



# U.S. Department of Energy

Oakland Operations Office, Oakland, California

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## FINAL WORK PLAN FOR BULKING AND SAMPLING SEGREGATED SOUTHWEST TRENCHES REMOVAL ACTION WASTE

at the

LABORATORY FOR ENERGY-RELATED HEALTH RESEARCH  
UNIVERSITY OF CALIFORNIA, DAVIS

*Prepared for:*

**United States Department of Energy**  
Oakland Operations Office  
1301 Clay Street  
Oakland, California 94612-5208

*Prepared by:*

**Weiss Associates**  
5801 Christie Avenue, Suite 600  
Emeryville, California 94608-1827

November 3, 2000

Rev. 0

DOE Oakland Operations Contract DE-AC03-96SF20686

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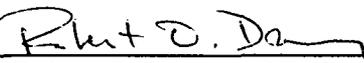
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## CONTENTS

1.	INTRODUCTION	1-1
	1.1 Background	1-1
	1.2 Work Plan Organization	1-1
	1.3 Objectives	1-2
	1.4 Schedule	1-2
	1.5 RESPONSIBILITIES	1-2
	1.5.1 Corporate Responsibilities	1-2
	1.5.2 Task Staff	1-3
2.	PREPARATORY PROCEDURES	2-1
	2.1 Work Area Preparation	2-1
	2.1.1 Materials, Equipment, Tools	2-1
	2.1.2 Work Area Set-up	2-2
	2.1.3 Dry Run	2-2
3.	STAGING, SEGREGATION AND BULKING	3-1
	3.1 Waste Staging	3-1
	3.2 Segregation	3-2
	3.3 Bulking	3-3
4.	SAMPLING AND ANALYSIS PROCEDURES	4-1
	4.1 Sample Collection	4-1
	4.1.1 Phase I Non-Rad Impacted	4-2
	4.1.2 Phase II Rad Impacted	4-2

4.2	Sample Documentation	4-3
4.2.1	Chain-of-Custody Forms	4-3
4.2.2	Field Logbook/Field Activity Daily Log	4-3
4.2.3	Sample Numbers	4-4
4.2.4	Sample Labels	4-4
4.2.5	Custody Seals	4-5
4.3	Sample Packaging	4-5
5.	WORK AREA DISMANTLEMENT	5-1
6.	WASTE MANAGEMENT	6-1
6.1	Waste Minimization	6-1
6.2	Task-Specific Guidance	6-1
6.3	Waste Tracking System	6-2
7.	HEALTH AND SAFETY	7-1
7.1	Activity Hazard Analysis	7-1
7.1.1	Radiological Exposure	7-1
7.1.2	Chemical Exposure	7-2
7.2	Hazard Controls	7-3
7.2.1	Hazardous Work Permit	7-3
7.2.2	Boundaries	7-3
7.2.3	Personal Protective Equipment	7-3
7.2.4	Decontamination Procedures	7-4
7.2.5	Training	7-4
7.2.6	Buddy System	7-4
7.2.7	Safety Equipment	7-5
7.2.8	HEPA Ventilation System	7-5
7.2.9	Spill Containment	7-5
7.2.10	Air Monitoring	7-6
7.2.11	Site Emergencies	7-6

8.	QUALITY ASSURANCE	8-1
9.	REFERENCES	9-1

## TABLES

Table 1-1. Description and Characterization Strategy for Excavated Southwest Trenches Waste, LEHR Southwest Trenches Waste

Table 1-2. Segregated Southwest Trenches Waste Bulking and Sampling Schedule, LEHR Southwest Trenches Waste

Table 4-1. Southwest Trenches Waste Characterization Matrix, LEHR Southwest Trenches Waste

Table 4-2. Packaging, Labeling and Transportation Requirements, LEHR Southwest Trenches Waste

## ATTACHMENTS

Attachment 1 – Activity Hazard Analysis

Attachment 2 – ALARA Guidelines

## ACRONYMS

AHA	Activity Hazard Analysis
ALARA	As-Low-As-Reasonably-Achievable
CA	Contamination area
CE	California empty
CFR	Code of Federal Regulations
COC	Chain-of-custody
CPGERP	Contingency Plan and General Emergency Response Procedures
DAC	Derived air concentration
DOP	Diethylhexyl Phthalate
dpm/100 cm	Disintegrations per minute per 100 square centimeters
EMS	Environmental Management Services
HAZCAT®	Hazardous Categorization
HEPA	High-Efficiency Particulate Air
HSP	Health and Safety Procedure
HWP	Hazardous Work Permit
ID	Identification
IDW	Investigation-derived waste
IT Corp.	International Technology Corporation
LEHR	Laboratory for Energy-Related Health Research
LLW	Low-level radioactive waste
PHSM	Project Health and Safety Manager
PHSP	Project Health and Safety Plan
PID	photo-ionization detector
PQAM	Project Quality Assurance Manager
PPE	Personal protective equipment
PTL	Project Task Leader

QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RA	Removal action
RCRA	Resource Conservation and Recovery Act of 1976
RCT	Radiological Control Technician
RPP	Radiological Protection Program
RSO	Radiation Safety Officer
SC	Site Coordinator
SHSO	Site Health and Safety Officer
SOP	Standard Operating Procedure
SWT	Southwest Trenches
WAC	Waste acceptance criteria
WTS	Waste tracking sheet

## 1. INTRODUCTION

This work plan presents the approach and procedures for bulking, packaging and characterizing segregated and secondary wastes from the 1998 Southwest Trenches (SWT) Removal Action (RA) at the Laboratory for Energy-Related Health Research (LEHR) Site, University of California at Davis, California. This work plan includes descriptions and rationale for the planned activities, detailed procedures for all fieldwork, quality assurance/quality control (QA/QC), health and safety and waste management.

### 1.1 Background

During the 1998 SWT RA, buried laboratory waste (previously referred to as poly-bucket waste) and potentially mixed waste (i.e., wood and soil) were excavated and segregated for additional evaluation. Secondary waste including spent immunoassay test reagents, investigation-derived waste (IDW) (SWT nitrate delineation and designated level sampling drill cuttings), and archived samples from an onsite laboratory was also generated during the RA. Waste descriptions and volumes for the aforementioned waste streams are included in Table 1-1.

Segregation conducted in 1999 under the Work Plan for Inventory, Hazardous Categorization and Segregation of Southwest Trenches Removal Action Lab Waste (Weiss, 1999d) yielded 21 composite groups from the laboratory waste (poly-bucket waste) for additional characterization. In addition, a data gap analysis was conducted that identified the need to collect additional waste characterization samples of the potentially mixed waste (soil and wood), the spent immunoassay test reagents, IDW, and archived samples.

### 1.2 Work Plan Organization

Sections 2, 3, 4 and 5 of this work plan present the procedures for conducting bulking, sampling and packaging activities. Section 6 describes the waste management procedures. Section 7 summarizes Health and Safety requirements, and Section 8 describes applicable Quality Assurance guidance. Cited references are listed in Section 9. Activity Hazard Analysis (AHA) and As-Low-As-Reasonably-Achievable (ALARA) Guidelines are included in Attachments 1 and 2, respectively.

### 1.3 Objectives

The objectives of this activity are to accurately characterize and designate segregated SWT RA waste in order to meet the Waste Acceptance Criteria (WAC) of the intended disposal facility, Envirocare of Utah, Incorporated (Envirocare). Following validation by the project chemist (or designee), analytical data generated by this activity will be distributed to the LEHR Waste Management Team and the waste will be designated into appropriate classifications for disposal purposes. To meet this objective, the following site activities are required:

- Segregate identified waste streams;
- Consolidate the waste (i.e. archived samples) into larger packages for efficient sampling and transportation as appropriate;
- Collect samples for waste characterization;
- Prepare the samples/waste packages for shipment; and,
- Ship samples to an analytical laboratory.

Following completion of this task and subsequent data validation and waste designation, waste profiles will be completed. Based on preliminary results, the remaining waste will be profiled against the waste acceptance criteria of Envirocare. All remaining Southwest Trenches low-level waste will be shipped off site for disposal by the end of Calendar Year 2000 assuming that the waste is acceptable by Envirocare.

### 1.4 Schedule

The schedule for all phases of work associated with this task is summarized in Table 1-2.

### 1.5 RESPONSIBILITIES

#### 1.5.1 Corporate Responsibilities

The responsibilities of the three companies conducting the activities under this work plan are briefly summarized below.

*Weiss Associates*—Development of this work plan; management and oversight; on-site health and safety oversight; waste segregation; bulking and sampling; on-site task coordination; waste management; and updating the Waste Tracking System.

*International Technology Corporation (IT Corp.)*—All required on-site radiological support.

*Environmental Management Services, Inc. (EMS)*—Consultation during task activities, specifically during lab pack procedure development and implementation, and review of analysis plan to meet the WAC of Envirocare. In addition EMS will designate the waste and complete applicable waste profiles utilizing the dataset generated by this activity.

### 1.5.2 Task Staff

Task-specific personnel and associated responsibilities are described below:

- Program Manager – Mike Dresen – Weiss;
- Project Manager – Bob Devany – Weiss;
- Project Health and Safety Manager (PHSM) – Jerry McHugh, CIH – Weiss;
- Radiation Control Manager (RCM) – Jerry McHugh, CIH – Weiss;
- Project Task Leader (PTL) – John Wolf – Weiss;
- Site Coordinator (SC) – John Wolf – Weiss;
- Field Waste Coordinator – John Wolf – Weiss.
- Site Health and Safety Officer (SHSO) – Kim Warren – Weiss;
- Health and Safety Coordinator – Kim Warren – Weiss;
- Radiation Safety Officer (RSO) – Dave Ochs – IT;
- Radiation Control Technician (RCT) – To be determined – IT;
- Project Quality Assurance Manager (PQAM) – Dolores Loll – Weiss;
- Waste Specialist (WS) – Dawn Mitchell – EMS; and,
- Project Chemist – Santiago Lee – Weiss;

The responsibilities of the aforementioned staff are detailed in the Project Health and Safety Plan (PHSP) (Weiss, 1998a).

Table 1-1. Description and Characterization Strategy for Excavated Southwest Trenches Waste, LEHR Southwest

Bulking/ Sampling Group	Staging Group	Sample ID	LEHR Package Identification	Container Description	Estimated Waste Volume and Description
1	Phase II, potentially rad- impacted	CWDTTC075	LEHR0230a	1 x 250-ml round bottom flask	25 mg soil
			LEHR0230b	1 x casserole/crucible	5 g white powder
			LEHR0230c	1 x 50-ml open top tube	15 g black granular materia
			LEHR0230d	1 x 50-ml open top tube	15 g white powder and sand
			LEHR0230e	1 x 25-ml open top tube	5 g white powder and soil
2	Phase II, potentially rad- impacted	CWDTTC076	LEHR0232	350 x 0.5-ml vials stored in 2 x one-gallon ziplock bags	175 ml congealed liquid, some soil
			LEHR0239a	500 x 0.5-ml vials	175 ml congealed liquid, some soil
3	Phase II, potentially rad- impacted	CWDTTC077	LEHR0324a	1 x 250-ml jar/flask	10 ml brown, transparent fluid
4	Phase II, potentially rad- impacted	CWDTTC078	LEHR0241a	2 x 20-ml test tubes	5 ml blood and soil
			LEHR0335a	8 x 1-gal bags filled with 20-ml test tubes	3 L congealed blood and soil
			LEHR0335b	3 x 1-gal bags filled with 20-ml test tubes	2.5 L congealed blood and soil
			LEHR0335c	1 x 1-gal bag	1.5 L congealed blood and soil
			LEHR0335d	1 x 1-gal bag	1.5 L congealed blood and soil
			LEHR0335e	1 x 1-gal bag	1.5 L congealed blood and soil
			LEHR0335f	1 x 1-gal bag	1.5 L congealed blood and soil

Table 1-1. Description and Characterization Strategy for Excavated Southwest Trenches Waste, LEHR Southwest

Bulking/ Sampling Group	Staging Group	Sample ID	LEHR Package Identification	Container Description	Estimated Waste Volume and Description
1	Phase II, potentially rad- impacted	CWDTC075	LEHR0230a	1 x 250-ml round bottom flask	25 mg soil
			LEHR0230b	1 x casserole/crucible	5 g white powder
			LEHR0230c	1 x 50-ml open top tube	15 g black granular materia
			LEHR0230d	1 x 50-ml open top tube	15 g white powder an sand
			LEHR0230e	1 x 25-ml open top tube	5 g white powder an soil
2	Phase II, potentially rad- impacted	CWDTC076	LEHR0232	350 x 0.5-ml vials stored in 2 x one-gallon ziplock bags	175 ml congealed liquid, son soil
			LEHR0239a	500 x 0.5-ml vials	175 ml congealed liquid, son soil
3	Phase II, potentially rad- impacted	CWDTC077	LEHR0324a	1 x 250-ml jar/flask	10 ml brown, transpare fluid
4	Phase II, potentially rad- impacted	CWDTC078	LEHR0241a	2 x 20-ml test tubes	5 ml blood and soil
			LEHR0335a	8 x 1-gal bags filled with 20-ml test tubes	3 L congealed blood an soil
			LEHR0335b	3 x 1-gal bags filled with 20-ml test tubes	2.5 L congealed blood and soil
			LEHR0335c	1 x 1-gal bag	1.5 L congealed blood and soil
			LEHR0335d	1 x 1-gal bag	1.5 L congealed blood and soil
			LEHR0335e	1 x 1-gal bag	1.5 L congealed blood and soil
			LEHR0335f	1 x 1-gal bag	1.5 L congealed blood and soil

Table 1-1. Description and Characterization Strategy for Excavated Southwest Trenches Waste, LEHR Southwest

Bulking/ Sampling Group	Staging Group	Sample ID	LEHR Package Identification	Container Description	Estimated Waste Volume and Description
5	Phase II, potentially rad- impacted	CWDTC079	LEHR0324i	1 x 25-ml test tube	10 g agar (gel)
			LEHR0325a	3 x 40-ml test tubes	20 g agar (gel)
6	Phase II, potentially rad- impacted	CWDTC080	LEHR0325c	1 x 50-ml capped jar	25 g white flakes
			LEHR0325d	1 x 100-ml capped jar	5 g white flakes
			LEHR0239b	1 x 100-ml jar	20 g beige, crusty powder
7	Phase II, potentially rad- impacted	CWDTC081	LEHR0325e	1 x 250-ml jar	100 g metallic disks, 1-inch diameter, coated in white powder
8	Phase II, potentially rad- impacted	CWDTC082	LEHR0326a	1 x 2-gal bucket	2.25 kg solid, white chalky material
9	Phase II, potentially rad- impacted	CWDTC083	LEHR0235	1 x 1-gal jug	2.8 L clear, yellow liquid
10	Phase II, potentially rad- impacted	CWDTC084	LEHR0324c	1 x 500-ml glass jar, labeled "Nesslers Solution"	20 ml clear liquid

Table 1-1. Description and Characterization Strategy for Excavated Southwest Trenches Waste, LEHR Southwest

Bulking/ Sampling Group	Staging Group	Sample ID	LEHR Package Identification	Container Description	Estimated Waste Volume and Description
11	Phase II, potentially rad- impacted	CWDTC085	LEHR0233	1 x 1-L poly bucket	150 ml dark liquid
12	Phase II, potentially rad- impacted	CWDTC086	LEHR0234	1 x 1-gal jug, labeled "Nitric Acid"	1 L clear liquid
13	Phase II, potentially rad- impacted	CWDTC087	LEHR0239c	1 x 50-ml jar	10 g black/beige specimen
14	Phase II, potentially rad- impacted	CWDTC088	LEHR0240	3 x quart size bags	2.25 kg animal hair, feces (?), dry bones
15	Phase II, potentially rad- impacted	CWDTC089	LEHR0242a	1 x 250-ml jar	5 ml clear liquid
16	Phase II, potentially rad- impacted	CWDTC090	LEHR0242b	1 x 250-ml jar	5 g pea-sized, dark spheres

Table 1-1. Description and Characterization Strategy for Excavated Southwest Trenches Waste, LEHR Southwest

Bulking/ Sampling Group	Staging Group	Sample ID	LEHR Package Identification	Container Description	Estimated Waste Volume and Description
17	Phase II, potentially rad- impacted	CWDTC091	LEHR0244a	1 x 1-L jar	2 g of soil, filter paper, plast soil
18	Phase II, potentially rad- impacted	CWDTC092	LEHR0324d	1 x 40-ml jar	30 ml clear liquid
19	Phase II, potentially rad- impacted	CWDTC093	LEHR0324k	1 x 20-ml test tube	10 ml cloudy, amber liquid with precipitate
20	Phase II, potentially rad- impacted	CWDTC094	LEHR0326	1 x 5-gal bucket	2.25 kg soil
21	Phase II, potentially rad- impacted	CWDTC095	LEHR1311	1 x 55-gal drum	0.25 cu yd soil
22	Phase II, potentially rad- impacted	CWDTC096	LEHR 0336	1 x 55-gal drum	wood (creosote?), soil
			LEHR 0337	1 x B-25 box	wood (creosote?), metal pipe plastic buckets, rubber tire

Table 1-1. Description and Characterization Strategy for Excavated Southwest Trenches Waste, LEHR Southwest

Bulking/ Sampling Group	Staging Group	Sample ID	LEHR Package Identification	Container Description	Estimated Waste Volume and Description
23	Phase II, potentially rad- impacted	CWDTC097	LEHR 0336	1 x 55-gal drum	wood (creosote?), soil
			LEHR 0337	1 x B-25 box	wood (creosote?), metal pip plastic buckets, rubber tire
24	Phase I, non-rad impacted	CWDTC098	LEHR 1306	3 x 1-L poly bucket	Immunoassay Test Spoils
			LEHR 1307	3 x 1-L poly bucket	Immunoassay Test Spoils
			LEHR 1308	3 x 1-L poly bucket	Immunoassay Test Spoils
25	Phase I, non-rad impacted	CSDTC099	LEHR 1306	3 x 1-L poly bucket	Immunoassay Test Spoils (HCl)
			LEHR 1307	3 x 1-L poly bucket	Immunoassay Test Spoils (HCl)
			LEHR 1308	3 x 1-L poly bucket	Immunoassay Test Spoils (HCl)
26	Phase I, non-rad impacted	CWDTC100	LEHR 1306	1 x 55-gal drum	Archived Chlordane Screenin Samples
			LEHR 1307	1 x 55-gal drum	Archived Chlordane Screenin Samples
			LEHR 1308	1 x 55-gal drum	Archived Chlordane Screenin Samples
			LEHR 1325	1 x 55-gal drum	Archived Chlordane Screenin Samples
			LEHR 1326	1 x 25-gal cooler	Archived Chlordane Screenin Samples

Table 1-1. Description and Characterization Strategy for Excavated Southwest Trenches Waste, LEHR Southwest

Bulking/ Sampling Group	Staging Group	Sample ID	LEHR Package Identification	Container Description	Estimated Waste Volume and Description
27	Phase II, potentially rad- impacted	CWDTC101	LEHR 0629	1 x 55-gal drum	Nitrate Delineation IDW (Soil)
			LEHR 0632	1 x 55-gal drum	Nitrate Delineation IDW (Soil)
			LEHR 1298	1 x 55-gal drum	DLS IDW (Soil)
			LEHR 0300	1 x B-25 box	SWT RA Soil/Debris
			LEHR 0342	1 x B-25 box	SWT RA Soil/Debris

**Notes:**

- Analytical laboratory to perform sample preparation (i.e., crush, ash, etc.) as appropriate, then analyze samples for radiological suite (RS), chemical suite  
 Analytical laboratory to determine appropriate sample preparation methods and appropriate level of effort.
- Because of contamination control issues, these waste packages were not HAZCATED.
- Sample containers are as follows: 1 x 8-oz jar, 1 x 2-L poly, 2 x 16-oz jar, 1 x 4-oz jar (fill to the top with no headspace, for VOC analysis).
- 1-gallon poly bucket of wood pieces, chips and/or shavings.

**Abbreviations:**

$\mu$ R/hr = micro Rem per hour  
 BKG = Background ( $\mu$ R/hr)  
 CS = Chemical Suite. See Table 3 for details.  
 cu yd = cubic yard  
 DLS = Designated-Level Sampling  
 DS = Disposal Suite. See Table 3 for details.  
 IDW = Investigation-derived waste

g = gram  
 gal = gallon  
 H<sup>3</sup> = Tritium  
 HCl = Hydrochloric acid  
 kg = kilogram  
 L = liter  
 lbs = pounds

mg = milligram  
 ml = milliliter  
 mR = milli Rem per hour  
 N/A = Not available  
 RS = Full Radiological Suite. See  
 Sample ID = Sample Identification  
 TBD = To be determined

Table 1-2. Segregated Southwest Trenches Waste Bulking and Sampling Schedule, LEHR Southwest Trenches Waste

ID	Task Name	Start	Finish	Month											
				Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	
1	<b>Segregated Southwest Trenches Waste Bulking and Sampling Schedule</b>	Mon 5/1/00	Fri 12/29/00												
2	Generate Draft WP, ALARA Guidelines and AHA	Mon 5/1/00	Fri 6/9/00												
3	DOE/WA/EMS Review Draft WP, ALARA and AHA	Mon 6/12/00	Fri 6/23/00												
4	Project delayed due to funding shortfall	Mon 6/26/00	Sun 10/1/00												
5	Finalize DOE/WA/EMS Review Draft WP, ALARA and AHA	Mon 10/2/00	Wed 11/1/00												
6	Generate Draft HWP	Mon 10/9/00	Fri 10/13/00												
7	Finalize HWP	Thu 11/2/00	Fri 11/3/00												
8	Complete Field Work	Fri 11/3/00	Fri 11/17/00												
9	Update WMTS	Mon 11/20/00	Fri 12/1/00												
10	Complete shipment of all work	Fri 12/29/00	Fri 12/29/00												

**Abbreviations:**

- AHA Activity Hazard Analysis
- ALARA As-Low-As-Reasonably-Achievable
- HWP Hazardous Work Permit
- WP Work Plan

## 2. PREPARATORY PROCEDURES

The preparatory procedures that will be used to conduct the bulking and sample collection activities of segregated SWT RA waste are described below.

### 2.1 Work Area Preparation

The work bench established in the Geriatrics-I building (Building H-292) for previous hazardous categorization (HAZCAT®) where the majority of the waste is currently stored will be used for this work. This section describes the re-establishment of the work area in Building H-292.

#### 2.1.1 *Materials, Equipment, Tools*

Materials, equipment, and tools required to complete the bulking and sampling may include, but are not limited to, the following:

- Waste packages (bags, drums, etc.);
- Hand tools;
- Clear, plastic bags (various sizes for packaging);
- Absorbent material (Chemsorb, Vermiculite, etc.);
- Labeling supplies;
- Packaging supplies (e.g. duct tape, bubble-wrap, coolers, etc.);
- Herculite or polyethylene sheeting;
- Health physics supplies;
- Radiological instrumentation;
- Industrial hygiene monitoring equipment;
- Photography equipment and supplies;
- Personal protective equipment (PPE);
- Photo-ionization detector;
- High-efficiency particulate air (HEPA) vacuum;
- HEPA ventilation system;
- Portable lighting; and,
- Electric generator.

### 2.1.2 *Work Area Set-up*

An area within Geriatrics-I, clear of obstructions and stored items, will be established as a Contamination Area (CA). This area should be large enough to accommodate the following:

- Work bench;
- Waste containers (poly-bucket waste, four 55-gallon drums, etc.);
- Two sample technicians;
- RCT; and,
- Lab pack area.

The floor area will be covered with a non-permeable material (Herculite™, poly sheeting or equivalent). The limits of the work area will be defined using stanchions and yellow and magenta rope or ribbon. A single point of access and egress will be established with a step-off pad.

In addition, CA will be established in an aisle in the Western Dog Pens to facilitate the incorporation of SWT RA soil drums into B-25 boxes for efficient sampling and disposal.

### 2.1.3 *Dry Run*

A dry run of the planned activities will be conducted as detailed in Sections 3 and 4 using clean materials and pails to ensure that the work area is adequate and the fume hood functions properly. Any adjustments will be made and any problems identified during the dry run will be corrected. The dry run will be repeated as needed to ensure that the work area will support the planned activities.

### 3. STAGING, SEGREGATION AND BULKING

This section describes the procedures for staging all segregated SWT RA waste, segregating the spent immunoassay test reagents and clean lab waste, and bulking archived soil samples for composite analysis.

#### 3.1 Waste Staging

Waste packages scheduled for sampling, bulking and/or repackaging are identified by the unique waste tracking numbers listed in Table 1-1. These packages will be moved into the work area in two phases:

Phase I – Non-rad impacted waste:

- Immunoassay test spoils; and,
- Archived SWT RA chlordane delineation samples.

Phase II – Potentially rad-impacted waste:

- IDW soil (SWT nitrate delineation and designated-level sampling drill cuttings);
- Soil and wood;
- Soil; and,
- Poly-bucket waste.

Phase I segregation, bulking sampling and packaging will be conducted in the work area prior to the establishment of a radioactive CA in order to prevent possible generation of additional radioactive and/or mixed waste. Phase II wastes are known to contain radioactive constituents and will be handled separately. Table 1 lists the phase assignments.

The contents of the SWT IDW soil drums identified in Table 1-1 as Bulking/Sampling Group 27 will be distributed into B-25 boxes associated with Group 27 that have sufficient capacity to accommodate the additional volume and weight. These B-25 boxes will not be moved to Geriatrics-I as they are co-located in Eastern Dog Pen Aisle 3 and will be sampled in place under the supervision of LEHR radiation control staff. Appropriate contamination controls will be utilized as specified in the RPP and in the following SOPs:

- 32.1, Contamination Control; and,
- 34.1, Waste Processing and Packaging.

## 3.2 Segregation

Phase I wastes consisting of spent immunoassay test reagents, experimental debris and archived SWT RA chlordane delineation samples are commingled in four 55-gallon drums and a cooler identified in Table 1-1. These waste streams require segregation prior to sampling. To minimize waste, empty labware and debris will be segregated as clean material. These materials are not subject to regulation under the Resource Conservation and Recovery Act of 1976 (RCRA), 40 Code of Federal Regulations (CFR) Section 261.7 if they meet the more conservative requirements for an empty container as specified in Title 22 of the California Code of Regulations (CCR) Section 66261.7.

A container is considered non-regulated empty material per 22 CCR 66261.7 if the material is not acutely toxic and meets either of the two following criteria:

- The material is pourable, no hazardous material can be poured or drained from the container when it is held in any orientation (e.g., tilted, inverted, etc.); or,
- The material is not pourable, no hazardous material remains in or on the container that can feasibly be removed by physical methods (excluding rinsing) which comply with local air pollution control laws and which are commonly employed to remove material from that container. Following material removal, the top, bottom and sidewalls of such a container shall not contain remaining adhered or crusted material resulting from buildup of successive layers of material or a mass of solidified material. A thin uniform layer or dried material or powder is considered acceptable.

Drums will be handled in accordance with Health and Safety Procedure (HSP) 2.1, Handling Drums and Containers. The segregation will be conducted as follows:

- Inspect and open drum in accordance with HSP 2.1, Handling Drums and Containers;
- Segregate empty labware (see criteria above), test debris (stir sticks, pipette tips sample preparation dishes, etc) and place into clean trash bag as RCRA clean, non-regulated waste;
- Segregate liquid-containing packages (vials, reagent accumulation containers, standards, etc.);
- Segregate acidic liquid waste from non-acidic waste;
- Segregate soil samples;
- Radiologically survey empty drums and empty waste/sample containers as specified in SOP 32.1, Contamination Control; and,
- Complete Waste Tracking System updates as required.

### 3.3 Bulking

To characterize SWT RA waste in an efficient, cost-effective manner, like wastes will be repacked into large containers and a composite sample will be collected. As described in Section 3.2, empty containers will be added to the California empty (CE), non-regulated waste bag. Phase I and Phase II waste bulking is described below.

#### Phase I – Non-rad impacted waste:

- Bulk non-acidic liquid wastes (Bulking/Sampling Group 24) into 2-liter poly containers and discard empty containers into a CE, non-regulated trash bag. Attach sample label to new packages as listed in Table 1-1;
- Bulk acidic liquid wastes (Bulking/Sampling Group 25) into 2-liter poly containers and discard empty containers into a CE, non-regulated trash bag. Attach sample label to new packages as listed in Table 1-1;
- Empty contents of soil sample jars (Bulking/Sampling Group 26) into a lined, 55-gallon drum. Discard empty glass jars and lids into the CE, non-regulated trash bag;
- If using a new drum, complete a LEHR WTS, label drum(s) and assign a LEHR Waste Tracking Number to the new package;
- If re-using one of the original drums in which the samples were stored in, keep the LEHR number and complete an updated LEHR WTS; and
- Provide the Field Waste Coordinator with new and/or updated WTSs.

#### Phase II – Rad-impacted waste:

SWT nitrate delineation and designated-level sampling drill cuttings packaged in 55-gallon drums will be incorporated into B-25 boxes as identified in Table 1, Bulking and Sampling Group 27. SWT waste package 0336 will be added to waste package 0337. Drums will be handled in accordance with HSP 2.1, Handling Drums and Containers. The bulking will be conducted as follows:

- Inspect and open drums in accordance with HSP 2.1;
- Open B-25 box;
- Use forklift with drum handling equipment to lift and empty contents of 55-gallon drum into selected B-25 box;
- RCT to survey drum for release;
- Label drums as empty and stage in former Co-60 field with other empty drums in a designated storage area for disposal at a future time;
- Complete Waste Tracking System updates as required; and
- Provide the Field Waste Coordinator with new and/or updated WTSs.

## 4. SAMPLING AND ANALYSIS PROCEDURES

SWT RA waste descriptions and characterization strategies are presented in Table 1-1 and sample specific analytical parameters are identified in Table 4-1. Sampling procedures are divided into two phases and five categories:

### Phase I – Non-Rad Impacted Waste:

- Immunoassay test spoils; and,
- Archived SWT RA chlordane delineation samples.

### Phase II – Potentially Rad-Impacted Waste:

- IDW soil (SWT nitrate delineation and designated-level sampling drill cuttings);
- Soil and wood;
- Soil; and,
- Poly-bucket waste.

### 4.1 Sample Collection

Sample matrices, unique sample identification numbers and specific analytical requirements are described in Tables 1-1 and 4-1. Samples will be collected in accordance with the following SOPs:

- 3.1, Surface and Shallow Subsurface Soil Sampling;
- 1.1, Chain-of-Custody; and,
- 2.1, Sample Handling, Packaging and Shipping.

Sample suites are divided into three categories:

- Radiological (Rad);
- Chemical (Chem); and,
- Disposal (Disp).

The analytical laboratory will be instructed to composite and process the waste as appropriate (bulk, crush, ash, etc.) and to complete the analyses in the order that they are listed in Table 4-1. Specific sample collection procedures are described in Sections 4.1.1 and 4.1.2.

#### *4.1.1 Phase I Non-Rad Impacted*

##### **4.1.1.1 Spent Immunoassay Reagents**

Spent immunoassay reagents will be bulked into 2-liter poly-containers as described in Section 3.3. Two sets of containers will be sent to the analytical laboratory for composite analysis. One of the sets contains dilute HCl and will be analyzed separately. The analytical laboratory will be instructed to composite and process the waste as appropriate (bulk, crush, ash, etc.) and complete the analyses in the order that they are listed in Table 3-1.

##### **4.1.1.2 Archived Samples**

One composite sample will be collected from bulked, archived samples. The required sample volumes, required analyses and sample containers are provided in Tables 1-1 and 4-1. The analytical laboratory will process these samples following standard LEHR waste sample processing and characterization procedures as detailed in the analytical laboratory contract.

#### *4.1.2 Phase II Rad Impacted*

##### **4.1.2.1 Segregated Labwaste (poly-buckets)**

The excavated labwaste will be shipped intact to the analytical laboratory. Samples, sample containers, sample packaging and packaging materials will be processed and analyzed at the analytical laboratory as described in Tables 1-1 and 4-1. No samples will be directly collected from the poly-bucket lab waste by WA or its subcontractors; they will be extracted by the contracted analytical laboratory.

##### **4.1.2.2 Wood**

One wood sample will be collected from SWT RA waste packages associated with a disposal trench that was lined with wood potentially preserved with hazardous constituents (Sampling Group 22). During conduct of the RA, these packages were segregated for further evaluation. One wood sample will be collected and placed in a 1-gallon poly-bucket. The sample will be collected using a handsaw, chisel or another appropriate sampling device. Unique sample identifications numbers, required sample volumes and requested analysis are presented in Tables 1-1 and 4-1.

##### **4.1.2.3 Soil**

Soil samples will be collected from Sampling Groups 20, 21, 23, 26 and 27 as identified in Tables 1-1 and 4-1. These samples will be collected from the waste packages with hand trowels in accordance with the following SOPs:

- 3.1, Surface and Shallow Subsurface Soil Sampling;
- 1.1, Chain-of-custody; and,
- 2.1, Sample Handling, Packaging and Shipping.

Tables 1-1 and 4-1 list the unique composite sample identification number (ID), sample containers and volumes and required analyses. Disposable hand trowels will be placed in the waste package following sample collection.

## 4.2 Sample Documentation

The usability of the data obtained during this sampling event will depend on its quality. A number of factors relate to data quality. Sample collection methods are as important as the methods used for sample analysis to ensure data quality. Following proper sample collection and analysis procedures reduces sampling and analytical error. To ensure sample integrity, samples will be handled using complete COC documentation and preserved using proper sample preservation techniques, holding times, and shipment methods. Obtaining valid and comparable data also requires adequate QA/QC procedures and documentation.

The components of the sample documentation and custody system will include the following:

- COC Form;
- Field Logbook/Field Activity Daily Log;
- Sample Numbers;
- Sample Labels; and,
- Custody Seals.

### 4.2.1 Chain-of-Custody Forms

COC forms will be completed by the sampling team members to track sample custody as well as specify the requested analyses. COC forms will be completed in accordance with the requirements of SOP 1.1, Chain-of-Custody.

### 4.2.2 Field Logbook/Field Activity Daily Log

Descriptions and observations made during field and sampling activities will be documented in the field logbook/Field Activity Daily Log. The following information will be recorded in the field logbook/Field Activity Daily Log:

- Project name and number;
- Location of site;
- Purpose of sampling;
- Description of field activities;
- Names of sampling personnel;
- Date and time of entries;
- Sample description, using the Unified Soil Classification System for soil/sediment;

- Waste description (color, consistency, matrix, etc.);
- Date and time of sample collection;
- Sample locations, ID number and sampling methodology;
- Field observations;
- Results of field measurements; and,
- Results of field calibrations for instruments used.

This information will be provided to the PTL for distribution to the LEHR Waste Management Team and to the LEHR library for incorporation into the project files.

#### 4.2.3 *Sample Numbers*

A unique alphanumeric identification number will be assigned to each sample collected, using the following format:

aabbccc

Where,

aa = Type of sample and matrix

SS - soil sample

WS - water sample

CW - composite waste

bbb = Three-letter acronym designating the sample area at the site, e.g.:

DTC - disposal trench confirmation

ccc = Sequential sample number (e.g., 001, 002, 003)

Unique sample identification numbers are provided for each sample and/or sample group in Tables 1-1 and 4-1.

#### 4.2.4 *Sample Labels*

Sample labels will be attached to individual sample containers and will contain the following information:

- Project number;
- Sample ID number;
- Date and time collected;
- Initials of sampler; and,
- Requested analyses.

#### 4.2.5 Custody Seals

Custody seals will be used to detect tampering and will be placed over the lid of the shipping container and annotated with the following information:

- Date and time; and,
- Initials of sampler.

### 4.3 Sample Packaging

Portions of the excavated labwaste have characteristics that require special handling and packaging for safe transport to the analytical laboratory. Packaging requirements, shipping considerations, packaging specifics and special hazards are identified in Table 4-2. These procedures were developed using the Hazardous Materials, Substances and Waste Compliance Guide (Hazardous Materials Publishers Company, 1998) in compliance with 49 CFR and in conjunction with the United States Department of Transportation (DOT), International Air Transportation Association, International Civil Aviation Organization, and Federal Express, the selected carrier.

In general, reactive substances such as strong acids or oxidizers will be packaged and shipped separately. In addition, absorbent materials will be added between inner and outer waste packages in sufficient quantities to absorb at least 150% of the liquid waste and to provide shock protection.

Table 4-1. Packaging, Labeling and Transportation Requirements, LEHR Southwest Trenches Waste

Analysis/Lab Method	Unit Price <sup>(1)</sup> (45 day TAT)	Sample Group Number												
		1	2	3	4	5	6	7	8	9	10	11	12	1
		TBD	Urine	Urine	Blood	Agar	Silicate/Carbonate	Silver	Calcium Carbonate	HCl	HCl	Hypochlorite	Arsenic Acid	Tissue Sample
Special Handling/Preparation Charge <sup>(2)</sup>	\$ 50.00	1	1	1	1	1	1	1	1	1	1	1	1	1
Gross Alpha/Beta (EPA 9310)	\$ 67.50	1	1	1	1	1	1	1	1	1	1	1	1	1
Gamma Emitters (EPA 901.1) <sup>(3)</sup>	\$ 108.00	1	1	1	1	1	1	1	1	1	1	1	1	1
Radium-226 (EPA 901.1) <sup>(4)</sup>	\$ 108.00	0	0	0	0	0	0	0	0	0	0	0	0	0
Strontium-90 (EPA 905.0)	\$ 157.50	1	1	1	1	1	1	1	1	1	1	1	1	1
Americium-241 (Lab SOP)	\$ 148.50	1	1	1	1	1	1	1	1	1	1	1	1	1
Plutonium-241 (Lab SOP)	\$ 148.50	1	1	1	1	1	1	1	1	1	1	1	1	1
Uranium-238 (Lab SOP)	\$ 148.50	1	1	1	1	1	1	1	1	1	1	1	1	1
Thorium-228, 230, 232 (Lab SOP)	\$ 148.50	1	1	1	1	1	1	1	1	1	1	1	1	1
Tritium (EPA 906.0)	\$ 58.50	1	1	1	1	1	1	1	1	1	1	1	1	1
Carbon-14 (Lab SOP)	\$ 117.00	1	1	1	1	1	1	1	1	1	1	1	1	1
VOCs (SW-846 8260)	\$ 170.00	0	0	0	0	0	0	0	1	0	0	0	0	0
SVOCs (SW-846 8270)	\$ 361.28	0	0	0	0	0	0	0	1	0	0	0	0	0
Pest/PCBs (SW-846 8081)	\$ 191.25	0	0	0	0	0	0	0	1	0	0	0	0	0
Title 22 Metals (SW-846 6010/7471; 17 metals)	\$ 204.00	0	0	0	0	0	0	0	1	0	0	0	0	0
Chromium (VI) (EPA 3060A/7196)	\$ 51.00	0	0	0	0	0	0	0	1	0	0	0	0	0
Nitrate (EPA 300.0)	\$ 29.75	0	0	0	0	0	0	0	1	0	0	0	0	0
Reactive Cyanide (EPA 7.3.3.2)	\$ 34.00	0	0	0	0	0	0	0	1	0	0	0	0	0
Reactive Sulfide (EPA 7.3.4.2)	\$ 34.00	0	0	0	0	0	0	0	1	0	0	0	0	0
Paint Filter Test (EPA 9095)	\$ 17.00	0	0	0	0	0	0	0	1	0	0	0	0	0
pH (EPA 9045)	\$ 12.75	0	0	0	0	0	0	0	1	0	0	0	0	0
Formaldehyde (Modified NIOSH 3500/AOAC 20.062)	\$ 63.75	0	0	0	0	0	0	0	1	0	0	0	0	0
Herbicides (EPA 8151)	\$ 136.00	0	0	0	0	0	0	0	1	0	0	0	0	0
Ignitability (EPA 1020A or 1010)	\$ 21.25	0	0	0	0	0	0	0	1	0	0	0	0	0
Total Plate Count (S.M. 17th Ed. 9215)	\$ 35.00	0	0	0	0	0	0	0	1	0	0	0	0	0
TCLP-Extraction, with Chromium and Nickel analysis	\$ 85.00	0	0	0	0	0	0	0	1	0	0	0	0	0
STLC-Extraction, with Chromium and Nickel analysis	\$ 85.00	0	0	0	0	0	0	0	1	0	0	0	0	0
<b>Total</b>														

**Assumptions:**

Full data packages, one (1) copy of sample results and QC summaries, and EDDs are required for all samples analyzed.  
 "Unit Prices" shall include cost of sample containers (if applicable), sampling media (if applicable), full data packages, sample and sample container storage and disposal, and other costs (calibration, internal QC, re-analysis, dilutions, etc.).  
 Modification to analytical procedures and QC requirements are not allowed.  
 Contract required detection limits must be achieved by increasing the count time and/or sample size. Maximum error must be 25% or less for the radiological analysis.  
 Samples will be processed in order to characterize as a composite. Processing and radiological suite will occur first, then chemical suite, and finally disposal suite.

Table 4-2. Packaging, Labeling and Transportation Requirements, LEHR Southwest Trenches Waste

Bulking / Sampling Groups (Sample ID)	LEHR Package Identification	HAZCAT ® Conclusion	Shipping Name	Hazard Class	Identification Number	Packaging Group	Outer Label	Inner Package Label	Shipping & Labeling Requirements
<b>Lab Pack Type 1: Biohazards</b>									
2 (CWDT076)	LEHR0232	Urine	Non-Infectious	7	UN 2910	N/A	Biohazard	Radioactive	Must be packaged in UN containers. Must have label on outside packaging. Must have sticker of 2 arrows pointing up. Must meet the following packaging requirements: 1. Watertight primary receptacles; 2. Watertight secondary receptacles; 3. Absorbent material and two times the volume; and 4. Sturdy outer packaging. Ship per LEHR SOP 2.1, Sample Handling, Packing and Shipment, as potentially radioactive. Must have radioactive label on inner package.
	LEHR0239a	Urine	Non-Infectious	7	UN 2910	N/A	Biohazard	Radioactive	
3 (CWDT077)	LEHR0324a	Urine	Non-Infectious	7	UN 2910	N/A	Biohazard	Radioactive	
4 (CWDT078)	LEHR0241a	Blood	Non-Infectious	7	UN 2910	N/A	Biohazard	Radioactive	
	LEHR0335a	Blood	Non-Infectious	7	UN 2910	N/A	Biohazard	Radioactive	
	LEHR0335b	Blood	Non-Infectious	7	UN 2910	N/A	Biohazard	Radioactive	
	LEHR0335c	Blood	Non-Infectious	7	UN 2910	N/A	Biohazard	Radioactive	
	LEHR0335d	Blood	Non-Infectious	7	UN 2910	N/A	Biohazard	Radioactive	
	LEHR0335e	Blood	Non-Infectious	7	UN 2910	N/A	Biohazard	Radioactive	
13 (CWDT087)	LEHR0239c	Tissue	Non-Infectious	7	UN 2910	N/A	Biohazard	Radioactive	
14 (CWDT088)	LEHR0240	Biologic	Non-Infectious	7	UN 2910	N/A	Biohazard	Radioactive	
<b>Lab Pack Type 2: Hazardous Materials, Potentially Rad-Impacted</b>									
9 (CWDT083)	LEHR0235	HCl	Hydrochloric Acid	8, 7	UN 1789 UN 2910	II	Corrosive <sup>1</sup>	Radioactive	Must be packaged in UN containers Must have shipping label on outside packaging. Must have sticker of 2 arrows pointing up. Must have proper shipping label and hazard identification label. Must meet the following packaging requirements: 1. Watertight primary receptacles; 2. Watertight secondary receptacles; 3. Absorbent material to absorb two times the volume; and 4. Sturdy outer packaging. Ship per LEHR SOP 2.1 Sample Handling, Packing and Shipment as potentially radioactive. Must have radioactive label on inner package.
10 (CWDT084)	LEHR0324c	HCl	Hydrochloric Acid	8, 7	UN 1789 UN 2910	II	Corrosive	Radioactive	
11 (CWDT085)	LEHR0233	Hypochlorite	Hypochlorite	8, 7	UN 1791 UN 2910	II	Corrosive	Radioactive	
12 (CWDT086)	LEHR0234	Arsenic Acid	Arsenic Acid	6.1, 7	UN 1553 UN 2910	I	Poison <sup>1</sup>	Radioactive	
15 (CWDT089)	LEHR0242a	Silver Nitrate	Silver Nitrate	5.1, 7	UN 1493 UN 2910	II	Oxidizer	Radioactive	

Table 4-2. Packaging, Labeling and Transportation Requirements, LEHR Southwest Trenches Waste (continued)

Bulking / Sampling Groups (Sample ID)	LEHR Package Identification	HAZCAT ® Conclusion	Shipping Name	Hazard Class	Identification Number	Packaging Group	Outer Label	Inner Package Label	Shipping & Labeling Requirements
<b>Lab Pack 3: Non-Hazardous Materials, Potentially Rad-Impacted</b>									
1 (CWDTC075)	LEHR0230a	N/A	N/A	N/A	N/A	N/A	N/A	Radioactive	Ship per LEHR SOP 2.1, Sample Handling, Packing and Shipment, as potentially radioactive. Must have radioactive label on inner package. Must meet the following packaging requirements: 1. Watertight primary receptacles; 2. Watertight secondary receptacles; 3. Absorbent material; and 4. Sturdy outer packaging.
	LEHR0230b	N/A	N/A	N/A	N/A	N/A	N/A	Radioactive	
	LEHR0230c	N/A	N/A	N/A	N/A	N/A	N/A	Radioactive	
	LEHR0230d	N/A	N/A	N/A	N/A	N/A	N/A	Radioactive	
5 (CWDTC079)	LEHR0230e	N/A	N/A	N/A	N/A	N/A	N/A	Radioactive	
	LEHR0324l	Agar	N/A	N/A	N/A	N/A	N/A	Radioactive	
6 (CWDTC080)	LEHR0325a	Agar	N/A	N/A	N/A	N/A	N/A	Radioactive	
	LEHR0325c	Silicate	N/A	N/A	N/A	N/A	N/A	Radioactive	
	LEHR0325d	Calcium Carbonate	N/A	N/A	N/A	N/A	N/A	Radioactive	
7 (CWDTC081)	LEHR0239b	Carbonate	N/A	N/A	N/A	N/A	N/A	Radioactive	
8 (CWDTC082)	LEHR0325e	Silver	N/A	N/A	N/A	N/A	N/A	Radioactive	
18 (CWDTC092)	LEHR0326a	Calcium carbonate	N/A	N/A	N/A	N/A	N/A	Radioactive	
21 (CWDTC095)	LEHR0324d	Sugar Solution	N/A	N/A	N/A	N/A	N/A	Radioactive	
22 (CWDTC096)	LEHR1311	N/A	N/A	N/A	N/A	N/A	N/A	Radioactive	
	LEHR 0336	N/A	N/A	N/A	N/A	N/A	N/A	Radioactive	
23 (CWDTC097)	LEHR 0337	N/A	N/A	N/A	N/A	N/A	N/A	Radioactive	
	LEHR 0336	N/A	N/A	N/A	N/A	N/A	N/A	Radioactive	
26 (CWDTC100)	LEHR 0337	N/A	N/A	N/A	N/A	N/A	N/A	Radioactive	
	LEHR 1306	N/A	N/A	N/A	N/A	N/A	N/A	Radioactive	
	LEHR 1307	N/A	N/A	N/A	N/A	N/A	N/A	Radioactive	
24 (CWDTC098)	LEHR 1308	N/A	N/A	N/A	N/A	N/A	N/A	Radioactive	
	LEHR 1306	N/A	N/A	N/A	N/A	N/A	N/A	Radioactive	
	LEHR 1307	N/A	N/A	N/A	N/A	N/A	N/A	Radioactive	
25 (CSDTC099)	LEHR 1308	N/A	N/A	N/A	N/A	N/A	N/A	Radioactive	
	LEHR 1306	N/A	N/A	N/A	N/A	N/A	N/A	Radioactive	
	LEHR 1307	N/A	N/A	N/A	N/A	N/A	N/A	Radioactive	

Notes:

<sup>1</sup> "Cargo Aircraft ONLY" label on outer package. For combination packagings, if glass inner packagings (including ampoules) are used, they must be packed with absorbent material in tightly closed receptacles before packing in outer packagings. For combination packagings, if plastic inner packagings are used, they must be packed in tightly closed metal receptacles before packing in outer packagings.

Abbreviations:

N/A = Not Available.

Sample ID = Sample Identification

## 5. WORK AREA DISMANTLEMENT

After sampling, bulking and packaging activities are complete, the work area will be decontaminated and dismantled in accordance with the Radiological Protection Program (Weiss, 1999b), specifically SOP 32.1, Contamination Control.

## 6. WASTE MANAGEMENT

The LEHR Waste Management Plan (Weiss, 2000e) outlines the appropriate process or expected lifecycle for all types of potential waste streams anticipated to be managed on site. Upon completion of the tasks outlined in this work plan, the project team will be able to manage the subject wastes in the most safe, efficient, cost-effective and compliant manner possible. In addition, analytical data will be generated that will facilitate waste designation and waste profiling for eventual waste disposal. All activities will be conducted in accordance with the following SOPs:

- 34.1, Waste Processing and Packaging;
- 34.2, Low-Level Radioactive Waste Storage;
- 34.4, Clean Waste Handling; and,
- 34.5, Waste Tracking System.

### 6.1 Waste Minimization

The LEHR Waste Management Program is committed to minimizing waste volumes at the LEHR Site by giving preference to source reduction, material substitution, decontamination, and recycling. Whenever possible, materials will be radiologically surveyed and released for disposal at a permitted disposal facility as non-radioactive waste. Work schedules and project planning will be designed and maintained to minimize the unnecessary donning and doffing of PPE to minimize secondary wastes.

A primary component of this task is to segregate empty, non-regulated waste packages that are currently comingled with potentially contaminated soil and liquids. In effect, this waste minimization technique will allow empty containers and packages to be disposed as non-regulated waste rather than carrying the designation of the soil and liquids that they formerly contained.

### 6.2 Task-Specific Guidance

All excavated lab waste will be sent to an analytical laboratory for characterization. All immunoassay test spoils will be sent to an analytical laboratory for characterization, and the remaining empty glassware and packaging will be segregated as non-regulated, CE material for eventual disposal (see Section 3.2). Bulked, archived samples will be managed as potentially hazardous waste pending analysis. The potentially mixed waste (soil and wood) will be managed as low-level radioactive waste (LLW) pending analysis. All secondary waste (i.e., PPE) will be accumulated and added to appropriate SWT RA waste packages for eventual disposal as LLW.

### 6.3 Waste Tracking System

WTSs shall be completed whenever the status of a waste package is modified as described in SOP 34.5, Waste Tracking System. Examples of when WTSs shall be completed are listed below:

- The contents of a package are modified (i.e. transferred, combined, added to, etc.);
- A package is rendered empty (contents transferred to another container);
- A package is sampled;
- A new package is used and therefore requires a unique LEHR WTS number; and,
- The storage location of the package changes (i.e. a package is transferred from the Western Dog Pens to Geriatric-I).

New and updated WTSs will be submitted to the FWC daily for review. Following review and approval, the WTSs will be submitted to the LEHR Waste Tracking System Coordinator for incorporation into the LEHR Waste Tracking System database.

## 7. HEALTH AND SAFETY

Health and safety considerations for the activities detailed within this plan are addressed in the following documents:

- PHSP (Weiss, 1998a);
- HSPs (Weiss, 2000d);
- SOPs (Weiss, 1999c);
- Contingency Plan and General Emergency Response Procedures (Weiss, 2000c);
- ALARA Program (Weiss, 1999a); and,
- RPP (Weiss, 1999b).

The health and safety considerations presented in this section coupled with the foregoing listed documents are the safety and health program required by 29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response*, and 10 CFR 835, *Occupational Radiation Protection*, for these work activities.

### 7.1 Activity Hazard Analysis

An AHA identifies potential safety, health and environmental hazards and defines controls necessary for the protection of personnel. Hazard analysis helps ensure that all safety concerns associated with sampling and waste handling activities are met. An AHA describing hazard analysis and controls related to activities covered by this work plan is presented as Attachment 1.

During these activities, the SHSO or designee will monitor activities for any changes in conditions that would require modification of controls (e.g., PPE). In the event that changes produce radiological or industrial health and safety conditions that are not covered by this work plan or referenced documents, this work plan and Hazardous Work Permits will be modified in accordance with the procedures contained in Standard Quality Procedure 11.1, *Fieldwork Variances/Request for Information* (Weiss, 2000b).

#### 7.1.1 Radiological Exposure

The excavated wastes and materials contain low-levels of radioactive material from prior animal research activities. The predominant radionuclides used during these activities were radium-226, strontium-90, Cesium-137, and tritium. During waste segregation and packaging

activities in support of the SWT RA, there was indication of tritium contamination in one of the poly-buckets to be categorized (approximately seven microcuries per swipe).

Waste sample handling and packaging may present exposure to radioactive materials through contact, ingestion, and inhalation. Exposure rates and contamination levels will be monitored and controlled by the RCT in accordance with the RPP and the following procedures:

- SOP 24.1, Radiological Areas and Postings;
- SOP 25.1, Radiological Surveys and Instrumentation;
- SOP 32.1, Contamination Control;
- SOP 37.1, Tennelec Series 5 Low Background Counting System;
- SOP 37.2, Liquid Scintillation Counter;
- HSP 14.1, Airborne Radioactivity Monitoring;
- HSP 15.1, External Radiation Control; and,
- HSP 17.1, Hazardous Work Permits

Personnel radiological exposure will be maintained ALARA by employing all appropriate engineering and administrative controls. The use of a HEPA ventilation unit and appropriate PPE will serve as the major engineering controls. Administrative controls to be used consist of the HWP, personnel training and adherence to all site procedures and postings.

Personnel will wear Modified Level D PPE as defined in the PHSP and as specified on the HWP. The level of PPE will be modified and the HWP will be revised if radiological conditions exceed anticipated action levels stated in Section 7.2.10 of this work plan.

ALARA guidelines for this activity are included as Attachment 2.

### *7.1.2 Chemical Exposure*

The excavated lab waste materials (poly-buckets) contain hazardous chemicals (see Table 1). The potentially mixed waste (wood and soil), the archived samples and the spent immunoassay test spoils may contain hazardous chemicals. Whenever possible, bulking and sampling activities will be carried out in the capture zone of the HEPA ventilation unit. No direct sampling of the excavated lab waste is required, eliminating potential chemical exposure to personnel. During the HAZCAT® in 1999, no elevated detections were recorded with the photo-ionization detector (PID) and none are expected during conduct of the activities detailed in this work plan.

Baseline and periodic real time air monitoring will be performed in the breathing zone for volatile organic compounds with a PID. Ingestion of chemicals will be minimized by use of proper PPE and personal hygiene. Administrative and engineering controls will be used to reduce potential exposure to chemicals. Should airborne concentrations exceed action levels stated in Section 7.2.10 of this work plan, additional engineering controls will be implemented if feasible before considering the use of additional PPE. During conduct of this activity, pH strips will be placed on the work table and be utilized to monitor the work area for acid contamination.

## 7.2 Hazard Controls

The control measures to be implemented during the execution of this work plan are described below, and will supplement the PHSP.

### 7.2.1 Hazardous Work Permit

A HWP will be used to control work in the contamination area. The HWP will be issued in accordance with the procedures specified in the PHSP. All work is to be performed in accordance with this approved HWP which will at minimum describe or reference the following:

- Scope of work to be performed;
- Anticipated radiological, safety, and industrial hygiene conditions;
- PPE and respiratory protection requirements;
- Radiological and industrial hygiene monitoring requirements;
- Dosimetry requirements;
- Work plan and/or AHA;
- Period for which the HWP is valid; and,
- Additional requirements for entry.

### 7.2.2 Boundaries

The work area will be enclosed by boundary ropes or ribbons supported with stanchions. The placement of the stanchions and boundaries will be planned by the PTL/SC to facilitate access to the work area for equipment. The boundaries will be set up and signs posted in accordance with the PHSP and the RPP.

### 7.2.3 Personal Protective Equipment

Employees will wear modified Level D PPE in accordance with the PPE selection matrix in Section 9 of the PHSP. RCTs and the SHSO will collect air-monitoring data during conduct of the activities covered in this work plan. The task-specific level of protection will be upgraded or downgraded based on the measurements of direct reading instruments compared to action levels in section 7.2.10 of this plan, a change in site conditions or other findings. Changes in the level of protection require approval by the PHSM, or designee.

Modified Level D PPE will consist of the following:

- Steel-toed shoes;
- Chemical resistant outer and inner boot covers;
- Tyvek coveralls;
- Safety glasses with side shields;

- Chemical resistant inner and outer gloves; and
- Full tape of wrists, ankles and zipper.

#### 7.2.4 Decontamination Procedures

Decontamination procedures will be conducted in accordance with Section 10 of the PHSP for personnel, equipment and PPE, and with HSP 18.1, Personal Contamination (Update No.1). When performing radiological work, workers will perform personal monitoring with the guidance of a RCT. All equipment/materials will be monitored and handled/packaged in accordance with the RPP and SOP 32.1, Contamination Control.

#### 7.2.5 Training

Personnel performing activities associated with this activity will receive training covering this plan and with HSP 20.1, Worker Safety and Radiation Protection Training, Rev 0 (Update 1). Minimum training requirements will be specified in the HWP. The SHSO and RSO will ensure that all personnel are trained in accordance with the PHSP and RPP as appropriate. Only qualified personnel as determined by the PM and PHSM will be allowed to carry out tasks described herein. As specified in the PHSP, daily tailgate safety meetings will be conducted that will supplement the LEHR training program.

#### 7.2.6 Buddy System

The buddy system will be utilized to protect personnel in the work area. At least two persons will be required to be in the work area when work is conducted in the CA.

The buddy system is a method of organizing employees into work groups and is designed to provide those employees with assistance when needed. Each employee in a work group is designated to be observed by at least one other person. Assignment of designated partners should take place during the daily tailgate safety meeting.

The responsibility of the buddy is to:

- Provide assistance, if needed;
- Maintain line-of-sight contact or verbal contact with workers in the CA;
- Observe for signs of chemical or physical trauma or heat stress such as:
  - changes in complexion and skin discoloration;
  - changes in coordination or demeanor;
  - excessive saliva and pupillary response; or,

- changes in speech pattern;
- Periodically verify the integrity of all protective clothing; and,
- Notify the SHSO and TL/SC if emergency help is needed.

### 7.2.7 *Safety Equipment*

In addition to other equipment specified in this work plan, the following safety equipment will be staged at the boundary of the CA:

- First aid kit;
- Portable eyewash station and hand shower;
- Air horn;
- Portable radio for emergency communications; and,
- Fire extinguisher.

### 7.2.8 *HEPA Ventilation System*

A HEPA ventilation system will be used during this activity. Site HEPA ventilation units are rated to filter up to 2,000 cubic feet per minute. The HEPA unit will be operated by site RCTs under the supervision of the RSO. The HEPA unit will be placed in a location that will draw potential airborne contaminants away from personnel, through the HEPA filters, and exhausted outside the building. The ventilation units will be positioned to effectively capture potential contaminants while ensuring that the ventilation rate is neither excessive nor capable of capturing unwanted items in the ventilation ductwork. Smoke tubes or other airflow devices will be utilized to ensure that the HEPA filtration units are appropriately positioned and providing the necessary capture velocity and area.

### 7.2.9 *Spill Containment*

In addition to the mitigation measures presented in this work plan, a spill and discharge control plan has been prepared to provide contingency measures for potential spills and discharges from handling and movement of potentially hazardous wastes. This spill and discharge control plan is in the PHSP and the CPGERP. Spill control kits are located throughout Geriatrics-I in sufficient quantity to mitigate any spills of the subject materials.

### 7.2.10 Air Monitoring

Air monitoring is essential to ensure that all field personnel will be adequately protected from airborne contaminants. Air monitoring will be conducted in accordance with:

- HSP 6.1, Air Monitoring;
- HSP 14.1, Airborne Radioactivity Monitoring;
- Section 11 of the PHSP; and,
- Monitoring Guidelines.

General area radiological air monitoring locations will be near/in the work area having the highest potential for generating airborne radioactive contaminants.

All personal integrated air monitoring samples and direct instrumentation readings taken for the purpose of determining appropriate Health and Safety precautions shall be collected/taken in the approximate "breathing zone" of site personnel and integrated over an appropriate time interval. As appropriate, selective monitoring of high-risk workers will be conducted.

The action levels are:

- VOC's – 200 parts per million in "breathing zone" for methanol (sample groups 24 and 25, see Table 1); and,
- Airborne Radioactivity – 0.1 times the derived air concentration (DAC). For radionuclides of concern the DACs are:
  - Radium-226 –  $3E^{-10}$  microcuries/ml
  - Strontium-90 –  $2E^{-9}$  microcuries/ml

### 7.2.11 Site Emergencies

All site workers shall be trained on the procedures outlined in the CPGERP for responding to potential incidents. The SHSO will ensure that all appropriate emergency equipment is available and review evacuation procedures with workers.

## 8. QUALITY ASSURANCE

This section addresses QA/QC for the scope of work described in this document. The objective of this section is to provide a framework to ensure that quality is integrated within every aspect of the project work.

Personnel involved in conducting or supervising the work described in this work plan are responsible for certifying that they have been instructed in applicable sections of the work plan, including health and safety, as may affect their work. This certification will be obtained, documented and filed for each affected worker by the PTL, or designee, in accordance with the requirement outlined in the Quality Assurance Project Plan (QAPP) (Weiss, 2000a).

Other quality assurance requirements applicable to this work plan are detailed in the QAPP for the environmental restoration activities at the LEHR site (Weiss, 2000a). This plan is based upon the requirements of United States Department of Energy Order 414.1A *Quality Assurance* and United States Environmental Protection Agency QAMS-005/80 *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans* as they are applicable to the scope of work.

Samples collected under this work plan will be analyzed by General Engineering Laboratories, Inc. in Charleston, South Carolina. Laboratory reports (hard copies and electronic files) will be forwarded from the laboratories to the Weiss Associates Data Validation Chemist. These results will be validated and transferred to the project database by the Weiss Associates Database Manager in accordance with procedures described in the QAPP.

## 9. REFERENCES

- Hazardous Materials Publishing Co., Inc., 1998, 1998/1999 Hazardous Materials, Substances and Waste Compliance Guide.
- Weiss Associates (Weiss), 1998, Project Health and Safety Plan for Environmental Restoration/Waste Management for the Laboratory for Energy-Related Health Research (LEHR), University of California at Davis, California, November.
- Weiss, 1999a, Final As-Low-As-Reasonably-Achievable (ALARA) Program for the Laboratory for Energy-Related Health Research (LEHR), University of California at Davis, California, July, Rev. 3.
- Weiss, 1999b, Final Radiological Protection Program for the Laboratory for Energy-Related Health Research (LEHR), University of California at Davis, California, November, Rev. 3.
- Weiss, 1999c, Standard Operating Procedures for the Laboratory for Energy-Related Health Research (LEHR), University of California at Davis, California, December.
- Weiss, 1999d, Work Plan for Inventory, Hazardous Categorization and Segregation of Southwest Trenches Removal Action Lab Waste for the Laboratory for Energy-Related Health Research (LEHR), University of California at Davis, California, December.
- Weiss, 2000a, Quality Assurance Project Plan for Environmental Restoration/Waste Management at the Laboratory for Energy-Related Health Research, University of California, Davis, June, Rev. 3.
- Weiss, 2000b, Standard Quality Procedures for Environmental Restoration/Waste Management at the Laboratory for Energy-Related Health Research, University of California, Davis, June.
- Weiss, 2000c, Contingency Plan and General Emergency Response Procedures for the Laboratory for Energy-Related Health Research (LEHR), University of California at Davis, California, August.
- Weiss, 2000d, Health and Safety Procedures, for the Laboratory for Energy-Related Health Research, University of California, Davis, August.
- Weiss, 2000e, Waste Management Plan for Removal Actions in the Southwest Trenches, Ra/Sr Treatment Systems, and Domestic Septic Systems Areas at the Laboratory for Energy-Related Health Research, University of California, Davis, July, Rev. 0.

## **ATTACHMENT 1**

### **ACTIVITY HAZARD ANALYSIS**

Attachment 1. Activity Hazard Analysis for LEHR Southwest Trenches Waste Bulking and Sampling

Work Plan Step	Associated Hazards	Hazard Controls
Task Set-up/Dismantlement	Radioactive contamination	<p>Personnel who handle radioactive materials will, at a minimum, have completed the appropriate level of Rad Worker training. All activities performed in a contamination area will be approved by the Radiation Safety Officer, in accordance with the provisions of the Hazardous Work Permit (HWP) and under supervision of RCT.</p> <p>Personnel will wear appropriate personal protective equipment (PPE) to prevent inhalation of, or skin contact with, any form of contaminant. A HWP will be used for control of any work involving contaminants. Use of engineering controls will be evaluated. Soils will be monitored with a Geiger-Mueller (GM) counter and sodium iodide scintillation detector and photoionization detector (PID). Air monitoring in the area will be conducted to evaluate the level of protection and upgrade PPE as appropriate.</p> <p>Rad Worker II training and site specific training will be provided for unescorted workers.</p> <p>No eating, drinking or smoking in contamination area.</p> <p>Workers will have OSHA 40 hour, OSHA 8 hour refresher, and OSHA 8 hour supervisor training (as appropriate).</p>
	Chemical exposure	<p>All workers will comply with the approved HWP.</p> <p>Modified Level D PPE will be used. The eye wash will be staged near the work area and staff will be trained to locate and utilize the chemical decontamination shower. Staff will be trained to understand hazards of chemicals.</p> <p>No eating, drinking or smoking in contamination area.</p>
	Slips, trips, falls	<p>Visually inspect the area prior to work. Maintain a clear work area and follow good cleanup practices.</p>

Attachment 1. Activity Hazard Analysis for LEHR Southwest Trenches Waste Bulking and Sampling

Work Plan Step	Associated Hazards	Hazard Controls
	Lifting heavy objects	Workers will be trained in proper lifting techniques. Lift heavy objects (greater than 50 lbs) with two or more people and use proper lifting equipment. Daily lifting equipment inspections. Only qualified personnel will operate lifting equipment.
Bulking/Segregation	Radioactive contamination	See Above
	Chemical exposure	See Above
	Heat/cold stress	Workers will be properly trained to identify signs of heat/cold stress. Drinking water will be available. Work shifts will be designed appropriately for environmental conditions.
	Lifting heavy objects	See Above
	Slips, trips, falls	See Above
Sample Collection	Radioactive contamination	See Above
	Chemical exposure	See Above
	Heat/cold stress	See Above
	Slips, trips, falls	See Above

Attachment 1. Activity Hazard Analysis for LEHR Southwest Trenches Waste Bulking and Sampling

Work Plan Step	Associated Hazards	Hazard Controls
	Hand and power tools	Conduct daily visual tool inspection. Workers to be trained in the proper operation of tools. Workers will wear proper PPE.
Operating Heavy Equipment	Lifting heavy objects	See Above
	Heat/cold stress	See Above
	Slips, trips, falls	See Above
Waste Handling	Radioactive contamination	See Above
	Chemical exposure	See Above
	Heat/cold stress	See Above
	Lifting heavy objects	See Above
	Slips, trips, falls	See Above

**Abbreviations:**

HEPA High-Efficiency Particulate Air  
 PPE Personal Protective Equipment  
 RCT Radiological Control Technician

**ATTACHMENT 2**

**ALARA GUIDELINES**

**ALARA GUIDELINES FOR BULKING AND  
SAMPLING SOUTHWEST TRENCHES  
REMOVAL ACTION LAB WASTE**

at the

**LABORATORY FOR ENERGY-RELATED HEALTH RESEARCH  
UNIVERSITY OF CALIFORNIA, DAVIS**

*Prepared for:*

**United States Department of Energy**  
Oakland Operations Office  
1301 Clay Street  
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November 3, 2000  
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Issued To: \_\_\_\_\_ Date: \_\_\_\_\_

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**ALARA GUIDELINES FOR BULKING AND  
SAMPLING OF SOUTHWEST TRENCHES  
REMOVAL ACTION LAB WASTE**

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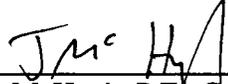
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## CONTENTS

1.	INTRODUCTION	1-1
2.	GUIDELINES/PRACTICES	2-1

## 1. INTRODUCTION

As-Low-As-Reasonably-Achievable (ALARA) consideration is required for work involving removal actions (RAs) at LEHR in accordance with 10 CFR 835 and the LEHR ALARA Program. Specifically, these ALARA guidelines/practices pertain to performing segregation, sampling, bulking and packaging of various wastes removed during the Southwest Trenches RA. These activities are detailed in the Work Plan for Bulking and Sampling of Southwest Trenches Removal Action Waste. These ALARA guidelines/practices may benefit by change (addition, deletion, or revision) as the project planned activities progress. Change shall be approved by the Radiological Safety Officer (RSO) or Radiological Control Manager (RCM) and be appropriately documented. These guidelines/practices may apply to other tasks upon written direction of the RSO or RCM. These ALARA guidelines/practices are not necessarily inclusive of all procedures required for either worker protection or preservation of the environment.

## 2. GUIDELINES/PRACTICES

There is no anticipated, significant, known or measurable radiation dose (either external or internal) associated with the tasks required by this work plan. Therefore, a graded approach was made to evaluate and implement ALARA procedures. In accordance with the LEHR ALARA Program, every effort should be made to maintain doses to ALARA levels. Therefore, the following precautionary procedures should be implemented:

### ADMINISTRATIVE CONTROLS

#### Training:

1. Each worker entering the exclusion zone shall be instructed on these ALARA provisions (either as on the job training or at a tailgate safety meeting).
2. Reinforcement of Rad Worker II training shall be periodically conducted during tailgate safety meetings and on the job instruction to demonstrate how ALARA can be achieved by use of appropriate work procedures and practices.
3. Workers shall be instructed in the proper use of tools and methods to limit the generation of dust and/or vapors.
4. Workers shall be instructed in methods of maintaining PPE integrity to reduce personal contamination, including methods to reduce likelihood of cuts (creating potential for contamination) from waste (i.e., sharps) and equipment.
5. Personnel shall be instructed on the proper means of egress from contaminated areas to reduce exposure and the possibility of spreading contamination.
6. Workers shall be advised of areas or surfaces that are known to contain appreciable levels of removable surface contamination above background.
7. New or revised ALARA guidelines/practices shall be added to this list as identified throughout the task. These changes shall be discussed during tailgate safety meetings with site workers.
8. A dry-run or mock-up shall be used whenever possible to ensure workers are familiar with equipment and to mitigate any potential problems without actually handling radiological material.

9. Material shall be radiologically screened prior to handling.
10. Radiologically-impacted packages will not be opened unless necessary.
11. Work shall begin with the least contaminated area and finish with the most contaminated area when practical.
12. Workers shall be instructed on the purpose, intent, and proper operation of the HEPA filtration unit as it applies to their task assignments.

**All Personnel:**

1. Workers shall follow all applicable project procedures, practice, and work plan instructions as advised by the Radiological Control Technician (RCT), the Radiological Safety Officer (RSO), the Site Health and Safety Officer (SHSO), and supervisory personnel.
2. Workers shall not follow procedures that are deemed non-ALARA by the RCT, the RSO, the SHSO, or supervisory personnel.
3. Workers shall optimize all work and operations to maintain dose ALARA, when and where practical.
4. Workers shall not bring construction materials, tools, and equipment not required for work into the CA, where practical.
5. Workers or supervisors shall ensure equipment is operational and functional prior to bringing it in to the CA.
6. Workers shall maintain a reasonable distance between themselves and the work task if their duties do not require their immediate presence at the task site.
7. Workers shall follow protocols for personal decontamination, personal hygiene, and work zone controls to minimize exposure.
8. All waste handling shall be done in a safe, expedient and planned manner.
9. If a HEPA filter is required for a task, then the work should be discontinued if the HEPA filter fails.
10. The workers should avoid placement of their heads in the air flow pathway between the work area and the HEPA filter.

### **Supervisors/Managers:**

1. Supervisory personnel shall optimize all work and operations to maintain dose ALARA, when and where practical.
2. Only workers that have a need to be within the CA shall be permitted to enter the CA.
3. Supervisors shall attempt to eliminate any unnecessary work.
4. Supervisors shall ensure use of a trained work force, sequence tasks to reduce exposure, schedule work in an efficient manner, and identify/coordinate necessary resource requirements.
5. Any materials, tools, or equipment required for work in the CA shall be evaluated by a RCT for ease of decontamination prior to bringing such equipment into the CA.
6. Equipment shall not be knowingly exposed to contaminants that knowingly cannot be decontaminated without major personnel exposures.
7. When practical, extension tools shall be used to eliminate or minimize personnel entry into the CA.
8. Supervisors shall ensure equipment is operational and functional prior to bringing it in to measure dose exposures in the contamination area.
9. Workers shall be supervised and monitored to minimize exposure to airborne contamination.

### **ENGINEERING CONTROLS**

1. All work areas, including lay down and waste storage areas, shall be chosen with ALARA considerations in mind.
2. Foot traffic patterns and pathways shall be chosen to minimize the potential spread of contamination and cross-contamination.
3. Precautions shall be taken to prevent and mitigate any waste spills, especially to drainage pathways, and to prevent off-site release of airborne contaminants.
4. Air intakes shall be re-routed to minimize exposure to adjoining structures and personnel when practicable.
5. The work area shall be ventilated using a HEPA filtration system which is vented to the building exterior.

6. Direct contact with objects containing known and measurable radiological contamination shall be avoided by placement of barriers, such as plastic, between the workers and these objects when practical.
7. Periodic visual checks (smoke test or equal) should be conducted of the HEPA unit to ascertain that the capture velocity and area are adequate.
8. The HEPA units shall be checked to evaluate their capture efficiency (Dioctyl-ethylhexyl Phthalate test or equal).

## **MONITORING**

1. Every effort shall be made to keep all doses ALARA and less than 100 mrem Cumulative Effective Dose Equivalent (CEDE).
2. Monitoring shall be conducted and consideration of measured levels should be utilized in ALARA procedures review and revision.
3. RCTs shall incorporate radiological hold points into monitoring and evaluation, when appropriate.
4. Waste containers shall be swipe-sampled and analyzed, when directed by the RSO, prior to being handled for evaluation or removal from the CA.
5. Unknown waste materials shall not initially be approached by anyone other than an RCT.
6. All containers shall be tagged with the appropriate information which conveys the hazard associated with it (dose rate, isotope, etc.).