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1997 RECEIVED HAZARDOUS WASTE PROGRAM

Mr. Ted Taylor
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Los Alamos, NM 87544

SUBJECT: FINAL VCA PLAN FOR TAs 12, 15, and 39, PRSs 12-001(b), 15-009(e), AND 39-002(a) ACTIVITIES

Dear Ted:

Enclosed for your records please find two copies each of the final Voluntary Corrective Action (VCA) Plans for Technical Area (TA) 12, Potential Release Site (PRS) 12-001(b); TA-15, PRS 15-009(e); and TA-39, PRS 39-002(a) activities. These activities are planned for completion in Fiscal Year 1997. Informational copies of these VCA Plans 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 Gilgosh at (505) 667-5794.

Sincerely,

Jorg Jansen, Program Manager
Environmental Restoration Project

JJ/rfr

Enclosures: (1) Final VCA Plans for TAs 12, 15, and 39, PRSs 12-001(b), 15-009(e), and 39-002(a)

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04453
TA-12

Voluntary Corrective Action Plan for

Potential Release Site
12-001(b)
Firing Site

Field Unit 2

Environmental
Restoration
Project

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A Department of Energy
Environmental Cleanup Program

Los Alamos
NATIONAL LABORATORY

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VOLUNTARY CORRECTIVE ACTION PLAN FOR POTENTIAL RELEASE SITE 12-001(b) - FIRING SITE

1.0 INTRODUCTION

The potential release site (PRS) 12-001(b) addressed in this voluntary corrective action (VCA) plan is located in Technical Area (TA) -12 at the Los Alamos National Laboratory and is described as an open firing pit. A wide range of high explosive (HE) shots were conducted in this pit following World War II.

1.1 Site Type and Description

PRS 12-001(b) is an open firing pit approximately 21 ft long x 17 ft wide x 3 ft deep, located 175 ft east of the steel-lined pit [PRS 12-001(a)] on the north side of Redondo Road. The firing site was abandoned during the 1950s. The shots conducted at this site utilized uranium, lead, and HE.

1.1.1 Operational History

TA-12 (L-Site) is a decomissioned firing site located totally within the present TA-67, which was established in 1989 when the Laboratory redefined technical area boundaries. L-Site was constructed in 1944 for the Explosives Division (X-Division). Early experiments were performed by the Terminal Observations Group (X-1B) (Linschitz 1945, ER ID No. 4855). During 1945, the open pit at PRS 12-001(b) was used by Group X-1B for calorimetric experiments (Martell 1993, 21-0076). By 1962, Group GMX-7 (detonators, firing, and cables) had taken charge of L-Site and supervised a small-scale cleanup of dispersed HE at that time (Anderson 1962, ER ID No. 4860). This PRS is also discussed in Section 5.1 of the OU 1085 work plan (LANL 1994, 1156).

1.1.2 COPCs and Rationale for Proposed Remedial Action

Surface soil around the firing pit may have been contaminated because of dispersion of explosives, radionuclides, and metals during detonations. The field investigation during the 1995 sampling season found elevated levels of depleted uranium (DU) as well as visible pieces of HE and shrapnel. Samples were collected from the open firing pit as well as from the area surrounding the pit. The elevated levels of DU were found in the surface soil from the firing pit. Visible HE and shrapnel were observed scattered in an area defined approximately by a 150-ft radius around the firing pit. The COPC identified at PRS 12-001(b) is DU.

2.0 SITE CHARACTERIZATION

The firing site consists of a depression, approximately 21 x 17 x 3 ft, as well as an area defined by a 150-ft radius from the center of the depression. Both the firing pit depression and the surrounding area were sampled as part of the Phase I investigation.

2.1 RFI Information/Other Decision Data

A screening radiological survey on April 23, 1993 found readings approximately twice background in the open firing pit at PRS 12-001(b). A Geiger-Müller thin-window probe was used and indicated the presence of beta-gamma emitting radionuclides (probably from uranium decay products) (Martell 1993, 21-0066). Small pieces of uranium (<1 in. in diameter) and HE were also observed in the open firing pit.

On June 24, 1993, field spot-test kits were used to survey for explosives at the firing site. All swipes of the surface and near-surface soils, as well as material believed to contain uranium in the open firing pit, were negative. However, small pieces of pink material, identified in earlier field visits, tested positive for

RDX, which was consistent with the fixed laboratory analysis of the material. Other pieces of suspected HE tested positive for TNT (Harris 1993, ER ID No. 55590).

The Phase I sampling was conducted in July 1995 in accordance with the RFI work plan (LANL 1994, 1156). The objectives of sampling were to determine whether or not contamination exists. Eight sampling locations were screened for radionuclides using a 44-9 pancake probe and for metals using x-ray fluorescence (XRF). Ten samples were collected (nine surface samples and one subsurface sample). Four samples were submitted to the analytical laboratory, two in the open firing pit at 0 to 6 in. and 18 to 24 in. from one sample location, and two surface soil samples (0 to 6 in. and 0 to 3 in.) from the surrounding area. 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 (Figure 7.3-1) shows the sample locations for this PRS.

In accordance with the RFI work plan (LANL 1994, 1156), the collected samples were submitted to an offsite laboratory for analysis. Analyses for radionuclides were requested by gamma spectroscopy in addition to those requested for uranium, HE, and target analyte list (TAL) metals. According to the chain-of-custody records, the samples were submitted and analyzed within the prescribed holding times with the exception of the HE analysis for sample No. 0212-95-0018, which exceeded the 14-day holding time by two days (see Section 2.1.1).

2.1.1 Data Quality Evaluation

The QA/QC data associated with the analyses at PRS 12-001(b) (inorganics, HE, and radionuclides) indicated that 100% of the data were acceptable and defensible (Table 7.2-1). The QA/QC mechanisms were effective in ensuring the reliability of measured data within expected limits of sampling and analytical error. Of the approximately 240 pieces of analytical data, approximately 24% were qualified as either undetected estimated (UJ) or estimated (J).

Inorganics. Antimony, cadmium, and mercury in all samples, selenium in one sample, and antimony, arsenic, beryllium, and cadmium in the laboratory duplicates of one sample are J qualified because they were detected below the estimated quantitation limits (EQLs). The sample 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.

Arsenic, beryllium, cobalt, copper, lead, nickel, selenium, silver, thallium, vanadium, and zinc in two samples had matrix spike/matrix spike duplicate recoveries that were outside of established limits and are qualified as either UJ or J. However, the data usability was not affected because the results were biased high for these analytes. In addition, antimony, barium, and iron had laboratory control sample (LCS) recoveries outside of established limits and are qualified as J. The data for antimony and iron are usable because the recoveries were <1% and <5%, respectively, below the lower limit (80%) and are one-quarter to one-half of the background UTLs. The data usability for barium is not affected because the results are biased high. As a result, the biases do not affect the data comparisons for these analytes.

Aluminum, arsenic, barium, beryllium, cadmium, chromium, iron, lead, manganese, mercury, nickel, selenium, and zinc were detected in one or both of the laboratory blanks at concentrations below or equivalent to the method detection limits (MDLs). The sample values for these analytes were greater than 5X the blank values. Therefore, the data are not qualified and are usable as reported.

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

Organics. All HE analytes in one sample had matrix spike recoveries outside of established limits and are qualified as UJ. The data are usable because the recoveries were 74% to 90% so that the analytes

would be detected and quantified if present. In addition, all HE analytes, except for 2,6-dinitrotoluene and sym-trinitrobenzene, had LCS recoveries outside of established limits and are qualified as UJ. The data are usable because the recoveries were 50% to 75% (lower limit), which is sufficient to detect and quantify the analytes if present.

The same sample (No. 0212-95-0018) was extracted after the recommended 14-day holding time for HE. The sample exceeded the recommended holding time by two days and the results are qualified as UJ. The data are considered valid estimated values and the usability is unaffected because the maximum holding time for nitramines (RDX and HMX) is up to eight weeks and no degradation products of nitroaromatics (TNT and TNB) were detected in the sample (Fisk 1993, ER ID No. 55601). Although the HE data for this sample has several QA/QC problems, the data may still be used in the data comparison, but should probably be used with caution.

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

Radionuclides. Uranium-235 and -238 were detected in the laboratory blank. The sample values for these analytes in two of the samples were less than 5X the blank values, indicating that the presence of uranium-235 and -238 in these samples may be due to laboratory contamination. The data should be qualified as undetected (U) and are usable as nondetects in the data comparison. The sample values in the other two samples were greater than 5X the blank values and should not be qualified. The uranium-235 and -238 data for these samples are considered usable as reported.

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

2.1.2 Sampling Results

FIMAD contains all of the analytical data collected at PRS 12-001(b). The reported values for detected chemicals are compared with the respective background upper tolerance levels (UTLs) and screening action levels (SALs). Data comparison tables of detected concentrations greater than background UTLs and SALs are provided in Annex 7.2. Based upon a review of the sampling data, the results are summarized as follows:

- Two inorganics—copper and uranium—were detected in the surface soil at concentrations above their background UTLs (Table 7.2-2). Uranium was also detected in the subsurface sample at a concentration above the background UTL. All other inorganics were detected at concentrations below their respective background UTLs and are eliminated from further evaluation.

- Copper was detected above background, but below its SAL of 2,800 mg/kg, in one surface soil sample from the area around the firing pit and was not retained as a COPC. Copper was not submitted to a multiple chemical evaluation (MCE) because it was the only inorganic detected above background UTL and below SAL. Uranium was detected at a concentration greater than its inorganic SAL (based on systemic effects) of 230 mg/kg in one surface soil sample from the open firing pit and is retained as a chemical of potential concern (COPC) (Table 7.2-2).

- The isotopic ratio of uranium-238 to -234 was greater than 10:1, indicating that the uranium detected at this site was DU. Uranium-235 and -238 were detected above their background UTLs and were carried forward to the SAL comparison stage (Table 7.2-3). Uranium-234 was detected below its background UTL and was eliminated from further evaluation.

- Uranium-238 and uranium were detected at concentrations above their respective SALs of 10 pCi/g and 130 mg/kg (DU SAL for uranium) in one surface soil sample from the firing pit (Table 7.2-3). Because uranium-238 is a primary constituent of total uranium, uranium is the only COPC for which a site-specific PRG is calculated. Uranium-235 was detected below its SAL, but 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 is not retained as a COPC.

- No HE was detected in any of the samples submitted for laboratory analysis.

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 12-001(b) is associated with the open firing pit as well as the area surrounding the pit within a 150-ft radius of the center of the depression. The Phase I sampling indicated that the firing pit contains elevated concentrations of DU, while field observations found visible pieces of HE and shrapnel scattered throughout the surrounding area.

3.0 PROPOSED REMEDY

3.1 Description of the Proposed Remedial Action

The remedial action at PRS 12-001(b) consists of removing the top few inches of surface soil from the open firing pit, if it is determined that the soil contains unacceptable levels of DU, as well as picking up the pieces of HE and shrapnel from the surrounding area. An unpaved road leading up to the firing site makes the PRS easily accessible. There are no fences, trenches, etc., that would impede site access.

To implement the remedies, the following plan will be followed. Following appropriate health and safety screening (see Annex 7.6), the surface soil within the firing pit at PRS 12-001(b) will be field screened using a 44-9 pancake probe and visually inspected for DU. Instrument readings greater than the readings at the location sampled from which the maximum detected concentration was found during the Phase I investigation will indicate the areas that may be remediated. Areas with high readings will be sampled and analyzed in the field using a Ludlum 2121 with a sodium iodide detector to determine the activity of the sample in pCi/g. Subsequently, the firing pit will be screened using the UltraSonic Ranging and Data System (USRADS), a mobile survey system provided by CHEMRAD, to determine whether all of the contaminated areas have been remediated. This system provides high resolution tracking and high density sampling of a given area and can be hand carried or mounted on a vehicle. The field screening will assist the remediation team in more precisely defining the area of contamination and will ensure that all DU-contaminated soil is remediated while minimizing the amount of waste generated. Those areas of the firing pit that are identified as being contaminated will be scraped down 6 in. by hand shoveling using plastic or stainless steel tools. The soil will 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 as detailed in Annex 7.7.

Visible pieces of HE collected from the pit, as well as the surrounding area, will be placed in a separate container and managed as hazardous waste. The soil in the areas from which pieces of HE are collected will be screened using field spot-test kits to determine if there is HE contamination of the underlying soil. If the soil is positive for HE, the soil will be removed and placed in the HE containers. Similarly, visible pieces of DU or soil pieces identified by field rad screening as being contaminated will be collected in a separate container and managed as low-level rad waste. The USRADS will also be utilized to survey the area encompassed by the 150-ft radius to ensure that all contaminated soil is identified and remediated.

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.

Prior to beginning remedial action, a radiation level for cleanup will be established. This level will be used to determine whether or not fixed radiation exists or if all the radioactivity is removed with the soil. When the soil is completely removed, the firing pit area will be screened, relative to the LANL background, to ensure the removal of radiological contamination. At this time, confirmatory cleanup samples of the underlying soil will be collected. The results of the field screening measurements, along with the fixed analytical results, will be provided in the VCA completion report.

After completion of the soil removal and confirmatory sampling, tools and equipment will be decontaminated, and the decon fluid will be stored in bung top 55-gallon drums, sampled for waste characterization, and disposed of accordingly. Personal protective equipment (PPE) will be cleaned. Uncleanable portions will be cut out and disposed of as waste. All drums will be stored onsite, on pallets, under plastic, and initially managed as non-RCRA waste, until the results of the waste characterization are received. At that time, 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 12-001(b) lies within DOE-owned land and is removed from public access roads. The anticipated future land use is expected to be continued Laboratory operations (i.e., industrial land use), but the RFI work plan (LANL 1994, 1156) also listed recreational users as potential future receptors. However, because the area is inside the security fence and access is limited to those individuals with appropriate clearance, it is unlikely that this area will be available for recreational purposes.

Preliminary remediation goals (PRGs) for uranium, the COPC retained from the human health screening assessment, were calculated based on the expected land use at the site, i.e., industrial. The industrial site-specific PRG was calculated to be 698 mg/kg or 279 pCi/g (Table 3.2-1). The PRG was derived using RESRAD 5.61 (computer printouts are provided in Annex 7.1) and is based on an exposure of 30 mrem/yr. LANL site-specific exposure input parameters were used in the model (LANL 1996, ER ID No. 54849) and are presented in Annex 7.1.

TABLE 3.2-1

SITE-SPECIFIC PRGs FOR PRS 12-001(b)

COPC	Maximum Sample Value		PRGs		Rationale
Uranium	469 mg/kg	188 pCi/g	698 mg/kg	279 pCi/g	Radionuclide (based on a dose of 30 mrem/yr)

Based on the sample results, the maximum detected concentration of uranium did not exceed the site-specific PRG derived for this site. However, because the open firing pit was sampled at only one location, the area will be thoroughly screened for uranium as described in Section 3.1. If the field screening values exceed the readings of the sample location from which the maximum detected concentration was found, the area will be cleaned up to a concentration below this standard.

None of the samples analyzed were found to contain high concentrations of HE. However, pieces of HE were scattered throughout the area and will be cleaned up and disposed of appropriately. The basis for the cleanup is to remove the potential hazard of unexploded HE from the area.

3.3 Site Restoration

Following confirmation that the PRS has been remediated in accordance with this plan, the excavated areas will be returned to the original grade and revegetated, i.e., reseeded. Backfill material (if needed) will consist of clean fill obtained from the Laboratory maintenance contractor.

4.0 WASTE MANAGEMENT

4.1 Estimated Types and Volumes of Waste

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

TABLE 4.1-1

ESTIMATED WASTE TYPES AND VOLUMES

Item	Waste Type	Anticipated Volume
Sampling Waste/PPE	Solid - potential hazardous	<1 55-gallon drum
Contaminated Soils	Solid - low-level radioactive	4 B-25 containers (3 cubic yards each)
Decontamination Wastes	Liquid - potential hazardous	<30 gallons

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

Soil and firing residues (e.g., visible pieces of shrapnel, DU, and HE) will be removed from this PRS. The known contaminants from this site may include HE products and DU. The estimated volume of soil to be removed is four B-25 containers. The soil will be stored onsite in the containers until the results of the chemical analyses are known.

One representative composite sample will be collected from each B-25 of soil. The following analyses will be conducted based on the Phase I RFI results: TCLP metals, isotopic uranium, semi-volatile organic compounds (SVOCs), gamma spectroscopy, and HE. As the soil is removed from the PRS and placed in the B-25 containers, it will be screened for gross radioactivity (alpha, beta, and gamma) by hand-held instruments. Visible pieces of DU and HE will be collected from the firing pit and surrounding area and placed in separate containers.

Visibly contaminated PPE and sampling equipment may be considered radioactive waste depending on the results of the field radiological screening. Visibly uncontaminated items will be considered either industrial or radioactive wastes depending on the results of the field screening. The volume of PPE/sampling equipment generated during the VCA is estimated to be less than one 55-gallon drum and will not be directly sampled.

Decontamination liquids—Liquinox® detergent, tap water, and distilled water—may be radioactive waste. One grab sample of the decontamination liquids will be collected and analyzed for TCLP metals, isotopic uranium, SVOCs, gamma spectroscopy, and HE. The total volume of decontamination liquids generated is estimated to be less than 30 gallons.

4.2 Method of Management and Disposal

Waste soil will be stored/handled as non-RCRA wastes. DOE Order 5820.2A (Radioactive Waste Management) requirements. Wastes will be stored at the PRS and will be initially managed as low-level radioactive waste pending the analytical results. The storage area will be roped off and labeled as a radioactive materials storage area. Once the analytical results are received, the hazard category of each B-25 container or 55-gallon drum will be determined. The wastes will then be appropriately disposed of depending on whether it is RCRA, mixed, radioactive, or nonradioactive waste.

Visibly contaminated PPE and sampling equipment will be segregated and managed as low-level radioactive waste. The total volume is estimated to be less than one 55-gallon drum. The PPE/sampling equipment will be placed in sealed bags inside a B-25 container. The waste will be disposed of in the same manner as the B-25 container with the highest RCRA, mixed, or radioactive wastes. Visibly uncontaminated PPE/sampling equipment (i.e., with no elevated radiation levels as determined by the field screening) will be segregated and placed in labeled and sealed plastic bags inside a 55-gallon drum. If no radioactive or hazardous constituents are detected in the soil waste analyses, the PPE/sampling equipment may be disposed of as industrial waste.

Decontamination liquids will be managed as low-level radioactive wastes and stored in a 55-gallon drum in the same area as the B-25 containers. The total volume of decontamination liquids generated is estimated to be 30 gallons or less. A grab sample of the liquid waste will be collected and the analytical results used to determine the final disposal location. Nonhazardous decontamination liquids will be disposed of at the TA-46 Sanitary Wastewater System Consolidation (SWSC) Plant if the waste meets the acceptance requirements. Liquid waste not meeting the SWSC acceptance requirements will be disposed of as low-level radioactive liquid waste at the TA-50 treatment, disposal, and storage (TSD) facility or as hazardous or low-level radioactive waste at another approved TSD facility.

EM-SWO personnel will assist in the determination of the final disposal location for the wastes and verify the availability of TSD space, if necessary. Offsite disposal of mixed waste will require further analyses to meet the waste acceptance criteria of Envirocare, the Utah mixed waste disposal facility. Additional analyses will be performed only after the mixed waste status of the soil in the B-25 containers has been verified.

5.0 DESCRIPTION OF CONFIRMATORY/VERIFICATION SAMPLING

The soil samples analyzed previously for this PRS show elevated levels of DU that are less than the industrial PRG for DU of 698 mg/kg. This cleanup is designed to remove the visible pieces of HE, shrapnel, and DU from the surface of the firing site. Field screening with USRADS will be conducted during the remediation to ensure that all areas that are contaminated above the PRG will be remediated. Confirmatory screening will be conducted using XRF to measure concentrations of uranium remaining in the soil. Eight random locations within a 30-ft radius of the center of the firing pit will be screened, along with eight random locations from 30 to 150 ft from the center of the firing pit. This screening is not expected to show any contamination above the PRG; however, if any concentrations above 80% of the PRG (558 mg/kg) are recorded, those samples with the highest value will be submitted to a fixed analytical laboratory for confirmation. Remediation standards for this site will be attained when the results exhibit concentrations below the industrial PRG. Soil that registers a positive result from the HE spot-test kits will be submitted to the fixed analytical laboratory for analysis. In addition, soil beneath the positive HE spot-test (6 to 12 in.) will be submitted for HE analysis by the analytical laboratory for confirmation of clean soil.

6.0 ESTIMATED TIME TO COMPLETE THE ACTION AND UNCERTAINTIES

The estimated completion time at PRS 12-001(b) is 3 weeks (15 working days). This estimate is based on 1 day to mobilize, 13 days to complete the removal of contaminated soil and the visible pieces of HE

and shrapnel, and to ship the confirmatory samples, and 1 day to demobilize. The analytical results from the waste characterization and confirmation sampling are expected to be received within 30 days, and waste removal from onsite storage is expected within another 60 days. Therefore, the total time from mobilization to removal of waste is estimated to be about 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, and for the four 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 B-25 container estimate, the effort will be stopped and re-evaluated.

ANNEX 7.1

RISK-BASED CLEANUP LEVEL ASSUMPTIONS AND CALCULATIONS

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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				
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				
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				
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				
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				
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				
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)
D-34				

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)	1.000E+04	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	3.300E-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
R015	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)
R015	Unsat. zone 1, total porosity	not used	4.000E-01	---	TPUZ(1)
R015	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)
R015	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)
R015	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)
R015	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)
R016	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)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	8.715E-06	ALEACH(6)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(6)
R016	Distribution coefficients for U-235				
R016	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)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(7)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	8.715E-06	ALEACH(7)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)
R016	Distribution coefficients for U-238				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(8)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(8,1)
R016	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	8.715E-06	ALEACH(8)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(8)
R016	Distribution coefficients for daughter Ac-227				
R016	Contaminated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCC(1)
R016	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)
R016	Saturated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.174E-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	8.715E-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	4.361E-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	6.228E-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	7.273E-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	0.000E+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	0.000E+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	3.000E-02	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:	10000.00 square meters	U-234	8.500E-02
Thickness:	0.33 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):	4.318E-02	4.318E-02	4.318E-02	4.318E-02	4.317E-02	4.295E-02	1.453E-02	0.000E+00
M(t):	1.439E-03	1.439E-03	1.439E-03	1.439E-03	1.439E-03	1.432E-03	4.843E-04	0.000E+00

Maximum TDOSE(t): 4.318E-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	5.792E-06	0.0001	1.747E-03	0.0405	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.019E-04	0.0047
U-235	1.783E-03	0.0413	2.681E-04	0.0062	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.138E-05	0.0007
U-238	2.056E-02	0.4760	1.656E-02	0.3834	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.035E-03	0.0471
Total	2.234E-02	0.5174	1.857E-02	0.4300	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.268E-03	0.0525

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	1.955E-03	0.0453
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	2.083E-03	0.0482
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	3.915E-02	0.9065
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	4.318E-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	5.792E-06	0.0001	1.747E-03	0.0405	1.675E-09	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.019E-04	0.0047
U-235	1.783E-03	0.0413	2.682E-04	0.0062	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.141E-05	0.0007
U-238	2.056E-02	0.4760	1.655E-02	0.3834	1.616E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.035E-03	0.0471
Total	2.234E-02	0.5174	1.857E-02	0.4300	1.675E-09	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.268E-03	0.0525

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	1.955E-03	0.0453
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	2.083E-03	0.0482
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	3.914E-02	0.9065
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	4.318E-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.
U-234	5.795E-06	0.0001	1.747E-03	0.0405	1.501E-08	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.019E-04	0.0047
U-235	1.784E-03	0.0413	2.683E-04	0.0062	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.146E-05	0.0007
U-238	2.055E-02	0.4760	1.655E-02	0.3834	4.145E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.035E-03	0.0471
Total	2.234E-02	0.5174	1.857E-02	0.4300	1.501E-08	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.268E-03	0.0525

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

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	1.955E-03	0.0453
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	2.083E-03	0.0482
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	3.914E-02	0.9065
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	4.318E-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	5.824E-06	0.0001	1.747E-03	0.0405	1.640E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.020E-04	0.0047
U-235	1.784E-03	0.0413	2.691E-04	0.0062	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.169E-05	0.0007
U-238	2.055E-02	0.4760	1.655E-02	0.3834	1.645E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.035E-03	0.0471
Total	2.234E-02	0.5174	1.857E-02	0.4301	1.641E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.268E-03	0.0525

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	1.955E-03	0.0453
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	2.085E-03	0.0483
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	3.914E-02	0.9064
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	4.318E-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	6.070E-06	0.0001	1.748E-03	0.0405	1.405E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.020E-04	0.0047
U-235	1.787E-03	0.0414	2.731E-04	0.0063	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.256E-05	0.0008
U-238	2.053E-02	0.4756	1.655E-02	0.3834	4.226E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.034E-03	0.0471
Total	2.233E-02	0.5172	1.857E-02	0.4302	1.405E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.269E-03	0.0526

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	1.957E-03	0.0453
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	2.092E-03	0.0485
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	3.912E-02	0.9062
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	4.317E-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	8.761E-06	0.0002	1.749E-03	0.0407	1.262E-05	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.021E-04	0.0047
U-235	1.792E-03	0.0417	2.954E-04	0.0069	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.655E-05	0.0009
U-238	2.027E-02	0.4720	1.655E-02	0.3853	1.269E-08	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.034E-03	0.0474
Total	2.207E-02	0.5139	1.859E-02	0.4329	1.263E-05	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.272E-03	0.0529

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	1.972E-03	0.0459
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	2.124E-03	0.0495
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	3.885E-02	0.9046
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	4.295E-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	1.443E-05	0.0010	3.505E-04	0.0241	1.739E-05	0.0012	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.063E-05	0.0028
U-235	9.557E-04	0.0658	7.356E-05	0.0051	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.798E-06	0.0007
U-238	9.354E-03	0.6439	3.306E-03	0.2275	5.283E-08	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.062E-04	0.0280
Total	1.032E-02	0.7107	3.730E-03	0.2567	1.745E-05	0.0012	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.567E-04	0.0314

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	4.230E-04	0.0291
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	1.039E-03	0.0715
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	1.307E-02	0.8994
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	1.453E-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+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	2.300E-02	2.300E-02	2.300E-02	2.300E-02	2.299E-02	2.297E-02	4.620E-03	0.000E+00
U-234	Th-230	1.000E+00	0.000E+00	5.002E-07	1.501E-06	5.002E-06	1.500E-05	4.997E-05	3.017E-05	0.000E+00
U-234	Ra-226	1.000E+00	0.000E+00	2.335E-08	2.093E-07	2.293E-06	1.978E-05	1.836E-04	3.248E-04	0.000E+00
U-234	Pb-210	1.000E+00	0.000E+00	1.317E-12	3.500E-11	1.229E-09	2.872E-08	7.009E-07	1.857E-06	0.000E+00
U-234	ΣDSR(j)		2.300E-02	2.300E-02	2.300E-02	2.300E-02	2.302E-02	2.321E-02	4.977E-03	0.000E+00
U-235	U-235	1.000E+00	1.488E-01	1.488E-01	1.488E-01	1.488E-01	1.489E-01	1.488E-01	7.152E-02	0.000E+00
U-235	Pa-231	1.000E+00	0.000E+00	6.779E-06	2.033E-05	6.778E-05	2.033E-04	6.763E-04	4.600E-04	0.000E+00
U-235	Ac-227	1.000E+00	0.000E+00	5.024E-07	4.428E-06	4.579E-05	3.404E-04	2.224E-03	2.240E-03	0.000E+00
U-235	ΣDSR(j)		1.488E-01	1.488E-01	1.488E-01	1.489E-01	1.495E-01	1.517E-01	7.422E-02	0.000E+00
U-238	U-238	1.000E+00	4.345E-02	4.345E-02	4.345E-02	4.344E-02	4.342E-02	4.311E-02	1.450E-02	0.000E+00
U-238	U-234	1.000E+00	0.000E+00	6.520E-08	1.956E-07	6.519E-07	1.955E-06	6.513E-06	3.931E-06	0.000E+00
U-238	Th-230	1.000E+00	0.000E+00	7.092E-13	6.381E-12	7.090E-11	6.379E-10	7.084E-09	1.283E-08	0.000E+00
U-238	Ra-226	1.000E+00	0.000E+00	2.125E-14	5.454E-13	2.170E-11	5.614E-10	1.741E-08	9.307E-08	0.000E+00
U-238	Pb-210	1.000E+00	0.000E+00	0.000E+00	2.559E-17	9.051E-15	6.376E-13	5.572E-11	4.863E-10	0.000E+00
U-238	ΣDSR(j)		4.345E-02	4.345E-02	4.345E-02	4.344E-02	4.342E-02	4.312E-02	1.450E-02	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	1.304E+03	1.304E+03	1.304E+03	1.304E+03	1.303E+03	1.293E+03	6.028E+03	*6.245E+09
U-235	2.017E+02	2.016E+02	2.016E+02	2.014E+02	2.007E+02	1.977E+02	4.042E+02	*2.160E+06
U-238	6.905E+02	6.905E+02	6.905E+02	6.906E+02	6.909E+02	6.958E+02	2.069E+03	*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	179.9 ± 0.2	2.348E-02	1.278E+03	2.300E-02	1.304E+03
U-235	1.400E-02	145.7 ± 0.1	1.525E-01	1.967E+02	1.488E-01	2.017E+02
U-238	9.010E-01	0.000E+00	4.345E-02	6.905E+02	4.345E-02	6.905E+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	1.955E-03	1.955E-03	1.955E-03	1.955E-03	1.954E-03	1.953E-03	3.927E-04	0.000E+00
U-234	U-238	1.000E+00	0.000E+00	5.874E-08	1.762E-07	5.874E-07	1.762E-06	5.868E-06	3.542E-06	0.000E+00
U-234	ΣDOSE(j):		1.955E-03	1.955E-03	1.955E-03	1.955E-03	1.956E-03	1.958E-03	3.962E-04	0.000E+00
Th-230	U-234	1.000E+00	0.000E+00	4.252E-08	1.275E-07	4.251E-07	1.275E-06	4.247E-06	2.565E-06	0.000E+00
Th-230	U-238	1.000E+00	0.000E+00	6.390E-13	5.749E-12	6.388E-11	5.748E-10	6.382E-09	1.156E-08	0.000E+00
Th-230	ΣDOSE(j):		0.000E+00	4.252E-08	1.276E-07	4.252E-07	1.276E-06	4.254E-06	2.576E-06	0.000E+00
Ra-226	U-234	1.000E+00	0.000E+00	1.985E-09	1.779E-08	1.949E-07	1.682E-06	1.560E-05	2.761E-05	0.000E+00
Ra-226	U-238	1.000E+00	0.000E+00	1.915E-14	4.914E-13	1.955E-11	5.058E-10	1.569E-08	8.385E-08	0.000E+00
Ra-226	ΣDOSE(j):		0.000E+00	1.985E-09	1.779E-08	1.950E-07	1.682E-06	1.562E-05	2.769E-05	0.000E+00
Pb-210	U-234	1.000E+00	0.000E+00	1.119E-13	2.975E-12	1.044E-10	2.441E-09	5.958E-08	1.578E-07	0.000E+00
Pb-210	U-238	1.000E+00	0.000E+00	0.000E+00	2.306E-17	8.155E-15	5.745E-13	5.020E-11	4.382E-10	0.000E+00
Pb-210	ΣDOSE(j):		0.000E+00	1.119E-13	2.975E-12	1.044E-10	2.442E-09	5.963E-08	1.583E-07	0.000E+00
U-235	U-235	1.000E+00	2.083E-03	2.083E-03	2.083E-03	2.084E-03	2.085E-03	2.084E-03	1.001E-03	0.000E+00
Pa-231	U-235	1.000E+00	0.000E+00	9.490E-08	2.847E-07	9.489E-07	2.846E-06	9.469E-06	6.441E-06	0.000E+00
Ac-227	U-235	1.000E+00	0.000E+00	7.034E-09	6.199E-08	6.410E-07	4.766E-06	3.114E-05	3.137E-05	0.000E+00
U-238	U-238	1.000E+00	3.915E-02	3.914E-02	3.914E-02	3.914E-02	3.912E-02	3.884E-02	1.306E-02	0.000E+00

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

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	BRF(i)	S(j,t), 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	8.500E-02	8.500E-02	8.500E-02	8.499E-02	8.497E-02	8.490E-02	8.471E-02	8.402E-02
U-234	U-238	1.000E+00	0.000E+00	2.554E-06	7.663E-06	2.554E-05	7.661E-05	2.552E-04	7.640E-04	2.529E-03
U-234	ΣS(j):		8.500E-02	8.500E-02	8.500E-02	8.502E-02	8.505E-02	8.516E-02	8.547E-02	8.655E-02
Th-230	U-234	1.000E+00	0.000E+00	7.652E-07	2.295E-06	7.651E-06	2.295E-05	7.644E-05	2.288E-04	7.573E-04
Th-230	U-238	1.000E+00	0.000E+00	1.150E-11	1.035E-10	1.150E-09	1.034E-08	1.149E-07	1.032E-06	1.139E-05
Th-230	ΣS(j):		0.000E+00	7.652E-07	2.296E-06	7.652E-06	2.296E-05	7.655E-05	2.299E-04	7.687E-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	1.429E-04
Ra-226	U-238	1.000E+00	0.000E+00	1.599E-15	4.118E-14	1.660E-12	4.467E-11	1.641E-09	4.329E-08	1.482E-06
Ra-226	ΣS(j):		0.000E+00	1.657E-10	1.491E-09	1.655E-08	1.485E-07	1.634E-06	1.430E-05	1.444E-04
Pb-210	U-234	1.000E+00	0.000E+00	1.704E-12	4.529E-11	1.590E-09	3.716E-08	9.070E-07	1.157E-05	1.346E-04
Pb-210	U-238	1.000E+00	0.000E+00	0.000E+00	3.510E-16	1.241E-13	8.745E-12	7.642E-10	3.211E-08	1.352E-06
Pb-210	ΣS(j):		0.000E+00	1.704E-12	4.529E-11	1.590E-09	3.717E-08	9.077E-07	1.160E-05	1.359E-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	1.388E-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	8.835E-05	2.906E-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	7.910E-05	2.814E-04
U-238	U-238	1.000E+00	9.010E-01	9.010E-01	9.010E-01	9.009E-01	9.008E-01	9.002E-01	8.986E-01	8.932E-01

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. A hard copy of the data is available from the RPF under the title "RFI Report for Potential Release Sites at TA-14 and TA-12/67 (located in former Operable Unit 1085), Field Unit 2," (Environmental Restoration Project 1996, 1394).

TABLE 7.2-1

DATA QUALITY EVALUATION FOR PRS 12-001(b) SAMPLES

Batch Number	Sample Number	Suite	Comments
69704	0212-95-0011, -0012,-0013	Inorganics	Antimony, cadmium, and mercury in all samples, and selenium in one sample antimony, arsenic, beryllium, and cadmium are J qualified because they were detected below the estimated quantitation limits (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.
70317	0212-95-0018		Antimony, arsenic, beryllium, and cadmium in the laboratory duplicates are J qualified 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.
70012	0212-95-0011, -0012,-0013, -0018		Mercury in all samples is J qualified 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" 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.
69704	0212-95-0011, -0012,-0013	Inorganics	Arsenic, beryllium, chromium, lead, nickel, selenium, silver, thallium, vanadium, and zinc in sample No. 0212-95-0011 had matrix spike/matrix spike duplicate recoveries outside of established limits and qualified as UJ or J. The data are usable because the results are biased high.
70317	0212-95-0018		Arsenic, beryllium, chromium, cobalt, copper, lead, nickel, selenium, silver, thallium,vanadium, and zinc in the sample had matrix spike/matrix spike duplicate recoveries outside of established limits and qualified as UJ or J. The data are usable because the results are biased high.
69704	0212-95-0011, -0012,-0013	Inorganics	Antimony, barium, and iron had laboratory control sample (LCS) recoveries for all samples outside of established limits and are qualified as J. The data for antimony and iron are usable because the recoveries were <1% and <5%, respectively, below the lower limit (80%) and are one-quarter to one-half of the background UTLs. The data usability for barium is not affected because the results are biased high. As a result, the biases do not affect the data comparisons for these analytes.

TABLE 7.2-1

DATA QUALITY EVALUATION FOR PRS 12-001(b) SAMPLES (concluded)

Batch Number	Sample Number	Suite	Comments
69704	0212-95-0011, -0012,-0013	Inorganics	Aluminum, barium, beryllium, cadmium, chromium, iron, manganese, nickel, selenium, and zinc were detected in the laboratory blank at concentrations below or equivalent to the method detection limits (MDLs). The sample values for these analytes were greater than 5X the blank values. Therefore, the sample values are not qualified and are usable as reported.
70317	0212-95-0018	Inorganics	Aluminum, arsenic, barium, beryllium, cadmium, chromium, lead, manganese, nickel, and zinc were detected in the laboratory blank at concentrations below or equivalent to the MDLs. The sample values for these analytes were greater than 5X the blank values. Therefore, the sample values are not qualified and are usable as reported.
70012	0212-95-0011, -0012,-0013, -0018		Mercury was detected in the laboratory blank at a concentration below or equivalent to the MDL. The sample values for this analyte were greater than 5X the blank value. Therefore, the sample values are not qualified and are usable as reported.
70436	0212-95-0018	HE	The high explosive sample was extracted after the recommended 14-day holding time. The sample exceeded the recommended holding time by 2 days and are qualified as UJ. The data are considered valid estimated values and the usability is unaffected because the maximum holding time for nitramines (RDX and HMX) is up to 8 weeks and no degradation products of nitroaromatics (TNT and TNB) were detected in the sample (Fisk 1993, ER ID No. 55601).
70436	0212-95-0018	HE	All HE analytes,except 2,6-dinitrotoluene and sym-trinitrobenzene, had LCS recoveries outside of established limits and are qualified as UJ. The data are usable because the recoveries were >50%<75% (lower limit), which is sufficient to detect and quantify the analytes if present.
70436	0212-95-0018	HE	All HE analytes had a matrix spike recoveries outside of established limits and are qualified as UJ. The data are usable because the recoveries were >74%<90% so that the analytes would be detected and quantified if present.
69743	0212-95-0011, -0012	Radionuclides	Uranium-235 and -238 were detected in the laboratory blank. Sample concentrations were less than 5X the blank value in two samples, indicating that the presence of uranium-235 and -238 in these samples is due to contamination. The data should be qualified as undetected (U) and are usable as nondetects in the data comparison.
	0212-95-0013, -0018		Sample concentrations in the other two samples were greater than 5X the blank value and should not be qualified. The uranium-235 and -238 data for these samples are considered usable as reported.

TABLE 7.2-2

INORGANIC CHEMICALS WITH CONCENTRATIONS AT OR ABOVE BACKGROUND SCREENING VALUES FOR PRS 12-001(b)

Sample ID	Location ID	Depth (in.)	Copper (mg/kg)	Uranium (mg/kg)
SAL	N/A[b]	N/A[b]	2800	230[c]
soil UTL[a]	N/A[b]	N/A[b]	15.5	5.45
0212-95-0011	12-1009	0-6	8.4	459
0212-95-0012	12-1009	18-24	6.2	42.8
0212-95-0013	12-1010	0-3	63.4	13.6

[a]Upper tolerance limit of LANL-wide soil background data from A,B, and C horizons.
[b]N/A = Not applicable
[c]Inorganic uranium SAL of 230 mg/kg is based on systemic effects (kidney).

TABLE 7.2-3

RADIONUCLIDES WITH CONCENTRATIONS AT OR ABOVE BACKGROUND SCREENING VALUES FOR PRS 12-001(b)

Sample ID	Location ID	Depth (in.)	Uranium-235 (pCi/g)	Uranium-238 (pCi/g)	Uranium (mg/kg)
SAL	N/A[b]	N/A[b]	10	67	130[c]
soil UTL[a]	N/A[b]	N/A[b]	0.084[d]	1.82[d]	5.45
0212-95-0011	12-1009	0-6	16.6	264	459 (183.6)
0212-95-0012	12-1009	18-24	1.7	26.9	42.8 (17.1)[e]
0212-95-0013	12-1010	0-3	0.4(U)	3.1(U)	13.6 (5.4)[e]

[a]Upper tolerance limit of LANL-wide soil background data from A,B, and C horizons.
[b]N/A = Not applicable.
[c]Depleted uranium SAL of 130 mg/kg is based on radiation dose.
[d]Maximum detected value from Environmental Surveillance data.
[e]Number in parenthesis is the equivalent activity of uranium in picocuries per gram (pCi/g) obtained by multiplying the uranium concentration by 0.4.

ANNEX 7.3

SITE MAP

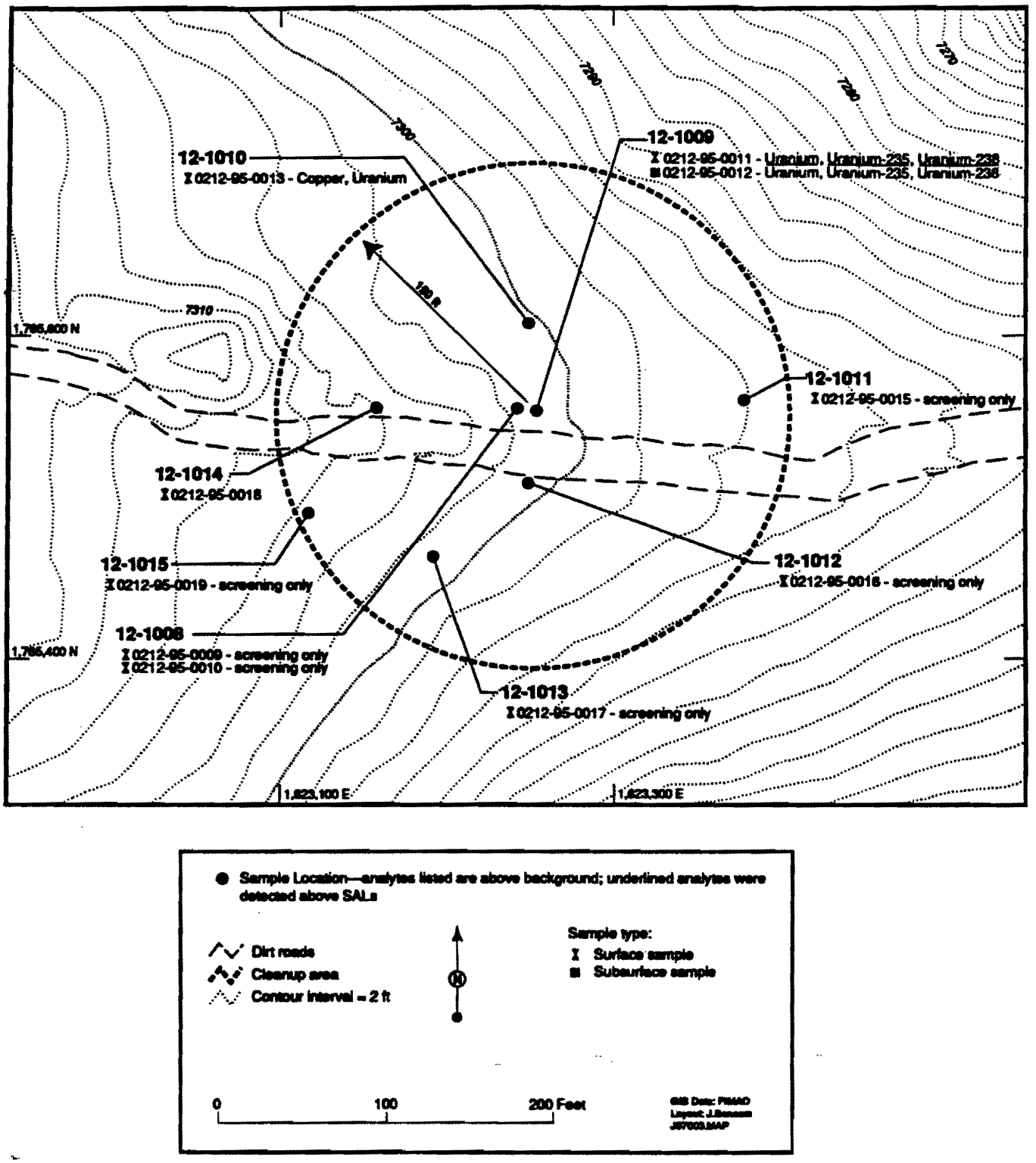

Figure 7.3-1. Site map for PRS 12-001(b)

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 the Los Alamos National Laboratory (LANL) to comply with applicable federal and state occupational health and safety (HS) requirements, including those of the U.S. Department of Energy (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 upon 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

Los Alamos
NATIONAL LABORATORY
memorandum

To/MS: Memo To The File
From/MS: T.E. Gene Gould, EES-15, MS G787
Phone/FAX: 5-4348/5-1976
Date: January 22, 1997

Earth and Environmental Science Division
EES-15, Environmental Science Group
Los Alamos, New Mexico 87545

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 12-001(b).

TEG/nar

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1085/FU2	12-001(b)	Inactive Firing Site
All Waste Types or Wastestreams: Soil, sampling waste/PPE, and decontamination 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.): VCA	

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

The remedial action at PRS-12-001(b) consists of removing the top few inches of surface soil contaminated with DU from the open firing pit. In addition, pieces of HE and shrapnel from the surrounding area will be picked up. The surface soil within the firing pit at this PRS will be field screened for elevated radioactivity and visually inspected for uranium. Locations identified as contaminated will be removed by scrapping them down to 6 inches depth by hand shoveling with plastic or stainless steel tools. Visible pieces of HE collected from the pit and surrounding area will be placed in a separate container and managed as hazardous waste. The underlying soil around the HE pieces will be screened using an HE field test kit and removed if the results are positive. Visible pieces of DU or soil pieces identified as contaminated by field radiological screening will be put in a separate container and managed as low-level radioactive waste. After the soil, DU, and HE are removed, confirmatory cleanup samples will be collected from the underlying soil.

Acceptable Knowledge

Site Description, Site History, and Historical Waste Generating Processes or Activities: (Include dates for site history): PRS 12-001(b) is an open firing pit approximately 21 ft. by 17 ft. and 3 ft. deep, located on the north side of Redondo Road at TA-12 (L-Site). Shots at this site involved uranium, lead, and HE. TA-12 was constructed in 1944 with early experiments performed by the Terminal Observations Group (X-1B). During 1945, the open pit at 12-001(b) was used for calorimetric experiments. The firing site was abandoned in the 1950s. By 1962, Group GMX-7 (Detonators, Firing and Cables) had taken charge of L-site and performed a small-scale cleanup of dispersed HE (RFI Work Plan for OU 1085, May 1994). Surface soil around the firing pit may have been contaminated by the dispersion of explosives, radionuclides, and metals during detonations. In 1995, elevated levels of DU and visible pieces of HE and shrapnel were found. DU was in the surface soil at the firing pit, while visible HE and shrapnel were scattered within a 150 ft. radius around the firing pit.

Previous Investigation Analytical Results: (Report the analytical methods and results above background levels) A 1993 field screening survey detected beta and gamma emitting radionuclides at twice the background level in the firing pit. Small pieces of uranium and HE were also observed. A spot field test for HEs gave only negative results in the firing pit, however, small pieces of pink materials in the surrounding area tested positive for RDX. Other pieces of suspected HE tested positive for TNT. Phase I sampling was conducted in July 1995. Four samples were submitted to the analytical laboratory, two samples from the firing pit and two from the surrounding area. Analyses were requested for gamma spectroscopy, uranium, HE and TAL metals. The highest concentrations of analytes found in single samples were total uranium (459 mg/kg), U-235 (16.6 pCi/g) and U-238 (264 pCi/g). No HEs were detected in any of the four samples submitted for laboratory analysis.

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1085/FU2	12-001(b)	Inactive Firing Site
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: Four B-25 containers.
Waste Packaging: Four B-25 containers

Characterization Strategy

Description of Strategy:

One representative sample will be taken from each B-25 container. The soil will be analyzed for TCLP metals, isotopic uranium, SVOCs, gamma spectroscopy 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 least five subsamples. Each composite sample will be analyzed for the constituents indicated in the above paragraph.

* 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	

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1085/FU2	12-001(b)	Inactive Firing Site
Specific Waste Type: Soil		

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
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 Spectroscopy	HASL 300	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	12-001(b)	Inactive Firing Site
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 the Phase I analytical samples, HEs were not detected, but pieces of HE were observed on the ground. Soil wastes will be sampled will be sampled for TCLP metals, isotopic uranium, SVOCs, gamma spectroscopy, and HE. 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.

_X_ RCRA: (90-Day Storage Requirement)

Waste will be stored/handled in accordance with 20 NMAC Generator Requirements. Pieces of HE gathered from the soil surface area will be stored in a separate container in a less-than-90-Day storage area.

Preliminary Determination for Radioactivity

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

Field radiological screening and analytical results indicate the present of U-235 and U-238 at slightly elevated levels. Visible pieces of DU are also present. Pieces of DU will be gathered and stored separately from the soil removed. Both the DU pieces and the soil in the B-25 containers will be managed as low-level radioactive wastes.

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. Pieces of DU will be stored in a smaller separate sealed container. 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	12-001(B)	Inactive Firing Site
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 labeled and sealed plastic bags. Visibly contaminated PPE will be placed in a B-25 container. Visibly uncontaminated PPE will be placed in a 55-gal. drum.

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 Con.		No		X	
Semivolatile Constit.		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	12-001(b)	Inactive Firing Site
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	12-001(b)	Inactive Firing Site
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, no HEs were detected in the analytical samples. Soil wastes will be sampled for TCLP metals, isotopic uranium, SVOCs, gamma spectroscopy, and HE. 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 B-25 container. The container of soil waste and PPE will be stored in a roped-off area that is labeled as a radioactive materials storage area.

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1085/FU2	12-001(b)	Inactive Firing Site
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 30 gallons.
Waste Packaging: The liquids 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 analyzed for TCLP metals, HE, SVOCs, gamma spectroscopy and isotopic uranium. The decontamination liquids from this PRS will be segregated, placed in a separate drum and labeled with the PRS number.

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 the constituents listed above. 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 30 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		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	12-001(b)	Inactive Firing Site
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 Pest./ Herb.		No		X	
Gross Alpha		Yes			X
Gross Beta		Yes			X
Gross Gamma		Yes			X
Tritium[3]		No		X	
Gamma Spectro.	HASL300	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	12-001(b)	Inactive Firing Site
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, no HEs were detected in the laboratory analysis of soil samples. Decon. waste liquids will be sampled for TCLP metals, isotopic uranium, SVOCs, gamma spectroscopy, and HE. 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.

U-235 and U-238 are expected to be present in the soil at above background levels based on Phase I field screening and analytical laboratory results. The decontamination 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 along with the containers 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	12-001(b)	Inactive Firing Site
Waste Types or Wastestreams: Soil, sampling equipment/PPE, and decontamination wastes (liquids)		

Signatures:

Field Team Leader _____ 2/10/97

Field Team Waste Management Coordinator _____ 2-4-97

Waste Management Representative _____ 2/3/97

ANNEX 7.8

VCA CHECKLIST AND FIELD WORK AUTHORIZATION FORM

Voluntary Corrective Action (VCA)
Checklist and Fieldwork Authorization Form
PRS 12-001(b) 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 3/31/97

FPC _____ Date 4/24/97

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

FPL _____ Date 3/31/97

FPC _____ Date 4/24/97

Through reviewing the VCA Plan, for site(s) 12-001(b), and believing that the above criteria have been met, I authorize the fieldwork to proceed.

DOE ER Program Manager _____ Date 4/25/97

ANNEX 7.9

COST ESTIMATE

Table 7.9-1 is a cost estimate for PRS 12-001(b).

TABLE 7.9-1

COST ESTIMATE FOR PRS 12-001(b)

Plan Development	$ 1,500
Mobilization	$ 2,000
Cleanup	$20,000
Verification Sampling	$ 5,000
Waste Disposal	$10,000
Field Screening	$ 5,000
Demobilization	$ 2,500
Reporting	$ 1,000
Total Cost	$47,000

8.0 REFERENCES

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