Los Alamos National Laboratory

UNIVERSITY OF CALIFORNIA

Environmental Restoration

Environmental Restoration Project
MS M992
Los Alamos, New Mexico 87545
505-667-0808/FAX 505-665-4747

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MAY 1997
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Mr. Ted Taylor
Los Alamos Area Office
US Department of Energy, MS A316
Los Alamos, NM 87544

SUBJECT: FINAL VCA PLAN FOR TA-14, PRSs 14-002(a) AND 14-010 ACTIVITIES

Dear Ted:

Enclosed for your records please find two copies of the final Voluntary Corrective Action (VCA) Plan for Technical Area (TA) 14, Potential Release Sites 14-002(a) and 14-010 activities. These activities are planned for completion in Fiscal Year 1997. Informational copies of this VCA Plan are being distributed to the regulators.

Your Field Project Manager participated in developing and reviewing this plan. The VCA Checklist and Field Authorization Form have been completed and signed and are also included in the enclosed plan.

If you have any questions, please call Gene Gould at (505) 667-0402 or Mike Gilgosch at (505) 667-5794.

Sincerely,

Jorg Jansen, Program Manager
Environmental Restoration Project

JJ/ss

Enclosure: (1) Final VCA Plan for TA-14, PRSs 14-002(a), 14-010

Cy (w/ enc.):
M. Gilgosch, LAAO, MS A316
G. Gould, EES-15, MS G787
D. Griswold, AL-ERD, MS A906
J. Harry, EES-5, MS M992
N. Naraine, DOE-HQ, EM-453
D. Neleigh, EPA, R.6, 6PD-N (2 copies)
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B. Garcia, NMED-HRMB (2 copies)
M. Leavitt, NMED-GWQB
J. Parker, NMED-OB
G. Saums, NMED-SWQB
S. Yanicak, NMED-AIP, MS J993

Cy (w/o encs.):
T. Baca, EM, MS J591
D. Bradbury, EM/ER, MS M992
T. Glatzmaier, DDEES/ER, MS M992
D. McInroy, EM/ER, MS M992
J. Levings, AL-ERD, MS A906
W. Spurgeon, DOE-HQ, EM-453
J. Vozella, LAAO, MS A316
K. Zamora, LAAO, MS A316
EM/ER File, MS M992

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Voluntary Corrective Action Plan for

Potential Release Sites
14-002(a), Firing Site
14-010, Sump

Field Unit 2

Environmental Restoration Project

May 1997

A Department of Energy
Environmental Cleanup Program

Los Alamos
NATIONAL LABORATORY

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VOLUNTARY CORRECTIVE ACTION PLAN FOR POTENTIAL RELEASE SITES 14-002(a) - FIRING SITE AND 14-010 - SUMP

1.0 INTRODUCTION

The potential release sites (PRSs) at Los Alamos National Laboratory (the Laboratory/LANL) addressed in this voluntary corrective action (VCA) plan are located within LANL's western area of Technical Area (TA) -14, formerly called Q-Site.

1.1 Site Type and Description

PRS 14-002(a) is described as a decommissioned, closed high explosive (HE) firing chamber at Building TA-14-2, which was built in October 1944 (Figure 7.3-1). In the early 1970s, the closed chamber was removed because of plans to build a new HE test facility in the same area.

The notice of deficiency (NOD) response, dated October 31, 1994, to the RCRA Facility Investigation (RFI) work plan (LANL 1994, 1156) describes ruptured sandbags southeast of Building TA-14-39. As a result of the NOD, this sand was sampled in one location and is considered to be all that remains of PRS 14-002(a).

PRS 14-010 is described as a decommissioned explosive waste sump located south of and adjacent to Building TA-14-2 (Figure 7.3-1). A drain extended from the sump across the road (Courtwright 1973, ER ID No. 5081). The sump and drainline around the base of the floor slab at Building TA-14-2 were excavated by hand and removed (Owen 1973, 21-0067). The area was paved over or replaced by the bullet test facility [PRS 14-001(f)]. Currently, PRS 14-010 consists of a drainline and its associated drainage area.

1.1.1 Operational History

PRS 14-002(a) was a heavily reinforced concrete structure (16 x 21.6 x 13 ft) with a steel plate lining (LANL 1993, 21-0077). It was used extensively for HE tests, many of which involved uranium, low-order detonations, or both. This PRS is discussed in Section 5.3 of the RFI work plan.

PRS 14-010 was an explosive waste sump next to Building TA-14-2 with a drainline that extended across the road. The sump may have contained HE and toxic chemicals (Ortiz 1973, 55598). The contents of the sump were removed and disposed by Group WX-2 in the early 1970s (Russo 1973, ER ID No. 5088). This PRS is discussed in Section 5.3 of the RFI work plan.

1.1.2 COPCs and Rationale for Proposed Remedial Actions

One surface soil sample (0 to 6 in.) was collected from the sandbags near the location of the former Building TA-14-2 at PRS 14-002(a) in accordance with the approved RFI work plan. Analytical results found the sand to contain uranium at concentrations greater than screening action level (SAL). Five samples [four surface (0 to 6 in.) and one subsurface (14 to 20 in.)] were collected from the existing drainline at PRS 14-010. Analytical results indicated that uranium was present at concentrations above SAL in two surface soil samples. Both these PRSs are in or near water courses, as listed with NMED.

Based on the chemical of potential concern (COPC) (i.e., uranium) and on the fact that the sites are in a drainage area, a cleanup is recommended for both PRSs. The proposed corrective action for PRS 14-002(a) is to remove the contaminated sand, the sandbags, and the underlying soil (if it is determined to be

contaminated). The proposed corrective action for PRS 14-010 is to excavate the contaminated surface soil in order to remove it from the drainage area.

2.0 SITE CHARACTERIZATION

The sandbags at PRS 14-002(a) are located in a small area approximately 6 m^2 and are approximately 7 in. deep. PRS 14-010 is a relatively small drainage area (approximately 50 m^2) with contamination confined to the surface soil (0 to 6 in.).

2.1 RFI Information/Other Decision Data

No previous sampling has been reported for either of the PRSs. Before removal, a survey of Building TA-14-2 revealed that the building was contaminated with alpha radiation (from uranium). Any building materials and/or asphalt contaminated with uranium were removed and appropriately disposed of and the building was burned onsite in 1973. All noncombustible materials were removed and disposed of appropriately.

Phase I sampling at both sites was conducted in July 1995 to determine whether or not contamination exists. At PRS 14-002(a), one surface sample was collected using the approved spade and scoop technique (LANL-ER-SOP 6.09). At PRS 14-010, four surface soil samples (one 0 to 4 in.; three 0 to 6 in.) and one subsurface soil sample (14 to 20 in.) were collected. The surface soil samples were collected using the approved spade and scoop technique (LANL-ER-SOP 6.09), and the subsurface soil sample was collected using the approved hand auger technique (LANL-ER-SOP 6.10). The site map in Annex 7.3 shows the sample locations for each PRS.

In accordance with the RFI work plan, the five samples collected at the two PRSs were submitted to an offsite laboratory for analysis. In addition to those requested for uranium, HE, and target analyte list (TAL) metals, analysis for radionuclides was requested by gamma spectroscopy. According to chain-of-custody records, the samples were submitted and analyzed within the prescribed holding times.

2.1.1 Data Quality Evaluation

PRS 14-002(a)

The quality assurance/quality control (QA/QC) data associated with the analyses at PRS 14-002(a) (inorganics, HE, and radionuclides) indicated that 100% of the sample analytical data were acceptable and defensible (Table 7.2-1). The QA/QC mechanisms were effective in ensuring the reliability of the measured data within expected limits of sampling and analytical error. Of the approximately 50 pieces of analytical data from the one sample collected, 23% are qualified as either undetected estimated (UJ) or estimated (J).

Inorganics. Arsenic, beryllium, cadmium, and selenium were detected below the estimated quantitation limits (EQLs) and are qualified as J. The sample results have a high degree of uncertainty because they cannot be accurately distinguished from instrument "noise" levels. As a result, the data are usable as estimated values, but should be used with caution in the screening assessment because they cannot be accurately quantified.

The chromium in the sample had a laboratory control sample (LCS) recovery outside of the established limits (80% to 120%). The sample value is qualified as J, and the data usability was not affected because the result was biased high. Barium, beryllium, cadmium, chromium, copper, manganese, mercury, nickel, vanadium, and zinc were detected in the laboratory blank at concentrations below or equivalent to the method detection limits (MDLs). The sample values are greater than 5X the blank values. The data are not qualified and are usable as reported.

All other inorganic data are considered to be usable as reported.

Organics. 2-Amino-4,6-dinitrotoluene, 4-amino-2,6-dinitrotoluene, nitrobenzene, and o,p-nitrotoluenes had LCS recoveries that were outside the established limits (75% to 125%) and are qualified as UJ. Data are usable because the recoveries were <5% below the limit, so the analytes would have been detected and quantified if present.

All other organic data are considered to be usable as reported.

Radionuclides. There were no QA/QC problems associated with the radionuclide data from this PRS.

PRS 14-010

The QA/QC data associated with the analyses at PRS 14-010 (inorganics, HE, and radionuclides) indicated that 100% of the sample analytical data were acceptable and defensible (Table 7.2-2). The QA/QC mechanisms were effective in ensuring the reliability of measured data within expected limits of sampling and analytical error. Of the approximately 600 pieces of analytical data, 8% are qualified as either UJ or J.

Inorganics. Antimony, beryllium, cadmium, mercury, selenium, and thallium are qualified as J because they were detected below the EQLs. The values have a high degree of uncertainty because they cannot be accurately distinguished from the instrument "noise" levels. As a result, the data are usable as estimated values, but should be used with caution in the screening assessment because they cannot be accurately quantified.

Antimony, barium, cadmium, chromium, manganese, and vanadium were detected in the laboratory blank at concentrations below or equivalent to the MDLs. The sample values are greater than 5X the blank values. The data are not qualified and are usable as reported.

All other inorganic data are considered to be usable as reported.

Organics. HMX in two samples is qualified as J because it was detected below the EQL. The values have a high degree of uncertainty because they cannot be accurately distinguished from the instrument "noise" level. As a result, the data are usable as estimated values, but should be used with caution in the screening assessment because they cannot be accurately quantified.

The LCS recoveries for 4-amino-2,6-dinitrotoluene, nitrobenzene, and meta-, ortho-, and para-nitrotoluenes in all five samples were outside of the established limits (75% to 125%) and are qualified as UJ. The data are usable because the recoveries were <4% below the limits so the analytes would be detected and quantified if present.

All other organic data are considered usable as reported.

Radionuclides. Uranium-238 was detected in the laboratory blank at concentrations below or equivalent to the MDLs. The one sample value was less than 5X the blank values, indicating that the presence of uranium-238 in this sample may be due to contamination. The datum for this sample should be qualified as undetected (U) and is usable as a nondetect. The other four sample values are greater than 5X the blank values. The data are not qualified and are usable as reported.

All other radionuclide data are considered usable as reported.

2.1.2 Sampling Results

PRS 14-002(a)

FIMAD contains all of the analytical data collected at PRS 14-002(a). The reported values for detected chemicals are compared with the respective background upper tolerance levels (UTLs) and SALs. Data comparison tables of detected concentrations greater than background UTLs and SALs are provided in Annex 7.2. Based on a review of the sampling data, the results are summarized as follows:

- Four inorganics—chromium, copper, nickel, and uranium—were detected above background UTLs (Table 7.2-3).
- Three analytes—chromium, copper, and nickel—had concentrations below their respective SALs and were submitted to an multiple chemical evaluation (MCE) for noncarcinogenic effects (Table 7.2-4). The sum of the maximum normalized concentrations was 0.1, which is less than the target value of one, indicating that potential adverse health effects are unlikely. Therefore, these three inorganics were eliminated from further evaluation. Chromium (total) was considered to consist of the noncarcinogenic form (Cr III) rather than the carcinogenic hexavalent form (Cr VI) because the latter exists for only a short time in the environment before reduction occurs to Cr III.
- Uranium was detected at a concentration greater than its inorganic SAL (based on systemic effects) of 230 mg/kg and is retained as a COPC (Table 7.2-3).
- The isotopic ratio of uranium-238 to -234 was greater than 10:1, indicating that the uranium detected at this site was depleted uranium (DU). Uranium-235 and -238 were detected above their background UTLs and were carried forward to the SAL comparison stage (Table 7.2-5). Uranium-234 was detected below its background UTL and was eliminated from further consideration.
- Uranium-238 and uranium were detected at concentrations above their respective SALs of 10 pCi/g and 130 mg/kg (DU SAL for uranium) (Table 7.2-5). Because uranium-238 is the major isotope of total uranium, uranium-238 is the COPC for which a site-specific preliminary remediation goal (PRG) is calculated. Uranium-235 was detected below its SAL; however, because it was the only analyte in the radionuclide effects category above background and is also a constituent of uranium, it was not submitted to an MCE and was not retained as a COPC.

The results of the RFI screening assessment indicate that uranium (inclusive of uranium-238 and -235) has been retained as a COPC.

PRS 14-010

FIMAD contains all of the analytical data collected at PRS 14-010. The reported values for both detected and undetected chemicals are compared with the respective background UTLs and SALs. Data comparison tables of detected concentrations greater than background UTLs and SALs are provided in Annex 7.2. Based on a review of the sampling data, the results are summarized as follows:

- Ten inorganics—chromium, cobalt, copper, lead, nickel, silver, selenium, thallium, uranium, and zinc—were detected above background UTLs in the surface soil (Table 7.2-6).
- Nine inorganics—chromium, cobalt, copper, lead, nickel, silver, selenium, thallium, and zinc—were detected at concentrations below their respective SALs and were submitted to an MCE for noncarcinogenic effects (Table 7.2-7). Chromium was considered to consist of the trivalent form (Cr III) as described above. The sum of the maximum normalized concentrations was 0.6, which is less than the target value of one, indicating adverse health effects from exposure would be unlikely. Therefore, chromium, cobalt, copper, lead, nickel, silver, selenium, thallium, and zinc were eliminated from further evaluation.

- Uranium was detected at concentrations greater than its inorganic SAL (based on systemic effects) of 230 mg/kg in two samples and was retained as a COPC (Table 7.2-6).
- The isotopic ratio of uranium-238 to -234 was greater than 10:1 at several sampling locations, indicating that the uranium detected at this PRS was DU. Uranium-235 and -238 were detected above their background UTLs, while uranium-234 was detected below its background UTL (Table 7.2-8).
- Uranium-238 and uranium were detected at concentrations above their respective SALs of 10 pCi/g and 130 mg/kg (DU SAL for uranium) (Table 7.2-8). Because uranium-238 is the primary isotope of total uranium, uranium-238 is the COPC for which a site-specific PRG is calculated. Uranium-235 was detected below its SAL; however, because it was the only analyte in the radionuclide effects category above background and is also a constituent of uranium, it was not submitted to an MCE and was not retained as a COPC.
- One HE compound—HMX—was detected in the surface soil (40.8 mg/kg) and in the drainline (14.5 mg/kg) below its SAL of 3,300 mg/kg and was included in the MCE for noncarcinogenic effects (Table 7.2-7). This compound was not retained as a COPC because it was below SAL and the sum of the normalized concentrations in the MCE (0.6) was below the target value of 1.0.

The results of the RFI screening assessment indicate that uranium (inclusive of uranium-238 and -235) has been retained as a COPC.

2.2 Nature and Extent of Contamination

The nature and extent of the contamination at PRS 14-002(a) is believed to be associated with the location of the sandbags as well as possibly some of the underlying soil and the immediate area around the sandbags. To the west of the sandbags is a concrete slab.

The nature and extent of the contamination at PRS 14-010 is confined to the drainage area from Building TA-14-2 (approximately 50 m^2). Based on the Phase I sampling, the contamination is limited to the surface soil.

3.0 PROPOSED REMEDY

3.1 Description of the Proposed Remedial Actions

The remedial action at PRS 14-002(a) consists of removing the sandbags as well as a few inches of sand and soil resulting from burst sandbags that are now resting partially on an asphalt pad and partially on the soil. The remedial action at PRS 14-010 consists of removing the top few inches of surface soil by hand along the drainage course. Both PRSs are easily accessible, with paved surfaces on three sides of PRS 14-002(a). There are no fences, trenches, etc., that would impede site access. Remediation will eliminate the potential for contaminants (e.g., DU, HE) to migrate in the drainage areas.

To implement the remedies, the following plan will be used. After appropriate health and safety screening (see Annex 7.6), the soil on the surface of the pad at PRS 14-002(a) will be picked up by hand shoveling, using plastic or equivalent equipment, and placed in B-25 containers. Field screening of the drainage area at PRS 14-010 will be conducted using a 44-9 pancake probe as well as visual inspection of the area to look for DU. A probe reading of more than twice the background established for the pancake probe will be used to identify areas in the drainage that may require further analyses. The field screening will assist the remediation team in more precisely defining the area of contamination and will ensure that all contaminated soil is remediated while minimizing the amount of waste generated. The contaminated surface soil at both PRSs will be scraped down to 6 in. and removed by hand shoveling and placed in B-25 containers. During the placement of soil into the B-25 containers, portions of the soil will be placed in a plastic bowl or equivalent, so that when the container is full, a representative composite sample of the

contents of the container exists. The contents of the bowl will be homogenized by hand, with a plastic spoon or equivalent, and placed in the appropriate container for waste characterization analysis (see Annex 7.7 for details). After the shoveling is completed, a dustpan and whisk broom will be used to remove the remaining particles from the asphalt at PRS 14-002(a). This soil will also be placed in the B-25 containers as waste.

It is not anticipated, but if any visible pieces of HE are detected during the soil removal, the HE pieces will be collected in a separate container and managed as hazardous waste. Similarly, visible pieces of DU, or specific soil pieces identified by field rad screening, will be collected in a separate container and managed as low-level rad waste.

During the excavation of the soil, dust suppression will be performed using hand-held water sprayers. The application of water will be limited and will not result in runoff or in the generation of a dual-phase (water and soil) waste.

Before beginning remedial action, a radiation level for cleanup will be established. This level will be used to determine whether or not fixed radiation exists on the asphalt or if all the radioactivity is removed with the sand and soil. When the soil is completely removed, the asphalt area at PRS 14-002(a) will be swiped and analyzed, relative to the LANL background, for removable radiological contamination. At this time, confirmatory cleanup samples of the underlying soil at both sites will be collected. The results of the field screening measurements, along with the fixed analytical results, will be provided in the VCA report.

Upon completion of the soil removal and confirmatory sampling, tools and equipment will be decontaminated. The decon fluid will be stored in lined 55-gallon drums or B-25 containers, sampled for waste characterization, and disposed of accordingly. Personal protective equipment (PPE) will be cleaned and uncleanable portions will be cut out and disposed of as waste. Until the results of the waste characterization are received, all drums will be stored onsite, on pallets, under plastic, and initially managed as non-RCRA waste. After the results have been received, final disposition for the drums will be determined.

The Spill Prevention, Control, and Countermeasures (SPCC) Plan and the Stormwater Plan will be followed and the Air Pollution Control Procedures, if applicable.

3.2 Basis for Cleanup Levels

PRS 14-002(a)

PRS 14-002(a) lies within DOE-owned land and is removed from public access roads. The anticipated future land use is expected to be exclusively for Laboratory operations (i.e., industrial land use only). It is located at the start of a small drainage area and remediation will eliminate the potential for contaminants to migrate.

A PRG for the COPC retained from the human health screening assessment, i.e., uranium, was calculated based on the expected land use at the site. The site-specific PRG was calculated to be 987 mg/kg or 395 pCi/g (Table 3.2-1). The derivation of the PRG was calculated using RESRAD 5.61 (computer printout is provided in Annex 7.1) and is based on an exposure of 30 mrem/yr (see Annex 7.1). LANL site-specific exposure input parameters were used in the model (Perona 1996, 1330) and are presented in Annex 7.1.

TABLE 3.2-1

SITE-SPECIFIC PRGs FOR PRS 14-002(a)

COPC	Sample Value		PRG		Rationale
Uranium	2,010 mg/kg	804 pCi/g	987 mg/kg	395 pCi/g	Radionuclide (based on a dose of 30 mrem/year)

Based on the sample results, the maximum detected concentration of uranium exceeded the site-specific PRG. In addition, this PRS is near a drainage area and remediation will remove the potential for dispersion of inorganics and uranium to surface waters. Therefore, PRS 14-002(a) will be cleaned to at least this concentration of uranium.

PRS 14-010

PRS 14-010 lies within DOE-owned land and is removed from public access roads. The anticipated future land use is expected to be exclusively for Laboratory operations (i.e., industrial land use only).

A PRG for the COPC retained from the human health screening assessment, i.e., uranium, was calculated based on the expected land use at the site. The site-specific PRG was calculated to be 987 mg/kg or 395 pCi/g (Table 3.2-2). The derivation of the PRG was calculated using RESRAD 5.61 (computer printout is provided in Annex 7.1) and is based on an exposure of 30 mrem/yr (see Annex 7.1). LANL site-specific exposure input parameters were used in the model (Perona 1996, 1330) and are presented in Annex 7.1.

TABLE 3.2-2

SITE-SPECIFIC PRGs FOR PRS 14-010

COPC	Sample Value		PRG		Rationale
Uranium	1,370 mg/kg	548 pCi/g	987 mg/kg	395 pCi/g	Radionuclide (based on a dose of 30 mrem/year)

Based on the sample results, the maximum detected concentration of uranium exceeded the site-specific PRG. In addition, this PRS is near a drainage area and remediation will remove the potential for dispersion of inorganics and uranium to surface waters. Therefore, PRS 14-010 will be cleaned to at least this concentration of uranium.

3.3 Site Restoration

Because PRS 14-002(a) consists of soil partially located on a pad, site restoration may not be necessary. Following confirmation that both PRSs have been remediated in accordance with this plan, the excavated areas will be returned to the original grade and reseeded, if necessary. The area will be stabilized to prevent erosion until vegetation has been established. Backfill material will consist of clean fill obtained from the Laboratory maintenance contractor.

Following remediation of PRS 14-010, the area will be returned to the original grade and reseeded. If necessary, burlap or other suitable material will be placed on the ground to stablize the soil until the grass is growing. The burlap will be removed at that time. Backfill material will consist of clean fill obtained from the Laboratory maintenance contractor.

4.0 WASTE MANAGEMENT

4.1 Estimated Types and Volumes of Waste

PRS 14-002(a)

Wastes expected to be generated during the VCA at this PRS are included in Table 4.1-1.

TABLE 4.1-1

ESTIMATED TYPES AND VOLUMES AND WASTE

Item	Waste Type	Anticipated Volume
Sampling waste/PPE	Solid - potential radioactive	<1 55-gallon drum
Contaminated soils	Solid - radioactive	<1 B-25 containers (3 cubic yards each)
Decontamination wastes	Liquid - potential radioactive	<25 gallons

A Characterization Strategy Form (CSF) has been submitted to EM-SWO and ESH-19. The CSF describes the waste characterization/strategy requirements and all the uncertainties in determining the waste types and volumes are summarized below.

Soil contaminated with DU will be put in an anticipated maximum of one B-25 container. It will initially be managed as non-RCRA waste. The B-25 container will be sealed. After the waste is characterized by specified laboratory analyses, a final RCRA determination will be made. Each drum will be disposed of according to its hazard classification (RCRA, mixed, radioactive, or nonhazardous waste). One composite sample will be taken from the B-25 container and analyzed for isotopic uranium, HE, semi-volatile organic compounds (SVOCs), and toxicity characteristic leaching procedure (TCLP) metals.

Visibly contaminated PPE and sampling equipment will initially be considered low-level radioactive/non-RCRA waste based on previous analytical data. Visibly uncontaminated items will be considered nonhazardous or radioactive waste, depending on the field screening results. The volume generated is anticipated to be less than one 55-gallon drum. PPE/sampling equipment will be placed in sealed plastic bags inside the 55-gallon drum and will not be directly sampled. Soil sampling results will be used to characterize the PPE.

Decontamination liquids—Liquinox® detergent, tap water, and distilled water—may be low-level radioactive waste. A total volume of less than 25 gallons is anticipated to be generated and will be segregated. The decontamination liquid waste will be placed in 5-gallon containers labeled with the PRS number and placed inside a 55-gallon drum with the PPE and sampling equipment.

Decontamination liquids will be evaluated as low-level radioactive/non-RCRA waste, based on the results of an analysis of a grab liquid waste sample, which will be analyzed for TCLP metals, HE, SVOCs, and isotopic uranium.

PRS 14-010

Wastes expected to be generated during the VCA at this PRS are included in Table 4.1-2.

TABLE 4.1-2

ESTIMATED TYPES AND VOLUMES OF WASTE FOR PRS 14-010

Item	Waste Type	Anticipated Volume
Sampling waste/PPE	Solid - potential radioactive	<1 55-gallon drum
Contaminated soils	Solid - radioactive	3 B-25 containers (3 cubic yards each)
Decontamination wastes	Liquid - potential radioactive	<20 gallons

A Characterization Strategy Form (CSF) has been submitted to EM-SWO and ESH-19. The CSF describes the waste characterization/strategy requirements and all uncertainties in determination of waste types and volumes are summarized below.

Soil contaminated with DU will be placed in a maximum of three B-25 containers. The containers will be sealed. After the waste is characterized by specified laboratory analyses, it will be disposed of according to its hazard classification (RCRA, mixed, radioactive, or nonhazardous waste). One composite sample taken from each B-25 container will be analyzed for TCLP metals, isotopic uranium, SVOCs, volatile organic compounds (VOCs), and HE. Visible pieces of HE and DU (if found) will be segregated and disposed of as hazardous or radioactive waste, respectively.

Visibly contaminated PPE and sampling equipment will be considered low-level radioactive waste if the radiological field screening detects readings above background levels. Visibly contaminated items will be considered industrial or radioactive waste depending on the field screening results. The volume generated will be less than one 55-gallon drum. The PPE/sampling equipment will be segregated into visibly contaminated and uncontaminated categories and placed in separate sealed bags inside a 55-gallon drum. These items will not be directly sampled.

Decontamination liquids—Liquinox® detergent, tap water, and distilled water—may be low-level radioactive waste. A total volume of less than 20 gallons will be generated and will be segregated. The decontamination liquid waste will be placed in 5-gallon containers labeled with the PRS number and placed inside a 55-gallon drum with the PPE and sampling equipment.

The decontamination liquids will be classified as either RCRA, mixed, radioactive, or nonhazardous waste depending on the results of a grab liquid waste sample. The grab sample will be analyzed for TCLP metals, isotopic uranium, SVOCs, VOCs, and HE.

4.2 Method of Management and Disposal

PRS 14-002(a)

Waste soil will be stored/handled in accordance with DOE Order 5820.2A (Radioactive Waste Management) requirements. Until all analyses are completed for the soil, waste will be stored at the PRS in the B-25 container as non-RCRA waste. The B-25 container will be labeled with a completed Radioactive Materials Tag and the storage area will be roped off and labeled as a radioactive materials storage area. The soil will be removed from the PRS after the analytical results are evaluated and a RCRA Subtitle C determination is made. Disposal will be in accordance with appropriate requirements.

Visibly contaminated or radioactive PPE/sampling equipment will be segregated and managed as non-RCRA waste and disposed of in a manner similar to that used in disposing of the B-25 container because of the difficulties of sample PPE.

Decontamination liquids will be managed as potential non-RCRA waste. The total volume is expected to be less than 25 gallons. The analysis of one grab sample of the waste liquids generated during the VCA will be used to determine its final disposal site. Analyses of the liquid waste will include TCLP metals, isotopic uranium, SVOCs, VOCs, and HE. After the hazard and radioactive determination has been made for the decontamination liquids, further analyses may be required to meet the waste acceptance criteria of a treatment, storage, and disposal (TSD) facility. If the liquids are nonhazardous and nonradioactive, one disposal site could be the TA-46 Sanitary Wastewater System Consolidation (SWSC) plant. If the decontamination liquids are found to be either hazardous or radioactive, their disposal may be at the TA-50 TSD or at another approved TSD facility.

EM-SWO personnel will assist in determining the final disposal location of the generated wastes. They will help find the required TSD space, if necessary.

PRS 14-010

Waste soil will be stored/handled in accordance with DOE Order 5820.2A requirements. Until all laboratory analyses are completed on the soil in each container, this waste will be stored at the PRS in B-25 containers. Each B-25 container will be labeled with a completed Radioactive Materials Tag and the storage area will be roped off and labeled as a radioactive materials storage area. Based on the analytical results, the soil will subsequently be disposed of as radioactive, mixed, or nonhazardous waste. Disposal will be in accordance with appropriate requirements.

Visibly contaminated PPE/sampling equipment will be segregated and managed as non-RCRA waste. The total volume is expected to be less than 55 gallons (i.e., one drum). It will be stored onsite until the soil analyses are completed and the results received from the analytical laboratory. This waste will be disposed of in the same manner as the B-25 container with the highest level of RCRA, mixed, or radioactive wastes.

Decontamination liquids (20 gallons or less total volume) will be managed as non-RCRA waste. A grab sample of the liquid waste will be collected during the VCA and analyzed to determine its final disposal site. Analyses of the liquid waste will include TCLP metals, isotopic uranium, SVOCs, VOCs, and HE. Further analyses may be required to meet the waste acceptance criteria of a TSD after the hazard and radioactive determination has been made for the decontamination liquids. If the liquids are nonhazardous and nonradioactive, one disposal site could be the TA-46 SWSC plant. If the decontamination liquids are found to be either hazardous or radioactive, their disposal may be at the TA-50 TSD or at another approved TSD facility.

EM-SWO personnel will assist in determining the final disposal location of the generated wastes. They will help find the required TSD space, if necessary.

5.0 DESCRIPTION OF CONFIRMATORY/VERIFICATION SAMPLING

After the sandbags are removed, any soil directly underneath the sandbags at PRS 14-002(a) will be sampled in two places using field screening techniques and fixed laboratory analyses. Samples taken from 3 ft away from the center of the sandbags on each of two perpendicular transects will also be screened where soil matrix exists (there is concrete in at least one direction). Similarly, following removal of the top 6 in. of soil from PRS 14-010, field screening will be conducted on a 5-ft grid over the remediated zone. The field screening will be performed using x-ray fluorescence (XRF) to look for uranium. The two locations that represent the highest XRF readings will be sampled and sent to an analytical laboratory for confirmation of the XRF results.

The field screening will help the remediation team more precisely define the area of contamination in order to ensure that all soil contaminated at levels of concern for human health is remediated, while

minimizing the amount of waste generated. Should contamination be discovered in the soil (although this is not expected), further field screening and excavation will be performed around the affected location.

In order to confirm that there has not been migration from the site, samples will also be collected from the surface soil at 5, 10, 15, and 20 ft downgradient from PRS 14-010. These samples will be sent to an analytical laboratory for uranium analysis and will be reported with the confirmatory sample results.

The industrial PRG for DU is 987 mg/kg or 395 pCi/g. Remediation standards for this site will be attained when the results exhibit no contamination above the level of the industrial PRGs.

6.0 ESTIMATED TIME TO COMPLETE THE ACTION AND UNCERTAINTIES

The estimated completion time for the VCA at PRS 14-002(a) is three days. This estimate is based on a one-day mobilization, one day to complete the removal of the sandbags and contaminated soil as well as shipment of the confirmatory samples, and one day to demobilize. The estimated completion time for the VCA at PRS 14-010 is two weeks (10 working days). This estimate is based on a one-day mobilization, eight days to complete the removal of contaminated soil and shipment of the confirmatory samples, and one day to demobilize. The analytical results from the waste characterization and confirmation sampling are expected to be received within 30 days. Waste removal from onsite storage is expected within 60 days. Thus, the total time for both VCAs from mobilization to removal of waste is estimated to be 90 days.

There are few uncertainties with these cleanups. The amount of waste is easily identifiable. No heavy equipment (other than a drum loader) will be necessary. For the three B-25 container total waste estimate, adequate TSD capacity should exist. If, during the course of the removal, the waste volume exceeds 200% of the four B-25 container estimate, the effort will be stopped and re-evaluated.

ANNEX 7.1

RISK-BASED CLEANUP LEVEL ASSUMPTIONS AND CALCULATIONS

The site-specific PRG for uranium was calculated using the RESRAD model, version 5.61.

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Du

50 m²

.3 m

Dose Conversion Factor (and Related) Parameter Summary
File: DOSFAC.BIN

Menu	Parameter	Current Value	Default	Parameter Name
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Ac-227+D	6.720E+00	6.720E+00	DCF2(1)
B-1	Pa-231	1.280E+00	1.280E+00	DCF2(2)
B-1	Pb-210+D	2.320E-02	2.320E-02	DCF2(3)
B-1	Ra-226+D	8.600E-03	8.600E-03	DCF2(4)
B-1	Th-230	3.260E-01	3.260E-01	DCF2(5)
B-1	U-234	1.320E-01	1.320E-01	DCF2(6)
B-1	U-235+D	1.230E-01	1.230E-01	DCF2(7)
B-1	U-238+D	1.180E-01	1.180E-01	DCF2(8)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Ac-227+D	1.480E-02	1.480E-02	DCF3(1)
D-1	Pa-231	1.060E-02	1.060E-02	DCF3(2)
D-1	Pb-210+D	7.270E-03	7.270E-03	DCF3(3)
D-1	Ra-226+D	1.330E-03	1.330E-03	DCF3(4)
D-1	Th-230	5.480E-04	5.480E-04	DCF3(5)
D-1	U-234	2.830E-04	2.830E-04	DCF3(6)
D-1	U-235+D	2.670E-04	2.670E-04	DCF3(7)
D-1	U-238+D	2.690E-04	2.690E-04	DCF3(8)
D-34	Food transfer factors:			
D-34	Ac-227+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(1,1)
D-34	Ac-227+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,2)
D-34	Ac-227+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,3)
D-34	Pa-231 , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(2,1)
D-34	Pa-231 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(2,2)
D-34	Pa-231 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(2,3)
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(3,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(3,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(3,3)
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(4,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,3)
D-34	Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(5,1)
D-34	Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(5,2)
D-34	Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(5,3)
D-34	U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(6,1)
D-34	U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(6,2)
D-34	U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(6,3)
D-34	U-235+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(7,1)
D-34	U-235+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(7,2)
D-34	U-235+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(7,3)

Dose Conversion Factor (and Related) Parameter Summary (continued)
File: DOSFAC.BIN

Menu	Parameter	Current Value	Default	Parameter Name
D-34	U-238+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(8,1)
D-34	U-238+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(8,2)
D-34	U-238+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(8,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Ac-227+D , fish	1.500E+01	1.500E+01	BIOFAC(1,1)
D-5	Ac-227+D , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(1,2)
D-5				
D-5	Pa-231 , fish	1.000E+01	1.000E+01	BIOFAC(2,1)
D-5	Pa-231 , crustacea and mollusks	1.100E+02	1.100E+02	BIOFAC(2,2)
D-5				
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(3,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(3,2)
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(4,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(4,2)
D-5				
D-5	Th-230 , fish	1.000E+02	1.000E+02	BIOFAC(5,1)
D-5	Th-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(5,2)
D-5				
D-5	U-234 , fish	1.000E+01	1.000E+01	BIOFAC(6,1)
D-5	U-234 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(6,2)
D-5				
D-5	U-235+D , fish	1.000E+01	1.000E+01	BIOFAC(7,1)
D-5	U-235+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(7,2)
D-5				
D-5	U-238+D , fish	1.000E+01	1.000E+01	BIOFAC(8,1)
D-5	U-238+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(8,2)

Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	5.000E+01	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	3.000E-01	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	1.000E+02	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	3.000E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+01	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+01	3.000E+01	---	T(5)
R011	Times for calculations (yr)	1.000E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	3.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	1.000E+03	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): U-234	8.500E-02	0.000E+00	---	S1(6)
R012	Initial principal radionuclide (pCi/g): U-235	1.400E-02	0.000E+00	---	S1(7)
R012	Initial principal radionuclide (pCi/g): U-238	9.010E-01	0.000E+00	---	S1(8)
R012	Concentration in groundwater (pCi/L): U-234	not used	0.000E+00	---	W1(6)
R012	Concentration in groundwater (pCi/L): U-235	not used	0.000E+00	---	W1(7)
R012	Concentration in groundwater (pCi/L): U-238	not used	0.000E+00	---	W1(8)
R013	Cover depth (m)	0.000E+00	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	not used	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	not used	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.600E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone effective porosity	2.000E-01	2.000E-01	---	EPCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	4.400E+02	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	4.050E+00	5.300E+00	---	BCZ
R013	Humidity in air (g/cm**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	9.990E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	4.800E-01	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	0.000E+00	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	5.200E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	2.700E+07	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.600E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	3.000E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	3.000E-01	2.000E-01	---	EPSZ
R014	Saturated zone hydraulic conductivity (m/yr)	1.000E+02	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	2.000E-02	2.000E-02	---	HGWT
R014	Saturated zone b parameter	4.050E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	3.000E-01	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	1.000E+01	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
015	Number of unsaturated zone strata	not used	1	---	NS
R015	Unsat. zone 1, thickness (m)	not used	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	not used	1.500E+00	---	DENSUZ(1)
015	Unsat. zone 1, total porosity	not used	4.000E-01	---	TPUZ(1)
015	Unsat. zone 1, effective porosity	not used	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	not used	5.300E+00	---	BUZ(1)
015	Unsat. zone 1, hydraulic conductivity (m/yr)	not used	1.000E+01	---	HCUZ(1)
R015	Unsat. zone 2, thickness (m)	not used	0.000E+00	---	H(2)
R015	Unsat. zone 2, soil density (g/cm**3)	not used	1.500E+00	---	DENSUZ(2)
015	Unsat. zone 2, total porosity	not used	4.000E-01	---	TPUZ(2)
R015	Unsat. zone 2, effective porosity	not used	2.000E-01	---	EPUZ(2)
R015	Unsat. zone 2, soil-specific b parameter	not used	5.300E+00	---	BUZ(2)
015	Unsat. zone 2, hydraulic conductivity (m/yr)	not used	1.000E+01	---	HCUZ(2)
R016	Distribution coefficients for U-234				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(6)
016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(6,1)
R016	Unsaturated zone 2 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(6,2)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(6)
016	Leach rate (/yr)	0.000E+00	0.000E+00	9.587E-06	ALEACH(6)
016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(6)
016	Distribution coefficients for U-235				
016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(7)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(7,1)
R016	Unsaturated zone 2 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(7,2)
016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(7)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	9.587E-06	ALEACH(7)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)
016	Distribution coefficients for U-238				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(8)
016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(8,1)
016	Unsaturated zone 2 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(8,2)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(8)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	9.587E-06	ALEACH(8)
016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(8)
R016	Distribution coefficients for daughter Ac-227				
016	Contaminated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCC(1)
016	Unsaturated zone 1 (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCU(1,1)
R016	Unsaturated zone 2 (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCU(1,2)
016	Saturated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCS(1)
016	Leach rate (/yr)	0.000E+00	0.000E+00	2.392E-05	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for daughter Pa-231				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(2,1)
R016	Unsaturated zone 2 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(2,2)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	9.587E-06	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for daughter Pb-210				
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(3,1)
R016	Unsaturated zone 2 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(3,2)
R016	Saturated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.797E-06	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
R016	Distribution coefficients for daughter Ra-226				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(4,1)
R016	Unsaturated zone 2 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(4,2)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.850E-06	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
R016	Distribution coefficients for daughter Th-230				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(5)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(5,1)
R016	Unsaturated zone 2 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(5,2)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	8.000E-09	ALEACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)
R017	Inhalation rate (m**3/yr)	1.490E+04	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	9.000E-05	2.000E-04	---	MLINH
R017	Dilution length for airborne dust, inhalation (m)	3.000E+00	3.000E+00	---	LM
R017	Exposure duration	2.500E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	7.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	1.840E-01	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	4.600E-02	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	1 shows circular AREA.	FS

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	not used	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	3.650E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	not used	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	not used	1.000E+00	---	FDW
R018	Contamination fraction of household water	0.000E+00	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	not used	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	not used	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	not used	-1	---	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	not used	1.000E-04	---	MLFD

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	not used	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	1.000E+00	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	not used	1.000E+00	---	FGWIR
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	not used	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	not used	1.000E+00	---	STOR_T(2)
STOR	Milk	not used	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	not used	2.000E+01	---	STOR_T(4)
STOR	Fish	not used	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	not used	7.000E+00	---	STOR_T(6)
STOR	Well water	not used	1.000E+00	---	STOR_T(7)
STOR	Surface water	not used	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	not used	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	1.500E-01	1.500E-01	---	FLOOR
R021	Bulk density of building foundation (g/cm**3)	2.400E+00	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	4.000E-01	1.000E-01	---	TPFL
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	1.000E-01	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	3.000E-07	3.000E-07	---	DIFFL
R021	in contaminated zone soil	2.000E-06	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	2.000E+00	2.000E+00	---	HMIX
R021	Average annual wind speed (m/sec)	3.000E+00	2.000E+00	---	WIND
R021	Average building air exchange rate (1/hr)	1.000E+00	5.000E-01	---	REXG
R021	Height of the building (room) (m)	2.500E+00	2.500E+00	---	HRM
R021	Building interior area factor	0.000E+00	0.000E+00	code computed (time dependent)	FAI
R021	Building depth below ground surface (m)	-1.000E+00	-1.000E+00	code computed (time dependent)	DMFL
R021	Emanating power of Rn-222 gas	2.500E-01	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)

Summary of Pathway Selections

Pathway	User Selection
1 -- external gamma	active
2 -- inhalation (w/o radon)	active
3 -- plant ingestion	suppressed
4 -- meat ingestion	suppressed
5 -- milk ingestion	suppressed
6 -- aquatic foods	suppressed
7 -- drinking water	suppressed
8 -- soil ingestion	active
9 -- radon	active

Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	50.00 square meters	U-234	8.500E+02
Thickness:	0.30 meters	U-235	1.400E-02
Cover Depth:	0.00 meters	U-238	9.010E-01

Total Dose TDOSE(t), mrem/yr
Basic Radiation Dose Limit = 30 mrem/yr
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
TDOSE(t):	3.039E-02	3.039E-02	3.038E-02	3.036E-02	3.028E-02	2.980E-02	0.000E+00	0.000E+00
M(t):	1.013E-03	1.013E-03	1.013E-03	1.012E-03	1.009E-03	9.934E-04	0.000E+00	0.000E+00

Maximum TDOSE(t): 3.039E-02 mrem/yr at t = 0.000E+00 years

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	4.673E-06	0.0002	1.263E-03	0.0416	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.010E-05	0.0003
U-235	1.390E-03	0.0457	1.939E-04	0.0064	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.569E-06	0.0001
U-238	1.545E-02	0.5084	1.197E-02	0.3940	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.017E-04	0.0033
Total	1.685E-02	0.5543	1.343E-02	0.4419	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.134E-04	0.0037

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.278E-03	0.0421
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.586E-03	0.0522
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.752E-02	0.9058
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.039E-02	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	4.673E-06	0.0002	1.263E-03	0.0416	7.763E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.010E-05	0.0003
U-235	1.390E-03	0.0457	1.940E-04	0.0064	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.570E-06	0.0001
U-238	1.545E-02	0.5084	1.197E-02	0.3940	5.388E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.017E-04	0.0033
Total	1.684E-02	0.5543	1.343E-02	0.4420	7.763E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.134E-04	0.0037

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.278E-03	0.0421
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.586E-03	0.0522
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.752E-02	0.9058
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.039E-02	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
-234	4.675E-06	0.0002	1.263E-03	0.0416	6.950E-09	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.010E-05	0.0003
U-235	1.390E-03	0.0458	1.941E-04	0.0064	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.573E-06	0.0001
U-238	1.544E-02	0.5083	1.197E-02	0.3941	2.092E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.017E-04	0.0033
Total	1.684E-02	0.5542	1.343E-02	0.4421	6.950E-09	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.134E-04	0.0037

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Dependent Pathways

adio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.278E-03	0.0421
-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.586E-03	0.0522
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.752E-02	0.9057
otal	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.038E-02	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	4.696E-06	0.0002	1.264E-03	0.0416	7.580E-08	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.010E-05	0.0003
U-235	1.389E-03	0.0458	1.946E-04	0.0064	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.585E-06	0.0001
U-238	1.542E-02	0.5079	1.197E-02	0.3944	7.591E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.017E-04	0.0034
Total	1.681E-02	0.5539	1.343E-02	0.4424	7.581E-08	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.134E-04	0.0037

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.278E-03	0.0421
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.586E-03	0.0522
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.749E-02	0.9057
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.036E-02	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	4.876E-06	0.0002	1.264E-03	0.0417	6.449E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.010E-05	0.0003
U-235	1.388E-03	0.0458	1.975E-04	0.0065	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.628E-06	0.0001
U-238	1.534E-02	0.5067	1.197E-02	0.3953	1.940E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.017E-04	0.0034
Total	1.674E-02	0.5527	1.343E-02	0.4435	6.451E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.134E-04	0.0037

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.279E-03	0.0423
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.587E-03	0.0524
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.742E-02	0.9053
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.028E-02	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	6.791E-06	0.0002	1.265E-03	0.0424	5.603E-06	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.011E-05	0.0003
U-235	1.378E-03	0.0462	2.136E-04	0.0072	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.827E-06	0.0001
U-238	1.485E-02	0.4984	1.196E-02	0.4015	5.633E-09	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.017E-04	0.0034
Total	1.624E-02	0.5449	1.344E-02	0.4511	5.609E-06	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.136E-04	0.0038

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.287E-03	0.0432
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.594E-03	0.0535
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.692E-02	0.9033
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.980E-02	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

*Sum of all water independent and dependent pathways.

Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Branch Fraction	DSR(j,t) (mrem/yr)/(pCi/g) t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
U-234	U-234	1.000E+00	1.504E-02	1.504E-02	1.504E-02	1.504E-02	1.503E-02	1.502E-02	0.000E+00	0.000E+00
U-234	Th-230	1.000E+00	0.000E+00	3.340E-07	1.002E-06	3.340E-06	1.002E-05	3.336E-05	0.000E+00	0.000E+00
U-234	Ra-226	1.000E+00	0.000E+00	1.181E-08	1.058E-07	1.158E-06	9.959E-06	9.084E-05	0.000E+00	0.000E+00
U-234	Pb-210	1.000E+00	0.000E+00	1.300E-13	3.456E-12	1.213E-10	2.836E-09	6.918E-08	0.000E+00	0.000E+00
U-234	ΣDSR(j)		1.504E-02	1.504E-02	1.504E-02	1.504E-02	1.505E-02	1.514E-02	0.000E+00	0.000E+00
U-235	U-235	1.000E+00	1.133E-01	1.132E-01	1.132E-01	1.132E-01	1.131E-01	1.120E-01	0.000E+00	0.000E+00
U-235	Pa-231	1.000E+00	0.000E+00	3.669E-06	1.101E-05	3.668E-05	1.100E-04	3.651E-04	0.000E+00	0.000E+00
U-235	Ac-227	1.000E+00	0.000E+00	3.406E-07	3.001E-06	3.103E-05	2.305E-04	1.501E-03	0.000E+00	0.000E+00
U-235	ΣDSR(j)		1.133E-01	1.133E-01	1.133E-01	1.133E-01	1.134E-01	1.138E-01	0.000E+00	0.000E+00
U-238	U-238	1.000E+00	3.055E-02	3.055E-02	3.054E-02	3.051E-02	3.043E-02	2.987E-02	0.000E+00	0.000E+00
U-238	U-234	1.000E+00	0.000E+00	4.263E-08	1.279E-07	4.263E-07	1.279E-06	4.259E-06	0.000E+00	0.000E+00
U-238	Th-230	1.000E+00	0.000E+00	4.734E-13	4.261E-12	4.734E-11	4.260E-10	4.729E-09	0.000E+00	0.000E+00
U-238	Ra-226	1.000E+00	0.000E+00	7.732E-15	3.005E-13	1.094E-11	2.827E-10	8.615E-09	0.000E+00	0.000E+00
U-238	Pb-210	1.000E+00	0.000E+00	2.882E-18	1.330E-17	8.752E-16	6.294E-14	5.499E-12	0.000E+00	0.000E+00
U-238	ΣDSR(j)		3.055E-02	3.055E-02	3.054E-02	3.051E-02	3.043E-02	2.988E-02	0.000E+00	0.000E+00

Branch Fraction is the cumulative factor for the j'th principal radionuclide daughter: CUMBRF(j) = BRF(1)*BRF(2)* ... BRF(j).
The DSR includes contributions from associated (half-life > 0.5 yr) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 30 mrem/yr

Nuclide (i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
U-234	1.995E+03	1.995E+03	1.995E+03	1.995E+03	1.993E+03	1.981E+03	*6.245E+09	*6.245E+09
U-235	2.649E+02	2.649E+02	2.649E+02	2.649E+02	2.646E+02	2.635E+02	*2.160E+06	*2.160E+06
U-238	9.820E+02	9.821E+02	9.823E+02	9.832E+02	9.859E+02	1.004E+03	*3.360E+05	*3.360E+05

*At specific activity limit

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
and at tmax = time of maximum total dose = 0.000E+00 years

Nuclide (i)	Initial pCi/g	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
U-234	8.500E-02	149.9 ± 0.1	1.523E-02	1.970E+03	1.504E-02	1.995E+03
U-235	1.400E-02	92.81 ± 0.09	1.138E-01	2.635E+02	1.133E-01	2.649E+02
U-238	9.010E-01	0.000E+00	3.055E-02	9.820E+02	3.055E-02	9.820E+02

Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	BRF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
U-234	U-234	1.000E+00	1.278E-03	1.278E-03	1.278E-03	1.278E-03	1.278E-03	1.277E-03	0.000E+00	0.000E+00
U-234	U-238	1.000E+00	0.000E+00	3.841E-08	1.152E-07	3.841E-07	1.152E-06	3.837E-06	0.000E+00	0.000E+00
U-234	ΔDOSE(j):		1.278E-03	1.278E-03	1.278E-03	1.278E-03	1.279E-03	1.280E-03	0.000E+00	0.000E+00
Th-230	U-234	1.000E+00	0.000E+00	2.839E-08	8.517E-08	2.839E-07	8.514E-07	2.836E-06	0.000E+00	0.000E+00
Th-230	U-238	1.000E+00	0.000E+00	4.266E-13	3.839E-12	4.265E-11	3.838E-10	4.261E-09	0.000E+00	0.000E+00
Th-230	ΔDOSE(j):		0.000E+00	2.839E-08	8.517E-08	2.839E-07	8.518E-07	2.840E-06	0.000E+00	0.000E+00
Ra-226	U-234	1.000E+00	0.000E+00	1.004E-09	8.995E-09	9.844E-08	8.465E-07	7.721E-06	0.000E+00	0.000E+00
Ra-226	U-238	1.000E+00	0.000E+00	6.967E-15	2.708E-13	9.858E-12	2.547E-10	7.762E-09	0.000E+00	0.000E+00
Ra-226	ΔDOSE(j):		0.000E+00	1.004E-09	8.995E-09	9.845E-08	8.468E-07	7.729E-06	0.000E+00	0.000E+00
Pb-210	U-234	1.000E+00	0.000E+00	1.105E-14	2.937E-13	1.031E-11	2.410E-10	5.880E-09	0.000E+00	0.000E+00
Pb-210	U-238	1.000E+00	0.000E+00	2.597E-18	1.198E-17	7.886E-16	5.671E-14	4.955E-12	0.000E+00	0.000E+00
Pb-210	ΔDOSE(j):		0.000E+00	1.105E-14	2.938E-13	1.031E-11	2.411E-10	5.885E-09	0.000E+00	0.000E+00
U-235	U-235	1.000E+00	1.585E-03	1.585E-03	1.585E-03	1.585E-03	1.585E-03	1.568E-03	0.000E+00	0.000E+00
Pa-231	U-235	1.000E+00	0.000E+00	5.137E-08	1.541E-07	5.136E-07	1.540E-06	5.112E-06	0.000E+00	0.000E+00
Ac-227	U-235	1.000E+00	0.000E+00	4.768E-09	4.202E-08	4.344E-07	3.227E-06	2.101E-05	0.000E+00	0.000E+00
U-238	U-238	1.000E+00	2.752E-02	2.752E-02	2.752E-02	2.749E-02	2.741E-02	2.692E-02	0.000E+00	0.000E+00

BRF(i) is the branch fraction of the parent nuclide.

Summary : RESRAD default data File: LADU1.DAT

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide	Parent	BRF(i)	S(j,t), pCi/g							
S(j)	(i)		t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
áááááá	áááááá	áááááááá	áááááááá	áááááááá	áááááááá	áááááááá	áááááááá	áááááááá	áááááááá	áááááááá
U-234	U-234	1.000E+00	8.500E-02	8.500E-02	8.500E-02	8.499E-02	8.497E-02	8.489E-02	8.468E-02	8.395E-02
U-234	U-238	1.000E+00	0.000E+00	2.554E-06	7.663E-06	2.554E-05	7.660E-05	2.551E-04	7.638E-04	2.526E-03
U-234	δS(j):		8.500E-02	8.500E-02	8.500E-02	8.501E-02	8.504E-02	8.515E-02	8.545E-02	8.648E-02
Th-230	U-234	1.000E+00	0.000E+00	7.652E-07	2.295E-06	7.651E-06	2.295E-05	7.643E-05	2.288E-04	7.570E-04
Th-230	U-238	1.000E+00	0.000E+00	1.150E-11	1.035E-10	1.150E-09	1.034E-08	1.148E-07	1.032E-06	1.138E-05
Th-230	δS(j):		0.000E+00	7.652E-07	2.296E-06	7.652E-06	2.296E-05	7.655E-05	2.298E-04	7.684E-04
Ra-226	U-234	1.000E+00	0.000E+00	1.657E-10	1.491E-09	1.655E-08	1.485E-07	1.632E-06	1.425E-05	1.428E-04
Ra-226	U-238	1.000E+00	0.000E+00	1.150E-15	4.488E-14	1.657E-12	4.467E-11	1.641E-09	4.328E-08	1.481E-06
Ra-226	δS(j):		0.000E+00	1.657E-10	1.491E-09	1.655E-08	1.485E-07	1.634E-06	1.429E-05	1.443E-04
Pb-210	U-234	1.000E+00	0.000E+00	1.704E-12	4.529E-11	1.590E-09	3.716E-08	9.069E-07	1.156E-05	1.345E-04
Pb-210	U-238	1.000E+00	0.000E+00	4.004E-16	1.847E-15	1.216E-13	8.744E-12	7.641E-10	3.211E-08	1.351E-06
Pb-210	δS(j):		0.000E+00	1.704E-12	4.529E-11	1.590E-09	3.717E-08	9.077E-07	1.160E-05	1.358E-04
U-235	U-235	1.000E+00	1.400E-02	1.400E-02	1.400E-02	1.400E-02	1.400E-02	1.399E-02	1.396E-02	1.387E-02
Pa-231	U-235	1.000E+00	0.000E+00	2.962E-07	8.886E-07	2.962E-06	8.881E-06	2.956E-05	8.833E-05	2.903E-04
Ac-227	U-235	1.000E+00	0.000E+00	4.665E-09	4.111E-08	4.251E-07	3.160E-06	2.066E-05	7.907E-05	2.812E-04
U-238	U-238	1.000E+00	9.010E-01	9.010E-01	9.010E-01	9.009E-01	9.007E-01	9.001E-01	8.984E-01	8.924E-01
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BRF(i) is the branch fraction of the parent nuclide.

ANNEX 7.2

RFI ANALYTICAL RESULTS

All analytical data are available on FIMAD. If FIMAD is not accessible, data will be provided on request. The data are summarized in an RFI report for TA-15 (Environmental Restoration Project 1996, 1394). A summary of the analytical data is provided in the following tables.

TABLE 7.2-1

DATA QUALITY EVALUATION FOR SAMPLE FROM PRS 14-002(a)

Batch Number	Sample ID	Suite	Comments
69184	0214-95-0058	Inorganics	Arsenic, beryllium, cadmium, and selenium are qualified as J and because they were below the EQLs. The sample results have a high degree of uncertainty because the values cannot be accurately distinguished from instrument "noise" levels. As a result, the data are usable as estimated values, but should be used with caution in the screening assessment because they cannot be accurately quantified.
69184	0214-95-0058	Inorganics	Chromium recovery in the LCS was outside the established limits (80% to 120%). Datum is qualified as J, but the usability was unaffected because the result was biased high.
69184	0214-95-0058	Inorganics	Barium, beryllium, cadmium, chromium, copper, manganese, nickel, vanadium, and zinc were detected in the laboratory blank. Sample values were >5X the blank values, are not qualified, and are considered usable as reported.
69437			Mercury was detected in the laboratory blank. Sample value was >5X the blank value, is not qualified, and is considered usable as reported.
69174	0214-95-0058	HE	2-Amino-4,6-dinitrotoluene,4-amino-2,6-dinitrotoluene, nitrobenzene, o,p-nitrotoluenes had LCS recoveries outside the acceptable limits. Data qualified as UJ, but usability was unaffected. Data are usable because the recoveries were <5% below the limit, so the analytes would have been detected and quantified if present.

TABLE 7.2-2

DATA QUALITY EVALUATION FOR SAMPLES FROM PRS 14-010

Batch Number	Sample ID	Suite	Comments
69029	0214-95-0048, -0049,-0050, -0051,-0052	Inorganics	Antimony and thallium in four samples, beryllium, cadmium, and selenium in three samples, and silver in one sample are qualified as J because they were detected below the EQLs. The sample results have a high degree of uncertainty because the values cannot be accurately distinguished from instrument "noise" levels. As a result, the data are usable as estimated values, but should be used with caution in the screening assessment because they cannot be accurately quantified.
69092	0214-95-0048, -0049,-0050, -0051		Mercury in four samples is qualified as J because it was detected below the EQL. The sample results have a high degree of uncertainty because the values cannot be accurately distinguished from instrument "noise" levels. As a result, the data are usable as estimated values, but should be used with caution in the screening assessment because they cannot be accurately quantified.
69029	0214-95-0048, -0049,-0050, -0051,-0052	Inorganics	Antimony, barium, cadmium, chromium, manganese, and vanadium in all samples were detected in the laboratory blank. Sample values were >5X the blank values, are not qualified, and are usable as reported.
68962	0214-95-0050, -0051	HE	HMX in two samples is qualified as J because it was detected below the EQL. The sample results have a high degree of uncertainty because the values cannot be accurately distinguished from instrument "noise" levels. As a result, the data are usable as estimated values, but should be used with caution in the screening assessment because they cannot be accurately quantified.
68962	0214-95-0048, -0049,-0050, -0051,-0052	HE	4-amino-2,6-dinitrotoluene, nitrobenzene, meta-, ortho-, and para-nitrotoluenes recoveries in the LCS were outside of established limits for all samples (75% to 125%). Data are qualified as UJ and are usable because the recoveries were <4% below the lower limit so the analyte would be detected and quantified if present.
68714	0214-95-0051	Radionuclide	Uranium-238 in one sample was detected in the laboratory blank. Sample concentrations were <5X the blank value, indicating is due to blank contamination. Datum should be qualified as U and is usable as a nondetect.
	0214-95-0048, -0049,-0050, -0052		Uranium-238 in four samples was detected in the laboratory blank. Sample concentrations were >5X the blank value, are not qualified, and are usable as reported.

TABLE 7.2-3

INORGANICS WITH CONCENTRATIONS GREATER THAN BACKGROUND UTL FOR PRS 14-002(a)

Sample ID	Depth (in.)	Chromium (mg/kg)	Copper (mg/kg)	Nickel (mg/kg)	Uranium (mg/kg)
SAL	N/A	210	2,800	1,500	230
LANL UTL	N/A	19.3	30.7	15.2	5.45
0214-95-0058	0-6	20	83.2	32.9	2,010

Notes: N/A = Not applicable
Sample value in shaded box is greater than SAL.

TABLE 7.2-4

MULTIPLE CHEMICAL EVALUATION FOR SOIL SAMPLE FROM PRS 14-002(a)

Chemical	Location ID	Sample ID	Maximum Sample Values	Soil SAL	Normalized Values
Noncarcinogenic Effects (mg/kg)					
Chromium	14-1036	0214-95-0058	20	210	0.09
Copper	14-1036	0214-95-0058	83.2	2,800	0.03
Nickel	14-1036	0214-95-0058	32.9	1,500	0.02
				Total	0.14

TABLE 7.2-5

RADIONUCLIDES WITH CONCENTRATIONS GREATER THAN BACKGROUND UTL FOR PRS 14-002(a)

Sample ID	Depth (in.)	Uranium (mg/kg)	Uranium-235 (pCi/g)	Uranium-238 (pCi/g)
SAL	N/A	130	10	67
LANL UTL	N/A	5.45	0.08	1.82
0214-95-0058	0-6	2,010	3.36	176

Notes: N/A = Not applicable
Sample value in shaded box is greater than SAL.

TABLE 7.2-6

INORGANICS WITH CONCENTRATIONS GREATER THAN BACKGROUND UTL FOR PRS 14-010

Sample ID	Depth (in.)	Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Nickel (mg/kg)
SAL	N/A	210	4600	2800	400	1500
LANL UTL	N/A	19.3	19.2	15.5	23.3	15.2
0214-95-0048	14-20	2.9	1.3	7.9	15.7	2.7
0214-95-0049	0-4	19.5	10	158	54.2	49
0214-95-0050	0-6	23.6	62.2	152	26.6	128
0214-95-0051	0-6	2.0	1.2	3.3	25.4	2.2
0214-95-0052	0-6	3.4	1.5	4.9	2.4	2.4

Sample ID	Depth (in.)	Silver (mg/kg)	Selenium (mg/kg)	Thallium (mg/kg)	Uranium (mg/kg)	Zinc (mg/kg)
SAL	N/A	380	380	5.4	230	23,000
LANL UTL	N/A	Not Available	1.7	1.0	5.45	50.8
0214-95-0048	14-20	0.5(U)	0.2(J)	0.3(J)	14.5	19.7
0214-95-0049	0-4	4.3	1.1	0.2(J)	1,370	54.8
0214-95-0050	0-6	0.3(J)	3.2	1.8	681	22.4
0214-95-0051	0-6	0.5(U)	0.2(J)	0.5(J)	8.6	20.6
0214-95-0052	0-6	0.5(U)	0.08(J)	0.1(J)	7	11.1

Notes: N/A = Not applicable
Sample value in shaded box is greater than SAL.

TABLE 7.2-7

MULTIPLE CHEMICAL EVALUATION FOR SOIL SAMPLES FROM PRS 14-010

Chemical	Location ID	Sample ID	Maximum Sample Values	Soil SAL	Normalized Values
Noncarcinogenic Effects (mg/kg)					
Chromium	14-1029	0214-95-0050	23.6	210	0.11
Cobalt	14-1029	0214-95-0050	62.2	4,600	0.01
Copper	14-1028	0214-95-0049	158	2,800	0.05
HMX	14-1029	0214-95-0048	40.8	3,300	0.01
Nickel	14-1029	0214-95-0050	128	1,500	0.09
Selenium	14-1029	0214-95-0050	3.2	380	0.01
Silver	14-1028	0214-95-0049	4.3	380	0.01
Thallium	14-1029	0214-95-0050	1.8	5.4	0.3
Zinc	14-1028	0214-95-0049	54.8	23,000	0.002
				Total	0.6

TABLE 7.2-8

RADIONUCLIDES WITH CONCENTRATIONS GREATER THAN BACKGROUND UTL FOR PRS 14-010

Sample ID	Depth (in.)	Uranium (mg/kg)	Uranium-235 (pCi/g)	Uranium-238 (pCi/g)
SAL	N/A	130	10	67
LANL UTL	N/A	5.45	0.08	1.82
0214-95-0048	0-6	14.5	0.3(U)	7.5
0214-95-0049	0-6	1,370	2.7	143
0214-95-0050	0-6	681	0.63	36
0214-95-0051	0-6	8.6	0.1(U)	3.5(U)
0214-95-0052	0-6	7	0.2(U)	7.3

Notes: N/A = Not applicable
Sample value in shaded box is greater than SAL.

ANNEX 7.3

SITE MAP

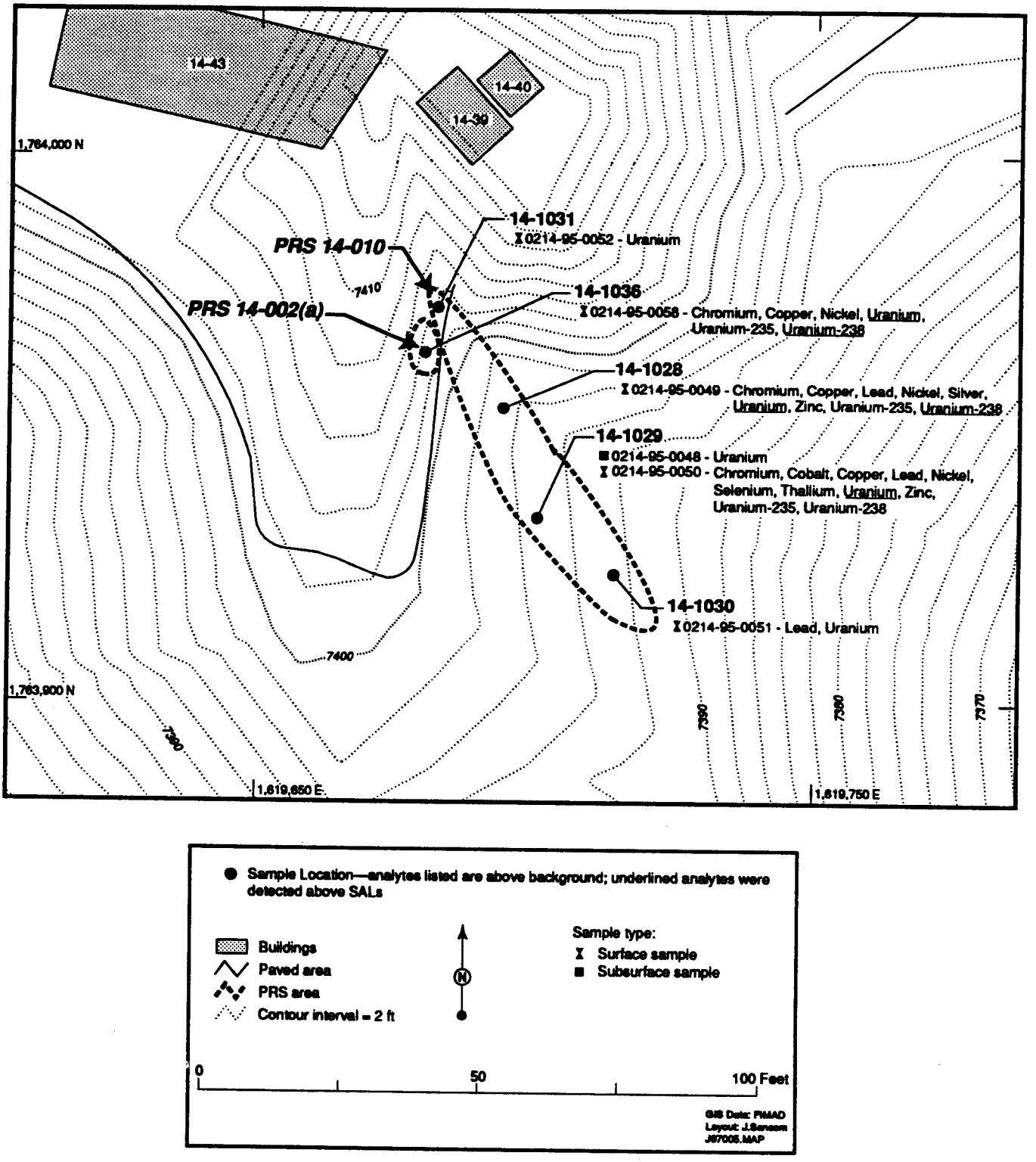

Figure 7.3-1. Site map for PRSs 14-002(a) and 14-010

ANNEX 7.4

IMPLEMENTATION SOPS

See Environmental Restoration Standard Operating Procedures, Volumes I and II, November 17, 1993, Los Alamos National Laboratory.

ANNEX 7.5

QUALITY ASSURANCE PLAN

See Quality Program Plan and Quality Assurance Project Plan for Environmental Restoration, February 1995 revision, Los Alamos National Laboratory.

ANNEX 7.6

SITE-SPECIFIC HEALTH AND SAFETY PLAN

Prior to initiation of any work, a completed Site Specific Health and Safety Plan (SSHASP) will be approved by LANL representatives, including the Explosives Review Committee.

This Site-Specific Health and Safety Plan (SSHASP) will be developed for the Environmental Restoration (ER) Project at LANL to comply with applicable federal and state occupational health and safety (HS) requirements, including those of the DOE. The DOE requires LANL to comply with the federal Occupational Safety and Health Administration (OSHA) requirements, although operations at LANL are not subject to the jurisdiction of OSHA. The environmental restoration (ER) Project has developed a generic Health and Safety Plan, the ER Project HASP, which establishes HS information and requirements applicable to ER field operations projectwide. In addition to the HASP, this SSHASP establishes site-specific HS information and requirements applicable to the scope of work described in Section 2.

ER participants are responsible for conducting work in accordance with applicable regulations. The term "ER participants" refers to anyone performing ER work, including LANL, subcontractors to LANL and their lower-tier contractors, consultants, and agents. In some cases in this document, LANL has chosen to invoke OSHA and LANL requirements that may not ordinarily apply to ER field operations (e.g., OSHA's general industry standards in Part 1910 of Title 29 of the Code of Federal Regulations [29 CFR 1910]). These choices were made on a case-by-case basis to maintain consistency with LANL's ALARA policy and to clarify LANL's expectations with regard to interpretable requirements of the multiple agencies governing ER work. Where there is concern that implementation of work orders or HS requirements would conflict with contract terms, or that it could unreasonably compromise the safety or health of an individual or the environment, such concerns should immediately be brought to the attention of the Contract Administrator and the Field Unit HS Representative. Failure to comply with terms of HS plans may constitute cause to stop activity or the issuance of a stop work order, as specified in Section 3.4.2 of the HASP, without cost or penalty to LANL.

This SSHASP shall be reviewed and approved in accordance with Section 1.2 of the HASP. Once this SSHASP has been approved, revisions will be tracked using a SSHASP modification form (Appendix B of the HASP) per Section 1.3 of the HASP. Modifications to this SSHASP may result in a change to the terms or scope of a subcontract. Completion of an SSHASP modification form is <u>not</u> the means for modifying the scope or terms of the project contract. To modify a contract, the Subcontractor shall notify the Contract Administrator and Field Unit HS Representative under the changes clause and shall not proceed with the change until a change order has been mutually agreed on between the parties, or unless unilateral direction is given by the Contract Administrator.

The SSHASP will be presented in a format similar to this example:

1.0 Introduction
2.0 Background Information

Table 2-1 Site Description(s)
Table 2-2 Scope of Work

3.0 Organization, Responsibilities and Authority
4.0 Hazard Analysis
4.1 Personnel by Task
4.2 Hazard Substances of Occupational Health Concern
4.3 Hazard Assessment and Administrative/Engineering Controls
5.0 Site Controls

6.0 Exposure Monitoring and Corresponding Actions
6.1 Direct-Reading Monitoring
6.2 Personal Dosimetry
6.3 Area Sampling
7.0 Personal Protective Equipment

8.0 Decontamination

9.0 Emergency/Incident Action Plan
10.0 Training

11.0 Medical Surveillance

12.0 Quality Control and Quality Assurance (QC/QA)
13.0 Recordkeeping

Appendixes

A Map(s) of Site Locations and Site Control Zones/Facilities
B Hazardous Substance - Hazard Assessment
C Chemical, Physical, and Toxicological Properties of Hazardous Chemical Substances
D Emergency Contacts and Route(s) to Medical Services

ANNEX 7.7

WASTE MANAGEMENT CHECKLIST

PRS 14-002(a)

Los Alamos
NATIONAL LABORATORY
memorandum

To/MS: Memo To The File
From/MS: T. E. Gene Gould, ESA-EPE, G787
Phone/FAX: 7-0402/5-1976
Date: November 18, 1996

Engineering Sciences and Applications
ESA-EPE, Energy and Process Engineering

SUBJECT: CHARACTERIZATION STRATEGY FORM

Based on my review of available information and my professional judgment, it is not necessary to sample for tritium because it is not a potential contaminant at PRS 14-002a.

TEG/nr

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1085/FU2	14-002(a)	Debris at Firing Pad (removed)
All Waste Types or Wastestreams: Soil, sampling waste/PPE, & decontamination waste (liquid)		

Completed By: J. W. Heyser	Date: February 10, 1997
FPL: T. E. Gene Gould	WMC: Jeff Bingham, ESA-EPE
Type of Activity (site investigation, EC, etc.): VCA	

Description of the Activity (e.g., drilling, surface sampling, excavation and recontouring, soil washing, etc.)

Soil will be removed by hand shoveling and placed in one B-25 container. Visible pieces of DU will be segregated and disposed of as radioactive waste.

Acceptable Knowledge

Site Description, Site History, and Historical Waste Generating Processes or Activities: (Include dates for site history):

PRS 14-002(a) is a decommissioned, closed HE firing chamber that has been removed. The site was completed October 1, 1944 and was constructed of heavily reinforced concrete construction 16 by 21.6 by 13 ft tall with steel plate lining (LANL 1993, 21-0077). In the early 1970s, the decision was made to remove the closed chamber TA-14-2 because a new HE test facility was to be built in the same area. Sandbags, soil and debris (small pieces of metals, e.g. nuts, bolts, and tin cans), believed to be associated with the site, are still present (RFI Work Plan for OU 1085, 1994). This sand was sampled in one location.

Previous Investigation Analytical Results: (Attach copy of analytical methods and results above background levels). A survey of the bunker found that the building, PRS 14-002(a), was contaminated with alpha radiation from uranium. Asphalt in the surrounding area that was contaminated with uranium was apparently removed in the 1970s, and taken to Area G (Gibbons 1973, 21-0067, RFI Work Plan for OU 1085, 1994)

This PRS was sampled during July, 1995. Radiological surveys were conducted immediately prior to sampling to help characterize the PRS and to help establish health and safety conditions for on-site workers. No readings above site specific background were reported from these radiological surveys. One piece of what appeared to be depleted uranium was noticed at a depth of 5" during sampling. HE Spot Tests were carried out at the sample location prior to any intrusive activities, but no positive results were obtained. Radiological screening measured only radiation levels below those which would have required special labeling or packaging of the soil samples being sent off-site for analysis. X-Ray Fluorescence analysis was carried out at the field office after sampling.

A single surface sample was collected using the approved spade and scoop technique (LANL-ER-SOP 6.09. This sample was submitted to an off-site laboratory for analysis, in accordance with the RFI Work Plan. Analysis was requested for total uranium, HE, and TAL metals. Per chain-of-custody records, the sample was submitted and analyzed within the prescribed holding times. Only total uranium(2,010 mg/kg) and uranium-238 (176 pCi/g) were present at above background levels..

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1085/FU2	14-002(a)	Debris at Firing Pad (removed)
Specific Waste Type: Soil		

Waste Description

Description of Waste Type, Potential Contaminants, Volume Estimate, and Waste Packaging:

Soil contaminated with uranium (depleted) will be put in a one B-25 container. The container will be sealed. After the wastes are characterized by specified laboratory analyses, they will be disposed of according to their hazard classification (RCRA, mixed, radioactive or non-hazardous waste) in approved disposal facilities.

Characterization Strategy

Description of Strategy:

One representative sample will be taken from the B-25 container. This sample will be analyzed for SVOCs, HE, TCLP metals, and isotopic uranium

Waste Sampling*: (If sampling will be used, indicate how many grab or composite samples will be collected per container or volume of waste and whether the waste is considered homogeneous or heterogeneous.)

One composite sample consisting of at least five subsamples will be taken from the B-25 container. The sample will be composed of soil taken from different levels in the container as it is filled with the soil being removed from the PRS. Analyses are indicated above.

* Grab sampling is appropriate for wastes that are fairly homogeneous, such as liquid wastes.
* Composite sampling is appropriate for wastes that are heterogeneous, such as soil, sediment, and debris.

Analytical Strategy

Analyte Category	Analytical Method	May be Present (yes, no, unknown)	Direct Sampling of Containerized Waste	Acceptable Knowledge Existing Information	Acceptable Knowledge Data from Proposed Site Characterization
Volatile Organic Constituents		No		X	
Semivolatile Constituents	SW 846 82370	Yes	X		
Organic Pesticides		No		X	

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1085/FU2	14-002(a)	Debris at Firing Pad (removed)
Specific Waste Type: Soil		

Analyte Category	Analytical Method	May be Present	Direct Sampling	Existing Information	Data from Proposed Site Characterization
Organic Herbicides		No		X	
Pesticides and PCBs		No		X	
PCBs		No		X	
Total Metals		Yes		X	
Total Cyanide		No		X	
Other Inorganic Constit. (specify)		No		X	
High Explosive Constituents	SW 846 8330	Yes	X		
Asbestos		No		X	
TPH		No		X	
TCLP Metals	SW 846 1311, 6010, 7470	Yes	X		
TCLP Organics		No		X	
TCLP Pest. & Herb.		No		X	
Gross Alpha	Field Screen	Yes	X		
Gross Beta	"	Yes	X		
Gross Gamma	"	Yes	X		
Tritium[1]		No		X	
Gamma Spectro.		Yes		X	
Isotopic Plutonium		No		X	
Total Plutonium		No		X	
Isotopic Uranium	HASL 300	Yes	X		
Total Uranium		Yes		X	
Strontium-90		No		X	
Americium-241		No		X	

[1] If tritium is not expected, attach a statement signed by the FPL stating that, based on a review of the available information and professional judgment, it is not necessary to sample for tritium at this site.

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1085/FU2	14-002(a)	Debris at Firing Pad (removed)
Specific Waste Type: Soil		

Preliminary RCRA Determination

Based on available information, indicate the waste and whether it could potentially be any of the wastes as defined in 40 CFR 261. List the F-, D-, K-, P-, or U- category and number.

No RCRA listed wastes are expected in the soils and debris that will be removed from this PRS.

Preliminary RCRA Status

_X_ Non-RCRA: (No 90-Day Storage Requirement)

Describe how waste will be stored/handled: Wastes will be stored at the PRS in a B-25 container until all analyses are completed for the B-25. A final RCRA determination of the status of the wastes will be made based on the results of the analyses to ensure that they are properly disposed of as radioactive, mixed, hazardous, or non-hazardous waste.

____ RCRA: (90-Day Storage Requirement)

Waste will be stored/handled in accordance with 20 NMAC Generator Requirements

Preliminary Determination for Radioactivity

Based on available information, indicate the amount and type of radiation contamination expected in the waste.

This PRS contains elevated levels of depleted uranium based on an analysis of uranium isotopic ratios (U-235 and U-238) that was performed by John Mann, a certified health physicist.

Preliminary Radioactivity Status

____ Material is not radioactive

Describe how waste will be stored/handled

_X_ Material is radioactive

Describe the controlled area, labeling, and protection against inadvertent contamination. The wastes will be kept at the PRS in a B-25 container labeled as radioactive that is within an area also labeled radioactive. Depending on the results of the analyses, the soil and debris will be disposed of as either radioactive or non-radioactive waste.

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1085/FU2	14-002(a)	Debris from Firing Pad(removed)
Specific Waste Type: PPE and sampling equipment		

Waste Description

Description of Waste Type, Potential Contaminants, Volume Estimate, and Waste Packaging:

Waste Type Description: PPE & sampling equipment
Potential Regulatory Status: Visibly contaminated items will be considered radioactive or non-hazardous waste (depending on the radiological field screening results of the removed soil). Visibly uncontaminated items will also be considered industrial or radioactive waste (depending on the radiological field screening results).
Volume Estimate: The volume generated will be less than one 55-gal. drum.
Waste Packaging: The PPE will be placed inside sealed and labeled plastic bags that will be then placed inside a 55-gal. drum or B-25 container.

Characterization Strategy

Description of Strategy:

If possible, the PPE/sampling equipment will be decontaminated prior to disposal. After decontamination the PPE/sampling equipment will be field monitored for gross alpha, gross beta and gross gamma radiation in accordance with LANL-ER-SOP-10.07, "Field Monitoring for Surface and Volume Radioactivity Levels." Gross alpha radiation will be measured using an alpha probe, gross beta radiation will be analyzed using a beta/gamma probe, and gross gamma radiation will be measured using a Ludlum Model 2221 Scaler/Ratemeter with a Ludlum Model 44-10 2" x 2" Gamma Scintillator (SPA-3), which is equivalent to micro-R.

The waste will be inspected to determine if there is any visible contamination. If it is not visibly contaminated and does not have readings above background radioactivity, it will be placed in plastic bags, segregated by PRS, and disposed of as industrial waste. If the PPE/sampling equipment is not decontaminated or if decontamination is not effective, the contaminated piece(s) will be placed in separate plastic bags, segregated by PRS. Each plastic bag will be labeled with the PRS number. The contaminated items will be characterized to determine their RCRA and radioactivity status based on the analytical results of soil samples removed from the same PRS. The PPE/sampling equipment will be assumed to have a similar level of contamination as the highest levels reported for a single sample analyzed at this PRS.

Waste Sampling*: (If sampling will be used, indicate how many grab or composite samples will be collected per container or volume of waste and whether the waste is considered homogeneous or heterogeneous.)

The PPE/sampling equipment will not be directly sampled, but will be characterized as described above.

* Grab sampling is appropriate for wastes that are fairly homogeneous, such as liquid wastes.
* Composite sampling is appropriate for wastes that are heterogeneous, such as soil, sediment, and debris.

Analytical Strategy

Analyte Category	Analytical Method	May be Present (yes, no, unknown)	Direct Sampling of Containerized Waste	Acceptable Knowledge Existing Information	Acceptable Knowledge Data from Proposed Site Characterization
Volatile Organic Constituents		No		X	
Semivolatile Constit.		No		X	
Organic Pesticides		No		X	
Organic Herbicides		No		X	
Pesticides and PCBs		No		X	
PCBs		No		X	

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1085/FU2	14-002(a)	Debris at Firing Pad (removed)
Specific Waste Type: PPE and sampling equipment		

Analytical Strategy (Continued)

Analyte Category	Analytical Method	May be Present (yes, no, unknown)	Direct Sampling of Containerized Waste	Acceptable Knowledge Existing Information	Acceptable Knowledge Data from Proposed Site Characterization
Total Metals		Yes		X	
Total Cyanide		No		X	
Other Inorganic Constituents (specify)		No		X	
High Explosive Constituents		Yes		X	
Asbestos		No		X	
TPH		No		X	
TCLP Metals		Yes		X	
TCLP Organics		No		X	
TCLP Pesticides and Herbicides		No		X	
Gross Alpha	Field Screen	Yes	X		
Gross Beta	"	Yes	X		
Gross Gamma	"	Yes	X		
Tritium[2]		No		X	
Gamma Spectroscopy		Yes		X	
Isotopic Plutonium		No		X	
Total Plutonium		No		X	
Isotopic Uranium		Yes		X	
Total Uranium		Yes		X	
Strontium-90		No		X	
Americium-241		No		X	

[2] If tritium is not expected, attach a statement signed by the FPL stating that, based on a review of the available information and professional judgment, it is not necessary to sample for tritium at this site.

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1085/FU2	14-002(a)	Debris at Firing Pad(removed)
Specific Waste Type: PPE and sampling equipment		

Preliminary RCRA Determination

Based on available information, indicate the waste and whether it could potentially be any of the wastes as defined in 40 CFR 261. List the F-, D-, K-, P-, or U- category and number.

No RCRA-listed wastes are expected based on knowledge from previous site characterizations.

Preliminary RCRA Status

__X__ Non-RCRA: (No 90-Day Storage Requirement)
Describe how waste will be stored/handled: Visibly uncontaminated and contaminated items will be segregated from each other and managed as non-RCRA waste. The total volume expected is less than one 55-gal. drum. A final RCRA determination will be made after the soil analyses are complete. The PPE and sampling equipment will then be disposed of in a similar manner as the soil in the B-25 container, which is as RCRA, mixed, radioactive or non-hazardous waste.

_____ RCRA: (90-Day Storage Requirement)
Waste will be stored/handled in accordance with 20 NMAC Generator Requirements.

Preliminary Determination for Radioactivity

Based on available information, indicate the amount and type of radiation contamination expected in the waste.

The soil removed at this PRS is expected to contain total uranium and U-238 at above background levels. PPE and sampling equipment may possibly contaminated with uranium.

Preliminary Radioactivity Status

__X__ Material is not radioactive. Describe how waste will be stored/handled. Visibly uncontaminated items which are not radioactive according to field screening results will be managed as non-radioactive waste. They will be segregated and stored at the PRS until the results of the soil analyses are known and a final RCRA determination is made.

__X__ Material is radioactive. Describe the controlled area, labeling, and protection against inadvertent contamination. Visibly contaminated PPE and sampling equipment will be considered as potentially radioactive. These materials will be segregated in labeled plastic bags and stored at the PRS in the B-25 container labeled radioactive. The final disposition of the wastes will be the same as for the soil containing the highest level of radioactivity.

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1085/FU2	14-002(a)	Debris at Firing Pad (removed)
Specific Waste Type: Decontamination wastes (liquids)		

Waste Description

Description of Waste Type, Potential Contaminants, Volume Estimate, and Waste Packaging:

Waste Type Description: Decontamination liquids consist of Liquinox® detergent, tap water and distilled water.
Potential Regulatory Status: Radioactive or non-hazardous waste.
Volume Estimate: A total volume of less than 25 gallons.
Waste Packaging: The liquid will be placed in 5-gallon containers that are then placed inside a 55-gallon drum.

Characterization Strategy

Description of Strategy:

The RCRA classification of the decontamination liquids will be based on the results of analyses similar to those performed on the soil samples. The decontamination liquids from this PRS will be segregated in 5-gal. containers that are labeled with the PRS number and a radioactive label and then placed in a drum labeled with a radioactive label. Further analyses may be required to meet the waste acceptance criteria of a TSD after the hazard and radioactive determination is made for the decon. liquids. Disposal sites could be the TA-46 SWSC sewer plant, if the liquids are non-hazardous and non-radioactive. If they are either hazardous or radioactive disposal may be at the TA-50 TSD or at another approved TSD.

Waste Sampling*: (If sampling will be used, indicate how many grab or composite samples will be collected per container or volume of waste and whether the waste is considered homogeneous or heterogeneous.)

One composite sample of the decontamination liquids will be analyzed for SVOCs, TCLP metals, HE, and isotopic uranium.

* Grab sampling is appropriate for wastes that are fairly homogeneous, such as liquid wastes.
* Composite sampling is appropriate for wastes that are heterogeneous, such as soil, sediment, and debris.

Analytical Strategy

Analyte Category	Analytical Method	May be Present (yes, no, unknown)	Direct Sampling of Containerized Waste	Acceptable Knowledge Existing Information	Acceptable Knowledge Data from Proposed Site Characterization
Volatile Organic Constituents		No		X	
Semivolatile Constituents	SW 846 8270	Yes	X		
Organic Pesticides		No		X	
Organic Herbicides		No		X	
Pesticides and PCBs		No		X	
PCBs		No		X	

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1085/FU2	14-002(a)	Debris at Firing Pad (removed)
Specific Waste Type: Decontamination wastes (liquids)		

Analytical Strategy (Continued)

Analyte Category	Analytical Method	May be Present (yes, no, unknown)	Direct Sampling of Containerized Waste	Acceptable Knowledge Existing Information	Acceptable Knowledge Data from Proposed Site Characterization
Total Metals		Yes		X	
Total Cyanide		No		X	
Other Inorganic Constit. (specify)		No		X	
High Explosive Constituents	SW 846 8330	Yes	X		
Asbestos		No		X	
TPH		No		X	
TCLP Metals	SW 846 1311, 6010,7470	Yes	X		
TCLP Organics		No		X	
TCLP Pest. & Herb.		No		X	
Gross Alpha		Yes		X	
Gross Beta		Yes		X	
Gross Gamma		Yes		X	
Tritium[3]		No		X	
Gamma Spect.		Yes		X	
Isotopic Plutonium		No		X	
Total Plutonium		No		X	
Isotopic Uranium	HASL 300	Yes	X		
Total Uranium		Yes		X	
Strontium-90		No		X	
Americium-241		No		X	

[3] If tritium is not expected, attach a statement signed by the FPL stating that, based on a review of the available information and professional judgment, it is not necessary to sample for tritium at this site.

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1085/FU2	14-002(a)	Debris at Firing Pad (removed)
Specific Waste Type: Decontamination Wastes (liquids)		

Preliminary RCRA Determination

Based on available information, indicate the waste and whether it could potentially be any of the wastes as defined in 40 CFR 261. List the F-, D-, K-, P-, or U- category and number.

The liquid wastes are not expected to contain RCRA listed constituents. A final RCRA determination will be based on the analytical results for the liquid wastes.

Preliminary RCRA Status

__X__ Non-RCRA: (No 90-Day Storage Requirement)
Describe how waste will be stored/handled: Liquids will be stored in labeled containers at the PRS until the results of the analyses are known. A final RCRA determination will be made based on the results for the liquid wastes. The wastes will be then disposed of as RCRA, mixed, radioactive or non-hazardous wastes.

_____ RCRA: (90-Day Storage Requirement)
Waste will be stored/handled in accordance with 20 NMAC Generator Requirements.

Preliminary Determination for Radioactivity

Based on available information, indicate the amount and type of radiation contamination expected in the waste.

The soil removed is expected to have total uranium and U-238 levels in excess of the site-specific PRGs. Consequently, the decontamination wastes may also contain sufficient uranium to be classified as radioactive.

Preliminary Radioactivity Status

_____ Material is not radioactive
Describe how waste will be stored/handled

__X__ Material is radioactive
Describe the controlled area, labeling, and protection against inadvertent contamination. The liquid wastes will be managed as radioactive wastes that are labeled and stored within a 55-gal. drum at the PRS until all analyses are complete. The storage area will be labeled radioactive. A final determination of their radioactive status will be made based on the analytical results of the liquid wastes.

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1085/FU2	14-002(a)	Debris at Firing Pad (removed)
Waste Types or Wastestreams: Soil, sampling waste/PPE, and decontamination waste (liquids)		

Signatures:

Field Team Leader _____

Field Team Waste Management Coordinator _____

Waste Management Representative _____

PRS 14-010

Los Alamos
NATIONAL
LABORATORY
memorandum

Engineering Sciences and Applications
ESA-EPE, Energy and Process Engineering

To/MS: Memo To The File
From/MS: T. E. Gene Gould, ESA-EPE, G787
Phone/FAX: 7-0402/5-1976
Date: April 17, 1996

SUBJECT: CHARACTERIZATION STRATEGY FORM

Based on my review of available information and my professional judgment, it is not necessary to sample for tritium because it is not a potential contaminant at PRS 14-010.

TEG/nr

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1085/FU2	14-010	Drainage area
All Waste Types or Wastestreams: Soil, sampling waste/PPE, and decon. wastes (liquids		

Completed By: J. W. Heyser	Date: February 10, 1997
FPL: T. E. Gene Gould	WMC: Jeff Bingham, ESA-EPE
Type of Activity (site investigation, EC, etc.): BMP	

Description of the Activity (e.g., drilling, surface sampling, excavation and recontouring, soil washing, etc.)

Soil will be hand dug from a drainage area located below the site of a decommissioned waste sump that was removed in 1973. The soil will be put in two B-25 containers.

Acceptable Knowledge

Site Description, Site History, and Historical Waste Generating Processes or Activities: (Include dates for site history):

TA-14 (Q-site) was constructed in 1944 for the close observation of small explosives charges. A closed chamber (TA-14-2) failed structurally after several charges were fired within it. This chamber was later used as a bullet impact firing chamber, where radioactive materials were used. The chamber (TA-14-2) was decommissioned and removed in 1973. Located next to the former chamber (TA-14-2), a concrete sump may have contained HEs and toxic chemicals. Its drain line extended from the sump to across the road. PRS 14-010 is the location where the drainline ended in a drainage area (RFI Work Plan for OU 1085, May 1994).

Previous Investigation Analytical Results: (Report the analytical methods and results above background levels)

During Phase I investigation, the drainage area was sampled. Radioactive field screening was done with hand-held instruments; HEs were sampled with a field spot test; and metals were measured by XRF. Five samples were sent to an analytical laboratory for analysis by a gamma scan + total uranium, and for HE and TAL metals. Field screening detected no elevated radiation; one sample had a positive HE test; and two XRF samples contained elevated uranium. In the laboratory analyses, HMX (40.8 mg/kg maximum) was above its background level in a surface and a subsurface sample. No metals were above their TC screening levels; but chromium (23.6 mg/kg), lead (54.2 mg/kg), silver (4.3 mg/kg), selenium (3.2 mg/kg), and zinc (54.8 mg/kg) were above background levels. Total uranium (at 1,370 and 681 mg/kg in two samples) and U-238 (at 143 pCi/g in one sample) were above their respective background levels. Depleted uranium was present (based on an analysis of the isotopic ratios of U-235, U-234 and U-238) in four of five laboratory samples.

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1085/FU2	14-010	Drainage area
Specific Waste Type: Soil		

Waste Description

Description of Waste Type, Potential Contaminants, Volume Estimate, and Waste Packaging:

Waste Type Description: Soil
Potential Regulatory Status: Low-level radioactive waste
Volume Estimate: Two B-25 containers.
Waste Packaging: Two B-25 containers

Characterization Strategy

Description of Strategy:

One representative sample will be taken from B-25 container. The soil will be analyzed for TCLP metals, isotopic uranium, SVOCs, VOCs, and HE. If found, visible pieces of HE and DU will be segregated and disposed of as hazardous or radioactive waste, respectively. Field screening with hand-held instruments will be used to monitor for alpha, beta and gamma radiation and HE will be detected by a field spot test.

Waste Sampling*: (If sampling will be used, indicate how many grab or composite samples will be collected per container or volume of waste and whether the waste is considered homogeneous or heterogeneous.)

One composite sample will be collected from each B-25 container waste. One composite sample is considered to be representative because the waste is fairly homogenous based on field observation. The composite sample will consist of at five subsamples. Each composite sample will be analyzed for TCLP metals, isotopic uranium, SVOCs, and HE. VOCs will be analyzed in a separate grab sample.

* Grab sampling is appropriate for wastes that are fairly homogeneous, such as liquid wastes.
* Composite sampling is appropriate for wastes that are heterogeneous, such as soil, sediment, and debris.

Analytical Strategy

Analyte Category	Analytical Method	May be Present (yes, no, unknown)	Direct Sampling of Containerized Waste	Acceptable Knowledge Existing Information	Acceptable Knowledge Data from Proposed Site Characterization
Volatile Organic Constituents	SW 846 8240	Yes	X		
Semivolatile Constituents	SW 846 8270	Yes	X		
Organic Pesticides		No		X	
Organic Herbicides		No		X	
Pesticides and PCBs		No		X	

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1085/FU2	14-010	Drainage area
Specific Waste Type: Soil		

PCBs		No		X	
Total Metals		Yes			X
Total Cyanide		No		X	
Other Inorganic Constituents (specify)		No		X	
High Explosive Constituents	SW 846 8330	Yes	X		
Asbestos		No		X	
TPH		No		X	
TCLP Metals	SW 846 1311, 6010, 7470	Yes	X		
TCLP Organics		No		X	
TCLP Pesticides and Herbicides		No		X	
Gross Alpha	Field Screen	Yes	X		
Gross Beta	"	Yes	X		
Gross Gamma	"	Yes	X		
Tritium[1]		No		X	
Gamma Spectroscopy		Yes			X
Isotopic Plutonium		No		X	
Total Plutonium		No		X	
Isotopic Uranium	HASL 300	Yes	X		
Total Uranium		Yes			X
Strontium-90		No		X	
Americium-241		No		X	

[1] If tritium is not expected, attach a statement signed by the FPL stating that, based on a review of the available information and professional judgment, it is not necessary to sample for tritium at this site.

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1085/FU2	14-010	Drainage area
Specific Waste Type: Soil		

Preliminary RCRA Determination

Based on available information, indicate the waste and whether it could potentially be any of the wastes as defined in 40 CFR 261. List the F-, D-, K-, P-, or U- category and number.

In Phase I sampling, no samples contained metals above their TC screening levels. HMX was present in two of five samples. Soil wastes will be sampled for SVOCs, VOCs, isotopic uranium, HE and TCLP metals. A final RCRA determination will be made after the soil sample results are evaluated.

Preliminary RCRA Status

_X_ Non-RCRA: (No 90-Day Storage Requirement)
Describe how waste will be stored/handled: Wastes will be stored on-site in sealed B-25 containers until the soil sample results are evaluated and a final RCRA determination is made.

____ RCRA: (90-Day Storage Requirement)
Waste will be stored/handled in accordance with 20 NMAC Generator Requirements

Preliminary Determination for Radioactivity

Based on available information, indicate the amount and type of radiation contamination expected in the waste.

John Mann, a certified health physicist, reviewed the site history and the Phase I data to identify radionuclides that could be present in the waste. Based on his review, four of five samples contained depleted uranium, and U-235 and U-238 are expected to be present at levels above their respective backgrounds. Therefore, the waste will probably be classified as low-level radioactive waste.

Preliminary Radioactivity Status

____ Material is not radioactive
Describe how waste will be stored/handled

_X_ Material is radioactive
Describe the controlled area, labeling, and protection against inadvertent contamination. Wastes will be stored in sealed B-25 containers. Each container will be labeled with a completed and attached Radioactive Materials Tag. The storage area will be roped off and labeled as a radioactive materials storage area.

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1085/FU2	14-010	Drainage area

Specific Waste Type: PPE and sampling equipment

Waste Description

Description of Waste Type, Potential Contaminants, Volume Estimate, and Waste Packaging:

Waste Type Description: PPE & sampling equipment
Potential Regulatory Status: Visibly contaminated items will be considered low-level radioactive waste (based on the radiological field screening results of the soil removed). Visibly uncontaminated items will be considered non-hazardous or radioactive waste based on the field screening results.
Volume Estimate: The volume generated will be less than one 55-gal. drum.
Waste Packaging: The PPE will be placed in sealed plastic bags labeled with the PRS number, and then placed inside the B-25 container.

Characterization Strategy

Description of Strategy: If possible, the PPE/sampling equipment will be decontaminated prior to disposal. After decontamination the PPE/sampling equipment will be field screened for gross alpha, gross beta and gross gamma radiation in accordance with LANL-ER-SOP-10.07, "Field Monitoring for Surface and Volume Radioactivity Levels." Gross alpha radiation will be screened using an alpha probe, gross beta radiation will be screened using a beta/gamma probe, and gross gamma radiation will be screened using a Ludlum Model 2221 Scaler/Ratemeter with a Ludlum Model 44-10 2" x 2" Gamma Scintillator (SPA-3), which is equivalent to micro-R. The waste will be inspected to determine if there is any visible contamination. If it is not visibly contaminated and does not have readings above background radioactivity, it will be placed in plastic bags, segregated by PRS, and disposed of as non-hazardous waste.
If the PPE/sampling equipment is not decontaminated or if decontamination is not effective, the contaminated piece(s) will be placed in separate plastic bags, segregated by PRS. Each plastic bag will be labeled with the PRS number. The RCRA and radioactivity status of the contaminated items will be based on the analytical results of soil samples associated with this PRS (See Analyte Suite section of this form). The PPE/sampling equipment will be assumed to have a similar level of contamination as the highest level reported in a single soil sample at this PRS.
Waste Sampling*: (If sampling will be used, indicate how many grab or composite samples will be collected per container or volume of waste and whether the waste is considered homogeneous or heterogeneous.)
The PPE/sampling equipment will not be directly sampled, but will be characterized as described above.

* Grab sampling is appropriate for wastes that are fairly homogeneous, such as liquid wastes.
* Composite sampling is appropriate for wastes that are heterogeneous, such as soil, sediment, and debris.

Analytical Strategy

Analyte Category	Analytical Method	May be Present (yes, no, unknown)	Direct Sampling of Containerized Waste	Acceptable Knowledge Existing Information	Acceptable Knowledge Data from Proposed Site Characterization
Volatile Organic Constituents		Yes			X
Semivolatile Constituents		Yes			X
Organic Pesticides		No		X	
Organic Herbicides		No		X	
Pesticides and PCBs		No		X	
PCBs		No		X	

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1085/FU2	14-010	Drainage area
Specific Waste Type: PPE & sampling equipment		

Analytical Strategy (Continued)

Analyte Category	Analytical Method	May be Present (yes, no, unknown)	Direct Sampling of Containerized Waste	Acceptable Knowledge Existing Information	Acceptable Knowledge Data from Proposed Site Characterization
Total Metals		Yes			X
Total Cyanide		No		X	
Other Inorganic Constituents (specify)		No		X	
High Explosive Constituents		Yes			X
Asbestos		No		X	
TPH		No		X	
TCLP Metals		Yes			X
TCLP Organics		No		X	
TCLP Pesticides and Herbicides		No		X	
Gross Alpha	Field screen	Yes	X		
Gross Beta	"	Yes	X		
Gross Gamma	"	Yes	X		
Tritium[2]		No		X	
Gamma Spectroscopy		Yes			X
Isotopic Plutonium		No		X	
Total Plutonium		No		X	
Isotopic Uranium		Yes			X
Total Uranium		Yes			X
Strontium-90		No		X	
Americium-241		No		X	

[2] If tritium is not expected, attach a statement signed by the FPL stating that, based on a review of the available information and professional judgment, it is not necessary to sample for tritium at this site.

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1085/FU2	14-010	Drainage area
Specific Waste Type: PPE and sampling equipment		

Preliminary RCRA Determination

Based on available information, indicate the waste and whether it could potentially be any of the wastes as defined in 40 CFR 261. List the F-, D-, K-, P-, or U- category and number.

During Phase I sampling, HMX was detected in two soil samples. Soil wastes will be sampled for SVOCs, isotopic uranium, HE and TCLP metals. A final RCRA determination for the PPE/sampling equipment will be based on an evaluation of the soil sample results.

Preliminary RCRA Status

__X__ Non-RCRA: (No 90-Day Storage Requirement) Describe how waste will be stored/handled:
Visibly contaminated and uncontaminated items will be segregated and managed as non-RCRA wastes. A final RCRA determination will be made after the soil sample results are evaluated.

_____ RCRA: (90-Day Storage Requirement)
Waste will be stored/handled in accordance with 20 NMAC Generator Requirements

Preliminary Determination for Radioactivity

Based on available information, indicate the amount and type of radiation contamination expected in the waste.

Visibly uncontaminated PPE and sampling equipment is expected to be non-radioactive. Visibly contaminated PPE and sampling equipment will be initially classified as radioactive waste

Preliminary Radioactivity Status

__X__ Material is not radioactive

Describe how waste will be stored/handled. Visibly uncontaminated items will be placed in separately sealed and labeled plastic bags and stored inside a 55-gal. drum.

__X__ Material is radioactive

Describe the controlled area, labeling, and protection against inadvertent contamination
Visibly contaminated items will be placed in separately sealed and labeled plastic bags and stored inside a 55-gal. drum or B-25 container. They will be stored along with the containers of soil waste in a roped-off area labeled as a storage area for radioactive materials.

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1085/FU2	14-010	Drainage area
Specific Waste Type: Decontamination wastes (liquids)		

Waste Description

Description of Waste Type, Potential Contaminants, Volume Estimate, and Waste Packaging:

Waste Type Description: Decontamination liquids consist of Liquinox® detergent, tap water and distilled water.
Potential Regulatory Status: Low-level radioactive liquid waste.
Volume Estimate: A total volume of less than 20 gallons.
Waste Packaging: The liquid will be placed inside a 55-gallon drum.

Characterization Strategy

Description of Strategy:

The decontamination liquids will be characterized for RCRA based on the results of an analysis of a grab liquid sample. The decontamination liquids from this PRS will be segregated, placed in a separate drum and labeled with the PRS number. Further analyses may be required to meet the waste acceptance criteria of a TSD after the hazard and radioactive determination is made for the decon. liquids. Disposal sites could be the TA-46 SWSC sewer plant, if the liquids are non-hazardous and non-radioactive. If they are either hazardous or radioactive disposal may be at the TA-50 TSD or at another approved TSD.

Waste Sampling*: (If sampling will be used, indicate how many grab or composite samples will be collected per container or volume of waste and whether the waste is considered homogeneous or heterogeneous.)

One grab sample of the decontamination liquids will be analyzed for TCLP metals, HE, SVOCs, VOCs, and isotopic uranium. A grab sample was selected because the waste is expected to be homogeneous. One sample per waste stream was considered sufficient because of the small volume of the waste stream (less than 20 gallons).

* Grab sampling is appropriate for wastes that are fairly homogeneous, such as liquid wastes.
* Composite sampling is appropriate for wastes that are heterogeneous, such as soil, sediment, and debris.

Analytical Strategy

Analyte Category	Analytical Method	May be Present (yes, no, unknown)	Direct Sampling of Containerized Waste	Acceptable Knowledge Existing Information	Acceptable Knowledge Data from Proposed Site Characterization
Volatile Organic Constituents	SW 846 8240	Yes	X		
Semivolatile Constituents	SW 846 8270	Yes	X		
Organic Pesticides		No		X	
Organic Herbicides		No		X	
Pesticides and PCBs		No		X	
PCBs		No		X	

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1085/FU2	14-010	Drainage area
Specific Waste Type: Decontamination wastes (liquids)		

Analytical Strategy (Continued)

Analyte Category	Analytical Method	May be Present (yes, no, unknown)	Direct Sampling of Containerized Waste	Acceptable Knowledge Existing Information	Acceptable Knowledge Data from Proposed Site Characterization
Total Metals		Yes			X
Total Cyanide		No		X	
Other Inorganic Constituents (specify)		No		X	
High Explosive Constituents	SW 846 8330	Yes	X		
Asbestos		No		X	
TPH		No		X	
TCLP Metals	SW 846 1311, 6010,7470	Yes	X		
TCLP Organics		No		X	
TCLP Pesticides and Herbicides		No		X	
Gross Alpha		Yes			X
Gross Beta		Yes			X
Gross Gamma		Yes			X
Tritium[3]		No		X	
Gamma Spect.		Yes			X
Isotopic Plutonium		No		X	
Total Plutonium		No		X	
Isotopic Uranium	HASL300	Yes	X		
Total Uranium		Yes			X
Strontium-90		No		X	
Americium-241		No		X	

[3] If tritium is not expected, attach a statement signed by the FPL stating that, based on a review of the available information and professional judgment, it is not necessary to sample for tritium at this site.

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1085/FU2	14-010	Drainage area
Specific Waste Type: Decontamination wastes (liquids)		

Preliminary RCRA Determination

Based on available information, indicate the waste and whether it could potentially be any of the wastes as defined in 40 CFR 261. List the F-, D-, K-, P-, or U- category and number.

During Phase I sampling, only HMX was detected in the laboratory analysis of soil samples. Decon. waste liquids will be sampled for SVOCs, VOCs, isotopic uranium, HE, and TCLP metals. A final RCRA determination will be made after the liquid sample results are evaluated.

Preliminary RCRA Status

__X__ Non-RCRA: (No 90-Day Storage Requirement)
Describe how waste will be stored/handled: Wastes will be initially managed as non-RCRA waste. A final RCRA determination will be made after the liquid sample results are evaluated.

____ RCRA: (90-Day Storage Requirement)
Waste will be stored/handled in accordance with 20 NMAC Generator Requirements

Preliminary Determination for Radioactivity

Based on available information, indicate the amount and type of radiation contamination expected in the waste.

John Mann, a certified health physicist, reviewed the site history and the Phase I data to identify probable radionuclides that could be present in the soil waste. Based on his review, U-235 and U-238 are expected to be present in the soil at levels above their respective backgrounds. The decon. liquids will be initially classified as low-level radioactive waste.

Preliminary Radioactivity Status

____ Material is not radioactive
Describe how waste will be stored/handled

__X__ Material is radioactive
Describe the controlled area, labeling, and protection against inadvertent contamination. The decontamination liquids will be stored in a sealed 55-gal. drum that is labeled as radioactive. This drum will be stored with the container of soil waste inside the radioactive materials storage area. A final radioactive determination will be made after the liquid sample results are evaluated.

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1085/FU2	14-010	Drainage area
Waste Types or Wastestreams: Soil, sampling/PPE, and decon. wastes (liquids)		

Signatures:

Field Team Leader _____

Field Team Waste Management Coordinator _____

Waste Management Representative _____

ANNEX 7.8

VCA CHECKLIST AND FIELD WORK AUTHORIZATION FORM

Voluntary Corrective Action (VCA)
Checklist and Fieldwork Authorization Form

PRS 14-002(a) HSWA or AOC

X_____ COPC(s) defined.

X_____ Nature and extent defined or field screening method available to guide where not defined.

X_____ Remedy is obvious.

X_____ Time for removal is less than 6 months.

X_____ Remedy is final.

X_____ Land use assumptions straightforward.

X_____ Treatment, Storage, Disposal Facilities are available for waste type and volume.

X_____ Cleanup cost is reasonable for the planned action, and meets accelerated decision logic criterion for decision to proceed with VCA.

Explain criteria not checked above._____

_____

_____

Through reviewing the above criteria associated with this site, I believe that a VCA is the appropriate Accelerated Cleanup approach.

FPL _____ Date 4/2/97

FPC _____ Date 4/28/97

The undersigned have reviewed the final plan and believe that it fully satisfies the appropriate Accelerated Cleanup approach.

FPL _____ Date 4/2/97

FPC _____ Date 4/28/97

Through reviewing the VCA Plan, for site(s) 14-002(a) , and believing that the above criteria have been met, I authorize the fieldwork to proceed.

DOE ER Program Manager_____ Date 4/28/97

Voluntary Corrective Action (VCA)
Checklist and Fieldwork Authorization Form

PRS 14-010 HSWA or AOC

X_____ COPC(s) defined.

X_____ Nature and extent defined or field screening method available to guide where not defined.

X_____ Remedy is obvious.

X_____ Time for removal is less than 6 months.

X_____ Remedy is final.

X_____ Land use assumptions straightforward.

X_____ Treatment, Storage, Disposal Facilities are available for waste type and volume.

X_____ Cleanup cost is reasonable for the planned action, and meets accelerated decision logic criterion for decision to proceed with VCA.

Explain criteria not checked above._____

_____

_____

Through reviewing the above criteria associated with this site, I believe that a VCA is the appropriate Accelerated Cleanup approach.

FPL _____ Date 4/2/97

FPC _____ Date 4/28/97

The undersigned have reviewed the final plan and believe that it fully satisfies the appropriate Accelerated Cleanup approach.

FPL _____ Date 4/2/97

FPC _____ Date 4/28/97

Through reviewing the VCA Plan, for site(s) 14-010 , and believing that the above criteria have been met, I authorize the fieldwork to proceed.

DOE ER Program Manager_____ Date 4/28/97

ANNEX 7.9

COMBINED COST ESTIMATE FOR PRSs 14-002(a) AND 14-010

Plan Development	$ 1,500
Mobilization	$ 8,000
Cleanup	$25,000
Verification Sampling	$ 5,000
Lab Analyses/Waste Disposal	$ 2,500
Field Screening	$ 1,500
Site Restoration/Demobilization	$ 1,500
Reporting	$ 1,000
Total Cost	$40,000

8.0 REFERENCES

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