LANL 1997
ERID# 56355

Voluntary Corrective Action Plan for

Potential Release Site
18-006
Uranium Solution Pipe

Field Unit 2

Environmental
Restoration
Project

August 1997

A Department of Energy
Environmental Cleanup Program

LA-UR-97-3144

Los Alamos
NATIONAL LABORATORY

7397

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VOLUNTARY CORRECTIVE ACTION PLAN FOR POTENTIAL RELEASE SITE 18-006 - URANIUM SOLUTION PIPE

1.0 INTRODUCTION

The potential release site (PRS) 18-006 addressed in this voluntary corrective action (VCA) plan is located within LANL's western area of technical area (TA) 18.

1.1 Site Type and Description

PRS 18-006 is located in a graded, fenced, relatively flat canyon-bottom at the northwest corner of TA-18, approximately 60 ft north of the creek in Pajarito Canyon (Figure 1.1-1). The PRS consists of a 100-ft long underground stainless steel pipe, located adjacent to and west of Building TA-18-168. The 6-in. diameter pipe was used to store uranium reactor fuel for the former "Kinglet" liquid-fuel reactor that previously occupied Building TA-18-168. The pipe is tilted slightly so that its depth ranges from 3 ft at its west end to 5 ft at the east end. Drawings show that its east end terminates 2 ft from the building. It has no connection to the building, but it is in close proximity to a buried grounding cable that surrounds the building's foundation.

The west end of the pipe is approximately 5 ft inside the corner fence post of the outer security fence for TA-18. The underground pipe passes beneath the inner security fence that surrounds both Building TA-18-168 and nearby Building TA-18-23, a nuclear criticality facility. The VCA work will be coordinated with site security requirements and adjacent experimental operations.

1.1.1 Operational History

The history of PRS 18-006 is discussed in detail in Section 6.2 of the OU 1093 RFI work plan (LANL 1993, 1085). The PRS was part of the Los Alamos Critical Experiment Facility (LACEF) in Building TA-18-168, used by Group N-2, later P-5, in 1970 to 1974 for liquid-fueled reactor experiments. The Kinglet fission reactor used uranyl sulfate liquid fuel, which was stored between experiments in a noncritical configuration in the underground pipe. The Kinglet reactor was decommissioned in 1974, the fuel was removed, and the pipe was flushed twice with water according to a former LACEF employee. No other decontamination effort is known. The eastward slope of the fuel pipe, the position of the fuel transfer tube at the very tip of the pipe's downhill end, and the reported double rinsing of the pipe mean that only a very small quantity (perhaps a few tens of milliliters) of extremely dilute uranium solution is expected to have remained in the pipe's east end. No information has been located regarding isotopic analysis of removed fuel.

1.1.2 COPCs and Rationale for Proposed Remedial Actions

The fuel used in the pipe consisted of 560 liters 93.2% (by weight) enriched uranium dissolved in 0.5M sulfuric acid. The resulting uranyl sulfate solution completely filled the horizontal portion of the fuel pipe plus a few inches of the vertical part. The former employee said that only 8 liters of the 560 were actually involved in the critical reaction during each period of operation and that fission products tended to be trapped in the metal of the reactor vessel rather than be found in the fuel. This leads to the anticipation that, after the pipe was emptied, any residual fuel did not contain appreciable levels of fission products. Rinsing of the pipe was done by filling it with water, presumably to the level the fuel had occupied (560 liters), thus greatly diluting any residual fuel. If the pipe was completely emptied, refilled and again emptied, any remaining liquid would be expected to contain only small amounts of contamination. Preliminary sampling inside the pipe was conducted to verify the anticipated level of contamination

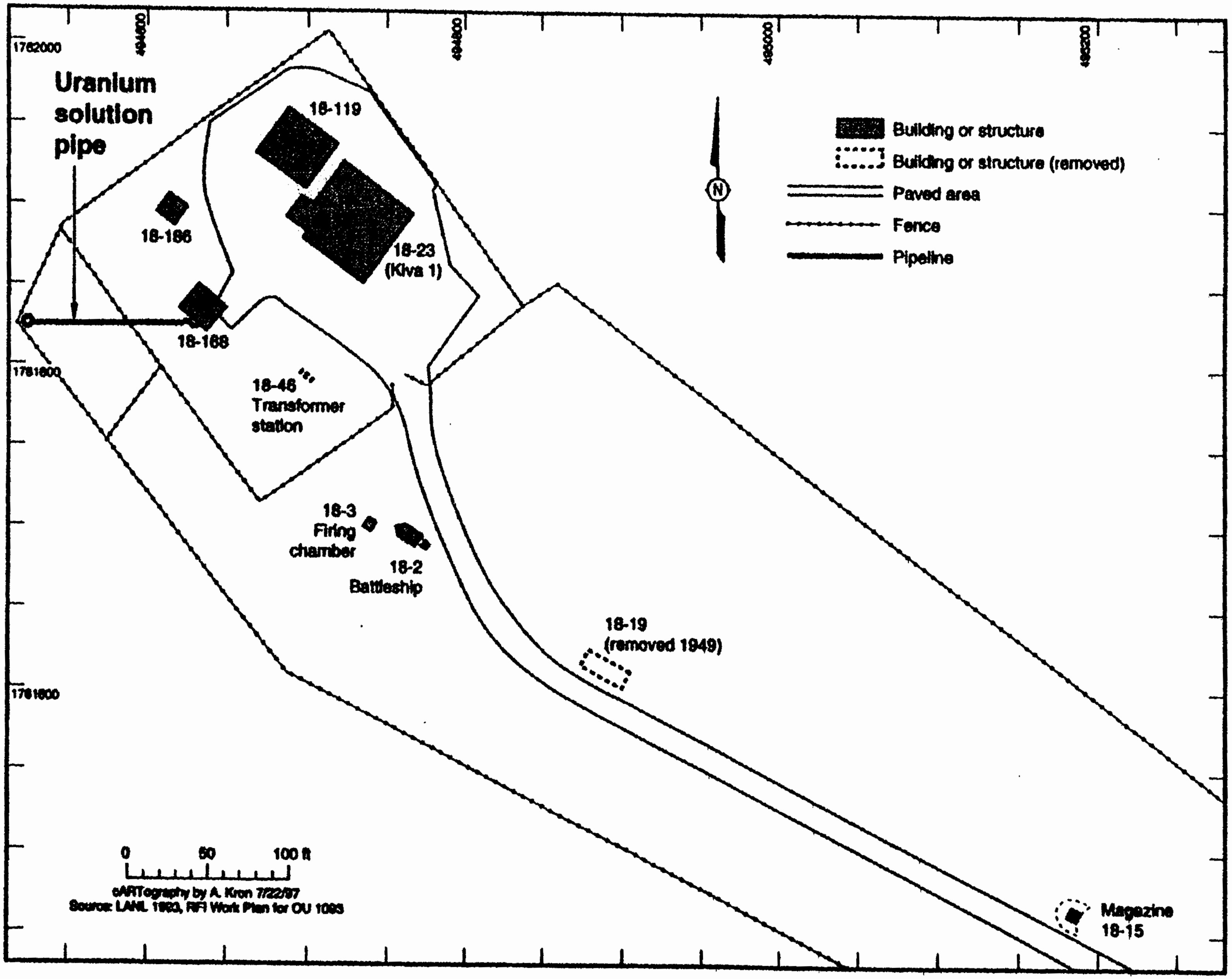

Figure 1.1-1. Location of uranium solution pipe at TA-18.

sufficiently to guide radiological control measures used for the VCA. At the time of sampling, the pipe was not thought to contain liquid; however, during the sampling, residual liquid was found. This liquid was the basis for the sample results presented in Section 2.1.2 of this report. The primary isotopes, as indicated from the characterization sampling, are U-235, U-233/234, and U-238. There were also trace metals present, although none were above the RCRA screening levels. The pH (12.8) of the liquid indicated corrosivity.

The LACEF reactor was decommissioned and removed in the late 1970s. Groundwater monitoring from nearby wells does not indicate that the pipe has leaked. Although this VCA is not driven by RCRA/HWSA permit requirements, it removes a potential source of contamination and accomplishes DOE's desire to bring ultimate closure to known areas of concern by cleanups or NFA decisions.

2.0 SITE CHARACTERIZATION

2.1 RFI Information/Other Decision Data

2.1.1 Previous Investigations

Because the fuel pipe was designed for safe containment of the fuel solution and passed a helium gas retention check before it was filled, there is little likelihood of pipe leakage. As a check, LANL installed four monitoring wells around the LACEF facility (Building TA-18-168) in 1990 to determine groundwater radioactivity levels at the facility. Data were collected for a LACEF safety analysis report (LATA 1991, ER ID No. 12464) for subsurface soil and groundwater both upgradient and downgradient of PRS 18-006. All radionuclide concentrations in groundwater downgradient from the PRS were below detection levels, and well below screening action levels. In addition, no significant differences were noted between soil radionuclide concentrations upgradient and downgradient from the PRS, nor with offsite background sample locations.

2.1.2 RCRA Field Investigation

Section 4.7.2 of the 1995 RFI report (Environmental Restoration Project 1995, 1283) and its radiological addendum discuss results of groundwater sampling of the LACEF wells adjacent to PRS 18-006. The presence of low concentrations of multiple radionuclides, including plutonium, suggests a source other than PRS 18-006 since only uranium was used in the fuel pipe. The adjacent septic drainfield of PRSs 18-003(a and b) is a potential source, since low levels of similar contaminants were found there and in an associated industrial waste catch tank and septic tank.

2.1.3 Design Information

Drawings indicate that the pipe is welded, schedule-40 stainless steel, 0.25-in. thick and wrapped in electric heating tape, and encased in a 1-in. thick layer of polyurethane insulating foam (Figure 2.1.3-1). The west end of the pipe curves upward and becomes a vertical pipe protruding from a 4-ft x 4-ft x 6-in. thick concrete slab on the ground surface. The top end of the pipe has a welded flange with a bolted-on, round endplate. This aboveground part of the pipe is covered with a cylindrical, 2-ft diameter aluminum can, which is approximately 3 ft tall that rests on the concrete slab.

The underground east end of the pipe terminates at a welded, flat endplate. Located at this end are two 0.50-in. diameter, vertical stainless steel tubes that extend from the bottom inside surface of the fuel storage pipe upward to a point above grade. One was a fuel transfer tube for the reactor and the other a refueling tube. The former rises to a few inches above grade and bends horizontally, ending at a screw-on cap. The latter, used to defuel the pipe, is visible as a 2-ft tall tube with a downward hooked tip. The ends of both tubes have screw-on caps.

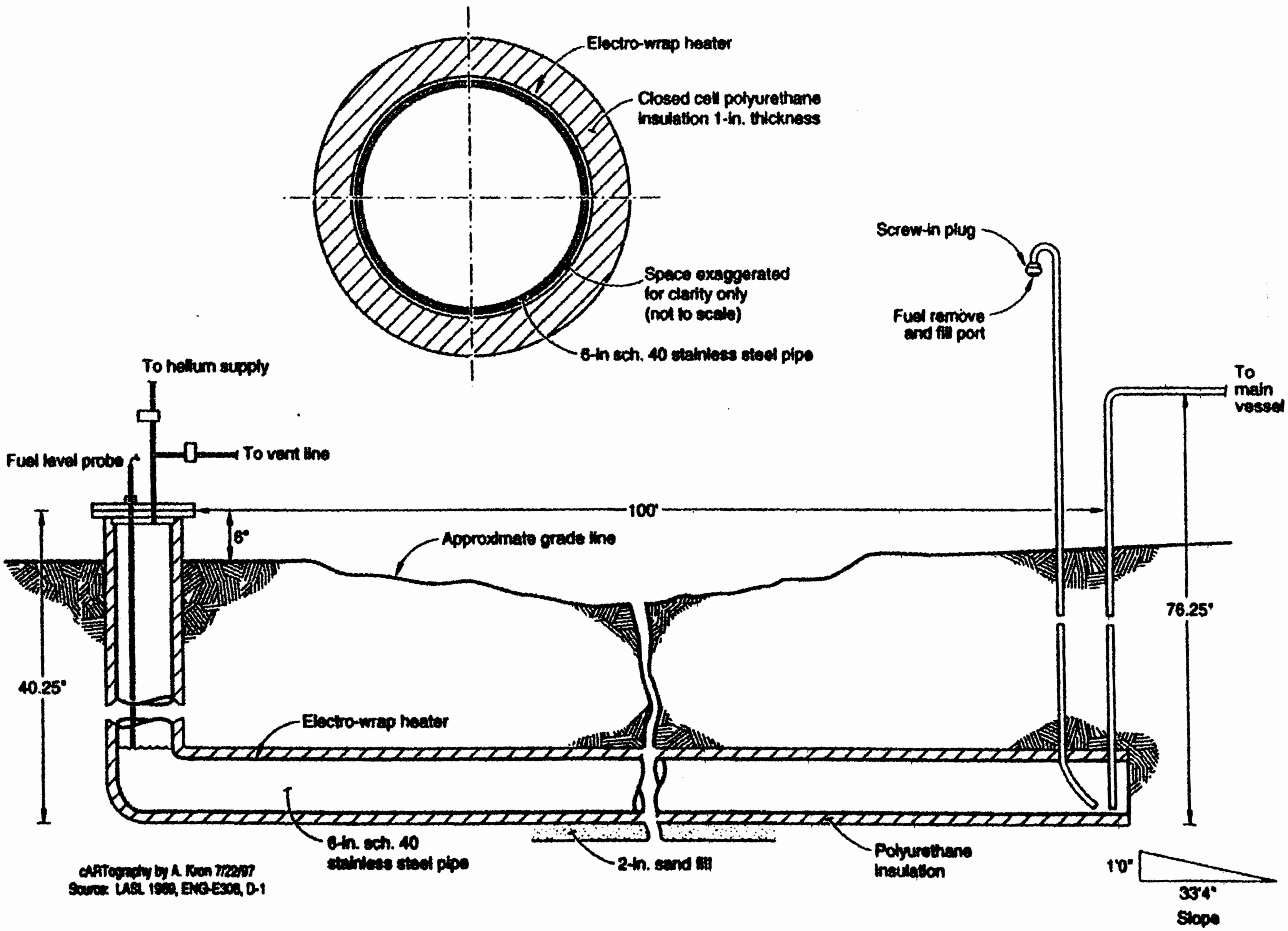

Figure 2.1.3-1. Cross sections along length and diameter of pipe.

Either can be used for access inside the downhill end of the fuel storage pipe to sample for any gases or radioactive contamination.

Associated equipment on the concrete slab are tubing previously used to pressurize the pipe for fuel transfer, and an electrical box for the pipe's heating tape. The electrical box will be de-energized and locked out (if necessary) prior to the start of work.

2.1.4 Data Quality Evaluation

The quality assurance/quality control (QA/QC) data associated with the analyses at PRS 18-006 (inorganics, volatiles, and radionuclides) were not available for inclusion in this plan. The QA/QC data will be available and evaluated before the final report is written for this VCA. The preliminary data do not indicate any associated problems with the data [i.e., missed holding times, contaminant of concern (COC) irregularities.]

2.1.5 Sampling Results

The reported values from the sample collected from the uranium solution pipe are presented in Annex 7.2. The results are summarized as follows:

The TCLP metals analysis detected five inorganics—arsenic, barium, chromium, mercury, and selenium—in the water sample collected from the interior of the pipe. None of these inorganics were present at concentrations greater than their respective TCLP levels (Table 7.2-1).

Isotopic uranium was detected in the water sample collected from the interior of the pipe. Uranium-234 was detected at 109 pCi/L, uranium-235 was detected at 3 pCi/L, and uranium-238 was detected at 0.58 pCi/L (Table 7.2-2). The high activity concentration of uranium-234 in the sample is indicative of highly enriched uranium.

The liquid in the pipe was found to be at pH 12.8, which makes the liquid corrosive.

Acetone and 2-butanone (methyl ethyl ketone) were detected in the liquid collected from the pipe. Acetone was also detected in the method blank, but the concentration detected in the pipe liquid was more than 10x the blank value. The 2-butanone detect was below the EQL and, therefore, is qualified as J because it cannot be accurately quantified. The detected concentrations were less than the Region 9 preliminary remediation goals (PRGs) (EPA 1996, 1351) for tap water and, therefore, are not considered to be chemicals of potential concern (COPCs) (Table 7.2-3). No other VOCs were detected in the liquid from the uranium pipe.

The results of the sampling indicated that uranium-234 and -235 are present at elevated activity concentrations and that the liquid that was present was corrosive. However, because all of the liquid was removed during the sampling process, no corrosive waste remains.

2.2 Nature and Extent of Contamination

Contamination is not expected in the soil surrounding the fuel pipe. Because of the construction of the pipe, any leakage through welds would most likely have been at the downhill east end and where the two tubes penetrate its top surface and hydrostatic pressure of the fuel would have been somewhat higher. Thus, the contamination is expected to be bounded by the physical extent of the pipe. This expectation does not preclude the collection of confirmatory samples to justify this assertion.

3.0 PROPOSED REMEDY

3.1 Description of the Proposed Remedial Actions

Before excavation, the pipe was sampled via the refueling transfer tube to determine the nature and level of contamination and whether pressurization or liquid exists inside. Results of analyses of the pipe contents are used to determine specifics of Radiological Work Permit (RWP) constraints, personal protective equipment, airborne and liquid contamination measures, and radioactive waste management procedures that will be needed. Appropriate radworker procedures will be used for contamination control and worker safety.

A backhoe or trenching machine will be used to expose the 100-ft long pipe in three separately trenched sections, whose lengths are dictated by positions of the overlying security fences. Several areas of the trenches will be enlarged to safely accommodate below-grade work (3- to 5-ft deep) such as pipe cutting operations. Although the pipe's internal radioactive contamination is low, the stainless steel pipe will be cut with mechanical cutting methods to reduce the chance of airborne emissions. At each cutting location, a suitable contamination control enclosure will surround the work. In this way, the pipe will be cut into three main pieces, the cut ends capped, and the pieces secured for safe lifting, using supporting cables.

Each pipe section will be separately raised or dragged from the trench with the use of a crane or forklift (avoiding an overhead power line). As each piece is lifted, it will be turned sideways to the trench and set upon an above-grade cradle for further sectioning within contamination control enclosures. Cut and capped sections will then be removed from the worksite to an adjacent staging area. After the pipe has been removed from the trench, a sampling team will obtain soil samples in and below the trench using a long-handle hand auger to avoid entering narrow parts of the trench. Each section of trench will then be refilled to grade with excavated material (unless contaminated as determined by field screening) before excavating the next section.

If subsequent analysis of subsurface soil samples indicates radiological contamination from the pipe has migrated into the underlying soil, the appropriate section of trench will be reopened and subsurface soil removed until field instruments indicate the concentration of radionuclides has been reduced to background levels. In regard to waste disposal, any corrosive fuel solutions encountered will be containerized and disposed of according to proper material accountability and disposal procedures. The contaminated pipe sections will be placed in a B-25 container and appropriately controlled. Any contaminated soil will also be containerized and disposed of according to appropriate procedures.

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

The Spill Prevention, Control, and Countermeasures (SPCC) Plan will be followed, as well as air pollution control procedures, if applicable.

3.2 Basis for Cleanup Levels

PRS 18-006 lies within DOE-owned land and is removed from public access roads. In the future, the land is anticipated to be used exclusively for Laboratory operations (i.e., industrial land use). Identification of the COPCs considered for this VCA was based on the sampling of the pipe contents.

PRGs for the COPCs retained from the sampling of the pipe contents, i.e., uranium-234 and -235, were calculated based on the expected land use at the site (industrial). The derivation of the PRGs was done using RESRAD 5.70 (computer printout is provided in Annex 7.1) and are based on a dose limit of 15 mrem/yr. The uranium used at this PRS was enriched uranium, which consists of approximately 96% uranium-234 and 3% uranium-235 by activity. The PRG for enriched uranium (826 pCi/g) calculated by RESRAD was multiplied by the respective percent abundances to obtain the PRGs for the isotopic components. The site-specific PRGs were calculated to be 793 pCi/g for uranium-234 and 25 pCi/g for uranium-235. LANL site-specific exposure input parameters were used in the model (LANL 1996) and are presented in Annex 7.1.

TABLE 3.2-1

SITE-SPECIFIC PRGs FOR PRS 18-006

COPCs	Sample Values	PRGs	Rationale
Uranium-234	109 pCi/L	793 pCi/g	Radionuclide (based on a dose of 15 mrem/yr)
Uranium-235	3.0 pCi/L	25 pCi/g	Radionuclide (based on a dose of 15 mrem/yr)

When the pipe is removed, soil samples will be collected from the area beneath the pipe. The sample results will be compared to the cleanup levels presented above to determine if remedial activities need to be conducted at this site. If remediation is warranted, PRS 18-006 will be cleaned up to the calculated PRGs for uranium-234 and -235.

3.3 Site Restoration

Clean fill and, if uncontaminated, the excavated material will be used to fill the trenches. The site will then be regraded and regraveled to meet security and erosion control requirements.

4.0 WASTE MANAGEMENT

4.1 Estimated Types and Volumes of Waste

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

TABLE 4.1-1

ESTIMATED TYPES AND VOLUMES OF WASTE

Item	Waste Type	Anticipated Volume
Sampling Waste/PPE	Solid - potential hazardous	< 10 55-gallon drums
Contaminated Soils	Solid - hazardous	<12 55-gallon drums
Solution Pipe (cut sections)	Solid - low-level radioactive	1 B-25 container (3 cu. yd.)
Pipe Insulation	Solid - nonhazardous	< 5 55-gallon drums
Pipe Sludge	Solid - hazardous	< 5 gal. container
Solution Pipe Contents	Liquid - hazardous	< 1 gal. container
Decontamination Wastes	Liquid - potential hazardous	< 8 55-gallon drums

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

It is anticipated that any pipe contaminated with uranium will be put in a maximum of one B-25 container. It will be managed as non-RCRA, low-level radioactive waste. The B-25 container will be sealed. Visibly contaminated PPE and sampling equipment will initially be considered low-level radioactive/non-RCRA waste based on previous analytical data. Depending on the field screening results, visibly uncontaminated items will be considered nonhazardous or radioactive waste. The volume generated is anticipated to be less than one 55-gallon drum. PPE/sampling equipment will be placed in sealed plastic bags inside a 55-gallon drum. It will not be directly sampled. Soil sampling results will be used to characterize the PPE.

If any of the soil beneath the pipe is contaminated, it will be removed and packaged in the same B-25 container as the cut pipe sections.

Pipe insulation will be field screened for radioactivity and segregated according to its radiological characteristics. If the insulation is not radiologically contaminated, it will be placed in 55-gallon drums and managed as nonradioactive, nonhazardous waste. Sections of the insulation deemed radiologically contaminated will be packaged separately and disposed as low-level radioactive waste.

Although significant amounts of residual sludge or liquid are not anticipated, if encountered, these waste streams will be segregated and containerized. If a sufficient amount of sludge is encountered, samples will be collected for TAL metals, SVOC, VOC, tritium, and isotopic uranium. If additional liquid is present, this too will be sampled for waste acceptance criteria. Any liquid or sludge in the pipe will be disposed as hazardous, mixed, or radioactive water as required by the results of their analyses.

Decontamination liquids—Liquinox® detergent, tap water, and distilled water—may be classified as low-level radioactive waste. A total volume of less than eight 55-gallon drums are anticipated to be generated and will be segregated. The decontamination liquid waste will be placed in 5-gallon containers labeled with the PRS number and placed inside a 55-gallon drum along with the PPE and sampling equipment. Decontamination liquids will be evaluated as low-level radioactive/non-RCRA waste, based on the results of an analysis of a grab liquid waste sample. This will be analyzed for total metals, gamma spectroscopy, SVOCs, and isotopic uranium.

4.2 Method of Management and Disposal

Waste soil will be stored/handled in accordance with 20 New Mexico Administrative Code (NMAC) Generator Requirements and/or DOE Order 5820.2A (Radioactive Waste Management) requirements. Waste will be stored at the PRS as non-RCRA waste in the B-25 container. The B-25 container will be labeled with a completed Radioactive Materials Tag and the storage area will be roped off and labeled as a radioactive materials storage area. If soil removal is indicated, the soil will be removed from the PRS after the analytical results are evaluated and a RCRA determination is made. Disposal will be in accordance with appropriate requirements.

Visibly contaminated or radioactive PPE/sampling equipment will be segregated and managed as non-RCRA waste, then disposed of in the B-25 container with the cut pipe sections.

Decontamination liquids will be managed as potential non-RCRA waste. The total number is expected to be less than eight 55-gallon drums. The analysis of a grab sample of the waste liquids generated during the VCA will be used to determine its final disposal site. Analyses of the liquid waste will include TAL metals, isotopic uranium, SVOCs, and gamma spectroscopy. Further analyses may be required to meet the waste acceptance criteria of a treatment, storage, and disposal (TSD) facility after the hazard and radioactive determination has been made for the decontamination liquids. If the liquids are nonhazardous and nonradioactive, disposal could be the TA-46 Sanitary Wastewater System Consolidation (SWSC) plant. If the decontamination liquids are found to be either hazardous or radioactive, their disposal may be at the TA-50 TSD or at another approved TSD facility.

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

5.0 DESCRIPTION OF CONFIRMATORY/VERIFICATION SAMPLING

Soil directly underneath the pipe at PRS 18-006 (after the pipe is removed) will be sampled in three locations and submitted for laboratory analysis. These samples will be collected along the length of the trench and submitted to an analytical laboratory for total metals and isotopic uranium analysis. Additionally, any area that is visibly stained will also be sampled.

The industrial PRG for uranium-234 is 793 pCi/g and for uranium-235 is 25 pCi/g. Remediation standards for this site will be attained when the results exhibit no contamination above the level of the industrial PRGs.

6.0 ESTIMATED TIME TO COMPLETE THE ACTION AND UNCERTAINTIES

The estimated completion time for the VCA is nine days. This estimate is based upon a one-day mobilization, five days to complete the excavation, cutting and containerizing of the pipe, one day to complete the confirmatory sampling, one day to restore the site, and one day to complete demobilization, etc. The analytical results from the waste characterization and confirmation sampling are expected to be received within seven days. Waste removal from onsite storage is expected within another 60 days. Thus, the total timeframe for the VCA from mobilization to removal of waste is estimated to be about 90 days.

There are many uncertainties associated with this cleanup. The waste streams and amounts of waste to be generated are the largest uncertainty. The waste streams and volumes presented in this plan represent a worst-case analysis. 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.

7.0 ANNEXES

ANNEX 7.1

RISK-BASED CLEANUP LEVEL ASSUMPTIONS AND CALCULATIONS

The site-specific PRG for uranium was calculated using the RESRAD model, version 5.70.

Table of Contents
AAAAAAAAAAAAAAAA
I: Mixture Sums and Single Radionuclide Guidelines

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

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

Dose Conv[illegible]n Factor (and Related) Parameter Summary (continued)
File: DOSFAC.BIN

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

Site-Specific Parameter Summary

Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
rea of contaminated zone (m**2)	5.000E+01	1.000E+04	—	AREA
hickness of contaminated zone (m)	3.000E-01	2.000E+00	—	THICK0
ength parallel to aquifer flow (m)	1.000E+02	1.000E+02	—	LCZPAQ
asic radiation dose limit (mrem/yr)	3.000E+01	3.000E+01	—	BRDL
ime since placement of material (yr)	0.000E+00	0.000E+00	—	TI
imes for calculations (yr)	1.000E+00	1.000E+00	—	T(2)
imes for calculations (yr)	3.000E+00	3.000E+00	—	T(3)
imes for calculations (yr)	1.000E+01	1.000E+01	—	T(4)
imes for calculations (yr)	3.000E+01	3.000E+01	—	T(5)
imes for calculations (yr)	1.000E+02	1.000E+02	—	T(6)
imes for calculations (yr)	3.000E+02	3.000E+02	—	T(7)
imes for calculations (yr)	1.000E+03	1.000E+03	—	T(8)
imes for calculations (yr)	not used	0.000E+00	—	T(9)
imes for calculations (yr)	not used	0.000E+00	—	T(10)
ial principal radionuclide (pCi/g): U-234	9.600E-01	0.000E+00	—	S1(6)
ial principal radionuclide (pCi/g): U-235	3.000E-02	0.000E+00	—	S1(7)
ial principal radionuclide (pCi/g): U-238	6.300E-03	0.000E+00	—	S1(8)
ncentration in groundwater (pCi/L): U-234	not used	0.000E+00	—	W1(6)
ncentration in groundwater (pCi/L): U-235	not used	0.000E+00	—	W1(7)
ncentration in groundwater (pCi/L): U-238	not used	0.000E+00	—	W1(8)
ver depth (m)	0.000E+00	0.000E+00	—	COVER0
nsity of cover material (g/cm**3)	not used	1.500E+00	—	DENSCV
ver depth erosion rate (m/yr)	not used	1.000E-03	—	VCV
nsity of contaminated zone (g/cm**3)	1.600E+00	1.500E+00	—	DENSCZ
ntaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	—	VCZ
ntaminated zone total porosity	4.000E-01	4.000E-01	—	TPCZ
ntaminated zone effective porosity	2.000E-01	2.000E-01	—	EPCZ
ntaminated zone hydraulic conductivity (m/yr)	4.400E+02	1.000E+01	—	HCCZ
ntaminated zone b parameter	4.050E+00	5.300E+00	—	BCZ
midity in air (g/cm**3)	not used	8.000E+00	—	HUMID
apotranspiration coefficient	9.990E-01	5.000E-01	—	EVAPTR
cipitation (m/yr)	4.800E-01	1.000E+00	—	PRECIP
ation (m/yr)	0.000E+00	2.000E-01	—	RI
ation mode	overhead	overhead	—	IDITCH
off coefficient	5.200E-01	2.000E-01	—	RUNOFF
ershed area for nearby stream or pond (m**2)	2.700E+07	1.000E+06	—	WAREA
uracy for water/soil computations	1.000E-03	1.000E-03	—	EPS
sity of saturated zone (g/cm**3)	1.600E+00	1.500E+00	—	DENSAQ
rated zone total porosity	3.000E-01	4.000E-01	—	TPSZ
rated zone effective porosity	3.000E-01	2.000E-01	—	EPSZ
rated zone hydraulic conductivity (m/yr)	1.000E+02	1.000E+02	—	HCSZ
rated zone hydraulic gradient	2.000E-02	2.000E-02	—	HGWT
rated zone b parameter	4.050E+00	5.300E+00	—	BSZ
r table drop rate (m/yr)	3.000E-01	1.000E-03	—	VWT
pump intake depth (m below water table)	1.000E+01	1.000E+01	—	DWIBWT
l: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	—	MODEL
pumping rate (m**3/yr)	2.500E+02	2.500E+02	—	UW

...te-Specific Parameter Summary (continued)

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

Site-Specific Parameter Summary (continued)

Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
istribution coefficients for daughter Pa-231				
Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	—	DCNUCC(2)
Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	—	DCNUCU(2,1)
Unsaturated zone 2 (cm**3/g)	5.000E+01	5.000E+01	—	DCNUCU(2,2)
Saturated zone (cm**3/g)	5.000E+01	5.000E+01	—	DCNUCS(2)
Leach rate (/yr)	0.000E+00	0.000E+00	9.587E-08	ALEACH(2)
Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
stribution coefficients for daughter Pb-210				
Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	—	DCNUCC(3)
nsaturated zone 1 (cm**3/g)	1.000E+02	1.000E+02	—	DCNUCU(3,1)
nsaturated zone 2 (cm**3/g)	1.000E+02	1.000E+02	—	DCNUCU(3,2)
aturated zone (cm**3/g)	1.000E+02	1.000E+02	—	DCNUCS(3)
each rate (/yr)	0.000E+00	0.000E+00	4.797E-08	ALEACH(3)
olubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
tribution coefficients for daughter Ra-226				
ontaminated zone (cm**3/g)	7.000E+01	7.000E+01	—	DCNUCC(4)
nsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	—	DCNUCU(4,1)
nsaturated zone 2 (cm**3/g)	7.000E+01	7.000E+01	—	DCNUCU(4,2)
aturated zone (cm**3/g)	7.000E+01	7.000E+01	—	DCNUCS(4)
each rate (/yr)	0.000E+00	0.000E+00	6.850E-08	ALEACH(4)
lubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
ribution coefficients for daughter Th-230				
ntaminated zone (cm**3/g)	6.000E+04	6.000E+04	—	DCNUCC(5)
saturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	—	DCNUCU(5,1)
saturated zone 2 (cm**3/g)	6.000E+04	6.000E+04	—	DCNUCU(5,2)
turated zone (cm**3/g)	6.000E+04	6.000E+04	—	DCNUCS(5)
ach rate (/yr)	0.000E+00	0.000E+00	8.000E-09	ALEACH(5)
lubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)
lation rate (m**3/yr)	1.490E+04	8.400E+03	—	INHALR
s loading for inhalation (g/m**3)	9.000E-05	2.000E-04	—	MLINH
ion length for airborne dust, inhalation (m)	3.000E+00	3.000E+00	—	LM
sure duration	2.500E+01	3.000E+01	—	ED
ding factor, inhalation	4.000E-01	4.000E-01	—	SHF3
ding factor, external gamma	7.000E-01	7.000E-01	—	SHF1
ion of time spent indoors	1.640E-01	5.000E-01	—	FIND
ion of time spent outdoors (on site)	4.600E-02	2.500E-01	—	FOTD
e factor flag, external gamma	1.000E+00	1.000E+00	1 shows circular AREA.	FS

Site-Specific Parameter Summary (continued)

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

Site-Specific Parameter Summary (continued)

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

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.D, Version 5.70    T« Limit = 0.5 year       07/17/97  13:09    Page  10
ry : RESRAD Default Parameters                        File: TA-18UCO.RAD

taminated Zone Dimensions          Initial Soil Concentrations, pCi/g
AAAAAAAAAAAAAAAAAAAAAAAAAAA         AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
a:    50.00 square meters            U-234    9.600E-01
ess:    0.30 meters                 U-235    3.000E-02
)epth:    0.00 meters                U-238    6.300E-03


            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)
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
s): 0.000E+00  1.000E+00  3.000E+00  1.000E+01  3.000E+01  1.000E+02  3.000E+02  1.000E+03
IE(t): 1.803E-02  1.803E-02  1.303E-02  1.803E-02  1.804E-02  1.812E-02  0.000E+00  0.000E+00
): 6.009E-04  6.009E-04  6.009E-04  6.010E-04  6.014E-04  6.040E-04  0.000E+00  0.000E+00

n TDOSE(t):  1.815E-02 mrem/yr   at t =   143.9 ñ 0.1 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 =  143.9  years

               Water Independent Pathways (Inhalation excludes radon)

iround          Inhalation          Radon          Plant          Meat          Milk          Soil
AAAAAAAAAAAAAAA AAAAAAAAAAAAAAA AAAAAAAAAAAAAAA AAAAAAAAAAAAAAA AAAAAAAAAAAAAAA AAAAAAAAAAAAAAA AAAAAAAAAAAAAAA
nrem/yr fract.  mrem/yr fract.  mrem/yr fract.  mrem/yr fract.  mrem/yr fract.  mrem/yr fract.  mrem/yr fract.
\AAAAAAAAA AAAAAA AAAAAAAAA AAAAAA AAAAAAAAA AAAAAA AAAAAAAAA AAAAAA AAAAAAAAA AAAAAA AAAAAAAAA AAAAAA AAAAAAAAA AAAAAA
897E-05 0.0055  1.429E-02 0.7873  7.559E-05 0.0042  0.000E+00 0.0000  0.000E+00 0.0000  0.000E+00 0.0000  1.142E-04 0.0063
902E-03 0.1599  4.821E-04 0.0266  0.000E+00 0.0000  0.000E+00 0.0000  0.000E+00 0.0000  0.000E+00 0.0000  4.206E-06 0.0002
928E-05 0.0055  8.364E-05 0.0046  6.782E-11 0.0000  0.000E+00 0.0000  0.000E+00 0.0000  0.000E+00 0.0000  7.107E-07 0.0000
IIIII IIIIIII IIIII IIIIIII IIIII IIIIIII IIIII IIIIIII IIIII IIIIIII IIIII IIIIIII IIIII
00E-03 0.1708  1.466E-02 0.8185  7.559E-05 0.0042  0.000E+00 0.0000  0.000E+00 0.0000  0.000E+00 0.0000  1.191E-04 0.0066


     Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
              As mrem/yr and Fraction of Total Dose At t =  143.9  years

                      Water Dependent Pathways

'ater          Fish          Radon          Plant          Meat          Milk          All Pathways*
AAAAAAAAAAAAAA AAAAAAAAAAAAAAA AAAAAAAAAAAAAAA AAAAAAAAAAAAAAA AAAAAAAAAAAAAAA AAAAAAAAAAAAAAA AAAAAAAAAAAAAAA
'em/yr fract.  mrem/yr fract.  mrem/yr fract.  mrem/yr fract.  mrem/yr fract.  mrem/yr fract.  mrem/yr fract.
AAAAAAAAA AAAAAA AAAAAAAAA AAAAAA AAAAAAAAA AAAAAA AAAAAAAAA AAAAAA AAAAAAAAA AAAAAA AAAAAAAAA AAAAAA AAAAAAAAA AAAAAA
00E+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  1.456E-02 0.8032
00E+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  3.388E-03 0.1867
00E+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  1.836E-04 0.0101
IIIII IIIIIII IIIII IIIIIII IIIII IIIIIII IIIII IIIIIII IIIII IIIIIII IIIII IIIIIII IIIII
)E+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  1.815E-02 1.0000

water independent and dependent pathways.
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Total D... Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p...
...mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

...de	Ground mrem/yr	Ground fract.	Inhalation mrem/yr	Inhalation fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	Soil mrem/yr	Soil fract.
4	5.277E-05	0.0029	1.427E-02	0.7916	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.140E-04	0.0063
5	2.979E-03	0.1652	4.155E-04	0.0231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.362E-06	0.0002
[illegible]	1.080E-04	0.0060	8.371E-05	0.0046	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.114E-07	0.0000
	3.140E-03	0.1742	1.477E-02	0.8193	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.161E-04	0.0066

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

...e	Water mrem/yr	Water fract.	Fish mrem/yr	Fish fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	All Pathways* mrem/yr	All Pathways* fract.
	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	1.444E-02	0.8008
	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	3.398E-03	0.1885
	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	1.925E-04	0.0107
	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	1.803E-02	1.0000

...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)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
le	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
	5.278E-05	0.0029	1.427E-02	0.7916	5.241E-09	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.140E-04	0.0063
	2.979E-03	0.1652	4.156E-04	0.0231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.365E-06	0.0002
	1.080E-04	0.0060	8.371E-05	0.0046	2.252E-17	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.113E-07	0.0000
	3.139E-03	0.1742	1.477E-02	0.8193	5.241E-09	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.181E-04	0.0066

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

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
	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	1.444E-02	0.8008
	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	3.398E-03	0.1885
	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	1.924E-04	0.0107
	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	1.803E-02	1.0000

/ all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

io-ide	Ground mrem/yr	Ground fract.	Inhalation mrem/yr	Inhalation fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	Soil mrem/yr	Soil fract.
14	5.280E-05	0.0029	1.427E-02	0.7916	4.702E-08	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.140E-04	0.0063
15	2.978E-03	0.1652	4.159E-04	0.0231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.371E-06	0.0002
18	1.080E-04	0.0060	8.371E-05	0.0046	8.762E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.113E-07	0.0000
l	3.139E-03	0.1741	1.477E-02	0.8193	4.702E-08	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.181E-04	0.0066

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

o-de	Water mrem/yr	Water fract.	Fish mrem/yr	Fish fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	All Pathways* mrem/yr	All Pathways* fract.
4	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	1.444E-02	0.8009
5	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	3.398E-03	0.1885
3	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	1.924E-04	0.0107
	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	1.803E-02	1.0000

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)

o-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
de	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
4	5.304E-05	0.0029	1.427E-02	0.7916	5.164E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.140E-04	0.0063
5	2.977E-03	0.1651	4.171E-04	0.0231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.396E-06	0.0002
8	1.078E-04	0.0060	8.371E-05	0.0046	3.201E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.113E-07	0.0000
	3.136E-03	0.1741	1.477E-02	0.8193	5.164E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.182E-04	0.0066

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

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
	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	1.444E-02	0.8009
	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	3.398E-03	0.1885
	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	1.922E-04	0.0107
	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	1.803E-02	1.0000

f 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	5.507E-05	0.0031	1.427E-02	0.7912	4.485E-06	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.141E-04	0.0063
U-235	2.975E-03	0.1649	4.233E-04	0.0235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.488E-06	0.0002
U-238	1.073E-04	0.0059	8.370E-05	0.0046	8.354E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.112E-07	0.0000
Total	3.137E-03	0.1739	1.478E-02	0.8193	4.485E-06	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.183E-04	0.0066

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	1.445E-02	0.8008
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	3.402E-03	0.1886
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	1.917E-04	0.0106
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	1.804E-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)

lo- lide	Ground mrem/yr	Ground fract.	Inhalation mrem/yr	Inhalation fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	Soil mrem/yr	Soil fract.
34	7.670E-05	0.0042	1.426E-02	0.7883	4.238E-05	0.0023	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.141E-04	0.0063
35	2.953E-03	0.1630	4.578E-04	0.0253	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.916E-06	0.0002
38	1.039E-04	0.0057	8.366E-05	0.0046	2.638E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.109E-07	0.0000
l	3.134E-03	0.1730	1.483E-02	0.8182	4.238E-05	0.0023	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.186E-04	0.0066

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

- e	Water mrem/yr	Water fract.	Fish mrem/yr	Fish fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	All Pathways* mrem/yr	All Pathways* fract.
	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	1.452E-02	0.8011
	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	3.415E-03	0.1885
	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	1.882E-04	0.0104
	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	1.812E-02	1.0000

f 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)

```
 Ground          Inhalation        Radon           Plant           Meat            Milk            Soil
AAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAA
 mrem/yr fract.  mrem/yr fract.  mrem/yr fract.  mrem/yr fract.  mrem/yr fract.  mrem/yr fract.  mrem/yr fract.
AA AAAAAAAAA AAAAAA AAAAAAAAA AAAAAA AAAAAAAAA AAAAAA AAAAAAAAA AAAAAA AAAAAAAAA AAAAAA AAAAAAAAA AAAAAA AAAAAAAAA AAAAAA
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
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
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
||||||||| |||||| ||||||||| |||||| ||||||||| |||||| ||||||||| |||||| ||||||||| |||||| ||||||||| |||||| ||||||||| ||||||
).000E+00 0.0000 0.000E+00 0.0000 0.000E+00 0.0000 0.000E+00 0.0000 0.000E+00 0.0000 0.000E+00 0.0000 0.000E+00 0.0000
```

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

Water Dependent Pathways

```
 Water           Fish            Radon           Plant           Meat            Milk            All Pathways*
AAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAA
 mrem/yr fract.  mrem/yr fract.  mrem/yr fract.  mrem/yr fract.  mrem/yr fract.  mrem/yr fract.  mrem/yr fract.
AA AAAAAAAAA AAAAAA AAAAAAAAA AAAAAA AAAAAAAAA AAAAAA AAAAAAAAA AAAAAA AAAAAAAAA AAAAAA AAAAAAAAA AAAAAA AAAAAAAAA AAAAAA
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
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
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
||||||||| |||||| ||||||||| |||||| ||||||||| |||||| ||||||||| |||||| ||||||||| |||||| ||||||||| |||||| ||||||||| ||||||
.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
```

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)

Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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
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
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
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

Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
rem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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
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
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
0E+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

l water independent and dependent pathways.

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

Parent (i)	Product (j)	Branch Fraction	DSR(j,t) (mrem/yr)/(pCi/g) t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
U-234	U-234	1.000E+00	1.504E-02	1.504E-02	1.504E-02	1.504E-02	1.503E-02	1.502E-02	0.000E+00	0.000E+00
U-234	Th-230	1.000E+00	0.000E+00	3.340E-07	1.002E-06	3.340E-06	1.002E-05	3.336E-05	0.000E+00	0.000E+00
U-234	Ra-226	1.000E+00	0.000E+00	8.135E-09	7.303E-08	8.043E-07	7.045E-06	6.907E-05	0.000E+00	0.000E+00
U-234	Pb-210	1.000E+00	0.000E+00	1.300E-13	3.456E-12	1.213E-10	2.836E-09	6.918E-08	0.000E+00	0.000E+00
U-234	∑DSR(j)		1.504E-02	1.504E-02	1.504E-02	1.504E-02	1.505E-02	1.512E-02	0.000E+00	0.000E+00
U-235	U-235	1.000E+00	1.133E-01	1.132E-01	1.132E-01	1.132E-01	1.131E-01	1.120E-01	0.000E+00	0.000E+00
U-235	Pa-231	1.000E+00	0.000E+00	3.669E-06	1.101E-05	3.666E-05	1.100E-04	3.651E-04	0.000E+00	0.000E+00
U-235	Ac-227	1.000E+00	0.000E+00	3.406E-07	3.001E-06	3.103E-05	2.305E-04	1.501E-03	0.000E+00	0.000E+00
U-235	∑DSR(j)		1.133E-01	1.133E-01	1.133E-01	1.133E-01	1.134E-01	1.136E-01	0.000E+00	0.000E+00
U-238	U-238	1.000E+00	3.055E-02	3.055E-02	3.054E-02	3.051E-02	3.043E-02	2.987E-02	0.000E+00	0.000E+00
U-238	U-234	1.000E+00	0.000E+00	4.263E-08	1.279E-07	4.263E-07	1.279E-06	4.259E-06	0.000E+00	0.000E+00
U-238	Th-230	1.000E+00	0.000E+00	4.734E-13	4.261E-12	4.734E-11	4.260E-10	4.729E-09	0.000E+00	0.000E+00
U-238	Ra-226	1.000E+00	0.000E+00	5.327E-15	2.074E-13	7.598E-12	1.999E-10	6.550E-09	0.000E+00	0.000E+00
U-238	Pb-210	1.000E+00	0.000E+00	2.882E-18	1.330E-17	8.752E-16	6.294E-14	5.499E-12	0.000E+00	0.000E+00
U-238	∑DSR(j)		3.055E-02	3.055E-02	3.054E-02	3.051E-02	3.043E-02	2.986E-02	0.000E+00	0.000E+00

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

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

Nuclide (i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
U-234	1.995E+03	1.995E+03	1.995E+03	1.995E+03	1.993E+03	1.984E+03	*6.245E+09	*6.245E+09
U-235	2.649E+02	2.649E+02	2.649E+02	2.649E+02	2.646E+02	2.635E+02	*2.160E+06	*2.160E+06
U-238	9.820E+02	9.821E+02	9.823E+02	9.832E+02	9.859E+02	1.004E+03	*3.360E+05	*3.360E+05

*At specific activity limit

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
and at tmax = time of maximum total dose = 143.9 ñ 0.1 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	9.600E-01	149.9 ñ 0.1	1.520E-02	1.974E+03	1.519E-02	1.975E+03
U-235	3.000E-02	92.81 ñ 0.09	1.136E-01	2.635E+02	1.129E-01	2.656E+02
U-238	6.300E-03	0.000E+00	3.055E-02	9.820E+02	2.915E-02	1.029E+03

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

ide (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
4	U-234	1.000E+00	1.444E-02	1.444E-02	1.444E-02	1.443E-02	1.443E-02	1.442E-02	0.000E+00	0.000E+00
4	U-238	1.000E+00	0.000E+00	2.686E-10	8.057E-10	2.686E-09	8.055E-09	2.683E-08	0.000E+00	0.000E+00
4	åDOSE(j):		1.444E-02	1.444E-02	1.444E-02	1.443E-02	1.443E-02	1.442E-02	0.000E+00	0.000E+00
0	U-234	1.000E+00	0.000E+00	3.206E-07	9.619E-07	3.206E-06	9.616E-06	3.203E-05	0.000E+00	0.000E+00
0	U-238	1.000E+00	0.000E+00	2.983E-15	2.684E-14	2.982E-13	2.684E-12	2.979E-11	0.000E+00	0.000E+00
0	åDOSE(j):		0.000E+00	3.206E-07	9.619E-07	3.206E-06	9.616E-06	3.203E-05	0.000E+00	0.000E+00
26	U-234	1.000E+00	0.000E+00	7.809E-09	7.011E-08	7.721E-07	6.763E-06	6.631E-05	0.000E+00	0.000E+00
26	U-238	1.000E+00	0.000E+00	3.356E-17	1.307E-15	4.787E-14	1.260E-12	4.127E-11	0.000E+00	0.000E+00
26	åDOSE(j):		0.000E+00	7.809E-09	7.011E-08	7.721E-07	6.763E-06	6.631E-05	0.000E+00	0.000E+00
0	U-234	1.000E+00	0.000E+00	1.248E-13	3.318E-12	1.165E-10	2.722E-09	6.641E-08	0.000E+00	0.000E+00
0	U-238	1.000E+00	0.000E+00	1.816E-20	8.376E-20	5.514E-18	3.965E-16	3.464E-14	0.000E+00	0.000E+00
0	åDOSE(j):		0.000E+00	1.248E-13	3.318E-12	1.165E-10	2.722E-09	6.641E-08	0.000E+00	0.000E+00
	U-235	1.000E+00	3.398E-03	3.397E-03	3.397E-03	3.398E-03	3.392E-03	3.359E-03	0.000E+00	0.000E+00
1	U-235	1.000E+00	0.000E+00	1.101E-07	3.302E-07	1.100E-06	3.299E-06	1.095E-05	0.000E+00	0.000E+00
7	U-235	1.000E+00	0.000E+00	1.022E-08	9.004E-08	9.309E-07	6.916E-06	4.502E-05	0.000E+00	0.000E+00
	U-238	1.000E+00	1.925E-04	1.924E-04	1.924E-04	1.922E-04	1.917E-04	1.882E-04	0.000E+00	0.000E+00

is the branch fraction of the parent nuclide.

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

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	1.000E+00	9.600E-01	9.600E-01	9.600E-01	9.599E-01	9.596E-01	9.588E-01	9.564E-01	9.481E-01
U-238	1.000E+00	0.000E+00	1.786E-08	5.358E-08	1.786E-07	5.356E-07	1.784E-06	5.340E-06	1.766E-05
ΣS(j):		9.600E-01	9.600E-01	9.600E-01	9.599E-01	9.596E-01	9.588E-01	9.564E-01	9.482E-01
U-234	1.000E+00	0.000E+00	8.642E-06	2.592E-05	8.641E-05	2.592E-04	8.633E-04	2.584E-03	8.550E-03
U-238	1.000E+00	0.000E+00	8.039E-14	7.235E-13	8.038E-12	7.233E-11	8.031E-10	7.213E-09	7.956E-08
ΣS(j):		0.000E+00	8.642E-06	2.592E-05	8.641E-05	2.592E-04	8.633E-04	2.584E-03	8.550E-03
U-234	1.000E+00	0.000E+00	1.872E-09	1.684E-08	1.869E-07	1.677E-06	1.843E-05	1.609E-04	1.613E-03
U-238	1.000E+00	0.000E+00	8.043E-18	3.136E-16	1.159E-14	3.123E-13	1.147E-11	3.026E-10	1.035E-08
ΣS(j):		0.000E+00	1.872E-09	1.684E-08	1.869E-07	1.677E-06	1.843E-05	1.609E-04	1.613E-03
U-234	1.000E+00	0.000E+00	1.924E-11	5.115E-10	1.796E-08	4.197E-07	1.024E-05	1.306E-04	1.519E-03
U-238	1.000E+00	0.000E+00	2.800E-18	1.291E-17	8.501E-16	6.114E-14	5.343E-12	2.245E-10	9.446E-09
ΣS(j):		0.000E+00	1.924E-11	5.115E-10	1.796E-08	4.197E-07	1.024E-05	1.306E-04	1.519E-03
U-235	1.000E+00	3.000E-02	3.000E-02	3.000E-02	3.000E-02	2.999E-02	2.997E-02	2.991E-02	2.971E-02
U-235	1.000E+00	0.000E+00	6.347E-07	1.904E-06	6.346E-06	1.903E-05	6.335E-05	1.893E-04	6.221E-04
U-235	1.000E+00	0.000E+00	9.997E-09	8.810E-08	9.110E-07	6.772E-06	4.427E-05	1.694E-04	6.025E-04
U-238	1.000E+00	6.300E-03	6.300E-03	6.300E-03	6.299E-03	6.298E-03	6.294E-03	6.282E-03	6.240E-03

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.

TABLE 7.2-1

TCLP RESULTS OF SAMPLING FROM THE URANIUM SOLUTION PIPE AT PRS 18-006

Sample ID	Arsenic (µg/L)	Barium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)
RCRA Waste Toxicity Characteristics	5,000	100,000	1,000	5,000
0218-97-0056	30.3	52.2	< 2 (U)	2,840

Sample ID	Lead (µg/L)	Mercury (µg/L)	Selenium (µg/L)	Silver (µg/L)
RCRA Waste Toxicity Characteristics	5,000	200	1,000	5,000
0218-97-0056	< 12 (U)	0.45	813	< 7 (U)

U = qualifier indicates constituent not at detectable levels.

TABLE 7.2-2

ISOTOPIC URANIUM RESULTS FROM THE URANIUM PIPE AT PRS 18-006

ple ID	Uranium-234 (pCi/L)	Uranium-235 (pCi/L)	Uranium-238 (pCi/L)
)056	88	2.7	0.58
	89	2.6	0.45
	109	3.0	0.36

TABLE 7.2-3

ORGANIC RESULTS FROM THE URANIUM PIPE AT PRS 18-006

ample ID	Acetone (µg/L)	2-Butanone (µg/L)
PRG	610	1,900
057	340	13(J)

: indicates an estimated value below instrument detection levels.

ANNEX 7.3

SITE MAP

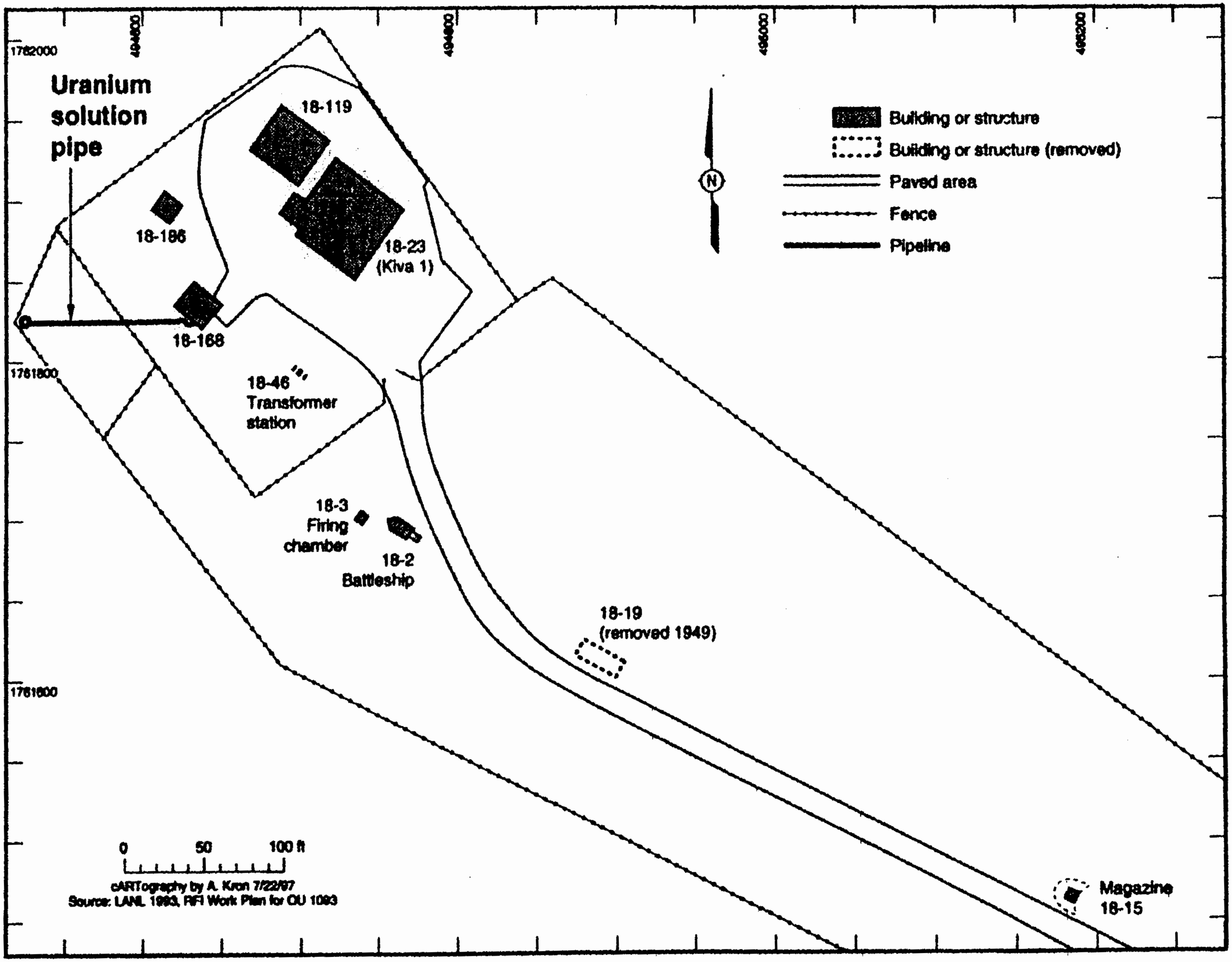

Figure 7.3-1. Site map of PRS 18-006.

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.

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 not 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

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1093/FU2	18-006	Uranium solution pipe
All Waste Types or Wastestreams: Pipe liquid, pipe sludge, cut pipe, pipe insulation, soil, PPE and waste handling equipment, and decontamination liquids (for PPE/waste handling equipment)		

Completed By J. W. Heyser	Date July 30, 1997
FPL: T. E. Gene Gould	WMC Jeff Bingham, EES-15
Type of Activity (site investigation, EC, etc.): VCA	

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

The uranium solution pipe will be removed during this VCA. Prior to digging up this buried pipe (100 ft-long by a 6-inch diameter) any residual liquid (less than one-half gal.) will be removed through the refueling or reactor transfer tubes that exit above the surface of the ground. The emptied pipe will be exposed with a trench dug around it and then the exposed pipe will be cut into sections that are capped and removed. After each section of pipe is removed, the soil under it will be sampled to determine if there was any leakage. If the subsequent analysis of subsurface soil samples indicates radiological contamination from the pipe, that section of trench will be reopened and subsurface soil will be removed until field screening indicates only background radiation levels.

Acceptable Knowledge

Site Description, Site History, and Historical Waste Generating Processes or Activities: (Include dates for site history) PRS 18-006 is a 100 ft. Schedule-40 stainless steel pipe (0.25 in. thick) once used to store a liquid uranyl sulfate solution (93 % enriched uranium) that served as fuel for fission reactions in the Kinglet fission reactor, operated from 1970 to 1974. The pipe is tilted slightly and buried 3 to 5 ft deep at the south side of TA-18-168 (near Kiva 1) which housed the reactor (RFI Work Plan for OU 1093, May 1993). Fission products produced during reactor operations tended to be trapped in the metal reactor vessel rather then remaining in the reactor fuel solution. After the Kinglet reactor was decommissioned in 1974, the liquid fuel was removed and the storage pipe was flushed twice with water. No organic compounds were present in the uranyl sulfate fuel solution or were used to rinse the pipe during its decommissioning (R. Mynard, EES-15, conversation with former LACEF employee). Since the stainless steel pipe was designed to store the radioactive solution, no leakage is expected in the surrounding soil. Data taken from four surrounding monitoring wells (installed in 1990) showed no increased radionuclides downgradient from this PRS. In addition no significant differences were noted between radionuclide concentrations upgradient and downgradient when they were compared with offsite background sample locations.

Previous Investigation Analytical Results. (Report the analytical methods and results above background levels) In June 1997 the liquid in the pipe was sampled for isotopic uranium, TCLP metals, and pH. U-235 was 2.74 pCi/l. All metals were below their TC levels, the highest metals were chromium at 2,840 µg/l and selenium at 813 µg/l. The pH of the solution was 12.8 which is slightly above the corrosivity limit of pH 12.5, but which can be neutralized by the generator as a D002 waste. In subsequent sampling for VOAs, all the liquid was removed from the pipe. Acetone (620 µg/l) and 2-butanone (15 µg/l, a J qualified value) were detected. Only a trace volume of liquid is expected to remain in the pipe, but if sufficient liquid is present a second VOC analysis should confirm whether or not these organics are present.

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1093/FU2	18-006	Uranium solution pipe

Specific Waste Type: Pipe liquid

Waste Description

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

Waste Type Description: Liquid waste from low end of buried pipe.
Potential Regulatory Status: RCRA due to pH 12.8 and VOAs.
Volume Estimate: None to less than one-half gallon.
Waste Packaging: Liquid will be stored in a closed container until analyses are completed and its waste status is determined.

Characterization Strategy

Description of Strategy: In June 1997, the liquid in the pipe was sampled for TCLP metals, iso-uranium, and pH. During a second sampling attempt, two VOA samples were collected, which removed all remaining liquid from the low-end of the pipe. Additional planned analyses could not be completed for gross alpha/beta radiation, tritium, TAL metals plus boron, reactive cyanide plus sulfide, Sr-90, TSS, and SVOCs.

Only a trace of liquid is expected to be present in the pipe during the VCA so this waste stream may not be generated. If additional liquid is found in the pipe during the VCA, samples will be taken for the above analyses not completed earlier. VOCs also will be sampled a second time.

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 for each of the uncompleted analyses listed above will be taken.

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

Analytical Strategy

Analyte Category	Analytical Method	May be Present (yes, no, unknown)	Direct Sampling of Containerized Waste	Acceptable Knowledge Existing Information	Acceptable Knowledge Data from Proposed Site Characterization
Volatile Organic Constituents	SW 846 8260	Unk	X[2]		
Semivolatile Constituents	SW 846, 8270	Unk	X[2]		
Organic Pesticides		No		X	

1) Sampling completed in June or July 1997
2) Sample will be analyzed only if sufficient liquid is present in the pipe during the VCA

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1093/FU2	18-006	Uranium solution pipe
Specific Waste Type: Pipe liquid		

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
Organic Herbicides		No		X	
Pesticides and PCBs		No		X	
PCBs		No		X	
Total Metals		Yes		X	
Total Cyanide	SW 846, Ch 7	Unk	X[2]		
Other Inorganic Constit.(specify)		No		X	
High Explosive Con.		No		X	
Asbestos		No		X	
TPH		No		X	
TCLP Metals		Yes		X[1]	
TCLP Organics		No		X	
TCLP Pest & Herb		No		X	
Gross Alpha	Field	Yes			X
Gross Beta	screen	Yes			X
Gross Gamma	"	Unk			X
Tritium[1]	HASL 300	Unk	X[2]		
Gamma Spectro		No			
Isotopic Plutonium		No		X	
Total Plutonium		No		X	
Isotopic Uranium		Yes		X[1]	
Total Uranium		Yes		X	
Strontium-90	HASL 300	Unk	X[2]		
Americium-241		No		X	

1) Sampling completed in June or July 1997
2) Sample will be analyzed only if sufficient liquid is present in the pipe during the VCA

[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
1093/FU2	18-006	Uranium solution pipe

Specific Waste Type: Pipe liquid

Preliminary RCRA Determination

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

The residual pipe liquid was RCRA due to its pH of 12.8 which is above the pH 12.5 level for corrosivity. TCLP metals were below their TC regulatory limits. If liquid is present in the pipe during the VCA, the additional analyses listed above will be completed in order to determine its waste classification.

Preliminary RCRA Status

____ Non-RCRA: (No 90-Day Storage Requirement)
Describe how waste will be stored/handled:

__X__ RCRA: (90-Day Storage Requirement)
Waste will be stored/handled in accordance with 20 NMAC Generator Requirements. The liquid will be stored onsite in a closed container until all the analyses are completed and a final RCRA determination is made.

Preliminary Determination for Radioactivity

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

The pipe held a solution of enriched uranyl sulfate from 1970 to 1974. After decommissioning the pipe was flushed twice with water. The analyses for isotopic uranium detected low levels of U-234, U-235, and U-238.

____ 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 waste liquid will be stored onsite in a sealed container in an area labeled as a radioactive storage area.

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1093/FU2	18-006	Uranium solution pipe
Specific Waste Type: Pipe Sludge		

Waste Description

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

Waste Type Description: Sludge (if present) in storage pipe.
Potential Regulatory Status: RCRA mixed waste due to pH 12.8
Volume Estimate: A trace to less than five gallons.
Waste Packaging: Sludge not attached to pipe surface will be removed and stored in a closed container until analyses are completed and its waste status is determined.

Characterization Strategy

Description of Strategy: During the two previous sampling efforts, only a little sediment was present at the low-end of the pipe. The last two samples taken for VOAs removed all of the liquid. Sludge, as a loose residue may be present on the inside of the pipe, but the volume is expected to be small. If sludge is present in sufficient quantity, the following analyses will be done: iso-uranium, TCLP metals, SVOCs, and tritium.

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 sludge, expected to be present only at the low end of the pipe, is considered sufficient. Additional samples will be taken if instead a sludge residue is evenly distributed along the length of the pipe.

* 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		Unk	X[4]		
Semivolatile Constituents	SW 846 8270	Unk	X[4]		
Organic Pesticides		No		X	

4) Sample taken only if a sufficient volume of sludge is present

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1093/FU2	18-006	Uranium solution pipe
Specific Waste Type: Pipe sludge		

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
Organic Herbicides		No		X	
Pesticides and PCBs		No		X	
PCBs		No		X	
Total Metals		Yes	X[4]		
Total Cyanide		Unk	X[4]		
Other Inorganic Cons.(specify)		No		X	
High Explosive Con		No		X	
Asbestos		No		X	
TPH		No		X	
TCLP Metals	SW 846, 1311,6010	Yes	X[4]		
TCLP Organics		No		X	
TCLP Pest. & Herb.		No		X	
Gross Alpha	Field	Yes	X		
Gross Beta	screen	Yes	X		
Gross Gamma	"	Yes	X		
Tritium[2]	HASL 300	Yes	X[4]		
Gamma Spectro.		No		X	
Isotopic Plutonium		No		X	
Total Plutonium		No		X	
Isotopic Uranium	HASL 300	Yes	X[4]		
Total Uranium		Yes		X	
Strontium-90		No		X	
Americium-241		No		X	

4) Sample taken only if a sufficient volume of sludge is present.

[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
1093/FU2	18-006	Uranium solution pipe

Specific Waste Type: Pipe sludge

Preliminary RCRA Determination

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

The sludge, if present, is considered RCRA due to high pH and possible TCLP metal content. A final RCRA determination will be based on the analyses listed above plus the analyses for the pipe liquid.

Preliminary RCRA Status

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

Describe how waste will be stored/handled:

The sludge will be stored onsite in a sealed container until all analyses are evaluated and a final RCRA determination is made.

Preliminary Determination for Radioactivity

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

The pipe held a solution of enriched uranyl sulfate from 1970 to 1974. After decommissioning the pipe was flushed twice with water. The liquid analyses for isotopic uranium detected low levels of U-234, U-235, and U-238. The sludge is expected to be low-level radioactive.

Preliminary Radioactivity Status

____ Material is not radioactive

Describe how waste will be stored/handled

__X__ Material is radioactive

Describe the controlled area, labeling, and protection against inadvertent contamination

The sludge will be stored onsite in a sealed container that is labeled as a radioactive sto~age area.

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1093/FU2	18-006	Uranium solution pipe

Specific Waste Type: Cut pipe

Waste Description

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

Waste Type Description: Cut sections of storage pipe.
Potential Regulatory Status: Low-level radioactive waste. The final waste status of the pipe will be based on analyses for liquid and pipe sludge and field screening results.
Volume Estimate: 100 feet total by 6 in. in diameter.
Waste Packaging: Cut pipe will be put in up to three waste disposal boxes (90 cu. ft each).

Characterization Strategy

Description of Strategy:

As the buried pipe is exposed, its uncut surface will be scanned for radiation. Each newly cut section of the pipe will also be thoroughly screened for radiation at its cut ends. The characterization of the stainless steel pipe will be based on the analyses of the liquid and sludge. If insufficient quantities of sludge or liquid are present for sampling, the pipe will be characterized by field screening and the associated analyses in adjacent soil samples and in the decontamination liquids used to rinse the PPE/waste handling equipment.

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.)

No direct sampling will be performed on the stainless steel sections of the pipe.

* 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[5]	
Semivolatile Constituents		Unk			X[6]
Organic Pesticides		No		X	
Organic Herbicides		No		X	
Pesticides and PCBs		No		X	
PCBs		No		X	

5) Pipe liquid analysis taken in June/July 1997.
6) Results from pipe liquid, sludge, or decontamination liquids.

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1093/FU2	18-006	Uranium solution pipe
Specific Waste Type: Cut pipe		

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[5]	
Total Cyanide		No		X	
Other Inorganic Constit. (specify)		No		X	
High Explosive Con.		No		X	
Asbestos		No		X	
TPH		No		X	
TCLP Metals		Yes		X[5]	
TCLP Organics		No		X	
TCLP Pest. and Herb.		No		X	
Gross Alpha	Field	Yes	X		
Gross Beta	screen	Yes	X		
Gross Gamma	"	Yes	X		
Tritium[3]		Unk			X[6]
Gamma Spectroscopy		No		X	
Isotopic Plutonium		No		X	
Total Plutonium		No		X	
Isotopic Uranium		Yes			X[6]
Total Uranium		Yes		X	
Strontium-90		No		X	
Americium-241		No		X	

5) Pipe liquid analyses taken in June/July 1997.

6) Results from pipe liquid, sludge, or decontamination liquids

[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
1093/FU2	18-006	Uranium solution pipe
Specific Waste Type: Cut pipe		

Preliminary RCRA Determination

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

The pipe itself is expected to be non-RCRA by low-level radioactive waste. If firmly attached residue is present, the pipe could be mixed waste. This residue may be removed by dry sandblasting at TA-50. The final RCRA status of the pipe sections will be based on the results for the pipe liquid, sludge, adjacent soil samples and decontamination liquids.

Preliminary RCRA Status

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

Describe how waste will be stored/handled: The pipe segments will be stored in sealed waste disposal boxes on site until all associated analyses are evaluated and a final RCRA determination is made.

_____ RCRA: (90-Day Storage Requirement)

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

Preliminary Determination for Radioactivity

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

The pipe sections are expected to be low-level radioactive because this pipe once contained a solution of enriched uranyl sulfate. The pipe was decontaminated by flushing twice so the residual radiation is expected to be low. A final determination of its radiation status will be made after the associated analyses are evaluated.

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 cut pipe sections will be stored in waste disposal boxes onsite until all associated analyses are evaluated.

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1093/FU2	18-006	Underground Storage Tank

Specific Waste Type: Pipe insulation

Waste Description

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

Waste Type Description: Pipe insulation composed of a one-inch layer polyurethane insulating foam and electrical heating tape..
Potential Regulatory Status: Non-hazardous waste
Volume Estimate: Hollow cylinder (6 to 8 inches in diameter) by 100 feet in length. Less than five 55-gallon drums
Waste Packaging: The insulation will be stripped from the cut sections of the pipe. Insulation potentially exposed to the cut ends of the pipe will be segregated from the unexposed insulation. Insulation will be stored in 55 gal. drums in a radiological controlled area.

Characterization Strategy

Description of Strategy: As each section of pipe is exposed, its outer insulation will be visibly examined for signs of staining and screened for surface radiation. After cutting each pipe section, the insulation will be removed without exposing it to the cut ends of the pipe. Insulation that comes in contact with the cut ends of the pipe sections will be segregated away from the insulation not exposed to the cut ends. Visibly stained insulation and/or insulation with above background radiation readings will also segregated by placing it in separately labeled bags. Most of the insulation should be non-hazardous and non-radioactive (below appropriate release criteria as determined by LANL-ER-SOP-10.07) and eligible for free-release from the radiological controlled area.

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 insulation will not be directly sampled. Its waste classification will be based on the analytical results for the surrounding soil, the field screening of the insulation and the external side of pipe below each section of insulation. The analyses for the internal pipe liquid and sludge will only be used to evaluate that insulation which has come into contact with the cut ends of the pipe.

- 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		Unk			X[7]
Semivolatile Constituents		Unk			X[7]
Organic Pesticides		No		X	
Organic Herbicides		No		X	
Pesticides and PCBs		No		X	
PCBs		No		X	

7) Associated soil analyses taken during VCA

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1093/FU2	18-006	Uranium solution pipe
Specific Waste Type: Pipe insulation		

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		Unk			X[7)]
Total Cyanide		No		X	
Other Inorganic Constit (specify)		No		X	
High Explosive Con		No		X	
Asbestos		No		X	
TPH		No		X	
TCLP Metals		Unk		X	
TCLP Organics		No		X	
TCLP Pest. & Herb.		No		X	
Gross Alpha	Field	Unk	X		
Gross Beta	screen	Unk	X		
Gross Gamma	"	Unk	X		
Tritium[4]		Unk			X[7)]
Gamma Spectroscopy		No		X	
Isotopic Plutonium		No		X	
Total Plutonium		No		X	
Isotopic Uranium		Unk			X[7)]
Total Uranium		Unk		X	
Strontium-90		No		X	
Americium-241		No		X	

7) Analyses from associated soil samples

[4] 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
1093/FU2	18-006	Uranium solution pipe

Specific Waste Type: Pipe insulation

Preliminary RCRA Determination

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

The pipe insulation is a standard construction material used for many types of buried pipe. It is not a waste product resulting from LANL operations. Its waste status is expected to be non-hazardous and non-radioactive. A final RCRA determination will be based on the associated soil samples, and the field screening of the insulation and external surface of the exposed pipe sections after the insulation has been removed.

Preliminary RCRA Status

__X__ Non-RCRA. (No 90-Day Storage Requirement)
Describe how waste will be stored/handled:
The insulation will be stored onsite in 55-gal drums until all associated analyses 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.

The insulation is expected to be non-radioactive as it covered a stainless steel pipe designed to hold the uranyl sulfate solution. A final determination as to its radioactive status will be based on the field screening results and the associated soil analyses.

Preliminary Radioactivity Status

__X__ Material is not radioactive
Describe how waste will be stored/handled
The insulation waste will be stored onsite in 55-gal drums

_____ Material is radioactive
Describe the controlled area, labeling, and protection against inadvertent contamination

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1093/FU2	18-006	Underground Storage Tank

Specific Waste Type: Subsurface soil

Waste Description

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

Waste Type Description: Soil adjacent to and below the pipe, generated only if above background radiation is detected is detected in the soil.
Potential Regulatory Status: Low-level radioactive waste
Volume Estimate: Zero to twelve 55-gal drums.
Waste Packaging: Soil that was visibly stained or has above background radiation will be removed from the trench below the pipe. Soil samples will be used to determine the waste classification of any removed soil.

Characterization Strategy

Description of Strategy: The stainless steel pipe (originally designed to hold the uranyl sulfate solution) is expected to be intact, so the surrounding soil should not be contaminated by leakage. Soil samples will be taken in visibly stained areas near the pipe (if they are present) and at various locations in the soil below the pipe specified in the sampling plan. The soil will be analyzed for iso-uranium, TAL metals, VOCs, SVOCs, and tritium.

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.)

Composite sampling will be used at the locations selected for soil sampling due to the probable heterogeneity of the underlying soil.

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

Analytical Strategy

Analyte Category	Analytical Method	May be Present (yes, no, unknown)	Direct Sampling of Containerized Waste	Acceptable Knowledge Existing Information	Acceptable Knowledge Data from Proposed Site Characterization
Volatile Organic Constituents	SW 846 8260	Unk	X		
Semivolatile Constituents	SW 846 8270	Unk	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
1093/FU2	18-006	Uranium solution pipe
Specific Waste Type: Subsurface soil		

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	SW 846 6010	Yes	X		
Total Cyanide		No		X	
Other Inorganic Cons (specify)		No		X	
High Explosive Con		No		X	
Asbestos		No		X	
TPH		No		X	
TCLP Metals		Yes		X	
TCLP Organics		No		X	
TCLP Pest. & Herb.		No		X	
Gross Alpha	Field	Unk	X		
Gross Beta	screen	Unk	X		
Gross Gamma	"	Unk	X		
Tritium[5]	HASL300	Unk	X		
Gamma Spectro.		No		X	
Isotopic Plutonium		No		X	
Total Plutonium		No		X	
Isotopic Uranium	HASL300	Unk	X		
Total Uranium		Unk		X	
Strontium-90		No		X	
Americium-241		No		X	

[5] 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
1093/FU2	18-006	Uranium solution pipe
Specific Waste Type: Subsurface 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.

The soil around the pipe is expected to be non-hazardous and non-radioactive, because no know leakages have occurred at this PRS. A final RCRA determination of the soil will be based on an evaluation of the analytical results of the soil samples.

Preliminary RCRA Status

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

Describe how waste will be stored/handled:

No soil will be removed unless the analytical results indicate that the pipe has probably leaked into the soil.

_____ RCRA: (90-Day Storage Requirement)

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

Preliminary Determination for Radioactivity

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

The soil is expected to be non-radioactive, because the pipe is not expected to have leaked. A final determination of the radioactive status of the soil will be based on an evaluation of the analytical results for the soil samples.

Preliminary Radioactivity Status

__X__ Material is not radioactive

Describe how waste will be stored/handled

Soil wastes will be generated only if the pipe is determined to have leaked wastes into the surrounding soil.

__X__ Material is radioactive

Describe the controlled area, labeling, and protection against inadvertent contamination

Soil wastes will be stored onsite in labeled 55-gal. drums in an area labeled as a storage area for radioactive materials. The radioactive status of the wastes will be based on an evaluation of the results for the soil samples.

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1093/FU2	18-006	Underground Storage Tank

Specific Waste Type: PPE and waste handling equipment

Waste Description

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

Waste Type Description: PPE and waste handling equipment
Potential Regulatory Status. Visibly contaminated PPE will be initially considered low-level radioactive, while visibly uncontaminated PPE/waste sampling equipment will considered non-hazardous
Volume Estimate Less than ten 55-gal drums.
Waste Packaging Visibly contaminated and visibly uncontaminated PPE/waste handling equipment will be segregated by placing each waste in separate plastic bags that are stored inside 55-gal drums

Characterization Strategy

Description of Strategy: If possible, the PPE/waste handling equipment will be decontaminated prior to disposal After decontamination, the PPE/waste handling 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 disposed as non-hazardous and non-radioactive 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 the corresponding pipe liquid, pipe sludge and/or soil samples where the PPE/waste handling equipment was potentially exposed to contamination (See Analyte Suite section of this form). The visibly contaminated PPE/waste handling equipment will be assumed to have a similar level of contamination as the highest level reported for the corresponding samples of pipe liquid, pipe sludge, and/or soil samples
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/waste handling equipment will not be directly sampled
* 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 Cons		No			X
Semivolatile Constit		No			X
Organic Pesticides		No		X	
Organic Herbicides		No		X	
Pesticides and PCBs		No		X	
PCBs		No		X	

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1093/FU2	18-006	Uranium solution pipe
Specific Waste Type: PPE and waste handling 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		Unk			X
Total Cyanide		No		X	
Other Inorganic Constit (specify)		No		X	
High Explosive Con		No		X	
Asbestos		No		X	
TPH		No		X	
TCLP Metals		Unk		X	
TCLP Organics		No		X	
TCLP Pest. & Herb.		No		X	
Gross Alpha	Field	Unk	X		
Gross Beta	screen	Unk	X		
Gross Gamma	"	Unk	X		
Tritium[a]		No		X	
Gamma Spectro.		No		X	
Isotopic Plutonium		No		X	
Total Plutonium		No		X	
Isotopic Uranium		Unk			X
Total Uranium		Unk		X	
Strontium-90		No		X	
Americium-241		No		X	

[a] 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
1093/FU2	18-006	Uranium solution pipe

Specific Waste Type: PPE and waste handling 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

The PPE/waste handling equipment will be segregated according to the location where it were used (pipe exposure, pipe cutting/removal, soil sampling, etc.) The visibly clean waste will be segregated and considered to be non-hazardous and non-radioactive if field screening results are negative A final RCRA determination for the visibly stained PPE/waste handling equipment will be based on an evaluation of corresponding sample results for pipe liquid, sludge, and or soil samples

Preliminary RCRA Status

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

Describe how waste will be stored/handled.

Visibly clean PPE/waste handling equipment that has no above-background radiation will be put in 55-gal drums and stored onsite until it can be disposed of as non-hazardous waste

__X__ RCRA: (90-Day Storage Requirement)

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

Visibly contaminated PPE/sampling equipment will be stored on site in sealed 55-gal drums. Its RCRA status will be based on the analytical results for the samples taken from the location where it was used

Preliminary Determination for Radioactivity

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

PPE/waste sampling equipment that has no above background radiation will be considered non-radioactive. Waste with above background radiation readings according to field screening will be considered low-level radioactive waste

Preliminary Radioactivity Status

__X__ Material is not radioactive

Describe how waste will be stored/handled

Visibly clean PPE/waste sampling equipment will be stored onsite in 5-gals drums until it can be disposed of as non-hazardous waste.

__X__ Material is radioactive

Describe the controlled area, labeling, and protection against inadvertent contamination

PPE/waste handling equipment with above background radiation levels will be stored onsite in sealed 55 gals drums labeled as radioactive waste

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1093/FU2	18-006	Underground Storage Tank

Specific Waste Type: Decontamination liquids (PPE/waste handling equipment)

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 eight 55-gal. drums.
Waste Packaging: The liquid will be placed inside 55-gallon drum and stored onsite until all analyses are completed.

Characterization Strategy

Description of Strategy:

The decontamination liquids will be characterized for RCRA based on the results of an analysis of grab liquid samples. One grab sample of the decontamination liquids will be analyzed for TAL metals, VOCs, SVOCs, and isotopic uranium. The decontamination liquids from this PRS will be segregated, placed in a separate drum and labeled with the PRS number. Further analyses may be required to meet the waste acceptance criteria of the TSD (potentially TA-50 or SWSC sewer plant) after the hazard and radioactive determinations are made for the decon. liquids.

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.)

A grab sample was selected because the waste is expected to be homogeneous. One sample from every other drum is considered sufficient to characterize this liquid waste.

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

Analytical Strategy

Analyte Category	Analytical Method	May be Present (yes, no, unknown)	Direct Sampling of Containerized Waste	Acceptable Knowledge Existing Information	Acceptable Knowledge Data from Proposed Site Characterization
Volatile Organic Constituents	SW 846 8260	Unk	X		
Semivolatile Constituents	SW 846 8270	Unk	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
1093/FU2	18-006	Uranium solution pipe
Specific Waste Type: Decontamination liquids(PPE/waste handling 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	SW 846 6010	Unk	X		
Total Cyanide		No		X	
Other Inorganic Constit (specify)		No		X	
High Explosive Constituents		No		X	
Asbestos		No		X	
TPH		No		X	
TCLP Metals		Unk		X	
TCLP Organics		No		X	
TCLP Pest. & Herb		No		X	
Gross Alpha	Field	Unk			X
Gross Beta	screen	Unk			X
Gross Gamma	"	Unk			X
Tritium[*]		No		X	
Gamma Spectro		No		X	
Isotopic Plutonium		No		X	
Total Plutonium		No		X	
Isotopic Uranium	HASL300	Unk	X		
Total Uranium		Unk		X	
Strontium-90		No		X	
Americium-241		No		X	

[*] 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
1093/FU2	18-006	Uranium solution pipe
Specific Waste Type: Decontamination liquids (PPE/waste handling 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.

The decontamination liquids are expected to be non-hazardous and non-radioactive. A final RCRA determination will be based on an evaluation of the analytical results for the decon. liquids.

Preliminary RCRA Status

__X__ Non-RCRA: (No 90-Day Storage Requirement)
Describe how waste will be stored/handled:
The decon. liquids will be stored onsite in sealed 55-gal. drums.

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

Preliminary Determination for Radioactivity

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

The decon. liquids are not expected to be radioactive. A final determination of their radioactive status will be based on the analytical results for the decon. liquids.

__X__ Material is not radioactive
Describe how waste will be stored/handled
The decon. liquids will be stored onsite in sealed 55-gal drums.

_____ Material is radioactive
Describe the controlled area, labeling, and protection against inadvertent contamination

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1093/FU2	18-006	Uranium solution pipe
Waste Types or Wastestreams: Pipe liquid, pipe sludge, cut pipe, pipe insulation, soil, PPE and waste handling equipment, and decontamination liquids (for PPE/waste handling equipment)		

Signatures:

Field Team Leader ____ 8/4/97

Field Team Waste Management Coordinator ____ 7-14-97

Waste Management Representative ____ 7/28/97

ANNEX 7.8

VCA CHECKLIST AND FIELD WORK AUTHORIZATION FORM

Voluntary Corrective Action (VCA)
Checklist and Fieldwork Authorization Form

PRS 18-006 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 [signature] Date 8/5/97

FPC [signature] Date 8/6/97

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

FPL [signature] Date 8/5/97

FPC [signature] Date 8/6/97

Through reviewing the VCA Plan, for site(s) 18-006 and believing that the above criteria have been met, I authorize the fieldwork to proceed.

DOE ER Program Manager [signature] Date 8/12/97

ANNEX 7.9

COST ESTIMATE FOR PRS 18-006

Plan Development	$ 22,000
Mobilization	$ 18,000
Cleanup	$115,000
Verification Sampling	$ 5,000
Lab Analyses/Waste Disposal	$ 19,000
Field Screening	$ 1,500
Site Restoration/Demobilization	$ 10,000
Reporting	$ 3,400
Total Cost	$193,900

8.0 REFERENCES

Environmental Restoration Project, October 1995. "RFI Report for Potential Release Sites 18-002(a-c), 18-003(a-h), 18-004(a,b), 18-005(a), 18-008, 18-010(b-f), 18-011, 18-012(a-c), 18-013, 27-002 (located in former Operable Unit 1093), Field Unit 2," Volumes I and II, Los Alamos National Laboratory Report LA-UR-95-3833, ER ID Nos. 52183 and 51854, Los Alamos, New Mexico. (Environmental Restoration Project 1995, 1283)

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