Final

Phase I RFI/RI Report
Operable Unit No. 15
Inside Building Closures

U.S. Department of Energy
Rocky Flats Environmental Technology Site
Golden, Colorado

January 1995

REVIEWED FOR CLASSIFICATION/UCNI
By
Date 12-14-94

PRINTED ON RECYCLED PAPER

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LIST OF ACRONYMS

ARARs	Applicable or Relevant and Appropriate Requirements
BRA	Baseline Risk Assessment
CCR	Colorado Code of Regulations
CDPHE	Colorado Department of Public Health and Environment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
COC	Chain-of-Custody form
CRQL	Contract Required Quantitation Limit
D&D	Decontamination and Decommissioning
DEHP	bis(2-ethylhexyl)phthalate
DOE	United States Department of Energy
DQO	Data Quality Objective
EE	Ecological Evaluation
EG&G	EG&G Rocky Flats, Inc.
EPA	United States Environmental Protection Agency
FSP	Field Sampling Plan
GENII	Hanford Environmental Dosimetry System (Generation II)
GRRASP	General Radiochemistry and Routine Analytical Services Protocol
HHRA	Human Health Risk Assessment
HSP	Health and Safety Practice
IAG	Interagency Agreement
IHSS	Individual Hazardous Substance Site
M&O	Management and Operating
MS	matrix spike
MSD	matrix spike duplicate
NRC	United States Nuclear Regulatory Commission
PVC	polyvinyl chloride
OU15	Operable Unit 15
PARCC	precision, accuracy, representativeness, completeness and comparability
QAPjP	Quality Assurance Project Plan
QA/QC	quality assurance/quality control
RAGS	Risk Assessment Guidance for Superfund
RCA	Radiologically Controlled Area
RCRA	Resource Conservation and Recovery Act
RFEDS	Rocky Flats Environmental Database System
RFI/RI	RCRA Facility Investigation/Remedial Investigation
RFETS	Rocky Flats Environmental Technology Site

RPD	relative percent difference
SOP	Standard Operating Procedure
SOW	Statement of Work
TAL	Target Analyte List
TCL	Target Compound List
TM#1	Technical Memorandum Number 1
VOC	volatile organic compound
WSRIC	Waste Stream and Residue Identification and Characterization

LIST OF LABORATORY QUALIFIERS

LAB QUAL	DESCRIPTION
*	Outside contract required QC limits - organic
*	DUP analysis outside control limits - inorganic
+	MSA correlation coefficient less than 0.995 - inorganic
A	TIC suspected aldol-conden product - organic
B	Analyte found in blank and sample - organic
B	Less than method detection limit but greater than or equal to instrument detection limit -inorganic
C	Pesticide where I.D. confirmed by GC/MS - organic
D	Compounds identified using secondary dilution factor - organic
D	No surrogate/matrix spike recovery, extract diluted
E	Concentration exceeds calibration range of instrument - organic
E	Estimated due to interference - inorganic
F	Estimated, compound off-scale in both columns - organic
G	Native analyte greater than 4 times spike added - inorganic
I	Interference
J	Estimated value less than sample's detection limit
K	Result is between the IDL and MDL (CRDL)
M	Duplication injection precision not met - inorganic
N	Spiked recovery not within control limits - inorganic
S	Determined by MSA, can't be with + or W - inorganic
T	Compound found in TCLP extract blank and sample
U	Undetected, analyzed for but not detected
W	Post-digestion spike outside of control limit - inorganic
X	Lab software flag, entered manually - organic
X	Detection limit greater than normal, sample matrix interference - inorganic
X	Result by calculation - GRRASP
Y	Indistinguishable isomer in TIC - organic
Z	Questionable identification, matrix interference of columns - organic

LIST OF VALIDATION CODES

VAL CODE	DESCRIPTION
	Indicates the record was not validated
A	Data is acceptable, with qualifications
B	Indicates compound was found in blank and sample
E	Associated value exceeds calibration range, dilute and reanalyze
J	Associated value is estimated quantity
JA	Estimated, acceptable
R	Data is rejected
U	Analyzed, not detected at or above method detection limit
V	Data is valid
VA	Data is valid, acceptable with qualifications
Y	Analytical results in validation process
Z	Validation was not requested or performed

LIST OF DATA TABLE FIELD DESCRIPTIONS

DATA FIELD	DESCRIPTION
IHSS	IHSS that sample was collected at or associated with.
Sample Number	The sample identifier.
QC Code	Quality control sample information provided by the field.
QC Partner	The sample number associated with a QC sample's REAL sample is entered here. If the sample is REAL then this column is left blank.
Sample Date	The date the sample was collected.
Test Group	Also referred to as the method code. This is a RFEDS code for the method used to analyze a group of samples.
Result Type	RFEDS codes that differentiate between target analytical results, laboratory quality assurance samples, and laboratory reanalysis. This field specifically distinguishes the multiple analytical attempts when more than one analysis attempt was necessary or requested.
Compound/Radionuclide	The analyzed compound/radionuclide name.
Result	Concentration numeric value.
Error	The error is a measure of the variability of the instrument reading during sample counting. The value provided is an estimate of two times the standard deviation of the instrument count over the counting duration. The error is estimated from the reported instrument count rate, the instrument detector efficiency (isotope-specific), the tracer recovery, the sample aliquot (volume or weight), and the counting duration for the specific sample. The error is reported in the same units as the sample result. Error data is provided for radionuclide analyses only.

LIST OF DATA TABLE FIELD DESCRIPTIONS (continued)

DATA FIELD	DESCRIPTION
Qualifier	A code which indicates qualifications or limitations to the reported result.
Detection Limit	The detection limit specified for the analysis type as required in the GRRASP. For diluted samples, the detection limit is corrected for the dilution factor.
Validation Code	Validation code for the result.

LIST OF OU15 QC CODE DESCRIPTIONS

QC CODE	DESCRIPTION
DUP	Duplicate sample taken in the field
FB	Field blank (source water sample)
REAL	Real sample
RNS	Equipment rinsate blank following decontamination or hot water rinsate sampling system equipment blank
TB	Trip blank

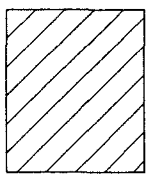
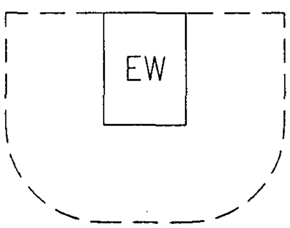
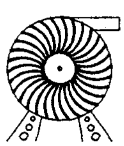
LIST OF OU15 TEST GROUP DESCRIPTIONS

TEST GROUP	DESCRIPTION
BNACLP	Semi-volatile organic compounds
DMETADD	Dissolved metals (additional list)
DSMETCLP	Dissolved metals (CLP list)
DRADS	Dissolved radionuclides
VOACLP	Volatile organic compounds
WQPL	Water quality parameters (cyanide)

LIST OF OU15 RESULT TYPE DESCRIPTIONS

RESULT TYPE	DESCRIPTION
DIL	Dilution
DL1	Dilution
DUP	Laboratory Duplicate
RA1	Re-analysis first try
REP	Replicate
TIC	Tentatively identified compound
TR1	Target analysis first retry
TR2	Target analysis second retry
TRG	Target

DRAWING LEGEND

1 (dotted box)	SMEAR SAMPLE/FINAL RADIOLOGICAL SURVEY LOCATION
1	SMEAR SAMPLE/FINAL RADIOLOGICAL SURVEY NUMBER
BU00050ER *4472046* (boxed)	HOT WATER RINSATE SAMPLE LOCATION
BU00050ER	HOT WATER RINSATE SAMPLE NUMBER
4472046	HOT WATER RINSATE SAMPLE LOCATION CODE
	IHSS LOCATION
	ROOM/EQUIPMENT BOUNDARY
CL	COLUMN
	DOOR
	OBSTRUCTED SPACE BOUNDARY
	EYE WASH
	PUMP
	HEATING ELEMENT

ABBREVIATIONS

ACT	ACTIVATED
BLDG	BUILDING
DIA	DIAMETER
EB	ELECTRON BEAM
HEPA	HIGH EFFICIENCY PARTICULATE AIR
NO	NUMBER
RAD	RADIOLOGICAL
VAC	VOLTS-ALTERNATING CURRENT

KEYWORDS	ISSUE	DESCRIPTION	DATE	RFETS				DOE	CLASS	JOB NO.
1. OU15	A	ORIGINAL ISSUE	XX/XX/93	RCH	KAS	PRB	DLS			
2. PHASE I										
3. RFI/RI										
4. REPORT										
5.										

DESIGNED	HEA	XX/XX/93
DRAWN	SCHACKLIN	12/21/93
CHECKED	BIERBAUM	XX/XX/93
APPROVED	SCHUBBE	XX/XX/93
SUBMITTED	BIERBAUM	XX/XX/93
APPROVED RFETS		
APPROVED DOE		

BLDG./FACILITY: SITE
ROOM/AREA: GEN
GRID COOR./COL NO.:
MASTER: YES ☐ NO ☒
SCALE: NONE

U.S. DEPARTMENT OF ENERGY
ROCKY FLATS AREA OFFICE GOLDEN, COLORADO

Rocky Flats Environmental Technology Site
GOLDEN, COLORADO 80401

OU15 PHASE I RFI/RI

DRAWING LEGEND AND ABBREVIATIONS

SIZE	DRAWING NUMBER	ISSUE	FIGURE
B	.	A	TOC-1

SITE
BLDG/FAC.
GEN
ROOM/AREA

H Htg-Vent
A Arch
G GL Box
E Elec
D Detection
M Mech
I Inst
B Building
T Title
C Civil
U Utilities
P Piping
W Fire Prot.
L Layouts
F Flow Diag.
S Stds
X Alarms

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EXECUTIVE SUMMARY

The Phase I Resource Conservation and Recovery Act (RCRA) Facility Investigation/Remedial Investigation (RFI/RI) at the Rocky Flats Environmental Technology Site (RFETS) for Operable Unit 15 (OU15) was conducted to satisfy the requirements of RCRA, the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), and the Colorado Hazardous Waste Act, as mandated by the Interagency Agreement (IAG) dated January 22, 1991 (DOE, 1991). The performance of the Phase I RFI/RI and the preparation of this report has been guided by the Final OU15 Phase I RFI/RI Work Plan dated March 1993 (the Work Plan) (DOE, 1993) and Technical Memorandum Number 1 for the OU15 Phase I RFI/RI dated May 1994 (TM#1) (DOE, 1994a).

OU15 consists of six RCRA-regulated interim status closure units located inside buildings within the RFETS complex. The six Individual Hazardous Substance Sites (IHSSs) and their locations are:

IHSS 178	Building 881, Drum Storage Area (Room 165)
IHSS 179	Building 865, Drum Storage Area (Room 145)
IHSS 180	Building 883, Drum Storage Area (Room 104)
IHSS 204	Building 447, Unit 45, Original Uranium Chip Roaster (Rooms 32 and 502)
IHSS 211	Building 881, Unit 26, Drum Storage Area (Room 266B)
IHSS 217	Building 881, Unit 32, Cyanide Bench Scale Treatment (Room 131C)

In complying with the requirements of the IAG (DOE, 1991) as they apply to OU15, both RCRA and CERCLA concerns are addressed in this document. This document presents the methods and results associated with the OU15 field investigation, and provides the decision basis for recommending whether further actions are required at any of the IHSSs.

The general objectives of the RFI/RI are to:

1. Characterize the nature and extent of contamination associated with the OU15 IHSSs;
2. Determine whether releases have occurred from any of the OU15 IHSSs;
3. Determine the need for additional investigation addressing contaminant migration outside the buildings (Stage 3); and
4. Support a decision regarding the need for further action or remediation at each of the OU15 IHSSs.

The specific objectives of the OU15 Phase I RFI/RI site investigation, as presented in the Work Plan (DOE, 1993), were to 1) characterize site physical features; 2) define contaminant sources; 3) determine nature and extent of contamination; 4) describe contaminant fate and transport; and 5) provide a baseline risk assessment. The following activities were completed for each IHSS during the OU15 field investigations: a review of new and/or additional information, a visual inspection and documentation of current conditions at the IHSS, and sampling and analysis of surfaces within and around the IHSS. The sampling and analysis program included the collection of radiological and beryllium smear samples and hot water rinsate samples (including verification samples). In addition, final radiological surveys were performed during the Stage 1 and 2 field investigations.

The Phase I RFI/RI was conducted in accordance with the approved Work Plan (DOE, 1993), the site-wide Quality Assurance Project Plan (QAPjP) (EG&G, 1991b), and EG&G Rocky Flats, Inc. (EG&G) Standard Operating Procedures (SOPs). Data Quality Objectives (DQOs) were established in the Work Plan (DOE, 1993) to qualitatively and quantitatively evaluate the useability of the data in terms of precision, accuracy, representativeness, completeness, and comparability (PARCC) parameters. Based on the specific numerical PARCC objectives set out in the Work Plan (DOE, 1993), as well as the qualitative goals of the investigation program, the DQOs were met by the Phase I RFI/RI. The data were judged of sufficient quality to support the required decision process.

The evaluation of contamination associated with the OU15 IHSSs involved two separate steps which were driven by the two regulatory programs under which OU15 is being addressed. The first step was to address RCRA-regulated constituents as they relate to the closure performance standards within each IHSS. This step also included an examination of the potential for releases from each IHSS. The approach used to evaluate the existing database against the RCRA closure performance standards involved comparing the results of chemical analyses of the hot water rinsate samples against the standards. The second step was to address radionuclides to determine the need for further action with respect to CERCLA. According to the Applicable or Relevant and Appropriate Requirements (ARARs) specified in the Work Plan (DOE, 1993), the radionuclide data were evaluated to determine whether any of the IHSSs require additional CERCLA evaluation prior to closure. Beryllium data were evaluated for consistency with RFETS beryllium control procedures.

The evaluation of RCRA-regulated constituents revealed that all of the IHSSs were in compliance with the specified RCRA clean closure performance standards for OU15. Only IHSS 178 showed detectable concentrations of a RCRA-regulated constituent of regulatory concern (butyl benzyl phthalate) in the verification samples. However, butyl benzyl phthalate is a component of common flooring materials, paints and polyvinyl chloride (PVC). It was not identified as a RCRA constituent expected to be present at IHSS 178, and was therefore attributed to cross-contamination from flooring materials or other, non-RCRA sources. In the other IHSSs, no

RCRA-regulated constituents of regulatory concern were detected in the verification samples that were not directly attributable to cross-contamination via the Quality Assurance samples taken during the Phase I RFI/RI investigation.

The evaluation of CERCLA concerns involved comparing radionuclide levels to the ARARs identified in the Work Plan (DOE, 1993). A review of the levels of radionuclides present at the OU15 IHSSs revealed that worker radiation protection standards specified as ARARs for OU15 in the Work Plan (DOE, 1993) were not exceeded. IHSS 204 complies with these ARARs by being maintained in a protective state for workers in accordance with the procedures that specifically govern operations and worker exposures at RFETS.

Because the IHSSs which compose OU15 are all aboveground and enclosed within a building structure, many of the potential fate and transport processes identified were not considered relevant contaminant migration mechanisms, especially when considering the concentrations of constituents detected within the IHSSs. Regarding the Baseline Risk Assessment (BRA), the Work Plan (DOE, 1993) provided for the performance of a BRA in only two cases: first, if the radionuclide analytical data exceeded the radiation standards provided in the cited ARARs; and second, if migration of constituents to locations outside the OU15 buildings could be shown to have occurred. Since neither of these conditions was found in the Phase I RFI/RI, a BRA was not performed for OU15.

Based on the results of the Phase I RFI/RI activities, the following conclusions have been drawn:

1. **The requirements of the IAG (DOE, 1991) and the Final OU15 Phase I RFI/RI Work Plan (DOE, 1993) have been met and are documented in this submittal, the Phase I RFI/RI Report.**

   Section 1.0 presents a detailed evaluation of the requirements of the IAG (DOE, 1991) and of the Work Plan (DOE, 1993). Tables 1-1 and 1-2 list the specific requirements and show where in the Phase I RFI/RI Report the requirements are addressed.

2. **The data quality objectives specified in the Work Plan (DOE, 1993) have been met.**

   Section 4.0 presents the DQOs for the Phase I investigation and evaluates the results of the Phase I investigation against the specific OU15 DQO and PARCC criteria.

3. **The IHSSs investigated are in compliance with the RCRA clean closure performance standards.**

   The results of the Phase I investigation presented in Section 5.1 show that the IHSSs are in compliance with the RCRA clean closure performance standards as specified in the Work Plan (DOE, 1993) and the RFETS State RCRA Permit (CDPHE, 1991).

4. **The IHSSs investigated are in compliance with the ARARs identified for radionuclides.**

   The results of the Phase I investigation presented in Sections 2.0 and 5.2 show that the IHSSs are in compliance with the worker radiation protection standards specified as ARARs in the Work Plan (DOE, 1993). IHSS 204 complies with the ARARs by being maintained in a protective state for workers in accordance with the procedures that specifically govern operations and worker exposures at RFETS.

5. **Beryllium contamination is not directly attributable to waste materials stored at IHSS 179 or 180.**

   Beryllium concentrations detected in the post-rinsate smear samples collected within IHSSs 179 and 180 are below the RFETS beryllium smear control level established in RFETS Health and Safety Practice (HSP) 13.04, Beryllium Protection (EG&G, 1994). In the absence of a promulgated regulatory standard for beryllium surface contamination, RFETS has established this control level as an accepted and achievable cleanliness level to control worker exposure to beryllium. The review of the beryllium smear data presented in this report indicated that the OU15 IHSSs were likely not the sources of beryllium found during the Phase I RFI/RI investigation.

6. **No evidence exists to indicate that releases of hazardous or radioactive constituents have occurred from OU15 IHSSs to the environment.**

   The sources for this conclusion include historical records, interviews with relevant personnel, visual inspections of the IHSSs, and review of sampling results. These data are presented in Sections 2.0, 5.0 and 6.0.

7. **A Stage 3 (outdoor) investigation is not required.**

   The results of the Stage 1 and 2 investigation along with the review of historical records and visual inspections indicated that there had not been releases from OU15 IHSSs to the environment. Therefore, according to the Work Plan (DOE, 1993), no Stage 3 investigation is required.

8. **There is no evidence to indicate the existence of an imminent threat of a release of hazardous or radioactive constituents from OU15 IHSSs to the environment.**

   Sampling results presented in Section 5.0 for the six IHSSs, along with the evaluation of the conceptual model and fate and transport mechanisms presented in Sections 2.0 and 6.0, show that a release to the environment from these IHSSs is highly improbable with the controls and procedures currently in place.

9. There is no current or imminent threat to workers at the OU15 IHSSs under their current industrial use.

Based on the ARARs specified in the Work Plan (DOE, 1993) and the evaluation of the radionuclide sampling results presented in Section 5.2, the IHSSs do not exceed radiation protection standards applicable under their current industrial use. For IHSS 204, the radiation protection ARARs are met based on compliance with the procedures developed for operations and worker exposures at RFETS. The evaluation of hazardous constituents presented in Section 5.1 showed that no detectable levels of hazardous constituents remain in the IHSSs other than those attributable to leaching from flooring materials.

1.0 INTRODUCTION

The Operable Unit 15 (OU15) Phase I Resource Conservation and Recovery Act (RCRA) Facility Investigation/Remedial Investigation (RFI/RI) at the Rocky Flats Environmental Technology Site (RFETS) was conducted to satisfy the requirements of RCRA, the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), and the Colorado Hazardous Waste Act, as mandated by the Interagency Agreement (IAG) dated January 22, 1991 (DOE, 1991). The RFI/RI activities were completed in accordance with the Final Phase I RFI/RI Work Plan for OU15 (the Work Plan) (DOE, 1993). The RFI/RI is supported by the Final Phase I RFI/RI Technical Memorandum Number 1 (TM#1) dated May 1994 (DOE, 1994a). TM#1 (DOE, 1994a) describes the implementation of the Work Plan (DOE, 1993) Field Sampling Plan (FSP) and provides the results of completed sampling activities. The Phase I RFI/RI Report describes the objectives, planning, performance and results of the Phase I RFI/RI activities.

1.1 Background Information

This section presents background information on site operations and location, describes the OU15 Individual Hazardous Substance Sites (IHSSs) and their respective locations, and summarizes some of the previous environmental investigations conducted at RFETS.

1.1.1 Site Operations

RFETS is a government-owned, contractor-operated facility, which is part of the nationwide nuclear weapons complex. RFETS, known as the Rocky Flats Plant until 1994, was operated for the U.S. Atomic Energy Commission from its inception in 1951 until the Commission was dissolved in January 1975. At that time, responsibility for the site was assigned to the Energy Research and Development Administration, which was succeeded by the U.S. Department of Energy (DOE) in 1977. Dow Chemical U.S.A., an operating unit of the Dow Chemical Company, was the Management and Operating (M&O) contractor of the facility from 1951 until June 30, 1975. Rockwell International was the M&O contractor responsible for operating RFETS from July 1, 1975, until December 31, 1989. EG&G Rocky Flats, Inc (EG&G) became the M&O contractor at RFETS on January 1, 1990.

Operations at RFETS consisted of fabrication of nuclear weapons components from plutonium, uranium and various nonradioactive metals (principally beryllium and stainless steel). Parts made at RFETS were shipped elsewhere for assembly. In addition, RFETS reprocessed components after they were removed from obsolete weapons for recovery of plutonium. Other activities at RFETS included research and development in metallurgy, machining, non-destructive testing, coatings, remote engineering, chemistry and physics. Both radioactive and nonradioactive wastes were generated in the production process. Current waste handling practices involve on-site and off-site recycling of hazardous materials, on-site storage of hazardous and radioactive mixed wastes, and off-site disposal of low-level radioactive materials at appropriate DOE facilities. However, RFETS operating procedures have historically included both on-site storage and disposal of hazardous, low-level radioactive, and low-level radioactive mixed wastes. Preliminary assessments identified some of the past on-site storage and disposal locations as potential sources of environmental contamination.

1.1.2 Site Location

RFETS is located in northern Jefferson County, Colorado, approximately 16 miles northwest of Denver. Other nearby cities include Boulder, Westminster, Broomfield and Arvada, all of which are located less than 10 miles from RFETS. RFETS consists of approximately 6,550 acres of federal land in Sections 1 through 4 and 9 through 15 of T2S, R70W, 6th Principal Meridian. Major buildings are concentrated within the primary RFETS site in the approximately 400 acres industrial area. A buffer zone of approximately 6,150 acres surrounds the industrial area.

RFETS is bounded on the north by State Highway 128, on the east by Jefferson County Highway 17 (also known as Indiana Street), on the south by agricultural and industrial properties and Highway 72, and on the west by State Highway 93. A map showing the RFETS site and buffer zone is provided as Figure 1-1.

1.1.3 OU15 Area Site Locations and Descriptions

OU15 consists of six RCRA-regulated interim status closure units located within buildings in the RFETS complex, as shown in Figure 1-2. The six IHSSs and their locations are listed below:

IHSS 178	Building 881, Drum Storage Area (Room 165)
IHSS 179	Building 865, Drum Storage Area (Room 145)
IHSS 180	Building 883, Drum Storage Area (Room 104)
IHSS 204	Building 447, Unit 45, Original Uranium Chip Roaster (Rooms 32 and 502)
IHSS 211	Building 881, Unit 26, Drum Storage Area (Room 266B)
IHSS 217	Building 881, Unit 32, Cyanide Bench Scale Treatment (Room 131C)

More detailed descriptions of each IHSS, including physical characteristics and historical use, are provided in Section 2.0.

1.1.4 Previous Investigations

Various studies have been conducted at RFETS to characterize environmental media and to assess the extent of radiological and chemical contaminant releases to the environment. The investigations performed prior to 1986 were summarized by Rockwell International (Rockwell, 1986a) and include the following:

1. Detailed description of the regional geology (Malde, 1955; Spencer, 1961; Scott, 1960, 1963, 1970, 1972, and 1975; Van Horn, 1972 and 1976; Dames and Moore, 1981; and Robson et al., 1981a and 1981b).

2. Several drilling programs beginning in 1960 that resulted in construction of approximately 60 monitoring wells by 1982.

3. An investigation of surface water and groundwater flow systems by the U.S. Geological Survey (Hurr, 1976).

4. Environmental, ecological, and public health studies that culminated in an Environmental Impact Statement (DOE, 1980).

5. A summary report on groundwater hydrology using data from 1960 to 1985 (Hydro-Search, 1985).

6. A preliminary electromagnetic survey of the site perimeter (Hydro-Search, 1986).

7. A soil-gas survey of the site perimeter and buffer zone (Tracer Research, 1986).

8. Routine environmental monitoring programs addressing air, surface water, groundwater, and soils (Rockwell, 1975 through 1985, and 1986a).

In 1986, two major investigations were completed at RFETS. The first was the DOE Comprehensive Environmental Assessment and Response Program Phase I Installation Assessment (DOE, 1986), which included analyses and identification of current operational activities, active and inactive waste sites, current and past waste management practices, and potential environmental pathways through which contaminants could be transported. A number of sites that could potentially have adverse impacts on the environment were identified. These sites were designated as Solid Waste Management Units by Rockwell International (Rockwell, 1987). In accordance with the IAG (DOE, 1991), Solid Waste Management Units are now designated as IHSSs, and are divided into three categories:

1. Hazardous substance sites that will continue to operate as RCRA units.
2. Hazardous substance sites that will be closed under RCRA interim status.
3. Inactive hazardous substance sites that will be investigated and cleaned up under Section 3004(u) of RCRA or pertinent sections of CERCLA and the Superfund Amendments and Reauthorization Act of 1986.

The second major investigation completed at RFETS in 1986 involved a hydrogeologic and hydrochemical characterization of the entire site. Plans for this study were presented by Rockwell International (Rockwell, 1986b and 1986c), and study results were reported by Rockwell International (Rockwell, 1986d).

Prior to the OU15 Phase I RFI/RI, no investigations had been completed to specifically addresses the units associated with OU15. Additional environmental investigations have been performed at RFETS in areas in the vicinity of the buildings that contain the OU15 IHSSs, but none have been related to these particular IHSSs.

1.2 Objectives and Approach

Section 4.1 of the Work Plan (DOE, 1993) provides the overall objectives of the OU15 Phase I RFI/RI. The Work Plan (DOE, 1993) provides a technically adequate basis for characterization of indoor contamination at the IHSSs which compose OU15. The general objectives of the RFI/RI are to:

1. Characterize the nature and extent of contamination associated with the OU15 IHSSs;

2. Determine whether releases have occurred from any of the OU15 IHSSs;

3. Determine the need for additional investigation addressing contaminant migration outside the buildings (Stage 3); and

4. Support a decision regarding the need for further action or remediation at each of the OU15 IHSSs.

The requirements and criteria for evaluating the need for further action at OU15 are defined within the context of the regulatory programs incorporated through the IAG (DOE, 1991).

In complying with the requirements of the IAG (DOE, 1991) as they apply to OU15, both RCRA and CERCLA concerns must be addressed. In the case of OU15, the two environmental acts have defined objectives in terms of the specific evaluations to be performed in the Phase I RFI/RI. Specifically:

1. The RCRA regulations apply to the closure of RCRA-regulated units within OU15 and address only RCRA-regulated constituents that have been released or are located within the unit boundaries. The RCRA closure performance standards are addressed in the Work Plan (DOE, 1993) and are defined in the RFETS State RCRA Permit (CDPHE, 1991).

2. CERCLA requirements specify that the remediation of an operable unit be performed in such a manner as to be protective of human health and the environment. In the case of RCRA-regulated units, the CERCLA requirements are satisfied through application of the RCRA closure performance standards to each IHSS for RCRA-regulated constituents, because the RCRA closure performance standards are more stringent than the general protectiveness requirements of CERCLA. Therefore, the CERCLA evaluation for OU15 is restricted to determining protectiveness as it relates to the radionuclides present at IHSSs within OU15.

The purpose of the Phase I RFI/RI is to develop the necessary data to support the evaluations under RCRA and CERCLA as described above. The logic applied to the decision process was detailed in the Work Plan (DOE, 1993), and included three primary components:

1. Visual inspections and historical records reviews to determine whether any evidence exists indicating releases to the environment or any present threat of releases to the environment;

2. Comparison of sampling results to RCRA clean closure performance standards to determine suitability of IHSSs for RCRA clean closure; and

3. Comparison of radionuclide results to specified radiation protection standards to determine if a Baseline Risk Assessment (BRA) should be performed. The purpose of the BRA, if required, would be to determine the need for remedial action with respect to radionuclides.

The approach taken in presenting the results of the Phase I FSP for OU15 focuses on the three components described above. In addition, the Phase I RFI/RI Report satisfies the requirements established in the IAG (DOE, 1991) and agreed to in the Work Plan (DOE, 1993). This approach is described in the following subsections.

1.2.1 Requirements of the Interagency Agreement

In accordance with the IAG (DOE, 1991), the OU15 Phase I RFI/RI includes IHSSs 178, 179, 180, 204, 211 and 217. OU15 was originally composed of eight IHSSs; however, IHSSs 212 and 215 are no longer included as part of this investigation. The closure of IHSS 212 is now addressed in Part VIII of the RFETS RCRA Mixed Residues Permit Modification (DOE, 1992a). If any corrective action under CERCLA is necessary, the work will be performed pursuant to the IAG (DOE, 1991), including the issuance of a decision document to close the unit. IHSS 215 was transferred to Operable Unit 9 in a

Modification to Work of the IAG (DOE, 1991) dated April 21, 1992, and has already been included in the Phase I RFI/RI for Operable Unit 9.

The Final Phase I RFI/RI Work Plan (DOE, 1993) was approved for OU15 in accordance with the IAG (DOE, 1991). Following completion of the work, the Draft Phase I RFI/RI Report was submitted by the IAG (DOE, 1991) milestone date of August 1, 1994. The Phase I RFI/RI Report must contain a Preliminary Site Characterization Summary describing the operable unit, and the nature and extent of contamination with data sufficient to support a BRA for OU15, if one is required. The Report must also contain the BRA, or justification for why a BRA is not required, and an identification of any releases from OU15 (or IHSSs within OU15) and any areas which may have been impacted by such releases. The Final Phase I RFI/RI Report had to be submitted by the IAG (DOE, 1991) milestone date of January 4, 1995. If it is determined that no additional investigation is required at OU15, the Final Phase I RFI/RI Report for OU15 will become the Final RFI/RI Report. Otherwise, a second phase of investigation will be initiated.

In accordance with Section I.B.II.a of the IAG (DOE, 1991) Attachment 2 - Statement of Work, additional action at an IHSS within OU15 may be required if:

1. There has been a release of hazardous constituents or hazardous substances to the environment external to the IHSS, or

2. There is a threat of post-closure escape of hazardous waste, hazardous constituents, leachates, run-off, hazardous waste decomposition products, or hazardous substances.

If there have been no releases and there is no threat of release at an IHSS, then further action will not be required.

Prior to submission of the Draft Phase I RFI/RI Report, the IAG (DOE, 1991) required that DOE submit to the U.S. Environmental Protection Agency (EPA) and the Colorado Department of Public Health and Environment (CDPHE) a series of four technical memoranda describing the BRA, including:

1. Contaminant Identification and Documentation;
2. Exposure Assessment and Documentation;
3. Toxicity Assessment and Documentation; and
4. Risk Characterization.

The IAG (DOE, 1991) allows for the consolidation of these four technical memoranda into one document, if appropriate. However, as discussed in Section 7.0, a BRA is not required for OU15. Therefore, a BRA and the series of four technical memoranda describing the BRA were not prepared. A technical memorandum, TM#1 (DOE, 1994a), was developed to present the results from the implementation of the FSP, and is described in Section 1.2.3.

Specific requirements of the IAG (DOE, 1991) are listed in Table 1-1, along with an explanation of how each requirement was met and where it is addressed in the Phase I RFI/RI Report.

1.2.2 Work Plan Requirements

The scope of work for the Phase I RFI/RI at OU15 was approved in the Final Phase I RFI/RI Work Plan (DOE, 1993). This section briefly describes the key work elements contained in the Work Plan (DOE, 1993).

The original Stage 1 and 2 sampling and inspection activities for the OU15 Phase I RFI/RI were conducted from April 23, 1993 to November 9, 1993 at the six IHSSs. Verification sampling and analysis was performed at five of the IHSSs from May 25, 1994 to June 20, 1994. The Phase I RFI/RI investigation included indoor surface sampling for chemical and radiological contamination in all of the IHSSs, but did not include collection of any samples of outdoor environmental media (soil, air, water). Analytical parameters were selected for each IHSS based on its previous uses, and included volatile and semi-volatile organic compounds, metals, cyanide, and radionuclides.

Samples were collected from surfaces (i.e., floors and structures) within each IHSS as well as from areas defined as "perimeter" and "pathway" areas. Perimeter and pathway areas were selected to determine whether contamination from within an IHSS had migrated out of the IHSS. The data collected included hot water rinsate samples, beryllium and radiological smear samples, and fixed radiation surveys.

The details of the scope of work for the OU15 Phase I RFI/RI are presented in the Work Plan (DOE, 1993) and are summarized in Section 3.0 of this document. Specific requirements of the Work Plan (DOE, 1993) are listed in Table 1-2, along with an explanation of how each requirement was met and where it is addressed in the Phase I RFI/RI Report.

1.2.3 Summary of Technical Memorandum Number 1

The Work Plan (DOE, 1993) required preparation of TM#1 (DOE, 1994a) to document the results of the Stage 1 and 2 field sampling program, to establish the adequacy of the data set for the Phase I RFI/RI, and to determine if sampling outside the OU15 buildings (Stage 3) would be required. TM#1 was submitted in May 1994, and presented the following findings:

1. No evidence existed of releases from the OU15 IHSSs to outdoor locations, therefore, no outdoor (Stage 3) field work was required.

2. No RCRA-regulated constituents of regulatory concern were detected in the hot water rinsate samples from IHSSs 178, 179, 180, 204 and 211.

3. Cyanide was detected in the hot water rinsate samples from IHSS 217. As a result, verification sampling was proposed for this IHSS.

4. None of the OU15 IHSSs exceeded the worker radiation protection standards specified in the Work Plan (DOE, 1993). In accordance with the Work Plan (DOE, 1993), the full radiological screening process was not performed for IHSS 204. No further investigatory action for radionuclides was proposed for OU15.

5. Beryllium surface contamination levels in excess of the internal RFETS control level were detected in post-rinsate smear samples from perimeter and pathway locations for IHSSs 179 and 180. The pattern of detections and the relative magnitude of the results within and around each of the IHSSs did not indicate that the beryllium surface contamination was attributable to the storage of wastes in the IHSSs.

TM#1 (DOE, 1994a) was accepted and approved by CDPHE on June 20, 1994 and by EPA on July 5, 1994. CDPHE's and EPA's approval of TM#1 was conditional based on the completion of verification sampling for cyanide at IHSS 217 and for butyl benzyl phthalate at IHSSs 178 and 211. Verification sampling was completed for these IHSSs as described in Sections 3.0, 4.0 and 5.0 of the Phase I RFI/RI Report.

1.3 Report Organization

Section 2.0 of this document summarizes the historical information available for each IHSS and presents the results of the visual inspections for each IHSS. Section 3.0 describes the methods used to collect the Stage 1 and 2 samples. Section 4.0 discusses the OU15 Phase I RFI/RI data quality objectives and compares the Stage 1 and 2 sampling results to these objectives. Section 5.0 presents the Stage 1 and 2 analytical data and compares them to the appropriate standards. Section 6.0 summarizes the evaluation of fate and transport of constituents at OU15. Section 7.0 addresses the BRA. Section 8.0 presents the conclusions of the Phase I RFI/RI Report.

Table 1-1
IAG Statement of Work Requirements and RFI/RI Disposition

IAG REQUIREMENT	SECTION	RFI/RI DISPOSITION	SECTION
Work must be consistent with regulatory guidance documents specified.	I.A	The work performed was consistent with the guidance documents and was implemented in accordance with agency approved SOPs. The SOPs were developed to be consistent with the guidance documents listed.	All sections
Investigatory work at OU15 must be completed in accordance with the Final Phase I RFI/RI Work Plan for OU15.	I.B.9	The OU15 RFI/RI field activities were completed in accordance with the Final Phase I RFI/RI Work Plan dated March 23, 1993.	All sections, in particular 1.2.2
The investigatory work must be presented in a draft Phase I RFI/RI report which must include a Preliminary Site Characterization and recommendations for additional work under the Phase II investigation.	I.B.9	This document is submitted as the Phase I RFI/RI report. Based on the findings of the Phase I investigation, a Phase II investigation is not required.	All sections
For interim status units undergoing closure within buildings a RFI/RI report shall provide documentation on the nature and extent of contamination at or from each IHSS and for no further action at OU15, determine that there: • has not been a release of hazardous constituents or hazardous substances to the environment external to the IHSS, and; • is no threat of post-closure escape of hazardous waste, hazardous constituents, leachates, run-off, hazardous waste decomposition products or hazardous substance.	I.B.11. a.	The nature and extent of contamination is addressed in Section 5.0. The findings presented in Sections 2.0 and 5.0, and summarized in Section 6.0 show that no evidence exists indicating migration of hazardous constituents/substances to locations outside the buildings in which the OU15 IHSSs are located. Therefore, the Clean Closure Performance Standards have been met for each IHSS.	2.0, 5.0 and 6.0
The Phase I RFI/RI Report shall include a Preliminary Site Characterization Summary which shall include: • a summary of investigative activities; • description and display of data documenting the location and characteristics of surface and subsurface features and affected media; • a description of the location, type, and quantity of contaminants; and • extent of contaminant migration within each affected media.	VII.A	The site physical features and contaminant sources were evaluated during site inspections and the review of historical information. Contaminant nature and extent, and fate and transport were evaluated during sampling activities and data evaluation.	2.0, 3.0, 5.0, 6.0 and 7.0

Table 1-1
IAG Statement of Work Requirements and RFI/RI Disposition

IAG REQUIREMENT	SECTION	RFI/RI DISPOSITION	SECTION
The RFI/RI Report shall be submitted for regulatory review within the required submittal schedule.	VII.C.	This submittal, the Phase I RFI/RI Report, is provided in accordance with the schedule presented in the IAG.	1.0
The RFI/RI Report shall include the draft Baseline Risk Assessment.	VII.C.	The findings presented in Sections 2.0 and 5.0, and summarized in Section 6.0 show that a Baseline Risk Assessment is not required according to the approach approved in the Final Work Plan.	2.0, 5.0, 6.0 and 7.0
The RFI/RI Report shall provide: • a summary of field activities; • contaminant source characterization; • contaminant nature and extent characterization; • contaminants fate and transport evaluation; • environmental setting characterization; • identification of areas threatened by releases; • a determination of short- and long-term threats to human health and the environment; and • results of the draft Baseline Risk Assessment.	VIII.C.	The field activities and contaminant source characterization are discussed in Sections 2.0 and 3.0, contaminant source characterization is discussed in Section 5.0, and contaminant fate and transport is discussed in Section 6.0. Threats to human health and the environment and the Baseline Risk Assessment are discussed in Section 7.0.	2.0, 3.0, 5.0, 6.0, 7.0 and 8.0
A Baseline Risk Assessment shall be prepared and include: • contaminant identification and documentation; • exposure assessment and documentation; • toxicity assessment and documentation; and • risk characterization.	VII.D	The findings presented in Sections 2.0 and 5.0, and summarized in Section 6.0 show that a Baseline Risk Assessment is not required according to the approach approved in the Final Work Plan.	2.0, 5.0, 6.0 and 7.0
An Environmental Evaluation Plan and Report shall be submitted in addition to the Human Health Risk Assessment.	VIII	The findings presented in Sections 2.0 and 5.0, and summarized in Section 6.0 show that an Environmental Evaluation Plan and Report are not required according to the approach approved in the Final Work Plan.	2.0, 5.0, 6.0 and 7.0

Table 1-2
Work Plan Commitments and RFI/RI Disposition

WORK PLAN COMMITMENT	PAGE	RFI/RI DISPOSITION	SECTION
Section 2.0 - Site Characterization			
Review operational histories and relevant design and construction of each IHSS.	2-2	Visual inspections were performed prior to sampling activities and included an assessment of the unit configurations, containment system and floor conditions.	2.0
Refine or expand a conceptual model to address issues of concern	2-29	For each IHSS, the contaminant source(s), release mechanisms, transport media, and exposure routes and receptors were evaluated to refine the site conceptual model.	2.0 and 6.0
Section 3.0 - OU15 Applicable or Relevant and Appropriate Requirements			
Evaluate Colorado Clean Closure Performance Standards (6 CCR 1007-3, Part 265.111) and occupational radiation standards (29 CFR 1910.96 and 10 CFR 20) in accordance with Chapter 3, Part 15 of the IAG.	3-1	Clean closure status for each IHSS was determined by comparing the organic and inorganic contaminant concentrations in the hot water rinsate samples to levels established in the RFETS State RCRA Permit. The evaluation of radiological constituents was based on comparing the worker dose-rate associated with those constituents to the standards specified in the Work Plan.	1.0 and 5.0
Section 4.0 - Data Needs and Data Quality Objectives			
Perform tasks to meet the following Data Quality Objectives identified in the Work Plan: • Characterize Site Physical Features; • Define Contaminant Sources; • Determine Nature and Extent of Contamination; • Describe Contaminant Fate and Transport; and • Provide a Baseline Risk Assessment.	4-6	The site physical features and contaminant sources were evaluated during site inspections and the review of historical information. Contaminant nature and extent, and fate and transport were evaluated during sampling activities and data evaluation. Following these activities, the need to complete a baseline risk assessment was evaluated.	2.0, 3.0, 4.0, 5.0, 6.0 and 7.0
If contaminant concentrations in initial samples exceed the Clean Closure Performance Standards, then resampling and reanalysis is required for verification.	4-11, 7-9, 7-13	One round of verification sampling was completed for five of the IHSSs.	3.0, 4.0 and 5.0
Three types of samples must be collected: swipes, steam rinsate, and surveys.	4-11	Evaluation of each IHSS included collecting and analyzing swipe and hot water rinsate samples, and conducting radiological surveys.	3.0
A full PARCC evaluation must be completed.	4-12	An evaluation of PARCC parameters was completed to determine data quality and useability.	4.0

Table 1-2
Work Plan Commitments and RFI/RI Disposition

WORK PLAN COMMITMENT	PAGE	RFI/RI DISPOSITION	SECTION
If contaminant concentrations in resampled and reanalyzed rinsate samples exceed the Clean Closure Performance Standards, then a Technical Memorandum must be prepared to address further remedial actions.	4-13	After the completion of verification sampling all IHSSs met the Clean Closure Performance Standards.	5.0
Section 5.0 - RCRA Facility Investigation/Remedial Investigation Tasks			
Prior to implementing the Work Plan, new information regarding each IHSS must be reviewed. Information reviewed includes: • site-wide surface water data; • groundwater monitoring data; • Waste Stream and Residue Identification and Characterization (WSRIC) program data; and • on-going radiological data monitoring.	5-3 7-7	Additional research on the historical uses of and releases from each IHSS was completed. The research consisted of document and database reviews, and interviews with RFETS building personnel. Additional information was incorporated into the historical use descriptions for each IHSS.	2.0
Data validation will follow: • U.S. EPA guidelines for inorganic and volatile organic compounds and • EG&G guidelines (QAPjP) for radiochemistry and major ions.	5-4	EPA approved analytical methods were used as specified in the Work Plan. The analytical data collected was entered into the RFEDS data management system. Data within the system undergoes validation following EPA protocols as described in the QAPjP. Data validation for OU15 is complete.	3.0 and 4.0
Data generated will be summarized graphically or in tabular form. Contaminant distribution maps will be prepared where appropriate.	5-6	The data is organized into tables for each IHSS, and is also displayed on figures of each IHSS.	5.0
Remedial alternative development will include the following steps: • develop a list of action types; • identify/screen technology groups for action types; • identify/evaluate process options for each technology group; • assemble selected technologies in site closure and corrective action alternatives; • screen assembled alternatives regarding short- and long-term effectiveness; and • develop preliminary risk-based remedial action goals for affected media.	5-9	Remedial alternative development, if necessary, will be addressed in subsequent documents.	N/A
Develop a treatability work plan if a treatability study is necessary.	5-13	Treatability studies, if necessary, will be addressed in subsequent documents.	N/A

Table 1-2
Work Plan Commitments and RFI/RI Disposition

WORK PLAN COMMITMENT	PAGE	RFI/RI DISPOSITION	SECTION
Prepare RFI/RI report containing: • field activities description; • site physical conditions; • site characterization results; • contaminant fate and transport; • findings summary; and • identification of data needs if further action is necessary.	5-13	This document is the Phase I RFI/RI Report. Field activities and site physical features are described in Sections 2.0 and 3.0, and contaminant fate and transport are described in Sections 6.0. Findings and conclusions are summarized in Section 8.0.	2.0, 3.0, 6.0 and 8.0
Section 6.0 - Schedule			
Meet schedule requirements: • 1/4/95 - Project Management • 3/1/93 - Project Planning • 1/4/95 - Community Relations • 9/21/93 - Field Investigation • 5/15/94 - Sample/Analysis & Data Validation • 6/20/94 - Data Evaluation • 7/13/94 - Baseline Risk Assessment • 1/4/95 - Phase I RFI/RI Report.	6-1	• Project management and community relations are ongoing through the completion of the Phase I RFI/RI Report. • Field investigations, sampling and analysis, and data evaluation were completed following verification sampling and analysis on 6/20/94. Data validation is complete. • A Baseline Risk Assessment was determined not to be necessary. • The Phase I RFI/RI Report is being submitted in accordance with the IAG schedule.	N/A
Section 7.0 - Field Sampling Plan			

Conduct staged field sampling activities.
• Stage 1 - contaminant characterization:
  • information review;
  • visual inspection;
  • swipe, steam and verification sampling/analysis;
  • radiation surveys/risk determination.
• Stage 2 - contaminant nature and extent/release potential:
  • swipe, steam, and verification sampling/analysis; and
  • radiation surveys/risk determination.
• Stage 3 - Work Plan to investigate/conduct impacted media outside IHSSs and risk assessment.
	7-5, 10-6	Stage 1 and 2 sampling activities were conducted at each IHSS. During these activities, new information was reviewed, the IHSSs were inspected, swipe, hot water and verification samples were collected, and radiological surveys were performed. It was determined that Stage 3 investigation was not required.	2.0 and 3.0

Chemicals identified in the WSRIC review as being stored in the IHSS will be evaluated with respect to fate and transport characteristics.	7-10	Information obtained from site inspections, records review, sampling, and analysis were applied in evaluating chemical fate and transport from each IHSS.	2.0 and 7.0

Table 1-2
Work Plan Commitments and RFI/RI Disposition

WORK PLAN COMMITMENT	PAGE	RFI/RI DISPOSITION	SECTION
Visual inspections conducted at each IHSS to define current conditions and prepare detailed sketches.	7-11	Visual inspections of each IHSS were conducted and figures were prepared to represent IHSS conditions.	2.0, 3.0 and 5.0
Radiological contamination swipe sampling will be conducted as follows: • sample area is 1 meter/side; • 1 sample/5 locations for 10 or more locations and • 1 sample/1 location for 10 or less locations; • in accordance with SOP - EMRG 3.1; and • plot results on a sketch map.	7-11	Radiological swipe sampling was conducted as required, but at a greater frequency than required. Work was performed in accordance with EMRG 3.1. Results of the swipe samples are provided in tabular form and on figures.	2.0, 3.0, 4.0 and 5.0
Steam sampling and rinsate analysis will be conducted as follows: • Stage 1 - collect 1 sample in IHSS and 1 at perimeter; • Stage 2 - collect samples along migration pathways, pending Stage 1 results; • in accordance with EM FO.03 and FO.04.	7-12	Stage 1 and 2 samples were collected and analyzed for each IHSS.	3.0, 4.0 and 5.0
Radiological Surveys within each square meter will include: • gamma surveys; • beta surveys; and • compliance with SOP - EMRG RO 1.1, 1.2, and 1.3.	7-13, 7-22	Radiological surveys were conducted as required and in accordance with EMRG RO 1.1, 1.2, and 1.3.	2.0, 3.0, 4.0 and 5.0
Data will be entered into RFEDS per input requirements.	7-23	Data was entered into RFEDS data base as required.	3.0, 4.0 and Appendix E
Steam rinsate samples will be analyzed in accordance with the GRRASP for: • TAL dissolved metals; • TCL VOCs; • TCL semi-volatile organic compounds; • radionuclides (U 233/234, 235, and 238; Pu 239/240; Am 241; gross alpha; and gross beta); and • cyanide.	7-24	Samples were analyzed for the required analytes in accordance with GRRASP.	3.0, 4.0 and 5.0
Collect, preserve, and handle samples per EMD OP FO.13.	7-25 and Table 7-3	Samples were collected, preserved, and handled in accordance with EMD OP FO.13 and other applicable procedures.	3.0, and Appendices B, C and D

Table 1-2
Work Plan Commitments and RFI/RI Disposition

WORK PLAN COMMITMENT	PAGE	RFI/RI DISPOSITION	SECTION
Data must be entered into RFEDS and tracked using sample data tracking sheets.	7-26	Samples were entered into RFEDS and tracked as required.	3.0, 4.0, 5.0, and Appendices B, C and D
Collect and analyze field QC samples at the specified frequency (QC sample per/IHSS sample) for organic, inorganic, and radionuclide analysis: • duplicates - 1/10; • equipment rinsate blanks - 1/20; and • trip blanks - 1/10 (organic compounds only).	7-26, Table 7-4, and 10-7	QC sample collection exceeded the required frequencies.	3.0 and 4.0
Coordinate ongoing building operations or activities with field work to eliminate adverse impact on field investigation.	7-27	Site visits were scheduled with appropriate EG&G personnel to eliminate potential conflicts with the investigation.	N/A
Section 8.0 - Human Health Risk Assessment			
Evaluate the need for a Baseline Risk Assessment.	8-1	The findings presented in Sections 2.0 and 5.0, and summarized in Section 6.0 show that a BRA is not required.	1.0 and 7.0
Section 9.0 - Environmental Evaluation			
Evaluate the need for an Environmental Evaluation.	9-1	The findings presented in Sections 2.0 and 5.0, and summarized in Section 6.0 show that an Environmental Evaluation is not required.	1.0 and 7.0
Section 10.0 - Quality Assurance Addendum			
Personnel must meet qualification and training requirements specified under EMD OP and EMRGs.	10-3	All on-site personnel involved in the RFI/RI investigation completed the necessary 40-hour OSHA training and RFETS site-specific training.	N/A
A QA summary report will be prepared annually or at the conclusion of the identified activities (whichever is more frequent).	10-3	Internal audits of the sampling methodology, data quality, and data presentation were conducted routinely during the course of the investigation.	4.0
Evaluate data quality using PARCC parameters and objectives specified in the QAPjP and the GRRASP. The goals specified apply to the steam rinsate analyses. PARCC goals for the radiological screening data and survey will be achieved by following established SOPs.	10-5	A PARCC evaluation was completed in accordance with goals identified in the QAPjP.	4.0

Table 1-2
Work Plan Commitments and RFI/RI Disposition

WORK PLAN COMMITMENT	PAGE	RFI/RI DISPOSITION	SECTION
Non-dedicated sampling equipment used more than once will be decontaminated between sampling locations in accordance with OPS-FO.03.	10-6	Sampling equipment was decontaminated between sample collection in accordance with OPS FO.03. Equipment rinsate blanks were collected from final decontamination rinsate to evaluate the effectiveness of the decontamination procedures.	3.0 and 4.0
The laboratory contractor must submit written OPs to the laboratory analysis task leader for approval. Procedures must be consistent with EPA-CLP QC procedures.	10-8	Laboratory QC procedures are defined in the QAPjP and GRRASP. Data is validated as part of the EG&G data management program.	3.0 and 4.0
Quality assurance monitoring will be conducted which will include field inspections and audits/surveillance will be conducted.	10-9	Internal audits of the sampling methodology, data quality, and data presentation were conducted routinely during the course of the investigation.	N/A
Data validation and reduction will be conducted as described in the GRRASP and QAPjP. Data will be flagged as valid, acceptable with qualifications, or rejected.	10-10 and 10-17	The analytical data collected was entered into the RFEDS data management system. This data undergoes validation following EPA protocols as described in the QAPjP.	3.0 and 4.0
DCNs or operating procedures addenda will be submitted if changes and variances to approved operating procedures occur.	10-11	DCNs to SOP FO.27 were submitted through the EG&G document control process.	3.0 and 4.0
Contractor-provided equipment and procured materials that have the ability to impact the quality of the data will be inspected prior to field work for acceptability.	10-12 and 10-14	All equipment was inspected for suitability prior to use during field activities.	N/A
Sample identification, containers, preservation, and chain-of-custody form requirements will be met as specified in Sections 7 and 8.	10-13 and 10-15	Sample identification, containers, preservation, and chain-of-custody requirements were followed in accordance with the specified SOPs.	3.0, and Appendices A, C, D and E
Field equipment used in radiological surveys will be calibrated and maintained in accordance with the manufacturer's instructions.	10-14	Radiological surveys were conducted in accordance with approved SOPs.	3.0 and Appendix A
Control of nonconformances and corrective actions will be conducted as required and outlined in the QAPjP.	10-16	Work was completed in conformance to specified requirements. No corrective actions were required.	N/A
Quality assurance records will be controlled in accordance with OPS-FO.02, Field Document Control.	10-16	Quality assurance records were maintained throughout the sampling activities.	Appendices A, B, C, D and E

2.0 IHSS INFORMATION

This section describes the site conceptual model, and summarizes the historical use, presents the visual inspection findings, and describes the radiological/beryllium controls and postings for each of the six IHSSs which compose OU15. The description of the site conceptual model in this report is based on the model originally presented in the Work Plan (DOE, 1993). Visual inspections of each IHSS were completed before sampling activities began. Drawings of each IHSS were developed from measurements taken during the visual inspections. A legend describing the symbols and abbreviations used on the IHSS drawings is provided in the Table of Contents. The general RFETS requirements regarding radiological/beryllium controls and postings are presented, along with the specific postings and controls for each IHSS.

Visual inspections were performed to assess the configuration of the units, to identify the presence and condition of berms or other secondary containment systems, and to document the conditions of the floors. The floors were inspected for slopes, cracks, and/or worn areas that might represent contaminant migration pathways and the presence of any sumps or drains. Visual inspections were performed at each IHSS prior to sampling activities.

Additional research on the historical uses of and releases from each IHSS was completed as part of the Stage 1 and 2 field investigations. The research consisted of document and database reviews and interviews with RFETS building personnel. The documents and database reviewed included the Final Historical Release Report for the Rocky Flats Plant (DOE, 1992b), the Task 3/4 Draft Report: Rocky Flats History (ChemRisk, 1992), and the EG&G Spill/Release Database. This additional information was incorporated into the historical use descriptions for each IHSS.

The description of RFETS radiological and beryllium control and posting requirements was developed based on a review of DOE orders, the DOE Radiological Control Manual (DOE, 1994b), and applicable RFETS Health and Safety Practices (HSPs) (EG&G, 1994). The current controls and postings associated with each IHSS are also described.

2.1 Site Conceptual Model

This section presents a site conceptual model for the IHSSs within OU15. It is based on the unit descriptions, site conditions, and the nature of contamination discussed in this document. A site conceptual model is intended to describe the known and suspected sources of contamination, types of potential contamination, affected media, potential contaminant migration pathways, and environmental receptors. As a result, this site conceptual model is beneficial in assisting with the understanding and interpretation of the sampling methods and results, and for evaluating the need for further action at the OU15 IHSSs.

The primary purpose of the conceptual model is to aid in identifying exposure pathways by which human and biotic receptors may be exposed to contaminants. EPA defines an exposure pathway as ". . . a unique mechanism by which a population may be exposed to chemicals at or originating from the site . . ." (EPA, 1989a). An exposure pathway must include a contaminant source, a release mechanism, a transport medium (pathway), an exposure route, and a receptor. An exposure pathway is not complete without each of these five components. The individual components of the exposure pathway are defined as follows:

- Contaminant Source (Section 2.1.1): For purposes of the OU15 conceptual model, the contaminant source is divided into primary sources (i.e., the IHSSs within the buildings) and secondary sources (i.e., environmental media outside of the buildings which potentially have been directly affected by releases from OU15 IHSSs). If a release from a primary source impacted environmental media outside the building, then the contaminated media would be considered a secondary contaminant source.

- Release Mechanisms (Section 2.1.2): Release mechanisms are physical and chemical processes by which contaminants are released from the source. The conceptual model identifies primary release mechanisms, which release contaminants directly from the IHSSs (in this case, leaks and spills) and secondary release mechanisms, which release contaminants by volatilization, air dispersion, "runoff" (inside buildings, such as spills, leaks or floodwaters), infiltration (into building materials), and tracking.

- Transport Medium (Pathway) (Section 2.1.2): Transport media are the media into which contaminants are released from the source and from which contaminants are in turn released to a receptor (or to another transport medium by a secondary release mechanism). Primary transport media within the buildings include air, water/waste liquids, and biota (humans). Secondary transport media include air, surface water, groundwater, and biota (humans) outside the buildings.

- Exposure Route (Section 2.1.3): Exposure routes are avenues through which contaminants are physiologically incorporated by a receptor. Exposure routes for receptors at OU15 are inhalation, ingestion, and dermal contact.

- Receptor (Section 2.1.3): Receptors are primarily human populations that are affected by the contamination released from a site. Human receptors for OU15 primarily include RFETS workers and visitors. Environmental receptors include biota (both flora and fauna) indigenous to the OU15 environs.

The conceptual model provides a contaminant source characterization and an overview of all the potential exposure pathways from releases from and into each transport medium. Some of these pathways have a higher potential for occurrence than others. Significant exposure pathways are identified by evaluating the fate and mobility of the contaminant in each potential source and transport medium.

The following sections describe sources of contamination, mechanisms of contaminant release, potential contaminant migration pathways, and receptors. The model was originally presented in the Work Plan (DOE, 1993) and was based on an initial evaluation of preliminary data. A graphical depiction of the conceptual model for OU15 is included as Figure 2-1.

2.1.1 Contaminant Source

Drums of stored wastes are the primary potential source of contamination at the OU15 drum storage areas - IHSSs 178, 179, 180, and 211. The Original Uranium Chip Roaster, including Rooms 32 and 502, represents the primary potential source of contamination at IHSS 204. At IHSS 217, the primary potential source of contamination includes the 4-liter bottle(s) that contained neutralized cyanide waste, the laboratory table, and the fume hood. In addition, other contaminants may have been present at IHSS 217. For all six OU15 IHSSs, contaminated environmental media (e.g., soil) outside the OU15 buildings would be considered a secondary potential contaminant source.

<u>Source Characteristics</u>

The IHSSs comprising OU15 are described in detail in Sections 2.3 through 2.8. As discussed in these sections, no historical releases to the ground surface and/or beneath the buildings have been identified within OU15. Therefore, potentially contaminated media outside of OU15 buildings, such as soils, are not considered to be current contaminant sources.

<u>Contaminant Characteristics</u>

The characteristics of wastes associated with OU15 IHSSs are also addressed in Sections 2.3 through 2.8. At the four drum storage areas, a variety of wastes are potential contaminants. At IHSS 178 volatile organic compounds (VOCs), and possibly radioactive wastes, were stored in drums. At IHSS 179 oils, chlorinated solvents, radioactive wastes, and possibly beryllium were stored in drums. At IHSS 180 VOCs, beryllium, and radioactive wastes were stored in drums along with oils contaminated with other organic compounds and uranium. A variety of solid and liquid wastes were stored within IHSS 211. These wastes included VOCs, metals, and low-level radioactive mixed wastes contaminated with Uranium-238. At IHSS 204, the Original Uranium Chip Roaster, potential contaminants include uranium chips coated with oil and organic solvents. At IHSS 217, cyanide wastes were contained within a 4-liter bottle(s). Cyanide also may have contaminated the laboratory table and fume hood.

No analytical results from environmental media outside the OU15 buildings that may have been contaminated by primary sources within OU15 IHSSs currently exist, and it is not possible to characterize secondary contaminant sources at this time. However, as mentioned previously, no historical releases to the ground surface and/or beneath the buildings are believed to have occurred from the IHSSs within OU15 because; 1) no releases have been documented, and 2) secondary containment systems (including the buildings themselves) would have prevented releases to environmental media outside of the buildings. Section 5.0 provides the rationale for selecting contaminants of concern for analytical evaluation.

2.1.2 Release Mechanisms and Transport Pathways

The primary release mechanisms for the drum storage areas in IHSSs 178, 179, 180 and 211 are leaks, spills, and other accidental releases from drums. Secondary release mechanisms at these IHSSs depend on the physical and chemical properties of the wastes and include runoff, infiltration, volatilization, and tracking. Release mechanisms for liquid wastes include surface runoff along drum containers, floors, walls, cracks, etc. and leaching of spilled liquids into building materials. Volatilization of liquid wastes and airborne dispersion of contaminated solids (i.e., dust/particulates) may have also occurred at these IHSSs assuming a release from the drums. Additionally, wastes can be tracked outside of the IHSS by humans and machinery resulting in dispersion of contaminants within the building and potentially, to outside areas.

The primary release mechanisms for the Original Uranium Chip Roaster, IHSS 204, are also spills and leaks. Secondary release mechanisms at IHSS 204 include volatilization, air dispersion, inside building runoff, infiltration into building materials, and tracking. On June 28, 1985, and July 20, 1986, the area around the Original Uranium Chip Roaster was flooded with water. Secondary release of contaminants may have occurred at these times via suspension and/or dissolution in water and subsequent transport by runoff outside of the IHSS.

At IHSS 217, the primary release mechanisms are spills, leaks, and volatilization from the 4-liter bottle(s). Potential leaks and spills were likely contained within the laboratory table/hood structure. However, assuming that the containment structure overflowed, secondary release may have occurred by airborne dispersion, runoff, infiltration into building materials, and tracking.

Potential release pathways from the IHSSs to other rooms inside the building or outside areas include: 1) surface runoff to drains and cracks with possible infiltration into the building materials/structure and subsequent infiltration to soils outside of the buildings; 2) surface runoff to inside areas where protective surface coatings are damaged or not present with infiltration into building materials/structures and possible infiltration to soils outside of the buildings; 3) overflow of bermed areas and surface runoff to other rooms inside the buildings and subsequent infiltration to soils outside of the buildings; and 4) tracking by humans and machinery throughout the buildings.

Historical accounts of OU15 releases (Sections 2.3 through 2.8) indicate that no known releases have occurred at any of the IHSSs (IHSS 204 may have had a secondary release associated with the two floods). In addition, ongoing health and safety monitoring for radiological contamination performed at RFETS, and data and observations from the OU15 field investigations do not indicate significant contamination associated with the OU15 IHSSs. Therefore the potential for migration of contaminants through the building and release to environmental media outside the buildings is considered low.

2.1.3 Exposure Routes and Receptors

Contaminants released from OU15 could affect potential receptors through inhalation of airborne particles or vapors, and through ingestion or injection of or dermal contact with contaminated source or transport media. As discussed in the Work Plan (DOE, 1993), environmental receptors within OU15 are considered to be non-existent. Because of the location of OU15 and the lack of documented releases, it is reasonable to conclude that contamination from OU15 will not affect off-site populations during the time it is being addressed under the auspices of the IAG (DOE, 1991). Therefore, the only potential human receptors for consideration of contaminant exposure are RFETS workers and visitors to the site.

2.2 RFETS Control and Posting Requirements

In order to protect workers at DOE sites and facilities, DOE has established practices for the conduct of radiological control activities. The requirements associated with DOE's radiological control program are presented in a series of DOE documents, which include DOE Order 5480.11, and its replacements, 10 Code of Federal Regulations (CFR) 835 and the DOE Radiological Control Manual (DOE, 1994b). The procedures that implement the DOE radiological control program at individual DOE sites and facilities are developed on a site-specific basis. RFETS HSP Section 18, Radiation Protection

(EG&G, 1994), contains the procedures developed for RFETS, and includes the requirements associated with radiological controls and postings.

The former production/processing buildings at RFETS typically contain both controlled and uncontrolled areas. Uncontrolled areas consist of offices, locker rooms and other non-radiological laboratories and process areas, and are not subject to any radiological controls. Controlled areas (also referred to as Radiologically Controlled Areas or RCAs) are physically separated from uncontrolled areas and include former and current radiological process/storage areas to which access is managed in order to protect individuals from exposure to radiation and/or radioactive materials. Although access to controlled areas is managed, individuals who enter only controlled areas without entering radiological areas are not expected to receive a total effective dose equivalent of more than 0.1 rem per year. Controlled areas provide access to radiological areas, while also serving as a buffer between uncontrolled areas and the radiological areas.

Radiological areas are located within larger controlled areas, and represent areas that contain specific radiation or radiological hazards. Radiological areas, which must be posted in accordance with the requirements of Section 18 of the HSP (EG&G, 1994), include: Radiation Areas, High Radiation Areas, Contamination Areas, High Contamination Areas and Airborne Radioactivity Areas. These radiological areas are designated as such based on their radiation dose-rate levels, removable and fixed contamination levels, and airborne concentration levels. A generic layout showing a typical relationship between uncontrolled, controlled and radiological areas at RFETS is included as Figure 2-2. The figure does not depict any specific area, but is instead provided for purposes of illustration.

Specific requirements apply for individuals entering and working in controlled and radiological areas, and encompass training, access control, work control, protective clothing, respiratory protection, and radiation monitoring and dose limits. The requirements are selected and implemented for each area based on the type of area, the levels of radiation and contamination, and the hazards present.

Posting requirements are also established based on the type of controlled or radiological area. In general, postings are used to alert personnel to the presence of radiation and radioactive materials and to aid them in minimizing exposures and preventing the spread of contamination. Specific requirements apply to the types of signs, markings and barriers used for posting.

The organizational responsibilities and requirements for working with and monitoring beryllium at RFETS are defined in HSP 13.04, Beryllium Protection (EG&G, 1994). HSP 13.04 (EG&G, 1994) specifies access control, posting, protective clothing, respiratory protection, air and surface monitoring, work control, and training requirements for work in beryllium control areas. HSP 13.04 (EG&G, 1994) also presents the RFETS action and control levels for airborne and surface contamination.

As a matter of policy, DOE is committed to a maintaining personal radiation and beryllium exposure As Low As is Reasonably Achievable. As a goal, DOE specifies that radiation exposure of the work force and public shall be controlled such that radiation exposures are well below regulatory limits and that there is no radiation exposure without commensurate benefit. For beryllium, DOE's goal is to keep beryllium air and surface contamination substantially lower than the required limits.

2.3 IHSS 178

IHSS 178 is a drum storage area located in Room 165 of Building 881 (Figure 2-3). The following subsections summarize the historical use of the IHSS as documented in the Work Plan (DOE, 1993), present additional historical information, and describe the findings from the visual inspection and the postings and controls visit of IHSS 178.

2.3.1 Historical Use of IHSS 178

IHSS 178 is a drum storage area located within Room 165 on the first floor of Building 881. There is no basement beneath Room 165. The drum storage area was first used in 1953 when Building 881 operations began. Currently IHSS 178 is used as a RCRA 90-day accumulation area.

The drums stored at this IHSS contained wastes generated within Building 881. Analytical results for wastes from Building 881 typical of those stored in IHSS 178 are presented in the Work Plan (DOE, 1993). These drums contained VOCs (Freon TF and 1,1,1-trichloroethane), and possibly low-level radioactive wastes.

Routine visual monitoring for spills and/or releases was conducted during the period of operation of this storage unit. However, the visual monitoring frequency is not presently known. As part of the development of the closure plan for this unit, a site visit was performed during November 1986. At that time, there was no visual evidence or documentation of any spills or releases in the storage unit. Five 55-gallon drums were stored at this IHSS in November 1986.

According to the Final Historical Release Report (DOE, 1992b), "no documentation was found that indicates a release to the environment." During a site visit on April 28, 1994, no hazardous waste was being accumulated in the area. RFETS building personnel indicated that no hazardous waste had been accumulated in the room for some time (time frame not specified). A review of inspection logs which dated from March 1, 1989 through April 27, 1993 revealed no information documenting or alluding to any spills or releases of hazardous wastes or constituents.

2.3.2 *Visual Inspection of IHSS 178*

As part of the OU15 Phase I RFI/RI, the site was visited on April 23, 1993 to visually observe the condition of IHSS 178. At the time of the visit, no drums were stored in the IHSS. The IHSS is located in Room 165 of Building 881, on the floor adjacent to the access door for the building plenum in Room 164. The IHSS was demarcated by two painted circles, each approximately four feet in diameter, that straddle a building column.

A maximum of five 55-gallon drums could be stored in the IHSS at one time. There were no secondary containment berms present around the IHSS or at the doors, and no discernable slope was noted for the floor. With the exception of the IHSS circles, the majority of the concrete floor in Room 165 was not painted. The unpainted concrete did have a finishing coat and was in good condition.

2.3.3 *Controls and Postings for IHSS 178*

As part of the OU15 Phase I RFI/RI, IHSS 178 was visited on November 3, 1994 to observe the postings and controls present at the IHSS. At the time of the visit, Room 165 was not posted for any radiological or beryllium controls, and there were no access restrictions to the room or the IHSS. The entrance to Room 164, part of the building plenum system and adjacent to the IHSS, was posted as an RCA. This posting did not apply to either the IHSS or the remainder of Room 165, since Room 164 is physically separated from Room 165 by a sealed submarine door.

2.4 *IHSS 179*

IHSS 179 is a drum storage area located in Room 145 of Building 865 (Figure 2-4). The following subsections summarize the historical use of the IHSS as documented in the

Work Plan (DOE, 1993), present additional historical information, and describe the findings from the visual inspection and the postings and controls visit of IHSS 179.

2.4.1 Historical Use of IHSS 179

IHSS 179 is a drum storage area located in the north end of Room 145, which is situated on the ground floor in the center of Building 865. Drum storage in IHSS 179 began in 1970. By November 1986, IHSS 179 was being used as a RCRA 90-day accumulation area. The maximum inventory stored in the IHSS at any one time was ten 55-gallon drums. The drums stored in IHSS 179 were placed directly on the concrete floor. No containment berms were present immediately adjacent to the IHSS.

Samples were obtained from drums stored in IHSS 179 during May and July 1986, and analyzed for total alpha, beryllium, and select organic compounds. Total alpha, beryllium, and certain organic compounds were detected in one or both of the drums sampled. The results of the analyses are presented in the Work Plan (DOE, 1993).

During a site visit in November 1986, two drums were being stored in the IHSS. The drums contained oils, chlorinated solvents, radioactive waste, and possibly beryllium. Shortly thereafter, the use of chlorinated solvents was eliminated in the area where the wastes stored in IHSS 179 were being generated. Consequently, after 1986, it is likely that the waste drums stored in IHSS 179 contained only oil possibly contaminated with beryllium and radioactive waste.

The drums stored in IHSS 179 were visually monitored daily for spills and releases. There have been no documented releases and based on prior visual inspections, and there was no evidence of spills. If any spills from the drums did occur, the spilled material may have collected in the concrete pit underneath the Electron Beam welder, located north of the IHSS. The pit has a sump with an automatic pump operated by a float switch. Accumulated liquids would have been transferred via overhead piping and the valve vault system to Building 374 for treatment.

The Final Historical Release Report (DOE, 1992b) states, "There have been no documented releases and based on a visual inspection on November of 1986, there was no visual evidence of spills."

The Task 3/4 Draft Report (ChemRisk, 1992) indicates that the following chemicals of concern have been used in Room 145: chromium boride, chromium carbide, chromium silicide, lead powder, nickel, and nitric acid. It should be noted that Room 145 is a large process area, and involves many operations not associated with the drum storage area.

A report generated from the EG&G Spill/Release Database indicates that approximately 50 gallons of process waste water was released in Room 145 on April 6, 1990. According to the report, "50 gallons of Process Waste was released to the Mezzanine and floor of Room 145 after a pipe union broke. Samples were taken for analysis, and the spill was vacuumed up and returned to the Process Waste system by 0930."

2.4.2 Visual Inspection of IHSS 179

As part of the OU15 Phase I RFI/RI, the site was visited on April 23, 1993 to visually observe the condition of IHSS 179. At the time of the visit, no drums were stored in the IHSS. The IHSS was located, in Building 865, on the floor of Room 145 in front of a large electrical panel, and was painted to mark its location. Its dimensions were approximately 8 feet by 12 feet. Markings were also present to identify the access requirements for the electrical panel.

There were no secondary containment berms present around the IHSS. The floor sloped north towards a concrete pit in the floor under the Electron Beam welder. The concrete floor in the IHSS and surrounding area was painted and was in good condition.

2.4.3 Controls and Postings for IHSS 179

As part of the OU15 Phase I RFI/RI, IHSS 179 was visited on November 3, 1994 to observe the postings and controls present at the IHSS. The entry into Room 145 was posted as an RCA and a Contamination Area. The entry into Room 145 was also posted as a Beryllium Control Area. Room 145 is a large process area that was formerly used for the production of uranium and beryllium parts. The Contamination Area and Beryllium Control Area postings at the entry to Room 145 reflect conditions that can be encountered somewhere within the room. No specific radiological or beryllium controls were posted at the actual IHSS area, which covers only a small fraction of the area of the entire room.

2.5 IHSS 180

IHSS 180 is a drum storage area located in Room 104 of Building 883 (Figure 2-5). The following subsections summarize the historical use of the IHSS as documented in the Work Plan (DOE, 1993), present additional historical information, and describe the findings from the visual inspection and the postings and controls visit of IHSS 180.

2.5.1 Historical Use of IHSS 180

IHSS 180 is a drum storage area located within Room 104 of Building 883. Room 104 was added on to the east side of the original building and was built on a grade. The area was first used as a container storage area in 1981 and has been used as a 90-day accumulation area for RCRA-regulated wastes for part of its operational history.

The storage area within Room 104 measures 10 feet by 16 feet. The unit stored a maximum of thirty 55-gallon drums, which were placed directly on the floor. There are no containment berms around the drums and no drains in the floor.

Samples from drums stored in the area were obtained on five separate dates and analyzed for total alpha, beryllium, and "general components." The results of the analyses are presented in the Work Plan (DOE, 1993). As indicated by the analytical results, VOCs, beryllium, and radioactivity were present in the drums sampled. The wastes included oils contaminated with organic compounds and uranium. Visual monitoring of the storage area was conducted periodically, but the frequency is not presently known. No documentation indicating a release from drums stored at this IHSS was found.

According to the Final Historical Release Report (DOE, 1992b), "There have been no documented releases and, based on a visual inspection on November of 1986, there was no visual evidence of spills or leakage." No additional information on the wastes stored in the IHSS was found.

2.5.2 *Visual Inspection of IHSS 180*

As part of the OU15 Phase I RFI/RI, the site was visited on April 23, 1993 to visually observe the condition of IHSS 180. At the time of the visit, no drums were stored in the IHSS, but the unit was designated for storage of low-level radioactive waste (non-hazardous). The IHSS was located on the floor of Room 104 in Building 883, and was painted to mark its location.

There were no secondary containment berms present around the IHSS or at the dock door leading from Room 104 to the outside of the building. The floor sloped from the IHSS toward the weigh scale, which was housed in a concrete pit recessed in the floor, and not toward the dock door. The concrete floor in the IHSS and surrounding area was painted, although the paint was scuffed and in poor condition.

2.5.3 Controls and Postings for IHSS 180

As part of the OU15 Phase I RFI/RI, IHSS 180 was visited on November 3, 1994 to observe the postings and controls present at the IHSS. The entries into Room 137, which provides access into the Building 883 process areas, and Room 104 were posted as RCAs and Contamination Areas. Room 104 is part of a large process area that was formerly used for the production of uranium parts. The Contamination Area postings at the entries to Rooms 104 and 137 reflect conditions that can be encountered somewhere within the process area. No specific radiological or beryllium controls were posted at the actual IHSS area, which covers only a small fraction of the process area.

2.6 IHSS 204

IHSS 204 (also known as RCRA Unit 45) is the Original Uranium Chip Roaster located in Rooms 32 and 502 in Building 447 (Figures 2-6 and 2-7). Access to the unit is provided by Rooms 31 and 501. An equipment wash rack/drum washing basin associated with the Original Uranium Chip Roaster is located in Room 501 (Figure 2-8). The following subsections summarize the historical use of the IHSS as documented in the Work Plan (DOE, 1993), present additional historical information, and describe the findings from the visual inspection and the postings and controls visit of IHSS 204.

2.6.1 Historical Use of IHSS 204

The Original Uranium Chip Roaster is located in Rooms 32 and 502 of Building 447, and is constructed of mild steel casing lined with alumina refractory brick. It is cylindrical with a diameter of 5 feet 6 inches and a height of 7 feet 4 inches. The unit was identified as Unit 45 in the 1986 RCRA Part B permit application (Rockwell, 1986e).

The unit oxidizes elemental uranium to uranium oxide. Depleted uranium chips originated from the Building 444 production area and were historically coated with small amounts of oils and coolants (Freon TF and 1,1,1-trichloroethane). Chips were stored in 55-gallon drums and transferred to Building 447 for roasting. Currently, the Original Uranium Chip Roaster is still operational; however, the uranium chips are no longer coated with oils or coolants that are RCRA-regulated hazardous wastes.

Before roasting, the chips were rinsed with hot water to remove excess coatings. The rinsate was disposed of in the building process drain. The chips were fed into the top of the roaster at a rate of approximately three 55-gallon drums per day. The chips ignited upon entry and sustained self-combustion throughout the roasting cycle. When the roasting cycle was complete, the uranium oxide was removed through a hole in the bottom of the unit and was collected in 30-gallon drums.

An incident involving the roaster occurred in Room 32 of Building 447 on June 28, 1985. The ignition of some cardboard in the room set off the sprinklers and fire alarm, and flooded the basement of the building. A second incident, indirectly related to this IHSS occurred on July 20, 1986. During a major rain event, a main 36-inch storm sewer/drainage system failed and flooded portions of Buildings 444 and 447. In Building 447, several inches of water accumulated throughout the process areas. The basement, including Room 32, was flooded with several feet of water.

The Final Historical Release Report (DOE, 1992b) states, "Because of the operating temperatures of the roaster and the chemical and physical properties of freon TF and 1,1,1-trichloroethane, it is not expected that any residual material remains in this unit." RFETS building personnel indicated that there have been no spills or releases associated with this unit during their tenure with the building over the last 15 years. They added that no hazardous constituents (e.g., solvents) have been used in association with the unit since January of 1988.

2.6.2 Visual Inspection of IHSS 204

As part of the OU15 Phase I RFI/RI, the site was visited on April 23, 1993 to visually observe the condition of IHSS 204. At the time of the visit, approximately twelve drums were stored in Room 32, and six drums were stored in Room 502. Miscellaneous equipment including ladders and drum dollies were also present in both rooms. No drums or equipment were present in the Wash Rack/Drum Washing Basin, which is located in Room 501. The Original Uranium Chip Roaster spans two floors. The chip inlet is located upstairs in Room 502, and the main body of the roaster, including the oxide outlet ports, is located in Room 32, directly beneath Room 502.

There were no secondary containment berms present around Rooms 32 or 502. No discernable slope was noted for the floors in either room. The concrete floor in both rooms was painted and generally in good condition, although black dust was visible on the floors and exterior surfaces of the chip roaster in both rooms. The concrete pad and berm of the Wash Rack/Drum Washing Basin was in good condition with no apparent gaps or cracks. The floor in the basin sloped to a process drain located in the center of the pad.

2.6.3 Controls and Postings for IHSS 204

As part of the OU15 Phase I RFI/RI, IHSS 204 was visited on November 9, 1994 to observe the postings and controls present at the IHSS. The entry into Room 101 in Building 444, which provides access into the Building 444 and 447 process areas, was posted as an RCA. The doors to Rooms 31 and 501 were posted to warn unauthorized personnel to keep out. Caution labels warning of internal contamination were affixed to the Wash Rack/Drum Washing Basin in Room 501. Room 502, which contains the chip inlet, was posted as a Contamination Area. Room 32, which contains the main body of the chip roaster and the oxide outlet ports, was posted as a Radiation Area and a Contamination Area. The room was also posted to identify it as a hazardous waste treatment unit.

2.7 IHSS 211

IHSS 211 (also known as RCRA Unit 26) is a drum storage area located in Room 266B of Building 881 (Figure 2-9). The following subsections summarize the historical use of the IHSS as documented in the Work Plan (DOE, 1993), present additional historical information, and describe the findings from the visual inspection and the postings and controls visit of IHSS 211.

2.7.1 Historical Use of IHSS 211

IHSS 211 is a drum storage area located in Room 266B on the second floor annex of Building 881. Since May 16, 1989, IHSS 211 has been operating as a RCRA 90-day accumulation area. Prior to this time, the unit was a drum storage area for mixed waste and was included in the hazardous and low-level mixed waste RCRA Part B permit application as Unit 26. The unit was first used as a drum storage area in 1981.

The wastes stored in the unit have historically included both liquids and solids generated from the general laboratories in the building. The waste streams currently approved for storage in Unit 26 include low-level combustible waste possibly contaminated with hazardous solvents and/or metals, and metal and glass waste or materials contaminated with hazardous solvents. There was no recorded documentation of a spill or release in the unit.

According to the Final Historical Release Report (DOE, 1992b), there is no indication that hazardous waste or constituents have been released in association with this area. A review of inspection logs which dated from March 1, 1989 through April 27, 1993 revealed no information documenting or alluding to any spills or releases of hazardous wastes or constituents.

The Task 3/4 Draft Report (ChemRisk, 1992) indicates that the following chemicals of concern have been used in Room 266: carbon tetrachloride, chloroform, and nickel catalyst. It should be noted that Room 266 is separated from Room 266B by a wall and a sealed doorway. The same report indicates that the following chemicals have been used in Building 881 laboratories: benzene, beryllium, cadmium and cadmium compounds, carbon tetrachloride, chloroform, chromium and chromium compounds, lead and lead compounds, mercury, methylene chloride, nickel and nickel compounds, nitric acid, tetrachloroethylene, 1,1,1-trichloroethane, and trichloroethylene.

A report generated from the EG&G Spill/Release Database indicates that 2.5 gallons of nitrate solution was released in Room 266 on January 21, 1991. According to the report, the "scrubber hose came loose from the pump and sprayed a lab hood and into the ceiling tile. The pump was shut off and the leak was stopped." The liquid waste was collected using a vacuum cleaner and then poured into the process drain system.

2.7.2 Visual Inspection of IHSS 211

As part of the OU15 Phase I RFI/RI, the site was visited on April 23, 1993 to visually observe the condition of IHSS 211. At the time of the visit, there were seven 55-gallon drums located in the IHSS. Six of the drums contained solid waste, and one of the drums contained liquid waste and was stored in a portable secondary containment unit.

The drum storage area was 10 feet by 20 feet and could store a maximum of twenty-nine 55-gallon drums at one time. The floor was constructed of concrete, which was sealed with epoxy paint. Drums were stored directly on the floor or in portable secondary containment units. Weekly container inspections were conducted to visually assess the integrity of the drums and to check for leaks and spills.

There were no secondary containment berms around the storage area, at the entrance to the IHSS, or under the sealed door at the back of the IHSS. The concrete floor, painted with an epoxy coating, was in good condition; however, a sealed crack in the floor approximately one to two inches wide ran the length of the room. RFETS building personnel were unfamiliar with when the crack had first appeared and how often it had been repaired, but indicated that the crack had most recently been repaired approximately one month prior to the site visit. RFETS building personnel added that the crack may have originally been narrower, and may have been ground out at the surface to facilitate its repair. They also stated that a standing work order is in place in Building 881 to immediately repair any cracks which develop in the floor of IHSS 211.

Since the building is partially below grade, ground water may leak into Building 881 in the vicinity of Room 266B. Room 266B had two catch pans positioned approximately 6 inches under the ceiling to collect potential seepage into the room. The catch pans drained to collection bottles on the floor. Additional catch pans and collection bottles were located in the hallway outside of the IHSS.

2.7.3 Controls and Postings for IHSS 211

As part of the OU15 Phase I RFI/RI, IHSS 211 was visited on November 3, 1994 to observe the postings and controls present at the IHSS. At the time of the visit, Room 266B was not posted for any radiological or beryllium controls. The room was posted as a RCRA 90-day accumulation area. Access to the room/IHSS was restricted by a locked cage door.

2.8 IHSS 217

IHSS 217 is the cyanide bench scale treatment unit (RCRA Unit 32) located in Room 131C of Building 881 (Figure 2-10). The following subsections summarize the historical use of the IHSS as documented in the Work Plan (DOE, 1993), present additional historical information, and describe the findings from the visual inspection and the postings and controls visit of IHSS 217.

2.8.1 Historical Use of IHSS 217

IHSS 217 is a cyanide bench scale treatment process (RCRA Unit 32) located in Room 131C, on the first floor of Building 881. The unit consisted of a 4 feet by 5 feet painted metal fume hood and laboratory table, three 4-liter polyethylene bottles, a glass beaker, and a chlorine-specific ion electrode. The laboratory table and metal fume hood were originally installed in 1952. No information was available regarding the operational history of this unit prior to its use for treatment of cyanide. The hood appeared to be made of metal covered with a coat of paint. The hood had an integral lip across the front which provided containment of any wastes spilled within the hood.

The bench scale treatment process converted cyanide to cyanate. Aqueous cyanide solutions were transferred to Unit 32 for analysis of cyanide content using a cyanide still.

Very low concentrations of other listed hazardous wastes may have been in these solutions. Wastes generated from this analysis were collected in the three 4-liter polyethylene bottles stored in the steel fume hood of the unit. The bottom of the fume hood acted as a secondary containment system in the event of a spill. There was no automated monitoring system for detecting releases. No more than five liters of the cyanide waste were stored in the unit at any given time. The cyanide solution was treated in a 4-liter bottle with sodium or calcium hypochlorite to oxidize the cyanide to cyanate. A residual chlorine-specific ion electrode was used to determine when the conversion was complete. There have been no documented releases from the polyethylene bottles or spills during transfer or neutralization.

The neutralized solution was poured down a process waste drain located in Room 131C and transferred via the process waste line system to Building 374 for further treatment. Since the drain is also used for disposal of other wastes generated in the laboratory, the drain and the associated piping will be investigated separately from IHSS 217.

According to the Final Historical Release Report (DOE, 1992b), the cyanide bench scale treatment unit was used from 1986 until September of 1988. The report states, "No documentation was found which indicated a release to the environment". A review of inspection logs which dated from March 1, 1989 through April 27, 1993 revealed no information documenting or alluding to any spills or releases of hazardous wastes or constituents. The Task 3/4 Draft Report (ChemRisk, 1992) indicates that the following chemicals of concern have been used in Room 131C: nitric acid, potassium chromate, and lead standard.

2.8.2 Visual Inspection of IHSS 217

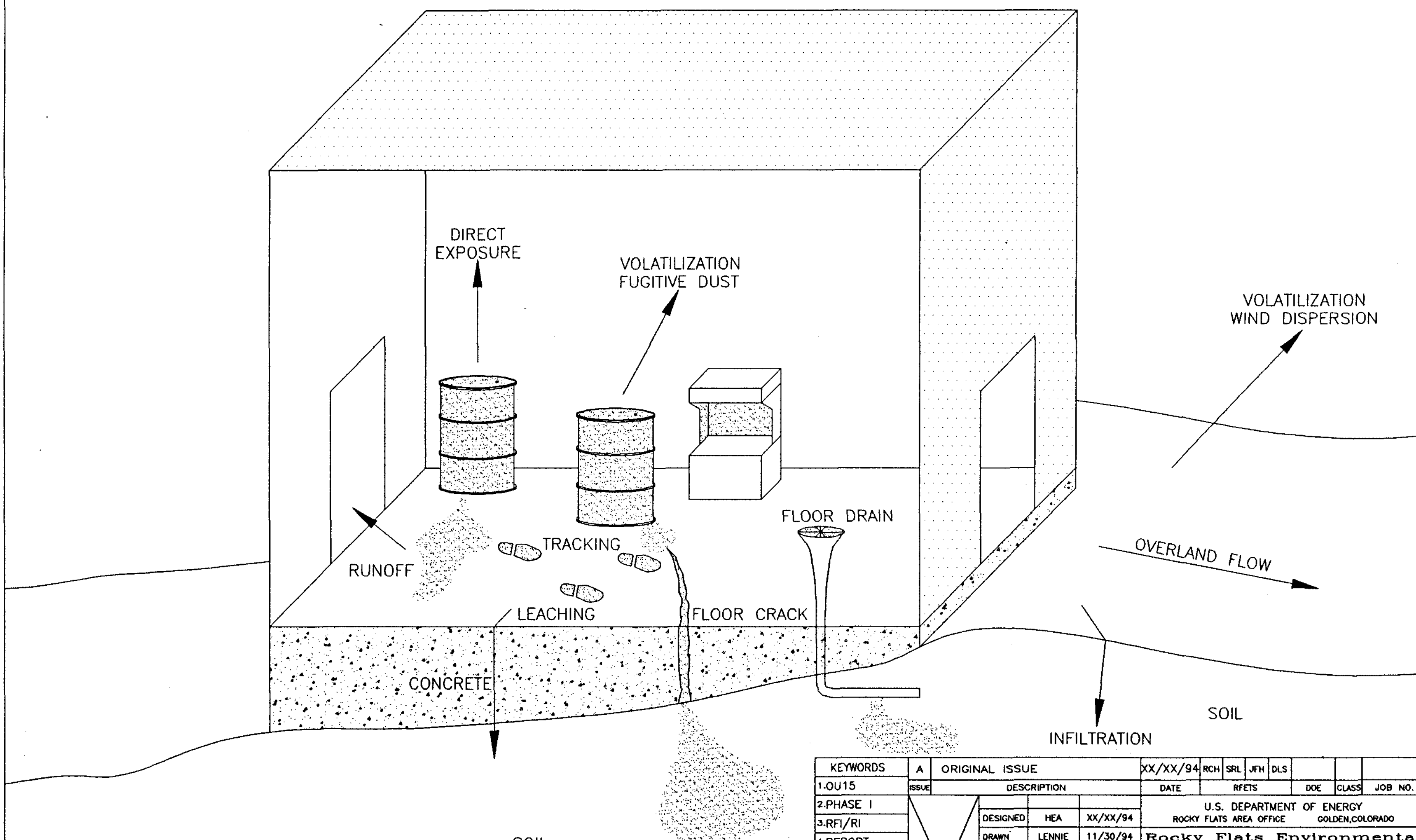
As part of the OU15 Phase I RFI/RI, the site was visited on April 23, 1993 to visually observe the condition of IHSS 217. At the time of the visit, the unit was not operational.

Two permanently attached crucibles and a removable tray were present on top of the laboratory table surface. Some staining was evident on both the laboratory table and fume hood surfaces.

Secondary containment for the laboratory table was provided by the fume hood itself and a lip on the front side of the table. The floor in Room 131C was covered with linoleum tiles which appeared to be in good condition but had some staining. There were no secondary containment berms present around Room 131C.

2.8.3 Controls and Postings for IHSS 217

As part of the OU15 Phase I RFI/RI, IHSS 217 was visited on November 3, 1994 to observe the postings and controls present at the IHSS. At the time of the visit, Room 131C was not posted for any radiological or beryllium controls. Access to the Room 131 laboratory area was restricted by a locked door.



KEYWORDS
1.OU15
2.PHASE I
3.RFI/RI
4.REPORT
5.
BLDG./FACILITY
ROOM/AREA
GRID COOR./COL. NO.
MASTER YES ☐ NO ☒

ISSUE	DESCRIPTION	DATE	RFETS				DOE	CLASS	JOB NO.
A	ORIGINAL ISSUE	XX/XX/94	RCH	SRL	JFH	DLS			

DESIGNED	HEA	XX/XX/94
DRAWN	LENNIE	11/30/94
CHECKED	HAASBEEK	XX/XX/94
APPROVED	SCHUBBE	XX/XX/94
SUBMITTED	BIERBAUM	XX/XX/94
APPROVED RFETS		
APPROVED DOE		

SCALE: NONE

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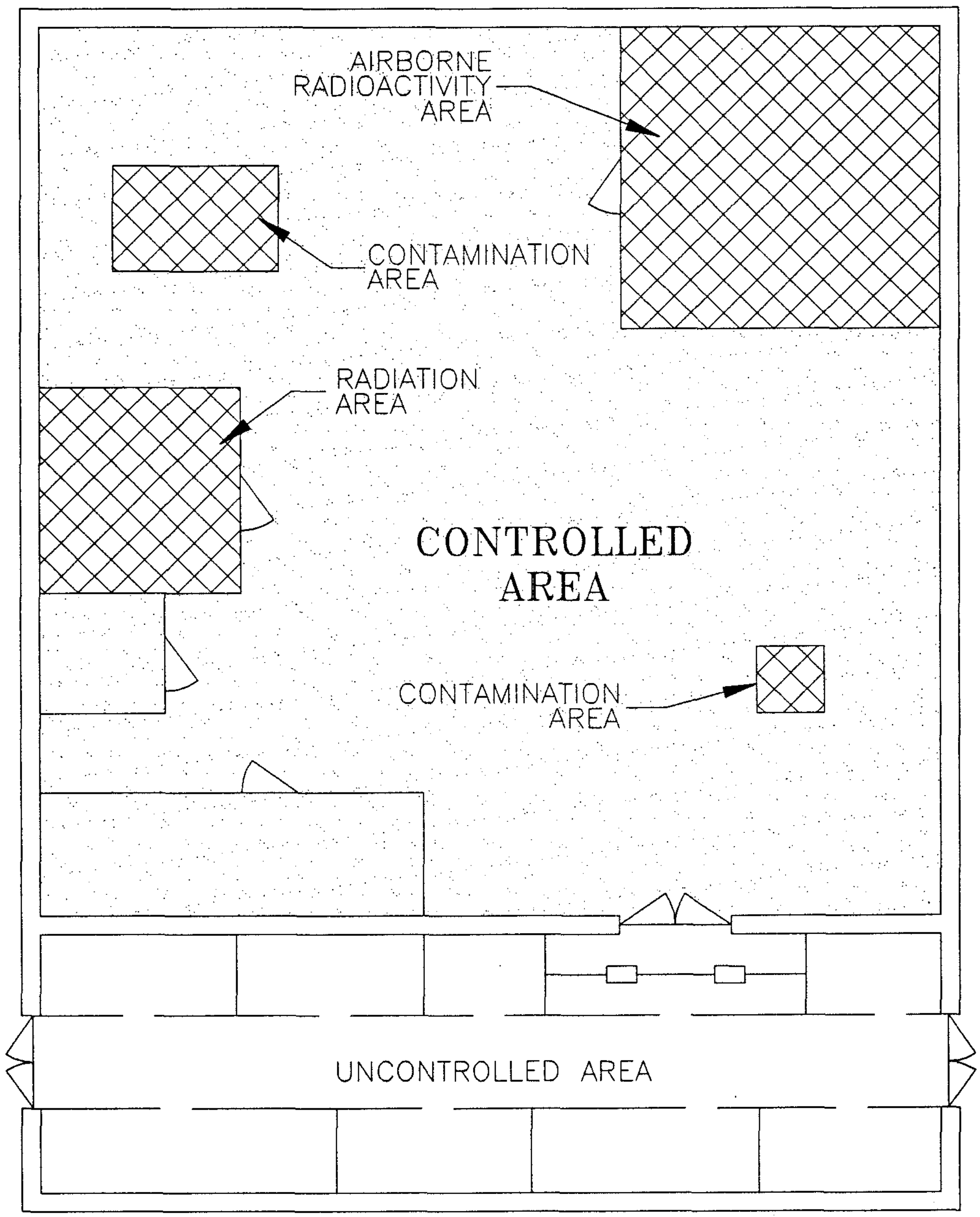
Rocky Flats Environmental Technology Site
GOLDEN,COLORADO 80401
OU15 PHASE I RFI/RI

CONCEPTUAL MODEL FOR OU15

SIZE	DRAWING NUMBER	ISSUE	FIGURE
A	.	A	2-1

BLDG.FAC.
ROOM/AREA
H Htg-Vent
A Arch
G GL Box
E Elec
D Detection
M Mech
I Inst
B Building
T Title
C Civil
U Utilities
P Piping
W Fire Prot.
L Layouts
F Flow Diag.
S Stds
X Alarms



KEYWORDS	A	ORIGINAL ISSUE	XX/XX/94	RCH	SRL	DFG	DLS			
1.OU15	ISSUE	DESCRIPTION	DATE	RFETS				DOE	CLASS	JOB NO.

2.PHASE I	DESIGNED	HEA	XX/XX/94
3.RFI/RI	DRAWN	LENNIE	11/30/94
4.REPORT	CHECKED	GIETZEN	XX/XX/94
5.	APPROVED	SCHUBBE	XX/XX/94
BLDG./FACILITY GENERAL			
ROOM/AREA GENERAL			
GRID COOR./COL. NO.	SUBMITTED	BIERBAUM	XX/XX/94
MASTER YES ☐ NO ☒ — SCALE: NONE	APPROVED RFETS		
	APPROVED DOE		

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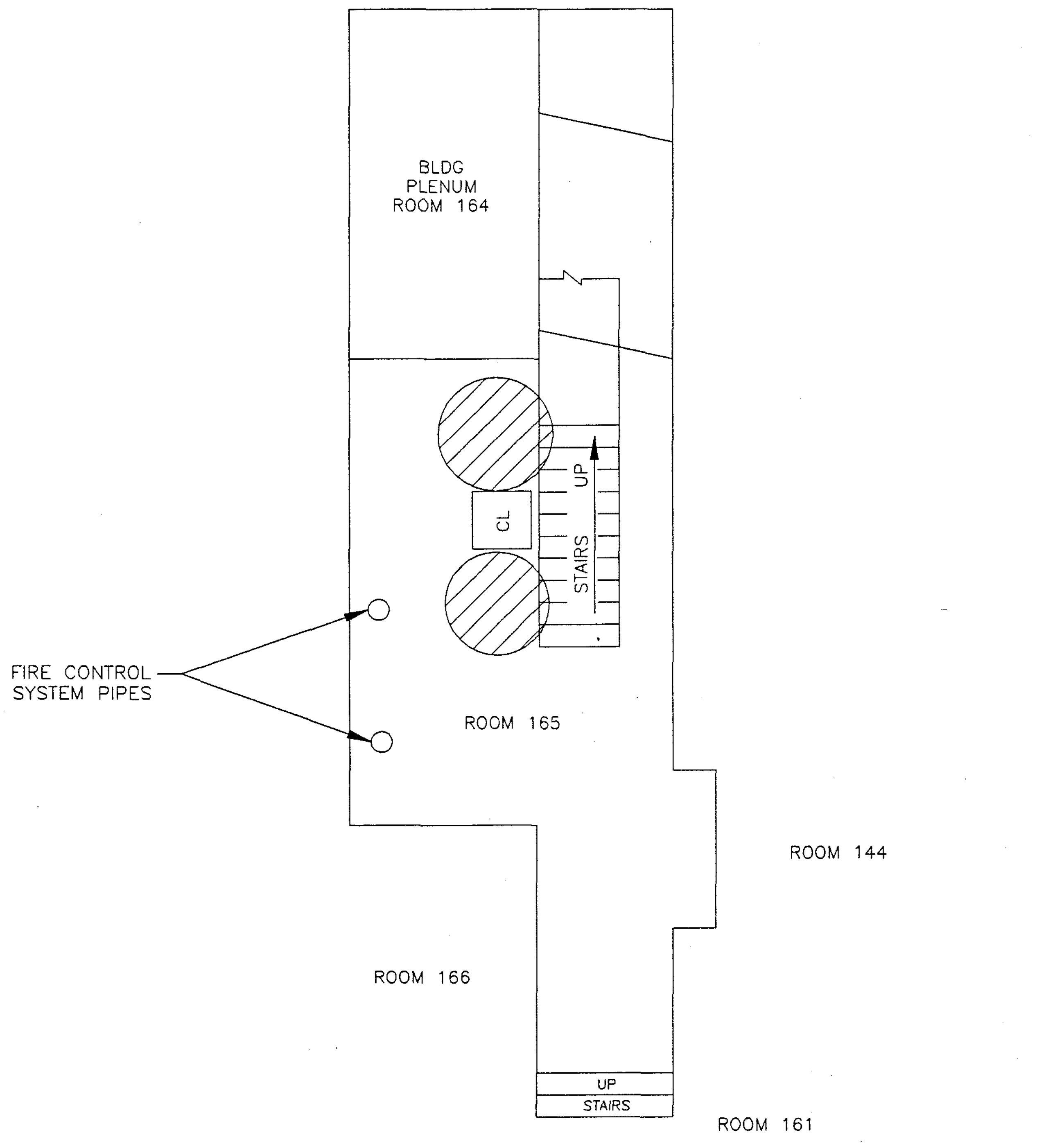
OU15 PHASE I RFI/RI

GENERIC LAYOUT FOR CONTROLLED AREAS

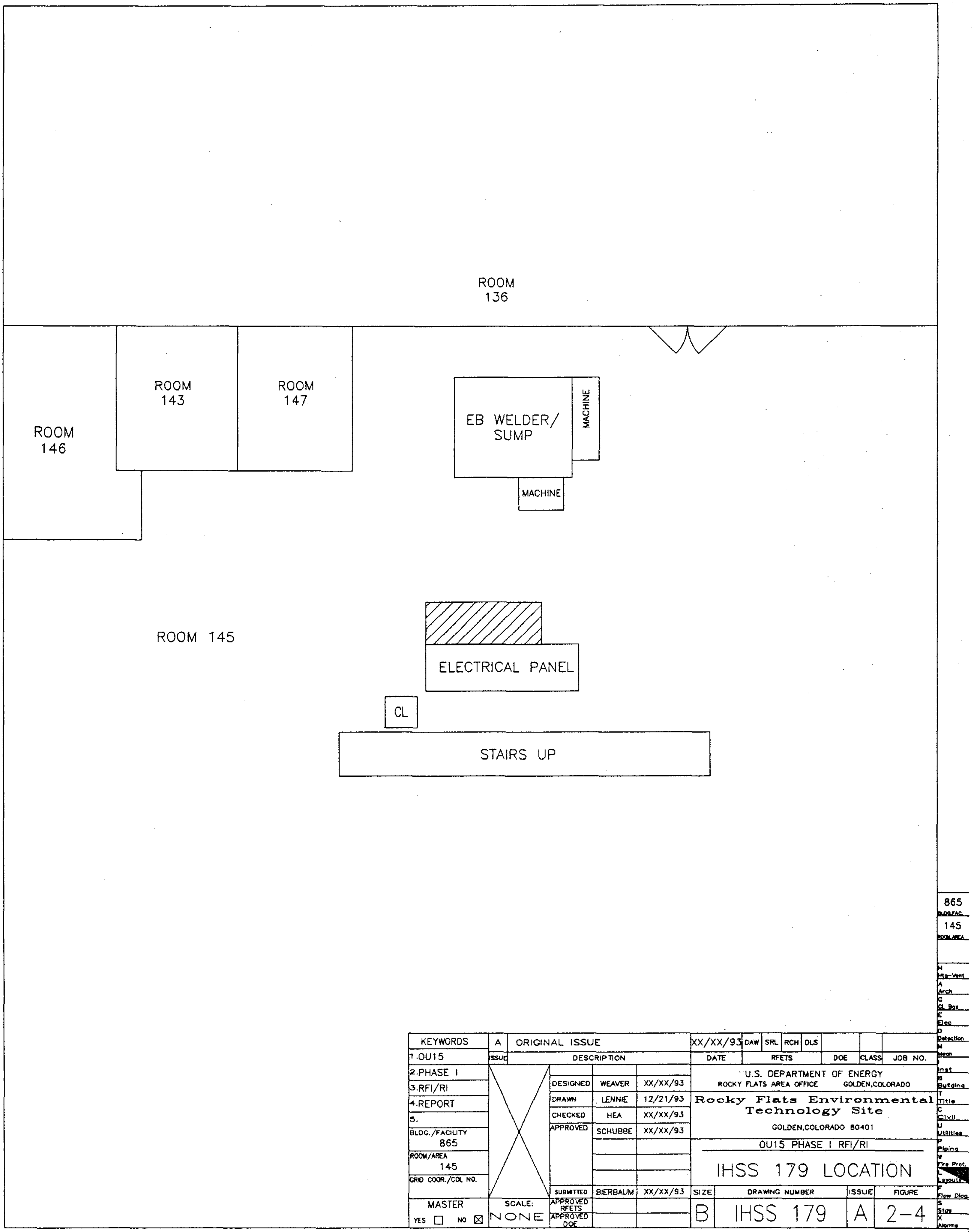
SIZE	DRAWING NUMBER	ISSUE	FIGURE
A	.	A	2-2

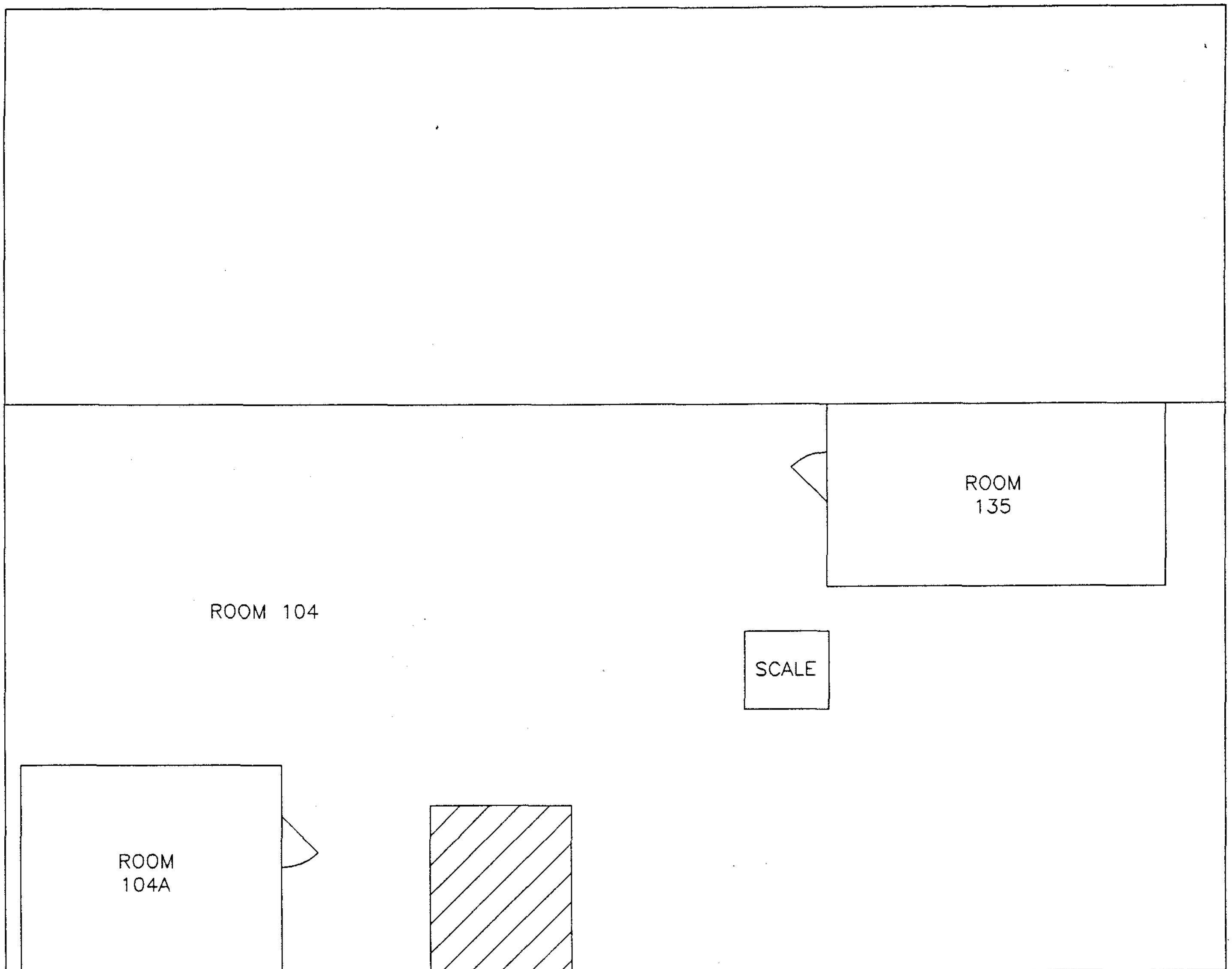
GEN BLDG/FAC.
GEN ROOM/AREA
H Htg-Vent
A Arch
G GL Box
E Elec
D Detection
M Mech
I Inst
B Building
T Title
C Civil
U Utilities
P Piping
V Fire Prot.
L Layout
F Flow Diag.
S Stds
X Alarms



KEYWORDS	A	ORIGINAL ISSUE			XX/XX/93	RCH	SRL	PRB	DLS	
1.OU15	ISSUE	DESCRIPTION			DATE	RFETS		DOE	CLASS	JOB NO.
2.PHASE I					U.S. DEPARTMENT OF ENERGY ROCKY FLATS AREA OFFICE GOLDEN,COLORADO					
3.RFI/RI		DESIGNED	HEA	XX/XX/93						
4.REPORT		DRAWN	LENNIE	12/21/93	Rocky Flats Environmental Technology Site GOLDEN,COLORADO 80401					
5.		CHECKED	BIERBAUM	XX/XX/93						
BLDG./FACILITY 881		APPROVED	SCHUBBE	XX/XX/93	OU15 PHASE I RFI/RI					
ROOM/AREA 165					IHSS 178 LOCATION					
GRID COOR./COL NO.		SUBMITTED	BIERBAUM	XX/XX/93	SIZE	DRAWING NUMBER		ISSUE	FIGURE	
MASTER YES ☐ NO ☒	SCALE: NONE	APPROVED RFETS APPROVED DOE			B	IHSS 178		A	2-3	

881 BLDG/FAC.
165 ROOM/AREA
H Htg-Vent
A Arch
G GL Box
E Elec
D Detection
M Mech
I Inst
B Building
T Title
C Civil
U Utilities
P Piping
W Fire Prot.
L Layouts
F Flow Diag.
S Stds
X Alarms

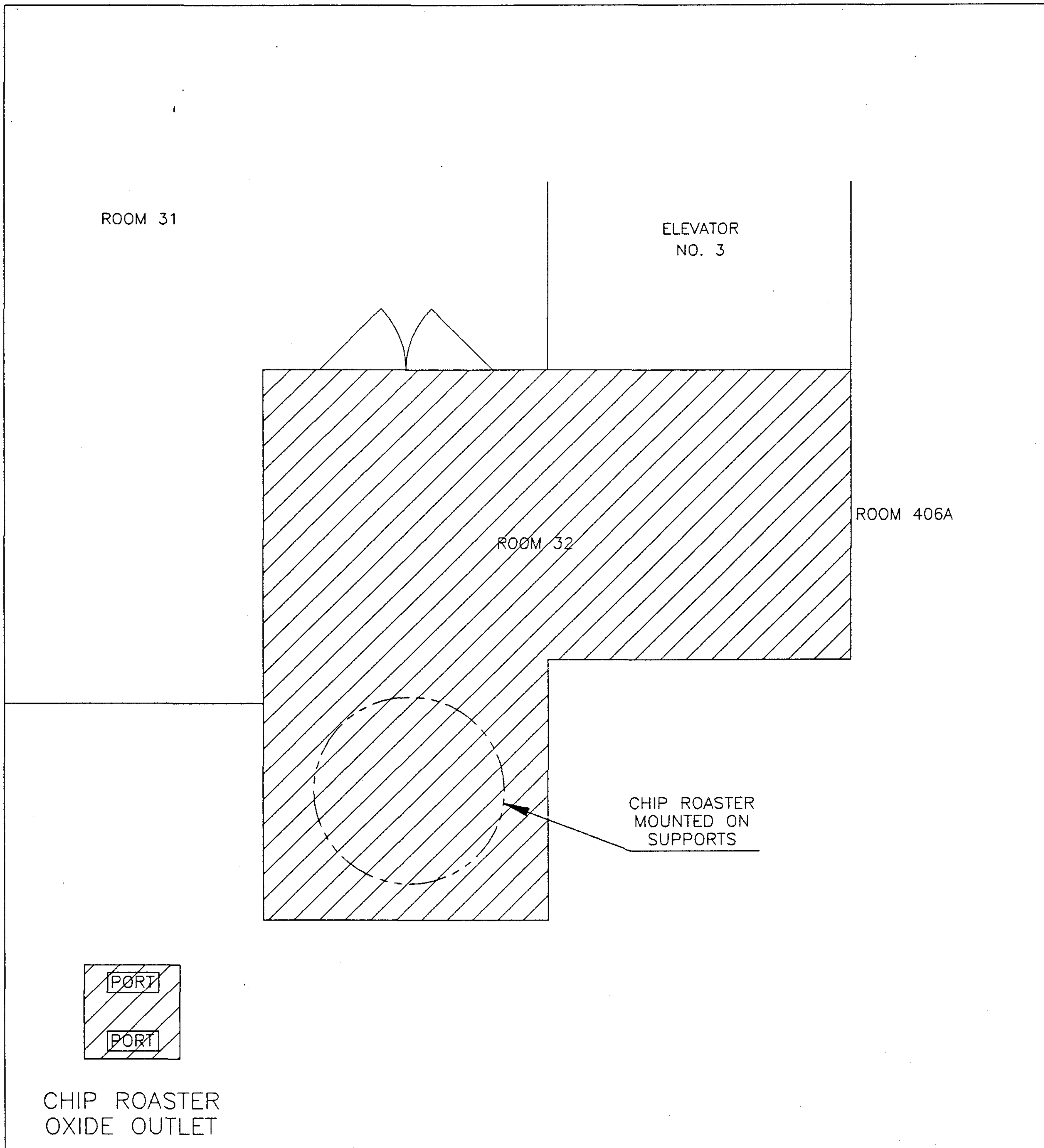

ROOM 136
ROOM 143
ROOM 147
ROOM 146
EB WELDER/ SUMP
MACHINE
MACHINE
ROOM 145
ELECTRICAL PANEL
CL
STAIRS UP
KEYWORDS
1.OU15
2.PHASE I
3.RFI/RI
4.REPORT
5.
BLDG./FACILITY 865
ROOM/AREA 145
GRID COOR./COL NO.
MASTER YES ☐ NO ☒
SCALE: NONE
A ORIGINAL ISSUE XX/XX/93 DAW SRL RCH DLS
ISSUE DESCRIPTION DATE RFETS DOE CLASS JOB NO.
DESIGNED WEAVER XX/XX/93
DRAWN LENNIE 12/21/93
CHECKED HEA XX/XX/93
APPROVED SCHUBBE XX/XX/93
SUBMITTED BIERBAUM XX/XX/93
APPROVED RFETS
APPROVED DOE
U.S. DEPARTMENT OF ENERGY
ROCKY FLATS AREA OFFICE GOLDEN,COLORADO
Rocky Flats Environmental Technology Site
GOLDEN,COLORADO 80401
OU15 PHASE I RFI/RI
IHSS 179 LOCATION
SIZE B
DRAWING NUMBER IHSS 179
ISSUE A
FIGURE 2-4
865
BLDG/FAC
145
ROOM/AREA



KEYWORDS	A	ORIGINAL ISSUE	XX/XX/93	DAW	SRL	RKT	DLS			
1. OU15	ISSUE	DESCRIPTION	DATE	RFETS				DOE	CLASS	JOB NO.

2. PHASE I				U.S. DEPARTMENT OF ENERGY ROCKY FLATS AREA OFFICE GOLDEN, COLORADO
3. RFI/RI	DESIGNED	WEAVER	XX/XX/93	
4. REPORT	DRAWN	LENNIE	12/20/93	Rocky Flats Environmental Technology Site GOLDEN, COLORADO 80401
5.	CHECKED	TERRIEN	XX/XX/93	
BLDG./FACILITY 883	APPROVED	SCHUBBE	XX/XX/93	OU15 PHASE I RFI/RI
ROOM/AREA 104				IHSS 180 LOCATION
GRID COOR./COL NO.	SUBMITTED	BIERBAUM	XX/XX/93	SIZE: B / DRAWING NUMBER: IHSS 180 / ISSUE: A / FIGURE: 2-5
MASTER YES ☐ NO ☒ — SCALE: NONE	APPROVED RFETS			
	APPROVED DOE			

883
BLDG/FAC
104
ROOM AREA
H Htg-Vent
A Arch
C GL Box
E Elec
D Detection
M Mech
I Inst
B Building
T Title
C Civil
U Utilities
P Piping
W Fire Prot.
L Layouts
F Flow Diag
S Stds
X Alarms



KEYWORDS	A	ORIGINAL ISSUE	XX/XX/93	RCH	SRL	DAW	DLS
1.OU15	ISSUE	DESCRIPTION	DATE	RFETS		DOE	CLASS / JOB NO.
2.PHASE I							
3.RFI/RI		DESIGNED	HEA	XX/XX/93			
4.REPORT		DRAWN	LENNIE	12/20/93			
5.		CHECKED	WEAVER	XX/XX/93			
BLDG./FACILITY 447		APPROVED	SCHUBBE	XX/XX/93			
ROOM/AREA 31/32							
GRID COOR./COL NO.		SUBMITTED	BIERBAUM	XX/XX/93			
MASTER YES ☐ NO ☒	SCALE: NONE	APPROVED RFETS / APPROVED DOE					

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Rocky Flats Environmental Technology Site
GOLDEN,COLORADO 80401

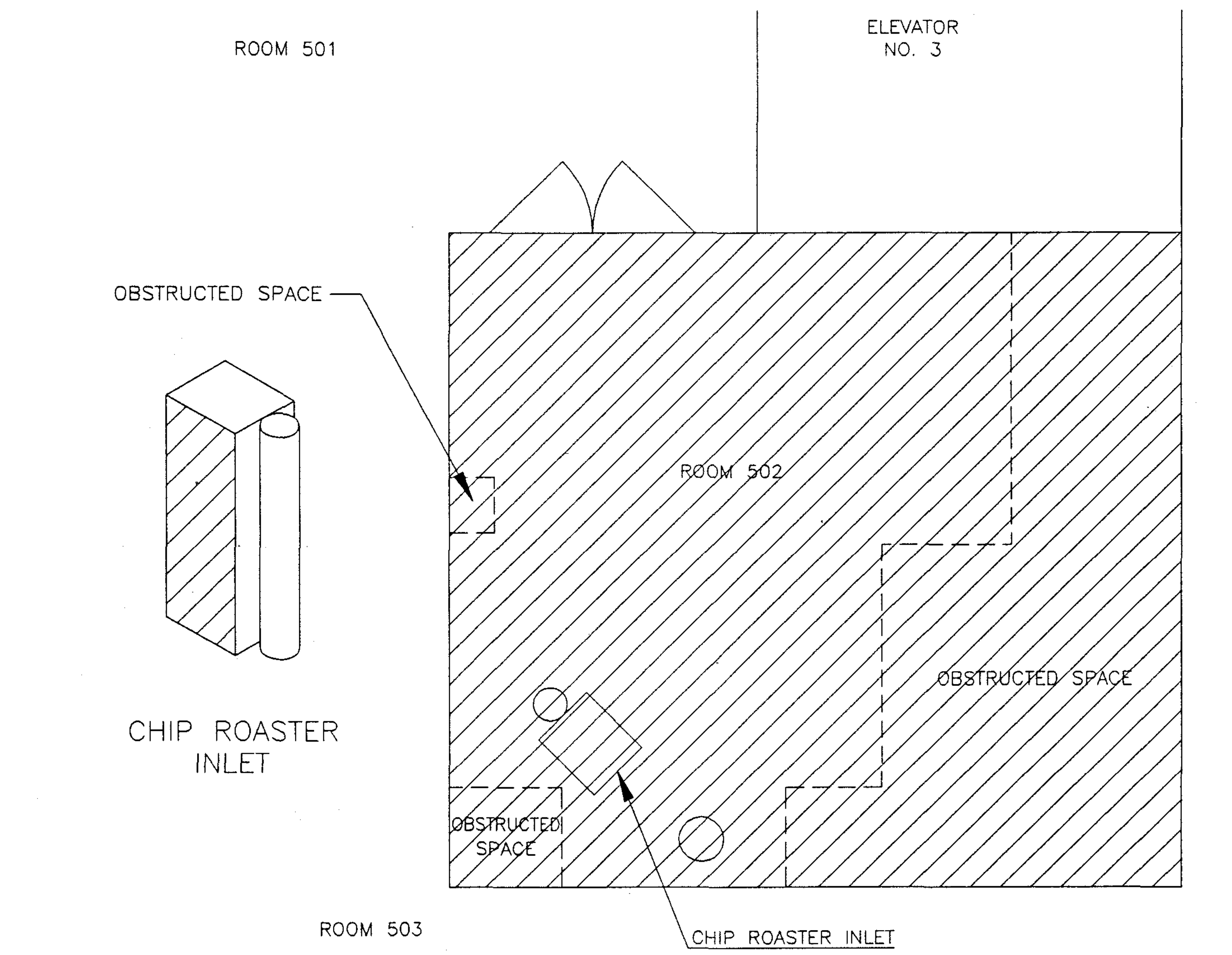
OU15 PHASE I RFI/RI

IHSS 204 LOCATION

SIZE	DRAWING NUMBER	ISSUE	FIGURE
B	IHSS 204	A	2-6

447 BLDG/FAC.
31/32 ROOM/AREA

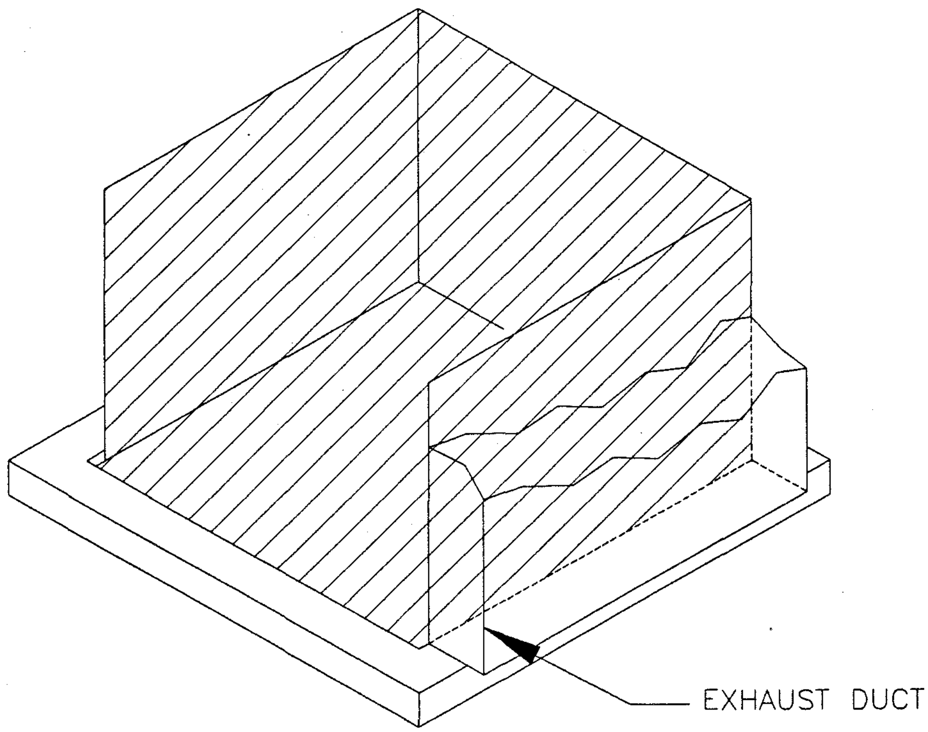
H Htg-Vent
A Arch
G GL Box
E Elec
D Detection
M Mech
I Inst
B Building
T Title
C Civil
U Utilities
P Piping
W Fire Prot.
L Layouts
F Flow Diag.
S Stds
X Alarms



KEYWORDS	ISSUE	DESCRIPTION	DATE	RFETS				DOE	CLASS	JOB NO.
1.OU15	A	ORIGINAL ISSUE	XX/XX/93	RCH	SRL	DAW	DLS			

2.PHASE I	DESIGNED	HEA	XX/XX/93	U.S. DEPARTMENT OF ENERGY ROCKY FLATS AREA OFFICE GOLDEN,COLORADO
3.RFI/RI	DRAWN	LENNIE	XX/XX/93	Rocky Flats Environmental Technology Site
4.REPORT	CHECKED	WEAVER	XX/XX/93	GOLDEN,COLORADO 80401
5.	APPROVED	SCHUBBE	XX/XX/93	
BLDG./FACILITY 447				OU15 PHASE I RFI/RI
ROOM/AREA 501/502				IHSS 204 LOCATION
GRID COOR./COL NO.	SUBMITTED	BIERBAUM	XX/XX/93	SIZE: B · DRAWING NUMBER: IHSS 204 · ISSUE: A · FIGURE: 2-7
MASTER YES ☐ NO ☒	SCALE: NONE APPROVED RFETS APPROVED DOE			

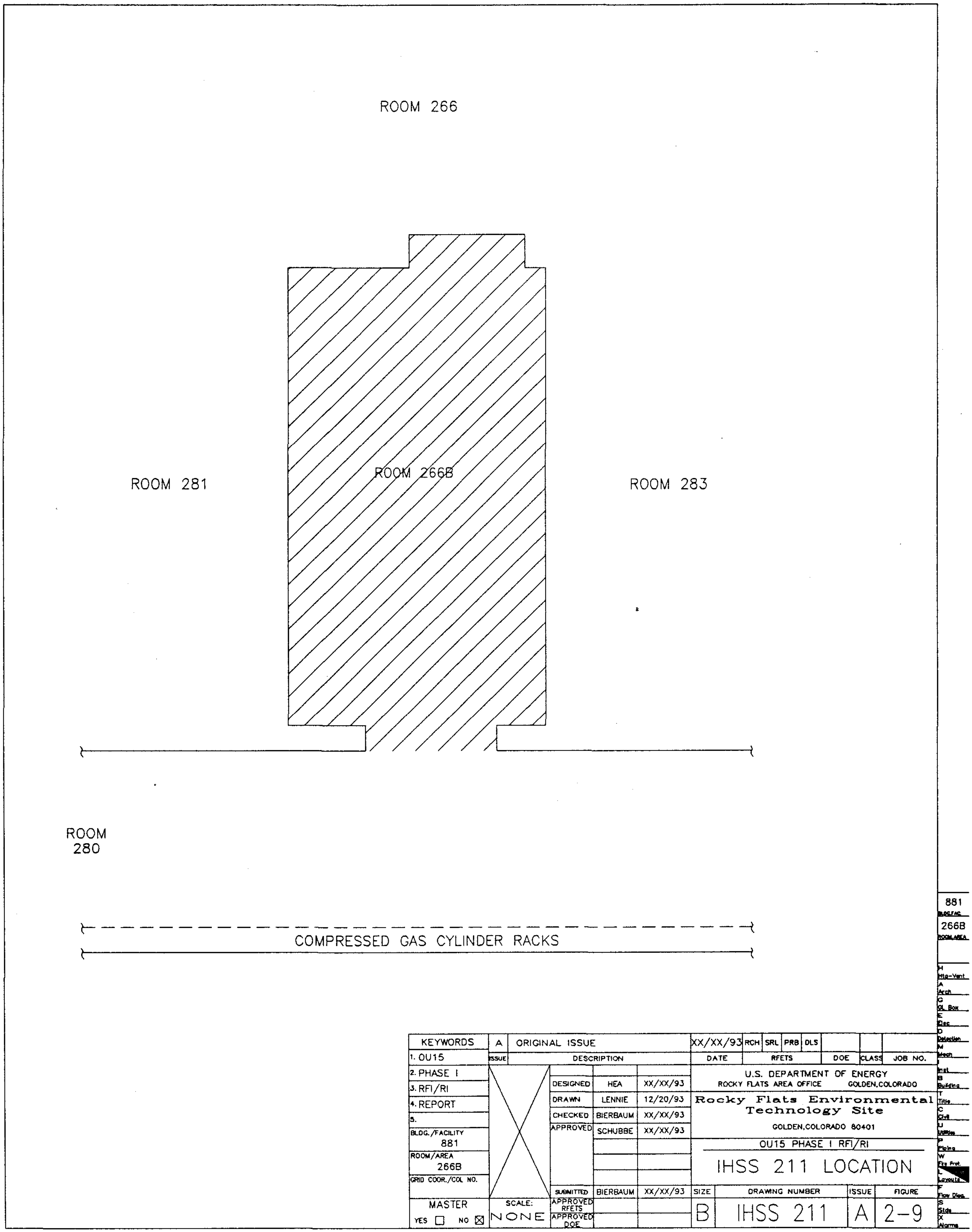
447 BLDG/FAC
502 ROOM/AREA
H Htg-Vent
A Arch
G GL Box
E Elec
D Detection
M Mech
I Inst
B Building
T Title
C Civil
U Utilities
P Piping
W Fire Prot.
L Layout
F Flow Diag.
S Stds
X Alarms



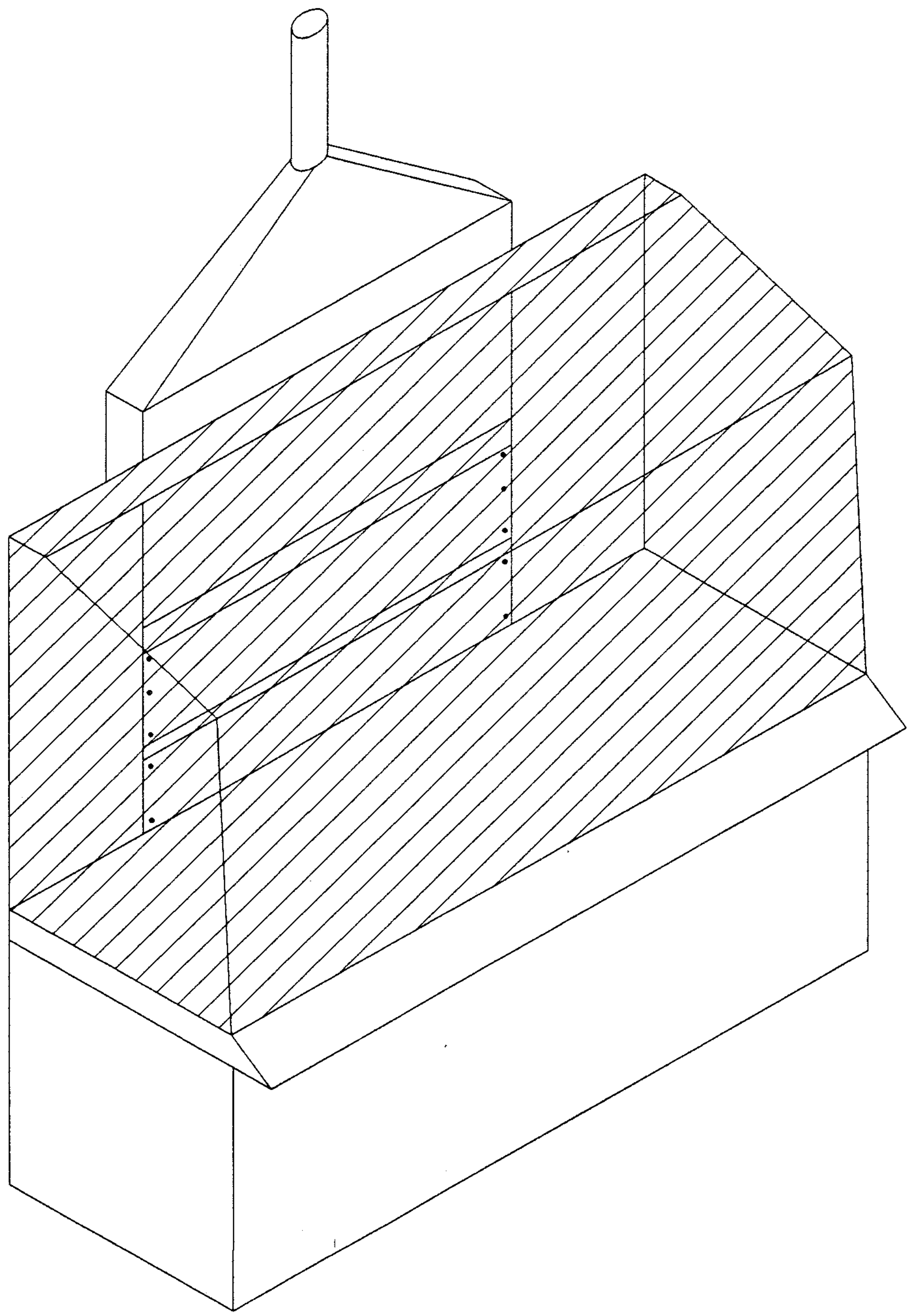
WASH RACK/DRUM WASHING BASIN

KEYWORDS	A	ORIGINAL ISSUE		XX/XX/93	RCH	SRL	DAW	DLS			
1.OU15	ISSUE	DESCRIPTION		DATE	RFETS				DOE	CLASS	JOB NO.
2.PHASE I				U.S. DEPARTMENT OF ENERGY ROCKY FLATS AREA OFFICE GOLDEN,COLORADO							
3.RFI/RI		DESIGNED	HEA	XX/XX/93							
4.REPORT		DRAWN	SCHACKLIN	12/20/93	Rocky Flats Environmental Technology Site						
5.		CHECKED	WEAVER	XX/XX/93							
BLDG./FACILITY 447		APPROVED	SCHUBBE	XX/XX/93	GOLDEN,COLORADO 80401						
ROOM/AREA 501					OU15 PHASE I RFI/RI						
GRID COOR./COL NO.					IHSS 204 LOCATION						
		SUBMITTED	BIERBAUM	XX/XX/93	SIZE	DRAWING NUMBER			ISSUE	FIGURE	
MASTER YES ☐ NO ☒	SCALE: NONE	APPROVED RFETS / APPROVED DOE			B	IHSS 204			A	2-8	

447
BLDG/FAC
501
ROOM/AREA
H Htg-Vent
A Arch
G GL Box
E Elec
D Detection
M Mech
I Inst
B Building
T Title
C Civil
U Utilities
P Piping
F Fire Prot.
L Layouts
F Flow Diag
S Stds
X Alarms


ROOM 266
ROOM 281
ROOM 266B
ROOM 283
ROOM 280
COMPRESSED GAS CYLINDER RACKS
881
266B
KEYWORDS
1. OU15
2. PHASE I
3. RFI/RI
4. REPORT
5.
BLDG./FACILITY 881
ROOM/AREA 266B
GRID COOR./COL NO.
MASTER
YES ☐ NO ☒
A
ORIGINAL ISSUE
XX/XX/93
RCH SRL PRB DLS
ISSUE DESCRIPTION DATE RFETS DOE CLASS JOB NO.
DESIGNED HEA XX/XX/93
DRAWN LENNIE 12/20/93
CHECKED BIERBAUM XX/XX/93
APPROVED SCHUBBE XX/XX/93
SUBMITTED BIERBAUM XX/XX/93
APPROVED RFETS
APPROVED DOE
SCALE: NONE
U.S. DEPARTMENT OF ENERGY
ROCKY FLATS AREA OFFICE GOLDEN,COLORADO
Rocky Flats Environmental Technology Site
GOLDEN,COLORADO 80401
OU15 PHASE I RFI/RI
IHSS 211 LOCATION
SIZE B
DRAWING NUMBER IHSS 211
ISSUE A
FIGURE 2-9
H Htg-Vent
A Arch
G GL Box
E Elec
D Detection
M Mech
I Inst
B Building
T Title
C Civil
U Utilities
P Piping
W Fire Prot.
L Layouts
F Flow Diag.
S Stds
X Alarms

CYANIDE BENCH SCALE TREATMENT LABORATORY TABLE AND FUME HOOD



KEYWORDS	A	ORIGINAL ISSUE	XX/XX/93	RCH	SRL	PRB	DLS			
1.OU15	ISSUE	DESCRIPTION	DATE	RFETS				DOE	CLASS	JOB NO.

2.PHASE I				U.S. DEPARTMENT OF ENERGY ROCKY FLATS AREA OFFICE GOLDEN,COLORADO
3.RFI/RI	DESIGNED	HEA	XX/XX/93	
4.REPORT	DRAWN	LENNIE	12/20/93	Rocky Flats Environmental Technology Site
5.	CHECKED	BIERBAUM	XX/XX/93	GOLDEN,COLORADO 80401
BLDG./FACILITY 881	APPROVED	SCHUBBE	XX/XX/93	OU15 PHASE I RFI/RI
ROOM/AREA 131C				IHSS 217 LOCATION
GRID COOR./COL NO.	SUBMITTED	BIERBAUM	XX/XX/93	SIZE: B · DRAWING NUMBER: IHSS 217 · ISSUE: A · FIGURE: 2-10
MASTER YES ☐ NO ☒	SCALE: NONE	APPROVED RFETS / APPROVED DOE		

881 BLDG.FAC.
131C ROOM/AREA
H Htg-Vent
A Arch
C QL Box
E Elec
D Detection
M Mech
I Inst
B Building
T Title
C Civil
U Utilities
P Piping
W Fire Prot.
L Layouts
F Flow Diag.
S Stds
X Alarms

3.0 OU15 FIELD INVESTIGATION

This section summarizes the site investigation objectives, and the sampling and analysis performed during the combined Stage 1 and 2 field investigation. It also describes the FSP sampling, analytical, and quality assurance/quality control (QA/QC) procedures that were followed. Additional detail on the FSP, including a discussion of the sampling strategy and analytical rationale is provided in Section 7.0 of the Work Plan (DOE, 1993).

3.1 Site Investigation Objectives

The specific objectives of the OU15 Phase I RFI/RI site investigation, as presented in the Work Plan (DOE, 1993), are as follows:

Characterize Site Physical Features

(1) Evaluate construction and physical features of the IHSSs and secondary containment systems.

(2) Further evaluate the current condition of the units.

Define Contaminant Sources

(1) Identify and characterize wastes historically stored/processed at the IHSSs.

(2) Determine the presence or absence of contamination within the IHSSs.

Determine Nature and Extent of Contamination

(1) Determine the spatial distribution of contaminants related to the IHSSs.

Describe Contaminant Fate and Transport

(1) Assess current condition of secondary containment systems at each IHSS.

(2) Evaluate potential migration pathways from each IHSS to environmental media outside of the buildings.

Provide a Baseline Risk Assessment

(1) Objectives of the BRA are discussed in Sections 8.0 and 9.0 of the Work Plan (DOE, 1993).

3.2 Sampling Activities

The original field sampling activities were conducted from April 23, 1993 to November 9, 1993 to characterize contamination inside and around the perimeter of each IHSS. Samples were also collected along pathways outside the perimeter and leading away from the IHSS that might have been impacted by spilled material migrating out of the IHSS. Additional hot water rinsate verification samples were collected in five of the IHSSs from May 25, 1994 to June 20, 1994.

Activities performed as part of the field investigations included:

- a review of new and/or additional information (documented in Section 2.0);
- a visual inspection and documentation of current conditions (documented in Section 2.0); and
- the sampling and analysis of surfaces within each IHSS area.

Sampling was conducted to characterize contamination within the IHSS, perimeter, and pathway areas. Smear sampling for removable radiological (alpha and beta) and, if appropriate, beryllium contamination was performed first. This was followed by hot water sampling and rinsate analysis for Target Compound List (TCL) VOCs, TCL semi-volatile organic compounds, Target Analyte List (TAL) dissolved metals, dissolved radionuclides, and cyanide, as appropriate for each IHSS. A second set of removable alpha, beta, and (if applicable) beryllium analyses, along with fixed alpha and beta analyses, and beta and gamma dose-rate surveys were then performed, as appropriate for each IHSS. Finally, based on the results of the original hot water rinsate sampling and analysis, hot water rinsate verification samples were collected as necessary for each IHSS.

The combined Stage 1 and 2 investigation programs for each IHSS are summarized in Table 3-1 which details the field sampling and analysis completed. Additional information regarding the number and location of radiological and hot water rinsate samples collected for each IHSS is included in the following subsections.

3.2.1 IHSS 178 - Building 881 Drum Storage Area

Following the initial review of new data and information, and after the visual inspection of IHSS 178, 30 radiological smear samples were collected at the locations shown in Figure 3-1. Three hot water rinsate samples were then obtained from the IHSS, perimeter, and pathway areas as shown in Figure 3-2. Final radiological surveys at each of the 30 initial smear sample locations shown in Figure 3-1 completed the initial Stage 1 and 2 field investigation of IHSS 178. One hot water rinsate verification sample was later obtained from the IHSS location shown in Figure 3-2.

3.2.2 IHSS 179 - Building 865 Drum Storage Area

Following the initial review of new data and information, and after the visual inspection of IHSS 179, 23 radiological and beryllium smear samples were collected at the locations shown in Figure 3-3. Three hot water rinsate samples were then obtained from the IHSS, perimeter, and pathway areas as shown in Figure 3-4. Final radiological surveys at each of the 23 initial smear sample locations shown in Figure 3-3 completed the initial Stage 1 and 2 field investigation of IHSS 179. One hot water rinsate verification sample was later obtained from the IHSS location shown in Figure 3-4.

3.2.3 IHSS 180 - Building 883 Drum Storage Area

Following the initial review of new data and information, and after the visual inspection of IHSS 180, 49 radiological and beryllium smear samples were collected at the locations shown in Figure 3-5. Four hot water rinsate samples were then obtained from the IHSS, perimeter, and pathway areas as shown in Figure 3-6. The weigh scale located adjacent to the IHSS was not disassembled to perform either hot water rinsate or radiological sampling beneath the scale plate. Final radiological surveys at each of the 49 initial smear sample locations shown in Figure 3-5 completed the initial Stage 1 and 2 field investigation of IHSS 180. One hot water rinsate verification sample was later obtained from the IHSS location shown in Figure 3-6.

3.2.4 IHSS 204 - Unit 45, Original Uranium Chip Roaster

Following the initial review of new data and information, and after the visual inspection of IHSS 204, radiological smear samples were collected from the areas that compose IHSS 204. Thirty-three smear samples were collected from the floor in Rooms 31 and 32, and one sample was collected from the exterior surface of the oxide outlet of the Original Uranium Chip Roaster. Figure 3-7 shows the locations for these samples.

Thirty-one smear samples were collected from the floor in Rooms 501 and 502, and two samples were collected from the exterior surface of the chip inlet of the Original Uranium Chip Roaster. Figure 3-8 shows these sample locations. Ten smear samples were also collected from the Wash Rack/Drum Washing Basin in Room 501 as shown in Figure 3-9.

Seven hot water rinsate samples were obtained from the areas that compose IHSS 204. One rinsate sample was collected from the floor of Room 31, Room 32, Room 501, and Room 502. One sample was also collected from the exterior surface of the oxide outlet and from the exterior surface of the chip inlet of the Original Uranium Chip Roaster. One rinsate sample was collected from the floor in Room 501, and one rinsate sample was also collected from the Wash Rack/Drum Washing Basin in Room 501. One sample was collected from the floor in Room 502. Sampling locations are shown in Figures 3-10, 3-11, and 3-12. In accordance with the requirements of the Work Plan (DOE, 1993), no final radiological surveys were performed for IHSS 204.

3.2.5 IHSS 211 - Unit 26, Building 881 Drum Storage Area

Following the initial review of new data and information, and after the visual inspection of IHSS 211, 32 radiological smear samples were collected at the locations shown in Figure 3-13. Three hot water rinsate samples were then obtained from the IHSS, perimeter, and pathway areas as shown in Figure 3-14. Final radiological surveys at each of the 32 initial smear sample locations shown in Figure 3-13 completed the initial Stage 1 and 2 field investigation of IHSS 211. One hot water rinsate verification sample was later obtained from the IHSS location shown in Figure 3-14.

3.2.6 IHSS 217 - Unit 32, Cyanide Bench Scale Treatment

Following the initial review of new data and information, and after the visual inspection of IHSS 217, five radiological smear samples were collected from the floor adjacent to the laboratory table (perimeter) and eight samples were collected from the laboratory table and fume hood (IHSS) at the locations shown in Figures 3-15 and 3-16, respectively. One hot water rinsate sample was then obtained from each of these areas as shown in Figures 3-17 and 3-18. Final radiological surveys at each of the 13 initial smear sample locations shown in Figures 3-15 and 3-16 completed the initial Stage 1 and 2 field investigation of IHSS 217. One hot water rinsate verification sample was later obtained from the IHSS location shown in Figure 3-18.

3.3 Sample Collection and Field Analysis Procedures

This section describes the procedures used to collect radiological and beryllium smear samples, and hot water rinsate samples (including verification samples), and to perform the final radiological surveys during the Stage 1 and 2 field investigations.

3.3.1 Smear Sample Collection

All smear samples were obtained according to procedures outlined in Radiological Operating Instruction 3.1. This procedure is the base document for Environmental Management Radiological Guidelines Section 3.1 (Performance of Surface Contamination Surveys). Each IHSS, along with its associated perimeter and pathway areas, was divided into sampling areas measuring one square meter each. To collect the samples, smear paper was rubbed over an area of approximately 100 square centimeters within each square meter.

The smear samples were analyzed with an Eberline SAC-4 Alpha-Scintillation Smear Counting Instrument for alpha counting and an Eberline BC-4 Beta Smear Counting Instrument for beta counting. All smear samples from IHSS 179 and IHSS 180 were also analyzed for beryllium using the on-site beryllium counter (the Beryllium Activated Swipe Test). Radiological and beryllium results were recorded on data sheets by EG&G Radiological Control and Industrial Hygiene technicians, respectively. Copies of these original data sheets are provided in Appendix A.

3.3.2 Hot Water Rinsate Sample Collection

Hot water rinsate samples were collected in accordance with EG&G Standard Operating Procedure (SOP) FO.27 (Collection of Floor/Equipment Hot Water Rinsate Samples), which is included as Appendix B. The hot water rinsate sample collection system designed for use during the OU15 field investigation consisted of a series of modular components divided into two major groups. The first group included a spray applicator and vacuum head, an interceptor can/receiver, and associated connecting hoses and fittings. To prevent cross-contamination between IHSSs, a set of this equipment was dedicated to each of the IHSSs sampled. The second equipment group consisted of a hot water reservoir and heater, a High Efficiency Particulate Air vacuum unit, an activated carbon adsorption unit, and associated connecting hoses and fittings. This equipment was reused for all of the IHSSs sampled, because the equipment was remotely positioned outside of the IHSS and potentially contaminated areas. A schematic of the hot water rinsate sample collection system is shown in Figure 3-19.

The hot water spray was applied to and vacuumed from the sample areas in a manner which allowed the entire sample area to be uniformly covered. Hot water was applied at the rate necessary to generate enough sample volume to perform the required sample analyses. In all cases, however, the application rate was kept below 0.17 gallons per square foot to avoid an unrepresentative dilution of the sample.

The hot water rinsate samples were collected from the rinsate sample bag located in the interceptor can/receiver. Sample collection procedures were followed as specified in EG&G SOP FO.27. The approximate volume of sample was determined by weighing the sample bag and its contents, and field parameters including pH, temperature, and conductivity (specific conductance) were measured in accordance with EG&G SOP SW.2 (Field Measurement of Surface Water) and recorded on a hot water rinsate sampling log sheet. Any unusual observations about the liquid, including color or odor were also noted. Copies of the log sheets are provided in Appendix C. All Chain-of-Custody forms (COCs) and field documentation were completed in accordance with the requirements of EG&G SOP FO.13 (Containerizing, Preserving, Handling, and Shipping Soil and Water Samples) and the Work Plan (DOE, 1993). Copies of the COCs are provided in Appendix D.

3.3.3 Final Radiological Surveys

A second set of removable alpha, beta, and, if applicable, beryllium analyses; fixed alpha and beta radiological surveys; and beta and gamma dose-rate surveys were performed for each of the one square meter areas sampled during the initial smear sample collection, with the exception of those associated with IHSS 204. The final radiological surveys were conducted and recorded as specified in Radiological Operating Instructions 1.1, 1.2 and 3.1. These procedures are the base documents for the Environmental Management Radiological Guidelines Section 1.1 (Gamma Radiation Surveys), Section 1.2 (Beta Radiation Surveys), and Section 3.1 (Performance of Surface Contamination Surveys), respectively.

The second set of smear samples were collected and analyzed using the procedure outlined in Section 3.3.1. A Ludlum Model 12-1A count-rate instrument (or equivalent) was used for measuring direct alpha activity and a Ludlum Model 31 (or equivalent) was used for direct measurement of beta activity. Beta and gamma dose-rate surveys were performed using a Victoreen 450B instrument.

3.3.4 *Hot Water Rinsate Verification Sample Collection*

The decision to conduct verification sampling for each IHSS was based on the results of the original hot water rinsate sampling presented in Section 5.0. If the analytical results for the applicable hazardous constituents listed in 6 Colorado Code of Regulations (CCR) 1007-3 Part 261 Appendix VIII exceeded their corresponding RCRA clean closure performance standards and their presence could not be attributed to QA/QC reasons, verification sampling was deemed necessary for the IHSS. The verification sampling and analysis was limited to only the actual IHSS location and to those hazardous constituents whose concentrations exceeded their respective RCRA clean closure performance standards. The hot water rinsate verification samples were collected according to the same procedures described in Section 3.3.2 for the original hot water rinsate samples.

3.4 *Chemical and Radionuclide Laboratory Analysis Methods*

The hot water rinsate samples generated during OU15 sampling were analyzed for some or all of the parameters listed below. Also listed is the EPA Contract Laboratory Program (CLP) Statement of Work (SOW) method numbers for the non-radiological parameters. Since CLP methods are not available for radiochemistry analyses, the individual isotopes in the dissolved radionuclide samples were analyzed in accordance with the method requirements specified in Part B of the EG&G Rocky Flats General Radiochemistry and Routine Analytical Services Protocol (GRRASP) (EG&G, 1991a).

Parameter	Analytical Method
TAL dissolved metals	CLP-SOW 7/88
TCL VOCs	CLP-SOW 2/88

TCL semi-volatile organic compounds	CLP-SOW 2/88
cyanide	CLP-SOW 7/88
dissolved radionuclides	Varies by isotope

The specific analytes and detection/quantification limits for the OU15 Phase I RFI/RI are identified in the GRRASP (EG&G, 1991a). Part A of the GRRASP (EG&G, 1991a) provides the specific analytes and individual detection/quantification limits for the TAL dissolved metals and cyanide, and the TCL VOCs and semi-volatile organic compounds. Part B of the GRRASP (EG&G, 1991a) provides similar information specific to the radionuclide parameters.

3.5 Data Quality Assurance/Quality Control

Four types of QA/QC samples were collected for the hot water rinsate sampling in accordance with the requirements of Section 6.3 of EG&G SOP FO.27. The hot water source or field blanks (taken from the field water source prior to being used for rinsate generation), sample duplicates, equipment rinsate blanks, and trip blanks were analyzed for the same constituents as their associated real samples. A summary of all the original hot water rinsate and QA/QC samples collected is provided in Table 3-2 and is sorted by IHSS. Table 3-3 presents the same information for the verification samples. In Building 881, the same hot water source was used for the original sampling of IHSSs 178, 211 and 217; therefore, only one hot water source sample was collected. Since IHSSs 179, 180 and 204 each had a different hot water source, one sample was collected from each source. Distilled water was used as the hot water source for all of the verification samples.

The equipment rinsate blanks collected in the field measured the effectiveness of sampling equipment decontamination, but did not measure the impact of the entire hot water rinsate sampling system in an operating mode. This is because the equipment rinsate blanks were not collected while the equipment was operating, and therefore do not reflect leaching from plastic and other system components into the hot water. As a result, three equipment blank samples, or hot water rinsate blanks, were collected from the hot water rinsate sampling system on April 27, 1994 at an off-site location. These samples were collected by using the entire sampling system to rinse a clean glass surface. Distilled water was used as the source water. These samples were analyzed to determine the influence of the sampling equipment on the hot water rinsate samples collected during the Stage 1 and 2 field investigations. A trip blank sample accompanied the three equipment blank samples.

3.6 Data Processing and Storage

Hot water rinsate samples collected from floor areas and designated equipment were assigned sequential numbers based on the order in which they were collected. Each sample and associated location was marked on the corresponding IHSS diagram, measured relative to IHSS structures, and described in the designated field book.

In order to maintain consistency with the Rocky Flats Environmental Database System (RFEDS) sample numbering system, a block of sample numbers was assigned by EG&G Environmental Restoration Sample Management for the OU15 Phase I RFI/RI hot water rinsate samples. The RFEDS sample numbers consist of a two digit sample prefix indicating sample type, a five digit serial number identifying the sample, and a suffix identifying the contractor collecting the sample. For example, the sample number BU00011ER indicates a building sampie (BU), serial number eleven (00011), collected by ERM-Rocky Mountain, Inc. (ER).

Location codes have also been established in the RFEDS for each sample. Each location code consists of seven digits and describes where its associated sample was collected. The first three digits in each location code identify the building in which the IHSS is located, the second three digits represent the particular IHSS, and the last digit indicates the sample area (e.g., the IHSS [1], perimeter, [2] or pathway [3]). For example, the location code 8811782, identifies that the sample was collected from the perimeter area of IHSS 178 in Building 881. For IHSS 204, a different set of numbers was used to designate the sample area (the last digit in the location code), due to the greater number and variety of hot water rinsate sampling locations. Sample area identifiers for IHSS 204 were defined as follows: The Wash Rack/Drum Washing Basin (1), the floor in Room 501 (2), the floor in Room 502 (3), the chip inlet (4), the floor in Room 31 (5), the floor in Room 32 (6), and the oxide outlet (7).

Data collected during the initial radiological and beryllium smear sampling, and the final radiological surveys were recorded directly on data sheets by EG&G Radiological Control and Industrial Hygiene technicians. Sample/survey locations were determined based on the layout of one square meter grids. For each IHSS, the position of the sampling/survey squares was plotted on the IHSS diagram and numbered sequentially. Sample/survey results were then identified and tracked by this numbering scheme. These radiological data were not compatible with the RFEDS structure, so they are instead maintained in hard copy form in the project files. Data generated from both the radiological sampling and surveys and the hot water rinsate sampling are managed in accordance with the prescribed QA/QC procedures described in EG&G SOP FO.14 (Field Data Management).

Table 3-1
OU15 Field Investigation Activities

IHSS	Data Review	Visual Inspection	Smear Sampling		Hot Water Rinsate Sampling/Analysis					Final Radiological Surveys			
										Smear Samples			
			Rads	Be	VOCs	Semi-VOCs	Rads	Metals	Cyanide	Rads	Be	Fixed	Dose-Rate
178	X	X	X		X	X	X			X		X	X
179	X	X	X	X	X	X	X			X	X	X	X
180	X	X	X	X	X	X	X			X	X	X	X
204	X	X	X		X	X	X						
211	X	X	X		X	X	X	X		X		X	X
217	X	X	X		X	X	X	X	X	X		X	X

Table 3-2
Summary of Hot Water Rinsate Real & QA/QC Samples

IHSS	Date Sampled	Hot Water Rinsate Sample	Field Blank	Sample Duplicate	Trip Blank	Equipment Rinse
178	08/16/93	BU00011ER (IHSS)	BU00001ER (From tap in Room 261)	BU00012ER	BU00010ER	BU00013ER
		BU00014ER (Perimeter)	---	---	---	---
		BU00015ER (Pathway)	---	---	---	---
179	09/15/93	BU00033ER (Perimeter)	BU00032ER (From tap in Room 145)	BU00034ER	BU00031ER	BU00035ER
		BU00036ER (IHSS)	---	---	---	---
		BU00037ER (Pathway)	---	---	---	---
180	09/01/93	BU00023ER (IHSS)	BU00022ER (From tap in Room 104)	BU00024ER	BU00021ER	BU00025ER
		BU00026ER (Perimeter)	---	---	---	---
	09/02/93	BU00027ER (Pathway)	---	BU00028ER	---	BU00029ER
		BU00030ER (Pathway)	---	---	---	---

Table 3-2
Summary of Hot Water Rinsate Real & QA/QC Samples

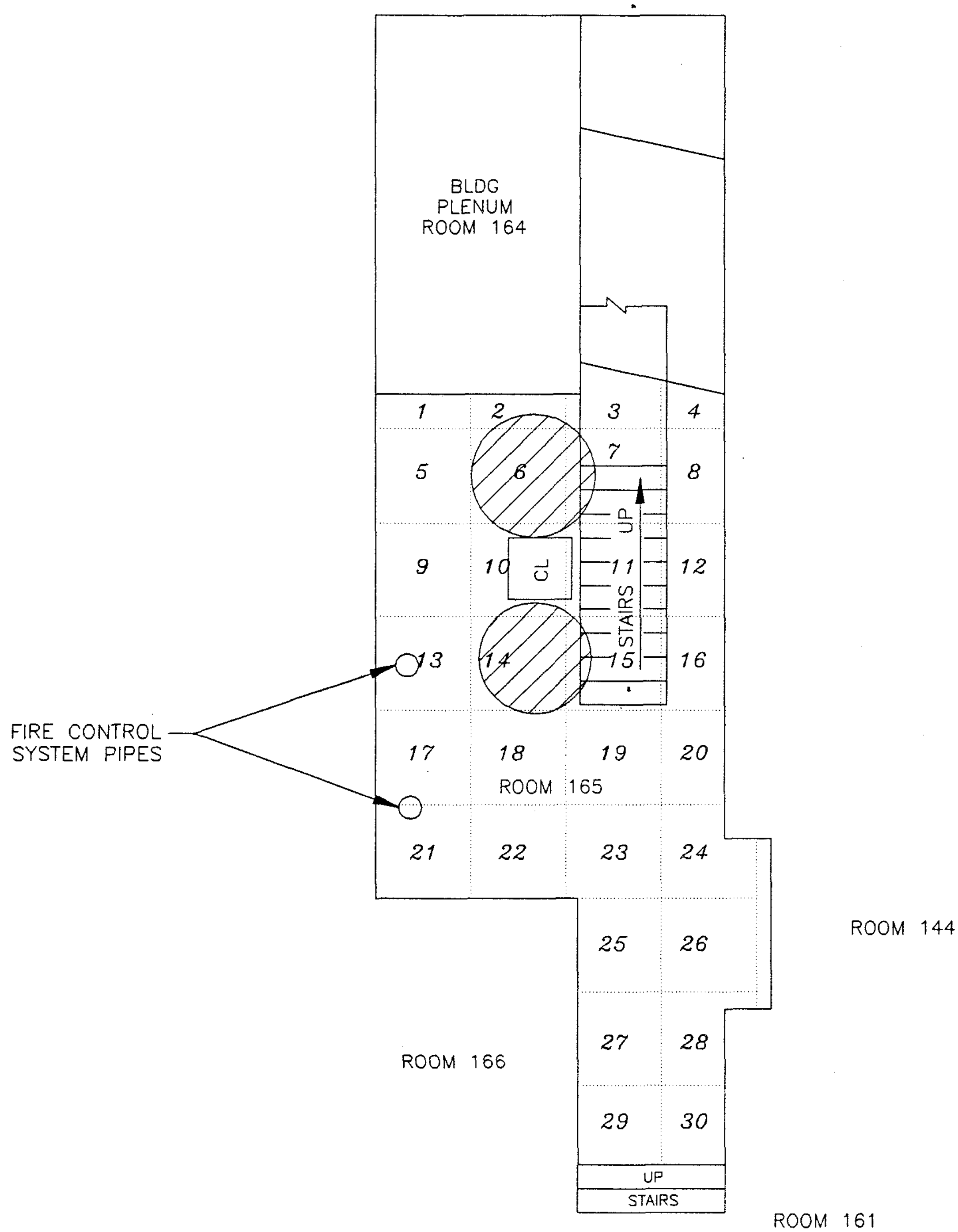
IHSS	Date Sampled	Hot Water Rinsate Sample	Field Blank	Sample Duplicate	Trip Blank	Equipment Rinse
204	10/11/93	BU00040ER (Wash Rack)	BU00039ER (From tap in Room 501)	BU00041ER	BU00038ER	BU00042ER
		BU00043ER (Rm 501 Perimeter)	---	---	---	---
		BU00044ER (Rm 502 IHSS)	---	---	---	---
		BU00045ER (Chip Inlet)	---	---	---	---
	11/09/93	BU00047ER (Rm 31 Perimeter)	---	BU00048ER	BU00046ER	BU00049ER
		BU00050ER (Rm 32 IHSS)	---	---	---	---
		BU00051ER (Oxide Outlet)	---	---	---	---

Table 3-2
Summary of Hot Water Rinsate Real & QA/QC Samples

IHSS	Date Sampled	Hot Water Rinsate Sample	Field Blank	Sample Duplicate	Trip Blank	Equipment Rinse
211	08/09/93	BU00002ER (IHSS)	BU00001ER (From tap in Room 261)	BU00003ER	BU00005ER	BU00004ER
	08/11/93	BU00006ER (Perimeter)	---	---	---	BU00007ER
		BU00008ER (Pathway)	---	BU00009ER	---	---
217	08/17/93	BU00017ER (IHSS)	BU00001ER (From tap in Room 261)	BU00018ER	BU00016ER	BU00019ER
		BU00020ER (Perimeter)	---	---	---	---

Table 3-3
Summary of Hot Water Rinsate Verification Samples

IHSS	Date Sampled	Hot Water Rinsate Sample	Field Blank	Sample Duplicate	Trip Blank	Equipment Rinse
178	06/01/94	BU00058ER (IHSS)	---	BU00059ER	---	BU00060ER
179	06/08/94	BU00062ER (IHSS)	---	BU00063ER	---	---
180	06/20/94	BU00065ER (IHSS)	---	BU00066ER	BU00064ER	---
211	06/01/94	BU00061ER (IHSS)	---	---	---	---
217	05/25/94	BU00056ER (IHSS)	---	BU00057ER	---	---



KEYWORDS	A	ORIGINAL ISSUE	XX/XX/93	RCH	SRL	PRB	DLS			
1.OU15	ISSUE	DESCRIPTION	DATE	RFETS				DOE	CLASS	JOB NO.
2.PHASE I										
3.RFI/RI										
4.REPORT										
5.										
BLDG./FACILITY 881										
ROOM/AREA 165										
GRID COOR./COL NO.										

DESIGNED	HEA	XX/XX/93
DRAWN	LENNIE	12/21/93
CHECKED	BIERBAUM	XX/XX/93
APPROVED	SCHUBBE	XX/XX/93
SUBMITTED	BIERBAUM	XX/XX/93
APPROVED RFETS		
APPROVED DOE		

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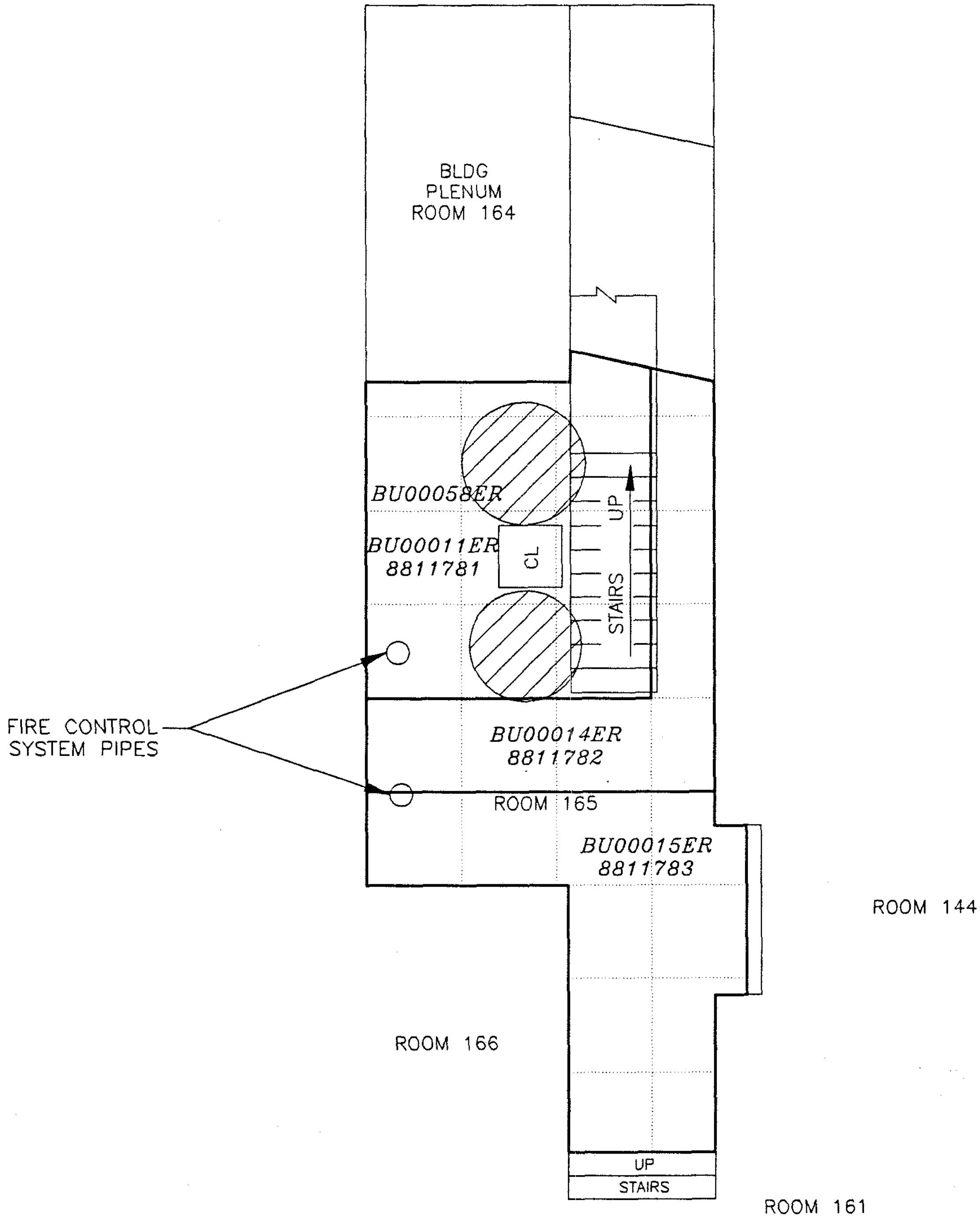
Rocky Flats Environmental Technology Site
GOLDEN,COLORADO 80401

OU15 PHASE I RFI/RI

IHSS 178 RAD SAMPLE LOCATIONS

MASTER	SCALE:	SIZE	DRAWING NUMBER	ISSUE	FIGURE
YES ☐ NO ☒	NONE	B	IHSS 178	A	3-1

881 BLDG/FAC
165 ROOM/AREA
H Htg-Vent
A Arch
G GL Box
E Elec
D Detection
M Mech
I Inst
B Building
T Title
C Civil
U Utilities
P Piping
F Fire Prot.
L Layouts
F Flow Diag.
S Stds
X Alarms



KEYWORDS	ISSUE	DESCRIPTION	DATE	RFETS	DOE	CLASS	JOB NO.
1.OU15	A	ORIGINAL ISSUE	XX/XX/93	RCH SRL PRB DLS			
2.PHASE I							
3.RFI/RI							
4.REPORT							
5.							

DESIGNED	HEA	XX/XX/93
DRAWN	LENNIE	12/21/93
CHECKED	BIERBAUM	XX/XX/93
APPROVED	SCHUBBE	XX/XX/93
SUBMITTED	BIERBAUM	XX/XX/93
APPROVED RFETS		
APPROVED DOE		

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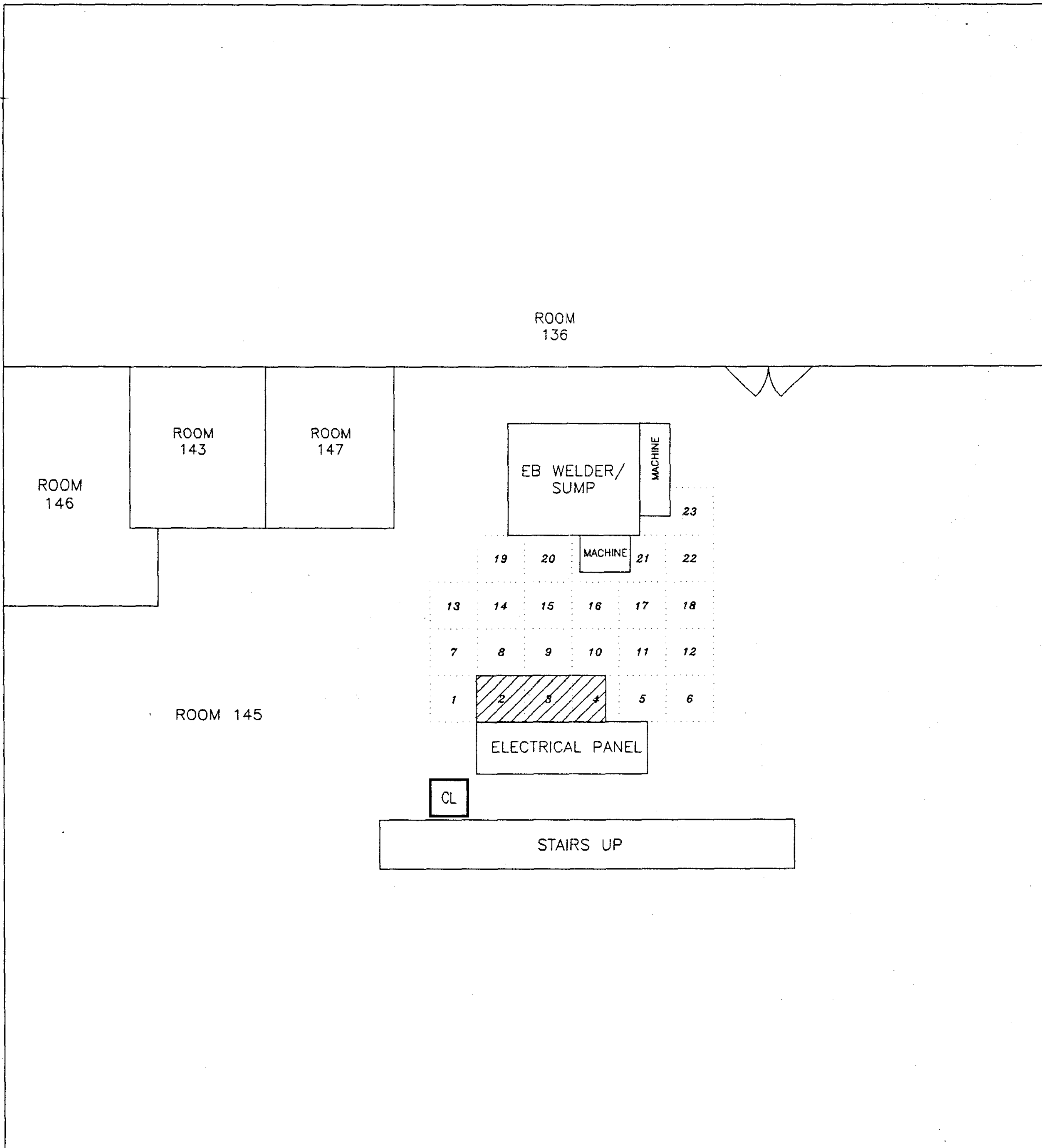
OU15 PHASE I RFI/RI

IHSS 178 RINSATE SAMPLE LOCATIONS

BLDG./FACILITY	ROOM/AREA	GRID COOR./COL NO.	MASTER	SCALE:	SIZE	DRAWING NUMBER	ISSUE	FIGURE
881	165		YES ☐ NO ☒	NONE	B	IHSS 178	A	3-2

881
BLDG/FAC
165
ROOM/AREA
H Htg-Vent
A Arch
G GL Box
E Elec
D Detection
M Mech
I Inst
B Building
T Title
C Civil
U Utilities
P Piping
W Fire Prot.
L Layouts
F Flow Diag.
S Stds
X Alarms



KEYWORDS	A	ORIGINAL ISSUE	XX/XX/93	DAW SRL RCH DLS		
1.OU15	ISSUE	DESCRIPTION	DATE	RFETS	DOE	CLASS / JOB NO.
2.PHASE I				U.S. DEPARTMENT OF ENERGY ROCKY FLATS AREA OFFICE GOLDEN,COLORADO		
3.RFI/RI		DESIGNED	WEAVER	XX/XX/93		
4.REPORT		DRAWN	LENNIE	12/21/93		
5.		CHECKED	HEA	XX/XX/93		
BLDG./FACILITY 865		APPROVED	SCHUBBE	XX/XX/93		
ROOM/AREA 145						
GRID COOR./COL NO.		SUBMITTED	BIERBAUM	XX/XX/93		
MASTER YES ☐ NO ☒	SCALE: NONE	APPROVED RFETS / APPROVED DOE				

Rocky Flats Environmental Technology Site
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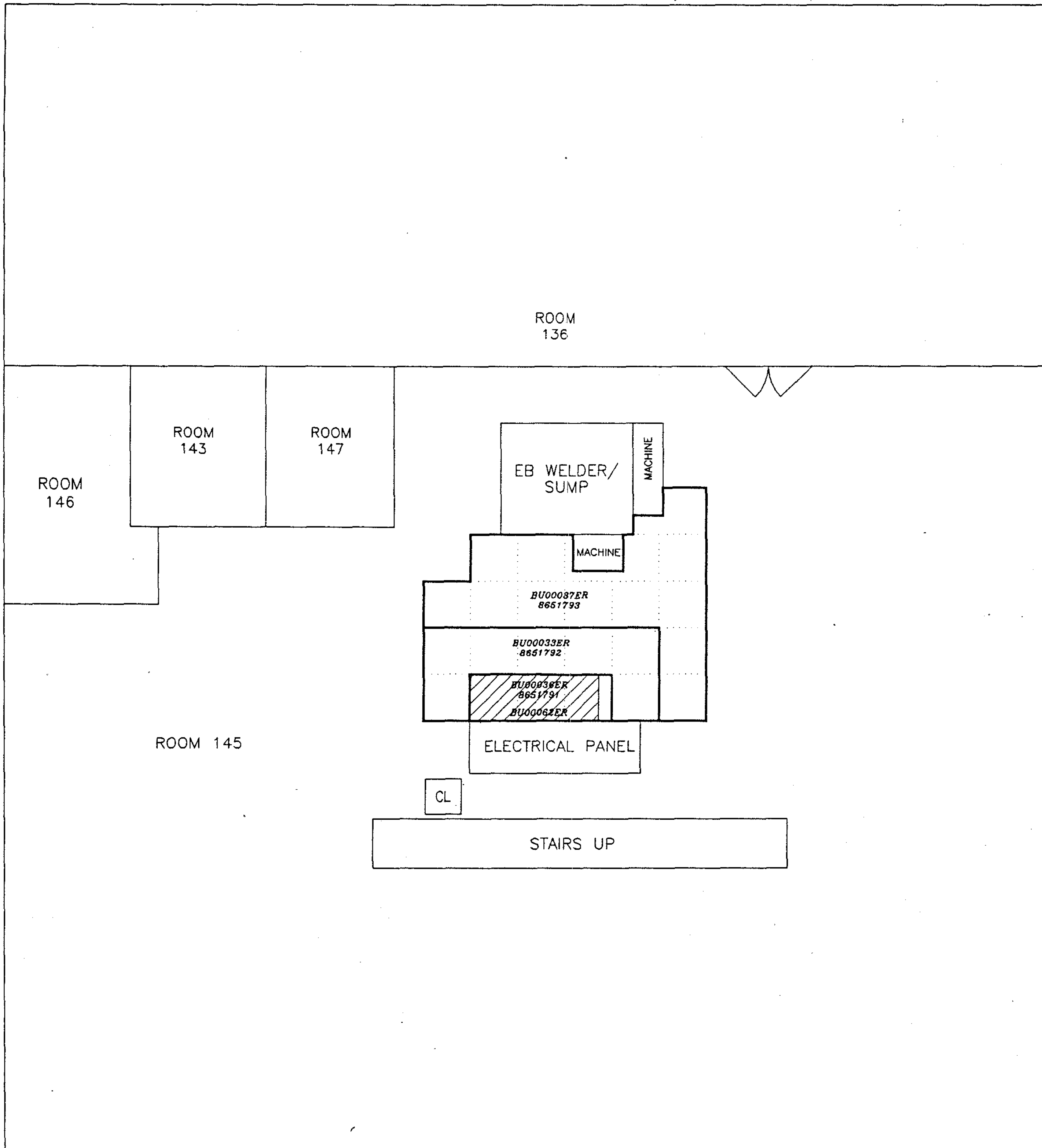
OU15 PHASE I RFI/RI

IHSS 179 RAD SAMPLE LOCATIONS

SIZE	DRAWING NUMBER	ISSUE	FIGURE
B	IHSS 179	A	3-3

H Htg-Vent
A Arch
G Gl. Box
E Elec
D Detection
M Mech
I Inst
B Building
T Title
C Civil
U Utilities
P Piping
W Fire Prot.
L Layouts
F Flow Diag.
S Stds
X Alarms



KEYWORDS: 1. OU15; 2. PHASE I; 3. RFI/RI; 4. REPORT; 5.

BLDG./FACILITY: 865

ROOM/AREA: 145

GRID COOR./COL NO.:

MASTER: YES ☐ NO ☒

SCALE: NONE

ISSUE	DESCRIPTION	DATE	RFETS				DOE	CLASS	JOB NO.
A	ORIGINAL ISSUE	XX/XX/93	DAW	SRL	RCH	DLS			

DESIGNED	WEAVER	XX/XX/93
DRAWN	LENNIE	12/21/93
CHECKED	HEA	XX/XX/93
APPROVED	SCHUBBE	XX/XX/93
SUBMITTED	BIERBAUM	XX/XX/93
APPROVED RFETS		
APPROVED DOE		

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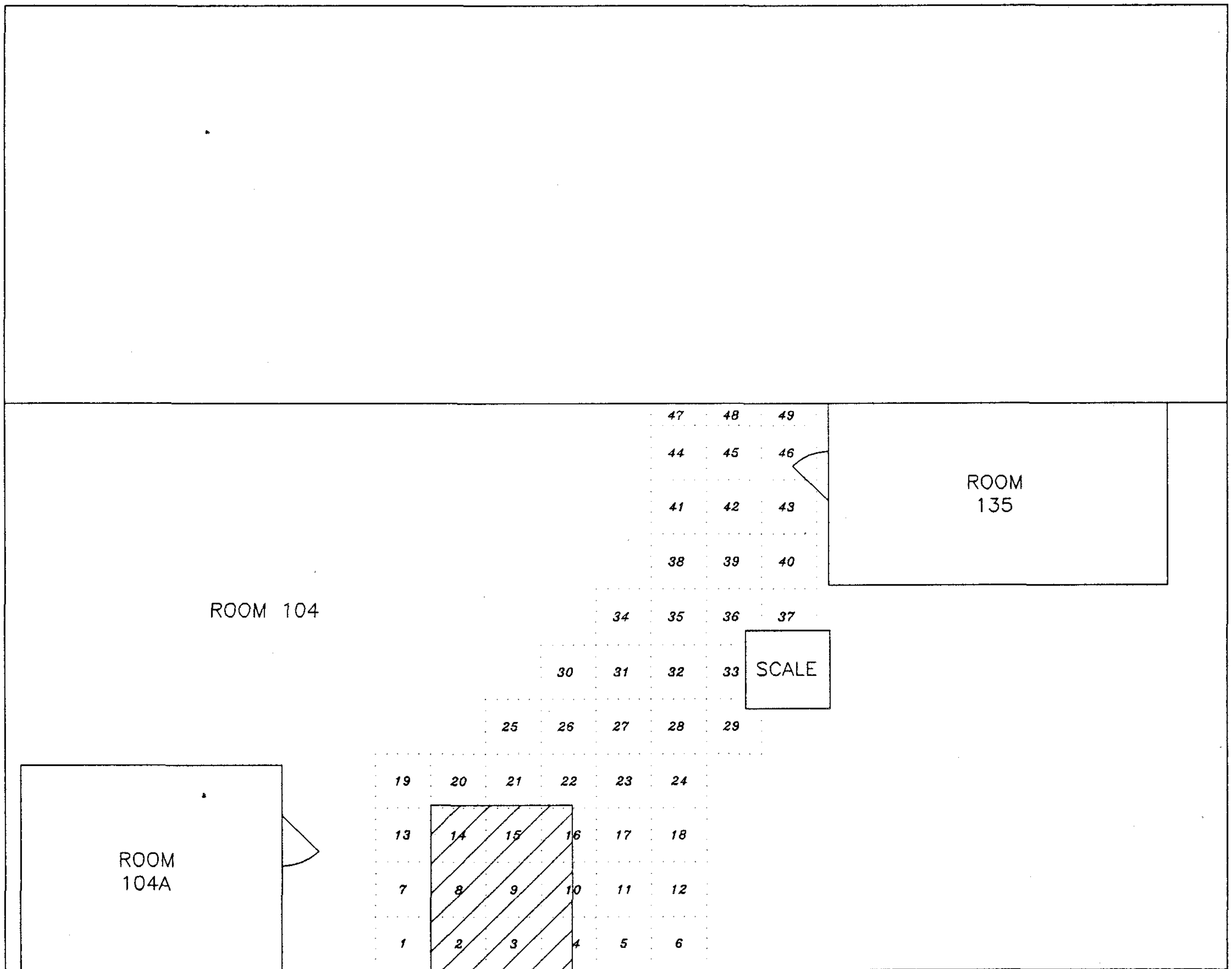
OU15 PHASE I RFI/RI

IHSS 179 RINSATE SAMPLE LOCATIONS

SIZE	DRAWING NUMBER	ISSUE	FIGURE
B	IHSS 179	A	3-4

865 BLDG/FAC.
145 ROOM/AREA

H Htg-Vent
A Arch
G GL Box
E Elec
D Detection
M Mech
I Inst
B Building
T Title
C Civil
U Utilities
P Piping
W Fire Prot.
L Layouts
F Flow Diag.
S Site
X Norms



KEYWORDS	A	ORIGINAL ISSUE	XX/XX/93	DAW	SRL	RKT	DLS			
1. OU15	ISSUE	DESCRIPTION	DATE	RFETS				DOE	CLASS	JOB NO.
2. PHASE I										
3. RFI/RI										
4. REPORT										
5.										

DESIGNED	WEAVER	XX/XX/93
DRAWN	LENNIE	12/20/93
CHECKED	TERRIEN	XX/XX/93
APPROVED	SCHUBBE	XX/XX/93
SUBMITTED	BIERBAUM	XX/XX/93
APPROVED RFETS		
APPROVED DOE		

BLDG./FACILITY 883
ROOM/AREA 104
GRID COOR./COL NO.
MASTER YES ☐ NO ☒
SCALE: NONE

U.S. DEPARTMENT OF ENERGY
ROCKY FLATS AREA OFFICE GOLDEN, COLORADO

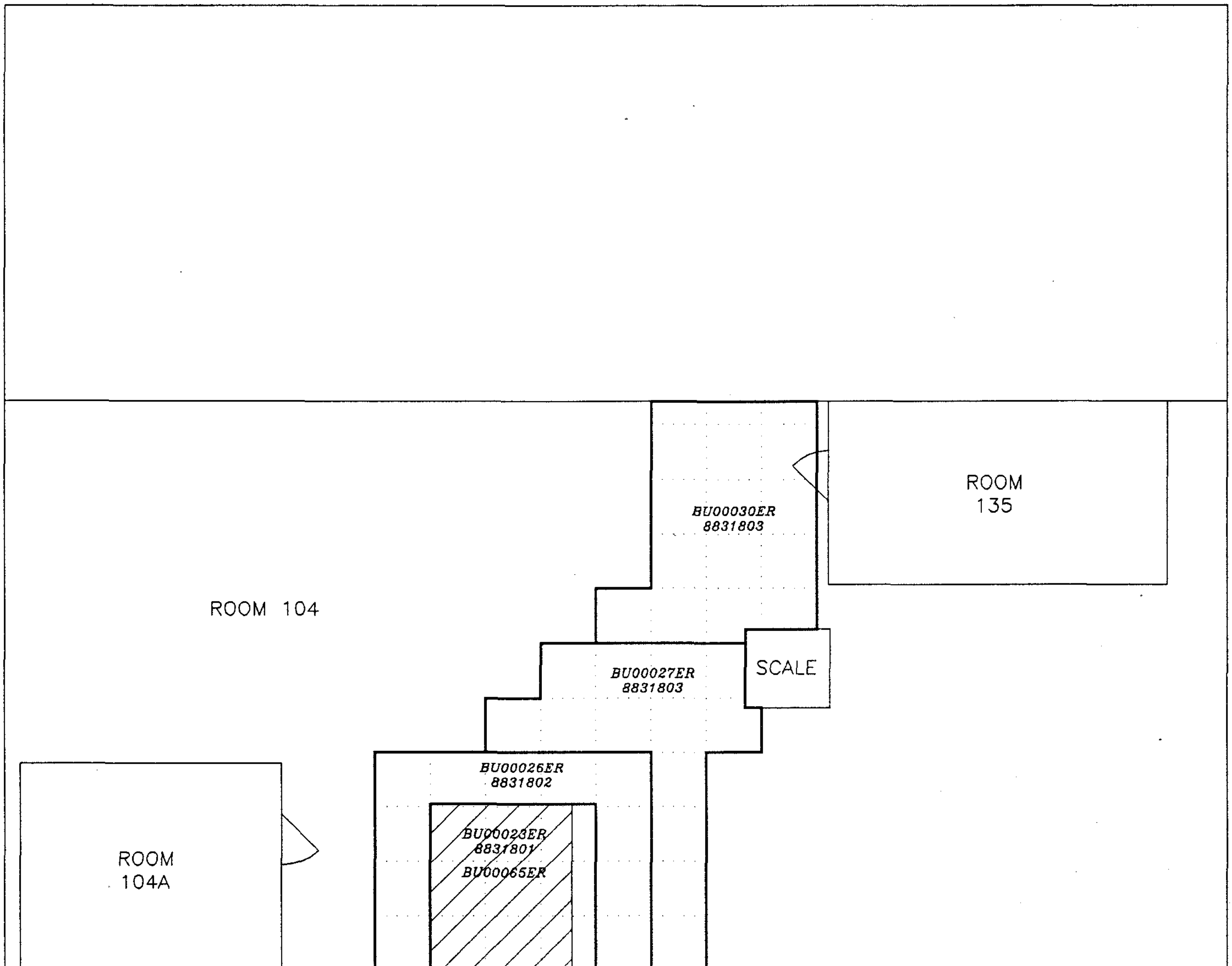
Rocky Flats Environmental Technology Site
GOLDEN, COLORADO 80401

OU15 PHASE I RFI/RI

IHSS 180 RAD SAMPLE LOCATIONS

SIZE	DRAWING NUMBER	ISSUE	FIGURE
B	IHSS 180	A	3-5

883
BLDG/AC
104
ROOM AREA
H Htg-Vent
A Arch
G GL Box
E Elec
D Detection
M Mech
I Inst
B Building
T Title
C Civil
U Utilities
P Piping
W Fire Prot.
L Layouts
F Flow Diag.
S Site
X Alarms



KEYWORDS	A	ORIGINAL ISSUE	XX/XX/93	DAW	SRL	RKT	DLS			
1. OU15	ISSUE	DESCRIPTION	DATE	RFETS				DOE	CLASS	JOB NO.
2. PHASE 1										
3. RFI/RI										
4. REPORT										
5.										

DESIGNED	WEAVER XX/XX/93
DRAWN	LENNIE 12/20/93
CHECKED	TERRIEN XX/XX/93
APPROVED	SCHUBBE XX/XX/93
SUBMITTED	BIERBAUM XX/XX/93
APPROVED RFETS	
APPROVED DOE	

BLDG./FACILITY 883
ROOM/AREA 104
GRID COOR./COL NO.

MASTER YES ☐ NO ☒

SCALE: NONE

U.S. DEPARTMENT OF ENERGY
ROCKY FLATS AREA OFFICE GOLDEN, COLORADO

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GOLDEN, COLORADO 80401

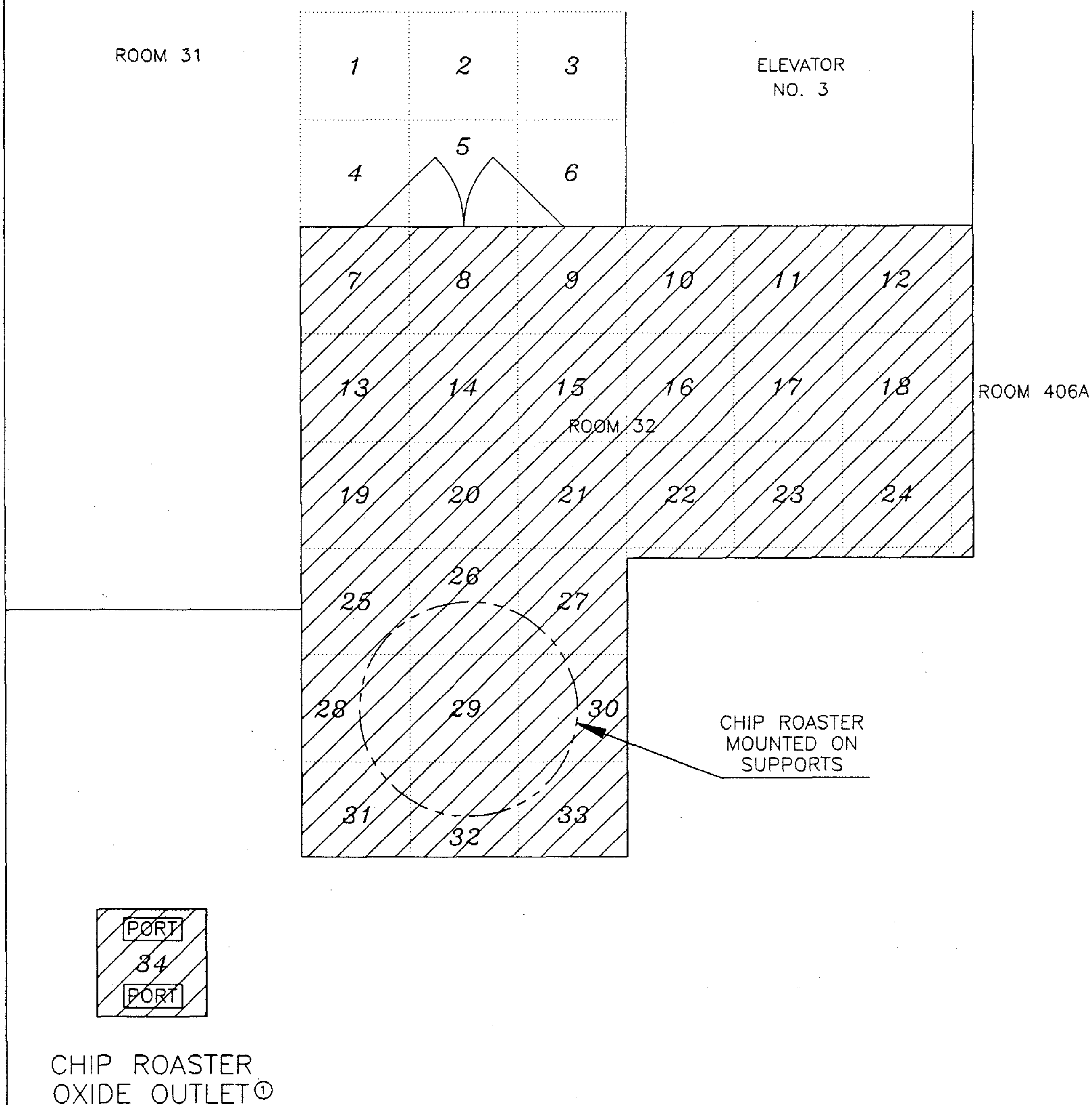
OU15 PHASE I RFI/RI
IHSS 180 RINSATE SAMPLE LOCATIONS

SIZE	DRAWING NUMBER	ISSUE	FIGURE
B	IHSS 180	A	3-6

883 BLDG/FAC
104 ROOM AREA

NOTES

① A SMEAR SAMPLE WAS COLLECTED FROM THE SURFACE OF THE CHIP ROASTER AROUND THE OXIDE OUTLET PORTS.



KEYWORDS		
1. OU15		
2. PHASE I		
3. RFI/RI		
4. REPORT		
5.		
BLDG./FACILITY 447		
ROOM/AREA 31/32		
GRID COOR./COL NO.		
MASTER YES ☐ NO ☒		

ISSUE	DESCRIPTION	DATE	RFETS				DOE	CLASS	JOB NO.
A	ORIGINAL ISSUE	XX/XX/93	RCH	SRL	DAW	DLS			

DESIGNED	HEA	XX/XX/93
DRAWN	LENNIE	12/20/93
CHECKED	WEAVER	XX/XX/93
APPROVED	SCHUBBE	XX/XX/93
SUBMITTED	BIERBAUM	XX/XX/93
APPROVED RFETS		
APPROVED DOE		

SCALE: NONE

U.S. DEPARTMENT OF ENERGY
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Rocky Flats Environmental Technology Site
GOLDEN, COLORADO 80401

OU15 PHASE I RFI/RI

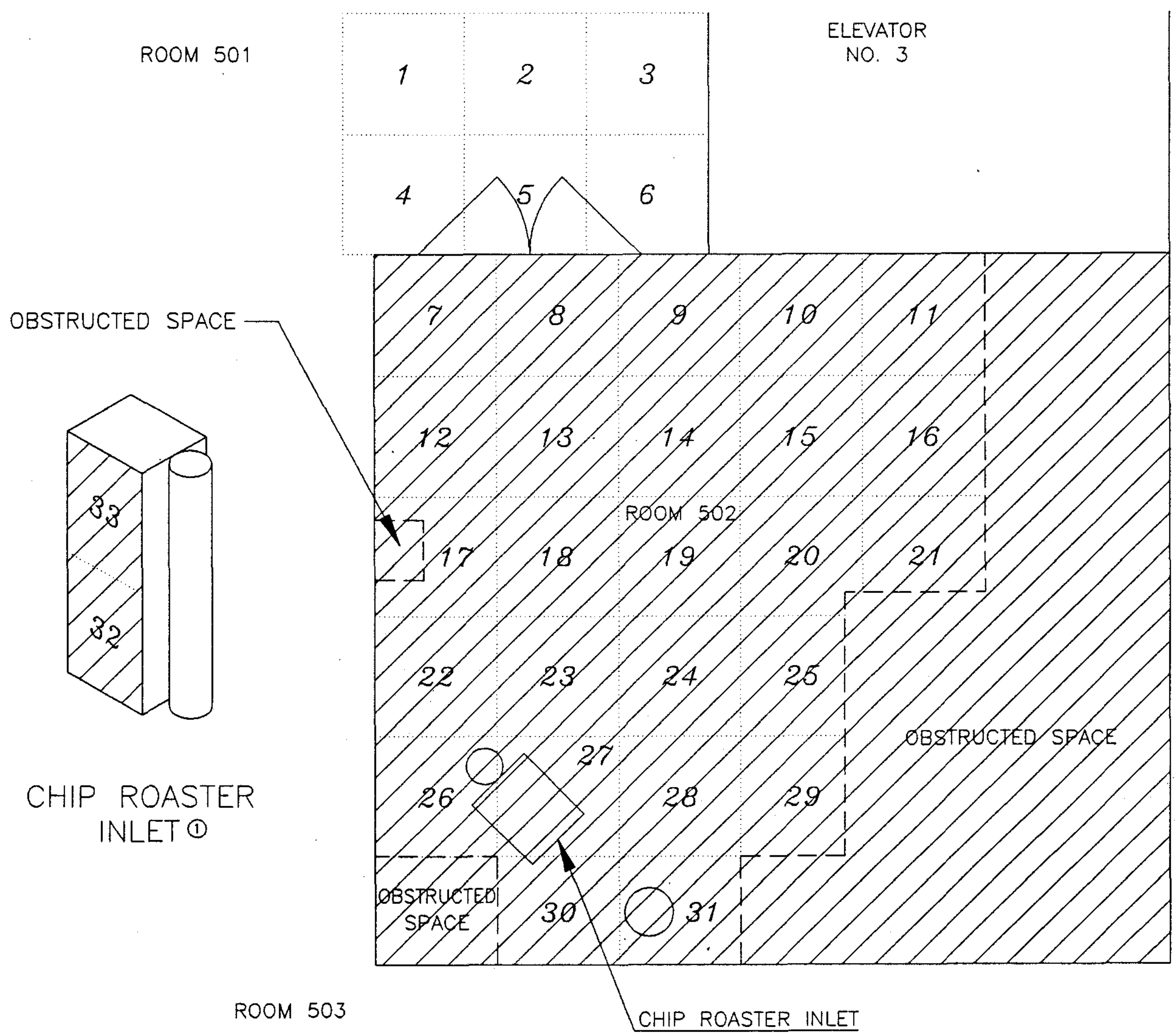
IHSS 204 RAD SAMPLE LOCATIONS

SIZE	DRAWING NUMBER	ISSUE	FIGURE
B	IHSS 204	A	3-7

447 BLDG/FAC
31/32 ROOM/AREA

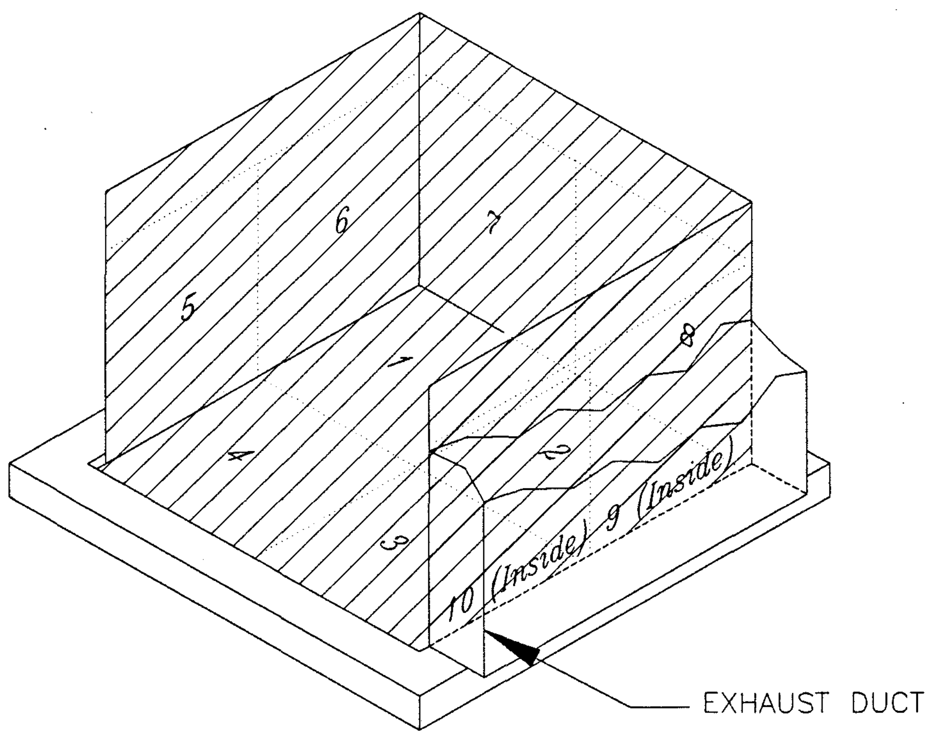
NOTES

① TWO SMEAR SAMPLES WERE COLLECTED FROM THE SURFACE OF THE CHIP ROASTER INLET.



KEYWORDS	A	ORIGINAL ISSUE			XX/XX/93	RCH	SRL	DAW	DLS	
1.OU15	ISSUE	DESCRIPTION			DATE	RFETS		DOE	CLASS	JOB NO.
2.PHASE I					U.S. DEPARTMENT OF ENERGY ROCKY FLATS AREA OFFICE GOLDEN,COLORADO					
3.RFI/RI		DESIGNED	HEA	XX/XX/93						
4.REPORT		DRAWN	LENNIE	XX/XX/93	Rocky Flats Environmental Technology Site					
5.		CHECKED	WEAVER	XX/XX/93	GOLDEN,COLORADO 80401					
BLDG./FACILITY 447		APPROVED	SCHUBBE	XX/XX/93	OU15 PHASE I RFI/RI					
ROOM/AREA 501/502					IHSS 204 RAD SAMPLE LOCATIONS					
GRID COOR./COL NO.		SUBMITTED	BIERBAUM	XX/XX/93	SIZE	DRAWING NUMBER		ISSUE	FIGURE	
MASTER YES ☐ NO ☒	SCALE: NONE	APPROVED RFETS / APPROVED DOE			B	IHSS 204		A	3-8	

447 BLDG/FAC.
502 ROOM/AREA
H Htg-Vent
A Arch
C GL Box
E Elec
D Detection
M Mech
I Inst
B Building
T Title
C Civil
U Utilities
P Piping
W Fire Prot.
L Layouts
F Flow Diag.
S Stds
X Alarms

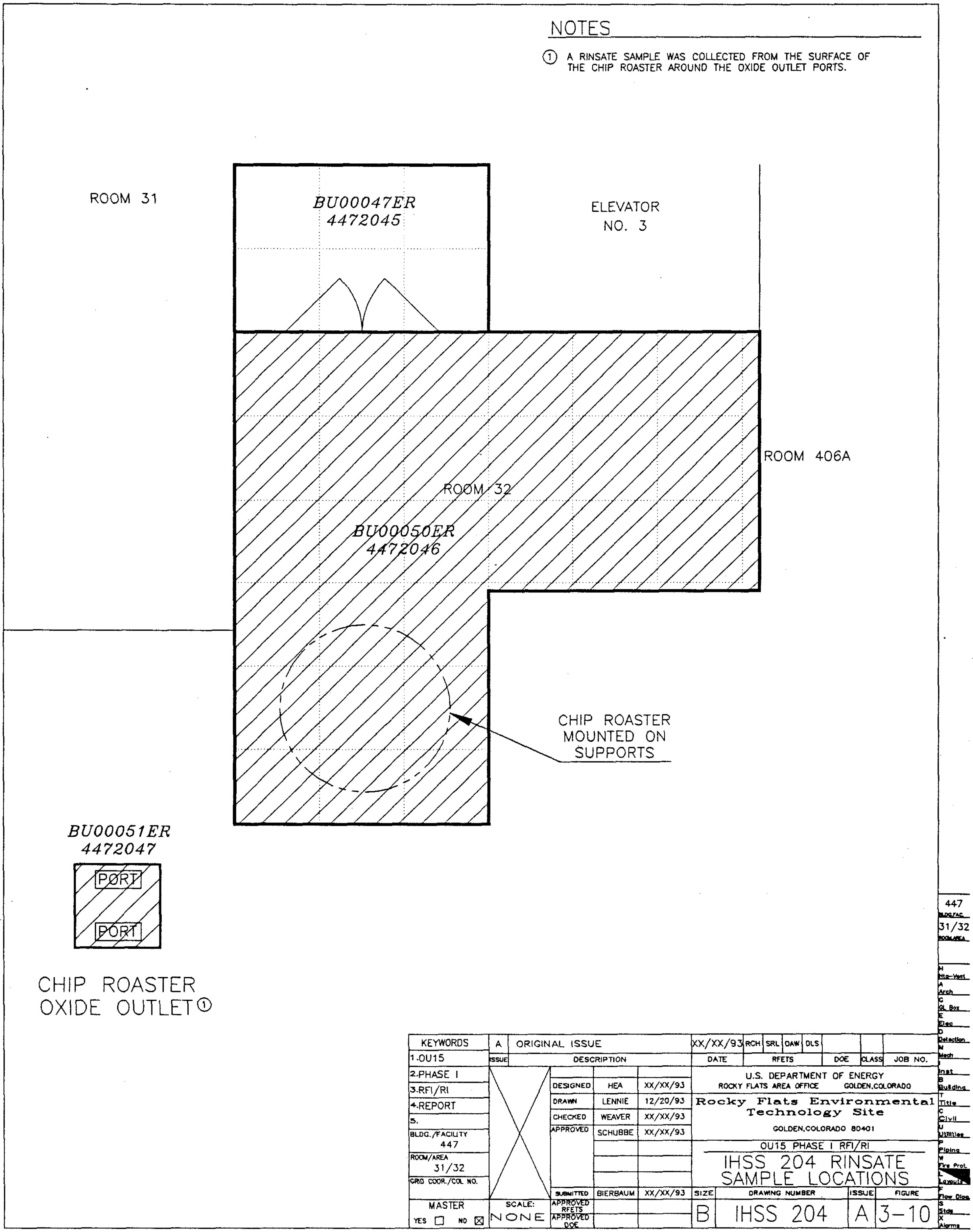


WASH RACK/DRUM WASHING BASIN

KEYWORDS	A	ORIGINAL ISSUE	XX/XX/93	RCH SRL DAW DLS			
1.OU15	ISSUE	DESCRIPTION	DATE	RFETS	DOE	CLASS	JOB NO.
2.PHASE I							
3.RFI/RI		DESIGNED	HEA	XX/XX/93	U.S. DEPARTMENT OF ENERGY ROCKY FLATS AREA OFFICE GOLDEN,COLORADO		
4.REPORT		DRAWN	SCHACKLIN	12/20/93	Rocky Flats Environmental Technology Site		
5.		CHECKED	WEAVER	XX/XX/93	GOLDEN,COLORADO 80401		
BLDG./FACILITY 447		APPROVED	SCHUBBE	XX/XX/93	OU15 PHASE I RFI/RI		
ROOM/AREA 501					IHSS 204 RAD SAMPLE LOCATIONS		
GRID COOR./COL NO.		SUBMITTED	BIERBAUM	XX/XX/93	SIZE	DRAWING NUMBER	ISSUE / FIGURE
MASTER YES ☐ NO ☒	SCALE: NONE	APPROVED RFETS / APPROVED DOE			B	IHSS 204	A / 3-9

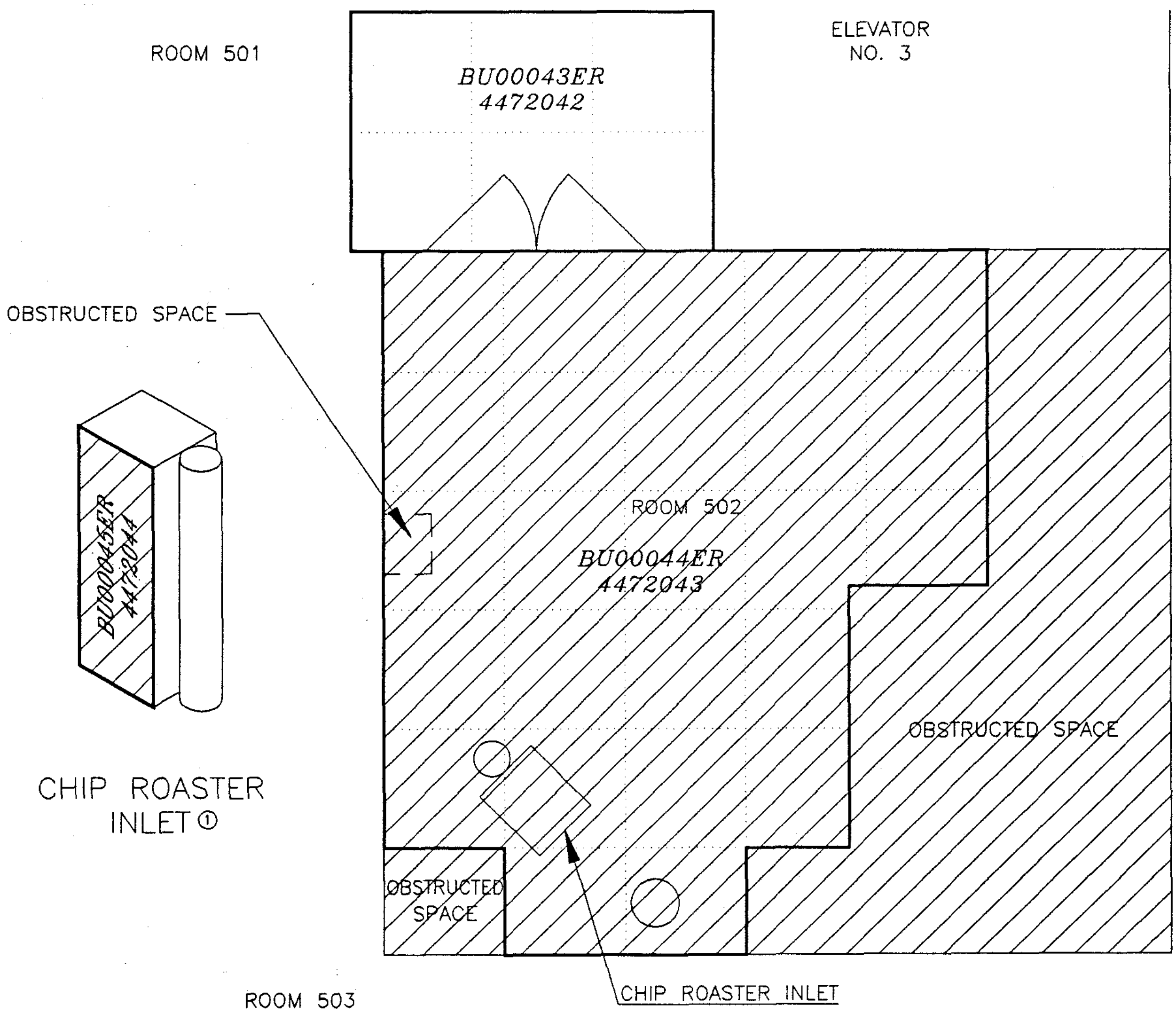
447
BLDG/FAC
501
ROOM/AREA

H Htg-Vent
A Arch
G GL Box
E Elec
D Detection
M Mech
I Inst
B Building
T Title
C Civil
U Utilities
P Piping
F Fire Prot.
L Layouts
F Flow Diag.
S Stds
X Alarms


NOTES
① A RINSATE SAMPLE WAS COLLECTED FROM THE SURFACE OF THE CHIP ROASTER AROUND THE OXIDE OUTLET PORTS.
ROOM 31
BU00047ER
4472045
ELEVATOR
NO. 3
ROOM 406A
ROOM 32
BU00050ER
4472046
CHIP ROASTER
MOUNTED ON
SUPPORTS
BU00051ER
4472047
PORT
PORT
CHIP ROASTER
OXIDE OUTLET ①
KEYWORDS
1.OU15
2.PHASE I
3.RFI/RI
4.REPORT
5.
BLDG./FACILITY 447
ROOM/AREA 31/32
GRID COOR./COL NO.
MASTER YES ☐ NO ☒
A ORIGINAL ISSUE XX/XX/93 RCH SRL DAW DLS
ISSUE DESCRIPTION DATE RFETS DOE CLASS JOB NO.
DESIGNED HEA XX/XX/93
DRAWN LENNIE 12/20/93
CHECKED WEAVER XX/XX/93
APPROVED SCHUBBE XX/XX/93
SUBMITTED BIERBAUM XX/XX/93
APPROVED RFETS
APPROVED DOE
SCALE: NONE
U.S. DEPARTMENT OF ENERGY
ROCKY FLATS AREA OFFICE GOLDEN,COLORADO
Rocky Flats Environmental Technology Site
GOLDEN,COLORADO 80401
OU15 PHASE I RFI/RI
IHSS 204 RINSATE SAMPLE LOCATIONS
SIZE B
DRAWING NUMBER IHSS 204
ISSUE A
FIGURE 3-10
447
31/32
H Htg-Vent
A Arch
C GL Box
E Elec
D Detection
M Mech
I Inst
B Building
T Title
C Civil
U Utilities
P Piping
W Fire Prot.
L Layouts
F Flow Diag.
S Stds
X Alarms

NOTES

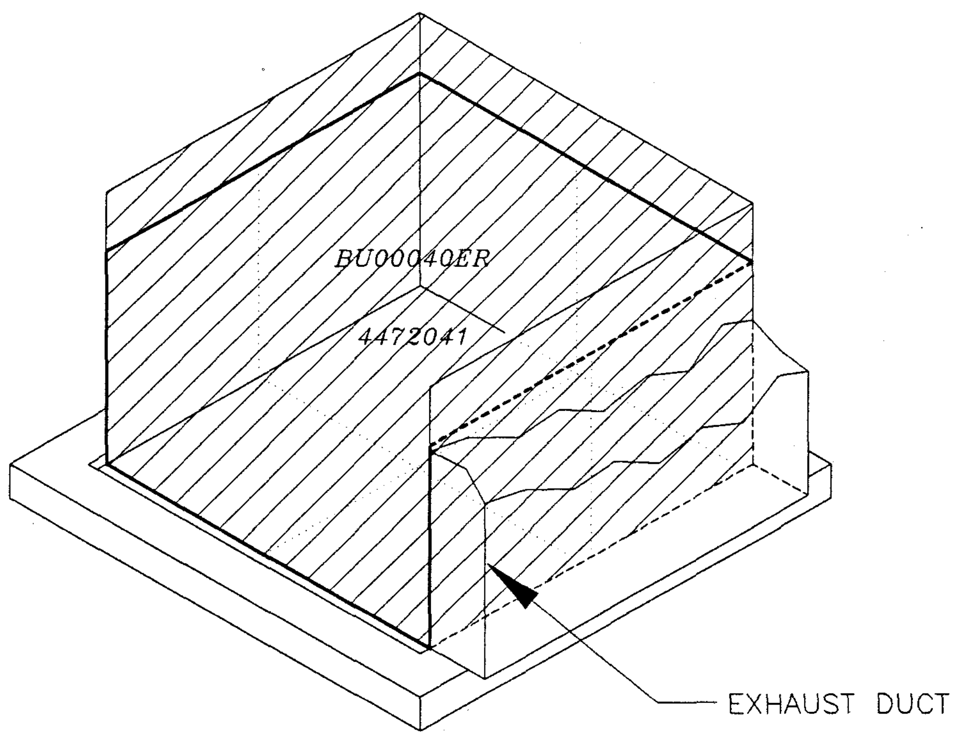
① A RINSATE SAMPLE WAS COLLECTED FROM THE SURFACE OF THE CHIP ROASTER INLET.



KEYWORDS	A	ORIGINAL ISSUE		XX/XX/93	RCH SRL DAW DLS			
1.OU15	ISSUE	DESCRIPTION		DATE	RFETS	DOE	CLASS	JOB NO.
2.PHASE I		DESIGNED	HEA	XX/XX/93	U.S. DEPARTMENT OF ENERGY ROCKY FLATS AREA OFFICE GOLDEN,COLORADO			
3.RFI/RI		DRAWN	LENNIE	XX/XX/93	Rocky Flats Environmental Technology Site			
4.REPORT		CHECKED	WEAVER	XX/XX/93				
5.		APPROVED	SCHUBBE	XX/XX/93	GOLDEN,COLORADO 80401			
BLDG./FACILITY 447					OU15 PHASE I RFI/RI			
ROOM/AREA 501/502					IHSS 204 RINSATE SAMPLE LOCATIONS			
GRID COOR./COL NO.		SUBMITTED	BIERBAUM	XX/XX/93	SIZE	DRAWING NUMBER	ISSUE	FIGURE
MASTER YES ☐ NO ☒	SCALE: NONE	APPROVED RFETS APPROVED DOE			B	IHSS 204	A	3-11

447
BLDG./FAC.
502
ROOM/AREA

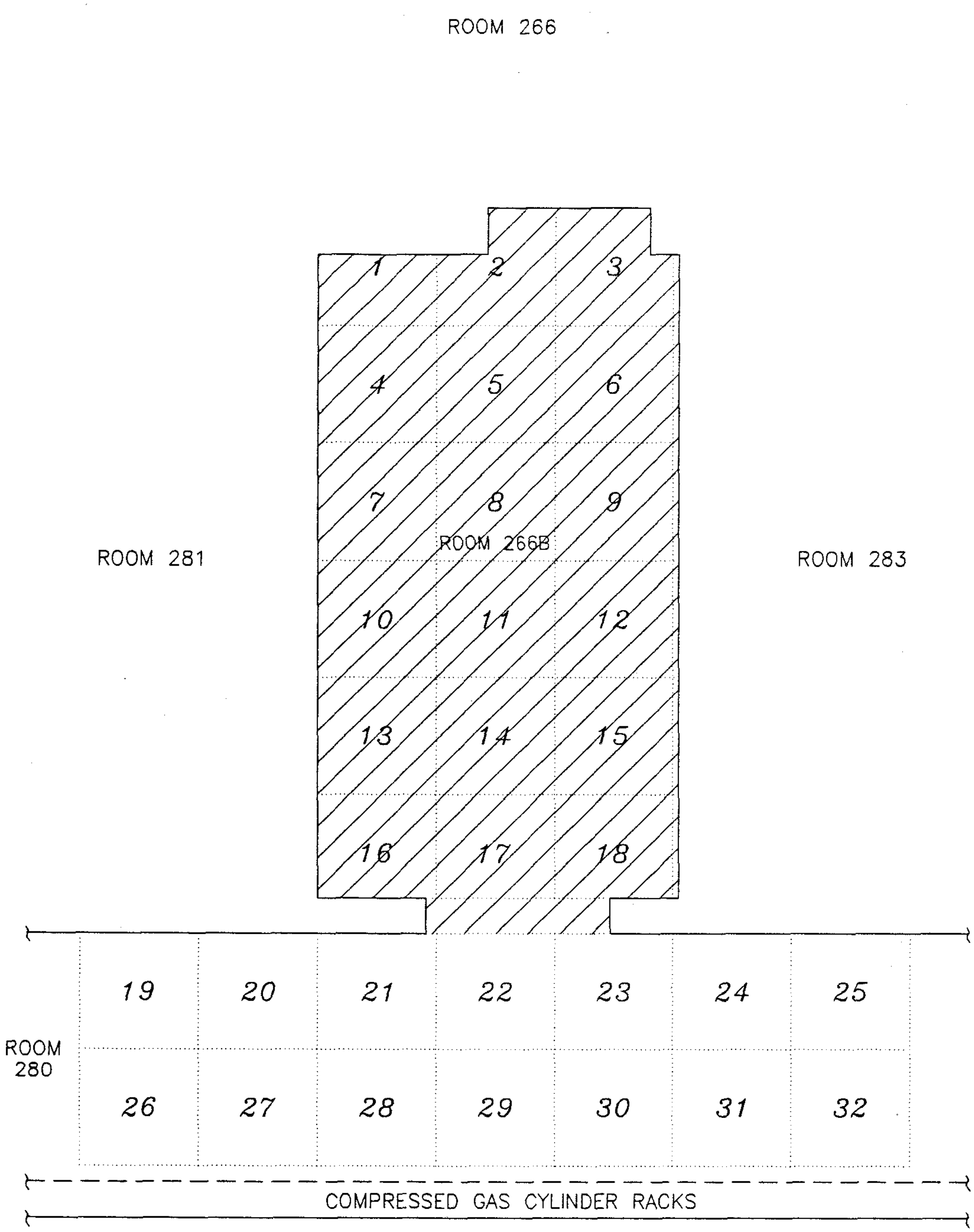
H Htg-Vent
A Arch
G GL Box
E Elec
D Detection
M Mech
I Inst
B Building
T Title
C Civil
U Utilities
P Piping
W Fire Prot.
L Layouts
F Flow Diag.
S Stds
X Alarms



WASH RACK/DRUM WASHING BASIN

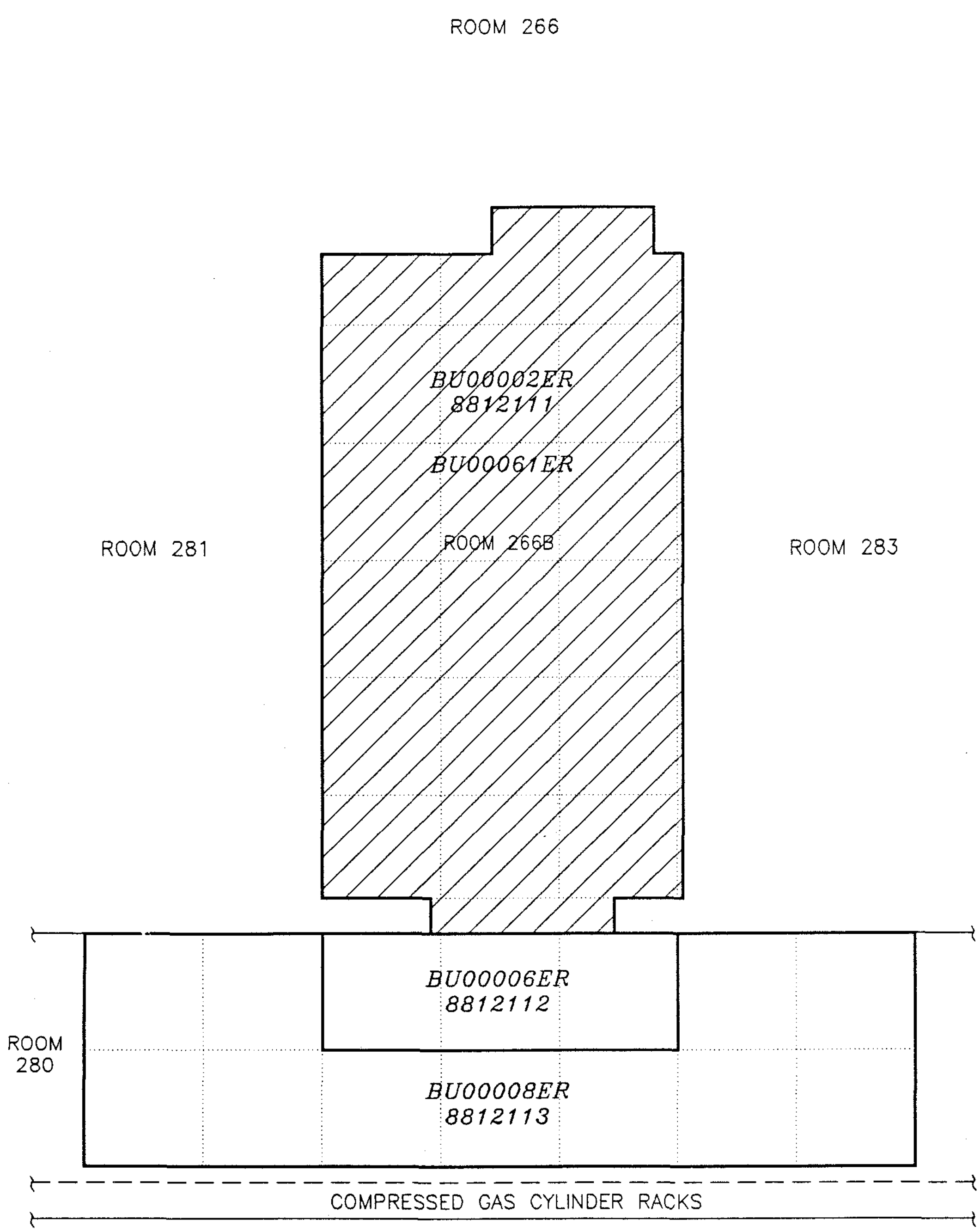
KEYWORDS	A	ORIGINAL ISSUE			XX/XX/93	RCH SRL DAW DLS			
1.OU15	ISSUE	DESCRIPTION			DATE	RFETS	DOE	CLASS	JOB NO.
2.PHASE I		DESIGNED	HEA	XX/XX/93	U.S. DEPARTMENT OF ENERGY ROCKY FLATS AREA OFFICE GOLDEN,COLORADO				
3.RFI/RI		DRAWN	SCHACKLIN	12/20/93	Rocky Flats Environmental Technology Site				
4.REPORT		CHECKED	WEAVER	XX/XX/93	GOLDEN,COLORADO 80401				
5.		APPROVED	SCHUBBE	XX/XX/93					
BLDG./FACILITY 447					OU15 PHASE I RFI/RI				
ROOM/AREA 501					IHSS 204 RINSATE SAMPLE LOCATIONS				
GRID COOR./COL NO.		SUBMITTED	BIERBAUM	XX/XX/93	SIZE	DRAWING NUMBER	ISSUE	FIGURE	
MASTER YES ☐ NO ☒	SCALE: NONE	APPROVED RFETS / APPROVED DOE			B	IHSS 204	A	3-12	

447 BLDG.FAC.
501 ROOM/AREA
H Htg-Vent
A Arch
G GL Box
E Elec
D Detection
M Mech
I Inst
B Building
T Title
C Civil
U Utilities
P Piping
W Fire Prot.
L Layouts
F Flow Diag.
S Stds
X Alarms



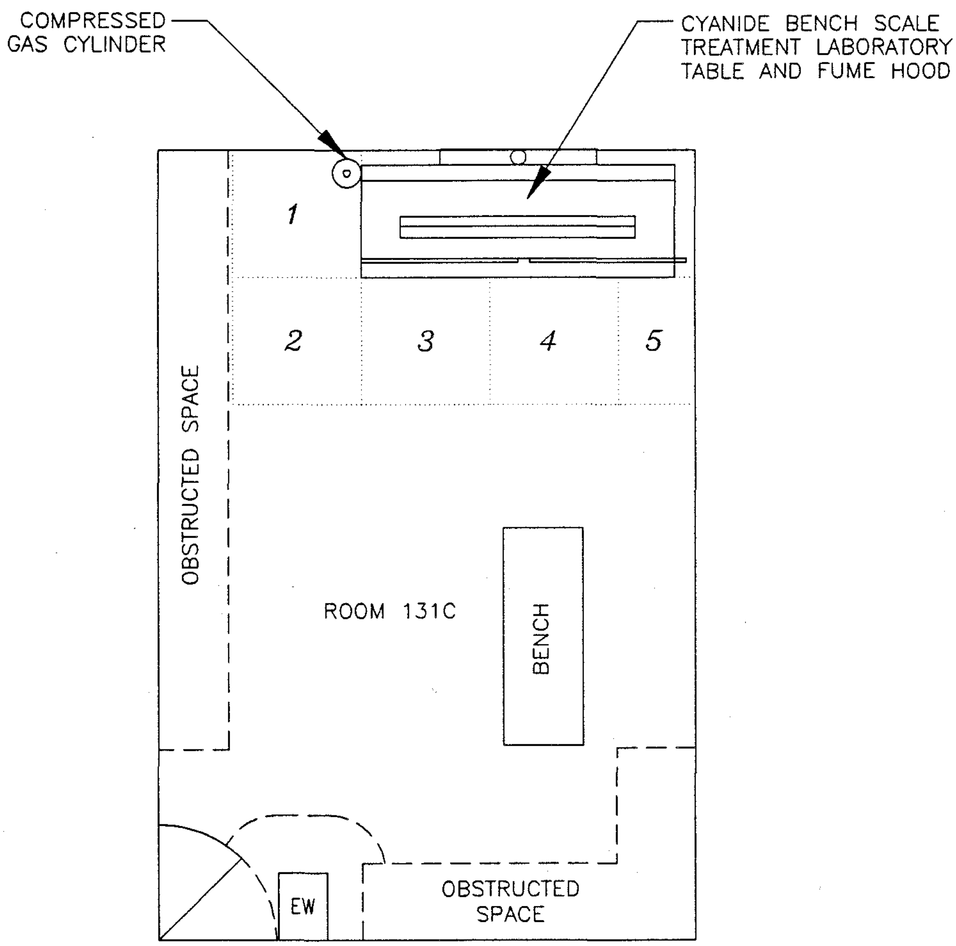
KEYWORDS	A	ORIGINAL ISSUE	XX/XX/93	RCH SRL PRB DLS			
1. OU15	ISSUE	DESCRIPTION	DATE	RFETS	DOE	CLASS	JOB NO.
2. PHASE I				U.S. DEPARTMENT OF ENERGY ROCKY FLATS AREA OFFICE GOLDEN, COLORADO			
3. RFI/RI		DESIGNED	HEA	XX/XX/93			
4. REPORT		DRAWN	LENNIE	12/20/93	Rocky Flats Environmental Technology Site		
5.		CHECKED	BIERBAUM	XX/XX/93	GOLDEN, COLORADO 80401		
BLDG./FACILITY 881		APPROVED	SCHUBBE	XX/XX/93	OU15 PHASE I RFI/RI		
ROOM/AREA 266B					IHSS 211 RAD SAMPLE LOCATIONS		
GRID COOR./COL NO.		SUBMITTED	BIERBAUM	XX/XX/93	SIZE	DRAWING NUMBER	ISSUE / FIGURE
MASTER YES ☐ NO ☒	SCALE: NONE	APPROVED RFETS / APPROVED DOE			B	IHSS 211	A / 3-13

881
BLDG/FAC
266B
ROOM/AREA



KEYWORDS	A	ORIGINAL ISSUE			XX/XX/93	RCH	SRL	PRB	DLS			
1. OU15	ISSUE	DESCRIPTION			DATE	RFETS				DOE	CLASS	JOB NO.
2. PHASE I					U.S. DEPARTMENT OF ENERGY ROCKY FLATS AREA OFFICE GOLDEN, COLORADO							
3. RFI/RI		DESIGNED	HEA	XX/XX/93								
4. REPORT		DRAWN	LENNIE	12/20/93	**Rocky Flats Environmental Technology Site**							
5.		CHECKED	BIERBAUM	XX/XX/93								
BLDG./FACILITY 881		APPROVED	SCHUBBE	XX/XX/93	GOLDEN, COLORADO 80401							
ROOM/AREA 266B					OU15 PHASE I RFI/RI							
GRID COOR./COL NO.					IHSS 211 RINSATE SAMPLE LOCATIONS							
		SUBMITTED	BIERBAUM	XX/XX/93	SIZE	DRAWING NUMBER				ISSUE	FIGURE	
MASTER YES ☐ NO ☒	SCALE: NONE	APPROVED RFETS / APPROVED DOE			B	IHSS 211				A	3-14	

881
266B



KEYWORDS	A	ORIGINAL ISSUE	XX/XX/93	RCH SRL PRB DLS		
1. OU15	ISSUE	DESCRIPTION	DATE	RFETS	DOE CLASS	JOB NO.

KEYWORDS: 1. OU15; 2. PHASE I; 3. RFI/RI; 4. REPORT; 5.

BLDG./FACILITY 881

ROOM/AREA 131C

GRID COOR./COL NO.

MASTER YES ☐ NO ☒

SCALE: NONE

DESIGNED	HEA	XX/XX/93
DRAWN	LENNIE	12/20/93
CHECKED	BIERBAUM	XX/XX/93
APPROVED	SCHUBBE	XX/XX/93
SUBMITTED	BIERBAUM	XX/XX/93
APPROVED RFETS		
APPROVED DOE		

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Rocky Flats Environmental Technology Site
GOLDEN, COLORADO 80401

OU15 PHASE I RFI/RI

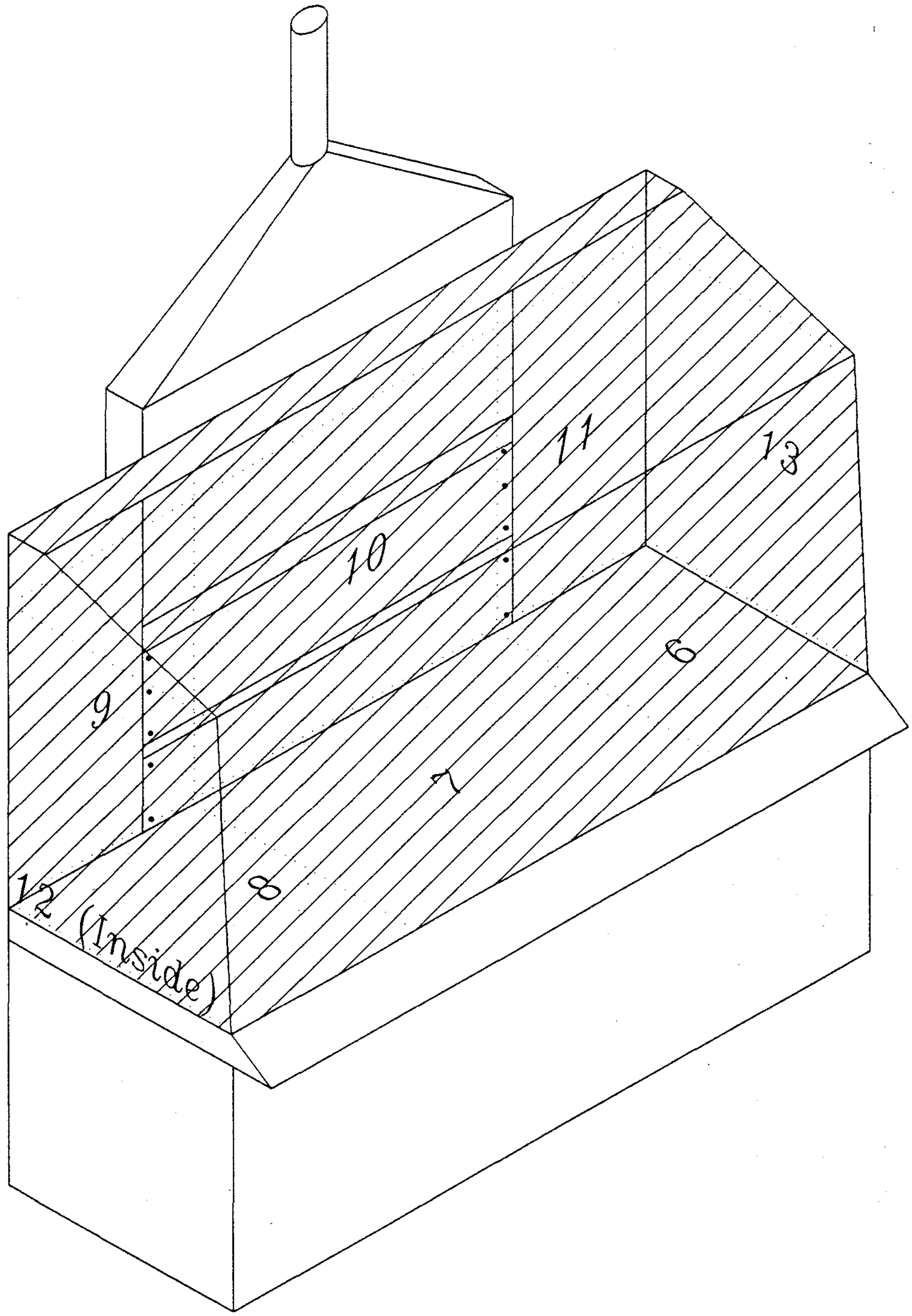
IHSS 217 RAD SAMPLE LOCATIONS

SIZE	DRAWING NUMBER	ISSUE	FIGURE
B	IHSS 217	A	3-15

881 BLDG/FAC
131C ROOM/AREA

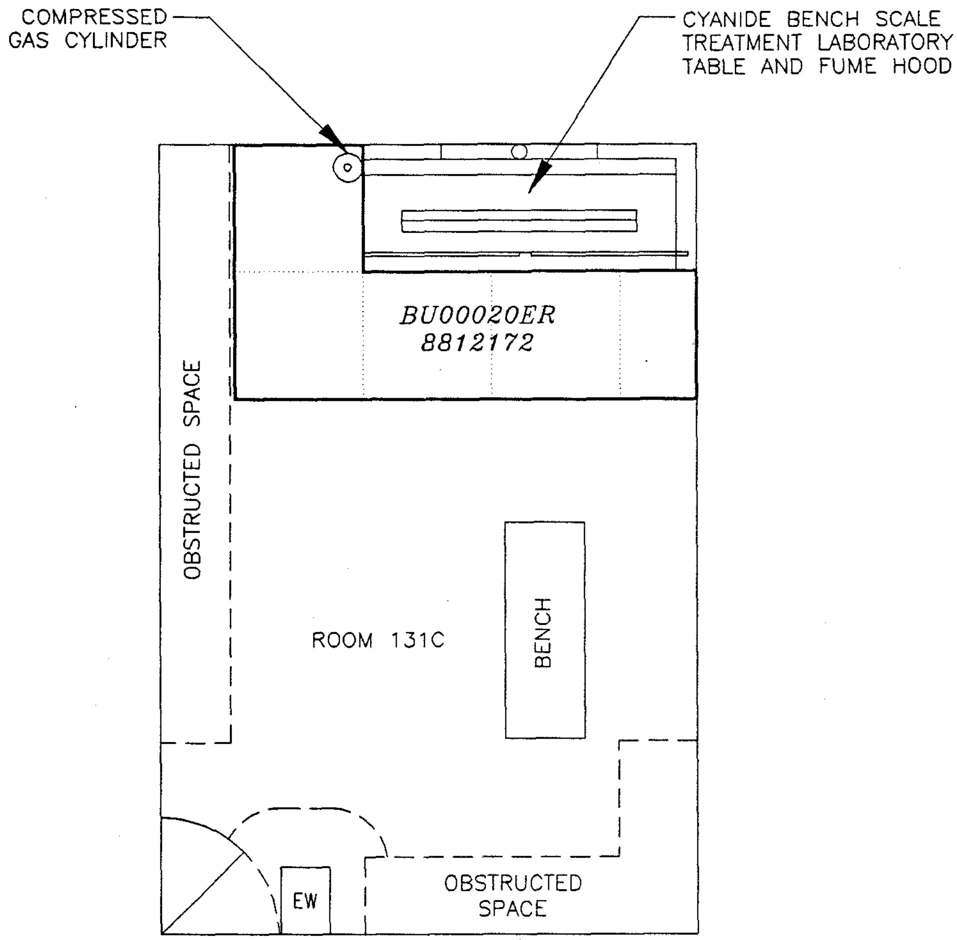
H Htg-Vent
A Arch
G Gl. Box
E Elec
D Detection
M Mech
I Inst
B Building
T Title
C Civil
U Utilities
P Piping
W Fire Prot.
L Layouts
F Flow Diag.
S Stds
X Alarms

CYANIDE BENCH SCALE TREATMENT LABORATORY TABLE AND FUME HOOD



KEYWORDS	A	ORIGINAL ISSUE			XX/XX/93	RCH SRL PRB DLS				
1.OU15	ISSUE	DESCRIPTION			DATE	RFETS		DOE	CLASS	JOB NO.
2.PHASE I					U.S. DEPARTMENT OF ENERGY ROCKY FLATS AREA OFFICE GOLDEN,COLORADO					
3.RFI/RI		DESIGNED	HEA	XX/XX/93						
4.REPORT		DRAWN	LENNIE	12/20/93	Rocky Flats Environmental Technology Site					
5.		CHECKED	BIERBAUM	XX/XX/93						
BLDG./FACILITY 881		APPROVED	SCHUBBE	XX/XX/93	GOLDEN,COLORADO 80401					
ROOM/AREA 131C					OU15 PHASE I RFI/RI IHSS 217 RAD SAMPLE LOCATIONS					
GRID COOR./COL NO.		SUBMITTED	BIERBAUM	XX/XX/93	SIZE	DRAWING NUMBER		ISSUE	FIGURE	
MASTER YES ☐ NO ☒	SCALE: NONE	APPROVED RFETS APPROVED DOE			B	IHSS 217		A	3-16	

881
BLDG/FAC
131C
ROOM/AREA
H Htg-Vent
A Arch
G GL Box
E Elec
D Detection
M Mech
I Inst
B Building
T Title
C Civil
U Utilities
P Piping
W Fire Prot.
L Layouts
F Flow Diag.
S Stds
X Alarms



KEYWORDS	ISSUE	DESCRIPTION	DATE	RFETS	DOE	CLASS	JOB NO.
1. OU15	A	ORIGINAL ISSUE	XX/XX/93	RCH SRL PRB DLS			
2. PHASE I							
3. RFI/RI							
4. REPORT							
5.							

DESIGNED	HEA	XX/XX/93
DRAWN	LENNIE	12/20/93
CHECKED	BIERBAUM	XX/XX/93
APPROVED	SCHUBBE	XX/XX/93
SUBMITTED	BIERBAUM	XX/XX/93
APPROVED RFETS		
APPROVED DOE		

BLDG./FACILITY 881
ROOM/AREA 131C
GRID COOR./COL NO.
MASTER YES ☐ NO ☒
SCALE: NONE

U.S. DEPARTMENT OF ENERGY
ROCKY FLATS AREA OFFICE GOLDEN,COLORADO

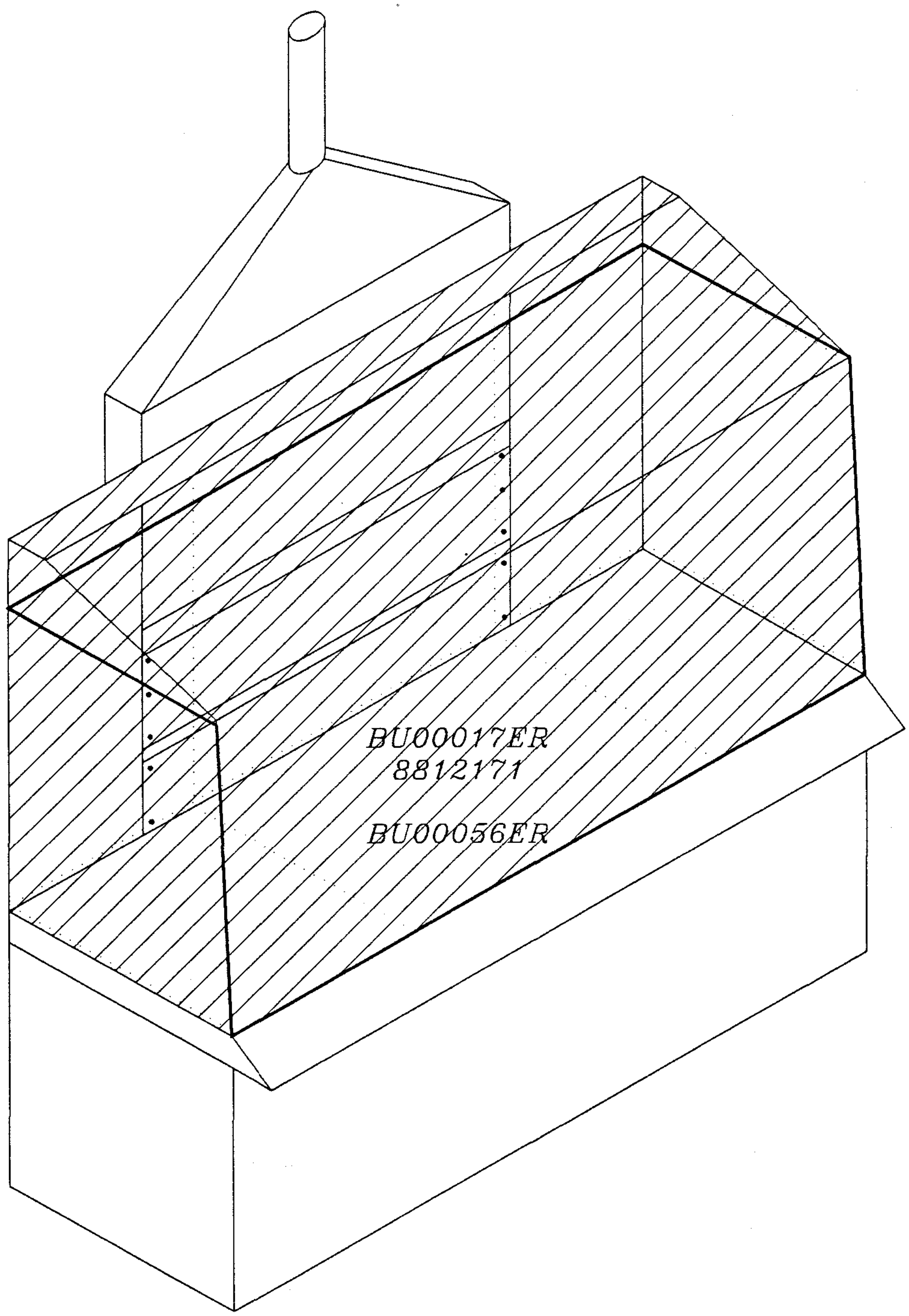
Rocky Flats Environmental Technology Site
GOLDEN,COLORADO 80401

OU15 PHASE I RFI/RI
IHSS 217 RINSATE SAMPLE LOCATIONS

SIZE	DRAWING NUMBER	ISSUE	FIGURE
B	IHSS 217	A	3-17

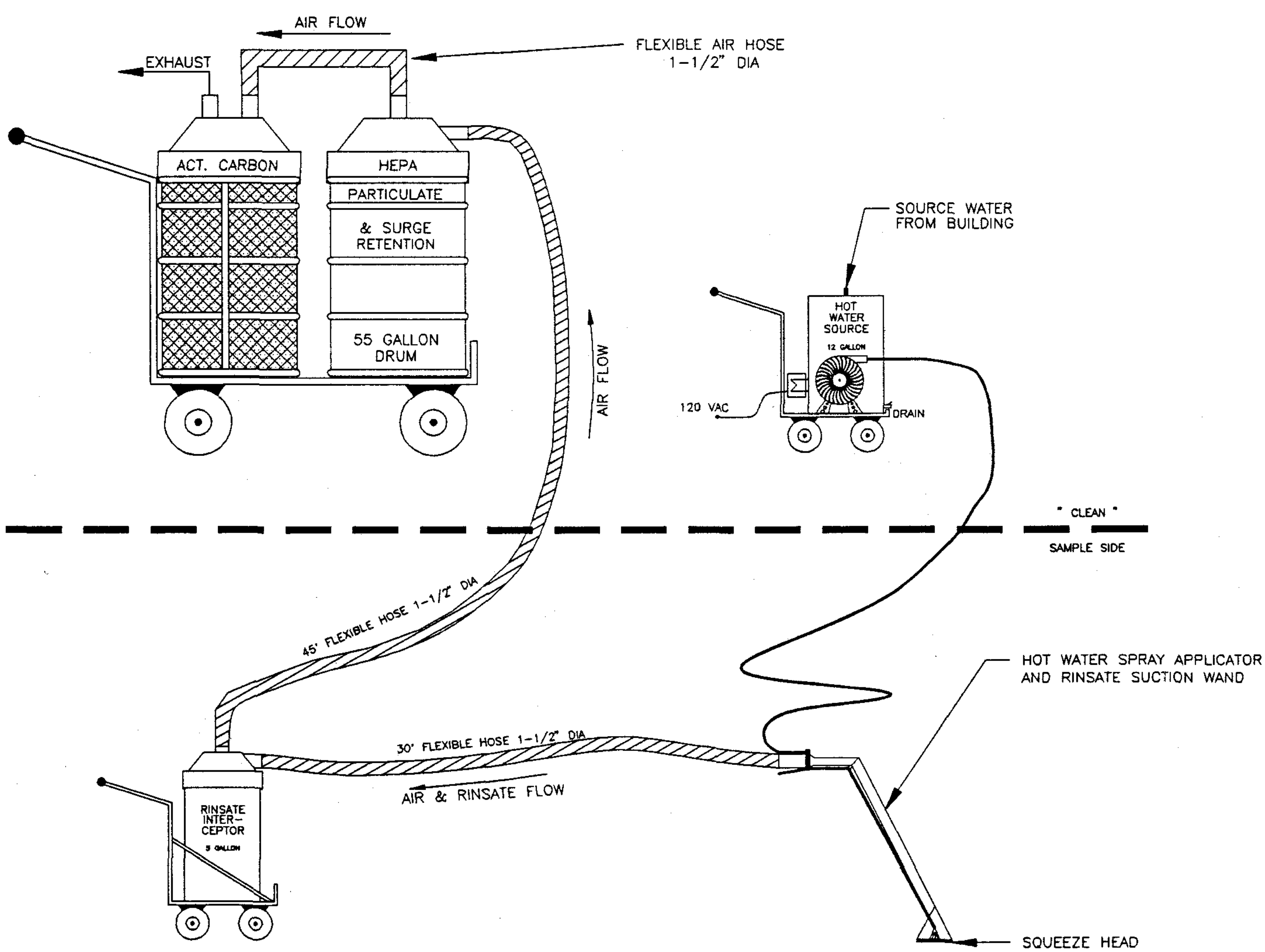
881 BLDG/FAC
131C ROOM/AREA
H Htg-Vent
A Arch
G GL Box
E Elec
D Detection
M Mech
I Inst
B Building
T Title
C Civil
U Utilities
P Piping
W Fire Prot.
L Layouts
F Flow Diag.
S Stds
X Alarms

CYANIDE BENCH SCALE TREATMENT LABORATORY TABLE AND FUME HOOD



KEYWORDS	A	ORIGINAL ISSUE			XX/XX/93	RCH	SRL	PRB	DLS			
1 OU15	ISSUE	DESCRIPTION			DATE	RFETS				DOE	CLASS	JOB NO.
2 PHASE I					U.S. DEPARTMENT OF ENERGY ROCKY FLATS AREA OFFICE GOLDEN, COLORADO							
3 RFI/RI		DESIGNED	HEA	XX/XX/93								
4 REPORT		DRAWN	LENNIE	12/20/93	Rocky Flats Environmental Technology Site							
5.		CHECKED	BIERBAUM	XX/XX/93								
BLDG./FACILITY 881		APPROVED	SCHUBBE	XX/XX/93	GOLDEN, COLORADO 80401							
ROOM/AREA 131C					OU15 PHASE I RFI/RI							
GRID COOR./COL NO.					IHSS 217 RINSATE SAMPLE LOCATIONS							
MASTER	SCALE:	SUBMITTED	BIERBAUM	XX/XX/93	SIZE	DRAWING NUMBER				ISSUE	FIGURE	
YES ☐ NO ☒	NONE	APPROVED RFETS / APPROVED DOE			B	IHSS 217				A	3-18	

881 BLDG/FAC
131C ROOM/AREA
H Htg-Vent
A Arch
G GL Box
E Elec
D Detection
M Mech
I Inst.
B Building
T Title
C Civil
U Utilities
P Piping
W Fire Prot.
L Layouts
F Flow Diag.
S Stds
X Alarms



KEYWORDS	ISSUE	DESCRIPTION	DATE	RFETS	DOE	CLASS	JOB NO.
1. OU15	A	ORIGINAL ISSUE	XX/XX/93	DSH SRL RCH DLS			
2. PHASE I							
3. RFI/RI							
4. REPORT							
5.							

DESIGNED	HINDS	04/01/93
DRAWN	LENNIE	12/21/93
CHECKED	HEA	XX/XX/93
APPROVED	SCHUBBE	XX/XX/93
SUBMITTED	BIERBAUM	XX/XX/93
APPROVED RFETS		
APPROVED DOE		

BLDG./FACILITY

ROOM/AREA

GRID COOR./COL NO.

MASTER YES ☐ NO ☒

SCALE: NONE

U.S. DEPARTMENT OF ENERGY
ROCKY FLATS AREA OFFICE GOLDEN, COLORADO

Rocky Flats Environmental Technology Site
GOLDEN, COLORADO 80401

OU15 PHASE I RFI/RI

HOT WATER RINSATE SAMPLING SYSTEM

SIZE	DRAWING NUMBER	ISSUE	FIGURE
B		A	3-19

4.0 DATA QUALITY EVALUATION

The Phase I RFI/RI was conducted in accordance with the approved Work Plan (DOE, 1993), the site-wide Quality Assurance Project Plan (QAPjP) (EG&G, 1991b), and SOPs as amended by the Work Plan (DOE, 1993). This section addresses the quality and useability of the data collected during the OU15 Phase I RFI/RI to determine if the site-specific objectives were achieved. Data Quality Objectives (DQOs) were established in the Work Plan (DOE, 1993) to qualitatively and quantitatively evaluate the useability of the data in terms of precision, accuracy, representativeness, completeness, and comparability (PARCC) parameters. Definitions of the codes used in the Section 4.0 and 5.0 data tables are included in the Table of Contents. It should be noted that a blank entry on the hot water rinsate sampling data tables reflects that the corresponding field in the RFEDS database is blank for that particular record.

4.1 Phase I RFI/RI Data Quality Objectives

The site-specific objectives of the OU15 Phase I RFI/RI were established according to the requirements of the IAG (DOE, 1991) and the OU15 Work Plan (DOE, 1993). The site-specific data quality objectives are described in Section 4.0 of the Work Plan (DOE, 1993). The objectives were achieved by reviewing new and historical information, visually inspecting and documenting current IHSS conditions, and sampling and analyzing surfaces within each IHSS area. Table 3-1 in Section 3.0 summarizes field investigation activities completed for the OU15 Phase I RFI/RI. Achievement of each site-specific DQO is discussed in the following sections.

4.1.1 Characterize Site Physical Features

Each IHSS was visually inspected to evaluate site physical features and collect pertinent information regarding the nature, extent, and migration potential of contamination. The inspection characterized general building construction, IHSS design, and current condition; and examined floor thickness, slope, drains, coatings (seals/paints), condition, and secondary containment.

4.1.2 Define Contaminant Sources

Contaminant sources were defined by identifying and characterizing wastes that were historically stored or processed in each IHSS and by determining the presence or absence of contamination within each IHSS. Contaminant source information was collected via a detailed records review. In addition, samples were collected inside IHSS boundaries and analyzed for radionuclides, beryllium, TCL VOCs, TCL semi-volatile organic compounds, and TAL metals.

4.1.3 Determine Nature and Extent of Contamination

The nature and extent of contamination was determined by evaluating the spatial distribution of IHSS-related contaminants. Spatial distribution was determined by establishing a sampling grid and collecting and analyzing three types of samples including:

- surficial smear samples for radionuclide and beryllium analysis;
- hot water rinsate samples for TCL VOCs, TCL semi-volatile organic compounds, and TAL metals analysis; and
- radiation surveys for fixed radionuclide constituents.

In addition, samples were collected from within each IHSS, and from areas around the perimeter and along pathways leading from each IHSS to provide sufficient coverage of the extent of contamination.

4.1.4 Describe Contaminant Fate and Transport

Contaminant fate and transport was evaluated by assessing the current condition of secondary containment at each IHSS and assessing the potential contamination migration pathways from each IHSS to the environment outside of the IHSS. Information obtained from site inspections, records review, sampling, and analysis were applied in determining the potential for a release, direct release mechanisms, and chemical/radiological gradients from each IHSS.

4.1.5 Support a Baseline Risk Assessment

The satisfaction of each of the DQOs would provide support for a BRA, if required. Section 300.430(d) of the National Contingency Plan states that as part of the remedial investigation, a BRA is to be conducted to determine whether contaminants of concern identified at the site pose a current or potential future risk to human health and the environment in the absence of remedial action. However, the OU15 IHSSs are RCRA closure units and must therefore meet the RCRA clean closure performance standards. The clean closure performance standards were defined by reviewing the RFETS State RCRA Permit (CDPHE, 1991). The data were evaluated to determine if the standard was achieved at each IHSS. Based on guidance provided in the "Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part A" (EPA, 1989b) (RAGS Part A), the following criteria indicate the data suitability for a BRA:

- Standard EPA and GRRASP (EG&G, 1991a) methods were used ensuring an adequate level of data quality assurance.

- Detection limits achieved using EPA and GRRASP (EG&G, 1991a) methods are sufficiently low to support calculations at low risk levels. Few samples were diluted due to interference, and the dilution factors necessary were low (generally 2.0).

- The number of samples, locations, and analytes were sufficient to characterize the nature and extent of contamination.

- Specific compounds and radionuclides were identified, as opposed to groups of compounds such as Total Petroleum Hydrocarbons, thus allowing for specific compound toxicities to be used.

- The data underwent QA/QC scrutiny during the RFEDS process, as well as an evaluation for PARCC parameters provided below.

Based on these factors, the data would be of sufficient quality to support a BRA, if necessary. In addition, the radiological data would be of sufficient quality to support a radionuclide-specific dose assessment, if necessary.

4.2 Data Useability

The analytical program requirements are based on the DQOs and resulting FSP as defined in the Work Plan (DOE, 1993), Sections 4.0 and 7.0. To ensure data quality, a quality control program was developed and is described in the Quality Assurance Addendum in Section 10.0 of the Work Plan (DOE, 1993). As part of the quality control program for OU15, field QC samples were collected. The quality of data collected is measured in terms of PARCC parameters. In addition, hot water rinsate blank samples, trip blank samples, and field blank (source water) samples were collected and analyzed to characterize other potential contaminant sources.

4.2.1 Quality Control

Four types of QA/QC samples were collected for the hot water rinsate sampling in accordance with the requirements of Section 6.3 of EG&G SOP FO.27. A summary of all individual hot water rinsate and QA/QC samples collected is provided in Table 3-2 (sorted by IHSS). The hot water source or field blanks (taken from the field water source prior to being used for rinsate generation), sample duplicates, equipment rinsate blanks, and trip blanks were analyzed for the same constituents as their associated real samples. In Building 881, the same hot water source was used for the original sampling of IHSSs 178, 211 and 217; therefore, only one hot water source sample was collected. Since IHSSs 179, 180 and 204 each had a different hot water source, one sample was collected from each source. No additional source water samples were collected during verification sampling because distilled water was used. Comparison of the proposed hot water rinsate field QC sampling frequency to the actual hot water rinsate field sampling frequency is presented in Table 4-1.

Duplicate samples were collected by the sampling team and were used as a relative measure of the precision of the sample collection process. These samples were collected at the same time, using the same procedures, the same equipment, and the same types of containers as required for the real samples. They were also preserved in the same manner and submitted for the same analyses as required for the real samples.

Equipment rinsate blanks were collected from final decontamination rinsate to evaluate the success of the field sampling team's decontamination efforts on non-dedicated sampling equipment. Equipment rinsate blanks were obtained by rinsing cleaned equipment with distilled water prior to sample collection. The rinsate was collected and placed in the appropriate sample containers.

Trip blanks consisting of distilled water were prepared by a laboratory technician and accompanied each shipment of water samples for VOC analysis. Trip blanks were stored with the group of samples with which they were associated. Analysis of the trip blanks were used in conjunction with air monitoring data from field activities and other information to assess the influence of ongoing waste operations on the quality of data collected.

Hot water rinsate blanks were collected by reproducing the hot water rinsate sampling procedure using distilled water to rinse a clean glass plate. The results from these samples were used to identify any contaminants which were attributable to the sampling equipment.

4.2.2 PARCC

Precision, accuracy, and completeness are quantitative measures of data quality, while representativeness and comparability are qualitative statements that express the degree to which sample data represent actual conditions and describe the confidence of one data set as compared to another. The PARCC parameters are defined in Appendix A of the QAPjP (EG&G, 1991b).

The analytical data generated using EPA and other well-established methods as identified in the GRRASP (EG&G, 1991a) and QAPjP (EG&G, 1991b), are presented in Section 5.0. The analytical data were reviewed and validated independently of the laboratory and the sample collection contractor, and the results were documented in data validation reports. Standard method-specific data validation procedures developed by EG&G and based on the EPA CLP data validation functional guidelines were used to validate the data.

The three classes of data quality used by EG&G are:

- V - Valid and usable without qualifications;
- A - Acceptable for use with qualifications; and
- R - Rejected.

Other validation codes, as presented in the Table of Contents, fall within these three basic categories. A list of laboratory qualifiers is also included in the Table of Contents. For the purposes of this report, valid and acceptable data were considered of equal utility. As of November 11, 1994, 100% of all OU15 Phase I RFI/RI data had been processed for data validation. Of the processed data less than 0.5% had been rejected.

Precision

Precision is a measure of mutual agreement among individual measurements of the same property, under identical conditions. Precision is assessed by calculating the relative percent difference (RPD), which is the quotient of the difference between the field (real) and duplicate analytical result, and the average of those results for the given analytes expressed as a percentage:

$$RPD=\frac{(V_1-V_2)}{\frac{1}{2}(V_1+V_2)}*100\%$$

Where: RPD = Relative Percent Difference

V_1, V_2 = the values of the duplicate samples

Field Precision

Field duplicates from the hot water rinsate are collected following the field sample collection using the same sampling technique used for the original or "real" samples. Comparison of the data results from the real and duplicate samples provides a measure of the sample homogeneity and sampling technique precision with respect to the amount of error attributed to sampling technique and variability in the analyte concentration in the medium being sampled. The field precision objective specified in the Quality Assurance Addendum is to obtain a RPD of ≤ 30% for water samples. For metals at concentrations near the quantitation limits, precision is expressed as acceptable if the difference between the real and duplicate results is numerically less than the Contract Required Quantitation Limit (CRQL) or if the RPD criterion is met.

In conjunction with the precision objectives outlined in the Quality Assurance Addendum, the number of duplicate samples required to demonstrate precision was one duplicate pair for every 10 samples collected or 10% of the field samples. Table 4-1 lists the achieved field QC sample frequency for the samples collected. A list of duplicates and associated field samples (QC partners) for all compounds detected above the CRQL is presented by sample number and analyte in Table 4-2. Calculated RPDs are also presented in Table 4-2.

Based on the analytical results, RPDs were calculated for a total of 113 field duplicate pairs. The calculated RPD values are summarized in Table 4-3. Overall, a total of 84% of the field duplicates analyzed met the field precision goals.

Some of the duplicate sample pairs analyzed for radionuclides reported concentrations near the minimum detectable activity. Reproduceability under these circumstances is difficult because of the analytical limitations and may not reflect poor field precision.

Therefore, if the CRQL criterion is applied as described for metals, 84% of the radionuclide duplicate pairs achieved the field precision goals.

Cyanide, semi-volatile organic, and VOC field duplicate pairs met the field precision goals in 76% of the samples compared.

Metal field duplicate pairs met the field precision goals in approximately 94% of the samples compared.

Based on the stringent goal of ≤ 30% RPDs, the degree to which the field duplicate data met the goal is sufficient to meet the overall precision objective for the project. To overcome any possible bias introduced by analytical error, both real and duplicate results were evaluated separately (rather than averaging the two) such that the maximum possible concentration in each sample was screened.

<u>Laboratory Precision</u>

Laboratory precision is evaluated through the use of laboratory duplicates for inorganic analyses and matrix spikes (MS) and matrix spike duplicates (MSD) for the organic analyses. Duplicate precision is calculated as RPD; MS/MSD precision is assessed by calculating a RPD between the percent recoveries observed for the method-specific spiked compounds. Laboratory precision goals are mandated by the analytical method for each group and assessed for achievement during data validation. Data not meeting the precision goals set forth by the method are normally rejected during the RFEDS data validation process.

Accuracy

The accuracy of the data obtained in an investigation is a function of the sampling technique, potential for sample contamination during collection and the analytical capabilities of the laboratory. Accuracy means the nearness of a result, or the mean of a set of results, to the true value. Accuracy is assessed by analysis of reference samples of known concentrations, percent recoveries for spiked samples, and by review of blank data (field equipment, trip, or method blanks) which may have an effect on measurement accuracy.

Field Accuracy

Field Accuracy is assessed by comparing sample analyte concentrations to those present in associated field blanks. Four types of samples were collected to evaluate field accuracy:

- equipment rinsate blanks, which quantify the efficacy of the equipment decontamination procedures and identify any contaminants associated with sample cross-contamination;
- trip blanks, which identify cross-contamination of samples from sources at RFETS other than the OU15 IHSSs;
- field blanks (source water), which identify contaminants already present in hot water rinsate source water prior to sample collection; and
- hot water rinsate blanks, which identify any contaminants leaching out of the sampling equipment, and which are therefore artifacts of the sampling method.

The results for each of these sample types are given below.

Field Accuracy - Equipment Rinsate Blanks

The equipment rinsate blanks are used to monitor for sample cross-contamination and the effectiveness of the decontamination process. The blanks are collected by rinsing decontaminated sampling equipment with distilled water, placing the liquid in the appropriate sample container and preserving as required. Table 4-1 presents the proposed and actual frequencies for equipment rinsate sampling relative to the actual number of field samples collected. The field QC sample frequency goal was one in 20 or 5%. During the original sampling, one rinsate blank was collected each day for a total of 9 samples. During the verification sampling, only one rinsate blank needed to be collected because of the extensive use of dedicated sampling equipment. Between the two, a total of 10 samples were collected, representing an actual frequency of 37%.

Table 4-4 indicates that the VOCs, total xylenes and methylene chloride were detected in the rinsate blanks. As noted in the CLP statement of work for organic analyses, these compounds are common laboratory solvents and are often inadvertently introduced into samples from the laboratory atmosphere. In accordance with the CLP protocol, the data validators assess whether the occurrence of these compounds is due to laboratory contamination by comparing the sample results to the laboratory blanks. Total xylenes were detected in only two samples, BU00013ER and BU00019ER. The reported detections were estimated and below the CRQL (data flagged with a J). Methylene chloride was detected in only two samples, BU00025ER and BU00004ER. The reported detections were either estimated and below the CRQL or at the CRQL.

Table 4-4 also shows the semi-volatile organic compounds detected in the equipment rinsate blanks. Of these samples, bis(2-ethylhexyl)phthalate (DEHP) and phenol were the only identified semi-volatile organic compounds detected. DEHP was detected in two samples, BU00042ER and BU00049ER. One of the reported concentrations was estimated and below the CRQL and the other was within the same order of magnitude as the CRQL. Phthalates are a common laboratory contaminant. Phenol was reported at an estimated concentration below the CRQL only once, in sample BU00060ER.

Metals were identified in three of the rinsate blanks (BU00004ER, BU00007ER, and BU00019ER). The metals detected in the rinsate blanks were silicon, zinc, cadmium, and lead.

As presented in Table 4-4, rinsate samples contained Americium-241, Plutonium-239/240, Uranium-233-234, Uranium-235, Uranium-238, Gross α, and Gross β above the CRQL. Based on the reported error range of the analytical technique, however, many of these values could fall below the CRQL at the lower end of the estimated range..

Overall, the low concentrations of constituents in the equipment rinsate blanks, as compared to the magnitude of concentrations detected in real samples, indicated that the equipment decontamination procedures were adequate and that significant cross-contamination of samples did not occur.

<u>Field Accuracy - Trip Blanks</u>

Table 4-5 shows the analytical results for the trip blank samples. A total of 9 trip blanks were collected and analyzed. Eight of the samples were analyzed only for VOCs. The ninth sample was analyzed for VOCs, semi-volatile organic compounds, TAL dissolved metals, and cyanide. Table 4-5 indicates that methylene chloride was positively identified in three trip blanks taken from IHSSs 180, 204, and 211. Two of the methylene chloride detections were above the CRQL. Methylene chloride is a common laboratory cross-contaminant, and is easily incorporated into a sample erroneously via deposition from air, since methylene chloride is both highly volatile and highly soluble. The maximum concentration of methylene chloride detected in the trip blanks was 14 μg/l.

Several metals were also detected at low concentrations in sample BU00052ER. This sample was the trip blank taken during the hot water rinsate blank sample collection. The only metal detected above the CRQL was cadmium at 17.6 μg/l.

Overall, the trip blank results indicated that cross-contamination did not occur from non-related sources during sampling events. The only significant exception was methylene chloride, which was either introduced from airborne sources before or during sample preparation, or from laboratory cross-contamination during analysis of the trip blanks.

Field Accuracy - Field Blanks (Source Water Samples)

Operation of the hot water sampling equipment utilized on-site tap water as the water source for generating the rinsate for the original samples. Contaminants already present in source water were identified by sampling the source water prior to its use for sampling. Table 4-6 shows the results of the sample analyses of source water samples. In addition, since RFETS has a single domestic water source, additional analytical data on RFETS domestic water obtained from the RFETS Industrial Hygiene department are also presented in Table 4-6.

The results shown in Table 4-6 indicate that several organic and inorganic compounds were present in the source water. Those that exceeded the CRQL in one or more of the source water samples were:

silicon at 3670 μg/l;
cadmium at 10.8 μg/l;
calcium at 8120 μg/l;
iron at 674 μg/l;
sodium at 6250 μg/l;
bromodichloromethane up to 6 μg/l;
chloroform up to 180 μg/l; and
methylene chloride up to 21 μg/l.

The inorganic compounds detected are commonly found in water supplies and are not surprising. The detections of bromodichloromethane, chloroform, and methylene chloride may have been due to their presence in the source water, or cross-contamination during laboratory analysis. Bromodichloromethane and chloroform are more likely to have been present in the source water, whereas methylene chloride is more likely to have been a laboratory cross-contaminant. These organic constituents were not expected at any of the IHSSs, partially due to their volatility and correspondingly short environmental half-lives, but also because they were not listed as being part of the waste materials handled at any of the IHSSs. Therefore, their presence in source water samples did not interfere significantly with the objectives of the sampling effort to characterize IHSS-related contamination.

Field Accuracy - Hot Water Rinsate Blanks

Hot water rinsate blank samples were collected by applying distilled water to a clean glass surface using the hot water rinsate sampling system. Table 4-7 shows the analytical results from these samples.

Table 4-7 shows the presence of DEHP in all three of the hot water rinsate blanks. The DEHP concentrations ranged from 19 μg/l to 28 μg/l. All three of the samples also showed phenol exceeding the calibration range of the analytical instrument. The samples were diluted and reanalyzed and showed phenol ranging from 180 μg/l to 380 μg/l.

The hot water rinsate blanks also showed the presence of several metals; however, only three were detected above the CRQL. These were cadmium at 11.7 μg/l, lead at 5.5 μg/l, and zinc from 103 μg/l to 133 μg/l.

The presence of cadmium, lead, and zinc was probably attributable to their presence in the distilled source water or in the metal components of the sampling system. However, the presence of DEHP and phenol was more clearly linked to leaching of these constituents from the sampling equipment. Therefore, these constituents at concentrations similar to those reported above should be considered artifacts of the sampling procedure.

Laboratory Accuracy

Accuracy of the laboratory data is assessed through the calculation of the percent recoveries from MS samples for inorganic analytes, MS/MSD samples for organic analytes, and any in-house or blind certified standard that the laboratory analyzes as part of the required QA/QC program. Acceptable accuracy for inorganic MS samples is routinely a recovery of 75% to 125%. The percent recoveries for the organic MS/MSD analyses is mandated by analytical methods for the specific spiked compounds. Acceptable accuracy of the in-house standards is a recovery of 80% and 120%. Use of method blanks analyses in the laboratory also assist in analytical accuracy. All these measurements are evaluated during the RFEDS data validation process. When analytical accuracy goals are not achieved, data are normally rejected.

Evaluation of the validation qualifiers cited for data rejection are listed in the Table of Contents. Rejection of data can often be associated with accuracy problems. However, as previously discussed, less than 0.5% of the validated data has been rejected, which suggests that accuracy is not a significant problem with the validated data set.

Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent a characteristic(s) of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is a qualitative parameter that is most concerned with proper network design, sampling locations, and sampling methods.

Representativeness of the sources of contamination in OU15 IHSSs is supported by the extensiveness of the Phase I RFI/RI sampling effort in characterizing the investigation area. Representativeness is considered in project planning and supported by the Work Plan (DOE, 1993), the Quality Assurance Addendum, and associated SOPs. The Work Plan (DOE, 1993) was designed based on the results of the previous investigations and on the DQOs identified. The sampling activities were designed and conducted to define the existing sources of contamination present in OU15. The plans and procedures were reviewed and approved by appropriate technical and agency representatives. As a result, sampling design for the Phase I RFI/RI is assumed to be representative of site conditions.

Comparability

Comparability is used to express the confidence with which one set of data can be compared to another set. Comparability is promoted by using similar sampling and analytical methods, and reporting data in uniform units. To achieve comparability for the Phase I RFI/RI data, all analyses and sampling techniques prescribed in the Work Plan (DOE, 1993) are EPA accepted or equivalent methods. The data are reported in uniform units for each method and media. A demonstration of the comparability of the data is the general consistency in the results between the various sample locations within each IHSS, as well as between different IHSSs.

Completeness

The objective of completeness is that the investigation provides enough planned data such that the objectives of the project are met. Completeness for the Phase I RFI/RI was evaluated by comparing the planned number to the actual number of samples collected and analyzed. The analytical results should be validated and deemed valid or acceptable to be considered in an assessment of completeness. The overall completeness goal for the Phase I RFI/RI was 90%.

As shown on Tables 3-1, 3-2 and 3-3, the Phase I RFI/RI data set was to consist of a specific number of samples for each sample type for each IHSS. Based on a comparison with the actual work completed, the Phase I RFI/RI data exceeded the completeness criteria of 90%.

4.2.3 Statistical Evaluation of Smear Data

Methodology and Results

The pre-rinsate and post-rinsate alpha and beta smear sample data presented in Section 5.2 were statistically evaluated using a Chi Square (χ^2) distribution. The Chi Square statistical method was applied to test the hypothesis that increases in alpha or beta activity in post-rinsate samples are the result of random variation. The theory is tested by initially assuming a theoretical frequency of a specified outcome within a sample population. For OU15, the method was applied by defining the following:

- a sample population consists of smear data for each IHSS;
- alpha and beta data are separate sample populations;
- the smear data are divisible into two categories where in Category 1 the post-rinsate activity is greater than the pre-rinsate data, and where in Category 2 the post-rinsate data is less than or equal to the pre-rinsate data; and
- 50 percent of the sample results will be in Category 1 and 50 percent will be in Category 2 (a theoretical frequency of 50 percent). For IHSS's where the sample population consists of an odd number of sample points, the odd or last sample was placed in Category 2.

The observed values are compared to the theoretical values using the formula:

$$\chi^2 = \frac{(|f_1 - F_1| - 0.5)^2}{F_1} + \frac{(|f_2 - F_2| - 0.5)^2}{15}$$

where:

χ^2	=	Chi Square statistic
f_1	=	observed frequency where post-rinsate samples have higher activities than pre-rinsate samples;
f_2	=	observed frequency where post-rinsate samples have less than or equal to activities than pre-rinsate samples; and
F_1, F_2	=	theoretical frequencies.

The formula includes a correction for continuity to account for the small number of categories. Chi Square values have been tabulated for varying numbers of categories and percent confidence levels (Dixon and Massey, 1983). The calculated Chi Square value for two categories and a 95 percent confidence level is 3.84. Thus, Chi Square values calculated with the observed OU15 data that are greater than 3.84 indicate that the hypothesis is not valid and therefore the change in smear samples results from pre-rinsate to post-rinsate is not attributable to random variation.

The Chi Square statistical results for each IHSS are summarized below. The χ^2 calculation for the IHSS 178 alpha smear data is also provided below as an example.

$$\chi^2 = \frac{[(9-15) - 1/2]^2}{15} + \frac{[(21-15) - 1/2]^2}{15} = 4.04$$

- IHSS 178: χ^2 = 4.04 for alpha data indicating that the theory of random variability is not valid at a 95 percent confidence level. χ^2 = 0.30 for beta data indicating that the theory of random variability is valid at a 95 percent confidence level.

- IHSS 179: χ^2 = 19.21 for alpha data, and 23.04 for beta data indicating that the theory of random variability is not valid at the 95 percent confidence level.

- IHSS 180: χ^2 = 0.51 for alpha data and 0.05 for beta data indicating that the theory of random variability is valid at the 95 percent confidence level.

- IHSS 204: no post-rinsate samples collected.

- IHSS 211: χ^2 = 3.78 for alpha data and 1.54 for beta data indicating that the theory of random variability is valid at the 95 percent confidence level.

- IHSS 217: χ^2 = 0.69 for alpha data and 0.07 for beta data indicating that the theory of random variability is valid at the 95 percent confidence level.

Explanation of Results

Based on the sampling methodology and counting equipment, a certain amount of variability was expected in the smear sampling process. The evaluation of the pre- and post-rinsate sample data for IHSSs 178 and 179 suggests, however, that the increase in alpha activity for both IHSSs and beta activity for IHSS 179 is not attributable to random variability. One factor may have accounted for the increase in smear sample activities for these two IHSSs.

The hot water rinsate sampling system applies a heated, pressurized water stream to the surface being sampled, and then removes the rinsate under a vacuum. This action has a tendency to mobilize surface contamination and entrap it in the rinsate stream, which is the goal of the sampling method. In conjunction, the hot water rinsate sampling process also draws contaminants out of cracks and fissures in the surface. Although much of the removable contamination will be entrained in the rinsate stream, some will remain on the surface being sampled. This effectively can serve to make contaminants more accessible at the surface, thereby resulting in higher post-rinsate sample results. These results are more representative of current surface contamination levels for an IHSS than the pre-rinsate smear samples.

It is important to note that the hot water rinsate sampling equipment itself did not contaminate the surfaces being sampled, but instead was able to mobilize existing contamination and bring it to the surface. Therefore, this sampling methodology accurately reflects cleaning operations with respect to hazardous constituent sampling, and provides a conservative estimate of the amount of contamination which could normally be removed from that surface with respect to radiological constituent sampling.

Table 4-1
Comparison of Proposed to Actual
Hot Water Rinsate QC Sampling Frequency

Sample Type	*Proposed Frequency*	*Actual Frequency*
Duplicates[1]	1/10 or 10%	13/27 or 48%
Field Blanks	One per source	4/4 or 100%
Equipment Rinsate Blanks[2]	1/20 or 5%	10/27 or 37%
Trip Blanks	1/20 or 5%	9/27 or 33%

1/10 = one QC sample per ten samples collected

1 Duplicate samples were to be collected at a minimum of 1/10 or once per day of sampling, whichever was more frequent.

2 Equipment rinsate blanks were to be collected at a minimum of 1/20 or once per day of sampling, whichever was more frequent.

Table 4-2
Duplicate Sample Results and Relative Percent Differences

IHSS	Sample Number	QC Code	QC Partner	Test Group	Result Type	Compound	Result	Units	Error	Qualifier	Detection Limit	Validation Code	RPD
178	BU00011ER	REAL		BNACLP	TRG	BENZOIC ACID	65	UG/L			50	JA	
178	BU00012ER	DUP	BU00011ER	BNACLP	TRG	BENZOIC ACID	79	UG/L			50	JA	-19.4%
178	BU00011ER	REAL		BNACLP	TRG	BIS(2-ETHYLHEXYL)PHTHALATE	140	UG/L			10	JA	
178	BU00012ER	DUP	BU00011ER	BNACLP	TRG	BIS(2-ETHYLHEXYL)PHTHALATE	160	UG/L			10	JA	-13.3%
178	BU00011ER	REAL		BNACLP	TRG	BUTYL BENZYL PHTHALATE	38	UG/L			10	JA	
178	BU00012ER	DUP	BU00011ER	BNACLP	TRG	BUTYL BENZYL PHTHALATE	51	UG/L			10	JA	-29.2%
178	BU00011ER	REAL		BNACLP	TRG	DI-n-BUTYL PHTHALATE	13	UG/L			10	V	
178	BU00012ER	DUP	BU00011ER	BNACLP	TRG	DI-n-BUTYL PHTHALATE	17	UG/L			10	V	-26.7%
178	BU00011ER	REAL		BNACLP	TRG	PHENOL	45	UG/L			10	V	
178	BU00012ER	DUP	BU00011ER	BNACLP	TRG	PHENOL	65	UG/L			10	V	-36.4%
178	BU00011ER	REAL		DRADS	TRG	GROSS ALPHA	7.9	PCI/L	1.2		0.82	V	
178	BU00012ER	DUP	BU00011ER	DRADS	TRG	GROSS ALPHA	8.7	PCI/L	1.3		0.69	V	-9.6%
178	BU00011ER	REAL		DRADS	TRG	GROSS BETA	11	PCI/L	4.0		5.5	V	
178	BU00012ER	DUP	BU00011ER	DRADS	TRG	GROSS BETA	17	PCI/L	4.1		5.1	V	-42.9%
178	BU00011ER	REAL		DRADS	TRG	PLUTONIUM-239/240	.023	PCI/L	0.012	B	0.009	V	
178	BU00012ER	DUP	BU00011ER	DRADS	TRG	PLUTONIUM-239/240	.024	PCI/L	0.012	B	0.007	V	-4.3%
178	BU00011ER	REAL		DRADS	TRG	URANIUM-233,-234	9.3	PCI/L	1.7	B	0.11	A	
178	BU00012ER	DUP	BU00011ER	DRADS	TRG	URANIUM-233,-234	9.6	PCI/L	1.8	B	0.037	A	-3.2%
178	BU00011ER	REAL		DRADS	TRG	URANIUM-238	1	PCI/L	0.44	B	0.061	A	
178	BU00012ER	DUP	BU00011ER	DRADS	TRG	URANIUM-238	1.2	PCI/L	0.50	B	0.063	A	-18.2%
178	BU00058ER	REAL		BNACLP	TRG	BUTYL BENZYL PHTHALATE	39	UG/L			10.0000	V	
178	BU00059ER	DUP	BU00058ER	BNACLP	TRG	BUTYL BENZYL PHTHALATE	18	UG/L			10.0000	V	73.7%
178	BU00058ER	REAL		BNACLP	TRG	PHENOL	120	UG/L			10.0000	V	
178	BU00059ER	DUP	BU00058ER	BNACLP	TRG	PHENOL	140	UG/L			10.0000	V	-15.4%
179	BU00033ER	REAL		BNACLP	DL1	BIS(2-ETHYLHEXYL)PHTHALATE	720	UG/L		D	10	V	
179	BU00034ER	DUP	BU00033ER	BNACLP	DL1	BIS(2-ETHYLHEXYL)PHTHALATE	670	UG/L		D	10	V	7.2%

Table 4-2
Duplicate Sample Results and Relative Percent Differences

IHSS	Sample Number	QC Code	QC Partner	Test Group	Result Type	Compound	Result	Units	Error	Qualifier	Detection Limit	Validation Code	RPD
179	BU00033ER	REAL		BNACLP	TRG	DI-n-OCTYL PHTHALATE	30	UG/L			10	V	
179	BU00034ER	DUP	BU00033ER	BNACLP	TRG	DI-n-OCTYL PHTHALATE	29	UG/L			10	V	3.4%
179	BU00033ER	REAL		BNACLP	TRG	PHENOL	78	UG/L			10	V	
179	BU00034ER	DUP	BU00033ER	BNACLP	TRG	PHENOL	95	UG/L			10	V	-19.7%
179	BU00033ER	REAL		DRADS	TRG	GROSS ALPHA	18	PCI/L	1.3		0.51	V	
179	BU00034ER	DUP	BU00033ER	DRADS	TRG	GROSS ALPHA	17	PCI/L	1.2		0.56	V	5.7%
179	BU00033ER	REAL		DRADS	TRG	GROSS BETA	27	PCI/L	2.8		2.5	V	
179	BU00034ER	DUP	BU00033ER	DRADS	TRG	GROSS BETA	25	PCI/L	2.7		2.3	V	7.7%
179	BU00033ER	REAL		DRADS	TRG	RADIUM-226	.86	PCI/L	0.050	B	0.040	A	
179	BU00034ER	DUP	BU00033ER	DRADS	TRG	RADIUM-226	.66	PCI/L	0.050	B	0.070	A	26.3%
179	BU00033ER	REAL		DRADS	TRG	URANIUM-233,-234	3.0	PCI/L	0.79	B	0.12	A	
179	BU00034ER	DUP	BU00033ER	DRADS	TRG	URANIUM-233,-234	3.3	PCI/L	0.94	B	0.13	A	-9.5%
179	BU00033ER	REAL		DRADS	TRG	URANIUM-238	19	PCI/L	2.9	B	0.062	A	
179	BU00034ER	DUP	BU00033ER	DRADS	TRG	URANIUM-238	16	PCI/L	2.8	B	0.15	A	17.1%
179	BU00062ER	REAL		BNACLP	TRG	PHENOL	81	UG/L			10.0000	V	
179	BU00063ER	DUP	BU00062ER	BNACLP	TRG	PHENOL	84	UG/L			10.0000	V	-3.6%
180	BU00023ER	REAL		BNACLP	TRG	BIS(2-ETHYLHEXYL)PHTHALATE	150	UG/L			10	V	
180	BU00024ER	DUP	BU00023ER	BNACLP	DL1	BIS(2-ETHYLHEXYL)PHTHALATE	230	UG/L		D	10	V	-42.1%
180	BU00023ER	REAL		BNACLP	TRG	PHENOL	47	UG/L			10	V	
180	BU00024ER	DUP	BU00023ER	BNACLP	TRG	PHENOL	47	UG/L			10	V	0.0%
180	BU00023ER	REAL		DRADS	TRG	GROSS ALPHA	50	PCI/L	1.9		0.34	V	
180	BU00024ER	DUP	BU00023ER	DRADS	TRG	GROSS ALPHA	50	PCI/L	1.9		0.42	V	0.0%
180	BU00023ER	REAL		DRADS	TRG	GROSS BETA	55	PCI/L	3.7		2.6	V	
180	BU00024ER	DUP	BU00023ER	DRADS	TRG	GROSS BETA	68	PCI/L	4.0		2.5	V	-21.1%
180	BU00023ER	REAL		DRADS	TRG	RADIUM-226	.57	PCI/L	0.080	B	0.11	A	
180	BU00024ER	DUP	BU00023ER	DRADS	TRG	RADIUM-226	.28	PCI/L	0.080	BJ	0.12	A	68.2%

Table 4-2
Duplicate Sample Results and Relative Percent Differences

IHSS	Sample Number	QC Code	QC Partner	Test Group	Result Type	Compound	Result	Units	Error	Qualifier	Detection Limit	Validation Code	RPD
180	BU00023ER	REAL		DRADS	TRG	URANIUM-233,-234	12	PCI/L	1.9	B	0.056	A	
180	BU00024ER	DUP	BU00023ER	DRADS	TRG	URANIUM-233,-234	11	PCI/L	2.2	B	0.13	A	8.7%
180	BU00023ER	REAL		DRADS	TRG	URANIUM-238	58	PCI/L	7.3	B	0.031	A	
180	BU00024ER	DUP	BU00023ER	DRADS	TRG	URANIUM-238	67	PCI/L	9.5	B	0.076	A	-14.4%
180	BU00023ER	REAL		VOACLP	TRG	METHYLENE CHLORIDE	27	UG/L			5	V	
180	BU00024ER	DUP	BU00023ER	VOACLP	TRG	METHYLENE CHLORIDE	21	UG/L			5	V	25.0%
180	BU00027ER	REAL		BNACLP	DL1	BIS(2-ETHYLHEXYL)PHTHALATE	520	UG/L		D	10	V	
180	BU00028ER	DUP	BU00027ER	BNACLP	DL1	BIS(2-ETHYLHEXYL)PHTHALATE	520	UG/L		D	10	V	0.0%
180	BU00027ER	REAL		BNACLP	TRG	DI-n-BUTYL PHTHALATE	44	UG/L			10	V	
180	BU00028ER	DUP	BU00027ER	BNACLP	TRG	DI-n-BUTYL PHTHALATE	41	UG/L			10	V	7.1%
180	BU00027ER	REAL		BNACLP	TRG	DI-n-OCTYL PHTHALATE	23	UG/L			10	V	
180	BU00028ER	DUP	BU00027ER	BNACLP	TRG	DI-n-OCTYL PHTHALATE	22	UG/L			10	V	4.4%
180	BU00027ER	REAL		BNACLP	TRG	PHENOL	47	UG/L			10	V	
180	BU00028ER	DUP	BU00027ER	BNACLP	TRG	PHENOL	40	UG/L			10	V	16.1%
180	BU00027ER	REAL		DRADS	TRG	GROSS ALPHA	150	PCI/L	3.5		0.41	V	
180	BU00028ER	DUP	BU00027ER	DRADS	TRG	GROSS ALPHA	190	PCI/L	4.0		0.36	V	-23.5%
180	BU00027ER	REAL		DRADS	TRG	GROSS BETA	180	PCI/L	6.4		3.0	V	
180	BU00028ER	DUP	BU00027ER	DRADS	TRG	GROSS BETA	180	PCI/L	6.3		2.8	V	0.0%
180	BU00027ER	REAL		DRADS	TRG	URANIUM-233,-234	37	PCI/L	5.3	B	0.14	A	
180	BU00028ER	DUP	BU00027ER	DRADS	TRG	URANIUM-233,-234	40	PCI/L	5.9	B	0.075	A	-7.8%
180	BU00027ER	REAL		DRADS	TRG	URANIUM-235	4.4	PCI/L	1.1		0.12	A	
180	BU00028ER	DUP	BU00027ER	DRADS	TRG	URANIUM-235	4.5	PCI/L	1.1	B	0.042	A	-2.2%
180	BU00027ER	REAL		DRADS	TRG	URANIUM-238	220	PCI/L	28	B	0.15	A	
180	BU00028ER	DUP	BU00027ER	DRADS	TRG	URANIUM-238	250	PCI/L	33	B	0.042	A	-12.8%
180	BU00065ER	REAL		BNACLP	TRG	BIS(2-ETHYLHEXYL)PHTHALATE	280	UG/L			10.0000	V	
180	BU00066ER	DUP	BU00065ER	BNACLP	DIL	BIS(2-ETHYLHEXYL)PHTHALATE	690	UG/L		D	10.0000	V	-84.5%

Table 4-2
Duplicate Sample Results and Relative Percent Differences

IHSS	Sample Number	QC Code	QC Partner	Test Group	Result Type	Compound	Result	Units	Error	Qualifier	Detection Limit	Validation Code	RPD
180	BU00065ER	REAL		BNACLP	TRG	PHENOL	15	UG/L			10.0000	V	
180	BU00066ER	DUP	BU00065ER	BNACLP	TRG	PHENOL	31	UG/L			10.0000	V	-69.6%
204	BU00040ER	REAL		DRADS	TRG	GROSS ALPHA	150	PCI/L	8.0		1	V	
204	BU00041ER	DUP	BU00040ER	DRADS	TRG	GROSS ALPHA	140	PCI/L	7.7		1	V	6.9%
204	BU00040ER	REAL		DRADS	TRG	GROSS BETA	72	PCI/L	3.6		2	A	
204	BU00041ER	DUP	BU00040ER	DRADS	TRG	GROSS BETA	78	PCI/L	3.8		2	A	-8.0%
204	BU00040ER	REAL		DRADS	TRG	URANIUM-233,-234	24	PCI/L	2.9		0.5	V	
204	BU00041ER	DUP	BU00040ER	DRADS	TRG	URANIUM-233,-234	26	PCI/L	3.1		0.6	V	-8.0%
204	BU00040ER	REAL		DRADS	TRG	URANIUM-235	3.5	PCI/L	0.77		0.2	V	
204	BU00041ER	DUP	BU00040ER	DRADS	TRG	URANIUM-235	5.3	PCI/L	0.96		0.2	V	-40.9%
204	BU00040ER	REAL		DRADS	TRG	URANIUM-238	180	PCI/L	19		0.5	V	
204	BU00041ER	DUP	BU00040ER	DRADS	TRG	URANIUM-238	200	PCI/L	20		0.5	V	-10.5%
204	BU00047ER	REAL		BNACLP	DIL	BIS(2-ETHYLHEXYL)PHTHALATE	780	UG/L		D	10	V	
204	BU00048ER	DUP	BU00047ER	BNACLP	DIL	BIS(2-ETHYLHEXYL)PHTHALATE	790	UG/L		D	10	V	-1.3%
204	BU00047ER	REAL		DRADS	TRG	GROSS ALPHA	160	PCI/L	9.8		2	V	
204	BU00048ER	DUP	BU00047ER	DRADS	TRG	GROSS ALPHA	180	PCI/L	11		3	V	-11.8%
204	BU00047ER	REAL		DRADS	TRG	GROSS BETA	45	PCI/L	3.1		2	A	
204	BU00048ER	DUP	BU00047ER	DRADS	TRG	GROSS BETA	63	PCI/L	3.5		2	A	-33.3%
204	BU00047ER	REAL		DRADS	TRG	URANIUM-233,-234	29	PCI/L	3.2		0.5	V	
204	BU00048ER	DUP	BU00047ER	DRADS	TRG	URANIUM-233,-234	27	PCI/L	3.2		0.5	A	7.1%
204	BU00047ER	REAL		DRADS	TRG	URANIUM-235	4.4	PCI/L	0.79		0.2	V	
204	BU00048ER	DUP	BU00047ER	DRADS	TRG	URANIUM-235	4.3	PCI/L	0.80		0.2	A	2.3%
204	BU00047ER	REAL		DRADS	TRG	URANIUM-238	210	PCI/L	20		0.5	V	
204	BU00048ER	DUP	BU00047ER	DRADS	TRG	URANIUM-238	210	PCI/L	21	B	0.5	A	0.0%
211	BU00002ER	REAL		BNACLP	TRG	2-METHYLPHENOL	110	UG/L			10	V	
211	BU00003ER	DUP	BU00002ER	BNACLP	TRG	2-METHYLPHENOL	120	UG/L			10	V	-8.7%

Table 4-2
Duplicate Sample Results and Relative Percent Differences

IHSS	Sample Number	QC Code	QC Partner	Test Group	Result Type	Compound	Result	Units	Error	Qualifier	Detection Limit	Validation Code	RPD
211	BU00002ER	REAL		BNACLP	DL1	BENZOIC ACID	250	UG/L		D	50	V	
211	BU00003ER	DUP	BU00002ER	BNACLP	DL1	BENZOIC ACID	240	UG/L		D	50	V	4.1%
211	BU00002ER	REAL		BNACLP	TRG	BENZYL ALCOHOL	10	UG/L			10	V	
211	BU00003ER	DUP	BU00002ER	BNACLP	TRG	BENZYL ALCOHOL	11	UG/L			10	V	-9.5%
211	BU00002ER	REAL		BNACLP	TRG	BUTYL BENZYL PHTHALATE	54	UG/L			10	JA	
211	BU00003ER	DUP	BU00002ER	BNACLP	TRG	BUTYL BENZYL PHTHALATE	75	UG/L			10	JA	-32.6%
211	BU00002ER	REAL		BNACLP	DL1	PHENOL	150	UG/L		D	10	V	
211	BU00003ER	DUP	BU00002ER	BNACLP	DL1	PHENOL	170	UG/L		D	10	V	-12.5%
211	BU00002ER	REAL		DMETADD	TRG	SILICON	9250	UG/L			100	JA	
211	BU00003ER	DUP	BU00002ER	DMETADD	TRG	SILICON	8510	UG/L			100	JA	8.3%
211	BU00002ER	REAL		DRADS	TRG	GROSS ALPHA	7.1	PCI/L	0.93		0.61	V	
211	BU00003ER	DUP	BU00002ER	DRADS	TRG	GROSS ALPHA	7.4	PCI/L	1.0		0.65	V	-4.1%
211	BU00002ER	REAL		DRADS	TRG	GROSS BETA	19	PCI/L	2.5		2.6	V	
211	BU00003ER	DUP	BU00002ER	DRADS	TRG	GROSS BETA	16	PCI/L	2.4		2.6	V	17.1%
211	BU00002ER	REAL		DSMETCLP	TRG	CALCIUM	37400	UG/L			5000	JA	
211	BU00003ER	DUP	BU00002ER	DSMETCLP	TRG	CALCIUM	39400	UG/L			5000	JA	-5.2%
211	BU00002ER	REAL		DSMETCLP	TRG	COPPER	34.4	UG/L			25	V	
211	BU00003ER	DUP	BU00002ER	DSMETCLP	TRG	COPPER	30.1	UG/L			25	V	13.3%
211	BU00002ER	REAL		DSMETCLP	TRG	LEAD	9.1	UG/L			5	V	
211	BU00003ER	DUP	BU00002ER	DSMETCLP	TRG	LEAD	4.4	UG/L			5	V	69.6%
211	BU00002ER	REAL		DSMETCLP	TRG	POTASSIUM	25600	UG/L			5000	V	
211	BU00003ER	DUP	BU00002ER	DSMETCLP	TRG	POTASSIUM	24400	UG/L			5000	V	4.8%
211	BU00002ER	REAL		DSMETCLP	TRG	SODIUM	53900	UG/L			5000	JA	
211	BU00003ER	DUP	BU00002ER	DSMETCLP	TRG	SODIUM	53700	UG/L			5000	JA	0.4%
211	BU00002ER	REAL		DSMETCLP	TRG	ZINC	40.5	UG/L			20	V	
211	BU00003ER	DUP	BU00002ER	DSMETCLP	TRG	ZINC	32.3	UG/L			20	V	22.5%

Table 4-2
Duplicate Sample Results and Relative Percent Differences

IHSS	Sample Number	QC Code	QC Partner	Test Group	Result Type	Compound	Result	Units	Error	Qualifier	Detection Limit	Validation Code	RPD
211	BU00002ER	REAL		VOACLP	TRG	TOTAL XYLENES	9	UG/L			5	V	
211	BU00003ER	DUP	BU00002ER	VOACLP	TRG	TOTAL XYLENES	18	UG/L			5	V	-66.7%
211	BU00008ER	REAL		BNACLP	DL1	BUTYL BENZYL PHTHALATE	77	UG/L		D	10	JA	
211	BU00009ER	DUP	BU00008ER	BNACLP	DL1	BUTYL BENZYL PHTHALATE	130	UG/L		D	10	JA	-51.2%
211	BU00008ER	REAL		BNACLP	TRG	DI-n-BUTYL PHTHALATE	34	UG/L			10	V	
211	BU00009ER	DUP	BU00008ER	BNACLP	TRG	DI-n-BUTYL PHTHALATE	29	UG/L			10	V	15.9%
211	BU00008ER	REAL		BNACLP	TRG	DI-n-OCTYL PHTHALATE	24	UG/L			10	V	
211	BU00009ER	DUP	BU00008ER	BNACLP	TRG	DI-n-OCTYL PHTHALATE	18	UG/L			10	V	28.6%
211	BU00008ER	REAL		BNACLP	TRG	PHENOL	67	UG/L			10	V	
211	BU00009ER	DUP	BU00008ER	BNACLP	TRG	PHENOL	41	UG/L			10	V	48.1%
211	BU00008ER	REAL		DMETADD	TRG	SILICON	5110	UG/L			100	JA	
211	BU00009ER	DUP	BU00008ER	DMETADD	TRG	SILICON	4760	UG/L			100	JA	7.1%
211	BU00008ER	REAL		DRADS	TRG	GROSS ALPHA	4.8	PCI/L	1.4		1.4	V	
211	BU00009ER	DUP	BU00008ER	DRADS	TRG	GROSS ALPHA	2.4	PCI/L	0.54		0.54	V	66.7%
211	BU00008ER	REAL		DRADS	TRG	GROSS BETA	6.7	PCI/L	2.2		3.0	V	
211	BU00009ER	DUP	BU00008ER	DRADS	TRG	GROSS BETA	8.9	PCI/L	2.1		2.6	V	-28.2%
211	BU00008ER	REAL		DRADS	TRG	PLUTONIUM-239/240	.02	PCI/L	0.008	B	0.001	A	
211	BU00009ER	DUP	BU00008ER	DRADS	TRG	PLUTONIUM-239/240	.013	PCI/L	0.006	B	0.003	A	42.4%
211	BU00008ER	REAL		DRADS	TRG	URANIUM-233,-234	1.5	PCI/L	0.66		0.14	A	
211	BU00009ER	DUP	BU00008ER	DRADS	TRG	URANIUM-233,-234	1.3	PCI/L	0.56		0.14	A	14.3%
211	BU00008ER	REAL		DSMETCLP	TRG	CALCIUM	13600	UG/L			5000	JA	
211	BU00009ER	DUP	BU00008ER	DSMETCLP	TRG	CALCIUM	13400	UG/L			5000	JA	1.5%
211	BU00008ER	REAL		DSMETCLP	TRG	COPPER	43.7	UG/L			25	V	
211	BU00009ER	DUP	BU00008ER	DSMETCLP	TRG	COPPER	39.7	UG/L			25	V	9.6%
211	BU00008ER	REAL		DSMETCLP	TRG	IRON	323	UG/L			100	JA	
211	BU00009ER	DUP	BU00008ER	DSMETCLP	TRG	IRON	178	UG/L			100	JA	57.9%

Table 4-2
Duplicate Sample Results and Relative Percent Differences

IHSS	Sample Number	QC Code	QC Partner	Test Group	Result Type	Compound	Result	Units	Error	Qualifier	Detection Limit	Validation Code	RPD
211	BU00008ER	REAL		DSMETCLP	TRG	LEAD	7.5	UG/L			5	V	
211	BU00009ER	DUP	BU00008ER	DSMETCLP	TRG	LEAD	6.8	UG/L			5	V	9.8%
211	BU00008ER	REAL		DSMETCLP	TRG	POTASSIUM	15300	UG/L			5000	V	
211	BU00009ER	DUP	BU00008ER	DSMETCLP	TRG	POTASSIUM	16500	UG/L			5000	V	-7.5%
211	BU00008ER	REAL		DSMETCLP	TRG	SODIUM	28800	UG/L			5000	JA	
211	BU00009ER	DUP	BU00008ER	DSMETCLP	TRG	SODIUM	28800	UG/L			5000	JA	0.0%
211	BU00008ER	REAL		DSMETCLP	TRG	ZINC	91.8	UG/L			20	V	
211	BU00009ER	DUP	BU00008ER	DSMETCLP	TRG	ZINC	74.6	UG/L			20	V	20.7%
217	BU00017ER	REAL		BNACLP	TRG	BIS(2-ETHYLHEXYL)PHTHALATE	53	UG/L			10	JA	
217	BU00018ER	DUP	BU00017ER	BNACLP	TRG	BIS(2-ETHYLHEXYL)PHTHALATE	53	UG/L			10	JA	0.0%
217	BU00017ER	REAL		BNACLP	TRG	BUTYL BENZYL PHTHALATE	21	UG/L			10	JA	
217	BU00018ER	DUP	BU00017ER	BNACLP	TRG	BUTYL BENZYL PHTHALATE	23	UG/L			10	JA	-9.1%
217	BU00017ER	REAL		BNACLP	TRG	PHENOL	18	UG/L			10	V	
217	BU00018ER	DUP	BU00017ER	BNACLP	TRG	PHENOL	18	UG/L			10	V	0.0%
217	BU00017ER	REAL		DMETADD	TRG	LITHIUM	256	UG/L			100	V	
217	BU00018ER	DUP	BU00017ER	DMETADD	TRG	LITHIUM	247	UG/L			100	V	3.6%
217	BU00017ER	REAL		DMETADD	TRG	SILICON	3630	UG/L			100	JA	
217	BU00018ER	DUP	BU00017ER	DMETADD	TRG	SILICON	3690	UG/L			100	JA	-1.6%
217	BU00017ER	REAL		DRADS	TRG	AMERICIUM-241	0.21	PCI/L	0.032		0.004	V	
217	BU00018ER	DUP	BU00017ER	DRADS	TRG	AMERICIUM-241	0.22	PCI/L	0.038		0.005	V	-4.7%
217	BU00017ER	REAL		DRADS	TRG	GROSS ALPHA	30	PCI/L	1.7		0.40	V	
217	BU00018ER	DUP	BU00017ER	DRADS	TRG	GROSS ALPHA	41	PCI/L	2.1		0.61	V	-31.0%
217	BU00017ER	REAL		DRADS	TRG	GROSS BETA	20	PCI/L	2.6		2.6	V	
217	BU00018ER	DUP	BU00017ER	DRADS	TRG	GROSS BETA	26	PCI/L	2.8		2.7	V	-26.1%
217	BU00017ER	REAL		DRADS	TRG	PLUTONIUM-239/240	0.037	PCI/L	0.014		0.002	V	
217	BU00018ER	DUP	BU00017ER	DRADS	TRG	PLUTONIUM-239/240	0.042	PCI/L	0.012		0.005	V	-12.7%

Table 4-2
Duplicate Sample Results and Relative Percent Differences

IHSS	Sample Number	QC Code	QC Partner	Test Group	Result Type	Compound	Result	Units	Error	Qualifier	Detection Limit	Validation Code	RPD
217	BU00017ER	REAL		DRADS	TRG	URANIUM-233,-234	22	PCI/L	3.3		0.13	V	
217	BU00018ER	DUP	BU00017ER	DRADS	TRG	URANIUM-233,-234	27	PCI/L	3.9		0.091	V	-20.4%
217	BU00017ER	REAL		DRADS	TRG	URANIUM-235	0.91	PCI/L	0.43		0.064	V	
217	BU00018ER	DUP	BU00017ER	DRADS	TRG	URANIUM-235	0.90	PCI/L	0.40		0.091	V	1.1%
217	BU00017ER	REAL		DRADS	TRG	URANIUM-238	15	PCI/L	2.5		0.064	V	
217	BU00018ER	DUP	BU00017ER	DRADS	TRG	URANIUM-238	17	PCI/L	2.7		0.091	V	-12.5%
217	BU00017ER	REAL		DSMETCLP	TRG	BERYLLIUM	7.2	UG/L			5	JA	
217	BU00018ER	DUP	BU00017ER	DSMETCLP	TRG	BERYLLIUM	7.4	UG/L			5	JA	-2.7%
217	BU00017ER	REAL		DSMETCLP	TRG	CADMIUM	75.8	UG/L			5	JA	
217	BU00018ER	DUP	BU00017ER	DSMETCLP	TRG	CADMIUM	73.5	UG/L			5	JA	3.1%
217	BU00017ER	REAL		DSMETCLP	TRG	CALCIUM	42300	UG/L			5000	JA	
217	BU00018ER	DUP	BU00017ER	DSMETCLP	TRG	CALCIUM	42700	UG/L			5000	JA	-0.9%
217	BU00017ER	REAL		DSMETCLP	TRG	CHROMIUM	37.5	UG/L			10	V	
217	BU00018ER	DUP	BU00017ER	DSMETCLP	TRG	CHROMIUM	36.9	UG/L			10	V	1.6%
217	BU00017ER	REAL		DSMETCLP	TRG	COBALT	72.2	UG/L			50	V	
217	BU00018ER	DUP	BU00017ER	DSMETCLP	TRG	COBALT	67.9	UG/L			50	V	6.1%
217	BU00017ER	REAL		DSMETCLP	TRG	COPPER	281	UG/L			25	V	
217	BU00018ER	DUP	BU00017ER	DSMETCLP	TRG	COPPER	287	UG/L			25	V	-2.1%
217	BU00017ER	REAL		DSMETCLP	TRG	IRON	143	UG/L			100	JA	
217	BU00018ER	DUP	BU00017ER	DSMETCLP	TRG	IRON	131	UG/L			100	JA	8.8%
217	BU00017ER	REAL		DSMETCLP	TRG	MAGNESIUM	14000	UG/L			5000	JA	
217	BU00018ER	DUP	BU00017ER	DSMETCLP	TRG	MAGNESIUM	14200	UG/L			5000	JA	-1.4%
217	BU00017ER	REAL		DSMETCLP	TRG	MANGANESE	1200	UG/L			15	V	
217	BU00018ER	DUP	BU00017ER	DSMETCLP	TRG	MANGANESE	1200	UG/L			15	V	0.0%
217	BU00017ER	REAL		DSMETCLP	TRG	MERCURY	1.6	UG/L			.2	V	
217	BU00018ER	DUP	BU00017ER	DSMETCLP	TRG	MERCURY	1.7	UG/L			.2	V	-6.1%

Table 4-2
Duplicate Sample Results and Relative Percent Differences

IHSS	Sample Number	QC Code	QC Partner	Test Group	Result Type	Compound	Result	Units	Error	Qualifier	Detection Limit	Validation Code	RPD
217	BU00017ER	REAL		DSMETCLP	TRG	NICKEL	5630	UG/L			40	V	
217	BU00018ER	DUP	BU00017ER	DSMETCLP	TRG	NICKEL	5670	UG/L			40	V	-0.7%
217	BU00017ER	REAL		DSMETCLP	TRG	POTASSIUM	5270	UG/L			5000	V	
217	BU00018ER	DUP	BU00017ER	DSMETCLP	TRG	POTASSIUM	5140	UG/L			5000	V	2.5%
217	BU00017ER	REAL		DSMETCLP	TRG	SILVER	22.1	UG/L			10	V	
217	BU00018ER	DUP	BU00017ER	DSMETCLP	TRG	SILVER	21.3	UG/L			10	V	3.7%
217	BU00017ER	REAL		DSMETCLP	TRG	SODIUM	17400	UG/L			5000	JA	
217	BU00018ER	DUP	BU00017ER	DSMETCLP	TRG	SODIUM	16600	UG/L			5000	JA	4.7%
217	BU00017ER	REAL		DSMETCLP	TRG	ZINC	986	UG/L			20	V	
217	BU00018ER	DUP	BU00017ER	DSMETCLP	TRG	ZINC	1020	UG/L			20	V	-3.4%
217	BU00017ER	REAL		VOACLP	TRG	4-METHYL-2-PENTANONE	26	UG/L			10	V	
217	BU00018ER	DUP	BU00017ER	VOACLP	TRG	4-METHYL-2-PENTANONE	28	UG/L			10	V	-7.4%
217	BU00017ER	REAL		VOACLP	TRG	CHLOROFORM	5	UG/L			5	V	
217	BU00018ER	DUP	BU00017ER	VOACLP	TRG	CHLOROFORM	5	UG/L			5	V	0.0%
217	BU00017ER	REAL		VOACLP	TRG	TOTAL XYLENES	11	UG/L			5	V	
217	BU00018ER	DUP	BU00017ER	VOACLP	TRG	TOTAL XYLENES	11	UG/L			5	V	0.0%
217	BU00017ER	REAL		WQPL	TRG	CYANIDE	142	UG/L			5	JA	
217	BU00018ER	DUP	BU00017ER	WQPL	TRG	CYANIDE	171	UG/L			5	JA	-18.5%

Table 4-3
Summary of Relative Percent Difference Values

RPD Value Range[1]	*No. of Duplicate Pairs*	*Percent of Values in Range*	*Cumulative Percent*
0 - 10%	64	56.6%	56.6%
10 - 20%	19	16.8%	73.4%
20 - 30%	12	10.6%	84.0%
30 - 50%	9	8.0%	92.0%
50 - 100%	9	8.0%	100.0%
> 100%	0	0.0%	100.0%
Total	113	100.0%	100.0%

1 These ranges are established based on the absolute value (i.e., the magnitude of the result without regard to its sign) of the RPD values presented in Table 4-2.

Table 4-4
Equipment Rinsate Blank Sample Results

IHSS	Sample Number	QC Partner	Sample Date	Test Group	Compound	Result	Units	Error	Qualifier	Detection Limit	Validation Code
178	BU00013ER		16-Aug-93	DRADS	PLUTONIUM-239/240	.011	PCI/L	0.010	B	0.003	V
178	BU00013ER		16-Aug-93	DRADS	URANIUM-233,-234	.65	PCI/L	0.35	B	0.061	A
178	BU00013ER		16-Aug-93	DRADS	URANIUM-238	.7	PCI/L	0.36	B	0.036	A
178	BU00013ER		16-Aug-93	VOACLP	TOTAL XYLENES	2	UG/L		J	5	A
178	BU00060ER	BU00058ER	1-Jun-94	BNACLP	PHENOL	3	UG/L		J	10	A
179	BU00035ER	BU00033ER	15-Sep-93	DRADS	GROSS ALPHA	0.58	PCI/L	0.26	J	0.28	V
179	BU00035ER	BU00033ER	15-Sep-93	DRADS	PLUTONIUM-239/240	0.002	PCI/L	0.002	J	0.001	V
179	BU00035ER	BU00033ER	15-Sep-93	DRADS	URANIUM-233,-234	0.65	PCI/L	0.42	B	0.054	A
179	BU00035ER	BU00033ER	15-Sep-93	DRADS	URANIUM-235	0.065	PCI/L	0.13	BJ	0.054	A
179	BU00035ER	BU00033ER	15-Sep-93	DRADS	URANIUM-238	0.98	PCI/L	0.53	B	0.054	A
180	BU00025ER	BU00023ER	01-Sep-93	DRADS	AMERICIUM-241	0.008	PCI/L	0.008	J	0.003	V
180	BU00025ER	BU00023ER	01-Sep-93	DRADS	URANIUM-233,-234	0.67	PCI/L	0.35	B	0.035	A
180	BU00025ER	BU00023ER	01-Sep-93	DRADS	URANIUM-238	1.3	PCI/L	0.50	B	0.035	A
180	BU00025ER	BU00023ER	01-Sep-93	VOACLP	METHYLENE CHLORIDE	5	UG/L			5	V
180	BU00029ER	BU00027ER	02-Sep-93	DRADS	AMERICIUM-241	0.003	PCI/L	0.004	J	0.001	V
180	BU00029ER	BU00027ER	02-Sep-93	DRADS	GROSS ALPHA	4.4	PCI/L	0.61		0.51	V
180	BU00029ER	BU00027ER	02-Sep-93	DRADS	GROSS BETA	7.5	PCI/L	2.0		2.5	V
180	BU00029ER	BU00027ER	02-Sep-93	DRADS	URANIUM-233,-234	1.6	PCI/L	0.57	B	0.11	A
180	BU00029ER	BU00027ER	02-Sep-93	DRADS	URANIUM-235	0.084	PCI/L	0.13	J	0.067	A
180	BU00029ER	BU00027ER	02-Sep-93	DRADS	URANIUM-238	3.2	PCI/L	0.85	B	0.067	A
204	BU00042ER	BU00040ER	11-Oct-93	BNACLP	BIS(2-ETHYLHEXYL)PHTHALATE	16	UG/L			10	V
204	BU00042ER	BU00040ER	11-Oct-93	DRADS	GROSS ALPHA	6.0	PCI/L	1.8		1	V
204	BU00042ER	BU00040ER	11-Oct-93	DRADS	GROSS BETA	2.7	PCI/L	1.3	J	2	V
204	BU00042ER	BU00040ER	11-Oct-93	DRADS	URANIUM-233,-234	0.99	PCI/L	0.35		0.2	V
204	BU00042ER	BU00040ER	11-Oct-93	DRADS	URANIUM-238	6.2	PCI/L	1.1		0.2	V
204	BU00049ER	BU00047ER	09-Nov-93	BNACLP	BIS(2-ETHYLHEXYL)PHTHALATE	5	UG/L		J	10	A
204	BU00049ER	BU00047ER	09-Nov-93	DRADS	URANIUM-238	0.68	PCI/L	0.29		0.2	V

Table 4-4
Equipment Rinsate Blank Sample Results

IHSS	*Sample Number*	*QC Partner*	*Sample Date*	*Test Group*	*Compound*	*Result*	*Units*	*Error*	*Qualifier*	*Detection Limit*	*Validation Code*
211	BU00004ER		09-Aug-93	DMETADD	SILICON	223	UG/L			100	JA
211	BU00004ER		09-Aug-93	DMETADD	STRONTIUM	4.5	UG/L		B	200	V
211	BU00004ER		09-Aug-93	DRADS	AMERICIUM-241	.009	PCI/L	0.006	BJ	0.002	V
211	BU00004ER		09-Aug-93	DSMETCLP	CALCIUM	1140	UG/L		B	5000	JA
211	BU00004ER		09-Aug-93	DSMETCLP	SODIUM	272	UG/L		B	5000	JA
211	BU00004ER		09-Aug-93	DSMETCLP	ZINC	2	UG/L		B	20	V
211	BU00004ER		09-Aug-93	VOACLP	METHYLENE CHLORIDE	4	UG/L		J	5	A
211	BU00007ER		11-Aug-93	DMETADD	CESIUM	43	UG/L		B	1000	JA
211	BU00007ER		11-Aug-93	DMETADD	SILICON	70.4	UG/L		B	100	JA
211	BU00007ER		11-Aug-93	DMETADD	STRONTIUM	2.6	UG/L		B	200	V
211	BU00007ER		11-Aug-93	DRADS	AMERICIUM-241	.004	PCI/L	0.004	BJ	0.001	V
211	BU00007ER		11-Aug-93	DRADS	URANIUM-233,-234	.051	PCI/L	0.10	BJ	0.042	A
211	BU00007ER		11-Aug-93	DSMETCLP	CADMIUM	6.4	UG/L			5	JA
211	BU00007ER		11-Aug-93	DSMETCLP	CALCIUM	652	UG/L		B	5000	JA
211	BU00007ER		11-Aug-93	DSMETCLP	SODIUM	264	UG/L		B	5000	JA
211	BU00007ER		11-Aug-93	DSMETCLP	ZINC	6.4	UG/L		B	20	V
217	BU00019ER		17-Aug-93	DMETADD	STRONTIUM	.67	UG/L		B	200	V
217	BU00019ER		17-Aug-93	DRADS	AMERICIUM-241	0.030	PCI/L	0.012		0.006	V
217	BU00019ER		17-Aug-93	DRADS	URANIUM-233,-234	0.13	PCI/L	0.15	J	0.037	V
217	BU00019ER		17-Aug-93	DRADS	URANIUM-238	0.12	PCI/L	0.15	J	0.097	V
217	BU00019ER		17-Aug-93	DSMETCLP	CADMIUM	16.3	UG/L			5	JA
217	BU00019ER		17-Aug-93	DSMETCLP	COPPER	6.4	UG/L		B	25	V
217	BU00019ER		17-Aug-93	DSMETCLP	LEAD	13.6	UG/L			5	V
217	BU00019ER		17-Aug-93	DSMETCLP	SODIUM	310	UG/L		B	5000	JA
217	BU00019ER		17-Aug-93	DSMETCLP	ZINC	8.2	UG/L		B	20	V
217	BU00019ER		17-Aug-93	VOACLP	TOTAL XYLENES	3	UG/L		J	5	A

Table 4-5
Trip Blank Sample Results

IHSS	*Sample Number*	*Sample Date*	*Test Group*	*Compound*	*Result (ug/l)*	*Qualifier*	*Detection Limit (ug/l)*	*Validation Code*
180	BU00021ER	01-Sep-93	VOACLP	METHYLENE CHLORIDE	14		5	V
204	BU00046ER	09-Nov-93	VOACLP	METHYLENE CHLORIDE	2	J	5	A
211	BU00005ER	09-Aug-93	VOACLP	METHYLENE CHLORIDE	7		5	V
*	BU00052ER	27-Apr-94	DMETADD	LITHIUM	10.2	B	100	V
	BU00052ER	27-Apr-94	DSMETCLP	ANTIMONY	30.6	B	60	V
	BU00052ER	27-Apr-94	DSMETCLP	CADMIUM	17.6		5	V
	BU00052ER	27-Apr-94	DSMETCLP	LEAD	4.6		5	V
	BU00052ER	27-Apr-94	DSMETCLP	POTASSIUM	510	B	5000	V
	BU00052ER	27-Apr-94	DSMETCLP	SELENIUM	1.9	B	5	V
	BU00052ER	27-Apr-94	DSMETCLP	SILVER	4.0	B	10	JA
	BU00052ER	27-Apr-94	DSMETCLP	SODIUM	332	B	5000	V
	BU00052ER	27-Apr-94	DSMETCLP	VANADIUM	12.2	B	50	V

* Trip blank for hot water rinsate blank collection.

Table 4-6
Field Blank (Source Water) Sample Results

IHSS	*Sample Number*	*Sample Date*	*Test Group*	*Compound*	*Result (ug/l)*	*Qualifier*	*Detection Limit (ug/l)*	*Validation Code*
211	BU00001ER	09-Aug-93	DMETADD	SILICON	3670		100	JA
211	BU00001ER	09-Aug-93	DMETADD	STRONTIUM	43.4	B	200	V
211	BU00001ER	09-Aug-93	DSMETCLP	BARIUM	15.5	B	200	V
211	BU00001ER	09-Aug-93	DSMETCLP	CADMIUM	10.8		5	JA
211	BU00001ER	09-Aug-93	DSMETCLP	CALCIUM	8120		5000	JA
211	BU00001ER	09-Aug-93	DSMETCLP	COPPER	12.9	B	25	V
211	BU00001ER	09-Aug-93	DSMETCLP	IRON	674		100	JA
211	BU00001ER	09-Aug-93	DSMETCLP	LEAD	1.8	B	5	V
211	BU00001ER	09-Aug-93	DSMETCLP	MAGNESIUM	1460	B	5000	JA
211	BU00001ER	09-Aug-93	DSMETCLP	MANGANESE	8.7	B	15	JA
211	BU00001ER	09-Aug-93	DSMETCLP	SODIUM	6250		5000	JA
211	BU00001ER	09-Aug-93	DSMETCLP	ZINC	2.5	B	20	V
180	BU00022ER	01-Sep-93	VOACLP	BROMODICHLOROMETHANE	2	J	5	A
204	BU00039ER	11-Oct-93	VOACLP	BROMODICHLOROMETHANE	3	J	5	A
211	BU00001ER	09-Aug-93	VOACLP	BROMODICHLOROMETHANE	4	J	5	A
		8-Mar-93	VOACLP	BROMODICHLOROMETHANE	6			
		8-Mar-93	VOACLP	BROMODICHLOROMETHANE	5			
		14-Feb-94	VOACLP	BROMODICHLOROMETHANE	4.4			
		14-Feb-94	VOACLP	BROMODICHLOROMETHANE	4.8			
		14-Feb-94	VOACLP	BROMODICHLOROMETHANE	4.4			
179	BU00032ER	15-Sep-93	VOACLP	CHLOROFORM	100		5	V
180	BU00022ER	01-Sep-93	VOACLP	CHLOROFORM	120		5	V
204	BU00039ER	11-Oct-93	VOACLP	CHLOROFORM	95		5	V
211	BU00001ER	09-Aug-93	VOACLP	CHLOROFORM	180		5	V
		16-Aug-93	VOACLP	CHLOROFORM	104			
		16-Aug-93	VOACLP	CHLOROFORM	116			
		16-Aug-93	VOACLP	CHLOROFORM	125			
		10-May-93	VOACLP	CHLOROFORM	36			
		10-May-93	VOACLP	CHLOROFORM	43			
		10-May-93	VOACLP	CHLOROFORM	48			

Table 4-6
Field Blank (Source Water) Sample Results

IHSS	*Sample Number*	*Sample Date*	*Test Group*	*Compound*	*Result (ug/l)*	*Qualifier*	*Detection Limit (ug/l)*	*Validation Code*
		8-Nov-93	VOACLP	CHLOROFORM	44			
		8-Nov-93	VOACLP	CHLOROFORM	56			
		8-Nov-93	VOACLP	CHLOROFORM	43			
		8-Mar-93	VOACLP	CHLOROFORM	62			
		8-Mar-93	VOACLP	CHLOROFORM	43			
		8-Mar-93	VOACLP	CHLOROFORM	48			
		10-Feb-93	VOACLP	CHLOROFORM	30			
		10-Feb-93	VOACLP	CHLOROFORM	38			
		10-Feb-93	VOACLP	CHLOROFORM	30			
		10-Feb-93	VOACLP	CHLOROFORM	39			
		14-Feb-94	VOACLP	CHLOROFORM	47			
		14-Feb-94	VOACLP	CHLOROFORM	40			
		14-Feb-94	VOACLP	CHLOROFORM	42			
		24-Mar-93	VOACLP	DIBROMOCHLOROMETHANE	0.3			
		24-Mar-93	VOACLP	DIBROMOCHLOROMETHANE	0.4			
		24-Mar-93	VOACLP	DIBROMOCHLOROMETHANE	0.2			
180	BU00022ER	01-Sep-93	VOACLP	METHYLENE CHLORIDE	21		5	V
211	BU00001ER	09-Aug-93	VOACLP	METHYLENE CHLORIDE	3	J	5	A
211	BU00001ER	09-Aug-93	VOACLP	TRICHLOROETHENE	1	J	5	A

Table 4-7
Hot Water Rinsate Blank Sample Results

Sample Number	*Sample Date*	*Test Group*	*Compound*	*Result (ug/l)*	*Qualifier*	*Detection Limit (ug/l)*	*Validation Code*
BU00053ER	27-Apr-94	BNACLP	BIS(2-ETHYLHEXYL)PHTHALATE	28		10	V
BU00054ER	27-Apr-94	BNACLP	BIS(2-ETHYLHEXYL)PHTHALATE	19		10	V
BU00055ER	27-Apr-94	BNACLP	BIS(2-ETHYLHEXYL)PHTHALATE	22		10	V
BU00053ER	27-Apr-94	BNACLP	PHENOL	180	D	10	V
BU00054ER	27-Apr-94	BNACLP	PHENOL	240	D	10	V
BU00055ER	27-Apr-94	BNACLP	PHENOL	380	D	10	V
BU00053ER	27-Apr-94	DMETADD	LITHIUM	6.7	B	100	JA
BU00053ER	27-Apr-94	DMETADD	SILICON	78.5	B	100	JA
BU00054ER	27-Apr-94	DMETADD	SILICON	89.5	B	100	V
BU00055ER	27-Apr-94	DMETADD	SILICON	89.5	B	100	V
BU00053ER	27-Apr-94	DSMETCLP	BARIUM	2.7	B	200	JA
BU00055ER	27-Apr-94	DSMETCLP	BARIUM	3.4	B	200	V
BU00054ER	27-Apr-94	DSMETCLP	CADMIUM	11.7		5	V
BU00053ER	27-Apr-94	DSMETCLP	CALCIUM	931	B	5000	JA
BU00054ER	27-Apr-94	DSMETCLP	CALCIUM	854	B	5000	V
BU00055ER	27-Apr-94	DSMETCLP	CALCIUM	753	B	5000	V
BU00053ER	27-Apr-94	DSMETCLP	LEAD	4.1		5	JA
BU00054ER	27-Apr-94	DSMETCLP	LEAD	5.5		5	V
BU00055ER	27-Apr-94	DSMETCLP	LEAD	2.8	B	5	V
BU00053ER	27-Apr-94	DSMETCLP	MANGANESE	5.2	B	15	JA
BU00054ER	27-Apr-94	DSMETCLP	MANGANESE	3.5	B	15	V
BU00055ER	27-Apr-94	DSMETCLP	MANGANESE	2.8	B	15	V
BU00053ER	27-Apr-94	DSMETCLP	POTASSIUM	1020	B	5000	JA
BU00054ER	27-Apr-94	DSMETCLP	POTASSIUM	475	B	5000	V
BU00055ER	27-Apr-94	DSMETCLP	POTASSIUM	501	B	5000	V
BU00053ER	27-Apr-94	DSMETCLP	SODIUM	1370	B	5000	JA
BU00054ER	27-Apr-94	DSMETCLP	SODIUM	965	B	5000	V
BU00055ER	27-Apr-94	DSMETCLP	SODIUM	961	B	5000	V
BU00053ER	27-Apr-94	DSMETCLP	ZINC	104		20	JA
BU00054ER	27-Apr-94	DSMETCLP	ZINC	103		20	V
BU00055ER	27-Apr-94	DSMETCLP	ZINC	133		20	V

5.0 NATURE AND EXTENT OF CONTAMINATION

This section defines the nature and extent of contamination for the six IHSSs which compose OU15. The evaluation of contamination associated with the OU15 IHSSs is split into two sections; one that addresses RCRA-regulated constituents (Section 5.1), and one that addresses CERCLA concerns (Section 5.2). The basis for this division stems from the hybrid RCRA/CERCLA regulatory environment under which OU15 is being addressed. More details on the basis for this approach are given in Section 1.0.

With regard to the hot water rinsate samples, only those individual constituents that were detected by the laboratory analysis are reported in the sections below. The hot water rinsate sample results presented in this section are validated data. A complete printout of all hot water rinsate analytical data from RFEDS, and a description of RFEDS codes and field names are provided in Appendix E. Electronic copies of the analytical data from RFEDS were provided to CDPHE and EPA with the submittal of the Phase I RFI/RI Report.

5.1 Evaluation of RCRA-Regulated Constituents

As described in Section 1.0, the evaluation of the data collected pursuant to the FSP for OU15 involves two distinct steps. The first step is an evaluation of the RCRA-regulated constituents as they relate to the closure performance standards within each IHSS, as well as an examination of the potential for releases from each IHSS. The potential for releases was addressed in Section 2.0. A comparison of the data collected for each IHSS for RCRA-regulated constituents to the appropriate performance standards is presented in this section. Section 5.1.1 describes the approach taken to evaluating data for RCRA-regulated constituents. Sections 5.1.2 through 5.1.7 present the data for each IHSS. Section 5.1.8 provides a summary of the data for all of the IHSSs.

5.1.1 Approach

The approach taken in this section to evaluate the existing database against the specified RCRA closure performance standards involved comparing the results of chemical analyses of the hot water rinsate samples against the standards. A discussion of the Applicable or Relevant and Appropriate Requirements (ARARs) approved in the Work Plan (DOE, 1993) for RCRA-regulated constituents is included in this section. The performance standards and the rationale followed in comparing the analytical data to those standards are also described in this section.

5.1.1.1 Evaluation of ARARs

Section 3.0 of the Work Plan (DOE, 1993) specifies that the Clean Closure Performance Standard (6 CCR 1007-3, Part 265.111) will serve as the ARAR for RCRA-regulated constituents during the OU15 Phase I RFI/RI. This standard states that the owner or operator must close a facility in a manner that:

- minimizes the need for further maintenance; and
- controls, minimizes or eliminates, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products to the ground or surface waters or to the atmosphere.

CDPHE has requested (via their comment letter on the Draft TM#1 dated March 31, 1994) that the closure performance standards listed in the State RCRA Permit (CDPHE, 1991) issued October 30, 1991 for RFETS be applied to OU15 to satisfy the requirements of 6 CCR 1007-3, Part 265.111. The closure performance standards from the State RCRA Permit (CDPHE, 1991) are described in detail below in Section 5.1.1.3.

5.1.1.2 Data Evaluation Approach

The data evaluated in this section included only those chemical results for RCRA-regulated constituents (i.e., hazardous constituents listed in 6 CCR 1007-3 Part 261 Appendix VIII). In addition, only positively detected results were included in the analysis. Various fields in the RFEDS database were examined to define positively detected results. The selection criteria included:

- Only results for RCRA-regulated constituents were evaluated in this section. All results for radionuclide analyses were evaluated separately in Section 5.2.
- Results qualified with a "U," indicating that the compound was not detected above the instrument detection limit in the sample, were eliminated from further consideration.
- Results for organic compounds qualified with a "B," indicating that the compound was detected in a blank sample at a similar concentration, were considered laboratory artifacts and eliminated from further consideration.
- Only results with a QC CODE of "REAL" or "DUP" were included. Other QC CODE values indicate blank samples or other quality assurance samples, which were evaluated as part of the PARCC analysis presented in Section 4.0.
- Results with RESULT TYPE codes that indicate non-target parameters such as tentatively identified compounds and unknowns were not evaluated.
- Only target parameter results with RESULT TYPE codes such as "TRG," "DL1," or "DIL" were evaluated. For a given sample and compound, the result with a "TRG" code was used for the data evaluation, unless it had a VALIDATION code of "Z." In this case, the corresponding higher quality result (without the "Z" VALIDATION code) was substituted.
- Results reported in units of percent (%) indicate matrix spike compounds added to a sample by the laboratory for quality assurance purposes. These records were not considered further.
- Results with a qualifier code of "J" for organics or "B" for inorganics were not included since these qualifiers indicate that the reported concentration is an

estimate below the CRQL. This approach is consistent with the definition of the RCRA closure performance standards presented in Section 5.1.1.3.

- All data manually collected (i.e., smear sample results and dose-rate survey results) were included for further evaluation. These results were evaluated separately in Section 5.2.

The remaining results were included in the RCRA evaluation.

5.1.1.3 RCRA Closure Performance Standards

This section describes the closure performance standards required by the State RCRA Permit (CDPHE, 1991) issued October 30, 1991 for RFETS. The standards require the following:

a. Close the hazardous and mixed waste units in a manner that minimizes the need for further maintenance and controls; minimizes or eliminates the threat to human health and the environment; and minimizes or eliminates the post-closure escape of hazardous waste, hazardous waste constituents, leachate, contaminated rainfall, or waste decomposition products to the ground, surface waters, or the atmosphere.

b. The closure performance standard for used rinsate from decontamination of concrete secondary containment areas shall be as follow:

    (1) There must be no detectable levels of hazardous organic constituents;

    (2) It must not exhibit any characteristic of a hazardous waste as defined in 6 CCR 1007-3 Part 261, Subpart C; and

    (3) The levels of toxicity characteristic metals must be at or below the background level in the unused rinsate solution.

c. Parameter selection for the used rinsate analysis will be based on the specific wastes stored at the unit. These wastes are specified in Part III of the State RCRA Permit (CDPHE, 1991).

As previously stated, these closure performance standards were also applied to the OU15 IHSSs. The constituents of concern, including those that are RCRA-regulated, were defined for each IHSS in the Work Plan (DOE, 1993), and are as follows:

IHSS 178 - radionuclides, Freon TF, and 1,1,1-trichloroethane

IHSS 179 - radionuclides, chlorinated solvents, beryllium, Freon TF, and 1,1,1-trichloroethane

IHSS 180 - uranium, radionuclides, beryllium, Freon TF, and 1,1,1-trichloroethane

IHSS 204 - uranium, solvents, Freon TF, and 1,1,1-trichloroethane

IHSS 211 - radionuclides, carbon tetrachloride, acetone, methyl alcohol, butyl alcohol, and various TAL metals

IHSS 217 - aqueous cyanide solutions (other contaminants, excluding pesticides and polychlorinated biphenyls are possible)

These lists of compounds for each IHSS were used in the evaluations below to support the analysis of RCRA-regulated substances at each IHSS. It should be noted that carbon dioxide was identified in the Work Plan (DOE, 1993) as a constituent of concern for IHSSs 179 and 180 based on information presented in a set of analytical reports for Buildings 865 and 883 (Rockwell, 1986f). Carbon dioxide, however, was not evaluated during the OU15 field investigations, since it is a common component of the Earth's atmosphere and is not regulated as a hazardous waste or substance.

5.1.2 IHSS 178

Tables 5-1 and 5-2 show the results of the hot water rinsate sampling performed in IHSS 178. Table 5-1 shows only those compounds positively identified and detected at or above the method detection limit within IHSS 178. Of the five compounds detected, only

DEHP, butyl benzyl phthalate, and phenol are RCRA Appendix VIII compounds and are therefore of concern for the RCRA closure of IHSS 178. Figure 5-1 presents the results plotted on a drawing of IHSS 178.

DEHP was detected in hot water rinsate blank samples at concentrations up to 28 μg/l. DEHP was detected at IHSS 178 in sample number BU00011ER, and its duplicate BU00012ER, at 140 μg/l and 160 μg/l, respectively. These concentrations are less than one order of magnitude greater than the blank concentration. RAGS Part A (EPA, 1989b) indicates that, for common cross-contaminants such as DEHP, concentrations within one order of magnitude of a blank concentration can be attributed to cross-contamination. Therefore, the DEHP concentrations have been attributed to leaching from plastic components in the sample collection equipment.

Butyl benzyl phthalate is most commonly used in paints, flooring materials and polyvinyl chloride (PVC). This and other phthalates are commonly leached from paints, plastics, and flooring materials. Butyl benzyl phthalate was detected in hot water rinsate samples from IHSSs 178, 211, and 217. These detections are attributed to paint, plastics and flooring materials, and are therefore assumed not to be present as RCRA waste materials at IHSS 178. Furthermore, the list of RCRA-regulated constituents of regulatory concern at IHSS 178, given in Section 5.1.1.3, does not include phthalates in general, nor butyl benzyl phthalate specifically.

Phenol was detected in the hot water rinsate blank samples at concentrations up to 380 μg/l. Therefore, the phenol detections of 45 μg/l and 65 μg/l at IHSS 178 are attributed to the hot water rinsate sampling equipment.

In accordance with the Work Plan (DOE, 1993), verification sampling was conducted in IHSS 178 for the three RCRA Appendix VIII compounds detected during the original sampling of the IHSS. DEHP and phenol were detected in the verification sample and its duplicate, BU00058ER and BU00059ER, respectively, and are once again attributed to the sampling equipment. DEHP was also detected in the laboratory blank sample. Butyl benzyl phthalate was detected in samples BU00058ER and BU00059ER at concentrations of 39 μg/l and 18 μg/l, respectively. These concentrations are very similar to those detected in the original samples. The detections of butyl benzyl phthalate are once again attributed to paint, plastics and flooring materials, and are therefore not assumed to be present as RCRA waste materials at IHSS 178.

Following the logic presented in the Work Plan (DOE, 1993), perimeter and pathway sampling results are not evaluated because no releases were identified in the historical records or visual inspection reports for IHSS 178, and no RCRA-regulated constituents of regulatory concern were identified in the IHSS sampling. Appendix E contains a complete listing of all analytical results from the perimeter and pathway sampling for IHSS 178.

5.1.3 IHSS 179

Tables 5-3 and 5-4 show the results of the hot water rinsate sampling performed in IHSS 179. Two compounds, DEHP and phenol, were detected in the original sampling, and are both RCRA Appendix VIII compounds. Figure 5-2 presents the results plotted on a drawing of IHSS 179.

DEHP was detected in hot water rinsate blank samples at concentrations up to 28 μg/l. DEHP was detected at IHSS 179 in sample number BU00036ER at 230 μg/l. This concentration is less than one order of magnitude greater than the blank concentration and is therefore attributed to leaching from plastic components in the sample collection equipment.

Phenol was detected in the hot water rinsate blank samples at concentrations up to 380 μg/l. Therefore, the phenol detection of 53 μg/l at IHSS 179 is attributed to the hot water rinsate sampling equipment.

In accordance with the Work Plan (DOE, 1993), verification sampling was conducted in IHSS 179 for the two RCRA Appendix VIII compounds detected during the original sampling of the IHSS. DEHP and phenol were detected in the verification sample and its duplicate, BU00062ER and BU00063ER, respectively, and are once again attributed to the sampling equipment. DEHP was also detected in the laboratory blank sample.

Following the logic presented in the Work Plan (DOE, 1993), perimeter and pathway sampling results are not evaluated because no releases were identified in the historical records or visual inspection reports for IHSS 179, and no RCRA-regulated constituents of regulatory concern were identified in the IHSS sampling. Appendix E contains a complete listing of all analytical results from the perimeter and pathway sampling for IHSS 179.

5.1.4 IHSS 180

Tables 5-5 and 5-6 show the results of the hot water rinsate sampling performed in IHSS 180. Three compounds, DEHP, phenol, and methylene chloride, were detected in the original samples, and all RCRA Appendix VIII compounds. Figure 5-3 presents the results plotted on a drawing of IHSS 180.

DEHP was detected in hot water rinsate blank samples at concentrations up to 28 μg/l. DEHP was detected at IHSS 180 in sample number BU00023ER and its duplicate BU00024ER at 150 μg/l and 230 μg/l, respectively. These concentrations are less than one order of magnitude greater than the blank concentration and are therefore attributed to leaching from plastic components in the sample collection equipment.

Phenol was detected in the hot water rinsate blank samples at concentrations up to 380 µg/l. Therefore, the phenol detections of 47 µg/l (in both the real sample and its duplicate) at IHSS 180 are attributed to the hot water rinsate sampling equipment.

Methylene chloride was detected in source water (field blank) samples at concentrations up to 21 µg/l. It was also detected in the trip blanks for IHSSs 180, 204, and 211 at concentrations up to 14 µg/l. Therefore, the presence of methylene chloride in sample number BU00023ER and its duplicate BU00024ER at 27 µg/l and 21 µg/l, respectively, is attributed to the source water or laboratory cross-contamination.

In accordance with the Work Plan (DOE, 1993), verification sampling was conducted in IHSS 180 for the three RCRA Appendix VIII compounds detected during the original sampling of the IHSS. DEHP and phenol were detected in the verification sample and its duplicate, BU00065ER and BU00066ER, respectively, and are once again attributed to the sampling equipment. Methylene chloride was not detected in either sample.

Following the logic presented in the Work Plan (DOE, 1993), perimeter and pathway sampling results are not evaluated because no releases were identified in the historical records or visual inspection reports for IHSS 180, and no RCRA-regulated constituents of regulatory concern were identified in the IHSS sampling. Appendix E contains a complete listing of all analytical results from the perimeter and pathway sampling for IHSS 180.

5.1.5 IHSS 204

Table 5-7 shows the results of the hot water rinsate sampling performed in IHSS 204. Five compounds were detected, three of which are RCRA Appendix VIII compounds. These were DEHP, di-n-octyl phthalate, and phenol. Figures 5-4, 5-5 and 5-6 present the results plotted on drawings of IHSS 204.

Based on the listing of RCRA-regulated constituents of regulatory concern at IHSS 204 (a RCRA treatment unit) given in Section 5.1.1.3, only VOCs, such as solvents and coolants from uranium machining, are of regulatory concern and are therefore subject to evaluation in this section. No VOCs or coolants were detected at IHSS 204, therefore no verification sampling was performed.

Following the logic presented in the Work Plan (DOE, 1993), perimeter sampling results are not evaluated because no releases were identified in the historical records or visual inspection reports for IHSS 204, and no RCRA-regulated constituents of regulatory concern were identified in the IHSS sampling. Appendix E contains a complete listing of all analytical results from the perimeter sampling for IHSS 204.

5.1.6 IHSS 211

Tables 5-8 and 5-9 show the results of the hot water rinsate sampling performed in IHSS 211. Six organic compounds and nine inorganic compounds were detected in the original samples. Two of the organic compounds (butyl benzyl phthalate and phenol) and two of the inorganic compounds (cadmium and lead) are RCRA Appendix VIII compounds. Figure 5-7 presents the results plotted on a drawing of IHSS 211.

Butyl benzyl phthalate is most commonly used in paints, flooring materials and PVC. This and other phthalates are commonly leached from paints, plastics, and flooring materials. Butyl benzyl phthalate was detected in hot water rinsate samples from IHSSs 178, 211, and 217. These detections are attributed to paints, plastics and flooring materials, and are therefore assumed not to be present as RCRA waste materials at IHSS 211. Furthermore, the list of RCRA-regulated constituents of regulatory concern at IHSS 211, given in Section 5.1.1.3, does not include phthalates in general, nor butyl benzyl phthalate specifically.

Phenol was detected in the hot water rinsate blank samples at concentrations up to 380 μg/l. Therefore, the phenol detections of 170 μg/l and 150 μg/l at IHSS 211 are attributed to the hot water rinsate sampling equipment.

Cadmium was detected in sample number BU00002ER at 17 μg/l. The duplicate of this sample (BU00003ER) reported cadmium as "non-detect." The detection limit in the real and duplicate samples was 5 μg/l. Cadmium was detected in one source water sample for IHSS 211 at 10.8 μg/l. It was also reported in a trip blank at 17.6 μg/l, in hot water rinsate blanks at 11.7 μg/l, and in equipment rinse blanks at 6.4 μg/l and 16.3 μg/l. Therefore, the presence of cadmium in hot water rinsate samples taken from IHSS 211 is attributed to the source water and sampling equipment.

Lead was detected in sample number BU00002ER and its duplicate BU00003ER at concentrations of 9.1 and 4.4 μg/l, respectively. Lead was detected in the source water sample from IHSS 211 at 1.8 μg/l. Lead was also detected in a trip blank at 4.6 μg/l, in the hot water rinsate blank samples at concentrations ranging from 2.8 μg/l to 5.5 μg/l, and in the equipment rinse blank samples from IHSS 217 at 13.6 μg/l. Therefore, the lead concentrations detected in hot water rinsate samples taken at IHSS 211 are attributed to source water.

In accordance with the Work Plan (DOE, 1993), verification sampling was conducted in IHSS 211 for the four RCRA Appendix VIII compounds detected during the original sampling of the IHSS. Phenol was detected in the verification sample, BU00061ER, and is once again attributed to the sampling equipment. Lead was also detected, and is related to the blank contamination factors discussed above. Butyl benzyl phthalate and cadmium were not detected in sample BU00061ER.

Following the logic presented in the Work Plan (DOE, 1993), perimeter and pathway sampling results are not evaluated because no releases were identified in the historical records or visual inspection reports for IHSS 211, and no RCRA-regulated constituents of regulatory concern were identified in the IHSS sampling. Appendix E contains a complete listing of all analytical results from the perimeter and pathway sampling for IHSS 211.

5.1.7 IHSS 217

Tables 5-10 and 5-11 show the results of the hot water rinsate sampling performed in IHSS 217. Six organic compounds and eighteen inorganic compounds were detected in the original samples. Four of the organic compounds (DEHP, butyl benzyl phthalate, phenol, and chloroform) and seven of the inorganic compounds (beryllium, cadmium, chromium, mercury, nickel, silver, and cyanide) are RCRA Appendix VIII compounds. Figures 5-8 and 5-9 present the results plotted on drawings of IHSS 217.

Based on the listing of RCRA-regulated constituents of regulatory concern at IHSS 217 (a RCRA treatment unit), only cyanide is of regulatory concern and is therefore subject to evaluation in this section. Cyanide was detected in sample number BU00017ER and its duplicate at 142 μg/l and 171 μg/l, respectively. Cyanide was not detected in the sample from the IHSS 217 perimeter area (the floor adjacent to the laboratory table and hood)

In accordance with the Work Plan (DOE, 1993), verification sampling was conducted for cyanide in IHSS 217. Cyanide was not detected in either verification sample, BU00056ER or its duplicate, BU00057ER.

Following the logic presented in the Work Plan (DOE, 1993), perimeter sampling results are not evaluated because no releases were identified in the historical records or visual inspection reports for IHSS 217, and no RCRA-regulated constituents of regulatory concern were identified in the IHSS sampling. Appendix E contains a complete listing of all analytical results from the perimeter sampling for IHSS 217.

5.1.8 Summary of RCRA Evaluation

The purpose of the RCRA evaluation is to determine whether each of the six IHSSs in OU15 is in compliance with the requirements for RCRA clean closure specified by CDPHE and described in Section 5.1.3. The evaluation consisted of evaluating the analytical results to determine if detectable levels of RCRA-regulated constituents were found that could be reasonably expected to be associated with waste storage or treatment at an IHSS.

The analyses of the original hot water rinsate samples indicated the presence of RCRA-regulated constituents (Appendix VIII) in all six of the OU15 IHSSs. In IHSS 204, however, the specific constituents of regulatory concern (VOCs and coolants) for the IHSS were not detected. As a result, no additional sampling was conducted at IHSS 204.

For the other five IHSSs, many of the RCRA-regulated compounds detected in the original hot water rinsate samples were also detected in various blank samples collected as part of the QA/QC process. DEHP, which was present in many of the original samples, was positively identified in the hot water rinsate blank samples, and was attributed to the sampling equipment. Phenol was detected at several IHSSs, but was also identified in the hot water rinsate blank samples. Therefore, the presence of phenol was attributed to the sampling equipment. Methylene chloride was detected at one IHSS, but was also detected in trip blanks and source water (field blank) samples, and was therefore attributed to cross-contamination. A few metals were detected in hot water rinsate from IHSS 211. However, these metals were also present at similar concentrations in the source water (field blank samples). Their detection in the IHSS samples was attributed to their presence in the source water used for the hot water rinsate sampling.

Two constituents of regulatory concern, butyl benzyl phthalate (IHSSs 178 and 211) and cyanide (IHSS 217), could not be directly attributed to contaminants present in the various blank samples. As a result, verification sampling was completed for these three IHSSs (sampling was also conducted at IHSSs 179 and 180 while Final TM#1 (DOE, 1994a) was still being reviewed).

Butyl benzyl phthalate and cyanide were not detected in the verification samples from IHSSs 211 and 217, respectively. Butyl benzyl phthalate was, however, detected in the real and duplicate samples from IHSS 178 at concentrations of 39 μg/l and 18 μg/l, respectively. These concentrations are approximately the same as those detected in the original samples.

Butyl benzyl phthalate was not identified as a RCRA-regulated constituent of regulatory concern at IHSS 178. Therefore, the presence of butyl benzyl phthalate is attributed to paint, plastics and flooring materials, and is assumed not to be related to RCRA waste materials at IHSS 178.

Based on the assessments described above, it is concluded that each of the six IHSSs in OU15 show compliance with the specified RCRA clean closure performance standards.

5.2 CERCLA Evaluation

This section presents the decision process used for each IHSS to determine the need for further action with respect to radionuclides. Beryllium is also addressed in this section since it does not fall within the scope of Section 5.1. Section 5.2.1 describes the approach taken to evaluating radionuclide and beryllium data. Sections 5.2.2 through

5.2.7 present the decision process applied to each IHSS. Section 5.2.8 provides a summary of the decision process for all IHSSs.

5.2.1 Approach

To determine whether any of the IHSSs require additional CERCLA evaluation prior to closure, the radionuclide data collected during the Stage 1 and 2 field investigations were evaluated by comparison to the radiation protection standards specified as ARARs in the Work Plan (DOE, 1993). If the activities of radionuclides present within an IHSS fell below the appropriate regulatory criteria, then no further action was recommended. If an IHSS had shown radionuclide levels in excess of the specified radiation protection standards, a CERCLA BRA would have been proposed to determine if remedial action was necessary.

Beryllium data were addressed in a different manner to allow for consistency with RFETS beryllium control procedures. The results of the beryllium smear samples are presented for IHSSs 179 and 180 in Sections 5.2.3 and 5.2.4, respectively. Conclusions regarding the need for further action with respect to beryllium contamination are presented in Section 5.2.8.

5.2.1.1 Evaluation of ARARs

Section 3.0 of the Work Plan (DOE, 1993) specifies that the occupational radiation standards based on Occupational Safety and Health Act standards for ionizing radiation (29 CFR 1910.96) will serve as the ARARs for radionuclides during the OU15 Phase I RFI/RI. The specific standards that were used in evaluating the radionuclide data associated with the OU15 IHSSs are listed below in Section 5.2.1.3.

5.2.1.2 Radionuclide Data Evaluation Approach

This section discusses the data which was used to evaluate radionuclides at each of the six IHSSs. The specific data are presented in data tables for each IHSS in Sections 5.2.2 through 5.2.7. The radiological data collected during the Stage 1 and 2 field work included the following:

- fixed alpha and beta radiation surveys;
- beta and gamma dose-rate data, expressed as millirems of radiation exposure per unit of time;
- gross alpha and beta counts for smear samples, expressed as radiological activity per unit area;
- radionuclide-specific data for hot water rinsate samples, expressed as radiological activity per unit volume (these were converted to a unit area basis consistent with the smear sampling data as described below); and
- the RFETS radiological control program (as described in Section 2.0).

The fixed alpha and beta radiation surveys were not evaluated further. Due to the high detection limits of the instruments used, and the variability of the results, these data are not of the appropriate quality for a dose analysis. For alpha radiation, only the removable portion of the total radiation is important, because it is only a health concern via ingestion or inhalation. External alpha radiation will not generally penetrate even the outer layers of skin. For beta radiation, the removable portion was characterized by the beta smear samples, while the fixed external irradiation component was characterized by the beta dose-rate surveys. The data provided by the removable alpha and beta smear samples, and the beta and gamma dose-rate surveys were of higher quality, and were sufficient to complete the radiological analysis of each IHSS. Therefore, the fixed radiation surveys were not required to complete the objectives of the analysis.

The radionuclides which were evaluated for OU15 included all those positively identified at OU15. The radionuclides detected were Americium-241 (Am-241), Radium-226 (Ra-226), Plutonium-239 (Pu-239), Plutonium-240 (Pu-240), Uranium-233 (U-233), Uranium-234 (U-234), Uranium-235 (U-235), and Uranium-238 (U-238).

The radionuclide activity levels presented in data tables in Sections 5.2.2 through 5.2.7 are converted from the reported result in pCi/l to a dust equivalent activity in pCi/g, as follows:

$$C_{dust} = C_{rinsate} * \frac{RV}{A * SD}$$

where:

- C_{dust} = dust equivalent activity (pCi/g)
- $C_{rinsate}$ = hot water rinsate activity (pCi/l)
- RV = rinsate volume (l)
- A = rinsate sample area (m^2)
- SD = surface dust amount (g/m^2)

The surface dust amount was assumed to be 560 mg/m^2, or 0.56 g/m^2 (Hawley, 1985). An example calculation is provided below for a Pu-239/240 activity of 7.9 pCi/l, a rinsate volume of 15.09 l, and a rinsate area of 10 m^2:

$$C_{dust} = 7.9 * \frac{15.09}{10 * 0.56} = 21.3 pCi/g$$

5.2.1.3 Radiation Protection Standards

The results of the field radiation surveys and the smear and hot water rinsate sampling undertaken at OU15 were compared to the CFR and DOE standards outlined in Section 3.0 of the Work Plan (DOE, 1993) and listed below:

10 CFR 20, App. B:	Protection against radiation;
29 CFR 1910.96 (b):	Exposure of individuals to radiation in restricted areas;
29 CFR 1910.96 (c):	Exposure to airborne radioactive materials;
29 CFR 1910.96 (l):	Notification of incidents;
DOE Order 5400.5:	Radiation protection of the public and the environment; and
DOE Order 5480.11:	Radiation protection for occupational workers.

Dose-based screening levels express the maximum rate (e.g., hourly or daily) at which individuals may be exposed to radiation. Dose limits are typically expressed as millirems per year or rems per year, and indicate the maximum acceptable whole-body dose an individual may receive over the indicated time period. Dose-based screening levels do not relate directly to excess cancer risk, and are commonly used by health-physicists or promulgated as guidance by DOE and the U.S. Nuclear Regulatory Commission (NRC).

Since the publication of the Work Plan (DOE, 1993), 10 CFR 835 has been promulgated to address occupational radiation protection for DOE activities. 10 CFR 835, which became effective on January 14, 1994, replaces DOE Order 5480.11. Both 10 CFR 835 and 10 CFR 20 require that facility owners/operators control worker exposures in a manner that limits worker doses to the dose limits provided. Exposure controls (such as protective clothing) are acceptable as a means of meeting the dose limits established under 10 CFR 20 and 10 CFR 835. The specific 10 CFR 20 and 10 CFR 835 dose limit standards for workers that were used to establish the radionuclide screening levels for the OU15 Stage 1 and 2 data are listed below. It should be noted that during the course of the OU15 RFI/RI, the standards included in 10 CFR 20 were updated. Correspondingly, the list of numerical standards originally presented in TM#1 (DOE, 1994a) was modified for the Phase I RFI/RI Report to reflect the changes to 10 CFR 20.

total effective dose equivalent	5 rem per year
any organ or tissue other than the lens of the eye	50 rem per year
the lens of the eye	15 rem per year
the skin or any extremity	50 rem per year

These dose limits are consistent in all of the referenced ARARs and 10 CFR 835. Total effective dose equivalent is equal to the sum of the committed effective dose equivalent (internal doses) and the deep-dose equivalent (external doses). In addition to dose limitations, concentrations of specific airborne radionuclides are presented in the regulations which correspond to the specified dose-rate limitations. These airborne concentration limitations were used to establish the screening levels for the OU15 Stage 1 and 2 data. Acceptable air concentrations of radionuclides were converted to acceptable dust concentrations using the following equation, which is presented in "Residual Radioactive Contamination from Decommissioning" (NRC, 1990):

$$C_{dust}\left(\frac{pCi}{g}\right)=\frac{C_{air}\left(\frac{pCi}{m^3}\right)}{DL\left(\frac{g}{m^3}\right)}$$

where DL is the dust loading in air. The dust loading value used was 100 $\mu g/m^3$ (NRC, 1992).

An example calculation is provided below for Am-241, for which the given airborne standard is 3.00 x 10^{-12} $\mu Ci/ml$:

$$DustEquivalent=\frac{3.00*10^{-12}\ \mu Ci/ml}{100\mu g/m^3}*\frac{10^6 ml}{m^3}*\frac{10^6\mu g}{g}*\frac{10^6 pCi}{\mu Ci}=3.00*10^4 pCi/g$$

The standards given for the radionuclides in the updated 10 CFR 20, Appendix B and their equivalent dust concentrations are provided below:

Radionuclide	Occupational Airborne Concentration Limit (μCi/ml)	Dust Equivalent (pCi/g)
Am-241 (soluble)	3.00e-12	3.00e+4
Ra-226 (soluble)	3.00e-10	3.00e+6
Pu-239 (soluble)	3.00e-12	3.00e+4
Pu-240 (soluble)	3.00e-12	3.00e+4
U-233 (soluble)	2.00e-11	2.00e+5
U-234 (soluble)*	2.00e-11	2.00e+5
U-235 (soluble)*	2.00e-11	2.00e+5
U-238 (soluble)*	2.00e-11	2.00e+5

* For soluble mixtures of U-234, U-235, and U-238 in air, chemical toxicity may be the limiting factor. The CFR and DOE standards listed in this section provide details on calculating the concentration values.

Note: The values originally presented in TM#1 (DOE, 1994a) have been modified for the Phase I RFI/RI Report to reflect the changes to 10 CFR 20.

The radionuclide analytical results were compared to the dose-rate and airborne concentration screening levels criteria identified above. Where the data exceeded any of the above screening criteria, a whole-body dose estimate was made using International Commission on Radiological Protection dose conversion factors provided in Federal Guidance Reports 11 and 12 (EPA, 1988; EPA, 1993). A computer code was used to perform the dose conversion calculations, although no fate and transport calculations were made.

Dose conversions were calculated using the Hanford Environmental Dosimetry System (Generation II, or GENII). The GENII computer code was developed through the

Hanford Environmental Dosimetry Upgrade Project in November 1988, and is designed to implement the internal dosimetry models recommended by the International Commission on Radiological Protection. Additional details on the operation of the GENII code can be found in "GENII - The Hanford Environmental Dosimetry Software System, Volumes 1 through 3" (Napier, et. al., 1988). The GENII code was recommended for use in evaluating exposures to residual radionuclides within buildings by the NRC (NRC, 1990).

The radiological screening was performed in four steps, as follows:

1. The hot water rinsate radionuclide results shown in Tables 5-12, 5-15, 5-19, 5-23, 5-25 and 5-28 were screened against the dust equivalent screening levels provided above.

2. The post-rinsate alpha and beta smear sample results presented in Tables 5-13, 5-16, 5-20, 5-26 and 5-29 were also screened against the levels shown above. Since the specific radionuclide inventory making up the total alpha and beta counts is unknown, the conservative assumption was made to screen against the radionuclide with the lowest acceptable level in dust. All of the radionuclides detected at OU15 are alpha particle emitters. Therefore, the lowest level shown above (3.00×10^4 pCi/g in dust for Pu-239/240) was used to screen all alpha smear data. Of the radionuclides detected at OU15, none are direct beta-emitters. However, U-235 and U-238 decay to produce Thorium-231 and Thorium-234 (Th-231 and Th-234). The standards for these isotopes are higher (3×10^{-6} μCi/ml and 6×10^{-8} μCi/ml in air, respectively) than any of the isotopes analyzed as part of the OU15 Phase I RFI/RI. Therefore, to be conservative, all beta smear samples were screened against the acceptable dust level for U-238.

3. The beta and gamma dose-rate survey results presented in Tables 5-14, 5-17, 5-21, 5-27 and 5-30 were screened against the whole body dose limit of 5 rem per year, listed above. This dose limit was converted assuming a standard worker exposure of 2000 hours per year, resulting in a screening level of 2.5 mrem/hr. For the purposes of this document, the standard worker is defined as an individual working in the area of concern 40 hours per week for 50 weeks per year. No specific assumptions are made with respect to the health or physical characteristics of the individual, nor with respect to controls on protective clothing or other procedures which may be used to limit exposures.

4. In IHSSs where any of the hot water rinsate radionuclide results, the alpha and beta smear sample results, or the beta and gamma dose-rate surveys failed the initial screening, the post-rinsate smear data were used with the GENII computer code to determine total effective dose equivalent resulting from the maximum total alpha or beta activity detected anywhere in the IHSS. The approach used to determine doses was based on the NRC indoor dust exposure scenario (NRC, 1990). In addition, the use of the highest activity detected in the IHSS instead of an average activity yielded a conservative estimate of the total dose. Finally, since the radionuclide inventory in the total alpha and beta smear results was unknown, a GENII run was made using the total activity for each of the radionuclides detected at OU15. The highest predicted total effective dose equivalent was then compared to the yearly dose limit to complete the screening analysis.

The results of the four-step radiological screening for each IHSS are presented in Sections 5.2.2 through 5.2.7.

5.2.2 IHSS 178

The analytical data for radionuclides detected in the hot water rinsate samples from IHSS 178 are included in Table 5-12. The analytical results of the radiological smear samples collected initially and during the final radiological surveys (pre- and post-rinsate samples) are presented in Table 5-13. The results of the beta and gamma dose-rate surveys are summarized in Table 5-14. Figures 5-10 and 5-11 present the radiological results plotted on drawings of IHSS 178.

The results of the four-step radionuclide screening process are presented below:

<u>Step 1</u>

No radionuclides detected in the hot water rinsate samples exceeded the permissible radionuclide levels presented in Section 5.2.1.3.

Step 2

None of the post-rinsate smear samples exhibited total alpha activity exceeding the permissible radionuclide levels presented in Section 5.2.1.3. In addition, none of the post-rinsate smear samples exhibited total beta activity exceeding the permissible U-238 level presented in Section 5.2.1.3.

Step 3

None of the areas surveyed for beta and gamma dose-rate exceeded the established screening limit of 2.5 mrem/hr.

Step 4

Since none of the data collected in steps 1 through 3 at IHSS 178 exceeded the screening criteria, no GENII analysis was performed for this IHSS.

5.2.3 IHSS 179

The analytical results for the hot water rinsate samples, alpha and beta smear samples, and beta and gamma dose-rate surveys for IHSS 179 are provided in Tables 5-15 through 5-17. The results of the beryllium smear samples collected initially and during the final radiological surveys (pre- and post-rinsate samples) are provided in Table 5-18. Figures 5-12 and 5-13 present the radiological and beryllium results plotted on drawings of IHSS 179.

The results of the four-step radionuclide screening process are presented below:

Step 1

No radionuclides detected in the hot water rinsate samples exceeded the permissible radionuclide levels presented in Section 5.2.1.3.

Step 2

None of the post-rinsate smear samples exhibited total alpha or beta activity exceeding the permissible levels presented in Section 5.2.1.3.

Step 3

None of the areas surveyed for beta and gamma dose-rate in IHSS 179 exceeded the established screening limit of 2.5 mrem/hr.

Step 4

Since none of the data collected in steps 1 through 3 at IHSS 179 exceeded the screening criteria, no GENII analysis was performed for this IHSS.

5.2.4 IHSS 180

The analytical results for the hot water rinsate samples, alpha and beta smear samples, beta and gamma dose-rate surveys, and beryllium smears for IHSS 180 are provided in Tables 5-19 through 5-22. Figures 5-14 and 5-15 present the radiological and beryllium results plotted on drawings of IHSS 180.

The results of the four-step radionuclide screening process are presented below:

Step 1

No radionuclides detected in the hot water rinsate samples exceeded the permissible radionuclide levels presented in Section 5.2.1.3.

Step 2

None of the post-rinsate smear samples from IHSS 180 exhibited total alpha or beta activity exceeding the permissible levels presented in Section 5.2.1.3.

Step 3

Seven of the sampling areas surveyed for beta dose-rate exceeded the established screening limit of 2.5 mrem/hr. Therefore, additional evaluation of radiological exposure was conducted in Step 4. None of the areas exceeded the screening limit for gamma dose-rate.

Step 4

Some of the beta dose-rate surveys at IHSS 180 failed the conservative screening criteria established under Step 3. Therefore, the GENII model was used to estimate the whole-body dose expected as a result of occupational exposures in IHSS 180. To provide a conservative analysis, the highest total alpha or beta reading from the post-rinsate smear sampling data (69 dpm/100 cm^2, total beta at sampling area 10 [See Figure 5-15]) was used to generate the dust and airborne concentrations for input to the GENII model.

The GENII model assumes that the exposed individual receives a radiological dose via incidental ingestion of dust, inhalation of airborne dust, and direct external irradiation. The dust concentration used for the ingestion and irradiation pathways was converted from the smear sample concentration using an assumed dust loading of 560 mg/m^2 on surfaces (Hawley, 1985) and 100 $\mu g/m^3$ in air (NRC, 1992). This resulted in a radionuclide concentration in dust of 5.6 x 10^6 pCi/kg. The air concentration was estimated at 0.560 pCi/m^3, as described in Section 5.2.1.3.

Since the specific radionuclide inventory comprising the total alpha and beta radiation reading was unknown, the GENII model was run once for each of the six radionuclides detected at OU15. Copies of the GENII runs generated for IHSS 180 are provided in Appendix F. In each GENII run, the total activity was input assuming that it was all attributable to one of the six radionuclides under evaluation. The maximum predicted dose from any of the six runs was then used as a basis for evaluating the screening results. The results for IHSS 180 were:

Radionuclide	Total Effective Dose Equivalent
Am-241	3.7 rem/yr
Pu-239/240	0.38 rem/yr
Ra-226	0.85 rem/yr
U-233/234	0.17 rem/yr
U-235	0.44 rem/yr
U-238	0.15 rem/yr

The GENII results for an occupational exposure show total effective dose equivalents below the limit value of 5 rem/yr. The GENII assessment was conservative in that the maximum total alpha or beta radiation reading was used, and the worst-case was selected in terms of the radionuclide inventory comprising the total alpha or beta count.

5.2.5 IHSS 204

The analytical results for the hot water rinsate samples and alpha and beta smear samples for IHSS 204 are provided in Tables 5-23 and 5-24. Figures 5-16 through 5-21 present the radiological results plotted on drawings of IHSS 204.

No radionuclides detected in the hot water rinsate samples from IHSS 204 exceeded the permissible radionuclide levels presented in Section 5.2.1.3. An evaluation of the pre-rinsate smear samples from the floor surfaces in Rooms 32 and 502 and the outside surfaces of the Chip Roaster inlet and outlet revealed surface concentrations of up to 14,000 dpm/100 cm^2 alpha (Room 32, sampling area 18 [See Figure 5-19]) and 151,515 dpm/100 cm^2 beta (Room 32, sampling area 24 [See Figure 5-19]). The magnitude of these results confirmed the presence of radiological contamination at IHSS 204. As provided in the Work Plan (DOE, 1993), the final radiological surveys (including post-rinsate smear samples) were not conducted for IHSS 204.

In accordance with the requirements of RFETS HSP Section 18 (EG&G, 1994), Rooms 32 (Contamination and Radiation Area) and 502 (Contamination Area) are posted and managed as radiological areas. Worker exposures at IHSS 204 are controlled (see Section 2.0) based on the implementation of the procedures, including those in RFETS HSP Section 18 (EG&G, 1994), that govern operations at RFETS.

5.2.6 IHSS 211

The analytical results for the hot water rinsate samples, alpha and beta smear samples, and beta and gamma dose-rate surveys for IHSS 211 are provided in Tables 5-25 through 5-27. Figures 5-22 and 5-23 present the radiological results plotted on drawings of IHSS 211.

The results of the four-step radionuclide screening process are presented below:

<u>Step 1</u>
No radionuclides detected in the hot water rinsate samples exceeded the permissible radionuclide levels presented in Section 5.2.1.3.

<u>Step 2</u>
None of the post-rinsate smear samples from IHSS 211 exhibited total alpha or beta activity exceeding the permissible radionuclide levels presented in Section 5.2.1.3.

<u>Step 3</u>
None of the areas surveyed for beta and gamma dose-rate in IHSS 211 exceeded the established screening limit of 2.5 mrem/hr.

Step 4

Because none of the data collected at IHSS 211 exceeded the screening criteria described in Steps 1 through 3, no GENII analysis was performed for this IHSS.

5.2.7 IHSS 217

The analytical results for the hot water rinsate samples, alpha and beta smear samples, and beta and gamma dose-rate surveys for IHSS 217 are provided in Tables 5-28 through 5-30. Figures 5-24 through 5-27 present the radiological results plotted on drawings of IHSS 217.

The results of the four-step radionuclide screening process are presented below:

Step 1

No radionuclides detected in the hot water rinsate samples from IHSS 217 exceeded the permissible radionuclide levels presented in Section 5.2.1.3.

Step 2

None of the post-rinsate smear samples from IHSS 217 exhibited total alpha or beta activity exceeding the permissible radionuclide levels presented in Section 5.2.1.3.

Step 3

None of the areas surveyed for beta and gamma dose-rate in IHSS 217 exceeded the established screening limit of 2.5 mrem/hr.

Step 4

Since none of the data collected at IHSS 217 exceeded the screening criteria described in Steps 1 through 3, no GENII analysis was performed for this IHSS.

5.2.8 Summary of CERCLA Evaluation

The CERCLA evaluation for OU15 consisted of comparing radionuclide data to appropriate regulatory criteria and standards, as well as to NRC, DOE, and RFETS guidance, and evaluating beryllium smear data. The radionuclide evaluation is summarized in Section 5.2.8.1, and the beryllium evaluation is addressed in Section 5.2.8.2.

5.2.8.1 Radionuclide Evaluation

Radionuclide results from the hot water rinsate samples, total alpha and beta counts from smear samples, and beta and gamma dose-rate data from dose-rate surveys were compared to radiation protection standards for workers for IHSS 178, 179, 180, 211 and 217. The standards included maximum permissible airborne radionuclide levels and maximum permissible dose limits for all exposure pathways. None of the IHSSs showed radionuclide levels which yielded calculated exceedences of the maximum permissible radionuclide levels in air. IHSS 180 showed beta dose-rate survey data which exceeded the initial screening level of 2.5 mrem/hr. However, GENII calculations of total effective dose equivalent from specific radionuclides at IHSS 180 showed that the worker dose limits were not exceeded at the IHSS.

Only the radionuclide results from the hot water rinsate samples were compared to the standards for IHSS 204. The calculations developed from these results did not exceed the maximum permissible radionuclide levels in air. The magnitude of the pre-rinsate smear sample results confirmed the presence of radiological contamination at IHSS 204. Worker exposures at IHSS 204 are controlled based on the implementation of the procedures that govern operations at RFETS.

5.2.8.2 Beryllium Evaluation

An RFETS beryllium smear sample control level of 25 micrograms per square foot (approximately 2.7 micrograms per 100 square centimeters) is established in RFETS HSP 13.04 (EG&G, 1994). In the absence of a promulgated regulatory standard for beryllium surface contamination, RFETS has established this control level as an accepted and achievable cleanliness level to control worker exposure to beryllium. The presence of a beryllium surface concentration in excess of this control level within IHSSs 179 and 180 was only detected in one IHSS 179 pre-rinsate smear sample. The post-rinsate smear samples collected within IHSSs 179 and 180, which are most representative of current conditions, were all below this control level. The analytical results for pre-rinsate and post-rinsate smear sampling for IHSSs 179 and 180 are included on Figures 5-13 and 5-15, respectively.

In addition to beryllium smear samples taken within the IHSSs, the areas around each of the IHSSs (perimeter and pathway locations) were also sampled. Some of the beryllium results for the areas surrounding IHSSs 179 and 180 exceeded the RFETS control level in the pre-rinsate and/or post-rinsate samples. The pattern of detections and the relative magnitude of the results within and around each of the IHSSs did not indicate that the beryllium surface contamination was attributable to the storage of wastes in the IHSSs.

Table 5-1
Organic Compounds Detected in IHSS Hot Water Rinsate Samples
IHSS 178

Building	*IHSS*	*Location*	*Sample Number*	*Sample Date*	*Test Group*	*Compound*	*Result (ug/l)*	*Qualifier*	*Detection Limit (ug/l)*	*Validation Code*	*QC Code*	*QC Partner*	*Appendix VIII Compound?*
881	178	IHSS	BU00011ER	16-Aug-93	BNACLP	BENZOIC ACID	65		50	JA	REAL		
881	178	IHSS	BU00011ER	16-Aug-93	BNACLP	BIS(2-ETHYLHEXYL)PHTHALATE	140		10	JA	REAL		YES
881	178	IHSS	BU00011ER	16-Aug-93	BNACLP	BUTYL BENZYL PHTHALATE	38		10	JA	REAL		YES
881	178	IHSS	BU00011ER	16-Aug-93	BNACLP	DI-n-BUTYL PHTHALATE	13		10	V	REAL		
881	178	IHSS	BU00011ER	16-Aug-93	BNACLP	PHENOL	45		10	V	REAL		YES
881	178	IHSS	BU00012ER	16-Aug-93	BNACLP	BENZOIC ACID	79		50	JA	DUP	BU00011ER	
881	178	IHSS	BU00012ER	16-Aug-93	BNACLP	BIS(2-ETHYLHEXYL)PHTHALATE	160		10	JA	DUP	BU00011ER	YES
881	178	IHSS	BU00012ER	16-Aug-93	BNACLP	BUTYL BENZYL PHTHALATE	51		10	JA	DUP	BU00011ER	YES
881	178	IHSS	BU00012ER	16-Aug-93	BNACLP	DI-n-BUTYL PHTHALATE	17		10	V	DUP	BU00011ER	
881	178	IHSS	BU00012ER	16-Aug-93	BNACLP	PHENOL	65		10	V	DUP	BU00011ER	YES

Table 5-2
Hot Water Rinsate Verification Sample Results
IHSS 178

Building	*IHSS*	*Location*	*Sample Number*	*Sample Date*	*Test Group*	*Compound*	*Result (ug/l)*	*Qualifier*	*Detection Limit (ug/l)*	*Validation Code*	*QC Code*	*QC Partner*	*Appendix VIII Compound?*
881	178	IHSS	BU00058ER	1-Jun-94	BNACLP	BIS(2-ETHYLHEXYL)PHTHALATE	260	B	10	V	REAL		YES
881	178	IHSS	BU00058ER	1-Jun-94	BNACLP	BUTYL BENZYL PHTHALATE	39		10	V	REAL		YES
881	178	IHSS	BU00058ER	1-Jun-94	BNACLP	PHENOL	120		10	V	REAL		YES
881	178	IHSS	BU00059ER	1-Jun-94	BNACLP	BIS(2-ETHYLHEXYL)PHTHALATE	190	B	10	V	DUP	BU00058ER	YES
881	178	IHSS	BU00059ER	1-Jun-94	BNACLP	BUTYL BENZYL PHTHALATE	18		10	V	DUP	BU00058ER	YES
881	178	IHSS	BU00059ER	1-Jun-94	BNACLP	PHENOL	140		10	V	DUP	BU00058ER	YES

Table 5-3
Organic Compounds Detected in IHSS Hot Water Rinsate Samples
IHSS 179

Building	*IHSS*	*Location*	*Sample Number*	*Sample Date*	*Test Group*	*Compound*	*Result (ug/l)*	*Qualifier*	*Detection Limit (ug/l)*	*Validation Code*	*QC Code*	*QC Partner*	*Appendix VIII Compound?*
865	179	IHSS	BU00036ER	15-Sep-93	BNACLP	BIS(2-ETHYLHEXYL)PHTHALATE	230	D	10	V	REAL		YES
865	179	IHSS	BU00036ER	15-Sep-93	BNACLP	PHENOL	53		10	V	REAL		YES

Table 5-4
Hot Water Rinsate Verification Sample Results
IHSS 179

Building	*IHSS*	*Location*	*Sample Number*	*Sample Date*	*Test Group*	*Compound*	*Result (ug/l)*	*Qualifier*	*Detection Limit (ug/l)*	*Validation Code*	*QC Code*	*QC Partner*	*Appendix VIII Compound?*
865	179	IHSS	BU00062ER	8-Jun-94	BNACLP	BIS(2-ETHYLHEXYL)PHTHALATE	150	B	10	V	REAL		YES
865	179	IHSS	BU00062ER	8-Jun-94	BNACLP	PHENOL	81		10	V	REAL		YES
865	179	IHSS	BU00063ER	8-Jun-94	BNACLP	BIS(2-ETHYLHEXYL)PHTHALATE	200	B	10	V	DUP	BU00062ER	YES
865	179	IHSS	BU00063ER	8-Jun-94	BNACLP	PHENOL	84		10	V	DUP	BU00062ER	YES

Table 5-5
Organic Compounds Detected in IHSS Hot Water Rinsate Samples
IHSS 180

Building	*IHSS*	*Location*	*Sample Number*	*Sample Date*	*Test Group*	*Compound*	*Result (ug/l)*	*Qualifier*	*Detection Limit (ug/l)*	*Validation Code*	*QC Code*	*QC Partner*	*Appendix VIII Compound?*
883	180	IHSS	BU00023ER	01-Sep-93	BNACLP	BIS(2-ETHYLHEXYL)PHTHALATE	150		10	V	REAL		YES
883	180	IHSS	BU00023ER	01-Sep-93	BNACLP	PHENOL	47		10	V	REAL		YES
883	180	IHSS	BU00023ER	01-Sep-93	VOACLP	METHYLENE CHLORIDE	27		5	V	REAL		YES
883	180	IHSS	BU00024ER	01-Sep-93	BNACLP	BIS(2-ETHYLHEXYL)PHTHALATE	230	D	10	V	DUP	BU00023ER	YES
883	180	IHSS	BU00024ER	01-Sep-93	BNACLP	PHENOL	47		10	V	DUP	BU00023ER	YES
883	180	IHSS	BU00024ER	01-Sep-93	VOACLP	METHYLENE CHLORIDE	21		5	V	DUP	BU00023ER	YES

Table 5-6
Hot Water Rinsate Verification Sample Results
IHSS 180

Building	*IHSS*	*Location*	*Sample Number*	*Sample Date*	*Test Group*	*Compound*	*Result (ug/l)*	*Qualifier*	*Detection Limit (ug/l)*	*Validation Code*	*QC Code*	*QC Partner*	*Appendix VIII Compound?*
883	180	IHSS	BU00065ER	20-Jun-94	BNACLP	BIS(2-ETHYLHEXYL)PHTHALATE	280		10	V	REAL		YES
883	180	IHSS	BU00065ER	20-Jun-94	BNACLP	PHENOL	15		10	V	REAL		YES
883	180	IHSS	BU00065ER	20-Jun-94	VOACLP	METHYLENE CHLORIDE	5	U	5	V	REAL		YES
883	180	IHSS	BU00066ER	20-Jun-94	BNACLP	BIS(2-ETHYLHEXYL)PHTHALATE	690	D	10	V	DUP	BU00065ER	YES
883	180	IHSS	BU00066ER	20-Jun-94	BNACLP	PHENOL	31		10	V	DUP	BU00065ER	YES
883	180	IHSS	BU00066ER	20-Jun-94	VOACLP	METHYLENE CHLORIDE	5	U	5	V	DUP	BU00065ER	YES

Table 5-7
Organic Compounds Detected in Hot Water Rinsate Samples
IHSS 204

Building	*IHSS*	*Location*	*Sample Number*	*Sample Date*	*Test Group*	*Compound*	*Result (ug/l)*	*Qualifier*	*Detection Limit (ug/l)*	*Validation Code*	*QC Code*	*QC Partner*	*Appendix VIII Compound?*
447	204	Room 502	BU00044ER	11-Oct-93	BNACLP	BIS(2-ETHYLHEXYL)PHTHALATE	930	D	10	V	REAL		Yes
447	204	Room 502	BU00044ER	11-Oct-93	BNACLP	DI-n-OCTYL PHTHALATE	12		10	V	REAL		Yes
447	204	Room 502	BU00044ER	11-Oct-93	BNACLP	PHENOL	23		10	V	REAL		Yes
447	204	Inlet	BU00045ER	11-Oct-93	BNACLP	BIS(2-ETHYLHEXYL)PHTHALATE	270	D	10	V	REAL		Yes
447	204	Inlet	BU00045ER	11-Oct-93	BNACLP	DI-n-OCTYL PHTHALATE	28		10	V	REAL		Yes
447	204	Inlet	BU00045ER	11-Oct-93	BNACLP	PHENOL	98		10	V	REAL		Yes
447	204	Room 32	BU00050ER	09-Nov-93	BNACLP	BENZOIC ACID	160	E	50	A	REAL		
447	204	Room 32	BU00050ER	09-Nov-93	BNACLP	BIS(2-ETHYLHEXYL)PHTHALATE	160		10	V	REAL		Yes
447	204	Room 32	BU00050ER	09-Nov-93	BNACLP	DI-n-OCTYL PHTHALATE	16		10	V	REAL		Yes
447	204	Room 32	BU00050ER	09-Nov-93	BNACLP	PHENOL	58		10	V	REAL		Yes
447	204	Outlet	BU00051ER	09-Nov-93	BNACLP	2-NITROPHENOL	13		10	V	REAL		
447	204	Outlet	BU00051ER	09-Nov-93	BNACLP	BIS(2-ETHYLHEXYL)PHTHALATE	57		10	V	REAL		Yes
447	204	Outlet	BU00051ER	09-Nov-93	BNACLP	DI-n-OCTYL PHTHALATE	43		10	V	REAL		Yes
447	204	Outlet	BU00051ER	09-Nov-93	BNACLP	PHENOL	450	D	10	V	REAL		Yes

Table 5-8
Organic and Inorganic Compounds Detected in IHSS Hot Water Rinsate Samples
IHSS 211

Building	IHSS	Location	Sample Number	Sample Date	Test Group	Compound	Result (ug/l)	Qualifier	Detection Limit (ug/l)	Validation Code	QC Code	QC Partner*	Appendix VIII Compound?
881	211	IHSS	BU00002ER	09-Aug-93	BNACLP	2-METHYLPHENOL	110		10	V	REAL		
881	211	IHSS	BU00002ER	09-Aug-93	BNACLP	BENZOIC ACID	250	D	50	V	REAL		
881	211	IHSS	BU00002ER	09-Aug-93	BNACLP	BENZYL ALCOHOL	10		10	V	REAL		
881	211	IHSS	BU00002ER	09-Aug-93	BNACLP	BUTYL BENZYL PHTHALATE	54		10	JA	REAL		YES
881	211	IHSS	BU00002ER	09-Aug-93	BNACLP	PHENOL	150	D	10	V	REAL		YES
881	211	IHSS	BU00002ER	09-Aug-93	DMETADD	SILICON	9250		100	JA	REAL		
881	211	IHSS	BU00002ER	09-Aug-93	DSMETCLP	CADMIUM	17		5	JA	REAL		YES
881	211	IHSS	BU00002ER	09-Aug-93	DSMETCLP	CALCIUM	37400		5000	JA	REAL		
881	211	IHSS	BU00002ER	09-Aug-93	DSMETCLP	COPPER	34.4		25	V	REAL		
881	211	IHSS	BU00002ER	09-Aug-93	DSMETCLP	IRON	135		100	JA	REAL		
881	211	IHSS	BU00002ER	09-Aug-93	DSMETCLP	LEAD	9.1		5	V	REAL		YES
881	211	IHSS	BU00002ER	09-Aug-93	DSMETCLP	POTASSIUM	25600		5000	V	REAL		
881	211	IHSS	BU00002ER	09-Aug-93	DSMETCLP	SODIUM	53900		5000	JA	REAL		
881	211	IHSS	BU00002ER	09-Aug-93	DSMETCLP	ZINC	40.5		20	V	REAL		
881	211	IHSS	BU00002ER	09-Aug-93	VOACLP	TOTAL XYLENES	9		5	V	REAL		
881	211	IHSS	BU00003ER	09-Aug-93	BNACLP	2-METHYLPHENOL	120		10	V	DUP	BU00002ER	
881	211	IHSS	BU00003ER	09-Aug-93	BNACLP	BENZOIC ACID	240	D	50	V	DUP	BU00002ER	
881	211	IHSS	BU00003ER	09-Aug-93	BNACLP	BENZYL ALCOHOL	11		10	V	DUP	BU00002ER	
881	211	IHSS	BU00003ER	09-Aug-93	BNACLP	BUTYL BENZYL PHTHALATE	75		10	JA	DUP	BU00002ER	YES
881	211	IHSS	BU00003ER	09-Aug-93	BNACLP	PHENOL	170	D	10	V	DUP	BU00002ER	YES
881	211	IHSS	BU00003ER	09-Aug-93	DMETADD	SILICON	8510		100	JA	DUP	BU00002ER	
881	211	IHSS	BU00003ER	09-Aug-93	DSMETCLP	CALCIUM	39400		5000	JA	DUP	BU00002ER	
881	211	IHSS	BU00003ER	09-Aug-93	DSMETCLP	COPPER	30.1		25	V	DUP	BU00002ER	
881	211	IHSS	BU00003ER	09-Aug-93	DSMETCLP	LEAD	4.4		5	V	DUP	BU00002ER	YES
881	211	IHSS	BU00003ER	09-Aug-93	DSMETCLP	POTASSIUM	24400		5000	V	DUP	BU00002ER	
881	211	IHSS	BU00003ER	09-Aug-93	DSMETCLP	SODIUM	53700		5000	JA	DUP	BU00002ER	
881	211	IHSS	BU00003ER	09-Aug-93	DSMETCLP	ZINC	32.3		20	V	DUP	BU00002ER	
881	211	IHSS	BU00003ER	09-Aug-93	VOACLP	TOTAL XYLENES	18		5	V	DUP	BU00002ER	

* The data for IHSS 211 QC Partner samples was not input into RFEDS, but has been manually entered here.

Table 5-9
Hot Water Rinsate Verification Sample Results
IHSS 211

Building	*IHSS*	*Location*	*Sample Number*	*Sample Date*	*Test Group*	*Compound*	*Result (ug/l)*	*Qualifier*	*Detection Limit (ug/l)*	*Validation Code*	*QC Code*	*QC Partner*	*Appendix VIII Compound?*
881	211	IHSS	BU00061ER	1-Jun-94	BNACLP	BUTYL BENZYL PHTHALATE	10	U	10	V	REAL		YES
881	211	IHSS	BU00061ER	1-Jun-94	BNACLP	PHENOL	94		10	V	REAL		YES
881	211	IHSS	BU00061ER	1-Jun-94	DSMETCLP	CADMIUM	3.0	U	5	V	REAL		YES
881	211	IHSS	BU00061ER	1-Jun-94	DSMETCLP	LEAD	5.0		3	V	REAL		YES

Table 5-10
Organic and Inorganic Compounds Detected in IHSS Hot Water Rinsate Samples
IHSS 217

Building	*IHSS*	*Location*	*Sample Number*	*Sample Date*	*Test Group*	*Compound*	*Result (ug/l)*	*Qualifier*	*Detection Limit (ug/l)*	*Validation Code*	*QC Code*	*QC Partner*	*Appendix VIII Compound?*
881	217	IHSS	BU00017ER	17-Aug-93	BNACLP	BIS(2-ETHYLHEXYL)PHTHALATE	53		10	JA	REAL		YES
881	217	IHSS	BU00017ER	17-Aug-93	BNACLP	BUTYL BENZYL PHTHALATE	21		10	JA	REAL		YES
881	217	IHSS	BU00017ER	17-Aug-93	BNACLP	PHENOL	18		10	V	REAL		YES
881	217	IHSS	BU00017ER	17-Aug-93	DMETADD	LITHIUM	256		100	V	REAL		
881	217	IHSS	BU00017ER	17-Aug-93	DMETADD	SILICON	3630		100	JA	REAL		
881	217	IHSS	BU00017ER	17-Aug-93	DSMETCLP	BERYLLIUM	7.2		5	JA	REAL		YES
881	217	IHSS	BU00017ER	17-Aug-93	DSMETCLP	CADMIUM	75.8		5	JA	REAL		YES
881	217	IHSS	BU00017ER	17-Aug-93	DSMETCLP	CALCIUM	42300		5000	JA	REAL		
881	217	IHSS	BU00017ER	17-Aug-93	DSMETCLP	CHROMIUM	37.5		10	V	REAL		YES
881	217	IHSS	BU00017ER	17-Aug-93	DSMETCLP	COBALT	72.2		50	V	REAL		
881	217	IHSS	BU00017ER	17-Aug-93	DSMETCLP	COPPER	281		25	V	REAL		
881	217	IHSS	BU00017ER	17-Aug-93	DSMETCLP	IRON	143		100	JA	REAL		
881	217	IHSS	BU00017ER	17-Aug-93	DSMETCLP	MAGNESIUM	14000		5000	JA	REAL		
881	217	IHSS	BU00017ER	17-Aug-93	DSMETCLP	MANGANESE	1200		15	V	REAL		
881	217	IHSS	BU00017ER	17-Aug-93	DSMETCLP	MERCURY	1.6		.2	V	REAL		YES
881	217	IHSS	BU00017ER	17-Aug-93	DSMETCLP	NICKEL	5630		40	V	REAL		YES
881	217	IHSS	BU00017ER	17-Aug-93	DSMETCLP	POTASSIUM	5270		5000	V	REAL		
881	217	IHSS	BU00017ER	17-Aug-93	DSMETCLP	SILVER	22.1		10	V	REAL		YES
881	217	IHSS	BU00017ER	17-Aug-93	DSMETCLP	SODIUM	17400		5000	JA	REAL		
881	217	IHSS	BU00017ER	17-Aug-93	DSMETCLP	ZINC	986		20	V	REAL		
881	217	IHSS	BU00017ER	17-Aug-93	VOACLP	4-METHYL-2-PENTANONE	26		10	V	REAL		
881	217	IHSS	BU00017ER	17-Aug-93	VOACLP	CHLOROFORM	5		5	V	REAL		YES
881	217	IHSS	BU00017ER	17-Aug-93	VOACLP	TOTAL XYLENES	11		5	V	REAL		
881	217	IHSS	BU00017ER	17-Aug-93	WQPL	CYANIDE	142		5	JA	REAL		YES

Table 5-10
Organic and Inorganic Compounds Detected in IHSS Hot Water Rinsate Samples
IHSS 217

Building	IHSS	Location	Sample Number	Sample Date	Test Group	Compound	Result (ug/l)	Qualifier	Detection Limit (ug/l)	Validation Code	QC Code	QC Partner	Appendix VIII Compound?
881	217	IHSS	BU00018ER	17-Aug-93	BNACLP	BIS(2-ETHYLHEXYL)PHTHALATE	53		10	JA	DUP	BU00017ER	YES
881	217	IHSS	BU00018ER	17-Aug-93	BNACLP	BUTYL BENZYL PHTHALATE	23		10	JA	DUP	BU00017ER	YES
881	217	IHSS	BU00018ER	17-Aug-93	BNACLP	PHENOL	18		10	V	DUP	BU00017ER	YES
881	217	IHSS	BU00018ER	17-Aug-93	DMETADD	LITHIUM	247		100	V	DUP	BU00017ER	
881	217	IHSS	BU00018ER	17-Aug-93	DMETADD	SILICON	3690		100	JA	DUP	BU00017ER	
881	217	IHSS	BU00018ER	17-Aug-93	DSMETCLP	BERYLLIUM	7.4		5	JA	DUP	BU00017ER	YES
881	217	IHSS	BU00018ER	17-Aug-93	DSMETCLP	CADMIUM	73.5		5	JA	DUP	BU00017ER	YES
881	217	IHSS	BU00018ER	17-Aug-93	DSMETCLP	CALCIUM	42700		5000	JA	DUP	BU00017ER	
881	217	IHSS	BU00018ER	17-Aug-93	DSMETCLP	CHROMIUM	36.9		10	V	DUP	BU00017ER	YES
881	217	IHSS	BU00018ER	17-Aug-93	DSMETCLP	COBALT	67.9		50	V	DUP	BU00017ER	
881	217	IHSS	BU00018ER	17-Aug-93	DSMETCLP	COPPER	287		25	V	DUP	BU00017ER	
881	217	IHSS	BU00018ER	17-Aug-93	DSMETCLP	IRON	131		100	JA	DUP	BU00017ER	
881	217	IHSS	BU00018ER	17-Aug-93	DSMETCLP	MAGNESIUM	14200		5000	JA	DUP	BU00017ER	
881	217	IHSS	BU00018ER	17-Aug-93	DSMETCLP	MANGANESE	1200		15	V	DUP	BU00017ER	
881	217	IHSS	BU00018ER	17-Aug-93	DSMETCLP	MERCURY	1.7		.2	V	DUP	BU00017ER	YES
881	217	IHSS	BU00018ER	17-Aug-93	DSMETCLP	NICKEL	5670		40	V	DUP	BU00017ER	YES
881	217	IHSS	BU00018ER	17-Aug-93	DSMETCLP	POTASSIUM	5140		5000	V	DUP	BU00017ER	
881	217	IHSS	BU00018ER	17-Aug-93	DSMETCLP	SILVER	21.3		10	V	DUP	BU00017ER	YES
881	217	IHSS	BU00018ER	17-Aug-93	DSMETCLP	SODIUM	16600		5000	JA	DUP	BU00017ER	
881	217	IHSS	BU00018ER	17-Aug-93	DSMETCLP	ZINC	1020		20	V	DUP	BU00017ER	
881	217	IHSS	BU00018ER	17-Aug-93	VOACLP	4-METHYL-2-PENTANONE	28		10	V	DUP	BU00017ER	
881	217	IHSS	BU00018ER	17-Aug-93	VOACLP	CHLOROFORM	5		5	V	DUP	BU00017ER	YES
881	217	IHSS	BU00018ER	17-Aug-93	VOACLP	TOTAL XYLENES	11		5	V	DUP	BU00017ER	
881	217	IHSS	BU00018ER	17-Aug-93	WQPL	CYANIDE	171		5	JA	DUP	BU00017ER	YES

Table 5-11
Hot Water Rinsate Verification Sample Results
IHSS 217

Building	*IHSS*	*Location*	*Sample Number*	*Sample Date*	*Test Group*	*Compound*	*Result (ug/l)*	*Qualifier*	*Detection Limit (ug/l)*	*Validation Code*	*QC Code*	*QC Partner*	*Appendix VIII Compound?*
881	217	IHSS	BU00056ER	25-May-94	WQPL	CYANIDE	10	U	10	V	REAL		YES
881	217	IHSS	BU00057ER	25-May-94	WQPL	CYANIDE	10	U	10	V	DUP	BU00056ER	YES

Table 5-12
Radionuclides Detected in Hot Water Rinsate Samples
IHSS 178

Building	IHSS	Location	Sample Number	Sample Date	Test Group	Radionuclide	Result (pCi/L)	Error	Qualifier	Detection Limit (pCi/L)	Validation Code	QC Code	QC Partner	Rinsate Volume (L)	Rinsate Area (m^2)	Concentration in Dust* (pCi/g)
881	178	IHSS	BU00011ER	16-Aug-93	DRADS	GROSS ALPHA	7.9	1.2		0.82	V	REAL		15.09	10	2.13e+1
881	178	IHSS	BU00011ER	16-Aug-93	DRADS	GROSS BETA	11	4.0		5.5	V	REAL		15.09	10	2.96e+1
881	178	IHSS	BU00011ER	16-Aug-93	DRADS	PLUTONIUM-239/240	.023	0.012	B	0.009	V	REAL		15.09	10	6.20e-2
881	178	IHSS	BU00011ER	16-Aug-93	DRADS	RADIUM-226	.37	0.18	BJ	0.26	A	REAL		15.09	10	9.97e-1
881	178	IHSS	BU00011ER	16-Aug-93	DRADS	URANIUM-233,-234	9.3	1.7	B	0.11	A	REAL		15.09	10	2.51e+1
881	178	IHSS	BU00011ER	16-Aug-93	DRADS	URANIUM-235	.22	0.20	J	0.036	A	REAL		15.09	10	5.93e-1
881	178	IHSS	BU00011ER	16-Aug-93	DRADS	URANIUM-238	1	0.44	B	0.061	A	REAL		15.09	10	2.69e+0
881	178	IHSS	BU00012ER	16-Aug-93	DRADS	GROSS ALPHA	8.7	1.3		0.69	V	DUP	BU00011ER	15.09	10	2.34e+1
881	178	IHSS	BU00012ER	16-Aug-93	DRADS	GROSS BETA	17	4.1		5.1	V	DUP	BU00011ER	15.09	10	4.58e+1
881	178	IHSS	BU00012ER	16-Aug-93	DRADS	PLUTONIUM-239/240	.024	0.012	B	0.007	V	DUP	BU00011ER	15.09	10	6.47e-2
881	178	IHSS	BU00012ER	16-Aug-93	DRADS	RADIUM-226	.49	0.14	BJ	0.14	A	DUP	BU00011ER	15.09	10	1.32e+0
881	178	IHSS	BU00012ER	16-Aug-93	DRADS	URANIUM-233,-234	9.6	1.8	B	0.037	A	DUP	BU00011ER	15.09	10	2.59e+1
881	178	IHSS	BU00012ER	16-Aug-93	DRADS	URANIUM-235	.44	0.29	J	0.063	A	DUP	BU00011ER	15.09	10	1.19e+0
881	178	IHSS	BU00012ER	16-Aug-93	DRADS	URANIUM-238	1.2	0.50	B	0.063	A	DUP	BU00011ER	15.09	10	3.23e+0
881	178	Perimeter	BU00014ER	16-Aug-93	DRADS	GROSS ALPHA	5.2	0.79		0.47	V	REAL		11.73	6	1.82e+1
881	178	Perimeter	BU00014ER	16-Aug-93	DRADS	GROSS BETA	10	2.9		3.9	V	REAL		11.73	6	3.49e+1
881	178	Perimeter	BU00014ER	16-Aug-93	DRADS	PLUTONIUM-239/240	.02	0.010	B	0.005	V	REAL		11.73	6	6.98e-2
881	178	Perimeter	BU00014ER	16-Aug-93	DRADS	RADIUM-226	.47	0.20	BJ	0.27	A	REAL		11.73	6	1.64e+0
881	178	Perimeter	BU00014ER	16-Aug-93	DRADS	URANIUM-233,-234	5.5	1.2	B	0.035	A	REAL		11.73	6	1.92e+1
881	178	Perimeter	BU00014ER	16-Aug-93	DRADS	URANIUM-235	.21	0.19	J	0.060	A	REAL		11.73	6	7.33e-1
881	178	Perimeter	BU00014ER	16-Aug-93	DRADS	URANIUM-238	.81	0.38	B	0.035	A	REAL		11.73	6	2.83e+0
881	178	Pathway	BU00015ER	16-Aug-93	DRADS	AMERICIUM-241	.019	0.010		0.002	V	REAL		13.29	8.8	5.12e-2
881	178	Pathway	BU00015ER	16-Aug-93	DRADS	GROSS ALPHA	28	2.2		0.83	V	REAL		13.29	8.8	7.55e+1
881	178	Pathway	BU00015ER	16-Aug-93	DRADS	GROSS BETA	21	4.4		5.4	V	REAL		13.29	8.8	5.66e+1
881	178	Pathway	BU00015ER	16-Aug-93	DRADS	PLUTONIUM-239/240	.046	0.016		0.008	V	REAL		13.29	8.8	1.24e-1
881	178	Pathway	BU00015ER	16-Aug-93	DRADS	RADIUM-226	.45	0.19	BJ	0.27	A	REAL		13.29	8.8	1.21e+0
881	178	Pathway	BU00015ER	16-Aug-93	DRADS	URANIUM-233,-234	26	3.6	B	0.058	A	REAL		13.29	8.8	7.01e+1
881	178	Pathway	BU00015ER	16-Aug-93	DRADS	URANIUM-235	.98	0.42		0.058	A	REAL		13.29	8.8	2.64e+0
881	178	Pathway	BU00015ER	16-Aug-93	DRADS	URANIUM-238	.94	0.41	B	0.058	A	REAL		13.29	8.8	2.54e+0

* Calculated assuming 560 mg of dust per square meter.

Table 5-13
Smear Sample Results
IHSS 178

				Pre-Rinsate Smear Sample		*Pre-Rinsate Dust Concentration**		*Post-Rinsate Smear Sample*		*Post-Rinsate Dust Concentration**	
Building	*Room*	*IHSS*	*Area*	*Alpha (dpm/100 cm^2)*	*Beta (dpm/100 cm^2)*	*Alpha (pCi/g)*	*Beta (pCi/g)*	*Alpha (dpm/100 cm^2)*	*Beta (dpm/100 cm^2)*	*Alpha (pCi/g)*	*Beta (pCi/g)*
881	165	178	1	3	0	2.4e+2	0.0e+0	0	18	0.0e+0	1.4e+3
881	165	178	2	0	0	0.0e+0	0.0e+0	0	0	0.0e+0	0.0e+0
881	165	178	3	0	18	0.0e+0	1.4e+3	0	3	0.0e+0	2.4e+2
881	165	178	4	0	3	0.0e+0	2.4e+2	0	9	0.0e+0	7.2e+2
881	165	178	5	3	0	2.4e+2	0.0e+0	3	0	2.4e+2	0.0e+0
881	165	178	6	9	0	7.2e+2	0.0e+0	3	0	2.4e+2	0.0e+0
881	165	178	7	0	12	0.0e+0	9.7e+2	3	15	2.4e+2	1.2e+3
881	165	178	8	0	24	0.0e+0	1.9e+3	9	9	7.2e+2	7.2e+2
881	165	178	9	3	0	2.4e+2	0.0e+0	0	21	0.0e+0	1.7e+3
881	165	178	10	9	9	7.2e+2	7.2e+2	0	0	0.0e+0	0.0e+0
881	165	178	11	0	0	0.0e+0	0.0e+0	3	0	2.4e+2	0.0e+0
881	165	178	12	0	30	0.0e+0	2.4e+3	3	3	2.4e+2	2.4e+2
881	165	178	13	0	0	0.0e+0	0.0e+0	0	27	0.0e+0	2.2e+3
881	165	178	14	0	15	0.0e+0	1.2e+3	0	40	0.0e+0	3.2e+3
881	165	178	15	0	3	0.0e+0	2.4e+2	3	0	2.4e+2	0.0e+0
881	165	178	16	6	0	4.8e+2	0.0e+0	0	6	0.0e+0	4.8e+2
881	165	178	17	0	0	0.0e+0	0.0e+0	9	33	7.2e+2	2.7e+3
881	165	178	18	0	9	0.0e+0	7.2e+2	6	18	4.8e+2	1.4e+3
881	165	178	19	3	0	2.4e+2	0.0e+0	0	0	0.0e+0	0.0e+0
881	165	178	20	3	6	2.4e+2	4.8e+2	6	0	4.8e+2	0.0e+0
881	165	178	21	0	0	0.0e+0	0.0e+0	0	0	0.0e+0	0.0e+0
881	165	178	22	0	0	0.0e+0	0.0e+0	0	0	0.0e+0	0.0e+0
881	165	178	23	3	3	2.4e+2	2.4e+2	0	27	0.0e+0	2.2e+3
881	165	178	24	0	9	0.0e+0	7.2e+2	0	30	0.0e+0	2.4e+3
881	165	178	25	0	6	0.0e+0	4.8e+2	0	0	0.0e+0	0.0e+0
881	165	178	26	6	0	4.8e+2	0.0e+0	0	36	0.0e+0	2.9e+3
881	165	178	27	3	0	2.4e+2	0.0e+0	6	0	4.8e+2	0.0e+0
881	165	178	28	3	6	2.4e+2	4.8e+2	0	0	0.0e+0	0.0e+0
881	165	178	29	0	18	0.0e+0	1.4e+3	0	0	0.0e+0	0.0e+0
881	165	178	30	0	0	0.0e+0	0.0e+0	0	39	0.0e+0	3.1e+3

* Calculated assuming 560 mg dust per square meter

Table 5-14
Beta and Gamma Dose-Rate Survey Data
IHSS 178

Building	*Room*	*IHSS*	*Area*	*Gamma Dose-Rate (mrem/hr)*	*Beta Dose-Rate (mrem/hr)*
881	165	178	1	0	0
881	165	178	2	0	0
881	165	178	3	0	0
881	165	178	4	0	0
881	165	178	5	0	0
881	165	178	6	0	0
881	165	178	7	0	0
881	165	178	8	0	0
881	165	178	9	0	0
881	165	178	10	0	0
881	165	178	11	0	0
881	165	178	12	0	0
881	165	178	13	0	0
881	165	178	14	0	0
881	165	178	15	0	0
881	165	178	16	0	0
881	165	178	17	0	0.4
881	165	178	18	0	0.4
881	165	178	19	0	0.4
881	165	178	20	0	0.4
881	165	178	21	0	0.4
881	165	178	22	0	0.4
881	165	178	23	0	0.4
881	165	178	24	0	0.4
881	165	178	25	0	0.4
881	165	178	26	0	0.4
881	165	178	27	0	0.4
881	165	178	28	0	0.4
881	165	178	29	0	0.4
881	165	178	30	0	0.4

Table 5-15
Radionuclides Detected in Hot Water Rinsate Samples
IHSS 179

Building	*IHSS*	*Location*	*Sample Number*	*Sample Date*	*Test Group*	*Radionuclide*	*Result (pCi/L)*	*Error*	*Qualifier*	*Detection Limit (pCi/L)*	*Validation Code*	*QC Code*	*QC Partner*	*Rinsate Volume (L)*	*Rinsate Area (m^2)*	*Concentration in Dust* (pCi/g)*
865	179	Perimeter	BU00033ER	15-Sep-93	DRADS	AMERICIUM-241	0.007	0.004	J	0.001	V	REAL		15.91	7	2.84e-2
865	179	Perimeter	BU00033ER	15-Sep-93	DRADS	GROSS ALPHA	18	1.3		0.51	V	REAL		15.91	7	7.31e+1
865	179	Perimeter	BU00033ER	15-Sep-93	DRADS	GROSS BETA	27	2.8		2.5	V	REAL		15.91	7	1.10e+2
865	179	Perimeter	BU00033ER	15-Sep-93	DRADS	PLUTONIUM-239/240	0.005	0.004	J	0.005	V	REAL		15.91	7	2.03e-2
865	179	Perimeter	BU00033ER	15-Sep-93	DRADS	RADIUM-226	.86	0.050	B	0.040	A	REAL		15.91	7	3.49e+0
865	179	Perimeter	BU00033ER	15-Sep-93	DRADS	URANIUM-233,-234	3.0	0.79	B	0.12	A	REAL		15.91	7	1.22e+1
865	179	Perimeter	BU00033ER	15-Sep-93	DRADS	URANIUM-235	0.17	0.17	BJ	0.035	A	REAL		15.91	7	6.90e-1
865	179	Perimeter	BU00033ER	15-Sep-93	DRADS	URANIUM-238	19	2.9	B	0.062	A	REAL		15.91	7	7.71e+1
865	179	Perimeter	BU00034ER	15-Sep-93	DRADS	AMERICIUM-241	0.007	0.004	J	0.001	V	DUP	BU00033ER	15.91	7	2.84e-2
865	179	Perimeter	BU00034ER	15-Sep-93	DRADS	GROSS ALPHA	17	1.2		0.56	V	DUP	BU00033ER	15.91	7	6.90e+1
865	179	Perimeter	BU00034ER	15-Sep-93	DRADS	GROSS BETA	25	2.7		2.3	V	DUP	BU00033ER	15.91	7	1.01e+2
865	179	Perimeter	BU00034ER	15-Sep-93	DRADS	PLUTONIUM-239/240	0.015	0.008		0.007	V	DUP	BU00033ER	15.91	7	6.09e-2
865	179	Perimeter	BU00034ER	15-Sep-93	DRADS	RADIUM-226	.66	0.050	B	0.070	A	DUP	BU00033ER	15.91	7	2.68e+0
865	179	Perimeter	BU00034ER	15-Sep-93	DRADS	URANIUM-233,-234	3.3	0.94	B	0.13	A	DUP	BU00033ER	15.91	7	1.34e+1
865	179	Perimeter	BU00034ER	15-Sep-93	DRADS	URANIUM-235	0.31	0.26	BJ	0.043	A	DUP	BU00033ER	15.91	7	1.26e+0
865	179	Perimeter	BU00034ER	15-Sep-93	DRADS	URANIUM-238	16	2.8	B	0.15	A	DUP	BU00033ER	15.91	7	6.49e+1
865	179	IHSS	BU00036ER	15-Sep-93	DRADS	AMERICIUM-241	0.018	0.008		0.004	V	REAL		9.09	3	9.74e-2
865	179	IHSS	BU00036ER	15-Sep-93	DRADS	GROSS ALPHA	9.0	0.89		0.49	V	REAL		9.09	3	4.87e+1
865	179	IHSS	BU00036ER	15-Sep-93	DRADS	GROSS BETA	13	2.3		2.6	V	REAL		9.09	3	7.03e+1
865	179	IHSS	BU00036ER	15-Sep-93	DRADS	PLUTONIUM-239/240	0.014	0.008		0.004	V	REAL		9.09	3	7.58e-2
865	179	IHSS	BU00036ER	15-Sep-93	DRADS	URANIUM-233,-234	1.9	0.68	B	0.13	A	REAL		9.09	3	1.03e+1
865	179	IHSS	BU00036ER	15-Sep-93	DRADS	URANIUM-235	0.10	0.15	BJ	0.043	A	REAL		9.09	3	5.41e-1
865	179	IHSS	BU00036ER	15-Sep-93	DRADS	URANIUM-238	9.2	1.8	B	0.043	A	REAL		9.09	3	4.98e+1
865	179	Pathway	BU00037ER	15-Sep-93	DRADS	GROSS ALPHA	120	4.1		0.64	V	REAL		9.52	13.3	1.53e+2
865	179	Pathway	BU00037ER	15-Sep-93	DRADS	GROSS BETA	130	6.9		4.1	V	REAL		9.52	13.3	1.66e+2
865	179	Pathway	BU00037ER	15-Sep-93	DRADS	PLUTONIUM-239/240	0.006	0.006	J	0.006	V	REAL		9.52	13.3	7.67e-3
865	179	Pathway	BU00037ER	15-Sep-93	DRADS	RADIUM-226	.67	0.050	B	0.070	A	REAL		9.52	13.3	8.56e-1
865	179	Pathway	BU00037ER	15-Sep-93	DRADS	URANIUM-233,-234	18	2.8	B	0.037	A	REAL		9.52	13.3	2.30e+1
865	179	Pathway	BU00037ER	15-Sep-93	DRADS	URANIUM-235	2.3	0.69	B	0.037	A	REAL		9.52	13.3	2.94e+0
865	179	Pathway	BU00037ER	15-Sep-93	DRADS	URANIUM-238	130	17	B	0.065	A	REAL		9.52	13.3	1.66e+2

* Calculated assuming 560 mg per square meter.

Table 5-16
Smear Sample Results
IHSS 179

				Pre-Rinsate Smear Sample		Pre-Rinsate Dust Concentration*		Post-Rinsate Smear Sample		Post-Rinsate Dust Concentration*	
Building	*Room*	*IHSS*	*Area*	*Alpha (dpm/100 cm^2)*	*Beta (dpm/100 cm^2)*	*Alpha (pCi/g)*	*Beta (pCi/g)*	*Alpha (dpm/100 cm^2)*	*Beta (dpm/100 cm^2)*	*Alpha (pCi/g)*	*Beta (pCi/g)*
865	145	179	1	12	24	9.7e+2	1.9e+3	15	42	1.2e+3	3.4e+3
865	145	179	2	6	15	4.8e+2	1.2e+3	21	39	1.7e+3	3.1e+3
865	145	179	3	12	12	9.7e+2	9.7e+2	15	27	1.2e+3	2.2e+3
865	145	179	4	9	0	7.2e+2	0.0e+0	12	42	9.7e+2	3.4e+3
865	145	179	5	15	9	1.2e+3	7.2e+2	42	45	3.4e+3	3.6e+3
865	145	179	6	3	15	2.4e+2	1.2e+3	45	36	3.6e+3	2.9e+3
865	145	179	7	9	12	7.2e+2	9.7e+2	21	51	1.7e+3	4.1e+3
865	145	179	8	3	0	2.4e+2	0.0e+0	33	99	2.7e+3	8.0e+3
865	145	179	9	3	9	2.4e+2	7.2e+2	15	36	1.2e+3	2.9e+3
865	145	179	10	12	0	9.7e+2	0.0e+0	27	36	2.2e+3	2.9e+3
865	145	179	11	6	24	4.8e+2	1.9e+3	33	60	2.7e+3	4.8e+3
865	145	179	12	3	0	2.4e+2	0.0e+0	27	54	2.2e+3	4.3e+3
865	145	179	13	12	0	9.7e+2	0.0e+0	69	66	5.6e+3	5.3e+3
865	145	179	14	3	39	2.4e+2	3.1e+3	15	72	1.2e+3	5.8e+3
865	145	179	15	3	18	2.4e+2	1.4e+3	53	69	4.3e+3	5.6e+3
865	145	179	16	9	12	7.2e+2	9.7e+2	21	90	1.7e+3	7.2e+3
865	145	179	17	12	6	9.7e+2	4.8e+2	21	15	1.7e+3	1.2e+3
865	145	179	18	9	0	7.2e+2	0.0e+0	39	72	3.1e+3	5.8e+3
865	145	179	19	9	6	7.2e+2	4.8e+2	39	30	3.1e+3	2.4e+3
865	145	179	20	12	0	9.7e+2	0.0e+0	21	66	1.7e+3	5.3e+3
865	145	179	21	6	42	4.8e+2	3.4e+3	21	69	1.7e+3	5.6e+3
865	145	179	22	6	0	4.8e+2	0.0e+0	39	72	3.1e+3	5.8e+3
865	145	179	23	6	15	4.8e+2	1.2e+3	6	39	4.8e+2	3.1e+3

* Calculated assuming 560 mg dust per square meter

Table 5-17
Beta and Gamma Dose-Rate Survey Data
IHSS 179

Building	*Room*	*IHSS*	*Area*	*Gamma Dose-Rate (mrem/hr)*	*Beta Dose-Rate (mrem/hr)*
865	145	179	1	0	0
865	145	179	2	0	0
865	145	179	3	0	0
865	145	179	4	0	0
865	145	179	5	0	0
865	145	179	6	0	0
865	145	179	7	0	0
865	145	179	8	0.4	0
865	145	179	9	0	1.2
865	145	179	10	0.2	0
865	145	179	11	0	0
865	145	179	12	0	0
865	145	179	13	0	0
865	145	179	14	0	1.6
865	145	179	15	0	0
865	145	179	16	0	0
865	145	179	17	0	0
865	145	179	18	0	0
865	145	179	19	0	0
865	145	179	20	0	0
865	145	179	21	0	0
865	145	179	22	0	0
865	145	179	23	0	0

Table 5-18
Beryllium Smear Data
IHSS 179

Building	*Room*	*IHSS*	*Area*	*Pre-Rinsate Smear Sample Beryllium (ug/100cm^2)*	*Post-Rinsate Smear Sample Beryllium (ug/100cm^2)*	*Pre-Rinsate Dust Concentration Beryllium* (mg/kg)*	*Post-Rinsate Dust Concentration Beryllium* (mg/kg)*
865	145	179	1	2	0	3.57e+2	
865	145	179	2	0	0		
865	145	179	3	4	1	7.14e+2	1.79e+2
865	145	179	4	0	0		
865	145	179	5	0	0		
865	145	179	6	1	0	1.79e+2	
865	145	179	7	0	4		7.14e+2
865	145	179	8	2	1	3.57e+2	1.79e+2
865	145	179	9	0	0		
865	145	179	10	0	2		3.57e+2
865	145	179	11	4	3	7.14e+2	5.36e+2
865	145	179	12	0	0		
865	145	179	13	1	1	1.79e+2	1.79e+2
865	145	179	14	3	0	5.36e+2	
865	145	179	15	0	0		
865	145	179	16	0	0		
865	145	179	17	1	0	1.79e+2	
865	145	179	18	0	0		
865	145	179	19	4	2	7.14e+2	3.57e+2
865	145	179	20	0	0		
865	145	179	21	0	0		
865	145	179	22	0	1		1.79e+2
865	145	179	23	not counted	0		

* Values calculated assuming 560 mg dust per square meter.

Table 5-19
Radionuclides Detected in Hot Water Rinsate Samples
IHSS 180

Building	IHSS	Location	Sample Number	Sample Date	Test Group	Radionuclide	Result (pCi/L)	Error	Qualifier	Detection Limit (pCi/L)	Validation Code	QC Code	QC Partner	Rinsate Volume (L)	Rinsate Area (m^2)	Concentration in Dust* (pCi/g)
883	180	IHSS	BU00023ER	01-Sep-93	DRADS	AMERICIUM-241	0.008	0.006	J	0.002	V	REAL		19.81	9	3.14e-2
883	180	IHSS	BU00023ER	01-Sep-93	DRADS	GROSS ALPHA	50	1.9		0.34	V	REAL		19.81	9	1.97e+2
883	180	IHSS	BU00023ER	01-Sep-93	DRADS	GROSS BETA	55	3.7		2.6	V	REAL		19.81	9	2.16e+2
883	180	IHSS	BU00023ER	01-Sep-93	DRADS	PLUTONIUM-239/240	0.005	0.006	J	0.004	V	REAL		19.81	9	1.97e-2
883	180	IHSS	BU00023ER	01-Sep-93	DRADS	RADIUM-226	.57	0.080	B	0.11	A	REAL		19.81	9	2.24e+0
883	180	IHSS	BU00023ER	01-Sep-93	DRADS	URANIUM-233,-234	12	1.9	B	0.056	A	REAL		19.81	9	4.72e+1
883	180	IHSS	BU00023ER	01-Sep-93	DRADS	URANIUM-235	0.30	0.22	BJ	0.031	A	REAL		19.81	9	1.18e+0
883	180	IHSS	BU00023ER	01-Sep-93	DRADS	URANIUM-238	58	7.3	B	0.031	A	REAL		19.81	9	2.28e+2
883	180	IHSS	BU00024ER	01-Sep-93	DRADS	GROSS ALPHA	50	1.9		0.42	V	DUP	BU00023ER	19.81	9	1.97e+2
883	180	IHSS	BU00024ER	01-Sep-93	DRADS	GROSS BETA	68	4.0		2.5	V	DUP	BU00023ER	19.81	9	2.67e+2
883	180	IHSS	BU00024ER	01-Sep-93	DRADS	PLUTONIUM-239/240	0.007	0.006	J	0.002	V	DUP	BU00023ER	19.81	9	2.75e-2
883	180	IHSS	BU00024ER	01-Sep-93	DRADS	RADIUM-226	.28	0.080	BJ	0.12	A	DUP	BU00023ER	19.81	9	1.10e+0
883	180	IHSS	BU00024ER	01-Sep-93	DRADS	URANIUM-233,-234	11	2.2	B	0.13	A	DUP	BU00023ER	19.81	9	4.32e+1
883	180	IHSS	BU00024ER	01-Sep-93	DRADS	URANIUM-235	1.2	0.53		0.13	A	DUP	BU00023ER	19.81	9	4.72e+0
883	180	IHSS	BU00024ER	01-Sep-93	DRADS	URANIUM-238	67	9.5	B	0.076	A	DUP	BU00023ER	19.81	9	2.63e+2
883	180	Perimeter	BU00026ER	01-Sep-93	DRADS	AMERICIUM-241	0.007	0.006	J	0.002	V	REAL		13.76	11	1.56e-2
883	180	Perimeter	BU00026ER	01-Sep-93	DRADS	GROSS ALPHA	270	4.8		0.58	V	REAL		13.76	11	6.03e+2
883	180	Perimeter	BU00026ER	01-Sep-93	DRADS	GROSS BETA	300	8.1		2.7	V	REAL		13.76	11	6.70e+2
883	180	Perimeter	BU00026ER	01-Sep-93	DRADS	PLUTONIUM-239/240	0.007	0.006	J	0.006	V	REAL		13.76	11	1.56e-2
883	180	Perimeter	BU00026ER	01-Sep-93	DRADS	RADIUM-226	.4	0.060	BJ	0.060	A	REAL		13.76	11	8.94e-1
883	180	Perimeter	BU00026ER	01-Sep-93	DRADS	URANIUM-233,-234	60	9.1	B	0.087	A	REAL		13.76	11	1.34e+2
883	180	Perimeter	BU00026ER	01-Sep-93	DRADS	URANIUM-235	9.7	2.0		0.087	A	REAL		13.76	11	2.17e+1
883	180	Perimeter	BU00026ER	01-Sep-93	DRADS	URANIUM-238	380	54	B	0.049	A	REAL		13.76	11	8.49e+2
883	180	Pathway	BU00027ER	02-Sep-93	DRADS	GROSS ALPHA	150	3.5		0.41	V	REAL		21.3	12.7	4.49e+2
883	180	Pathway	BU00027ER	02-Sep-93	DRADS	GROSS BETA	180	6.4		3.0	V	REAL		21.3	12.7	5.39e+2
883	180	Pathway	BU00027ER	02-Sep-93	DRADS	PLUTONIUM-239/240	0.006	0.004	J	0.004	V	REAL		21.3	12.7	1.80e-2
883	180	Pathway	BU00027ER	02-Sep-93	DRADS	RADIUM-226	.46	0.11	BJ	0.15	A	REAL		21.3	12.7	1.38e+0
883	180	Pathway	BU00027ER	02-Sep-93	DRADS	URANIUM-233,-234	37	5.3	B	0.14	A	REAL		21.3	12.7	1.11e+2
883	180	Pathway	BU00027ER	02-Sep-93	DRADS	URANIUM-235	4.4	1.1		0.12	A	REAL		21.3	12.7	1.32e+1
883	180	Pathway	BU00027ER	02-Sep-93	DRADS	URANIUM-238	220	28	B	0.15	A	REAL		21.3	12.7	6.59e+2

Table 5-19
Radionuclides Detected in Hot Water Rinsate Samples
IHSS 180

Building	*IHSS*	*Location*	*Sample Number*	*Sample Date*	*Test Group*	*Radionuclide*	*Result (pCi/L)*	*Error*	*Qualifier*	*Detection Limit (pCi/L)*	*Validation Code*	*QC Code*	*QC Partner*	*Rinsate Volume (L)*	*Rinsate Area (m^2)*	*Concentration in Dust* (pCi/g)*
883	180	Pathway	BU00028ER	02-Sep-93	DRADS	AMERICIUM-241	0.004	0.004	J	0.001	V	DUP	BU00027ER	21.3	12.7	1.20e-2
883	180	Pathway	BU00028ER	02-Sep-93	DRADS	GROSS ALPHA	190	4.0		0.36	V	DUP	BU00027ER	21.3	12.7	5.69e+2
883	180	Pathway	BU00028ER	02-Sep-93	DRADS	GROSS BETA	·180	6.3		2.8	V	DUP	BU00027ER	21.3	12.7	5.39e+2
883	180	Pathway	BU00028ER	02-Sep-93	DRADS	PLUTONIUM-239/240	0.007	0.004	J	0.001	V	DUP	BU00027ER	21.3	12.7	2.10e-2
883	180	Pathway	BU00028ER	02-Sep-93	DRADS	RADIUM-226	.51	0.10	B	0.13	A	DUP	BU00027ER	21.3	12.7	1.53e+0
883	180	Pathway	BU00028ER	02-Sep-93	DRADS	URANIUM-233,-234	40	5.9	B	0.075	A	DUP	BU00027ER	21.3	12.7	1.20e+2
883	180	Pathway	BU00028ER	02-Sep-93	DRADS	URANIUM-235	4.5	1.1	B	0.042	A	DUP	BU00027ER	21.3	12.7	1.35e+1
883	180	Pathway	BU00028ER	02-Sep-93	DRADS	URANIUM-238	250	33	B	0.042	A	DUP	BU00027ER	21.3	12.7	7.49e+2
883	180	Pathway	BU00030ER	02-Sep-93	DRADS	AMERICIUM-241	0.006	0.004	J	0.002	V	REAL		12.87	13.9	9.92e-3
883	180	Pathway	BU00030ER	02-Sep-93	DRADS	GROSS ALPHA	100	3.1		0.59	V	REAL		12.87	13.9	1.65e+2
883	180	Pathway	BU00030ER	02-Sep-93	DRADS	GROSS BETA	140	5.6		2.7	V	REAL		12.87	13.9	2.31e+2
883	180	Pathway	BU00030ER	02-Sep-93	DRADS	PLUTONIUM-239/240	0.004	0.004	J	0.001	V	REAL		12.87	13.9	6.61e-3
883	180	Pathway	BU00030ER	02-Sep-93	DRADS	RADIUM-226	.28	0.070	BJ	0.10	A	REAL		12.87	13.9	4.63e-1
883	180	Pathway	BU00030ER	02-Sep-93	DRADS	URANIUM-233,-234	21	3.1	B	0.034	A	REAL		12.87	13.9	3.47e+1
883	180	Pathway	BU00030ER	02-Sep-93	DRADS	URANIUM-235	1.3	0.48	B	0.034	A	REAL		12.87	13.9	2.15e+0
883	180	Pathway	BU00030ER	02-Sep-93	DRADS	URANIUM-238	110	14	B	0.060	A	REAL		12.87	13.9	1.82e+2

* Calculated assuming 560 mg of dust per square meter.

Table 5-20
Smear Sample Results
IHSS 180

				Pre-Rinsate Smear Sample		Pre-Rinsate Dust Concentration*		Post-Rinsate Smear Sample		Post-Rinsate Dust Concentration*	
Building	Room	IHSS	Area	Alpha (dpm/100 cm^2)	Beta (dpm/100 cm^2)	Alpha (pCi/g)	Beta (pCi/g)	Alpha (dpm/100 cm^2)	Beta (dpm/100 cm^2)	Alpha (pCi/g)	Beta (pCi/g)
883	104	180	1	6	0	4.8e+2	0.0e+0	9	0	7.2e+2	0.0e+0
883	104	180	2	9	18	7.2e+2	1.4e+3	6	0	4.8e+2	0.0e+0
883	104	180	3	15	0	1.2e+3	0.0e+0	12	0	9.7e+2	0.0e+0
883	104	180	4	6	0	4.8e+2	0.0e+0	6	9	4.8e+2	7.2e+2
883	104	180	5	12	0	9.7e+2	0.0e+0	21	30	1.7e+3	2.4e+3
883	104	180	6	15	15	1.2e+3	1.2e+3	6	24	4.8e+2	1.9e+3
883	104	180	7	15	0	1.2e+3	0.0e+0	18	21	1.4e+3	1.7e+3
883	104	180	8	9	24	7.2e+2	1.9e+3	6	24	4.8e+2	1.9e+3
883	104	180	9	9	21	7.2e+2	1.7e+3	12	21	9.7e+2	1.7e+3
883	104	180	10	6	27	4.8e+2	2.2e+3	9	69	7.2e+2	5.6e+3
883	104	180	11	6	0	4.8e+2	0.0e+0	6	0	4.8e+2	0.0e+0
883	104	180	12	15	30	1.2e+3	2.4e+3	6	36	4.8e+2	2.9e+3
883	104	180	13	15	45	1.2e+3	3.6e+3	30	6	2.4e+3	4.8e+2
883	104	180	14	12	21	9.7e+2	1.7e+3	3	24	2.4e+2	1.9e+3
883	104	180	15	15	18	1.2e+3	1.4e+3	9	12	7.2e+2	9.7e+2
883	104	180	16	6	0	4.8e+2	0.0e+0	3	18	2.4e+2	1.4e+3
883	104	180	17	9	12	7.2e+2	9.7e+2	18	12	1.4e+3	9.7e+2
883	104	180	18	9	0	7.2e+2	0.0e+0	9	15	7.2e+2	1.2e+3
883	104	180	19	15	9	1.2e+3	7.2e+2	18	9	1.4e+3	7.2e+2
883	104	180	20	6	9	4.8e+2	7.2e+2	3	30	2.4e+2	2.4e+3
883	104	180	21	6	18	4.8e+2	1.4e+3	9	0	7.2e+2	0.0e+0
883	104	180	22	3	57	2.4e+2	4.6e+3	12	24	9.7e+2	1.9e+3
883	104	180	23	0	0	0.0e+0	0.0e+0	9	48	7.2e+2	3.9e+3
883	104	180	24	3	0	2.4e+2	0.0e+0	18	0	1.4e+3	0.0e+0
883	104	180	25	9	12	7.2e+2	9.7e+2	12	0	9.7e+2	0.0e+0
883	104	180	26	6	0	4.8e+2	0.0e+0	45	3	3.6e+3	2.4e+2
883	104	180	27	18	12	1.4e+3	9.7e+2	21	33	1.7e+3	2.7e+3
883	104	180	28	9	18	7.2e+2	1.4e+3	21	6	1.7e+3	4.8e+2
883	104	180	29	3	27	2.4e+2	2.2e+3	9	36	7.2e+2	2.9e+3
883	104	180	30	6	39	4.8e+2	3.1e+3	15	39	1.2e+3	3.1e+3
883	104	180	31	6	0	4.8e+2	0.0e+0	21	54	1.7e+3	4.3e+3
883	104	180	32	21	0	1.7e+3	0.0e+0	21	42	1.7e+3	3.4e+3
883	104	180	33	6	0	4.8e+2	0.0e+0	6	57	4.8e+2	4.6e+3
883	104	180	34	6	30	4.8e+2	2.4e+3	21	45	1.7e+3	3.6e+3
883	104	180	35	9	9	7.2e+2	7.2e+2	3	21	2.4e+2	1.7e+3
883	104	180	36	9	3	7.2e+2	2.4e+2	9	6	7.2e+2	4.8e+2

Table 5-20
Smear Sample Results
IHSS 180

Building	Room	IHSS	Area	Pre-Rinsate Smear Sample Alpha (dpm/100 cm^2)	Pre-Rinsate Smear Sample Beta (dpm/100 cm^2)	Pre-Rinsate Dust Concentration* Alpha (pCi/g)	Pre-Rinsate Dust Concentration* Beta (pCi/g)	Post-Rinsate Smear Sample Alpha (dpm/100 cm^2)	Post-Rinsate Smear Sample Beta (dpm/100 cm^2)	Post-Rinsate Dust Concentration* Alpha (pCi/g)	Post-Rinsate Dust Concentration* Beta (pCi/g)
883	104	180	37	0	36	0.0e+0	2.9e+3	0	3	0.0e+0	2.4e+2
883	104	180	38	9	6	7.2e+2	4.8e+2	21	15	1.7e+3	1.2e+3
883	104	180	39	3	0	2.4e+2	0.0e+0	12	21	9.7e+2	1.7e+3
883	104	180	40	21	0	1.7e+3	0.0e+0	3	45	2.4e+2	3.6e+3
883	104	180	41	0	21	0.0e+0	1.7e+3	12	0	9.7e+2	0.0e+0
883	104	180	42	12	0	9.7e+2	0.0e+0	6	0	4.8e+2	0.0e+0
883	104	180	43	0	12	0.0e+0	9.7e+2	12	0	9.7e+2	0.0e+0
883	104	180	44	0	0	0.0e+0	0.0e+0	3	3	2.4e+2	2.4e+2
883	104	180	45	0	0	0.0e+0	0.0e+0	6	0	4.8e+2	0.0e+0
883	104	180	46	0	0	0.0e+0	0.0e+0	9	0	7.2e+2	0.0e+0
883	104	180	47	18	18	1.4e+3	1.4e+3	3	12	2.4e+2	9.7e+2
883	104	180	48	12	12	9.7e+2	9.7e+2	3	0	2.4e+2	0.0e+0
883	104	180	49	6	6	4.8e+2	4.8e+2	6	0	4.8e+2	0.0e+0

* Calculated assuming 560 mg of dust per square meter.

Table 5-21
Beta and Gamma Dose-Rate Survey Data
IHSS 180

Building	*Room*	*IHSS*	*Area*	*Gamma Dose-Rate (mrem/hr)*	*Beta Dose-Rate (mrem/hr)*
883	104	180	1	0.1	0
883	104	180	2	0	0.4
883	104	180	3	0	0.4
883	104	180	4	0	0
883	104	180	5	0.1	1.2
883	104	180	6	0	0.4
883	104	180	7	0.1	0
883	104	180	8	0	0
883	104	180	9	0	0.4
883	104	180	10	0	0.4
883	104	180	11	0	0.4
883	104	180	12	0	0
883	104	180	13	0	0
883	104	180	14	0	0.4
883	104	180	15	0	0.4
883	104	180	16	0	0.4
883	104	180	17	0	0.4
883	104	180	18	0.1	2
883	104	180	19	0	0.8
883	104	180	20	0.1	2
883	104	180	21	0	0.8
883	104	180	22	0.1	0
883	104	180	23	0.5	11.2
883	104	180	24	0	0
883	104	180	25	0	0.8
883	104	180	26	0	0.8
883	104	180	27	0.4	0.4
883	104	180	28	0	0.1
883	104	180	29	0.1	4.4
883	104	180	30	0.3	5.6
883	104	180	31	0.2	3.6
883	104	180	32	0	0.2
883	104	180	33	0.3	2.4
883	104	180	34	0.1	0.8
883	104	180	35	0.1	0.4
883	104	180	36	0	0.4
883	104	180	37	0	0
883	104	180	38	0	0
883	104	180	39	0	0.4
883	104	180	40	0	0
883	104	180	41	0.3	4.4
883	104	180	42	0.1	3.2
883	104	180	43	0.1	2.8
883	104	180	44	0	0.4
883	104	180	45	0	0.4
883	104	180	46	0	0.4
883	104	180	47	0.1	0.4
883	104	180	48	0	1.2
883	104	180	49	0	0.4

Table 5-22
Beryllium Smear Data
IHSS 180

Building	*Room*	*IHSS*	*Area*	*Pre-Rinsate Smear Sample Beryllium (ug/100cm^2)*	*Post-Rinsate Smear Sample Beryllium (ug/100cm^2)*	*Pre-Rinsate Dust Concentration Beryllium* (mg/kg)*	*Post-Rinsate Dust Concentration Beryllium* (mg/kg)*
883	104	180	1	0	1		1.79e+2
883	104	180	2	0	0		
883	104	180	3	0	0		
883	104	180	4	1	0	1.79e+2	
883	104	180	5	3	0	5.36e+2	
883	104	180	6	0	0		
883	104	180	7	0	2		3.57e+2
883	104	180	8	0	0		
883	104	180	9	0	0		
883	104	180	10	1	0	1.79e+2	
883	104	180	11	0	0		
883	104	180	12	0	0		
883	104	180	13	0	0		
883	104	180	14	0	0		
883	104	180	15	0	0		
883	104	180	16	0	0		
883	104	180	17	0	0		
883	104	180	18	0	0		
883	104	180	19	3	0	5.36e+2	
883	104	180	20	1	0	1.79e+2	
883	104	180	21	0	0		
883	104	180	22	0	3		5.36e+2
883	104	180	23	0	0		
883	104	180	24	0	0		
883	104	180	25	4	0	7.14e+2	
883	104	180	26	1	0	1.79e+2	
883	104	180	27	0	0		
883	104	180	28	0	0		
883	104	180	29	0	0		
883	104	180	30	0	0		
883	104	180	31	0	3		5.36e+2
883	104	180	32	0	0		
883	104	180	33	0	23		4.11e+3
883	104	180	34	1	2	1.79e+2	3.57e+2
883	104	180	35	4	8	7.14e+2	1.43e+3
883	104	180	36	0	6		1.07e+3
883	104	180	37	0	0		
883	104	180	38	0	6		1.07e+3
883	104	180	39	0	0		
883	104	180	40	0	0		
883	104	180	41	0	2		3.57e+2
883	104	180	42	0	0		
883	104	180	43	0	0		
883	104	180	44	14	0	2.50e+3	
883	104	180	45	0	0		
883	104	180	46	0	27		4.82e+3
883	104	180	47	0	33		5.89e+3
883	104	180	48	1	14	1.79e+2	2.50e+3
883	104	180	49	0	1		1.79e+2

* Values calculated assuming 560 mg dust per square meter.

Table 5-23
Radionuclides Detected in Hot Water Rinsate Samples
IHSS 204

Building	*IHSS*	*Location*	*Sample Number*	*Sample Date*	*Test Group*	*Radionuclide*	*Result (pCi/L)*	*Error*	*Qualifier*	*Detection Limit (pCi/L)*	*Validation Code*	*QC Code*	*QC Partner*	*Rinsate Volume (L)*	*Rinsate Area (m^2)*	*Concentration in Dust* (pCi/g)*
447	204	Wash Rack	BU00040ER	11-Oct-93	DRADS	GROSS ALPHA	150	8.0		1	V	REAL		23.9	8.2	7.81e+2
447	204	Wash Rack	BU00040ER	11-Oct-93	DRADS	GROSS BETA	72	3.6		2	A	REAL		23.9	8.2	3.75e+2
447	204	Wash Rack	BU00040ER	11-Oct-93	DRADS	URANIUM-233,-234	24	2.9		0.5	V	REAL		23.9	8.2	1.25e+2
447	204	Wash Rack	BU00040ER	11-Oct-93	DRADS	URANIUM-235	3.5	0.77		0.2	V	REAL		23.9	8.2	1.82e+1
447	204	Wash Rack	BU00040ER	11-Oct-93	DRADS	URANIUM-238	180	19		0.5	V	REAL		23.9	8.2	9.37e+2
447	204	Wash Rack	BU00041ER	11-Oct-93	DRADS	GROSS ALPHA	140	7.7		1	V	DUP	BU00040ER	23.9	8.2	7.29e+2
447	204	Wash Rack	BU00041ER	11-Oct-93	DRADS	GROSS BETA	78	3.8		2	A	DUP	BU00040ER	23.9	8.2	4.06e+2
447	204	Wash Rack	BU00041ER	11-Oct-93	DRADS	URANIUM-233,-234	26	3.1		0.6	V	DUP	BU00040ER	23.9	8.2	1.35e+2
447	204	Wash Rack	BU00041ER	11-Oct-93	DRADS	URANIUM-235	5.3	0.96		0.2	V	DUP	BU00040ER	23.9	8.2	2.76e+1
447	204	Wash Rack	BU00041ER	11-Oct-93	DRADS	URANIUM-238	200	20		0.5	V	DUP	BU00040ER	23.9	8.2	1.04e+3
447	204	Room 501	BU00043ER	11-Oct-93	DRADS	GROSS ALPHA	36	3.9		1	V	REAL		11.27	6	1.21e+2
447	204	Room 501	BU00043ER	11-Oct-93	DRADS	GROSS BETA	35	2.6		2	A	REAL		11.27	6	1.17e+2
447	204	Room 501	BU00043ER	11-Oct-93	DRADS	PLUTONIUM-239/240	0.013	0.011	B	0.01	A	REAL		11.27	6	4.36e-2
447	204	Room 501	BU00043ER	11-Oct-93	DRADS	URANIUM-233,-234	4.9	1.2		0.6	V	REAL		11.27	6	1.64e+1
447	204	Room 501	BU00043ER	11-Oct-93	DRADS	URANIUM-235	0.88	0.49		0.5	V	REAL		11.27	6	2.95e+0
447	204	Room 501	BU00043ER	11-Oct-93	DRADS	URANIUM-238	34	5.6		0.5	V	REAL		11.27	6	1.14e+2
447	204	Room 502	BU00044ER	11-Oct-93	DRADS	GROSS ALPHA	520	17		2	V	REAL		12.03	23.5	4.75e+2
447	204	Room 502	BU00044ER	11-Oct-93	DRADS	GROSS BETA	680	10		2	A	REAL		12.03	23.5	6.22e+2
447	204	Room 502	BU00044ER	11-Oct-93	DRADS	PLUTONIUM-239/240	0.016	0.007	B	0.005	A	REAL		12.03	23.5	1.46e-2
447	204	Room 502	BU00044ER	11-Oct-93	DRADS	URANIUM-233,-234	110	10		0.6	R	REAL		12.03	23.5	1.01e+2
447	204	Room 502	BU00044ER	11-Oct-93	DRADS	URANIUM-235	8.4	3.2		7	R	REAL		12.03	23.5	7.68e+0
447	204	Room 502	BU00044ER	11-Oct-93	DRADS	URANIUM-238	840	77		0.6	R	REAL		12.03	23.5	7.68e+2
447	204	Room 31	BU00047ER	09-Nov-93	DRADS	GROSS ALPHA	160	9.8		2	V	REAL		16.75	5.7	8.40e+2
447	204	Room 31	BU00047ER	09-Nov-93	DRADS	GROSS BETA	45	3.1		2	A	REAL		16.75	5.7	2.36e+2
447	204	Room 31	BU00047ER	09-Nov-93	DRADS	URANIUM-233,-234	29	3.2		0.5	V	REAL		16.75	5.7	1.52e+2
447	204	Room 31	BU00047ER	09-Nov-93	DRADS	URANIUM-235	4.4	0.79		0.2	V	REAL		16.75	5.7	2.31e+1
447	204	Room 31	BU00047ER	09-Nov-93	DRADS	URANIUM-238	210	20		0.5	V	REAL		16.75	5.7	1.10e+3
447	204	Room 31	BU00048ER	09-Nov-93	DRADS	GROSS ALPHA	180	11		3	V	DUP	BU00047ER	16.75	5.7	9.45e+2
447	204	Room 31	BU00048ER	09-Nov-93	DRADS	GROSS BETA	63	3.5		2	A	DUP	BU00047ER	16.75	5.7	3.31e+2
447	204	Room 31	BU00048ER	09-Nov-93	DRADS	URANIUM-233,-234	27	3.2		0.5	A	DUP	BU00047ER	16.75	5.7	1.42e+2
447	204	Room 31	BU00048ER	09-Nov-93	DRADS	URANIUM-235	4.3	0.80		0.2	A	DUP	BU00047ER	16.75	5.7	2.26e+1
447	204	Room 31	BU00048ER	09-Nov-93	DRADS	URANIUM-238	210	21	B	0.5	A	DUP	BU00047ER	16.75	5.7	1.10e+3
447	204	Room 32	BU00050ER	09-Nov-93	DRADS	GROSS ALPHA	6400	61		2	V	REAL		12.51	27.7	5.16e+3
447	204	Room 32	BU00050ER	09-Nov-93	DRADS	PLUTONIUM-239/240	0.014	0.006		0.006	V	REAL		12.51	27.7	1.13e-2
447	204	Room 32	BU00050ER	09-Nov-93	DRADS	URANIUM-238	7600	2000		900	V	REAL		12.51	27.7	6.13e+3

* Calculated assuming 560 mg of dust per square meter.

Table 5-24
Smear Sample Results
IHSS 204

				Pre-Rinsate Smear Sample		*Pre-Rinsate Dust Concentration**		*Post-Rinsate Smear Sample*		*Post-Rinsate Dust Concentration**	
Building	*Room*	*IHSS*	*Area*	*Alpha (dpm/100 cm^2)*	*Beta (dpm/100 cm^2)*	*Alpha (pCi/g)*	*Beta (pCi/g)*	*Alpha (dpm/100 cm^2)*	*Beta (dpm/100 cm^2)*	*Alpha (pCi/g)*	*Beta (pCi/g)*
447	31	204	1	24	0	1.9e+3	0.0e+0	Post-Rinsate Smear Samples not collected for IHSS 204.			
447	31	204	2	12	6	9.7e+2	4.8e+2				
447	31	204	3	6	0	4.8e+2	0.0e+0				
447	31	204	4	30	0	2.4e+3	0.0e+0				
447	31	204	5	15	33	1.2e+3	2.7e+3				
447	31	204	6	12	9	9.7e+2	7.2e+2				
447	32	204	7	2600	13252	2.1e+5	1.1e+6				
447	32	204	8	2000	11363	1.6e+5	9.1e+5				
447	32	204	9	2400	18939	1.9e+5	1.5e+6				
447	32	204	10	2000	14204	1.6e+5	1.1e+6				
447	32	204	11	3200	28409	2.6e+5	2.3e+6				
447	32	204	12	5000	37878	4.0e+5	3.0e+6				
447	32	204	13	2200	12310	1.8e+5	9.9e+5				
447	32	204	14	3000	16098	2.4e+5	1.3e+6				
447	32	204	15	2600	12310	2.1e+5	9.9e+5				
447	32	204	16	4000	28409	3.2e+5	2.3e+6				
447	32	204	17	4000	23674	3.2e+5	1.9e+6				
447	32	204	18	14000	132575	1.1e+6	1.1e+7				
447	32	204	19	6000	57878	4.8e+5	4.7e+6				
447	32	204	20	11000	71522	8.8e+5	5.8e+6				
447	32	204	21	6000	56818	4.8e+5	4.6e+6				
447	32	204	22	6000	28409	4.8e+5	2.3e+6				
447	32	204	23	8000	47348	6.4e+5	3.8e+6				
447	32	204	24	12000	151515	9.7e+5	1.2e+7				
447	32	204	25	1600	12310	1.3e+5	9.9e+5				
447	32	204	26	4000	18939	3.2e+5	1.5e+6				
447	32	204	27	3000	12310	2.4e+5	9.9e+5				
447	32	204	28	1400	9469	1.1e+5	7.6e+5				
447	32	204	29	12000	104166	9.7e+5	8.4e+6				
447	32	204	30	3000	16099	2.4e+5	1.3e+6				
447	32	204	31	6000	66290	4.8e+5	5.3e+6				
447	32	204	32	5000	66290	4.0e+5	5.3e+6				
447	32	204	33	8000	47350	6.4e+5	3.8e+6				
447	32	204	34	10000	66290	8.0e+5	5.3e+6				
447	501	204	1	0	0	0.0e+0	0.0e+0				
447	501	204	2	12	3	9.7e+2	2.4e+2				
447	501	204	3	15	0	1.2e+3	0.0e+0				
447	501	204	4	30	0	2.4e+3	0.0e+0				
447	501	204	5	6	60	4.8e+2	4.8e+3				
447	501	204	6	12	0	9.7e+2	0.0e+0				

Table 5-24
Smear Sample Results
IHSS 204

Building	Room	IHSS	Area	Pre-Rinsate Smear Sample Alpha (dpm/100 cm^2)	Pre-Rinsate Smear Sample Beta (dpm/100 cm^2)	Pre-Rinsate Dust Concentration* Alpha (pCi/g)	Pre-Rinsate Dust Concentration* Beta (pCi/g)	Post-Rinsate Smear Sample Alpha (dpm/100 cm^2)	Post-Rinsate Smear Sample Beta (dpm/100 cm^2)	Post-Rinsate Dust Concentration* Alpha (pCi/g)	Post-Rinsate Dust Concentration* Beta (pCi/g)
447	502	204	7	102	114	8.2e+3	9.2e+3				
447	502	204	8	132	168	1.1e+4	1.4e+4				
447	502	204	9	99	162	8.0e+3	1.3e+4				
447	502	204	10	222	243	1.8e+4	2.0e+4				
447	502	204	11	129	219	1.0e+4	1.8e+4				
447	502	204	12	153	222	1.2e+4	1.8e+4				
447	502	204	13	174	279	1.4e+4	2.2e+4				
447	502	204	14	123	156	9.9e+3	1.3e+4				
447	502	204	15	198	213	1.6e+4	1.7e+4				
447	502	204	16	1359	3834	1.1e+5	3.1e+5				
447	502	204	17	336	588	2.7e+4	4.7e+4				
447	502	204	18	294	426	2.4e+4	3.4e+4				
447	502	204	19	342	576	2.8e+4	4.6e+4				
447	502	204	20	324	594	2.6e+4	4.8e+4				
447	502	204	21	135	285	1.1e+4	2.3e+4				
447	502	204	22	279	372	2.2e+4	3.0e+4				
447	502	204	23	273	504	2.2e+4	4.1e+4				
447	502	204	24	669	1551	5.4e+4	1.2e+5				
447	502	204	25	417	1029	3.4e+4	8.3e+4				
447	502	204	26	243	303	2.0e+4	2.4e+4				
447	502	204	27	708	2331	5.7e+4	1.9e+5				
447	502	204	28	447	927	3.6e+4	7.5e+4				
447	502	204	29	408	636	3.3e+4	5.1e+4				
447	502	204	30	486	711	3.9e+4	5.7e+4				
447	502	204	31	375	768	3.0e+4	6.2e+4				
447	502	204	32	411	588	3.3e+4	4.7e+4				
447	502	204	33	189	339	1.5e+4	2.7e+4				
447	501WR	204	1	129	750	1.0e+4	6.0e+4				
447	501WR	204	2	216	1194	1.7e+4	9.6e+4				
447	501WR	204	3	99	132	8.0e+3	1.1e+4				
447	501WR	204	4	228	807	1.8e+4	6.5e+4				
447	501WR	204	5	42	18	3.4e+3	1.4e+3				
447	501WR	204	6	12	0	9.7e+2	0.0e+0				
447	501WR	204	7	3	0	2.4e+2	0.0e+0				
447	501WR	204	8	3	6	2.4e+2	4.8e+2				
447	501WR	204	9	12	6	9.7e+2	4.8e+2				
447	501WR	204	10	9	not counted	7.2e+2					

* Calculated assuming 560 mg of dust per square meter.

Table 5-25
Radionuclides Detected in Hot Water Rinsate Samples
IHSS 211

Building	IHSS	Location	Sample Number	Sample Date	Test Group	Radionuclide	Result (pCi/L)	Error	Qualifier	Detection Limit (pCi/L)	Validation Code	QC Code	QC Partner*	Rinsate Volume (L)	Rinsate Area (m^2)	Concentration in Dust** (pCi/g)
881	211	IHSS	BU00002ER	09-Aug-93	DRADS	AMERICIUM-241	.007	0.006	BJ	0.004	V	REAL		10.7	17.8	7.51e-3
881	211	IHSS	BU00002ER	09-Aug-93	DRADS	GROSS ALPHA	7.1	0.93		0.61	V	REAL		10.7	17.8	7.62e+0
881	211	IHSS	BU00002ER	09-Aug-93	DRADS	GROSS BETA	19	2.5		2.6	V	REAL		10.7	17.8	2.04e+1
881	211	IHSS	BU00002ER	09-Aug-93	DRADS	PLUTONIUM-239/240	.15	0.024	B	0.003	A	REAL		10.7	17.8	1.61e-1
881	211	IHSS	BU00002ER	09-Aug-93	DRADS	RADIUM-226	.65	0.19	B	0.24	A	REAL		10.7	17.8	6.98e-1
881	211	IHSS	BU00003ER	09-Aug-93	DRADS	GROSS ALPHA	7.4	1.0		0.65	V	DUP	BU00002ER	10.7	17.8	7.94e+0
881	211	IHSS	BU00003ER	09-Aug-93	DRADS	GROSS BETA	16	2.4		2.6	V	DUP	BU00002ER	10.7	17.8	1.72e+1
881	211	IHSS	BU00003ER	09-Aug-93	DRADS	RADIUM-226	.14	0.070	J	0.10	A	DUP	BU00002ER	10.7	17.8	1.50e-1
881	211	IHSS	BU00003ER	09-Aug-93	DRADS	URANIUM-233,-234	6.2	1.7	B	0.069	A	DUP	BU00002ER	10.7	17.8	6.66e+0
881	211	IHSS	BU00003ER	09-Aug-93	DRADS	URANIUM-235	.25	0.29	J	0.069	A	DUP	BU00002ER	10.7	17.8	2.68e-1
881	211	IHSS	BU00003ER	09-Aug-93	DRADS	URANIUM-238	.65	0.48		0.12	A	DUP	BU00002ER	10.7	17.8	6.98e-1
881	211	Perimeter	BU00006ER	11-Aug-93	DRADS	GROSS ALPHA	1.6	0.41	J	0.37	V	REAL		9.47	3	9.02e+0
881	211	Perimeter	BU00006ER	11-Aug-93	DRADS	GROSS BETA	5.9	2.1		2.9	V	REAL		9.47	3	3.33e+1
881	211	Perimeter	BU00006ER	11-Aug-93	DRADS	PLUTONIUM-239/240	.018	0.008	B	0.002	A	REAL		9.47	3	1.01e-1
881	211	Perimeter	BU00006ER	11-Aug-93	DRADS	URANIUM-233,-234	1.4	0.56	B	0.11	A	REAL		9.47	3	7.89e+0
881	211	Perimeter	BU00006ER	11-Aug-93	DRADS	URANIUM-235	.13	0.17	J	0.11	A	REAL		9.47	3	7.33e-1
881	211	Perimeter	BU00006ER	11-Aug-93	DRADS	URANIUM-238	.13	0.17	J	0.11	A	REAL		9.47	3	7.33e-1
881	211	Pathway	BU00008ER	11-Aug-93	DRADS	GROSS ALPHA	4.8	1.4		1.4	V	REAL		15.32	11	1.19e+1
881	211	Pathway	BU00008ER	11-Aug-93	DRADS	GROSS BETA	6.7	2.2		3.0	V	REAL		15.32	11	1.67e+1
881	211	Pathway	BU00008ER	11-Aug-93	DRADS	PLUTONIUM-239/240	.02	0.008	B	0.001	A	REAL		15.32	11	4.97e-2
881	211	Pathway	BU00008ER	11-Aug-93	DRADS	URANIUM-233,-234	1.5	0.66		0.14	A	REAL		15.32	11	3.73e+0
881	211	Pathway	BU00008ER	11-Aug-93	DRADS	URANIUM-235	.19	0.22	J	0.053	A	REAL		15.32	11	4.73e-1
881	211	Pathway	BU00008ER	11-Aug-93	DRADS	URANIUM-238	.32	0.29	J	0.053	A	REAL		15.32	11	7.96e-1
881	211	Pathway	BU00009ER	11-Aug-93	DRADS	GROSS ALPHA	2.4	0.54		0.54	V	DUP	BU00008ER	15.32	11	5.97e+0
881	211	Pathway	BU00009ER	11-Aug-93	DRADS	GROSS BETA	8.9	2.1		2.6	V	DUP	BU00008ER	15.32	11	2.21e+1
881	211	Pathway	BU00009ER	11-Aug-93	DRADS	PLUTONIUM-239/240	.013	0.006	B	0.003	A	DUP	BU00008ER	15.32	11	3.23e-2
881	211	Pathway	BU00009ER	11-Aug-93	DRADS	URANIUM-233,-234	1.3	0.56		0.14	A	DUP	BU00008ER	15.32	11	3.23e+0
881	211	Pathway	BU00009ER	11-Aug-93	DRADS	URANIUM-238	.2	0.21	J	0.074	A	DUP	BU00008ER	15.32	11	4.97e-1

* The data for IHSS 211 QC Partner samples was not input into RFEDS, but has been manually entered here.
** Calculated assuming 560 mg dust per square meter.

Table 5-26
Smear Sample Results
IHSS 211

Building	Room	IHSS	Area	Pre-Rinsate Smear Sample Alpha (dpm/100 cm^2)	Pre-Rinsate Smear Sample Beta (dpm/100 cm^2)	Pre-Rinsate Dust Concentration* Alpha (pCi/g)	Pre-Rinsate Dust Concentration* Beta (pCi/g)	Post-Rinsate Smear Sample Alpha (dpm/100 cm^2)	Post-Rinsate Smear Sample Beta (dpm/100 cm^2)	Post-Rinsate Dust Concentration* Alpha (pCi/g)	Post-Rinsate Dust Concentration* Beta (pCi/g)
881	266B	211	1	6	0	4.8e+2	0.0e+0	0	0	0.0e+0	0.0e+0
881	266B	211	2	0	0	0.0e+0	0.0e+0	0	0	0.0e+0	0.0e+0
881	266B	211	3	0	18	0.0e+0	1.4e+3	0	24	0.0e+0	1.9e+3
881	266B	211	4	3	51	2.4e+2	4.1e+3	0	0	0.0e+0	0.0e+0
881	266B	211	5	0	0	0.0e+0	0.0e+0	0	24	0.0e+0	1.9e+3
881	266B	211	6	3	0	2.4e+2	0.0e+0	0	0	0.0e+0	0.0e+0
881	266B	211	7	3	0	2.4e+2	0.0e+0	0	3	0.0e+0	2.4e+2
881	266B	211	8	3	36	2.4e+2	2.9e+3	6	12	4.8e+2	9.7e+2
881	266B	211	9	0	0	0.0e+0	0.0e+0	6	27	4.8e+2	2.2e+3
881	266B	211	10	3	0	2.4e+2	0.0e+0	0	0	0.0e+0	0.0e+0
881	266B	211	11	0	0	0.0e+0	0.0e+0	0	3	0.0e+0	2.4e+2
881	266B	211	12	0	0	0.0e+0	0.0e+0	3	0	2.4e+2	0.0e+0
881	266B	211	13	0	0	0.0e+0	0.0e+0	0	0	0.0e+0	0.0e+0
881	266B	211	14	3	6	2.4e+2	4.8e+2	0	0	0.0e+0	0.0e+0
881	266B	211	15	6	33	4.8e+2	2.7e+3	3	24	2.4e+2	1.9e+3
881	266B	211	16	6	3	4.8e+2	2.4e+2	9	0	7.2e+2	0.0e+0
881	266B	211	17	0	36	0.0e+0	2.9e+3	3	27	2.4e+2	2.2e+3
881	266B	211	18	0	9	0.0e+0	7.2e+2	0	3	0.0e+0	2.4e+2
881	266B	211	19	3	0	2.4e+2	0.0e+0	0	0	0.0e+0	0.0e+0
881	266B	211	20	3	0	2.4e+2	0.0e+0	0	6	0.0e+0	4.8e+2
881	266B	211	21	3	0	2.4e+2	0.0e+0	0	0	0.0e+0	0.0e+0
881	266B	211	22	0	0	0.0e+0	0.0e+0	3	0	2.4e+2	0.0e+0
881	266B	211	23	0	0	0.0e+0	0.0e+0	0	27	0.0e+0	2.2e+3
881	266B	211	24	0	0	0.0e+0	0.0e+0	3	3	2.4e+2	2.4e+2
881	266B	211	25	0	0	0.0e+0	0.0e+0	3	15	2.4e+2	1.2e+3
881	266B	211	26	3	0	2.4e+2	0.0e+0	0	18	0.0e+0	1.4e+3
881	266B	211	27	0	0	0.0e+0	0.0e+0	3	0	2.4e+2	0.0e+0
881	266B	211	28	6	0	4.8e+2	0.0e+0	3	15	2.4e+2	1.2e+3
881	266B	211	29	0	0	0.0e+0	0.0e+0	3	0	2.4e+2	0.0e+0
881	266B	211	30	0	0	0.0e+0	0.0e+0	0	3	0.0e+0	2.4e+2
881	266B	211	31	3	0	2.4e+2	0.0e+0	0	0	0.0e+0	0.0e+0
881	266B	211	32	0	21	0.0e+0	1.7e+3	0	0	0.0e+0	0.0e+0

* Calculated assuming 560 mg of dust per square meter.

Table 5-27
Beta and Gamma Dose-Rate Survey Data
IHSS 211

Building	*Room*	*IHSS*	*Area*	*Gamma Dose-Rate (mrem/hr)*	*Beta Dose-Rate (mrem/hr)*
881	266B	211	1	0	0
881	266B	211	2	0	0
881	266B	211	3	0	0
881	266B	211	4	0	0
881	266B	211	5	0	0
881	266B	211	6	0	0
881	266B	211	7	0	0
881	266B	211	8	0	0
881	266B	211	9	0	0
881	266B	211	10	0	0
881	266B	211	11	0	0
881	266B	211	12	0	0
881	266B	211	13	0	0
881	266B	211	14	0	0
881	266B	211	15	0	0
881	266B	211	16	0	0.4
881	266B	211	17	0	0.4
881	266B	211	18	0	0
881	266B	211	19	0	0
881	266B	211	20	0	0
881	266B	211	21	0	0
881	266B	211	22	0	0
881	266B	211	23	0	0
881	266B	211	24	0	0
881	266B	211	25	0	0
881	266B	211	26	0	0
881	266B	211	27	0	0
881	266B	211	28	0	0
881	266B	211	29	0	0
881	266B	211	30	0	0
881	266B	211	31	0	0
881	266B	211	32	0	0

Table 5-28
Radionuclides Detected in Hot Water Rinsate Samples
IHSS 217

Building	*IHSS*	*Location*	*Sample Number*	*Sample Date*	*Test Group*	*Radionuclide*	*Result (pCi/L)*	*Error*	*Qualifier*	*Detection Limit (pCi/L)*	*Validation Code*	*QC Code*	*QC Partner*	*Rinsate Volume (L)*	*Rinsate Area (m^2)*	*Concentration in Dust* (pCi/g)*
881	217	IHSS	BU00017ER	17-Aug-93	DRADS	AMERICIUM-241	0.21	0.032		0.004	V	REAL		22.97	6.1	1.41e+0
881	217	IHSS	BU00017ER	17-Aug-93	DRADS	GROSS ALPHA	30	1.7		0.40	V	REAL		22.97	6.1	2.02e+2
881	217	IHSS	BU00017ER	17-Aug-93	DRADS	GROSS BETA	20	2.6		2.6	V	REAL		22.97	6.1	1.34e+2
881	217	IHSS	BU00017ER	17-Aug-93	DRADS	PLUTONIUM-239/240	0.037	0.014		0.002	V	REAL		22.97	6.1	2.49e-1
881	217	IHSS	BU00017ER	17-Aug-93	DRADS	RADIUM-226	.18	0.040	BJ	0.060	A	REAL		22.97	6.1	1.21e+0
881	217	IHSS	BU00017ER	17-Aug-93	DRADS	URANIUM-233,-234	22	3.3		0.13	V	REAL		22.97	6.1	1.48e+2
881	217	IHSS	BU00017ER	17-Aug-93	DRADS	URANIUM-235	0.91	0.43		0.064	V	REAL		22.97	6.1	6.12e+0
881	217	IHSS	BU00017ER	17-Aug-93	DRADS	URANIUM-238	15	2.5		0.064	V	REAL		22.97	6.1	1.01e+2
881	217	IHSS	BU00018ER	17-Aug-93	DRADS	AMERICIUM-241	0.22	0.038		0.005	V	DUP	BU00017ER	22.97	6.1	1.48e+0
881	217	IHSS	BU00018ER	17-Aug-93	DRADS	GROSS ALPHA	41	2.1		0.61	V	DUP	BU00017ER	22.97	6.1	2.76e+2
881	217	IHSS	BU00018ER	17-Aug-93	DRADS	GROSS BETA	26	2.8		2.7	V	DUP	BU00017ER	22.97	6.1	1.75e+2
881	217	IHSS	BU00018ER	17-Aug-93	DRADS	PLUTONIUM-239/240	0.042	0.012		0.005	V	DUP	BU00017ER	22.97	6.1	2.82e-1
881	217	IHSS	BU00018ER	17-Aug-93	DRADS	RADIUM-226	.21	0.030	BJ	0.040	A	DUP	BU00017ER	22.97	6.1	1.41e+0
881	217	IHSS	BU00018ER	17-Aug-93	DRADS	URANIUM-233,-234	27	3.9		0.091	V	DUP	BU00017ER	22.97	6.1	1.82e+2
881	217	IHSS	BU00018ER	17-Aug-93	DRADS	URANIUM-235	0.90	0.40		0.091	V	DUP	BU00017ER	22.97	6.1	6.05e+0
881	217	IHSS	BU00018ER	17-Aug-93	DRADS	URANIUM-238	17	2.7		0.091	V	DUP	BU00017ER	22.97	6.1	1.14e+2
881	217	Perimeter	BU00020ER	17-Aug-93	DRADS	AMERICIUM-241	0.017	0.008		0.004	V	REAL		14.34	4.6	9.46e-2
881	217	Perimeter	BU00020ER	17-Aug-93	DRADS	GROSS ALPHA	6.9	0.78		0.40	V	REAL		14.34	4.6	3.84e+1
881	217	Perimeter	BU00020ER	17-Aug-93	DRADS	GROSS BETA	15	2.4		2.7	V	REAL		14.34	4.6	8.35e+1
881	217	Perimeter	BU00020ER	17-Aug-93	DRADS	PLUTONIUM-239/240	0.016	0.008		0.002	V	REAL		14.34	4.6	8.91e-2
881	217	Perimeter	BU00020ER	17-Aug-93	DRADS	RADIUM-226	.25	0.040	BJ	0.060	A	REAL		14.34	4.6	1.39e+0
881	217	Perimeter	BU00020ER	17-Aug-93	DRADS	URANIUM-233,-234	5.6	1.3		0.11	V	REAL		14.34	4.6	3.12e+1
881	217	Perimeter	BU00020ER	17-Aug-93	DRADS	URANIUM-235	0.20	0.20	J	0.042	V	REAL		14.34	4.6	1.11e+0
881	217	Perimeter	BU00020ER	17-Aug-93	DRADS	URANIUM-238	2.3	0.74		0.042	V	REAL		14.34	4.6	1.28e+1

* Calculated assuming 560 mg of dust per square meter.

Table 5-29
Smear Sample Results
IHSS 217

				Pre-Rinsate Smear Sample		*Pre-Rinsate Dust Concentration**		*Post-Rinsate Smear Sample*		*Post-Rinsate Dust Concentration**	
Building	*Room*	*IHSS*	*Area*	*Alpha (dpm/100 cm^2)*	*Beta (dpm/100 cm^2)*	*Alpha (pCi/g)*	*Beta (pCi/g)*	*Alpha (dpm/100 cm^2)*	*Beta (dpm/100 cm^2)*	*Alpha (pCi/g)*	*Beta (pCi/g)*
881	131C	217	1	3	0	2.4e+2	0.0e+0	0	3	0.0e+0	2.4e+2
881	131C	217	2	0	12	0.0e+0	9.7e+2	6	0	4.8e+2	0.0e+0
881	131C	217	3	0	18	0.0e+0	1.4e+3	0	12	0.0e+0	9.7e+2
881	131C	217	4	0	30	0.0e+0	2.4e+3	3	0	2.4e+2	0.0e+0
881	131C	217	5	3	18	2.4e+2	1.4e+3	3	9	2.4e+2	7.2e+2
881	131C	217	6	6	0	4.8e+2	0.0e+0	0	30	0.0e+0	2.4e+3
881	131C	217	7	6	39	4.8e+2	3.1e+3	0	9	0.0e+0	7.2e+2
881	131C	217	8	6	3	4.8e+2	2.4e+2	3	30	2.4e+2	2.4e+3
881	131C	217	9	0	0	0.0e+0	0.0e+0	0	9	0.0e+0	7.2e+2
881	131C	217	10	3	27	2.4e+2	2.2e+3	3	33	2.4e+2	2.7e+3
881	131C	217	11	0	24	0.0e+0	1.9e+3	0	6	0.0e+0	4.8e+2
881	131C	217	12	3	36	2.4e+2	2.9e+3	6	24	4.8e+2	1.9e+3
881	131C	217	13	6	24	4.8e+2	1.9e+3	9	3	7.2e+2	2.4e+2

* Calculated assuming 560 mg of dust per square meter.

Table 5-30
Beta and Gamma Dose-Rate Survey Data
IHSS 217

Building	*Room*	*IHSS*	*Area*	*Gamma Dose-Rate (mrem/hr)*	*Beta Dose-Rate (mrem/hr)*
881	131C	217	1	0	0.4
881	131C	217	2	0	0.4
881	131C	217	3	0	0.4
881	131C	217	4	0	0.4
881	131C	217	5	0	0.4
881	131C	217	6	0	0.4
881	131C	217	7	0	0.4
881	131C	217	8	0	0.4
881	131C	217	9	0.1	0
881	131C	217	10	0.1	0
881	131C	217	11	0.1	0
881	131C	217	12	0	0
881	131C	217	13	0	0

6.0 *FATE AND TRANSPORT SUMMARY*

The migration of contaminants in the environment is governed by a unique set of fate and transport mechanisms. The basic elements which affect fate and transport of contaminants are the properties of the surficial or subsurface environment in which potential contaminant migration may occur, and the physiochemical and biological properties of the contaminant itself. Some of the specific factors which define the transport of a contaminant within the environment include permeability, adsorption and the nature of preferential flow patterns such as joints and fractures. A few of the important specific contaminant(s) properties include the volatilization potential, the rate of degradation and transformation, and the degree of interaction between the contaminant and the media in which it is released. These parameters, as well as other processes, combine to define the rate of migration for any contaminants which may have been released from a source.

Because the IHSSs which compose OU15 are all aboveground and enclosed within a building structure, certain fate and transport processes are considerably more relevant to potential contaminant migration. As described in Section 2.0, if a release occurs as a result of a leak or spill in the IHSS, or through an associated secondary release from the underlying building material, the most important primary transport mechanisms in the individual IHSSs are as follows:

- volatilization into the atmosphere;
- air dispersion by ventilation and worker/equipment movement;
- runoff (inside building) by primary release and/or secondary release;
- suspension/dissolution in water released to drain openings;
- worker tracking of constituents to other areas;

- percolation of constituents through flooring via cracks and/or joints; and
- percolation of constituents through subsurface soil;

Due to the unique use, location and waste types stored or generated in each of the IHSSs, it is likely that only a subset of the fate and transport processes identified above are relevant at each OU15 IHSS. At the drum storage areas and treatment units where liquid wastes were stored or treated (IHSSs 178, 179, 180, 211 and 217) most of the above identified fate and transport mechanisms may be applicable. The release pathway of greatest potential importance is likely through any fractures or joints in the flooring underneath the IHSSs. A settlement type floor fracture was observed in IHSS 211, however, this fracture had been repaired and was sealed over with paint. As a result, any potentially spilled waste liquids would likely have volatilized or have been cleaned up prior to any significant seepage occurring through this fracture. For liquids which may have entered the floor fracture, it is likely that migration would be minimal since a sufficient hydrostatic head would likely not have been present to drive any liquids a distance beyond a few inches into the flooring. It should also be noted that a standing work order is in place in Building 881 to immediately repair any cracks which develop in the floor of IHSS 211. None of the other IHSSs had fractures or joints in the floor surfaces which were significant enough to serve as a contaminant pathway.

For liquid waste spills or leaks, worker tracking of potential contaminants is likely to be of less importance as a contaminant transport mechanism since any leaks or spills would probably evaporate within a short amount of time leaving little residue to be spread by workers or other contact mechanisms.

At the IHSSs where solid wastes were stored or treated (all six of the OU15 IHSSs), volatilization of the solid waste materials into the atmosphere and percolation of waste materials through flooring fractures and joints are of less importance as contaminant transport mechanisms. Instead, worker tracking, equipment movement, and building-related forced air movement are more likely to be the potential contaminant fate and transport mechanisms of concern, either through independent action, or in combination with one another.

As discussed in Section 5.0, the OU15 sampling results indicated that the contaminants of concern at the particular IHSSs were not detected in sufficient quantities to represent any concern. This non-detection resulted from either a lack of any leaks or spills within the sampled areas, or the insignificance of any small releases which may have occurred and were cleaned up prior to any transport of the contaminants. . Whatever fate and transport mechanism may have been of most importance, it appears likely that transport via these mechanisms has been negligible. The rigorous inspection and response procedures which have been implemented at the OU15 IHSSs serve to eliminate any potential contaminant transport from the IHSSs.

7.0 BASELINE RISK ASSESSMENT

The purpose of the BRA process under CERCLA is to determine the need for remedial action at a site. The BRA is comprised of two components, the Human Health Risk Assessment (HHRA) and the Ecological Evaluation (EE). The HHRA estimates potential health impacts to human receptors and compares these risk estimates to regulatory guidance levels of acceptable risk. The EE evaluates potential impacts to ecological receptors (including flora and fauna). Both the HHRA and the EE, as part of the BRA, are performed assuming that no remedial actions take place at the site and that unrestricted use of the site is permitted. The results of the BRA are used to determine whether areas within the site require evaluation with respect to remedial action. The BRA is usually followed by the calculation of chemical-specific and media-specific cleanup levels which may be risk-based or may be derived from promulgated regulations (e.g., drinking water standards). These specific remediation targets are then used to drive the design of remedial alternatives in the Feasibility Study phase of the CERCLA process, or the Corrective Measures Study phase of the RCRA process.

The regulatory environment within which the Phase I RFI/RI for OU15 is being conducted is a hybrid RCRA closure and CERCLA evaluation. The approach for the Phase I RFI/RI BRA is outlined in Section 5.6 of the Final Phase I RFI/RI Work Plan (DOE, 1993) for OU15. The approach for determining the need for additional remedial action at OU15 is split into two portions: evaluation of RCRA regulated constituents of concern (RCRA constituents), and evaluation of non-RCRA constituents (primarily radionuclides). This approach is reiterated in the approved Final TM#1 (DOE, 1994a).

As described in TM#1 (DOE, 1994a), the RCRA closure for OU15 addresses RCRA constituents by comparison to specified RCRA Clean Closure Performance Standards. The definition of the applicable RCRA Clean Closure Performance Standards and their use in evaluating analytical results for RCRA constituents was approved in the Work Plan

(DOE, 1993). As stated in the Work Plan (DOE, 1993), because of the nature of the RCRA Clean Closure Performance Standards, a HHRA would not be required for OU15 for any RCRA hazardous materials. Therefore, with respect to RCRA constituents, an HHRA has not been performed, and the evaluation of the analytical data from the Phase I RFI/RI field investigation program has been restricted to a comparison of analytical results to the RCRA Clean Closure Performance Standards. This approach is presented in detail in the approved TM#1 (DOE, 1994a). The evaluation of RCRA constituents is presented in Section 5.1 of this report.

The evaluation of non-RCRA constituents (i.e., radionuclides) is also described in the Work Plan (DOE, 1993). The method specified for evaluating radionuclides involved comparing the analytical results to specific regulatory limits on exposures. The ARARs for this evaluation were specified in Section 3.0 of the Work Plan (DOE, 1993) and include airborne concentration limits and radiological dose limitations. The Work Plan (DOE, 1993) states that an HHRA for radionuclides would only be required if the radiation standards provided in the cited ARARs were exceeded. The evaluation of the radionuclide analytical results is presented in Section 5.2 of this report, and is also provided in TM#1 (DOE, 1994a). Since none of the radionuclide results exceeded the standards provided in the ARARs, a HHRA was not performed for radionuclides.

With respect to ecological receptors, the Work Plan (DOE, 1993) states that an EE would not be required for OU15 IHSSs since they are all located within buildings that are situated within the industrialized area of RFETS. Therefore, an EE has not been performed for OU15.

The findings presented in Sections 2.0 and 5.0 and summarized in Section 6.0 show that no evidence exists indicating migration of constituents to locations outside the buildings in which the OU15 IHSSs are located. Therefore, a BRA has not been performed for locations outside the OU15 buildings.

To summarize, the Work Plan (DOE, 1993) provides for the performance of a BRA in only two cases: first, if the radionuclide analytical data indicated an exceedence of the radiation standards provided in the cited ARARs; and second, if migration of constituents to locations outside the OU15 buildings could be shown to have occurred. Since neither of these conditions was found in the Phase I RFI/RI, a BRA was not performed for OU15.

8.0 SUMMARY AND CONCLUSIONS

The Phase I RFI/RI for OU15 has been conducted under a hybrid RCRA/CERCLA regulatory program. The blending of these programs with respect to OU15 was agreed to in the IAG (DOE, 1991). In addition, specific objectives and procedures for the OU15 Phase I RFI/RI were agreed to in the Final Work Plan (DOE, 1993). All of the requirements specified in the IAG (DOE, 1991) and in the Work Plan (DOE, 1993) have been met and are described in this Phase I RFI/RI Report. The investigations conducted as part of the Phase I RFI/RI focused on developing the necessary data to support a determination for each IHSS as to whether:

1. Additional outdoor investigation would be required;
2. The IHSS meets RCRA clean closure performance standards; and
3. The IHSS requires additional consideration with respect to radionuclides under CERCLA.

The approach to determining these issues was specified in the Work Plan (DOE, 1993) and included evaluation of release reports and historical information on IHSS operations, visual inspections of each IHSS, sampling and analysis for RCRA constituents and radionuclides, and comparison of sampling results to specific ARARs. Based on the results of the Phase I RFI/RI activities, the following conclusions have been drawn:

1. **The requirements of the IAG (DOE, 1991) and the Final OU15 Phase I RFI/RI Work Plan (DOE, 1993) have been met and are documented in this submittal, the Phase I RFI/RI Report.**

   Section 1.0 presents a detailed evaluation of the requirements of the IAG (DOE, 1991) and of the Work Plan (DOE, 1993). Tables 1-1 and 1-2 list the specific requirements and show where in the Phase I RFI/RI Report the requirements are addressed.

2. **The data quality objectives specified in the Work Plan (DOE, 1993) have been met.**

   Section 4.0 presents the DQOs for the Phase I investigation and evaluates the results of the Phase I investigation against the specific OU15 DQO and PARCC criteria.

3. **The IHSSs investigated are in compliance with the RCRA clean closure performance standards.**

   The results of the Phase I investigation presented in Section 5.1 show that the IHSSs are in compliance with the RCRA clean closure performance standards as specified in the Work Plan (DOE, 1993) and the RFETS State RCRA Permit (CDPHE, 1991). Only IHSS 178 showed detectable concentrations of a RCRA-regulated constituent of regulatory concern (butyl benzyl phthalate) in the verification samples. However, butyl benzyl phthalate is a component of paints, common flooring materials and PVC. It was not identified as a RCRA constituent expected to be present at IHSS 178, and was therefore attributed to cross-contamination from flooring materials or other, non-RCRA sources. In the other IHSSs, no RCRA-regulated constituents of regulatory concern were detected in the verification samples that were not directly attributable to cross-contamination via the Quality Assurance samples taken during the Phase I RFI/RI investigation.

4. **The IHSSs investigated are in compliance with the ARARs identified for radionuclides.**

   The results of the Phase I investigation presented in Sections 2.0 and 5.2 show that the IHSSs are in compliance with the worker radiation protection standards specified as ARARs in the Work Plan (DOE, 1993). IHSS 204 complies with the ARARs by being maintained in a protective state for workers in accordance with the procedures that specifically govern operations and worker exposures at RFETS.

5. **Beryllium contamination is not directly attributable to waste materials stored at IHSS 179 or 180.**

   Beryllium concentrations detected in the post-rinsate smear samples collected within IHSSs 179 and 180 are below the RFETS beryllium smear control level established in HSP 13.04 (EG&G, 1994). In the absence of a promulgated regulatory standard for beryllium surface contamination, RFETS has established this control level as an accepted and achievable cleanliness level to control worker exposure to beryllium. The review of the beryllium smear data presented in this report indicated that the OU15 IHSSs were likely not the sources of beryllium found during the Phase I RFI/RI investigation.

6. **No evidence exists to indicate that releases of hazardous or radioactive constituents have occurred from OU15 IHSSs to the environment.**

   The sources for this conclusion include historical records, interviews with relevant personnel, visual inspections of the IHSSs, and review of sampling results. These data are presented in Sections 2.0, 5.0 and 6.0.

7. **A Stage 3 (outdoor) investigation is not required.**

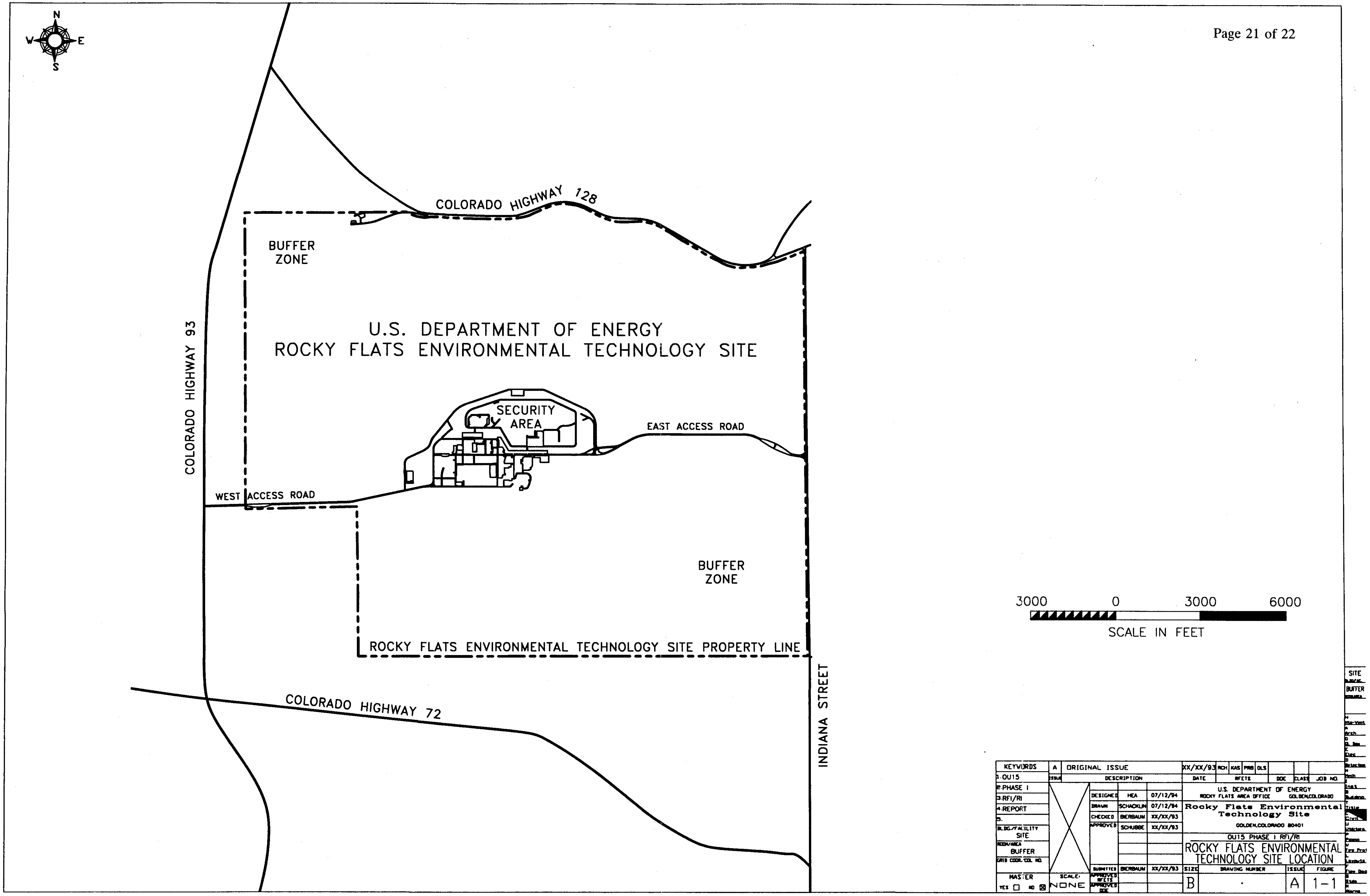
   The results of the Stage 1 and 2 investigation along with the review of historical records and visual inspections indicated that there had not been releases from OU15 IHSSs to the environment. Therefore, according to the Work Plan (DOE, 1993), no Stage 3 investigation is required.

8. **There is no evidence to indicate the existence of an imminent threat of a release of hazardous or radioactive constituents from OU15 IHSSs to the environment.**

   Sampling results presented in Section 5.0 for the six IHSSs, along with the evaluation of the conceptual model and fate and transport mechanisms presented in Sections 2.0 and 6.0, show that a release to the environment from these IHSSs is highly improbable with the controls and procedures currently in place.

9. **There is no current or imminent threat to workers at the OU15 IHSSs under their current industrial use.**

   Based on the ARARs specified in the Work Plan (DOE, 1993) and the evaluation of the radionuclide sampling results presented in Section 5.2, the IHSSs do not exceed radiation protection standards applicable under their current industrial use. For IHSS 204, the radiation protection ARARs are met based on compliance with the procedures developed for operations and worker exposures at RFETS. The evaluation of hazardous constituents presented in Section 5.1 showed that no detectable levels of hazardous constituents remain in the IHSSs other than those attributable to leaching from flooring materials.


N
S
E
W
COLORADO HIGHWAY 128
BUFFER ZONE
U.S. DEPARTMENT OF ENERGY
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
SECURITY AREA
EAST ACCESS ROAD
WEST ACCESS ROAD
COLORADO HIGHWAY 93
BUFFER ZONE
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE PROPERTY LINE
COLORADO HIGHWAY 72
INDIANA STREET
3000 0 3000 6000
SCALE IN FEET
KEYWORDS
1.OU15
2.PHASE I
3.RFI/RI
4.REPORT
BLDG./FACILITY SITE
BUFFER
MASTER
SCALE: NONE
A ORIGINAL ISSUE
DESCRIPTION
DESIGNED HEA 07/12/94
DRAWN SCHACKLIN 07/12/94
CHECKED BIERBAUM XX/XX/93
APPROVED SCHUBBE XX/XX/93
SUBMITTED BIERBAUM XX/XX/93
XX/XX/93
U.S. DEPARTMENT OF ENERGY
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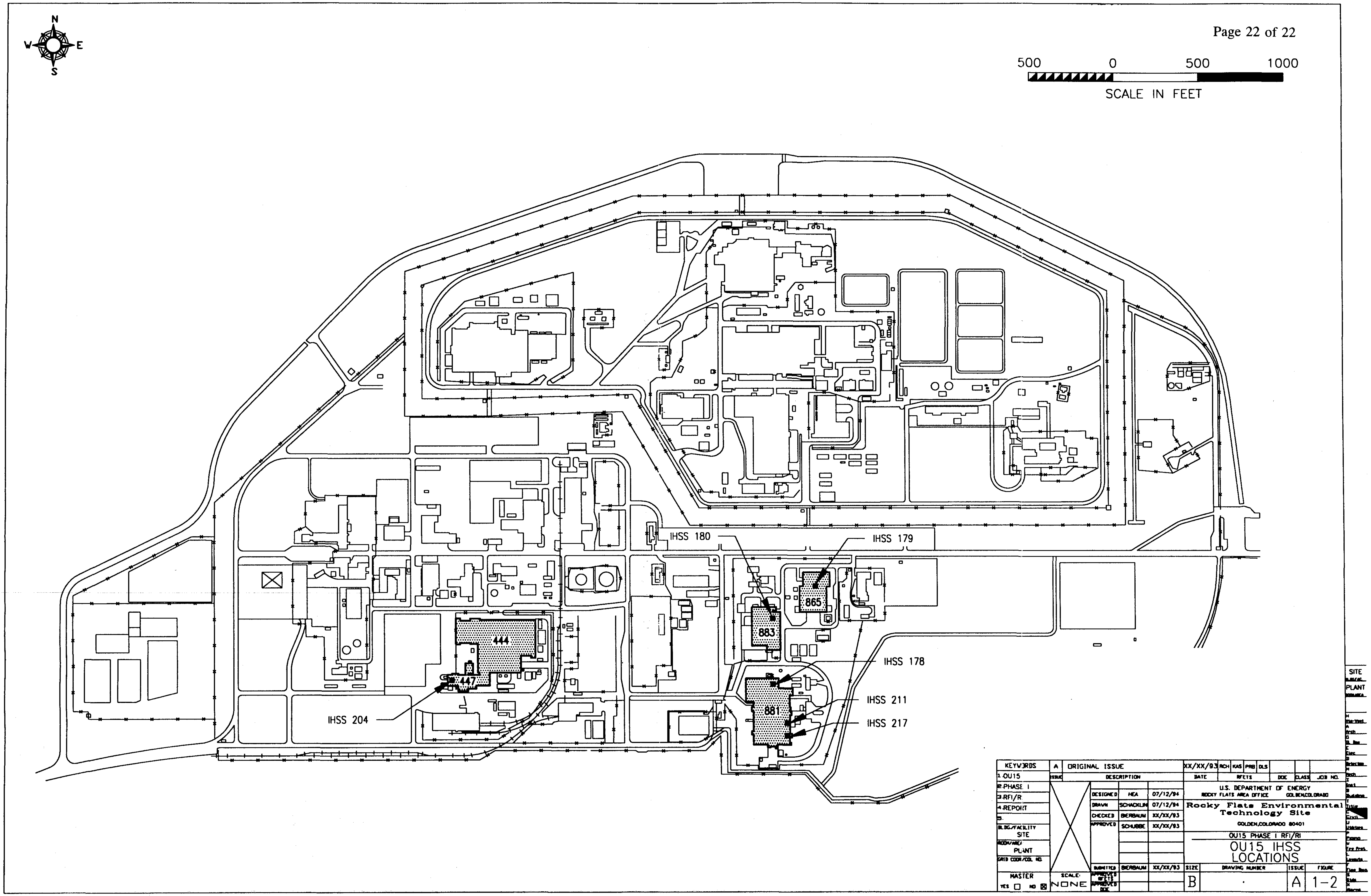
Rocky Flats Environmental Technology Site
GOLDEN,COLORADO 80401
OU15 PHASE I RFI/RI
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE LOCATION
SIZE B
ISSUE A
FIGURE 1-1
SITE
BUFFER


N
W
E
S
500 0 500 1000
SCALE IN FEET
IHSS 180
IHSS 179
865
883
IHSS 178
881
IHSS 211
IHSS 217
444
447
IHSS 204
KEYWORDS
1.OU15
2.PHASE I
3.RFI/R
4.REPORT
BLDG/FACILITY SITE
PLANT
MASTER
YES ☐ NO ☒
SCALE: NONE
A ORIGINAL ISSUE XX/XX/93
DESIGNED HEA 07/12/94
DRAWN SCHACKLIN 07/12/94
CHECKED BIERBAUM XX/XX/93
APPROVED SCHUBBE XX/XX/93
SUBMITTED BIERBAUM XX/XX/93
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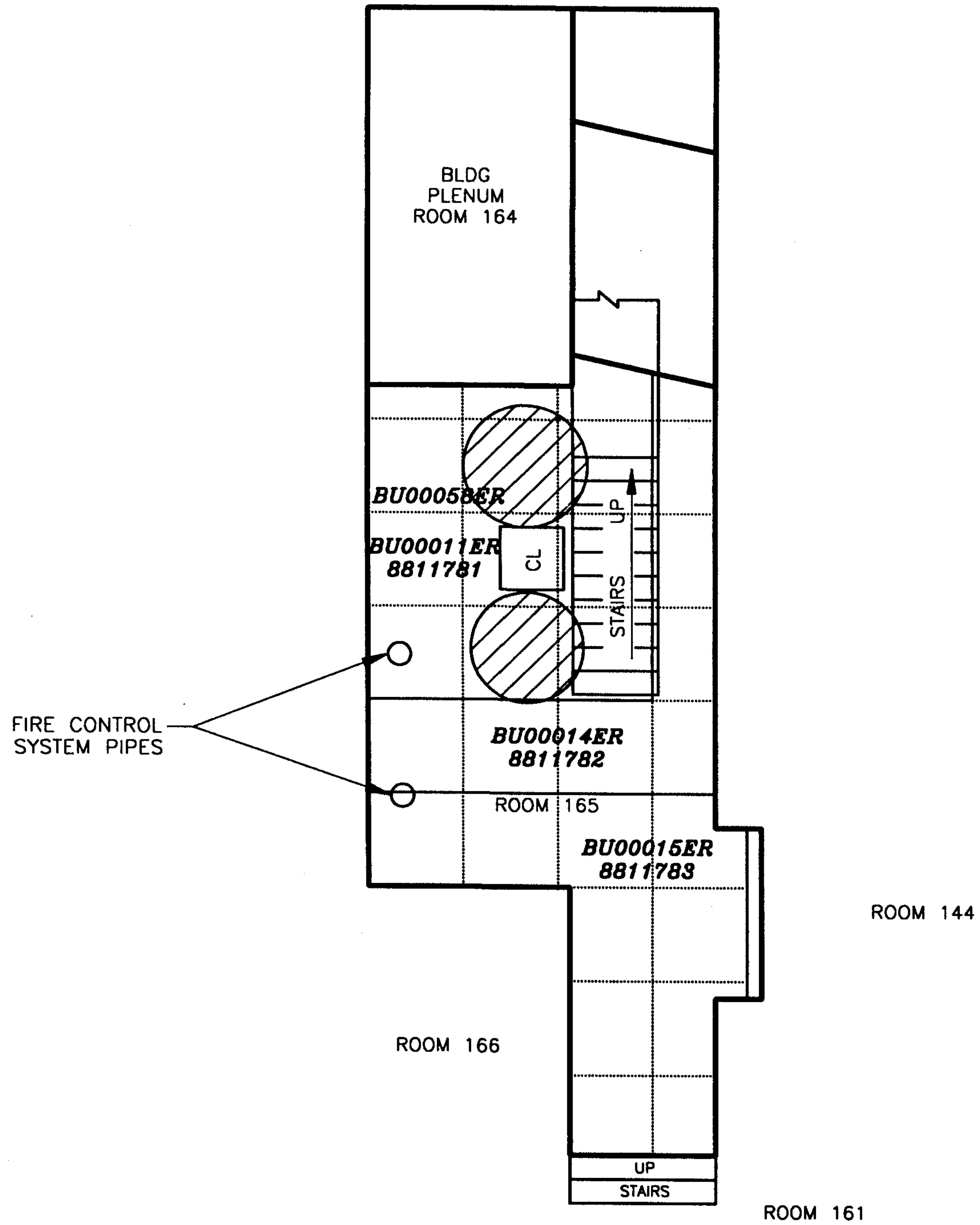
GOLDEN,COLORADO 80401
OU15 PHASE I RFI/RI
OU15 IHSS LOCATIONS
SIZE B
ISSUE A
FIGURE 1-2
SITE
PLANT



Sample Number	Test Group	Compound	Result (ug/l)	Qualifier	Detection Limit (ug/l)	QC Code	QC Partner
ORIGINAL SAMPLES							
BU00011ER	BNACLP	BENZOIC ACID	65		50	REAL	
BU00011ER	BNACLP	BIS(2-ETHYLHEXYL)PHTHALATE	140		10	REAL	
BU00011ER	BNACLP	BUTYL BENZYL PHTHALATE	38		10	REAL	
BU00011ER	BNACLP	DI-n-BUTYL PHTHALATE	13		10	REAL	
BU00011ER	BNACLP	PHENOL	45		10	REAL	
BU00012ER	BNACLP	BENZOIC ACID	79		50	DUP	BU00011ER
BU00012ER	BNACLP	BIS(2-ETHYLHEXYL)PHTHALATE	160		10	DUP	BU00011ER
BU00012ER	BNACLP	BUTYL BENZYL PHTHALATE	51		10	DUP	BU00011ER
BU00012ER	BNACLP	DI-n-BUTYL PHTHALATE	17		10	DUP	BU00011ER
BU00012ER	BNACLP	PHENOL	65		10	DUP	BU00011ER
VERIFICATION SAMPLES							
BU00058ER	BNACLP	BIS(2-ETHYLHEXYL)PHTHALATE	260	B	10	REAL	
BU00058ER	BNACLP	BUTYL BENZYL PHTHALATE	39		10	REAL	
BU00058ER	BNACLP	PHENOL	120		10	REAL	
BU00059ER	BNACLP	BIS(2-ETHYLHEXYL)PHTHALATE	190	B	10	DUP	BU00058ER
BU00059ER	BNACLP	BUTYL BENZYL PHTHALATE	18		10	DUP	BU00058ER
BU00059ER	BNACLP	PHENOL	140		10	DUP	BU00058ER

KEYWORDS: 1.OU15 2.PHASE I 3.RFI/RI 4.REPORT 5.
BLDG./FACILITY 881
ROOM/AREA 165

A ORIGINAL ISSUE XX/XX/93 RCH KAS PRB DLS

DESIGNED HEA 07/12/94
DRAWN SCHACKLIN 07/12/94
CHECKED BIERBAUM XX/XX/93
APPROVED SCHUBBE XX/XX/93
SUBMITTED BIERBAUM XX/XX/93

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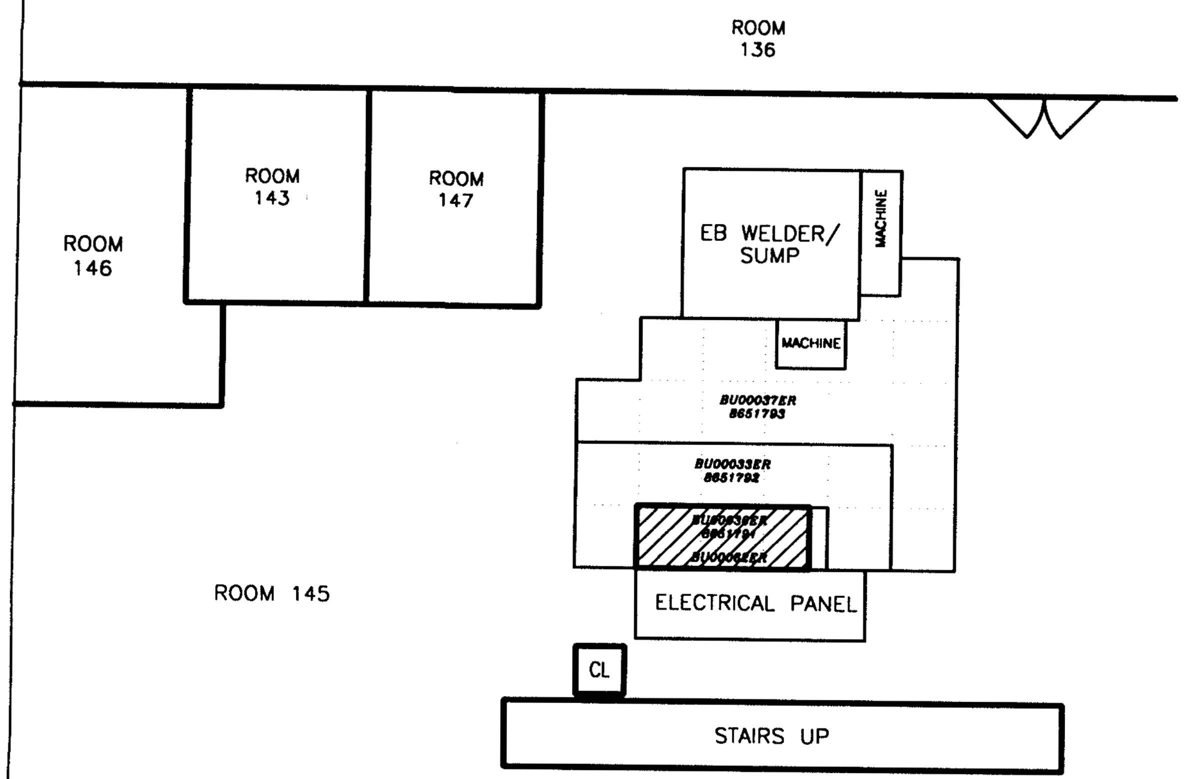
OU15 PHASE I RFI/RI
IHSS 178 RINSATE SAMPLE LOCATIONS & RESULTS

MASTER YES ☐ NO ☒
SCALE: NONE
SIZE B | DRAWING NUMBER IHSS 178 | ISSUE A | FIGURE 5-1

Sample Number	Test Group	Compound	Result (ug/l)	Qualifier	Detection Limit (ug/l)	QC Code	QC Partner
ORIGINAL SAMPLES							
BU00036ER	BNACLP	BIS(2-ETHYLHEXYL)PHTHALATE	230	D	10	REAL	
BU00036ER	BNACLP	PHENOL	53		10	REAL	
VERIFICATION SAMPLES							
BU00062ER	BNACLP	BIS(2-ETHYLHEXYL)PHTHALATE	150	B	10	REAL	
BU00062ER	BNACLP	PHENOL	81		10	REAL	
BU00063ER	BNACLP	BIS(2-ETHYLHEXYL)PHTHALATE	200	B	10	DUP	BU00062ER
BU00063ER	BNACLP	PHENOL	84		10	DUP	BU00062ER



KEYWORDS: 1.OU15 2.PHASE I 3.RFI/RI 4.REPORT 5.
BLDG./FACILITY 865
ROOM/AREA 145
GRID COOR./COL NO.
MASTER YES ☐ NO ☒
SCALE: NONE

A ORIGINAL ISSUE XX/XX/93 DAW KAS RCH DLS

DESIGNED WEAVER 07/12/94
DRAWN SCHACKLIN 07/12/94
CHECKED HEA XX/XX/93
APPROVED SCHUBBE XX/XX/93
SUBMITTED BIERBAUM XX/XX/93
APPROVED RFETS
APPROVED DOE

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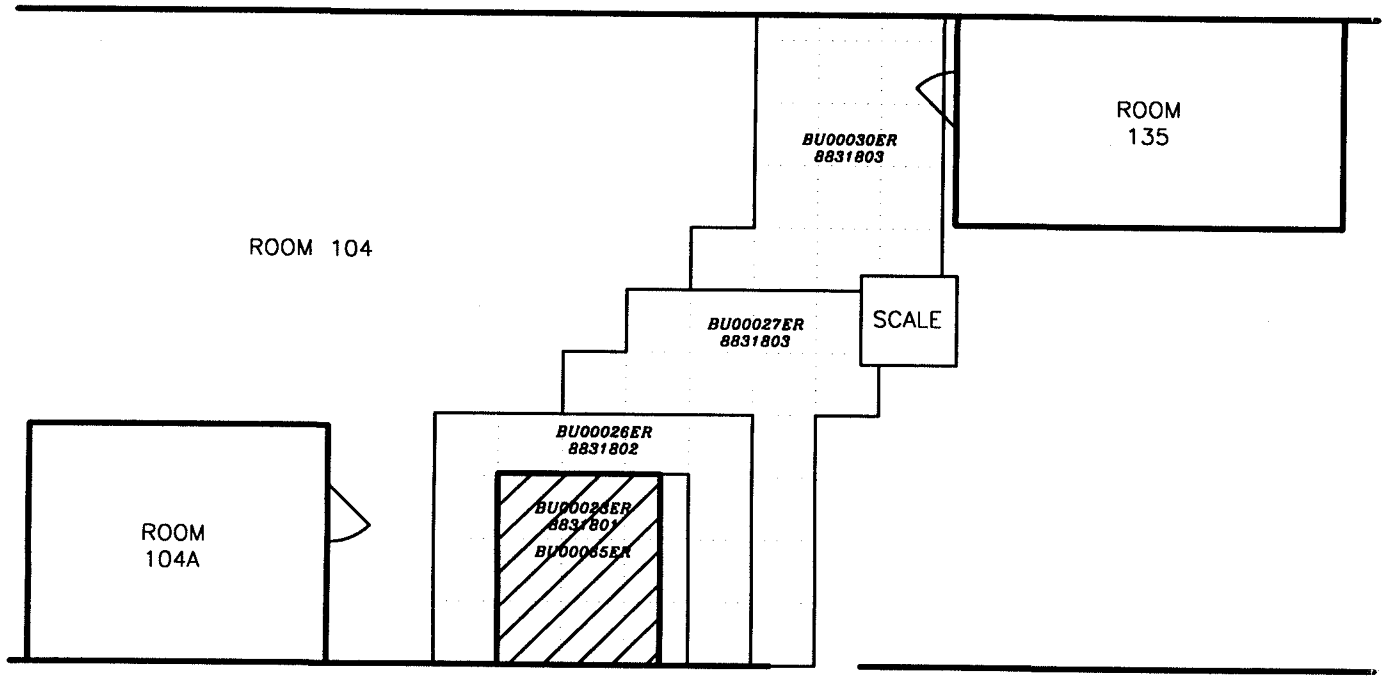
OU15 PHASE I RFI/RI
IHSS 179 RINSATE SAMPLE LOCATIONS & RESULTS

SIZE B | DRAWING NUMBER IHSS 179 | ISSUE A | FIGURE 5-2



Sample Number	Test Group	Compound	Result (ug/l)	Qualifier	Detection Limit (ug/l)	QC Code	QC Partner
ORIGINAL SAMPLES							
BU00023ER	BNACLP	BIS(2-ETHYLHEXYL)PHTHALATE	150		10	REAL	
BU00023ER	BNACLP	PHENOL	47		10	REAL	
BU00023ER	VOACLP	METHYLENE CHLORIDE	27		5	REAL	
BU00024ER	BNACLP	BIS(2-ETHYLHEXYL)PHTHALATE	230	D	10	DUP	BU00023ER
BU00024ER	BNACLP	PHENOL	47		10	DUP	BU00023ER
BU00024ER	VOACLP	METHYLENE CHLORIDE	21		5	DUP	BU00023ER
VERIFICATION SAMPLES							
BU00065ER	BNACLP	BIS(2-ETHYLHEXYL)PHTHALATE	280		10	REAL	
BU00065ER	BNACLP	PHENOL	15		10	REAL	
BU00065ER	VOACLP	METHYLENE CHLORIDE	5	U	5	REAL	
BU00066ER	BNACLP	BIS(2-ETHYLHEXYL)PHTHALATE	690	D	10	DUP	BU00065ER
BU00066ER	BNACLP	PHENOL	31		10	DUP	BU00065ER
BU00066ER	VOACLP	METHYLENE CHLORIDE	5	U	5	DUP	BU00065ER

KEYWORDS: 1-OU15; 2-PHASE 1; 3-RFI/RI; 4-REPORT; 5.
BLDG./FACILITY 883; ROOM/AREA 104; GRID COOR./COL. NO.
MASTER YES ☐ NO ☒
SCALE: NONE

A ORIGINAL ISSUE XX/XX/93

DESIGNED	WEAVER	07/12/94
DRAWN	SCHACKLIN	07/12/94
CHECKED	TERREN	XX/XX/93
APPROVED	SCHUBBE	XX/XX/93
SUBMITTED	BIERBAUM	XX/XX/93

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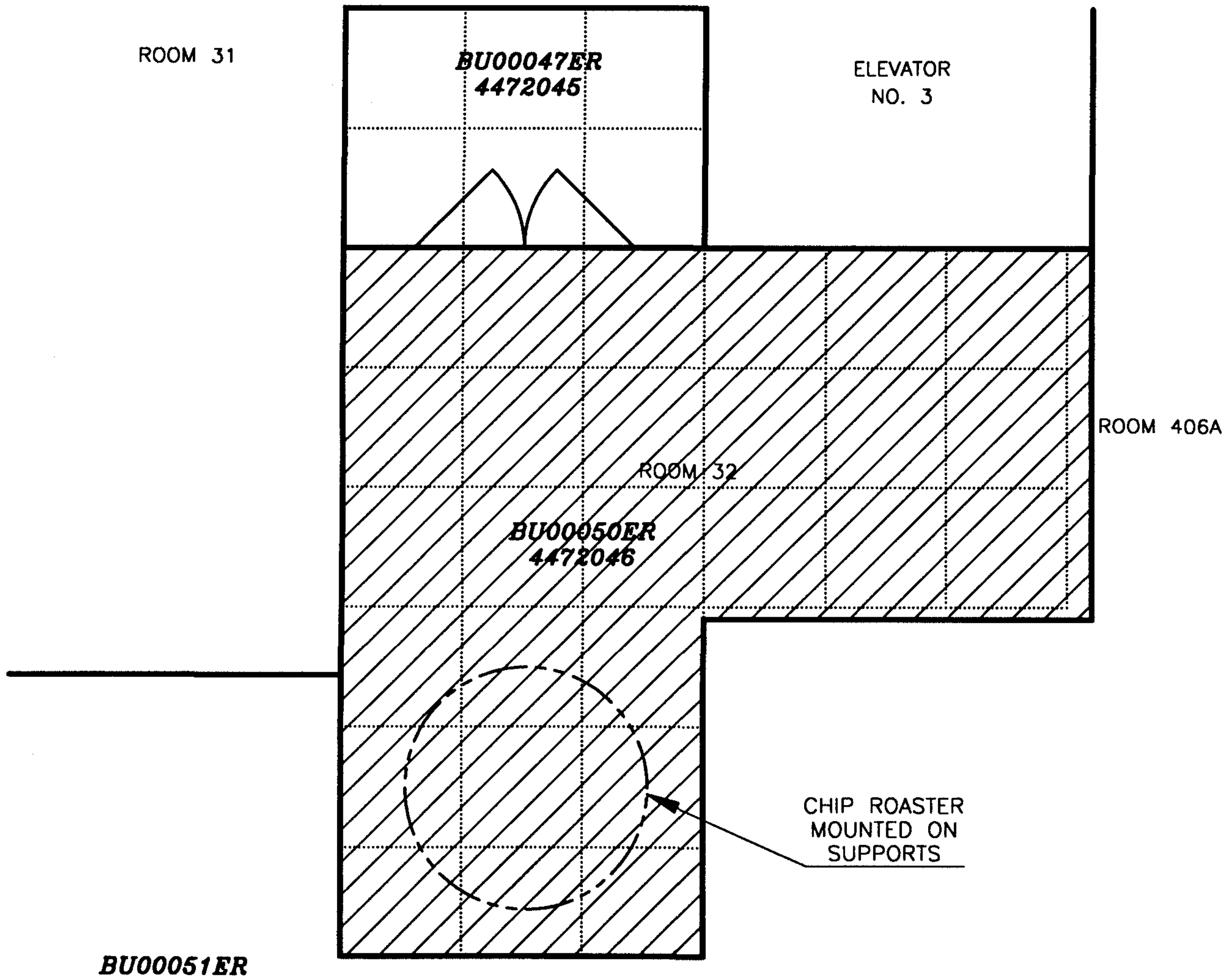
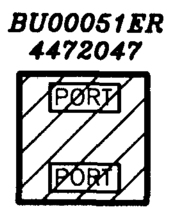
OU15 PHASE I RFI/RI
IHSS 180 RINSATE SAMPLE LOCATIONS & RESULTS
SIZE B DRAWING NUMBER IHSS 180 ISSUE A FIGURE 5-3

NOTES

① A RINSATE SAMPLE WAS COLLECTED FROM THE SURFACE OF THE CHIP ROASTER AROUND THE OXIDE OUTLET PORTS.

Sample Number	Test Group	Compound	Result (ug/l)	Qualifier	Detection Limit (ug/l)	QC Code	QC Partner
ORIGINAL SAMPLES							
BU00050ER	BNACLP	BENZOIC ACID	160	E	50	REAL	
BU00050ER	BNACLP	BIS(2-ETHYLHEXYL)PHTHALATE	160		10	REAL	
BU00050ER	BNACLP	DI-n-OCTYL PHTHALATE	16		10	REAL	
BU00050ER	BNACLP	PHENOL	58		10	REAL	
BU00051ER	BNACLP	2-NITROPHENOL	13		10	REAL	
BU00051ER	BNACLP	BIS(2-ETHYLHEXYL)PHTHALATE	57		10	REAL	
BU00051ER	BNACLP	DI-n-OCTYL PHTHALATE	43		10	REAL	
BU00051ER	BNACLP	PHENOL	450	D	10	REAL	





CHIP ROASTER
OXIDE OUTLET①

KEYWORDS	1-OU15, 2-PHASE I, 3-RFI/RI, 4-REPORT, 5.
BLDG./FACILITY	447
ROOM/AREA	31/32
MASTER	YES ☐ NO ☒
SCALE	NONE
A	ORIGINAL ISSUE — XX/XX/93
DESIGNED	HEA 07/12/94
DRAWN	SCHACKLIN 07/12/94
CHECKED	WEAVER XX/XX/93
APPROVED	SCHUBBE XX/XX/93
SUBMITTED	BIERBAUM XX/XX/93

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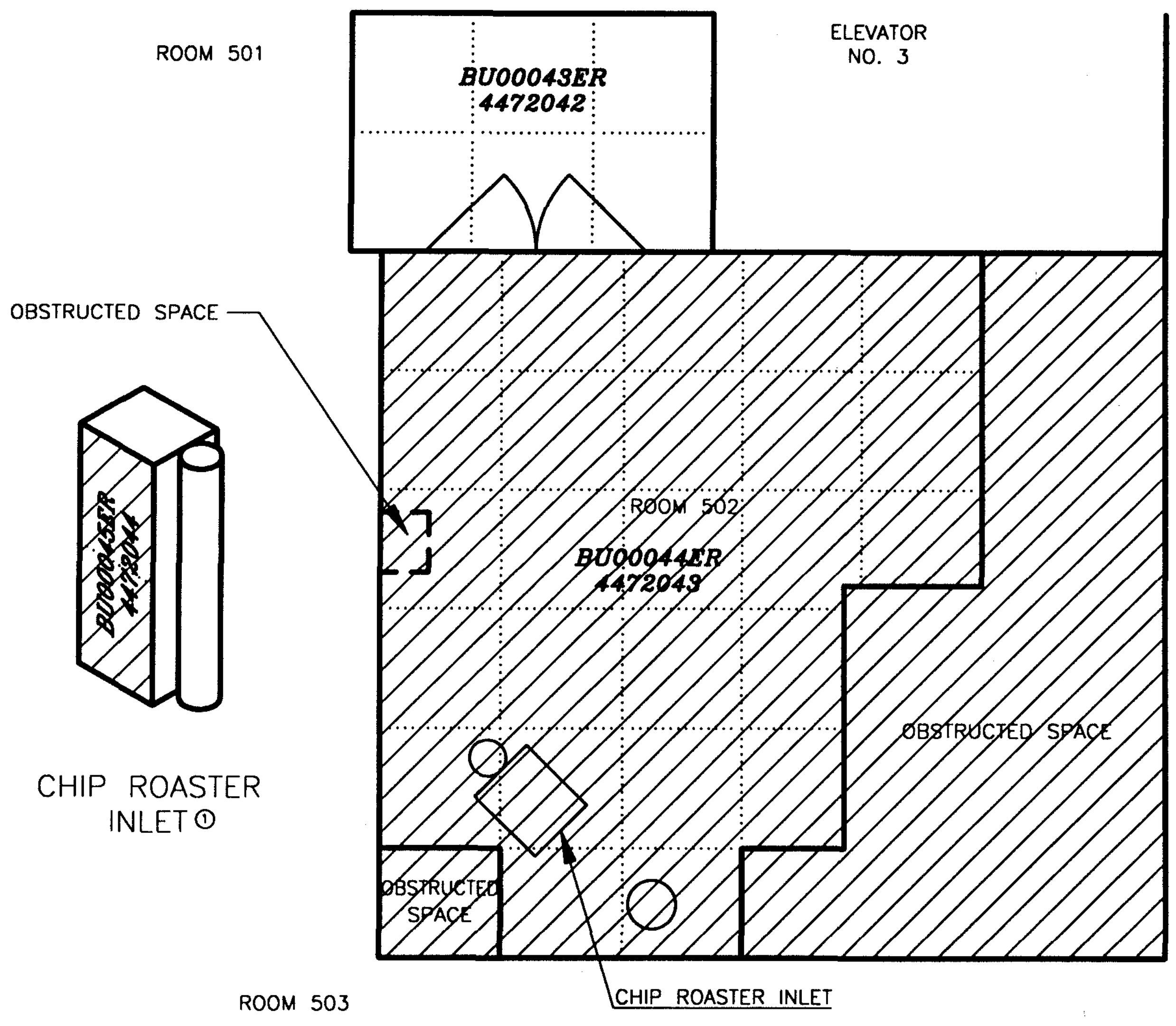
OU15 PHASE I RFI/RI
IHSS 204 RINSATE SAMPLE LOCATIONS & RESULTS

SIZE	DRAWING NUMBER	ISSUE	FIGURE
B	IHSS 204	A	5-4

NOTES

① A RINSATE SAMPLE WAS COLLECTED FROM THE SURFACE OF THE CHIP ROASTER INLET.

Sample Number	Test Group	Compound	Result (ug/l)	Qualifier	Detection Limit (ug/l)	QC Code	QC Partner
ORIGINAL SAMPLES							
BU00044ER	BNACLP	BIS(2-ETHYLHEXYL)PHTHALATE	930	D	10	REAL	
BU00044ER	BNACLP	DI-n-OCTYL PHTHALATE	12		10	REAL	
BU00044ER	BNACLP	PHENOL	23		10	REAL	
BU00045ER	BNACLP	BIS(2-ETHYLHEXYL)PHTHALATE	270	D	10	REAL	
BU00045ER	BNACLP	DI-n-OCTYL PHTHALATE	28		10	REAL	
BU00045ER	BNACLP	PHENOL	98		10	REAL	



KEYWORDS: 1-OU15; 2-PHASE I; 3-RFI/RI; 4-REPORT; 5.
BLDG./FACILITY 447
ROOM/AREA 501/502
MASTER YES ☐ NO ☒
SCALE: NONE

A ORIGINAL ISSUE XX/XX/93

DESIGNED HEA 07/12/94
DRAWN SCHACKLIN 07/12/94
CHECKED WEAVER XX/XX/93
APPROVED SCHUBBE XX/XX/93
SUBMITTED BIERBAUM XX/XX/93

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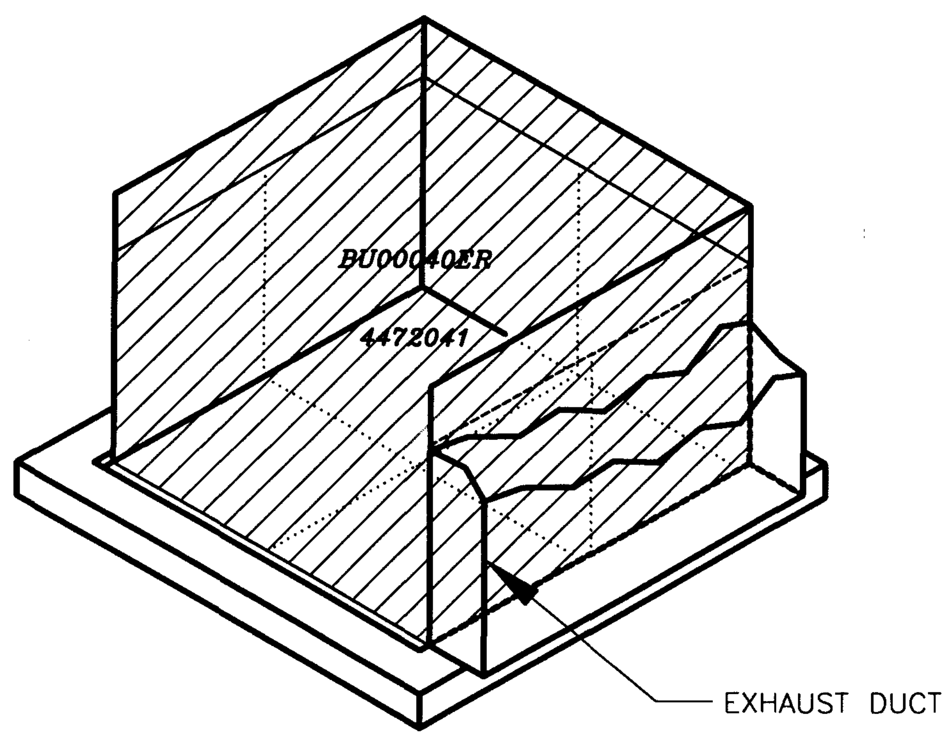
OU15 PHASE I RFI/RI
IHSS 204 RINSATE SAMPLE LOCATIONS & RESULTS

SIZE B | DRAWING NUMBER IHSS 204 | ISSUE A | FIGURE 5-5

Sample Number	Test Group	Compound	Result (ug/l)	Qualifier	Detection Limit (ug/l)	QC Code	QC Partner

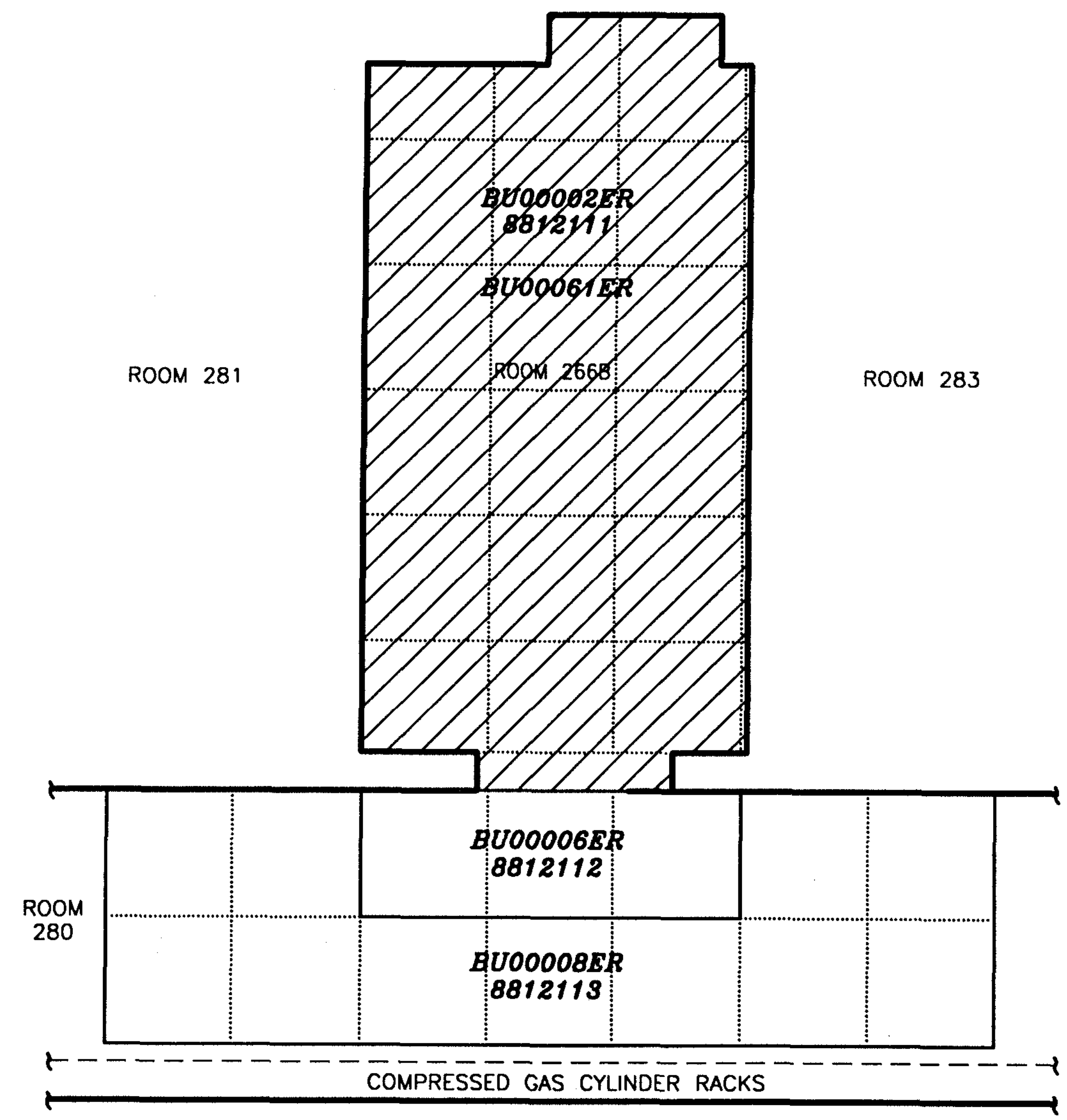
ORIGINAL SAMPLES

No target organic compounds detected in the Wash Rack/Drum Washing Basin samples.



WASH RACK/DRUM WASHING BASIN

KEYWORDS	A	ORIGINAL ISSUE	XX/XX/93	RCH	KAS	DAW	DLS
1.OU15	ISSUE	DESCRIPTION	DATE	RFETS	DOE	CLASS	JOB NO.
2.PHASE I		DESIGNED HEA 07/12/94	U.S. DEPARTMENT OF ENERGY ROCKY FLATS AREA OFFICE GOLDEN,COLORADO				
3.RFI/RI		DRAWN SCHACKLIN 07/12/94	Rocky Flats Environmental Technology Site				
4.REPORT		CHECKED WEAVER XX/XX/93	GOLDEN,COLORADO 80401				
5.		APPROVED SCHUBBE XX/XX/93	OU15 PHASE I RFI/RI				
BLDG./FACILITY 447			IHSS 204 RINSATE SAMPLE LOCATIONS & RESULTS				
ROOM/AREA 501							
GRID COOR./COL NO.		SUBMITTED BIERBAUM XX/XX/93	SIZE	DRAWING NUMBER	ISSUE	FIGURE	
MASTER YES ☐ NO ☒	SCALE: NONE	APPROVED RFETS / APPROVED DOE	B	IHSS 204	A	5-6	



Sample Number	Test Group	Compound	Result (ug/l)	Qualifier	Detection Limit (ug/l)	QC Code	QC Partner
ORIGINAL SAMPLES							
BU00002ER	BNACLP	2-METHYLPHENOL	110		10	REAL	
BU00002ER	BNACLP	BENZOIC ACID	250	D	50	REAL	
BU00002ER	BNACLP	BENZYL ALCOHOL	10		10	REAL	
BU00002ER	BNACLP	BUTYL BENZYL PHTHALATE	54		10	REAL	
BU00002ER	BNACLP	PHENOL	150	D	10	REAL	
BU00002ER	DMETADD	SILICON	9250		100	REAL	
BU00002ER	DSMETCLP	CADMIUM	17		5	REAL	
BU00002ER	DSMETCLP	CALCIUM	37400		5000	REAL	
BU00002ER	DSMETCLP	COPPER	34.4		25	REAL	
BU00002ER	DSMETCLP	IRON	135		100	REAL	
BU00002ER	DSMETCLP	LEAD	9.1		5	REAL	
BU00002ER	DSMETCLP	POTASSIUM	25600		5000	REAL	
BU00002ER	DSMETCLP	SODIUM	53900		5000	REAL	
BU00002ER	DSMETCLP	ZINC	40.5		20	REAL	
BU00002ER	VOACLP	TOTAL XYLENES	9		5	REAL	
BU00003ER	BNACLP	2-METHYLPHENOL	120		10	DUP	BU00002ER
BU00003ER	BNACLP	BENZOIC ACID	240	D	50	DUP	BU00002ER
BU00003ER	BNACLP	BENZYL ALCOHOL	11		10	DUP	BU00002ER
BU00003ER	BNACLP	BUTYL BENZYL PHTHALATE	75		10	DUP	BU00002ER
BU00003ER	BNACLP	PHENOL	170	D	10	DUP	BU00002ER
BU00003ER	DMETADD	SILICON	8510		100	DUP	BU00002ER
BU00003ER	DSMETCLP	CALCIUM	39400		5000	DUP	BU00002ER
BU00003ER	DSMETCLP	COPPER	30.1		25	DUP	BU00002ER
BU00003ER	DSMETCLP	LEAD	4.4		5	DUP	BU00002ER
BU00003ER	DSMETCLP	POTASSIUM	24400		5000	DUP	BU00002ER
BU00003ER	DSMETCLP	SODIUM	53700		5000	DUP	BU00002ER
BU00003ER	DSMETCLP	ZINC	32.3		20	DUP	BU00002ER
BU00003ER	VOACLP	TOTAL XYLENES	18		5	DUP	BU00002ER
VERIFICATION SAMPLES							
BU00061ER	BNACLP	BUTYL BENZYL PHTHALATE	10	U	10	REAL	
BU00061ER	BNACLP	PHENOL	94		10	REAL	
BU00061ER	DSMETCLP	CADMIUM	3.0	U	5	REAL	
BU00061ER	DSMETCLP	LEAD	5.0		3	REAL	

KEYWORDS: 1.OU15 2.PHASE I 3.RFI/RI 4.REPORT 5.
BLDG./FACILITY 881
ROOM/AREA 2668
GRID COOR./C.S. NO.
MASTER YES ☐ NO ☒

A ORIGINAL ISSUE XX/XX/93

DESIGNED HEA 07/12/94
DRAWN SCHACKLIN 07/12/94
CHECKED BIERBAUM XX/XX/93
APPROVED SCHUBBE XX/XX/93
SUBMITTED BIERBAUM XX/XX/93
SCALE: NONE

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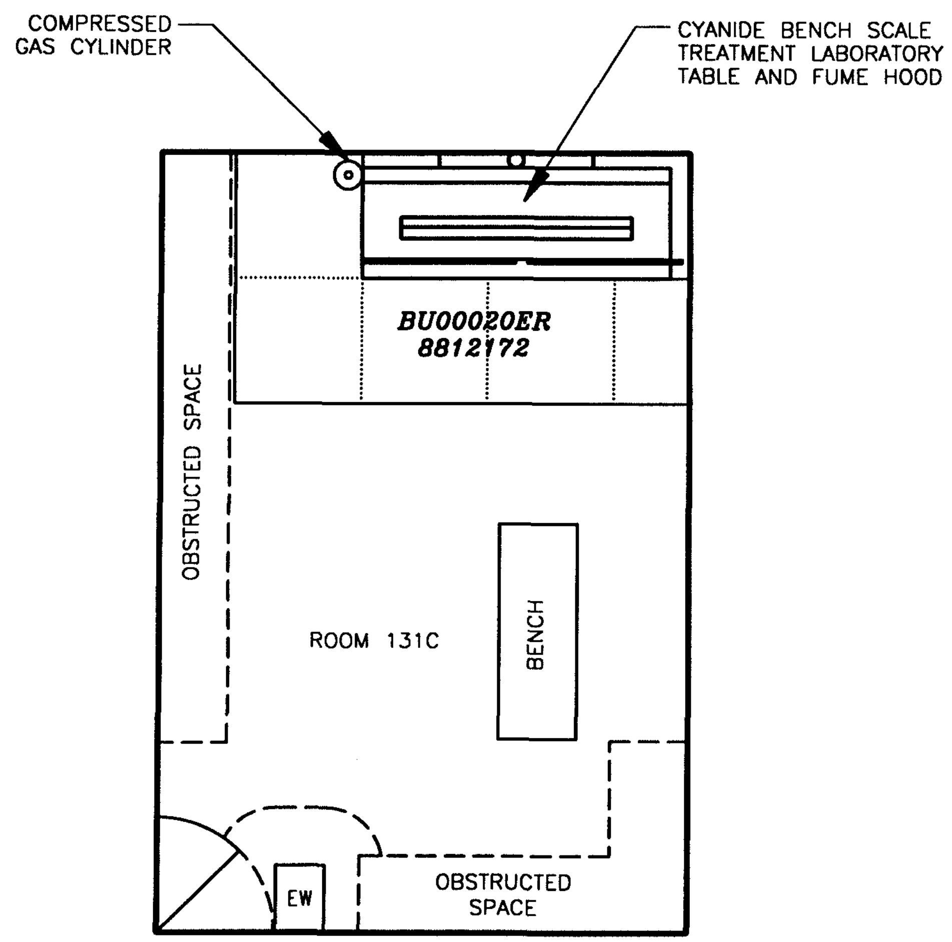
GOLDEN,COLORADO 80401
OU15 PHASE I RFI/RI
IHSS 211 RINSATE SAMPLE LOCATIONS & RESULTS

SIZE	DRAWING NUMBER	ISSUE	FIGURE
B	IHSS 211	A	5-7

Sample Number	Test Group	Compound	Result (ug/l)	Qualifier	Detection Limit (ug/l)	QC Code	QC Partner

ORIGINAL SAMPLES

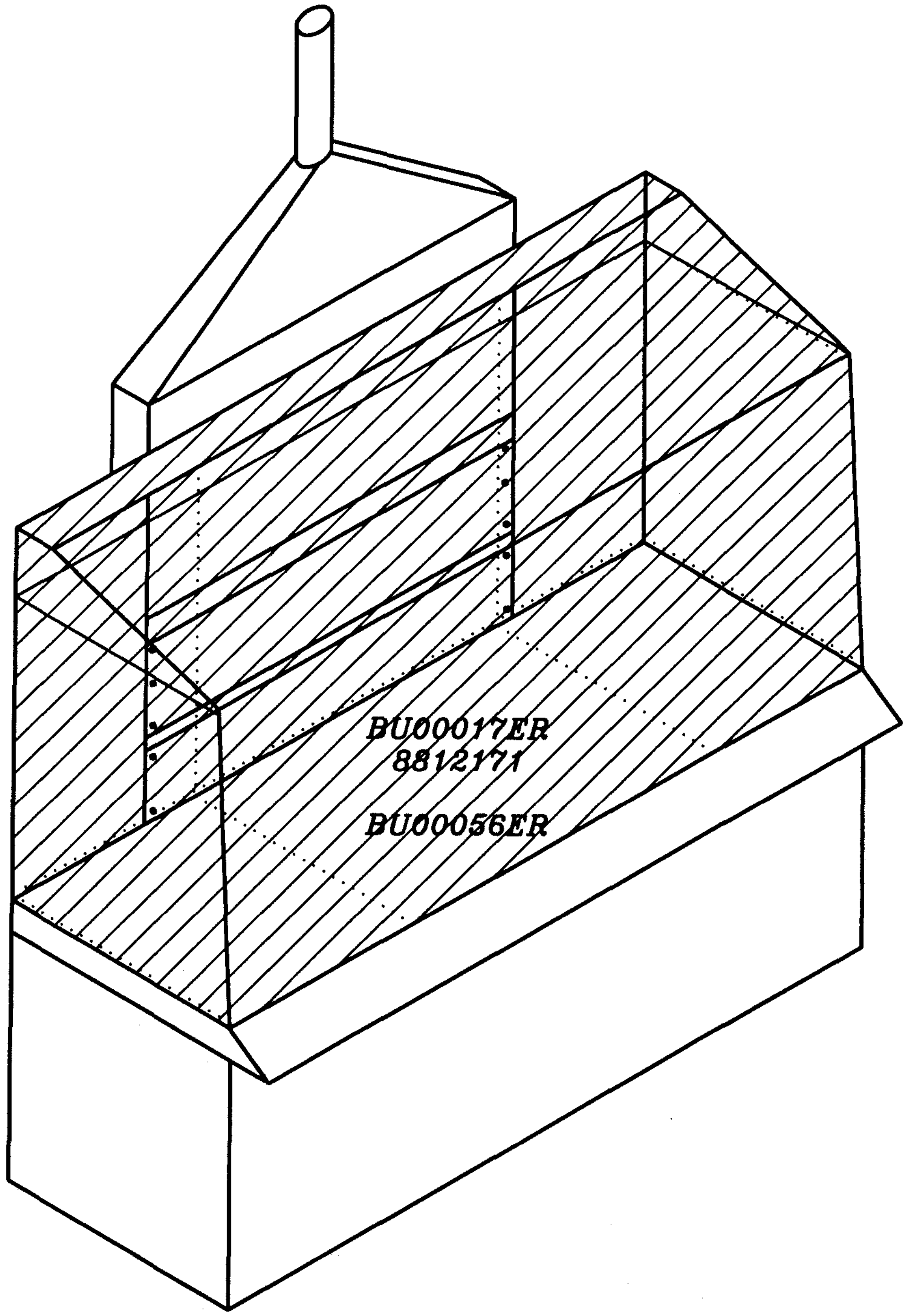
Perimeter location, IHSS sample results presented on Figure 5-9.



KEYWORDS	A	ORIGINAL ISSUE		XX/XX/93	RCH	KAS	PRB	DLS
1. OU15	ISSUE	DESCRIPTION		DATE	RFETS	DOE	CLASS	JOB NO.
2. PHASE I		DESIGNED	HEA	07/12/94	U.S. DEPARTMENT OF ENERGY ROCKY FLATS AREA OFFICE GOLDEN, COLORADO			
3. RFI/RI		DRAWN	SCHACKLIN	07/12/94	Rocky Flats Environmental Technology Site			
4. REPORT		CHECKED	BIERBAUM	XX/XX/93	GOLDEN, COLORADO 80401			
5.		APPROVED	SCHUBBE	XX/XX/93	OU15 PHASE I RFI/RI			
BLDG./FACILITY 881					IHSS 217 RINSATE SAMPLE LOCATIONS & RESULTS			
ROOM/AREA 131C		SUBMITTED	BIERBAUM	XX/XX/93	SIZE	DRAWING NUMBER	ISSUE	FIGURE
GRID COOR./COL. NO.		APPROVED RFETS						
MASTER YES ☐ NO ☒	SCALE: NONE	APPROVED DOE			B	IHSS 217	A	5-8

881
131C

CYANIDE BENCH SCALE TREATMENT
LABORATORY TABLE AND FUME HOOD



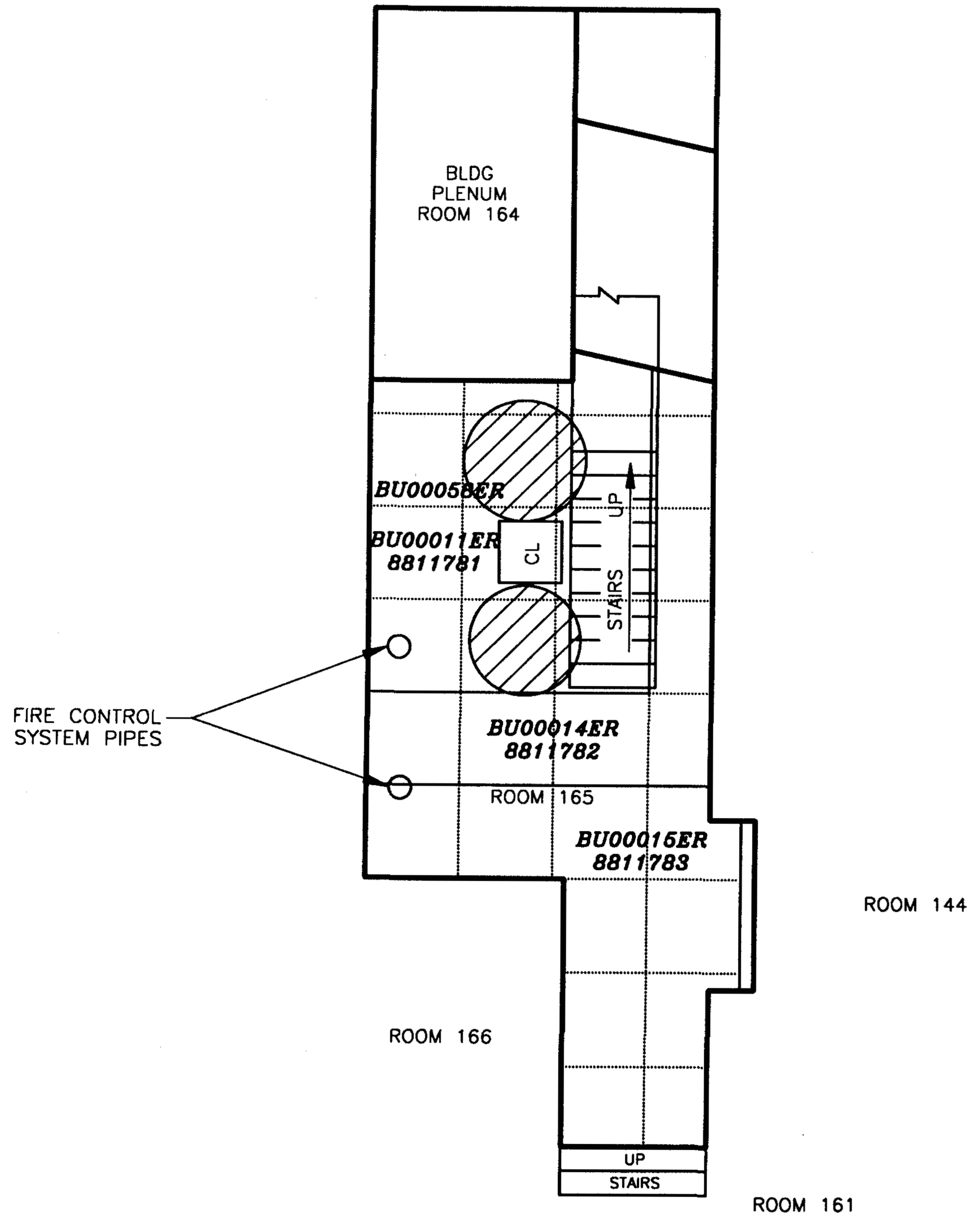
Sample Number	Test Group	Compound	Result (ug/l)	Qualifier	Detection Limit (ug/l)	QC Code	QC Partner
ORIGINAL SAMPLES							
BU00017ER	BNACLP	BIS(2-ETHYLHEXYL)PHTHALATE	53		10	REAL	
BU00017ER	BNACLP	BUTYL BENZYL PHTHALATE	21		10	REAL	
BU00017ER	BNACLP	PHENOL	18		10	REAL	
BU00017ER	DMETADD	LITHIUM	256		100	REAL	
BU00017ER	DMETADD	SILICON	3630		100	REAL	
BU00017ER	DSMETCLP	BERYLLIUM	7.2		5	REAL	
BU00017ER	DSMETCLP	CADMIUM	75.8		5	REAL	
BU00017ER	DSMETCLP	CALCIUM	42300		5000	REAL	
BU00017ER	DSMETCLP	CHROMIUM	37.5		10	REAL	
BU00017ER	DSMETCLP	COBALT	72.2		50	REAL	
BU00017ER	DSMETCLP	COPPER	281		25	REAL	
BU00017ER	DSMETCLP	IRON	143		100	REAL	
BU00017ER	DSMETCLP	MAGNESIUM	14000		5000	REAL	
BU00017ER	DSMETCLP	MANGANESE	1200		15	REAL	
BU00017ER	DSMETCLP	MERCURY	1.6		.2	REAL	
BU00017ER	DSMETCLP	NICKEL	5630		40	REAL	
BU00017ER	DSMETCLP	POTASSIUM	5270		5000	REAL	
BU00017ER	DSMETCLP	SILVER	22.1		10	REAL	
BU00017ER	DSMETCLP	SODIUM	17400		5000	REAL	
BU00017ER	DSMETCLP	ZINC	986		20	REAL	
BU00017ER	VOACLP	4-METHYL-2-PENTANONE	26		10	REAL	
BU00017ER	VOACLP	CHLOROFORM	5		5	REAL	
BU00017ER	VOACLP	TOTAL XYLENES	11		5	REAL	
BU00017ER	WQPL	CYANIDE	142		5	REAL	
BU00018ER	BNACLP	BIS(2-ETHYLHEXYL)PHTHALATE	53		10	DUP	BU00017ER
BU00018ER	BNACLP	BUTYL BENZYL PHTHALATE	23		10	DUP	BU00017ER
BU00018ER	BNACLP	PHENOL	18		10	DUP	BU00017ER
BU00018ER	DMETADD	LITHIUM	247		100	DUP	BU00017ER
BU00018ER	DMETADD	SILICON	3690		100	DUP	BU00017ER
BU00018ER	DSMETCLP	BERYLLIUM	7.4		5	DUP	BU00017ER
BU00018ER	DSMETCLP	CADMIUM	73.5		5	DUP	BU00017ER
BU00018ER	DSMETCLP	CALCIUM	42700		5000	DUP	BU00017ER
BU00018ER	DSMETCLP	CHROMIUM	36.9		10	DUP	BU00017ER
BU00018ER	DSMETCLP	COBALT	67.9		50	DUP	BU00017ER
BU00018ER	DSMETCLP	COPPER	287		25	DUP	BU00017ER
BU00018ER	DSMETCLP	IRON	131		100	DUP	BU00017ER
BU00018ER	DSMETCLP	MAGNESIUM	14200		5000	DUP	BU00017ER
BU00018ER	DSMETCLP	MANGANESE	1200		15	DUP	BU00017ER
BU00018ER	DSMETCLP	MERCURY	1.7		.2	DUP	BU00017ER
BU00018ER	DSMETCLP	NICKEL	5670		40	DUP	BU00017ER
BU00018ER	DSMETCLP	POTASSIUM	5140		5000	DUP	BU00017ER
BU00018ER	DSMETCLP	SILVER	21.3		10	DUP	BU00017ER
BU00018ER	DSMETCLP	SODIUM	16600		5000	DUP	BU00017ER
BU00018ER	DSMETCLP	ZINC	1020		20	DUP	BU00017ER
BU00018ER	VOACLP	4-METHYL-2-PENTANONE	28		10	DUP	BU00017ER
BU00018ER	VOACLP	CHLOROFORM	5		5	DUP	BU00017ER
BU00018ER	VOACLP	TOTAL XYLENES	11		5	DUP	BU00017ER
BU00018ER	WQPL	CYANIDE	171		5	DUP	BU00017ER
VERIFICATION SAMPLES							
BU00056ER	WQPL	CYANIDE	10	U	10	REAL	
BU00057ER	WQPL	CYANIDE	10	U	10	DUP	BU00056ER

KEYWORDS: 1-OU15, 2-PHASE I, 3-RFI/RI, 4-REPORT
BLDG./FACILITY 881; ROOM/AREA 131C
MASTER YES ☐ NO ☒
SCALE: NONE
A ORIGINAL ISSUE XX/XX/93
DESIGNED HEA 07/12/94; DRAWN SCHACKLIN 07/12/94; CHECKED BIERBAUM XX/XX/93; APPROVED SCHUBBE XX/XX/93; SUBMITTED BIERBAUM XX/XX/93

U.S. DEPARTMENT OF ENERGY
ROCKY FLATS AREA OFFICE GOLDEN, COLORADO
Rocky Flats Environmental Technology Site
GOLDEN, COLORADO 80401
OU15 PHASE I RFI/RI
IHSS 217 RINSATE
SAMPLE LOCATIONS & RESULTS

SIZE B | DRAWING NUMBER IHSS 217 | ISSUE A | FIGURE 5-9

Sample Number	Test Group	Radionuclide	Result (pCi/L)	Error	Qualifier	Detection Limit (pCi/L)	QC Code	QC Partner
BU00011ER	DRADS	GROSS ALPHA	7.9	1.2		0.82	REAL	
BU00011ER	DRADS	GROSS BETA	11	4.0		5.5	REAL	
BU00011ER	DRADS	PLUTONIUM-239/240	.023	0.012	B	0.009	REAL	
BU00011ER	DRADS	RADIUM-226	.37	0.18	BJ	0.26	REAL	
BU00011ER	DRADS	URANIUM-233,-234	9.3	1.7	B	0.11	REAL	
BU00011ER	DRADS	URANIUM-235	.22	0.20	J	0.036	REAL	
BU00011ER	DRADS	URANIUM-238	1	0.44	B	0.061	REAL	
BU00012ER	DRADS	GROSS ALPHA	8.7	1.3		0.69	DUP	BU00011ER
BU00012ER	DRADS	GROSS BETA	17	4.1		5.1	DUP	BU00011ER
BU00012ER	DRADS	PLUTONIUM-239/240	.024	0.012	B	0.007	DUP	BU00011ER
BU00012ER	DRADS	RADIUM-226	.49	0.14	BJ	0.14	DUP	BU00011ER
BU00012ER	DRADS	URANIUM-233,-234	9.6	1.8	B	0.037	DUP	BU00011ER
BU00012ER	DRADS	URANIUM-235	.44	0.29	J	0.063	DUP	BU00011ER
BU00012ER	DRADS	URANIUM-238	1.2	0.50	B	0.063	DUP	BU00011ER
BU00014ER	DRADS	GROSS ALPHA	5.2	0.79		0.47	REAL	
BU00014ER	DRADS	GROSS BETA	10	2.9		3.9	REAL	
BU00014ER	DRADS	PLUTONIUM-239/240	.02	0.010	B	0.005	REAL	
BU00014ER	DRADS	RADIUM-226	.47	0.20	BJ	0.27	REAL	
BU00014ER	DRADS	URANIUM-233,-234	5.5	1.2	B	0.035	REAL	
BU00014ER	DRADS	URANIUM-235	.21	0.19	J	0.060	REAL	
BU00014ER	DRADS	URANIUM-238	.81	0.38	B	0.035	REAL	
BU00015ER	DRADS	AMERICIUM-241	.019	0.010		0.002	REAL	
BU00015ER	DRADS	GROSS ALPHA	28	2.2		0.83	REAL	
BU00015ER	DRADS	GROSS BETA	21	4.4		5.4	REAL	
BU00015ER	DRADS	PLUTONIUM-239/240	.046	0.016		0.008	REAL	
BU00015ER	DRADS	RADIUM-226	.45	0.19	BJ	0.27	REAL	
BU00015ER	DRADS	URANIUM-233,-234	26	3.6	B	0.058	REAL	
BU00015ER	DRADS	URANIUM-235	.98	0.42		0.058	REAL	
BU00015ER	DRADS	URANIUM-238	.94	0.41	B	0.058	REAL	



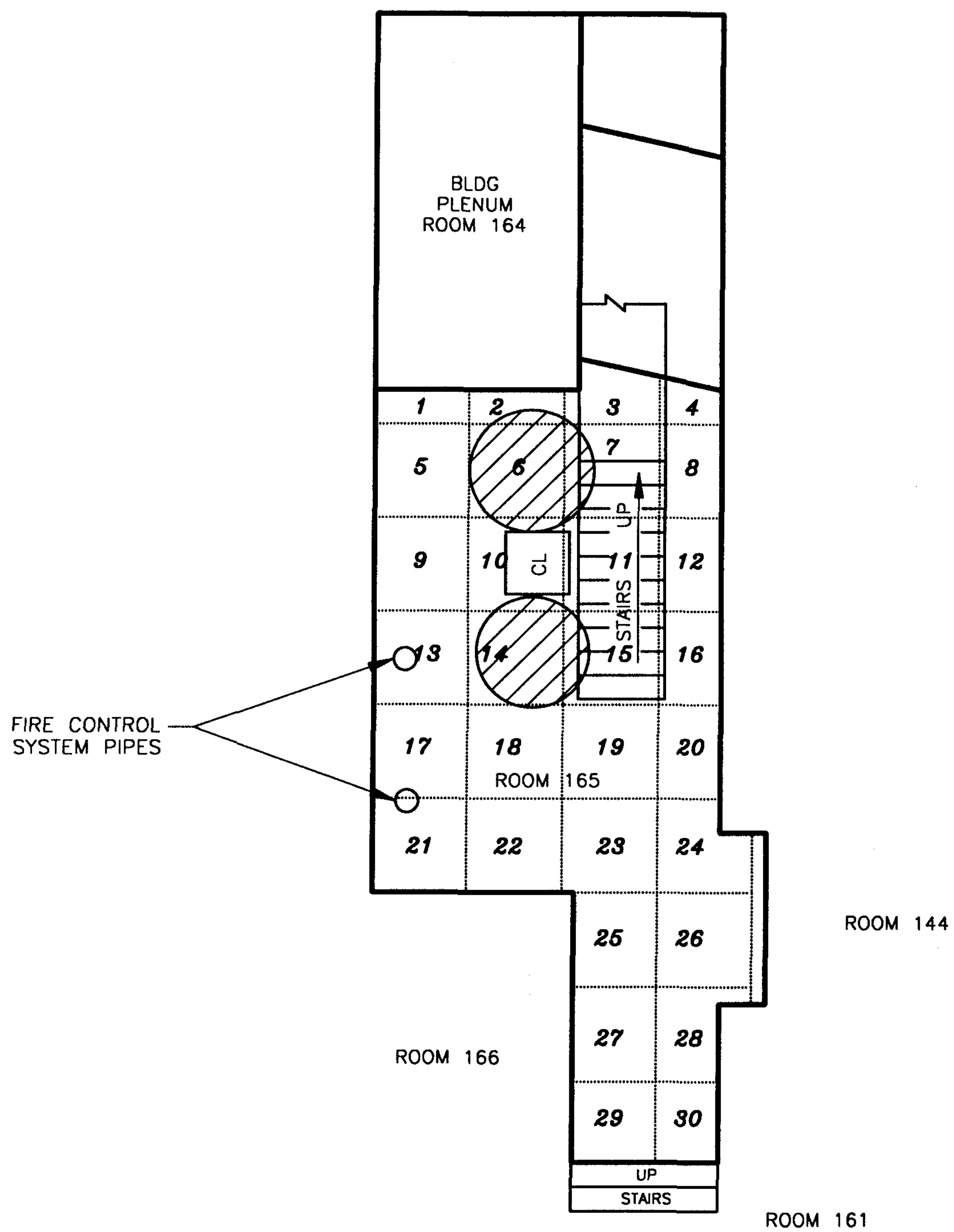
KEYWORDS: 1. OU15; 2. PHASE I; 3. RFI/RI; 4. REPORT; 5.
BLDG./FACILITY 881; ROOM/AREA 165; GRID COOR./COL. NO.
MASTER YES ☐ NO ☒; SCALE: NONE

A ORIGINAL ISSUE XX/XX/93 RCH KAS PRB DLS
DESIGNED HEA 07/12/94; DRAWN SCHACKLIN 07/12/94; CHECKED BIERBAUM XX/XX/93; APPROVED SCHUBBE XX/XX/93; SUBMITTED BIERBAUM XX/XX/93

U.S. DEPARTMENT OF ENERGY
ROCKY FLATS AREA OFFICE GOLDEN, COLORADO
Rocky Flats Environmental Technology Site
GOLDEN, COLORADO 80401
OU15 PHASE I RFI/RI
IHSS 178 RINSATE SAMPLE LOCATIONS & RESULTS
SIZE B DRAWING NUMBER IHSS 178 ISSUE A FIGURE 5-10

881
165

Area	Pre-Rinsate Smear Sample Alpha (dpm/100 cm^2)	Pre-Rinsate Smear Sample Beta (dpm/100 cm^2)	Post-Rinsate Smear Sample Alpha (dpm/100 cm^2)	Post-Rinsate Smear Sample Beta (dpm/100 cm^2)	Gamma Dose-Rate (mrem/hr)	Beta Dose-Rate (mrem/hr)
1	3	0	0	18	0	0
2	0	0	0	0	0	0
3	0	18	0	3	0	0
4	0	3	0	9	0	0
5	3	0	3	0	0	0
6	9	0	3	0	0	0
7	0	12	3	15	0	0
8	0	24	9	9	0	0
9	3	0	0	21	0	0
10	9	9	0	0	0	0
11	0	0	3	0	0	0
12	0	30	3	3	0	0
13	0	0	0	27	0	0
14	0	15	0	40	0	0
15	0	3	3	0	0	0
16	6	0	0	6	0	0
17	0	0	9	33	0	0.4
18	0	9	6	18	0	0.4
19	3	0	0	0	0	0.4
20	3	6	6	0	0	0.4
21	0	0	0	0	0	0.4
22	0	0	0	0	0	0.4
23	3	3	0	27	0	0.4
24	0	9	0	30	0	0.4
25	0	6	0	0	0	0.4
26	6	0	0	36	0	0.4
27	3	0	6	0	0	0.4
28	3	6	0	0	0	0.4
29	0	18	0	0	0	0.4
30	0	0	0	39	0	0.4



KEYWORDS		
1.OU15	A ORIGINAL ISSUE	XX/XX/93 RCH KAS PRB DLS
2.PHASE I	DESIGNED HEA 07/12/94	U.S. DEPARTMENT OF ENERGY ROCKY FLATS AREA OFFICE GOLDEN,COLORADO
3.RFI/RI	DRAWN SCHACKLIN 07/12/94	Rocky Flats Environmental Technology Site
4.REPORT	CHECKED BIERBAUM XX/XX/93	GOLDEN,COLORADO 80401
5.	APPROVED SCHUBBE XX/XX/93	OU15 PHASE I RFI/RI
BLDG./FACILITY 881		IHSS 178 RAD SAMPLE LOCATIONS & RESULTS
ROOM/AREA 165	SUBMITTED BIERBAUM XX/XX/93	SIZE B
MASTER YES ☐ NO ☒	SCALE: NONE	DRAWING NUMBER IHSS 178 ISSUE A FIGURE 5-11

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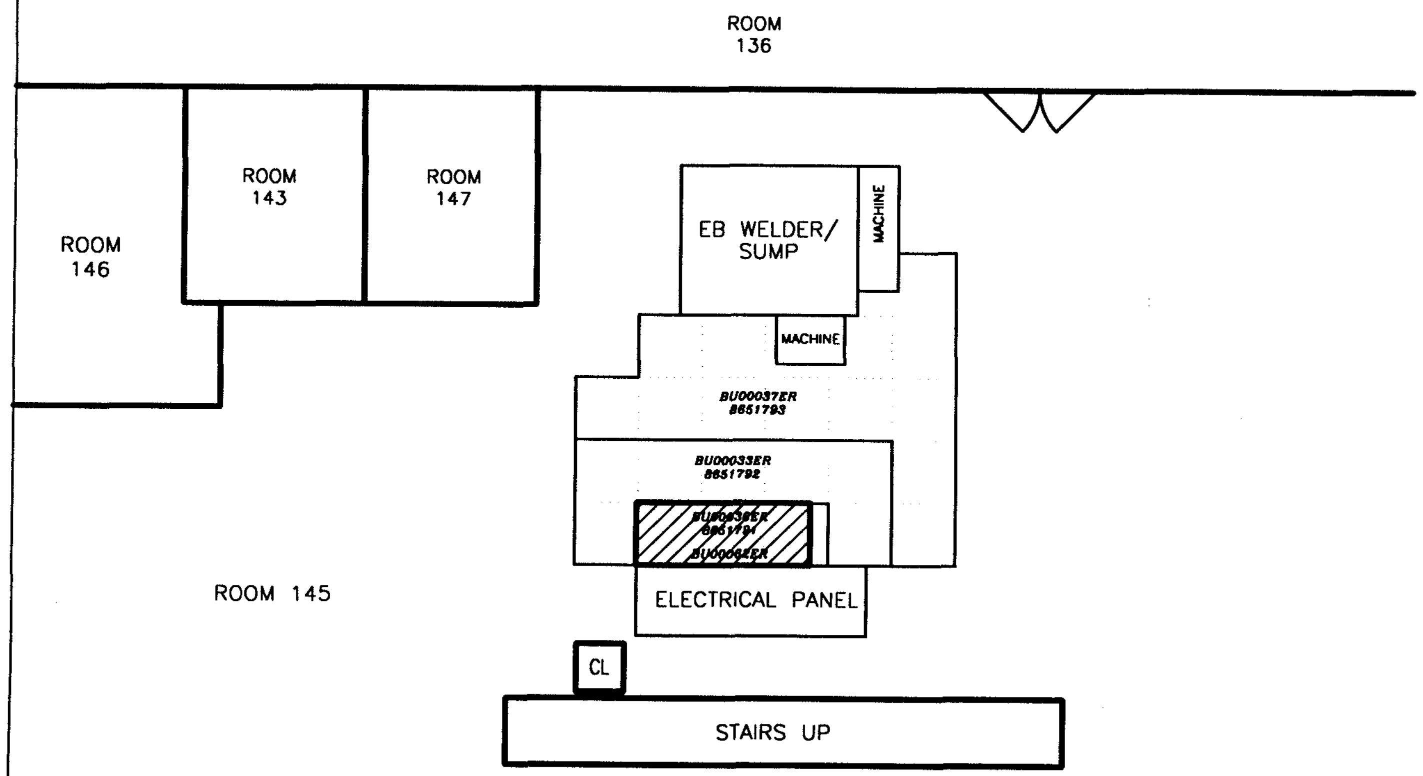
165

Sample Number	Test Group	Radionuclide	Result (pCi/L)	Error	Qualifier	Detection Limit (pCi/L)	QC Code	QC Partner
BU00033ER	DRADS	AMERICIUM-241	0.007	0.004	J	0.001	REAL	
BU00033ER	DRADS	GROSS ALPHA	18	1.3		0.51	REAL	
BU00033ER	DRADS	GROSS BETA	27	2.8		2.5	REAL	
BU00033ER	DRADS	PLUTONIUM-239/240	0.005	0.004	J	0.005	REAL	
BU00033ER	DRADS	RADIUM-226	.86	0.050	B	0.040	REAL	
BU00033ER	DRADS	URANIUM-233,-234	3.0	0.79	B	0.12	REAL	
BU00033ER	DRADS	URANIUM-235	0.17	0.17	BJ	0.035	REAL	
BU00033ER	DRADS	URANIUM-238	19	2.9	B	0.062	REAL	
BU00034ER	DRADS	AMERICIUM-241	0.007	0.004	J	0.001	DUP	BU00033ER
BU00034ER	DRADS	GROSS ALPHA	17	1.2		0.56	DUP	BU00033ER
BU00034ER	DRADS	GROSS BETA	25	2.7		2.3	DUP	BU00033ER
BU00034ER	DRADS	PLUTONIUM-239/240	0.015	0.008		0.007	DUP	BU00033ER
BU00034ER	DRADS	RADIUM-226	.66	0.050	B	0.070	DUP	BU00033ER
BU00034ER	DRADS	URANIUM-233,-234	3.3	0.94	B	0.13	DUP	BU00033ER
BU00034ER	DRADS	URANIUM-235	0.31	0.26	BJ	0.043	DUP	BU00033ER
BU00034ER	DRADS	URANIUM-238	16	2.8	B	0.15	DUP	BU00033ER
BU00036ER	DRADS	AMERICIUM-241	0.018	0.008		0.004	REAL	
BU00036ER	DRADS	GROSS ALPHA	9.0	0.89		0.49	REAL	
BU00036ER	DRADS	GROSS BETA	13	2.3		2.6	REAL	
BU00036ER	DRADS	PLUTONIUM-239/240	0.014	0.008		0.004	REAL	
BU00036ER	DRADS	URANIUM-233,-234	1.9	0.68	B	0.13	REAL	
BU00036ER	DRADS	URANIUM-235	0.10	0.15	BJ	0.043	REAL	
BU00036ER	DRADS	URANIUM-238	9.2	1.8	B	0.043	REAL	
BU00037ER	DRADS	GROSS ALPHA	120	4.1		0.64	REAL	
BU00037ER	DRADS	GROSS BETA	130	6.9		4.1	REAL	
BU00037ER	DRADS	PLUTONIUM-239/240	0.006	0.006	J	0.006	REAL	
BU00037ER	DRADS	RADIUM-226	.67	0.050	B	0.070	REAL	
BU00037ER	DRADS	URANIUM-233,-234	18	2.8	B	0.037	REAL	
BU00037ER	DRADS	URANIUM-235	2.3	0.69	B	0.037	REAL	
BU00037ER	DRADS	URANIUM-238	130	17	B	0.065	REAL	



KEYWORDS: 1. OU15; 2. PHASE I; 3. RFI/RI; 4. REPORT
BLDG./FACILITY: 865
ROOM/AREA: 145
MASTER: YES ☐ NO ☒
SCALE: NONE

A — ORIGINAL ISSUE — XX/XX/93

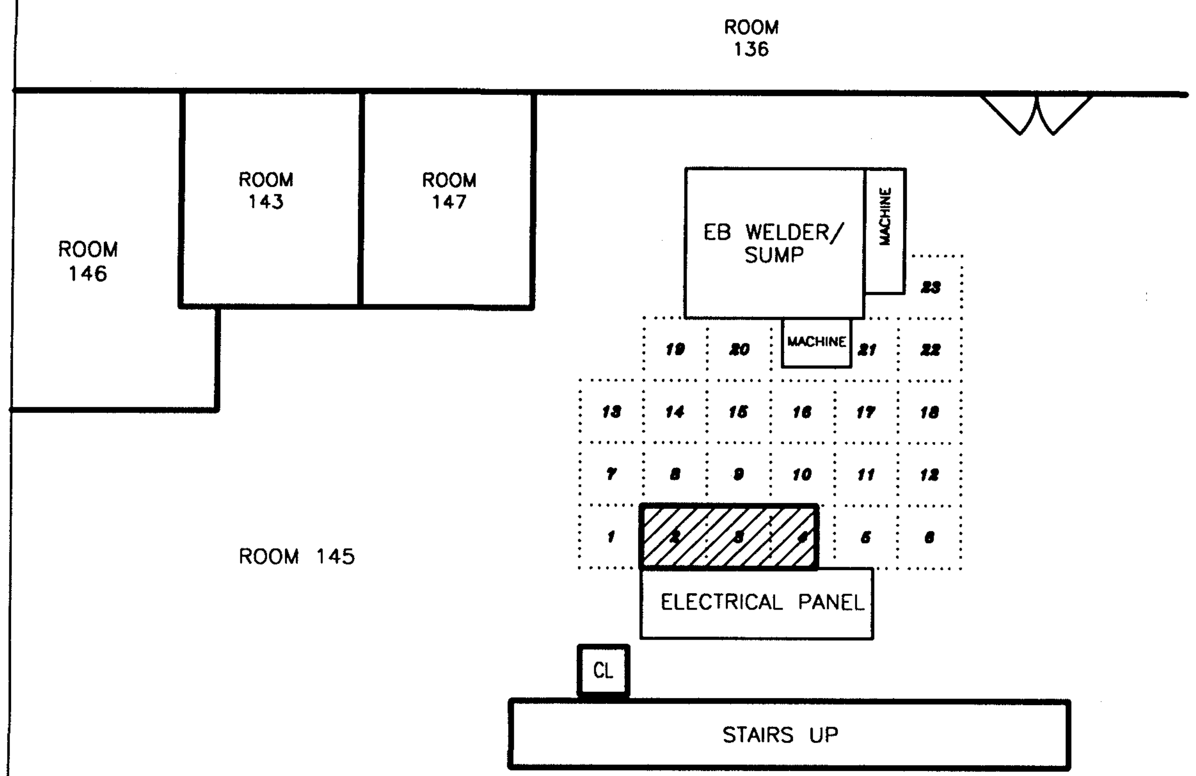
DESIGNED: WEAVER 07/12/94
DRAWN: SCHACKLIN 07/12/94
CHECKED: HEA XX/XX/93
APPROVED: SCHUBBE XX/XX/93
SUBMITTED: BIERBAUM XX/XX/93

U.S. DEPARTMENT OF ENERGY
ROCKY FLATS AREA OFFICE, GOLDEN, COLORADO
Rocky Flats Environmental Technology Site
GOLDEN, COLORADO 80401

OU15 PHASE I RFI/RI
IHSS 179 RINSATE SAMPLE LOCATIONS & RESULTS

SIZE: B — DRAWING NUMBER: IHSS 179 — ISSUE: A — FIGURE: 5-12

Area	Pre-Rinsate Alpha (dpm/100 cm^2)	Smear Sample Beta (dpm/100 cm^2)	Post-Rinsate Alpha (dpm/100 cm^2)	Smear Sample Beta (dpm/100 cm^2)	Gamma Dose-Rate (mrem/hr)	Beta Dose-Rate (mrem/hr)	Pre-Rinsate Smear Sample Beryllium (ug/100cm^2)	Post-Rinsate Smear Sample Beryllium (ug/100cm^2)
1	12	24	15	42	0	0	2	0
2	6	15	21	39	0	0	0	0
3	12	12	15	27	0	0	4	1
4	9	0	12	42	0	0	0	0
5	15	9	42	45	0	0	0	0
6	3	15	45	36	0	0	1	0
7	9	12	21	51	0	0	0	4
8	3	0	33	99	0.4	0	2	1
9	3	9	15	36	0	1.2	0	0
10	12	0	27	36	0.2	0	0	2
11	6	24	33	60	0	0	4	3
12	3	0	27	54	0	0	0	0
13	12	0	69	66	0	0	1	1
14	3	39	15	72	0	1.6	3	0
15	3	18	53	69	0	0	0	0
16	9	12	21	90	0	0	0	0
17	12	6	21	15	0	0	1	0
18	9	0	39	72	0	0	0	0
19	9	6	39	30	0	0	4	2
20	12	0	21	66	0	0	0	0
21	6	42	21	69	0	0	0	0
22	6	0	39	72	0	0	0	1
23	6	15	6	39	0	0	not counted	0



KEYWORDS: 1-OU15; 2-PHASE I; 3-RFI/RI; 4-REPORT; BLDG./FACILITY 865; ROOM/AREA 145

A ORIGINAL ISSUE XX/XX/93

DESIGNED WEAVER 07/12/94; DRAWN LEMME 07/12/94; CHECKED HEA XX/XX/93; APPROVED SCHUBBE XX/XX/93; SUBMITTED BIERBAUM XX/XX/93

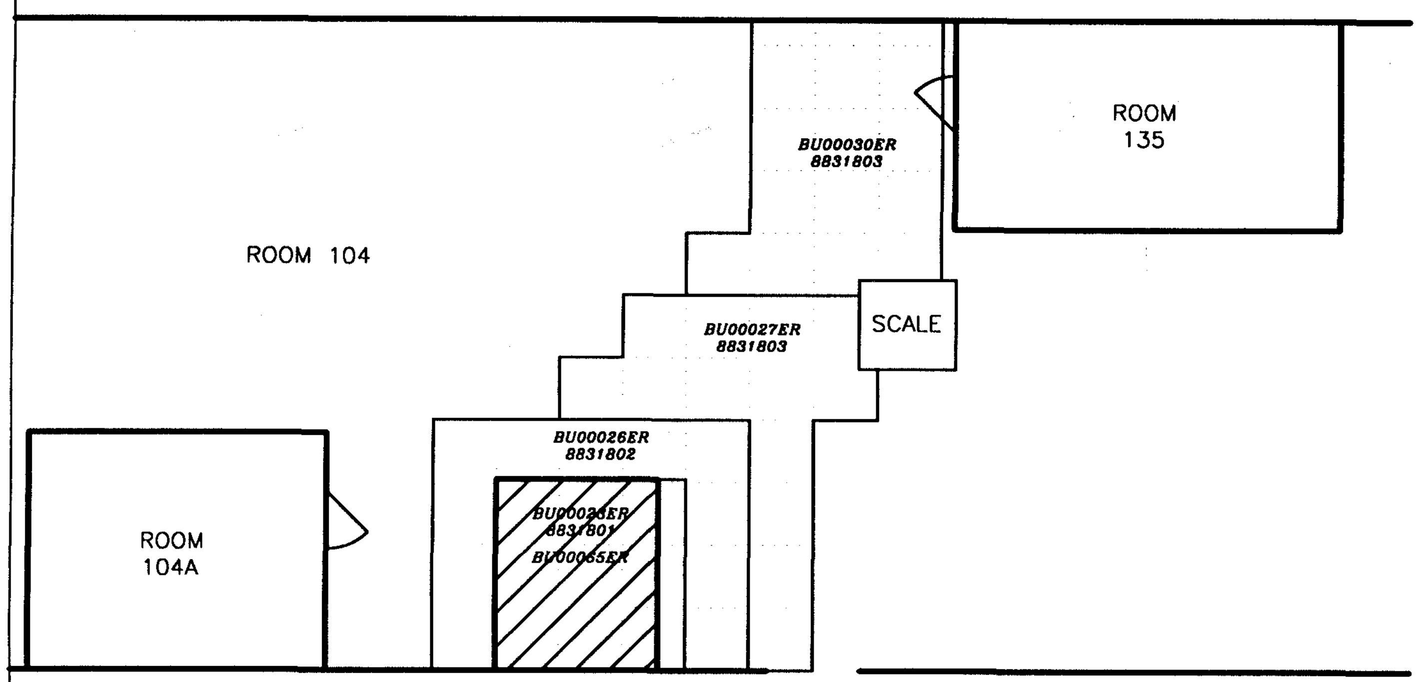
U.S. DEPARTMENT OF ENERGY, ROCKY FLATS AREA OFFICE, GOLDEN, COLORADO

Rocky Flats Environmental Technology Site, GOLDEN, COLORADO 80401

OU15 PHASE I RFI/RI

IHSS 179 RAD SAMPLE LOCATIONS & RESULTS

MASTER: YES ☐ NO ☒ | SCALE: NONE | SIZE: B | DRAWING NUMBER: IHSS 179 | ISSUE: A | FIGURE: 5-13



Sample Number	Test Group	Radionuclide	Result (pCi/L)	Error	Qualifier	Detection Limit (pCi/L)	QC Code	QC Partner
BU00023ER	DRADS	AMERICIUM-241	0.008	0.006	J	0.002	REAL	
BU00023ER	DRADS	GROSS ALPHA	50	1.9		0.34	REAL	
BU00023ER	DRADS	GROSS BETA	55	3.7		2.6	REAL	
BU00023ER	DRADS	PLUTONIUM-239/240	0.005	0.006	J	0.004	REAL	
BU00023ER	DRADS	RADIUM-226	.57	0.080	B	0.11	REAL	
BU00023ER	DRADS	URANIUM-233,-234	12	1.9	B	0.056	REAL	
BU00023ER	DRADS	URANIUM-235	0.30	0.22	BJ	0.031	REAL	
BU00023ER	DRADS	URANIUM-238	58	7.3	B	0.031	REAL	
BU00024ER	DRADS	GROSS ALPHA	50	1.9		0.42	DUP	BU00023ER
BU00024ER	DRADS	GROSS BETA	68	4.0		2.5	DUP	BU00023ER
BU00024ER	DRADS	PLUTONIUM-239/240	0.007	0.006	J	0.002	DUP	BU00023ER
BU00024ER	DRADS	RADIUM-226	.28	0.080	BJ	0.12	DUP	BU00023ER
BU00024ER	DRADS	URANIUM-233,-234	11	2.2	B	0.13	DUP	BU00023ER
BU00024ER	DRADS	URANIUM-235	1.2	0.53		0.13	DUP	BU00023ER
BU00024ER	DRADS	URANIUM-238	67	9.5	B	0.076	DUP	BU00023ER
BU00026ER	DRADS	AMERICIUM-241	0.007	0.006	J	0.002	REAL	
BU00026ER	DRADS	GROSS ALPHA	270	4.8		0.58	REAL	
BU00026ER	DRADS	GROSS BETA	300	3.1		2.7	REAL	
BU00026ER	DRADS	PLUTONIUM-239/240	0.007	0.006	J	0.006	REAL	
BU00026ER	DRADS	RADIUM-226	.4	0.060	BJ	0.060	REAL	
BU00026ER	DRADS	URANIUM-233,-234	60	9.1	B	0.087	REAL	
BU00026ER	DRADS	URANIUM-235	9.7	2.0		0.087	REAL	
BU00026ER	DRADS	URANIUM-238	380	54	B	0.049	REAL	
BU00027ER	DRADS	GROSS ALPHA	150	3.5		0.41	REAL	
BU00027ER	DRADS	GROSS BETA	180	6.4		3.0	REAL	
BU00027ER	DRADS	PLUTONIUM-239/240	0.006	0.004	J	0.004	REAL	
BU00027ER	DRADS	RADIUM-226	.46	0.11	BJ	0.15	REAL	
BU00027ER	DRADS	URANIUM-233,-234	37	5.3	B	0.14	REAL	
BU00027ER	DRADS	URANIUM-235	4.4	1.1		0.12	REAL	
BU00027ER	DRADS	URANIUM-238	220	28	B	0.15	REAL	
BU00028ER	DRADS	AMERICIUM-241	0.004	0.004	J	0.001	DUP	BU00027ER
BU00028ER	DRADS	GROSS ALPHA	190	4.0		0.36	DUP	BU00027ER
BU00028ER	DRADS	GROSS BETA	180	6.3		2.8	DUP	BU00027ER
BU00028ER	DRADS	PLUTONIUM-239/240	0.007	0.004	J	0.001	DUP	BU00027ER
BU00028ER	DRADS	RADIUM-226	.51	0.10	B	0.13	DUP	BU00027ER
BU00028ER	DRADS	URANIUM-233,-234	40	5.9	B	0.075	DUP	BU00027ER
BU00028ER	DRADS	URANIUM-235	4.5	1.1	B	0.042	DUP	BU00027ER
BU00028ER	DRADS	URANIUM-238	250	33	B	0.042	DUP	BU00027ER
BU00030ER	DRADS	AMERICIUM-241	0.006	0.004	J	0.002	REAL	
BU00030ER	DRADS	GROSS ALPHA	100	3.1		0.59	REAL	
BU00030ER	DRADS	GROSS BETA	140	5.6		2.7	REAL	
BU00030ER	DRADS	PLUTONIUM-239/240	0.004	0.004	J	0.001	REAL	
BU00030ER	DRADS	RADIUM-226	.28	0.070	BJ	0.10	REAL	
BU00030ER	DRADS	URANIUM-233,-234	21	3.1	B	0.034	REAL	
BU00030ER	DRADS	URANIUM-235	1.3	0.48	B	0.034	REAL	
BU00030ER	DRADS	URANIUM-238	110	14	B	0.060	REAL	

KEYWORDS: 1. OU15 2. PHASE 1 3. RFI/RI 4. REPORT

BLDG./FACILITY: 883 ROOM/AREA: 104

A ORIGINAL ISSUE XX/XX/93

DESIGNED WEAVER 07/12/94; DRAWN SCHACKLIN 07/12/94; CHECKED TERRIEN XX/XX/93; APPROVED SCHUBBE XX/XX/93; SUBMITTED BIERBAUM XX/XX/93

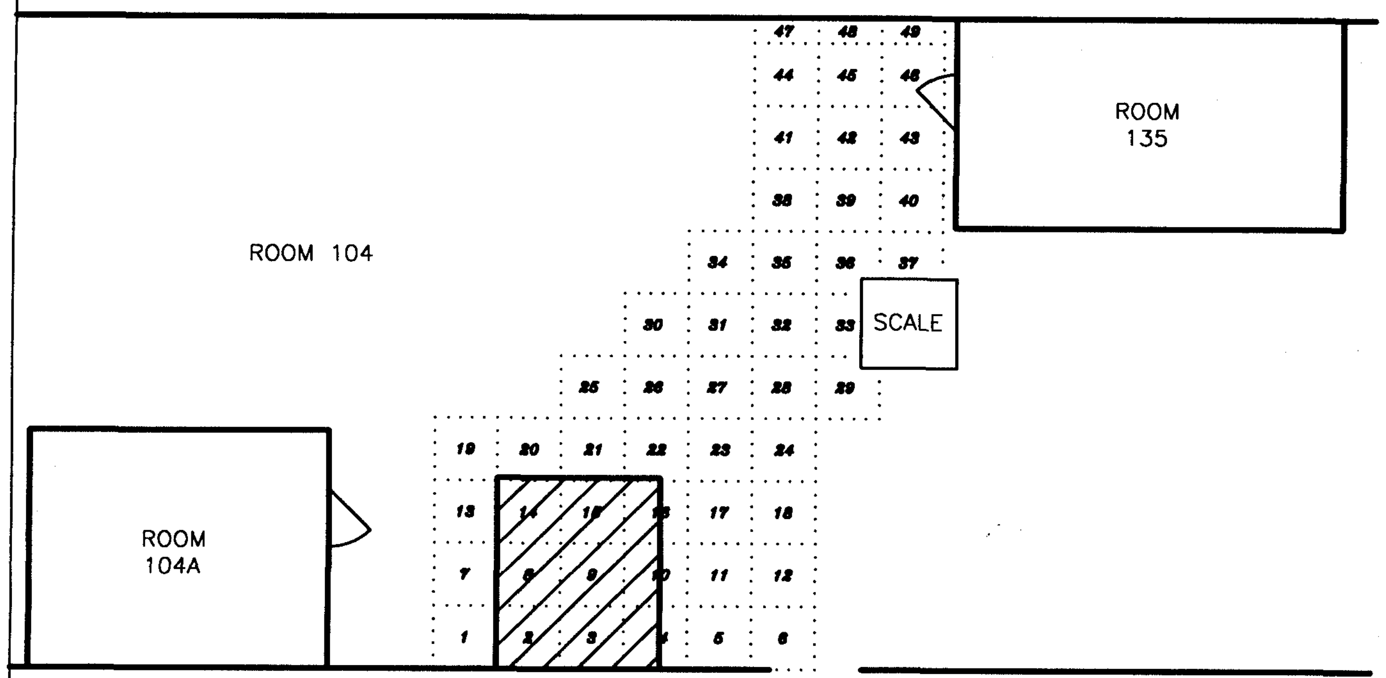
U.S. DEPARTMENT OF ENERGY
ROCKY FLATS AREA OFFICE GOLDEN,COLORADO

Rocky Flats Environmental Technology Site
GOLDEN,COLORADO 80401

OU15 PHASE I RFI/RI

IHSS 180 RINSATE SAMPLE LOCATIONS & RESULTS

MASTER: YES ☐ NO ☒ SCALE: NONE SIZE: B DRAWING NUMBER: IHSS 180 ISSUE: A FIGURE: 5-14



Area	Pre-Rinsate Alpha (dpm/100 cm^2)	Smear Sample Beta (dpm/100 cm^2)	Post-Rinsate Alpha (dpm/100 cm^2)	Smear Sample Beta (dpm/100 cm^2)	Gamma Dose-Rate (mrem/hr)	Beta Dose-Rate (mrem/hr)	Pre-Rinsate Smear Sample Beryllium (ug/100cm^2)	Post-Rinsate Smear Sample Beryllium (ug/100cm^2)
1	6	0	9	0	0.1	0	0	1
2	9	18	6	0	0	0.4	0	0
3	15	0	12	0	0	0.4	0	0
4	6	0	6	9	0	0	1	0
5	12	0	21	30	0.1	1.2	3	0
6	15	15	6	24	0	0.4	0	0
7	15	0	18	21	0.1	0	0	2
8	9	24	6	24	0	0	0	0
9	9	21	12	21	0	0.4	0	0
10	6	27	9	69	0	0.4	1	0
11	6	0	6	0	0	0.4	0	0
12	15	30	6	36	0	0	0	0
13	15	45	30	6	0	0	0	0
14	12	21	3	24	0	0.4	0	0
15	15	18	9	12	0	0.4	0	0
16	6	0	3	18	0	0.4	0	0
17	9	12	18	12	0	0.4	0	0
18	9	0	9	15	0.1	2	0	0
19	15	9	18	9	0	0.8	3	0
20	6	9	3	30	0.1	2	1	0
21	6	18	9	0	0	0.8	0	0
22	3	57	12	24	0.1	0	0	3
23	0	0	9	48	0.5	11.2	0	0
24	3	0	18	0	0	0	0	0
25	9	12	12	0	0	0.8	4	0
26	6	0	45	3	0	0.8	1	0
27	18	12	21	33	0.4	0.4	0	0
28	9	18	21	6	0	0.1	0	0
29	3	27	9	36	0.1	4.4	0	0
30	6	39	15	39	0.3	5.6	0	0
31	6	0	21	54	0.2	3.6	0	3
32	21	0	21	42	0	0.2	0	0
33	6	0	6	57	0.3	2.4	0	23
34	6	30	21	45	0.1	0.8	1	2
35	9	9	3	21	0.1	0.4	4	8
36	9	3	9	6	0	0.4	0	6
37	0	36	0	3	0	0	0	0
38	9	6	21	15	0	0	0	6
39	3	0	12	21	0	0.4	0	0
40	21	0	3	45	0	0	0	0
41	0	21	12	0	0.3	4.4	0	2
42	12	0	6	0	0.1	3.2	0	0
43	0	12	12	0	0.1	2.8	0	0
44	0	0	3	3	0	0.4	14	0
45	0	0	6	0	0	0.4	0	0
46	0	0	9	0	0	0.4	0	27
47	18	18	3	12	0.1	0.4	0	33
48	12	12	3	0	0	1.2	1	14
49	6	6	6	0	0	0.4	0	1

KEYWORDS: 1. OU15; 2. PHASE I; 3. RFI/RI; 4. REPORT; 5.
BLDG./FACILITY: 883
ROOM/AREA: 104
GRID COOR./COL. NO.
MASTER: YES ☐ NO ☒
SCALE: NONE

ISSUE	DESCRIPTION	DATE				
A	ORIGINAL ISSUE	XX/XX/93	DAW	KAS	RKT	DLS

DESIGNED	WEAVER	07/12/94
DRAWN	SCHACKLIN	07/12/94
CHECKED	TERREN	XX/XX/93
APPROVED	SCHUBBE	XX/XX/93
SUBMITTED	BIERBAUM	XX/XX/93
APPROVED RFETS		
APPROVED DOE		

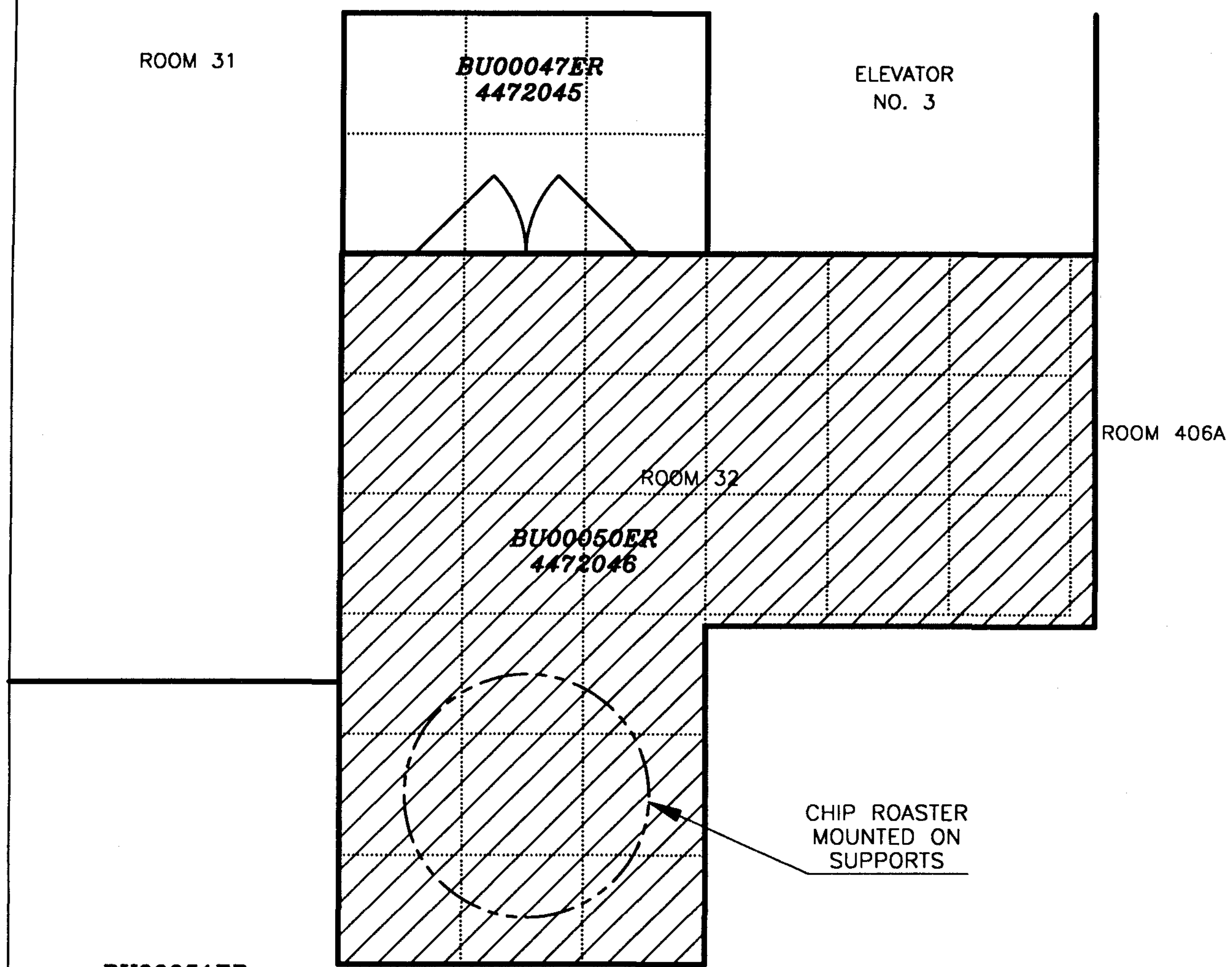
U.S. DEPARTMENT OF ENERGY
ROCKY FLATS AREA OFFICE GOLDEN, COLORADO
Rocky Flats Environmental Technology Site
GOLDEN, COLORADO 80401
OU15 PHASE I RFI/RI
IHSS 180 RAD
SAMPLE LOCATIONS & RESULTS

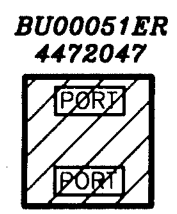
SIZE	DRAWING NUMBER	ISSUE	FIGURE
B	IHSS 180	A	5-15

NOTES

① A RINSATE SAMPLE WAS COLLECTED FROM THE SURFACE OF THE CHIP ROASTER AROUND THE OXIDE OUTLET PORTS.

Sample Number	Test Group	Radionuclide	Result (pCi/L)	Error	Qualifier	Detection Limit (pCi/L)	QC Code	QC Partner
BU00047ER	DRADS	GROSS ALPHA	160	9.8		2	REAL	
BU00047ER	DRADS	GROSS BETA	45	3.1		2	REAL	
BU00047ER	DRADS	URANIUM-233,-234	29	3.2		0.5	REAL	
BU00047ER	DRADS	URANIUM-235	4.4	0.79		0.2	REAL	
BU00047ER	DRADS	URANIUM-238	210	20		0.5	REAL	
BU00048ER	DRADS	GROSS ALPHA	180	11		3	DUP	BU00047ER
BU00048ER	DRADS	GROSS BETA	63	3.5		2	DUP	BU00047ER
BU00048ER	DRADS	URANIUM-233,-234	27	3.2		0.5	DUP	BU00047ER
BU00048ER	DRADS	URANIUM-235	4.3	0.80		0.2	DUP	BU00047ER
BU00048ER	DRADS	URANIUM-238	210	21	B	0.5	DUP	BU00047ER
BU00050ER	DRADS	GROSS ALPHA	6400	61		2	REAL	
BU00050ER	DRADS	PLUTONIUM-239/240	0.014	0.006		0.006	REAL	
BU00050ER	DRADS	URANIUM-238	7600	2000		900	REAL	





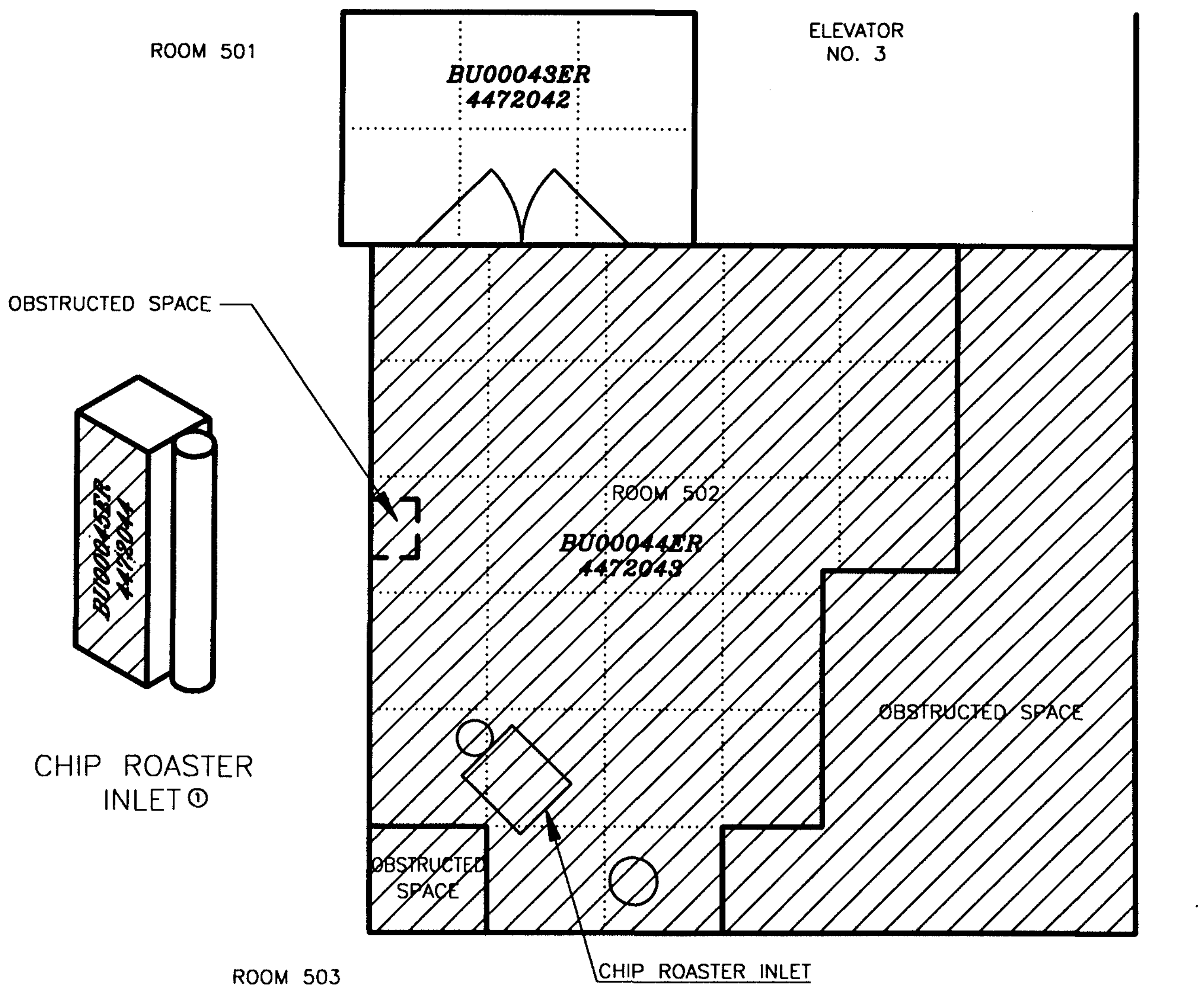
CHIP ROASTER OXIDE OUTLET①

KEYWORDS: 1. OU15; 2. PHASE I; 3. RFI/RI; 4. REPORT	A ORIGINAL ISSUE	XX/XX/93 RCH KAS DAW DLS
BLDG./FACILITY 447	DESIGNED HEA 07/12/94	U.S. DEPARTMENT OF ENERGY, ROCKY FLATS AREA OFFICE, GOLDEN, COLORADO
ROOM/AREA 31/32	DRAWN SCHACKLIN 07/12/94	Rocky Flats Environmental Technology Site, GOLDEN, COLORADO 80401
GRID COOR./CEL NO.	CHECKED WEAVER XX/XX/93	OU15 PHASE I RFI/RI
MASTER YES ☐ NO ☒	APPROVED SCHUBBE XX/XX/93; SUBMITTED BIERBAUM XX/XX/93	IHSS 204 RINSATE SAMPLE LOCATIONS & RESULTS
SCALE: NONE	APPROVED RFETS; APPROVED DOE	SIZE B; DRAWING NUMBER IHSS 204; ISSUE A; FIGURE 5-16

NOTES

① A RINSATE SAMPLE WAS COLLECTED FROM THE SURFACE OF THE CHIP ROASTER INLET.

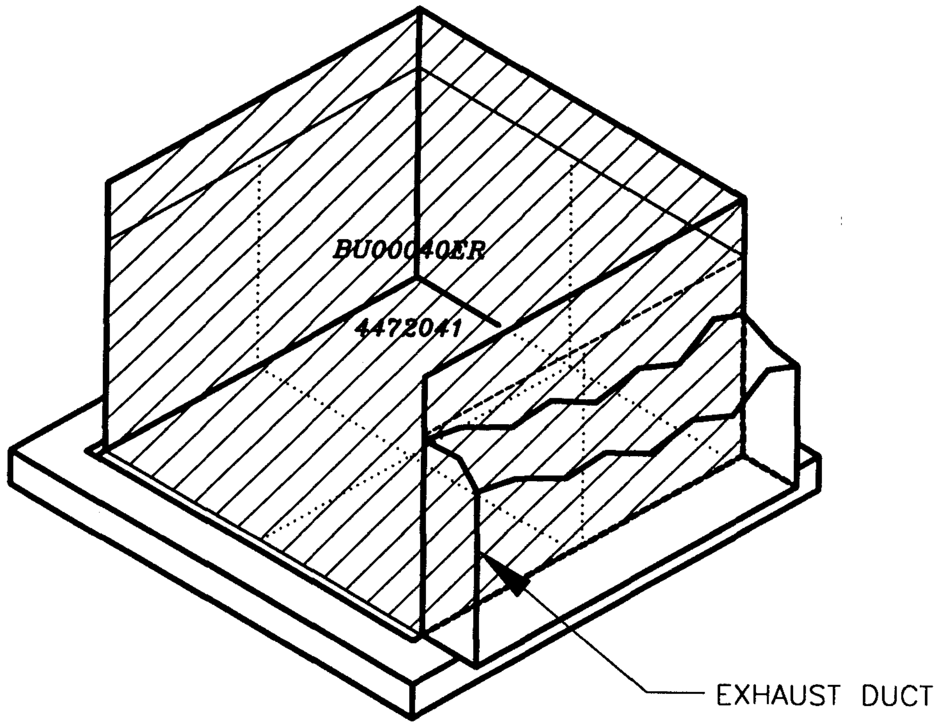
Sample Number	Test Group	Radionuclide	Result (pCi/L)	Error	Qualifier	Detection Limit (pCi/L)	QC Code	QC Partner
BU00043ER	DRADS	GROSS ALPHA	36	3.9		1	REAL	
BU00043ER	DRADS	GROSS BETA	35	2.6		2	REAL	
BU00043ER	DRADS	PLUTONIUM-239/240	0.013	0.011	B	0.01	REAL	
BU00043ER	DRADS	URANIUM-233,-234	4.9	1.2		0.6	REAL	
BU00043ER	DRADS	URANIUM-235	0.88	0.49		0.5	REAL	
BU00043ER	DRADS	URANIUM-238	34	5.6		0.5	REAL	
BU00044ER	DRADS	GROSS ALPHA	520	17		2	REAL	
BU00044ER	DRADS	GROSS BETA	680	10		2	REAL	
BU00044ER	DRADS	PLUTONIUM-239/240	0.016	0.007	B	0.005	REAL	
BU00044ER	DRADS	URANIUM-233,-234	110	10		0.6	REAL	
BU00044ER	DRADS	URANIUM-235	8.4	3.2		7	REAL	
BU00044ER	DRADS	URANIUM-238	840	77		0.6	REAL	



KEYWORDS	A	ORIGINAL ISSUE	XX/XX/93	RCH	KAS	DAW	DLS
1.OU15	ISSUE	DESCRIPTION	DATE	RFETS	DOE	CLASS	JOB NO.
2.PHASE I	DESIGNED	HEA	07/12/94	U.S. DEPARTMENT OF ENERGY ROCKY FLATS AREA OFFICE GOLDEN,COLORADO			
3.RFI/RI	DRAWN	SCHACKLIN	07/12/94	Rocky Flats Environmental Technology Site GOLDEN,COLORADO 80401			
4.REPORT	CHECKED	WEAVER	XX/XX/93	OU15 PHASE I RFI/RI			
5.	APPROVED	SCHUBBE	XX/XX/93	IHSS 204 RINSATE SAMPLE LOCATIONS & RESULTS			
BLDG./FACILITY 447	SUBMITTED	BIERBAUM	XX/XX/93	SIZE B	DRAWING NUMBER IHSS 204	ISSUE A	FIGURE 5-17
ROOM/AREA 501/502	APPROVED RFETS						
GRID COOR./COL NO.	APPROVED DOE						
MASTER YES ☐ NO ☒	SCALE: NONE						

447 502

Sample Number	Test Group	Radionuclide	Result (pCi/L)	Error	Qualifier	Detection Limit (pCi/L)	QC Code	QC Partner
BU00040ER	DRADS	GROSS ALPHA	150	8.0		1	REAL	
BU00040ER	DRADS	GROSS BETA	72	3.6		2	REAL	
BU00040ER	DRADS	URANIUM-233,-234	24	2.9		0.5	REAL	
BU00040ER	DRADS	URANIUM-235	3.5	0.77		0.2	REAL	
BU00040ER	DRADS	URANIUM-238	180	19		0.5	REAL	
BU00041ER	DRADS	GROSS ALPHA	140	7.7		1	DUP	BU00040ER
BU00041ER	DRADS	GROSS BETA	78	3.8		2	DUP	BU00040ER
BU00041ER	DRADS	URANIUM-233,-234	26	3.1		0.6	DUP	BU00040ER
BU00041ER	DRADS	URANIUM-235	5.3	0.96		0.2	DUP	BU00040ER
BU00041ER	DRADS	URANIUM-238	200	20		0.5	DUP	BU00040ER



WASH RACK/DRUM WASHING BASIN

KEYWORDS: 1. OU15; 2. PHASE I; 3. RFI/RI; 4. REPORT; 5.
BLDG./FACILITY 447
ROOM/AREA 501
MASTER YES ☐ NO ☒
SCALE: NONE

A ORIGINAL ISSUE XX/XX/93 RCH KAS DAW DLS

DESIGNED HEA 07/12/94
DRAWN SCHACKLIN 07/12/94
CHECKED WEAVER XX/XX/93
APPROVED SCHUBBE XX/XX/93
SUBMITTED BIERBAUM XX/XX/93

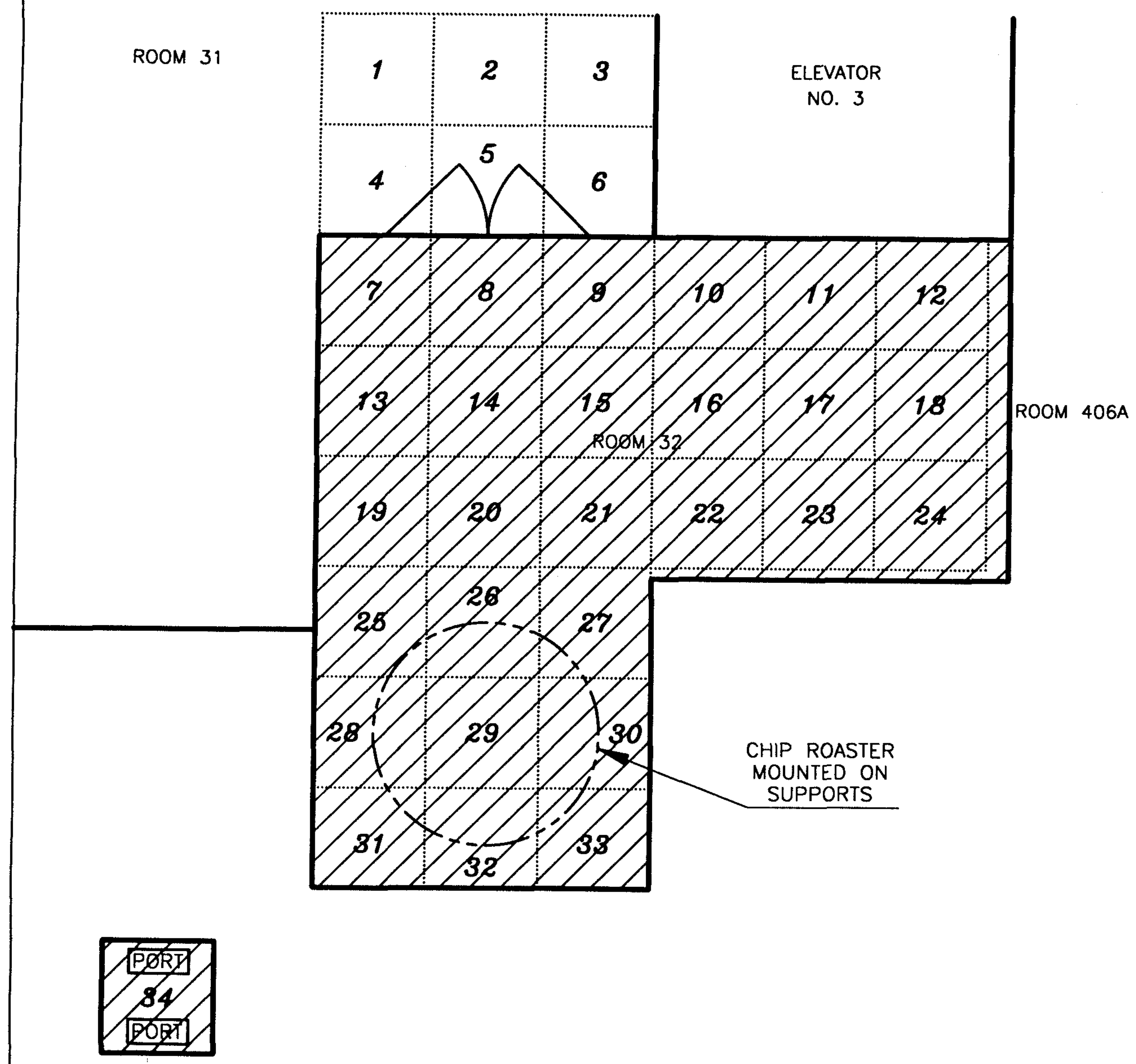
U.S. DEPARTMENT OF ENERGY
ROCKY FLATS AREA OFFICE GOLDEN, COLORADO
Rocky Flats Environmental Technology Site
GOLDEN, COLORADO 80401

OU15 PHASE I RFI/RI
IHSS 204 RINSATE SAMPLE LOCATIONS & RESULTS

SIZE B | DRAWING NUMBER IHSS 204 | ISSUE A | FIGURE 5-18

NOTES

① A SMEAR SAMPLE WAS COLLECTED FROM THE SURFACE OF THE CHIP ROASTER AROUND THE OXIDE OUTLET PORTS.



CHIP ROASTER①
OXIDE OUTLET

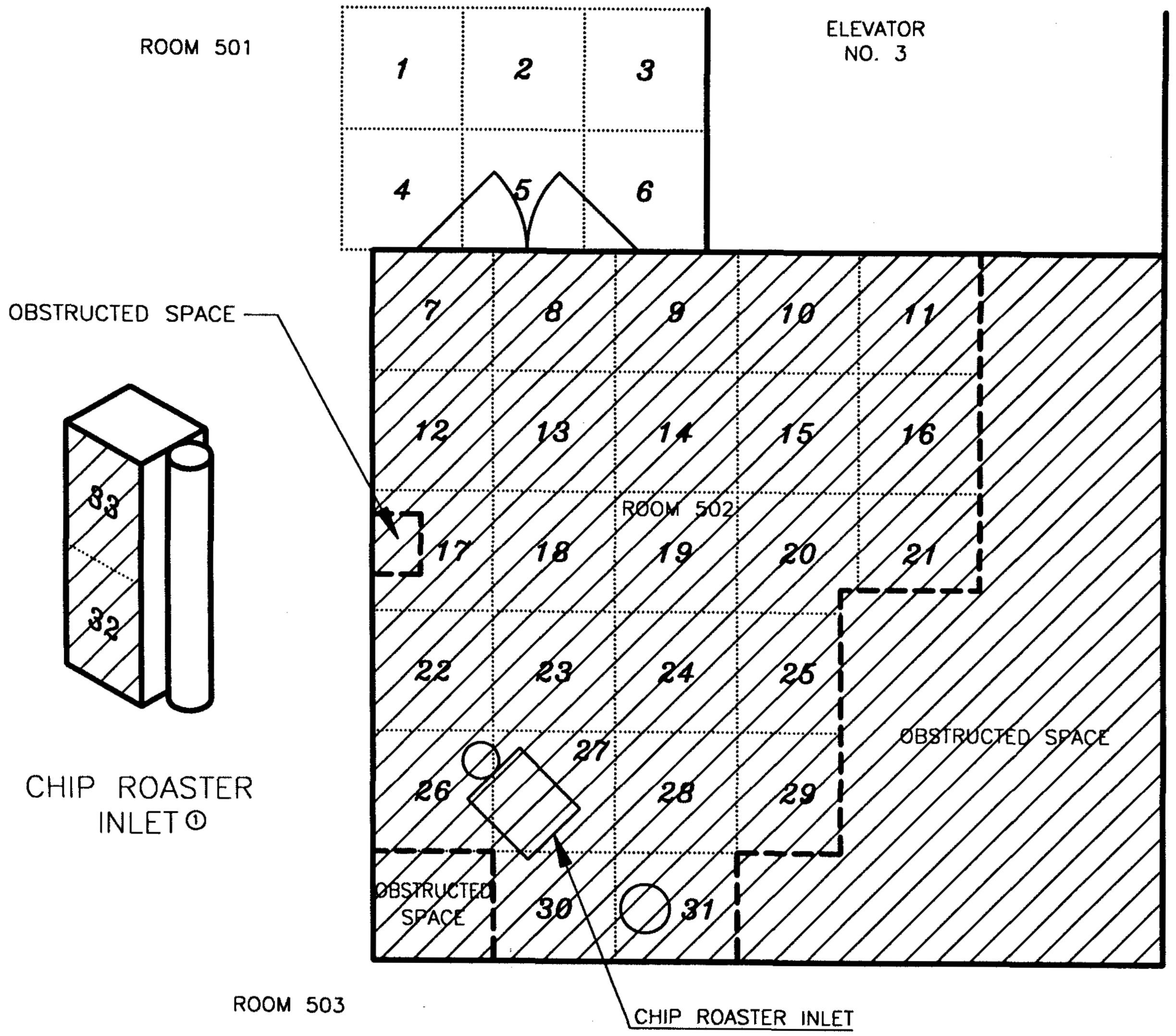
Pre-Rinsate Smear Sample

Area	Alpha (dpm/100 cm^2)	Beta (dpm/100 cm^2)
1	24	0
2	12	6
3	6	0
4	30	0
5	15	33
6	12	9
7	2600	13252
8	2000	11363
9	2400	18939
10	2000	14204
11	3200	28409
12	5000	37878
13	2200	12310
14	3000	16098
15	2600	12310
16	4000	28409
17	4000	23674
18	14000	132575
19	6000	57878
20	11000	71522
21	6000	56818
22	6000	28409
23	8000	47348
24	12000	151515
25	1600	12310
26	4000	18939
27	3000	12310
28	1400	9469
29	12000	104166
30	3000	16099
31	6000	66290
32	5000	66290
33	8000	47350
34	10000	66290

KEYWORDS	ISSUE	DESCRIPTION	DATE	
1.OU15	A	ORIGINAL ISSUE	XX/XX/93	RCH KAS DAW DLS
2.PHASE I	DESIGNED	HEA	07/12/94	U.S. DEPARTMENT OF ENERGY ROCKY FLATS AREA OFFICE GOLDEN,COLORADO
3.RFI/RI	DRAWN	SCHACKLIN	07/12/94	Rocky Flats Environmental Technology Site GOLDEN,COLORADO 80401
4.REPORT	CHECKED	WEAVER	XX/XX/93	OU15 PHASE I RFI/RI
5.	APPROVED	SCHUBBE	XX/XX/93	IHSS 204 RAD SAMPLE LOCATIONS & RESULTS
BLDG./FACILITY 447	SUBMITTED	BIERBAUM	XX/XX/93	
ROOM/AREA 31/32	APPROVED RFETS			
GRID COOR./COL. NO.	APPROVED DOE			
MASTER YES ☐ NO ☒	SCALE: NONE	SIZE B	DRAWING NUMBER IHSS 204	ISSUE A FIGURE 5-19

NOTES

① TWO SMEAR SAMPLES WERE COLLECTED FROM THE SURFACE OF THE CHIP ROASTER INLET.



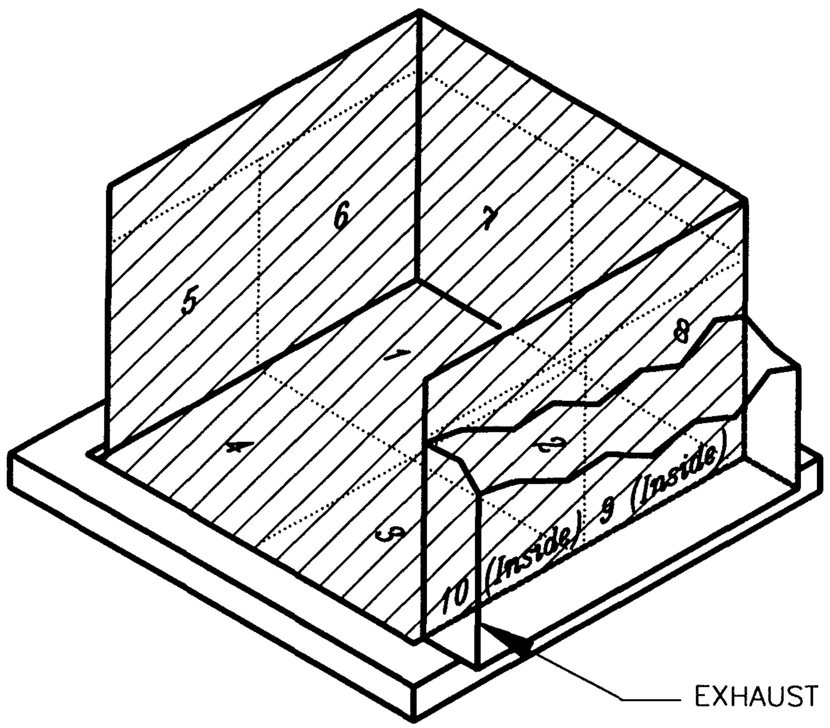
Pre-Rinsate Smear Sample

Area	Alpha (dpm/100 cm^2)	Beta (dpm/100 cm^2)
1	0	0
2	12	3
3	15	0
4	30	0
5	6	60
6	12	0
7	102	114
8	132	168
9	99	162
10	222	243
11	129	219
12	153	222
13	174	279
14	123	156
15	198	213
16	1359	3834
17	336	588
18	294	426
19	342	576
20	324	594
21	135	285
22	279	372
23	273	504
24	669	1551
25	417	1029
26	243	303
27	708	2331
28	447	927
29	408	636
30	486	711
31	375	768
32	411	588
33	189	339

KEYWORDS		
1.OU15	A ORIGINAL ISSUE	XX/XX/93 RCH KAS DAW DLS
2.PHASE I	DESIGNED HEA 07/12/94	U.S. DEPARTMENT OF ENERGY ROCKY FLATS AREA OFFICE GOLDEN, COLORADO
3.RFI/RI	DRAWN SCHACKLIN 07/12/94	Rocky Flats Environmental Technology Site GOLDEN, COLORADO 80401
4.REPORT	CHECKED WEAVER XX/XX/93	OU15 PHASE I RFI/RI
BLDG./FACILITY 447	APPROVED SCHUBBE XX/XX/93	IHSS 204 RAD SAMPLE LOCATIONS & RESULTS
ROOM/AREA 501/502	SUBMITTED BIERBAUM XX/XX/93	SIZE B DRAWING NUMBER IHSS 204 ISSUE A FIGURE 5-20
MASTER YES ☐ NO ☒	SCALE: NONE	

Pre-Rinsate Smear Sample

Area	Alpha (dpm/100 cm^2)	Beta (dpm/100 cm^2)
1	129	750
2	216	1194
3	99	132
4	228	807
5	42	18
6	12	0
7	3	0
8	3	6
9	12	6
10	9	not counted

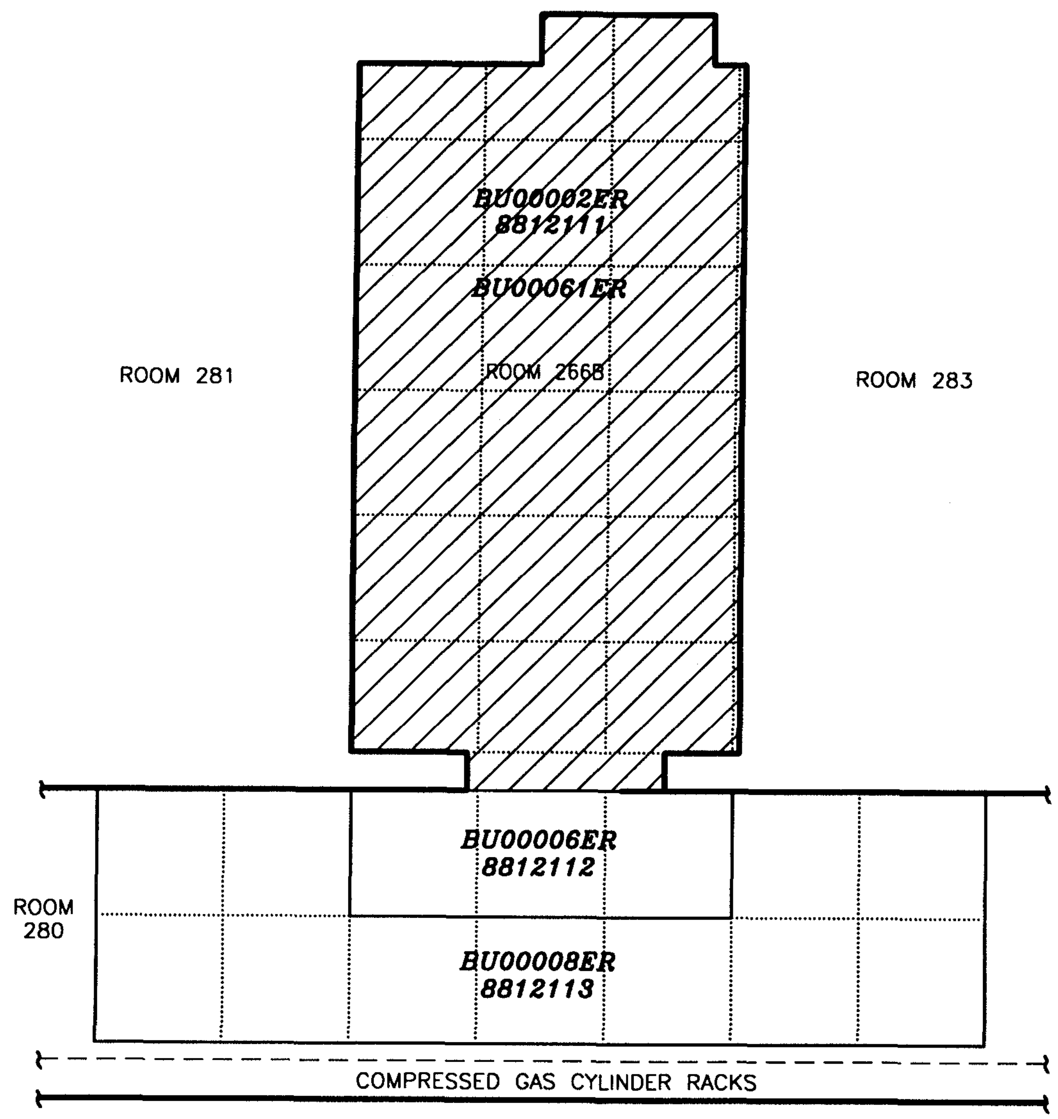


WASH RACK/DRUM WASHING BASIN

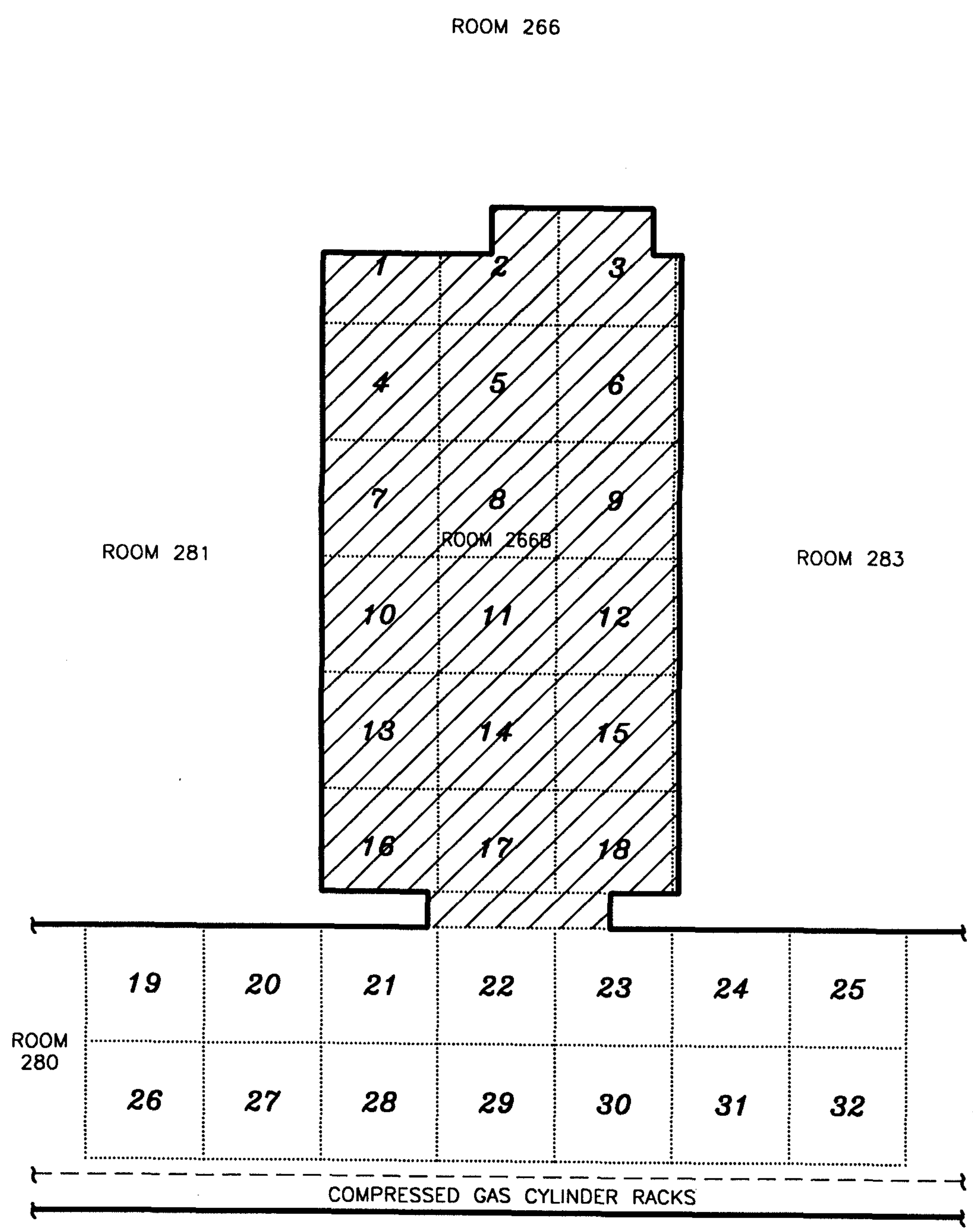
KEYWORDS	A	ORIGINAL ISSUE	XX/XX/93	RCH	KAS	DAW	DLS
1.OU15	ISSUE	DESCRIPTION	DATE	RFETS	DOE	CLASS	JOB NO.
2.PHASE I		DESIGNED HEA 07/12/94	U.S. DEPARTMENT OF ENERGY ROCKY FLATS AREA OFFICE GOLDEN, COLORADO				
3.RFI/RI		DRAWN SCHACKLIN 07/12/94	Rocky Flats Environmental Technology Site GOLDEN, COLORADO 80401				
4.REPORT		CHECKED WEAVER XX/XX/93					
5.		APPROVED SCHUBBE XX/XX/93	OU15 PHASE I RFI/RI				
BLDG./FACILITY 447			IHSS 204 RAD SAMPLE LOCATIONS & RESULTS				
ROOM/AREA 501							
GRID COOR./COL NO.		SUBMITTED BIERBAUM XX/XX/93	SIZE B	DRAWING NUMBER IHSS 204	ISSUE A	FIGURE 5-21	
MASTER YES ☐ NO ☒	SCALE: NONE	APPROVED RFETS / APPROVED DOE					

447
501

Sample Number	Test Group	Radionuclide	Result (pCi/L)	Error	Qualifier	Detection Limit (pCi/L)	QC Code	QC Partner
BU00002ER	DRADS	AMERICIUM-241	.007	0.006	BJ	0.004	REAL	
BU00002ER	DRADS	GROSS ALPHA	7.1	0.93		0.61	REAL	
BU00002ER	DRADS	GROSS BETA	19	2.5		2.6	REAL	
BU00002ER	DRADS	PLUTONIUM-239/240	.15	0.024	B	0.003	REAL	
BU00002ER	DRADS	RADIUM-226	.65	0.19	B	0.24	REAL	
BU00003ER	DRADS	GROSS ALPHA	7.4	1.0		0.65	DUP	BU00002ER
BU00003ER	DRADS	GROSS BETA	16	2.4		2.6	DUP	BU00002ER
BU00003ER	DRADS	RADIUM-226	.14	0.070	J	0.10	DUP	BU00002ER
BU00003ER	DRADS	URANIUM-233,-234	6.2	1.7	B	0.069	DUP	BU00002ER
BU00003ER	DRADS	URANIUM-235	.25	0.29	J	0.069	DUP	BU00002ER
BU00003ER	DRADS	URANIUM-238	.65	0.48		0.12	DUP	BU00002ER
BU00006ER	DRADS	GROSS ALPHA	1.6	0.41	J	0.37	REAL	
BU00006ER	DRADS	GROSS BETA	5.9	2.1		2.9	REAL	
BU00006ER	DRADS	PLUTONIUM-239/240	.018	0.008	B	0.002	REAL	
BU00006ER	DRADS	URANIUM-233,-234	1.4	0.56	B	0.11	REAL	
BU00006ER	DRADS	URANIUM-235	.13	0.17	J	0.11	REAL	
BU00006ER	DRADS	URANIUM-238	.13	0.17	J	0.11	REAL	
BU00008ER	DRADS	GROSS ALPHA	4.8	1.4		1.4	REAL	
BU00008ER	DRADS	GROSS BETA	6.7	2.2		3.0	REAL	
BU00008ER	DRADS	PLUTONIUM-239/240	.02	0.008	B	0.001	REAL	
BU00008ER	DRADS	URANIUM-233,-234	1.5	0.66		0.14	REAL	
BU00008ER	DRADS	URANIUM-235	.19	0.22	J	0.053	REAL	
BU00008ER	DRADS	URANIUM-238	.32	0.29	J	0.053	REAL	
BU00009ER	DRADS	GROSS ALPHA	2.4	0.54		0.54	DUP	BU00008ER
BU00009ER	DRADS	GROSS BETA	8.9	2.1		2.6	DUP	BU00008ER
BU00009ER	DRADS	PLUTONIUM-239/240	.013	0.006	B	0.003	DUP	BU00008ER
BU00009ER	DRADS	URANIUM-233,-234	1.3	0.56		0.14	DUP	BU00008ER
BU00009ER	DRADS	URANIUM-238	.2	0.21	J	0.074	DUP	BU00008ER



KEYWORDS	A	ORIGINAL ISSUE	XX/XX/93
1. OU15	ISSUE	DESCRIPTION	DATE
2. PHASE I		DESIGNED HEA 07/12/94	U.S. DEPARTMENT OF ENERGY ROCKY FLATS AREA OFFICE GOLDEN, COLORADO
3. RFI/RI		DRAWN SCHACKLIN 07/12/94	Rocky Flats Environmental Technology Site GOLDEN, COLORADO 80401
4. REPORT		CHECKED BIERBAUM XX/XX/93	OU15 PHASE I RFI/RI
BLDG./FACILITY 881		APPROVED SCHUBBE XX/XX/93	IHSS 211 RINSATE SAMPLE LOCATIONS & RESULTS
ROOM/AREA 266B		SUBMITTED BIERBAUM XX/XX/93	SIZE B DRAWING NUMBER IHSS 211 ISSUE A FIGURE 5-22
MASTER YES ☐ NO ☒	SCALE: NONE		



Area	Pre-Rinsate Smear Sample Alpha (dpm/100 cm^2)	Pre-Rinsate Smear Sample Beta (dpm/100 cm^2)	Post-Rinsate Smear Sample Alpha (dpm/100 cm^2)	Post-Rinsate Smear Sample Beta (dpm/100 cm^2)	Gamma Dose-Rate (mrem/hr)	Beta Dose-Rate (mrem/hr)
1	6	0	0	0	0	0
2	0	0	0	0	0	0
3	0	18	0	24	0	0
4	3	51	0	0	0	0
5	0	0	0	24	0	0
6	3	0	0	0	0	0
7	3	0	0	3	0	0
8	3	36	6	12	0	0
9	0	0	6	27	0	0
10	3	0	0	0	0	0
11	0	0	0	3	0	0
12	0	0	3	0	0	0
13	0	0	0	0	0	0
14	3	6	0	0	0	0
15	6	33	3	24	0	0
16	6	3	9	0	0	0.4
17	0	36	3	27	0	0.4
18	0	9	0	3	0	0
19	3	0	0	0	0	0
20	3	0	0	6	0	0
21	3	0	0	0	0	0
22	0	0	3	0	0	0
23	0	0	0	27	0	0
24	0	0	3	3	0	0
25	0	0	3	15	0	0
26	3	0	0	18	0	0
27	0	0	3	0	0	0
28	6	0	3	15	0	0
29	0	0	3	0	0	0
30	0	0	0	3	0	0
31	3	0	0	0	0	0
32	0	21	0	0	0	0

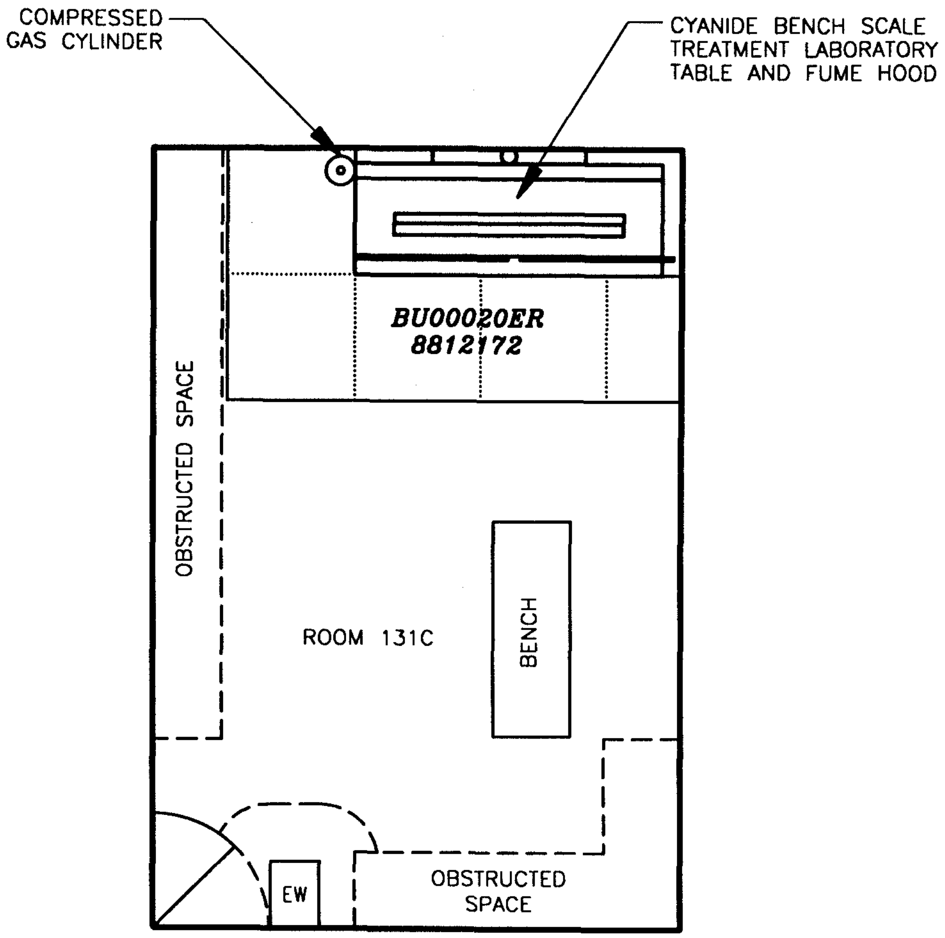
KEYWORDS: 1. OU15; 2. PHASE I; 3. RFI/RI; 4. REPORT
BLDG./FACILITY 881 — ROOM/AREA 266B
A — ORIGINAL ISSUE — XX/XX/93 — RCH KAS PRB DLS
DESIGNED HEA 07/12/94; DRAWN SCHACKLIN 07/12/94; CHECKED BIERBAUM XX/XX/93; APPROVED SCHUBBE XX/XX/93; SUBMITTED BIERBAUM XX/XX/93
MASTER YES ☐ NO ☒ — SCALE: NONE

U.S. DEPARTMENT OF ENERGY
ROCKY FLATS AREA OFFICE GOLDEN,COLORADO
Rocky Flats Environmental Technology Site
GOLDEN,COLORADO 80401

OU15 PHASE I RFI/RI
IHSS 211 RAD
SAMPLE LOCATIONS & RESULTS

SIZE	DRAWING NUMBER	ISSUE	FIGURE
B	IHSS 211	A	5-23

Sample Number	Test Group	Radionuclide	Result (pCi/L)	Error	Qualifier	Detection Limit (pCi/L)	QC Code	QC Partner
BU00020ER	DRADS	AMERICIUM-241	0.017	0.008		0.004	REAL	
BU00020ER	DRADS	GROSS ALPHA	6.9	0.78		0.40	REAL	
BU00020ER	DRADS	GROSS BETA	15	2.4		2.7	REAL	
BU00020ER	DRADS	PLUTONIUM-239/240	0.016	0.008		0.002	REAL	
BU00020ER	DRADS	RADIUM-226	.25	0.040	BJ	0.060	REAL	
BU00020ER	DRADS	URANIUM-233,-234	5.6	1.3		0.11	REAL	
BU00020ER	DRADS	URANIUM-235	0.20	0.20	J	0.042	REAL	
BU00020ER	DRADS	URANIUM-238	2.3	0.74		0.042	REAL	



KEYWORDS		
1. OU15	A	ORIGINAL ISSUE
2. PHASE I	ISSUE	DESCRIPTION
3. RFI/RI		
4. REPORT		
5.		
BLDG./FACILITY 881		
ROOM/AREA 131C		
GRID COOR./COL. NO.		
MASTER YES ☐ NO ☒	SCALE: NONE	

DESIGNED	HEA	07/12/94
DRAWN	SCHACKLIN	07/12/94
CHECKED	BIERBAUM	XX/XX/93
APPROVED	SCHUBBE	XX/XX/93
SUBMITTED	BIERBAUM	XX/XX/93
APPROVED RFETS		
APPROVED DOE		

XX/XX/93 RCH KAS PRB DLS
DATE RFETS DOE CLASS JOB NO.

U.S. DEPARTMENT OF ENERGY
ROCKY FLATS AREA OFFICE GOLDEN, COLORADO

Rocky Flats Environmental Technology Site
GOLDEN, COLORADO 80401

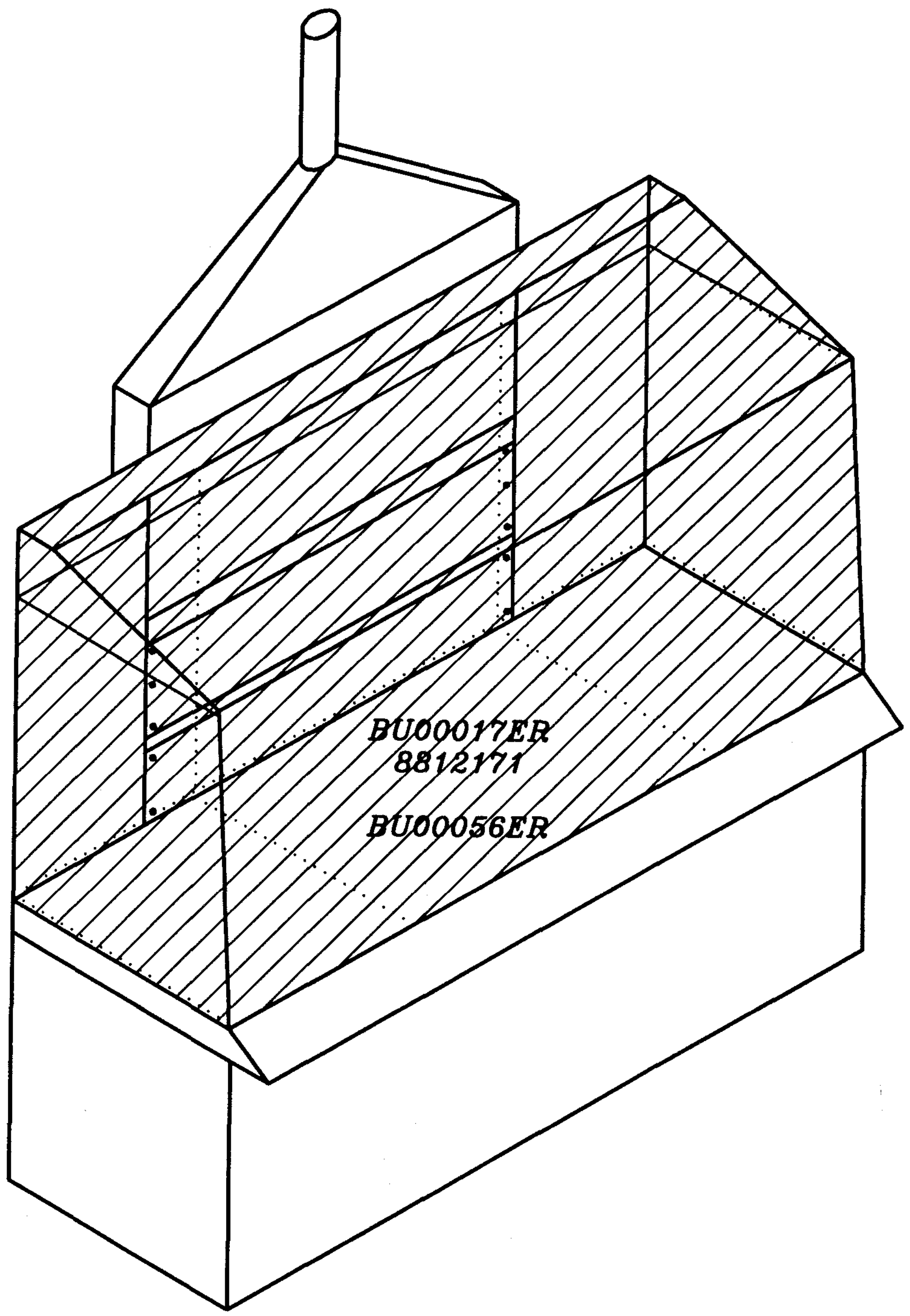
OU15 PHASE I RFI/RI

IHSS 217 RINSATE SAMPLE LOCATIONS & RESULTS

SIZE	DRAWING NUMBER	ISSUE	FIGURE
B	IHSS 217	A	5-24

881
131C

CYANIDE BENCH SCALE TREATMENT LABORATORY TABLE AND FUME HOOD



Sample Number	Test Group	Radionuclide	Result (pCi/L)	Error	Qualifier	Detection Limit (pCi/L)	QC Code	QC Partner
BU00017ER	DRADS	AMERICIUM-241	0.21	0.032		0.004	REAL	
BU00017ER	DRADS	GROSS ALPHA	30	1.7		0.40	REAL	
BU00017ER	DRADS	GROSS BETA	20	2.6		2.6	REAL	
BU00017ER	DRADS	PLUTONIUM-239/240	0.037	0.014		0.002	REAL	
BU00017ER	DRADS	RADIUM-226	.18	0.040	BJ	0.060	REAL	
BU00017ER	DRADS	URANIUM-233,-234	22	3.3		0.13	REAL	
BU00017ER	DRADS	URANIUM-235	0.91	0.43		0.064	REAL	
BU00017ER	DRADS	URANIUM-238	15	2.5		0.064	REAL	
BU00018ER	DRADS	AMERICIUM-241	0.22	0.038		0.005	DUP	BU00017ER
BU00018ER	DRADS	GROSS ALPHA	41	2.1		0.61	DUP	BU00017ER
BU00018ER	DRADS	GROSS BETA	26	2.8		2.7	DUP	BU00017ER
BU00018ER	DRADS	PLUTONIUM-239/240	0.042	0.012		0.005	DUP	BU00017ER
BU00018ER	DRADS	RADIUM-226	.21	0.030	BJ	0.040	DUP	BU00017ER
BU00018ER	DRADS	URANIUM-233,-234	27	3.9		0.091	DUP	BU00017ER
BU00018ER	DRADS	URANIUM-235	0.90	0.40		0.091	DUP	BU00017ER
BU00018ER	DRADS	URANIUM-238	17	2.7		0.091	DUP	BU00017ER

KEYWORDS: 1. OU15; 2. PHASE I; 3. RFI/RI; 4. REPORT; 5.
BLDG./FACILITY: 881
ROOM/AREA: 131C
GRID COOR./COL. NO.
MASTER: YES ☐ NO ☒
SCALE: NONE

A — ORIGINAL ISSUE — XX/XX/93

DESIGNED	HEA	07/12/94
DRAWN	SCHACKLIN	07/12/94
CHECKED	BIERBAUM	XX/XX/93
APPROVED	SCHUBBE	XX/XX/93
SUBMITTED	BIERBAUM	XX/XX/93
APPROVED RFETS		
APPROVED DOE		

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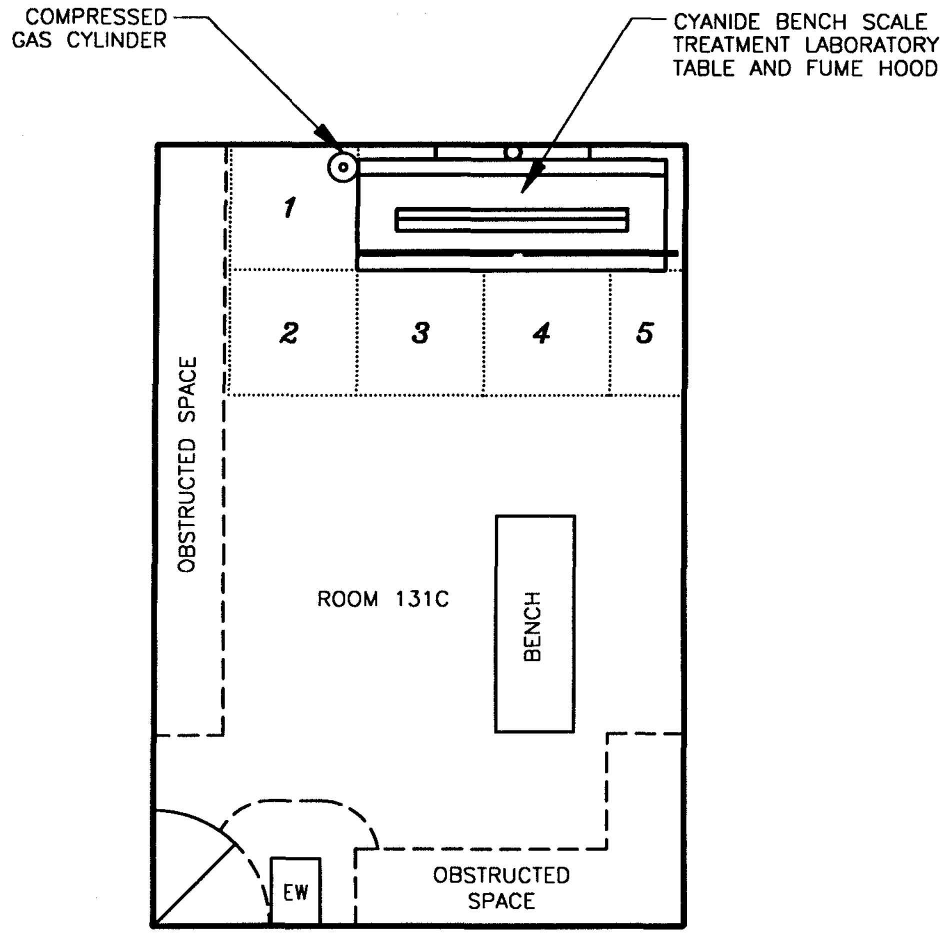
OU15 PHASE I RFI/RI
IHSS 217 RINSATE SAMPLE LOCATIONS & RESULTS

SIZE	DRAWING NUMBER	ISSUE	FIGURE
B	IHSS 217	A	5-25

Area	Pre-Rinsate Smear Sample Alpha (dpm/100 cm^2)	Pre-Rinsate Smear Sample Beta (dpm/100 cm^2)	Post-Rinsate Smear Sample Alpha (dpm/100 cm^2)	Post-Rinsate Smear Sample Beta (dpm/100 cm^2)	Gamma Dose-Rate (mrem/hr)	Beta Dose-Rate (mrem/hr)
1	3	0	0	3	0	0.4
2	0	12	6	0	0	0.4
3	0	18	0	12	0	0.4
4	0	30	3	0	0	0.4
5	3	18	3	9	0	0.4



KEYWORDS			
1. OU15	A	ORIGINAL ISSUE	XX/XX/93
2. PHASE I	DESIGNED	HEA	07/12/94
3. RFI/RI	DRAWN	SCHACKLIN	07/12/94
4. REPORT	CHECKED	BIERBAUM	XX/XX/93
BLDG./FACILITY 881	APPROVED	SCHUBBE	XX/XX/93
ROOM/AREA 131C	SUBMITTED	BIERBAUM	XX/XX/93
MASTER YES ☐ NO ☒	SCALE: NONE	APPROVED RFETS / APPROVED DOE	

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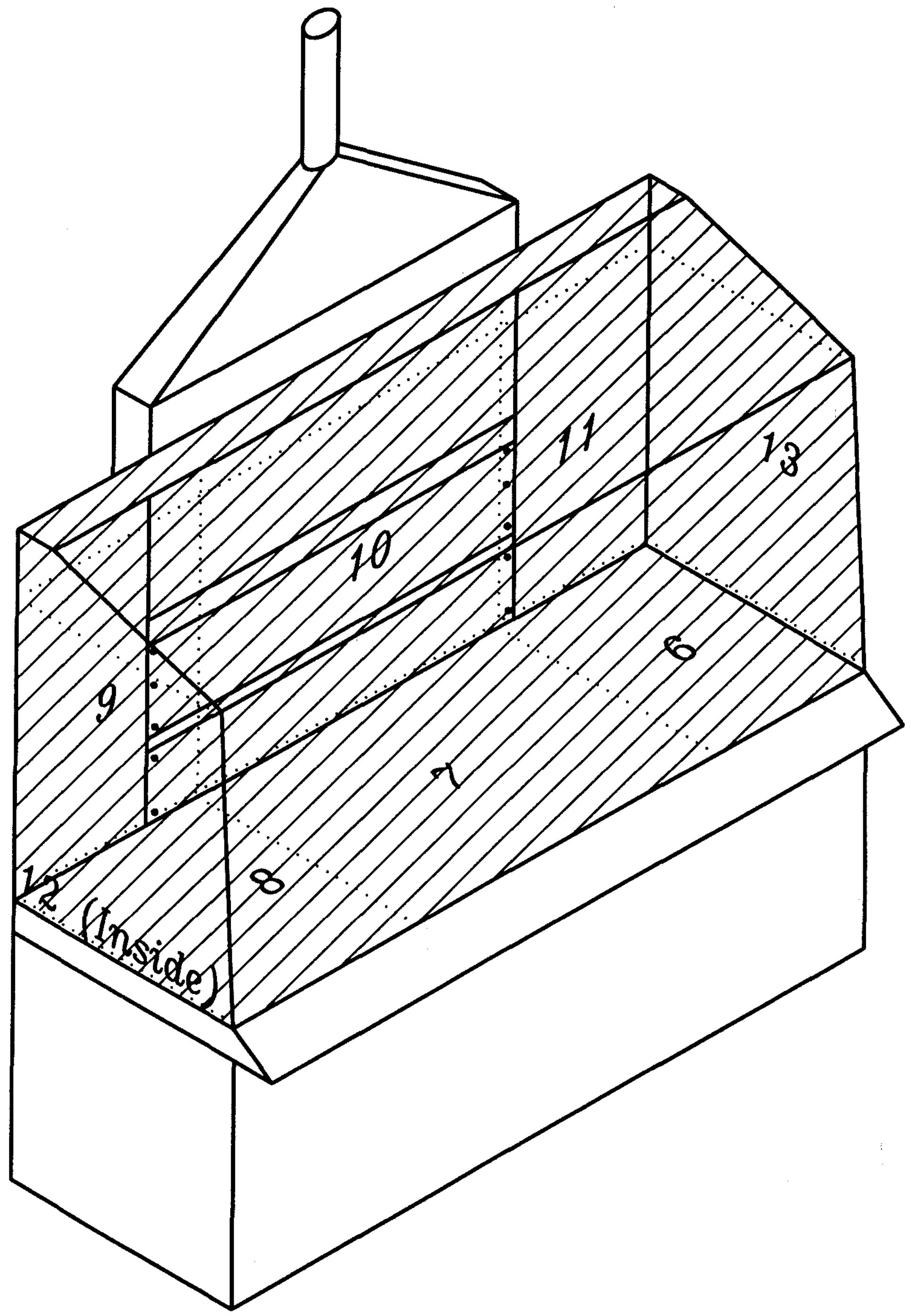
OU15 PHASE I RFI/RI
IHSS 217 RAD SAMPLE LOCATIONS & RESULTS

SIZE	DRAWING NUMBER	ISSUE	FIGURE
B	IHSS 217	A	5-26

CYANIDE BENCH SCALE TREATMENT
LABORATORY TABLE AND FUME HOOD



Area	Pre-Rinsate Smear Sample Alpha (dpm/100 cm^2)	Pre-Rinsate Smear Sample Beta (dpm/100 cm^2)	Post-Rinsate Smear Sample Alpha (dpm/100 cm^2)	Post-Rinsate Smear Sample Beta (dpm/100 cm^2)	Gamma Dose-Rate (mrem/hr)	Beta Dose-Rate (mrem/hr)
6	6	0	0	30	0	0.4
7	6	39	0	9	0	0.4
8	6	3	3	30	0	0.4
9	0	0	0	9	0.1	0
10	3	27	3	33	0.1	0
11	0	24	0	6	0.1	0
12	3	36	6	24	0	0
13	6	24	9	3	0	0

KEYWORDS: 1. OU15; 2. PHASE I; 3. RFI/RI; 4. REPORT; 5.
BLDG./FACILITY: 881
ROOM/AREA: 131C
MASTER: YES ☐ NO ☒
SCALE: NONE

A — ORIGINAL ISSUE — XX/XX/93

DESIGNED: HEA 07/12/94
DRAWN: SCHACKLIN 07/12/94
CHECKED: BIERBAUM XX/XX/93
APPROVED: SCHUBBE XX/XX/93
SUBMITTED: BIERBAUM XX/XX/93

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GOLDEN, COLORADO 80401
OU15 PHASE I RFI/RI
IHSS 217 RAD SAMPLE LOCATIONS & RESULTS

SIZE: B | DRAWING NUMBER: IHSS 217 | ISSUE: A | FIGURE: 5-27