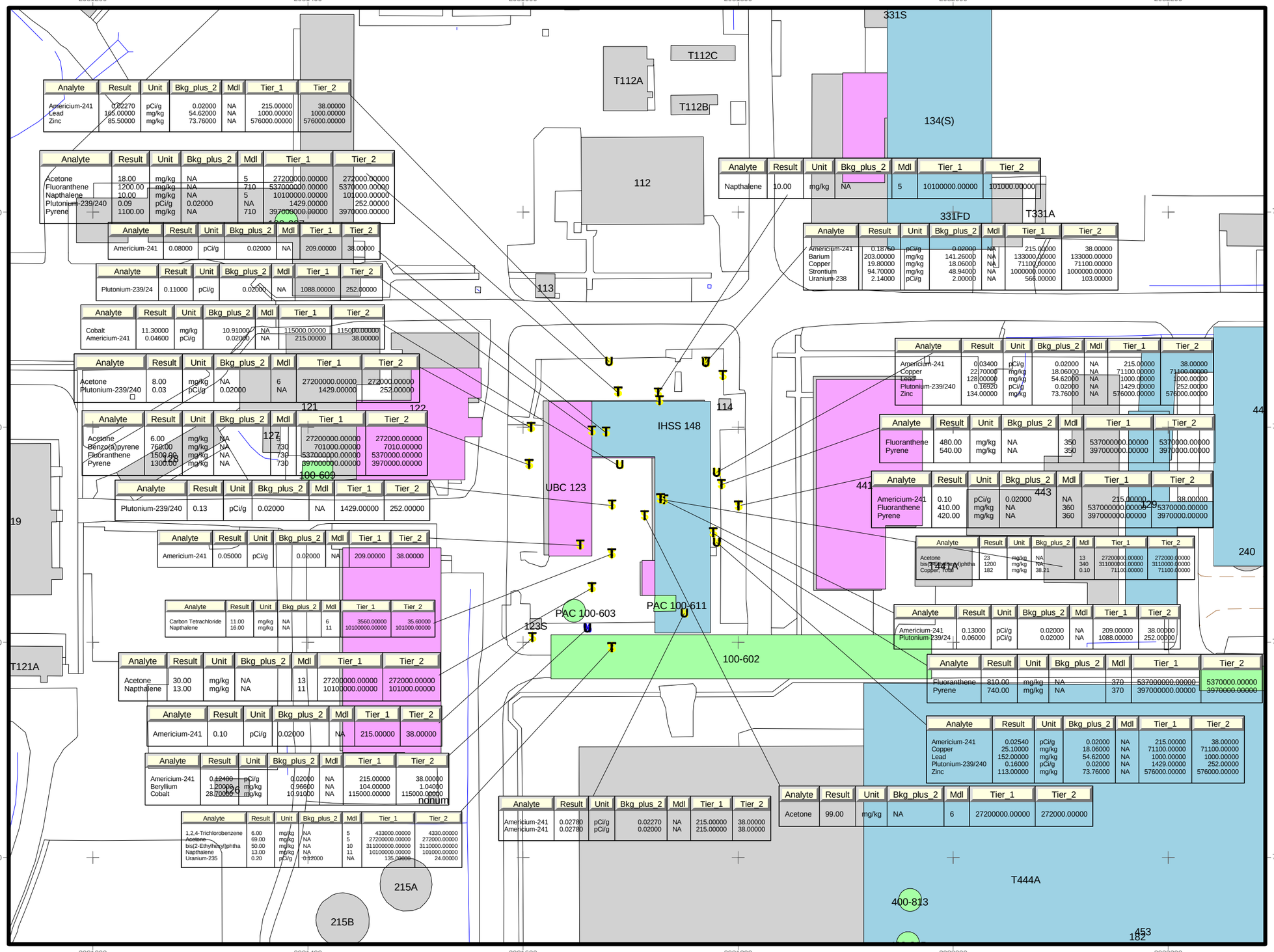

Figure 17
Residual Contamination
IHSS Group 100-4

KEY

- IHSS
- UBC
- Building
- Stream, ditch, or other drainage
- Paved area
- Fence
- Dirt road
- U — Pre-accelerated action surface soil sampling location
- T — Pre-accelerated action subsurface soil sampling location below Tier II AL
- T — Confirmation subsurface soil sampling location below Tier II AL

Note: For organics, mg/kg = ug/kg

N

Scale = 1:1,100

30 0 30 60 Feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

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Table 13
Residual Contamination Location Information

Location	Easting	Northing	Depth (ft)	Additional Cover
SS306893	2081750.00	749027.00	Surface Soil	Covered with approximately 5 inches of topsoil, revegetated
SS306793	2081660.00	749013.00	Surface Soil	Covered with approximately 5 inches of topsoil, revegetated
SS307093	2081780.00	749093.00	Surface Soil	NA
SS307293	2081690.00	749165.00	Surface Soil	Covered with approximately 5 inches of topsoil, revegetated
SS307393	2081780.00	749158.00	Surface Soil	Covered with approximately 5 inches of topsoil, revegetated
SS307593	2081680.00	749261.00	Surface Soil	NA
SS307693	2081770.00	749260.00	Surface Soil	NA
SS307693	2081770.00	749260.00	Surface Soil	NA
HDD-2-07	2081727.77	749133.00	5.2	Covered with approximately 5 inches of topsoil, revegetated
1	2081785.70	749247.70	0.0-6.0	NA
11	2081663.90	749050.30	0.0-6.0	Covered with approximately 5 inches of topsoil, revegetated
12	2081682.40	748994.60	0.0-6.0	NA
13	2081682.40	749082.10	0.0-6.0	Covered with approximately 5 inches of topsoil, revegetated
16	2081605.60	749165.00	0.0-6.0	NA
17	2081607.40	749199.60	0.0-6.0	NA
18	2081688.20	749232.30	0.0-6.0	NA
19	2081725.50	749231.40	0.0-6.0	Covered with approximately 5 inches of topsoil, revegetated
20	2081713.00	749117.40	0.0-6.0	Covered with approximately 5 inches of topsoil, revegetated
21	2081682.70	749127.20	0.0-6.0	Covered with approximately 5 inches of topsoil, revegetated
22	2081608.60	749004.00	0.0-6.0	NA
3	2081800.20	749126.30	0.0-6.0	NA
4	2081784.50	749146.50	0.0-6.0	NA
8	2081776.90	749101.30	0.0-6.0	NA
HDD-2-01	2081726.65	749224.34	3.9	Covered with approximately 5 inches of topsoil, revegetated
BU38-0005	2081653.00	749090.00	2.5 – 4.5	Covered with approximately 5 inches of topsoil, revegetated,
BU39-0004	2081677.00	749195.00	2.5 – 4.5	Covered with approximately 5 inches of topsoil, revegetated
Eastern Process Line	2081731.00	749132.00	2.5 – 4.5	Covered with approximately 5 inches of topsoil, revegetated
Northern Process Line	2081664.00	749196.00	2.5 – 4.5	Covered with approximately 5 inches of topsoil, revegetated

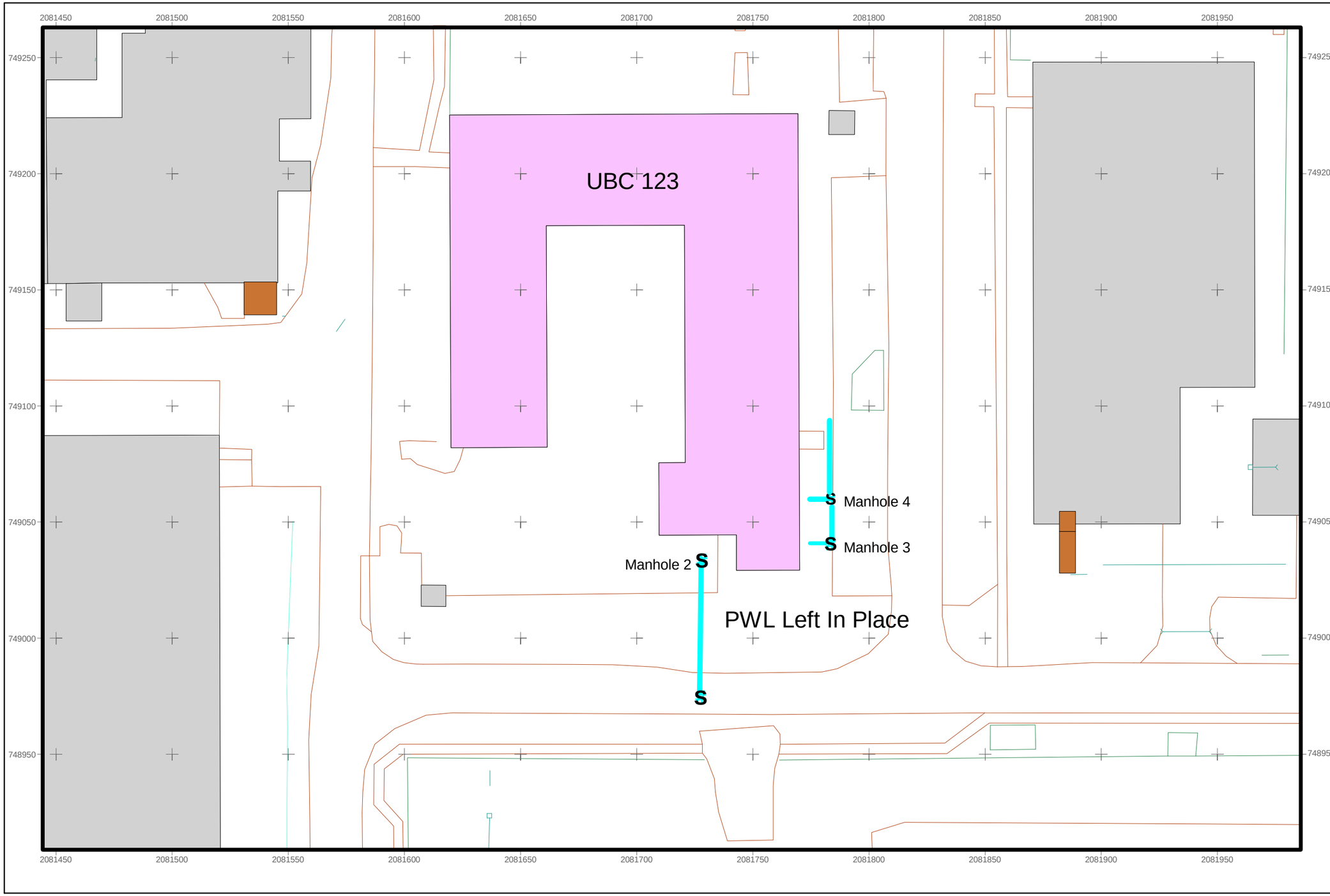

Figure 18
NPWL and OPWL
Left in Place

FY 2002 IHSS locations
FY 2002 PAC locations
FY 2002 UBC locations
Buildings and other structures
Process Waste Line - Left in Place
Paved areas
Dirt roads
Streams, ditches, or other drainage features

N

Scale =1:500

10 0 10 20 Feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

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- Residual lead concentrations in subsurface soil were less than Tier II ALs, proposed WRW ALS, and only slightly greater than background plus two standard deviations. Residual lead concentrations are slightly greater than proposed ecological ALs.

- Residual SVOC concentrations were less than Tier II ALs, proposed WRW ALs, and only slightly greater than MDLs, and the Tier II SOR was less than 1.

- Radionuclide activities in surface soil were less than Tier II ALs, proposed WRW ALs, and only slightly greater than background plus two standard deviations (DOE 2002b).

- Beryllium was detected at 0.16 mg/kg greater than the RFCA Tier II AL in surface soil at only one location outside of UBC 123, IHSS 148, and PAC 100-611 but within the AOC. This result was less than the MDL. Additionally, this location was covered with approximately 6 inches of soil and revegetated.

- Methylene chloride concentrations in subsurface soil, outside of UBC 123, IHSS 148, and PAC 100-611 but within the AOC, were greater than the RFCA Tier II AL at six locations. Methylene chloride was found in laboratory blanks associated with the data set and the results are likely due to laboratory contamination. Methylene chloride does not pose a significant risk at these concentrations.

4.0 STEWARDSHIP EVALUATION

The IHSS Group 100-4 stewardship evaluation was conducted through ongoing consultation with the regulatory agencies. Frequent informal project updates, e-mails, telephone and personal contact occurred throughout the project. Documentation associated with these contacts is provided in Appendix C.

4.1 Current Site Conditions

As discussed in Section 2.0, the accelerated action at IHSS Group 100-4 consisted of removal of slabs, footers, and utilities, and soil with metal contaminant concentrations greater than Tier I ALs. Section 3.0 presents residual contamination information.

The following conditions currently exist at IHSS Group 100-4:

- Potential sources of contamination that existed at IHSS Group 100-4 (building slab, source pits, process waste lines, and sumps) were removed.

- Residual radionuclide activities in subsurface soil are slightly greater than background plus two standard deviations.

- Residual lead concentrations in subsurface soil are slightly greater than background plus two standard deviations.

- Residual SVOC concentrations are slightly greater than MDLs, and the Tier II SOR is less than 1.

- Radionuclide activities in surface soil are slightly greater than background plus two standard deviations (DOE 2002b).

- Beryllium was detected at 0.16 mg/kg greater than the RFCA Tier II AL in surface soil at only one location outside of UBC 123, IHSS 148, and PAC 100-611 but within the AOC. This result was less than the MDL. Additionally, this location was covered with approximately 6 inches of soil and revegetated.

- Methylene chloride concentrations in subsurface soil, outside of UBC 123, IHSS 148, and PAC 100-611 but within the AOC, are greater than the RFCA Tier II AL but less than proposed WRR and ecological ALs at six locations. Methylene chloride was found in laboratory blanks associated with the data set and the results are likely due to laboratory contamination. Methylene chloride does not pose a significant risk at these concentrations.

- The pipeline extending east and then north from MH-3 was not removed. This cast iron pipeline, part of P-2, is approximately 5 feet below the surface. The pipeline end was sealed with Sika Grout 212. The pipeline extending south from MH-2 was not removed. This cast iron pipeline, part of P-1, is approximately 5 feet below the surface. The pipeline end was sealed with Sika Grout 212. This pipeline extends through PAC 100-602 to Valve Vault 18.

- The site was covered with approximately 6 inches of clean soil and regraded.

- The site was revegetated.

4.2 Near Term Management Recommendations

Because residual contaminant concentrations are low and potential contaminant sources were removed, mitigated or found not to have existed, no specific near-term management techniques are required. Potential contaminant sources and pathways have been removed. Contaminant concentrations in soil remaining at IHSS Group 100-4 do not trigger any further accelerated action. Excavation at the site will continue to be controlled through the Site Soil Disturbance Permit process. Fencing and signs restricting access will be posted to minimize disturbance to newly-revegetated areas. Site access and security controls and the Soil Disturbance Permit process will remain in place pending implementation of long-term controls.

4.3 Long-Term Stewardship Recommendations

Based on remaining environmental conditions at IHSS Group 100-4, no specific long-term stewardship activities are recommended for IHSS Group 100-4 beyond the generally applicable Site requirements that may be imposed on this area in the future, which are dependent upon the final remedy selected. Institutional controls that will be used as appropriate for this area include the following:

- Prohibitions on construction of buildings in the IA;
- Restrictions on excavation or other soil disturbance; and
- Prohibitions on groundwater pumping in the area of IHSS Group 100-4.

No specific engineered controls are recommended as a result of the conditions remaining in IHSS Group 100-4; and

No specific environmental monitoring is recommended as a result of the environmental conditions remaining in IHSS Group 100-4.

No specific institutional or physical controls, such as fences, are recommended as a result of the environmental conditions remaining in IHSS Group 100-4.

This closeout report and associated documentation will be retained as part of the Rocky Flats administrative record file. These specific long-term stewardship recommendations will also be summarized in the Rocky Flats *Long-Term Stewardship Strategy*.

IHSS Group 100-4 will be evaluated as part of the Sitewide CRA, which is part of the RFI/RI and Corrective Measures Study/Feasibility Study (CMS/FS) that will be conducted for the Site. The need for and extent of any, more general, long-term stewardship activities will also be analyzed in RFI/RI and CMS/FS and will be proposed as part of the preferred alternative in the Proposed Plan for the Site. Institutional controls and other long-term stewardship requirements for Rocky Flats will ultimately be contained in the Corrective Action Decision/Record of Decision (CAD/ROD), in any post-closure Colorado Hazardous Waste Act permit that may be required, and in any post-RFCA agreement.

4.4 Accelerated Action Stewardship

Stewardship actions that were implemented during the accelerated action included posting signs and barriers, including yellow chain and jersey barriers.

5.0 DATA QUALITY ASSESSMENT

The DQOs for this project, as defined in the IASAP (DOE 2001a), were achieved based on the DQA provided in the following sections. The DQO/DQA process ensures that the type, quantity, and quality of environmental data used in decision making are defensible, with emphasis on attaining adequate (statistical) confidence in the decisions. The DQO/DQA process is based on the following guidance and requirements:

- EPA QA/G-4, 1994. Guidance for the Data Quality Objective Process (EPA 1994a);
- EPA QA/G-9, 1998. Guidance for the Data Quality Assessment Process; Practical Methods for Data Analysis (EPA 1998); and
- DOE Order 414.1A, Quality Assurance (DOE 1999b)

Verification and validation (V&V) of the data are the primary components of the DQA. The final data are compared with original project DQOs and evaluated with respect to project decisions; uncertainty within the decisions; and quality criteria required for the data, specifically precision, accuracy, representativeness, completeness, comparability, and sensitivity (PARCCS). Validation criteria are consistent with the following RFETS-specific documents and industry guidelines:

- EPA 540/R-94/012, USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (EPA 1994b);
- EPA 540/R-94/013, USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (EPA 1994c); and
- Kaiser-Hill Company, L.L.C.(K-H) V&V Guidelines
  - General Guidelines for Data Verification and Validation, DA-GR01-v1, December 3, 1997
  - V&V Guidelines for Isotopic Determinations by Alpha Spectrometry, DA-RC01-v1, 2/13/98

  - V&V Guidelines for Volatile Organics, DA-SS01-v1, 12/3/97
  - V&V Guidelines for Semivolatile Organics, DA-SS02-v1, 12/3/97
  - V&V Guidelines for Metals, DA-SS05-v1, 12/18/97

- Lockheed-Martin, 1997, Evaluation of Radiochemical Data Usability, ES/ER/MS-5.

This report will be submitted to the Comprehensive Environmental, Response, Compensation and Liability Act (CERCLA) Administrative Record (AR) for permanent storage within 30 days of approval by CDPHE and/or the U.S. Environmental Protection Agency (EPA).

5.1 DQO Decisions

Consistent with the original DQO decision rules of the project, SOR calculations were conducted for each sample location using confirmation results. In accordance with the DQOs, if the SOR for radiological or nonradiological constituents does not exceed 1 then no further action is required. As shown in Section 2.3, SORs were below 1 and no further action is required.

5.2 Verification and Validation of Results

Verification ensures that data produced and used by the project are documented and traceable in accordance with quality requirements. Validation consists of a technical review of all data that directly support the project decisions so that any limitations of the data relative to project goals are delineated and the associated data are qualified accordingly. The V&V process defines the criteria that constitute data quality, namely PARCCS parameters. Data traceability and archival are also addressed. V&V criteria include the following:

- Chain-of-custody;
- Preservation and hold-times;
- Instrument calibrations;
- Preparation blanks;
- Interference check samples (metals);
- Matrix spikes/matrix spike duplicates (MS/MSD);
- Laboratory control samples (LCS);
- Field duplicate measurements;
- Chemical yield (radiochemistry);
- Required quantitation limits/minimum detectable activities (sensitivity of chemical and radiochemical measurements, respectively); and
- Sample analysis and preparation methods.

V&V results of electronic data are documented in the ER Remediation, Industrial D&D, and Site Services (RISS) Project File as “PlanvsActuals2.mdb” in Microsoft ACCESS).

Precision

Precision of results was acceptable with the qualifications discussed below, based on the frequency and results of duplicate Quality Control (QC) samples.

Laboratory precision was acceptable based on the frequency of MSD and laboratory duplicates (LDs) analyzed (≥1/laboratory batch, or ≥1:20 QC-to-real sample ratio), and the resulting relative percent difference (RPD) values resulting from those analyses (one exception was aluminum, at 48% RPD, in laboratory batch 2050380, but this does not affect project decisions). Maximum RPD values were typically <15%; the DQO is <30% for soil matrices.

Field sampling precision was adequate for radionuclides, but was indeterminate for nonradionuclides. Eleven field duplicates were analyzed for radiological constituents (seven for gamma spectroscopy and four for alpha spectroscopy). Precision was adequate based on repeatability of both field duplicate and real sample results to quantities well below associated RFCA ALs. No field duplicates were acquired for nonradiological samples, though all corresponding real results (Completeness) were repeatable at levels well below RFCA Tier II ALs. Based on the overall low concentrations as compared with ALs, there is no impact on decisions.

Accuracy and Bias

Location measurements recorded on maps are within ±1 ft, based on the Global Positioning System (GPS) technology in use (Trimble 4800 Series). Location measurements in trenches were offset, and the measurement was recalculated. Several confirmation sampling locations were not measured but were hand plotted and estimated.

The frequency of LCS was adequate, with at least one LCS per batch, though the lists of analytes were short for all methods except SW6010 (metals), where a complete list of analytes was used; likewise for MS. All LCS recoveries, for all chemical (nonradiological) analytes, were between 66% and 112%, which is within associated QC tolerances.

MS recoveries ranged from 37% to 121% with exceptions consisting of one iron and one silica (<16%), one 1,1-dichloroethene (171%), and one aluminum (928%). None of the out-of-specification occurrences impact decisions, as the magnitude of the low bias would not cause AL exceedances if results were corrected accordingly; positive biases did not cause false positives in the real samples. Chlorobenzene is qualified as an estimate for sample 02E0010-026.002, and may be biased low due to an MS recovery of 37% (the lower control limit is ~75%) for the associated laboratory batch.

Frequency of blank analyses (method blanks) was adequate at ≥1/laboratory batch for all chemical analyses. Blanks yielded no concentrations significant enough to cause a high bias in the corresponding real samples, i.e., there are no false positive results due to blank contamination.

Representativeness

Surface soil grab samples acquired for the project, are representative based on the number and location of samples acquired, in combination with the following criteria:

- Familiarity with site history and current IHSS configurations and collaborations by management and technical staff;
- Implementation of industry-standard chain-of-custody protocols;

- Compliance with sample preservation and hold times;
- Documented and Site-approved methods, particularly standard operating procedures (SOPs) controlled by the subcontractor; and
- Compliance with CDPHE- and EPA-approved sampling and analysis plans (the IASAP and IASAP Addendum).

Completeness

Sampling completeness is addressed in Table 14. The required minimum numbers of real samples and laboratory QC were acquired. The variance between planned versus actual field duplicates and their impact on decisions was addressed in the Precision section.

A summary of the V&V for all Electronic Data Deliverable (EDD) records, presented in Table 15 , indicates no rejection of the data. All estimated values were well less than associated RFCA ALs. Validation of results was completed at the minimum frequency of ≥10% per method and matrix-type, with the exception of radionuclides, where V&V is in progress. However, adequate frequency and performance of LCS for the radiological suites suggests that these data are valid. Note that headers within Table 15 indicate line item codes and generic labels for method types.

Comparability

Results presented are comparable with CERCLA data on a site- and DOE complex-wide basis. This comparability is based on:

- Use of standardized engineering units in the reporting of measurement results;
- Consistent sensitivities of measurements (≤ the required quantitation limit [RQL] or minimum detectable activity [MDA]);
- Use of site-approved procedures (Contractual Statements of Work for laboratory analyses);
- Systematic quality controls; and
- Thorough documentation of the planning, sampling/analysis process, and data reduction into formats designed for making decisions posed from the project's original data quality objectives.

Sensitivity

Adequate sensitivities, (i.e., detection limits) were attained for most analytes. Exceptions are listed in Tables 14 and 15. Although the listed analytes had detection limits in excess of associated subsurface soil action levels, none of the compounds were detected at or above the detection limit denoted by a "U" flag associated with the results. If a result was a "nondetect" (i.e., flagged as "U" by the laboratory), then it was not included in the SOR calculation. Ideally, detection limits are at least one-half the associated action level for those exceedances listed in Tables 16 and 17 below.

Table 14
IHSS Group 100-4–Sample Completeness Summary

Minimum Number of Samples Planned (including Media)	Number of Samples Taken (Real and QC)	Project Decisions (Conclusions) & Uncertainty
VOC		
None	2 real, soil 1 pipe scale	No contamination >RFCA Tier II
SVOC		
1 soil	3 real, soil	No contamination >RFCA Tier II
METALS		
5 soil	2 (full suite), soil, real 5 (lead only), soil, real 1 soil (TCLP), soil 1 pipe scale (TCLP), soil,	No contamination >RFCA Tier II
pH		
1 soil	5, soil, real	All pH results >7; no further evidence of acid spills
RADIOLOGICAL (APLHA SPEC)		
PWLs (trench bottom) - 14 Soil Sumps (excavation bottom) - 4 Source Pit - 2	55 real, soil 4 field duplicates 3 water 4 concrete	No contamination >RFCA Tier II; Water results indeterminate from Laboratory 559 due to high reporting limit
RADIOLOGICAL (GAMMA SPEC)		
Sumps (excavation bottom) - 4 Source Pit - 2	69 real, 4 duplicates (soil) 2 concrete	No contamination >RFCA Tier II

Table 15
IHSS Group 100-4 – Verification & Validation for Electronic Data Deliverable Records

SWD Validation Qualifier Code	Total of CAS Number	ASP-A-003	ASP-A-004	ASP-A-011	MET-A-023	MET-A-024	MET-A-031	MIS-A-004	RC10B 019	RFAA 005	URS10B 019	URS10B 19	VOAA 011	VOAA 011	SVO-A 007
		Alpha Spec			Metals			Corrosivity	Gamma Spec				VOC		SVOC
Null	2004	5	270	3	70	3	38	1	439	19	510	207	345	82	12
1	23							1					8	8	6
J	16			2	12		2								
V	220	10		4	34	4	4			38					126
V1	326							4					134	126	62
JB1	3													2	1
UJ	17				9		2								6
UJ1	3														3
Total	2612	15	270	9	125	7	46	6	439	38	510	207	487	218	216
% Validated	23%	5%	0%	%	38%	%		83%	**3%**	100%	%		39%		94%

Table 16
IHSS Group 100-4 Analytes with Detection Limits Exceeding Tier I Action Levels

CAS Number	Analyte Name	Reporting Limit (µg/kg)	Tier I AL (µg/kg)
121-14-2	2,4-Dinitrotoluene	100	5.01E+01
606-20-2	2,6-Dinitroltoluene	100	3.88E+01
111-44-4	Bis(2-Chloroethyl) Ether	52	9.73E+00
621-64-7	N-Nitroso-di-n-propylamine	94	1.89E+00

Table 17
IHSS Group 100-4 Analytes with Detection Limits Exceeding Tier II Action Levels

CAS Number	Analyte Name	Reporting Limit (µg/kg)	Tier II (µg/kg)
51-28-5	2,4-Dinitrophenol	520	5.29E+01
121-14-2	2,4-Dinitrotoluene	100	5.01E-01
606-20-2	2,6-Dinitrotoluene	100	3.88E-01
91-94-1	3,3'-Dichlorobenzidine	73	4.84E+00
91-94-1	3,3'-Dichlorobenzidine	75	4.84E+00
7440-38-2	Arsenic	3,400	2.99E+03
111-44-4	Bis(2-Chloroethyl) ether	51	9.73E-02
621-64-7	N-nitroso-di-n-propylamine	92	1.89E-02
98-95-3	Nitrobenzene	91	5.39E+01
87-86-5	Pentachlorophenol	400	2.11E+01

5.3 Data Quality Summary

The data presented in this section have been verified and validated for the purpose of corroborating decisions to acceptable levels of confidence as stated in the original DQOs for this project. Qualifications of the data are described above.

6.0 IHSS GROUP 100-5 ACTIVITIES

IHSS Group 100-5 consists of PAC 100-609, the security incinerator. The security incinerator was located south of Building 121 and was used for incineration of classified documents. The location of IHSS Group 100-5 is shown in Figure 1. During some period in its operating history, the incinerator was used to burn no carbon required (NCR)-type paper containing polychlorinated biphenyls (PCBs), which could have resulted in the generation of dioxins and furans. It is known that ash from the incinerator ash was being disposed at the Present Landfill (PAC NW-114) in December 1980. It is not known whether this was standard practice throughout the incinerator's operating history. According to one source, "tons" of NCR paper, containing up to 10% to 20% PCBs, was burned in the incinerator.

6.1 Site Characterization

As described in IASAP Addendum #IA-02-01 (DOE 2001b), PCOCs at IHSS Group 100-5 were determined based on historical knowledge (DOE 1992). PCOCs at this site are dioxins, furans, and PCBs. Surface soil samples were collected from six sampling locations beneath the concrete slab and analyzed. Sampling specifications are shown in Table 18, and results are shown in Table 19.

6.2 Accelerated Action Description

Accelerated action activities including a description of the AOC and removal activities are described below.

6.2.1 Area of Concern

The AOC, shown on Figure 19, was determined based on analytical results from IASAP Addendum #IA-02-01 (DOE 2001b) sampling. The AOC is defined as the area with concentration of contaminants greater than MDLs. The AOC map also illustrates the limits of RFCA Tier II and Tier I AL exceedances for PCBs. Because there are no existing RFCA ALs for dioxin and furan or congeners, a different framework was used for comparison of analytical results. Both EPA cleanup guidelines (EPA 1998) for residential and industrial use (in accordance with RFCA) and a reference value of 9 parts per trillion (ppt) toxicity equivalents (TEQ) (consultative process) were used for comparison. Results for dioxin and furan congeners were converted to TEQ using a toxicity equivalency factor (TEF) in accordance with SW8290 (EPA 1994d) and a recent World Health Organization (WHO) study (WHO 1998).

The TEF for each compound is presented in Table 20. The TEQ values for dioxin congeners are summed for each sampling location and the TEQ values for furan congeners were summed for each sampling location. These data are presented in Table 21. As shown on Table 21 there are no exceedances of the 9 ppt TEQ for the summed dioxin compounds. Results at one location, BT39-003, indicate a value of 10.87 ppt for the summed dioxin and furan congeners. While this value is slightly greater than the reference value of 9 ppt TEQ it as well as all other summated TEQ values are well within the cited Front Range background range of 0.1 to 57.5 ppt TEQ (EPA 2001). Additionally, the maximum 2,3,7,8-TCDD TEQ of 6.8 ppt was less than the 9 ppt TEQ value.

Additionally, as shown on Figure 20, there are no concentrations greater than RFCA Tier II, Tier I, or proposed WRW or ecological ALs (PCBs) or EPA cleanup guidelines. SOR calculations are based on PCB results. The Tier II SOR calculation results for nonradionuclides are presented on Figure 21. Dioxin and furan congeners do not have proposed RFCA ALs.

Table 18
IHSS Group 100-5, PAC 100-609–Characterization Sampling Specifications

IHSS Group	IHSS/PAC/UBC Site	Location Code	Easting	Northing	Media	Depth Interval Beneath Slabs (ft)	Analyte	Laboratory Method
100-5	PAC 100-609 – Security Incinerator	BT38-A001	2081396	749167	Surface Soil	0.0-0.5	Dioxin and Furan	8290
		BT38-A001	2081396	749167	Surface Soil	0.0-0.5	PCBs	8082
		BT38-A002	2081406	749165	Surface Soil	0.0-0.5	Dioxin and Furan	8290
		BT38-A002	2081406	749165	Surface Soil	0.0-0.5	PCBs	8082
		BT39-A001	2081397	749170	Surface Soil	0.0-0.5	Dioxin and Furan	8290
		BT39-A001	2081397	749170	Surface Soil	0.0-0.5	PCBs	8082
		BT39-A002	2081406	749170	Surface Soil	0.0-0.5	Dioxin and Furan	8290
		BT39-A002	2081406	749170	Surface Soil	0.0-0.5	PCBs	8082
		BT39-A003	2081400	749164	Surface Soil	0.0-0.5	Dioxin and Furan	8290
		BT39-A003	2081400	749164	Surface Soil	0.0-0.5	PCBs	8082
		BT39-A004	2081402	749170	Surface Soil	0.0-0.5	Dioxin and Furan	8290
		BT39-A004	2081402	749170	Surface Soil	0.0-0.5	PCBs	8082

Table 19
IHSS Group 100-5, PAC 100-609–Characterization Data Summary

IHSS Group	IHSS/PAC/UBC Site	Analyte	Maximum (µg/kg)	MDL (µg/kg)	Tier II AL (µg/kg)	Tier I AL (µg/kg)
100-5	100-609 – Security Incinerator	Aroclor-1016	19.5	<.069	224,000	2,240
		Aroclor-1221	ND	<.069	224,000	2,240
		Aroclor-1232	ND	<.069	224,000	2,240
		Aroclor-1242	23	<.069	224,000	2,240
		Aroclor-1248	42	<.069	224,000	2,240
		Aroclor-1254	30	<.069	224,000	2,240
		Aroclor-1260	17.5	<.069	224,000	2,240
		Analyte	**Maximum (pg/g)**	**RDL (pg/g)**	**EPA Residential Cleanup Guidance (pg/g)**	**EPA Industrial Cleanup Guidance (pg/g)**
		1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	33	<.22	1,000	5,000
		1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	6.2	<.22	1,000	5,000
		1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	0.34	<.22	1,000	5,000
		1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	0.23	<.22	1,000	5,000
		1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	1.5	<.22	1,000	5,000
		1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	1.2	<.22	1,000	5,000
		1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	1.2	<.22	1,000	5,000
		1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	1.2	<.22	1,000	5,000
		1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	1.2	<.22	1,000	5,000
		1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	0.82	<.22	1,000	5,000
		1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	4.3	<.22	1,000	5,000
		2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	0.82	<.22	1,000	5,000
		2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	1.9	<.22	1,000	5,000
		2,3,7,8-Tetrachlorodibenzofuran (TCDF)	12	<.22	1,000	5,000
		2,3,7,8,-Tetrachlorodibenzodioxin (TCDD)	6.8	<.22	1,000	5,000
		1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	290	<.22	1,000	5,000
		1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	16	<.22	1,000	5,000

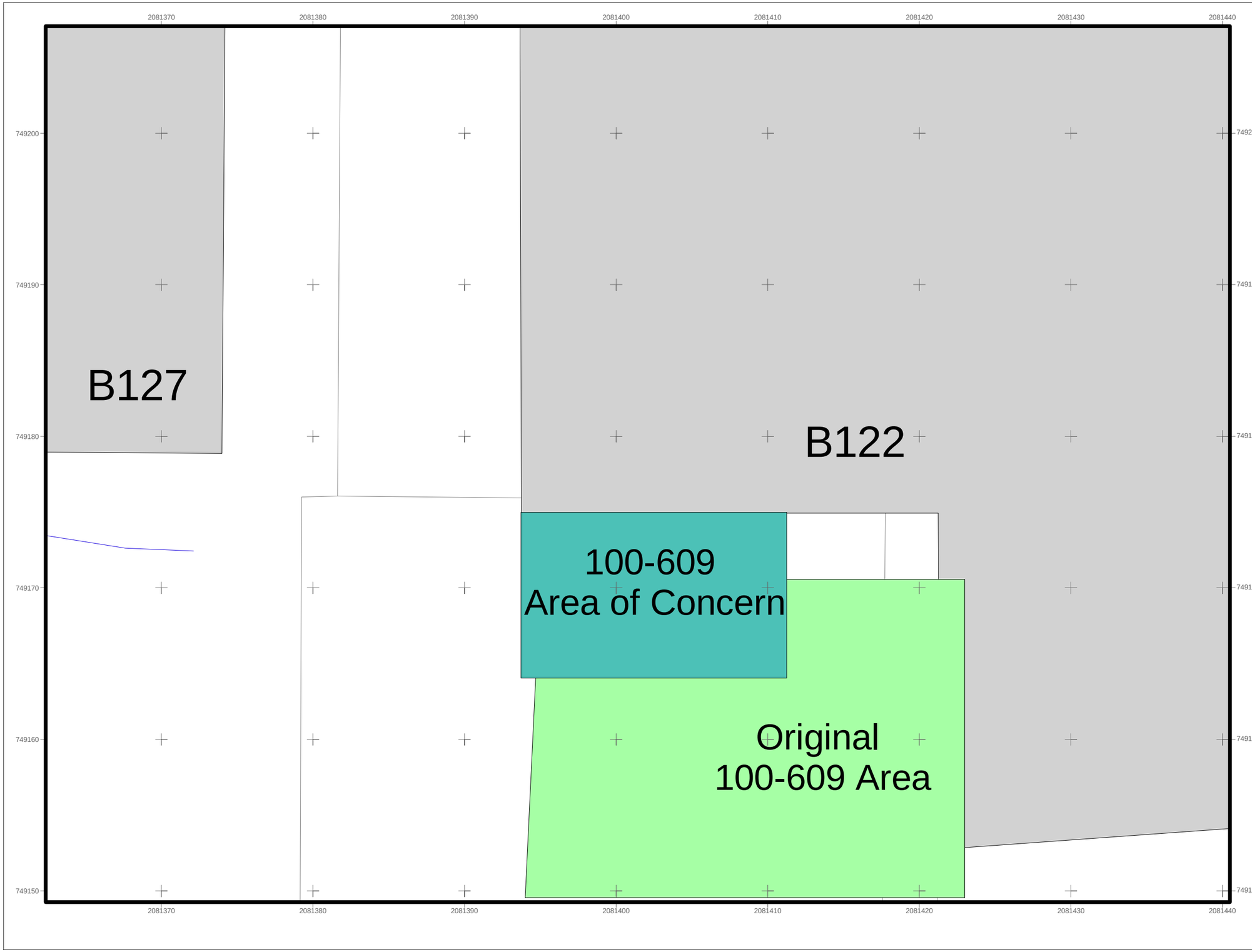


Figure 19
IHSS Group 100-5
Area of Concern

KEY

- 100-5 AOC
- Building
- Original 100-609 Area
- Dirt Road
- Paved area
- Stream, ditch, or drainage

N

Scale = 1:75

2 0 2 4 Feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

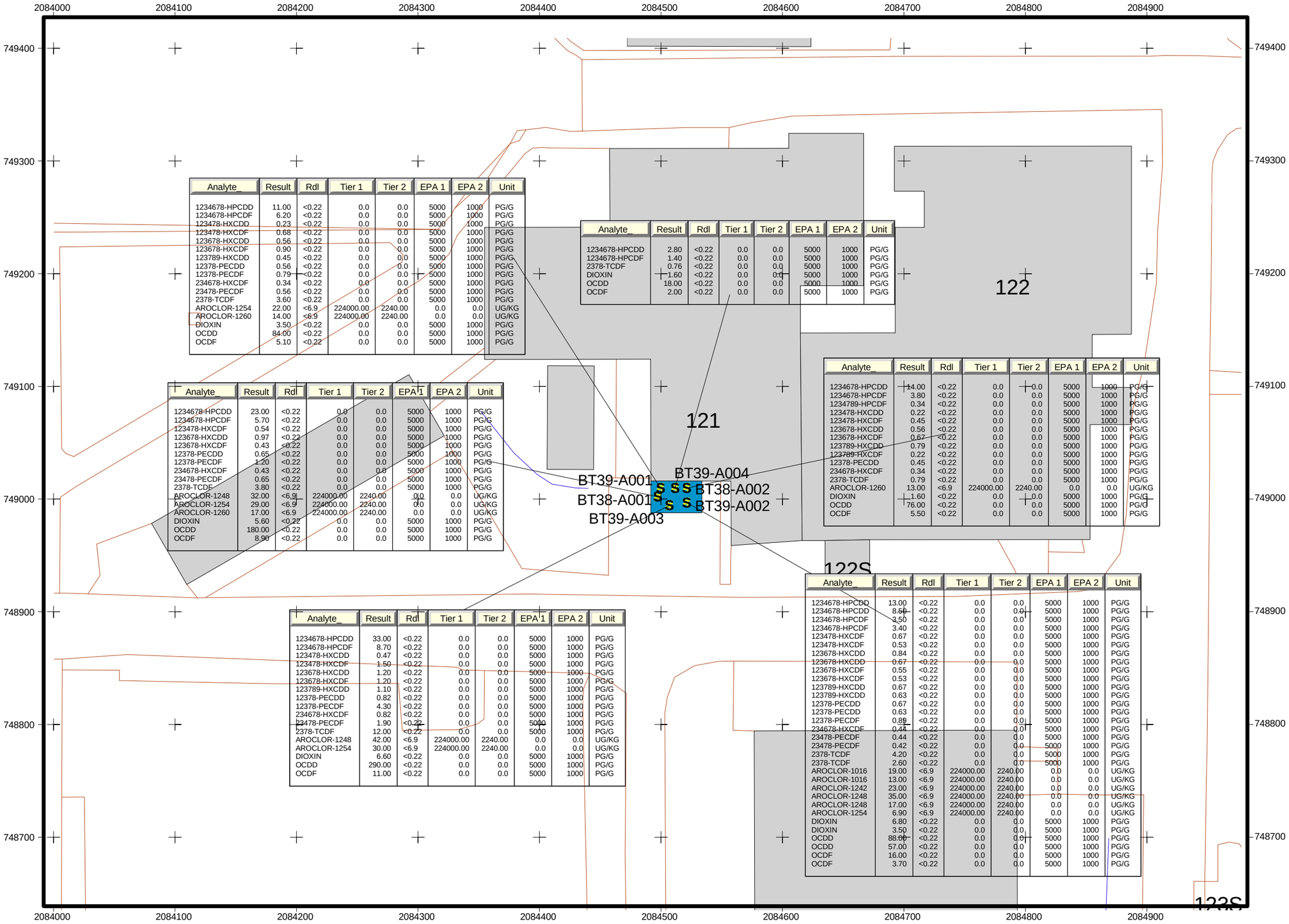
U.S. Department of Energy
Rocky Flats Environmemtal Technology Site

Prepared by:

KAISER•HILL COMPANY

100-5AOCsps

2003



Analyte	Result	Rdl	Tier 1	Tier 2	EPA 1	EPA 2	Unit
1234678-HPCDD	11.00	<0.22	0.0	0.0	5000	1000	PG/G
1234678-HPCDF	6.20	<0.22	0.0	0.0	5000	1000	PG/G
123478-HXCDD	0.23	<0.22	0.0	0.0	5000	1000	PG/G
123478-HXCDF	0.68	<0.22	0.0	0.0	5000	1000	PG/G
123678-HXCDD	0.56	<0.22	0.0	0.0	5000	1000	PG/G
123678-HXCDF	0.90	<0.22	0.0	0.0	5000	1000	PG/G
123789-HXCDD	0.45	<0.22	0.0	0.0	5000	1000	PG/G
12378-PECDD	0.56	<0.22	0.0	0.0	5000	1000	PG/G
12378-PECDF	0.79	<0.22	0.0	0.0	5000	1000	PG/G
234678-HXCDF	0.34	<0.22	0.0	0.0	5000	1000	PG/G
23478-PECDF	0.56	<0.22	0.0	0.0	5000	1000	PG/G
2378-TCDF	3.60	<0.22	0.0	0.0	5000	1000	PG/G
AROCLOR-1254	22.00	<6.9	224000.00	2240.00	0.0	0.0	UG/KG
AROCLOR-1260	14.00	<6.9	224000.00	2240.00	0.0	0.0	UG/KG
DIOXIN	3.50	<0.22	0.0	0.0	5000	1000	PG/G
OCDD	84.00	<0.22	0.0	0.0	5000	1000	PG/G
OCDF	5.10	<0.22	0.0	0.0	5000	1000	PG/G

Analyte	Result	Rdl	Tier 1	Tier 2	EPA 1	EPA 2	Unit
1234678-HPCDD	2.80	<0.22	0.0	0.0	5000	1000	PG/G
1234678-HPCDF	1.40	<0.22	0.0	0.0	5000	1000	PG/G
2378-TCDF	0.76	<0.22	0.0	0.0	5000	1000	PG/G
DIOXIN	1.60	<0.22	0.0	0.0	5000	1000	PG/G
OCDD	18.00	<0.22	0.0	0.0	5000	1000	PG/G
OCDF	2.00	<0.22	0.0	0.0	5000	1000	PG/G

Analyte	Result	Rdl	Tier 1	Tier 2	EPA 1	EPA 2	Unit
1234678-HPCDD	23.00	<0.22	0.0	0.0	5000	1000	PG/G
1234678-HPCDF	5.70	<0.22	0.0	0.0	5000	1000	PG/G
123478-HXCDF	0.54	<0.22	0.0	0.0	5000	1000	PG/G
123678-HXCDD	0.97	<0.22	0.0	0.0	5000	1000	PG/G
123678-HXCDF	0.43	<0.22	0.0	0.0	5000	1000	PG/G
12378-PECDD	0.65	<0.22	0.0	0.0	5000	1000	PG/G
12378-PECDF	1.20	<0.22	0.0	0.0	5000	1000	PG/G
234678-HXCDF	0.43	<0.22	0.0	0.0	5000	1000	PG/G
23478-PECDF	0.65	<0.22	0.0	0.0	5000	1000	PG/G
2378-TCDF	3.80	<0.22	0.0	0.0	5000	1000	PG/G
AROCLOR-1248	32.00	<6.9	224000.00	2240.00	0.0	0.0	UG/KG
AROCLOR-1254	29.00	<6.9	224000.00	2240.00	0.0	0.0	UG/KG
AROCLOR-1260	17.00	<6.9	224000.00	2240.00	0.0	0.0	UG/KG
DIOXIN	5.60	<0.22	0.0	0.0	5000	1000	PG/G
OCDD	180.00	<0.22	0.0	0.0	5000	1000	PG/G
OCDF	8.90	<0.22	0.0	0.0	5000	1000	PG/G

Analyte	Result	Rdl	Tier 1	Tier 2	EPA 1	EPA 2	Unit
1234678-HPCDD	14.00	<0.22	0.0	0.0	5000	1000	PG/G
1234678-HPCDF	3.80	<0.22	0.0	0.0	5000	1000	PG/G
1234789-HPCDF	0.34	<0.22	0.0	0.0	5000	1000	PG/G
123478-HXCDD	0.22	<0.22	0.0	0.0	5000	1000	PG/G
123478-HXCDF	0.45	<0.22	0.0	0.0	5000	1000	PG/G
123678-HXCDD	0.56	<0.22	0.0	0.0	5000	1000	PG/G
123678-HXCDF	0.67	<0.22	0.0	0.0	5000	1000	PG/G
123789-HXCDD	0.79	<0.22	0.0	0.0	5000	1000	PG/G
123789-HXCDF	0.22	<0.22	0.0	0.0	5000	1000	PG/G
12378-PECDD	0.45	<0.22	0.0	0.0	5000	1000	PG/G
234678-HXCDF	0.34	<0.22	0.0	0.0	5000	1000	PG/G
2378-TCDF	0.79	<0.22	0.0	0.0	5000	1000	PG/G
AROCLOR-1260	13.00	<6.9	224000.00	2240.00	0.0	0.0	UG/KG
DIOXIN	1.60	<0.22	0.0	0.0	5000	1000	PG/G
OCDD	76.00	<0.22	0.0	0.0	5000	1000	PG/G
OCDF	5.50	<0.22	0.0	0.0	5000	1000	PG/G

Analyte	Result	Rdl	Tier 1	Tier 2	EPA 1	EPA 2	Unit
1234678-HPCDD	33.00	<0.22	0.0	0.0	5000	1000	PG/G
1234678-HPCDF	8.70	<0.22	0.0	0.0	5000	1000	PG/G
123478-HXCDD	0.47	<0.22	0.0	0.0	5000	1000	PG/G
123478-HXCDF	1.50	<0.22	0.0	0.0	5000	1000	PG/G
123678-HXCDD	1.20	<0.22	0.0	0.0	5000	1000	PG/G
123678-HXCDF	1.20	<0.22	0.0	0.0	5000	1000	PG/G
123789-HXCDD	1.10	<0.22	0.0	0.0	5000	1000	PG/G
12378-PECDD	0.82	<0.22	0.0	0.0	5000	1000	PG/G
12378-PECDF	4.30	<0.22	0.0	0.0	5000	1000	PG/G
234678-HXCDF	0.82	<0.22	0.0	0.0	5000	1000	PG/G
23478-PECDF	1.90	<0.22	0.0	0.0	5000	1000	PG/G
2378-TCDF	12.00	<0.22	0.0	0.0	5000	1000	PG/G
AROCLOR-1248	42.00	<6.9	224000.00	2240.00	0.0	0.0	UG/KG
AROCLOR-1254	30.00	<6.9	224000.00	2240.00	0.0	0.0	UG/KG
DIOXIN	6.60	<0.22	0.0	0.0	5000	1000	PG/G
OCDD	290.00	<0.22	0.0	0.0	5000	1000	PG/G
OCDF	11.00	<0.22	0.0	0.0	5000	1000	PG/G

Analyte	Result	Rdl	Tier 1	Tier 2	EPA 1	EPA 2	Unit
1234678-HPCDD	13.00	<0.22	0.0	0.0	5000	1000	PG/G
1234678-HPCDD	8.50	<0.22	0.0	0.0	5000	1000	PG/G
1234678-HPCDF	3.50	<0.22	0.0	0.0	5000	1000	PG/G
1234678-HPCDF	3.40	<0.22	0.0	0.0	5000	1000	PG/G
123478-HXCDF	0.67	<0.22	0.0	0.0	5000	1000	PG/G
123478-HXCDF	0.53	<0.22	0.0	0.0	5000	1000	PG/G
123678-HXCDD	0.84	<0.22	0.0	0.0	5000	1000	PG/G
123678-HXCDD	0.67	<0.22	0.0	0.0	5000	1000	PG/G
123678-HXCDF	0.55	<0.22	0.0	0.0	5000	1000	PG/G
123678-HXCDF	0.53	<0.22	0.0	0.0	5000	1000	PG/G
123789-HXCDD	0.67	<0.22	0.0	0.0	5000	1000	PG/G
123789-HXCDD	0.63	<0.22	0.0	0.0	5000	1000	PG/G
12378-PECDD	0.67	<0.22	0.0	0.0	5000	1000	PG/G
12378-PECDD	0.63	<0.22	0.0	0.0	5000	1000	PG/G
12378-PECDF	0.89	<0.22	0.0	0.0	5000	1000	PG/G
234678-HXCDF	0.44	<0.22	0.0	0.0	5000	1000	PG/G
23478-PECDF	0.44	<0.22	0.0	0.0	5000	1000	PG/G
23478-PECDF	0.42	<0.22	0.0	0.0	5000	1000	PG/G
2378-TCDF	4.20	<0.22	0.0	0.0	5000	1000	PG/G
2378-TCDF	2.60	<0.22	0.0	0.0	5000	1000	PG/G
AROCLOR-1016	19.00	<6.9	224000.00	2240.00	0.0	0.0	UG/KG
AROCLOR-1016	13.00	<6.9	224000.00	2240.00	0.0	0.0	UG/KG
AROCLOR-1242	23.00	<6.9	224000.00	2240.00	0.0	0.0	UG/KG
AROCLOR-1248	35.00	<6.9	224000.00	2240.00	0.0	0.0	UG/KG
AROCLOR-1248	17.00	<6.9	224000.00	2240.00	0.0	0.0	UG/KG
AROCLOR-1254	6.90	<6.9	224000.00	2240.00	0.0	0.0	UG/KG
DIOXIN	6.80	<0.22	0.0	0.0	5000	1000	PG/G
DIOXIN	3.50	<0.22	0.0	0.0	5000	1000	PG/G
OCDD	88.00	<0.22	0.0	0.0	5000	1000	PG/G
OCDD	57.00	<0.22	0.0	0.0	5000	1000	PG/G
OCDF	16.00	<0.22	0.0	0.0	5000	1000	PG/G
OCDF	3.70	<0.22	0.0	0.0	5000	1000	PG/G

Figure 20
Sampling Results Greater Than Method Detection Limits at IHSS Group 100-5

Key

- S — Surface Soil Sampling Locations
- PAC 100-609
- Buildings and other structures
- Paved areas
- Dirt roads
- Drainage Features

N

Scale = 1:400

10 0 10 20 Feet

U.S. Department of Energy
Rocky Flats Environmental Technology Site

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

Prepared by:

KAISER•HILL COMPANY

100-4100-5drr.apr

2003

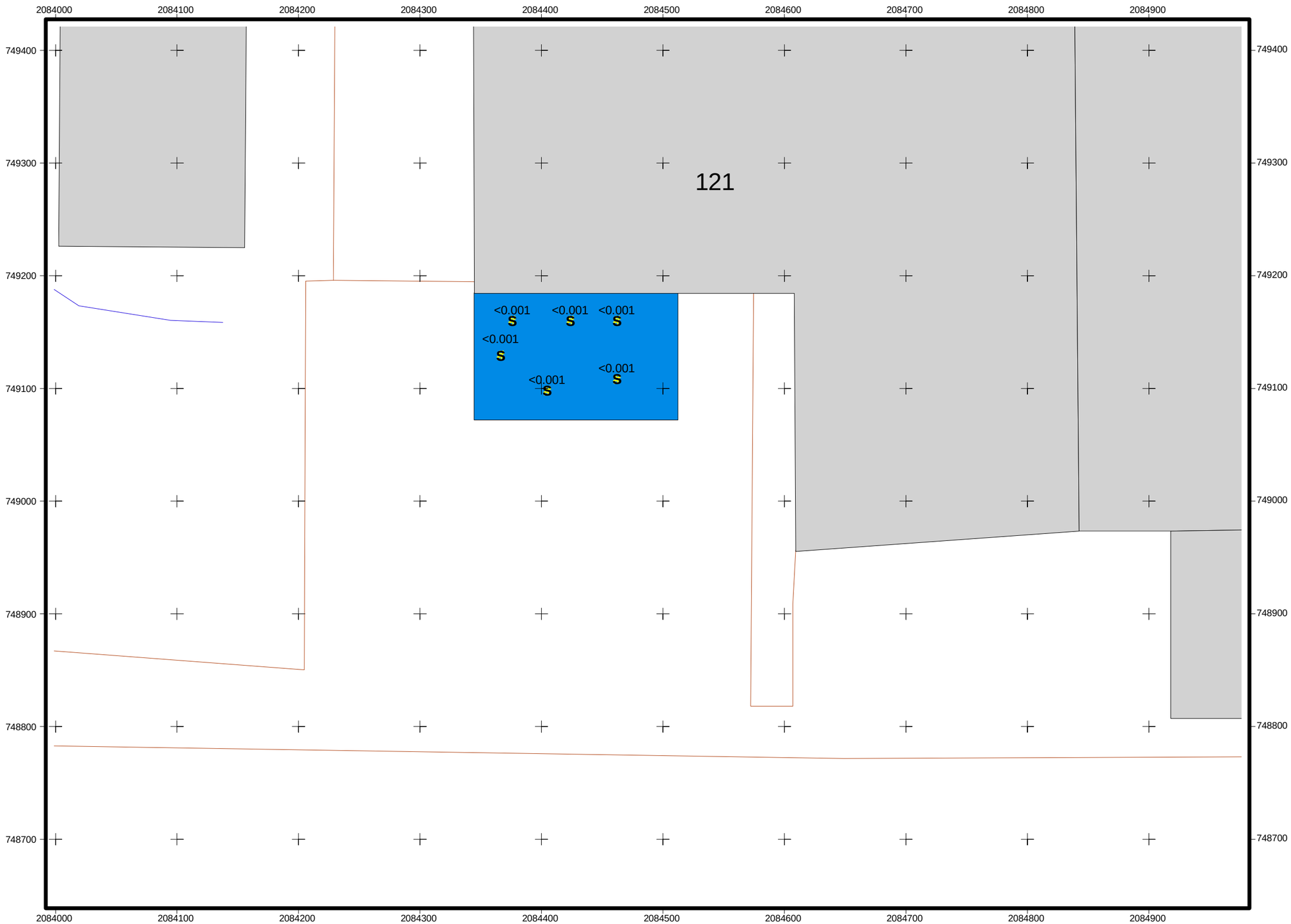


Figure 21
RFCA Tier II Nonradionuclide Sum of Ratios at IHSS Group 100-5

Key

- S Surface Soil Samples
- Buildings and other structures
- PAC 100-609
- Paved areas
- Dirt roads
- Drainage Features

N

Scale = 1:100

2 0 2 4 Feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental
Technology Site

Prepared By:

KAISER•HILL COMPANY

100-4100-5drr.apr

2003

Table 20
IHSS Group 100-5–Toxicity Equivalent Comparison

Analyte	TEF
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	0.01
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	0.01
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	0.01
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	0.10
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	0.10
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	0.10
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	0.10
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	0.10
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	0.10
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	1.00
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	0.05
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	0.10
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	0.50
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	0.10
2,3,7,8,-Tetrachlorodibenzodioxin (TCDD)	1
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	.0001
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	.0001

Table 21
Summed TEQs by Sample Location

Sampling Location	Summed CDD TEQs (ppt)	Summed CDF TEQs (ppt)	Summed CDD and CDF TEQs (ppt)
BT38-001	6.60	0.96	7.56
BT38-002	4.42	0.61	1.03
BT39-001	4.30	0.93	5.23
BT39-002	2.35	0.29	2.64
BT39-003	8.06	2.81	10.87
BT39-004	1.95	0.90	2.85

In accordance with the IASAP (DOE 2001a), the AOC based on characterization data becomes the revised PAC shape. This change will be archived through the Site Geographic Information Services Group.

The accelerated action objectives were developed and described in ER RSOP Notification #02-01 (DOE 2002b). The accelerated action objectives for IHSS Group 100-5 included the following:

- Remove the concrete slabs, which will be dispositioned in accordance with the RSOP for Concrete Recycling (DOE 1999a); and
- Remediate soil if dioxins or furans are found at levels greater than MDLs or a level agreed upon through the RFCA consultative process.

Remediation activities were conducted between March 6 and April 1, 2002. Dates and durations of significant activities are listed in Table 22.

Table 22
Dates and Duration of Accelerated Action Activities

Activity	Start Date	End Date	Duration
Remove incinerator slabs	March 6, 2002	March 6, 2002	1 Day
Characterization sampling at PAC 100-609	March 7, 2002	March 7, 2002	1 Day
Site reclamation	March 21, 2002	April 1, 2002	1 Day

Photographs of site activities are provided in Appendix A.

6.2.2 Removal Activities

Concrete Slabs

The two slabs at IHSS Group 100-5 were removed using a forklift after a corner of the slab was broken up sufficiently with a jackhammer to gain access to the underlying soil. The main slab was 20 inches thick. One composite sample was collected from the concrete for waste characterization. The sample was analyzed for metals, dioxins, and furans. The concrete slabs were surveyed for radiological constituents and recycled in accordance with the RSOP for Recycling Concrete (DOE 1999a).

Soil Removal

Because all analytical results indicated that dioxin and furan concentrations were less than EPA cleanup guidelines for residential use and the TEQ of 9 ppt and PCBs were less than RFCA Tier II ALs, no soil was removed. Therefore, confirmation samples were not collected because soil was not remediated. Characterization samples were analyzed at an offsite laboratory and also serve as confirmation samples.

6.3 Deviations from the ER RSOP

Deviations from the ER RSOP include the following:

- Dioxin and furan concentrations were compared to EPA cleanup guidelines and TEQ because RFCA Tier I and Tier II ALs were not available; and
- IHSS Group 100-5 was not revegetated because the Site security force needed to use this site.

6.4 Waste Management

Waste from the IHSS Group 100-5 consisted of concrete, which was recycled in accordance with the RSOP for Concrete Recycling (DOE 1999a).

6.5 Site Reclamation

IHSS Group 100-5 was covered with approximately 6 to 8 inches of roadbase, wheel-rolled, and compacted with a loader.

7.0 POST-REMEDIATION CONDITIONS

Residual contamination concentrations, MDLs, and EPA cleanup guidelines, at IHSS Group 100-5 are shown in Figure 21.

8.0 STEWARDSHIP EVALUATION

The IHSS Group 100-5 stewardship evaluation was conducted through ongoing consultation with the regulatory agencies. The regulatory agencies were informed through project updates, e-mail, telephone contact, and personal contact throughout the project duration.

8.1 Current Site Conditions

As discussed in Section 6.2.2, accelerated actions at IHSS 100-5 consisted of removal of the Security Incinerator slab. Residual contamination at IHSS Group 100-5 is summarized in Table 19 and shown on Figure 21. Based on the accelerated action the following conditions exist at IHSS Group 100-5:

- PCB concentrations in surface soil are slightly greater than MDL.
- PCB Tier II SORs are less than 1.
- Summed congener concentrations at sampling location BT39-003 were slightly greater than the TEQ of 9 but within the Front Range background range, and significantly less than EPA residential cleanup guidelines.
- Residual congener concentrations at all other locations were less than the TEQ of 9, within the Front Range background range, and EPA residential cleanup guidelines.
- The site was backfilled with the excavated soil and covered with approximately 6 to 8 inches of roadbase.

8.2 Near Term Management Recommendations

Because residual contaminant concentrations are low and potential contaminant sources were removed, mitigated or found not to have existed, no specific near-term management techniques are required. Contaminant concentrations in soil remaining at IHSS Group 100-5 do not trigger any further accelerated action. Excavation at the site will continue to be controlled through the Site Soil Disturbance Permit process. Fencing and signs restricting access will be posted to minimize disturbance to newly-revegetated areas. Site access and security controls and the Soil Disturbance Permit process will remain in place pending implementation of long-term controls.

8.3 Long-Term Stewardship Recommendation

Based on remaining environmental conditions at IHSS Group 100-5, no specific long-term stewardship activities are recommended for IHSS Group 100-5 beyond the generally applicable Site requirements that may be imposed on this area in the future, which are dependent upon the final remedy selected. Institutional controls that will be used as appropriate for this area include the following:

- Prohibitions on construction of buildings in the IA;
- Restrictions on excavation or other soil disturbance; and
- Prohibitions on groundwater pumping in the area of IHSS Group 100-5.

No specific engineered controls are recommended as a result of the conditions remaining in IHSS Group 100-5; and

No specific environmental monitoring is recommended as a result of the environmental conditions remaining in IHSS Group 100-5.

No specific institutional or physical controls, such as fences, are recommended as a result of the environmental conditions remaining in IHSS Group 100-5.

This closeout report and associated documentation will be retained as part of the Rocky Flats administrative record file. These specific long-term stewardship recommendations will also be summarized in the Rocky Flats *Long-Term Stewardship Strategy*.

IHSS Group 100-5 will be evaluated as part of the Sitewide CRA, which is part of the RFI/RI and CMS/FS that will be conducted for the Site. The need for and extent of any, more general, long-term stewardship activities will also be analyzed in RFI/RI and CMS/FS and will be proposed as part of the preferred alternative in the Proposed Plan for the Site. Institutional controls and other long-term stewardship requirements for Rocky Flats will ultimately be contained in the CAD/ROD, in any post-closure Colorado Hazardous Waste Act permit that may be required, and in any post-RFCA agreement.

8.3.1 Accelerated Action Stewardship

Stewardship actions that were implemented during the accelerated action included posting signs and barriers, including yellow chain and jersey barriers.

9.0 DATA QUALITY ASSESSMENT

The DQOs for this project, as defined in the IASAP (DOE 2001a), were achieved based on the DQA provided in the following sections. The DQO/DQA process ensures that the type, quantity, and quality of environmental data used in decision making are defensible, with emphasis on attaining adequate (statistical) confidence in the decisions. The DQO/DQA process is based on the following guidance and requirements:

- EPA QA/G-4, 1994. Guidance for the Data Quality Objective Process (EPA 1994a);
- EPA QA/G-9, 1998. Guidance for the Data Quality Assessment Process; Practical Methods for Data Analysis (EPA 1998); and
- DOE Order 414.1A, Quality Assurance (DOE 1999b).

V&V of the data are the primary components of the DQA. The final data are compared with original project DQOs and evaluated with respect to project decisions; uncertainty within the decisions; and quality criteria required for the data, specifically PARCCS. Validation criteria are consistent with the following RFETS-specific documents and industry guidelines:

- EPA 540/R-94/013, USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (EPA 1994c);
- EPA 540/R-94/012, USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (EPA 1994b);

- K-H V&V Guidelines
  - General Guidelines for Data Verification and Validation, DA-GR01-v1, December 3, 1997
  - V&V Guidelines for Isotopic Determinations by Alpha Spectrometry, DA-RC01-v1, 2/13/98
  - V&V Guidelines for Volatile Organics, DA-SS01-v1, 12/3/97
  - V&V Guidelines for Semivolatile Organics, DA-SS02-v1, 12/3/97
  - V&V Guidelines for Metals, DA-SS05-v1, 12/18/97; and
- Lockheed-Martin, 1997, Evaluation of Radiochemical Data Usability, ES/ER/MS-5.

This report will be submitted to the CERCLA AR for permanent storage within 30 days of approval by CDPHE and/or EPA.

9.1.1 DQO Decisions

Consistent with the original DQO decision rules of the project, SOR calculation was conducted, on sample results as applicable. PCB compounds have corresponding RFCA ALs that allow an SOR to be calculated, whereas the dioxin/furan results do not. In accordance with the DQO decision logic, if the summation for radiological or non-radiological constituents does not exceed 1, then no further action is required. All PCB SORs, per sample, were below 1; therefore, no further action is required relative to PCBs.

Because there are no existing RFCA ALs for dioxin and furan congeners, a different action level framework was used to compare with the dioxin/furan results. An action level of 9 ppt TEQ was used based on the consultative process. Results for the dioxin/furan were converted to TEQ and compared directly with the TEQ of 9 ppt. No individual compounds exceeded this level, and the highest value was 6.8 ppt for dioxin. Calculations are documented in the files "PlanvsActuals2.mdb" and "Dioxin-FuranAnlyRslt.xls" in Microsoft ACCESS.

Sample quantities by analytical method are shown in Table 23.

Table 23
IHSS Group 100-5–Sampling

Analyte	Matrix	EPA Method	Number of Samples (including QC samples)
PCBs	Soil	SW8082	7
Dioxin/Furan	Soil	SW8290	7

9.1.2 Verification and Validation of Results

Verification ensures that data produced and used by the project are documented and traceable per quality requirements. Validation consists of a technical review of project

data that directly support decisions, such that any limitations of the data relative to project goals are stated. V&V criteria include the following:

- Chain-of-custody;
- Preservation and hold-times;
- Instrument calibrations;
- Preparation blanks;
- Interference check samples (metals);
- MSs/MSDs;
- LCSs;
- Field duplicate measurements;
- Chemical yield (radiochemistry);
- RQL/MDA (sensitivity of chemical and radiochemical measurements, respectively); and
- Sample Analysis and Preparation methods.

Precision

Precision of field sampling was adequate based on repeatability of both field duplicate and real sample results to quantities well below associated action levels: <9 TEQ for dioxin/furans and <2,240 parts per billion (ppb) for PCBs. Only one field duplicate was necessary based on a set of less than 20 reals (i.e., a required duplicate sample frequency of ≥5%).

Laboratory precision was acceptable based on MS/MSD comparisons, which yielded a maximum relative percent difference of 3%; the DQO is <30% for organics in soils.

Accuracy and Bias

Distance measurements recorded on maps are within ±1 foot, based on the GPS technology in use (Trimble 4800 Series). LCSs and MSs were analyzed at an adequate frequency (≥1/laboratory batch) and were within QC tolerances. For LCS, minimum recoveries were 66% for Aroclor-1016 and 74% for 123789-HXCDD; for MS, minimum recoveries were 77% for Aroclor-1260 and 72% for 1234789-HPCDF.

Blanks yielded no concentrations significant enough to cause a high bias in the corresponding real samples, i.e., there are no false positive results due to blank contamination.

Representativeness

Surface soil grab samples acquired for the project, are representative based on the number and location of samples in combination with the following criteria:

- Familiarity with site history and current IHSS configurations;
- Collaborations by management and technical staff;
- Implementation of industry-standard Chain-of-Custody protocols;
- Compliance with sample preservation and hold times;
- Documented and Site-approved methods, particularly SOPs controlled by the subcontractor; and
- Compliance with state- and EPA-approved sampling and analysis plans including the IASAP and associated SAP Addenda.

Completeness

Sampling completeness is addressed in Table 24. The required minimum numbers of QC and real samples were acquired.

Table 24
IHSS Group 100-5–Sample Completeness Summary

Number of Samples Planned (Media; Real, and QC)	Number of Samples Taken (Real and QC)	Project Decisions (Conclusions) and Uncertainty
6 real 1 duplicate	7 (total) 6 Real, 1 field duplicate	No contamination per SOR calculation
6 real 1 duplicate	7 (total) 6 Real, 1 field duplicate	No contamination per 1:1 comparison TEQ of 9

A summary of the V&V for all EDD records indicates no rejection of the data. All estimated values were well less than associated RFCA ALs. Validation of results was completed at the minimum frequency (≥10% per method and per real sample matrix) as shown in Table 25.

Table 25
IHSS Group 100-5–Summary of Validated Records

Validation Qualifier Codes SWD	Total of CAS Number	PEP-A-007 SW8082 PCBs	TSK-A-003 SW8290 Dioxin/Furan
Null	48	14	34
V	145	47	98

Validation Qualifier Codes SWD	Total of CAS Number	PEP-A-007 SW8082 PCBs	TSK-A-003 SW8290 Dioxin/Furan
JB	21		21
UJ	2	2	
Total Records	216	63	153
% Validated		78%	78%

Comparability

All results presented are comparable with CERCLA data on an intrasite- and DOE complex-wide basis. This comparability is based on the following:

- Use of standardized engineering units in the reporting of measurement results;
- Consistent sensitivities of measurements (≤ 0.5 corresponding action levels);
- Use of site-approved procedures (e.g., Contractual Statements of Work for laboratory analyses);
- Systematic quality controls; and
- Thorough documentation of the planning, sampling/analysis process, and data reduction into formats designed for making decisions derived from the project's original DQOs.

Sensitivity

Adequate sensitivities, in units of micrograms per kilogram (µg/kg) (ppb) for PCBs and parts per trillion (pg/g) for dioxin/furans were attained for all analytes. The maximum detection limit (DL) for PCBs was 10 ppb (Aroclor-1232); the maximum DL given for dioxin/furans was zero. Ideally, detection limits are at least one-half of analyte's associated action level; all DLs were well below that for this project.

9.1.3 Data Quality Summary

The data presented in this report have been verified and validated for the purpose of corroborating decisions to acceptable levels of confidence as stated in the project's original DQOs. There are no qualifications of the data. Results indicate that no chemical contamination exists in excess of RFCA Tier I or Tier II ALS for PCBs, or for dioxins/furans in excess of TEQ. No further actions are necessary for IA Group 100-5.

10.0 REFERENCES

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