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. . . protecting the environment
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April 7, 1998

TO: Activity Control Envelope Members
Subject Matter Experts
Cross-Table Review Members

TRANSMITTAL OF THE FINAL ROCKY FLATS ENVIRONMENTAL SITE ACTIVITY CONTROL ENVELOPE (ACE) FOR THE SOURCE REMOVAL AT TRENCH 1 IHSS 108, REV. 0 - MCB-012-98

Enclosed is a copy of the "Final Rocky Flats Environmental Site Activity Control Envelope (ACE) for the Source Removal at Trench 1 IHSS 108, Rev. 0." I would like to take this time to thank you for your patience, time, and participation in the development of the ACE document.

If you have any questions or concerns please contact me at (303) 966-5891.

MC Burmeister

M. C. Burmeister
Project Manager

SLM/aw

Enclosure:
As Stated

ADMIN RECORD
BZ-I108-A-00035

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
ACTIVITY CONTROL ENVELOPE (ACE)
FOR THE
SOURCE REMOVAL AT TRENCH 1 IHSS 108, Rev. 0

PREPARED BY:

MC Burmeister / 3-11-98

Mark Burmeister Date
ACE Development Team Leader

The activity standards basis herein enhances the activity's safety basis and is consistent with the Auditable Safety Analysis and the Authorization Basis constituted by the Trench 1 Health and Safety Plan (HASP), and the Auditable Safety Analysis.

APPROVED BY:

Annette Primrose 3-11-98

Annette Primrose Date
ER Projects Manager

The activity standards basis defined herein is adequate for preparation and performance of the subject activity and is approved for site use.

CONCURRED BY:

[signature] / 3/12/98

Division Manager, Date
Activity Based Management

TRENCH 1 ACE DEVELOPMENT TEAM CONSENSUS

The individuals listed below are members of the ACE Development Team responsible for the preparation of this document. Signature indicates concurrence with the contents thereof.

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1.0 INTRODUCTION

1.1 Purpose

The purpose of this Activity Control Envelope (ACE) is to identify the standards, constraints, hazards, and controls associated with source removal at Trench 1 (T-1) IHSS 108 at the Rocky Flats Environmental Technology Site (RFETS).

T-1 is located just north of Central Avenue, west of the inner east access gate, and south and southeast of the Mound Area. The trench is approximately 250 feet long, 15 feet wide, and 10 feet deep. Records indicate that approximately 25,000 kilograms of unoxidized depleted uranium (DU) machining chips (uranium-238) and water soluble lathe coolant oils in an estimated 125 drums are buried in T-1. Records have been located documenting the placement of 85 drums in T-1 containing 10,000 to 20,000 kilograms of depleted uranium (DU). Burial of DU in T-1 began in November 1954 and ended in December 1962. The drums were covered with approximately 2 to 5 feet of soil. Each group (or shipment) of drums was placed in the trench and then covered with soil.

Based on existing records, process knowledge, and interviews with former workers, the drums in T-1 are believed to have originated from Building 444. During the period T-1 was open, Building 444 was a multi-purpose manufacturing facility with emphasis on manufacturing DU and DU alloy components.

In addition to the depleted uranium chips packed in lathe coolant, other wastes are documented as being buried in T-1. These wastes include at least ten (10) drums of cemented cyanide waste and at least one drum of "still bottoms", potentially originating from the Building 444 plating operations, and distillation unit, respectively. Still bottoms could have been produced by one or more processes. Evaporation of lathe coolant in drums produced a waste referred to as "still bottoms" in Building 444. Trichloroethene and tetrachloroethene were utilized to wipe down and clean completed DU components within Building 444, and a still was used to recover these compounds, producing a separate waste stream also called "still bottoms".

Geophysical characterization was performed in the spring of 1995. A series of electromagnetic (EM) and ground penetrating radar (GPR) surveys were performed at the T-1 site. The EM and GPR indicate that the bulk of the buried drums are located at the west end, and to a lesser extent the east end of the trench. Based on discussions, and interviews with retired workers, the drums containing the DU are believed to be buried in the western end of the trench; the eastern end of the trench is expected to contain crushed drums and construction debris (pallets, drum fragments, glass, etc.). A small amount of metallic objects and debris was also identified in the center of the trench.

Proposed actions that will be undertaken at the T-1 Site include removing the potentially pyrophoric depleted uranium (DU) from the trench for offsite stabilization/treatment, and removing and treating (if necessary) debris, contaminated soils, and other material that may be contained in the trench. The objective of the action is to remediate the risk posed to the environment and future users of the site by removing the potentially pyrophoric uranium and other materials. The DU and associated materials excavated from the trench are expected to be Low-Level Waste (LLW). When source removal is complete, the trench will not contain DU or soils contaminated above Rocky Flats Cleanup Agreement (RFCA) Tier I action levels for radionuclides or volatile organic compounds (VOCs). Work control documents for this project are 1) the Proposed Action Memorandum (PAM) for the Source Removal at Trench 1, IHSS 108, 2) The Sampling and Analysis Plan (SAP) to Support the Source Removal at Trench 1, IHSS 108, 3) the Site-Specific Health and Safety Plan (HASP) for the Source Removal at Trench 1, IHSS 108, including the Auditable Safety Analysis (ASA), 4) the Integrated Work Control Package (IWCP), 5) the Field Implementation Plan (FIP) for the Source Removal at Trench 1 IHSS 108, 6) Federal, State and Local Laws, 7) DOE Orders, and 8) RFETS policies and procedures.

The following major activities were assessed by the ACE team members and the Trench 1 Team Subject Matter Experts:

- Material Excavation
- Material Segregation and Staging prior to transfer to the Sampling and Inerting Pad (SIP)
- Packaging, Inerting and Sampling of excavated materials at the SIP

1.2 Scope

This document and the analysis herein are exclusively applicable to the source removal at T-1. This ACE addresses the major activities listed above, and does not include on-site over-the-road transportation, off-site transportation, treatment, and backfilling for reclamation and re-vegetation. These activities have been determined to be low risk, and therefore not subject to the ACE process. This ACE document may be used by any and all Site personnel who are directly or indirectly involved with the planning, development, implementation, or close-out of activities relating to the source removal at T-1.

1.3 Justification of Adequacy

The Justification of Adequacy (JOA) depicts a performance based rationale for the adequacy of the set of management, technical, and performance standards/expectations. It reflects a process of consensus by a specifically convened ACE Development Team. Development of work control documents using the standards and expectations identified in this ACE will serve as the basis to ensure adequate control of the performance of the project activities.

Activity Control Envelope team members addressed the T-1 site and hazards in the trench where the activity will be performed by using subject matter experts and activity walk-downs. The ACE team has sole responsibility for evaluation of the information presented and for determination of its adequacy. For the purposes of planning and assessment, the process has been broken into three major evolutions: excavation, segregation, and inerting and packaging. Each evolution will be performed repeatedly. Details of each, including expected conditions, flowcharts, controls, hazards and potential upset conditions, and response to upsets, are included in the following sections. Each evolution is summarized below; however, prior to describing each evolution, the conceptual model developed for Trench 1 should be understood.

TRENCH 1 CONCEPTUAL MODEL

The characterization and the development of the conceptual model for Trench 1 was started before the ACE Development Team convened. The conceptual model has since been reviewed, expanded and improved upon, and validated by the ACE Development Team.

Development of the Trench 1 conceptual model involved using several methodologies and sources, including:

- performing an extensive search and review of historical documentation, including memoranda, waste manifests, meeting notes, and compiling historical data from the Historical Release Report
- conducting personal interviews of retired building and operations staff to identify buried materials, potential contaminants, trench location, size, and configuration
- reviewing historical aerial photographs to identify disturbed areas, and verify trench dimensions and location, and determine time of operation
- reviewing existing subsurface soil and groundwater data
- conducting site visual surveys to identify physical features and establish a geophysical sampling grid
- conducting electromagnetic (EM) and ground penetrating radar (GPR) surveys to locate buried conductive and/or metallic objects and define trench boundaries
- performing soil gas surveys to identify and delineate potential contaminant plumes
- evaluating information and Lessons Learned from past Environmental Remediation projects, including Ryan's Pit, Trenches T-3/T-4, the Mound Site, and from other DOE Sites, and
- reviewing information on the 1982 incident and discovery of two drums uncovered during weed cutting activities.

Due to the suspected presence of pyrophoric uranium within Trench 1, and its potential hazards, no intrusive sampling activities have been conducted within the trench boundaries. Because the Trench 1 source removal action is focused on removal and stabilization of the depleted uranium and other wastes within the trench, as prescribed by the Rocky Flats Clean-up Agreement (RFCA), additional sampling and characterization is not prudent. Further sampling of the trench would likely not provide definitive information on the trench characterization due to the size of the trench and the scattered distribution of the drums within the trench. However, the characterization that has been performed has been determined by the ACE Development Team to reduce the uncertainties to a reasonable and acceptable level.

Trench 1 is known to contain depleted uranium in concentrations above the RFCA Tier I radionuclide action levels. Other potentially hazardous wastes, including cyanide and volatile organic compounds (VOCs) may be present in the trench and may exceed RFCA Tier I action levels as well. In order to comply with the RFCA, a remedial action is required for the Trench 1 area.

The primary purpose of a T-1 remedial action is to eliminate potential risks to human health and the environment by rendering the contaminants of concern non-hazardous. Three methods of remediation were evaluated for the T-1 site: (1) source removal, on-site treatment (encapsulation), and off-site disposal; (2) capping in place without source disturbance, and (3) source removal, off-site treatment/recycling (calcining), and disposal.

The T-1 source removal with on-site treatment approach entails excavating drums and stabilizing the potentially pyrophoric DU materials by encapsulation with a cement-based slurry. Further, an estimated 1,000 to 1,500 cubic yards of associated radiologically contaminated soils, debris, and other drummed wastes also located within the trench will be excavated and treated (if necessary) on site. All remediation wastes shall then be appropriately packaged for off-site disposal at a licensed facility.

The capping approach involves placing directly over the trench area an engineered cover that meets all Resource Conservation and Recovery Act (RCRA) design criteria. This reduces fugitive dust emissions and vertical migration of precipitation. A long-term monitoring and maintenance program would be implemented to track the potential groundwater impacts and maintain cap integrity.

The third approach considered source removal, with treatment (calcining) and potentially recycle of depleted uranium material at an off-site facility. The calcining process converts the reactive metal into a stable oxide and combines the soil and uranium oxide into a disposable waste form. Uranium retrieved without significant commingled soil may be recycled for beneficial re-use as shielding.

The remediation methods were reviewed and the excavation, off-site treatment (calcining), and disposal approach was selected. In consideration of present and future impacts, this option was considered the most suitable for the following reasons:

- **Source removal presents a permanent remedy**
  The long-term hazards posed by T-1 will be eliminated from RFETS when contaminated material is located and identified, immobilized, and transferred to one of a select number of locations in the U.S. that provide controlled management and inventory of radioactive wastes.

- **DU wastes have long term toxic potential**
  The toxic effects DU waste presents to humans will not degrade over a reasonable period of institutional control (*i.e.*, 100 to 1,000 years). The toxic potential could still be present long after an engineered cap has deteriorated.

- **Uranium oxide presents high inhalation risks**

Although DU does not pose a high radioactive dose risk, it is possible that some of the uranium has been transformed to uranium oxide. Uranium oxide in an uncontrolled state presents a high risk factor for inhalation of fine particles, which must be considered for future site uses.

- **Other unknown wastes must be managed**
  T-1 is documented to contain cemented cyanide waste, of which the level of stabilization is unknown. Other unknown wastes could exist in the T-1 trench. Best environmental management practices require that unknown hazardous wastes, especially those with possible groundwater impacts, be located, characterized, and rendered inert to provide long term protection.

- **Possible VOC impacts to RFETS groundwater exist**
  Because historical information indicates the use of tetrachloroethylene and trichlorethylene in Building 444, T-1 remains a potential source of VOC contamination, especially to the upper zones of groundwater at the RFETS.

- **Off-site treatment reduces risks to RFETS, Public Health, and the Environment**
  Because the pyrophoric depleted uranium materials will be immediately inerted in DOT certified shipping containers to render it stable, personnel handling and exposures are minimized for the worker, public, and the environment. Treatment of potentially pyrophoric materials will be performed at an existing off-site facility with the necessary controls in place to handle the material.

- **Calcining converts the uranium reactive metal into a stable non-reactive oxide**
  Because the reactive depleted uranium metal is calcined (oxidized) at approximately 550 ° C the metal is converted into stable uranium oxide (U_3O_8). Uranium oxide does not present any hazard with respect to potential fire. The traditional method for stabilization of uranium metal turnings involves the use of grout or similar product for encapsulation. Depleted uranium is not chemically changed by grouting, and long term degradation of the grouted waste form may occur as the uranium metal slowly combines with oxygen or moisture from the grout. This could result in fracturing of the grout monolith and provides for a potentially leachable uranium geometry.

- **Depleted uranium metal retrieved in intact drums may be recycled for use in shielding products**
  Depleted uranium metal without significant commingled soils may be recycled for reuse in shielding products. Significant cost savings can be realized by avoidance of transportation and disposal costs.

Excavation techniques and excavation activities were evaluated in detail and flow-charted by the ACE Development Team. The use of remote excavation techniques was evaluated, but was determined not to be necessary based on the hazards posed by the reasonably expected trench contents. An additional consideration is the benefit gained by real-time evaluation of the condition of the trench contents as they are uncovered.

Performance of remediation activities (excavation, segregation, inerting and packaging, including stockpiling of soils) within a temporary weather shelter was evaluated and concurred upon by the ACE Team with input from Subject Matter Experts (SME's).

The temporary weather shelter that will be erected over Trench 1 is illustrated in Figure 1. The shelter is fabricated of aluminum support beams and leak-tight polyvinyl chloride (PVC) panels. The structure is free-standing and requires no internal support members, allowing use of the entire floor space. Each of the PVC panels at the peak of the structure include a translucent section to allow light to enter the structure (i.e., skylight). The bright white color of the PVC panels aid the reflection of light inside the structure to provide a well-lit working environment during daylight hours. Portable light towers, separate from the structure, will be installed in the interior of the structure to allow work during evening hours, if necessary.

The shelter is designed to provide protection from the elements, specifically wind and precipitation. The structure is designed to withstand sustained 109 mile per hour winds. The PVC panels at the base of the structure extend 18 inches on the ground away from the structure. This serves to divert precipitation flowing from the structure away from the base of the structure.

The structure includes four types of doors: double panel rolling doors (DPRDs), side sliding doors (SSDs), and double and single personnel doors. The DPRDs and SSDs offer relatively large openings for moving equipment and waste containers into and out of the structure. These doors will also allow access by emergency vehicles if necessary. The double and single personnel doors contain windows.

The shelter includes a ventilation system to remove exhaust from the heavy equipment that will be operating inside the structure (e.g., trench excavation and soil handling). The ventilation system consists of 12 equally-spaced exhaust fans located at the peak of the structure and 13 equally-spaced vents at the base of the structure. The fans and vents are positioned to provide optimal "purging" of the structure. Quick shutdown buttons will be positioned within the shelter at various locations to allow for emergency shutdown of the ventilation system. Each fan includes a backdraft damper that automatically closes when the fan is turned off. Likewise, the vents include variable louvers that may be manually closed. Since various openings in the weather shelter, including entire side panels, vents, and personnel doors will be periodically opened throughout the excavation and material handling activities, the shelter will not operate as a sealed structure. Therefore, dust and radionuclide emissions will not be completely contained within the structure and will not be exclusively directed out through the fans.

EXCAVATION

Various configurations of the excavator, types of excavator, and placement of the excavator could be used. The trench contents will be excavated primarily with a track-mounted excavator equipped with a one or two-cubic yard bucket, and if needed, a backhoe and/or front-end loader. If the backhoe or front-end loader is used, it will not be in the trench, but on the side. Trench excavation will proceed from west to east. Since the cab of the excavator is located on the left hand side of the machinery, a blind spot would be created for the operator on the right hand side of the machinery due to the location and motions of the boom. In order to mitigate the potential hazards created operating this machinery with a blind spot, excavation will proceed from the west end of the trench.

The following are arguments for positioning the excavator on top of the trench, rather than to the side:

(1) This configuration allows easier access to the DU drums than from the side of the trench. It is easier for the operator to observe and evaluate the activity.

(2) There is not sufficient space over the entire length of trench to position the excavator on the north side. Space is limited on the south side of the trench as well, in part because the area on the south side of the trench will be used to stage containers for materials removed from the trench and for operating other heavy equipment for transporting the containers and soils.

Concerns with operating on top of the trench are that:

(1) The trench will subside due to the weight of the excavator. The excavator may "sink" into the trench and/or become unstable on the trench.

(2) The weight of the excavator will rupture an intact drum that has hydrogen build-up. With an ignition source, the drum could explode.

It is unlikely that the excavator would "sink" enough to be unmaneuverable and unable to drive out of the trench. The trench is expected to be approximately 15 feet wide. The excavator will have a track span at least 12 feet wide and will be capable of maneuvering with use of the boom/bucket for support. The large surface area provided by the track span is expected to adequately distribute the weight of the equipment and minimize the potential for sinking.

It is also unlikely that the weight of the excavator will rupture an intact drum, since the drums have been buried for 40 years and are not expected to be sealed and intact enough to be pressurized. The possibility that an intact drum with hydrogen buildup will be ruptured and an ignition source will be present at the same time is considered an unlikely event, based on the ASA.

The possibility exists for drums and other solid materials buried less than one to two feet below ground surface to be damaged as the excavator is maneuvered on top of the trench. A daily visual inspection will be completed prior to the start-up of excavation activities and/or movement of the excavator to ensure there are no objects located on the surface. Additionally, prior to start of excavation, a 3"-6" layer of road base was placed over the trench to ensure a level and stable working surface.

Excavation activities will consist of excavating, transporting, and staging all soil, depleted uranium chips, turnings, and fines, miscellaneous trash and debris, and any other wastes that may be buried in the trench. Trench 1 is estimated to contain 1,500 to 1,800 cubic yards of material including drums, miscellaneous debris and trash, and soil deposits used to backfill the trench.

Material removed from the trench will be initially characterized adjacent to the trench, through visual observation and field screening measurements, to ensure safe handling and to provide information for segregation and packaging. Excavated soil will be segregated and packaged for off-site disposal or transferred to the soil stockpile area inside the temporary structure for reuse as backfill. Drums will be packaged and transported to the SIP to evaluate and manage the drum contents. Drum contents will be properly inerted, stored, and treated depending on the outcome of the evaluation. Debris will be packaged and transported to a temporary staging area outside of the shelter and managed for offsite disposal. Remote handling devices will be used by workers, to the extent practical, to handle small items. The Integrated Work Control Package (IWCP) for excavation will outline steps for performing excavation tasks.

At least one spotter will assist the excavator operator from the side of the excavation in positioning the excavator over the trench and locating the excavator bucket inside the excavation. The spotter will communicate with the operator using a hand-held radio and/or hand signals. Once the excavation reaches a depth of four feet, a health and safety restricted zone of six feet from the edge of the excavation will be maintained for fall protection based on Occupation Safety and Health Administration (OSHA) regulations and the site-specific Health and Safety Plan (HASP). If personnel are required to get closer than six feet to the edge of the excavation, personal restraints will be used including a full body harness and appropriate hookups to a jersey barrier or equivalent fixed body. Personnel working in the Exclusion Zone/High Contamination Area (EZ/HCA) will maintain a safe distance from the excavator during operation. Project personnel can approach the excavator only after eye contact has been made with the spotter, the appropriate hand signals have been given and/or radio communication has been established between the spotter and the operator, the operator has placed the bucket on the ground, and the spotter has authorized personnel to approach.

To limit the hazard posed by an open trench, the trench excavation may be backfilled as the excavation is advanced. This will depend upon conditions encountered inside the trench. The excavation will be secured with appropriate barricades to prevent accidental slip, trip, or fall into the excavation. The excavation will be limited to the extent of contamination (confirmed by analytical data) within highly weathered bedrock, one to three feet below the alluvial/bedrock contact, or to the depth of groundwater, if encountered. Unweathered bedrock will not be excavated. For protection from potential exposure to hazardous substances in the trench, all work inside the exclusion zone will be performed in Level B protective equipment or as designated in the HASP. Refueling of heavy equipment will be performed with the trench in a fire-safe configuration, as designated in the HASP. The HASP outlines health and environmental monitoring, including on-going air monitoring and in-process radiological surveys, that will be conducted during the excavation activities. Decontamination and radiological surveying of excavation equipment and personnel will be performed according to the procedures outlined in the HASP.

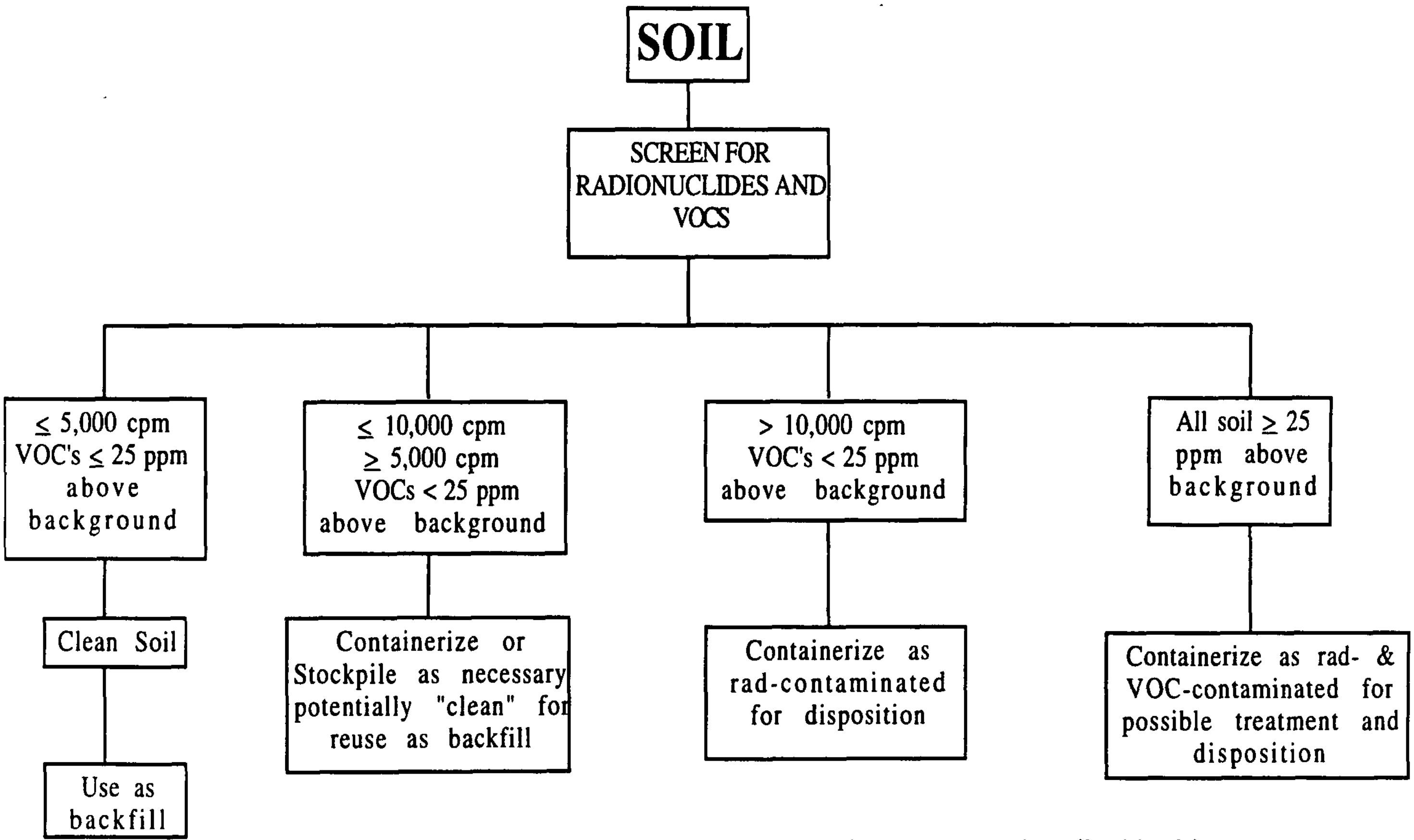
SOIL

Excavated soil will be raised in the excavator bucket, and the bucket will be placed on the ground along side the trench. For waste minimization purposes, soil in the bucket will be screened for levels of radiological and VOC contamination, then segregated based on the screening results. The soil will be radiologically screened using a Field Instrument for the Detection of Low-Energy Radiation (FIDLER) per RFETS Environmental Management Radiological Guidelines and the Sampling and Analysis Plan (SAP). An organic vapor analyzer (OVA) or similar instrument may be used to screen for VOC contamination. Refer to Figure 2 for a typical waste minimization/segregation process. Dependent upon the results of the initial characterization as depicted in Figure 2, excavated soil will be segregated and placed directly into waste packages or transferred to the soil stockpile area within the shelter along designated traffic routes.

All soils excavated from the trench will be sampled for compliance with Tier I radionuclide action levels. VOC-contaminated soil above Tier I action levels will be staged for future treatment and disposal. Radiologically contaminated soil below Tier I and greater than Tier II levels will be disposed of off-site or returned to the trench within a geotextile fabric. The geotextile fabric will allow for future retrieval of the soil if required.

Soil with less than 5,000 cpm with the FIDLER and VOCs detected at less than 25 ppm above background measurements on the OVA will be transferred to the soil stockpile area located in the north leg of the shelter using a front-end loader. Samples will be collected from

FIGURE 2
TYPICAL SOIL SEGREGATION EVALUATION DIAGRAM
(Soils requiring sampling will be sampled in accordance with the SAP)



NOTE: The radiological and chemical screening and segregation approach described in this document presently includes the anticipated action levels. Finalization of this approach will be accurately described in the Final Sampling and Analysis Plan. Final action levels may differ from those listed above.

the soil stockpile for confirmatory testing in accordance with the SAP.

Soil with less than or equal to 10,000 cpm and greater than or equal to 5,000 cpm with the FIDLER and VOCs detected at levels less than 25 ppm above background measurements on the OVA will be segregated and transferred to the soil stockpile area or containerized. Soil samples will be collected in accordance with the SAP to determine final disposition.

Soil exhibiting greater than 10,000 cpm with the FIDLER and VOCs detected at less than 25 ppm above background measurements on the OVA, and any soil with VOCs detected at levels greater than or equal to 25 ppm above background measurements on the OVA will be segregated and placed directly into Strong Tight Container packages appropriate for Class 7 (radioactive) materials. These soils will be sampled in accordance with the SAP and staged in the Waste Container Staging Area until final disposition.

If encountered, soil commingled with potentially pyrophoric depleted uranium material will also be segregated. Soil commingled with depleted uranium will be packaged adjacent to the trench and transferred to the SIP for further analysis, sampling, and inerting.

The screening level of 5,000 cpm on the FIDLER has been set as a conservative break point for soils and debris removed from Trench 1. Soils at this level should contain DOE radionuclides at concentrations below the Tier II action levels. The 5,000 cpm decision level was set based on:

- process knowledge of the FIDLER and its response to DOE radionuclides;
- past experience with RFETS soils contaminated with depleted uranium.

This screening level will be re-evaluated during the excavation activities by comparing the screening level to the observed radiological analytical results for the segregated soils. Based on this comparison and, if necessary, the screening level will be adjusted accordingly.

The 10,000 cpm and the 25 ppm action levels have been selected based on best available information and will be further evaluated and adjusted accordingly with analytical data gathered in the field.

Transport of the soil packages from the trench to the staging area inside the temporary structure on designated routes will be performed using a forklift. The outer sides of the soil packages will be visibly inspected by site personnel and brushed clean of any loose material before being transferred. All soil packages will be sealed, labeled, and decontaminated as appropriate inside the structure.

The filled containers will be moved to the radiological survey area where they will be monitored out of the HCA per the Site Radiological Control Manual and Operations Order No. OO-T1-007, Packaging of Trench 1 Waste.

Although significant levels of VOC contamination are not anticipated, given the sources of contamination, any detectable levels of carbon tetrachloride, tetrachloroethane or trichloroethane contained in the T-1 soil or debris would ordinarily require identification of the materials as RCRA hazardous. DOE is pursuing a risk-based contained-in determination for the soil and debris prior to excavation. This allows for optimal management of these marginally contaminated materials at facilities that are not otherwise permitted to handle RCRA hazardous wastes.

DRUMS

All intact drums encountered in the trench will be removed from the trench individually, in order to minimize the risk of exposure to workers, the environment, and the public. Drum exposure will be limited to one row at a time, so that a maximum of twelve drums will be exposed at any one time. A detailed evaluation of this control is presented in the Auditable Safety Analysis for Individual Hazardous Substance Site (IHSS) 108 Trench 1 Source Removal Project.

Before each intact drum is removed from the trench (including overpacked drums), the drum will be vented in the trench to ensure that the drum is not pressurized and to allow for future monitoring. The excavator bucket will be equipped with a non-sparking attachment to perform this task while minimizing spark-potential. The operator will either use the attachment to puncture the drum or lid to release any internal pressure, or will squeeze the drum slightly to deform the seal area and break the lid seal.

After each intact drum has been vented, it will be lifted using the excavator bucket and placed adjacent to the trench within a containment pan for initial characterization. Initial characterization will include: heat testing, radiation surveying, combustible gas monitoring, and VOC screening. The containment pan will minimize spread of contamination, and contain potential spill of liquids. The drum contents will be heat tested using a handheld infrared thermometer to measure the temperature of the drum contents and detect potential temperature increases in the drum resulting from ignition of pyrophoric depleted uranium chips/turnings. Appropriate coolants and fire controls will be used on the drum if the heat test is positive. Procedures for performing the heat test and measures for preventing any uncontrolled heating or burning in a drum are described in the HASP.

If the heat test results indicate no increase in temperature within the drum, a radiation dose survey will be performed using a beta/gamma radiation detector. The drum will then be field screened for radionuclides, VOCs and combustible gases using field instrumentation. If the initial characterization indicates that the drum can be safely handled, the drum will be placed into a DOT Type 7A 83-gallon overpack drum, or other appropriate Type 7A package. The overpack drum will be surveyed for removable contamination, and be decontaminated as necessary prior to transfer to the SIP. The drum will then be transferred via forklift to the SIP for further evaluation by the subcontractor. The field screening results for each drum will be recorded and provided to the subcontractor upon transfer.

Any drum with liquids and/or sludge, if encountered, will be inspected for labels, markings, or other information that may indicate its contents. The drum will be evaluated for radiation dose, VOC contamination, and combustible gases. The drum will then be transferred into a compatible overpack container.

The overpack container will be surveyed for removable contamination, and be decontaminated as necessary prior to transfer to the SIP for evaluation and management according to the SAP.

In the event of a depleted uranium fire, fire control and fire extinguishing will be conducted in accordance with the Fire and Emergency Services General Operating Guideline 3-FES-GOG-229, Pyrophoric Metals Fire Extinguishment. Appropriate fire control and fire suppression agents (*e.g.*, sodium chloride based powder [MET-L-X], dry magnesium oxide powder, water) will be located immediately adjacent to the excavation site and at locations where potentially pyrophoric depleted uranium material is handled. Project personnel are trained in the use of Fire and Emergency Services General Operating Guideline 3-FES-GOG-229, Pyrophoric Metals Fire Extinguishment. The RFETS Fire Department will be notified of any fire or other potentially hazardous condition at the site.

If the drums are not intact, approximately one to two cubic yards at a time of the potentially pyrophoric depleted uranium and associated material will be removed from the trench and placed directly into a Type 7A metal box. The material will undergo the same contamination screening, monitoring, and heat testing as described above for intact drums before it is transferred to the SIP.

Historical drum inventory lists for Trench 1 indicate that, in addition to the drums containing depleted uranium, one 55-gallon drum containing "still bottoms" and ten 55-gallon drums of cemented cyanide waste, originating from Building 444, were buried in the trench. Based on historical records and Building 444 process knowledge, the "still bottoms" could consist of either lathe coolant oil sludge or residual trichloroethylene and tetrachloroethylene waste solvents and sludge generated from machined parts cleaning. If encountered, the drums containing "still bottoms" and cemented cyanide will be repackaged in an overpack container and transferred to the SIP for evaluation and management.

SAMPLING AND INERTING PAD (SIP) OPERATIONS

The SIP will be located inside the west end of the temporary shelter in close proximity to the excavation. The SIP will consist of a soil-bermed pad lined with an HDPE synthetic liner, covered with a layer of soil or gravel for liner protection. Operations within the SIP will include receiving, managing, segregating, stabilization, sampling, and packaging the depleted uranium drums and soils, drums containing unknown liquids and solids, and other waste materials.

Waste material stabilization will involve inerting the potentially pyrophoric depleted uranium material to render it suitable for off-site shipment compliant with Department of Transportation (DOT) 49 CFR 173.418 for pyrophoric Class 7 (radioactive) materials. Intact drums received in DOT 7A, Type A 83-gallon overpack drums will be filled to completely cover the depleted uranium material with mineral oil. Depleted uranium commingled with soil in 7A metal boxes will be

inerted by adding dry soil to the top of the container to exclude all oxygen that might potentially react with any metallic uranium in the soil during shipment. The overpack drums, and Type 7A metal boxes will be fitted with a pressure vent (NFT model No. 013 or equivalent) to relieve possible minor quantities of hydrogen gas generated in the packages during shipment. Both of the above methods of inerting are compliant with DOT 49 CFR 173.418.

Waste material sampling within the SIP will be conducted in accordance with an RMRS-approved sampling and analysis plan prepared by the subcontractor. Liquids and sludges, if any, encountered in intact drums will be segregated from solids, if necessary, and sampled for waste characterization. Other unknown materials or containers will be evaluated and sampled as necessary, and appropriately packaged for treatment or disposal.

All waste packages will be sealed, decontaminated, and labeled prior to being released from the SIP. The exterior of the packages will be decontaminated using dry decontamination methods (e.g., brushing, wiping). Radiological screening and surveying will be conducted on the package exteriors to achieve applicable release limits specified by the RFETS Radiological Control Manual. All waste packaging in the SIP will be conducted under the supervision of an RMRS representative in accordance with the applicable RFETS waste packaging procedures. Waste packages will be approved by RMRS prior to use to assure compliance with RFETS policies, DOT, and selected disposal facility requirements.

The SIP operations will be performed by the subcontractor under a Health and Safety Plan developed by the subcontractor, addressing worker health and safety during all aspects of the waste material management, sampling, stabilization, and packaging activities. The Health and Safety Plan will be reviewed and approved by the RMRS Project Manager, RMRS Radiological Coordinator, RMRS Health and Safety Supervisor, RMRS Radiological Safety Section Manager, and SSOC Radiological Engineering prior to any activities at the site.

DEBRIS, UNKNOWN MATERIALS, AND SUSPECTED CLASSIFIED ITEMS

Miscellaneous debris and trash excavated from the trench are expected to include compatible materials such as personal protective equipment, wood, metal, rubber, plastics, paper, and glass. Immediately following removal from the trench, these items will be visually inspected for stains or discolorations. Debris will also be surveyed and screened for radiological and VOC contamination. These materials will be segregated adjacent to the excavation and packaged appropriately with like waste forms for transport to a staging area (figure 3).

Materials that cannot be immediately identified will be screened for radiological and VOC contamination, packaged, and sampled in accordance with the SAP to identify the contents. Materials contaminated with VOCs will be segregated, packaged, and staged for interim storage inside a temporary unit. Items suspected of being "classified" will be surveyed for radioactivity and inspected to ensure safe handling. The potentially classified item will be isolated and the

RFETS Classification Office will be contacted to remove the item and store it in a secure location.

Instructions/guidelines and checklists for "classified" items and unknown materials are included in the T-1 Field Implementation Plan (FIP), refer to figure 3 for these activities.

Any drum with liquids and/or sludge, if encountered, will be inspected for labels, markings, or other information that may indicate its contents. The drum will be evaluated for radiation dose, VOC contamination, and combustible gases. The drum will then be transferred into a compatible overpack container. The overpack container will be surveyed for removable contamination, and be decontaminated as necessary prior to transfer to the SIP for evaluation and management according to the SAP.

In the event that hazards or conditions unanticipated by the HASP are encountered, the project manager will complete the "checklist for restart of Trench 1" in accordance with Safety and Environmental Stewardship Directive OPS-DIR-001. The checklist requires signatures from the Environmental Restoration Vice President, Project Manager, and the IH and Rad Safety organizations, prior to restart.

EXCAVATION VERIFICATION SAMPLING

At the completion of excavation operations, verification soil samples will be collected along the base and sides of the excavation to document the post-action condition of the subsurface soils. Verification samples will be collected and analyzed according to the procedures and requirements stated in the SAP. The sampling will be performed after a nominal six-inch scrape below the drums and debris to clear the trench bottom of any residual waste material. Visible staining that may extend beneath the trench bottom will also be removed prior to sample collection. If sample analytical results indicate that contamination is present above cleanup target levels, further excavation and sampling will continue until cleanup target levels are achieved or one of the limiting conditions discussed below is met.

If contamination is encountered below the bottom of the trench, the excavation will be limited to the highly weathered bedrock, one to three feet below the alluvial/bedrock contact, or to the depth of groundwater, if encountered. Unweathered bedrock will not be excavated. An organic vapor analyzer (OVA) and a FIDLER will be used as field screening tools to guide excavation activities before excavation verification samples are collected.

Cleanup target levels used for excavation activities are the RFCA Tier I soil action levels for radionuclides, cyanide, and VOCs, if encountered. These action levels were incorporated to

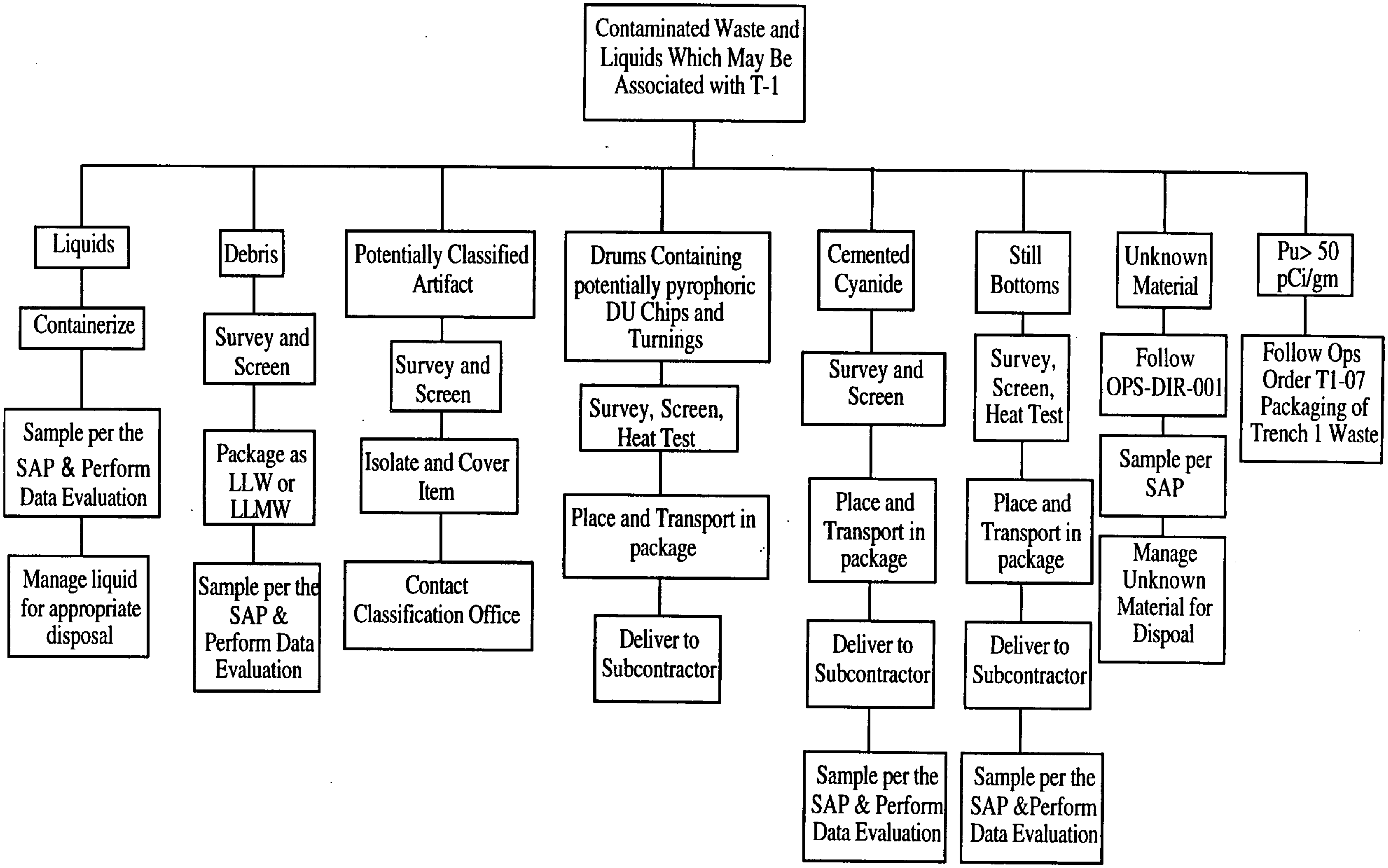


Figure 3
Material Segregation Evaluation Diagram

reduce risk to future site workers and users of the site and to prevent degradation of groundwater quality above the RFCA Tier I groundwater action levels. Table 1.1 lists radionuclide, VOC, and cyanide cleanup target levels. Contaminants listed in the table are the potential chemicals of concern for the project. To develop this list, historical data, retired worker interviews, and site waste records were assessed, and process knowledge was used.

TABLE 1.1
CONTAMINANTS OF CONCERN
CLEANUP TARGET LEVELS FOR EXCAVATION

Contaminant	Activity or Concentration
Uranium-238 (U-238)	586 pCi/g*
Cyanide	154,000 mg/kg
Tetrachloroethylene (PCE)	11.5 mg/kg
Trichloroethylene (TCE)	9.27 mg/kg

pCi/g = picocuries per gram
mg/kg = milligram per kilogram
*The cleanup target levels for radionuclides are not threshold values; additional isotopes present will cause this value to decrease

MANAGEMENT OF THE CONSOLIDATED SOIL STOCKPILE AREA

Soil excavated from Trench 1 with less than 10,000 cpm with the FIDLER and VOCs detected less than background measurements, and soils with less than 10,000 cpm with the FIDLER and VOCs detected greater than background measurements will be placed in the soil stockpile area within the temporary structure for storage until treatment or final disposition is determined. The soil will be transferred from the excavation to the soil stockpile using a front-end loader. To ensure safe movement of the front-end loader, a roadway will be established between the excavation site and the stockpile area.

The front-end loader will dump loads of soil at the soil stockpile in a manner which will limit the generation of dust. If necessary, dust suppression with clean water will be performed to limit the generation of airborne dust.

The stockpiled soil will be sampled in accordance with the SAP to confirm that the sample results meet or are below the Tier I RFCA action levels for radionuclides and VOCs. Soil with radionuclide contamination below the RFCA Tier II action levels will be returned to the trench. Radiologically contaminated soil below Tier I and greater that Tier II action levels will be disposed of off-site or returned to the trench within a geotextile fabric (to allow for future retrieval of the soil if required). If present, VOC-contaminated soil above Tier I action levels will be staged for future treatment (if necessary) and disposal.
After all soil has been removed from the stockpile area, a radiological survey of surface soil beneath the stockpile area will be performed. Any contaminated soil beneath the stockpile area

will be removed by a front-end loader or equivalent and managed for appropriate disposal, if required.

MANAGEMENT OF INCIDENTAL WATERS

Incidental waters encountered as a result of groundwater entering and collecting in the excavation will be removed from the excavation if sufficient volume is present to impact operations and will be transferred to a temporary storage container near the excavation. Surface water monitoring will be performed during excavation activities using existing automated stations near the site. Based on historical groundwater level measurements in the vicinity of Trench 1, groundwater is not expected to be encountered during excavation activities. Groundwater levels from the nearby monitoring wells will be measured before excavation to establish the depth to the unconfined water table.

Water collected from the excavation, if any, will be managed as incidental waters per site procedure Control and Disposition of Incidental Waters, 1-C91-EPR SW.01. Evaluation consists of analysis for gross alpha and gross beta radioactivity, conductivity, nitrates, pH, and volatile organic compounds. Additional analyses may be performed as specified in the SAP. If the water is found to be contaminated per procedure 1-C91-EPR SW.01 and contains volatile organic compounds equal to or greater than the RFCA surface water standards for Segment 5, the water may be treated on-site. Following treatment, the water will be sampled and released in accordance with discharge criteria.

AIR MONITORING

WORKER PROTECTION

Radiological high volume and low volume air sampling for particulate radionuclides will be performed within the temporary shelter during periods of soil movement or other dust generating activities per the ALARA job review. Continous air monitors (CAM's) will be located within the tent vestibules per the ALARA Job Review. The CAM's serve to alert potentially exposed individuals to unexpected increases in airborne radioactivity levels.

Real-time industrial hygiene air monitoring will be conducted inside the temporary structure to characterize potential personnel exposures and to ensure that airborne concentrations are below levels which are Immediately Dangerous to Life and Health (IDLH). Monitoring will be conducted for VOCs, carbon monoxide, nitrogen dioxide, particulates, and sulfur dioxide.

In addition to real-time monitoring, personal integrated air sampling will be conducted, at the discretion of the Site Safety Officer, at the excavation and the soil stockpile for VOCs, metals, cyanides, diesel emission gases, and dust. Job functions in the EZ will be observed in order to sample the highest risk employees.
Wind speed and direction outside of the temporary shelter will be monitored during work evolutions, monitoring will be performed in accordance with applicable RFETS Procedures and the HASP. During soil handling activities, dust minimization techniques such as water sprays will be used to control suspension of particulates.

AIR QUALITY

In addition, the Kaiser-Hill Air Quality Management group maintains the RFETS Radioactive Ambient Air Monitoring Program (RAAMP) which monitors the perimeter of RFETS continuously with samples collected and analyzed on a monthly basis. The RAAMP sampling network also includes samples from monitoring stations inside the perimeter of RFETS which are collected but not routinely analyzed unless conditions warrant additional analysis.

An enhanced, project-specific environmental air monitoring plan will be implemented during soil and debris handling activities. The project-specific air monitoring program will consist of routine and continuous monitoring at four existing RAAMP samplers located within the perimeter in the immediate vicinity of the T-1 site, and three high volume samplers located within the tent near those activities that have the greatest potential to release radionuclides into the ambient air. This routine air monitoring will be based on scheduled project activities with samples from each monitor collected and analyzed on a weekly basis. If a radionuclide release of concern is suspected based on project information or the routine sampling results, then an event sampling program will be implemented. Event sampling may include, but is not limited to, expedited sample analyses and evaluation, additional sampling and analyses at various locations, and/or more frequent sampling at various locations. The T-1 monitoring program is described in detail in the Trench 1 Source Removal Air Monitoring Plan.

It is important to note that the purpose of the enhanced, project-specific environmental air monitoring program is to provide ambient air and project emissions data necessary to determine (and manage) compliance with the public dose standard of Title 40 of the Code of Federal Regulations (CFR), Part 61.93, which has been determined to be protective of public health. It should be noted, the sampling conducted as part of this Air Quality monitoring plan will not provide "real-time" emissions data appropriate for use in protecting worker health and safety.

TRAFFIC MANAGEMENT

Traffic will be controlled by the traffic management plan included in the FIP. The traffic management plan is written to be protective of site workers from heavy equipment and the potential spread of radiologically and VOC contaminated soils.

CONCLUSIONS

In conclusion, while "unknowns" are inherent in this type of remediation project, the safety envelope developed for the project is designed and planned to address the unlikely events of hydrogen accumulation within a drum and a subsequent explosion, and a depleted uranium fire. Based on the activity identification and hazards assessment, the ACE team determined that the integrated collective set of controls (as implemented by the set of documents constituting the Authorization Basis) is sufficient. With the development and approval of appropriate work control documents, and adequate training, this activity can be authorized for performance (using the existing Authorization Basis and using the additional expectations developed as part of this ACE).

2.0 ACTIVITY CONTROL ENVELOPE

This section describes the ACE for the source removal at T-1, and includes the following:

- Bounding conditions
- Task identification and flow chart
- Standards/Expectations
- Hazards assessment
- Impediments to ACE implementation
- Readiness criteria

A detailed discussion of the hazards assessment prepared for this ACE is provided as Appendix I, Hazards Assessment.

2.1 Bounding Conditions

Bounding conditions are identified to provide assurance that this ACE is applied only to the activity for which it is pre-qualified.

If the conditions under which an activity is to be performed are not within the bounding conditions, one of the following actions must be performed:

(1) Change the conditions under which the activity is to be performed so that they fall within the bounding conditions.

(2) Use or generate a different ACE that is bounded by the conditions under which the proposed activity is expected to be performed.

2.1.1 Project-Specific Capabilities

This ACE is intended to be used with the approved Authorization Basis for the source removal at T-1. The approved Authorization Basis is the Site Specific Health and Safety Plan for the Source Removal at Trench 1 IHSS 108 together with the Auditable Safety Analysis. These documents must exist to support the application of this ACE.

2.1.2 Additional Bounding Conditions

- Handle only one bucket at a time and excavate such that the quantity of depleted uranium material exposed at any given time does not exceed that analyzed in the ASA.
- T-1 Dust Suppression
- Fire-safe configuration at the end of each work shift
- Personnel entry into the excavation trench is unauthorized unless life threatening situation arises
- Work will not be conducted within the weather shelter if an IDLH environment exists
- Bounding radiological conditions will be identified by the governing RWP's

2.2 Task Identification and Flowcharts

Figures 3A, 3B and 3C are flowcharts showing the principal tasks involved in the source removal activity at T-1. Individual tasks are represented as rectangles, the diamond figures representing a key decision.

Three major steps constitute this ACE as shown in Section 1.1, with each major step divided into specific tasks, discussion of which follows. Table 1-2, of Appendix I lists those tasks/steps for which hazards are identified.

2.2.1 Step/Task, Excavation, 1.0

This step in the activity addresses Excavation and includes the following tasks:

Task 1.1 Position excavator
Task 1.2 Remove soil
Task 1.3 Screen soil for rads (FIDLER) and VOCs (OVA)
Task 1.4 Segregate soil for waste minimazation
Task 1.5 Stockpile or Package soil as necessary
Task 1.6 Sample soil per SAP
Task 1.7 Package as appropriate or use as backfill
Task 1.8 Visually inspect excavated area
Task 1.9 Remove slough material
Task 1.10 Screen slough material
Task 1.11 Segregate slough material
Task 1.12 Place material in package or front-end loader
Task 1.13 Transport material to SIP/SSA/staging area
Task 1.14 Position excavator
Task 1.15 Remove contaminated soils
Task 1.16 Place sampling matrix
Task 1.17 Decontaminate/survey excavator bucket
Task 1.18 Collect verification sample
Task 1.19 Dewater trench as necessary

2.2.2 Step/Task, Segregation, 2.0

This step in the activity addresses Segregation and includes the following tasks:

Task 2.1 Vent/Pierce drum in trench, includes overpacked drums
Task 2.2 Lift drum out of trench
Task 2.3 Place drum in container pan
Task 2.4 Visually inspect drum
Task 2.5 Heat test drum
Task 2.6 Use approved fire controls on drum as necessary
Task 2.7 Radiation evaluation surveys (dose rate and in-process removable contamination)
Task 2.8 Post as necessary based on measured radiological levels
Task 2.9 Screen drum for VOCs and combustible gases
Task 2.10 Continue venting and monitor the surrounding area
Task 2.11 Place drum in package (7A Type A overpack or metal box)
Task 2.12 Transport drum to SIP for further evaluation, sampling, and inerting of DU material
Task 2.13 Radiation evaluation surveys (dose rate and in-process removable contamination)
Task 2.14 Post as necessary based on radiological levels

Task 2.15 Lift bucket of debris out of trench
Task 2.16 Radiological evaluation surveys (dose rate and in-process removable contamination)
Task 2.17 VOC screening per RMRS SAP
Task 2.18 Post as necessary based on measured radiological levels
Task 2.19 Reduce size of debris on case by case basis per written direction
Task 2.20 Transfer debris from bucket to package
Task 2.21 Sample per RMRS SAP
Task 2.22 Prepare package
Task 2.23 Transfer package to staging area when full

2.2.3 Step/Task, Inerting Process, 3.0

This step in the activity addresses Inerting and includes the following tasks:

Task 3.1 Evaluate and inventory drum contents
Task 3.2 Transfer liquid to package
Task 3.3 Sample liquids per subcontractor's SAP
Task 3.4 Manage liquids for disposal (by RMRS)
Task 3.5 Evaluate solid material
Task 3.6 As necessary reduce size of drum per written direction
Task 3.7 Package drum
Task 3.8 Transfer package to staging area when full
Task 3.9 Manage for appropriate disposal
Task 3.10 Segregate course material/drum fragments
Task 3.11 Sample per RMRS SAP
Task 3.12 Package as appropriate
Task 3.13 Transfer package to staging area when full
Task 3.14 Evaluate remaining solid material
Task 3.15 Inert DU in mineral oil
Task 3.16 Sample per subcontractor's SAP
Task 3.17 Prepare package
Task 3.18 Transfer package to staging area inside structure
Task 3.19 Release package from structure
Task 3.20 Transfer package to temporary on-site storage until analytical is received
Task 3.21 Weigh package
Task 3.22 Load package into transport
Task 3.23 Offsite shipment for treatment and disposal
Task 3.24 Inert DU in dry soil
Task 3.25 Segregate and isolate item
Task 3.26 Package appropriately
Task 3.27 Manage for appropriate disposal
Task 3.28 Sample per subcontractor's SAP
Task 3.29 Over or repackage cemented cyanide
Task 3.30 Transfer package to staging area
Task 3.31 Manage for disposal
Task 3.32 Sample per RMRS SAP

Task 3.33 Package debris
Task 3.34 Transfer package to staging area when full
Task 3.35 Manage for appropriate disposal

2.3 Standards/Expectations

The standards for this activity are presented in Table 1-4 as expectations of management, supervisors, and workers involved in accomplishing the activity. The letter in parentheses in front of each expectation indicates the personnel category responsible for accomplishing the expectation (m indicates management, s indicates supervisor, w indicates worker), while the letter following the expectation denotes the standard type represented by the expectation (m indicates management, t indicates technical, p indicates performance).

2.3.1 Implementing Documents

To assist the user of this ACE in creating work control documents, existing documents that will implement tasks or expectations are referenced in Table 1-4.

2.4 Hazard Assessment Summary

Using a brainstorming approach, the ACE team members and the Trench 1 Team Subject Matter Experts performed a comprehensive, primarily qualitative, hazards assessment of the individual activities in the T-1 source removal project. Details of the analysis are documented in Appendix I of this document.

2.5 Impediments to Implementation

Impediments to implementation for this ACE are defined as any event which would adversely effect the planned project budget or schedule, and /or identified as outside the bounds of the present trench characterization (i.e. unanticipated levels of weapons grade Pu/Am). Specific events identified as being potential impediments are:

- A "contained-in determination" for waste generated and being transported to the Subcontractor for off-site treatment being denied by the Regulatory Agencies.
- Delays in obtaining rush turnaround times on sample analysis.
- Any incident (fire, explosion, spill, etc.) exceeding the scenarios analyzed in the Auditable Safety Analysis.

2.6 Readiness Criteria

The following readiness criteria are provided to verify the implementation of the standards basis defined in this ACE. The readiness criteria are organized into three types of objectives:

- Hardware

- Personnel
- Management Systems

2.6.1 Hardware Objectives

Hardware objectives involve identifying and evaluating the readiness of structures, systems, and components to perform their necessary and intended functions during the performance of this activity. Specific readiness criteria for this activity include:

- Current documentation exists to confirm that, as appropriate, equipment used in the accomplishment of this activity has been identified, calibrated, verified as functional and available, tagged, and reviewed for compliance with applicable standards and safety requirements.

- The condition and functionality of hardware are adequate for accomplishing this activity and have been physically verified and documented to be operational.

- All hardware labeling is consistent with approved procedures.

2.6.2 Personnel Objectives

Personnel objectives involve identifying and verifying personnel training, experience, and qualifications, as well as adequate personnel resources necessary to conduct this activity. Specific readiness criteria associated with this activity include:

- The number of qualified personnel is sufficient to perform the work (minimum project staff and facility support staff availability as identified in the FY98 Work Package for the Source Removal at Trench 1).

- The Site-Specific Health and Safety Plan for Trench 1, and the Field Implementation Plan will include documentation to identify personnel assigned to the T-1 project.

- The Trench 1 Health and Safety Plan and the RMRS Readiness Review Checklist will include documentation that the training of assigned personnel is adequate to perform their assigned duties.

2.6.3 Management Systems Objectives

Management Systems Objectives involve identifying and verifying required plans and procedures, safety documentation, communication systems and alarms, and other administrative controls. Specific readiness criteria associated with this activity include:

- The ACE for the Source Removal at T-1 IHSS 108 is completed and reviewed

- T-1 Authorization for Soil Disturbance is completed and approved

- T-1 Field Implementation Plan is completed and approved
- T-1 Sampling and Analysis Plan (SAP) is completed and approved
- RMRS T-1 Project-Specific Health and Safety Plan is completed and approved
- The treatment subcontractor will have prepared a Project-Specific Health and Safety Plan (HASP) to address the expected and unexpected hazards or conditions associated with its operations. The subcontractor HASP will have been reviewed and approved by the appropriate K-H, SSOC, and RMRS personnel.
- The subcontractor prepared SAP, and Work Plan are completed and approved.
- Proposed Action Memorandum is completed and approved
- ALARA Job Review to Support T-1 is completed and approved
- T-1 Dust Suppression Procedure is completed and approved
- Site Reclamation-Reseeding Guidance and Specifications are completed
- Occurrence Reporting is performed in accordance with applicable procedures.
- Instructions for Discovery of Classified Artifacts are completed and written into the Field Implementation Plan
- Instructions for Discovery of Unknown Materials are completed and written into the Field Implementation Plan
- T-1 Auditable Safety Analysis is completed and approved
- T-1 IWCP packages are adequate, current and completed
- Mock-up demonstrations and walk-throughs are used to validate procedures and communications and to train staff
- Records generated for the T-1 project are retained in accordance with site Quality Assurance procedures.
- Pre-evolution and Plan of the Day briefings are conducted in accordance with the job specific COOP implementation plan included in the FIP.
- RMRS Environmental Restoration Accelerated Actions Readiness Review is completed and approved

- Emergency response and spill control procedures followed in accordance to the Site Health and Safety Practices Manual, Section 21.04

- Project personnel are trained in the use of Fire and Emergency Services General Operating Guideline 3-FES-GOG-229, Pyrophoric Metals Fire Extinguishment by RFETS Fire Department. RFETS Fire Department personnel are available for response to the project-site during the excavation operations.

- Incorporation of Lessons Learned from past projects.

- An Air Pollution Emission Notice (APEN) for the T-1 Source Removal Project is completed, approved, and submitted to the Colorado Department of Public Health and Environment (CDPHE), Air Pollution Control Division (APCD).

- Project Specific Operations Orders are identified and developed.

3.0 REFERENCES

1-E33-IWCP-3, Maintenance Work Package Planning Process

Kaiser-Hill Company, L.L.C., 1996, Rocky Flats Environmental Technology Site Radiological Controls Manual, Rocky Flats Environmental Technology Site, Golden, Colorado

1-31000-COOP, Conduct of Operations

Training User's Manual (TUM)

Department of Energy (DOE), 1996, Rocky Flats Cleanup Agreement, Rocky Flats Environmental Technology Site, Golden, Colorado

RMRS, 1997a, Final Proposed Action Memorandum for the Source Removal At Trench 1 IHSS 108, Rocky Flats Environmental Technology Site, Golden, Colorado, RF/RMRS-97-011, Rev. 3, May 1997.

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

RFETS Health and Safety Practices Manual

Occurrence Reporting ADM.-16.01

DOE-EM-STD-5502-94, DOE Limited Standard, Hazard Baseline Documentation

10 CFR 835

OSHA 29 CFR Part 1926, Subpart P-Excavation

3-FES-GOG-229 Pyrophoric Metals Fire Extinguishment

Rocky Flats Environmental Technology Site Radiological Control Manual

OPS-DIR-001 Safety and Environmental Stewardship Directive

APPENDIX I, HAZARDS ASSESSMENT

This appendix presents the results of the hazard assessment (HA) completed for the T-1 source removal project. The scope of the HA addresses the potential hazards, event scenarios, and consequences associated with the handling of depleted uranium (DU) and other identified and unidentified wastes at T-1 during the excavation, segregation, and treatment activities. The HA was conducted with the participation of the entire ACE development team, taking advantage of the diverse expertise and knowledge base of all team members. A brainstorming approach was used by the team in performing the key HA steps: Phase 1 is the hazard identification, Phase 2 is a screening hazard evaluation with the development of "What if?" scenarios including potential consequences and, Phase 3 is the association of existing and additional expectations for excavation and segregation based on the hazard/scenario/consequence determinations. The implementing documents were also identified during the course of the analysis.

During the first phase of the HA, Task Flow Charts for excavation, segregation, and treatment were generated. An initial list of excavation, segregation, and treatment expectations was created and maintained during the course of the analysis, but as the assessment progressed, the list was modified as necessary to ensure that it reflected the identified expectations. The team then generated a list of general hazards to select and/or aid in determining appropriate hazards and hazard types reasonably expected to exist or occur during T-1 activities.

The principal source of hazards in the excavation , segregation, inerting and packaging other than common industrial and construction hazards, is the handling of a drum that may contain pyrophoric materials in lathe coolant, hydrogen gas, radiologically contaminated dust, and unknown materials. The pyrophoric materials are drums of waste from Building 444 that were first placed in T-1 in November 1954; placement concluded in 1962. Wastes were initially buried in T-1 when Building 444 could not safely process drums of depleted uranium turnings that were combustible and presented a pyrophoric hazard. Historical information indicates other wastes from Building 444 are buried in T-1, including ten drums of cemented cyanide, one drum of "still bottoms," and "copper alloy." The east end of the trench is expected to contained crushed drums, broken pallets, debris, and trash.

Phase 1 Identifying and Categorizing General T-1-Specific Hazards

The key elements of the approach to determining the T-1 specific hazards was conducted by the ACE team as follows:

The team generated a list of general hazards to select and/or aid in determining appropriate hazards and hazard types reasonably expected to exist or occur during T-1 activities. An initial list was created and maintained during the course of the analysis, but as the assessment progressed, the list was modified as necessary to ensure that it reflected the identified hazards. As stated above, the ACE team used a brainstorming approach and their knowledge of the activity and types of hazards associated with source removal at T-1.

The results of this analysis are presented in the final list, Table 1-1, Project Specific Hazards.

Phase 2 Identifying Specific Hazards Potentially Associated with Each Excavation and Segregation Task/Step

The key elements of the approach to determining the T-1 specific hazards by task were conducted by the ACE team as follows:

After Task Flowcharts for T-1 were completed and the preliminary list of hazards was identified, the second phase of the HA was performed to determine potential hazards associated with each task presented in the activity flowcharts. That is, for each task/step in the excavation, segregation, inerting and packaging processes identified by this ACE, the hazards that could reasonably be anticipated to exist or occur were identified. The results of this analysis are presented in Table 1-2, Hazards Identification by Step/Task.

The team identified certain hazards and events associated with the activity that they believed required additional detailed analysis to ensure that controls would be adequate and that the activity was bounded by the approved Authorization Basis for T-1. The team requested the following additional analysis (Appendix II):

- Auditable Safety Analysis for Individual Hazardous Substance Site (IHSS) 108 Trench 1 (T-1) Source Removal Project

Phase 3 Postulating Scenarios For Normal and Reasonably Anticipated Off-Normal Conditions (i.e. "what if" scenarios) for Each Task

The key elements of the approach to determine the T-1 "what if" scenarios by task were conducted by the ACE team as follows:

Following the hazards identification for each task/step the ACE team related possible "what if" scenarios for reasonably expected off-normal conditions that may present hazards of concern during excavation, segregation, inerting and packaging. The hazards previously identified in Table 1-1 and the Hazards Identification by Step/Tasks in Table 1-2 were used to postulate scenarios for each task/step. Where additional hazards were identified Tables 1-1 and 1-2 were updated. After the ACE team began scenarios for the segregation process, its members determined that the "what if" scenarios for each task for segregation were repetitive from task to task. Because no real value was added with this method the ACE team agreed to take the "big picture" approach and evaluate all the "what if" scenarios for excavation, inerting and packaging as separate activities. The scenarios postulated for the T-1 excavation, segregation, inerting and packaging are listed by activity task/step in Table 1-3.

Phase 4 Determining Potential Consequences of Each Postulated Scenario

The key elements of the approach to determine potential consequences of each postulated scenario was conducted by the ACE team as follows:

Once scenarios were postulated for excavation, segregation, inerting and packaging the scenario list was reviewed to determine the potential consequences that may be associated with each scenario. For this step, Table 1-2 information provided guidance on expected consequences for the identified hazards. The potential consequences for each scenario under the excavation, segregation, inerting and packaging activities are identified in column 4 of Table 1-3.

Phase 5 Assigning Previously Defined Expectations to Each Speculated Scenario

The key elements of the approach to determine defined expectations were conducted by the ACE team as follows:

The scenario/consequence listing was again evaluated to determine applicable expectations previously defined for mitigating/preventing the postulated events and/or consequences thereof. This step was used to confirm the adequacy of the defined expectations and/or to identify additional ones necessary to provide satisfactory mitigation/prevention methods. The previously defined and newly defined expectations are reflected, respectively, in the last two columns of Table 1-3. Due to the fact that after the ACE team began scenarios for the segregation process, its members determined that the "what if" scenarios for each task for segregation were repetitive from task to task. The ACE team agreed to take the "big picture" approach and evaluate all the expectations for excavation, segregation, inerting and packaging as separate activities. The expectations postulated for the T-1 excavation, segregation, inerting and packaging processes are listed by activity task/step in Table 1-4.

Phase 6 Determining Applicable Bounding Conditions (if any) Relied On For Any Task in the Activity

The key elements of the approach to determine bounding conditions were conducted by the ACE team as follows:

Bounding conditions are generally set at the beginning of an analysis to better define the scope of bounds of the process being analyzed. For the T-1 source removal project, the initial bounding conditions were identified and listed in Section 2.1 of the main body of the ACE document. Apart from the subject activities being performed within the approved Authorization Basis, no additional bounding conditions were identified.

HAZARDS ASSESSMENT RESULTS/CONCLUSIONS

A comprehensive hazard assessment of the task/steps involved in the source removal activities at T-1 was performed by the ACE team members, and the T-1 Subject Matter Experts. The purpose of the HA was to identify, categorize, and evaluate the potential hazards associated with the subject activity. The results of this effort have been summarized in Tables 1-1, 1-2, 1-3, and 1-4 of this appendix. Normal and realistically anticipated off-normal conditions were evaluated, as documented herein. Under all conditions considered, the hazard scenario deemed to pose the highest risk of concern for the T-1 source removal project was the dispersion of radioactive particulates.

The proposed dispersion of radioactive particulates that could result from the T-1 excavation activity varies in quantities of DU particulates depending on the degree of oxidation and the condition of the drum. However, because the Auditable Safety Analysis (ASA) has already considered such releases, the type of releases speculated for this activity are bounded by the ASA which includes the following course of action. Excavation of T-1 will be performed by exposing discrete drum groupings within the trench as prescribed in the ASA. A drum grouping is expected to contain rows of drums containing 10 and 12 drums (5-6 drums stacked two high). Because of the pyrophoric nature of DU chips, the number of drums that will be simultaneously uncovered and exposed will be minimized. A single row will be excavated prior to beginning the next row. All drums encountered in the trench will be removed from the trench individually, one at a time, in order to minimize exposure to workers, the environment, and the public. A detailed evaluation of this bounding condition is provided in the ASA. T-1 Dust Suppression Procedures will also be in place to control particulate dust dispersion. Based on the "radiological" hazard classification determination, the radiological and chemical hazards associated with the T-1 Site source removal activities present negligible offsite risks to the public and the environment. A DU fire scenario involving 12 drums of chips/turnings has been postulated as a bounding accident scenario associated with project activities. Consequences to the collocated worker and public receptors has been determined to be *moderate* and *low*, respectively, for this bounding scenario based on the acceptance criteria documented in the ASA.

Contamination and personal injury/exposure are also of concern with respect to the anticipated particulate dispersion. However, all work outside of the excavation will be performed in Level B personal protective equipment, or as designated in the Site-Specific Health and Safety Plan. The Site-Specific HASP outlines the health, and environmental air monitoring that will be conducted during the excavation activities. Decontamination and radiological surveying of excavation equipment and personnel will be performed according to the procedures outlined in the Site-Specific HASP.

Excavations which are greater than 4 feet in depth are confined spaces. Confined spaces create potentially hazardous environments due to an oxygen deficient atmosphere, combustible and toxic gases. The Trench 1 excavation has been determined to be a confined space. It is anticipated that all removal of the waste material and sampling events will be performed without personnel entry into the trench. Personnel entry into the excavation trench is unauthorized unless life threatening situation arises and emergency personnel must respond (i.e. personnel falling into the trench). The potentially pyrophoric DU chips and turnings and associated soil and debris will be treated to remove the hazard of pyrophoricity. The waste will be treated through a stabilization process at an off-site facility, which involves oxidation of the DU to a stable oxide form.

Table 1-1 Project Specific Hazards

Item	Hazard ID
1	Crushing/pinching/cutting
2	High pressure (hydraulic) systems
3	Heavy equipment collision
4	Pressurized cylinders (propane operated forklifts) flammable gases
5	Trips/slips/falls
6	Radiological exposure
7	Chemical exposure
8	Splash hazards
9	Eye injury
10	Back strain
11	Noise
12	Heat stress and cold stress
13	Environmental release (airborne, spills, radiological and chemical)
14	Electrical
15	Fire hazard/smoke
16	Explosion
17	Poor communications
18	Low/inadequate illumination
19	Heavy Equipment Exhaust
20	Adverse weather conditions
21	Falling objects

Table 1-2 Hazards Identification by Step/Task

STEP/TASK		HAZARD(S)
1.0 EXCAVATION		
1.1	Position Excavator	Crushing/pinching/cutting High pressure (hydraulic) systems Heavy equipment collision Radiological exposure Chemical exposure Noise Heat stress/cold stress Environmental release Fire hazards Explosion Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders Trips/slips/falls Falling objects
1.2	Remove Soil	High pressure (hydraulic) systems Radiological exposure Chemical exposure Noise Heat stress/cold stress Environmental release Fire hazards Explosion Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders Trips/slips/falls Falling objects
1.3	Screen soil for rads (FIDLER) and VOCs (OVA)	Crushing/pinching/cutting and Trips/slips/falls High pressure (hydraulic) systems Heavy equipment collision Heavy equipment exhaust and Pressurized cylinders Radiological and Chemcial exposure Heat stress/cold stress Noise and Backstrain Falling objects

Table 1-2 Hazards Identification by Step/Task

1.0 EXCAVATION	STEP/TASK	HAZARDS
1.4	Segregate soil for waste minimization	No Hazard-decision point
1.5	Stockpile or package soil as necessary	Crushing/pinching/cutting High pressure (hydraulic) systems Heavy equipment collision Radiological and Chemical exposure Noise and Eye injury Heat stress/cold stress Environmental release Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders Trips/slips/falls Falling objects
1.6	Sample soil per SAP	Trips/slips/falls Radiological and Chemical exposure Back strain Heat stress/cold stress Environmental release Eye injury Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders Falling objects
1.7	Package as appropriate or use as backfill	Crushing/pinching/cutting High pressure (hydraulic) systems Heavy equipment collision Radiological and Chemical exposure Noise Heat stress/cold stress Environmental release Eye injury Trips/slips/falls Back strain and Heavy equipment exhaust Poor communications and Pressurized cylinders Low/inadequate illumination Falling objects

Table 1-2 Hazards Identification by Step/Task

1.0 EXCAVATION	STEP/TASK	HAZARDS
1.8	Visually inspect excavated area	Trips/slips/falls Radiological and Chemical exposure Heat stress/cold stress Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders Falling objects
1.9	Remove slough material	High pressure (hydraulic) systems Radiological and Chemical exposure Noise Heat stress/cold stress Environmental release Fire hazards Explosion Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders Trips/slips/falls Falling objects
1.10	Screen slough material	Crushing/pinching/cutting High pressure (hydraulic) systems Heavy equipment collision Trips/slips/falls Radiological and Chemical exposure Noise Backstrain Heat stress/cold stress Heavy equipment exhaust Pressurized cylinders Falling objects
1.11	Segregate slough material	No hazard-decision point

Table 1-2 Hazards Identification by Step/Task

1.0 EXCAVATION	STEP/TASK	HAZARDS
1.12	Place material in package or front-end loader	Crushing/pinching/cutting High pressure (hydraulic) systems Heavy equipment collision Radiological and Chemical exposure Heat stress/cold stress Environmental release Eye injury and Noise Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders Falling objects Trips/slips/falls
1.13	Transport material to SIP/SSA/staging area	Crushing/pinching/cutting High pressure (hydraulic) systems Heavy equipment collision Radiological and Chemical exposure Environmental release Heat stress/cold stress Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders and Noise Falling objects Trips/slips/falls
1.14	Position excavator	Crushing/pinching/cutting High pressure (hydraulic) systems Heavy equipment collision Radiological and Chemical exposure Heat stress/cold stress Environmental release Fire hazards and Explosion Falling objects Trips/slips/falls Poor communications and Noise Low/inadequate illumination Heavy equipment exhaust and Pressurized cylinders

Table 1-2 Hazards Identification by Step/Task

1.0 EXCAVATION	STEP/TASK	HAZARDS
1.15	Remove contaminated soils	High pressure (hydraulic) systems Radiological and Chemical exposure Noise Heat stress/cold stress Environmental release Fire hazards Explosion Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders Falling objects Trips/slips/falls
1.16	Place sampling matrix	Trips/slips/falls Radiological and Chemical exposure Backstrain Heat stress/cold stress Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders Falling objects
1.17	Decon/survey excavator bucket	Crushing/pinching/cutting High pressure (hydraulic) systems Heavy equipment collision Trips/slips/falls Radiological and Chemical exposure Splash hazard Eye injury Backstrain Noise Heat stress/cold stress Environmental release Poor communications Low/inadequate illumination Falling objects Heavy equipment exhaust Pressurized cylinders

Table 1-2 Hazards Identification by Step/Task

1.0 EXCAVATION	STEP/TASK	HAZARDS
1.18	Collect verification sample	High pressure (hydraulic) systems Heavy equipment collision Trips/slips/falls Radiological exposure Chemical exposure Eye injury Backstrain Noise and Crushing/pinching/cutting Heat stress/cold stress Environmental release Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders Falling objects
1.19	Dewater trench as necessary	Crushing/pinching/cutting Trips/slips/falls Radiological exposure Chemical exposure Splash hazard Noise Heat stress/cold stress Environmental release Electrical Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders Falling objects

Table 1-2 Hazards Identification by Step/Task

2.0 SEGREGATION	STEP/TASK	HAZARDS
2.1	Vent/pierce drum in trench, includes overpacked drum	High pressure (hydraulic) systems Radiological and Chemical exposure Splash hazard Eye injury Noise Heat stress/cold stress Environmental release Fire hazard Explosion Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders Falling objects Trips/slips/falls
2.2	Lift drum out of trench	High pressure (hydraulic) systems Radiological and Chemical exposure Noise and Heavy equipment exhaust Splash hazard Heat stress/cold stress Environmental release Fire hazard and Pressurized cylinders Poor communications Low/inadequate illumination Falling objects Trips/slips/falls
2.3	Place drum in container pan	High pressure (hydraulic) systems Radiological and Chemical exposure Noise and Heavy equipment exhaust Splash hazard Heat stress/cold stress Environmental release Fire hazard and Pressurized cylinders Poor communications Low/inadequate illumination Falling objects Trips/slips/falls

Table 1-2 Hazards Identification by Step/Task

2.0 SEGREGATION	STEP/TASK	HAZARDS
2.4	Visually inspect drum	Trips/slips/falls Radiological and Chemical exposure Backstrain Heat stress/cold stress Environmental release Fire hazard/smoke Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders Falling objects Splash hazard
2.5	Heat test drum	Trips/slips/falls Radiological exposure Chemical exposure Backstrain Heat stress/cold stress Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders Falling objects
2.6	Use appropriate fire controls on drum as necessary	Trips/slips/falls Radiological exposure Chemical exposure Backstrain Heat stress/cold stress Poor communications Low/inadequate illumination Heavy equipment exhaust Fire hazard/smoke Explosion Environmental release Pressurized cylinders Splash hazard Falling objects

Table 1-2 Hazards Identification by Step/Task

2.0 SEGREGATION	STEP/TASK	HAZARDS
2.7	Radiation evaluation surveys (dose rate and in-process removable contamination)	Trips/slips/falls Radiological exposure Chemical exposure Backstrain Heat stress/cold stress Fire Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders Falling objects
2.8	Post as necessary based on measured radiological levels	Trips/slips/falls Radiological exposure Chemical exposure Backstrain Heat stress/cold stress Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders Falling objects
2.9	Screen drum for VOCs and combustible gases	Trips/slips/falls Radiological exposure Chemical exposure Environmental release Heat stress/cold stress Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders Falling objects

Table 1-2 Hazards Identification by Step/Task

2.0 SEGREGATION	STEP/TASK	HAZARDS
2.10	Continue venting and monitor the surrounding area	High pressure (hydraulic) systems Radiological and Chemical exposure Noise Heat stress/cold stress Environmental release Fire hazard/smoke Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders Falling objects Trips/slips/falls
2.11	Place drum in package (7A,Type A overpack or metal box)	Crushing/pinching/cutting High pressure (hydraulic) systems Trips/slips/falls Radiological and Chemical exposure Splash hazard Eye injury Backstrain Noise Heat stress/cold stress Environmental release Fire/smoke Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders Falling objects
2.12	Transport drum SIP for further evaluation, sampling and inerting of DU material	Crushing/pinching/cutting/trips/slips/falls High pressure (hydraulic) systems Heavy equipment collision and Noise Radiological and chemical exposure Heat stress/cold stress Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders Falling objects

Table 1-2 Hazards Identification by Step/Task

2.0 SEGREGATION	STEP/TASK	HAZARDS
2.13	Radiation evaluation surveys (dose rate and in-process removable contamination)	Trips/slips/falls Radiological exposure Chemical exposure Backstrain Heat stress/cold stress Fire/smoke Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders Falling objects
2.14	Post area as necessary based on radiological levels	Trips/slips/falls Radiological exposure Chemical exposure Backstrain Heat stress/cold stress Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders Falling objects
2.15	Lift bucket of debris out of trench	High pressure (hydraulic) systems Radiological exposure Chemical exposure Noise Splash hazard Heat stress/cold stress Environmental release Fire hazard/smoke Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders Falling objects Trips/slips/falls

Table 1-2 Hazards Identification by Step/Task

2.0 SEGREGATION	STEP/TASK	HAZARDS
2.16	Radiological evaluation surveys (dose rate and in process removable contamination)	Trips/slips/falls Radiological and Chemical exposure Falling objects and Backstrain Heat stress/cold stress Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders
2.17	VOC screening per RMRS SAP	Trips/slips/falls Radiological and Chemical exposure Falling objects and Backstrain Heat stress/cold stress Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders
2.18	Post as necessary based on measured radiological levels	Trips/slips/falls and Backstrain Radiological exposure and Chemical exposure Heat stress/cold stress Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders Falling objects
2.19	Reduce size of debris on a case by case basis per written direction	Crushing/pinching/cutting High pressure (hydraulic) systems Heavy equipment collision Pressurized cylinders Trips/slips/falls and Falling objects Radiological and Chemical exposure Heavy equipment exhaust Noise and Eye injury Noise and Backstrain Heat stress/cold stress Environmental release Electrical Poor communications Low/inadequate illumination

Table 1-2 Hazards Identification by Step/Task

2.0 SEGREGATION	STEP/TASK	HAZARDS
2.20	Transfer debris from bucket to package	Crushing/pinching/cutting High pressure (hydraulic) systems Heavy equipment collision Radiological and Chemical exposure Environmental release Heat stress/cold stress Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders and Noise Falling objects Trips/slips/falls
2.21	Sample per RMRS SAP	Trips/slips/falls Radiological and Chemical exposure Back strain Heat stress/cold stress Environmental release Eye injury Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders Falling objects
2.22	Prepare package	Crushing/pinching/cutting High pressure (hydraulic) systems Heavy equipment collision Trips/slips/falls Radiological and Chemical exposure Falling objects Splash hazard Eye injury and Noise Backstrain Heat stress/cold stress Environmental release Poor communications Low/inadequate illumination Heavy equipment exhaust and Pressurized cylinders

Table 1-2 Hazards Identification by Step/Task

2.0 SEGREGATION	STEP/TASK	HAZARDS
2.23	Transfer package to staging area when full	Crushing/pinching/cutting High pressure (hydraulic) systems Heavy equipment collision Radiological and Chemical exposure Environmental release Heat stress/cold stress Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders and Noise Falling objects Trips/slips/falls

Table 1-2 Hazards Identification by Step/Task

3.0 INERTING	STEP/TASK	HAZARDS
3.1	Evaluate and inventory drum contents	Crushing/pinching/cutting Radiological and chemical exposure Environmental release Falling objects Trips/slips/falls Heat stress/cold stress Noise Back strain Fire hazards/smoke Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders
3.2	Transfer liquid to package	Crushing/pinching/cutting High pressure systems Radiological exposure Environmental release Chemical exposure Heavy equipment collision Trips/slips/falls Heat stress/cold stress Electrical Noise Back strain Eye injury Falling objects Splash hazards Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders

Table 1-2 Hazards Identification by Step/Task

3.0 INERTING	STEP/TASK	HAZARDS
3.3	Sample liquids per subcontrator's SAP	Crushing/pinching/cutting Radiological and Chemical exposure Environmental release Falling objects Trips/slips/falls Heat stress/cold stress Back strain and Eye injury Splash hazards Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders
3.4	Manage liquids for disposal	Crushing/pinching/cutting High pressure systems Radiological and Chemical exposure Environmental release Falling objects Heavy equipment Trips/slips/falls Heat stress/cold stress Electrical Noise and Back strain Eye injury Heavy equipment exhaust Pressurized cylinders
3.5	Evaluate solid material	Crushing/pinching/cutting Radiological and Chemical exposure Environmental release Falling objects Trips/slips/falls Heat stress/cold stress Noise and Back strain Fire hazards Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders

Table 1-2 Hazards Identification by Step/Task

3.0 INERTING	STEP/TASK	HAZARDS
3.6	Reduce size of debris on a case by case basis per written direction	Crushing/pinching/cutting High pressure (hydraulic) systems Heavy equipment collision Pressurized cylinders Trips/slips/falls and Falling objects Radiological and Chemical exposure Heavy equipment exhaust Noise and Eye injury Noise and Backstrain Heat stress/cold stress Environmental release Electrical Poor communications Low/inadequate illumination
3.7	Package drum	Crushing/pinching/cutting Falling objects Trips/slips/falls Heat stress/cold stress Noise Back strain Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders
3.8	Transfer package to staging area when full	Crushing/pinching/cutting High pressure (hydraulic) systems Heavy equipment collision Radiological and Chemical exposure Environmental release Heat stress/cold stress Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders and Noise Falling objects Trips/slips/falls

Table 1-2 Hazards Identification by Step/Task

3.0 INERTING	STEP/TASK	HAZARDS
3.9	Manage for appropriate disposal	Crushing/pinching/cutting and Trips/slips/falls Heavy equipment Heat stress/cold stress Back strain and Noise Poor communications Low/inadequate illumination Falling objects Heavy equipment exhaust
3.10	Segregate course material/drum fragments	Trips/slips/falls Radiological and Chemical exposure Back strain Heat stress/cold stress Environmental release Eye injury Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders Falling objects Crushing/pinching/cutting
3.11	Sample per RMRS SAP	Trips/slips/falls Radiological and Chemical exposure Back strain Heat stress/cold stress Environmental release Eye injury Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders Falling objects Crushing/pinching/cutting

Table 1-2 Hazards Identification by Step/Task

3.0 INERTING	STEP/TASK	HAZARDS
3.12	Package as appropriate	Crushing/pinching/cutting Falling objects Trips/slips/falls Heat stress/cold stress Heavy equipment exhaust Back strain and Noise Poor communications Low/inadequate illumination
3.13	Transfer package to staging area when full	Crushing/pinching/cutting High pressure (hydraulic) systems Heavy equipment collision Radiological and Chemical exposure Environmental release Heat stress/cold stress Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders and Noise Falling objects Trips/slips/falls
3.14	Evaluate remaining solid material	Crushing/pinching/cutting Radiological and Chemical exposure Environmental release Falling objects Trips/slips/falls Heat stress/cold stress Noise and Back strain Fire hazards Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders

Table 1-2 Hazards Identification by Step/Task

3.0 INERTING	STEP/TASK	HAZARDS
3.15	Inert DU in mineral oil	Crushing/pinching/cutting Radiological exposure Environmental release Chemical exposure Trips/slips/falls Heat stress/cold stress Electrical Eye injury Splash hazards Fire hazard/smoke Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders Falling objects
3.16	Sample per subcontractor's SAP	Trips/slips/falls Radiological and Chemical exposure Back strain Heat stress/cold stress Environmental release Eye injury Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders Falling objects Crushing/pinching/cutting

Table 1-2 Hazards Identification by Step/Task

3.0 INERTING	STEP/TASK	HAZARDS
3.17	Prepare package	Crushing/pinching/cutting High pressure (hydraulic) systems Heavy equipment collision Trips/slips/falls Radiological and Chemical exposure Falling objects Splash hazard Eye injury and Noise Backstrain Heat stress/cold stress Environmental release Poor communications Low/inadequate illumination Heavy equipment exhaust and Pressurized
3.18	Transfer package to staging area inside structure	Crushing/pinching/cutting High pressure (hydraulic) systems Heavy equipment collision Radiological and Chemical exposure Environmental release Heat stress/cold stress Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders and Noise Falling objects Trips/slips/falls
3.19	Release package from structure	Crushing/pinching/cutting High pressure (hydraulic) systems Heavy equipment collision Radiological and Chemical exposure Environmental release Heat stress/cold stress Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders Falling objects and Trips/slips/falls Adverse weather conditions Noise

Table 1-2 Hazards Identification by Step/Task

3.0 INERTING	STEP/TASK	HAZARDS
3.20	Transfer package to temporary on site storage until analytical is received	Crushing/pinching/cutting High pressure systems Trips/slips/falls Heat stress/cold stress Noise and Back strain Poor communications Low/inadequate illumination Falling objects Adverse weather conditions Radiological and Chemical exposure
3.21	Weigh package	Crushing/pinching/cutting High pressure systems Heavy equipment collision Trips/slips/falls Heat stress/cold stress Electrical and Back strain Low/inadequate illumination Falling objects Adverse weather conditions Radiological and Chemical exposure
3.22	Load package onto transport	Crushing/pinching/cutting High pressure systems Heavy equipment collision Trips/slips/falls and Back strain Heat stress/cold stress Low/inadequate illumination Falling objects Adverse weather conditions Radiological and Chemical exposure
3.23	Offsite shipment for treatment and disposal	Crushing/pinching/cutting Radiological exposure Trips/slips/falls Heat stress/cold stress Back strain and Falling objects Low/inadequate illumination Adverse weather conditions

Table 1-2 Hazards Identification by Step/Task

3.0 INERTING	STEP/TASK	HAZARDS
3.24	Inert DU in dry soil	Crushing/pinching/cutting Radiological and Chemical exposure Environmental release Trips/slips/falls Heat stress/cold stress Electrical and Eye injury Splash hazards and Falling objects Fire hazard/smoke Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders
3.25	Segregate and isolate item	Crushing/pinching/cutting Radiological and Chemical exposure Environmental release Trips/slips/falls Heat stress/cold stress Fire hazards and Back strain Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders Falling objects
3.26	Package appropriately	Crushing/pinching/cutting Falling objects Trips/slips/falls Heat stress/cold stress Back strain and Noise Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders
3.27	Manage for appropriate disposal	Crushing/pinching/cutting and Trips/slips/falls Heavy equipment Heat stress/cold stress Back strain and Noise Poor communications Low/inadequate illumination Falling objects Heavy equipment exhaust

Table 1-2 Hazards Identification by Step/Task

3.0 INERTING	STEP/TASK	HAZARDS
3.28	Sample per subcontractor's SAP	Trips/slips/falls Radiological and Chemical exposure Back strain Heat stress/cold stress Environmental release Eye injury Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders Falling objects Crushing/pinching/cutting
3.29	Over or Repackage cemented cyanide	Crushing/pinching/cutting Radiological and chemical exposure Falling objects Trips/slips/falls Heat stress/cold stress Poor communications and Back strain Heavy equipment exhaust Pressurized cylinders
3.30	Transfer package to staging area inside structure	Crushing/pinching/cutting High pressure (hydraulic) systems Heavy equipment collision Radiological and Chemical exposure Environmental release Heat stress/cold stress Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders and Noise Falling objects Trips/slips/falls

Table 1-2 Hazards Identification by Step/Task

3.0 INERTING	STEP/TASK	HAZARDS
3.31	Manage for appropriate disposal	Crushing/pinching/cutting and Trips/slips/falls Heavy equipment Heat stress/cold stress Back strain and Noise Poor communications Low/inadequate illumination Falling objects Heavy equipment exhaust
3.32	Sample per RMRS SAP	Trips/slips/falls Radiological and Chemical exposure Back strain Heat stress/cold stress Environmental release Eye injury Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders Falling objects Crushing/pinching/cutting
3.33	Package debris	Crushing/pinching/cutting Falling objects Trips/slips/falls Heat stress/cold stress Heavy equipment exhaust Back strain and Noise Poor communications Low/inadequate illumination

Table 1-2 Hazards Identification by Step/Task

3.0 INERTING	STEP/TASK	HAZARDS
3.34	Transfer package to staging area when full	Crushing/pinching/cutting High pressure (hydraulic) systems Heavy equipment collision Radiological and Chemical exposure Environmental release Heat stress/cold stress Poor communications Low/inadequate illumination Heavy equipment exhaust Pressurized cylinders and Noise Adverse weather conditions Falling objects Trips/slips/falls
3.35	Manage for appropriate disposal	Crushing/pinching/cutting Heavy equipment Heat stress/cold stress Back strain and Noise Poor communications Low/inadequate illumination Falling objects Trips/slips/falls Adverse weather conditions

Table 1-3 Screening Hazards Assessment Results

1.O	EXCAVATION				
	STEP/TASK	WHAT IF...?	POTENTIAL CONSEQUENCES	DEFINED EXPECTATIONS	ADDITIONAL EXPECTATIONS
	EXCAVATION PROCESS				
		Breathing air is lost	Personal injury, potential uptake, chemical/rad exposure	A, C, E, G, H, I, K, R, U	
		PPE is breached	Personal injury, exposure	A, G, H, E, R, U	
		Worker becomes cut, pinched, crushed	Personal injury, potential uptake, chemical/rad exposure	A, C, G, H, I, K, E, S, N, O, P, R, U, W, BB, CC, FF, QQ, RR	
		A DU fire starts	Personal injury, potential uptake, chemical/rad exposure, waste dispersion	A, C, G, H, J, L, T, W, Q, E, F, I, L, N, P, R, S, U, X, HHH	
		Unexpected material is uncovered	Personal injury, fire/explosion, dispersed contamination	A, C, F, G, H, I, J, W, L, N, P, R, U, X, Y, E, K, RR, SS, III	
		Chemical contamination is encountered	Potential spill/release	A, C, F, G, H, I, K, M, P, R, U, Y, E, Z, MM, SS, KKK	
		Radioactive contamination is encountered	Potential spill/release	A, C, F, G, H, K, M, R, S, U, X, Y, E, I, TT, III, Z	Minimum thresholds for anticipated isotopics identified
		Worker slips/trips/falls	Personal injury, exposure	A, C, G, H, I, M, E, R, U	
		Equipment fails	Potential spill/ release, personal injury, exposed waste in trench, unstable waste configuration	A, C, E, G, H, I, O, R, V	

Table 1-3 Screening Hazards Assessment Results

	Excavation Cont. STEP/TASK	WHAT IF...?	POTENTIAL CONSEQUENCES	DEFINED EXPECTATIONS	ADDITIONAL EXPECTATIONS
		Sample is dropped	Spill, potential release, personal injury, chem/rad exposure	A, C, F, G, H, I, R, X, III	
		Material is dropped	Spill, potential release, personal injury	A, C, F, G, H, I, R, X, III	
		Lighting is lost	Personal injury	A, E, H, I, V, R	
		Power is lost	Personal injury, potential uptake, chemical/rad exposure	A, E, H, I, V, R	
		More than 12 drums are exposed at a time	Exceed the Material at Risk level, chemical/rad exposure	A, C, H, I, T, R, J	
		High pressure hydraulic leak	Spill, potential release, personal injury	A, C, E, H, I, O	
		A drum explodes	Personal injury, potential uptake, chemical/rad exposure, waste dispersion	A, C, F, G, H, I, J, L, N, M, P, Q, T, W, III, JJJ, X, HH, Z	

2.0	SEGREGATION				
	STEP/TASK	WHAT IF...?	POTENTIAL CONSEQUENCES	DEFINED EXPECTATIONS	ADDITIONAL EXPECTATIONS
	SEGREGATION PROCESS				
		Breathing air is lost	Personal injury, potential uptake, chemical/rad exposure	A, C, E, G, H, I, K, R, U	
		PPE is breached	Personal injury, exposure	A, G, H, E, R, U	
		Worker becomes cut, pinched, crushed	Personal injury, potential uptake, chemical/rad exposure	A, C, G, H, I, K, E, S, N, O, P, R, U, W, BB, CC, FF, QQ, RR	
		A DU fire starts	Personal injury, potential uptake, chemical/rad exposure, waste dispersion	A, C, G, H, J, L, T, W, Q, E, F, I, L, N, P, R, S, U, X, HHH	
		A drum explodes	Personal injury, potential uptake, chemical/rad exposure, waste dispersion	A, C, F, G, H, I, J, L, N, M, P, Q, T, W, III, JJJ, X, HH, Z	
		Unexpected material is uncovered	personal injury, fire/explosion, dispersed contamination	A, C, F, G, H, I, J, W, L, N, P, R, U, X, Y, E, K, RR, SS, III	
		Chemical contamination is encountered	Potential spill/release	A, C, F, G, H, I, K, M, P, R, U, Y, E, Z, MM, SS, KKK	
		Radioactive contamination is encountered	Potential spill/release	A, C, F, G, H, K, M, R, S, U, X, Y, E, I, TT, III, Z	
		Worker slips/trips/falls	Personal injury, exposure	A, C, G, H, I, M, E, R, U	
		Material is dropped on the floor	Spill, potential release, personal injury	A, C, F, G, H, I, R, X, III	
		Equipment fails	Spill, potential release, personal injury	A, C, E, G, H, I, O, R, V	

See table 1-4 Expectations for Item References

Table 1-3 Screening Hazards Assessment Results

	Segregation Cont. STEP/TASK	WHAT IF...?	POTENTIAL CONSEQUENCES	DEFINED EXPECTATIONS	ADDITIONAL EXPECTATIONS
		Liquids are spilled	Potential release, personal injury	A, C, F, G, H, I, S, R, X, III	
		Contaminated solid is spilled	Spill, potential release, personal injury	A, C, F, G, H, I, S, R, X, III	
		Sample is dropped	Spill, potential release, personal injury	A, C, F, G, H, I, R, X, III	
		A tool breaks while emptying containers	Personal injury, potential uptake, chemical/rad exposure	A, E, H, S, U	
		Lighting is lost	Personal injury	A, E, H, I, V, R	
		Power is lost	Personal injury, potential uptake, chemical/rad exposure	A, E, H, I, V, R	
		Ventilation is lost	Potential uptake, chemical/rad exposure	A, E, F, H, I, R, V, JJJ	
		High wind collapses shelter	Personal injury, potential uptake, chemical/rad exposure	A, E, F, H, I, R, III	
		What if material is Pu	Potential dose exposure, may exceed Category 3	A, C, E, F, G, H, I, X, Z, FF, II, JJ, RR, TT, UU, XX, VV, EEE, HHH	
		There is a heavy equipment collision	Personal injury, chemical/rad exposure, waste dispersions, unstable waste configuration and condition	A, E, O, C, K, R	
		High wind breaks shelter	Personal injury, potential uptake, chemical/rad exposure	A, E, F, H, I, R, III	
		High pressure hydraulic leak	Spill, potential release	A, E, H, I, C, O	

Table 1-3 Screening Hazards Assessment Results

3.0	INERTING				
	STEP/TASK	**WHAT IF...?**	**POTENTIAL CONSEQUENCES**	**DEFINED EXPECTATIONS**	**ADDITIONAL EXPECTATIONS**
	INERTING PROCESS				
		Breathing air is lost	Personal injury, potential uptake, chemical/rad exposure	A, C, E, G, H, I, K, R, U	
		PPE is breached	Personal injury, exposure	A, G, H, E, R, U	
		Worker becomes cut, pinched, crushed	Personal injury, potential uptake, chemical/rad exposure	A, C, G, H, I, K, E, S, N, O, P, R, U, W, BB, CC, FF, QQ, RR	
		A DU fire starts	Personal injury, potential uptake, chemical/rad exposure, waste dispersion	A, C, G, H, J, L, T, W, Q, E, F, I, L, N, P, R, S, U, X, HHH	
		Worker slips/trips/falls	Personal injury, exposure	A, C, G, H, I, M, E, R, U	
		Material is dropped on the floor	Spill, potential release, personal injury	A, C, F, G, H, I, R, X, III	
		Equipment fails	Spill, potential release, personal injury	A, C, E, G, H, I, O, R, V	
		Liquids are spilled	Spill, potential release, personal injury	A, C, F, G, H, I, S, R, X, III	
		Contaminated solid is spilled	Spill, potential release, personal injury	A, C, F, G, H, I, R, X, III	
		Sample is dropped	Spill, potential release, personal injury	A, C, F, G, H, I, R, X, III	
		Lighting is lost	Personal injury, potential uptake, chemical/rad exposure	A, E, H, I, V, R	
		Power is lost	Personal injury, potential uptake, chemical/rad exposure	A, E, H, I, V, R	

See table 1-4 Expectations for Item References

Table 1-3 Screening Hazards Assessment Results

	Inerting Cont. STEP/TASK	WHAT IF...?	POTENTIAL CONSEQUENCES	DEFINED EXPECTATIONS	ADDITIONAL EXPECTATIONS
	INERTING PROCESS				
		High wind collapses shelter	Personal injury, potential uptake, chemical/rad exposure	A, E, F, H, I, R, III	
		High wind breaks shelter	Personal injury, potential uptake, chemical/rad exposure	A, E, F, H, I, R, III	
		Ventilation is lost	Potential uptake, chemical/rad exposure	A, E, F, H, I, R, V, JJJ	
		Run out of inerting supplies	Chemical/rad exposure, fire, rad contamination	A, I, U, OO	
		The Pu values on the AP2 are exceeded	Rad exposure, rad contamination, unstable waste configuration and condition	X, A, F, G, H, I, P, Y, DD, FF, JJ, TT, UU, HHH, III	
		The final package is over weight	Personal injury, rad exposure	A, H, I, U, BBB, GGG, AAA, VV	
		There is a heavy equipment collision	Personal injury, chemical/rad exposure, waste dispersions, unstable waste configuration and condition	A, E, O, C, K, R	

Table 1-4 Expectations

TASK		EXPECTATION	RFETS INFRASTRUCTURE AND IMPLEMENTING DOCUMENTS	COMMENTS
EXCAVATION, SEGREGATION, AND INERTING				
	A	(s)(m) Completed training matrix (P)	T-1 HASP, 1-10000 TUM, TSR Data base, RMRS QAPD	
	B	(s)(m)(w) Permits and regulatory documentations are approved and current (T)	RWP, Soil Disturbance permit, APEN, PAM, HSP12.08,	
	C	(s) P.O.D. approved/Pre-evolution briefing completed (P)	T-1 COOP Implementation Plan, COOP	
	D	(s) Environmental checklist completed (P)	PAM, "Site-Wide Environmental Compliance Program Management Plan, NEPA Program"	
	E	(w) Equipment checked and inspected (P)(T)	T-1 COOP Implementation Plan, FIP, skilled craft	
	F	(w) Monitoring equipment, including CAMS, on-site calibrated and operable (P)	HASP, RAAMP, SAP, Site Rad Con Manual, FIP, F0.1 Air Monitoring and Particulate Control, ALARA Job Review, Ops Order T1-08, QAPjP	
	G	(s)(w) Adequate PPE available (P)	HASP, RWP	
	H	(m)(s) Completed ASA, HASP, PAM, SAP and FIP (P)(M)	RFCA	
	I	(s)(m) Adequate support staff available (P)	T-1 COOP Implementation Plan, FY 98 WP	

Table 1-4 Expectations

TASK		EXPECTATION	RFETS INFRASTRUCTURE AND IMPLEMENTING DOCUMENTS	COMMENTS
	J	(s)(w) Appropriate and adequate fire controls in place, trained personnel present (T)(P)	3-FES-GOG-229 Pyrophoric Metals Fire Extinguishment, FIP, HASP	
	K	(w) Excavator appropriately placed to begin excavation (P)	FIP	
	L	(w)(s) Drum is heat-tested (T)(P)	FIP, job instruction, Ops Order T1-09 Heat Gun	
	M	(s)(w) Trench is adequately roped-off and posted (P)	OSHA (29 CFR Part 1926, Subpart P-Excavations), HASP, RWP	
	N	(s)(w) Bulging or pressurized drum can be safely vented in the trench (T)(P)	FIP, job instruction, HASP	
	O	(w) Equipment has adequate lift capacity (P)	OSHA (29 CFR Part 1926, Subpart H-Materials Handling, Storage, Use, and Disposal), FIP, HASP	
	P	(s)(w) Condition of drum (ie..bulging, etc.) can be visually inspected (T)(P)	FIP, skill of craft, HASP	
	Q	(s)(w) Drums will be handled one at a time & one row at a time (P)	ASA, FIP, HASP, PAM	
	R	(s)(w) Walk-downs/drills performed with site personnel prior to start of work (P)	T -1 COOP Implementation Plan, HASP	
	S	(s)(w) On-site personnel trained in handling and recognition of depleted uranium material(T)(P)	HASP, Quality Assurance Project Plan	
	T	(s)(w)Handle only one bucket at a time (P)	ASA, FIP	
	U	(s)(m) Operational procedures are completed to include all applicable job instructions (P)	FIP, F0.1 Air Monitoring and Particulate Control, QAPjP, COOP	
	V	(s) Provide back-up power as needed (P)	HASP, FIP	

Table 1-4 Expectations

TASK		EXPECTATION	RFETS INFRASTRUCTURE AND IMPLEMENTING DOCUMENTS	COMMENTS
	W	(s)(w)No unauthorized personnel will be allowed in the trench(P)	HASP, FIP	
	X	(s)(w)Rad control in place and located appropriately to minimize the spread of contamination within the working area and prevent the spread of contamination outside the working boundaries (T)(P)	Rad Control Manual, HSP, ROI, AIARA JOB REVIEW	
	Y	(w)(s)Sampling material, equipment, instrumentation, and containers available (T)	SAP, QAPjP	
	Z	(w)(s)Instruments required to perform analysis available (T)	SAP, QAPjP	
	AA	Intact drum is 55 gallons or smaller	HRR, Historical Records, skill of craft	
	BB	(w)(s)Intact drum has sufficient structural integrity to allow lifting with a sling (T)	Skill of the craft	
	CC	(w)(s)Sling and lifting equipment are available and certified (T)(M)	HSP 12.02, QAPjP	
	DD	(w)(s)Drum will fit in overpack (T)	Skill of the craft	
	EE	(w)(s)(m)Overpack drum meets DOT requirements (T)	FIP, HASP, 49 CFR 100-180	
	FF	(w)(s)Opening is large enough to perform sampling (4"-6") (T)	Skill of the craft, FIP, HASP	
	GG	(w)(s)Drum has sufficient integrity to pierce (T)	Skill of the craft, FIP, HASP	
	HH	(w)(s)Sparkless spike is available (T)	FIP, HASP	
	II	(w)(s)Equipment is available to transport drum (forklift)(T)	FIP, FY98 WP	
	JJ	(w)(s)Package is in a safe configuration (T)(M)	T1-07 Op Order for Packaging, WO-4034, FIP, HASP	

Table 1-4 Expectations

TASK		EXPECTATION	RFETS INFRASTRUCTURE AND IMPLEMENTING DOCUMENTS	COMMENTS
	KK	(w)(s)Gross decontamination of package is complete(T)	Rad Con Manual, RWP, FIP	
	LL	(w)(s)SIP is ready to receive package (T)	FIP, HASP, Subcontractor Workplan	
	MM	(w)Monitoring results are transported with package(T)	FIP, HASP, skill of craft, Rad Con Manual	
	NN	(w)(s)(m)Mineral oil meets DOT requirements(T)(M)	FIP, HASP, 49 CFR 100-180	
	OO	(w)(s)Sufficient quantity of mineral oil and soil is on hand to inert DU (T)	FIP, workplan, Ops Order for Packaging	
	PP	(w)(s)Equipment available to transfer mineral oil and soil to package (T)	FIP, subcontractor treatment workplan, Ops Order for Packaging	
	QQ	(w)(s)Opening in drum is large enough to accommodate inspection and consolidation of drum contents (T)	Skill of the craft, FIP, HASP	
	RR	(w)(s)Sufficient lighting available for inspection of material (T)(M)	FIP, HSP	
	SS	(w)(s)(m)Complete and approved Starmet SAP (T)(M)	Statement of Work, Workplan	
	TT	(w)(s)Procedure and methods for determining and analyzing for Pu are established (T)	SAP, HPGE Program, K-H Analytical Statement of Work, QAPjP	
	UU	(w)(s)All packages are appropriately labeled, and all documents accompany package (T)(M)	Ops Order for Packaging T-1 Waste, WO-4034, FIP	

Table 1-4 Expectations

TASK		EXPECTATION	RFETS INFRASTRUCTURE AND IMPLEMENTING DOCUMENTS	COMMENTS
	VV	(s)(m)Waste inspection and waste certification officials are at the Trench site, when required (M)(T)	FIP, Solid Radioactive Waste Packaging WO 4034, T1-07 Ops Order for Packaging T1 Waste, Ops Order T1-02 Organization Roles and Responsibilities	
	WW	(s)(m)Laydown (storage) area is established (T)	Rad Con Manual, FIP, RWP	
	XX	(w)(s)Radiological operations release of package from CA (T)(M)	Rad Con Manual, FIP, RWP	
	YY	(s)(m)Approved storage area is established and covered for temporary storage out of the main shelter area(T)	FIP, HASP, PAM	
	ZZ	(s)(w)Appropriate routine inspections are performed (includes monitoring for heat reaction)(T)(M)(P)	FIP, COOP Implementation Plan, HASP, QAPjP	
	AAA	(s)(w)Calibrated and adequate scale is available(T)(M)	FIP, Subcontractor treatment workplan, QAPjP	
	BBB	(w)(s)Package does not exceed certified payload(T)(M)	Ops Order Packaging, skill of the craft	
	CCC	(w)(s)Prior to transport required surveys are performed (T)(M)	Rad Con Manual, RWP	
	DDD	(s)(m)Carrier and driver are approved by traffic(T)	DOE Orders 1540 Series	
	EEE	(s)(m)Analytical results received and peer reviewed (M)	RMRS QA Plan, K-H Analytical Statement of Work	
	FFF	(s)(w)(m)Vehicles properly placarded if required(T)	Rocky Flats Traffic Management Desk Procedures and Work Guides, 49 CFR 100-180	

Table 1-4 Expectations

TASK		EXPECTATION	RFETS INFRASTRUCTURE AND IMPLEMENTING DOCUMENTS	COMMENTS
	GGG	(s)Waste certification official approval(T)	WO-4034, T1-07 Ops Order Packaging T1 Waste	
	HHH	Data evaluated and compared with applicable threshold limits and/or suspension guidelines	T1-07 Ops Order Packaging T1 Waste, SAP, RWP, Air Monitoring Plan	
	III	Reporting requirements are promulgated to all site workers	Occurrence Reporting ADM-16.01, T-1 COOP Implementation Plan	
	JJJ	Engineering controls and proper air flow are maintained in the vestibule to ensure personnel are wearing the appropriate PPE	IWCP, HSP	
	KKK	All liquids are field tested prior to pumping them into the poly tank to ensure compatibility of the waste	SAP	
		M=Management Standard T=Technical Standard P=Performance Standard m=management s=supervisor w=worker		
		Note: There may be expectations that are not associated with the Screening Hazards Assessment Results because the expectation was identified during the Hazards Identification by Step/Task		

CROSS TABLE REVIEW REPORT OF THE ACTIVITY CONTROL ENVELOPE (ACE) FOR SOURCE REMOVAL AT TRENCH 1 IHSS 108

February 25, 1998

Review Team Consensus

The individuals listed below were members of the Cross Table Review Group responsible for the review of the Activity Control Envelope (ACE) for Source Removal at Trench 1 IHSS 108. Signatures indicate concurrence with the contents of this report.

Alan Rodgers, ~~K-H~~

for John E. Law, RMRS

Shannon Walker-Lembke, Tenera

Stephanie DeWitt, ~~RMRS~~ K-H

Mark R. Steelman, EnergX

Joseph W. Mahaffey, K-H

Thomas P. Denny, DOE-RFFO

Thomas M. Lindsey, RMRS

R. Doyle Gillespie, K-H

Louie G. Schimpf, DCI

Judy A. Yeater, RMRS

Bates Estabrooks

1.0 Description of the Review

A cross table review was convened to conduct a technical review of Revision 4 of the Activity Control Envelope (ACE) for Source Removal at Trench 1 IHSS 108. The cross table review provided an in depth critique of assumptions, calculations, extrapolations, methodology, and acceptance criteria employed, and the conclusions included in the ACE. The review included representatives from the original Trench 1 ACE development team and a review group consisting of subject matter experts from SSOC, RMRS, DCI, and K-H. The review was conducted according to 1-U39-ADM-02.40, *Conduct of Cross Table Technical Reviews.*

The cross table review group consisted of twelve members with extensive collective experience in managing environmental excavation and remediation activities. The qualifications and experience of the review group members are included in Attachment 1, *Credentials Report.* The ACE development group included the following members:

Mark Burmeister, RMRS
Tracey Spence, RMRS
Susan Myrick, RMRS
Norma Castaneda, DOE-RFFO
John Miller, K-H/Tenera
Tom Greengard, K-H
Wayne Sproles, RMRS
Jeff Herring, DCI
Ken Gillespie, RMRS
Bill Gillen, K-H/Tenera
Don Barbour, Starmet
Nick Lombardo, S.M. Stoller
Mike Gaden, EnergX

The cross table review was conducted in two sessions, one on February 4, 1998, and one on February 5, 1998. The initial meeting of the cross table review group was to familiarize the group with the Cross Table Review process, the expectations for performing the review, and to ensure that the group included the appropriate disciplines. The group was presented with Revision 4 of the Activity Control Envelope (ACE) for Source Removal at Trench 1 IHSS 108. The group then began deliberations on Revision 4 of the ACE.

2.0 Review Results

Overall, the review group found that the expectations listed in the ACE for Source Removal at Trench 1 IHSS 108, when implemented, will provide an adequate set of controls for performing the excavation and segregation activities safely at Trench 1. Both meetings consisted of a page-by-page review of the ACE. The review group recommended a variety of changes to the ACE. Based on the discussions and recommended changes, the development group generated and provided a marked-up copy of the ACE to the review group for concurrence (Attachment 2). Attendance rosters for each of the cross table review meetings are included in Attachment 3.

The cross table review group and the development group agreed on the changes to be made to the Trench 1 ACE. The changes were made and verified on February 25, 1998.

3.0 Review Group Conclusions

Based upon the body of evidence presented during the cross table review, and with the issues resolution defined above, the consensus of the review group is that the expectations listed in the Trench 1 ACE, when implemented, will provide a reasonable and adequate set of standards and controls associated with source removal at Trench 1 IHSS 108 at the Rocky Flats Environmental Technology Site.

ATTACHMENT 1

CROSS TABLE REVIEW GROUP CREDENTIALS REPORT

ACTIVITY CONTROL ENVELOPE (ACE)
FOR SOURCE REMOVAL AT TRENCH 1 IHSS 108

Alan D. Rodgers

Organization: Waste & Remediation Operations - Kaiser-Hill

Relevant Experience:

Mr. Rodgers is a senior level technical manager offering a diversity of over 25 years experience in nuclear and hazardous materials management. Management experience includes operations of low-level, mixed, transuranic and other regulated waste treatment, storage and disposal facilities. Technical areas of performance have been focused on industrial and nuclear safety supporting fuel cycle, reactor and waste management programs. Experience has been gained primarily in support of Department of Energy contracts and most recently through start up and operation of a commercial waste treatment company.

John E. Law

Organization: Environmental Restoration - RMRS

Relevant Experience:

Mr. Law has more than 15 years of experience as a Manager, Project Manager and Engineer working on behalf of public and private sector clients. Areas of his expertise include regulatory negotiation, management of liquid waste treatment systems, development and implementation of accelerated remedial actions, surface water management, design and operation of groundwater intercept system, landfill closure, groundwater modeling, alternatives analysis, business development and litigation support, and experience on RCRA and CERCLA sites.

Shannon Walker-Lembke

Organization: Closure Projects - Tenera

Ms. Walker-Lembke is currently supporting Kaiser-Hill Closure Projects Program Chief Engineer in the areas of authorization basis, nuclear safety, and criticality safety. Ms. Walker-Lembke has a B.S. in Mechanical Engineering and has worked as a consulting engineer for government agencies and contractors for the past 10 years. She has performed and reviewed hazard assessments, safety analysis, and emergency planning for both nuclear and non-nuclear facilities and activities. Most recently, she maintained and developed authorization basis documents, including safety analysis reports and auditable safety analyses, for several RFETS waste management facilities, environmental remediation projects, and other non-nuclear facilities. Ms. Walker-Lembke has also supported a CERCLA clean-up project at the Idaho National Engineering Laboratory in the capacity of field Project Manager responsible for soil sampling and field laboratory analysis.

Stephanie DeWitt

Organization: Safety and Industrial Hygiene - K-H

Relevant Experience:

Ms. DeWitt has more than six years experience in the environmental science and health and safety fields. Her project management experience includes managing numerous projects ranging from site inspections to remediation activities at hazardous waste sites across the country. Ms. DeWitt has also provided extensive technical and health and safety support for projects at LANL, Rocky Mountain Arsenal, and at Dugway Proving Ground and Toole Army Depot in Utah. Specific experience includes providing overall Health and Safety support for projects involving unexploded ordinance, chemical warfare agents, and sampling and handling of drums with unknown contents, including hazard assessment and control.

Mark R. Steelman

Organization: Consultant - EnergX L.L.C. - K-H Facilitator

Relevant Experience:

Mr. Steelman, an engineer, has more than 22 years of experience in the nuclear industry, primarily at nuclear power plants and at facilities in the DOE defense nuclear complex. Mr. Steelman has worked at RFETS since 1990 and has served on the Senior Resumption Team (SRT) and then on the Technical Advisory Group (TAG) at the Rocky Flats Plant. In these capacities, he developed a thorough understanding of the Resumption program (he was a primary author of Revision 3 of the Resumption management plan) and of subsequent transition planning activities. He has prepared or directed the preparation of many key documents in support of the Resumption efforts at Rocky Flats, including the Building Closure Report for Building 559, the MAP Books for Buildings 559 and 707, the Collective Significance Evaluation performed on the DOE ORR for Building 559, and recent documents that addressed casual factors for the environmental compliance problems. Mr. Steelman is currently serving as an adjunct member of the Fluor Daniel Hanford Facility Evaluation Board (FEB) providing expertise in nuclear safety and has evaluated the Plutonium Finishing Plant.

Joseph W. Mahaffey

Organization: Nuclear Operations, Project Technical Integration - Kaiser-Hill

Mr. Mahaffey is a Certified Professional Manager with over 30 years experience in the nuclear industry including five years in program management, oversight, and integration, 19 years in naval nuclear reactor plant overhaul, testing and refueling project management and 10 years in operation, supervision, maintenance and training associated with U.S. naval nuclear powered ships and land-based prototype nuclear propulsion plants. Strong technical background in Radiological Protection, Health and Safety, Nuclear Operations, and Conduct of Operations.

Currently Mr. Mahaffey is providing senior level oversight, evaluation and integration of a wide range of subcontractor projects supporting Kaiser-Hill Nuclear Operations with a primary focus on the Site Radiological Control Program. Previous positions at RFETS include: Principal Management Integrator for Special Material Management and Integration, Operations; Technical Support Program Manager, Building Deactivation Program; and the EG&G Deputy and Acting Associate General Manager for Safety, Safeguards and Security.

Thomas Denny

Organization: Nuclear Engineer DOE-RFFO

Relevant Experience:

Thomas Denny has 13 years experience in the nuclear field. He holds a BS in Nuclear Engineering. Currently, Mr. Denny is a nuclear engineer with RFFO in the Engineering Support Division under the Assistant Manager for Engineering. The first five and one-half years of his career were spent at Mare Island Naval Shipyard in the Nuclear Engineering Department where he was involved in technical direction and coordination of the accomplishment of test programs on the nuclear propulsion plants. He served as a liaison between Naval and Shipyard personnel in order to coordinate testing. Mr. Denny came to DOE RFFO in September 1990 and fulfilled the role of a Facility Representative where he provided direct observation of contractor activities in Building 707 during resumption/restart and duct remediation activities. Mr. Denny joined the Safety and Health Division at RFFO in November 1992 as a health physicist providing Technical/Programmatic oversight of DOE contractors in the areas of Radiological Operations and Radiological Engineering. Mr. Denny has completed numerous assessments including Building 886 Conduct of Operations (COOP) Assessment, Building 886 Highly Enriched Uranyl Nitrate Tank Draining Readiness Assessment (RA), Highly Enriched Uranium Vulnerability Assessment, and recently participated on the Building 371 Caustic Waste Treatment System Operational Readiness Review (ORR), Building 771 Hydroxide Precipitation RA, Building 440 Waste Handling ORR, and the RA for the Building 707 Low Americium Salt Stabilization Activity.

Thomas Lindsay

Organization:

Relevant Experience:

Mr. Lindsay has over 10 years experience in Environmental Restoration and Cleanup. He has been a project manager and designer for multiple projects from $100K up to $160MM. He has worked for Conoco Inc. as a Field and Construction Engineer in the refinery and building construction area. He has worked at Savannah River and is now at the Rocky Flats Site as a Project Manager, Engineer, Groundwater Restoration and Constructing RCRA caps. Recently he has worked on the Source Removals at Trenches T1, T3/T-4 and the Mound area. Mr. Lindsay possess a B.S. in Chemical Engineering.

R. Doyle Gillespie

Organization:

Relevant Experience:

Mr. Gillespie has a B.S. in Mathematics from the University of Georgia. He has 13 years experience in the supervision of operation and maintenance of a naval nuclear propulsion plant including 12 Intermediate Maintenance Activity Refits and 1 Extended Refit Period/Ship year Availability. He also has 5 years radioactive and hazardous waste management experience at the Rocky Flats Site including the operation and supervision of five DOE nuclear facilities and 13 RCRA-permitted and interim status units. He has developed and supervised program start-up for a mixed waste management program for Commander, Submarine Forces, U.S. Pacific Fleet. He has supervised installation/ start-up/operational testing of a major communications system for submarine service and a waste supercompaction system.

Mr. Gillespie's two years in Quality Assurance at the Rocky Flats Site has been in the development and implementation of a 10 CFR 830.120 Quality Assurance Program for Kaiser-Hill, and root cause analyst for four major Price-Anderson Amendments Act events.

Judy A. Yeater

Organization: Radiological Operations

Relevant Experience:

Ms. Yeater has worked at Rocky Flats for ten years. First as a laborer for J.A. Jones doing structural upgrade to Building 770 and then on the removal of the Harwood press in Building 707.

In 1988, Judy became a chemical operator in Building 771, later working in Nondestructive Assay. Within three years she became an RCT II. Shw has worked on Venting and Aspirating, and Glove Washing in Building 776.

As an Environmental Restoration RCT, she has worked on Trenches 3 and 4, Mound I and II, and participated in he planning of Trench 1. Judy has participated on the Enhanced Work Planning team and is an active participant in the C.I.T.Y. Pilot Program.

Bates Estabrooks

Organization: Safe Sites of Colorado

Relevant Experience:

B.S. Physics; 1976 from the U. S. Naval Academy. Qualified Nuclear Plant Watch Officer, U. S. Navy. Over 20 years experience in the nuclear power and radiation safety industry with the U. S. Navy. Westinghouse Electric Corp., and Safe Sites of Colorado. Appointed Technical Expert to the International Electrotechnical Commission Technical Committee 45B for Radiation Protection Instrumentation.

Louie Schimpf

Organization: Dyncorp Heavy Equipment Operator

Relevant Experience:

Mr. Schimpf has over 24 years experience with all heavy-equipment and maintenance of them and has been At Rocky Flats for 9 years. During this time, he has been involved in hauling pondcrete and low level waste. digging up waste at the PCB cleanup project, 881 hot spot removal project. Ryan's pit. Trenches 3 & 4, the Mound site removal project and in the Activity Control Envelope (ACE) process.

Figure 3B
Trench 1 Excavation Flow Chart

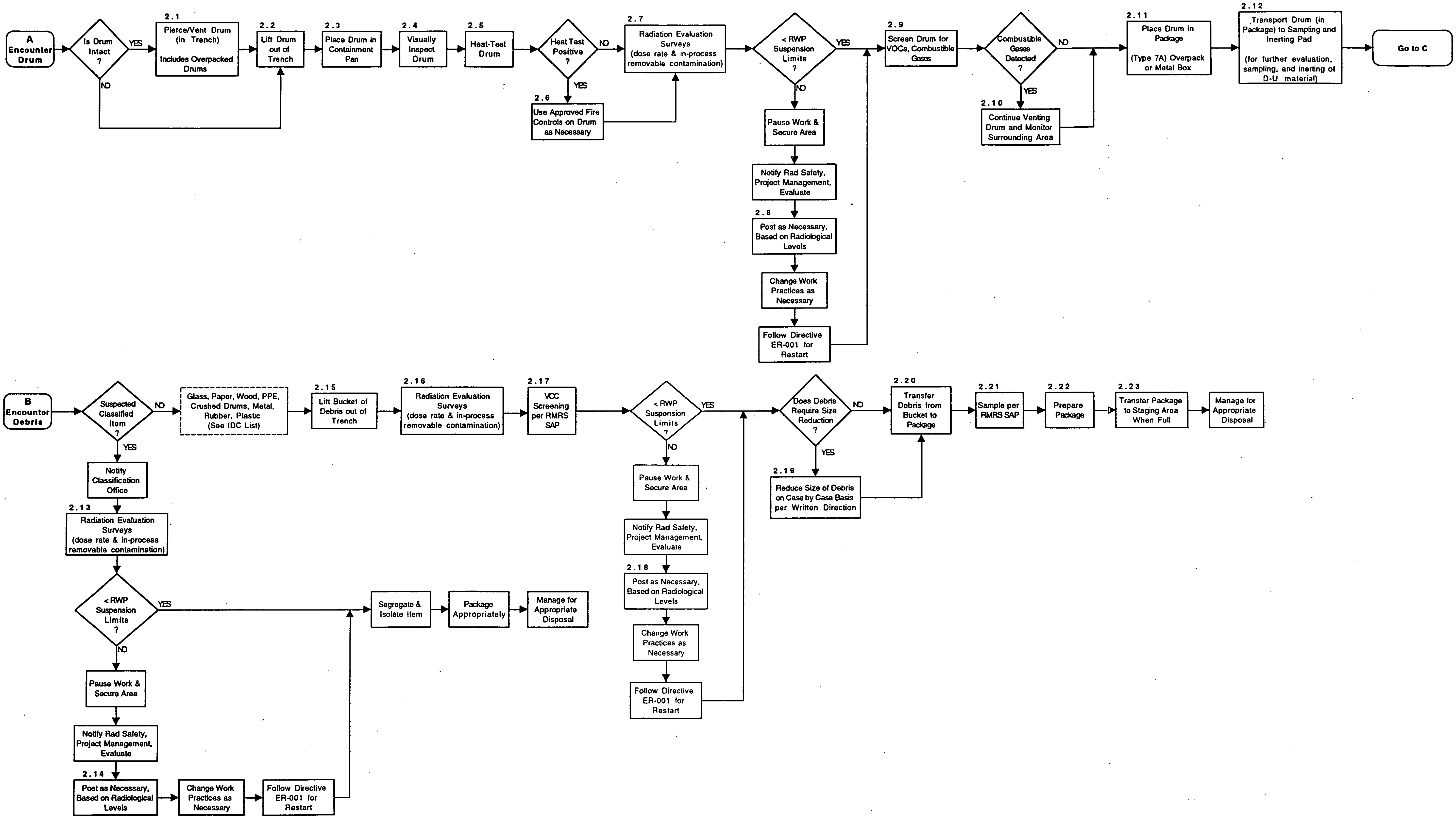
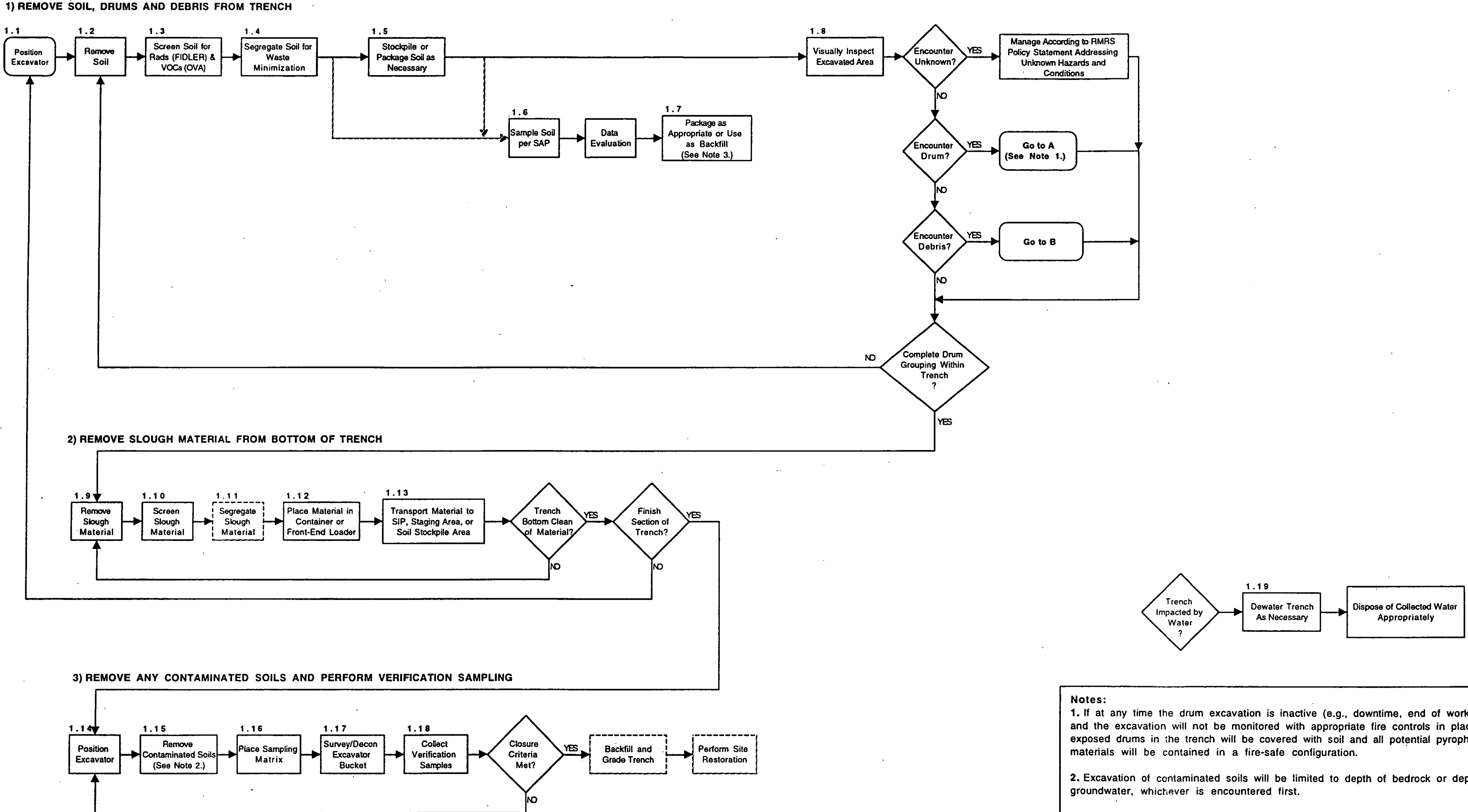


Figure 3A
Trench 1 Excavation Flow Chart

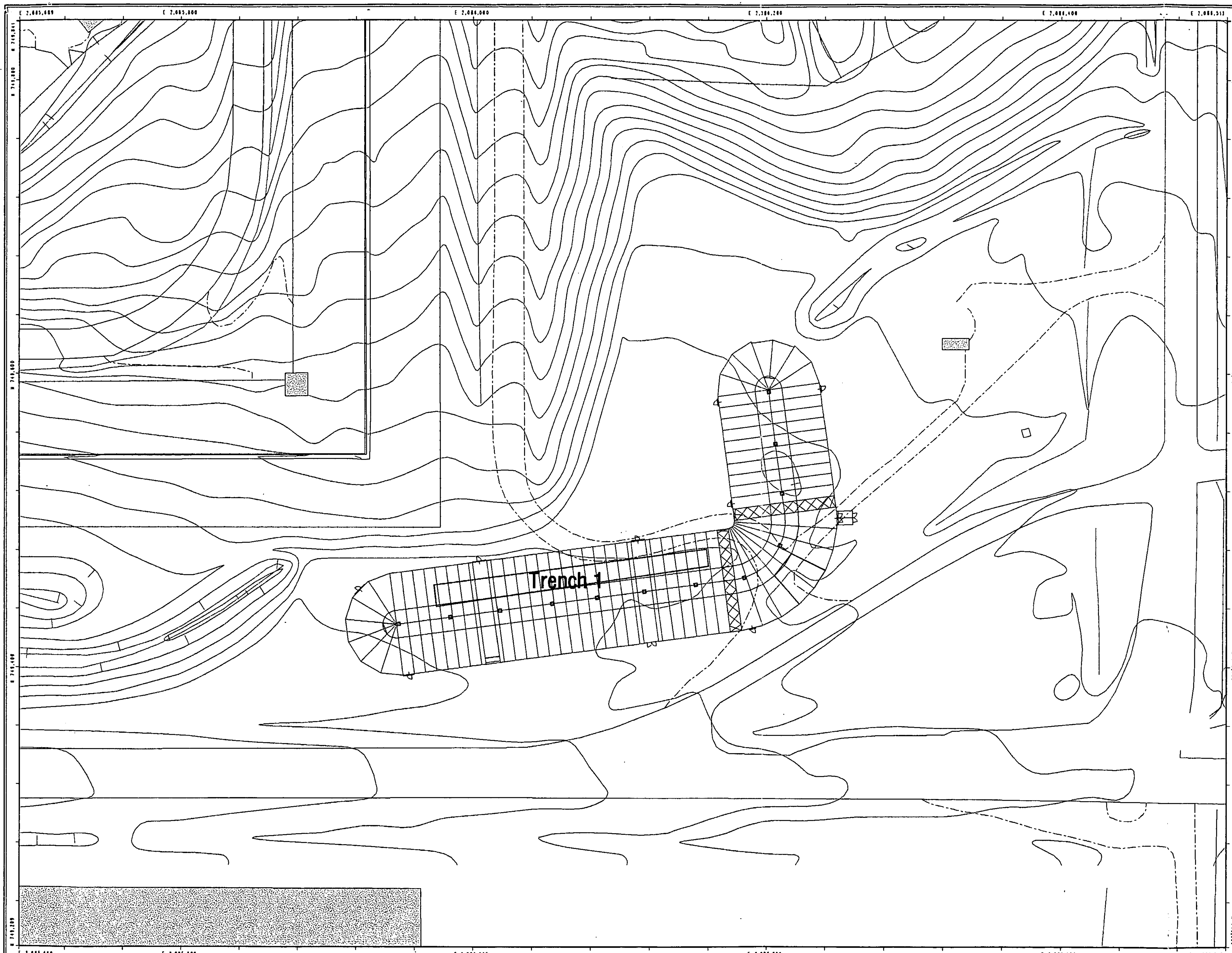


Notes:

1. If at any time the drum excavation is inactive (e.g., downtime, end of work shift) and the excavation will not be monitored with appropriate fire controls in place, exposed drums in the trench will be covered with soil and all potential pyrophoric materials will be contained in a fire-safe configuration.

2. Excavation of contaminated soils will be limited to depth of bedrock or depth to groundwater, whichever is encountered first.

3. VOC-contaminated soils, if any, may be temporarily stored pending treatment by low temperature thermal desorption.



Plan View of Trench 1 Weather Shelter

Figure 1

EXPLANATION

- 2 Foot Contours
- Trench 1 Boundary

Standard Map Features

- Buildings and other structures
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Paved roads
- Dirt roads

DATA SOURCE:
Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas.
Digitized from the othophotographs. 1/95

Scale = 1 : 770
1 inch represents approximately 64 feet

25 0 50 100ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

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

Prepared by:

RMRS Rocky Mountain Remediation Services, L.L.C.
Geographic Information Systems Group
Rocky Flats Environmental Technology Site
P.O. Box 464
Golden, CO 80402-0464

MAP ID: 98-0025

February 23, 1998

/gis2/projects/fy98/98-0025/shelter.aml

Figure 3C
TRENCH 1 SUBCONTRACTOR MATERIAL HANDLING FLOW CHART