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Mark Burmeister
Originator Name

G D DiGregorio
QA Approval

A. M. Tyson
Contractor Manager(s)

Ann K Sieben
Kaiser Hill Program Manager(s)

T G Hedahl
Kaiser-Hill Director

Document Subject

TRANSMITTAL OF THE DRAFT TRENCH 1 REMEDIATION PROJECT SUMMARY REV 0 DATED MAY 9 1997
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Discussion and/or Comments

Please find enclosed the Draft Trench 1 Remediation Project Summary for your review and submittal to the Department of Energy (DOE) for concurrent review The Project Summary was developed as a companion document to the Proposed Action Memorandum (PAM) for the Source Removal at Trench 1 IHSS 108 and provides additional detail on Trench 1 Comments on the Project Summary are requested by May 19 1997 Please find enclosed ten copies and a draft transmittal letter to the Department of Energy If you have any questions please contact Mark Burmeister at extension 5891

MCB/aw

Attachments
As Stated

cc
M C Broussard
M C Burmeister
A C Crawford
C S Evans
L Johnson
A M Tyson
M Wheeler
[redacted]

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TRENCH 1 REMEDIATION PROJECT SUMMARY May 9, 1997

1 Objectives

Remediation of Trench 1 (T 1) is being performed to remediate the risk posed to future users of the site by removing and stabilizing the potentially pyrophoric depleted uranium (DU) from the trench and removing debris, contaminated soils and other material that may be contained in the trench The focus of the T-1 remediation is to remove the DU from the trench and stabilize the DU for off-site disposal The purpose of the stabilization is to render the DU non-pyrophoric Excavation of soil and materials other than the drums of DU will be incidental to excavation and treatment of the DU

Thermal desorption has been selected as a contingency treatment for volatile organic contamination in soils Existing data do not indicate that T-1 is a source of volatile organic compound (VOC) contamination in groundwater Groundwater wells in the vicinity do not indicate contaminant plumes originating from T-1 If present, only minor volatile organic contamination is expected within the trench

2 History and Description of T-1

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 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 to 20 kilograms of DU Burial of DU in T-1 began in December 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, all of 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

3 Lessons Learned

The T-1 project team has contacted other DOE sites and British Nuclear Fuels seeking information on how depleted uranium has been handled by other groups Several sites (including RFETS) historically used "chip roasters" for thermally oxidizing uranium machine cuttings and turnings

The roasters were generally started by throwing a lighted piece of paper into the fresh, unoxidized chips (Oak Ridge, Hanford, and RFETS) Uranium fires were common during the production era, and were dealt with by several low-tech methods

- take the burning object outside and let it burn,
- quench the object in lathe coolant,
- quench the object in Met-L-X powder, or
- quench the object in a water bath

The T-1 project team visited Los Alamos National Laboratory and Sandia National Laboratory to meet with project teams that had successfully performed similar projects on DOE sites

Los Alamos has recently (1996) completed stabilization of 240 drums of DU chips and turnings The T-1 project team met with the Project Manager for the DU stabilization, with several project team members, including radiological control, and the team lead for development of the chemical oxidation process and portable chemical oxidation treatment skid

The DU chips at Los Alamos were stored in 30-gallon drums filled with diesel fuel to prevent oxidation The diesel fuel coats the chips when they are removed from the drum, so that they are not immediately exposed to oxygen The drums at Los Alamos were generated from a current process stored in an above-grade inspectable condition and were well documented and well characterized The chips were accumulated in water at the work stations, and consolidated into 30-gallon drums containing water When a drum was full, the water was drained for 50 minutes then the drum was refilled with diesel fuel for storage

The Los Alamos waste management group evaluated the use of the chemical-oxidation skid mounted process that has been developed at Los Alamos Because the chemical-oxidation unit has not completed pilot-scale mock up with either simulated or real wastes they determined that it was not a cost effective treatment for the waste DU

Los Alamos processed 240 drums in a period of one month, for a fixed price of $350,000 Three processes were submitted in response to the request for proposal cementation, sand addition and clay-type additive (produces gel type matrix, e g Petroset) Los Alamos chose the clay-type stabilization but considered all proposals responsive to the technical needs of the project

Stabilization at Los Alamos was done in a temporary HEPA-filtered enclosure An in-drum stabilization process with Petro-set was used The Petro-set stabilizes the diesel into a semi-solid non reactive form that reduces the pyrophoricity of the DU chips by encapsulation preventing oxygen from contact with the DU Also dilution of the DU with other material renders it less pyrophoric because the ability to transfer heat is lost in the dilution (see Section 5)

The stabilization process at Los Alamos was conducted without respiratory protection, as the DU chips in diesel fuel were not considered to be in a respirable form Some personnel skin contamination occurred early in the project, due to poor subcontractor work practices These were addressed by the radiological control organization and by additional training of the workers in the use of PPE and proper decontamination and donning and doffing procedures The biggest safety concern Los Alamos brought up was the cutting hazard of the very sharp DU turnings Los Alamos did not experience any fires, or evidence of the DU chips heating up during handling or treatment The average dose rate for stabilized waste was 0 7 mRem/hour/drum after processing No readings were detected from either the worker s personal dosimeters or from nasal swipes

Los Alamos indicated that the in-drum process was probably not applicable at RFETS given the expected degraded conditions of the T-1 drums The chemical-oxidation skid unit was not considered applicable given the expected mixture of DU, drum fragments, and soil

Several DU removal actions involving ordnance (DU shell casings) have also been conducted at Los Alamos These removal actions generally involved either shallow (0-2 feet) excavations or hand operations to remove DU shell fragments The DU fragments and contaminated soils have been placed in drums or roll offs for disposal on site The pyrophoric nature of the DU has not been an issue in these removal actions

Sandia National Laboratory has completed excavation of two landfills containing unknown high-hazard radioactive wastes, the Gas Cylinder Disposal Pit, and the Classified Waste Landfill These two landfills were considered to be similar to T-1 in the need to excavate, screen segregate, and package unknown wastes Sandia has also completed a site-wide cleanup of DU from ordnance The T-1 team met with the Project Manager who conducted the landfill cleanups, a member of the DU removal action team, and several members of the waste management staff

The Gas Cylinder Disposal Pit involved excavation and handling of high-hazard wastes including filled gas cylinders and pyrophoric metal (lithium) The excavator was equipped with a blast shield to protect the operator During the excavation a lithium fire occurred The fire occurred when the glass container storing the lithium under vacuum broke exposing the lithium to air The site was successfully evacuated in under one minute The fire which was small and did not spread, was allowed to burn out The Sandia project manager credited training which included practice evacuations for the quick response

The Sandia DU removal action covered 850 acres and produced 2 000 drums of DU mixed with soils Initially the larger DU fragments were segregated from the soil and drummed separately As the project progressed, it became clear that including the soil with the DU in the drums was not only faster in the field, but allowed the waste to be disposed as low level waste and shipped to Envirocare The drums filled only with DU fragments contained too much radioactivity to go to Envirocare, and will go to the Nevada Test Site (NTS) Neither Envirocare nor NTS had an issue with the potential pyrophoric nature of the DU There was no evidence of heat generation or of sparking during handling of the DU The major safety concern was encountering unexploded ordnance The Sandia Waste Management group is beginning to evaluate stabilization by cementation of some DU waste streams currently stored on site

Suggestions from the Sandia group included

- use of a blast shield on the excavator (to address T-1 project concerns about pyrophoric DU and unknowns),
- hands-on fire and evacuation training,
- location of the segregation and treatment facilities upwind of the trench,
- location of the decontamination corridor and project staging trailer upwind of the trench,
- evaluation of the use of a portable plastic wind screen and snow fences to reduce the velocity of winds as they cross the project site,
- starting at the east end of the trench, so that the excavator is upwind of the open excavation
- work at night during summer to reduce heat stress and increase stay times for personnel
- work with an open excavation, rather than an enclosure for safety of the workers, for better egress in case of fire/emergency, and access to emergency crews

The Sandia group did not expect the DU in T-1 to be pyrophoric, based on the length of time since the waste had been produced, the fact that it was stored in a water-based coolant, and that if drums have been breached, the DU has been exposed to the air and to moisture for several years The Sandia landfill excavation project manager thought that enclosing the trench would generate a much higher real hazard to the workers than was justified by the potential hazard of a DU fire with aged chips He noted that in his opinion, the biggest T-1 safety hazard was the cutting hazard The machining chips are razor-sharp when fresh, and partially oxidized cuttings are still expected to be very sharp

4 Authorization Basis and Activity Control Envelope

Authorization to proceed with the T-1 field work will be granted through the Rocky Mountain Remediation Services (RMRS), Kaiser-Hill (K-H), and Department of Energy (DOE) readiness review processes Approval is granted for operation of a facility or a project in accordance with the authorization documents In this case, the completed and approved Activity Control Envelope (ACE) document will be a large portion of the authorization basis for the project Other documents which will become part of the authorization basis include, the Proposed Action Memorandum, Hazard Categorization, Auditable Safety Analysis, Health and Safety Plan, and Sampling and Analysis Plan The ACE team consists of a team of professionals with relevant knowledge and experience, and includes subject matter experts in nuclear safety, health and safety, radiation control, excavation, and waste handling ACE documentation will provide an analysis of the work, including a detailed flow chart of the work, with fire and hazard assessments.

The ACE document will serve as documentation of the standards for the work to be performed at T-1 in support of the Site's cleanup mission The ACE document will list expected hazards for the process steps and will detail the programs, procedures, and training that must be in place to mitigate the project risks and perform the process steps safely The ACE process and documentation provides an analysis of a manageable scope of work including a definite start and finish point, and a flow chart of the process steps The ACE process supports the timely development of complete work control document(s) It also provides a coherent expression of the standards applicable to an activity and their adequacy for safe conduct of the work

The ACE team has incorporated the 'bottom up' planning system that provides for the incorporation and integration of necessary and sufficient standards as a basis for work planning authorization and performance The following tasks have been completed for T-1 planning per the ACE process

- ACE team selection
- Definition of Activity scope and bounding conditions,
- Validation of process selection,
- Construction of task flow charts for excavation, segregation and treatment,
- Definition of necessary and sufficient expectations applicable to the planning and conduct of each principal task on an Expectations Table,
- Performed the Activity Hazards Assessment to ensure that potential consequences of performing the T-1 activity, considering both normal and reasonably anticipated abnormal events are identified and evaluated as acceptable,
- Created the Hazards Identification by step/task table and the Screening Hazard Assessment Results table,
- Evaluation of an enclosure over the excavation area of the trench, and,
- Compile the ACE documentation to ensure that the ACE history file contains all the appropriate sections

The ACE team evaluated and validated selection of the treatment processes A list of treatment criteria was developed Each criteria was evaluated and assigned a weighted value The individual processes were ranked according to how well they met each criteria The process with the highest score was selected Stabilization was chosen by a significant score Selection of stabilization as the preferred treatment alternative for depleted uranium chips, and associated wastes from Trench T-1 was validated by the T-1 ACE team members on January 28 1997

The need for enclosing the trench during excavation was evaluated by the ACE Team The evaluation included development of a list of pros and cons, and a review of the fire, health and safety concerns of working within an enclosure The need for an excavation enclosure was also balanced by the results of air emissions calculations performed by the air group and by the nuclear safety analysis group Emissions calculations determined that radiological emissions from the project combined with all other emissions from the site would be well below the 10 mRem regulatory limit

5 Physical Characteristics of Depleted Uranium

The information in this section was obtained from DOE Handbook 1081-94, Primer on Spontaneous Heating and Pyrophoric Metals, and from Clark, 1991, Pyrophoric Potential of Finely Divided Plutonium Metal in soil at the 903 Drum Storage Site, Rocky Flats Plant, Golden Colorado Spontaneously combustible materials include those that ignite because of a slow buildup of heat (spontaneous heating) and those that ignite instantly in air (pyrophoricity) These materials react so readily with oxygen that a heat source is often not required for ignition For spontaneous ignition to occur the rate of heat generated through oxidation must exceed the rate of heat removal by conduction, convection, and radiation (thermal) As the temperature of the material begins to rise, the rate of heat generation often increases The result is a reaction which ultimately causes ignition If the rate of heat removal exceeds the rate of generation the material will cool and will not ignite The rate of heat removal may be increased through physical contact with a thermally conductive surface by rotating piles of combustibles to cool hot spots" or by circulating inert gases through piles to cool and displace oxygen

Nonenriched uranium is a radioactive metal that is also potentially combustible Its radioactivity does not affect its combustibility The radioactivity hazard is extremely low and uranium is generally considered a greater toxic hazard Uranium is a heavy metal poison although considerably less toxic than lead

The "activity" of a particle determines its propensity to react with its environment, the type and rate of the oxidation reaction A major factor that strongly influences activity is the amount of surface area available for chemical activity Because finely divide particles have a greater surface area available for chemical activity, they are generally more susceptible to pyrophoricity than the same quantity of metal in bulk, or massive form For reactive metals such as uranium, ignition temperatures are strongly dependent upon particle size

Most metallic uranium is handled in massive forms, and does not present a significant fire risk unless exposed to a severe and prolonged external fire Once ignited, massive uranium burns very slowly with virtually no visible flame. Burning uranium will react violently with solvents such as carbon tetrachloride, 1,1,1-trichloroethane, and the halons

Uranium in the finely divided form is readily ignitable, and uranium scrap (chips and turnings) from machining operations are subject to spontaneous ignition This reaction can usually be avoided by storage under dry (without moisture) oil Moist dust, turnings, and chips react slowly with water to produce hydrogen and uranium oxide Under a dry, slightly oxidizing atmosphere, however, uranium corrodes quiescently The heat generated from slow corrosion is not sufficient to ignite the uranium

Many metals form protective oxide films during the initial stages of oxidation These protective layers reduce the heat of adsorption and slow down or prevent oxidation (corrosion) deeper than the initial oxide layer In liquid water reactions, the corrosive liquid is able to diffuse through the oxide coating, with an end result of complete oxidation A particle of plutonium immersed in liquid water will undergo complete oxidation (Clark, 1991, Pyrophoric Potential of Finely Divided Plutonium Metal in soil at the 903 Drum Storage Site, Rocky Flats Plant, Golden, Colorado) Oxidation of uranium by water produces uranium oxides and hydrogen gas Therefore, there is potential for hydrogen build-up in the drums if they are air-tight. Because hydrogen is lighter than air, it will tend to diffuse upward out of drums and out of the soil unless it is sealed in gas-tight containers

The DU chips in T-1 were stored in a water-based coolant (CIMCOOL) Conversations with the CIMCOOL manufacturer and the material safety data sheet indicate that CIMCOOL is 65% water, and the remainder is a combination of fatty amides, tall oil fatty acids, mineral oil nitrite, formaldehyde, pink dye, dithanolintrosmide, and silicone antifoam It is not a hazardous material, and is not volatile The manufacturer notes that prior to use the CIMCOOL is diluted with 80 % water, so that the coolant as used is over 90 % water

Water is generally acceptable for use as an extinguishing or cooling agent for fires involving uranium However, the preferred method for extinguishing these fires is sodium-chloride based powders (MET-L-X) This dry powder is non-combustible and secondary fires do not result from its application to burning metal

6 Expected conditions

The DU chips and turnings in T-1 have been in the ground, stored in a water-based coolant for over 40 years According to former site workers, the drums were never intended to be air tight and were not sealed with that intent It is expected that some drums have degraded enough to have lost the liquid lathe coolant originally covering the chips Chips that have been exposed to air within the drum are expected to be oxidized Some drums may still be intact, and contain the lathe coolant originally covering the chips Chips still covered by coolant are expected to be partially to completely oxidized from the presence of a large amount of water in the coolant It is expected that during 40 years of exposure to atmospheric oxygen water and water vapor the depleted uranium chips in T 1 have oxidized into a non-pyrophoric form It is not likely that fresh surfaces of small particle size material have remained intact (unoxidized) for 40 years However the project is being designed and planned to address the potential of a DU fire

The safety analysis for excavation of T-1 analyzes a uranium fire involving 12 drums of DU as a bounding condition Twelve drums is the maximum that will be exposed at one time, assuming the drums are stacked 6 across and 2 high Only one row of drums will be exposed at a time during excavation

7 Treatment Alternative Evaluation and Selection

The purpose of the Trench T 1 Remediation project is to excavate the material which was buried in the trench along with associated soils contaminated above RFCA Tier I Action Levels, and treat, and/or prepare it for disposal at a suitable disposal facility In order to safely transport and dispose of depleted uranium chips they must be treated to make them non-pyrophoric Three potential treatment technologies which have been utilized within the Department of Energy (DOE) complex for uranium chips and fines were examined

- thermal oxidation
- chemical oxidation and
- stabilization

Thermal oxidation involves roasting reactive metal in air This process has historically been used within the DOE complex (Hanford Oak Ridge Freelanced and Rocky Flats) for treatment of uranium metal chips prior to reuse or disposal The principle advantage for thermal oxidation is that the exothermic and pyrophoric qualities of uranium metal are removed by conversion of the material to uranium oxide If the resultant uranium oxide was acceptable for disposal without further treatment there would be advantages in container and disposal volume efficiencies

Thermal oxidation processes require extensive cooling ventilation, and monitoring equipment to address environmental and safety concerns Temperatures sufficient to oxidize the uranium have been determined to be in the 1300° to 1500° C range (2000° - 2700° F) The reaction is essentially uncontrolled and hot spots can form in proximity to container walls The temperature range noted approaches the melting point of stainless steel (1450° C) Generation of uranium particulates and high temperature gas requires a reliable off-gas treatment system

Chemical oxidation is an aqueous process for controlled oxidation of uranium metal in an oxidizing solution Pilot scale testing of chemical oxidation of uranium metal has been performed at Los Alamos National Laboratory (LANL) The basis of the technology is mild solution oxidation using aqueous sodium hypochlorite (bleach) Common bleach was chosen as the oxidant because of its low cost public familiarity and effectiveness in producing a complete and controllable conversion of the metal to oxide The principle advantage of chemical oxidation is that the uranium metal achieves the same non reactive oxide state as thermal oxidation without the high temperatures and air emissions noted for thermal oxidation The low temperatures associated with chemical oxidation minimizes the potential for radionuclide release explosion or uncontrolled oxidation Full scale experience with this technology is lacking Pretreatment may be required for oils solvents and other materials (soils) The resulting uranium oxide (a finely divided yellow powder) is suitable for disposal after solidification or for recycle Secondary waste streams generated are chlorine and hydrogen off gases and a radioactive aqueous stream heavy in sulfate and chloride salts

Stabilization or solidification of uranium metal chips and fines has been accomplished at several DOE sites (Hanford, Rocky Flats, and Los Alamos), and other industries (Nuclear Fuel Services (NFS) at the NFS facility in Erwin, Tennessee, Chem-Nuclear Systems Inc (CNSI) at the General Electric Facility in Evandale, Ohio, and Morrison-Knudsen at the Army Materials Testing Laboratory (AMTL) in Watertown, Massachusetts) for treatment prior to disposal British Nuclear Fuel, Limited (BNFL) operates several large-scale stabilization plants treating uranium and other pyrophoric metals at their Sellefield waste handling plants in Great Britain RMRS has been working with BNFL stabilization experts to bound the stabilization process for the T-1 wastes Stabilization involves mixing the waste material with a cement-based mixture to form a stable block where uranium is isolated from oxygen and moisture

The principle advantage of stabilization is that the hazards byproducts, and additional steps associated with oxidation are removed Stabilization encases the uranium and renders it non-reactive in a stable monolith Underlying contaminated soils associated with the uranium metal chips could be treated without separation An increase in waste volumes is expected (estimated 50%), due to addition of the stabilizing agent

After evaluating the three treatment alternatives, stabilization was selected as the preferred alternative Stabilization is a safe, proven widely used, and cost effective method for stabilizing the mixture of soils uranium chips and associated debris expected in Trench T-1 Additionally, secondary waste streams are minimized, and the equipment required to perform the stabilization is primarily off-the-shelf" equipment (i e drum shredder, cement mixer, etc)

8 T-1 Stabilization Treatment Process

Because of the variety of potential conditions expected at T-1 the waste stabilization may potentially involve two process approaches The first would address drums of DU and DU chips associated with drums and drum fragments, and would treat waste with the highest potential to be pyrophoric The second would address soils and associated DU that is no longer contained in drums within the trench This will address the potentially pyrophoric DU associated with soils excavated from immediately between and beneath the drums Soils that are radiologically contaminated above Tier I action levels but that do not contain large amounts of visibly identifiable DU will be excavated, but may not be treated

Stabilization of DU chips with a low viscosity solidification agent would involve placing the DU chips and turnings (and associated drum fragments) on a screen to drain anv residual lathe coolant and perform a coarse size separation Material remaining on the screen will pass from the screen into the final waste container The waste container is currently anticipated to be a metal or wooden crate fitted with an interior screen that allows the stabilization agent to fill the annulus below and around the waste The stabilization agent would be mixed in a separate "clean' mixer, and poured over the waste in the box The stabilization agent will have a viscosity similar to water allowing it to penetrate the steel wool like chips and turnings and encapsulate them From 3 to 6 inches of stabilization agent will cover the waste on all sides allowing for minimal dose to persons working with the stabilized waste form

Stabilization of soil, drum fragments and DU would utilize a different stabilization agent and the waste would be mixed with the agent prior to pouring the mixture into the waste containers The waste stream treated by this process would also include the material that passed through the screen during draining and screening of the DU chip waste stream Stabilization of the entire DU and associated soils and drum fragments by mixing them with the agent is also an option

9 Excavation

Conventional excavation techniques will be utilized for removal of soil, drums, and debris in T-1 Drums containing depleted uranium or materials contaminated with depleted uranium chips and turnings will be sequentiallv removed from the trench in small manageable quantities

The drums will be exposed and excavated one row at a time so that the maximum number of drums exposed at any one time will be 12 assuming the drums are stacked 2 high in rows of 6 across Each drum will be tipped into the bucket individually and placed in the hopper for radiation screening heat testing and transport to the segregation and treatment enclosure Heat testing will be performed by examining each drum with a heat sensitive heat gun as utilized by fire protection agencies If heat is being generated within a drum appropriate coolants and fire controls will be in place Coolant may be used if the heat test is positive

If the drums are not intact then approximatelv one cubic vard of DU chips and associated soil material will be removed at a time This controlled removal will minimize fire hazards exposure to workers environment and the public Materials containing DU chips will be placed immediately within a steel hopper for transport to the segregation/treatment area

The hopper lid will be closed during its transport from the excavation to the segregation/treatment area. The segregation and treatment processes will be performed within an enclosed temporary structure The enclosure will be constructed adjacent to T-1, and will be constructed with secondary containment, and be equipped with a high efficiency particulate air (HEPA) filter system

Evaluation of excavation techniques The use of remote excavation techniques was evaluated, but was not determined to be necessary based on the expected condition of the trench contents Remotely-operated excavation equipment would still require personnel to be near the trench, especially if repairs to the equipment were necessary The highest hazard activity, piercing drums to release potential hydrogen build up will be performed remotely by using an attachment to the backhoe Methods of performing this in a metal enclosure without moving the drum out of the trench are being evaluated Personnel will not enter the trench

10 Waste Handling

Empty crushed drums, drum fragments, etc can effectively be sized and encapsulated within the cement matrix with the DU chips Cemented cyanide wastes, if encountered, that do not already meet the necessary waste disposal requirements, will be encapsulated similarly Other excavated materials, not suitable for stabilization will be segregated and handled appropriately The encapsulation process will include a number of process controls to ensure generation of a consistent, stable waste form, and will be operated within the safety envelope developed for the project

Thermal desorption has been selected for contingency treatment if soils contaminated with VOCs above RFCA Tier I Action Levels are encountered within Trench T-1 If VOC-contaminated soils are encountered above Tier I Action Levels, these soils will be excavated and either stored in roll-off containers or stockpiled until a thermal desorption unit is available on-site to treat the soils At this time, VOC contamination above Tier I levels is not anticipated, but is being addressed as a contingency

Debris from the eastern portion of the trench will be evaluated for the presence of volatile and radiological contamination using field screening instrumentation, and a determination of whether or not decontamination is necessary prior to disposal of the debris as low-level waste will be made at that time

11 Enclosure Evaluation

Waste treatment activities will be performed within a temporary containment structure as described in the Proposed Action Memorandum for the Source Removal at Trench 1 IHSS 108

To ensure a comprehensive evaluation of the need for an enclosure over the Trench T-1 excavation site the ACE team assessed both health and safety and radiological issues associated with a containment structure over the trench excavation site The following issues were reviewed with the appropriate subject matter experts

Health and Safety Concerns

- Carbon dioxide and carbon monoxide production within the enclosure,
- Nitrogen oxides and sulfur dioxide (NO, NO_2 and SO_2) within the enclosure,
- Increased Diesel/gasoline exhaust and particulates,
- Heavy equipment operations within limited space,
- Physical space limitations (building footprint),
- Increased heat stress/cold stress
- Emergency response difficulties
- Increased lighting requirements which would increase electrical hazards,
- Potential for an IDLH atmosphere and
- Potential for explosive gas build-up,

Radiological and Other Controls Obtained With Enclosure

- A full and complete HEPA ventilation system
- Contain all radiological contamination
- Prevent downwind dispersal
- Site control,
- Enables work to continue during high winds

Because one of the main concerns was air emissions of radionuclides from the project the RFETS Air Quality Management (AQM) organization performed modeling using the EPA-approved CAP88 PC dispersion model A more detailed analysis of the T-1 project as required under National Emission Standards for Emissions of Radionuclides and other Clean Air Act regulations will be performed by AQM prior to project startup A Safety Analysis completed by Nuclear Safety assessed the radiological and chemical hazards associated with the T-1 Site source removal activities Based on the "radiological" hazard classification determination T 1 presents negligible offsite impacts to the public and environment If a significant off-site impact was expected the need for an enclosure would have been reexamined The conservative modeling of air emissions indicates that the combined off-site releases from RFETS would be well below the 10 mRem regulatory limit

Excavation Enclosure Due to the extensive size of the trench and the need to use heavy equipment (excavator, dump truck, forklift vehicles) for removing the trench contents, it was determined by the ACE team that the use of a containment structure over the trench excavation site would significantly increase the number of potential worker health and safety concerns and hazards Limited egress from the structure in case of an emergency such as a DU fire was considered a significant hazard Limited access into the structure by emergency teams was also considered a problem

Working with heavy equipment in an enclosed space also generated significant hazards to workers These hazards include injuries and accidents resulting from collision with heavy equipment operating in a limited work area exposure to equipment emissions (CO CO_2 nitrous oxides and sulfur oxides) diesel fumes gasoline fumes IDLH atmospheres emergency response difficulties and increased electrical hazards Based on these findings the ACE team recommended not using a containment structure over the Trench T 1 excavation site

T-1 Contact List

Name	Affiliation	Phone/Fax
Norma Castaneda	DOE, Program Manager	(303) 966-4226/4728
Ann Sieben	Kaiser Hill, Program Manager	(303) 966-9886/6406
Mark Burmeister	RMRS, Project Manager	(303) 966-5891/8025
Susan Evans (technical issues)	RMRS, Assistant Project Manager	(303) 966-3199/7193
Susan Myrick (waste issues)	RMRS, Project Engineer	(303) 966-5051/8025
Tracy Spence (engineering and excavation issues)	RMRS, Project Engineer	(303) 966-4322/8025