Department of Energy

Washington, DC 20585

OCT 4 - 2005

Mr. James Lister, P.E.
New York State Department of
Environmental Conservation
Division of Environmental Remediation
625 Broadway – 11th Floor
Albany, New York 12233-7015

Mr. Doug Pocze
Federal Facilities Section
Emergency and Remedial Response Division
U.S. EPA - Region II
290 Broadway - 18th Floor
New York, New York 10007-1866

Dear Mr. Lister and Mr. Pocze:

SUBJECT: BROOKHAVEN NATIONAL LABORATORY (BNL) INTERAGENCY AGREEMENT: OPERABLE UNIT 1, AREA OF CONCERN 1, FORMER HAZARDOUS WASTE MANAGEMENT FACILITY CLOSEOUT REPORT (FHWMF)

Enclosed are two copies of the subject document. This report incorporates all comments received from the regulatory agencies and includes the Oak Ridge Institute for Science and Education independent verification report and is now considered final.

If you have any questions, please contact me at (631) 344-3429 or Terri Kneitel of my staff at (631) 344-2112.

Sincerely,

Rodrigo V. Rimando, Jr.
Brookhaven Project Director
Office of Environmental Management

Enclosure
As Stated:

cc: J. Malleck, EPA, w/encl.
B. Youngberg, NYSDEC, w/o encl.
W. Parrish, NYSDEC, w/encl.
M. Spivak, NYSDEC, w/encl.
R. Mitchell, NYSDOH, w/encl.
M. Soucie, NYSDOH, w/encl.
A. Salamie-Alfie, NYSDOH, w/encl.
R. Snyder, NYSDOH, w/encl.
M. Trent, SCDHS, w/o encl.
E. Governale, SCDHS, w/encl.
S. Robbins, SCDHS, w/encl.
T. Kneitel, SC-BHSO, w/encl.
L. Hill, BSA, w/o encl.
T. Daniels, BSA, w/o encl.
S. Kumar, BSA, w/o encl.

ENVIROCON

CLOSEOUT REPORT

Former Hazardous Waste Management Facility
Soil Remediation
Brookhaven National Laboratory
Upton, New York

Prepared for:
Brookhaven Science Associates, LLC
Building No. 460
Upton, NY 11973
Prime Contract No. DE-AC02-98CH10886

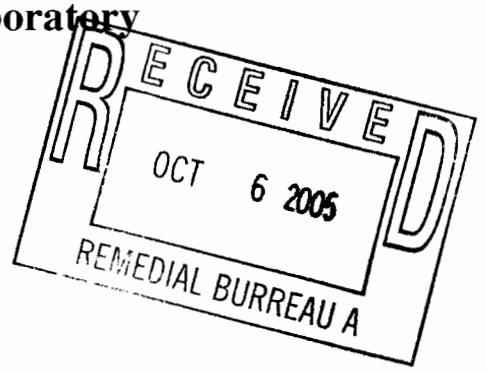
Prepared By:
Envirocon, Inc.
510 Heron Drive, Suite 208
Swedesboro, NJ 08085
Subcontract No. 88341

September 29, 2005

ENVIROCON

CLOSEOUT REPORT

Former Hazardous Waste Management Facility
Soil Remediation
Brookhaven National Laboratory
Upton, New York



Prepared for:
Brookhaven Science Associates, LLC
Building No. 460
Upton, NY 11973
Prime Contract No. DE-AC02-98CH10886

Prepared By:
Envirocon, Inc.
510 Heron Drive, Suite 208
Swedesboro, NJ 08085
Subcontract No. 88341

September 29, 2005

Executive Summary

The *Record of Decision – Operable Unit I and Radiologically Contaminated Soils (Including Areas of Concern 6, 8, 10, 16, 17, and 18)* (OU I ROD), dated August 1999, was developed by Brookhaven National Laboratory (BNL) for the U.S. Department of Energy (DOE). Specifically, the OU I ROD addressed contamination found at OU I and Areas of Concern (AOC)s 6, 8, 10, 16, 17 and 18. All the identified areas contained radiologically contaminated soils resultant from past waste handling operations, spills, or inadvertent use of contaminated soils for landscaping. The soils at the former Hazardous Waste Management Facility (HWMF) (AOC 1) had become contaminated with radionuclides as a result of leaks from past waste handling operations.

Soil cleanup objectives were established for this site and outlined in the OU I ROD. The soil cleanup objectives for radiological contamination were based on a dose, from remaining concentrations of all radionuclides present, of 15 millirem per year (mrem/year) above background considering 50 years of institutional control for industrial land use, per U.S. DOE Residual Radioactive Material Guideline Computer Code (RESRAD). The cleanup objective also was based on a 15 millirem per year dose to a future resident after 100 years of institutional control.

Remedial Action construction activities commenced in September 2004 and were completed during August 2005. The following summarizes the as-left conditions at the former HWMF and how they satisfy the requirements of the OU I ROD:

- The average Cs-137 and Sr-90 concentrations following remediation are 7.63 pCi/g and 1.51 pCi/g, respectively. The 95% upper confidence level (UCL) concentrations for Cs-137 and Sr-90 are 16.6 pCi/g and 5.3 pCi/g respectively.
- The dose to an industrial worker after 50 years of institutional controls is 1.8 mrem/yr and 4.0 mrem/yr using the average and 95% UCL concentrations, respectively. These annual dose projections are well below the 15 millirem per year cleanup goal in the OU I ROD.
- The dose to an industrial worker with no time for radioactive decay (i.e. present day) using the average and 95% UCL concentrations is 5.4 mrem/yr and 11.8 mrem/yr respectively. The dose to a resident after 50 years of institutional controls using average and UCL values are 6.1 mrem/yr and 14.5 mrem/yr. These additional dose projections indicate that the OU I ROD requirements are satisfied by a wide margin.

The former HWMF, AOC 1 meets all the completion requirements as specified in OSWER Directive 9320.2-09-A-P, *Closeout Procedures for National Priorities List Sites.* The affected areas were remediated in accordance with the decommissioning criteria of 10 CFR Part 834, Radiation Protection for the public and environment.

TABLE OF CONTENTS

FIGURES

TABLES

PHOTOGRAPHS

APPENDICES

ACRONYM LIST

ALARA	As Low As Reasonably Achievable
AOC	Area of Concern
AOI	Area of Interest
BNL	Brookhaven National Laboratory
CPM	Counts Per Minute
CERCLA	Comprehensive Environmental Response, Compensation & Liability Act
CY	Cubic Yards
DAC-Hr	Derived Air Concentration-Hour
DCGL	Derived Concentration Guideline Level
$DCGL_w$	Project Specific Derived Concentration Guideline Level
$DCGL_{EMC}$	Elevated Measurement Comparison Derived Concentration Guideline Level
DOE	Department Of Energy
DQO	Data Quality Objective
EMC	Elevated Measurement Comparison
EPA	United States Environmental Protection Agency
GPS	Global Positioning System
HWMF	Hazardous Waste Management Facility
HASP	Health and Safety Plan
IAG	Interagency Agreement
IH	Industrial Hygiene
ISOCS	In Situ Object Counting System
IVS	Independent Verification Survey
LBGR	Lower Bound of the Gray Region
MARSSIM	Muli-Agency Radiological Survey and Site Investigation Manuel
MVA	Mercury Vapor Analyzer
NaI	Sodium Iodide
NYSDEC	New York State Department of Conservation
ORISE	Oak Ridge Institute for Science and Education
USC	United States Code
OU	Operable Unit
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RCT	Radiological Controls Technician
RDIP	Remedial Design Implementation Plan
RESRAD	Residual Radioactive Materials Guidelines
RI	Remedial Investigation
ROD	Record of Decision
SI	Supplemental Investigation
STL	Severn Trent Laboratories
TCLP	Toxicity Characteristic Leaching Procedure
TLD	Thermoluminscent Dosimeter
WAC	Waste Acceptance Criteria
WCS	Waste Confirmation Sample

1.0 INTRODUCTION

1.1 Purpose

The purpose of this of this closeout report is to document the following at the former HWMF, BNL in accordance with *Closeout Procedures at National Priority List Sites, OSWER Directive 9320.2-09A-P* (EPA, June 2001):

- The excavation of contaminated soil above site cleanup goals;
- The removal of contaminated subsurface structures;
- The results of the final status survey and sampling, including Oak Ridge Institute for Science and Education (ORISE) independent verification survey and sampling results;
- The post closure dose assessment in accordance with the RESRAD;
- The characterization and disposal of soil and debris at Envirocare of Utah (Envirocare); and
- Site restoration.

BNL contracted Envirocon, Inc. to conduct the remaining remedial activities at the former HWMF, designated as AOC 1 within OU I, in accordance with the OU I ROD and the *Remedial Action Work Plan, Operable Unit I, Area of Concern 1, Former Hazardous Waste Management Facility* (BNL, March 2003). The scope of the remedial work was outlined in detail in the *Remedial Design Implementation Plan, Operable Unit I, Area of Concern 1, Former Hazardous Waste Management Facility Remedial Action Work Plan* (BNL, March 2004) and is identified throughout this document as the Former HWMF Soils Removal Project.

Previously completed work is listed in Section 2.0. The scope of work for the Former HWMF Soils Removal Project included the following:

- Remove radiologically and chemically contaminated soils above prescribed cleanup goals;
- Remove sub-surface storage structures;
- Package on-site, transport, and dispose of radiologically and chemically contaminated soils and debris off-site at a permitted facility;
- Collect and analyze endpoint samples to ensure cleanup goals have been achieved;
- Perform Final Status Surveys;
- Perform site restoration per the BNL project specification documents; and
- Prepare a dose assessment and a closeout report.

1.2 Site History and Regulatory Framework

BNL site is located in Suffolk County, New York, and is comprised of approximately 5,320 acres. Approximately 900 acres are developed. The U.S. Army occupied the BNL site, formerly Camp Upton, during World Wars I and II. Between the wars, the Civilian Conservation Corps operated the site. It was transferred to the Atomic Energy Commission in 1947, to the Energy Research and Development Administration in 1975, and to the U.S. DOE in 1977. A map illustrating the location of the BNL site is presented as Figure 1-1.

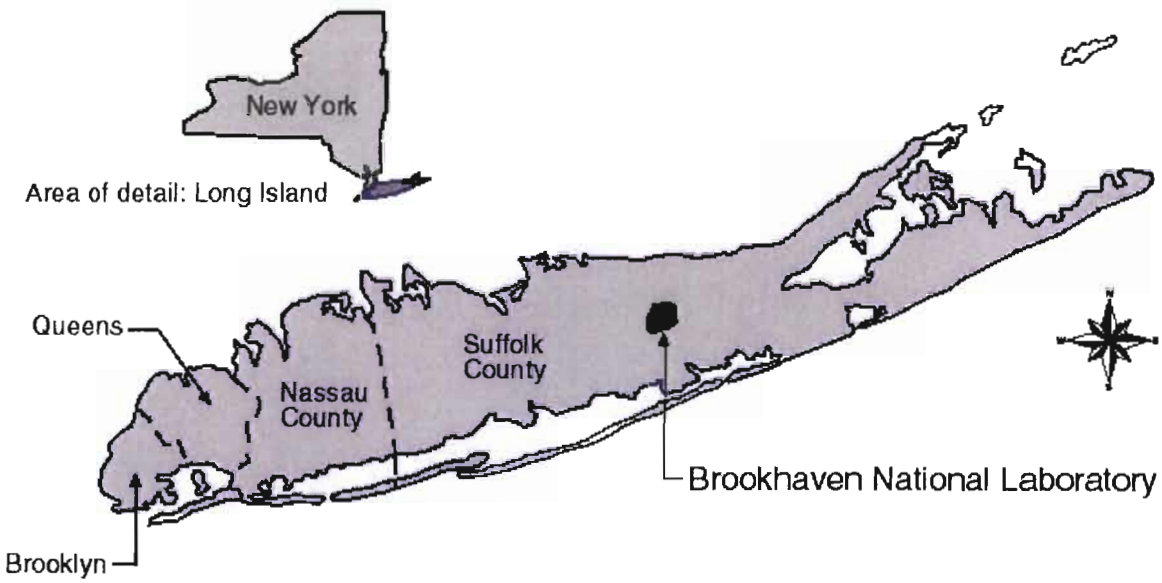


Figure 1-1. Brookhaven National Laboratory location.

In 1980, the BNL site was placed on New York State's Department of Environmental Conservation (NYSDEC) list of Inactive Hazardous Waste Sites. On December 21, 1989, the BNL site was included on the EPA's National Priorities List because of soil and groundwater contamination that resulted from BNL's past operations. Subsequently, the EPA, NYSDEC, and DOE entered into a Federal Facilities Agreement (herein referred to as the Interagency Agreement; [IAG]) that became effective in May 1992 (Administrative Docket Number: II-CERCLA-FFA-00201) to coordinate the cleanup.

The IAG identified AOCs that were grouped into OUs to be evaluated for response actions. The IAG requires a remedial investigation/feasibility study (RI/FS) for OU I, pursuant to 42 United States Code (USC) 9601 et. seq., to meet Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) requirements. An RI was performed at BNL by CDM in 1996 and IT in 1999. An FS was prepared by CDM in 1999. These studies are discussed further in Section 1.4.

BNL's *Site Baseline Report* (SAIC, 1992) grouped the identified AOCs into seven OUs; several were subsequently combined. This closeout report documents completion of the remedial action for AOC 1 (former HWMF) within OU I.

The former HWMF was used from the 1940s to 1997 as the central receiving facility for processing, limited treatment (neutralization), and storage of radioactive waste, hazardous waste, and mixed waste generated at BNL. The former HWMF operated as a Resource Conservation and Recovery Act (RCRA) permitted facility from 1992 until it underwent RCRA closure in 1998. As a result of several spills of hazardous and radioactive materials during operations at the former HWMF, the soils became contaminated with levels of cesium-137 (Cs-137), strontium-90 (Sr-90), mercury, and lead above cleanup goals established in the OU I ROD.

1.3 Operable Unit I Background

As part of remedial efforts at BNL, 30 AOCs were identified and grouped into seven OUs. The seven OUs were subsequently reduced to six OUs as a result of combining OU II and OU VII into OU II/VII. A map illustrating the BNL site and the OUs is presented as Figure 1-2.

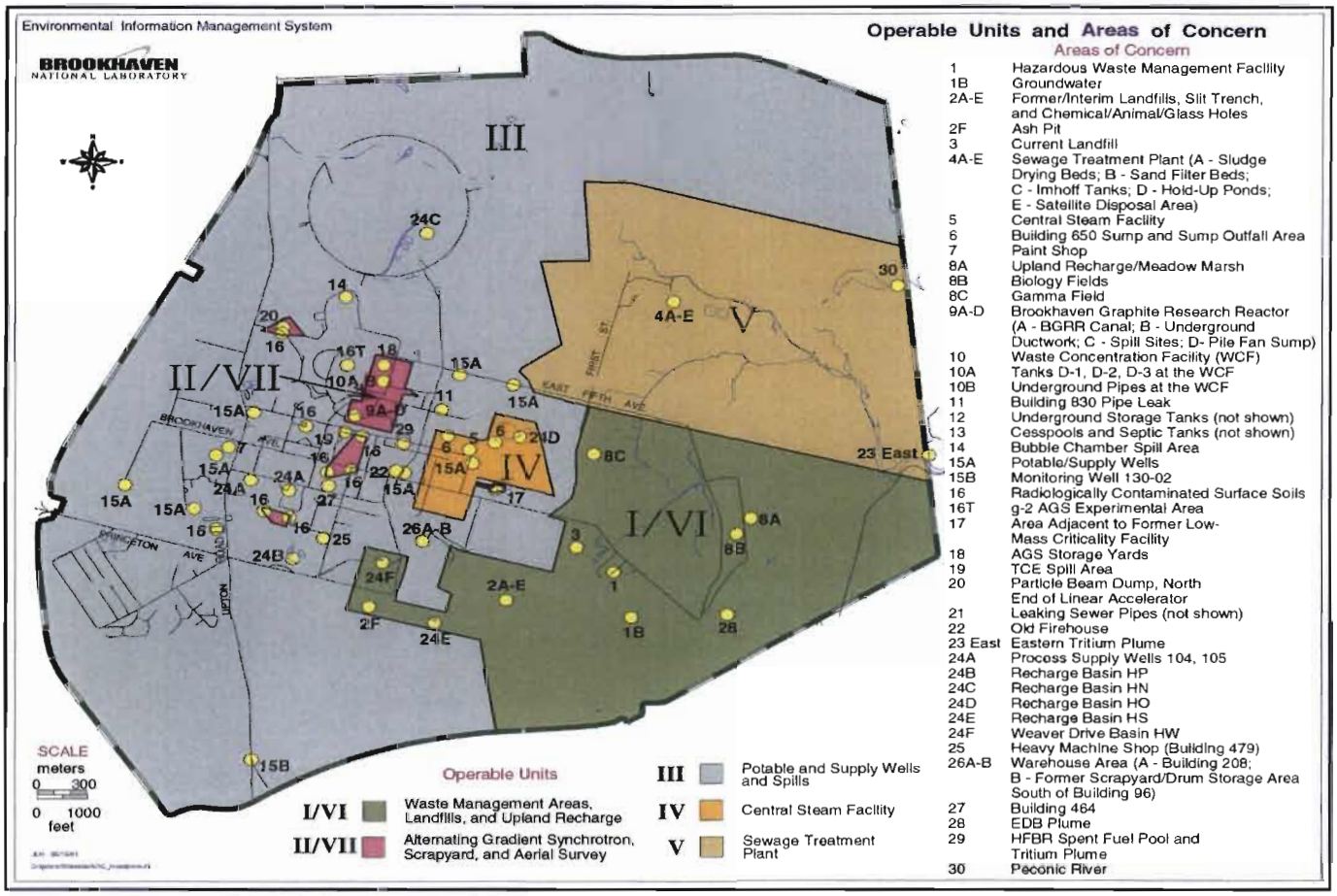


Figure 1-2. BNL's Operable Units.

The OU I ROD addressed AOCs grouped under OU I, including radiologically contaminated soils from AOCs 6, 8, 10, 16, 17, and 18. OU I sites include the former HWMF (AOC 1), Ash Pit (AOC 2F), Wooded Wetland (AOC 3), Upland Recharge/Meadow Marsh (AOC 8), and Recharge Basins HS and HW (AOC 24E and 24F). Radiologically contaminated soil was the principal threat addressed in the OU I ROD. The majority of the radiologically contaminated soil containing the highest contaminant levels was located at the former HWMF.

1.3.1 Former HWMF - AOC I

The former HWMF is located in the southeastern portion of the BNL site (Figure 1-3). It comprises about 12 acres (Figure 1-4). There were various buildings and former operational areas within the former HWMF. Approximately three acres were paved or contained buildings, and the remaining nine acres are open space or wooded.

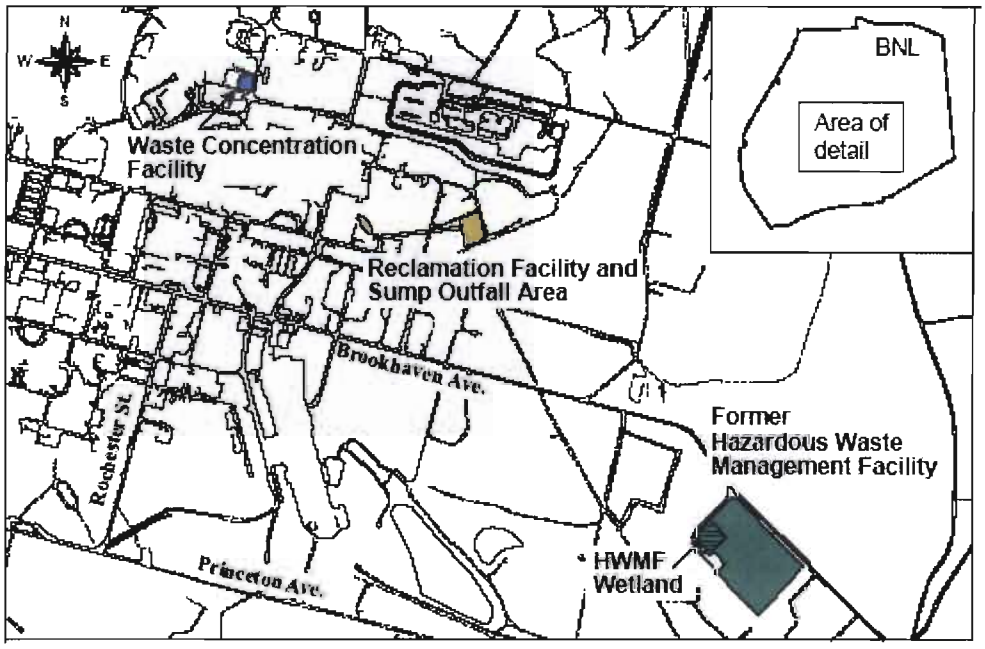


Figure 1-3. Former HWMF location.

In the northwestern portion of the former HWMF is a shallow wetland that seasonally ponds. It encompasses an area of approximately two acres, half of which lies inside the boundary of the former HWMF fence line. The wetland is shown on the National Wetland Inventory Mapping and was delineated as a federal wetland under Section 404 of the Clean Water Act. The NYSDEC regulates the wetland as a breeding ground for the Tiger Salamander, a New York State endangered species. The wetland received surface runoff from the former HWMF area, and as a result, the wetland sediment was contaminated with concentrations of Cs-137 above the cleanup goals established in the OU I ROD.

There were eight buildings and structures located at the former HWMF that were used for various chemical and/or radioactive operations and storage:

- 444 Building – Old Chemical Building (including the incinerator)
- 445 Building – Former HWMF Office Building/High Bay Shop
- 446 Building – Radioactive-waste Sorting Barn
- 447 Building – Rigging Shed/Equipment Storage Building
- 448 Building – Chemical Receipt Back Barn (Radioactive/Mixed waste storage)
- 483 Building – Chemical Storage Building
- 625 Structure – Detonation Area Viewing Bunker
- Sprung / Tent Structure

Above grade structures and buildings at the former HWMF were removed during the summer of 2003. Only the building slabs remain. This work is documented in the *Former Hazardous waste Management Facility Decontamination and Decommissioning Closeout Report* (BNL, November 2003). The building slabs are further discussed in Sections 3.4 and 3.5.

1.4 Remedial Investigation/Feasibility Study

An RI was conducted at BNL by CDM in 1996 and IT in 1999. An FS was prepared by CDM in 1999. The former HWMF (AOC 1) was included in the OU I RI. The RI was performed to evaluate the nature and extent of contamination, as well as the potential risks associated with the areas of concern. Several investigative approaches were utilized including radiological surveys, soil/sediment sampling, surface water sampling, and test pits.

Baseline chemical and radiological risk assessments were performed as part of the RI Report. A preliminary screening of ecological risks and a focused ecological risk assessment (including an addendum to the focused ecological risks assessment) were also completed. To further delineate soil, sediment, and asphalt contamination addressed in the RI, BNL also conducted a Supplemental Investigation (SI) at the former HWMF in 2003.

1.4.1 Supplemental Investigation Findings

Soil, sediment, and asphalt samples were collected based on data gaps and the radiological walkover survey results. Samples were analyzed for gamma emitting isotopes and Sr-90 using an on-site In Situ Object Counting System (ISOCS) and Beta Scintillation, respectively. In addition to ISOCS and Beta Scintillation analyses, samples were collected and analyzed for Toxicity Characteristic Leaching Procedure (TCLP), alpha isotopes, Total Lead, and polychlorinated biphenyls (PCBs).

As part of the SI, a radiological survey was performed using a Ludlum 2221 detector w/44-10 sodium Iodide probe attached to the Trimble Pro XR Global Positioning System (GPS). The results of this survey and additional pre-excavation walkover surveys are further discussed in Section 3.1.

Based on the RI and SI, Cs-137 and Sr-90 were detected in the former HWMF asphalt and soil above the cleanup goals of 67 pCi/g and 15 pCi/g, respectively. Maximum detected concentrations for Cs-137 and Sr-90 were 810,000 pCi/g and 1,300 pCi/g, respectively. Mercury was also detected above the cleanup goal of 1.84 mg/kg in soils in the vicinity of a UIC and its associated piping with a maximum concentration of 184 mg/kg (discussed further in Section 3.3.4). Detected radionuclides and chemical contaminants are listed in Table 1-1.

TABLE 1-1
Radionuclides Detected in AOC 1 Former HWMF (Including the Wetland)

Radionuclide	Maximum Concentration (pCi/g)	Representative Site Value[1] (pCi/g)	Cleanup Goal[2] (pCi/g)
Am-241	11	4.6	160
Cs-137	810,000	3,958	67
Co-60	6.5	0.4	3,356
Pu-238	0.18	0.06	274
Pu-239/240	19	3.4	170
K-40	20	7.0	NA[3]
Sr-90	1,300	29	15
H-3	54	0.2	9.6×10^{15}
U-235	21	7.4	29
U-238	2.8	0.73	11

[1] Representative site values were determined as follows: 25% percentile of the difference between the maximum and minimum value chosen to represent the site value given that the data is log normally distributed.
[2] Remediation goals were developed from RESRAD analyses reported in the OU I FS Report, March 1999. Cs-137 and Sr-90 are the only isotopes specified in the ROD.
[3]Not applicable – no remediation goal established for K40.

TABLE 1-1 Cont.
Chemical Contaminants of Concern in Sediment/Surface Soils for AOC 1 Former HWMF (Including the Wetland)

Chemical	Maximum Concentration (mg/kg)	Cleanup Goal (mg/kg)
Lead	4010	400
Mercury	184	1.84

2.0 SITE BACKGROUND

The following is a chronology of the main remedial events and the associated plans for AOC 1, the former HWMF:

- August 1999 - *OU I Record of Decision*
- October 2000 - *Remedial Design and General and Supplemental Specifications for Remedial Action, Operable Unit I Contaminated Soil and Debris*
- 2000-2002 - Aboveground waste in storage removed
- December 2001 - *Decommissioning Plan for the Former Hazardous Waste Management Facility Buildings and Structures*
- July 2002 - *Characterization and Waste Management Plan for the Former Hazardous Waste Management Facility Buildings and Structures*
- 2002 - Characterization field work for the decommissioning of the former HWMF buildings and structures
- March 2003 - *Remedial Action Work Plan, Operable Unit I, Area of Concern 1, Former Hazardous Waste Management Facility*
- April 2003 - *Supplemental Investigation Plan, Former Hazardous Waste Management Facility, Soil, Asphalt, and Debris*
- May 2003 - *Former Hazardous Waste Management Facility Decontamination and Decommissioning Characterization Report*
- June-July 2003 - SI field work
- July-September 2003 - Building decommissioning and decontamination field work, including removal of contaminated asphalt and underground storage tanks (UST)
- September 2003 - *Supplemental Investigation Report, Former Hazardous Waste Management Facility, Soil, Asphalt, and Debris*
- November 2003 - *Former Hazardous Waste Management Facility Decontamination and Decommissioning Closeout Report*
- March 2004 - *Remedial Design Implementation Plan, Operable Unit 1, Area of Concern 1, Former Hazardous Waste Management Facility*
- September 2004–August 2005 - Excavated contaminated soil above cleanup goals and removed contaminated subsurface structures
- March-August 2005 - Performed final status survey

2.1 OU I ROD Findings

The OU I ROD addresses contamination at AOCs 6, 8, 10, 16, 17, and 18. These areas contained radiologically contaminated soils resultant from past waste handling operations, spills, or inadvertent use of contaminated soils for landscaping. Soils at the former HWMF (AOC 1) became contaminated as the result of waste handling operations

and spills. Contamination was present in the form of Cs-137, Sr-90, Ra-226, lead, and mercury.

As a result of the OU I ROD findings, the DOE determined that remedial actions were required for several AOCs. The remedial actions for the former HWMF (AOC 1) included the excavation and disposal of radiological, mercury, and lead contaminated soil and wetlands sediment/surface soil to meet prescribed cleanup goals, as well as the removal and disposal of out-of-service facilities, tanks, piping, and equipment.

The OU I ROD established the following remedial objectives:

- Minimize threats to human health and the environment from site contaminants;
- Prevent or minimize the leaching of contaminants from the soils into the underlying aquifer as a result of the infiltration of precipitation;
- Prevent or minimize the migration of contaminants present in surface soils via surface runoff and windblown dusts;
- Prevent or minimize human exposure including direct external exposure, ingestion, inhalation, and dermal contact (for future residents, trespassers, site workers, and construction workers) and environmental exposure to contaminants in the surface and subsurface soils; and
- Prevent or minimize the uptake of contaminants present in the soils by ecological receptors.

The OU I ROD presented six alternatives for the remediation of contaminated soils and provided a comparative analysis of each alternative. The selected remedy was the excavation and off-site disposal of radiologically contaminated soils above cleanup goals, as well as the implementation of institutional controls. In addition, some associated structures would be removed as part of remedial efforts.

2.2 Site Cleanup Criteria

The radiological contaminants of concern at the former HWMF were CS-137, Ra-226, and Sr-90. The cleanup goals for specific radionuclides at the former HWMF were calculated using RESRAD, 15 millirem per year (mrem/yr) above background (*OSWER Directive 9200.4-1., EPA, 1997*), industrial land use with 50 years of institutional control, and residential land use with 100 years of institutional control by the DOE. The EPA's acceptable risk range of $1x10^{-4}$ to $1x10^{-6}$ was also set as a cleanup criterion for the former HWMF remedial action. In addition, the NYSDEC cleanup guideline of 10 mrem/yr, from Technical Administrative Guidance Memorandum (TAGM) 4003, was considered. The primary radiological isotope present at the site was Cs-137; its cleanup goal established in the OU I ROD is 67 picocuries per gram (pCi/g).

The potential for radiologically contaminated soil to impact groundwater also was considered. A soil cleanup goal for Sr-90 was calculated as 15 pCi/g, based on its potential to impact the groundwater. The goal also protects both residential and industrial uses. A 5-pCi/g-cleanup goal was selected for Radium-226 (Ra-226) based on DOE

Order 5400.5, *Radiation Protection of the Environment and the Public.*

The chemical contaminants of concern at the former HWMF were mercury and lead. The cleanup goal established for mercury is 1.84 milligrams/kilograms (mg/kg), based on the EPA's soil screening level guidance (*OSWER Directive 9355.4-23*) for protecting groundwater and residential use. A cleanup goal of 400 mg/kg for lead was also chosen based on the EPA's soil screening level guidance; this level is protective of residential use.

2.3 Design Criteria

Technical specifications and design criteria for the Former HWMF Soils Removal Project were developed in response to the evaluation of remedial actions described in the OU I ROD. The remedial approach and associated reference documents for the former HWMF were presented to Envirocon as part of BNL's contract document package.

The remedial design, presented in the *Remedial Design and General and Supplemental Specifications for Remedial Action Operable Unit I Contaminated Soil and Debris* (URS, October 2000), the *Remedial Action Work Plan, Operable Unit I, Area of Concern 1, Former Hazardous Waste Management Facility* (BNL, March 2003), and the *Remedial Design Implementation Plan, Operable Unit 1, Area of Concern 1, Former Hazardous Waste Management Facility* (BNL, March 2004) was developed by BNL to satisfy the requirements specified in the OU I ROD. The remedial design was developed in compliance with federal, state, and local regulatory requirements.

The remedial design included:

- A plan and process for ensuring the total exposure from all radioisotopes does not exceed 15 mrem/yr above background following the 50-year period for institutional control for the site;
- A method for instituting an ALARA analysis to identify cost effective measures for reducing exposure to residual contamination below cleanup goals;
- Methods to reduce waste volumes that require offsite disposal;
- An evaluation of waste acceptance criteria for offsite disposal to determine whether further stabilization of mixed wastes is required;
- An approach for post-remediation sampling to confirm that cleanup goals have been achieved; and
- An evaluation of transport and shipping regulations.

2.4 Community Relation Activities

A Community Relations Plan was completed for BNL in September 1991. In accordance with this plan and CERCLA sections 113 (k)(2)(B)(I-v) and 117, the community relations program focused on distribution of public information and community involvement. Community relations activities include a stakeholders' mailing list, community meetings, availability sessions, site tours, and workshops. An Administrative Record was established to document the basis for selecting the remedial actions at BNL. This record, as well as current site reports, press releases, and fact sheets are maintained at the BNL Research Library, Building 477A, Upton, N.Y., 11973.

The Administrative Record is also kept at the EPA's Region II Administrative Records Room, 290 Broadway, New York, N.Y., 10007-1866.

In accordance with CERCLA guidance and state requirements the project work plan, quality assurance plan, engineering evaluation/cost analysis, risk assessment, remedial investigation, and feasibility study were made available for public review. A full discussion of BNL's community involvement programs is presented in the OU I ROD.

3.0 CONSTRUCTION ACTIVITIES

All pre-construction tasks were completed prior to excavating, including equipment mobilization, radiological walkover surveys, site inspections, excavation area mark-outs, silt fence installation, and securing the general work area.

As noted in Section 1.3.1, above grade structures and buildings at the former HWMF were removed during the summer of 2003 leaving only the building slabs. The objective of the Former HWMF Soils Removal Project was to safely characterize, remediate, and dispose of radiologically and chemically contaminated soil, sediment, and debris in accordance with the OU I ROD, as well as the project specific plans. During the course of conducting walkover surveys at the site, it was noted that several of the building slabs that remained from the previous building removal project exhibited elevated gamma count rates. Subsequently, BNL conducted additional remediation of the building slabs. Following the additional remediation activities on building slabs, a final status survey and dose assessment was performed by Envirocon. The final status survey was independently verified by ORISE. This work is further discussed in sections 3.4 and 3.5. Final status surveys were completed using the *Multi-Agency Radiological Survey and Site Investigation Manual* (*MARSSIM*) guidelines.

Soils and subsurface structures at the former HWMF were divided into 11 areas designated A-K. These areas were further divided into survey units in accordance with the *MARSSIM* guidelines for survey unit classification and size. A survey unit is a physical area of structure or land area of specified size and shape for which a separate decision will be made on whether or not cleanup goals are met. Soils contaminated

above cleanup goals and sub-surface structures were designated as Class 1 survey units. The maximum suggested area for Class 1 soil area survey units is 2,000 square meters (m^2). Areas A and C-K were divided into nine (9) Class 1 survey units as shown on Figure 3-1. A site map showing the planned Class 1 and 2 survey units is presented as Figure 3-2. The *MARSSIM* classifications are discussed in further detail in Section 3.5.3.

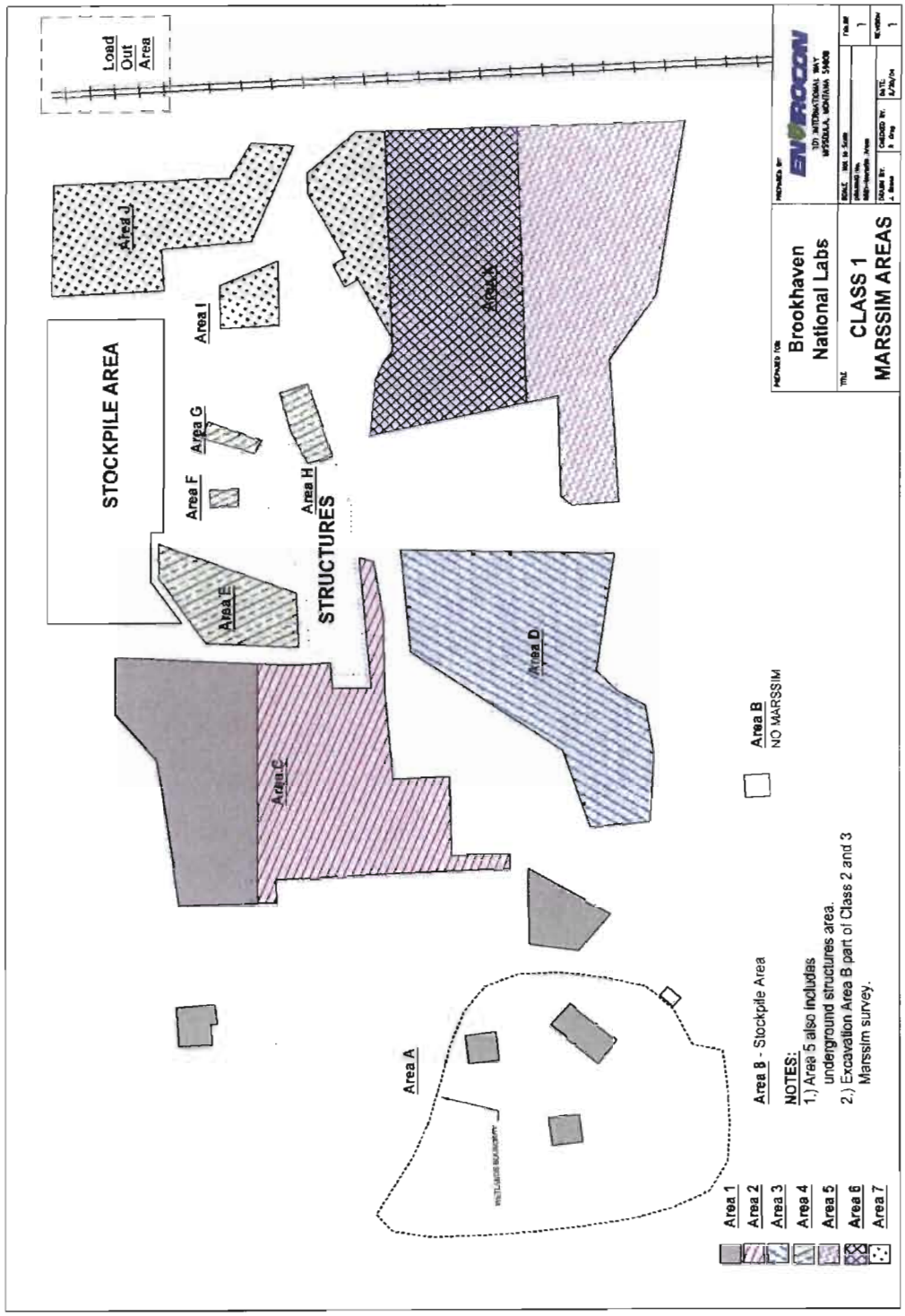


Figure 3-1. Nine (9) Planned MARSSIM Class 1 excavation areas.

3.1 Field Screening Prior To Excavation

During the SI work, seasonal standing water and extensive vegetation prohibited the completion of a radiological walkover survey in the wetlands area. A radiological walkover survey was performed in this area prior to the start of excavation activities. The survey was performed using Ludlum Model 2221 scaler/ratemeters used in conjunction with collimated two-inch-by-two-inch Sodium Iodide (NaI) detectors. Results from this radiological walkover survey and the SI walkover survey are presented as Figure 3-3.

3.2 Soil Excavation

Prior to the start of remedial activities, survey units were surveyed and marked out by Municipal Land Survey in accordance with the *Remedial Design Implementation Plan, Operable Unit I, Area of Concern 1, Former Hazardous Waste Management Facility* (BNL, March 2004) and the *Remedial Action Field Sampling Plan, Area of Concern 1, Former Hazardous Waste Management Facility* (Envirocon, October 2004). Soil and sediment were removed with an excavator and placed into a front-end loader bucket. Excavated materials were then either staged in an onsite soil stockpile, or direct loaded into railcars for shipment and final disposal at Envirocare of Utah (Envirocare).

According to the OU I ROD, the planned excavation volume for the Former HWMF Soils Removal Project was 35,000 CY. In process site characterization performed under the SI significantly reduced the estimated excavation volume. A total of 15,300 CY of soil and debris were shipped for disposal. Radiological surveys and onsite ISOCS analyses performed during remedial activities dictated the decreased excavation volume. In addition, an estimated 900 CY of contaminated soil was not excavated due to the planned future activities discussed below.

An area located in the northeast portion of the former HWMF was initially slated for remediation under the Former HWMF Soils Removal Project; however, a decision was subsequently made by BNL to de-scope that area, as it would be used for staging materials from other from remedial actions at BNL prior to being loaded into railcars for shipment and disposal. The estimated 900 CY of contaminated soil, designated as the Waste Loading Area on Figure 3-7-1, was not excavated as a result of this change in scope. The Waste Loading Area will be remediated in accordance with the cleanup goals specified in the OU I ROD upon the completion of waste loading activities associated with the demolition and decontamination work at BNL's reactors. An as-left radiological walkover survey of the Waste Loading Area was performed and is included as Appendix F.

Photograph 1 – Soil removal at the former HWMF.

Soils contaminated above cleanup goals for Cs-137 and Sr-90 were excavated in one-foot lifts unless prescribed excavation depths were one foot or less. In these cases initial excavation lifts were slightly less than one foot. After each lift, excavations were surveyed with a collimated NaI gamma scintillation detector. Further excavations were guided by the radiological survey results.

Except in several isolated areas where Sr-90 concentrations exceeded those of Cs-137 (Refer to Section 3.5.3 for the discussion on those areas), Cs-137 was the primary radiological contaminant that drove the remediation of the site. As a result, gamma count rates using field instruments (NaI gamma scintillation detectors) were used to identify areas requiring excavation to meet the site cleanup goals. An excavation action level of approximately 20,000 counts per minutes (cpm), uncorrected for background gamma count rates, was established as the criterion for determining when excavations were complete. This criterion was determined using a correlation between data from field radiological surveys, onsite ISOCS analyses, and offsite gamma spectroscopy analyses at Severn Trent Laboratories (STL). Correlation curves for instrument response and measured soil activity are presented as Figures 3-4 and 3-5.

Photograph 2 – Excavating and surveying at the former HWMF.

Survey units with levels of lead and mercury above cleanup goals were excavated to prescribed depths. In areas where chemical and radiological contamination were commingled, radiological surveys determined the final excavation depth and endpoint samples were collected to ensure cleanup goals were met for chemical contaminants. If endpoint sample results were above the project cleanup goals for lead and mercury, additional excavating was performed until endpoint concentrations were below those goals. Areas where soil was contaminated with lead and mercury concentrations above cleanup goals are shown on Figure 3-6. A map showing the final dimensions of the Class 1 and Class 2 survey units is presented as Figure 3-7-1.

3.3 Sub-surface Storage Structure Removals

In addition to excavating soils, several sub-surface storage structures were removed at the former HWMF. These structures included concrete and steel waste trenches, as well as corrugated, concrete, and clay pipes used for waste storage referred to as vertical holes and slant holes. Three additional structures were discovered and removed during remedial activities, referred to as discovered underground structures. Approximately 490 CY of waste debris from the removal of sub-surface storage structures was size reduced and loaded into rail cars for disposal at Envirocare. Waste debris was size reduced to

meet the Envirocare Waste Acceptance Criteria (WAC). The locations of sub-surface structures are shown on the former HWMF site plan (Figure 1-4).

3.3.1 Trenches

Nine trenches were removed during remedial activities at the former HWMF, designated as C1 through C9. The soil adjacent to each trench was excavated until the structure was fully exposed. Excavated soils were surveyed in accordance with project soil screening procedures. Approximately 570 CY of soil were shipped for disposal.

A concrete crusher was used to remove and dismantle each trench. In addition to concrete, several of the trenches were lined with a steel jacket. Trench debris, including steel and concrete, was segregated, surveyed, and size reduced with a shear prior to being loaded into railcars for shipment and final disposal at Envirocare. Approximately 200 CY of trench debris were shipped for disposal.

Photograph 3 – Uncovering trench at the former HWMF.

3.3.2 Slant Holes and Vertical Holes

Eight slant holes (A-1 through A-8) and sixteen vertical holes (B-1 through B-16) were removed during remedial activities at the former HWMF. The slant holes consisted of

either corrugated or steel pipe. The vertical holes consisted of either vitrified clay or concrete pipe. Prior to removal, a fixative spray was applied to the walls and bottoms of each structure, followed by an injection of a sand and cement grout to prevent the spreading of loose contamination. Overburden soils were excavated, surveyed, and segregated in accordance with project soil screening procedures. Soils contaminated above cleanup goals were either stockpiled or direct loaded in rail cars for disposal. Soils below cleanup goals were set aside and later used as backfill. Approximately 110 CY of soil were used as backfill and approximately 1,000 CY of soil were shipped for disposal.

Photograph 4 – Applying fixative to slant-holes at the former HWMF.

After each structure was exposed, it was removed with an excavator and size reduced. The waste debris, including corrugated pipe, concrete, steel, and vitrified clay was surveyed and segregated prior to being loaded into railcars for shipment and final disposal. Slant holes debris was placed in supersacks for contamination control purposes due to the presence of removable alpha activity (discussed below) prior to loading the material into railcars. Approximately 20 CY of slant holes debris and 20 CY of vertical holes debris were shipped for disposal.

Due to the presence of dispersible alpha contamination on piping associated with slant holes A-1 and A-2, additional controls were implemented during sizing and packaging operations. These controls included establishing a designated sizing area where the

ground was covered with geotextile and plastic as well as managing the dispersible alpha contamination with water during sizing and packaging activities. In addition, representative samples were collected from these pipes to ensure compliance with the Envirocare WAC. These sample results are summarized in Section 3.6.1.

Elevated gamma dose rates of 1000 mrem/hr at contact were observed at the bottom of vertical hole B-4. The source was later determined to be two small Sr-90 needles. Upon the establishment of the proper radiological controls, the two Sr-90 needles were removed from the excavation area. As a result of BNL's activity estimate for Sr-90 of 180 micro curies, it was determined the objects did not meet Envirocare's WAC. The Sr-90 needles were transferred to the BNL Waste Management Division for disposition, and later transported to Los Alamos National Laboratory for final disposal.

Photograph 5 – Removal of vertical hole at the former HWMF.

3.3.3 Discovered Sub-surface Structures

Three additional sub-surface structures were encountered during remedial activities in Excavation Areas C and D, as shown on Figure 1-4. Each structure consisted of a steel trench approximately 22 feet (ft) long, 2 ft wide and 3 ft deep. The tops of the structures were at or just below grade. A four-course concrete block wall surrounded the sub-surface portions of the structures. The structures were filled to grade with soil.

Photograph 6 – Discovered sub-surface structure as the former HWMF.

The soils inside and adjacent to each structure were excavated until the four walls were fully exposed. Excavated soils were surveyed and in accordance with project soil screening procedures. Approximately 160 CY of soil adjacent to the structures were shipped for disposal.

The structures were removed and dismantled with a concrete crusher. Structure debris, including steel and concrete, was size reduced with a shearer and segregated prior to being loaded into railcars for shipment and final disposal. Approximately 50 CY of debris were shipped for disposal from the discovered sub-surface structures.

3.3.4 Building 444 Drywell and Building 445 Septic Tank/Leach Field

The Building 444 drywell and Building 445 septic tank were previously removed during the building decommissioning and decontamination field work. This work is documented in the *Former Hazardous Waste Management Facility Decontamination and Decommissioning Closeout Report* (BNL, November 2003). The Building 444 drywell was included in the final status survey as part of Excavation Area A, and included in the ORISE independent verification survey. The final status survey is discussed further in Section 3.5.

The Building 445 leach field, located southwest of Building 445 (see Figure 3-6), was excavated as part of the Former HWMF Soils Removal Project. The clean soil above the percolation pipes was excavated and stockpiled to the south of the leach field. Approximately one foot of contaminated soil was excavated from the leach field and stockpiled inside the former HWMF for disposal with other waste soil from the site.

Post-excavation samples were collected and analyzed for total mercury. Hot spots that were above the project cleanup goal for mercury were re-excavated and re-sampled until the results were below the project cleanup goal. The associated endpoint sample results are presented in Table 3-8.

3.4 Concrete Slab Remedial Actions

Radiological surveys of the five building slabs (444, 445, 446, 448, and 447) and the concrete slab between excavation areas C and E (C/E Concrete Slab) were performed with a Ludlum Model 2221 scaler/ratemeter with a collimated two-inch-by-two-inch NaI detector in accordance with the project surveying procedures. Initial survey results indicated elevated gamma count rates that are summarized below in Table 3-1. Locations of the building slabs are illustrated on Figure 1-4.

Table 3-1
Initial Concrete Slab Radiological Survey Results

Building Slab No. or Description	Approx. Surface Area (ft^2)	Approximate Range of Gamma Count Rate (NaI 2x2)
444	1628	10,000 to 200,000 cpm
445	3774	5,000 to 30,000 cpm
446	1650	35,000 to 70,000 cpm
447	576	2,000 to 6,000 cpm
448	1575	30,000 to 300,000 cpm
C/E Concrete Slab	192	7,000 to 46,000 cpm

Portions of buildings slabs 444, 445, 446, 448 were determined to require further remedial action. The initial remedial action consisted of scabbling the surface (approx. one-quarter to three-quarter inch) of the concrete slabs. Isolated residual contamination was evident on a portion of the Building 448 slab after scabbling. This area of concrete was removed with a jackhammer. In addition, a small section of the northwest corner of the Building 445 slab was removed with the use of a backhoe. Approximately 10 CY of concrete slab debris was removed, loaded into railcars, and shipped to Envirocare for final disposal.

3.5 Final Status Surveys and Sampling

This section describes the methodology used for evaluating the concentrations of radiological and chemical contaminants of concern after completion of remediation activities. In addition, results of radiological surveys and analytical results for radionuclides and chemical contaminants are provided from soil sampling activities conducted during the course of the remediation of the site.

The primary scope of the project was remediation of contaminated soils, asphalt road areas, and removal of subsurface structures that were radiologically impacted from previous operations at the former HWMF.

As indicated in Section 3.2, excavation of radiologically contaminated soils was controlled by conducting excavation surveys with collimated gamma scintillation detectors. Gamma count rates were used to determine when the excavations were complete in each area. During excavation activities walkover surveys were performed and samples were collected and analyzed for Cs-137 using the onsite ISOCS unit. In addition, areas known to contain elevated Sr-90 concentrations were sampled and analyzed by beta scintillation or gas flow proportional counting methods to confirm that cleanup goals were met prior to initiating the final status survey. Following completion of the excavation surveys, a complete (100% coverage) GPS-based walkover survey was conducted using the collimated NaI scintillation detectors to document that radiological status of the survey unit.

Following completion of the walkover survey in each area, soil sampling was conducted to determine the post-remediation concentrations for the radionuclides of concern and to verify that the dose-based criteria established for the site had been met. For areas where chemical contaminants, i.e., mercury and lead, were present (based on SI data), soil sampling was also conducted to verify that cleanup goals for these contaminants were met. All soil samples were collected at depth of 0 to 6 inches from the bottom of the excavation in accordance with BNL EM-SOP-601, *Collection of Soil Samples, Rev. 1* (BNL, March 2003).

The residual radiological contamination that was present on concrete building foundations and structures within the fenced portion of the former HWMF was also evaluated. Final status surveys and dose assessments conducted for the building slabs are described in this section, as well as Section 3.7. The Waste Loading Area described in Section 3.2 was not included in the final status survey design; however the site conditions in this area were documented upon completion of the Former HWMF Soils Removal Project. An as-left radiological walkover survey of the Waste Loading Area is included as Appendix F.

3.5.1 Acceptance Criteria

This section provides the radionuclide-specific acceptance criteria for the land areas at the former HWMF. The following references were used to develop the FSSP, acceptance criteria and ALARA analysis:

- MARSSIM, NUREG-1575, Rev.1, August 2000.
- NUREG-1549, July 1998, Decision Methods for Dose Assessment to Comply With Radiological Criteria for License Termination, NRC.

- NUREG/CR-5512, October 1999, Vol. 3, Residual Radioactive Contamination From Decommissioning. Parameter Analysis. Draft Report for Comment, NRC.

- RG DG-4006, August 31, 1999, Demonstrating Compliance with the Radiological Criteria for License Termination.

- NUREG-1727, September 15, 2000, NMSS Decommissioning Standard Review Plan.

- NUREG-1757, September 2002, Consolidated NMSS Decommissioning Guidance. Decommissioning Process for Materials Licensees.

- Argonne National Laboratory (ANL), July 2001, User's Manual For RESRAD Version 6, ANL/EAD-4, Argonne, IL.

- ANL, 1993, Data Collection Handbook to Support Modeling the Impacts of Radioactive Material in Soil, ANL/EAIS-8, Argonne, IL.

Radionuclides of Concern

A review of the *Remedial Action Field Sampling Plan, Area of Concern 1, Former Hazardous Waste Management Facility* (Envirocon, October 2004), RESRAD models previously performed for the site, former HWMF operational monitoring, and other historical documents and procedures was performed to identify all of the radionuclides potentially used at the site. The primary radionuclides of concern, based on exposure potential, were Sr-90, Cs-137 and Ra-226. Other radionuclides of concern that were monitored a include Am-241, Pu-238, Pu-239/240, U-234, U-235, U-238 and tritium.

Derived Concentration Guideline Level (DCGL) for Soil

The cleanup goal for radionuclides in soil was based on a total effective dose equivalent limit of 15 millirem per year above background as suggested in *Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination* (OSWER Directive 9200.14-18) (EPA, August 1997). Cleanup levels were calculated using the RESRAD computer code, 15 millirem per year, the assumed future land use (industrial land use with 50 years of institutional control and residential land use with 100 years of institutional control), and 50 to 100 years of continued DOE control.

The results of the radiological soil analyses for each survey unit were subjected to a hierarchy of analyses and statistical testing to determine whether the survey unit met the cleanup goals established for the site. First, survey units were identified that had 100% of the individual sample results below the $DCGL_w$. Second, the average value for each of the primary radionuclides was determined and compared to the $DCGL_w$. Third, a determination of whether Ra-226 was present in concentrations above normal background levels was performed. Fourth, the analytical data for each survey unit was evaluated to determine if the sum of the fractions was below 1.

For survey units with one or more individual sample results above the $DCGL_w$, additional statistical evaluations were used to determine whether the survey units met the specified cleanup goals. The Elevated Measurements Comparison (EMC) test was applied first. If the data set did not pass the EMC test, the Sign test was then used to determine whether the survey unit met the cleanup goals.

MARSSIM provides release criteria adjustments for elevated localized total contamination based on dose modeling of smaller areas. Such adjustments are made by applying "area factors" in an EMC test. This has also been referred to as "Hot Spot Criteria". Table 3-2 presents area factors (based upon *MARSSIM* guidance) to be used for elevated measurement comparisons and to determine sampling requirements in situations where the scan instrument's minimum detectable concentration is greater than the appropriate $DCGL_W$. The appropriate $DCLG_{EMC}$ values are calculated by multiplying the appropriate $DCGL_W$ and the area factors presented in Table 3-2.

$$DCGL_{EMC} = \text{Area Factor} * DCGL_W$$

The elevated measurement criterion is only applicable to Class 1 areas since elevated activity exceeding the $DCGL_W$ is not expected in Class 2 areas. For Class 1 soil survey units, individual activity measurements above the $DCGL_w$ may be allowed, providing the appropriate statistical evaluations are successfully completed.

One of these statistical tests to be performed for survey units with individual measurements above the $DCGL_w$ is the EMC or "sigma" test. The survey unit is considered to meet the EMC test if the formula meets the criterion specified in the following formula:

$$\frac{\delta}{DCGL} + \frac{(\text{average concentration in elevated area} - \delta)}{(\text{area factor for elevated area})(\text{DCGL})} < 1$$

The value of δ is the average of the measurements outside of any elevated areas. A separate term is included for each elevated reading exceeding the $DCGL_W$.

Based on the development of hot spot criteria for the site, small areas of elevated radioactivity (above the $DCGL_w$) were allowed to remain, provided the levels of contamination and the size of the areas of elevated radioactivity fell within the hot spot criteria. Table 3-2 lists the hot spot criteria for Cs-137. Table 3-3 lists the hot spot criteria for Sr-90.

TABLE 3-2
MARSSIM Hot Spot Criteria for Cs-137

Max. Area (m^2)[1]	Area Factor[2]	Allowable Hot Spot Soil Conc. (pCi/g Cs-137)
1000 m2	1.1	74 pCi/g
300 m2	1.3	87 pCi/g
100 m2	1.4	94 pCi/g
30 m2	1.7	114 pCi/g
10 m2	2.4	161 pCi/g
1 m2	3.0	200 pCi/g

[1] Assumes a total survey unit area of 10,000 m^2
[2]From *MARSSIM* Table 5.6

TABLE 3-3
MARSSIM Hot Spot Criteria for Sr-90

Max. Area (m^2)[1]	Area Factor[2]	Allowable Hot Spot Soil Conc. (pCi/g Sr-90)
1000 m2	1.23	18.5 pCi/g
300 m2	4.07	61.1 pCi/g
100 m2	11.9	179 pCi/g
30 m2	38.2	573 pCi/g

[1]Assumes a total survey unit area of 10,000 m^2
[2]For Sr-90, area factors were not available in the *MARSSIM*; therefore area factors were calculated using the same methodology as described therein for the other nuclides.

The release criteria for land areas are the average activity concentrations in soil (pCi/g) that correspond to the dose-based radiological criteria of 10 CFR, part 834. The limits are radionuclide specific and the sum of fractions (unity rule) must be applied to show compliance with the acceptance criteria. Tables 3-2 and 3-3 present the area factors (based on *MARSSIM* guidance) to be used for EMC for Cs-137 and Sr-90, respectively. The appropriate $DCGL_{EMC}$ values are calculated by multiplying the appropriate $DCGL_w$ by the appropriate area factors provided in these tables.

3.5.2 Survey Objective

The final status survey of each Class 1 and Class 2 survey units were designed in accordance with Chapter 5 of the *MARSSIM* and employed a triangular grid system. In the discussion that follows, the number of soil samples in a given survey unit is n.

The mean survey unit Cs-137, Ra-226 and Sr-90 concentrations were determined for each survey unit by calculating the weighted average of the n samples from that unit. If xi ±

σi is the Cs-137 concentration and its uncertainty for the ith sample in a survey unit, then the mean $\overline{x}$ and its uncertainty $\overline{\sigma x}$ for that survey unit are:

$$\overline{x} = \frac{1}{n}\sum_{i=1}^{n} xi \text{ and } \overline{\sigma x} = \frac{1}{n}\sqrt{\sum_{i=1}^{n} \sigma i2}$$

All uncertainties are determined at the 95 percent confidence level (two standard deviations).

The mean survey unit Sr-90 concentration average $\overline{y}$ and its uncertainty $\overline{\sigma y}$ and the mean survey unit Ra-226 concentration average $\overline{z}$ and its uncertainty $\overline{\sigma z}$ were determined similarly.

The value D for use in applying the unity rule and its uncertainty σD are:

$$D = \frac{\overline{x}}{67 pCi/g - 1} + \frac{\overline{y}}{15 pCi/g - 1}; \text{ and}$$

$$\sigma D = \sqrt{\left(\frac{\sigma x}{67 pCi/g - 1}\right)^2 + \left(\frac{\sigma y}{15 pCi/g - 1}\right)^2}$$

Figure 3-8 (from *MARSSIM* Figure D.3) illustrates the decision rule, except that the value 1 substitutes for the DCGL in the figure. The measurement distribution of D, f(δ), is centered at D, the true value of the application of the unity rule. This distribution is shown in the lower graph of Figure 3-8.

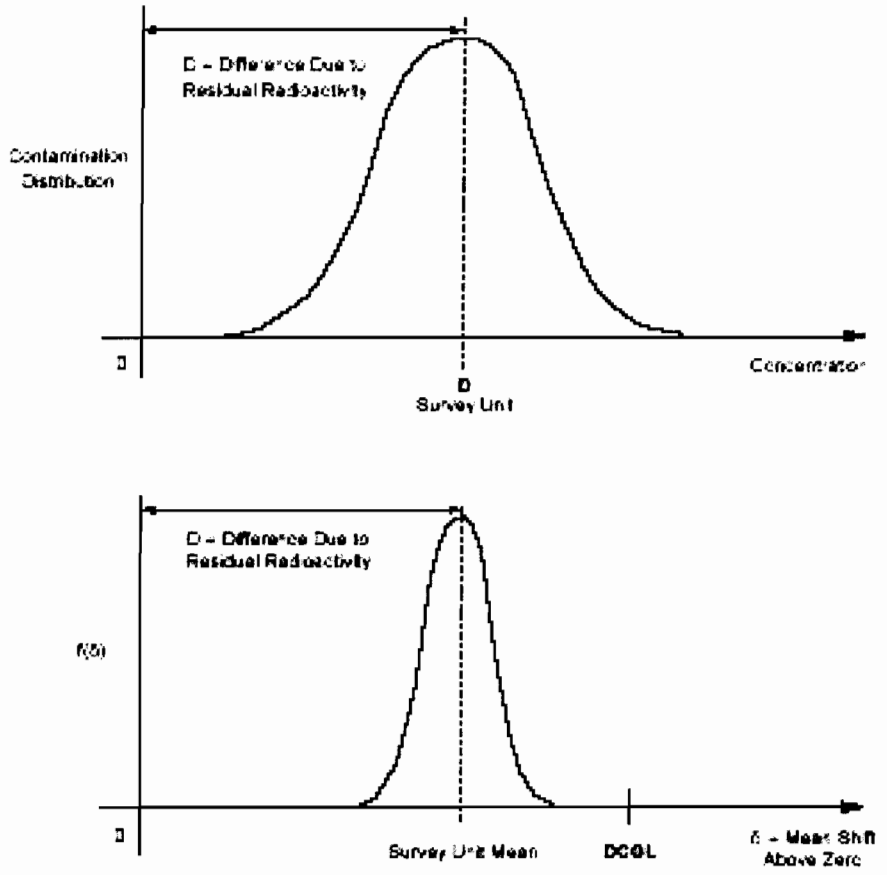


Figure 3-8. Decision Rule Graph.

As stated in *MARSSIM* Appendix D, "If f(δ) lies far to the left (or to the right) of [D = 1] [see *MARSSIM* Figure 5-1], a decision of whether or not the survey unit demonstrates compliance can be easily made. However, if f(δ) overlaps [D = 1], statistical decision rules are used to assist the decision maker."

Therefore, application of the results of the above calculations and the alternative actions leads to the following decision rules:

- If $\sigma D \leq 1 - D$ for a survey unit, then that survey unit meets the unity rule criterion at the 95 percent confidence level. No further action is required.

- If $-\sigma D \leq 1 - D \leq +\sigma D$ for a survey unit, then the survey of that survey unit is inconclusive at the 95 percent confidence level. An additional statistical test (the Sign test) is then used, as described in the *MARSSIM*. If the Sign test is also inconclusive, BNL personnel, in coordination with stakeholders and regulatory authorities, will decide the next course of action. Suggested further actions include spot remediation with or without periodic monitoring, or periodic monitoring until contamination has decayed and met the unity rule criterion.

- If $1 - D \leq -\sigma D$ for a survey unit, then that survey unit does not meet the unity rule criterion at the 95 percent confidence level. BNL personnel, in coordination with stakeholders and regulatory authorities, will decide the next course of action. Either land use restrictions with periodic monitoring until contamination has decayed and met the unity rule criterion or additional remediation followed by a another final status survey may be required.

The measured gamma count rates, exposure rates, and BetaScintTM results were compiled and analyzed similarly to provide additional information for the decision-making process. However, soil sample analytical results provided the primary data for decision-making.

Final status surveys were performed to demonstrate that average residual radioactivity levels within each survey unit meet the applicable acceptance criteria. The principal features of the final status survey land area protocol applied at the area are discussed in this report and include:

- Hypothesis Testing;
- Acceptable Decision Error Rates;
- Sign test;
- Establishing Radiological Background;
- Locating Discrete Soil Samples; and
- Scanning.

Hypothesis Testing

To provide statistically robust decisions regarding survey unit acceptability with respect to achieving the unrestricted use acceptance criteria approved for the survey area, the paired hypothesis testing approach was used. The paired hypotheses are the null, H_O, and alternative, H_A statements. The null hypothesis H_O poses that the measured average residual contamination in a survey unit *exceeds* the remedial objective (i.e., the $DCGL_W$ activity concentration). The complementary alternative hypothesis H_A presumes that the measured average residual contamination in a survey unit is *at or below* the remedial objective. The outcome of hypothesis testing was used to ascribe a statistically based level of confidence or probability to the decision made regarding the "true" as-left condition of a survey unit.

A Type I decision error occurs when the null hypothesis is rejected when it is true and is sometimes referred to as a false positive error. The probability of making a Type I decision error, or the level of significance, is denoted by alpha (α). Alpha reflects the amount of evidence the decision maker would like to see before abandoning the null hypothesis and is also referred to as the size of the test.

A Type II decision error occurs when the null hypothesis is accepted when it is false. This is sometimes referred to as a false negative error. The probability of making a Type

II decision error is denoted by beta (β). The term ($1 - \beta$) is the probability of rejecting the null hypothesis when it is false and is also referred to as the power of the test.

Decisions made from the results of the final status survey were based primarily on radioanalysis of soil samples for Cs-137, Ra-226 and Sr-90 concentrations. Experience indicates that uncertainties in the analytical data are significantly less than the $DCGL_w$s. This means that application of the decision rules with uncertainties at the 95 percent confidence level provides a 5 percent probability for both alpha and beta, neglecting the uncertainty in the $DCGL_w$s.

Decision Error Rates

Survey unit radiological measurement data were used to objectively determine the success or failure of the remediation work, i.e., whether the "true" as-left radiological condition is at or below ("success"), or above ("failure"), the applicable remedial objective. This final status survey determination framework for the cleanup area are depicted in the matrix below.

Hypothesis Testing Matrix for Survey Unit Final Status Survey Measurement Decisions

		Survey Unit Decision	
	Hypothesis	*"Success"* (Reject H_O)	*"Failure"* (Accept H_O)
"True" Condition of the Survey Unit	**H_A** Meets remedial objective (e.g., at or below $DCGL_W$ value)	No decision error (probability = $1 - \alpha$)	Incorrectly fail to release survey unit (Type II error with probability = β)
	H_O Exceeds remedial objective (e.g., exceeds $DCGL_W$ value)	Incorrectly release survey unit (Type I error with probability = α)	No decision error (probability = $1 - \beta$)

"*Success*" means that the null hypothesis H_O can be rejected and, therefore, the alternative hypothesis H_A is to be accepted at a decision error confidence interval of ($1 - \alpha$). The rejection of H_O also means that there is a very small likelihood (equal to the interval α) that the "success" decision is incorrect. Similarly, "*failure*" means that H_O is accepted (and H_A rejected) at a decision error confidence interval of ($1 - \beta$), with again a small likelihood (equal to β) that the failure decision is incorrect.

The error control Data Quality Objective (DQO) confidence intervals selected for the remediation area are $\alpha = 0.05$ for Type I errors and $\beta = 0.05$ for Type II errors. The Type

I error control DQO was selected because decisions regarding the success of remediation efforts directly affect the sustained protection of human health and environmental resources. The same DQO is used to cap conservative Type II decision errors because it is also important to limit unwarranted remediation.

The results of the statistical analysis are presented in Section 3.5.4.

3.5.3 Final Status Survey Design

Based on the size of the former HWMF and the duration of radiological operations that were conducted there, the entire portion of the site was considered as radiologically impacted. Those areas known or subsequently found to contain contamination levels above the cleanup goals (described below) were designated as Class 1 survey units in accordance with the *MARSSIM* guidelines. Remaining areas within the fenced portion of the site were designated as Class 2 survey units. This determination is supported by previous site characterization data and the presence of isolated hot spots in various areas throughout the site.

A two-step approach to cleanup confirmation for radiological soil contamination was followed using the *MARSSIM* approach at the former HWMF. The first step consisted of a GPS-based gamma scintillation walkover survey of remediated areas. Gamma walkover surveys were conducted using collimated two-inch-by-two-inch NaI detectors in conjunction with a Ludlum Model 2221 scaler/ratemeters, in accordance with the project soil screening procedures. The second step involved the collection of soil samples for on-site and offsite analysis to verify that residual radiological contamination levels were sufficiently low to meet the cleanup goals established for the site.

Class 1 survey units were established for soil remediation areas that contained radiological contamination above the cleanup goals prior to remedial activities. These were comprised of areas where soils and sub-surface structures were removed. The suggested maximum size area for a Class 1 survey unit is 2000 m^2 for soil areas. A total of 15 Class 1 survey units were established for the final status survey of soil excavation areas.

Class 2 survey units included areas that had the potential to become contaminated, but were not expected to exceed cleanup goals. A conservative survey approach was taken by classifying all areas inside of the fenced in former HWMF as Class 1 or Class 2 survey units even though not all of these areas were considered potentially contaminated. The suggested maximum size area for a Class 2 soil survey unit is 10,000 m^2. A total of 3 Class 2 survey units were established for the final status survey.

A random-start triangular grid patter for establishing the sample locations was set up in each survey unit. The spacing and number of sample locations in each survey unit was established using *MARSSIM* guidelines and Visual Sampling Plan (VSP) software.

Based on a series of ISOCS measurements of soil samples collected at the former HWMF during the early part of the project, the sample variability sigma (σ) was expected to be

18 pCi/g for Cs-137 soil contamination measurements in the Class 1 survey units. The Cs-137 $DCGL_w$ is 67 pCi/g and the Lower Bound of the Gray Region (LBGR) is 6.7pCi/g (Scan MDC value). The delta (Δ) is therefore 60.3. This corresponds to a relative shift (Δ/σ) of 3.35 and sample size of 14 using *MARSSIM* Table 5.5, using an error rate of 0.05 for both α and β. In accordance with the *MARSSIM* guidelines, an additional 20% was added to this value, which results in a sample density of approximately 17 samples per survey unit. Based on the size and configuration of the individual survey unit, slight adjustments in sample size were made for selected Class 1 survey units. Using the identical methodology as used for the Class 1 survey units, a sample size of 14 samples was calculated for Class 2 survey units.

Initial (starting point) sample locations for each survey unit were identified in the field with the aid of site landmarks. Subsequent sample locations were determined by taking field measurements with a tape measure or rope that had been cut to length to identify the proper spacing. The boundaries of the Class 1 and Class 2 survey units, as well as the associated sample locations are presented as Figure 3-7-1.

Surface soil samples were collected from the land surface to 6 inches (15 centimeters) below the surface in accordance with BNL EM-SOP-601, *Collection of Soil Samples, Rev. 1* (BNL, March 2003). The minimum volume per sample was one liter. Samples were thoroughly mixed and manually compacted as they were containerized into Marinelli beakers. Vegetation, animal matter, and rocks were excluded from the samples as much as reasonably possible.

Samples were immediately identified and labeled. The attached label included the sample ID number and date.

The sample identification code was SS05YYZZ, where "SS" denoted "surface soil sample," "05" refers to the year 2005, "YY" is the designator for the survey unit or reference area sampled, and "ZZ" is the sequential number to designate the samples. The location where each sample was collected was immediately cross-referenced with its sample identification code in project onsite records to assure proper correlation between analytical results and locations when the project report is prepared.

Sample results were averaged over a survey unit, samples were relatively large, disposable sample equipment was used, and any contribution of cross-contamination to uncertainties were negligible in comparison with statistical uncertainties in analysis results. Therefore, extensive cleaning of sampling equipment was not required. However, care was taken to prevent the transfer of sample material between samples from the same survey unit. No sample preparation steps were performed during the collection of the surface soil samples other than removal of non-soil material (grass, sticks, rocks, etc.).

Each sample collected to represent the final status of each survey unit was analyzed for Cs-137, Sr-90, and Ra-226. In addition, a single composite sample (composed of equal-sized aliquots from each of the discrete grab sample locations for each survey unit) was also prepared and analyzed for Am-241, Pu-238, Pu-239/240, U-234, U-235, U-238 and tritium.

In addition, there were several smaller areas within the former HWMF where characterization data indicated that Sr-90 was present in soil at higher concentrations than Cs-137. Additional Sr-90 sampling was performed in these areas to verify that additional excavation for Sr-90 was not required. These sample locations are illustrated on Figure 3-9.

Samples collected during the SI indicated that concentrations of Sr-90 could be found below the design excavation depth in the SB-37, SB-38, and SB-40 areas presented on Figure 3-9. Samples were collected in these areas with the use of a hand auger at the excavation depth indicated in the *Remedial Design Implementation Plan, Operable Unit 1, Area of Concern 1, Former Hazardous Waste Management Facility* (BNL, March 2004). Sr-90 results for these samples were 0.01 pCi/g, 0.12 pCi/g, and 0.07 pCi/g respectively.

The survey plan for concrete building slabs included fixed-point gamma count rate measurements at a distance of 1 meter above the surface of the slabs to approximate the whole body dose. The number and spacing of measurement locations was determined in accordance with *MARSSIM* guidelines. A total of 13 Class 1 survey units were established for the final status survey of the concrete slabs. The dimensions of the concrete slabs and the associated radiological survey points are presented as Figures 3-10-1 through 3-10-6. A summary of the radiological survey results is included as Appendix D.

A Class 1 survey was also performed on a soil pile containing material that was segregated during excavation activities to be later used as backfill for site restoration. In accordance with *MARSSIM* guidelines, the pile (65'x 30') was considered a single Class 1 survey unit. The sampling locations and dimensions for the clean soil pile are presented as Figure 3-11-1. The walkover survey results are presented as Figure 3-11-2.

Endpoint sample locations for Mercury and Lead were chosen in accordance with the *Remedial Design Implementation Plan, Operable Unit I, Area of Concern 1, Former Hazardous Waste Management Facility* (BNL, March 2004) and the *Remedial Action Field Sampling Plan, Area of Concern 1, Former Hazardous Waste Management Facility* (Envirocon, October 2004). These samples were shipped to STL for offsite analyses. Mercury and Lead sample locations are presented as Figure 3-6.

3.5.4 Final Status Survey and Sampling Results

The results of the final status radiological walkover survey exhibit count rates below 20,000 cpm for nearly all areas within the former HWMF and are less than 15,000 cpm for approximately 95% of the area. The 20,000 cpm count rate was determined to approximate the cleanup goal for Cs-137 in soil (67 pCi/g). Areas remaining that exceed 20,000 cpm, which were all less than 1 m^2 in size, are well within the hot spot criteria described above. The results from the final status radiological walkover survey are presented as Figure 3-7-2.

The results of soil sample results for each Class 1 and Class 2 survey unit are summarized in Table 3-4. According to the final status survey sample results, average concentrations for Cs-137 and Sr-90 are well below the cleanup goals of 67 pCi/g and 15 pCi/g, respectively. In addition, no sample results exceeded the cleanup goal of 5 pCi/g for Ra-226. Further, the results of the Ra-226 analyses indicate concentrations are at background levels. The site background level was previously determined to be 0.56 pCi/g (CDM, 1996). The average concentration measured at the former HWMF (based on 333 measurements) was 0.49 pCi/g.

All of the survey units also met the unity rule, i.e., the average Cs-137 concentration divided by its cleanup goal, plus the average concentration of Sr-90 divided by its cleanup goal was less than unity.

Of the fifteen Class 1 survey units, nine survey units had 100% of the individual sample results fall below the cleanup criteria for the three primary radionuclides of concern. Of the three Class 2 survey units, two survey units had 100% of the individual sample results fall below the cleanup criteria for the three primary radionuclides of concern.

There were seven survey units that had one or more individual sample locations that exceeded the cleanup goals for Cs-137 or Sr-90. The EMC test was run for survey units A, C3, D3, D4, K3, K4 and Z3. The size of the elevated measurement concentration area was determined by the ratio of the number of the total sample measurements that exceeded the $DCGL_w$ divided by the total number of sample locations times the area of the survey unit. This value was divided by the area factor in Table 3-2 (for Cs-137) or Table 3-3 (for Sr-90) to determine Sigma. The results of the EMC test are shown in the Table 3-5 below. As indicated in the table, some of the survey units failed this test. Consequently, they were subjected to the Sign test in order to determine whether these survey units met the applicable cleanup goals.

Table 3-5
Summary of EMC Test Results

Survey Unit	Radionuclide	Size of EMC Area (m^2)	Size of Survey Unit (m^2)	Area Factor	Sigma[1]
A	Sr-90	63	2000	3.9	.48
C3	Cs-137	45	675	1.2	.95
D3	Cs-137	80	1436	1.2	.90
D3	Sr-90	80	1436	2.2	1.01
D4	Sr-90	224	2014	1.2	1.87
K3	Cs-137	78	1405	1.2	.91
K4	Cs-137	44	741	1.2	1.23
Z3	Cs-137	416	5829	1.2	1.22

[1]Pass criteria is any value less than or equal to one.

Survey unit C3, D3, K3, K4 and Z3 each had a single Cs-137 result that was above 67 pCi/g. The Cs-137 concentrations above the cleanup goal were 74 pCi/g, 71 pCi/g, 72

pCi/g, 96 pCi/g and 95 pCi/g, respectively. The average Cs-137 concentration for each of these survey units was well below the Cs-137 cleanup goal. Although these results are well within the Cs-137 hot spot criteria specified in Section 3.5.1, further statistical analysis of the data was performed.

In accordance with the *MARSSIM* guidelines, the Sign test was used to determine whether the survey units met the cleanup goal as a whole. Each of the five survey units had a critical value that was greater than the critical value specified in Table I.3 of *MARSSIM* for $\alpha = 0.05$. Since the critical values exceed the specified critical value for the sample size used, the null hypothesis (that the survey unit does not meet the cleanup goal) is rejected. Therefore further remediation of these survey units was not warranted.

There were three survey units that had one or more sample results that were greater than the cleanup goal of 15 pCi/g for Sr-90. Concentrations detected above the remediation goal were as follows. Survey unit A had a single sample result of 20.1 pCi/g. Survey unit D3 had a single sample result of 32.1 pCi/g. Survey unit D4 had two Sr-90 sample results above the cleanup goal. One sample result was 43.5 pCi/g and the second was 81.1 pCi/g. The average Sr-90 concentration for each of these survey units was well below the Sr-90 cleanup goal; however, further statistical analysis of the data was performed.

For survey units A, D3 and D4, a Sign test was performed in accordance with the *MARSSIM* guidelines. Survey unit A had a sample size of N=32. The critical value for this sample size at an Alpha value of 0.05 (95 percent confidence interval), is 21, per *MARSSIM* Table I.3. Both survey units D3 and D4 had a sample size of N=18. The critical value for this sample size is 12. The critical value for survey unit A was 31. Critical values for survey units D3 and D4 were 17 and 16, respectively. Since the critical values exceed the specified critical value for the sample size used, the null hypothesis (that the survey unit does not meet the cleanup goal) is rejected. Therefore further remediation of these survey units was not warranted. The Sign test results are summarized in Table 3-6 below.

Table 3-6
Summary of Sign Test Results for Survey Units with Individual Sample Results Above the $DCGL_w$.

Survey Unit	Sample Size (N)	Radionuclide	Critical Value	MARSSIM Table I.3 Criterion
A	32	Sr-90	31	21
C3	15	Cs-137	14	11
D3	18	Cs-137, Sr-90	17	12
D4	18	Sr-90	16	12
K3	18	Cs-137	17	12
K4	17	Cs-137	16	12
Z3	14	Cs-137	13	10

A summary of the statistical tests for each survey unit is presented as Table 3-7.

In addition, composite sample results for alpha-emitting isotopes Am-241, Pu-238, Pu-239/240, U-238, U-235 and U-234, and tritium are were present below detection limits or at very low concentrations, i.e., less than 1 pCi/g. The composite samples were created by taking an equal size aliquot from each soil sample within the survey unit. Each composite sample was homogenized prior to analysis. While specific cleanup goals were not established for these isotopes, the resultant concentrations for all radionuclides for which sampling was conducted (excluding Ra-226 and other uranium series radionuclides, which are at background concentrations) were included as input to the RESRAD computer code used to conduct the radiological dose assessment for the project. This dose assessment is further discussed in Section 3.7.

Radioanalytical results for each sample collected are provided in Appendix A.

Chemical results for soil samples analyzed for mercury and lead also indicated that residual soil concentrations for these contaminants are within the respective cleanup goals for these contaminants, i.e., 400 mg/kg for lead and 1.84 mg/kg for mercury. The results of the chemical soil sampling are provided in Table 3-8.

3.5.5 Final Status Survey Conclusions

As indicated above, results of the final status survey and sampling following the completion of the remediation of the site demonstrate conformance to the site cleanup goals established in the OU I ROD and the former HWMF project plans. For each of the eighteen survey units, the average concentrations were within the specified $DCGL_w$ values for Cs-137, Sr-90 and Ra-226. Each survey unit also met the sum of the fractions criteria established as specified in the RI/FS and OU I ROD documents. Finally, the concentrations of isolated sample results that exceeded the $DCGL_w$ were shown to meet the $DCGL_{EMC}$ criteria and/or they passed the Sign test. Based on these results, each survey unit is determined to meet the cleanup goals established for the site.

Conformance with the radiological dose objective of 15 mrem/yr and the NYSDEC TAGM cleanup guideline of 10 mrem/yr is discussed in Section 3.7.

3.5.6 Final Status Survey Independent Verification

Independent Verification Surveys (IVSs) were conducted by an ORISE survey team. The ORISE survey team conducted surveying and sampling during three separate trips that were designed to support BNL by performing in process surveys of the completed survey units.

The first site visit occurred on April 17, 2005. During this visit, samples were collected from Survey Unit A. Seven samples were collected of the sediment from the bottom of the wetlands area.

A second ORISE site visit occurred from June 13-17, 2005. During this site visit, a complete walkover survey was conducted of Class 1 Survey Units A, C-1, C-2, C-3, D-1, D-2, D-3, D-4, D-5, D-6, and L and Class 2 survey units Z-1 and Z-2. In addition a total of 65 samples were collected.

A final ORISE site visit occurred from August 9-11, 2005. During this site visit, a complete radiological walkover survey was conducted of Class 1 Survey Units K1 through K4, Class 2 Survey Unit Z-3, and remediated hot spot locations within Class 1 Survey Unit C-1.

Results from these sampling events are presented in a separate ORISE Report included as Appendix E.

3.6 Waste Management

3.6.1 Waste Characterization and Handling

The waste management strategy, waste characterization, packaging, handling, and storage were performed in accordance with the *EM Waste Management Plan* (BNL, January 2002), the *Remedial Design Implementation Plan* (PWGC, March 2004), the *Waste Management Plan for the Former Hazardous Waste Management Facility Soil Remediation* (Envirocon, August 2004), and the *BNL Standard Based Management System*. Excavated soil and debris contaminated above cleanup goals were either stockpiled or direct loaded into railcars for shipment to Envirocare for final disposal. Small quantities of contaminated water were solidified with Waste Lock 770 or Zap Zorb and mixed with waste soils to be loaded and shipped for final disposal at Envirocare. Lime was temporarily used as a drying/solidifying agent for moist waste soils, however this practice was discontinued due to the resulting increase in soil pH levels. This issue is further discussed in Section 9.0.

Photograph 7 – Stockpiled waste soils at the former HWMF.

Photograph 8 – Loading railcars with waste soil at the former HWMF.

Waste verification sampling for soil and debris disposal was performed, in accordance with the *EM Waste Management Plan* (BNL, January 2002), at a frequency of 1 sample per five railcars (approximately 1 sample per 340 CY of soil). Samples were analyzed for

the Envirocare suite of parameters, which includes complete TCLP, gamma spectroscopy, Strontium-90 analysis, alpha spectroscopy, gross beta, PCBs/Pesticides, and physical parameters (pH, Reactivity, flashpoint). Since 339 railcars were shipped from the former HWMF, a total of 62 waste verification samples were collected and analyzed by STL. According to these sample results, the soil and debris shipped met Envirocare's WAC. Waste verification sample results are provided in Tables 3-9 through 3-12.

Due to the presences of dispersible alpha contamination in Slant Holes A-1 and A-2 (discussed in Section 3.3.2), representative waste confirmation samples were collected from soil and debris contained within the pipes to ensure compliance with Envirocare's WAC. These samples were shipped to STL and analyzed by alpha spectroscopy. Maximum concentrations reported by STL were as follows: 1,950 pCi/g Cs-137; 10,800 pCi/g Sr-90; 9,200 pCi/g Pu-239/240; and 2,110 pCi/g Am-241. According to these results, debris from Slant Hoes A-1 and A-2 meet Envirocare's WAC.

The Former HWMF Soils Removal Project also received, loaded, and shipped approximately 3,900 CY of waste soil and debris from the Waste Concentration Facility – 811 Underground Tank Removal and Soil Remediation Project (811 Project). Waste confirmation sample data was received from the 811 Project prior to the shipment of this soil and debris. Waste confirmation data from the 811 Project is presented in *Closeout Report, Brookhaven National Laboratory, Operable Unit 1 Area of Concern (AOC) 10, Waste Concentration Facility, Volumes 1 & 2* (Weston Solutions, June 2005).

3.6.2 Waste Shipment and Disposal

MHF, Incorporated; ECDC Logistics, LLC; and Cavanagh Services Group, LLC provided railcars for transportation of the waste soil and debris to Envirocare. After the railcars arrived on site, they were inspected and released for loading. The bottom of the inside of each railcar was covered with a geotextile liner and a Black Stallion® railcar liner was placed within each railcar prior to loading. Approximately 95-100 tons of waste was placed into each rail car. The weights of the soil and debris were determined utilizing a bucket scale on the front-end loader. After the waste was loaded into the railcar, the liner was closed/secured using tie wraps and bungee hooks for transport and secured into position. In addition, either a hard or soft tarp cover was secured over each railcar for shipment.

Photograph 9 – Sealed Black Stallion® liner in railcar at the former HWMF.

A total of 339 railcars were loaded and transported to Envirocare for final disposal, which equates to approximately 32,200 tons of material (including material from the 811 Project). Waste loading and shipping was initiated on October 20, 2004 and was completed on September 8, 2005. Waste soil and debris shipments tables are included in Appendix B.

3.6.3 Pollution Prevention and Waste Minimization Opportunities

Waste minimization and pollution prevention methods employed during remedial activities at the former HWMF include:

- Operating equipment outside of the controlled areas as much as possible to minimize contact with contaminated areas;
- Lining loader buckets with spill sheets to reduce the spread of contamination;
- Constructing roads of reusable material for equipment traffic and minimizing the use of blue stone;
- Constructing run-on berms around excavations;
- Constructing a berm and raised fence at the north side of the railcar loading area to contain storm water inside the work site;

- Surveying and segregating clean and contaminated soils during sub-surface structure removals;
- Performing a Class 1 *MARSSIM* survey of a stockpile to ensure that it could be used as backfill;
- Size reducing waste to meet Envirocare's WAC; and
- Judicious use of consumables.

3.7 Post Remediation Dose Assessment

A dose assessment was conducted to evaluate radiological dose impacts from residual radioactive materials remaining following the completion of the Former HWMF Soils Removal Project. The dose assessment for the soil excavation areas was conducted using the RESRAD computer code, version 6.3. The average site concentration for each radionuclide was used as input to the model (see Table 3-4). In addition, the code was run at the 95% upper confidence level (mean plus two standard deviations) as an additional measure of conservatism. In accordance with the RI/FS and OU I ROD, two potential radiological dose scenarios were evaluated following remediation. The first assessment considered the radiation dose to a hypothetical industrial worker after 50 years of institutional control. The second assessment considered the radiation dose to a future resident, assuming 100 years of institutional control.

Based on the results of the RESRAD model runs for the soil areas, the most significant contribution (>99 percent) of the projected radiation dose to the industrial worker was external gamma radiation from residual Cs-137. Therefore, in lieu of using RESRAD to evaluate project radiation doses to a hypothetical industrial worker, actual gamma dose rate measurements were used to develop the projected radiation dose from the building slabs. Gamma dose rates were measured with a gamma scintillation detector at a distance of one meter above the building slab surfaces. Survey units were established and measurements were taken using *MARSSIM* guidelines as discussed in Section 3.5. The results were then averaged to determine the average radiation dose for each building slab under current conditions. The results of the radiation survey measurements for the building slabs are provided in Figures 3-10-1 through 3-10-6. Radiation doses were then adjusted based on the 30.0 year half-life of Cs-137 to evaluate the future dose rates at 50 and 100 years post remediation.

Input parameters were identical to those used in the risk assessments performed as part of the RI/FS process.

For the industrial exposure scenario, a combined indoor/outdoor scenario was also evaluated, assuming 17% of the time outdoors and 6% of the time indoors. In addition, it was assumed that 50% of water consumption was from a groundwater well located at the remediated site.

Occupancy factors for the residential scenarios assumed 50% occupancy indoors and 25% occupancy outdoors.

Finally, an additional dose assessment was performed, which evaluated dose contributions from residual radioactive material in soils and the average dose from the building slabs. For this evaluation, the calculated dose was the average of the industrial worker dose (assuming average site soil concentrations) and the dose from working on the building slabs.

The results of the dose assessment indicate that the maximum projected dose to an industrial worker at Year 50 and the maximum projected dose to a resident at Year 100 at the former HWMF would be well below the dose objective of 15 mrem/yr established for the Former HWMF Soils Removal Project. The results also indicate that the NYSDEC TAGM 4003 guideline of 10 mrem/yr would also be met under each of the two scenarios described above. The results of the RESRAD computer modeling for each scenario are summarized in Table 3-17 below. Summary reports from the individual RESRAD code runs are provided in Appendix C.

Table 3-17
RESRAD Computer Modeling Results Summary

Exposure Scenario	Soil Concentration Data	Occupancy Factors[1]	Former HWMF Location	Projected Dose at Year 0 (mrem/yr TEDE)	Projected Dose at Year 50 (mrem/yr TEDE)	Projected Dose at Year 100 (mrem/yr TEDE)
Industrial	Average	17% Indoor 6% Outdoor	Soils	5.4	1.8	0.6
Industrial	95% UCL	17% Indoor 6% Outdoor	Soils	11.8	4.0	1.4
Residential	Average	50% Indoor 25% Outdoor	Soils	19.1	6.1	2.0
Residential	95% UCL	50% Indoor 25% Outdoor	Soils	44.9	14.5	4.7
Industrial	Average	23% Indoor	Building Slab 444	17.0	5.4	1.7
Industrial	Average	23% Indoor	Building Slab 445	9.0	2.8	0.9
Industrial	Average	23% Indoor	Building Slab 446	14.8	4.7	1.5
Industrial	Average	23% Indoor	Building Slab 447	2.6	0.8	0.3
Industrial	Average	23% Indoor	Building Slab 448	13.6	4.3	1.4
Industrial	Average	23% Indoor	C/E Slab	18.6	5.9	1.8
Industrial	Average	23% Indoor	Building Slabs (Avg.)	12.6	4.0	1.3
Industrial	Average	11% on Building Slabs 6% in Non-contaminated Buildings 6% Outdoors	Soils and Building Slab Surfaces	9.0	2.9	1.0

[1]Based on 8760 hours per year.

3.8 Site Restoration

The excavation areas were backfilled with material from off-site sources as well as the on-site BNL Research Support Building Construction Project. All fill material was analyzed to ensure it complied with the NYSDEC TAGM 4046 guidelines. These results are summarized in Tables 3-13 through 3-16.

Backfill material was placed and compacted in 12-inch lifts to at least 90 percent of the maximum density as determined by ASTM D698. The material was placed in sufficient quantities to ensure drainage would not significantly accumulate in any area and potentially create a wetland. Topsoil was placed following the placement of backfill material. The topsoil was tested to ensure it complied with the NYSDEC TAGM 4046 guidelines. These results are summarized in Table 3-13 through 3-16.

Site restoration was completed in accordance with the *Remedial Design Implementation Plan* (PWGC, March 2004) with two exceptions:

- The site was seeded with native grass seed (at a rate of 2 pounds of seed per 1,000 ft^2 of disturbed soil area) instead of winter rye seed; and
- Three (3) inches of topsoil cover was placed instead of six (6) inches.

Wetland restoration was completed in accordance with the NYSDEC Wetlands Permit to support a habitat for the Tiger Salamander. Restoration consisted of backfilling the excavated portion of the wetland with nutrient-rich soil in areas where standing water was less than eight (8) inches in depth and replanting it with vegetation common to the area, including Sedges and Tussock Sedge. The seed mixture spread in the wetlands area included Little Bluestem, Switch Grass, Tioga Deer Tongue, Red Top, and Barnyard Grass. In areas where the standing water level was lower than what was projected, sedges were not planted and the seed mixture was supplemented with winter rye seed at a rate of 2 pounds of seed per 1,000 ft^2 of area. The backfill soil characteristics were chosen to ensure that the wetland could retain water and supply necessary nutrients to support the existing ecological habitat.

4.0 PERFORMANCE STANDARDS AND CONSTRUCTION QUALITY CONTROL

As discussed in Section 3.0, the average concentrations for Cs-137, Sr-90, and Ra-226 were well below the cleanup goals. The calculated radiological doses from all radioisotopes were also well below the levels stipulated in the OU I ROD. The isolated areas with mercury and lead contamination were excavated until the concentrations in those areas were below the cleanup goals of 1.84 mg/kg and 400 mg/kg respectively.

Physical and radiological inspections were conducted on both incoming and outgoing railcars. Inspections were also conducted on stormwater control measures as well as

excavation operations. Excavation monitoring and field sampling procedures were also reviewed periodically.

Quality control/quality assurance (QA/QC) samples were collected in accordance with the Remedial Action Field Sampling Plan, Area of Concern 1, Former Hazardous Waste Management Facility (Envirocon, October 2004) and Collection and Frequency of Field Quality Control Samples, EM-SOP-200 (BNL, March 2003). A total of 19 field duplicates were collected. QA/QC results are summarized on Table 4-1.

5.0 FINAL INSPECTION AND CERTIFICATIONS

As described in Section 3.5.4, IVSs were performed by ORISE upon the completion of final status surveys performed by Envirocon.

A health and safety plan (HASP), the *Former Hazardous Waste Management Facility Soil Remediation Health and Safety Plan* (Envirocon, October 2004), was developed to address hazards associated with the Former HWMF Soils Removal Project. The information presented in the HASP was reviewed by the site employees prior to initiating the project work activities. A copy of the HASP was available onsite at all times for site employees to thoroughly review.

In addition to the HASP, Activity Hazard Analyses (AHAs) were written to highlight controls for specific tasks. The AHAs served as the primary procedure tool for ongoing hazard assessment and adjusting controls based upon employee suggestions, inspection findings, lessons learned, modification to work plans and procedures, and newly identified hazards. Site employees were expected to be familiar with and comply with all aspects of the AHAs.

Industrial hygiene (IH) and radiological monitoring were conducted in accordance with the *Community Air Monitoring Plan for the Former Hazardous Waste Management Facility Soil Remediation* (PWGC, January 2004), the *Former Hazardous Waste Management Facility Soil Remediation Health and Safety Plan* (Envirocon, October 2004), and the BNL Radiological Work Permit (RWP ERD04-06).

5.1 Industrial Hygiene Monitoring

IH monitoring was conducted by Envirocon personnel. A designated Site Health and Safety Officer was onsite during remedial activities. IH monitoring included real-time particulate air monitoring with MIE, Inc. DataRAMs (DataRAM), since contaminant-laden dust was seen to offer the greatest exposure potential to the chemical contaminants of concern. Personal DataRAMs were deployed whenever the planned remedial activities were perceived to have the potential to produce dust (excavating, size reducing, loading). DataRAMs were also placed at the north, south, east, and west perimeters of the former HWMF (work zone), as well as immediately downwind of remedial activities. The

action level of 0.150mg/m^3, established in the *Community Air Monitoring Plan for the Former Hazardous Waste Management Facility Soil Remediation* (PWGC, January 2004), was not exceeded during the remedial activities.

Additional real-time IH monitoring instruments that were maintained onsite during remedial activities included a MuliRAE monitor with sensors for volatile organics, oxygen level, combustible gases, carbon monoxide, and nitrogen dioxide, as well as a Jerome Mercury Vapor Analyzer (MVA). The MultiRAE was maintained onsite to be deployed in the event of a site discovery that had the potential to produce volatiles. The MultiRAE was not utilized during this project. The MVA was used when remedial activities were carried out in areas of known mercury contamination, however there were no mercury vapor detections.

In addition to real-time air monitoring, air samples were also collected for metals and silica (as quartz). There were no metal detections and silica sample results were below the applicable permissible exposure limit. IH analytical data, real-time monitoring data sheets, and equipment analytical logs are available from Envirocon upon request.

5.2 Radiological Monitoring

Radiological monitoring was conducted by BNL Radiological Control Technicians (RCT)s. Continuous RCT coverage was provided during remedial activities. Radiological monitoring included both general area and personal lapel air sample collection. General area air samples were collected with SAIC low volume air samplers positioned downwind of remedial activities and at the soil and debris dumping/railcar loading area. Each individual entering the work zone, or one individual in each work group (individuals working together on a similar task), wore an AIRCHEK personal lapel air sampler. General area and personal lapel air sample results were used to track derived air concentration-hour (DAC-Hr) exposures. A hold point for DAC-Hr exposures was determined by calculating 20 percent of the DAC-Hr hold point for Americium-241. All general area and personal lapel air sample results were below this hold point (4 E-13 micro Ci/cubic centimeter).

Thermoluminescent dosimeters (TLD) were worn by each individual entering the work zone. Alarming dosimeters were worn in instances when workers had the potential to be exposed to high radiation. The ALARA goal for individual dose for the Former HWMF Soils Removal was 250 mrem. No worker received a dose exceeding 12 percent (30 mrem) of this goal over the duration of the project.

Workers entering the work zone were also required to have a whole body count prior to starting work on the project and at the end of the project, or on an annual basis. In addition workers were required to complete a whole body monitoring using a PCM-1B or equivalent hand held instrument each time they exited the site, in accordance with FS-SOP-4027, *Entry/Egress Requirements For Areas Controlled For Radiological Purposes* (BNL, January 2003).

In addition to personal and general area monitoring, equipment used during remedial activities was monitored for radiological contamination. All equipment that was released from the work zone was surveyed in accordance with FS-SOP-1005, *Radiological Surveys Required For Release Of Materials From Areas Controlled For Radiological Purposes* (BNL, October 2004).

6.0 OPERATION AND MAINTENANCE ACTIVITES

Post remediation operation and maintenance activities at the former HWMF will be performed in accordance with the *Operable Unit I Soils and Operable Unit V Long-Term Monitoring and Maintenance Plan* (BNL, 2005) to ensure that land uses remain protective of public health and the environment. These activities will include inspections of site fencing, Tiger Salamander habitat monitoring and surveys, and institutional controls (warning notices, entry and access restrictions, land-use and real property controls, notifications and restrictions, digging permits, and government ownership). The clean fill and topsoil cover, placed during site restoration, will also be inspected for signs of erosion.

BNL's Long-Term Response Action Group (LTRA) will perform operation and maintenance activities. The LTRA Group Manager will ensure that the controls listed above are in place and routine monitoring is performed.

7.0 PROTECTIVENESS

The removal of contaminated soils and associated structures at the former HWMF, as well as the implementation of monitoring and institutional controls will protect human health and the environment. The removal of these wastes has minimized both the risk of exposure to on-site workers and the risks associated with future-use scenarios by decreasing radiation dose levels at the site. These remedial actions have also minimized the potential for the migration of contaminants into the underlying groundwater. In addition, removal of contaminated soils in the wetlands area reduced the risk of exposure to the Tiger Salamander.

8.0 FIVE YEAR REVIEW

Five-year reviews will be conducted to determine whether the remedy implemented continues to be protective of human health and the environment. These reviews will be performed in accordance with the *Comprehensive Five-Year Review Guidance, OSWER No. 9355.7-03B-P* (EPA, June 2001). The former HWMF will be included in the second sitewide Five-Year Review in 2010.

9.0 LESSONS LEARNED

The following is a summary of the lessons learned from this project and the corrective actions for future projects:

- The excavation process was most efficient when excavation proceeded in one area until the cleanup goal was reached rather than moving the excavation to another area to allow a walkover survey map to be generated between each excavation lift.

- The moisture content of soils, including frozen soils, to be loaded should be closely monitored to prevent liquids from leaking from railcars during transit. Lime should not be used as a solidifying/drying agent because it may increase the soil pH to levels that are unacceptable for the disposal facility. These lessons learned were shared throughout the DOE as part of the Transportation Improvement Review on Rail Shipments held on May 18-19, 2005 in Oak Ridge, Tennessee.

- Soft covers for railcars, if properly installed, can be used instead of hard covers. They are as effective in protecting the load from wind and precipitation during transit.

- A geophysical survey with ground penetrating radar should be considered during the investigation phase for sites of this size with several buildings that had been in use for decades. The results of this survey could be used to help identify borehole locations.

- The railcar loading process was modified to require covering the loaded cars the day they were loaded if inclement weather was forecasted. The National Weather Services web site, www.nws.noaa.gov, was an extremely effective tool for forecasting weather conditions. This procedural change minimized precipitation falling into loaded, but uncovered railcars.

- The railcar liners were upgraded from a system with ropes, to secure the liner between each of the nylon cable ties, to the Black Stallion® railcar liner with ratchet type nylon straps. The nylon straps proved to be superior to the rope in both the efficiency and quality of installation

- For railcars loaded with substantial amounts of debris, a non-woven geotextile was placed under the liner and above the Black Stallion® railcar liner. In addition, a second liner, fabricated of non-woven geotextile, was placed inside the liner package. Prior to loading the car with debris, a soil layer was placed in the railcar. The debris was topped off with another soil layer. These measures were effective in preventing damage to the liner package from the debris.

10.0 SUMMARY OF PROJECT COSTS

The remediation of soils and underground structures at the former HWMF cost approximately $9,700,000 to complete. This was just one part of the total cost of $27,860,000 estimated in the OU I ROD for radiologically contaminated soils. The cost summary presented in the OU I ROD included the remediation of the Building 811 UST's and soils, the Building 650 sump and outfall, chemical holes, landscape soils, and the building demolition at the former HWMF. The actual cost to complete these projects was approximately $31,000,000.

11.0 REFERENCES

ANL, 1993. *Manual for Implementing Residual Radioactive Material Guidelines Using RESRAD, Version 5.0,* Environmental Assessment Division, Agonne National Laboratory, Draft ANL/EAD/LD-2, 1993.

BNL, 1992. Interagency Agreement, May 1992.

BNL, 2001. FS-SOP-1040, *Airborne Radioactivity Sampling and Analysis*, December 2001.

BNL, 2003. EM-SOP-601, *Collection of Soil Samples, Rev. 1*, March 2003.

BNL, 2003. FS-SOP-4027, *Entry/Egress Requirements for Areas Controlled for Radiological Purposes,* January 2003.

BNL, 2004. FS-SOP-1005, *Radiological Surveys Required for Release of Materials from Areas Controlled for Radiological Purposes,* October 2004.

BNL, 2003. EM-SOP-200, *Collection and Frequency of Field Quality Control Samples,* March 2003.

BNL, 1999. *Proposed Plan for Operable Unit I and Radiologically Contaminated Soils*, 1999.

BNL, *Record of Decision, Operable Unit I and Radiologically Contaminated Soils*, August 1999.

BNL, 2003. *Former Hazardous Waste Management Facility Decontamination & Decommissioning Characterization Report*, May 2003.

BNL, 2003. *Remedial Action Work Plan, Operable Unit I, Area of Concern I, Former Hazardous Waste Management Facility*, March 2003

BNL, *Standards Based Management System*, as amended.

BNL, *Supplemental Investigation Report, Former Hazardous Waste Management Facility, Soil, Asphalt, and Debris*, September 22, 2003.

BNL, 2003. *Former Hazardous Waste Management Facility Decontamination & Decommissioning Closeout Report,* November 2003.

BNL, 2004. *Remedial Design Implementation Plan, Operable Unit I, Area of Concern 1, Former Hazardous Waste Management Facility Remedial Action Work Plan,* March 2004.

BNL, 2002. *Characterization and Waste Management Plan for the Former Hazardous Waste Management Facility Buildings and Structures,* July 2002.

BNL, 2002. *EM Waste Management Plan,* January 2002.

BNL, 2005. *Operable Unit 1 Soils and Operable Unit V Long-Term Monitoring and Maintenance Plan,* May 2005.

CDM, 1996. *Final Remedial Investigation and Risk Assessment Report for Operable Unit I/VI,* 1996.

CDM, 1999. *Final Feasibility Study Report for Operable Unit 1 Radiologically Contaminated Soils,* 1999.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Title 42, U.S. Code, Sec. 9620 et seq.

Department of Energy, DOE Order 5400.5, *Radiation Protection of the Environment and the Public,* as amended.

Envirocon, 2004. *Waste Management Plan for the Former Hazardous Waste Management Facility Soil Remediation,* August 2004.

Envirocon, 2004. *Remedial Action Field Sampling Plan, Area of Concern 1, Former Hazardous Waste Management Facility,* October 2004.

Envirocon, 2004. *Former Hazardous Waste Management Facility Soil Remediation Health and Safety Plan,* October 2004.

EPA, 1997. *Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination* (OSWER Directive 9200.14-18), 1997.

EPA, 2000. *Close Out Procedures for National Priorities List Sites* (OSWER Directive 9320.2-09A-P), January 2000.

EPA, 2000. *Multi-Agency Radiological Survey and Site Investigation Manual, Revision 1,* August 2000.

EPA, 2001. *Comprehensive Five-Year Review Guidance* (OSWER Directive 9355.7-03B-P), June 2001.

NYSDEC, 1993. *New York State Department of Environmental Conservation TAGM 4003: Cleanup Guideline for Soils Contaminated with Radioactive Materials,* September, 1993.

NYSDEC, 1994. *New York State Department of Environmental Conservation TAGM 4046: Determination of Soil Cleanup Objectives and Cleanup Levels,* January, 1994.

RESRAD, Residual Radioactive Material Guideline Computer Code

SAIC, 1992. *Brookhaven National Laboratory Site Baseline Report,* 1992.

URS, 2000. *Remedial Design and General Supplemental Specifications for Remedial Action, Operable Unit I Contaminated Soil and Debris,* October 2000.

Weston Solutions, 2005. *Closeout Report, Brookhaven National Laboratory, Operable Unit 1 Area of Concern (AOC) 10, Waste Concentration Facility, Volumes 1 & 2,* June 2005.

TABLE 3-4
Former Hazardous Waste Management Facility
Final Status Survey Data Summary

Survey Unit	MARSSIM Class	Offsite Lab Analytical Results																										
		Cs-137 (pCi/g)							Sr-90 (pCi/g)							Ra-226 (pCi/g)							Composite Sample Results (pCi/g)						
		Min	Max	Diff	Avg	Std. Dev.	No. samples below DCGL	Avg below DCGL	Min	Max	Diff	Avg	Std. Dev.	No. samples below DCGL	Avg below DCGL	Min	Max	Diff	Avg	Std. Dev.	No. samples below DCGL	Avg below DCGL	Pu-238	Pu-239/240	U-234	U-235	U-238	Am-241	H3
A	1	0.06	23.10	23.04	6.05	5.12	32	6.05	0.09	20.10	20.01	2.22	4.05	31	1.64	0.08	1.27	1.19	0.40	0.21	32	0.40	0.03	0.11	0.60	0.02	0.49	0.04	0.00
C-1	1	0.19	41.80	41.61	5.37	8.69	25	5.37	0.10	6.95	6.85	1.01	1.47	25	1.01	0.26	1.08	0.82	0.52	0.17	25	0.52	0.00	0.02	0.65	0.04	0.54	0.04	0.69
C-2	1	0.00	59.60	59.60	4.04	12.01	24	4.04	0.00	5.12	5.12	1.10	1.48	24	1.10	0.24	0.99	0.75	0.63	0.20	24	0.63	0.00	0.05	0.87	0.01	0.63	0.04	0.39
C-3	1	1.78	74.00	72.22	15.62	18.77	14	11.45	0.15	3.79	3.64	1.06	0.96	15	1.06	0.13	0.54	0.41	0.40	0.10	15	0.40	0.00	0.10	0.36	0.01	0.43	0.02	0.52
D-1	1	0.32	42.60	42.28	8.48	11.13	18	8.48	0.17	1.74	1.57	0.70	0.49	18	0.70	0.15	0.58	0.43	0.39	0.14	18	0.39	0.00	0.06	0.44	0.09	0.28	0.03	0.09
D-2	1	0.03	16.50	16.47	2.49	3.99	18	2.49	0.00	12.60	12.60	1.49	2.96	18	1.49	0.21	1.28	1.07	0.50	0.25	18	0.50	0.00	0.00	0.55	0.02	0.57	0.09	0.00
D-3	1	0.02	71.00	70.98	10.03	21.16	17	6.44	0.11	32.10	31.99	2.65	7.38	17	0.92	0.40	1.22	0.82	0.65	0.24	18	0.65	0.05	0.12	0.69	0.02	0.66	0.04	0.00
D-4	1	0.02	12.90	12.88	2.82	3.78	18	2.82	0.16	81.10	80.94	8.60	20.85	16	1.89	0.20	0.87	0.67	0.52	0.21	18	0.52	0.04	0.01	0.47	0.00	0.43	0.00	0.16
D-5	1	0.32	43.60	43.28	8.01	11.16	18	8.01	0.02	8.70	8.68	1.98	2.32	18	1.98	0.12	0.57	0.45	0.42	0.13	18	0.42	0.00	0.10	0.47	0.07	0.68	0.02	0.12
D-6	1	0.03	11.20	11.17	2.96	3.30	18	2.96	0.01	4.43	4.42	1.16	1.10	18	1.16	0.23	0.86	0.63	0.58	0.19	18	0.58	0.03	0.08	0.76	0.02	0.60	0.00	0.07
L	1	1.10	44.60	43.50	11.60	11.01	17	11.60	0.00	0.66	0.66	0.25	0.20	17	0.25	0.33	0.69	0.36	0.52	0.11	17	0.52	0.00	0.31	0.55	0.02	0.48	0.11	0.00
Z-1	2	0.54	29.70	29.16	5.19	7.55	14	5.19	0.03	0.84	0.81	0.43	0.29	14	0.43	0.32	0.53	0.21	0.41	0.06	14	0.41	0.01	0.18	0.60	0.07	0.53	0.02	0.00
Z-2	2	0.02	10.10	10.08	2.47	3.00	14	2.47	0.00	2.49	2.49	0.51	0.57	14	0.51	0.21	0.61	0.40	0.36	0.11	14	0.36	0.01	0.20	0.27	0.01	0.41	0.01	0.02
K-1	1	0.06	50.40	50.34	8.74	14.60	18	8.74	0.00	12.90	12.90	1.48	3.02	18	1.48	0.30	0.97	0.67	0.60	0.20	18	0.60	0.03	0.04	0.91	0.01	0.38	0.07	0.00
K-2	1	0.02	23.20	23.18	4.03	6.17	18	4.03	0.00	0.93	0.93	0.28	0.26	18	0.28	0.16	1.13	0.97	0.42	0.24	18	0.42	0.03	0.01	0.31	0.03	0.27	0.04	0.00
K-3	1	0.03	72.00	71.97	9.37	19.84	17	5.13	0.00	0.96	0.96	0.33	0.27	17	0.33	0.16	0.50	0.34	0.37	0.09	17	0.37	0.02	0.05	0.32	0.00	0.40	0.02	0.13
K-4	1	0.02	96.00	95.98	16.90	25.63	16	11.96	0.13	8.20	8.07	1.27	1.91	17	1.27	0.18	0.86	0.68	0.49	0.20	17	0.49	0.06	0.10	0.74	0.05	0.57	0.00	0.01
Z-3	2	0.98	95.00	94.02	13.13	25.81	13	6.83	0.10	1.64	1.54	0.67	0.43	14	0.67	0.38	0.85	0.47	0.63	0.14	14	0.63	0.00	0.00	0.61	0.03	0.76	0.12	0.03
Avg. Site Conc.					7.63							1.51							0.49				0.02	0.08	0.57	0.03	0.51	0.04	0.12
ROD Cleanup Goal					67.00							15.00							5.00				(See Note Below)						

Assumes a background concentration of 0.56 pCi/g Ra-226
Data is uncensored, i.e., actual concentrations are presented as reported from the lab, even if below the reported MDA.
Negative results are reported as 0.00.
Average concentration is an arithmetic mean of all sample results in each survey unit

TABLE 3-7
Former Hazardous Waste Management Facility
Screen Test and Statistical Test Report

Survey Unit	MARSSIM Class	Cs-137				Sr-90				Ra-226				Sum of Fractions	Cleanup Goals Met
		$DCGL_w$	$DCGL_{avg}$	EMC	Sign Test	$DCGL_w$	$DCGL_{avg}$	EMC	Sign Test	$DCGL_w$	$DCGL_{avg}$	EMC	Sign Test		
A	1	Pass	Pass	Pass	Pass	Failed	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Yes
C-1	1	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Yes
C-2	1	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Yes
C-3	1	Failed	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Yes
D-1	1	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Yes
D-2	1	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Yes
D-3	1	Failed	Pass	Pass	Pass	Failed	Pass	Fail	Pass	Pass	Pass	Pass	Pass	Pass	Yes
D-4	1	Pass	Pass	Pass	Pass	Failed	Pass	Fail	Pass	Pass	Pass	Pass	Pass	Pass	Yes
D-5	1	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Yes
D-6	1	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Yes
L	1	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Yes
Z-1	2	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Yes
Z-2	2	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Yes
K-1	1	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Yes
K-2	1	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Yes
K-3	1	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Yes
K-4	1	Pass	Pass	Fail	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Yes
Z-3	2	Pass	Pass	Fail	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Yes

established as specified in The RI/FS and ROD documents. Finally, the concentrations of isolated sample results that exceeded the DCGLw were shown to meet the $DCGL_{EMC}$ criteria and/or they passed the Sign test. Based on these results, each survey unit is determined the meet the cleanup goals established for the site.

TABLE 3-8

Former Hazardous Waste Management Facility

Mercury and Lead Sample Results

Sample ID	Date	Mercury results (mg/kg)[1]	Lead results (mg/kg)[2]	Chain of Custody
A-17	6/6/2005	0.054	N/A	21202
A-18	6/6/2005	1.1	N/A	21202
A-27	6/6/2005	0.056	N/A	21202
A-28	6/6/2005	0.45	N/A	21202
A-29	6/6/2005	0.095	N/A	21202
C2-04	3/14/2005	0.03	N/A	20299
C2-12	3/14/2005	ND	N/A	20299
445-02	1/14/2005	0.33	N/A	19820
445-04	1/14/2005	0.55	N/A	19820
445-07	1/14/2005	ND	N/A	19820
445-08	1/14/2005	0.025	N/A	19820
445-09	1/14/2005	0.06	N/A	19820
445-10	1/14/2005	0.026	N/A	19820
445-01A	7/6/2005	0.061	N/A	20748
445-03A	7/6/2005	0.18	N/A	20748
445-05D	9/7/2005	0.14	N/A	21370
H6-100A	7/21/2005	1.3	N/A	20751
445-06B	7/22/2005	0.012	N/A	20751
K4-04	7/29/2005	0.025	N/A	20920
K4-03	7/29/2005	0.12	N/A	20920
K4-02	7/29/2005	0.15	N/A	20920
K4-01	7/29/2005	0.0075	N/A	20920
K4-05	7/29/2005	0.04	N/A	20920
B-04-SW	8/9/2005	0.47	N/A	20922
B-05-SE	8/9/2005	0.78	N/A	20922
B-06-NW-B2	8/18/2005	0.85	N/A	20923
B-06-NW-A4	8/20/2005	0.23	N/A	20924
B-07-NE	8/9/2005	0.17	N/A	20922
A-17	6/6/2005	N/A	7.8	21202
A-18	6/6/2005	N/A	11.9	21202
A-27	6/6/2005	N/A	169	21202
A-28	6/6/2005	N/A	68.1	21202
A-29	6/6/2005	N/A	12.3	21202
D-23	7/11/2005	N/A	6.6	20749

[1]Mercury analyzed per EPA SW-846 Method 7471A

[2]Lead analyzed per EPA SW-846 Method 3050B

TABLE 3-9
Former Hazardous Waste Management Facility
Waste Confirmation Sample Results
TCLP Volatiles

Parameter	Allowable Conc.	WCS01	WCS02	WCS03	WCS04	WCS05	WCS06	WCS07	WCS08	WCS09	WCS10	WCS11	WCS12
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	ND	ND	ND	.015 J	ND	.015 J	.001 J	ND	ND	ND	ND	ND	ND
Vinyl chloride	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Parameter	Allowable Conc.	WCS13	WCS14	WCS15	WCS16	WCS17	WCS18	WCS19	WCS20	WCS21	WCS22	WCS23	WCS24
Benzene	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	NA	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	0.009	ND	ND
Trichloroethene	ND	ND	ND	ND	NA	ND	ND	0.009	0.009	ND	ND	ND	ND
Vinyl chloride	NA	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND

Concentrations in ppm

TABLE 3-9
Former Hazardous Waste Management Facility
Waste Confirmation Sample Results
TCLP Volatiles

Parameter	Allowable Conc.	WCS25	WCS26	WCS27	WCS28	WCS29	WCS30	WCS31	WCS32	WCS33	WCS34	WCS35	WCS36
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Parameter	Allowable Conc.	WCS37	WCS38	WCS39	WCS40	WCS41	WCS42	WCS43	WCS44	WCS45	WCS46	WCS47	WCS48
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Concentrations in ppm

TABLE 3-9
Former Hazardous Waste Management Facility
Waste Confirmation Sample Results
TCLP Volatiles

Parameter	Allowable Conc.	WCS49	WCS50	WCS51	WCS52	WCS53	WCS54	WCS55	WCS56	WCS57	WCS58	WCS59	WCS60
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	ND	ND	ND	0.011 J	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Concentrations in ppm

Parameter	Allowable Conc.	WCS61	WCS62
Benzene	ND	ND	ND
2-Butanone	NA	ND	ND
Carbon Tetrachloride	ND	ND	ND
Chlorobenzene	ND	ND	ND
Chloroform	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND
Tetrachloroethene	ND	ND	ND
Trichloroethene	ND	0.016 J	ND
Vinyl chloride	NA	ND	ND

Concentrations in ppm

TABLE 3-10
Former Hazardous Waste Management Facility
Waste Confirmation Sample Results
TCLP Semi-volatiles, PCBs, Herbicides/Pesticides

Parameter	Allowable Conc	WCS01	WCS02	WCS03	WCS04	WCS05	WCS06	WCS07	WCS08	WCS09	WCS10	WCS11	WCS12
Pyridine	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Methylphenol	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3-Methylphenol & 4-Methylphenol	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nitrobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4,6-Trichlorophenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dinitrotoluene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pentachlorophenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1016	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1221	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1232	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1242	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1248	NA	ND	ND	ND	ND	ND	ND	ND	ND	0.16	ND	ND	ND
Aroclor 1254*	0.928	ND	ND	ND	0.069	ND	0.054	0.26	ND	0.22	ND	ND	ND
Aroclor 1260*	4.10 E	0.0001	0.0001	ND	ND	ND	0.084	0.2	0.048	0.33	ND	ND	ND
Chlordane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
gamma-BHC (Lindane)	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor epoxide	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methoxychlor	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toxaphene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4,5-TP (Silvex)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Concentrations in ppm

*PCB values referenced in Waste Management Plan

TABLE 3-10
Former Hazardous Waste Management Facility
Waste Confirmation Sample Results
TCLP Semi-volatiles, PCBs, Herbicides/Pesticides

Parameter	Allowable Conc.	WCS13	WCS14	WCS15	WCS16	WCS17	WCS18	WCS19	WCS20	WCS21	WCS22	WCS23	WCS24
Pyridine	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	NA	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
2-Methylphenol	NA	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
3-Methylphenol & 4-Methylphenol	NA	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
Hexachloroethane	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
Nitrobenzene	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
2,4,6-Trichlorophenol	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dinitrotoluene	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobenzene	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
Pentachlorophenol	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1016	NA	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1221	NA	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1232	NA	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1242	NA	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1248	NA	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1254	0.928	ND	ND	0.26	NA	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1260	4.10 E	ND	ND	0.22	NA	0.044	ND	0.057	0.051	ND	ND	ND	ND
Chlordane	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
Endrin	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
gamma-BHC (Lindane)	NA	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor epoxide	NA	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
Methoxychlor	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
Toxaphene	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
2,4-D	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
2,4,5-TP (Silvex)	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND

Concentrations in ppm

*PCB values referenced in Waste Management Plan

TABLE 3-10
Former Hazardous Waste Management Facility
Waste Confirmation Sample Results
TCLP Semi-volatiles, PCBs, Herbicides/Pesticides

Parameter	Allowable Conc	WCS25	WCS26	WCS27	WCS28	WCS29	WCS30	WCS31	WCS32	WCS33	WCS34	WCS35	WCS36
Pyridine	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Methylphenol	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3-Methylphenol & 4-Methylphenol	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nitrobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4,6-Trichlorophenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dinitrotoluene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pentachlorophenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1016	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1221	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1232	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1242	NA	ND	ND	ND	0.18	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1248	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1254	0.928	ND	ND	0.46	ND	ND	ND	ND	ND	ND	0.09	ND	0.21
Aroclor 1260	4.10 E	ND	0.88	1.00	0.96	0.47	0.31	0.13	0.36	ND	0.12	0.065	0.41
Chlordane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
gamma-BHC (Lindane)	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor epoxide	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methoxychlor	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toxaphene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4,5-TP (Silvex)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Concentrations in ppm

***PCB values referenced in Waste Management Plan**

TABLE 3-10
Former Hazardous Waste Management Facility
Waste Confirmation Sample Results
TCLP Semi-volatiles, PCBs, Herbicides/Pesticides

Parameter	Allowable Conc.	WCS37	WCS38	WCS39	WCS40	WCS41	WCS42	WCS43	WCS44	WCS45	WCS46	WCS47	WCS48
Pyridine	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Methylphenol	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3-Methylphenol & 4-Methylphenol	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nitrobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4,6-Trichlorophenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dinitrotoluene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pentachlorophenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1016	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1221	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1232	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1242	NA	ND	ND	ND	0.180	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1248	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1254	0.928	0.11	0.240	0.065	0.450	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1260	4.10 E	0.098	0.130	0.150	0.500	ND	**1.6 E**	**2.6 D**	**1.30**	**0.72**	**0.31**	**0.32**	**0.39**
Chlordane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
gamma-BHC (Lindane)	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor epoxide	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methoxychlor	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toxaphene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4,5-TP (Silvex)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Concentrations in ppm

*PCB values referenced in Waste Management Plan

TABLE 3-10
Former Hazardous Waste Management Facility
Waste Confirmation Sample Results
TCLP Semi-volatiles, PCBs, Herbicides/Pesticides

Parameter	Allowable Conc.	WCS49	WCS50	WCS51	WCS52	WCS53	WCS54	WCS55	WCS56	WCS57	WCS58	WCS59	WCS60
Pyridine	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Methylphenol	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3-Methylphenol & 4-Methylphenol	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nitrobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4,6-Trichlorophenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dinitrotoluene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pentachlorophenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1016	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1221	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1232	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1242	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1248	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1254	0.928	ND	**0.076**	ND	ND	ND	ND	ND	ND	**0.044**	**0.88**	**0.34**	ND
Aroclor 1260	4.10 E	**0.22**	**0.16**	**30 D**	**0.59**	**0.052**	**0.109**	ND	**0.067**	**0.070**	**0.73**	**0.45**	**2 D**
Chlordane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
gamma-BHC (Lindane)	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor epoxide	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methoxychlor	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toxaphene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4,5-TP (Silvex)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Concentrations in ppm

*PCB values referenced in Waste Management Plan

TABLE 3-10
Former Hazardous Waste Management Facility
Waste Confirmation Sample Results
TCLP Semi-volatiles, PCBs, Herbicides/Pesticides

Parameter	Allowable Conc.	WCS61	WCS62
Pyridine	ND	ND	ND
1,4-Dichlorobenzene	NA	ND	ND
2-Methylphenol	NA	ND	ND
3-Methylphenol & 4-Methylphenol	NA	ND	ND
Hexachlorethane	ND	ND	ND
Nitrobenzene	ND	ND	ND
Hexachlorobutadiene	ND	ND	ND
2,4,6-Tricblorophenol	ND	ND	ND
2,4,5-Trichlorophenol	ND	ND	ND
2,4-Dinitrotolnene	ND	ND	ND
Hexachlorobenzene	ND	ND	ND
Pentachlorophenol	ND	ND	ND
Aroclor 1016	NA	ND	ND
Aroclor 1221	NA	ND	ND
Aroclor 1232	NA	ND	ND
Aroclor 1242	NA	ND	ND
Aroclor 1248	NA	ND	ND
Aroclor 1254	0.928	ND	ND
Aroclor 1260	4.10 E	0.38	0.69
Chlordane	ND	ND	ND
Endrin	ND	ND	ND
gamma-BHC (Lindane)	NA	ND	ND
Heptachlor	ND	ND	ND
Heptachlor epoxide	NA	ND	ND
Methoxychlor	ND	ND	ND
Toxaphene	ND	ND	ND
2,4-D	ND	ND	ND
2,4,5-TP (Silvex)	ND	ND	ND

Concentrations in ppm

*PCB values referenced in Waste Management Plan

TABLE 3-11
Former Hazardous Waste Management Facility
Waste Confirmation Sample Results
Metals General Chemistry

Parameter	Allowable Conc.	WCS01	WCS02	WCS03	WCS04	WCS05	WCS06	WCS07	WCS08	WCS09	WCS10	WCS11	WCS12
Arsenic	0.027	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Barium	0.76	.089 B	.118 B	.136 B	.310 B	.079 B	.142 B	.183 B	.206 B	.139 B	.125 B	.115 B	.102 B
Cadmium	0.49	ND	ND	ND	.009 B	ND	ND	.010 B	.004 B	ND	ND	ND	ND
Chromium	0.206	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Lead	0.56	ND	ND	ND	ND	ND	ND	ND	.018 B	0.183	ND	ND	ND
Silver	0.011	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Selenium	0.029	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Copper	NA	.017 B	.012 B	ND	ND	ND	ND	.036 B	ND	ND	ND	ND	ND
Zinc	1840	.085 B	.031 B	.023 B	0.598	.018 B	0.044	0.273	.124 N	.096 BN	0.044B	.180 B	.011 B
Mercury	0.0645	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00028B	ND	ND
pH	5-12	6.2	8.1	7.8	7.5	8.0	7.0	6.5	7.7	6.9	7.8	7.1	7.4
Flashpoint	>140° F	>140° F	>140° F	>140° F	>140° F	>140° F	>140° F	>140° F	>140° F	>140° F	>140° F	>140° F	>140° F
Percent Moisture	8-14.6%	18.3	9.2	8.6	9.6	6.6	9.3	13.6	9.2	13.5	15.0	12.3	7.7
Reactive Cyanide	ND	ND	ND	ND	ND	ND	0.26B	ND	ND	ND	ND	ND	ND
Reactive Sufide	0.1	ND	ND	ND	ND	ND	36.8	ND	ND	ND	ND	ND	ND

Parameter	Allowable Conc.	WCS13	WCS14	WCS15	WCS16	WCS17	WCS18	WCS19	WCS20	WCS21	WCS22	WCS23	WCS24
Arsenic	0.027	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
Barium	0.76	.097 B	.133 B	.222 B	NA	.169 B	.137 B	.067 B	.105 B	0.044 B	0.042 B	ND	.119 B
Cadmium	0.49	ND	.014 B	0.026	NA	ND	ND	ND	ND	ND	ND	ND	ND
Chromium	0.206	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
Lead	0.56	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
Silver	0.011	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
Selenium	0.029	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
Copper		ND	ND	.011 B	NA	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	1840	.013 B	.116 B	.190 B	NA	.053 B	.048 B	0.019	.046 B	0.0246 B	0.0227 B	.011 B	.014 B
Mercury	0.0645	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
pH	5-12	7.5	7.5	7.6	NA	7.6	7.4	7.8	7.4	6.6	7.7	7.7	7.8
Flashpoint	>140° F	>140° F	>140° F	>140° F	NA	>140° F	>140° F	>140° F	>140° F	>140° F	>140° F	>140° F	>140° F
Percent Moisture	8-14.6%	10.5	8.5	13.0	NA	14.2	16.9	9.3	12.3	9.4	7.1	9.0	14.0
Reactive Cyanide	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND
Reactive Sufide	0.1	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND

Concentrations in ppm

N- Spiked analyte recovery is outside stated control limits.

B- Estimated Result. Result is lower than reporting limit.

TABLE 3-11
Former Hazardous Waste Management Facility
Waste Confirmation Sample Results
Metals General Chemistry

Parameter	Allowable Conc.	WCS25	WCS26	WCS27	WCS28	WCS29	WCS30	WCS31	WCS32	WCS33	WCS34	WCS35	WCS36
Arsenic	0.027	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Barium	0.76	.122 B	.364 B	.286 B	.240 B	0.522 B	0.725 B	0.568 B	0.612 B	0.607 B	.194 B	.243 B	.220 B
Cadmium	0.49	ND	ND	.007 B	.010 B	ND	ND	ND	ND	0.082	.015 B	ND	.007 B
Chromium	0.206	ND	ND	ND	ND	ND	ND	ND	ND	0.039	ND	ND	ND
Lead	0.56	ND	0.001	ND	ND	ND	0.724	ND	ND	ND	ND	ND	ND
Silver	0.011	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Selenium	0.029	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Copper		ND	0.00	.020 B	.019 B	.051 B	0.302	ND	.146 B	ND	0.067 B	ND	ND
Zinc	1840	.020 B	0.001	0.209	0.153	0.159	0.544	83.9 B	0.155	0.628	0.117	0.119	0.124
Mercury	0.0645	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00 B	ND
pH	5-12	7.8	7.9	7.8	7.8	7.8	7.4	6.6	7.7	5.7	7.2	6.7	7.2
Flashpoint	>140° F	>140° F	>140° F	>140° F	>140° F	>140° F	>140° F	>140° F	>140° F	>140° F	>140° F	>140° F	>140° F
Percent Moisture	8-14.6%	13.9	18.9	21.9	20.7	9.3	12.3	9.4	7.1	23.1	14.8	14.1	11.9
Reactive Cyanide	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Reactive Sufide	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Parameter	Allowable Conc.	WCS37	WCS38	WCS39	WCS40	WCS41	WCS42	WCS43	WCS44	WCS45	WCS46	WCS47	WCS48
Arsenic	0.027	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Barium	0.76	.075 B	.087 B	ND	.176 B	.120 B	.147 B	.226 B,J	.333 B,J	0.158 B	.188 B	.167 B	.161 B
Cadmium	0.49	ND	ND	ND	.006 B	ND	ND	ND	ND	ND	ND	ND	ND
Chromium	0.206	ND	ND	ND	ND	ND	ND	ND	.0151 B	ND	ND	ND	ND
Lead	0.56	ND	ND	ND	ND	ND	ND	ND	.168 B	ND	ND	ND	.205 B
Silver	0.011	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Selenium	0.029	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Copper		ND	ND	ND	ND	ND	ND	.110 B	.0498 B	ND	.0384 B	ND	.0656 B
Zinc	1840	0.109	0.092 B	.056 B	2.25	.987 B	.0485 B	.231 J	.169 J	.0702 B	.0513 B	.0553 B	0.34
Mercury	0.0645	0.000 B	ND	ND	ND	ND	ND	.0081 B,J	.0084 B,J	.00029 B	ND	ND	ND
pH	5-12	5.8	5.8	7.9	7.8	5.3	8.1	7.4	6.6	7.3	7.5	7.6	7.4
Flashpoint	>140° F	>140° F	>140° F	>140° F	>140° F	>140° F	>140° F	>140° F	>140° F	>140° F	>140° F	>140° F	>140° F
Percent Moisture	8-14.6%	15.2	14.7	6.7	10.8	9.1	7.8	8.5	9.3	11.7	10 7	9.6	13.1
Reactive Cyanide	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Reactive Sufide	0.1	ND	ND	ND	ND	13.2 B	ND	ND	ND	ND	33.6	ND	ND

Concentrations in ppm

N- Spiked analyte recovery is outside stated control limits.

B- Estimated Result. Result is lower than reporting limit.

TABLE 3-11
Former Hazardous Waste Management Facility
Waste Confirmation Sample Results
Metals General Chemistry

Parameter	Allowable Conc.	WCS49	WCS50	WCS51	WCS52	WCS53	WCS54	WCS55	WCS56	WCS57	WCS58	WCS59	WCS60
Arsenic	0.027	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Barium	0.76	0.149 B	0.119 B	.165 B	.126 B	.121 B	.0848 B	.245 B	.161 B	.171 B	.220 B	.226 B	.262 B
Cadmium	0.49	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	.0082 B
Chromium	0.206	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Lead	0.56	0.118 B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Silver	0.011	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Selenium	0.029	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Copper		ND	.0276 B	.0316 B	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	1840	0.0722 B	.0561 B	0.126	0.089	.0807 B	.0763 B	.0646 B	.0456 B	.0751 B	0.180	0.228	0.106
Mercury	0.0645	ND	ND	.0025 B	ND	ND	ND	ND	ND	ND	ND	ND	ND
pH	5-12	8	7	7	6.9	6.8	5.7	6.4	6.6	5.8	7.9	7.5	7.2
Flashpoint	>140° F	>140° F	>140° F	>140° F	>140° F	>140° F	>140° F	>140° F	>140° F	>140° F	>140° F	>140° F	>140° F
Percent Moisture	8-14.6%	4.8	6.4	13.2	9	6.4	7.1	7.2	6.2	6.5	6.5	5.9	6.8
Reactive Cyanide	ND	ND	ND	ND	ND	ND	**0.075 B**	ND	ND	ND	**0.032 B**	ND	**0.032 B**
Reactive Sufide	**0.1**	ND	ND	ND	**24.4**	ND	ND	ND	ND	ND	ND	ND	**29.8**

Parameter	Allowable Conc.	WCS61	WCS50
Arsenic	0.027	ND	ND
Barium	0.76	0.216 B, J	0.233 B, J
Cadmium	0.49	ND	ND
Chromium	0.206	ND	ND
Lead	0.56	0.118 B	ND
Silver	0.011	ND	ND
Selenium	0.029	ND	ND
Copper		ND	.0276 B
Zinc	1840	0.0625 B, J	0.0522 B, J
Mercury	0.0645	ND	ND
pH	5-12	8.7	8.9
Flashpoint	>140° F	>140° F	>140° F
Percent Moisture	8-14.6%	7.4	4.6
Reactive Cyanide	ND	ND	ND
Reactive Sufide	**0.1**	ND	ND

Concentrations in ppm

N- Spiked analyte recovery is outside stated control limits.

B- Estimated Result. Result is lower than reporting limit.

TABLE 3-12
Former Hazardous Waste Management Facility
Waste Confirmation Sample Results
Radiological Analyses

Parameter	Maximum Allowable Conc.	WCS01	Uncertainty (+/-)	WCS02	Uncertainty (+/-)	WCS03	Uncertainty (+/-)	WCS04	Uncertainty (+/-)	WCS05	Uncertainty (+/-)	WCS06	Uncertainty (+/-)	WCS07	Uncertainty (+/-)	WCS08	Uncertainty (+/-)
Americium 241	8200	ND	0.26	ND	0.34	ND	0.91	ND	0.61	5.7	4.5	ND	0.93	ND	0.63	ND	0.29
Beryllium 7	5000	ND	2.1	ND	3.0	ND	19	ND	7	ND	17	ND	8.3	ND	5.3	ND	3.7
Cesium 134	15,000	ND	0.14	ND	0.17	ND	0.8	ND	0.39	ND	0.91	ND	0.49	ND	0.32	ND	0.22
Cesium 137	2.00E+06	133	21	325	53	12,000	1800	1890	260	6380	940	1710	270	720	120	411	63
Cobalt 57	10,000	ND	0.091	ND	0.13	ND	0.45	ND	0.28	ND	0.68	ND	0.33	ND	0.22	ND	0 13
Cobalt 60	1000	ND	0.055	ND	0.042	ND	0.085	29 J	0.1	0.41	0.18	ND	0.057	0.32	0.12	10.8	1.5
Europium 152	4.00E+05	ND	0.34	ND	0.37	ND	2.5	ND	0.61	ND	2.4	ND	0.93	ND	0.46	ND	1.1
Europium 154	5,000	ND	0.32	ND	0.32	ND	3.5	ND	0.8	ND	3.6	ND	1.4	ND	0.59	ND	1.1
Europium 155	5,000	ND	0.33	ND	0.47	ND	1.7	ND	1	ND	2.5	ND	1.2	ND	0.83	ND	0.49
Manganese 54	10,000	ND	0.038	ND	0.05	ND	0.42	ND	0.098	ND	0.43	ND	0.17	ND	0.067	ND	0.12
Sodium 22	10,000	ND	0.050	ND	0.041	ND	0.260	ND	0.065	ND	0.230	ND	0.110	ND	0.051	ND	0.071
Zinc 65	5000	ND	0.12	ND	0.095	ND	0.65	ND	0.19	ND	0.64	ND	0.25	ND	0.16	ND	0.29
Potassium 40	5000	5.0	1.5	5.6	1.3	ND	2.3	6.1	1.5	ND	1.3	4.5	1.7	7.3	1.8	5.6	1.6
Plutonium 238	500	ND	0.0	ND	0.0	ND	0.0	ND	0.1	ND	0.3	ND	0.0	ND	0.1	ND	0.11
Plutonium 239/240	1000	0.54 J	0.16	0.059 J	0.054	.108 J	0.082	0.31 J	0.16	.63 J	4.4	.28 J	0.19	1.08	0.26	.36 J	0.14
Strontium 90	25,000	4.26	0.92	1.02 J	0.53	3.89	0.73	8.0	1.1	272	28	4.24	0.73	9.8	1.2	3.07	0.66

Parameter	Maximum Allowable Conc.	WCS09	Uncertainty (+/-)	WCS10	Uncertainty (+/-)	WCS11	Uncertainty (+/-)	WCS12	Uncertainty (+/-)	WCS13	Uncertainty (+/-)	WCS14	Uncertainty (+/-)	WCS15	Uncertainty (+/-)	WCS16	Uncertainty (+/-)
Americium 241	5000	ND	0.44	ND	0.29	ND	0.29	ND	0.91	ND	0.24	3.10 J	0.92	ND	0.39	NA	NA
Beryllium 7	5000	ND	5.8	ND	2.4	ND	2.5	ND	7.3	ND	3.1	ND	5.9	ND	4.6	NA	NA
Cesium 134	15,000	ND	0.3	ND	0.17	ND	0.16	ND	0.40	ND	0.18	ND	0.33	ND	0.25	NA	NA
Cesium 137	2.00E+06	1090	160	151	22	171	27	1440	210	399	58	1460	210	696	97	NA	NA
Cobalt 57	10,000	ND	0.21	ND	0.10	ND	0.11	ND	0.32	ND	0.12	ND	0.23	ND	0.18	NA	NA
Cobalt 60	1000	1.06	0.25	ND	0.067	ND	0.056	ND	0.053	ND	0.041	5.78	0.84	0.43	0.12	NA	NA
Europium 152	4.00E+05	ND	0.73	ND	0.34	ND	0.38	ND	0.69	ND	0.32	ND	0.97	ND	0.40	NA	NA
Europium 154	5,000	ND	0.76	ND	0.23	ND	0.39	ND	0.89	ND	0.36	ND	1.1	ND	0.46	NA	NA
Europium 155	5,000	ND	0.75	ND	0.40	ND	0.39	ND	1.2	ND	0.41	ND	0.80	ND	0.64	NA	NA
Manganese 54	10,000	ND	0.085	ND	0.047	ND	0.047	ND	0.11	ND	0.045	ND	0.13	ND	0.054	NA	NA
Sodium 22	10,000	ND	0.069	ND	0.044	ND	0.056	ND	0.058	ND	0.05	ND	0.087	ND	0.048	NA	NA
Zinc 65	5000	ND	0.21	ND	0.12	ND	0.13	ND	0.18	ND	0.11	ND	0.25	ND	0.11	NA	NA
Potassium 40	5000	5.5	1.5	6.3	1.6	9.9	2.3	6.3	1.6	6.9	1.5	5.6	1.4	ND	1.5	NA	NA
Plutonium 238	500	ND	0 11	ND	0	ND	0.0	ND	0.0	ND	0.12	ND	0.1	0.64 J	0.19	NA	NA
Plutonium 239/240	1000	0.99	0.23	ND	0.17	ND	0.0	ND	0.063	ND	0	.150 J	0.089	48.8	4.1	NA	NA
Strontium 90	25,000	3.36	0.62	0.0 J	0.0	6.03	0.84	2.73	0.66	5.6	1.6	ND	1.0	104	11	NA	NA

Concentrations in pCi/g

Detectable concentrations in bold

J- Result is greater than sample detection limit but less than stated reporting limit.

TABLE 3-12
Former Hazardous Waste Management Facility
Waste Confirmation Sample Results
Radiological Analyses

Parameter	Maximum Allowable Conc.	WCS17	Uncertainty (+/-)	WCS18	Uncertainty (+/-)	WCS19	Uncertainty (+/-)	WCS20	Uncertainty (+/-)	WCS21	Uncertainty (+/-)	WCS22	Uncertainty (+/-)	WCS23	Uncertainty (+/-)	WCS24	Uncertainty (+/-)
Americium 241	5000	ND	0.61	ND	0.44	ND	0.29	ND	0.1	ND	0.72	ND	0.66	ND	0.12	ND	0.65
Beryllium 7	5000	ND	5.2	ND	3.8	ND	2.4	ND	0.22	ND	6.4	ND	5.8	ND	0.61	ND	5.0
Cesium 134	15,000	ND	0.31	ND	0.23	ND	0.15	ND	0.52	ND	0.39	ND	0.36	ND	0.06	ND	0.29
Cesium 137	2.00E+06	**800**	**120**	**505**	**78**	**228**	**35**	**500**	**4**	**1450**	**230**	**1270**	**200**	**11.3**	**1.8**	**770**	**110**
Cobalt 57	10,000	ND	1.9	ND	1.4	ND	0.91	ND	0.23	ND	2.3	ND	2.1	ND	0.28	ND	1.9
Cobalt 60	1000	ND	0.027	ND	0.038	ND	0.042	ND	74	ND	0.056	ND	0.046	ND	0.038	ND	0.042
Europium 152	4.00E+05	ND	1.4	ND	1.0	ND	0.65	ND	1.6	ND	1.7	ND	1.5	ND	0.19	ND	1.3
Europium 154	5,000	ND	0.53	ND	0.45	ND	0.34	ND	0.062	ND	1.7	ND	1.5	ND	0.25	ND	0.64
Europium 155	5,000	ND	0.85	ND	0.63	ND	0.41	ND	1.1	ND	1.0	ND	0.96	ND	0.14	ND	0.85
Manganese 54	10,000	ND	0.065	ND	0.057	ND	0.038	ND	0.092	ND	0.2	ND	0.18	ND	0.039	ND	0.086
Sodium 22	10,000	ND	0.049	ND	0.043	ND	0.025	ND	0.079	ND	0.12	ND	0.10	ND	0.04	ND	0.059
Zinc 65	5000	ND	0.14	ND	0.13	ND	0.090	ND	0.16	ND	0.31	ND	0.25	ND	0.10	ND	0.15
Potassium 40	5000	**6.6**	**1.8**	**5.0**	**1.4**	ND	1.4	**4.3**	**0.5**	**4.0**	**1.2**	**3.8**	**1.1**	**4.1**	**0.6**	**3.5**	**1.0**
Plutonium 238	500	ND	0.12	ND	0.0	ND	0.12	ND	0.15	ND	0.45	ND	0	ND	0.14	ND	0.38
Plutonium 239/240	1000	ND	0.069	**0.093**	**0.073**	ND	0.088	.82 J	0.07	ND	0.22	ND	0.33	ND	0.0	ND	0.29
Strontium 90	25,000	**0.91 J**	**0.43**	**0.73**	**0.52**	**1.27**	**0.7**	**12.9**	**0.9**	ND	**0.91**	ND	**0.86**	**26.9**	**2.9**	**16.6**	**1.9**

Parameter	Maximum Allowable Conc.	WCS25	Uncertainty (+/-)	WCS26	Uncertainty (+/-)	WC27	Uncertainty (+/-)	WCS28	Uncertainty (+/-)	WCS29	Uncertainty (+/-)	WCS30	Uncertainty (+/-)	WCS31	Uncertainty (+/-)	WCS32	Uncertainty (+/-)
Americium 241	8200	ND	1.6	ND	1.0	ND	0.87	ND	0.78	ND	0.51	ND	1.0	**7.3**	**1.5**	ND	0.75
Beryllium 7	5000	ND	14	ND	0.76	ND	6.9	ND	6.5	ND	4.1	ND	8.5	ND	6.7	ND	6.0
Cesium 134	15,000	ND	0.84	ND	6.7	ND	0.38	ND	0.39	ND	0.26	ND	0.53	ND	0.41	ND	0.34
Cesium 137	2.00E+06	**4390**	**670**	**1410**	**0.41**	**1220**	**180**	**1130**	**170**	**508**	**0.78**	**2260**	**350**	**1420**	**220**	**1100**	**160**
Cobalt 57	10,000	ND	4.6	ND	220	ND	2.5	ND	2.2	ND	1.5	ND	3.0	ND	2.3	ND	2.3
Cobalt 60	1000	ND	0.13	**1.17**	**2.3**	**1.34**	**0.28**	**1.80**	**0.36**	ND	0.058	ND	0.060	ND	0.08	ND	0.042
Europium 152	4.00E+05	ND	3.5	ND	0.26	ND	1.8	ND	1.6	ND	1.1	ND	2.2	ND	1.8	ND	1.6
Europium 154	5,000	ND	3.5	ND	1.8	ND	1.2	ND	1.1	ND	0.48	ND	1.9	ND	1.6	ND	0.90
Europium 155	5,000	ND	2.1	ND	1.6	ND	1.1	ND	0.997	ND	0.67	ND	1.4	ND	1.1	ND	0.99
Manganese 54	10,000	ND	0.43	ND	1.1	ND	0.13	ND	0.12	ND	0.067	ND	0.23	ND	0.2	ND	0.12
Sodium 22	10,000	ND	0.26	ND	0.20	ND	0.094	ND	0.088	ND	0.059	ND	0.12	ND	0.12	ND	0.075
Zinc 65	5000	ND	0.64	ND	0.12	ND	0.22	ND	0.23	ND	0.14	ND	0.33	ND	0.30	ND	0.18
Potassium 40	5000	**10.6**	**2.8**	**5.4**	**1.3**	**5.8**	**1.6**	**5.7**	**1.6**	**5.6**	**1.7**	**7.6**	**1.8**	ND	**1.5**	**5.9**	**1.5**
Plutonium 238	500	ND	0.0	ND	0.0	ND	0.43	ND	4.0	ND	0.21	ND	0.24	.87 J	0.35	ND	0.14
Plutonium 239/240	1000	**3.20**	**0.90**	6.7 J	1.8	3.5 J	1.3	ND	3.4	.42 J	0.21	ND	0.17	**66.5**	**9.1**	.37 J	0.19
Strontium 90	25,000	**102**	**10**	**7.4**	**1.2**	**8.6**	**1.3**	**17.6**	**2.3**	**3.16**	**0.70**	**4.48**	**0.75**	**63.6**	**6.6**	**3.82**	**0.67**

Concentrations in pCi/g

Detectable concentrations in bold

J- Result is greater than sample detection limit but less than stated reporting limit.

TABLE 3-12
Former Hazardous Waste Management Facility
Waste Confirmation Sample Results
Radiological Analyses

Parameter	Maximum Allowable Conc.	WCS33	Uncertainty (+/-)	WCS34	Uncertainty (+/-)	WCS35	Uncertainty (+/-)	WCS36	Uncertainty (+/-)	WCS37	Uncertainty (+/-)	WCS38	Uncertainty (+/-)	WCS39	Uncertainty (+/-)	WCS40	Uncertainty (+/-)
Americium 241	8200	ND	1.3	ND	0.19	1.58 J	0.93	0.43 J	0.34	ND	0.51	1.58 J	0.38	ND	0.61	2.5 J	1.8
Beryllium 7	5000	ND	11	ND	2.1	ND	6.6	ND	3.4	ND	4.1	ND	3.3	ND	5.3	ND	8.1
Cesium 134	15,000	ND	0.70	ND	0.15	ND	0.37	ND	0.18	ND	0.23	ND	0.23	ND	0.32	ND	0.46
Cesium 137	2.00E+06	3370	520	157	25	848	93	445	55	402	59	326	51	960	150	1660	240
Cobalt 57	10,000	ND	3.8	ND	0.68	ND	2.3	ND	0.96	ND	1.5	ND	1.2	ND	1.9	ND	3.0
Cobalt 60	1000	ND	0.083	.138 J	0.078	0.51	0.17	ND	0.079	ND	0.045	ND	0.043	ND	0.061	ND	0.090
Europium 152	4.00E+05	ND	2.9	ND	0.53	ND	1.7	ND	0.81	ND	1.1	ND	0.86	ND	1.4	ND	2.1
Europium 154	5,000	ND	2.8	ND	0.34	ND	1.1	ND	0.65	ND	0.48	ND	0.47	ND	1	ND	1.5
Europium 155	5,000	ND	1.7	ND	0.29	ND	1.1	ND	0.42	ND	0.69	ND	0.52	ND	0.87	ND	1.4
Manganese 54	10,000	ND	0.33	ND	0.043	ND	0.12	ND	0.077	ND	0.056	ND	0.061	ND	0.13	ND	0.18
Sodium 22	10,000	ND	0.20	ND	0.052	ND	0.090	ND	0.072	ND	0.053	ND	0.046	ND	0.091	ND	0.095
Zinc 65	5000	ND	0.49	ND	0.12	ND	0.23	ND	0.14	ND	0.095	ND	0.11	ND	0.20	ND	0.27
Potassium 40	5000	8.4	2.3	7.8	1.9	7.6	2.2	6.5	1.6	5.0	1.5	5.8	1.6	6.8	1.6	5.2	1.5
Plutonium 238	500	ND	0.11	ND	0.0	ND	0.17	ND	0.17	ND	0.150	ND	-0.19	ND	0.52	ND	0.22
Plutonium 239/240	1000	0.41	0.19	.60 J	0.22	6.7	1.0	3.96	0.66	ND	0.087	ND	0.10	.45 J	0.35	14.3	2.0
Strontium 90	25,000	1.31 J	0.47	ND	0.46	398	40	17.0	1.9	0.0 J	0.0	0.0 J	0.0	0.0 J	0.0	6.43	0.9

Parameter	Maximum Allowable Conc.	WCS41	Uncertainty (+/-)	WCS42	Uncertainty (+/-)	WCS43	Uncertainty (+/-)	WCS44	Uncertainty (+/-)	WCS45	Uncertainty (+/-)	WCS46	Uncertainty (+/-)	WCS47	Uncertainty (+/-)	WCS48	Uncertainty (+/-)
Americium 241	8200	ND	0.2	ND	2.0	ND	0.28	ND	0.65	ND	0.22	ND	0.22	ND	0.79	ND	0.99
Beryllium 7	5000	ND	1.3	ND	17	ND	3.2	ND	5.3	ND	1.8	ND	1.9	ND	6.4	ND	8.2
Cesium 134	15,000	ND	0.095	ND	0.98	ND	0.18	ND	0.29	ND	0.12	ND	0 11	ND	0.35	ND	0.46
Cesium 137	2.00E+06	53.4	8.2	6440	950	348	59	710	100	109	17	116	18	1090	160	1460	210
Cobalt 57	10,000	ND	0.5	ND	5.8	ND	1.1	ND	1.9	ND	0.65	ND	0.68	ND	2.3	ND	2.9
Cobalt 60	1000	ND	0.034	ND	0.190	ND	0.049	ND	0.067	ND	0.048	ND	0.059	0.82	0.2	ND	0.077
Europium 152	4.00E+05	ND	0.35	ND	4.2	ND	0.8	ND	1.3	ND	0.49	ND	0.5	ND	1.6	ND	2.1
Europium 154	5,000	ND	0.32	ND	5.4	ND	0.38	ND	0.7	ND	0.34	ND	0.4	ND	0.98	ND	1.3
Europium 155	5,000	ND	0.25	ND	2.5	ND	0.47	ND	0.9	ND	0.3	ND	0.31	ND	1	ND	1.3
Manganese 54	10,000	ND	0.04	ND	0.65	ND	0.048	ND	0.077	ND	0.037	ND	0.035	ND	0.12	ND	0.17
Sodium 22	10,000	ND	0.037	ND	0.36	ND	0.037	ND	0.053	ND	0.039	ND	0.047	ND	0.072	ND	0.072
Zinc 65	5000	ND	0.097	ND	0.93	ND	0.08	ND	0.15	ND	0.096	ND	0.13	ND	0.18	ND	0.24
Potassium 40	5000	4.9	1.6	ND	ND	6.1	1.6	5.3	1.5	7.8	1.7	6.6	1.7	5.4	1.5	6.1	1.7
Plutonium 238	500	ND	0.09	ND	-0.18	ND	0.15	ND	0	ND	0.15	ND	0.15	ND	0.17	ND	0.32
Plutonium 239/240	1000	.85 J	0.3	0.48 J	0.3	.18 J	0.14	.51 J	0.22	0.31 J	0.17	.68 J	0.26	.32 J	0.17	ND	0.2
Strontium 90	25,000	52.7	5.4	7.4	1.2	0.48	0.43	0.57	0.43	2.01J	0.56	2.39 J	0.56	2.81 J	0.64	4.73	0.69

Concentrations in pCi/g

Detectable concentrations in bold

J- Result is greater than sample detection limit but less than stated reporting limit.

TABLE 3-12
Former Hazardous Waste Management Facility
Waste Confirmation Sample Results
Radiological Analyses

Parameter	Maximum Allowable Conc.	WCS49	Uncertainty (+/-)	WCS50	Uncertainty (+/-)	WCS51	Uncertainty (+/-)	WCS52	Uncertainty (+/-)	WCS53	Uncertainty (+/-)	WCS54	Uncertainty (+/-)	WCS55	Uncertainty (+/-)	WCS56	Uncertainty (+/-)
Americium 241	8200	ND	0.5	ND	0.2	ND	0.4	ND	0.3	ND	0.3	ND	0.2	ND	0.2	ND	0.2
Beryllium 7	5000	ND	4.4	ND	1.5	ND	3.1	ND	2.8	ND	2.2	ND	1.8	ND	1	ND	1.7
Cesium 134	15,000	ND	0.28	ND	0.098	ND	0.18	ND	0.17	ND	0.12	ND	0.13	ND	0.07	ND	0.1
Cesium 137	2.00E+06	**600**	**92**	**55.3**	**8.2**	**240**	**35**	**273**	**42**	**137**	**20**	133	**21**	**26.8**	**4**	**108**	**17**
Cobalt 57	10,000	ND	1.6	ND	0.6	ND	1.2	ND	1.0	ND	0.8	ND	0 7	ND	0.4	ND	0.7
Cobalt 60	1000	ND	0.036	ND	0.043	ND	0.050	ND	0.042	ND	0.036	ND	0.037	ND	0.036	ND	0.054
Europium 152	4.00E+05	ND	1.1	ND	0.38	ND	0.82	ND	0.74	ND	0.57	ND	0.51	ND	0.26	ND	0.47
Europium 154	5,000	ND	0.55	ND	0.3	ND	0.35	ND	0.41	ND	0.27	ND	0.33	ND	0.35	ND	0.32
Europium 155	5,000	ND	0.72	ND	0.26	ND	0.53	ND	0.47	ND	0.37	ND	0.31	ND	0.2	ND	0.3
Manganese 54	10,000	ND	0.072	ND	0.044	ND	0.059	ND	0.052	ND	0.041	ND	0.034	ND	0.041	ND	0.038
Sodium 22	10,000	ND	0.044	ND	0.034	ND	0.066	ND	0.036	ND	0.035	ND	0.044	ND	0.046	ND	0.035
Zinc 65	5000	ND	0.12	ND	0.1	ND	0.13	ND	0.099	ND	0.1	ND	0.095	ND	0.13	ND	0.074
Potassium 40	5000	**4.4**	**1.4**	**7.8**	**1.8**	**6.6**	**1.8**	**6.1**	**1.6**	**6**	**1.5**	**5.6**	**1.3**	**7.3**	**1.7**	**4.5**	**1.3**
Plutonium 238	500	ND	0.13	ND	0.24	ND	0.19	ND	0.18	ND	0.05	ND	0.12	ND	0.11	ND	0.19
Plutonium 239/240	1000	**.17 J**	**0.1**	**.22 J**	**0.2**	**.26 J**	**0.2**	**.23 J**	**0.2**	ND	0.1	ND	0.1	ND	0.1	**0.16 J**	**0.1**
Strontium 90	25,000	**2.36**	**0.6**	**.61 J**	**0.5**	**5.66**	**0.8**	**1.38 J**	**0.5**	**0.81 J**	**0.5**	**0.79 J**	**0.4**	**0.92 J**	**0.5**	ND	0.4

Parameter	Maximum Allowable Conc.	WCS57	Uncertainty (+/-)	WCS58	Uncertainty (+/-)	WCS59	Uncertainty (+/-)	WCS60	Uncertainty (+/-)	WCS61	Uncertainty (+/-)	WCS62	Uncertainty (+/-)
Americium 241	8200	ND	0.4	ND	0.6	ND	1.0	ND	0.3	ND	0.24	ND	0.23
Beryllium 7	5000	ND	2.8	ND	5.3	ND	7.4	ND	2	ND	1.9	ND	0.6
Cesium 134	15,000	ND	0.16	ND	0.33	ND	0.43	ND	0.13	ND	0.13	ND	0.06
Cesium 137	2.00E+06	**226**	**33**	**1100**	**170**	**1630**	**240**	**110**	**17**	**106**	**16**	**121**	**19**
Cobalt 57	10,000	ND	1.0	ND	2.0	ND	2.9	ND	0.7	ND	0.69	0.81	0.69
Cobalt 60	1000	ND	0.050	**0.5**	**0.140**	ND	0.056	**0.263**	**0.096**	ND	0.057	**0.99**	**0.21**
Europium 152	4.00E+05	ND	0.72	ND	1.4	ND	1.9	ND	0.52	ND	0.51	ND	0.52
Europium 154	5,000	ND	0.33	ND	1.3	ND	1.5	ND	0.38	ND	0.30	ND	0.43
Europium 155	5,000	ND	0.46	ND	0.9	ND	1.3	ND	0.34	ND	0.32	ND	0.32
Manganese 54	10,000	ND	0.04	ND	0.16	ND	0.17	ND	0.049	ND	0.040	ND	0.058
Sodium 22	10,000	ND	0.035	ND	0.087	ND	0.086	ND	0.044	ND	0.076	ND	0.040
Zinc 65	5000	ND	0.1	ND	0.24	ND	0.23	ND	0.14	ND	0.035	ND	0.11
Potassium 40	5000	**5.2**	**1.5**	**3.3**	**1**	ND	-	**6.4**	**1.7**	ND	-	**5.3**	**1.4**
Plutonium 238	500	ND	0.17	ND	0.00	ND	0.07	ND	0.07	ND	0.072	ND	0.08
Plutonium 239/240	1000	ND	0.1	**0.62 J**	**0.2**	**.57 J**	**0.2**	**0.29 J**	**0.2**	**0.28 J**	**0.15**	**0.29**	**0.15**
Strontium 90	25,000	ND	0.3	9.2	1.2	**2.5 J**	0.6	**2.27 J**	**0.6**	**4.56**	**0.83**	3.56	**0.63**

Concentrations in pCi/g

Detectable concentrations in bold

J- Result is greater than sample detection limit but less than stated reporting limit.

TABLE 3-13

Site Restoration Materials

TAGM 4046 Recommended soil cleanup objectives

Volatile Organic Contaminants

Contaminant	Rec. Soil Cleanup Objective (ppm)[1]	Topsoil Results (ppm)	On-site Fill Results (ppm)
Acetone	0.2	0.007	ND
Benzene	0.06	ND	ND
Benzoic Acid	2.7	ND	ND
2-Butanone	0.3	ND	ND
Carbon Disulfide	2.7	ND	ND
Carbon Tetrachloride	0.6	ND	ND
Chlorobenzene	1.7	ND	ND
Chloroethane	1.9	ND	ND
Chloroform	0.3	ND	ND
Dibromochloro-methane	N/A	ND	ND
1,2-Dichloro-benzene	7.9	ND	0.001
1,3-Dichloro-benzene	1.6	ND	ND
1,4-Dichloro-benzene	8.5	ND	ND
1,1-Dichloroethane	0.2	ND	ND
1,2-Dichloroethane	0.1	ND	ND
1,1-Dichloroethene	0.4	ND	ND
1,2-Dichloroethene (trans)	0.3	ND	ND
1,3 dichloropropane	0.3	ND	ND
Ethylbenzene	5.5	ND	ND
113 Freon (1,1,2 Trichloro-1,2,2 Trifluoroethane)	6	ND	ND
Methylene chloride	0.1	ND	0.005
4-Methyl-2-Pentanone	1	ND	ND
Tetrachloroethene	1.4	ND	ND
1,1,1-Trichloroethane	0.8	ND	ND
1,1,2,2-Tetrachloro-ethane	0.6	ND	ND
1,2,3-trichloro-propane	0.4	ND	ND
1,2,4-trichloro-benzene	3.4	ND	ND
Toluene	1.5	ND	ND
Trichloroethene	0.7	ND	ND
Vinyl chloride	0.2	ND	ND
Xylenes	1.2	ND	ND

[1]As per TAGM #4046, Total VOCs < 10 ppm.

ND Not Detected

TABLE 3-14

Site Restoration Materials
TAGM 4046 Recommended soil cleanup objectives
Semi-Volatile Organic Contaminants

Contaminant	Rec. Soil Cleanup Objective (ppm) 1	Topsoil Results (ppm)	On-site Fill Results (ppm)
Acenaphthene	50.0[1]	ND	ND
Acenaphthylene	41	ND	ND
Aniline	0.1	ND	ND
Anthracene	50.0[1]	ND	ND
Benzo(a) anthracene	0.224 or MDL	ND	ND
Benzo (a) pyrene	0.061 or MDL	ND	ND
Benzo (b) fluoranthene	1.1	ND	ND
Benzo (g,h,i) perylene	50.0[1]	ND	ND
Benzo (k) fluoranthene	1.1	ND	ND
bis(2-ethylhexyl) phthalate	50.0[1]	10	ND
Butylbenzylphthlate	50.0[1]	ND	ND
Chrysene	0.4	ND	ND
4- Chloroaniline	0.220 or MDL	ND	ND
4-Chloro-3-methylphenol	0.240 or MDL	ND	ND
2-Chlorophenol	0.8	ND	ND
Dibenzofuran	6.2	ND	ND
Dibenzo(a,h) anthracene	0.014 or MDL	ND	ND
3,3'-Dichlorobenzidine	N/A	ND	ND
2,4-Dichlorophenol	0.4	ND	ND
2,4-Dinitrophenol	0.200 or MDL	ND	ND
2,6 Dinitrotoluene	1	ND	ND
Diethylphthlate	7.1	ND	ND
Dimethylphthlate	2	ND	ND
Di-n-butyl phthalate	8.1	ND	ND
Di-n-octyl phthlate	50.0[1]	ND	ND
Fluoranthene	50.0[1]	0.4	ND
Fluorene	50.0[1]	ND	ND
Hexachlorobenzene	0.41	ND	ND
Indeno (1,2,3-cd)pyrene	3.2	ND	0.24
Isophorone	4.4	ND	ND
2-methylnaphthalene	36.4	ND	ND
2-Methylphenol	0.100 or MDL	ND	ND
4-Methylphenol	0.9	ND	ND
Naphthalene	13	ND	ND
Nitrobenzene	0.200 or MDL	ND	ND
2-Nitroaniline	0.430 or MDL	ND	ND
2-Nitrophenol	0.330 or MDL	ND	ND
4-Nitrophenol	0.100 or MDL	ND	ND
3-Nitroaniline	0.500 or MDL	ND	ND
Pentachlorophenol	1.0 or MDL	ND	ND
Phenanthrene	50.0[1]	0.24	ND
Phenol	0.03 or MDL	ND	ND
Pyrene	50.0[1]	0.33	ND
2,4,5-Trichlorophenol	0.1	ND	ND

[1]As per TAGM #4046, Total VOCs < 10 ppm., Total Semi-VOCs < 500ppm

ND Not Detected

TABLE 3-15

Site Restoration Materials

TAGM 4046 Recommended soil cleanup objectives

Organic Pesticides / Herbicides and PCBs

Contaminant	Rec. Soil Cleanup Objective (ppm)	Topsoil Fill Results (ppm)	On-site Fill Results (ppm)
Aldrin	0.041	0.0035	ND
alpha- BHC	0.11	ND	ND
beta - BHC	0.2	ND	ND
delta - BHC	0.3	ND	ND
Chlordane	0.54	0.22	ND
2,4-D	0.5	ND	ND
4,4'- DDD	2.9	ND	ND
4,4'-DDE	2.1	0.024	0.002
4,4'-DDT	2.1	0.0014	0.001
Dibenzo-P-dioxins (PCDD) 2,3,7,8 TCDD	N/A	Not tested	Not tested
Dieldrin	0.044	ND	ND
Endosulfan I	0.9	0.008	ND
Endosulfan II	0.9	ND	ND
Endosulfan Sulfate	1	ND	ND
Endrin	0.1	ND	ND
Endrin keytone	N/A	ND	ND
gamma - BHC (Lindane)	0.06	ND	ND
gamma - chlordane	0.54	0.026	ND
Heptachlor	0.1	ND	ND
Heptachlor epoxide	0.02	0.0072	ND
Methoxychlor	***	ND	ND
Mitotane	N/A	Not tested	Not tested
Parathion	1.2	ND	ND
PCBs	1.0 (Surface) 10 (sub-surf)	0.013[1]	ND
Polychlorinated dibenzo-furans (PCDF)	N/A	Not tested	Not tested
Silvex	0.7	ND	ND
2,4,5-T	1.9	ND	ND

[1]**Aroclor 1260 only, all other Aroclor's ND**

ND Not Detected

TABLE 3-16

Site Restoration Materials

TAGM 4046 Recommended soil cleanup objectives

Heavy Metals

Contaminants	Eastern USA Background (ppm)	* CRDL (mg/kg or ppm)	Rec. Soil Cleanup Objective (ppm)[1]	Topsoil Fill Results (mg/kg)	On-site Fill Results (mg/kg)
Aluminum	33,000	2.0	SB	5080	4730
Antimony	N/A	0.6	SB	ND	ND
Arsenic	3-12[2]	0.1	7.5 or SB	4.4	ND
Barium	15-600	2.0	300 or SB	26.6	13.3
Beryllium	0-1.75	0.05	0.16 (HEAST) or SB	ND	ND
Cadmium	0.1-1	0.05	1 or SB	ND	ND
Calcium	130 - 35,000[2]	50.0	SB	5100	249
Chromium	1.5 - 40[2]	0.1	10 or SB	13	5.3
Cobalt	2.5 - 60[2]	0.5	30 or SB	2.5	2.0
Copper	1 - 50	0.25	25 or SB	14.8	3.7
Cyanide	N/A	0.1	See Note[3]	ND	ND
Iron	2,000 - 550,000	1.0	2,000 or SB	6840	6500
Lead	See Note[4]	0.03	SB[4]	19.2	3.7
Magnesium	100 - 5,000	50.0	SB	1490	765
Manganese	50 - 5,000	0.15	SB	159	76.6
Mercury	0.001 - 0.2	0.002	0.1	0.057	ND
Nickel	0.5 -25	0.4	13 or SB	6	3.4
Potassium	8,500 - 43,000[2]	50.0	SB	1110	226
Selenium	0.1 - 3.9	0.05	2 or SB	ND	ND
Silver	N/A	0.1	SB	ND	ND
Sodium	6,000 - 8,000	50.0	SB	107	46.0
Thallium	N/A	0.1	SB	ND	ND
Vanadium	1-300	0.5	150 or SB	11.5	9.3
Zinc	9-50	0.2	20 or SB	42.4	12.6

SB is site background

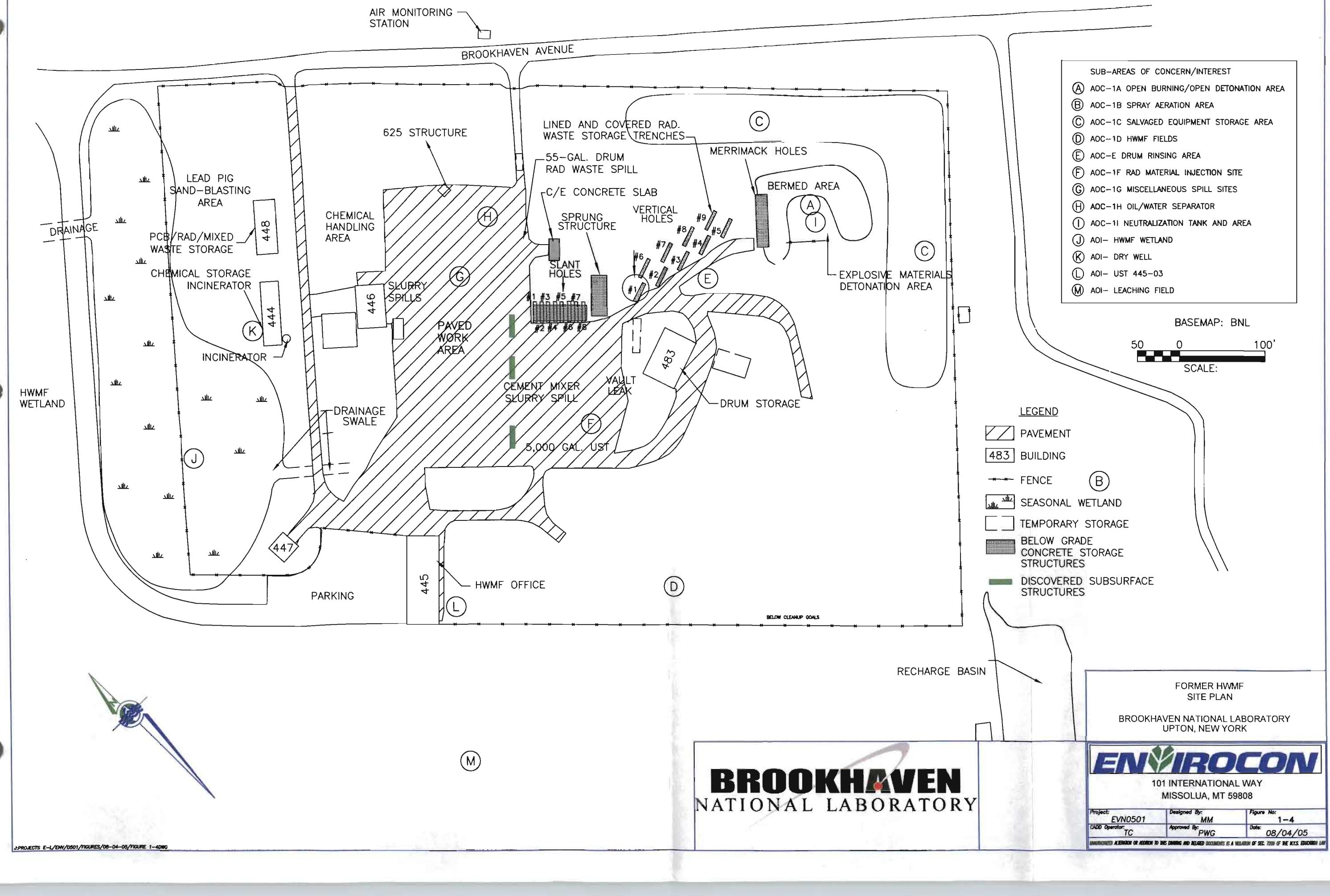
N/A is not available

[1]Recommended soil cleanup objectives are average background concentrations as reported in a 1984 survey of reference material by E. Carol McGovern, NYSDEC.

ND Not Detected

Table 4-1
Quality Assurance/Quality Control Sample Results

Sample ID	STL Results (pCi/g)		
	Cs-137	Sr-90	Ra-226
SS05A109	16.90	1.07	0.43
SS05A109-DUP	2.40	0.86	0.28
SS05C112	3.22	0.41	0.64
SS05C112-DUP	2.84	0.52	0.17
SS05C119	0.20	0.18	0.47
SS05C119-DUP	0.10	0.38	0.18
SS05C207	2.89	0.18	0.73
SS05C207-DUP	0.42	0.26	0.99
SS05C217	2.48	0.72	0.48
SS05C217-DUP	0.84	1.04	0.42
SS05C307	27.00	3.79	0.53
SS05C307-DUP	27.00	4.09	0.46
SS05D105	1.11	0.44	0.44
SS05D105-DUP	1.03	0.26	0.41
SS05D223	2.39	3.22	1.28
SS05D223-DUP	1.54	2.85	0.64
SS05D348	1.71	1.11	0.51
SS05D348-DUP	1.08	0.88	0.60
SS05D459	7.30	3.49	0.63
SS05D459-DUP	3.90	2.81	0.63
SS05D579	0.37	0.11	0.35
SS05D579-DUP	0.27	0.10	0.28
SS05D697	0.99	0.38	0.45
SS05D697-DUP	1.53	0.38	0.18
SS05L113	44.60	0.35	0.64
SS05L113-DUP	45.70	0.46	0.27
SS05Z105	2.64	0.62	0.32
SS05Z105-DUP	2.60	1.04	0.38
SS05Z210	10.10	1.97	0.36
SS05Z210-DUP	12.60	2.49	0.29
SS05K107	0.30	0.00	0.97
SS05K107-DUP	0.16	0.00	0.90
SS05K218	0.10	0.12	0.48
SS05K218-DUP	0.12	0.15	0.55
SS05K317	3.74	0.34	0.08
SS05K317-DUP	3.81	0.83	0.35
SS05Z313	3.65	1.08	0.85
SS05Z313-DUP	2.87	0.13	0.71



FORMER HWMF
SITE PLAN

BROOKHAVEN NATIONAL LABORATORY
UPTON, NEW YORK

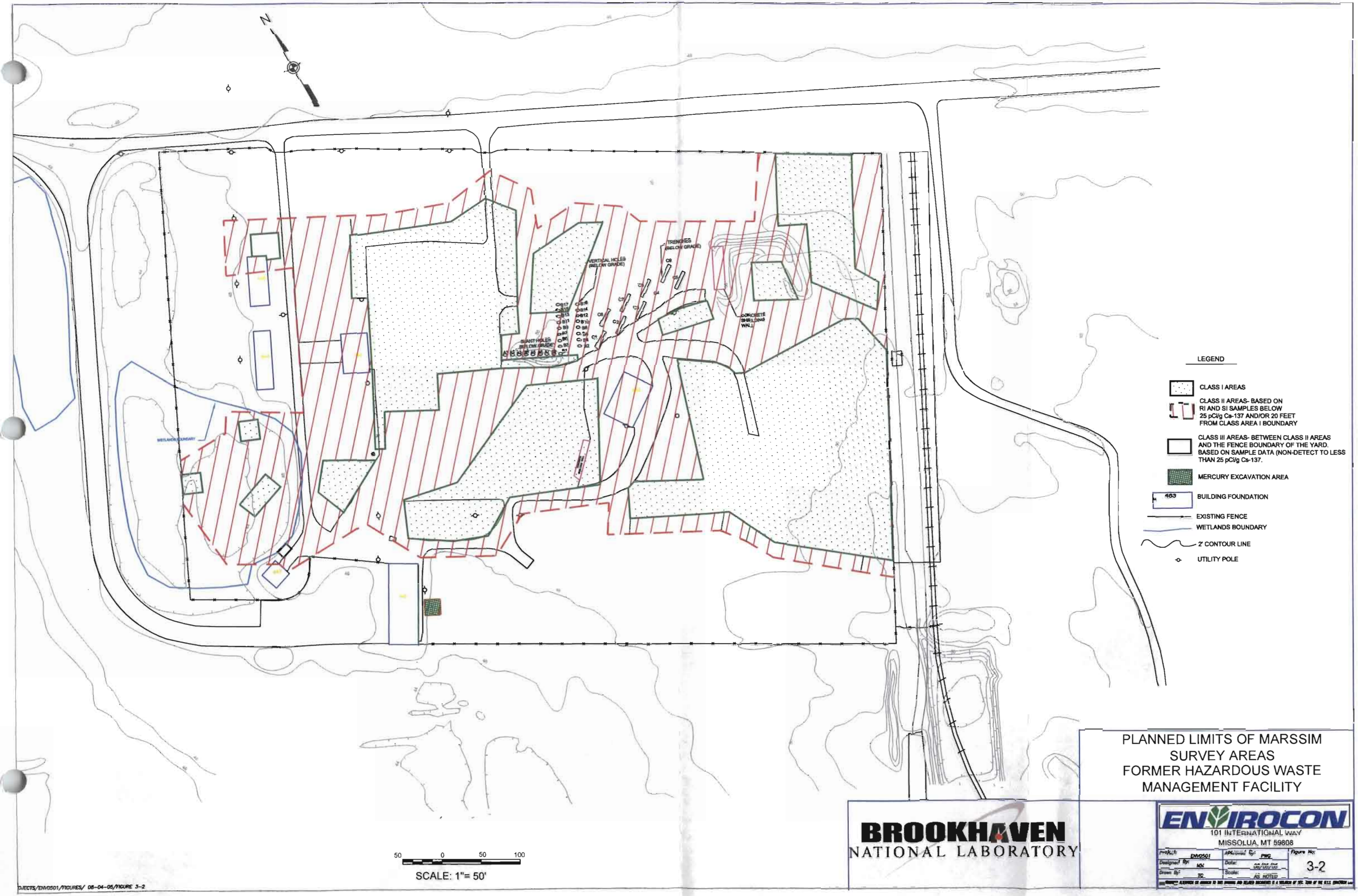
BROOKHAVEN NATIONAL LABORATORY

ENVIROCON
101 INTERNATIONAL WAY
MISSOLUA, MT 59808

Project:	Designed By:	Figure No:
EVN0501	MM	1-4
CADD Operator: TC	Approved By: PWG	Date: 08/04/05

UNAUTHORIZED ALTERATION OR ADDITION TO THIS DRAWING AND RELATED DOCUMENTS IS A VIOLATION OF SEC. 7209 OF THE N.Y.S. EDUCATION LAW

J:PROJECTS E-L/ENV/0501/FIGURES/08-04-05/FIGURE 1-4DWG



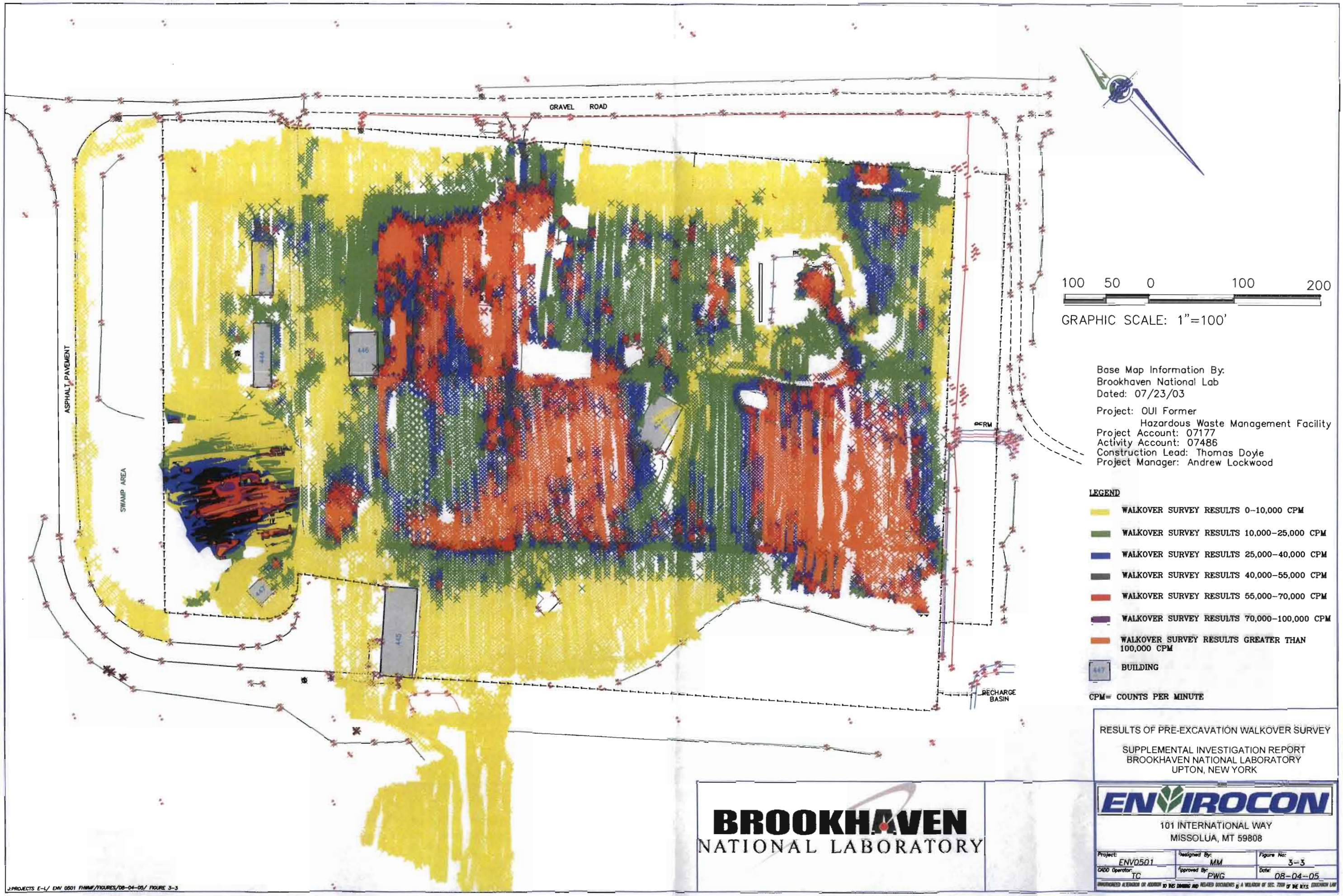
PLANNED LIMITS OF MARSSIM SURVEY AREAS FORMER HAZARDOUS WASTE MANAGEMENT FACILITY

BROOKHAVEN NATIONAL LABORATORY

ENVIROCON
101 INTERNATIONAL WAY
MISSOULA, MT 59808

Project: ENV0501	Approved By: PWG	Figure No: 3-2
Designed By: MK	Date: 08/05/08	
Drawn By: TC	Scale: AS NOTED	

OJECTS/ENV0501/FIGURES/ 08-04-05/FIGURE 3-2



Base Map Information By:
Brookhaven National Lab
Dated: 07/23/03

Project: OUI Former
Hazardous Waste Management Facility
Project Account: 07177
Activity Account: 07486
Construction Lead: Thomas Doyle
Project Manager: Andrew Lockwood

LEGEND

- WALKOVER SURVEY RESULTS 0–10,000 CPM
- WALKOVER SURVEY RESULTS 10,000–25,000 CPM
- WALKOVER SURVEY RESULTS 25,000–40,000 CPM
- WALKOVER SURVEY RESULTS 40,000–55,000 CPM
- WALKOVER SURVEY RESULTS 55,000–70,000 CPM
- WALKOVER SURVEY RESULTS 70,000–100,000 CPM
- WALKOVER SURVEY RESULTS GREATER THAN 100,000 CPM
- 447 BUILDING

CPM= COUNTS PER MINUTE

RESULTS OF PRE-EXCAVATION WALKOVER SURVEY

SUPPLEMENTAL INVESTIGATION REPORT
BROOKHAVEN NATIONAL LABORATORY
UPTON, NEW YORK

BROOKHAVEN NATIONAL LABORATORY

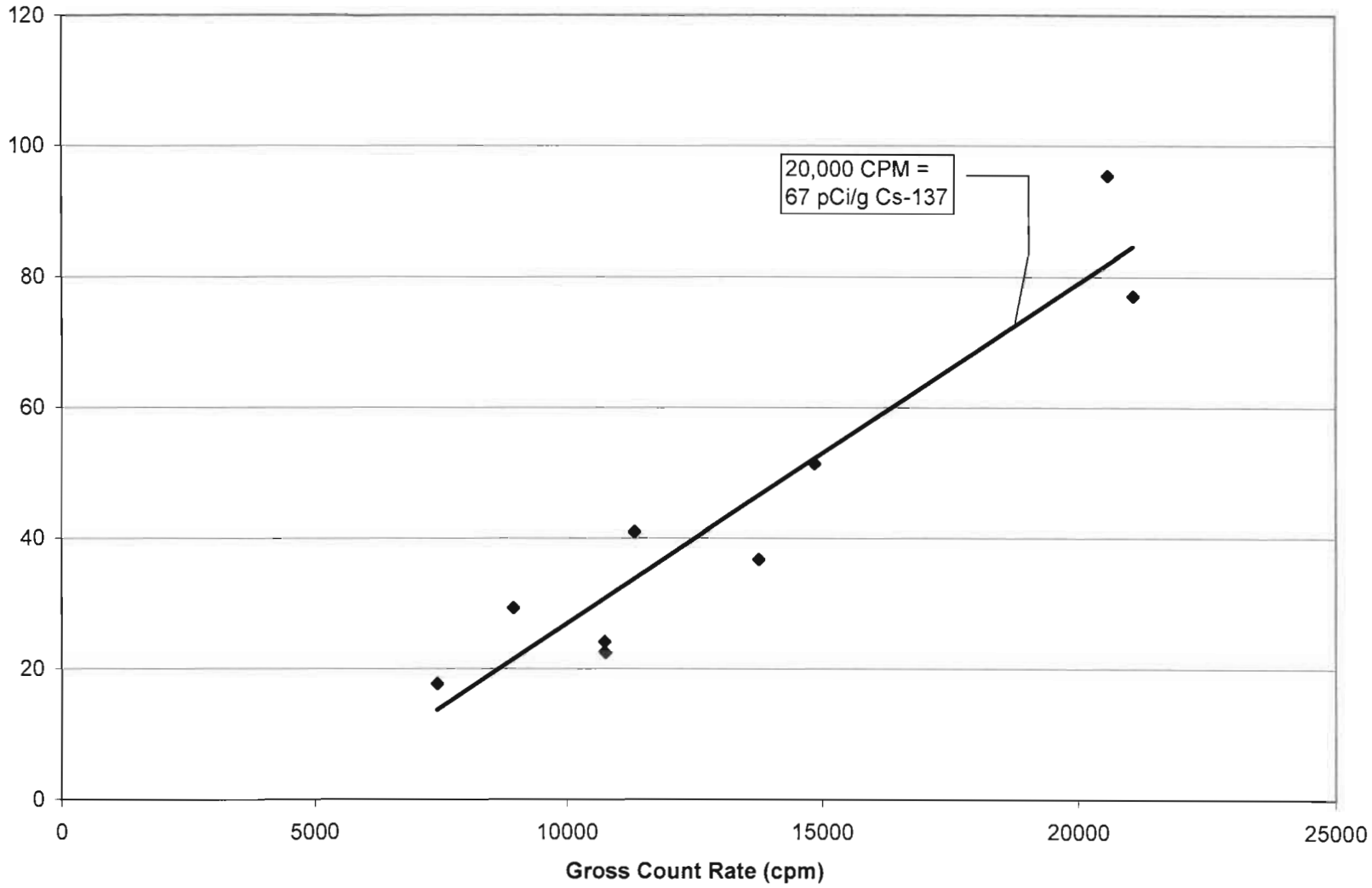
ENVIROCON
101 INTERNATIONAL WAY
MISSOULA, MT 59808

Project: ENV0501	Designed By: MM	Figure No: 3-3
CADD Operator: TC	Approved By: PWG	Date: 08-04-05

UNAUTHORIZED ALTERATION OR ADDITION TO THIS DRAWING AND RELATED DOCUMENTS IS A VIOLATION OF SEC. 7209 OF THE N.Y.S. EDUCATION LAW

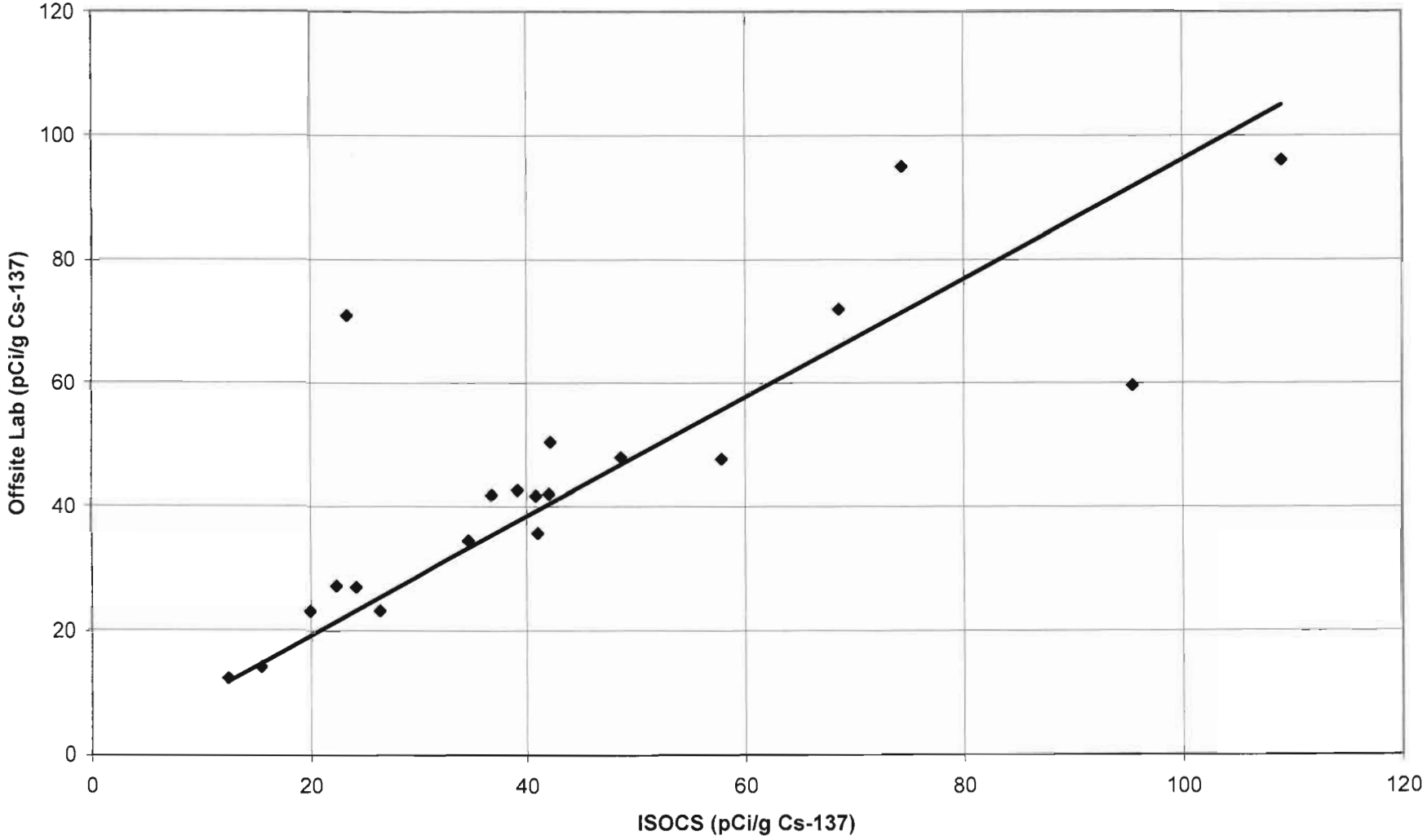
J:PROJECTS E-L/ ENV 0501 FINAL/FIGURES/08-04-05/ FIGURE 3-3

Figure 3-4
ISOCS/Walkover Survey Correlation Curve

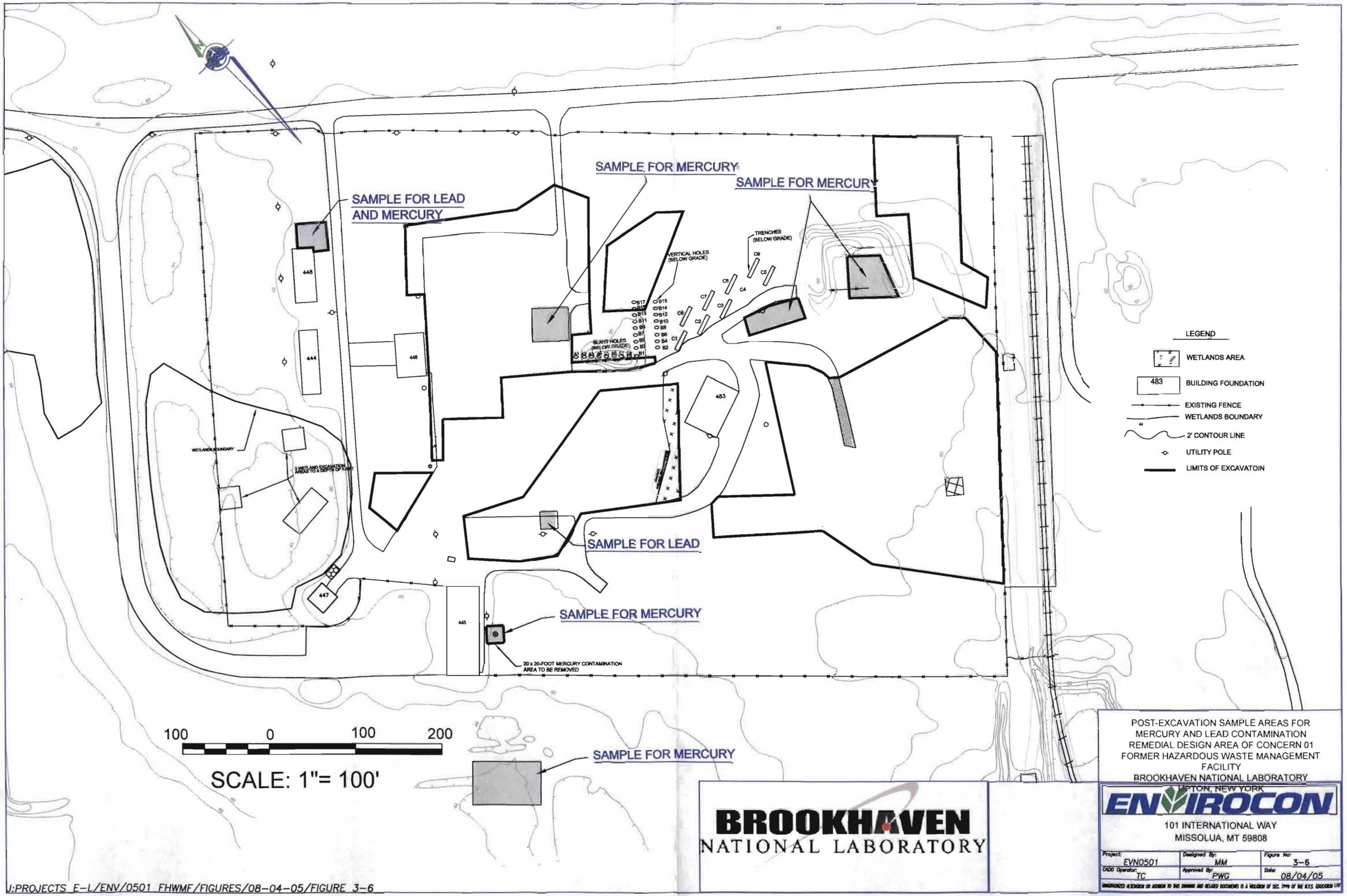


Note: Additional sample results used to establish correlation are not shown for presentation purposes.

Figure 3-5
ISOCS/Offsite Analysis Correlation Curve



Note: Additional sample results used to establish correlation are not shown for presentation purposes.



POST-EXCAVATION SAMPLE AREAS FOR MERCURY AND LEAD CONTAMINATION
REMEDIAL DESIGN AREA OF CONCERN 01
FORMER HAZARDOUS WASTE MANAGEMENT FACILITY
BROOKHAVEN NATIONAL LABORATORY
UPTON, NEW YORK

BROOKHAVEN NATIONAL LABORATORY

ENVIROCON
101 INTERNATIONAL WAY
MISSOULA, MT 59808

Project:	Designed By:	Figure No:
EVN0501	MM	3-6
CADD Operator:	Approved By:	Date:
TC	PWG	08/04/05

UNAUTHORIZED ALTERATION OR ADDITION TO THIS DRAWING AND RELATED DOCUMENTS IS A VIOLATION OF SEC. 7209 OF THE N.Y.S. EDUCATION LAW

J:PROJECTS_E-L/ENV/0501_FHWMF/FIGURES/08-04-05/FIGURE_3-6

100 50 0 100 200

GRAPHIC SCALE: 1"=100'

LEGEND

- WALKOVER SURVEY RESULTS 0-4,999 CPM
- WALKOVER SURVEY RESULTS 5,000-19,999 CPM
- WALKOVER SURVEY RESULTS 20,000-24,999 CPM
- WALKOVER SURVEY RESULTS 25,000-44,999 CPM
- WALKOVER SURVEY RESULTS 45,000-64,999 CPM
- WALKOVER SURVEY RESULTS 65,000-84,999 CPM
- WALKOVER SURVEY RESULTS GREATER THAN 85,000+ CPM
- 447 BUILDING

CPM= COUNTS PER MINUTE

ENVIROCON
101 INTERNATIONAL WAY
MISSOULA, MONTANA 59808

PREPARED FOR:
Brookhaven National Laboratory
Upton, New York

NO.	DATE	DESCRIPTION	BY

Engineer:

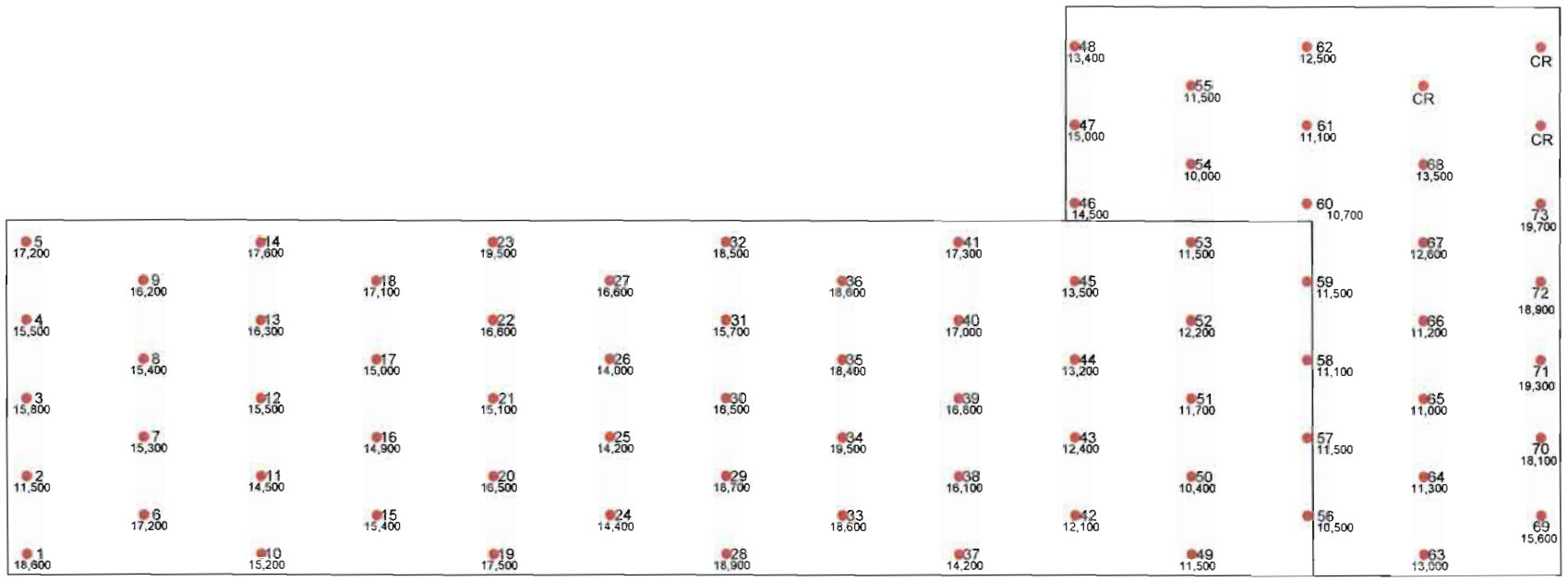
TITLE: FIGURE 3-7-2 Final Radiological Survey Results

Revision: X

Drawn	JS
Checked	RG
Approved	RG
Date	08-17-05
Dwg. No.	14582

Bet Scan Areas

PREPARED FOR: **Brookhaven National Labs**	PREPARED BY: ENVIROCON, 101 INTERNATIONAL WAY, MISSOULA, MONTANA 59808
TITLE: **FIGURE 3-9 Sr-90 BETA Schintillation Sample Locations**	SCALE: Not to Scale; DRAWING No.: 6681-Marssim Areas; DRAWN BY: J. Stone; CHECKED BY: R. Gray; DATE: 8/20/04; FIGURE: 3; REVISION: 1



LEGEND

10 POINT ANNOTATION

POINT

15,200 GAMMA COUNT RATE (cpm)

10 0 10 20

SCALE: 1"= 10'

BUILDING 444
CONCRETE SLAB
FINAL STATUS SURVEY
BROOKHAVEN NATIONAL LABORATORY
UPTON, NEW YORK

BROOKHAVEN NATIONAL LABORATORY

ENVIROCON
101 INTERNATIONAL WAY
MISSOLUA, MT 59808

Project: EVN0501	Designed By: MM	Figure No: 3-10-1
CADD Operator: TC	Approved By: PWG	Date: 08/04/05

UNAUTHORIZED ALTERATION OR ADDITION TO THIS DRAWING AND RELATED DOCUMENTS IS A VIOLATION OF SEC. 7209 OF THE N.Y.S. EDUCATION LAW

U:PROJECTS E-L/ENV/0501 FHWMF/FIGURES/09-28-05/FIGURE3-10-1

LEGEND

10 POINT ANNOTATION

POINT

13,500 GAMMA COUNT RATE (cpm)

10 0 10 20

SCALE: 1"= 10'

BUILDING 445
CONCRETE SLAB
FINAL STATUS SURVEY
BROOKHAVEN NATIONAL LABORATORY
UPTON, NEW YORK

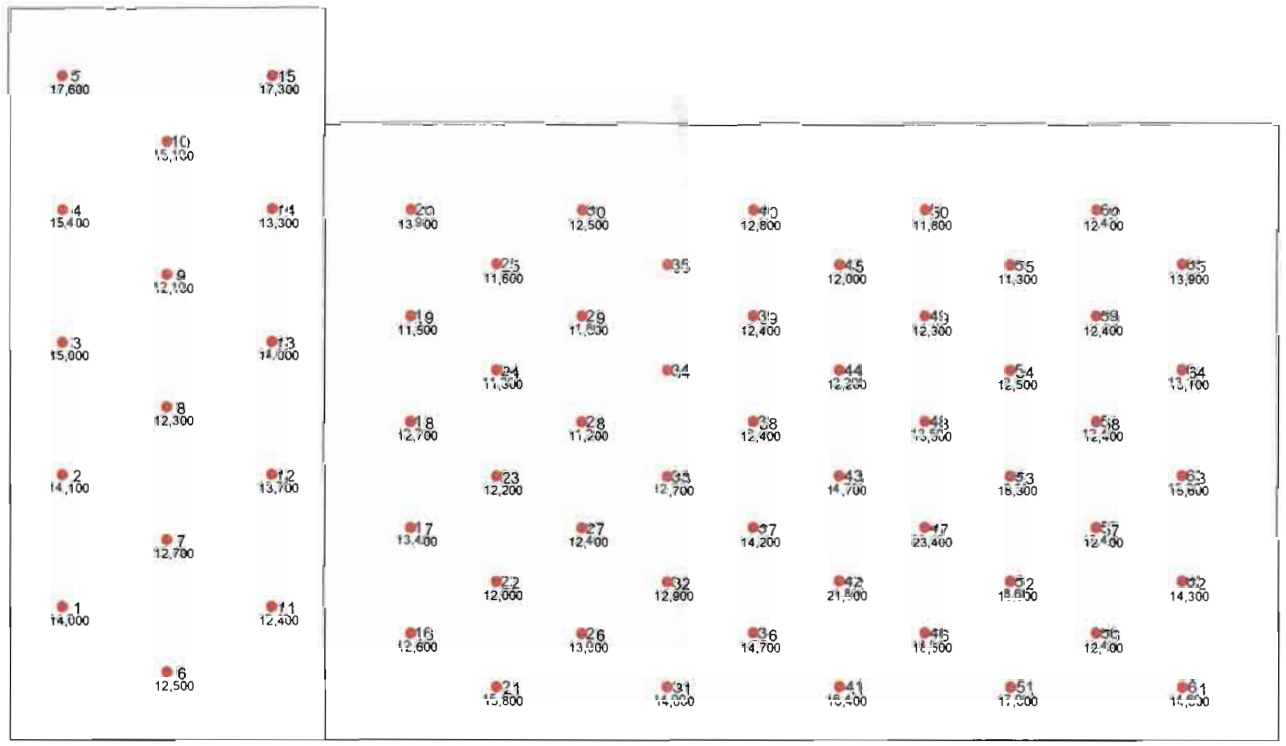
BROOKHAVEN NATIONAL LABORATORY

ENVIROCON
101 INTERNATIONAL WAY
MISSOLUA, MT 59808

Project: EVN0501	Designed By: MM	Figure No: 3-10-2
CADD Operator: TC	Approved By: PWG	Date: 08/04/05

UNAUTHORIZED ALTERATION OR ADDITION TO THIS DRAWING AND RELATED DOCUMENTS IS A VIOLATION OF SEC. 7209 OF THE N.Y.S. EDUCATION LAW

J:PROJECTS E-L/ENV/0501 FHWMF/FIGURES/09-28-05/FIGURE3-10-2



LEGEND

10 POINT ANNOTATION

● POINT

15,100 GAMMA COUNT RATE (cpm)

10 0 10 20

SCALE: 1"= 10'

BUILDING 446
CONCRETE SLAB
FINAL STATUS SURVEY
BROOKHAVEN NATIONAL LABORATORY
UPTON, NEW YORK

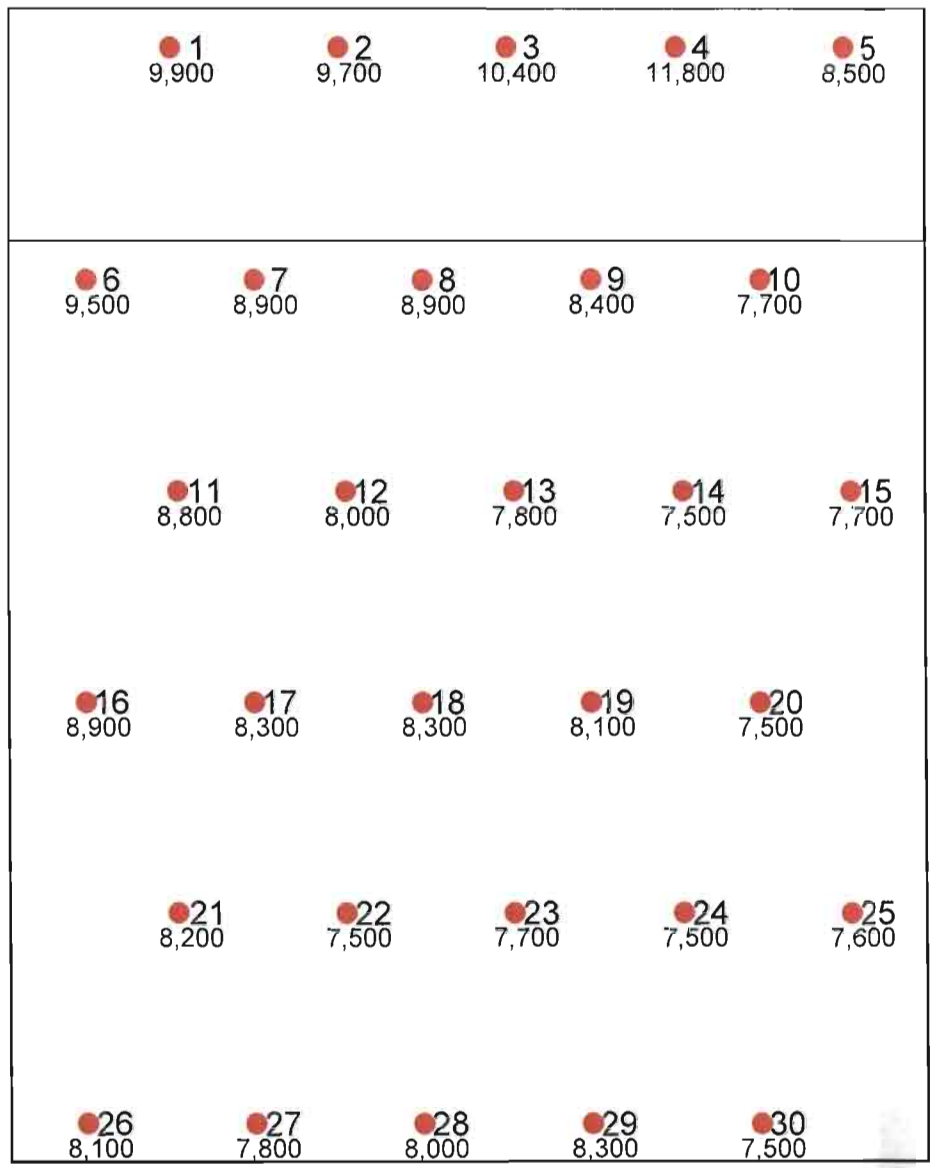
BROOKHAVEN NATIONAL LABORATORY

ENVIROCON
101 INTERNATIONAL WAY
MISSOLUA, MT 59808

Project: EVN0501	Designed By: MM	Figure No: 3-10-3
CADD Operator: TC	Approved By: PWG	Date: 08/04/05

UNAUTHORIZED ALTERATION OR ADDITION TO THIS DRAWING AND RELATED DOCUMENTS IS A VIOLATION OF SEC. 7209 OF THE N.Y.S. EDUCATION LAW

J:PROJECTS_E-L/ENV/0501_FHWMF/FIGURES/09-28-05/FIGURE3-10-3



LEGEND

10 POINT ANNOTATION

POINT

7,700 GAMM COUNT RATE (cpm)

5 0 5 10

SCALE: 1"= 5'

BUILDING 447
CONCRETE SLAB
FINAL STATUS SURVEY
BROOKHAVEN NATIONAL LABORATORY
UPTON, NEW YORK

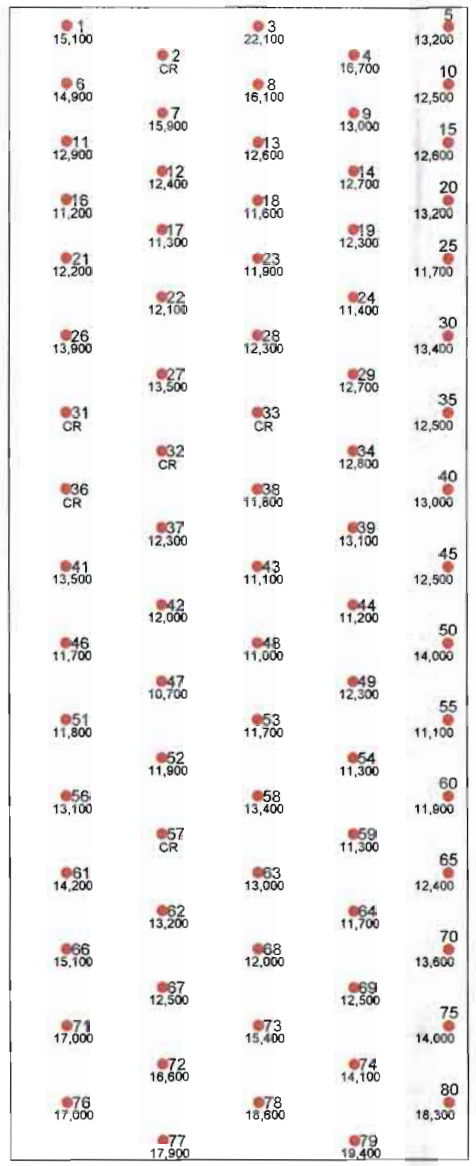
BROOKHAVEN NATIONAL LABORATORY

ENVIROCON
101 INTERNATIONAL WAY
MISSOULA, MT 59808

Project: EVN0501	Designed By: MM	Figure No: 3-10-4
CADD Operator: TC	Approved By: PWG	Date: 08/04/05

UNAUTHORIZED ALTERATION OR ADDITION TO THIS DRAWING AND RELATED DOCUMENTS IS A VIOLATION OF SEC. 7209 OF THE N.Y.S. EDUCATION LAW

J:PROJECTS E-L/ENV/0501 FHWMF/FIGURES/09-28-05/FIGURE3-10-4



LEGEND

10 POINT ANNOTATION

POINT

12,500 GAMMA COUNT RATE (cpm)

10 0 10 20

SCALE: 1"= 10'

BUILDING 448
CONCRETE SLAB
FINAL STATUS SURVEY
BROOKHAVEN NATIONAL LABORATORY
UPTON, NEW YORK

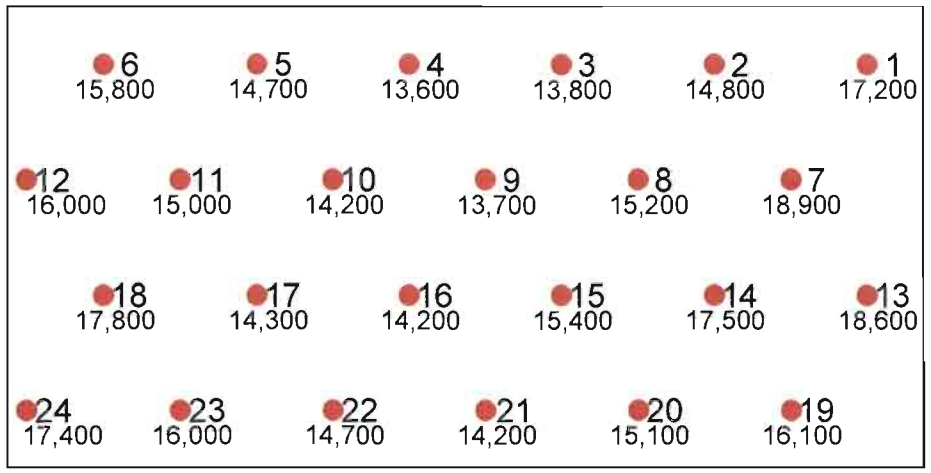
BROOKHAVEN NATIONAL LABORATORY

ENVIROCON
101 INTERNATIONAL WAY
MISSOLUA, MT 59808

Project: EVN0501	Designed By: MM	Figure No: 3-10-5
CADD Operator: TC	Approved By: PWG	Date: 08/04/05

UNAUTHORIZED ALTERATION OR ADDITION TO THIS DRAWING AND RELATED DOCUMENTS IS A VIOLATION OF SEC. 7209 OF THE N.Y.S. EDUCATION LAW

J:PROJECTS E-L/ENV/0501 FHWMF/FIGURES/09-28-05/FIGURE3-10-5



LEGEND

10 POINT ANNOTATION

● POINT

14,200 GAMM COUNT RATE (cpm)

5 0 5 10

SCALE: 1"= 5'

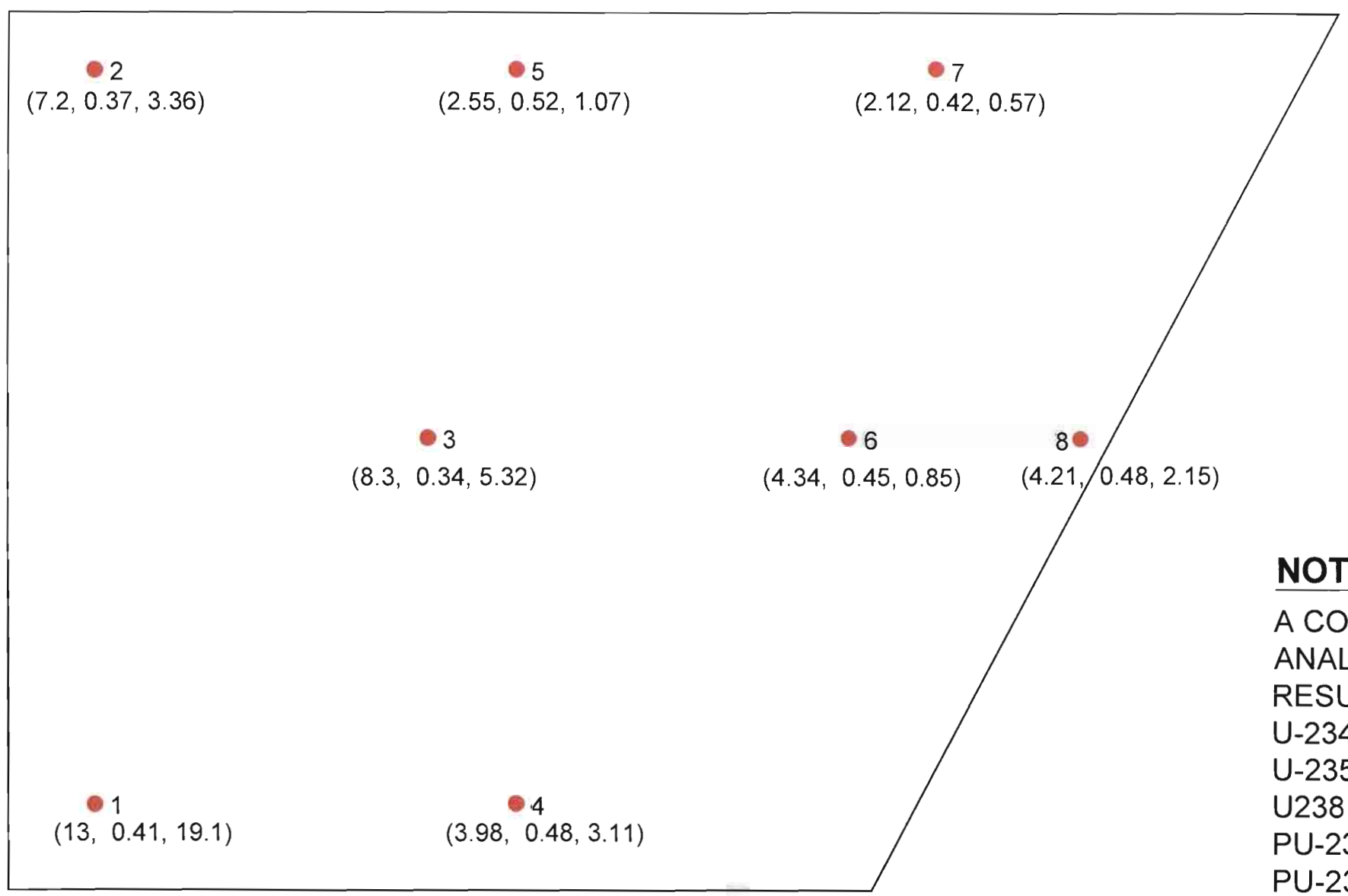
BROOKHAVEN NATIONAL LABORATORY

C/E CONCRETE SLAB
FINAL STATUS SURVEY
BROOKHAVEN NATIONAL LABORATORY
UPTON, NEW YORK

ENVIROCON
101 INTERNATIONAL WAY
MISSOLUA, MT 59808

Project: EVN0501	Designed By: MM	Figure No: 3-10-6
CADD Operator: TC	Approved By: PWG	Date: 08/04/05

J:PROJECTS E-L/ENV/0501 FHWMF/FIGURES/09-28-05/FIGURE3-10-6



NOTE

A COMPOSITE SAMPLE WAS ANALYZED WITH THE FOLLOWING RESULTS (VALUES IN PCI / G).
U-234 - 0.35
U-235 - ND
U238 - 0.43
PU-238 - ND
PU-239/240 - ND
TRITIUM - ND

LEGEND

1
(13, 0.41, 19.1) POINT NUMBER AND VALUES OF CS-137, RA-226, AND SR-90 IN PCI / G

POINT

5 0 5 10
SCALE: 1"= 5'

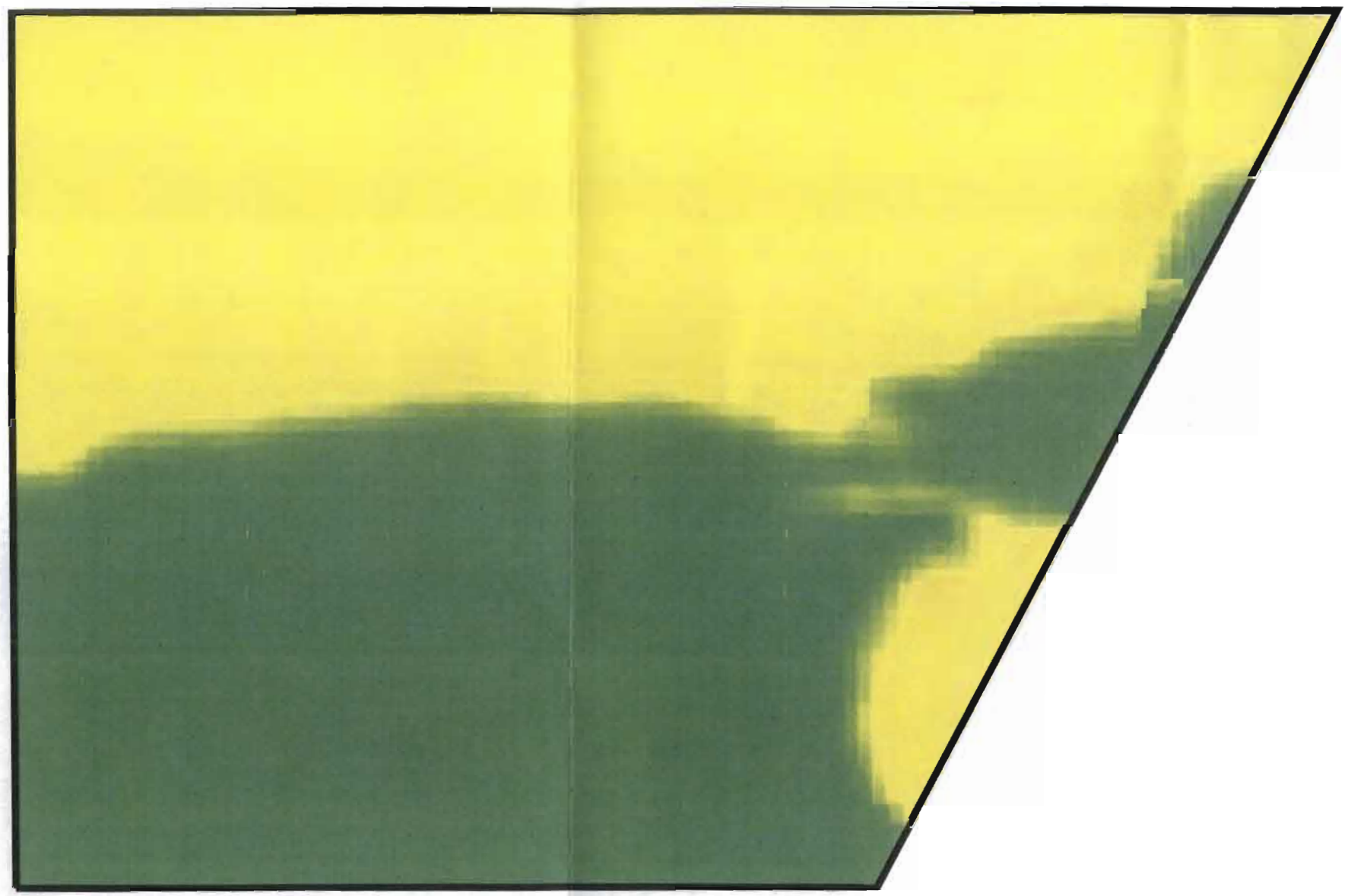
CLEAN SOIL PILE
FINAL STATUS SURVEY
BROOKHAVEN NATIONAL LABORATORY
UPTON, NEW YORK

BROOKHAVEN NATIONAL LABORATORY

ENVIROCON
101 INTERNATIONAL WAY
MISSOULA, MT 59808

Project: EVN0501	Designed By: MM	Figure No: 3-11-1
CADD Operator: TC	Approved By: PWG	Date: 09/15/05

J:PROJECTS E-L/ENV/0501 FHWMF/FIGURES/09-28-05/FIGURE3-11-1



5 0 5 10

SCALE: 1"= 5'

CLEAN SOIL PILE
FINAL STATUS SURVEY
BROOKHAVEN NATIONAL LABORATORY
UPTON, NEW YORK

BROOKHAVEN NATIONAL LABORATORY

ENVIROCON
101 INTERNATIONAL WAY
MISSOLUA, MT 59808

Project: EVN0501	Designed By: MM	Figure No: 3-11-2
CADD Operator: TC	Approved By: PWG	Date: 09/21/05

U:PROJECTS_E-L/ENV/0501_FHWMF/FIGURES/09-28-05/FIGURE3-11-2

Appendix A
Final Status Survey Soil Sample Results

Survey Unit A

Sample ID	Lab ID	In-situ gross (cpm)	ISOCs Activity (pCi/g Cs-137)	STL Results (pCi/g)									
				Cs-137	Sr-90	Ra-226	Pu 238	Pu 239/240	U-234	U-235	U-238	Am-241	H3
SS05A101	20690-001	6000	5.3	4.57	1.18	0.29	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05A102	20690-002	3300	2.0	2.24	0.18	0.35	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05A103	20690-003	4500	6.5	9.50	0.59	0.21	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05A104	20690-004	5040	6.0	7.70	0.81	0.29	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05A105	20690-005	4300	6.8	7.00	0.34	0.36	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05A106	20690-006	12200	19.9	23.10	0.49	0.47	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05A107	20690-007	4600	5.8	6.60	0.12	0.28	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05A108	20690-008	5100	9.2	10.50	0.56	0.27	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05A109	20690-009	9300	17.8	16.90	1.07	0.43	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05A110	20690-010	9200	5.7	6.20	1.16	0.31	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05A111	20690-011	5200	3.7	4.56	0.44	0.41	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05A112	20690-012	4600	5.5	5.85	0.28	0.08	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05A113	20690-013	5000	2.2	2.24	0.28	0.20	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05A114	20690-014	3700	4.5	4.10	0.09	0.23	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05A115	20690-015	3900	4.8	2.44	0.34	0.53	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05A116	20690-016	3100	1.6	1.49	0.06	0.47	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05A117	20690-017	3900	2.6	4.12	0.50	0.44	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05A118	20690-018	3900	1.5	1.66	11.80	0.53	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05A119	20690-019	3400	0.6	0.22	0.52	0.33	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05A120	20690-020	8300	11.0	11.50	20.10	0.29	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05A121	20690-021	5200	5.0	6.01	0.78	0.58	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05A122	20690-022	8300	10.1	14.40	4.82	0.53	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05A123	20690-023	2700	3.6	3.92	1.13	0.29	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05A124	20690-024	4300	4.4	4.10	2.70	0.23	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05A125	20690-025	4900	2.3	2.74	2.82	0.65	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05A126	20690-026	3900	0.9	1.08	1.56	0.43	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05A127	20690-027	5000	3.5	3.44	2.05	0.54	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05A128	20690-028	4900	5.3	6.20	7.40	1.27	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05A129	20690-029	5200	4.5	5.42	2.98	0.50	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05A130	20690-030	2700	2.2	1.67	0.24	0.26	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05A131	20690-031	6100	9.5	12.00	1.70	0.24	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05A132	20690-032	4200	0.0	0.06	1.89	0.36	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Avg of Cs-137, Sr-90 and Ra-226		5186	5	6.05	2.22	0.40							
Composite Sample Results							0.03	0.11	0.60	0.02	0.49	0.04	0.00

Survey Unit C-1

Sample ID	Lab ID	In-situ gross	ISOCs Activity	STL Results (pCi/g)									
		(cpm)	(pCi/g Cs-137)	Cs-137	Sr-90	Ra-226	Pu 238	Pu 239/240	U-234	U-235	U-238	Am-241	H3
SS05C101	20298-001	4800	9.3	6.80	0.50	0.26	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C102	20298-002	6100	8.5	9.30	0.47	0.50	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C103	20298-003	13800	36.8	41.80	1.44	0.49	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C104	20298-004	31000	1.5	0.19	0.20	0.45	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C105	20298-005	7500	17.8	18.00	1.11	0.44	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C106	20298-006	3700	2.1	0.96	0.10	0.78	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C107	20298-007	3300	2.1	0.61	1.69	0.61	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C108	20298-008	4100	5.2	4.80	0.47	0.64	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C109	20298-009	3100	2.3	1.20	0.15	0.54	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C110	20298-010	4200	6.6	5.60	1.39	0.41	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C111	20298-011	4400	8.6	7.00	1.29	0.48	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C112	20298-012	3800	4.2	3.22	0.41	0.64	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C113	20298-013	3800	4.1	6.60	0.50	0.53	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C114	20298-014	5300	6.8	1.67	0.71	0.41	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C115	20298-015	4200	0.0	3.62	0.65	0.50	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C116	20298-016	3100	2.0	0.47	0.28	0.71	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C117	20298-017	3900	1.3	0.20	6.95	0.52	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C118	20298-018	3100	1.9	0.36	3.94	0.62	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C119	20298-019	3700	2.2	0.20	0.18	0.47	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C120	20298-020	2300	2.0	2.76	0.80	1.08	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C121	20298-021	2300	1.2	0.49	0.28	0.49	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C122	20298-022	4100	3.1	1.78	0.15	0.33	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C123	20298-023	3100	1.6	10.20	0.80	0.33	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C124	20298-024	3600	14.2	6.14	0.44	0.42	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C125	20298-025	5400	3.9	0.21	0.24	0.36	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Avg of Cs-137, Sr-90 and Ra-226		5508	5.97	5.37	1.01	0.52							
Composite Sample Results							0.00	0.02	0.65	0.04	0.54	0.04	0.69

Survey Unit C-2

Sample ID	Lab ID	In-situ gross (cpm)	ISOCs Activity (pCi/g Cs-137)	STL Results (pCi/g)									
				Cs-137	Sr-90	Ra-226	Pu 238	Pu 239/240	U-234	U-235	U-238	Am-241	H3
SS05C201	20300-001	5100	6.1	6.60	0.55	0.51	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C202	20300-002	5500	2.0	0.42	0.48	0.63	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C203	20300-003	20600	95.4	59.60	1.93	0.36	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C204	20300-004	4200	3.1	1.53	0.05	0.54	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C205	20300-005	5700	6.4	0.04	0.33	0.61	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C206	20300-006	3200	1.8	2.89	0.18	0.73	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C207	20300-007	3200	4.1	0.00	0.25	0.78	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C208	20300-008	3200	3.5	2.19	0.26	0.71	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C209	20300-009	3400	1.3	7.80	4.05	0.30	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C210	20300-010	3225	4.3	2.36	5.12	0.65	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C211	20300-011	10900	6.1	0.00	0.00	0.77	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C212	20300-012	4700	4.8	0.88	0.37	0.24	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C213	20300-013	3400	1.6	0.29	0.50	0.75	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C214	20300-014	2900	3.0	0.33	0.52	0.55	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C215	20300-015	3000	1.7	2.48	0.72	0.48	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C216	20300-016	3900	1.6	1.47	4.74	0.52	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C217	20300-017	4200	2.0	0.00	0.32	0.99	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C218	20300-018	5400	2.4	0.04	0.49	0.77	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C219	20300-019	5400	2.3	0.63	0.40	0.79	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C220	20300-020	6000	2.1	0.08	0.15	0.95	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C221	20300-021	3700	1.3	0.06	0.43	0.96	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C222	20300-022	3200	1.5	1.39	2.30	0.58	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C223	20300-023	4500	2.7	4.42	0.97	0.62	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C224	20300-024	3500	1.3	1.42	1.32	0.31	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Avg for Cs-137, Sr-90 and Ra-226		5084	6.8	4.04	1.10	0.63							
Composite Sample Results							0.00	0.05	0.87	0.01	0.63	0.04	0.39

Survey Unit C-3

Sample ID	Lab ID	In-situ gross (cpm)	ISOCs Activity (pC/g Cs-137)	STL Results (pCi/g)									
				Cs-137	Sr-90	Ra-226	Pu 238	Pu 239/240	U-234	U-235	U-238	Am-241	H3
SS05C301	20301-001	3800	9.8	6.70	0.41	0.39	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C302	20301-002	6100	12.3	12.40	1.10	0.32	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C303	20301-003	4000	5.5	2.18	0.62	0.46	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C304	20301-004	3400	7.8	3.60	0.15	0.13	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C305	20301-005	4600	8.6	9.00	0.89	0.38	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C306	20301-006	11300	41.0	35.70	0.76	0.52	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C307	20301-007	10700	24.2	27.00	3.79	0.53	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C308	20301-008	10700	22.5	1.78	0.99	0.54	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C309	20301-009	3100	5.1	10.20	0.53	0.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C310	20301-010	6200	12.1	6.50	0.59	0.37	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C311	20301-011	4200	8.8	13.80	1.01	0.47	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C312	20301-012	4735	15.0	5.86	1.70	0.36	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C313	20301-013	5000	8.1	24.70	0.76	0.35	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C314	20301-014	9000	29.3	74.00	2.63	0.47	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05C315	20301-015	14800	51.3	8.50	0.47	0.37	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Avg for Cs-137, Sr-90 and Ra-226		6776	17.4	16.13	1.09	0.40							
Composite Sample Results							0.00	0.10	0.36	0.01	0.43	0.02	0.52

Survey Unit D-1

Sample ID	Lab ID	In-situ gross	ISOCs Activity	STL Results (pCi/g)									
		(cpm)	(pCi/g Cs-137)	Cs-137	Sr-90	Ra-226	Pu 238	Pu 239/240	U-234	U-235	U-238	Am-241	H3
SS05D101	20673-001	4200	1.5	1.43	0.17	0.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D102	20673-002	13000	39.1	42.60	1.23	0.15	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D103	20692-001	6900	10.8	4.77	0.70	0.33	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D104	20673-004	3100	0.6	0.32	0.52	0.19	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D105	20673-005	2900	1.4	1.11	0.44	0.44	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D106	20673-007	3900	2.0	1.71	0.40	0.51	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D107	20673-008	10400	22.3	27.20	0.93	0.50	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D108	20673-009	4600	5.7	6.90	1.50	0.58	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D109	20673-010	8300	18.6	18.20	1.29	0.32	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D110	20673-011	3400	1.6	1.79	0.22	0.51	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D111	20673-012	3200	1.4	1.23	0.74	0.55	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D112	20673-013	14100	15.4	14.20	0.76	0.38	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D113	20673-014	5700	11.6	10.70	1.74	0.43	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D114	20692-002	4400	2.2	1.96	0.26	0.27	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D115	20692-003	5300	3.6	3.29	0.25	0.31	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D116	20673-015	5000	17.4	9.20	0.60	0.23	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D117	20692-005	5500	4.5	3.43	0.00	0.26	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D118	20673-016	4100	2.4	2.64	0.81	0.58	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Avg for Cs-137, Sr-90 and Ra-226		6000	9.0	8.48	0.70	0.39							
Composite Sample Results							0.00	0.06	0.44	0.09	0.28	0.03	0.09

Survey Unit D-2

Sample ID	Lab ID	In-situ gross (cpm)	ISOCs Activity (pCi/g Cs-137)	STL Results (pCi/g)									
				Cs-137	Sr-90	Ra-226	Pu 238	Pu 239/240	U-234	U-235	U-238	Am-241	H3
SS05D219	20674-001	3200	1.1	0.88	0.34	0.21	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D220	20674-002	3600	2.4	1.82	0.2	0.44	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D221	20674-003	3700	0.8	0.48	0.78	0.47	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D222	20674-004	5700	2.8	2.33	0.37	0.29	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D223	20674-005	5500	1.4	2.39	3.22	1.28	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D224	20674-007	4800	5.0	4.96	0.58	0.49	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D225	20674-008	5600	0.9	0.86	0.00	0.21	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D226	20674-009	3900	0.7	0.62	0.34	0.55	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D227	20674-010	9200	15.3	16.50	3.89	0.50	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D228	20674-011	3400	0.5	0.26	0.33	0.35	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D229	20674-012	4800	0.4	0.03	0.32	0.78	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D230	20674-013	3100	0.6	0.40	0.53	0.43	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D231	20674-014	4500	0.7	0.51	0.41	0.44	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D232	20674-015	4000	0.4	0.11	0.68	0.61	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D233	20674-016	3900	2.6	2.37	0.39	0.32	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D234	20674-017	5500	6.0	7.50	12.6	0.46	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D235	20674-018	4200	2.8	2.56	1.23	0.39	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D236	20674-019	4300	0.4	0.15	0.68	0.69	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Avg for Cs-137, Sr-90 and Ra-226		4606	2.5	2.49	1.49	0.50							
Composite Sample Results							0.00	0.00	0.55	0.02	0.57	0.09	0.00

Survey Unit D-3

Sample ID	Lab ID	In-situ gross	ISOCs Activity	STL Results (pCi/g)									
		(cpm)	(pCi/g Cs-137)	Cs-137	Sr-90	Ra-226	Pu 238	Pu 239/240	U-234	U-235	U-238	Am-241	H3
SS05D337	20692-004	2100	23.4	71	1.46	0.63	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D338	20675-001	4700	0.9	0.11	2.07	1.22	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D339	20675-002	3600	7.6	11.90	0.75	0.49	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D340	20692-008	5500	0.9	0.88	0.53	0.43	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D341	20675-003	6200	1.2	0.70	32.10	0.42	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D342	20675-004	3300	4.6	5.19	0.59	0.54	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D343	20675-005	3600	19.0	64	1.85	0.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D344	20675-006	2700	3.7	4.84	1.88	0.78	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D345	20675-007	6700	0.6	0.36	0.91	0.57	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D346	20675-008	6400	1.0	2.11	0.12	0.87	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D347	20692-007	6100	8.7	9.10	0.26	0.38	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D348	20675-009	5100	1.6	1.71	1.11	0.51	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D349	20675-011	4400	1.6	2.27	0.32	0.76	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D350	20675-012	3400	2.0	2.04	0.33	0.65	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D351	20675-013	4000	1.1	0.97	1.38	0.60	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D352	20689-001	5700	0.2	0.02	0.14	0.14	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D353	20689-002	2400	0.9	1.23	1.46	0.24	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D354	20675-014	8300	2.0	3.15	0.47	0.54	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Avg for Cs-137, Sr-90 and Ra-226		4678	4.5	10.09	2.65	0.57							
Composite Sample Results							0.05	0.12	0.69	0.02	0.66	0.04	0.00

Survey Unit D-4

Sample ID	Lab ID	In-situ gross	ISOCs Activity	STL Results (pCi/g)									
		(cpm)	(pCi/g Cs-137)	Cs-137	Sr-90	Ra-226	Pu 238	Pu 239/240	U-234	U-235	U-238	Am-241	H3
SS05D455	20692-006	4200	1.6	1.23	0.23	0.26	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D456	20692-009	6000	8.3	9.80	0.75	0.34	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D457	20676-001	3600	2.2	2.51	1.10	0.42	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D458	20676-002	3800	0.4	0.19	0.61	0.42	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D459	20676-003	5100	4.0	7.30	3.49	0.63	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D460	20676-005	4100	0.5	0.10	1.33	0.63	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D461	20692-010	9500	9.6	12.90	1.11	0.20	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D462	20676-006	4800	2.8	6.01	0.54	0.61	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D463	20676-007	4800	0.8	0.59	0.98	0.74	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D464	20676-008	3800	0.3	0.11	0.42	0.83	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D465	20697-001	1900	6.0	0.79	1.59	0.36	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D466	20697-002	2100	0.0	0.14	0.28	0.51	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D467	20676-009	4800	0.6	0.15	43.50	0.66	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D468	20676-010	4200	3.6	3.72	0.46	0.32	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D469	20676-011	3900	1.8	2.09	14.90	0.87	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D470	20697-003	2300	4.6	0.59	81.10	0.27	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D471	20697-004	2100	0.0	0.02	0.16	0.86	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D472	20697-005	2600	0.0	2.52	2.26	0.50	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Avg for Cs-137, Sr-90 and Ra-226		4089	2.6	2.82	8.60	0.52							
Composite Sample Results							0.04	0.01	0.47	0.00	0.43	0.00	0.16

Survey Unit D-5

Sample ID	Lab ID	In-situ gross	ISOCs Activity	STL Results (pCi/g)									
		(cpm)	(pCi/g Cs-137)	Cs-137	Sr-90	Ra-226	Pu 238	Pu 239/240	U-234	U-235	U-238	Am-241	H3
SS05D573	20677-001	5200	11.6	14.70	2.06	0.49	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D574	20677-002	3900	1.7	1.84	5.41	0.44	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D575	20697-006	4100	0.0	11.30	8.70	0.52	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D577	20677-003	5000	5.0	5.69	0.32	0.50	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D578	20677-004	5600	3.8	4.44	0.24	0.57	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D579	20697-007	1900	0.0	0.37	0.11	0.35	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D580	20677-005	9500	25.7	27.20	2.18	0.52	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D581	20677-006	3800	1.5	1.66	4.22	0.12	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D582	20677-007	4300	1.8	1.49	3.95	0.56	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D583	20677-008	4500	0.9	0.63	0.43	0.56	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D584	20677-009	4100	3.3	2.84	2.22	0.35	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D585	20697-010	3000	18.9	4.90	0.60	0.35	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D586	20697-009	3800	16.6	2.72	0.16	0.44	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D587	20697-011	6900	14.7	0.32	0.02	0.24	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D589	20677-010	3600	2.5	1.55	0.24	0.19	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D576	20677-011	3800	7.1	7.90	0.96	0.49	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D588	20677-012	5400	11.8	11.00	1.27	0.46	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D590	20677-013	8100	31.3	43.60	2.55	0.42	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Avg for Cs-137, Sr-90 and Ra-226		4806	8.8	8.01	1.98	0.42							
Composite Sample Results							0.00	0.10	0.47	0.07	0.68	0.02	0.12

Survey Unit D-6

Sample ID	Lab ID	In-situ gross	ISOCs Activity	STL Results (pCi/g)									
		(cpm)	(pCi/g Cs-137)	Cs-137	Sr-90	Ra-226	Pu 238	Pu 239/240	U-234	U-235	U-238	Am-241	H3
SS05D691	20678-001	4100	2.5	2.96	1.43	0.41	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D692	20678-002	3790	2.9	3.43	2.53	0.38	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D693	20678-003	4000	1.8	1.88	0.61	0.51	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D694	20678-004	4500	1.9	1.91	1.15	0.86	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D695	20678-005	3700	0.8	0.57	0.78	0.62	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D696	20678-006	4100	1.3	0.98	0.81	0.70	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D697	20678-007	3800	1.2	0.99	0.38	0.45	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D698	20678-009	5400	8.9	8.60	0.64	0.50	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D6100	20678-010	5900	7.2	7.40	0.01	0.65	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D6101	20678-011	4100	0.4	0.03	0.10	0.42	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D6102	20678-012	3400	8.6	11.20	4.43	0.31	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D6103	20678-013	3700	1.3	1.13	0.72	0.71	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D6104	20678-014	4400	0.5	0.46	1.81	0.86	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D6105	20678-015	5300	7.0	7.40	2.22	0.78	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D6106	20678-016	4000	1.9	1.91	0.17	0.76	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D6107	20678-017	3300	0.6	0.13	0.44	0.23	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D699	20678-018	4000	2.1	2.16	1.97	0.51	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05D6108	20678-019	5300	1.4	1.60	0.69	0.81	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Avg for Cs-137, Sr-90 and Ra-226		4266	2.9	3.04	1.16	0.58							
Composite Sample Results							0.03	0.08	0.76	0.02	0.60	0.00	0.07

Survey Unit K-1

Sample ID	Lab ID	In-situ gross (cpm)	ISOCS Activity (pCi/g Cs-137)	STL Results (pCi/g)									
				Cs-137	Sr-90	Ra-226	Pu 238	Pu 239/240	U-234	U-235	U-238	Am-241	H3
SS05K101	20729-001	4,600	4.6	0.24	0.91	0.80	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K102	20729-002	4,100	4.2	0.32	0.36	0.56	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K103	20729-003	5,600	4.6	0.15	0.10	0.74	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K104	20729-004	9,400	7.4	2.33	0.24	0.39	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K105	20729-005	16,800	42.1	50.40	1.50	0.68	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K106	20729-006	5,200	5.1	1.02	0.26	0.82	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K107	20729-007	4,700	4.9	0.30	0.00	0.97	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K108	20729-008	4,600	4.5	0.06	0.00	0.81	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K109	20729-009	8,000	18.5	15.40	3.04	0.30	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K110	20729-010	5,100	5.1	0.91	0.20	0.55	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K111	20729-011	4,700	6.1	2.33	0.00	0.55	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K112	20729-012	15,700	34.7	34.50	3.01	0.47	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K113	20729-013	6,900	51.1	16.40	12.90	0.62	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K114	20729-014	4,000	4.8	0.28	0.34	0.39	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K115	20729-015	3,900	4.8	0.40	0.65	0.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K116	20729-016	3,900	6.5	1.54	0.00	0.32	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K117	20729-017	7,000	7.3	3.60	0.87	0.79	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K118	20729-018	52,900	25.8	27.10	2.25	0.60	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Avg for Cs-137, Sr-90 and Ra-226		9283	13.5	8.74	1.48	0.60							
Composite Sample Results							0.03	0.04	0.91	0.01	0.38	0.07	0.00

Survey Unit K-2

Sample ID	Lab ID	In-situ gross (cpm)	ISOCs Activity (pCi/g Cs-137)	STL Results (pCi/g)										
				Cs-137	Sr-90	Ra-226	Pu 238	Pu 239/240	U-234	U-235	U-238	Am-241	H3
SS05K201	20755-001	5000	13.4	5.71	0.31	0.37	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K202	20755-002	5400	5.5	0.24	0.48	0.66	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K203	20755-003	7300	11.1	6.80	0.33	0.33	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K204	20755-004	6500	6.1	0.42	0.00	0.24	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K205	20755-005	4000	5.7	0.02	0.00	0.31	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K206	20755-006	12800	6.8	1.67	0.07	0.16	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K207	20755-007	8800	6.3	0.53	0.15	0.19	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K208	20755-008	6500	7.8	1.63	0.11	0.17	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K209	20755-009	5900	6.9	1.62	0.45	0.78	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K210	20755-010	8800	20.9	16.40	0.58	1.13	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K211	20755-011	7100	7.7	2.26	0.00	0.54	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K212	20755-012	14100	26.4	23.20	0.93	0.46	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K213	20755-013	12500	10.2	3.44	0.39	0.29	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K214	20755-014	6400	6.0	0.20	0.17	0.35	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K215	20755-015	7900	10.4	4.40	0.20	0.31	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K216	20755-016	5400	8.1	2.85	0.06	0.41	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K217	20755-017	4100	6.7	1.00	0.64	0.35	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K218	20755-018	4000	5.8	0.10	0.12	0.48	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Avg for Cs-137, Sr-90 and Ra-226		7361	9.5	4.03	0.28	0.42							
Composite Sample Results							0.03	0.01	0.31	0.03	0.27	0.04	0.00

Survey Unit K-3

Sample ID	Lab ID	In-situ gross (cpm)	ISOCS Activity (pCi/g Cs-137)	STL Results (pCi/g)									
				Cs-137	Sr-90	Ra-226	Pu 238	Pu 239/240	U-234	U-235	U-238	Am-241	H3
SS05K301	20910-001	3800	5.5	0.17	0.13	0.45	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K302	20910-002	4200	6.7	1.45	0.52	0.46	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K303	20910-003	3100	5.9	0.40	0.52	0.37	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K304	20910-004	3300	6.4	1.11	0.00	0.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K305	20910-005	3100	5.4	0.12	0.05	0.35	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K306	20910-006	4000	6.5	1.23	0.65	0.50	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K307	20910-007	2800	5.3	0.55	0.10	0.46	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K308	20910-008	3600	6.8	2.31	0.44	0.42	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K309	20910-009	5300	12.6	7.80	0.39	0.49	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K310	20910-010	12000	57.8	47.60	0.69	0.39	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K311	20910-011	5200	6.5	1.24	0.42	0.29	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K312	20910-012	11000	68.5	72.00	0.96	0.31	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K313	20910-013	4800	6.5	2.89	0.13	0.24	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K314	20910-014	8100	26.6	15.60	0.20	0.36	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K315	20910-015	4400	7.1	1.10	0.11	0.31	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K316	20910-016	2500	5.5	0.03	0.27	0.16	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K317	20910-017	8500	8.9	3.74	0.08	0.34	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Avg for Cs-137, Sr-90 and Ra-226		5276	14.6	9.37	0.33	0.37							
Composite Sample Results							0.02	0.05	0.32	0.00	0.40	0.02	0.13

Survey Unit K-4

Sample ID	Lab ID	In-situ gross	ISOCs Activity	STL Results (pCi/g)									
		(cpm)	(pCi/g Cs-137)	Cs-137	Sr-90	Ra-226	Pu 238	Pu 239/240	U-234	U-235	U-238	Am-241	H3
SS05K401	20921-001	3500	11.8	0.02	1.35	0.27	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K402	20921-002	7400	20.9	10.40	1.46	0.68	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K403	20921-003	10300	48.6	47.90	2.02	0.74	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K404	20921-004	5700	13.7	1.56	0.59	0.51	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K405	20921-005	8500	24.0	10.00	1.02	0.18	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K406	20921-006	4000	14.8	2.35	0.47	0.42	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K407	20921-007	10800	42.0	42.00	2.35	0.59	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K408	20921-008	16400	109.1	96.00	8.20	0.67	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K409	20921-009	4700	15.2	2.58	1.14	0.62	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K410	20921-010	7400	21.9	14.60	0.33	0.64	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K411	20921-011	7800	61.7	39.30	1.15	0.27	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K412	20921-012	7700	14.7	5.23	0.28	0.50	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K413	20921-013	6300	14.0	2.67	0.13	0.86	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K414	20921-014	3700	14.6	1.71	0.26	0.29	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K415	20921-015	5800	14.0	2.08	0.20	0.32	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K416	20921-016	5900	13.0	0.71	0.40	0.36	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05K417	20921-017	5400	23.5	8.10	0.24	0.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Avg for Cs-137, Sr-90 and Ra-226		7135	28.1	16.89	1.27	0.49							
Composite Sample Results							0.06	0.10	0.58	0.05	0.59	0.00	0.01

Survey Unit L

Sample ID	Lab ID	In-situ gross (cpm)	ISOCs Activity (pCi/g Cs-137)	STL Results (pCi/g)									
				Cs-137	Sr-90	Ra-226	Pu 238	Pu 239/240	U-234	U-235	U-238	Am-241	H3
SS05L101	20695-001	4500	1.5	1.10	0.13	0.56	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05L102	20695-002	5000	6.8	6.30	0.00	0.33	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05L103	20695-003	8700	16.5	18.30	0.30	0.65	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05L104	20695-004	5100	2.5	4.50	0.43	0.41	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05L105	20695-005	4000	6.2	10.10	0.57	0.54	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05L106	20695-006	6100	13.2	8.40	0.16	0.69	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05L107	20695-007	4100	4.5	1.92	0.28	0.62	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05L108	20695-008	7000	9.4	17.40	0.03	0.48	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05L109	20695-009	10200	22.8	19.00	0.00	0.37	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05L110	20695-010	10100	11.2	15.60	0.17	0.54	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05L111	20695-011	5100	11.9	7.50	0.66	0.61	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05L112	20695-012	6100	10.9	9.20	0.54	0.42	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05L113	20695-013	12200	48.0	44.60	0.35	0.64	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05L114	20695-015	8500	15.2	27.90	0.02	0.51	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05L115	20695-016	5000	7.5	5.84	0.14	0.56	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05L116	20695-017	5800	7.6	16.20	0.25	0.48	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05L117	20695-018	4000	2.0	1.90	0.20	0.37	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Avg for Cs-137, Sr-90 and Ra-226		6559	11.6	12.69	0.25	0.52							
Composite Sample Results							0.00	0.31	0.55	0.02	0.48	0.11	0.00

Survey Unit Z-1

Sample ID	Lab ID	In-situ gross	ISOCs Activity	STL Results (pCi/g)									
		(cpm)	(pCi/g Cs-137)	Cs-137	Sr-90	Ra-226	Pu 238	Pu 239/240	U-234	U-235	U-238	Am-241	H3
SS05Z101	20693-001	3200	1.2	0.66	0.41	0.36	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05Z102	20689-003	3600	1.9	2.57	1.08	0.48	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05Z103	20693-003	8400	8.3	9.80	0.76	0.43	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05Z104	20693-004	4100	1.9	0.54	0.29	0.53	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05Z105	20693-005	7900	2.8	2.64	0.62	0.32	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05Z106	20693-007	4400	1.9	1.69	0.30	0.45	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05Z107	20693-008	3200	1.7	1.76	0.64	0.43	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05Z108	20693-009	5700	6.1	6.80	0.55	0.33	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05Z109	20693-010	3500	1.9	2.28	0.36	0.39	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05Z110	20693-011	5600	5.8	6.60	0.38	0.47	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05Z111	20693-012	4500	2.2	2.18	0.03	0.39	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05Z112	20693-013	4900	4.0	4.35	0.22	0.42	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05Z113	20693-014	15400	20.8	29.70	0.16	0.43	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05Z114	20693-015	3100	1.9	1.08	0.84	0.36	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Avg for Cs-137, Sr-90 and Ra-226		5536	4.5	5.19	0.47	0.41							
Composite Sample Results							0.01	0.18	0.60	0.07	0.53	0.02	0.00

Survey Unit Z-2

Sample ID	Lab ID	In-situ gross (cpm)	ISOCs Activity (pCi/g Cs-137)	STL Results (pCi/g)									
				Cs-137	Sr-90	Ra-226	Pu 238	Pu 239/240	U-234	U-235	U-238	Am-241	H3
SS05Z201	20694-001	3300	1.2	1.10	0.36	0.35	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05Z202	20694-002	2400	0.6	0.05	0.03	0.28	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05Z203	20694-003	3000	1.1	1.60	0.12	0.39	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05Z204	20694-004	4500	0.2	0.02	0.07	0.21	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05Z205	20694-005	5000	3.4	4.65	0.99	0.61	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05Z206	20694-006	3600	1.0	0.69	0.19	0.30	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05Z207	20694-007	3500	1.2	0.95	0.00	0.43	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05Z208	20694-008	3800	1.2	1.03	0.33	0.42	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05Z209	20694-009	3400	1.3	1.06	0.37	0.24	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05Z210	20694-010	7910	8.3	10.10	1.97	0.36	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05Z211	20694-012	5500	5.3	6.30	0.98	0.41	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05Z212	20694-013	3500	1.1	0.73	0.04	0.53	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05Z213	20694-014	2600	1.0	0.76	0.46	0.23	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05Z214	20694-015	5100	5.7	5.52	1.19	0.33	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Avg for Cs-137, Sr-90 and Ra-226		4079	2.3	2.47	0.51	0.36							
Composite Sample Results							0.01	0.20	0.27	0.01	0.41	0.01	0.02

Survey Unit Z-3

Sample ID	Lab ID	In-situ gross	ISOCs Activity	STL Results (pCi/g)										
		(cpm)	(pCi/g Cs-137)	Cs-137	Sr-90	Ra-226	Pu 238	Pu 239/240	U-234	U-235	U-238	Am-241	H3
SS05Z301	20757-001	3000	6.4	1.49	0.10	0.43	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05Z302	20757-002	3500	8.3	3.40	0.68	0.38	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05Z303	20757-003	3400	8.2	3.81	0.95	0.55	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05Z304	20757-004	3800	7.6	2.77	0.31	0.63	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05Z305	20757-005	4300	9.7	5.39	0.69	0.67	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05Z306	20757-006	3400	6.6	1.47	0.11	0.51	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05Z307	20757-007	3500	9.0	3.86	1.00	0.71	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05Z308	20757-008	3800	6.7	1.59	0.47	0.74	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05Z309	20757-009	3900	6.2	0.98	0.51	0.57	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05Z310	20757-010	24000	74.3	95.00	1.64	0.72	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05Z311	20757-011	15500	40.8	41.70	0.30	0.80	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05Z312	20757-012	6600	14.3	13.50	0.52	0.55	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05Z313	20757-013	4200	8.3	3.65	1.08	0.85	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SS05Z314	20757-015	4000	8.3	5.14	1.04	0.66	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Avg for Cs-137, Sr-90 and Ra-226		6207	15.3	13.13	0.67	0.63							
Composite Sample Results							0.00	0.00	0.61	0.03	0.76	0.12	0.03

Appendix B
Summary of Railcar Shipments to Envirocare

Environmental Restoration Railcar Volumes

Total CF	504,555
Total CY	18,687

FHWMF CF	431,424
FHWMF CY	15,979

811 CF	73,131
811 CY	2,709

Total Railcars Shipped - 339

Railcar #		Shipment ID	Total Weight	FHMWF Weight	811 Weight	Cubic Feet	FHWMF Cubic Feet	811 Cubic Feet	Shipment Date	Tons	WCS Number
MHFX	5684	257	192,791	192,791	0	1,886	1,886	0	10/29/2004	96.40	WCS-01
MHFX	5613	258	192,791	192,791	0	1,886	1,886	0	10/29/2004	96.40	WCS-01
MHFX	5662	259	192,791	192,791	0	1,886	1,886	0	10/29/2004	96.40	WCS-01
CEFX	31057	262	194,222	194,222	0	1,900	1,900	0	11/12/2004	97.11	WCS-01
CEFX	31031	263	194,222	194,222	0	1,900	1,900	0	11/12/2004	97.11	WCS-01
CEFX	31068	264	194,528	0	194,528	1,903	0	1,903	11/12/2004	0.00	NA
CEFX	31058	265	194,324	0	194,324	1,901	0	1,901	11/12/2004	0.00	NA
CEFX	31029	266	194,937	0	194,937	1,907	0	1,907	11/12/2004	0.00	NA
MHFX	5710	267	193,506	0	193,506	1,893	0	1,893	11/12/2004	0.00	NA
MHFX	5725	268	192,893	38,559	154,333	1,887	377	1,510	11/17/2004	19.28	NA
MHFX	5809	269	193,915	0	193,915	1,897	0	1,897	11/17/2004	0.00	NA
MHFX	5719	270	193,199	156,202	36,998	1,890	1,528	362	11/17/2004	78.10	WCS-02
CEFX	30919	271	192,535	0	192,535	1,884	0	1,884	11/17/2004	0.00	NA
MHFX	5849	272	194,569	0	194,569	1,903	0	1,903	11/17/2004	0.00	NA
MHFX	5844	273	194,089	0	194,089	1,899	0	1,899	11/17/2004	0.00	NA
MHFX	5699	274	193,711	0	193,711	1,895	0	1,895	11/17/2004	0.00	NA
MHFX	5630	275	191,635	0	191,635	1,875	0	1,875	11/17/2004	0.00	NA
MHFX	5788	276	192,739	0	192,739	1,886	0	1,886	11/17/2004	0.00	NA
MHFX	5714	277	193,015	54,932	138,083	1,888	537	1,351	11/17/2004	27.47	NA
MHFX	5782	278	192,862	192,862	0	1,887	1,887	0	11/17/2004	96.43	WCS-02
MHFX	5814	280	193,946	0	193,946	1,897	0	1,897	11/23/2004	0.00	NA
MHFX	5795	281	192,780	192,780	0	1,886	1,886	0	11/23/2004	96.39	WCS-02
MHFX	5773	282	192,780	192,780	0	1,886	1,886	0	11/23/2004	96.39	WCS-02
MHFX	5656	283	192,586	0	192,586	1,884	0	1,884	11/23/2004	0.00	NA
MHFX	5851	284	193,935	0	193,935	1,897	0	1,897	11/23/2004	0.00	NA
MHFX	5738	285	193,302	0	193,302	1,891	0	1,891	11/23/2004	0.00	NA
MHFX	5619	286	192,688	0	192,688	1,885	0	1,885	11/23/2004	0.00	NA
CEFX	30610	287	193,199	0	193,199	1,890	0	1,890	11/23/2004	0.00	NA
MHFX	5682	288	192,944	158,214	34,730	1,888	1,548	340	12/2/2004	79.11	WCS-02
MHFX	5690	289	192,934	192,934	0	1,887	1,887	0	12/2/2004	96.47	WCS-03
MHFX	5764	290	193,036	158,289	34,746	1,888	1,548	340	12/2/2004	79.14	WCS-03
MHFX	5691	291	192,555	157,895	34,660	1,884	1,545	339	12/2/2004	78.95	WCS-03
CEFX	32098	292	193,077	193,077	0	1,889	1,889	0	12/2/2004	96.54	WCS-03
MHFX	5692	293	193,240	170,051	23,189	1,890	1,664	227	12/2/2004	85.03	WCS-03
MHFX	5833	294	193,864	160,907	32,957	1,897	1,574	322	12/2/2004	80.45	WCS-04
MHFX	5668	295	193,251	166,195	27,055	1,891	1,626	265	12/2/2004	83.10	WCS-04
MHFX	5770	296	193,179	193,179	0	1,890	1,890	0	12/2/2004	96.59	WCS-04

NA-Not sampled under this project. See 811 Project Closeout for WCS results.

Railcar #		Shipment ID	Total Weight	FHMWF Weight	811 Weight	Cubic Feet	FHWMF Cubic Feet	811 Cubic Feet	Shipment Date	Tons	WCS Number
MHFX	5799	297	192,678	192,678	0	1,885	1,885	0	12/2/2004	96.34	WCS-04
CEFX	30927	298	191,717	0	191,717	1,876	0	1,876	12/2/2004	0.00	NA
MHFX	5642	299	193,087	169,917	23,170	1,889	1,662	227	12/2/2004	84.96	WCS-04
MHFX	5808	302	194,078	194,078	0	1,899	1,899	0	12/7/2004	97.04	WCS-05
MHFX	5832	303	192,739	192,739	0	1,886	1,886	0	12/7/2004	96.37	WCS-05
MHFX	5812	304	193,598	193,598	0	1,894	1,894	0	12/7/2004	96.80	WCS-05
MHFX	5780	305	192,944	192,944	0	1,888	1,888	0	12/7/2004	96.47	WCS-05
MHFX	5767	306	193,036	193,036	0	1,888	1,888	0	12/7/2004	96.52	WCS-05
MHFX	5859	307	193,803	193,803	0	1,896	1,896	0	12/7/2004	96.90	WCS-06
MHFX	5804	308	192,739	192,739	0	1,886	1,886	0	12/7/2004	96.37	WCS-06
MHFX	5734	310	193,036	193,036	0	1,888	1,888	0	12/7/2004	96.52	WCS-06
MHFX	5638	311	192,331	192,331	0	1,882	1,882	0	12/7/2004	96.17	WCS-06
MHFX	5861	312	193,843	193,843	0	1,896	1,896	0	12/7/2004	96.92	WCS-06
NDYX	320818	313	192,331	192,331	0	1,882	1,882	0	12/7/2004	96.17	WCS-07
HLMX	1151	314	190,828	190,828	0	1,867	1,867	0	12/7/2004	95.41	WCS-07
HLMX	1209	315	182,640	182,640	0	1,787	1,787	0	12/15/2004	91.32	WCS-07
MHFX	5755	316	192,535	192,535	0	1,884	1,884	0	12/15/2004	96.27	WCS-07
NDYX	320647	317	193,997	193,997	0	1,898	1,898	0	12/15/2004	97.00	WCS-08
HLMX	1243	318	190,439	190,439	0	1,863	1,863	0	12/15/2004	95.22	WCS-08
MHFX	5647	319	192,893	192,893	0	1,887	1,887	0	12/15/2004	96.45	WCS-08
NDYX	322002	320	192,883	192,883	0	1,887	1,887	0	12/15/2004	96.44	WCS-08
NDYX	322012	321	192,586	192,586	0	1,884	1,884	0	12/15/2004	96.29	WCS-08
MHFX	5688	322	193,199	193,199	0	1,890	1,890	0	12/15/2004	96.60	WCS-09
MHFX	5709	323	192,985	163,400	29,585	1,888	1,598	289	12/15/2004	81.70	WCS-09
MHFX	5628	324	192,688	159,719	32,969	1,885	1,562	323	12/15/2004	79.86	WCS-09
PW	30008	325	193,884	158,326	35,558	1,897	1,549	348	12/15/2004	79.16	WCS-09
MHFX	5706	326	193,874	0	193,874	1,897	0	1,897	12/15/2004	0.00	NA
MHFX	5648	327	192,944	192,944	0	1,888	1,888	0	12/15/2004	96.47	WCS-10
MHFX	5604	328	193,302	133,940	59,410	1,891	1,310	581	12/22/2004	66.97	WCS-10
MHFX	5802	329	193,537	119,857	73,679	1,893	1,173	721	12/22/2004	59.93	WCS-10
MHFX	5766	330	193,097	118,426	74,671	1,889	1,159	730	12/22/2004	59.21	WCS-10
NDYX	320654	332	194,017	194,017	0	1,898	1,898	0	12/22/2004	97.01	WCS-10
CEFX	31025	333	194,528	0	194,528	1,903	0	1,903	12/22/2004	0.00	NA
CEFX	31043	334	194,528	0	194,528	1,903	0	1,903	12/22/2004	0.00	NA
NDYX	320782	335	191,973	0	191,973	1,878	0	1,878	1/4/2004	0.00	NA
MHFX	5713	336	193,199	193,199	0	1,890	1,890	0	1/4/2004	96.60	WCS-11
NDYX	320668	337	194,119	194,119	0	1,899	1,899	0	1/4/2004	97.06	WCS-11
MHFX	5649	338	192,893	0	192,893	1,887	0	1,887	1/4/2004	0.00	NA
HLMX	1280	339	191,053	124,184	66,868	1,869	1,215	654	1/4/2004	62.09	WCS-12
CEFX	32718	340	193,813	129,855	63,958	1,896	1,270	626	1/4/2004	64.93	WCS-12
MHFX	5735	341	193,302	0	193,302	1,891	0	1,891	1/4/2004	0.00	NA
NDYX	320776	342	192,075	0	192,075	1,879	0	1,879	1/6/2004	0.00	NA
CEFX	32084	343	193,302	193,302	0	1,891	1,891	0	1/6/2004	96.65	WCS-12
MHFX	5613	344	192,791	192,791	0	1,886	1,886	0	1/6/2004	96.40	WCS-11

NA-Not sampled under this project. See 811 Project Closeout for WCS results.

Railcar #		Shipment ID	Total Weight	FHMWF Weight	811 Weight	Cubic Feet	FHWMF Cubic Feet	811 Cubic Feet	Shipment Date	Tons	WCS Number
MHFX	5662	345	192,586	192,586	0	1,884	1,884	0	1/6/2004	96.29	WCS-11
MHFX	5684	346	192,995	192,995	0	1,888	1,888	0	1/6/2004	96.50	WCS-11
NDYX	320793	347	192,688	192,688	0	1,885	1,885	0	1/6/2004	96.34	WCS-13
HLMX	1263	348	189,928	189,928	0	1,858	1,858	0	1/6/2004	94.96	WCS-13
NDYX	320800	349	192,279	192,279	0	1,881	1,881	0	1/6/2004	96.14	WCS-13
NDYX	320809	350	192,791	192,791	0	1,886	1,886	0	1/11/2004	96.40	WCS-13
NDYX	320152	351	193,097	193,097	0	1,889	1,889	0	1/11/2004	96.55	WCS-13
NDYX	320091	352	193,711	193,711	0	1,895	1,895	0	1/11/2004	96.86	WCS-12
MHFX	5687	353	193,097	0	193,097	1,889	0	1,889	1/11/2004	0.00	NA
MHFX	5851	354	194,222	159,262	34,960	1,900	1,558	342	1/17/2004	79.63	WCS-14
MHFX	5814	355	194,119	128,119	66,001	1,899	1,253	646	1/17/2004	64.06	WCS-15
MHFX	5619	356	192,791	163,872	28,919	1,886	1,603	283	1/17/2004	81.94	WCS-14
CEFX	30610	357	193,097	150,616	42,481	1,889	1,473	416	1/17/2004	75.31	WCS-14
MHFX	5656	358	192,791	192,791	0	1,886	1,886	0	1/17/2004	96.40	WCS-14
MHFX	5725	359	192,177	163,351	28,827	1,880	1,598	282	1/22/2004	81.68	WCS-15
MHFX	5719	360	193,302	164,306	28,995	1,891	1,607	284	1/22/2004	82.15	WCS-15
DJLX	98542	361	192,791	0	192,791	1,886	0	1,886	1/22/2004	0.00	NA
DJLX	98519	362	194,119	194,119	0	1,899	1,899	0	1/31/2004	97.06	WCS-17
DJLX	19109	363	193,813	193,813	0	1,896	1,896	0	1/31/2004	96.91	WCS-17
MHFX	5811	364	194,017	194,017	0	1,898	1,898	0	1/22/2004	97.01	WCS-15
MHFX	5841	365	192,791	192,791	0	1,886	1,886	0	1/22/2004	96.40	WCS-15
MHFX	5623	366	192,791	192,791	0	1,886	1,886	0	1/22/2004	96.40	WCS-15
MHFX	5738	369	192,893	192,893	0	1,887	1,887	0	1/31/2004	96.45	WCS-17
MHFX	5795	370	192,893	192,893	0	1,887	1,887	0	1/31/2004	96.45	WCS-17
MHFX	5773	371	192,893	192,893	0	1,887	1,887	0	1/31/2004	96.45	WCS-17
CEFX	31029	372	189,519	189,519	0	1,854	1,854	0	2/4/2005	94.76	WCS-18
MHFX	5699	373	192,791	192,791	0	1,886	1,886	0	2/4/2005	96.40	WCS-18
MHFX	5682	374	188,088	188,088	0	1,840	1,840	0	2/4/2005	94.04	WCS-18
MHFX	5809	377	173,020	0	173,020	1,693	0	1,693	2/4/2005	0.00	NA
MHFX	5788	378	188,140	188,140	0	1,841	1,841	0	2/4/2005	94.07	WCS-18
MHFX	5630	379	187,910	187,910	0	1,838	1,838	0	2/4/2005	93.96	WCS-18
CEFX	31057	380	189,590	189,590	0	1,855	1,855	0	2/4/2005	94.80	WCS-019
MHFX	5714	381	188,160	188,160	0	1,841	1,841	0	2/10/2005	94.08	WCS-019
MHFX	5830	382	189,120	0	189,120	1,850	0	1,850	2/10/2005	0.00	NA
MHFX	5849	383	189,050	189,050	0	1,849	1,849	0	2/10/2005	94.53	WCS-020
MHFX	5863	384	189,270	189,270	0	1,852	1,852	0	2/10/2005	94.64	WCS-020
CEFX	31058	385	188,800	188,800	0	1,847	1,847	0	2/10/2005	94.40	WCS-020
MHFX	5844	386	188,480	188,480	0	1,844	1,844	0	2/10/2005	94.24	WCS-019
CEFX	32039	387	188,250	188,250	0	1,842	1,842	0	2/10/2005	94.13	WCS-019
CEFX	30919	388	188,110	188,110	0	1,840	1,840	0	2/10/2005	94.06	WCS-019
MHFX	5867	389	189,600	189,600	0	1,855	1,855	0	2/10/2005	94.80	WCS-020
CEFX	31068	391	194,350	194,350	0	1,901	1,901	0	2/16/2005	97.18	WCS-020
CEFX	31031	392	194,380	194,380	0	1,902	1,902	0	2/16/2005	97.19	WCS-021
MHFX	5710	393	193,080	193,080	0	1,889	1,889	0	2/16/2005	96.54	WCS-021

NA-Not sampled under this project. See 811 Project Closeout for WCS results.

Railcar #		Shipment ID	Total Weight	FHMWF Weight	811 Weight	Cubic Feet	FHWMF Cubic Feet	811 Cubic Feet	Shipment Date	Tons	WCS Number
MHFX	5654	394	192,930	192,930	0	1,887	1,887	0	2/23/2005	96.47	WCS-024
HLMX	1170	395	191,060	191,060	0	1,869	1,869	0	2/23/2005	95.53	WCS-024
DJLX	98504	396	193,590	193,590	0	1,894	1,894	0	2/23/2005	96.80	WCS-024
MHFX	5605	397	193,410	193,410	0	1,892	1,892	0	2/23/2005	96.71	WCS-021
HLMX	1103	398	191,090	191,090	0	1,869	1,869	0	2/23/2005	95.55	WCS-021
NDYX	320638	399	194,415	194,415	0	1,902	1,902	0	2/23/2005	97.21	WCS-021
MHFX	5672	400	193,100	193,100	0	1,889	1,889	0	2/23/2005	96.55	WCS-024
NDYX	320681	401	194,360	194,360	0	1,901	1,901	0	2/27/2005	97.18	WCS-024
MHFX	5806	402	193,370	193,370	0	1,892	1,892	0	2/27/2005	96.69	WCS-025
NDYX	320637	403	194,245	194,245	0	1,900	1,900	0	2/27/2005	97.12	WCS-022
MHFX	5607	404	193,260	193,260	0	1,891	1,891	0	2/27/2005	96.63	WCS-022
NDYX	320135	405	193,830	193,830	0	1,896	1,896	0	2/27/2005	96.92	WCS-022
HLMX	1206	406	190,890	190,890	0	1,867	1,867	0	2/27/2005	95.45	WCS-022
HLMX	1293	407	191,170	191,170	0	1,870	1,870	0	2/27/2005	95.59	WCS-022
MHFX	5770	408	193,105	193,105	0	1,889	1,889	0	3/3/2005	96.55	WCS-023
NDYX	320821	409	192,580	192,580	0	1,884	1,884	0	3/3/2005	96.29	WCS-023
HLMX	1171	410	189,980	189,980	0	1,859	1,859	0	3/3/2005	94.99	WCS-023
MHFX	5773	420	192,910	192,910	0	1,887	1,887	0	4/28/2005	96.46	WCS-023
JTLX	239	421	194,480	194,480	0	1,903	1,903	0	4/28/2005	97.24	WCS-023
MHFX	5719	422	193,420	193,420	0	1,892	1,892	0	4/28/2005	96.71	WCS-025
MHFX	5795	423	193,800	193,800	0	1,896	1,896	0	4/28/2005	96.90	WCS-025
NDYX	320657	425	194,590	194,590	0	1,904	1,904	0	5/5/2005	97.30	WCS-025
MHFX	5790	426	193,240	193,240	0	1,890	1,890	0	5/5/2005	96.62	WCS-025
HLMX	1267	427	191,080	191,080	0	1,869	1,869	0	5/5/2005	95.54	WCS-027
NDYX	320785	428	193,160	193,160	0	1,890	1,890	0	5/5/2005	96.58	WCS-027
CEFX	32083	429	194,200	143,610	50,590	1,900	1,405	495	5/5/2005	71.81	WCS-027
HLMX	1221	430	191,580	191,580	0	1,874	1,874	0	5/5/2005	95.79	WCS-027
MHFX	5739	431	193,100	193,100	0	1,889	1,889	0	5/5/2005	96.55	WCS-028
MHFX	5831	432	194,840	194,840	0	1,906	1,906	0	5/5/2005	97.42	WCS-028
CEFX	31063	433	195,180	195,180	0	1,909	1,909	0	5/12/2005	97.59	WCS-028
CEFX	30318	434	185,990	185,990	0	1,819	1,819	0	5/12/2005	93.00	WCS-028
DJLX	98548	435	194,660	194,660	0	1,904	1,904	0	5/12/2005	97.33	WCS-028
CEFX	31053	436	194,150	194,150	0	1,899	1,899	0	5/12/2005	97.08	WCS-029
CEFX	31062	437	195,140	195,140	0	1,909	1,909	0	5/12/2005	97.57	WCS-029
DJJX	9937	439	182,810	182,810	0	1,788	1,788	0	5/20/2005	91.41	WCS-029
JTLX	100107	440	183,070	183,070	0	1,791	1,791	0	5/20/2005	91.54	WCS-029
DJJX	9927	441	183,560	183,560	0	1,796	1,796	0	5/20/2005	91.78	WCS-029
CEFX	33559	443	194,010	194,010	0	1,898	1,898	0	6/2/2005	97.01	WCS-030
CEFX	33444	444	193,890	193,890	0	1,897	1,897	0	6/2/2005	96.95	WCS-030
DJJX	9926	445	183,640	183,640	0	1,796	1,796	0	6/2/2005	91.82	WCS-030
DJJX	9924	446	183,710	183,710	0	1,797	1,797	0	6/2/2005	91.86	WCS-030
DJJX	9957	448	183,660	147,160	36,500	1,797	1,440	357	6/7/2005	73.58	WCS-030
DJJX	9960	449	183,770	151,600	32,170	1,798	1,483	315	6/10/2005	75.80	WCS-031
JTLX	100114	450	183,660	140,090	43,570	1,797	1,370	426	6/10/2005	70.05	WCS-031

NA-Not sampled under this project. See 811 Project Closeout for WCS results.

Railcar #		Shipment ID	Total Weight	FHMWF Weight	811 Weight	Cubic Feet	FHWMF Cubic Feet	811 Cubic Feet	Shipment Date	Tons	WCS Number
NDYX	360020	451	184,750	184,750	0	1,807	1,807	0	6/7/2005	92.38	WCS-031
DJLX	9978	452	183,290	183,290	0	1,793	1,793	0	6/7/2005	91.65	WCS-031
NDYX	360025	453	185,390	185,390	0	1,814	1,814	0	6/7/2005	92.70	WCS-031
MHFX	5795	454	193,770	193,770	0	1,896	1,896	0	6/7/2005	96.89	WCS-032
MHFX	5782	455	193,580	193,580	0	1,894	1,894	0	6/7/2005	96.79	WCS-032
JTLX	30132	456	193,980	193,980	0	1,898	1,898	0	6/7/2005	96.99	WCS-032
NDYX	360066	457	185,030	185,030	0	1,810	1,810	0	6/7/2005	92.52	WCS-032
NDYX	360067	458	185,180	185,180	0	1,812	1,812	0	6/7/2005	92.59	WCS-032
NDYX	360064	459	184,970	183,470	1,500	1,809	1,795	15	6/7/2005	91.74	WCS-033
NDYX	360063	460	185,380	185,380	0	1,814	1,814	0	6/7/2005	92.69	WCS-033
DJJX	9958	463	183,760	183,760	0	1,798	1,798	0	6/10/2005	91.88	WCS-033
JTLX	100116	464	183,770	183,770	0	1,798	1,798	0	6/10/2005	91.89	WCS-033
DJJX	9907	465	182,840	182,840	0	1,789	1,789	0	6/10/2005	91.42	WCS-033
MHFX	5719	466	193,880	193,880	0	1,897	1,897	0	6/10/2005	96.94	WCS-034
DJJX	9905	467	184,040	184,040	0	1,800	1,800	0	6/10/2005	92.02	WCS-034
DJJX	9915	468	183,540	183,540	0	1,796	1,796	0	6/14/2005	91.77	WCS-034
DJJX	9947	469	183,440	183,440	0	1,795	1,795	0	6/10/2005	91.72	WCS-034
DJJX	9918	470	183,590	183,590	0	1,796	1,796	0	6/10/2005	91.80	WCS-034
HLMX	1172	471	191,550	191,550	0	1,874	1,874	0	6/14/2005	95.78	WCS-035
DJJX	9923	472	183,570	183,570	0	1,796	1,796	0	6/14/2005	91.79	WCS-035
DJJX	9921	473	183,550	183,550	0	1,796	1,796	0	6/14/2005	91.78	WCS-035
DJJX	9906	474	183,900	183,900		1,799	1,799	0	6/14/2005	91.95	WCS-035
JTLX	100110	475	183,860	89,450	94,410	1,799	875	924	6/14/2005	44.73	WCS-035
JTLX	100108	476	183,410	123,690	59,720	1,794	1,210	584	6/14/2005	61.85	WCS-036
JTLX	5835	477	194,470	0	194,470	1,902	0	1,902	6/18/2005	0.00	WCS-036
JTLX	5801	478	193,820	63,850	129,970	1,896	625	1,271	6/18/2005	31.93	WCS-036
JTLX	100105	479	183,850	183,850	0	1,799	1,799	0	6/18/2005	91.93	WCS-036
JTLX	100111	480	183,820	140,900	42,920	1,798	1,378	420	6/18/2005	70.45	WCS-036
DJJX	9950	482	183,630	183,630	0	1,796	1,796	0	6/18/2005	91.82	WCS-037
DJJX	9948	483	183,570	183,570	0	1,796	1,796	0	6/18/2005	91.79	WCS-037
DJJX	9942	484	183,880	183,880	0	1,799	1,799	0	6/18/2005	91.94	WCS-037
DJLX	9945	485	183,700	183,700	0	1,797	1,797	0	6/18/2005	91.85	WCS-037
DJJX	9900	498	183,790	183,790	0	1,798	1,798	0	6/18/2005	91.90	WCS-037
DJJX	9930	499	183,600	183,600	0	1,796	1,796	0	6/18/2005	91.80	WCS-038
MHFX	5739	500	193,870	193,870	0	1,897	1,897	0	6/18/2005	96.94	WCS-038
NDYX	320657	501	194,900	194,900	0	1,907	1,907	0	6/18/2005	97.45	WCS-038
MHFX	5773	502	193,450	193,450	0	1,892	1,892	0	6/22/2005	96.73	WCS-038
MHFX	5790	503	193,320	193,320	0	1,891	1,891	0	6/22/2005	96.66	WCS-038
JTSX	8	504	180,120	180,120	0	1,762	1,762	0	6/22/2005	90.06	WCS-039
JTSX	16	505	181,230	181,230	0	1,773	1,773	0	6/22/2005	90.62	WCS-039
JTSX	32	506	180,300	180,300	0	1,764	1,764	0	6/22/2005	90.15	WCS-039
DJTX	60908	507	182,290	182,290	0	1,783	1,783	0	6/22/2005	91.15	WCS-039
CEFX	32083	508	194,410	194,410	0	1,902	1,902	0	6/22/2005	97.21	WCS-039
NDYX	320785	509	193,100	193,100	0	1,889	1,889	0	6/22/2005	96.55	WCS-040

NA-Not sampled under this project. See 811 Project Closeout for WCS results.

Railcar #		Shipment ID	Total Weight	FHMWF Weight	811 Weight	Cubic Feet	FHWMF Cubic Feet	811 Cubic Feet	Shipment Date	Tons	WCS Number
HLMX	1267	510	191,050	191,050	0	1,869	1,869	0	6/22/2005	95.53	WCS-040
JTSX	41	512	180,830	180,830	0	1,427	1,427	0	ONSITE	90.42	WCS-040
JTSX	17	513	181,210	181,210	0	1,430	1,430	0	8/6/2005	90.61	WCS-040
AM	916	514	181,750	181,750	0	1,434	1,434	0	8/6/2005	90.88	WCS-040
AM	951	515	181,880	181,880	0	1,436	1,436	0	8/6/2005	90.94	WCS-041
AM	917	516	181,900	181,900	0	1,436	1,436	0	ONSITE	90.95	WCS-041
AM	963	517	181,890	181,890	0	1,436	1,436	0	ONSITE	90.95	WCS-041
JTLX	100113	521	183,220	183,220	0	1,446	1,446	0	ONSITE	91.61	WCS-041
DJJX	9917	522	183,420	183,420	0	1,448	1,448	0	ONSITE	91.71	WCS-041
CEFX	33493	523	194,060	194,060	0	1,532	1,532	0	ONSITE	97.03	WCS-042
CEFX	33484	524	194,140	194,140	0	1,532	1,532	0	ONSITE	97.07	WCS-042
JTLX	100119	525	183,880	183,880	0	1,451	1,451	0	ONSITE	91.94	WCS-042
NDYX	320698	534	194,610	194,610	0	1,536	1,536	0	ONSITE	97.31	WCS-042
NDYX	320167	535	194,300	194,300	0	1,534	1,534	0	ONSITE	97.15	WCS-042
NDYX	320181	536	194,480	194,480	0	1,535	1,535	0	ONSITE	97.24	WCS-043
DJJX	9937	540	183,270	183,270	0	1,446	1,446	0	8/1/2005	91.64	WCS-047
JTLX	100107	541	183,390	183,390	0	1,447	1,447	0	8/1/2005	91.70	WCS-046
DJJX	9927	542	183,190	183,190	0	1,446	1,446	0	8/1/2005	91.60	WCS-046
DJJX	9918	543	185,860	185,860	0	1,467	1,467	0	8/1/2005	92.93	WCS-046
DJJX	9931	544	183,700	183,700	0	1,450	1,450	0	8/1/2005	91.85	WCS-046
AM	931	545	181,890	181,890	0	1,436	1,436	0	8/1/2005	90.95	WCS-046
DJJX	9962	546	183,030	183,030	0	1,445	1,445	0	8/1/2005	91.52	WCS-045
DJJX	9903	547	183,250	183,250	0	1,446	1,446	0	8/1/2005	91.63	WCS-045
DJJX	9922	548	183,540	183,540	0	1,449	1,449	0	8/1/2005	91.77	WCS-045
DJJX	9904	549	183,370	183,370	0	1,447	1,447	0	8/1/2005	91.69	WCS-045
CEFX	33163	550	199,560	199,560	0	1,575	1,575	0	8/2/2005	99.78	WCS-045
CEFX	31070	551	194,960	194,960	0	1,539	1,539	0	8/2/2005	97.48	WCS-044
MHFX	5610	552	193,890	193,890	0	1,530	1,530	0	8/2/2005	96.95	WCS-044
HLMX	1279	553	191,680	191,680	0	1,513	1,513	0	8/2/2005	95.84	WCS-044
DJJX	9932	554	182,400	182,400	0	1,440	1,440	0	8/2/2005	91.20	WCS-044
JTSX	43	555	181,390	181,390	0	1,432	1,432	0	8/2/2005	90.70	WCS-044
CEFX	33123	556	199,700	199,700	0	1,576	1,576	0	8/2/2005	99.85	WCS-043
HLMX	1221	557	191,720	191,720	0	1,513	1,513	0	8/2/2005	95.86	WCS-043
NDYX	320686	558	194,590	194,590	0	1,536	1,536	0	8/2/2005	97.30	WCS-043
CEFX	31028	559	194,940	194,940	0	1,539	1,539	0	8/2/2005	97.47	WCS-043
DJJX	9926	560	184,050	184,050	0	1,453	1,453	0	8/2/2005	92.03	WCS-047
DJJX	9924	561	183,750	183,750	0	1,450	1,450	0	8/2/2005	91.88	WCS-047
NDYX	360063	562	185,210	185,210	0	1,462	1,462	0	7/28/2005	92.61	WCS-047
MRMX	100108	563	199,820	199,820	0	1,577	1,577	0	8/2/2005	99.91	WCS-047
CEFX	33559	564	194,170	194,170	0	1,533	1,533	0	8/1/2005	97.09	WCS-048
NDYX	360064	565	185,230	185,230	0	1,462	1,462	0	7/28/2005	92.62	WCS-048
CEFX	33444	566	193,880	193,880	0	1,530	1,530	0	7/28/2005	96.94	WCS-048
DJJX	9915	575	182,960	182,960	0	1,444	1,444	0	7/29/2005	91.48	WCS-048
DJJX	9906	576	182,910	182,910	0	1,444	1,444	0	7/29/2005	91.46	WCS-048

NA-Not sampled under this project. See 811 Project Closeout for WCS results.

Railcar #		Shipment ID	Total Weight	FHMWF Weight	811 Weight	Cubic Feet	FHWMF Cubic Feet	811 Cubic Feet	Shipment Date	Tons	WCS Number
DJJX	9948	577	182,850	182,850	0	1,443	1,443	0	7/29/2005	91.43	WCS-049
DJJX	9950	578	182,340	182,340	0	1,439	1,439	0	7/29/2005	91.17	WCS-049
DJJX	9921	579	183,560	183,560	0	1,449	1,449	0	7/29/2005	91.78	WCS-049
DJJX	9930	580	183,450	183,450	0	1,448	1,448	0	7/29/2005	91.73	WCS-049
DJJX	9900	581	183,730	183,730	0	1,450	1,450	0	7/29/2005	91.87	WCS-049
NDYX	360017	582	185,180	185,180	0	1,462	1,462	0	7/29/2005	92.59	WCS-050
NDYX	360097	583	184,160	184,160	0	1,454	1,454	0	7/29/2005	92.08	WCS-050
NDYX	360052	584	185,000	185,000	0	1,460	1,460	0	7/29/2005	92.50	WCS-050
NDYX	360066	585	185,060	185,060	0	1,461	1,461	0	7/29/2005	92.53	WCS-050
MRMX	100116	586	200,760	200,760	0	1,585	1,585	0	7/29/2005	100.38	WCS-050
DJJX	9947	587	183,450	183,450	0	1,448	1,448	0	8/6/2005	91.73	WCS-051
JTLX	100108	588	182,290	182,290	0	1,439	1,439	0	8/6/2005	91.15	WCS-051
MRMX	100101	589	200,540	200,540	0	1,583	1,583	0	8/6/2005	100.27	WCS-051
NDYX	360067	590	185,200	185,200	0	1,462	1,462	0	8/6/2005	92.60	WCS-051
JTLX	5822	591	193,970	193,970	0	1,531	1,531	0	8/6/2005	96.99	WCS-051
NDYX	360006	592	185,060	185,060	0	1,461	1,461	0	8/6/2005	92.53	WCS-052
MRMX	100102	593	200,640	200,640	0	1,584	1,584	0	8/6/2005	100.32	WCS-052
AM	940	594	181,820	181,820	0	1,435	1,435	0	8/6/2005	90.91	WCS-052
DJJX	9905	595	183,790	183,790	0	1,451	1,451	0	8/6/2005	91.90	WCS-052
JTLX	100110	596	183,870	183,870	0	1,451	1,451	0	8/6/2005	91.94	WCS-052
MRMX	100112	597	200,200	200,200	0	1,580	1,580	0	8/6/2005	100.10	WCS-053
DJJX	9923	598	183,400	183,400	0	1,448	1,448	0	8/6/2005	91.70	WCS-053
DJJX	9954	599	183,770	183,770	0	1,450	1,450	0	8/6/2005	91.89	WCS-053
AM	915	600	182,720	182,720	0	1,442	1,442	0	8/6/2005	91.36	WCS-053
AM	929	601	182,250	182,250	0	1,438	1,438	0	8/6/2005	91.13	WCS-053
JTSX	8	602	180,130	180,130	0	1,422	1,422	0	8/6/2005	90.07	WCS-054
JTSX	32	603	180,240	180,240	0	1,423	1,423	0	8/6/2005	90.12	WCS-054
DJTX	60908	604	182,230	182,230	0	1,438	1,438	0	8/6/2005	91.12	WCS-054
NDYX	320698	605	194,790	194,790	0	1,537	1,537	0	8/6/2005	97.40	WCS-054
DJLX	9978	606	183,640	183,640	0	1,449	1,449	0	8/18/2005	91.82	WCS-054
MRMX	100118	607	200,580	200,580	0	1,583	1,583	0	8/18/2005	100.29	WCS-055
MRMX	100103	608	200,660	200,660	0	1,584	1,584	0	8/18/2005	100.33	WCS-055
JTLX	100116	609	183,770	183,770	0	1,450	1,450	0	8/20/2005	91.89	WCS-055
DJJX	9958	610	183,410	183,410	0	1,448	1,448	0	8/20/2005	91.71	WCS-055
MRMX	100110	611	199,770	199,770	0	1,577	1,577	0	8/20/2005	99.89	WCS-055
DJJX	9907	612	183,520	183,520	0	1,448	1,448	0	8/20/2005	91.76	WCS-056
AM	961	613	181,920	181,920	0	1,436	1,436	0	8/20/2005	90.96	WCS-056
AM	925	614	181,940	181,940	0	1,436	1,436	0	8/20/2005	90.97	WCS-056
DJJX	9960	615	183,720	183,720	0	1,450	1,450	0	8/20/2005	91.86	WCS-056
JTLX	100114	616	183,700	183,700	0	1,450	1,450	0	8/20/2005	91.85	WCS-056
MRMX	100113	617	200,170	200,170	0	1,580	1,580	0	8/20/2005	100.09	WCS-057
DJJX	9957	619	183,630	183,630	0	1,449	1,449	0	8/26/2005	91.82	WCS-057
NDYX	322032	620	193,800	193,800	0	1,530	1,530	0	8/26/2005	96.90	WCS-057
AM	959	621	182,260	182,260	0	1,439	1,439	0	8/26/2005	91.13	WCS-057
JTSX	28	622	181,100	181,100	0	1,429	1,429	0	8/26/2005	90.55	WCS-057

NA-Not sampled under this project. See 811 Project Closeout for WCS results.

Railcar #		Shipment ID	Total Weight	FHMWF Weight	811 Weight	Cubic Feet	FHWMF Cubic Feet	811 Cubic Feet	Shipment Date	Tons	WCS Number
JTSX	7	623	180,800	180,800	0	1,427	1,427	0	8/26/2005	90.40	WCS-058
CEFX	31033	624	195,100	195,100	0	1,540	1,540	0	8/26/2005	97.55	WCS-058
CEFX	30296	625	185,600	185,600	0	1,465	1,465	0	8/26/2005	92.80	WCS-058
CEFX	31719	626	194,670	194,670	0	1,536	1,536	0	8/26/2005	97.34	WCS-058
CEFX	31700	627	193,620	193,620	0	1,528	1,528	0	8/26/2005	96.81	WCS-058
CEFX	31036	628	194,660	194,660	0	1,536	1,536	0	8/26/2005	97.33	WCS-059
AM	947	629	181,780	181,780	0	1,435	1,435	0	8/26/2005	90.89	WCS-059
CEFX	31974	630	193,900	193,900	0	1,530	1,530	0	8/26/2005	96.95	WCS-059
CEFX	31677	631	194,560	194,560	0	1,536	1,536	0	8/26/2005	97.28	WCS-059
CEFX	31037	632	194,810	194,810	0	1,538	1,538	0	8/26/2005	97.41	WCS-059
MRMX	100111	633	200,000	200,000	0	1,579	1,579	0	8/26/2005	100.00	WCS-060
CEFX	31039	634	195,000	195,000	0	1,539	1,539	0	9/1/2005	97.50	WCS-24R
CEFX	33121	635	199,960	199,960	0	1,578	1,578	0	9/1/2005	99.98	WCS-24R
JTSX	24	636	182,450	182,450	0	1,440	1,440	0	9/1/2005	91.23	WCS-24R
DJTX	9945	637	183,660	183,660	0	1,450	1,450	0	9/1/2005	91.83	WCS-24R
CEFX	316500	638	194,500	194,500	0	1,535	1,535	0	9/1/2005	97.25	WCS-24R
JTLX	4058	639	194,180	194,180	0	1,533	1,533	0	9/1/2005	97.09	WCS-25R
CEFX	31041	640	194,890	194,890	0	1,538	1,538	0	9/3/2005	97.45	WCS-25R
CEFX	31956	641	193,890	193,890	0	1,530	1,530	0	9/3/2005	96.95	WCS-25R
CEFX	32016	642	194,060	194,060	0	1,532	1,532	0	9/3/2005	97.03	WCS-25R
CEFX	32094	643	194,080	194,080	0	1,532	1,532	0	9/3/2005	97.04	WCS-25R
JTLX	234	644	194,640	194,640	0	1,536	1,536	0	9/3/2005	97.32	WCS-26R
JTLX	185	645	193,910	193,910	0	1,530	1,530	0	9/3/2005	96.96	WCS-26R
MHFX	5794	646	193,630	193,630	0	1,528	1,528	0	9/3/2005	96.82	WCS-26R
CEFX	31960	647	193,960	193,960	0	1,531	1,531	0	9/3/2005	96.98	WCS-26R
DJJX	9942	648	183,880	183,880	0	1,451	1,451	0	9/3/2005	91.94	WCS-26R
JTLX	100105	649	183,780	183,780	0	1,451	1,451	0	9/3/2005	91.89	WCS-060
DJJX	19041	650	194,700	194,700	0	1,537	1,537	0	9/8/2005	97.35	WCS-060
MHFX	5765	651	193,540	193,540	0	1,528	1,528	0	9/8/2005	96.77	WCS-060
MHFX	5725	652	193,640	193,640	0	1,528	1,528	0	9/8/2005	96.82	WCS-060
DJJX	9915	653	182,480	182,480	0	1,440	1,440	0	9/8/2005	91.24	WCS-061
DJJX	9906	654	183,980	183,980	0	1,452	1,452	0	9/8/2005	91.99	WCS-061
DJJX	9921	655	183,020	183,020	0	1,445	1,445	0	9/8/2005	91.51	WCS-061
NDYX	360025	656	185,510	185,510	0	1,464	1,464	0	9/8/2005	92.76	WCS-061
CEFX	31735	657	194,630	194,630	0	1,536	1,536	0	9/8/2005	97.32	WCS-061
NDYX	316076	658	194,500	194,500	0	1,535	1,535	0	9/8/2005	97.25	WCS-062
NDYX	316103	659	192,790	192,790	0	1,522	1,522	0	9/8/2005	96.40	WCS-062

NA-Not sampled under this project. See 811 Project Closeout for WCS results.

Appendix C
RESRAD Reports

Summary : FHWMF Industrial Worker Scenario.Avg.9-25-05
File : IW.Avg.9-25-05.RAD

Table of Contents

Part I: Mixture Sums and Single Radionuclide Guidelines

Dose Conversion Factor (and Related) Parameter Summary
File: FGR 13 MORBIDITY

Menu	Parameter	Current Value	Base Case*	Parameter Name
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Ac-227+D	6.724E+00	6.700E+00	DCF2(1)
B-1	Am-241	4.440E-01	4.440E-01	DCF2(2)
B-1	Cs-137+D	3.190E-05	3.190E-05	DCF2(3)
B-1	H-3	6.400E-08	6.400E-08	DCF2(4)
B-1	Np-237+D	5.400E-01	5.400E-01	DCF2(5)
B-1	Pa-231	1.280E+00	1.280E+00	DCF2(6)
B-1	Pb-210+D	2.320E-02	1.360E-02	DCF2(7)
B-1	Pu-238	3.920E-01	3.920E-01	DCF2(8)
B-1	Pu-239	4.290E-01	4.290E-01	DCF2(10)
B-1	Pu-240	4.290E-01	4.290E-01	DCF2(11)
B-1	Ra-226+D	8.594E-03	8.580E-03	DCF2(13)
B-1	Ra-228+D	5.078E-03	4.770E-03	DCF2(14)
B-1	Sr-90+D	1.308E-03	1.300E-03	DCF2(15)
B-1	Th-228+D	3.454E-01	3.420E-01	DCF2(16)
B-1	Th-229+D	2.169E+00	2.150E+00	DCF2(17)
B-1	Th-230	3.260E-01	3.260E-01	DCF2(18)
B-1	Th-232	1.640E+00	1.640E+00	DCF2(19)
B-1	U-233	1.350E-01	1.350E-01	DCF2(20)
B-1	U-234	1.320E-01	1.320E-01	DCF2(21)
B-1	U-235+D	1.230E-01	1.230E-01	DCF2(22)
B-1	U-236	1.250E-01	1.250E-01	DCF2(23)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Ac-227+D	1.480E-02	1.410E-02	DCF3(1)
D-1	Am-241	3.640E-03	3.640E-03	DCF3(2)
D-1	Cs-137+D	5.000E-05	5.000E-05	DCF3(3)
D-1	H-3	6.400E-08	6.400E-08	DCF3(4)
D-1	Np-237+D	4.444E-03	4.440E-03	DCF3(5)
D-1	Pa-231	1.060E-02	1.060E-02	DCF3(6)
D-1	Pb-210+D	7.276E-03	5.370E-03	DCF3(7)
D-1	Pu-238	3.200E-03	3.200E-03	DCF3(8)
D-1	Pu-239	3.540E-03	3.540E-03	DCF3(10)
D-1	Pu-240	3.540E-03	3.540E-03	DCF3(11)
D-1	Ra-226+D	1.321E-03	1.320E-03	DCF3(13)
D-1	Ra-228+D	1.442E-03	1.440E-03	DCF3(14)
D-1	Sr-90+D	1.528E-04	1.420E-04	DCF3(15)
D-1	Th-228+D	8.086E-04	3.960E-04	DCF3(16)
D-1	Th-229+D	4.027E-03	3.530E-03	DCF3(17)
D-1	Th-230	5.480E-04	5.480E-04	DCF3(18)
D-1	Th-232	2.730E-03	2.730E-03	DCF3(19)
D-1	U-233	2.890E-04	2.890E-04	DCF3(20)
D-1	U-234	2.830E-04	2.830E-04	DCF3(21)
D-1	U-235+D	2.673E-04	2.660E-04	DCF3(22)
D-1	U-236	2.690E-04	2.690E-04	DCF3(23)
D-34	Food transfer factors:			
D-34	Ac-227+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(1,1)
D-34	Ac-227+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,2)
D-34	Ac-227+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,3)

Dose Conversion Factor (and Related) Parameter Summary (continued)
File: FGR 13 MORBIDITY

Menu	Parameter	Current Value	Base Case*	Parameter Name
D-34	Am-241 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(2,1)
D-34	Am-241 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-05	5.000E-05	RTF(2,2)
D-34	Am-241 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-06	2.000E-06	RTF(2,3)
D-34				
D-34	Cs-137+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(3,1)
D-34	Cs-137+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.000E-02	3.000E-02	RTF(3,2)
D-34	Cs-137+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	8.000E-03	8.000E-03	RTF(3,3)
D-34				
D-34	H-3 , plant/soil concentration ratio, dimensionless	4.800E+00	4.800E+00	RTF(4,1)
D-34	H-3 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.200E-02	1.200E-02	RTF(4,2)
D-34	H-3 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-02	1.000E-02	RTF(4,3)
D-34				
D-34	Np-237+D , plant/soil concentration ratio, dimensionless	2.000E-02	2.000E-02	RTF(5,1)
D-34	Np-237+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(5,2)
D-34	Np-237+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(5,3)
D-34				
D-34	Pa-231 , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(6,1)
D-34	Pa-231 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(6,2)
D-34	Pa-231 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(6,3)
D-34				
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(7,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(7,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(7,3)
D-34				
D-34	Pu-238 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(8,1)
D-34	Pu-238 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(8,2)
D-34	Pu-238 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-06	1.000E-06	RTF(8,3)
D-34				
D-34	Pu-239 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(10,1)
D-34	Pu-239 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(10,2)
D-34	Pu-239 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-06	1.000E-06	RTF(10,3)
D-34				
D-34	Pu-240 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(11,1)
D-34	Pu-240 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(11,2)
D-34	Pu-240 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-06	1.000E-06	RTF(11,3)
D-34				
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(13,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(13,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(13,3)
D-34				
D-34	Ra-228+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(14,1)
D-34	Ra-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(14,2)
D-34	Ra-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(14,3)
D-34				
D-34	Sr-90+D , plant/soil concentration ratio, dimensionless	3.000E-01	3.000E-01	RTF(15,1)
D-34	Sr-90+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-03	8.000E-03	RTF(15,2)
D-34	Sr-90+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-03	2.000E-03	RTF(15,3)
D-34				

Dose Conversion Factor (and Related) Parameter Summary (continued)
File: FGR 13 MORBIDITY

Menu	Parameter	Current Value	Base Case*	Parameter Name
D-34	Th-228+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(16,1)
D-34	Th-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(16,2)
D-34	Th-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(16,3)
D-34				
D-34	Th-229+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(17,1)
D-34	Th-229+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(17,2)
D-34	Th-229+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(17,3)
D-34				
D-34	Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(18,1)
D-34	Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(18,2)
D-34	Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(18,3)
D-34				
D-34	Th-232 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(19,1)
D-34	Th-232 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(19,2)
D-34	Th-232 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(19,3)
D-34				
D-34	U-233 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(20,1)
D-34	U-233 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(20,2)
D-34	U-233 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(20,3)
D-34				
D-34	U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(21,1)
D-34	U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(21,2)
D-34	U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(21,3)
D-34				
D-34	U-235+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(22,1)
D-34	U-235+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(22,2)
D-34	U-235+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(22,3)
D-34				
D-34	U-236 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(23,1)
D-34	U-236 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(23,2)
D-34	U-236 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(23,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Ac-227+D , fish	1.500E+01	1.500E+01	BIOFAC(1,1)
D-5	Ac-227+D , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(1,2)
D-5				
D-5	Am-241 , fish	3.000E+01	3.000E+01	BIOFAC(2,1)
D-5	Am-241 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(2,2)
D-5				
D-5	Cs-137+D , fish	2.000E+03	2.000E+03	BIOFAC(3,1)
D-5	Cs-137+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(3,2)
D-5				
D-5	H-3 , fish	1.000E+00	1.000E+00	BIOFAC(4,1)
D-5	H-3 , crustacea and mollusks	1.000E+00	1.000E+00	BIOFAC(4,2)
D-5				
D-5	Np-237+D , fish	3.000E+01	3.000E+01	BIOFAC(5,1)
D-5	Np-237+D , crustacea and mollusks	4.000E+02	4.000E+02	BIOFAC(5,2)
D-5				
D-5	Pa-231 , fish	1.000E+01	1.000E+01	BIOFAC(6,1)
D-5	Pa-231 , crustacea and mollusks	1.100E+02	1.100E+02	BIOFAC(6,2)

Dose Conversion Factor (and Related) Parameter Summary (continued)
File: FGR 13 MORBIDITY

Menu	Parameter	Current Value	Base Case*	Parameter Name
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(7,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(7,2)
D-5				
D-5	Pu-238 , fish	3.000E+01	3.000E+01	BIOFAC(8,1)
D-5	Pu-238 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(8,2)
D-5				
D-5	Pu-239 , fish	3.000E+01	3.000E+01	BIOFAC(10,1)
D-5	Pu-239 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(10,2)
D-5				
D-5	Pu-240 , fish	3.000E+01	3.000E+01	BIOFAC(11,1)
D-5	Pu-240 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(11,2)
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(13,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(13,2)
D-5				
D-5	Ra-228+D , fish	5.000E+01	5.000E+01	BIOFAC(14,1)
D-5	Ra-228+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(14,2)
D-5				
D-5	Sr-90+D , fish	6.000E+01	6.000E+01	BIOFAC(15,1)
D-5	Sr-90+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(15,2)
D-5				
D-5	Th-228+D , fish	1.000E+02	1.000E+02	BIOFAC(16,1)
D-5	Th-228+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(16,2)
D-5				
D-5	Th-229+D , fish	1.000E+02	1.000E+02	BIOFAC(17,1)
D-5	Th-229+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(17,2)
D-5				
D-5	Th-230 , fish	1.000E+02	1.000E+02	BIOFAC(18,1)
D-5	Th-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(18,2)
D-5				
D-5	Th-232 , fish	1.000E+02	1.000E+02	BIOFAC(19,1)
D-5	Th-232 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(19,2)
D-5				
D-5	U-233 , fish	1.000E+01	1.000E+01	BIOFAC(20,1)
D-5	U-233 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(20,2)
D-5				
D-5	U-234 , fish	1.000E+01	1.000E+01	BIOFAC(21,1)
D-5	U-234 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(21,2)
D-5				
D-5	U-235+D , fish	1.000E+01	1.000E+01	BIOFAC(22,1)
D-5	U-235+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(22,2)
D-5				
D-5	U-236 , fish	1.000E+01	1.000E+01	BIOFAC(23,1)
D-5	U-236 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(23,2)

*Base Case means Default.Lib w/o Associate Nuclide contributions.

Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	5.200E+04	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	5.000E+00	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	1.000E+02	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	1.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	2.500E+01	1.000E+00	---	T(2)
R011	Times for calculations (yr)	5.000E+01	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+02	1.000E+01	---	T(4)
R011	Times for calculations (yr)	not used	3.000E+01	---	T(5)
R011	Times for calculations (yr)	not used	1.000E+02	---	T(6)
R011	Times for calculations (yr)	not used	3.000E+02	---	T(7)
R011	Times for calculations (yr)	not used	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Am-241	4.000E-02	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Cs-137	7.630E+00	0.000E+00	---	S1(3)
R012	Initial principal radionuclide (pCi/g): H-3	1.200E-01	0.000E+00	---	S1(4)
R012	Initial principal radionuclide (pCi/g): Pu-238	2.000E-02	0.000E+00	---	S1(8)
R012	Initial principal radionuclide (pCi/g): Pu-239	8.000E-02	0.000E+00	---	S1(10)
R012	Initial principal radionuclide (pCi/g): Pu-240	8.000E-02	0.000E+00	---	S1(11)
R012	Initial principal radionuclide (pCi/g): Sr-90	1.510E+00	0.000E+00	---	S1(15)
R012	Concentration in groundwater (pCi/L): Am-241	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Cs-137	not used	0.000E+00	---	W1(3)
R012	Concentration in groundwater (pCi/L): H-3	not used	0.000E+00	---	W1(4)
R012	Concentration in groundwater (pCi/L): Pu-238	not used	0.000E+00	---	W1(8)
R012	Concentration in groundwater (pCi/L): Pu-239	not used	0.000E+00	---	W1(10)
R012	Concentration in groundwater (pCi/L): Pu-240	not used	0.000E+00	---	W1(11)
R012	Concentration in groundwater (pCi/L): Sr-90	not used	0.000E+00	---	W1(15)
R013	Cover depth (m)	0.000E+00	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	not used	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	not used	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.660E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	3.300E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	5.000E+03	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	4.900E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	2.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	8.000E+00	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	4.600E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.230E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	0.000E+00	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.660E+00	1.500E+00	---	DENSAQ

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R014	Saturated zone total porosity	3.300E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.400E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	2.000E-01	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	2.000E+04	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	4.800E-03	2.000E-02	---	HGWT
R014	Saturated zone b parameter	4.900E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	1.800E+01	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	not used	2.500E+02	---	UW
R015	Number of unsaturated zone strata	1	1	---	NS
R015	Unsat. zone 1, thickness (m)	0.000E+00	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.660E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	3.300E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.400E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	2.000E-01	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	4.900E+00	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	5.000E+03	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Am-241				
R016	Contaminated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.182E-03	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Cs-137				
R016	Contaminated zone (cm**3/g)	4.600E+03	4.600E+03	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	4.600E+03	4.600E+03	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	4.600E+03	4.600E+03	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.392E-05	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
R016	Distribution coefficients for H-3				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCU(4,1)
R016	Saturated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.314E-01	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
R016	Distribution coefficients for Pu-238				
R016	Contaminated zone (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCC(8)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCU(8,1)
R016	Saturated zone (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCS(8)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.201E-05	ALEACH(8)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(8)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for Pu-239				
R016	Contaminated zone (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCC(10)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCU(10,1)
R016	Saturated zone (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCS(10)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.201E-05	ALEACH(10)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(10)
R016	Distribution coefficients for Pu-240				
R016	Contaminated zone (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCC(11)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCU(11,1)
R016	Saturated zone (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCS(11)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.201E-05	ALEACH(11)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(11)
R016	Distribution coefficients for Sr-90				
R016	Contaminated zone (cm**3/g)	3.000E+01	3.000E+01	---	DCNUCC(15)
R016	Unsaturated zone 1 (cm**3/g)	3.000E+01	3.000E+01	---	DCNUCU(15,1)
R016	Saturated zone (cm**3/g)	3.000E+01	3.000E+01	---	DCNUCS(15)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.125E-03	ALEACH(15)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(15)
R016	Distribution coefficients for daughter Ac-227				
R016	Contaminated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.182E-03	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for daughter Np-237				
R016	Contaminated zone (cm**3/g)	-1.000E+00	-1.000E+00	2.574E+02	DCNUCC(5)
R016	Unsaturated zone 1 (cm**3/g)	-1.000E+00	-1.000E+00	2.574E+02	DCNUCU(5,1)
R016	Saturated zone (cm**3/g)	-1.000E+00	-1.000E+00	2.574E+02	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.486E-04	ALEACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)
R016	Distribution coefficients for daughter Pa-231				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(6)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(6,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(6)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.277E-03	ALEACH(6)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(6)
R016	Distribution coefficients for daughter Pb-210				
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(7)
R016	Unsaturated zone 1 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(7,1)
R016	Saturated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCS(7)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.394E-04	ALEACH(7)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for daughter Ra-226				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(13)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(13,1)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(13)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	9.130E-04	ALEACH(13)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(13)
R016	Distribution coefficients for daughter Ra-228				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(14)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(14,1)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(14)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	9.130E-04	ALEACH(14)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(14)
R016	Distribution coefficients for daughter Th-228				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(16)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(16,1)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(16)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.067E-06	ALEACH(16)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(16)
R016	Distribution coefficients for daughter Th-229				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(17)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(17,1)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(17)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.067E-06	ALEACH(17)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(17)
R016	Distribution coefficients for daughter Th-230				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(18)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(18,1)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(18)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.067E-06	ALEACH(18)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(18)
R016	Distribution coefficients for daughter Th-232				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(19)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(19,1)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(19)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.067E-06	ALEACH(19)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(19)
R016	Distribution coefficients for daughter U-233				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(20)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(20,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(20)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.277E-03	ALEACH(20)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(20)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for daughter U-234				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(21)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(21,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(21)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.277E-03	ALEACH(21)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(21)
R016	Distribution coefficients for daughter U-235				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(22)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(22,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(22)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.277E-03	ALEACH(22)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(22)
R016	Distribution coefficients for daughter U-236				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(23)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(23,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(23)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.277E-03	ALEACH(23)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(23)
R017	Inhalation rate (m**3/yr)	8.400E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-04	1.000E-04	---	MLINH
R017	Exposure duration	2.500E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	8.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	6.000E-02	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	1.700E-01	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular AREA.	FS
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	not used	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	3.650E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	3.500E+02	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	1.000E+00	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	not used	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	not used	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	not used	-1	---	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	not used	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	not used	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	not used	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	not used	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	not used	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	not used	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	not used	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	not used	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	not used	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	not used	8.000E-02	---	TE(3)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R19B	Translocation Factor for Non-Leafy	not used	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	not used	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	not used	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	not used	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
C14	DCF correction factor for gaseous forms of C14	not used	0.000E+00	---	CO2F
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR1
R021	Bulk density of building foundation (g/cm**3)	not used	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	not used	1.000E-01	---	TPFL
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
TITL	Number of graphical time points	32	---	---	NPTS
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	257	---	---	KYMAX

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	active
8 -- soil ingestion	active
9 -- radon	suppressed
Find peak pathway doses	suppressed

Contaminated Zone Dimensions	
Area:	52000.00 square meters
Thickness:	5.00 meters
Cover Depth:	0.00 meters

Initial Soil Concentrations, pCi/g	
Am-241	4.000E-02
Cs-137	7.630E+00
H-3	1.200E-01
Pu-238	2.000E-02
Pu-239	8.000E-02
Pu-240	8.000E-02
Sr-90	1.510E+00

Total Dose TDOSE(t), mrem/yr
Basic Radiation Dose Limit = 1.500E+01 mrem/yr
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

t (years):	0.000E+00	2.500E+01	5.000E+01	1.000E+02
TDOSE(t):	5.419E+00	3.138E+00	1.797E+00	6.004E-01
M(t):	3.612E-01	2.092E-01	1.198E-01	4.002E-02

Maximum TDOSE(t): 5.419E+00 mrem/yr at t = 0.000E+00 years

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	3.754E-04	0.0001	5.778E-04	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.319E-03	0.0002
Cs-137	5.393E+00	0.9953	7.846E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.166E-03	0.0006
H-3	0.000E+00	0.0000	4.695E-05	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.007E-08	0.0000
Pu-238	6.540E-07	0.0000	2.547E-04	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.352E-04	0.0001
Pu-239	5.020E-06	0.0000	1.119E-03	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.377E-03	0.0004
Pu-240	2.537E-06	0.0000	1.119E-03	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.377E-03	0.0004
Sr-90	7.707E-03	0.0014	6.360E-05	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.912E-03	0.0004
Total	5.401E+00	0.9968	3.189E-03	0.0006	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.159E-02	0.0021

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	1.453E-03	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.625E-03	0.0007
Cs-137	0.000E+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	5.396E+00	0.9958
H-3	3.907E-04	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.377E-04	0.0001
Pu-238	7.247E-12	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	7.905E-04	0.0001
Pu-239	9.757E-15	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	3.502E-03	0.0006
Pu-240	2.882E-13	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	3.499E-03	0.0006
Sr-90	9.895E-04	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.067E-02	0.0020
Total	2.833E-03	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.419E+00	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 = 2.500E+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.
Am-241	3.332E-04	0.0001	5.126E-04	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.082E-03	0.0003
Cs-137	3.026E+00	0.9642	4.402E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.776E-03	0.0006
H-3	0.000E+00	0.0000	2.211E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.887E-19	0.0000
Pu-238	5.365E-07	0.0000	2.089E-04	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.389E-04	0.0001
Pu-239	5.012E-06	0.0000	1.117E-03	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.374E-03	0.0008
Pu-240	2.529E-06	0.0000	1.115E-03	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.369E-03	0.0008
Sr-90	4.031E-03	0.0013	3.326E-05	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.000E-03	0.0003
Total	3.030E+00	0.9655	2.992E-03	0.0010	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.040E-03	0.0029

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 2.500E+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.
Am-241	6.874E-02	0.0219	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.067E-02	0.0225
Cs-137	0.000E+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	3.027E+00	0.9647
H-3	2.290E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.511E-15	0.0000
Pu-238	1.329E-08	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	6.483E-04	0.0002
Pu-239	1.917E-11	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	3.496E-03	0.0011
Pu-240	5.598E-10	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	3.487E-03	0.0011
Sr-90	2.734E-02	0.0087	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.240E-02	0.0103
Total	9.608E-02	0.0306	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.138E+00	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 = 5.000E+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.
Am-241	2.957E-04	0.0002	4.548E-04	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.599E-04	0.0005
Cs-137	1.698E+00	0.9445	2.470E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.965E-04	0.0006
H-3	0.000E+00	0.0000	9.281E-28	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.920E-31	0.0000
Pu-238	4.401E-07	0.0000	1.713E-04	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.600E-04	0.0002
Pu-239	5.005E-06	0.0000	1.116E-03	0.0006	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.370E-03	0.0013
Pu-240	2.520E-06	0.0000	1.111E-03	0.0006	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.361E-03	0.0013
Sr-90	2.108E-03	0.0012	1.740E-05	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.230E-04	0.0003
Total	1.700E+00	0.9458	2.873E-03	0.0016	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.570E-03	0.0042

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 5.000E+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.
Am-241	6.372E-02	0.0355	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.543E-02	0.0364
Cs-137	0.000E+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	1.699E+00	0.9450
H-3	9.642E-27	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	1.057E-26	0.0000
Pu-238	4.859E-08	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	5.317E-04	0.0003
Pu-239	7.809E-11	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	3.491E-03	0.0019
Pu-240	2.167E-09	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	3.475E-03	0.0019
Sr-90	2.322E-02	0.0129	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.587E-02	0.0144
Total	8.694E-02	0.0484	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.797E+00	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	2.329E-04	0.0004	3.580E-04	0.0006	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.557E-04	0.0013
Cs-137	5.343E-01	0.8900	7.774E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.137E-04	0.0005
H-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	0.000E+00	0.0000
Pu-238	2.963E-07	0.0000	1.152E-04	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.421E-04	0.0004
Pu-239	4.990E-06	0.0000	1.112E-03	0.0019	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.363E-03	0.0039
Pu-240	2.503E-06	0.0000	1.104E-03	0.0018	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.345E-03	0.0039
Sr-90	5.766E-04	0.0010	4.758E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.430E-04	0.0002
Total	5.351E-01	0.8913	2.695E-03	0.0045	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.162E-03	0.0103

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	5.004E-02	0.0833	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.139E-02	0.0856
Cs-137	0.000E+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	5.346E-01	0.8905
H-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	0.000E+00	0.0000
Pu-238	1.508E-07	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	3.578E-04	0.0006
Pu-239	2.987E-10	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	3.480E-03	0.0058
Pu-240	7.627E-09	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	3.451E-03	0.0057
Sr-90	6.338E-03	0.0106	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.062E-03	0.0118
Total	5.638E-02	0.0939	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.004E-01	1.0000

*Sum of all water independent and dependent pathways.

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

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	2.500E+01	5.000E+01	1.000E+02
Am-241	Am-241	1.000E+00	9.063E-02	1.767E+00	1.636E+00	1.285E+00
Am-241	Np-237+D	1.000E+00	4.689E-08	2.951E-06	6.228E-06	1.167E-05
Am-241	U-233	1.000E+00	3.633E-15	1.548E-11	9.239E-11	3.986E-10
Am-241	Th-229+D	1.000E+00	2.342E-17	1.580E-13	1.175E-12	8.561E-12
Am-241	∑DSR(j)		9.063E-02	1.767E+00	1.636E+00	1.285E+00
Cs-137+D	Cs-137+D	1.000E+00	7.072E-01	3.968E-01	2.226E-01	7.007E-02
H-3	H-3	1.000E+00	3.648E-03	2.093E-14	8.809E-26	0.000E+00
Pu-238	Pu-238	1.840E-09	7.272E-11	5.964E-11	4.891E-11	3.290E-11
Pu-238	Pu-238	1.000E+00	3.952E-02	3.241E-02	2.658E-02	1.788E-02
Pu-238	U-234	1.000E+00	9.924E-09	1.100E-06	3.201E-06	8.777E-06
Pu-238	Th-230	1.000E+00	6.575E-14	1.191E-10	4.339E-10	1.492E-09
Pu-238	Ra-226+D	1.000E+00	1.264E-15	6.823E-11	5.026E-10	3.575E-09
Pu-238	Pb-210+D	1.000E+00	5.934E-16	8.405E-13	1.729E-11	3.436E-10
Pu-238	∑DSR(j)		3.952E-02	3.241E-02	2.659E-02	1.789E-02
Pu-239	Pu-239	1.000E+00	4.377E-02	4.370E-02	4.364E-02	4.350E-02
Pu-239	U-235+D	1.000E+00	8.243E-11	4.360E-09	8.939E-09	1.864E-08
Pu-239	Pa-231	1.000E+00	1.823E-15	4.627E-12	3.085E-11	1.960E-10
Pu-239	Ac-227+D	1.000E+00	1.633E-15	5.688E-12	6.011E-11	4.338E-10
Pu-239	∑DSR(j)		4.377E-02	4.370E-02	4.364E-02	4.350E-02
Pu-240	Pu-240	4.950E-08	2.165E-09	2.158E-09	2.150E-09	2.135E-09
Pu-240	Pu-240	1.000E+00	4.374E-02	4.359E-02	4.344E-02	4.314E-02
Pu-240	U-236	1.000E+00	9.800E-11	1.173E-08	3.629E-08	1.130E-07
Pu-240	Th-232	1.000E+00	1.862E-20	3.595E-17	1.394E-16	5.398E-16
Pu-240	Ra-228+D	1.000E+00	9.641E-21	3.409E-16	1.745E-15	8.096E-15
Pu-240	Th-228+D	1.000E+00	1.061E-21	4.295E-16	2.512E-15	1.214E-14
Pu-240	∑DSR(j)		4.374E-02	4.359E-02	4.344E-02	4.314E-02
Sr-90+D	Sr-90+D	1.000E+00	7.068E-03	2.146E-02	1.713E-02	4.677E-03

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 1.500E+01 mrem/yr

Nuclide (i)	t= 0.000E+00	2.500E+01	5.000E+01	1.000E+02
Am-241	1.655E+02	8.490E+00	9.170E+00	1.168E+01
Cs-137	2.121E+01	3.780E+01	6.738E+01	2.141E+02
H-3	4.112E+03	7.168E+14	*9.597E+15	*9.597E+15
Pu-238	3.795E+02	4.628E+02	5.642E+02	8.385E+02
Pu-239	3.427E+02	3.432E+02	3.437E+02	3.448E+02
Pu-240	3.430E+02	3.441E+02	3.453E+02	3.477E+02
Sr-90	2.122E+03	6.990E+02	8.755E+02	3.207E+03

*At specific activity limit

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

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Am-241	4.000E-02	26.49 ± 0.05	1.832E+00	8.188E+00	9.063E-02	1.655E+02
Cs-137	7.630E+00	0.000E+00	7.072E-01	2.121E+01	7.072E-01	2.121E+01
H-3	1.200E-01	0.000E+00	3.648E-03	4.112E+03	3.648E-03	4.112E+03
Pu-238	2.000E-02	0.000E+00	3.952E-02	3.795E+02	3.952E-02	3.795E+02
Pu-239	8.000E-02	0.000E+00	4.377E-02	3.427E+02	4.377E-02	3.427E+02
Pu-240	8.000E-02	0.000E+00	4.374E-02	3.430E+02	4.374E-02	3.430E+02
Sr-90	1.510E+00	34.82 ± 0.07	2.224E-02	6.744E+02	7.068E-03	2.122E+03

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

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	2.500E+01	5.000E+01	1.000E+02
Am-241	Am-241	1.000E+00	3.625E-03	7.067E-02	6.543E-02	5.139E-02
Np-237	Am-241	1.000E+00	1.876E-09	1.180E-07	2.491E-07	4.669E-07
U-233	Am-241	1.000E+00	1.453E-16	6.192E-13	3.695E-12	1.594E-11
Th-229	Am-241	1.000E+00	9.367E-19	6.322E-15	4.700E-14	3.424E-13
Cs-137	Cs-137	1.000E+00	5.396E+00	3.027E+00	1.699E+00	5.346E-01
H-3	H-3	1.000E+00	4.377E-04	2.511E-15	1.057E-26	0.000E+00
Pu-238	Pu-238	1.840E-09	1.454E-12	1.193E-12	9.783E-13	6.580E-13
Pu-238	Pu-238	1.000E+00	7.905E-04	6.483E-04	5.317E-04	3.576E-04
Pu-238	∑DOSE(j)		7.905E-04	6.483E-04	5.317E-04	3.576E-04
U-234	Pu-238	1.000E+00	1.985E-10	2.200E-08	6.402E-08	1.755E-07
Th-230	Pu-238	1.000E+00	1.315E-15	2.381E-12	8.678E-12	2.983E-11
Ra-226	Pu-238	1.000E+00	2.528E-17	1.365E-12	1.005E-11	7.151E-11
Pb-210	Pu-238	1.000E+00	1.187E-17	1.681E-14	3.459E-13	6.872E-12
Pu-239	Pu-239	1.000E+00	3.502E-03	3.496E-03	3.491E-03	3.480E-03
U-235	Pu-239	1.000E+00	6.594E-12	3.488E-10	7.151E-10	1.492E-09
Pa-231	Pu-239	1.000E+00	1.459E-16	3.702E-13	2.468E-12	1.568E-11
Ac-227	Pu-239	1.000E+00	1.306E-16	4.551E-13	4.809E-12	3.471E-11
Pu-240	Pu-240	4.950E-08	1.732E-10	1.726E-10	1.720E-10	1.708E-10
Pu-240	Pu-240	1.000E+00	3.499E-03	3.487E-03	3.475E-03	3.451E-03
Pu-240	∑DOSE(j)		3.499E-03	3.487E-03	3.475E-03	3.451E-03
U-236	Pu-240	1.000E+00	7.840E-12	9.383E-10	2.903E-09	9.042E-09
Th-232	Pu-240	1.000E+00	1.489E-21	2.876E-18	1.115E-17	4.318E-17
Ra-228	Pu-240	1.000E+00	7.713E-22	2.727E-17	1.396E-16	6.477E-16
Th-228	Pu-240	1.000E+00	8.490E-23	3.436E-17	2.009E-16	9.711E-16
Sr-90	Sr-90	1.000E+00	1.067E-02	3.240E-02	2.587E-02	7.062E-03

THF(i) is the thread fraction of the parent nuclide.

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	2.500E+01	5.000E+01	1.000E+02
Am-241	Am-241	1.000E+00	4.000E-02	3.549E-02	3.149E-02	2.479E-02
Np-237	Am-241	1.000E+00	0.000E+00	3.043E-07	5.724E-07	1.016E-06
U-233	Am-241	1.000E+00	0.000E+00	1.680E-11	6.382E-11	2.306E-10
Th-229	Am-241	1.000E+00	0.000E+00	1.339E-14	1.030E-13	7.624E-13
Cs-137	Cs-137	1.000E+00	7.630E+00	4.281E+00	2.402E+00	7.559E-01
H-3	H-3	1.000E+00	1.200E-01	5.662E-13	2.381E-24	0.000E+00
Pu-238	Pu-238	1.840E-09	3.680E-11	3.018E-11	2.475E-11	1.665E-11
Pu-238	Pu-238	1.000E+00	2.000E-02	1.640E-02	1.345E-02	9.048E-03
Pu-238	∑S(j):		2.000E-02	1.640E-02	1.345E-02	9.048E-03
U-234	Pu-238	1.000E+00	0.000E+00	1.265E-06	2.262E-06	3.643E-06
Th-230	Pu-238	1.000E+00	0.000E+00	1.478E-10	5.491E-10	1.904E-09
Ra-226	Pu-238	1.000E+00	0.000E+00	5.393E-13	4.046E-12	2.856E-11
Pb-210	Pu-238	1.000E+00	0.000E+00	9.119E-14	1.205E-12	1.362E-11
Pu-239	Pu-239	1.000E+00	8.000E-02	7.988E-02	7.976E-02	7.951E-02
U-235	Pu-239	1.000E+00	0.000E+00	1.937E-09	3.810E-09	7.374E-09
Pa-231	Pu-239	1.000E+00	0.000E+00	5.096E-13	1.994E-12	7.637E-12
Ac-227	Pu-239	1.000E+00	0.000E+00	1.107E-13	7.257E-13	4.131E-12
Pu-240	Pu-240	4.950E-08	3.960E-09	3.946E-09	3.933E-09	3.906E-09
Pu-240	Pu-240	1.000E+00	8.000E-02	7.972E-02	7.945E-02	7.890E-02
Pu-240	∑S(j):		8.000E-02	7.972E-02	7.945E-02	7.890E-02
U-236	Pu-240	1.000E+00	0.000E+00	5.817E-08	1.143E-07	2.208E-07
Th-232	Pu-240	1.000E+00	0.000E+00	3.608E-17	1.427E-16	5.575E-16
Ra-228	Pu-240	1.000E+00	0.000E+00	1.966E-17	1.029E-16	4.712E-16
Th-228	Pu-240	1.000E+00	0.000E+00	1.504E-17	9.075E-17	4.444E-16
Sr-90	Sr-90	1.000E+00	1.510E+00	7.897E-01	4.130E-01	1.130E-01

THF(i) is the thread fraction of the parent nuclide.

RESCALC.EXE execution time = 71.35 seconds

Table of Contents

Part I: Mixture Sums and Single Radionuclide Guidelines

Dose Conversion Factor (and Related) Parameter Summary
File: FGR 13 MORBIDITY

Menu	Parameter	Current Value	Base Case*	Parameter Name
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Ac-227+D	6.724E+00	6.700E+00	DCF2(1)
B-1	Am-241	4.440E-01	4.440E-01	DCF2(2)
B-1	Cs-137+D	3.190E-05	3.190E-05	DCF2(3)
B-1	H-3	6.400E-08	6.400E-08	DCF2(4)
B-1	Np-237+D	5.400E-01	5.400E-01	DCF2(5)
B-1	Pa-231	1.280E+00	1.280E+00	DCF2(6)
B-1	Pb-210+D	2.320E-02	1.360E-02	DCF2(7)
B-1	Pu-238	3.920E-01	3.920E-01	DCF2(8)
B-1	Pu-239	4.290E-01	4.290E-01	DCF2(10)
B-1	Pu-240	4.290E-01	4.290E-01	DCF2(11)
B-1	Ra-226+D	8.594E-03	8.580E-03	DCF2(13)
B-1	Ra-228+D	5.078E-03	4.770E-03	DCF2(14)
B-1	Sr-90+D	1.308E-03	1.300E-03	DCF2(15)
B-1	Th-228+D	3.454E-01	3.420E-01	DCF2(16)
B-1	Th-229+D	2.169E+00	2.150E+00	DCF2(17)
B-1	Th-230	3.260E-01	3.260E-01	DCF2(18)
B-1	Th-232	1.640E+00	1.640E+00	DCF2(19)
B-1	U-233	1.350E-01	1.350E-01	DCF2(20)
B-1	U-234	1.320E-01	1.320E-01	DCF2(21)
B-1	U-235+D	1.230E-01	1.230E-01	DCF2(22)
B-1	U-236	1.250E-01	1.250E-01	DCF2(23)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Ac-227+D	1.480E-02	1.410E-02	DCF3(1)
D-1	Am-241	3.640E-03	3.640E-03	DCF3(2)
D-1	Cs-137+D	5.000E-05	5.000E-05	DCF3(3)
D-1	H-3	6.400E-08	6.400E-08	DCF3(4)
D-1	Np-237+D	4.444E-03	4.440E-03	DCF3(5)
D-1	Pa-231	1.060E-02	1.060E-02	DCF3(6)
D-1	Pb-210+D	7.276E-03	5.370E-03	DCF3(7)
D-1	Pu-238	3.200E-03	3.200E-03	DCF3(8)
D-1	Pu-239	3.540E-03	3.540E-03	DCF3(10)
D-1	Pu-240	3.540E-03	3.540E-03	DCF3(11)
D-1	Ra-226+D	1.321E-03	1.320E-03	DCF3(13)
D-1	Ra-228+D	1.442E-03	1.440E-03	DCF3(14)
D-1	Sr-90+D	1.528E-04	1.420E-04	DCF3(15)
D-1	Th-228+D	8.086E-04	3.960E-04	DCF3(16)
D-1	Th-229+D	4.027E-03	3.530E-03	DCF3(17)
D-1	Th-230	5.480E-04	5.480E-04	DCF3(18)
D-1	Th-232	2.730E-03	2.730E-03	DCF3(19)
D-1	U-233	2.890E-04	2.890E-04	DCF3(20)
D-1	U-234	2.830E-04	2.830E-04	DCF3(21)
D-1	U-235+D	2.673E-04	2.660E-04	DCF3(22)
D-1	U-236	2.690E-04	2.690E-04	DCF3(23)
D-34	Food transfer factors:			
D-34	Ac-227+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(1,1)
D-34	Ac-227+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,2)
D-34	Ac-227+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,3)
D-34				

Dose Conversion Factor (and Related) Parameter Summary (continued)
File: FGR 13 MORBIDITY

Menu	Parameter	Current Value	Base Case*	Parameter Name
D-34	Am-241 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(2,1)
D-34	Am-241 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-05	5.000E-05	RTF(2,2)
D-34	Am-241 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-06	2.000E-06	RTF(2,3)
D-34				
D-34	Cs-137+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(3,1)
D-34	Cs-137+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.000E-02	3.000E-02	RTF(3,2)
D-34	Cs-137+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	8.000E-03	8.000E-03	RTF(3,3)
D-34				
D-34	H-3 , plant/soil concentration ratio, dimensionless	4.800E+00	4.800E+00	RTF(4,1)
D-34	H-3 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.200E-02	1.200E-02	RTF(4,2)
D-34	H-3 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-02	1.000E-02	RTF(4,3)
D-34				
D-34	Np-237+D , plant/soil concentration ratio, dimensionless	2.000E-02	2.000E-02	RTF(5,1)
D-34	Np-237+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(5,2)
D-34	Np-237+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(5,3)
D-34				
D-34	Pa-231 , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(6,1)
D-34	Pa-231 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(6,2)
D-34	Pa-231 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(6,3)
D-34				
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(7,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(7,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(7,3)
D-34				
D-34	Pu-238 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(8,1)
D-34	Pu-238 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(8,2)
D-34	Pu-238 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-06	1.000E-06	RTF(8,3)
D-34				
D-34	Pu-239 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(10,1)
D-34	Pu-239 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(10,2)
D-34	Pu-239 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-06	1.000E-06	RTF(10,3)
D-34				
D-34	Pu-240 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(11,1)
D-34	Pu-240 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(11,2)
D-34	Pu-240 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-06	1.000E-06	RTF(11,3)
D-34				
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(13,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(13,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(13,3)
D-34				
D-34	Ra-228+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(14,1)
D-34	Ra-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(14,2)
D-34	Ra-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(14,3)
D-34				
D-34	Sr-90+D , plant/soil concentration ratio, dimensionless	3.000E-01	3.000E-01	RTF(15,1)
D-34	Sr-90+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-03	8.000E-03	RTF(15,2)
D-34	Sr-90+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-03	2.000E-03	RTF(15,3)
D-34				
D-34	Th-228+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(16,1)
D-34	Th-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(16,2)
D-34	Th-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(16,3)

Dose Conversion Factor (and Related) Parameter Summary (continued)
File: FGR 13 MORBIDITY

Menu	Parameter	Current Value	Base Case*	Parameter Name
D-34	Th-229+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(17,1)
D-34	Th-229+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(17,2)
D-34	Th-229+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(17,3)
D-34				
D-34	Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(18,1)
D-34	Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(18,2)
D-34	Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(18,3)
D-34				
D-34	Th-232 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(19,1)
D-34	Th-232 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(19,2)
D-34	Th-232 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(19,3)
D-34				
D-34	U-233 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(20,1)
D-34	U-233 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(20,2)
D-34	U-233 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(20,3)
D-34				
D-34	U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(21,1)
D-34	U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(21,2)
D-34	U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(21,3)
D-34				
D-34	U-235+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(22,1)
D-34	U-235+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(22,2)
D-34	U-235+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(22,3)
D-34				
D-34	U-236 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(23,1)
D-34	U-236 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(23,2)
D-34	U-236 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(23,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Ac-227+D , fish	1.500E+01	1.500E+01	BIOFAC(1,1)
D-5	Ac-227+D , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(1,2)
D-5				
D-5	Am-241 , fish	3.000E+01	3.000E+01	BIOFAC(2,1)
D-5	Am-241 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(2,2)
D-5				
D-5	Cs-137+D , fish	2.000E+03	2.000E+03	BIOFAC(3,1)
D-5	Cs-137+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(3,2)
D-5				
D-5	H-3 , fish	1.000E+00	1.000E+00	BIOFAC(4,1)
D-5	H-3 , crustacea and mollusks	1.000E+00	1.000E+00	BIOFAC(4,2)
D-5				
D-5	Np-237+D , fish	3.000E+01	3.000E+01	BIOFAC(5,1)
D-5	Np-237+D , crustacea and mollusks	4.000E+02	4.000E+02	BIOFAC(5,2)
D-5				
D-5	Pa-231 , fish	1.000E+01	1.000E+01	BIOFAC(6,1)
D-5	Pa-231 , crustacea and mollusks	1.100E+02	1.100E+02	BIOFAC(6,2)
D-5				
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(7,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(7,2)
D-5				

Dose Conversion Factor (and Related) Parameter Summary (continued)
File: FGR 13 MORBIDITY

Menu	Parameter	Current Value	Base Case*	Parameter Name
D-5	Pu-238 , fish	3.000E+01	3.000E+01	BIOFAC(8,1)
D-5	Pu-238 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(8,2)
D-5				
D-5	Pu-239 , fish	3.000E+01	3.000E+01	BIOFAC(10,1)
D-5	Pu-239 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(10,2)
D-5				
D-5	Pu-240 , fish	3.000E+01	3.000E+01	BIOFAC(11,1)
D-5	Pu-240 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(11,2)
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(13,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(13,2)
D-5				
D-5	Ra-228+D , fish	5.000E+01	5.000E+01	BIOFAC(14,1)
D-5	Ra-228+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(14,2)
D-5				
D-5	Sr-90+D , fish	6.000E+01	6.000E+01	BIOFAC(15,1)
D-5	Sr-90+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(15,2)
D-5				
D-5	Th-228+D , fish	1.000E+02	1.000E+02	BIOFAC(16,1)
D-5	Th-228+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(16,2)
D-5				
D-5	Th-229+D , fish	1.000E+02	1.000E+02	BIOFAC(17,1)
D-5	Th-229+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(17,2)
D-5				
D-5	Th-230 , fish	1.000E+02	1.000E+02	BIOFAC(18,1)
D-5	Th-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(18,2)
D-5				
D-5	Th-232 , fish	1.000E+02	1.000E+02	BIOFAC(19,1)
D-5	Th-232 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(19,2)
D-5				
D-5	U-233 , fish	1.000E+01	1.000E+01	BIOFAC(20,1)
D-5	U-233 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(20,2)
D-5				
D-5	U-234 , fish	1.000E+01	1.000E+01	BIOFAC(21,1)
D-5	U-234 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(21,2)
D-5				
D-5	U-235+D , fish	1.000E+01	1.000E+01	BIOFAC(22,1)
D-5	U-235+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(22,2)
D-5				
D-5	U-236 , fish	1.000E+01	1.000E+01	BIOFAC(23,1)
D-5	U-236 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(23,2)

*Base Case means Default.Lib w/o Associate Nuclide contributions.

Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	5.200E+04	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	5.000E+00	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	1.000E+02	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	1.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	2.500E+01	1.000E+00	---	T(2)
R011	Times for calculations (yr)	5.000E+01	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+02	1.000E+01	---	T(4)
R011	Times for calculations (yr)	not used	3.000E+01	---	T(5)
R011	Times for calculations (yr)	not used	1.000E+02	---	T(6)
R011	Times for calculations (yr)	not used	3.000E+02	---	T(7)
R011	Times for calculations (yr)	not used	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Am-241	1.100E-01	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Cs-137	1.663E+01	0.000E+00	---	S1(3)
R012	Initial principal radionuclide (pCi/g): H-3	5.300E-01	0.000E+00	---	S1(4)
R012	Initial principal radionuclide (pCi/g): Pu-238	6.000E-02	0.000E+00	---	S1(8)
R012	Initial principal radionuclide (pCi/g): Pu-239	2.500E-01	0.000E+00	---	S1(10)
R012	Initial principal radionuclide (pCi/g): Pu-240	2.500E-01	0.000E+00	---	S1(11)
R012	Initial principal radionuclide (pCi/g): Sr-90	5.300E+00	0.000E+00	---	S1(15)
R012	Concentration in groundwater (pCi/L): Am-241	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Cs-137	not used	0.000E+00	---	W1(3)
R012	Concentration in groundwater (pCi/L): H-3	not used	0.000E+00	---	W1(4)
R012	Concentration in groundwater (pCi/L): Pu-238	not used	0.000E+00	---	W1(8)
R012	Concentration in groundwater (pCi/L): Pu-239	not used	0.000E+00	---	W1(10)
R012	Concentration in groundwater (pCi/L): Pu-240	not used	0.000E+00	---	W1(11)
R012	Concentration in groundwater (pCi/L): Sr-90	not used	0.000E+00	---	W1(15)
R013	Cover depth (m)	0.000E+00	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	not used	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	not used	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.660E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	3.300E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	ECCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	5.000E+03	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	4.900E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	2.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	8.000E+00	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	4.600E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.230E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	0.000E+00	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.660E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	3.300E-01	4.000E-01	---	TPSZ

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESPAD (If different from user input)	Parameter Name
R014	Saturated zone effective porosity	2.400E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	2.000E-01	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	2.000E+04	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	4.800E-03	2.000E-02	---	HGWT
R014	Saturated zone b parameter	4.900E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	1.800E+01	1.000E+01	---	DW1BWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	not used	2.500E+02	---	UW
R015	Number of unsaturated zone strata	1	1	---	NS
R015	Unsat. zone 1, thickness (m)	0.000E+00	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.660E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	3.300E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.400E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	2.000E-01	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	4.900E+00	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	5.000E+03	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Am-241				
R016	Contaminated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.182E-03	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Cs-137				
R016	Contaminated zone (cm**3/g)	4.600E+03	4.600E+03	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	4.600E+03	4.600E+03	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	4.600E+03	4.600E+03	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.392E-05	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
R016	Distribution coefficients for H-3				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCU(4,1)
R016	Saturated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.314E-01	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
R016	Distribution coefficients for Pu-238				
R016	Contaminated zone (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCC(8)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCU(8,1)
R016	Saturated zone (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCS(8)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.201E-05	ALEACH(8)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(8)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for Pu-239				
R016	Contaminated zone (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCC(10)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCU(10,1)
R016	Saturated zone (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCS(10)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.201E-05	ALEACH(10)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(10)
R016	Distribution coefficients for Pu-240				
R016	Contaminated zone (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCC(11)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCU(11,1)
R016	Saturated zone (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCS(11)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.201E-05	ALEACH(11)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(11)
R016	Distribution coefficients for Sr-90				
R016	Contaminated zone (cm**3/g)	3.000E+01	3.000E+01	---	DCNUCC(15)
R016	Unsaturated zone 1 (cm**3/g)	3.000E+01	3.000E+01	---	DCNUCU(15,1)
R016	Saturated zone (cm**3/g)	3.000E+01	3.000E+01	---	DCNUCS(15)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.125E-03	ALEACH(15)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(15)
R016	Distribution coefficients for daughter Ac-227				
R016	Contaminated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.182E-03	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for daughter Np-237				
R016	Contaminated zone (cm**3/g)	-1.000E+00	-1.000E+00	2.574E+02	DCNUCC(5)
R016	Unsaturated zone 1 (cm**3/g)	-1.000E+00	-1.000E+00	2.574E+02	DCNUCU(5,1)
R016	Saturated zone (cm**3/g)	-1.000E+00	-1.000E+00	2.574E+02	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.486E-04	ALEACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)
R016	Distribution coefficients for daughter Pa-231				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(6)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(6,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(6)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.277E-03	ALEACH(6)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(6)
R016	Distribution coefficients for daughter Pb-210				
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(7)
R016	Unsaturated zone 1 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(7,1)
R016	Saturated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCS(7)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.394E-04	ALEACH(7)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for daughter Ra-226				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(13)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(13,1)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(13)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	9.130E-04	ALEACH(13)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(13)
R016	Distribution coefficients for daughter Ra-228				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(14)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(14,1)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(14)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	9.130E-04	ALEACH(14)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(14)
R016	Distribution coefficients for daughter Th-228				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(16)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(16,1)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(16)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.067E-06	ALEACH(16)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(16)
R016	Distribution coefficients for daughter Th-229				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(17)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(17,1)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(17)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.067E-06	ALEACH(17)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(17)
R016	Distribution coefficients for daughter Th-230				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(18)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(18,1)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(18)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.067E-06	ALEACH(18)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(18)
R016	Distribution coefficients for daughter Th-232				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(19)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(19,1)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(19)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.067E-06	ALEACH(19)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(19)
R016	Distribution coefficients for daughter U-233				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(20)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(20,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(20)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.277E-03	ALEACH(20)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(20)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for daughter U-234				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(21)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(21,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(21)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.277E-03	ALEACH(21)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(21)
R016	Distribution coefficients for daughter U-235				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(22)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(22,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(22)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.277E-03	ALEACH(22)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(22)
R016	Distribution coefficients for daughter U-236				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(23)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(23,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(23)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.277E-03	ALEACH(23)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(23)
R017	Inhalation rate (m**3/yr)	8.400E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-04	1.000E-04	---	MLINH
R017	Exposure duration	2.500E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	8.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	6.000E-02	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	1.700E-01	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular AREA.	FS
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	not used	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	3.650E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	3.500E+02	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	1.000E+00	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	not used	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	not used	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	not used	-1	---	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	not used	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	not used	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	not used	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	not used	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	not used	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	not used	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	not used	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	not used	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	not used	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	not used	8.000E-02	---	TE(3)
R19B	Translocation Factor for Non-Leafy	not used	1.000E-01	---	TIV(1)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R19B	Translocation Factor for Leafy	not used	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	not used	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	not used	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
C14	DCF correction factor for gaseous forms of C14	not used	0.000E+00	---	CO2F
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR1
R021	Bulk density of building foundation (g/cm**3)	not used	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	not used	1.000E-01	---	TPFL
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	32	---	---	NPTS
TITL	Maximum number of integration points for dose	17	---	---	LYMAX

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
TITL	Maximum number of integration points for risk	257	---	---	KYMAX

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	active
8 -- soil ingestion	active
9 -- radon	suppressed
Find peak pathway doses	suppressed

Contaminated Zone Dimensions

Area:	52000.00 square meters
Thickness:	5.00 meters
Cover Depth:	0.00 meters

Initial Soil Concentrations, pCi/g

Am-241	1.100E-01
Cs-137	1.663E+01
H-3	5.300E-01
Pu-238	6.000E-02
Pu-239	2.500E-01
Pu-240	2.500E-01
Sr-90	5.300E+00

Total Dose TDOSE(t), mrem/yr
Basic Radiation Dose Limit = 1.500E+01 mrem/yr
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

t (years):	0.000E+00	2.500E+01	5.000E+01	1.000E+02
TDOSE(t):	1.183E+01	6.930E+00	3.996E+00	1.354E+00
M(t):	7.890E-01	4.620E-01	2.664E-01	9.027E-02

Maximum TDOSE(t): 1.183E+01 mrem/yr at t = 0.000E+00 years

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	1.032E-03	0.0001	1.589E-03	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.353E-03	0.0003
Cs-137	1.175E+01	0.9932	1.710E-05	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.900E-03	0.0006
H-3	0.000E+00	0.0000	2.074E-04	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.770E-07	0.0000
Pu-238	1.962E-06	0.0000	7.640E-04	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.605E-03	0.0001
Pu-239	1.569E-05	0.0000	3.497E-03	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.429E-03	0.0006
Pu-240	7.929E-06	0.0000	3.497E-03	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.429E-03	0.0006
Sr-90	2.705E-02	0.0023	2.232E-04	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.711E-03	0.0006
Total	1.178E+01	0.9956	9.795E-03	0.0008	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.343E-02	0.0028

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	3.995E-03	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.969E-03	0.0008
Cs-137	0.000E+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	1.176E+01	0.9938
H-3	1.726E-03	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.933E-03	0.0002
Pu-238	2.174E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.371E-03	0.0002
Pu-239	3.049E-14	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	1.094E-02	0.0009
Pu-240	9.007E-13	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	1.093E-02	0.0009
Sr-90	3.473E-03	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.746E-02	0.0032
Total	9.194E-03	0.0008	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.183E+01	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 = 2.500E+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.
Am-241	9.162E-04	0.0001	1.410E-03	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.975E-03	0.0004
Cs-137	6.595E+00	0.9516	9.594E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.871E-03	0.0006
H-3	0.000E+00	0.0000	9.766E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.334E-19	0.0000
Pu-238	1.610E-06	0.0000	6.266E-04	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.317E-03	0.0002
Pu-239	1.566E-05	0.0000	3.492E-03	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.418E-03	0.0011
Pu-240	7.902E-06	0.0000	3.485E-03	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.403E-03	0.0011
Sr-90	1.415E-02	0.0020	1.167E-04	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.510E-03	0.0005
Total	6.610E+00	0.9537	9.140E-03	0.0013	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.649E-02	0.0038

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 2.500E+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.
Am-241	1.890E-01	0.0273	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.943E-01	0.0280
Cs-137	0.000E+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	6.598E+00	0.9521
H-3	1.011E-14	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	1.109E-14	0.0000
Pu-238	3.986E-08	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	1.945E-03	0.0003
Pu-239	5.989E-11	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	1.093E-02	0.0016
Pu-240	1.749E-09	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	1.090E-02	0.0016
Sr-90	9.595E-02	0.0138	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.137E-01	0.0164
Total	2.850E-01	0.0411	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.930E+00	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 = 5.000E+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.
Am-241	8.131E-04	0.0002	1.251E-03	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.640E-03	0.0007
Cs-137	3.700E+00	0.9259	5.383E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.177E-03	0.0005
H-3	0.000E+00	0.0000	4.099E-27	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.498E-30	0.0000
Pu-238	1.320E-06	0.0000	5.139E-04	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.080E-03	0.0003
Pu-239	1.564E-05	0.0000	3.487E-03	0.0009	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.407E-03	0.0019
Pu-240	7.875E-06	0.0000	3.473E-03	0.0009	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.378E-03	0.0018
Sr-90	7.399E-03	0.0019	6.106E-05	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.836E-03	0.0005
Total	3.708E+00	0.9279	8.791E-03	0.0022	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.251E-02	0.0056

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 5.000E+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.
Am-241	1.752E-01	0.0438	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.799E-01	0.0450
Cs-137	0.000E+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	3.702E+00	0.9264
H-3	4.258E-26	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.669E-26	0.0000
Pu-238	1.458E-07	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	1.595E-03	0.0004
Pu-239	2.440E-10	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	1.091E-02	0.0027
Pu-240	6.772E-09	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	1.086E-02	0.0027
Sr-90	8.151E-02	0.0204	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.081E-02	0.0227
Total	2.567E-01	0.0642	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.996E+00	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	6.404E-04	0.0005	9.846E-04	0.0007	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.078E-03	0.0015
Cs-137	1.165E+00	0.8600	1.694E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.837E-04	0.0005
H-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	0.000E+00	0.0000
Pu-238	8.888E-07	0.0000	3.457E-04	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.263E-04	0.0005
Pu-239	1.560E-05	0.0000	3.476E-03	0.0026	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.384E-03	0.0055
Pu-240	7.821E-06	0.0000	3.449E-03	0.0025	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.327E-03	0.0054
Sr-90	2.024E-03	0.0015	1.670E-05	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.020E-04	0.0004
Total	1.167E+00	0.8620	8.274E-03	0.0061	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.870E-02	0.0138

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	1.376E-01	0.1016	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.413E-01	0.1044
Cs-137	0.000E+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	1.165E+00	0.8605
H-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	0.000E+00	0.0000
Pu-238	4.525E-07	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	1.073E-03	0.0008
Pu-239	9.333E-10	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	1.088E-02	0.0080
Pu-240	2.383E-08	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	1.078E-02	0.0080
Sr-90	2.225E-02	0.0164	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.479E-02	0.0183
Total	1.599E-01	0.1181	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.354E+00	1.0000

*Sum of all water independent and dependent pathways.

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

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	2.500E+01	5.000E+01	1.000E+02
Am-241	Am-241	1.000E+00	9.063E-02	1.767E+00	1.636E+00	1.285E+00
Am-241	Np-237+D	1.000E+00	4.689E-08	2.951E-06	6.228E-06	1.167E-05
Am-241	U-233	1.000E+00	3.633E-15	1.548E-11	9.239E-11	3.986E-10
Am-241	Th-229+D	1.000E+00	2.342E-17	1.580E-13	1.175E-12	8.561E-12
Am-241	∑DSR(j)		9.063E-02	1.767E+00	1.636E+00	1.285E+00
Cs-137+D	Cs-137+D	1.000E+00	7.072E-01	3.968E-01	2.226E-01	7.007E-02
H-3	H-3	1.000E+00	3.648E-03	2.093E-14	8.809E-26	0.000E+00
Pu-238	Pu-238	1.840E-09	7.272E-11	5.964E-11	4.891E-11	3.290E-11
Pu-238	Pu-238	1.000E+00	3.952E-02	3.241E-02	2.658E-02	1.788E-02
Pu-238	U-234	1.000E+00	9.924E-09	1.100E-06	3.201E-06	8.777E-06
Pu-238	Th-230	1.000E+00	6.575E-14	1.191E-10	4.339E-10	1.492E-09
Pu-238	Ra-226+D	1.000E+00	1.264E-15	6.823E-11	5.026E-10	3.575E-09
Pu-238	Pb-210+D	1.000E+00	5.934E-16	8.405E-13	1.729E-11	3.436E-10
Pu-238	∑DSR(j)		3.952E-02	3.241E-02	2.659E-02	1.789E-02
Pu-239	Pu-239	1.000E+00	4.377E-02	4.370E-02	4.364E-02	4.350E-02
Pu-239	U-235+D	1.000E+00	8.243E-11	4.360E-09	8.939E-09	1.864E-08
Pu-239	Pa-231	1.000E+00	1.823E-15	4.627E-12	3.085E-11	1.960E-10
Pu-239	Ac-227+D	1.000E+00	1.633E-15	5.688E-12	6.011E-11	4.338E-10
Pu-239	∑DSR(j)		4.377E-02	4.370E-02	4.364E-02	4.350E-02
Pu-240	Pu-240	4.950E-08	2.165E-09	2.158E-09	2.150E-09	2.135E-09
Pu-240	Pu-240	1.000E+00	4.374E-02	4.359E-02	4.344E-02	4.314E-02
Pu-240	U-236	1.000E+00	9.800E-11	1.173E-08	3.629E-08	1.130E-07
Pu-240	Th-232	1.000E+00	1.862E-20	3.595E-17	1.394E-16	5.398E-16
Pu-240	Ra-228+D	1.000E+00	9.641E-21	3.409E-16	1.745E-15	8.096E-15
Pu-240	Th-228+D	1.000E+00	1.061E-21	4.295E-16	2.512E-15	1.214E-14
Pu-240	∑DSR(j)		4.374E-02	4.359E-02	4.344E-02	4.314E-02
Sr-90+D	Sr-90+D	1.000E+00	7.068E-03	2.146E-02	1.713E-02	4.677E-03

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 1.500E+01 mrem/yr

Nuclide (i)	t= 0.000E+00	2.500E+01	5.000E+01	1.000E+02
Am-241	1.655E+02	8.490E+00	9.170E+00	1.168E+01
Cs-137	2.121E+01	3.780E+01	6.738E+01	2.141E+02
H-3	4.112E+03	7.168E+14	*9.597E+15	*9.597E+15
Pu-238	3.795E+02	4.628E+02	5.642E+02	8.385E+02
Pu-239	3.427E+02	3.432E+02	3.437E+02	3.448E+02
Pu-240	3.430E+02	3.441E+02	3.453E+02	3.477E+02
Sr-90	2.122E+03	6.990E+02	8.755E+02	3.207E+03

*At specific activity limit

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

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Am-241	1.100E-01	26.49 ± 0.05	1.832E+00	8.188E+00	9.063E-02	1.655E+02
Cs-137	1.663E+01	0.000E+00	7.072E-01	2.121E+01	7.072E-01	2.121E+01
H-3	5.300E-01	0.000E+00	3.648E-03	4.112E+03	3.648E-03	4.112E+03
Pu-238	6.000E-02	0.000E+00	3.952E-02	3.795E+02	3.952E-02	3.795E+02
Pu-239	2.500E-01	0.000E+00	4.377E-02	3.427E+02	4.377E-02	3.427E+02
Pu-240	2.500E-01	0.000E+00	4.374E-02	3.430E+02	4.374E-02	3.430E+02
Sr-90	5.300E+00	34.82 ± 0.07	2.224E-02	6.744E+02	7.068E-03	2.122E+03

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

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	2.500E+01	5.000E+01	1.000E+02
Am-241	Am-241	1.000E+00	9.969E-03	1.943E-01	1.799E-01	1.413E-01
Np-237	Am-241	1.000E+00	5.158E-09	3.246E-07	6.851E-07	1.284E-06
U-233	Am-241	1.000E+00	3.997E-16	1.703E-12	1.016E-11	4.385E-11
Th-229	Am-241	1.000E+00	2.576E-18	1.739E-14	1.292E-13	9.417E-13
Cs-137	Cs-137	1.000E+00	1.176E+01	6.598E+00	3.702E+00	1.165E+00
H-3	H-3	1.000E+00	1.933E-03	1.109E-14	4.669E-26	0.000E+00
Pu-238	Pu-238	1.840E-09	4.363E-12	3.578E-12	2.935E-12	1.974E-12
Pu-238	Pu-238	1.000E+00	2.371E-03	1.945E-03	1.595E-03	1.073E-03
Pu-238	∑DOSE(j)		2.371E-03	1.945E-03	1.595E-03	1.073E-03
U-234	Pu-238	1.000E+00	5.954E-10	6.599E-08	1.921E-07	5.266E-07
Th-230	Pu-238	1.000E+00	3.945E-15	7.144E-12	2.603E-11	8.950E-11
Ra-226	Pu-238	1.000E+00	7.583E-17	4.094E-12	3.016E-11	2.145E-10
Pb-210	Pu-238	1.000E+00	3.560E-17	5.043E-14	1.038E-12	2.061E-11
Pu-239	Pu-239	1.000E+00	1.094E-02	1.093E-02	1.091E-02	1.088E-02
U-235	Pu-239	1.000E+00	2.061E-11	1.090E-09	2.235E-09	4.661E-09
Pa-231	Pu-239	1.000E+00	4.558E-16	1.157E-12	7.713E-12	4.900E-11
Ac-227	Pu-239	1.000E+00	4.082E-16	1.422E-12	1.503E-11	1.085E-10
Pu-240	Pu-240	4.950E-08	5.412E-10	5.394E-10	5.375E-10	5.338E-10
Pu-240	Pu-240	1.000E+00	1.093E-02	1.090E-02	1.086E-02	1.078E-02
Pu-240	∑DOSE(j)		1.093E-02	1.090E-02	1.086E-02	1.078E-02
U-236	Pu-240	1.000E+00	2.450E-11	2.932E-09	9.073E-09	2.826E-08
Th-232	Pu-240	1.000E+00	4.654E-21	8.986E-18	3.484E-17	1.349E-16
Ra-228	Pu-240	1.000E+00	2.410E-21	8.522E-17	4.363E-16	2.024E-15
Th-228	Pu-240	1.000E+00	2.653E-22	1.074E-16	6.279E-16	3.035E-15
Sr-90	Sr-90	1.000E+00	3.746E-02	1.137E-01	9.081E-02	2.479E-02

THF(i) is the thread fraction of the parent nuclide.

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	2.500E+01	5.000E+01	1.000E+02
Am-241	Am-241	1.000E+00	1.100E-01	9.760E-02	8.659E-02	6.816E-02
Np-237	Am-241	1.000E+00	0.000E+00	8.368E-07	1.574E-06	2.794E-06
U-233	Am-241	1.000E+00	0.000E+00	4.621E-11	1.755E-10	6.341E-10
Th-229	Am-241	1.000E+00	0.000E+00	3.682E-14	2.832E-13	2.096E-12
Cs-137	Cs-137	1.000E+00	1.663E+01	9.330E+00	5.234E+00	1.648E+00
H-3	H-3	1.000E+00	5.300E-01	2.501E-12	1.052E-23	0.000E+00
Pu-238	Pu-238	1.840E-09	1.104E-10	9.054E-11	7.426E-11	4.994E-11
Pu-238	Pu-238	1.000E+00	6.000E-02	4.921E-02	4.036E-02	2.714E-02
Pu-238	∑S(j):		6.000E-02	4.921E-02	4.036E-02	2.714E-02
U-234	Pu-238	1.000E+00	0.000E+00	3.794E-06	6.787E-06	1.093E-05
Th-230	Pu-238	1.000E+00	0.000E+00	4.435E-10	1.647E-09	5.713E-09
Ra-226	Pu-238	1.000E+00	0.000E+00	1.618E-12	1.214E-11	8.568E-11
Pb-210	Pu-238	1.000E+00	0.000E+00	2.736E-13	3.616E-12	4.086E-11
Pu-239	Pu-239	1.000E+00	2.500E-01	2.496E-01	2.492E-01	2.485E-01
U-235	Pu-239	1.000E+00	0.000E+00	6.054E-09	1.191E-08	2.304E-08
Pa-231	Pu-239	1.000E+00	0.000E+00	1.593E-12	6.233E-12	2.387E-11
Ac-227	Pu-239	1.000E+00	0.000E+00	3.458E-13	2.268E-12	1.291E-11
Pu-240	Pu-240	4.950E-08	1.237E-08	1.233E-08	1.229E-08	1.221E-08
Pu-240	Pu-240	1.000E+00	2.500E-01	2.491E-01	2.483E-01	2.466E-01
Pu-240	∑S(j):		2.500E-01	2.491E-01	2.483E-01	2.466E-01
U-236	Pu-240	1.000E+00	0.000E+00	1.818E-07	3.572E-07	6.899E-07
Th-232	Pu-240	1.000E+00	0.000E+00	1.128E-16	4.458E-16	1.742E-15
Ra-228	Pu-240	1.000E+00	0.000E+00	6.143E-17	3.215E-16	1.472E-15
Th-228	Pu-240	1.000E+00	0.000E+00	4.701E-17	2.836E-16	1.389E-15
Sr-90	Sr-90	1.000E+00	5.300E+00	2.772E+00	1.450E+00	3.965E-01

THF(i) is the thread fraction of the parent nuclide.

RESCALC.EXE execution time = 76.60 seconds

Table of Contents

Part I: Mixture Sums and Single Radionuclide Guidelines

Dose Conversion Factor (and Related) Parameter Summary
File: FGR 13 MORBIDITY

Menu	Parameter	Current Value	Base Case*	Parameter Name
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Ac-227+D	6.724E+00	6.700E+00	DCF2(1)
B-1	Am-241	4.440E-01	4.440E-01	DCF2(2)
B-1	Cs-137+D	3.190E-05	3.190E-05	DCF2(3)
B-1	H-3	6.400E-08	6.400E-08	DCF2(4)
B-1	Np-237+D	5.400E-01	5.400E-01	DCF2(5)
B-1	Pa-231	1.280E+00	1.280E+00	DCF2(6)
B-1	Pb-210+D	2.320E-02	1.360E-02	DCF2(7)
B-1	Pu-238	3.920E-01	3.920E-01	DCF2(8)
B-1	Pu-239	4.290E-01	4.290E-01	DCF2(10)
B-1	Pu-240	4.290E-01	4.290E-01	DCF2(11)
B-1	Ra-226+D	8.594E-03	8.580E-03	DCF2(13)
B-1	Ra-228+D	5.078E-03	4.770E-03	DCF2(14)
B-1	Sr-90+D	1.308E-03	1.300E-03	DCF2(15)
B-1	Th-228+D	3.454E-01	3.420E-01	DCF2(16)
B-1	Th-229+D	2.169E+00	2.150E+00	DCF2(17)
B-1	Th-230	3.260E-01	3.260E-01	DCF2(18)
B-1	Th-232	1.640E+00	1.640E+00	DCF2(19)
B-1	U-233	1.350E-01	1.350E-01	DCF2(20)
B-1	U-234	1.320E-01	1.320E-01	DCF2(21)
B-1	U-235+D	1.230E-01	1.230E-01	DCF2(22)
B-1	U-236	1.250E-01	1.250E-01	DCF2(23)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Ac-227+D	1.480E-02	1.410E-02	DCF3(1)
D-1	Am-241	3.640E-03	3.640E-03	DCF3(2)
D-1	Cs-137+D	5.000E-05	5.000E-05	DCF3(3)
D-1	H-3	6.400E-08	6.400E-08	DCF3(4)
D-1	Np-237+D	4.444E-03	4.440E-03	DCF3(5)
D-1	Pa-231	1.060E-02	1.060E-02	DCF3(6)
D-1	Pb-210+D	7.276E-03	5.370E-03	DCF3(7)
D-1	Pu-238	3.200E-03	3.200E-03	DCF3(8)
D-1	Pu-239	3.540E-03	3.540E-03	DCF3(10)
D-1	Pu-240	3.540E-03	3.540E-03	DCF3(11)
D-1	Ra-226+D	1.321E-03	1.320E-03	DCF3(13)
D-1	Ra-228+D	1.442E-03	1.440E-03	DCF3(14)
D-1	Sr-90+D	1.528E-04	1.420E-04	DCF3(15)
D-1	Th-228+D	8.086E-04	3.960E-04	DCF3(16)
D-1	Th-229+D	4.027E-03	3.530E-03	DCF3(17)
D-1	Th-230	5.480E-04	5.480E-04	DCF3(18)
D-1	Th-232	2.730E-03	2.730E-03	DCF3(19)
D-1	U-233	2.890E-04	2.890E-04	DCF3(20)
D-1	U-234	2.830E-04	2.830E-04	DCF3(21)
D-1	U-235+D	2.673E-04	2.660E-04	DCF3(22)
D-1	U-236	2.690E-04	2.690E-04	DCF3(23)
D-34	Food transfer factors:			
D-34	Ac-227+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(1,1)
D-34	Ac-227+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,2)
D-34	Ac-227+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,3)
D-34				

Dose Conversion Factor (and Related) Parameter Summary (continued)
File: FGR 13 MORBIDITY

Menu	Parameter	Current Value	Base Case*	Parameter Name
D-34	Am-241 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(2,1)
D-34	Am-241 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-05	5.000E-05	RTF(2,2)
D-34	Am-241 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-06	2.000E-06	RTF(2,3)
D-34				
D-34	Cs-137+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(3,1)
D-34	Cs-137+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.000E-02	3.000E-02	RTF(3,2)
D-34	Cs-137+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	8.000E-03	8.000E-03	RTF(3,3)
D-34				
D-34	H-3 , plant/soil concentration ratio, dimensionless	4.800E+00	4.800E+00	RTF(4,1)
D-34	H-3 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.200E-02	1.200E-02	RTF(4,2)
D-34	H-3 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-02	1.000E-02	RTF(4,3)
D-34				
D-34	Np-237+D , plant/soil concentration ratio, dimensionless	2.000E-02	2.000E-02	RTF(5,1)
D-34	Np-237+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(5,2)
D-34	Np-237+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(5,3)
D-34				
D-34	Pa-231 , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(6,1)
D-34	Pa-231 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(6,2)
D-34	Pa-231 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(6,3)
D-34				
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(7,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(7,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(7,3)
D-34				
D-34	Pu-238 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(8,1)
D-34	Pu-238 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(8,2)
D-34	Pu-238 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-06	1.000E-06	RTF(8,3)
D-34				
D-34	Pu-239 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(10,1)
D-34	Pu-239 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(10,2)
D-34	Pu-239 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-06	1.000E-06	RTF(10,3)
D-34				
D-34	Pu-240 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(11,1)
D-34	Pu-240 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(11,2)
D-34	Pu-240 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-06	1.000E-06	RTF(11,3)
D-34				
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(13,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(13,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(13,3)
D-34				
D-34	Ra-228+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(14,1)
D-34	Ra-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(14,2)
D-34	Ra-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(14,3)
D-34				
D-34	Sr-90+D , plant/soil concentration ratio, dimensionless	3.000E-01	3.000E-01	RTF(15,1)
D-34	Sr-90+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-03	8.000E-03	RTF(15,2)
D-34	Sr-90+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-03	2.000E-03	RTF(15,3)
D-34				
D-34	Th-228+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(16,1)
D-34	Th-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(16,2)
D-34	Th-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(16,3)

Dose Conversion Factor (and Related) Parameter Summary (continued)
File: FGR 13 MORBIDITY

Menu	Parameter	Current Value	Base Case*	Parameter Name
D-34	Th-229+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(17,1)
D-34	Th-229+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(17,2)
D-34	Th-229+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(17,3)
D-34				
D-34	Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(18,1)
D-34	Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(18,2)
D-34	Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(18,3)
D-34				
D-34	Th-232 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(19,1)
D-34	Th-232 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(19,2)
D-34	Th-232 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(19,3)
D-34				
D-34	U-233 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(20,1)
D-34	U-233 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(20,2)
D-34	U-233 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(20,3)
D-34				
D-34	U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(21,1)
D-34	U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(21,2)
D-34	U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(21,3)
D-34				
D-34	U-235+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(22,1)
D-34	U-235+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(22,2)
D-34	U-235+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(22,3)
D-34				
D-34	U-236 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(23,1)
D-34	U-236 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(23,2)
D-34	U-236 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(23,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Ac-227+D , fish	1.500E+01	1.500E+01	BIOFAC(1,1)
D-5	Ac-227+D , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(1,2)
D-5				
D-5	Am-241 , fish	3.000E+01	3.000E+01	BIOFAC(2,1)
D-5	Am-241 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(2,2)
D-5				
D-5	Cs-137+D , fish	2.000E+03	2.000E+03	BIOFAC(3,1)
D-5	Cs-137+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(3,2)
D-5				
D-5	H-3 , fish	1.000E+00	1.000E+00	BIOFAC(4,1)
D-5	H-3 , crustacea and mollusks	1.000E+00	1.000E+00	BIOFAC(4,2)
D-5				
D-5	Np-237+D , fish	3.000E+01	3.000E+01	BIOFAC(5,1)
D-5	Np-237+D , crustacea and mollusks	4.000E+02	4.000E+02	BIOFAC(5,2)
D-5				
D-5	Pa-231 , fish	1.000E+01	1.000E+01	BIOFAC(6,1)
D-5	Pa-231 , crustacea and mollusks	1.100E+02	1.100E+02	BIOFAC(6,2)
D-5				
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(7,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(7,2)
D-5				

Dose Conversion Factor (and Related) Parameter Summary (continued)
File: FGR 13 MORBIDITY

Menu	Parameter	Current Value	Base Case*	Parameter Name
D-5	Pu-238 , fish	3.000E+01	3.000E+01	BIOFAC(6,1)
D-5	Pu-238 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(6,2)
D-5				
D-5	Pu-239 , fish	3.000E+01	3.000E+01	BIOFAC(10,1)
D-5	Pu-239 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(10,2)
D-5				
D-5	Pu-240 , fish	3.000E+01	3.000E+01	BIOFAC(11,1)
D-5	Pu-240 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(11,2)
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(13,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(13,2)
D-5				
D-5	Ra-228+D , fish	5.000E+01	5.000E+01	BIOFAC(14,1)
D-5	Ra-228+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(14,2)
D-5				
D-5	Sr-90+D , fish	6.000E+01	6.000E+01	BIOFAC(15,1)
D-5	Sr-90+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(15,2)
D-5				
D-5	Th-228+D , fish	1.000E+02	1.000E+02	BIOFAC(16,1)
D-5	Th-228+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(16,2)
D-5				
D-5	Th-229+D , fish	1.000E+02	1.000E+02	BIOFAC(17,1)
D-5	Th-229+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(17,2)
D-5				
D-5	Th-230 , fish	1.000E+02	1.000E+02	BIOFAC(18,1)
D-5	Th-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(18,2)
D-5				
D-5	Th-232 , fish	1.000E+02	1.000E+02	BIOFAC(19,1)
D-5	Th-232 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(19,2)
D-5				
D-5	U-233 , fish	1.000E+01	1.000E+01	BIOFAC(20,1)
D-5	U-233 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(20,2)
D-5				
D-5	U-234 , fish	1.000E+01	1.000E+01	BIOFAC(21,1)
D-5	U-234 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(21,2)
D-5				
D-5	U-235+D , fish	1.000E+01	1.000E+01	BIOFAC(22,1)
D-5	U-235+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(22,2)
D-5				
D-5	U-236 , fish	1.000E+01	1.000E+01	BIOFAC(23,1)
D-5	U-236 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(23,2)

*Base Case means Default.Lib w/o Associate Nuclide contributions.

Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	5.200E+04	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	5.000E+00	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	1.000E+02	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	1.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	2.500E+01	1.000E+00	---	T(2)
R011	Times for calculations (yr)	5.000E+01	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+02	1.000E+01	---	T(4)
R011	Times for calculations (yr)	not used	3.000E+01	---	T(5)
R011	Times for calculations (yr)	not used	1.000E+02	---	T(6)
R011	Times for calculations (yr)	not used	3.000E+02	---	T(7)
R011	Times for calculations (yr)	not used	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Am-241	4.000E-02	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Cs-137	7.630E+00	0.000E+00	---	S1(3)
R012	Initial principal radionuclide (pCi/g): H-3	1.200E-01	0.000E+00	---	S1(4)
R012	Initial principal radionuclide (pCi/g): Pu-238	2.000E-02	0.000E+00	---	S1(8)
R012	Initial principal radionuclide (pCi/g): Pu-239	8.000E-02	0.000E+00	---	S1(10)
R012	Initial principal radionuclide (pCi/g): Pu-240	8.000E-02	0.000E+00	---	S1(11)
R012	Initial principal radionuclide (pCi/g): Sr-90	1.510E+00	0.000E+00	---	S1(15)
R012	Concentration in groundwater (pCi/L): Am-241	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Cs-137	not used	0.000E+00	---	W1(3)
R012	Concentration in groundwater (pCi/L): H-3	not used	0.000E+00	---	W1(4)
R012	Concentration in groundwater (pCi/L): Pu-238	not used	0.000E+00	---	W1(8)
R012	Concentration in groundwater (pCi/L): Pu-239	not used	0.000E+00	---	W1(10)
R012	Concentration in groundwater (pCi/L): Pu-240	not used	0.000E+00	---	W1(11)
R012	Concentration in groundwater (pCi/L): Sr-90	not used	0.000E+00	---	W1(15)
R013	Cover depth (m)	0.000E+00	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	not used	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	not used	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.660E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	3.300E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	5.000E+03	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	4.900E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	2.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	8.000E+00	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	4.600E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.230E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.600E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.660E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	3.300E-01	4.000E-01	---	TPSZ

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R014	Saturated zone effective porosity	2.400E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	2.000E-01	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	2.000E+04	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	4.800E-03	2.000E-02	---	HGWT
R014	Saturated zone b parameter	4.900E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	1.800E+01	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW
R015	Number of unsaturated zone strata	1	1	---	NS
R015	Unsat. zone 1, thickness (m)	0.000E+00	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.660E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	3.300E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.400E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	2.000E-01	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	4.900E+00	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	5.000E+03	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Am-241				
R016	Contaminated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.023E-03	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Cs-137				
R016	Contaminated zone (cm**3/g)	4.600E+03	4.600E+03	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	4.600E+03	4.600E+03	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	4.600E+03	4.600E+03	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.759E-05	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
R016	Distribution coefficients for H-3				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCU(4,1)
R016	Saturated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.718E-01	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
R016	Distribution coefficients for Pu-238				
R016	Contaminated zone (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCC(8)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCU(8,1)
R016	Saturated zone (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCS(8)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.047E-05	ALEACH(8)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(8)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for Pu-239				
R016	Contaminated zone (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCC(10)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCU(10,1)
R016	Saturated zone (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCS(10)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.047E-05	ALEACH(10)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(10)
R016	Distribution coefficients for Pu-240				
R016	Contaminated zone (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCC(11)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCU(11,1)
R016	Saturated zone (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCS(11)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.047E-05	ALEACH(11)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(11)
R016	Distribution coefficients for Sr-90				
R016	Contaminated zone (cm**3/g)	3.000E+01	3.000E+01	---	DCNUCC(15)
R016	Unsaturated zone 1 (cm**3/g)	3.000E+01	3.000E+01	---	DCNUCU(15,1)
R016	Saturated zone (cm**3/g)	3.000E+01	3.000E+01	---	DCNUCS(15)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.687E-03	ALEACH(15)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(15)
R016	Distribution coefficients for daughter Ac-227				
R016	Contaminated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.023E-03	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for daughter Np-237				
R016	Contaminated zone (cm**3/g)	-1.000E+00	-1.000E+00	2.574E+02	DCNUCC(5)
R016	Unsaturated zone 1 (cm**3/g)	-1.000E+00	-1.000E+00	2.574E+02	DCNUCU(5,1)
R016	Saturated zone (cm**3/g)	-1.000E+00	-1.000E+00	2.574E+02	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.143E-04	ALEACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)
R016	Distribution coefficients for daughter Pa-231				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(6)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(6,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(6)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.615E-03	ALEACH(6)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(6)
R016	Distribution coefficients for daughter Pb-210				
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(7)
R016	Unsaturated zone 1 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(7,1)
R016	Saturated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCS(7)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	8.084E-04	ALEACH(7)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for daughter Ra-226				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(13)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(13,1)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(13)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.154E-03	ALEACH(13)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(13)
R016	Distribution coefficients for daughter Ra-228				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(14)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(14,1)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(14)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.154E-03	ALEACH(14)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(14)
R016	Distribution coefficients for daughter Th-228				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(16)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(16,1)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(16)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.349E-06	ALEACH(16)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(16)
R016	Distribution coefficients for daughter Th-229				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(17)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(17,1)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(17)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.349E-06	ALEACH(17)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(17)
R016	Distribution coefficients for daughter Th-230				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(18)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(18,1)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(18)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.349E-06	ALEACH(18)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(18)
R016	Distribution coefficients for daughter Th-232				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(19)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(19,1)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(19)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.349E-06	ALEACH(19)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(19)
R016	Distribution coefficients for daughter U-233				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(20)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(20,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(20)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.615E-03	ALEACH(20)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(20)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for daughter U-234				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(21)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(21,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(21)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.615E-03	ALEACH(21)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(21)
R016	Distribution coefficients for daughter U-235				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(22)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(22,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(22)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.615E-03	ALEACH(22)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(22)
R016	Distribution coefficients for daughter U-236				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(23)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(23,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(23)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.615E-03	ALEACH(23)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(23)
R017	Inhalation rate (m**3/yr)	8.400E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-04	1.000E-04	---	MLINH
R017	Exposure duration	2.500E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	8.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	5.000E-01	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	2.500E-01	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular AREA.	FS
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	1.600E+02	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	1.400E+01	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	4.380E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	7.000E+02	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	1.000E+00	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	not used	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	1.000E+00	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	2.000E-01	-1	---	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	1.000E-05	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	9.000E-01	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	not used	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	1.000E+00	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	7.000E-01	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	1.500E+00	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	not used	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	1.700E-01	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	2.500E-01	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	not used	8.000E-02	---	TE(3)
R19B	Translocation Factor for Non-Leafy	1.000E-01	1.000E-01	---	TIV(1)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESPAD (If different from user input)	Parameter Name
R19B	Translocation Factor for Leafy	1.000E+00	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	not used	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	2.000E+01	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
C14	DCF correction factor for gaseous forms of C14	not used	0.000E+00	---	CO2F
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR1
R021	Bulk density of building foundation (g/cm**3)	not used	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	not used	1.000E-01	---	TPFL
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	32	---	---	NPTS
TITL	Maximum number of integration points for dose	17	---	---	LYMAX

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
TITL	Maximum number of integration points for risk	257	---	---	KYMAX

Summary of Pathway Selections

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

Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	52000.00 square meters	Am-241	4.000E-02
Thickness:	5.00 meters	Cs-137	7.630E+00
Cover Depth:	0.00 meters	H-3	1.200E-01
		Pu-238	2.000E-02
		Pu-239	8.000E-02
		Pu-240	8.000E-02
		Sr-90	1.510E+00

Total Dose TDOSE(t), mrem/yr
Basic Radiation Dose Limit = 1.500E+01 mrem/yr
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

t (years):	0.000E+00	2.500E+01	5.000E+01	1.000E+02
TDOSE(t):	1.909E+01	1.087E+01	6.146E+00	2.005E+00
M(t):	1.273E+00	7.248E-01	4.097E-01	1.337E-01

Maximum TDOSE(t): 1.909E+01 mrem/yr at t = 0.000E+00 years

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	1.119E-03	0.0001	1.340E-03	0.0001	0.000E+00	0.0000	5.054E-03	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	4.770E-03	0.0002
Cs-137	1.608E+01	0.8421	1.820E-05	0.0000	0.000E+00	0.0000	5.250E-01	0.0275	0.000E+00	0.0000	0.000E+00	0.0000	1.239E-02	0.0006
H-3	0.000E+00	0.0000	1.742E-04	0.0000	0.000E+00	0.0000	1.026E-03	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	1.411E-07	0.0000
Pu-238	1.950E-06	0.0000	5.907E-04	0.0000	0.000E+00	0.0000	2.219E-03	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	2.094E-03	0.0001
Pu-239	1.497E-05	0.0000	2.596E-03	0.0001	0.000E+00	0.0000	9.856E-03	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	9.303E-03	0.0005
Pu-240	7.566E-06	0.0000	2.596E-03	0.0001	0.000E+00	0.0000	9.856E-03	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	9.302E-03	0.0005
Sr-90	2.297E-02	0.0012	1.475E-04	0.0000	0.000E+00	0.0000	2.377E+00	0.1245	0.000E+00	0.0000	0.000E+00	0.0000	7.480E-03	0.0004
Total	1.610E+01	0.8434	7.462E-03	0.0004	0.000E+00	0.0000	2.930E+00	0.1535	0.000E+00	0.0000	0.000E+00	0.0000	4.534E-02	0.0024

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	3.709E-03	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	1.027E-04	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.609E-02	0.0008
Cs-137	0.000E+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	1.662E+01	0.8703
H-3	8.989E-04	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.745E-05	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.157E-03	0.0001
Pu-238	1.932E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.144E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.905E-03	0.0003
Pu-239	2.582E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.867E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.177E-02	0.0011
Pu-240	7.685E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.046E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.176E-02	0.0011
Sr-90	2.540E-03	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	7.567E-05	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.411E+00	0.1262
Total	7.148E-03	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	2.358E-04	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.909E+01	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 = 2.500E+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.
Am-241	9.724E-04	0.0001	1.164E-03	0.0001	0.000E+00	0.0000	4.392E-03	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	4.144E-03	0.0004
Cs-137	9.021E+00	0.8297	1.021E-05	0.0000	0.000E+00	0.0000	2.945E-01	0.0271	0.000E+00	0.0000	0.000E+00	0.0000	6.950E-03	0.0006
H-3	0.000E+00	0.0000	1.208E-18	0.0000	0.000E+00	0.0000	7.192E-18	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.788E-22	0.0000
Pu-238	1.599E-06	0.0000	4.843E-04	0.0000	0.000E+00	0.0000	1.819E-03	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	1.717E-03	0.0002
Pu-239	1.494E-05	0.0000	2.591E-03	0.0002	0.000E+00	0.0000	9.839E-03	0.0009	0.000E+00	0.0000	0.000E+00	0.0000	9.287E-03	0.0009
Pu-240	7.538E-06	0.0000	2.586E-03	0.0002	0.000E+00	0.0000	9.820E-03	0.0009	0.000E+00	0.0000	0.000E+00	0.0000	9.268E-03	0.0009
Sr-90	1.185E-02	0.0011	7.606E-05	0.0000	0.000E+00	0.0000	1.226E+00	0.1128	0.000E+00	0.0000	0.000E+00	0.0000	3.857E-03	0.0004
Total	9.033E+00	0.8308	6.912E-03	0.0006	0.000E+00	0.0000	1.546E+00	0.1422	0.000E+00	0.0000	0.000E+00	0.0000	3.522E-02	0.0032

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 2.500E+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.
Am-241	1.737E-01	0.0160	0.000E+00	0.0000	0.000E+00	0.0000	5.055E-03	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	1.894E-01	0.0174
Cs-137	0.000E+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	9.322E+00	0.8574
H-3	7.950E-18	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.258E-19	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.688E-17	0.0000
Pu-238	3.526E-08	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.025E-09	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.022E-03	0.0004
Pu-239	5.089E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.480E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.173E-02	0.0020
Pu-240	1.488E-09	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.327E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.168E-02	0.0020
Sr-90	6.968E-02	0.0064	0.000E+00	0.0000	0.000E+00	0.0000	2.186E-03	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	1.314E+00	0.1208
Total	2.434E-01	0.0224	0.000E+00	0.0000	0.000E+00	0.0000	7.241E-03	0.0007	0.000E+00	0.0000	0.000E+00	0.0000	1.087E+01	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 = 5.000E+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.
Am-241	8.450E-04	0.0001	1.011E-03	0.0002	0.000E+00	0.0000	3.817E-03	0.0006	0.000E+00	0.0000	0.000E+00	0.0000	3.600E-03	0.0006
Cs-137	5.060E+00	0.8234	5.728E-06	0.0000	0.000E+00	0.0000	1.652E-01	0.0269	0.000E+00	0.0000	0.000E+00	0.0000	3.899E-03	0.0006
H-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	0.000E+00	0.0000
Pu-238	1.312E-06	0.0000	3.971E-04	0.0001	0.000E+00	0.0000	1.492E-03	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	1.408E-03	0.0002
Pu-239	1.492E-05	0.0000	2.587E-03	0.0004	0.000E+00	0.0000	9.822E-03	0.0016	0.000E+00	0.0000	0.000E+00	0.0000	9.271E-03	0.0015
Pu-240	7.510E-06	0.0000	2.577E-03	0.0004	0.000E+00	0.0000	9.784E-03	0.0016	0.000E+00	0.0000	0.000E+00	0.0000	9.235E-03	0.0015
Sr-90	6.110E-03	0.0010	3.922E-05	0.0000	0.000E+00	0.0000	6.322E-01	0.1029	0.000E+00	0.0000	0.000E+00	0.0000	1.989E-03	0.0003
Total	5.067E+00	0.8245	6.617E-03	0.0011	0.000E+00	0.0000	8.224E-01	0.1338	0.000E+00	0.0000	0.000E+00	0.0000	2.940E-02	0.0048

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 5.000E+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.
Am-241	1.561E-01	0.0254	0.000E+00	0.0000	0.000E+00	0.0000	4.548E-03	0.0007	0.000E+00	0.0000	0.000E+00	0.0000	1.699E-01	0.0276
Cs-137	0.000E+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	5.230E+00	0.8509
H-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	0.000E+00	0.0000
Pu-238	1.284E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.738E-09	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.298E-03	0.0005
Pu-239	2.065E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.011E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.169E-02	0.0035
Pu-240	5.744E-09	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.672E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.160E-02	0.0035
Sr-90	5.769E-02	0.0094	0.000E+00	0.0000	0.000E+00	0.0000	1.812E-03	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	6.999E-01	0.1139
Total	2.138E-01	0.0348	0.000E+00	0.0000	0.000E+00	0.0000	6.359E-03	0.0010	0.000E+00	0.0000	0.000E+00	0.0000	6.146E+00	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	6.382E-04	0.0003	7.632E-04	0.0004	0.000E+00	0.0000	2.882E-03	0.0014	0.000E+00	0.0000	0.000E+00	0.0000	2.717E-03	0.0014
Cs-137	1.593E+00	0.7943	1.802E-06	0.0000	0.000E+00	0.0000	5.199E-02	0.0259	0.000E+00	0.0000	0.000E+00	0.0000	1.227E-03	0.0006
H-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	0.000E+00	0.0000
Pu-238	8.826E-07	0.0000	2.670E-04	0.0001	0.000E+00	0.0000	1.003E-03	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	9.466E-04	0.0005
Pu-239	1.487E-05	0.0000	2.578E-03	0.0013	0.000E+00	0.0000	9.788E-03	0.0049	0.000E+00	0.0000	0.000E+00	0.0000	9.239E-03	0.0046
Pu-240	7.456E-06	0.0000	2.558E-03	0.0013	0.000E+00	0.0000	9.713E-03	0.0048	0.000E+00	0.0000	0.000E+00	0.0000	9.167E-03	0.0046
Sr-90	1.625E-03	0.0008	1.043E-05	0.0000	0.000E+00	0.0000	1.681E-01	0.0839	0.000E+00	0.0000	0.000E+00	0.0000	5.290E-04	0.0003
Total	1.595E+00	0.7954	6.179E-03	0.0031	0.000E+00	0.0000	2.435E-01	0.1214	0.000E+00	0.0000	0.000E+00	0.0000	2.383E-02	0.0119

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	1.175E-01	0.0586	0.000E+00	0.0000	0.000E+00	0.0000	3.424E-03	0.0017	0.000E+00	0.0000	0.000E+00	0.0000	1.279E-01	0.0638
Cs-137	0.000E+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	1.646E+00	0.8208
H-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	0.000E+00	0.0000
Pu-238	3.888E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.133E-08	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.218E-03	0.0011
Pu-239	7.727E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.251E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.162E-02	0.0108
Pu-240	1.983E-08	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.777E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.145E-02	0.0107
Sr-90	1.531E-02	0.0076	0.000E+00	0.0000	0.000E+00	0.0000	4.807E-04	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	1.861E-01	0.0928
Total	1.328E-01	0.0662	0.000E+00	0.0000	0.000E+00	0.0000	3.905E-03	0.0019	0.000E+00	0.0000	0.000E+00	0.0000	2.005E+00	1.0000

*Sum of all water independent and dependent pathways.

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

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	2.500E+01	5.000E+01	1.000E+02
Am-241	Am-241	1.000E+00	4.023E-01	4.736E+00	4.247E+00	3.198E+00
Am-241	Np-237+D	1.000E+00	6.145E-07	3.232E-05	6.147E-05	1.081E-04
Am-241	U-233	1.000E+00	2.016E-14	5.266E-11	2.839E-10	1.164E-09
Am-241	Th-229+D	1.000E+00	6.661E-17	5.118E-13	3.776E-12	2.712E-11
Am-241	∑DSR(j)		4.023E-01	4.736E+00	4.248E+00	3.199E+00
Cs-137+D	Cs-137+D	1.000E+00	2.178E+00	1.222E+00	6.854E-01	2.157E-01
H-3	H-3	1.000E+00	1.797E-02	1.406E-16	8.449E-31	0.000E+00
Pu-238	Pu-238	1.840E-09	4.513E-10	3.700E-10	3.034E-10	2.040E-10
Pu-238	Pu-238	1.000E+00	2.453E-01	2.011E-01	1.649E-01	1.109E-01
Pu-238	U-234	1.000E+00	6.213E-08	4.642E-06	1.159E-05	2.792E-05
Pu-238	Th-230	1.000E+00	2.771E-13	4.795E-10	1.741E-09	5.944E-09
Pu-238	Ra-226+D	1.000E+00	5.087E-15	2.551E-10	1.867E-09	1.310E-08
Pu-238	Pb-210+D	1.000E+00	1.761E-15	1.540E-11	2.112E-10	2.734E-09
Pu-238	∑DSR(j)		2.453E-01	2.011E-01	1.649E-01	1.109E-01
Pu-239	Pu-239	1.000E+00	2.721E-01	2.717E-01	2.712E-01	2.702E-01
Pu-239	U-235+D	1.000E+00	2.565E-10	1.345E-08	2.730E-08	5.592E-08
Pu-239	Pa-231	1.000E+00	1.550E-14	3.734E-11	1.781E-10	8.721E-10
Pu-239	Ac-227+D	1.000E+00	3.684E-15	1.710E-11	1.714E-10	1.191E-09
Pu-239	∑DSR(j)		2.721E-01	2.717E-01	2.712E-01	2.702E-01
Pu-240	Pu-240	4.950E-08	1.347E-08	1.342E-08	1.337E-08	1.327E-08
Pu-240	Pu-240	1.000E+00	2.720E-01	2.710E-01	2.700E-01	2.681E-01
Pu-240	U-236	1.000E+00	6.161E-10	5.001E-08	1.337E-07	3.691E-07
Pu-240	Th-232	1.000E+00	7.859E-20	1.449E-16	5.599E-16	2.155E-15
Pu-240	Ra-228+D	1.000E+00	3.964E-20	1.532E-15	7.780E-15	3.557E-14
Pu-240	Th-228+D	1.000E+00	3.262E-21	1.285E-15	7.492E-15	3.600E-14
Pu-240	∑DSR(j)		2.720E-01	2.710E-01	2.700E-01	2.681E-01
Sr-90+D	Sr-90+D	1.000E+00	1.596E+00	8.700E-01	4.635E-01	1.232E-01

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 1.500E+01 mrem/yr

Nuclide (i)	t= 0.000E+00	2.500E+01	5.000E+01	1.000E+02
Am-241	3.728E+01	3.167E+00	3.531E+00	4.690E+00
Cs-137	6.887E+00	1.228E+01	2.189E+01	6.954E+01
H-3	8.346E+02	*9.597E+15	*9.597E+15	*9.597E+15
Pu-238	6.116E+01	7.458E+01	9.096E+01	1.353E+02
Pu-239	5.512E+01	5.522E+01	5.531E+01	5.550E+01
Pu-240	5.514E+01	5.534E+01	5.555E+01	5.596E+01
Sr-90	9.396E+00	1.724E+01	3.236E+01	1.217E+02

*At specific activity limit

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

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Am-241	4.000E-02	26.21 ± 0.05	4.859E+00	3.087E+00	4.023E-01	3.728E+01
Cs-137	7.630E+00	0.000E+00	2.178E+00	6.887E+00	2.178E+00	6.887E+00
H-3	1.200E-01	0.000E+00	1.797E-02	8.346E+02	1.797E-02	8.346E+02
Pu-238	2.000E-02	0.000E+00	2.453E-01	6.116E+01	2.453E-01	6.116E+01
Pu-239	8.000E-02	0.000E+00	2.721E-01	5.512E+01	2.721E-01	5.512E+01
Pu-240	8.000E-02	0.000E+00	2.720E-01	5.514E+01	2.720E-01	5.514E+01
Sr-90	1.510E+00	0.000E+00	1.596E+00	9.396E+00	1.596E+00	9.396E+00

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

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	2.500E+01	5.000E+01	1.000E+02
Am-241	Am-241	1.000E+00	1.609E-02	1.894E-01	1.699E-01	1.279E-01
Np-237	Am-241	1.000E+00	2.458E-08	1.293E-06	2.459E-06	4.324E-06
U-233	Am-241	1.000E+00	8.065E-16	2.107E-12	1.136E-11	4.654E-11
Th-229	Am-241	1.000E+00	2.664E-18	2.047E-14	1.510E-13	1.085E-12
Cs-137	Cs-137	1.000E+00	1.662E+01	9.322E+00	5.230E+00	1.646E+00
H-3	H-3	1.000E+00	2.157E-03	1.688E-17	0.000E+00	0.000E+00
Pu-238	Pu-238	1.840E-09	9.026E-12	7.401E-12	6.068E-12	4.080E-12
Pu-238	Pu-238	1.000E+00	4.905E-03	4.022E-03	3.298E-03	2.217E-03
Pu-238	∑DOSE(j)		4.905E-03	4.022E-03	3.298E-03	2.217E-03
U-234	Pu-238	1.000E+00	1.243E-09	9.285E-08	2.319E-07	5.583E-07
Th-230	Pu-238	1.000E+00	5.542E-15	9.590E-12	3.482E-11	1.189E-10
Ra-226	Pu-238	1.000E+00	1.017E-16	5.101E-12	3.733E-11	2.621E-10
Pb-210	Pu-238	1.000E+00	3.522E-17	3.080E-13	4.223E-12	5.468E-11
Pu-239	Pu-239	1.000E+00	2.177E-02	2.173E-02	2.169E-02	2.162E-02
U-235	Pu-239	1.000E+00	2.052E-11	1.076E-09	2.184E-09	4.473E-09
Pa-231	Pu-239	1.000E+00	1.240E-15	2.987E-12	1.425E-11	6.977E-11
Ac-227	Pu-239	1.000E+00	2.947E-16	1.368E-12	1.371E-11	9.530E-11
Pu-240	Pu-240	4.950E-08	1.077E-09	1.073E-09	1.069E-09	1.062E-09
Pu-240	Pu-240	1.000E+00	2.176E-02	2.168E-02	2.160E-02	2.145E-02
Pu-240	∑DOSE(j)		2.176E-02	2.168E-02	2.160E-02	2.145E-02
U-236	Pu-240	1.000E+00	4.929E-11	4.001E-09	1.070E-08	2.953E-08
Th-232	Pu-240	1.000E+00	6.287E-21	1.159E-17	4.479E-17	1.724E-16
Ra-228	Pu-240	1.000E+00	3.172E-21	1.225E-16	6.224E-16	2.846E-15
Th-228	Pu-240	1.000E+00	2.610E-22	1.028E-16	5.994E-16	2.880E-15
Sr-90	Sr-90	1.000E+00	2.411E+00	1.314E+00	6.999E-01	1.861E-01

THF(i) is the thread fraction of the parent nuclide.

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	2.500E+01	5.000E+01	1.000E+02
Am-241	Am-241	1.000E+00	4.000E-02	3.475E-02	3.019E-02	2.279E-02
Np-237	Am-241	1.000E+00	0.000E+00	3.009E-07	5.600E-07	9.740E-07
U-233	Am-241	1.000E+00	0.000E+00	1.663E-11	6.254E-11	2.216E-10
Th-229	Am-241	1.000E+00	0.000E+00	1.329E-14	1.014E-13	7.400E-13
Cs-137	Cs-137	1.000E+00	7.630E+00	4.280E+00	2.401E+00	7.557E-01
H-3	H-3	1.000E+00	1.200E-01	8.342E-16	5.014E-30	0.000E+00
Pu-238	Pu-238	1.840E-09	3.680E-11	3.017E-11	2.474E-11	1.663E-11
Pu-238	Pu-238	1.000E+00	2.000E-02	1.640E-02	1.345E-02	9.040E-03
Pu-238	∑S(j):		2.000E-02	1.640E-02	1.345E-02	9.040E-03
U-234	Pu-238	1.000E+00	0.000E+00	1.259E-06	2.242E-06	3.575E-06
Th-230	Pu-238	1.000E+00	0.000E+00	1.474E-10	5.459E-10	1.882E-09
Ra-226	Pu-238	1.000E+00	0.000E+00	5.373E-13	4.016E-12	2.813E-11
Pb-210	Pu-238	1.000E+00	0.000E+00	9.085E-14	1.196E-12	1.342E-11
Pu-239	Pu-239	1.000E+00	8.000E-02	7.986E-02	7.972E-02	7.945E-02
U-235	Pu-239	1.000E+00	0.000E+00	1.929E-09	3.778E-09	7.250E-09
Pa-231	Pu-239	1.000E+00	0.000E+00	5.068E-13	1.972E-12	7.467E-12
Ac-227	Pu-239	1.000E+00	0.000E+00	1.097E-13	7.133E-13	4.001E-12
Pu-240	Pu-240	4.950E-08	3.960E-09	3.946E-09	3.931E-09	3.902E-09
Pu-240	Pu-240	1.000E+00	8.000E-02	7.971E-02	7.942E-02	7.884E-02
Pu-240	∑S(j):		8.000E-02	7.971E-02	7.942E-02	7.884E-02
U-236	Pu-240	1.000E+00	0.000E+00	5.792E-08	1.133E-07	2.171E-07
Th-232	Pu-240	1.000E+00	0.000E+00	3.598E-17	1.418E-16	5.512E-16
Ra-228	Pu-240	1.000E+00	0.000E+00	1.959E-17	1.022E-16	4.655E-16
Th-228	Pu-240	1.000E+00	0.000E+00	1.500E-17	9.019E-17	4.392E-16
Sr-90	Sr-90	1.000E+00	1.510E+00	7.787E-01	4.016E-01	1.068E-01

THF(i) is the thread fraction of the parent nuclide.

RESCALC.EXE execution time = 63.84 seconds

Table of Contents

Part I: Mixture Sums and Single Radionuclide Guidelines

Dose Conversion Factor (and Related) Parameter Summary
File: FGR 13 MORBIDITY

Menu	Parameter	Current Value	Base Case*	Parameter Name
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Ac-227+D	6.724E+00	6.700E+00	DCF2(1)
B-1	Am-241	4.440E-01	4.440E-01	DCF2(2)
B-1	Cs-137+D	3.190E-05	3.190E-05	DCF2(3)
B-1	H-3	6.400E-08	6.400E-08	DCF2(4)
B-1	Np-237+D	5.400E-01	5.400E-01	DCF2(5)
B-1	Pa-231	1.280E+00	1.280E+00	DCF2(6)
B-1	Pb-210+D	2.320E-02	1.360E-02	DCF2(7)
B-1	Pu-238	3.920E-01	3.920E-01	DCF2(8)
B-1	Pu-239	4.290E-01	4.290E-01	DCF2(10)
B-1	Pu-240	4.290E-01	4.290E-01	DCF2(11)
B-1	Ra-226+D	8.594E-03	8.580E-03	DCF2(13)
B-1	Ra-228+D	5.078E-03	4.770E-03	DCF2(14)
B-1	Sr-90+D	1.308E-03	1.300E-03	DCF2(15)
B-1	Th-228+D	3.454E-01	3.420E-01	DCF2(16)
B-1	Th-229+D	2.169E+00	2.150E+00	DCF2(17)
B-1	Th-230	3.260E-01	3.260E-01	DCF2(18)
B-1	Th-232	1.640E+00	1.640E+00	DCF2(19)
B-1	U-233	1.350E-01	1.350E-01	DCF2(20)
B-1	U-234	1.320E-01	1.320E-01	DCF2(21)
B-1	U-235+D	1.230E-01	1.230E-01	DCF2(22)
B-1	U-236	1.250E-01	1.250E-01	DCF2(23)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Ac-227+D	1.480E-02	1.410E-02	DCF3(1)
D-1	Am-241	3.640E-03	3.640E-03	DCF3(2)
D-1	Cs-137+D	5.000E-05	5.000E-05	DCF3(3)
D-1	H-3	6.400E-08	6.400E-08	DCF3(4)
D-1	Np-237+D	4.444E-03	4.440E-03	DCF3(5)
D-1	Pa-231	1.060E-02	1.060E-02	DCF3(6)
D-1	Pb-210+D	7.276E-03	5.370E-03	DCF3(7)
D-1	Pu-238	3.200E-03	3.200E-03	DCF3(8)
D-1	Pu-239	3.540E-03	3.540E-03	DCF3(10)
D-1	Pu-240	3.540E-03	3.540E-03	DCF3(11)
D-1	Ra-226+D	1.321E-03	1.320E-03	DCF3(13)
D-1	Ra-228+D	1.442E-03	1.440E-03	DCF3(14)
D-1	Sr-90+D	1.528E-04	1.420E-04	DCF3(15)
D-1	Th-228+D	8.086E-04	3.960E-04	DCF3(16)
D-1	Th-229+D	4.027E-03	3.530E-03	DCF3(17)
D-1	Th-230	5.480E-04	5.480E-04	DCF3(18)
D-1	Th-232	2.730E-03	2.730E-03	DCF3(19)
D-1	U-233	2.890E-04	2.890E-04	DCF3(20)
D-1	U-234	2.830E-04	2.830E-04	DCF3(21)
D-1	U-235+D	2.673E-04	2.660E-04	DCF3(22)
D-1	U-236	2.690E-04	2.690E-04	DCF3(23)
D-34	Food transfer factors:			
D-34	Ac-227+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(1,1)
D-34	Ac-227+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,2)
D-34	Ac-227+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,3)
D-34				

Dose Conversion Factor (and Related) Parameter Summary (continued)
File: FGR 13 MORBIDITY

Menu	Parameter	Current Value	Base Case*	Parameter Name
D-34	Am-241 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(2,1)
D-34	Am-241 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-05	5.000E-05	RTF(2,2)
D-34	Am-241 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-06	2.000E-06	RTF(2,3)
D-34				
D-34	Cs-137+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(3,1)
D-34	Cs-137+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.000E-02	3.000E-02	RTF(3,2)
D-34	Cs-137+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	8.000E-03	8.000E-03	RTF(3,3)
D-34				
D-34	H-3 , plant/soil concentration ratio, dimensionless	4.800E+00	4.800E+00	RTF(4,1)
D-34	H-3 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.200E-02	1.200E-02	RTF(4,2)
D-34	H-3 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-02	1.000E-02	RTF(4,3)
D-34				
D-34	Np-237+D , plant/soil concentration ratio, dimensionless	2.000E-02	2.000E-02	RTF(5,1)
D-34	Np-237+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(5,2)
D-34	Np-237+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(5,3)
D-34				
D-34	Pa-231 , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(6,1)
D-34	Pa-231 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(6,2)
D-34	Pa-231 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(6,3)
D-34				
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(7,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(7,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(7,3)
D-34				
D-34	Pu-238 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(8,1)
D-34	Pu-238 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(8,2)
D-34	Pu-238 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-06	1.000E-06	RTF(8,3)
D-34				
D-34	Pu-239 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(10,1)
D-34	Pu-239 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(10,2)
D-34	Pu-239 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-06	1.000E-06	RTF(10,3)
D-34				
D-34	Pu-240 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(11,1)
D-34	Pu-240 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(11,2)
D-34	Pu-240 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-06	1.000E-06	RTF(11,3)
D-34				
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(13,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(13,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(13,3)
D-34				
D-34	Ra-228+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(14,1)
D-34	Ra-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(14,2)
D-34	Ra-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(14,3)
D-34				
D-34	Sr-90+D , plant/soil concentration ratio, dimensionless	3.000E-01	3.000E-01	RTF(15,1)
D-34	Sr-90+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-03	8.000E-03	RTF(15,2)
D-34	Sr-90+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-03	2.000E-03	RTF(15,3)
D-34				
D-34	Th-228+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(16,1)
D-34	Th-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(16,2)
D-34	Th-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(16,3)

Dose Conversion Factor (and Related) Parameter Summary (continued)
File: FGR 13 MORBIDITY

Menu	Parameter	Current Value	Base Case*	Parameter Name
D-34	Th-229+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(17,1)
D-34	Th-229+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(17,2)
D-34	Th-229+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(17,3)
D-34				
D-34	Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(18,1)
D-34	Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(18,2)
D-34	Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(18,3)
D-34				
D-34	Th-232 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(19,1)
D-34	Th-232 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(19,2)
D-34	Th-232 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(19,3)
D-34				
D-34	U-233 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(20,1)
D-34	U-233 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(20,2)
D-34	U-233 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(20,3)
D-34				
D-34	U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(21,1)
D-34	U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(21,2)
D-34	U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(21,3)
D-34				
D-34	U-235+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(22,1)
D-34	U-235+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(22,2)
D-34	U-235+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(22,3)
D-34				
D-34	U-236 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(23,1)
D-34	U-236 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(23,2)
D-34	U-236 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(23,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Ac-227+D , fish	1.500E+01	1.500E+01	BIOFAC(1,1)
D-5	Ac-227+D , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(1,2)
D-5				
D-5	Am-241 , fish	3.000E+01	3.000E+01	BIOFAC(2,1)
D-5	Am-241 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(2,2)
D-5				
D-5	Cs-137+D , fish	2.000E+03	2.000E+03	BIOFAC(3,1)
D-5	Cs-137+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(3,2)
D-5				
D-5	H-3 , fish	1.000E+00	1.000E+00	BIOFAC(4,1)
D-5	H-3 , crustacea and mollusks	1.000E+00	1.000E+00	BIOFAC(4,2)
D-5				
D-5	Np-237+D , fish	3.000E+01	3.000E+01	BIOFAC(5,1)
D-5	Np-237+D , crustacea and mollusks	4.000E+02	4.000E+02	BIOFAC(5,2)
D-5				
D-5	Pa-231 , fish	1.000E+01	1.000E+01	BIOFAC(6,1)
D-5	Pa-231 , crustacea and mollusks	1.100E+02	1.100E+02	BIOFAC(6,2)
D-5				
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(7,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(7,2)
D-5				

Dose Conversion Factor (and Related) Parameter Summary (continued)
File: FGR 13 MORBIDITY

Menu	Parameter	Current Value	Base Case*	Parameter Name
D-5	Pu-238 , fish	3.000E+01	3.000E+01	BIOFAC(8,1)
D-5	Pu-238 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(8,2)
D-5				
D-5	Pu-239 , fish	3.000E+01	3.000E+01	BIOFAC(10,1)
D-5	Pu-239 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(10,2)
D-5				
D-5	Pu-240 , fish	3.000E+01	3.000E+01	BIOFAC(11,1)
D-5	Pu-240 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(11,2)
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(13,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(13,2)
D-5				
D-5	Ra-228+D , fish	5.000E+01	5.000E+01	BIOFAC(14,1)
D-5	Ra-228+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(14,2)
D-5				
D-5	Sr-90+D , fish	6.000E+01	6.000E+01	BIOFAC(15,1)
D-5	Sr-90+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(15,2)
D-5				
D-5	Th-228+D , fish	1.000E+02	1.000E+02	BIOFAC(16,1)
D-5	Th-228+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(16,2)
D-5				
D-5	Th-229+D , fish	1.000E+02	1.000E+02	BIOFAC(17,1)
D-5	Th-229+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(17,2)
D-5				
D-5	Th-230 , fish	1.000E+02	1.000E+02	BIOFAC(18,1)
D-5	Th-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(18,2)
D-5				
D-5	Th-232 , fish	1.000E+02	1.000E+02	BIOFAC(19,1)
D-5	Th-232 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(19,2)
D-5				
D-5	U-233 , fish	1.000E+01	1.000E+01	BIOFAC(20,1)
D-5	U-233 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(20,2)
D-5				
D-5	U-234 , fish	1.000E+01	1.000E+01	BIOFAC(21,1)
D-5	U-234 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(21,2)
D-5				
D-5	U-235+D , fish	1.000E+01	1.000E+01	BIOFAC(22,1)
D-5	U-235+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(22,2)
D-5				
D-5	U-236 , fish	1.000E+01	1.000E+01	BIOFAC(23,1)
D-5	U-236 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(23,2)

*Base Case means Default.Lib w/o Associate Nuclide contributions.

Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	5.200E+04	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	5.000E+00	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	1.000E+02	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	1.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	2.500E+01	1.000E+00	---	T(2)
R011	Times for calculations (yr)	5.000E+01	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+02	1.000E+01	---	T(4)
R011	Times for calculations (yr)	not used	3.000E+01	---	T(5)
R011	Times for calculations (yr)	not used	1.000E+02	---	T(6)
R011	Times for calculations (yr)	not used	3.000E+02	---	T(7)
R011	Times for calculations (yr)	not used	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Am-241	1.100E-01	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Cs-137	1.663E+01	0.000E+00	---	S1(3)
R012	Initial principal radionuclide (pCi/g): H-3	5.300E-01	0.000E+00	---	S1(4)
R012	Initial principal radionuclide (pCi/g): Pu-238	6.000E-02	0.000E+00	---	S1(8)
R012	Initial principal radionuclide (pCi/g): Pu-239	2.500E-01	0.000E+00	---	S1(10)
R012	Initial principal radionuclide (pCi/g): Pu-240	2.500E-01	0.000E+00	---	S1(11)
R012	Initial principal radionuclide (pCi/g): Sr-90	5.300E+00	0.000E+00	---	S1(15)
R012	Concentration in groundwater (pCi/L): Am-241	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Cs-137	not used	0.000E+00	---	W1(3)
R012	Concentration in groundwater (pCi/L): H-3	not used	0.000E+00	---	W1(4)
R012	Concentration in groundwater (pCi/L): Pu-238	not used	0.000E+00	---	W1(8)
R012	Concentration in groundwater (pCi/L): Pu-239	not used	0.000E+00	---	W1(10)
R012	Concentration in groundwater (pCi/L): Pu-240	not used	0.000E+00	---	W1(11)
R012	Concentration in groundwater (pCi/L): Sr-90	not used	0.000E+00	---	W1(15)
R013	Cover depth (m)	0.000E+00	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	not used	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	not used	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.660E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	3.300E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	5.000E+03	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	4.900E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	2.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	8.000E+00	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	4.600E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.230E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.600E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.660E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	3.300E-01	4.000E-01	---	TPSZ

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R014	Saturated zone effective porosity	2.400E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	2.000E-01	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	2.000E+04	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	4.800E-03	2.000E-02	---	HGWT
R014	Saturated zone b parameter	4.900E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	1.800E+01	1.000E+01	---	LWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW
R015	Number of unsaturated zone strata	1	1	---	NS
R015	Unsat. zone 1, thickness (m)	0.000E+00	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.660E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	3.300E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.400E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	2.000E-01	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	4.900E+00	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	5.000E+03	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Am-241				
R016	Contaminated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.023E-03	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Cs-137				
R016	Contaminated zone (cm**3/g)	4.600E+03	4.600E+03	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	4.600E+03	4.600E+03	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	4.600E+03	4.600E+03	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.759E-05	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
R016	Distribution coefficients for H-3				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCU(4,1)
R016	Saturated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.718E-01	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
R016	Distribution coefficients for Pu-238				
R016	Contaminated zone (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCC(8)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCU(8,1)
R016	Saturated zone (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCS(8)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.047E-05	ALEACH(8)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(8)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for Pu-239				
R016	Contaminated zone (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCC(10)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCU(10,1)
R016	Saturated zone (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCS(10)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.047E-05	ALEACH(10)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(10)
R016	Distribution coefficients for Pu-240				
R016	Contaminated zone (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCC(11)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCU(11,1)
R016	Saturated zone (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCS(11)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.047E-05	ALEACH(11)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(11)
R016	Distribution coefficients for Sr-90				
R016	Contaminated zone (cm**3/g)	3.000E+01	3.000E+01	---	DCNUCC(15)
R016	Unsaturated zone 1 (cm**3/g)	3.000E+01	3.000E+01	---	DCNUCU(15,1)
R016	Saturated zone (cm**3/g)	3.000E+01	3.000E+01	---	DCNUCS(15)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.687E-03	ALEACH(15)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(15)
R016	Distribution coefficients for daughter Ac-227				
R016	Contaminated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.023E-03	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for daughter Np-237				
R016	Contaminated zone (cm**3/g)	-1.000E+00	-1.000E+00	2.574E+02	DCNUCC(5)
R016	Unsaturated zone 1 (cm**3/g)	-1.000E+00	-1.000E+00	2.574E+02	DCNUCU(5,1)
R016	Saturated zone (cm**3/g)	-1.000E+00	-1.000E+00	2.574E+02	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.143E-04	ALEACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)
R016	Distribution coefficients for daughter Pa-231				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(6)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(6,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(6)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.615E-03	ALEACH(6)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(6)
R016	Distribution coefficients for daughter Pb-210				
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(7)
R016	Unsaturated zone 1 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(7,1)
R016	Saturated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCS(7)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	8.084E-04	ALEACH(7)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for daughter Ra-226				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(13)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(13,1)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(13)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.154E-03	ALEACH(13)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(13)
R016	Distribution coefficients for daughter Ra-228				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(14)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(14,1)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(14)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.154E-03	ALEACH(14)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(14)
R016	Distribution coefficients for daughter Th-228				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(16)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(16,1)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(16)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.349E-06	ALEACH(16)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(16)
R016	Distribution coefficients for daughter Th-229				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(17)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(17,1)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(17)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.349E-06	ALEACH(17)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(17)
R016	Distribution coefficients for daughter Th-230				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(18)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(18,1)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(18)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.349E-06	ALEACH(18)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(18)
R016	Distribution coefficients for daughter Th-232				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(19)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(19,1)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(19)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.349E-06	ALEACH(19)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(19)
R016	Distribution coefficients for daughter U-233				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(20)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(20,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(20)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.615E-03	ALEACH(20)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(20)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for daughter U-234				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(21)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(21,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(21)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.615E-03	ALEACH(21)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(21)
R016	Distribution coefficients for daughter U-235				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(22)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(22,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(22)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.615E-03	ALEACH(22)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(22)
R016	Distribution coefficients for daughter U-236				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(23)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(23,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(23)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.615E-03	ALEACH(23)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(23)
R017	Inhalation rate (m**3/yr)	8.400E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-04	1.000E-04	---	MLINH
R017	Exposure duration	2.500E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	8.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	5.000E-01	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	2.500E-01	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular AREA.	FS
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	1.600E+02	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	1.400E+01	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	4.380E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	7.000E+02	5.100E+02	---	DW1
R018	Contamination fraction of drinking water	1.000E+00	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	not used	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	1.000E+00	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	2.000E-01	-1	---	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	1.000E-05	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	9.000E-01	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	not used	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	1.000E+00	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	7.000E-01	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	1.500E+00	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	not used	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	1.700E-01	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	2.500E-01	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	not used	8.000E-02	---	TE(3)
R19B	Translocation Factor for Non-Leafy	1.000E-01	1.000E-01	---	TIV(1)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R19B	Translocation Factor for Leafy	1.000E+00	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	not used	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	2.000E+01	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
C14	DCF correction factor for gaseous forms of C14	not used	0.000E+00	---	CO2F
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR1
R021	Bulk density of building foundation (g/cm**3)	not used	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	not used	1.000E-01	---	TPFL
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	32	---	---	NPTS
TITL	Maximum number of integration points for dose	17	---	---	LYMAX

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
TITL	Maximum number of integration points for risk	257	---	---	KYMAX

Summary of Pathway Selections

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

Contaminated Zone Dimensions	
Area:	52000.00 square meters
Thickness:	5.00 meters
Cover Depth:	0.00 meters

Initial Soil Concentrations, pCi/g	
Am-241	1.100E-01
Cs-137	1.663E+01
H-3	5.300E-01
Pu-238	6.000E-02
Pu-239	2.500E-01
Pu-240	2.500E-01
Sr-90	5.300E+00

Total Dose TDOSE(t), mrem/yr
Basic Radiation Dose Limit = 1.500E+01 mrem/yr
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

t (years):	0.000E+00	2.500E+01	5.000E+01	1.000E+02
TDOSE(t):	4.488E+01	2.560E+01	1.447E+01	4.733E+00
M(t):	2.992E+00	1.706E+00	9.645E-01	3.155E-01

Maximum TDOSE(t): 4.488E+01 mrem/yr at t = 0.000E+00 years

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	3.077E-03	0.0001	3.684E-03	0.0001	0.000E+00	0.0000	1.390E-02	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	1.312E-02	0.0003
Cs-137	3.505E+01	0.7808	3.967E-05	0.0000	0.000E+00	0.0000	1.144E+00	0.0255	0.000E+00	0.0000	0.000E+00	0.0000	2.700E-02	0.0006
H-3	0.000E+00	0.0000	7.695E-04	0.0000	0.000E+00	0.0000	4.531E-03	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	6.232E-07	0.0000
Pu-238	5.850E-06	0.0000	1.772E-03	0.0000	0.000E+00	0.0000	6.656E-03	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	6.282E-03	0.0001
Pu-239	4.677E-05	0.0000	8.112E-03	0.0002	0.000E+00	0.0000	3.080E-02	0.0007	0.000E+00	0.0000	0.000E+00	0.0000	2.907E-02	0.0006
Pu-240	2.364E-05	0.0000	8.112E-03	0.0002	0.000E+00	0.0000	3.080E-02	0.0007	0.000E+00	0.0000	0.000E+00	0.0000	2.907E-02	0.0006
Sr-90	8.064E-02	0.0018	5.177E-04	0.0000	0.000E+00	0.0000	8.344E+00	0.1859	0.000E+00	0.0000	0.000E+00	0.0000	2.625E-02	0.0006
Total	3.513E+01	0.7827	2.301E-02	0.0005	0.000E+00	0.0000	9.575E+00	0.2133	0.000E+00	0.0000	0.000E+00	0.0000	1.308E-01	0.0029

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	1.020E-02	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	2.824E-04	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.426E-02	0.0010
Cs-137	0.000E+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	3.622E+01	0.8069
H-3	3.970E-03	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	2.537E-04	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.525E-03	0.0002
Pu-238	5.797E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.543E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.472E-02	0.0003
Pu-239	8.070E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.146E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.803E-02	0.0015
Pu-240	2.402E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.394E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.801E-02	0.0015
Sr-90	8.916E-03	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	2.656E-04	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.461E+00	0.1885
Total	2.309E-02	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	8.018E-04	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.488E+01	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 = 2.500E+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.
Am-241	2.674E-03	0.0001	3.201E-03	0.0001	0.000E+00	0.0000	1.208E-02	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	1.140E-02	0.0004
Cs-137	1.966E+01	0.7681	2.225E-05	0.0000	0.000E+00	0.0000	6.419E-01	0.0251	0.000E+00	0.0000	0.000E+00	0.0000	1.515E-02	0.0006
H-3	0.000E+00	0.0000	5.337E-18	0.0000	0.000E+00	0.0000	3.176E-17	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.323E-21	0.0000
Pu-238	4.798E-06	0.0000	1.453E-03	0.0001	0.000E+00	0.0000	5.458E-03	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	5.151E-03	0.0002
Pu-239	4.669E-05	0.0000	8.098E-03	0.0003	0.000E+00	0.0000	3.075E-02	0.0012	0.000E+00	0.0000	0.000E+00	0.0000	2.902E-02	0.0011
Pu-240	2.356E-05	0.0000	8.082E-03	0.0003	0.000E+00	0.0000	3.069E-02	0.0012	0.000E+00	0.0000	0.000E+00	0.0000	2.896E-02	0.0011
Sr-90	4.158E-02	0.0016	2.670E-04	0.0000	0.000E+00	0.0000	4.303E+00	0.1681	0.000E+00	0.0000	0.000E+00	0.0000	1.354E-02	0.0005
Total	1.971E+01	0.7698	2.112E-02	0.0008	0.000E+00	0.0000	5.024E+00	0.1963	0.000E+00	0.0000	0.000E+00	0.0000	1.032E-01	0.0040

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 2.500E+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.
Am-241	4.777E-01	0.0187	0.000E+00	0.0000	0.000E+00	0.0000	1.390E-02	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	5.209E-01	0.0204
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.032E+01	0.7937
H-3	3.511E-17	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.322E-18	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.454E-17	0.0000
Pu-238	1.058E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.076E-09	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.207E-02	0.0005
Pu-239	1.590E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.624E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.791E-02	0.0027
Pu-240	4.650E-09	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.352E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.776E-02	0.0026
Sr-90	2.446E-01	0.0096	0.000E+00	0.0000	0.000E+00	0.0000	7.673E-03	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	4.611E+00	0.1801
Total	7.223E-01	0.0282	0.000E+00	0.0000	0.000E+00	0.0000	2.157E-02	0.0008	0.000E+00	0.0000	0.000E+00	0.0000	2.560E+01	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 = 5.000E+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.
Am-241	2.324E-03	0.0002	2.781E-03	0.0002	0.000E+00	0.0000	1.050E-02	0.0007	0.000E+00	0.0000	0.000E+00	0.0000	9.900E-03	0.0007
Cs-137	1.103E+01	0.7624	1.248E-05	0.0000	0.000E+00	0.0000	3.601E-01	0.0249	0.000E+00	0.0000	0.000E+00	0.0000	8.497E-03	0.0006
H-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	0.000E+00	0.0000
Pu-238	3.935E-06	0.0000	1.191E-03	0.0001	0.000E+00	0.0000	4.475E-03	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	4.224E-03	0.0003
Pu-239	4.662E-05	0.0000	8.084E-03	0.0006	0.000E+00	0.0000	3.069E-02	0.0021	0.000E+00	0.0000	0.000E+00	0.0000	2.897E-02	0.0020
Pu-240	2.347E-05	0.0000	8.053E-03	0.0006	0.000E+00	0.0000	3.058E-02	0.0021	0.000E+00	0.0000	0.000E+00	0.0000	2.886E-02	0.0020
Sr-90	2.144E-02	0.0015	1.377E-04	0.0000	0.000E+00	0.0000	2.219E+00	0.1534	0.000E+00	0.0000	0.000E+00	0.0000	6.982E-03	0.0005
Total	1.105E+01	0.7640	2.026E-02	0.0014	0.000E+00	0.0000	2.655E+00	0.1835	0.000E+00	0.0000	0.000E+00	0.0000	8.743E-02	0.0060

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 5.000E+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.
Am-241	4.292E-01	0.0297	0.000E+00	0.0000	0.000E+00	0.0000	1.251E-02	0.0009	0.000E+00	0.0000	0.000E+00	0.0000	4.672E-01	0.0323
Cs-137	0.000E+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	1.140E+01	0.7879
H-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	0.000E+00	0.0000
Pu-238	3.852E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.121E-08	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.895E-03	0.0007
Pu-239	6.453E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.878E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.780E-02	0.0047
Pu-240	1.795E-08	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.225E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.751E-02	0.0047
Sr-90	2.025E-01	0.0140	0.000E+00	0.0000	0.000E+00	0.0000	6.360E-03	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	2.457E+00	0.1698
Total	6.317E-01	0.0437	0.000E+00	0.0000	0.000E+00	0.0000	1.887E-02	0.0013	0.000E+00	0.0000	0.000E+00	0.0000	1.447E+01	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	1.755E-03	0.0004	2.099E-03	0.0004	0.000E+00	0.0000	7.927E-03	0.0017	0.000E+00	0.0000	0.000E+00	0.0000	7.473E-03	0.0016
Cs-137	3.471E+00	0.7333	3.929E-06	0.0000	0.000E+00	0.0000	1.133E-01	0.0239	0.000E+00	0.0000	0.000E+00	0.0000	2.674E-03	0.0006
H-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	0.000E+00	0.0000
Pu-238	2.648E-06	0.0000	8.011E-04	0.0002	0.000E+00	0.0000	3.009E-03	0.0006	0.000E+00	0.0000	0.000E+00	0.0000	2.840E-03	0.0006
Pu-239	4.646E-05	0.0000	8.056E-03	0.0017	0.000E+00	0.0000	3.059E-02	0.0065	0.000E+00	0.0000	0.000E+00	0.0000	2.887E-02	0.0061
Pu-240	2.330E-05	0.0000	7.994E-03	0.0017	0.000E+00	0.0000	3.035E-02	0.0064	0.000E+00	0.0000	0.000E+00	0.0000	2.865E-02	0.0061
Sr-90	5.703E-03	0.0012	3.661E-05	0.0000	0.000E+00	0.0000	5.901E-01	0.1247	0.000E+00	0.0000	0.000E+00	0.0000	1.857E-03	0.0004
Total	3.479E+00	0.7349	1.899E-02	0.0040	0.000E+00	0.0000	7.753E-01	0.1638	0.000E+00	0.0000	0.000E+00	0.0000	7.236E-02	0.0153

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	3.232E-01	0.0683	0.000E+00	0.0000	0.000E+00	0.0000	9.416E-03	0.0020	0.000E+00	0.0000	0.000E+00	0.0000	3.518E-01	0.0743
Cs-137	0.000E+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	3.587E+00	0.7578
H-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	0.000E+00	0.0000
Pu-238	1.166E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.398E-08	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.654E-03	0.0014
Pu-239	2.415E-09	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.035E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.756E-02	0.0143
Pu-240	6.198E-08	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.805E-09	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.702E-02	0.0142
Sr-90	5.373E-02	0.0114	0.000E+00	0.0000	0.000E+00	0.0000	1.687E-03	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	6.531E-01	0.1380
Total	3.769E-01	0.0796	0.000E+00	0.0000	0.000E+00	0.0000	1.110E-02	0.0023	0.000E+00	0.0000	0.000E+00	0.0000	4.733E+00	1.0000

*Sum of all water independent and dependent pathways.

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

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	2.500E+01	5.000E+01	1.000E+02
Am-241	Am-241	1.000E+00	4.023E-01	4.736E+00	4.247E+00	3.198E+00
Am-241	Np-237+D	1.000E+00	6.145E-07	3.232E-05	6.147E-05	1.081E-04
Am-241	U-233	1.000E+00	2.016E-14	5.266E-11	2.839E-10	1.164E-09
Am-241	Th-229+D	1.000E+00	6.661E-17	5.118E-13	3.776E-12	2.712E-11
Am-241	∑DSR(j)		4.023E-01	4.736E+00	4.248E+00	3.199E+00
Cs-137+D	Cs-137+D	1.000E+00	2.178E+00	1.222E+00	6.854E-01	2.157E-01
H-3	H-3	1.000E+00	1.797E-02	1.406E-16	8.449E-31	0.000E+00
Pu-238	Pu-238	1.840E-09	4.513E-10	3.700E-10	3.034E-10	2.040E-10
Pu-238	Pu-238	1.000E+00	2.453E-01	2.011E-01	1.649E-01	1.109E-01
Pu-238	U-234	1.000E+00	6.213E-08	4.642E-06	1.159E-05	2.792E-05
Pu-238	Th-230	1.000E+00	2.771E-13	4.795E-10	1.741E-09	5.944E-09
Pu-238	Ra-226+D	1.000E+00	5.087E-15	2.551E-10	1.867E-09	1.310E-08
Pu-238	Pb-210+D	1.000E+00	1.761E-15	1.540E-11	2.112E-10	2.734E-09
Pu-238	∑DSR(j)		2.453E-01	2.011E-01	1.649E-01	1.109E-01
Pu-239	Pu-239	1.000E+00	2.721E-01	2.717E-01	2.712E-01	2.702E-01
Pu-239	U-235+D	1.000E+00	2.565E-10	1.345E-08	2.730E-08	5.592E-08
Pu-239	Pa-231	1.000E+00	1.550E-14	3.734E-11	1.781E-10	8.721E-10
Pu-239	Ac-227+D	1.000E+00	3.684E-15	1.710E-11	1.714E-10	1.191E-09
Pu-239	∑DSR(j)		2.721E-01	2.717E-01	2.712E-01	2.702E-01
Pu-240	Pu-240	4.950E-08	1.347E-08	1.342E-08	1.337E-08	1.327E-08
Pu-240	Pu-240	1.000E+00	2.720E-01	2.710E-01	2.700E-01	2.681E-01
Pu-240	U-236	1.000E+00	6.161E-10	5.001E-08	1.337E-07	3.691E-07
Pu-240	Th-232	1.000E+00	7.859E-20	1.449E-16	5.599E-16	2.155E-15
Pu-240	Ra-228+D	1.000E+00	3.964E-20	1.532E-15	7.780E-15	3.557E-14
Pu-240	Th-228+D	1.000E+00	3.262E-21	1.285E-15	7.492E-15	3.600E-14
Pu-240	∑DSR(j)		2.720E-01	2.710E-01	2.700E-01	2.681E-01
Sr-90+D	Sr-90+D	1.000E+00	1.596E+00	8.700E-01	4.635E-01	1.232E-01

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 1.500E+01 mrem/yr

Nuclide (i)	t= 0.000E+00	2.500E+01	5.000E+01	1.000E+02
Am-241	3.728E+01	3.167E+00	3.531E+00	4.690E+00
Cs-137	6.887E+00	1.228E+01	2.189E+01	6.954E+01
H-3	8.346E+02	*9.597E+15	*9.597E+15	*9.597E+15
Pu-238	6.116E+01	7.458E+01	9.096E+01	1.353E+02
Pu-239	5.512E+01	5.522E+01	5.531E+01	5.550E+01
Pu-240	5.514E+01	5.534E+01	5.555E+01	5.596E+01
Sr-90	9.396E+00	1.724E+01	3.236E+01	1.217E+02

*At specific activity limit

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

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Am-241	1.100E-01	26.21 ± 0.05	4.859E+00	3.087E+00	4.023E-01	3.728E+01
Cs-137	1.663E+01	0.000E+00	2.178E+00	6.887E+00	2.178E+00	6.887E+00
H-3	5.300E-01	0.000E+00	1.797E-02	8.346E+02	1.797E-02	8.346E+02
Pu-238	6.000E-02	0.000E+00	2.453E-01	6.116E+01	2.453E-01	6.116E+01
Pu-239	2.500E-01	0.000E+00	2.721E-01	5.512E+01	2.721E-01	5.512E+01
Pu-240	2.500E-01	0.000E+00	2.720E-01	5.514E+01	2.720E-01	5.514E+01
Sr-90	5.300E+00	0.000E+00	1.596E+00	9.396E+00	1.596E+00	9.396E+00

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

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	2.500E+01	5.000E+01	1.000E+02
Am-241	Am-241	1.000E+00	4.426E-02	5.209E-01	4.672E-01	3.518E-01
Np-237	Am-241	1.000E+00	6.760E-08	3.555E-06	6.761E-06	1.189E-05
U-233	Am-241	1.000E+00	2.218E-15	5.793E-12	3.123E-11	1.280E-10
Th-229	Am-241	1.000E+00	7.327E-18	5.629E-14	4.153E-13	2.983E-12
Cs-137	Cs-137	1.000E+00	3.622E+01	2.032E+01	1.140E+01	3.587E+00
H-3	H-3	1.000E+00	9.525E-03	7.454E-17	0.000E+00	0.000E+00
Pu-238	Pu-238	1.840E-09	2.708E-11	2.220E-11	1.820E-11	1.224E-11
Pu-238	Pu-238	1.000E+00	1.472E-02	1.207E-02	9.894E-03	6.652E-03
Pu-238	∑DOSE(j)		1.472E-02	1.207E-02	9.894E-03	6.652E-03
U-234	Pu-238	1.000E+00	3.728E-09	2.785E-07	6.956E-07	1.675E-06
Th-230	Pu-238	1.000E+00	1.663E-14	2.877E-11	1.044E-10	3.567E-10
Ra-226	Pu-238	1.000E+00	3.052E-16	1.530E-11	1.120E-10	7.863E-10
Pb-210	Pu-238	1.000E+00	1.057E-16	9.239E-13	1.267E-11	1.640E-10
Pu-239	Pu-239	1.000E+00	6.803E-02	6.791E-02	6.780E-02	6.756E-02
U-235	Pu-239	1.000E+00	6.412E-11	3.362E-09	6.825E-09	1.398E-08
Pa-231	Pu-239	1.000E+00	3.875E-15	9.334E-12	4.452E-11	2.180E-10
Ac-227	Pu-239	1.000E+00	9.210E-16	4.276E-12	4.285E-11	2.978E-10
Pu-240	Pu-240	4.950E-08	3.366E-09	3.354E-09	3.342E-09	3.317E-09
Pu-240	Pu-240	1.000E+00	6.801E-02	6.776E-02	6.751E-02	6.702E-02
Pu-240	∑DOSE(j)		6.801E-02	6.776E-02	6.751E-02	6.702E-02
U-236	Pu-240	1.000E+00	1.540E-10	1.250E-08	3.343E-08	9.228E-08
Th-232	Pu-240	1.000E+00	1.965E-20	3.623E-17	1.400E-16	5.388E-16
Ra-228	Pu-240	1.000E+00	9.911E-21	3.829E-16	1.945E-15	8.893E-15
Th-228	Pu-240	1.000E+00	8.155E-22	3.213E-16	1.873E-15	8.999E-15
Sr-90	Sr-90	1.000E+00	8.461E+00	4.611E+00	2.457E+00	6.531E-01

THF(i) is the thread fraction of the parent nuclide.

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	2.500E+01	5.000E+01	1.000E+02
Am-241	Am-241	1.000E+00	1.100E-01	9.557E-02	8.303E-02	6.267E-02
Np-237	Am-241	1.000E+00	0.000E+00	8.276E-07	1.540E-06	2.679E-06
U-233	Am-241	1.000E+00	0.000E+00	4.574E-11	1.720E-10	6.093E-10
Th-229	Am-241	1.000E+00	0.000E+00	3.654E-14	2.789E-13	2.035E-12
Cs-137	Cs-137	1.000E+00	1.663E+01	9.329E+00	5.234E+00	1.647E+00
H-3	H-3	1.000E+00	5.300E-01	3.685E-15	2.215E-29	0.000E+00
Pu-238	Pu-238	1.840E-09	1.104E-10	9.052E-11	7.422E-11	4.990E-11
Pu-238	Pu-238	1.000E+00	6.000E-02	4.920E-02	4.034E-02	2.712E-02
Pu-238	∑S(j):		6.000E-02	4.920E-02	4.034E-02	2.712E-02
U-234	Pu-238	1.000E+00	0.000E+00	3.777E-06	6.725E-06	1.072E-05
Th-230	Pu-238	1.000E+00	0.000E+00	4.422E-10	1.638E-09	5.645E-09
Ra-226	Pu-238	1.000E+00	0.000E+00	1.612E-12	1.205E-11	8.440E-11
Pb-210	Pu-238	1.000E+00	0.000E+00	2.725E-13	3.589E-12	4.025E-11
Pu-239	Pu-239	1.000E+00	2.500E-01	2.496E-01	2.491E-01	2.483E-01
U-235	Pu-239	1.000E+00	0.000E+00	6.028E-09	1.181E-08	2.266E-08
Pa-231	Pu-239	1.000E+00	0.000E+00	1.584E-12	6.162E-12	2.333E-11
Ac-227	Pu-239	1.000E+00	0.000E+00	3.427E-13	2.229E-12	1.250E-11
Pu-240	Pu-240	4.950E-08	1.237E-08	1.233E-08	1.228E-08	1.220E-08
Pu-240	Pu-240	1.000E+00	2.500E-01	2.491E-01	2.482E-01	2.464E-01
Pu-240	∑S(j):		2.500E-01	2.491E-01	2.482E-01	2.464E-01
U-236	Pu-240	1.000E+00	0.000E+00	1.810E-07	3.542E-07	6.783E-07
Th-232	Pu-240	1.000E+00	0.000E+00	1.124E-16	4.432E-16	1.723E-15
Ra-228	Pu-240	1.000E+00	0.000E+00	6.122E-17	3.195E-16	1.455E-15
Th-228	Pu-240	1.000E+00	0.000E+00	4.686E-17	2.819E-16	1.372E-15
Sr-90	Sr-90	1.000E+00	5.300E+00	2.733E+00	1.409E+00	3.748E-01

THF(i) is the thread fraction of the parent nuclide.

RESCALC.EXE execution time = 67.95 seconds

Appendix D
Concrete Slab Survey Results Summary

Radiological Survey and Dose Assessment Summary
FHWMF Building Foundations/Structures

Building Foundation	SU No.	No. Measurement Locations	Avg Dose Rate (μR/hr) Year 0	Avg Dose Rate (μR/hr) Year 50	Projected Annual Dose (mrem/yr) Year 50[1]
Bldg 444	1	41	10.2	3.2	6.4
Bldg 444	2	32	6.8	2.1	4.3
Bldg 444 Avg.			8.7	2.7	**5.5**
Bldg 445	1	30	6.6	2.1	4.2
Bldg 445	2	17	4.0	1.2	2.5
Bldg 445	3	27	2.2	0.7	1.4
Bldg 445	4	30	1.2	0.4	0.7
Bldg 445 Avg.			3.5	1.1	**2.2**
Bldg 446	1	15	7.7	2.4	4.8
Bldg 446	2	50	7.3	2.3	4.6
Bldg 446 Avg.			7.4	2.3	**4.7**
Bldg 447 Avg.	1	30	1.3	0.4	**0.8**
Bldg 448	1	30	7.0	2.2	4.4
Bldg 448	2	30	5.6	1.8	3.5
Bldg 448	3	20	8.6	2.7	5.4
Bldg 448 Avg.			6.8	2.2	**4.3**
Structure (Area C/E) Avg.	1	24	9.3	2.9	**5.9**

[1] Based on an occupancy factor of 1.0 (2000 hours per year) for an industrial worker.

Appendix E
Oak Ridge Institute for Science and Education (ORISE) Independent Verification Survey and Sampling Report

ORISE
OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

September 29, 2005

Ms. Terri Kneitel
Brookhaven Group
U.S. Department of Energy
Building 464
P.O. Box 5000
Upton, NY 11973-5000

DOE CONTRACT NO. DE-AC05-00OR22750
SUBJECT: FINAL IN-PROCESS VERIFICATION SURVEY REPORT FOR THE FORMER HAZARDOUS WASTE MANAGEMENT FACILITY, BROOKHAVEN NATIONAL LABORATORY, UPTON, NEW YORK

Dear Ms. Kneitel:

The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) has prepared a final report for the Former Hazardous Waste Management Facility (FHWMF) at the Brookhaven National Laboratory in Upton, New York. Please find enclosed the subject document with your comments incorporated.

Please direct any questions you may have to me at (865) 576-5321 or Scott Kirk at (865) 574-0685.

Sincerely,

Phyllis C. Weaver
Project Leader/Health Physicist
Environmental Survey and
Site Assessment Program

PCW:db

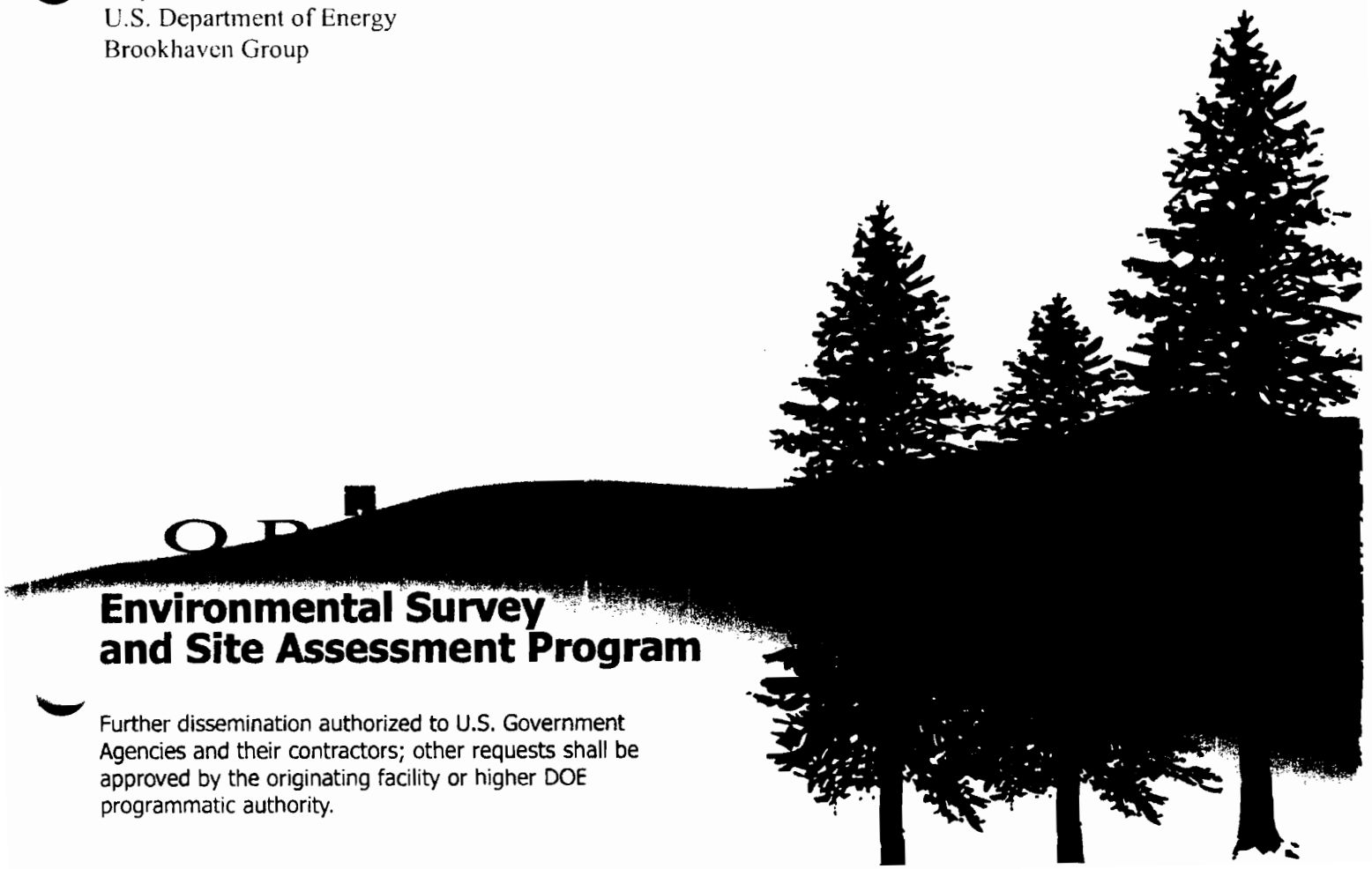
Attachment

cc: R. Rimondo, DOE/Brookhaven Group
L. Hill, DOE/Brookhaven Group
A. Boerner, ORISE/ESSAP
E. Abelquist, ORISE/ESSAP
S. Kirk, ORISE/ESSAP
File/0438

IN-PROCESS VERIFICATION SURVEY REPORT FOR THE FORMER HAZARDOUS WASTE MANAGEMENT FACILITY BROOKHAVEN NATIONAL LABORATORY UPTON, NEW YORK

P. C. WEAVER

Prepared for the
U.S. Department of Energy
Brookhaven Group



Environmental Survey and Site Assessment Program

The Oak Ridge Institute for Science and Education (ORISE) is a U.S. Department of Energy facility focusing on scientific initiatives to research health risks from occupational hazards, assess environmental cleanup, respond to radiation medical emergencies, support national security and emergency preparedness, and educate the next generation of scientists. ORISE is managed by Oak Ridge Associated Universities. Established in 1946, ORAU is a consortium of 91 colleges and universities.

NOTICES

IN-PROCESS VERIFICATION SURVEY REPORT FOR THE FORMER HAZARDOUS WASTE MANAGEMENT FACILITY BROOKHAVEN NATIONAL LABORATORY UPTON, NEW YORK

Prepared by

P. C. Weaver

Environmental Survey and Site Assessment Program
Oak Ridge Institute for Science and Education
Oak Ridge, Tennessee 37831-0117

Prepared for the

U.S. Department of Energy
Brookhaven Group

FINAL REPORT

SEPTEMBER 2005

Oak Ridge Institute for Science and Education performs complementary work under contract number DE-AC05-00OR22750 with the U.S. Department of Energy.

IN-PROCESS VERIFICATION SURVEY REPORT
FOR THE
FORMER HAZARDOUS WASTE MANAGEMENT FACILITY
BROOKHAVEN NATIONAL LABORATORY
UPTON, NEW YORK

Prepared by: _____ Date: 9/27/05
Phyllis Weaver, Project Leader
Environmental Survey and Site Assessment Program

Reviewed by: _____ Date: 9/28/05
Scott Kirk, Survey Projects Manager
Environmental Survey and Site Assessment Program

Reviewed by: _____ Date: 9/28/05
R. D. Condra, Laboratory Manager
Environmental Survey and Site Assessment Program

Reviewed by: _____ Date: 9/29/05
A. T. Payne, Quality Manager
Environmental Survey and Site Assessment Program

Reviewed by: _____ Date: 9/29/05
E. W. Abelquist, Program Director
Environmental Survey and Site Assessment Program

ACKNOWLEDGMENTS

The author would like to acknowledge the significant contributions of the following staff members:

FIELD STAFF

T. L. Brown
T. D. Herrera

LABORATORY STAFF

R. D. Condra
J. S. Cox
W. P. Ivey
W. F. Smith

CLERICAL STAFF

D. K. Boody
K. L. Pond
A. Ramsey

ILLUSTRATORS

T. D. Herrera

TABLE OF CONTENTS

PAGE

LIST OF FIGURES

LIST OF TABLES

ABBREVIATIONS AND ACRONYMS

AEC	Atomic Energy Commission
AOC	Area of Concern
BNL	Brookhaven National Laboratory
BSO	Brookhaven Site Office
cm	centimeter
cpm	counts per minute
DOE	U.S. Department of Energy
EMC	Elevated Measurement Comparison
ERDA	Energy Research and Development Administration
ESSAP	Environmental Survey and Site Assessment Program
FHWMF	former hazardous waste management facility
FSS	final status survey
ISOCS	*In Situ* Object Counting System
ITP	Intercomparison Testing Program
IVO	independent verification organization
ISM	integrated safety management
JHA	job hazard analysis
MAPEP	Mixed Analyte Performance Evaluation Program
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDC	minimum detectable concentration
MeV	million electron volts
m	meter
m^2	square meter
mrem/y	millirem per year
NaI	sodium iodide
NIST	National Institute of Standards and Technology
NRIP	NIST Radiochemistry Intercomparison Program
NYSDEC	New York State Department of Environmental Conservation
ORISE	Oak Ridge Institute for Science and Education
pCi/g	picocuries per gram
RCRA	Resource Conservation and Recovery Act
TAP	total absorption peak

IN-PROCESS VERIFICATION SURVEY REPORT
FOR THE
FORMER HAZARDOUS WASTE MANAGEMENT FACILITY
BROOKHAVEN NATIONAL LABORATORY
UPTON, NEW YORK

INTRODUCTION AND SITE HISTORY

Established in 1947, Brookhaven National Laboratory (BNL) has designed, built, and operated many research facilities for the scientific community. Formerly operated by the U.S. Army as Camp Upton during World Wars I and II and between the wars by the Civilian Conservation Corps, the site was transferred to the Atomic Energy Commission (AEC) in 1947, to the Energy Research and Development Administration (ERDA) in 1975, and to the U.S. Department of Energy (DOE) in 1977. While the site continues to carry out its DOE mission, legacy environmental restoration activities are also being conducted.

BNL has conducted remediation of contaminated soils at the Former Hazardous Waste Management Facility (FHWMF), in Area of Concern (AOC) 1. The FHWMF is located in the southeastern portion of the site and is comprised of approximately 12 acres. The FHWMF was used during the period between 1947 and 1997 as the central receiving facility for storage, processing, and limited treatment of radioactive, hazardous, and mixed waste generated at BNL. From 1992 to 1998, the FHWMF was operated as a Resource Conservation and Recovery Act (RCRA) permitted facility. Throughout the years of operation the site has handled solvents, waste oils, solids, caustics, ignitable waste, and various laboratory chemicals. While under U.S. Army occupation the site was used as a munitions storage area and livery stable. Along the northwestern portion of the FHWMF is a shallow wetland consisting of approximately 2 acres. This is a federal wetland under the Clean Water Act regulated by the New York State Department of Environmental Conservation (NYSDEC) as a breeding ground for the tiger salamander. All above grade structures and pavement with activity above the cleanup guidelines have been removed (BNL 2004a).

DOE's Brookhaven Site Office (BSO) is responsible for oversight of the AOC 1 remedial action activities. It is the policy of the DOE to perform independent (third party) verification of

remedial action. The purpose of these independent verifications is to confirm that remedial actions have been effective in meeting established site-specific guidelines and that the documentation accurately and adequately describes the radiological conditions at the site. The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) has been designated by the DOE as the organization responsible for this task at the Brookhaven National Laboratory, and has been requested to verify the current radiological status of the cleanup activities associated with the BNL AOC 1.

SITE DESCRIPTION

Brookhaven National Laboratory, situated on 5,265 acres of land owned by the DOE, is located in Suffolk County, New York (Figure 1). The FHWMF contains approximately 12 acres of land with approximately 2 acres of seasonal wetlands that border the FHWMF along the northwestern portion of the site (Figure 2). The previously developed site contained several facilities of both above-grade (buildings) and sub-grade structures for processing and storing wastes. Sub-grade structures consisted of metal containment pits, concrete vaults, and trenches (BNL 2004b). The FHWMF has been divided into survey units and classified based on the guiding principles in the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) (BNL 2004b and NRC 2000). The western two-thirds of the FHWMF consist of thirteen Class 1 areas and two Class 2 areas (BNL 2005a).

OBJECTIVES

The objective of the verification survey was to verify that remedial actions were effective through field survey and documentation review that the established site guidelines for the FHWMF have been met.

DOCUMENT REVIEW

ESSAP reviewed documentation provided by BNL associated with remediation of the FHWMF. A preliminary final status survey package summarizing the radiological status of the FHWMF was reviewed for the preparation of the verification survey plan (BNL 2005b). The remedial implementation and sampling plans for the entire FHWMF site including the wetlands were also

reviewed (BNL 2004a and b). Information was evaluated to assure that areas identified as exceeding the site release criteria have undergone decontamination and that residual activity levels satisfy the established radiological release criteria.

PROCEDURES

ESSAP conducted in-process verification surveys of the FHWMF during the periods of April 19 through 20, June 13 through 16, and August 9 through 11, 2005 at the request of the DOE BSO. The requests for verification surveys were made as remediated areas became available. The survey team performed visual inspections, measurements, and obtained surface soil samples. Verification survey activities were conducted in accordance with the site-specific survey plan submitted to and approved by the DOE, and the ORISE/ESSAP Survey Procedures and Quality Assurance Manuals (ORISE 2005a, 2004, and 2005b).

REFERENCE SYSTEM

The reference grid previously established by the contractor was not identifiable. Prominent site and structural features were used for referencing measurement and sampling locations.

SURFACE SCANS

Gamma surface scans were performed in 75 to 100 percent of accessible areas in the available Class 1 survey units and up to 50 percent of Class 2 survey units for verification. Class 1 survey units included all A survey units, C-1 to C-3, D-1 to D-6, and K-1 to K-4 survey units (Figure 3). Class 2 survey units included Z-1, Z-2, and Z-3 (Figure 3). Gamma scans were also performed on existing building pads. Gamma scans were performed using 1.25" by 1.5" NaI scintillation detectors coupled to ratemeters with audible indicators (Appendix A). Locations of elevated gamma radiation equal to or exceeding the field action level of 30,000 cpm were marked for further investigation. The action level for the NaI detector was approximately equivalent to the 67 pCi/g site guideline for Cs-137.

SOIL SAMPLING

ESSAP collected 119 soil samples typically from a depth of 0 to 15 cm. Sample locations were both randomly selected and based on judgment (where elevated gamma radiation levels were identified by surface scans) (Figures 4 and 5). On average, at least six samples per survey unit were collected from each Class 1 survey unit. Soil samples 001 through 007 were obtained from the wetlands portion of the FHWMF during the initial sampling period (April 19 to 20, 2005). The water level in the wetlands ranged from shallow to approximately a meter in depth. Because of safety concerns, the actual samples were collected by the BNL contractor while ESSAP observed and labeled each sample. Samples 008 through 072 were obtained during the second sampling campaign (June 13 through 16, 2005) from survey unit A, C-1 through C-3, D-1 through D-6, and Z-1 and Z-2 survey units. The last campaign (August 9 through 11, 2005) included re-sampling of previous locations identified by laboratory analysis as having Cs-137 concentrations greater than the elevated measurement concentration and at locations where the NaI post sampling count rate remained high (074 – 083 and 119). Sample 073 was not a re-sample but was collected from an area on the north side of the 448 pad in survey unit Z-1 that had been excavated after the ESSAP June 2005 survey effort. Samples 084 through 118 were collected from the K-1 through K-4 and Z-3 survey units during the August survey.

ESSAP and the BNL contractor split samples (a divided aliquot of the same sample) during the June 2005 effort in survey units C-2 through C-3, D-1 through D-6, and Z-1 and Z-2. During the re-sample effort conducted by ESSAP, split samples were made available for the BNL contractor.

SAMPLE ANALYSIS AND DATA INTERPRETATION

Radiological samples and data were returned to the ORISE/ESSAP laboratory in Oak Ridge, Tennessee, for analysis and interpretation. Radiological sample analyses were performed in accordance with the ORISE/ESSAP Laboratory Procedures Manual (ORISE 2005c). Soil samples were analyzed primarily for Cs-137 by gamma spectroscopy; however, the spectra were reviewed for other identifiable total absorption peaks (photopeaks) (Appendix A and B). In

accordance with the survey plan, gamma spectroscopy results, and contractor information, samples were selected randomly for Sr-90 analysis using wet chemistry procedures. The results were reported in picocuries per gram (pCi/g).

All radiological data and results were compared with the approved release criteria established for this project. Data and samples collected, as part of this survey, are currently archived by ESSAP until the final project report is approved by the BSO.

The predominant radionuclides of concern for the FHWMF area are Cs-137 and Sr-90. The cleanup goal for the project is based on a total dose limit of 15 mrem/y above background under an industrial use scenario after 50 years of institutional controls. Soil sample data were compared to the following site specific release criteria: Cs-137 (67 pCi/g), Sr-90 (15 pCi/g), and Ra-226 (5 pCi/g) as specified in the BNL implementation plan and approved by DOE (BNL 1999). The maximum Cs-137 hot spot criteria (or elevated measurement concentration) for a 1 m^2 area is 200 pCi/g.

FINDINGS AND RESULTS

DOCUMENT REVIEW

ESSAP reviewed the BNL Remedial Action Field Sampling Plan and determined that the final status survey (FSS) generally followed the guidance provided in the plan to demonstrate compliance with the guidelines. The expectation is that surface activity (0-15 cm) would meet the established criteria with few, if any, additional areas requiring remediation. Documentation of sample analysis data and walkover count rate data were provided by the contractor prior to ESSAP's verification survey in June (BNL 2005a). The data provided indicated that the contractor had met the project-specific criteria. A review of this final status survey data summary for the FHWMF did not indicate any areas having Cs-137 concentrations exceeding the criteria. However, in survey units A, D-3, and D-4 the maximum Sr-90 concentrations determined by BNL were 20.1, 32.1, and 81.1 pCi/g, respectively (BNL 2005a). These results exceed the 15 pCi/g guideline for Sr-90 used for other site projects at BNL. The summary consisted of a table of composite and individual soil sample results. ESSAP did not receive a

final status survey report prior to the preparation of this document.

SURFACE SCANS

Gamma surface scans were performed within the boundary fence of the wetlands and FHWMF. Surface scans of the wetlands were performed after the initial sampling campaign in April. Typically, the wetlands retain water throughout the year, but by June the water had evaporated allowing ESSAP unlimited access. Gamma activity in the wetlands ranged from 6,000 to 24,000 cpm. The wetlands are a part of the A survey unit. Activity in the remaining survey unit A areas also ranged from 6,000 to 24,000 cpm.

During the period of survey activities from June 13 through 19, ESSAP scanned Class 1 survey units C-1 through C-3 and D-1 through D-6, and Class 2 survey units Z-1 (excluding the boundary control station and adjacent area) and Z-2. Gamma scans identified activity ranging from 4,000 to 300,000 cpm in the Class 1 survey units. The highest reading was identified in a core hole located on the former Building 448 Pad in survey unit A. Gamma scan activity in Class 2 survey units ranged from 4,000 to 420,000 cpm. The highest gamma activity was detected on the asphalt in the southern section of survey unit Z-2 (Class 2). This asphalt area is located near the south entry gate just in front of the 445 Pad. The affected area consisted of approximately 60 to 80 m^2.

ESSAP conducted scans of the remaining survey units K-1 through K-4 and survey unit Z-3 (north and south) during the period of August 9 through 11, 2005. Initial scans identified several locations above the field action level in survey units K-1, K-2, K-3, and Z-3 north that were marked for either additional investigation or sampling. The contractor decided to remediate most of these locations to expedite the verification while ESSAP was present. Gamma scan activity prior to remediation ranged from 4,000 to 170,000 cpm. The highest activity was identified in survey unit K-1. After remediation the gamma scan activity ranged from approximately 4,000 to 28,000 cpm.

RADIONUCLIDE CONCENTRATIONS IN SOIL

The primary radionuclide of concern at the FHWMF is Cs-137 based upon previous characterization information and the results of the contractor's sampling effort during remedial activities. Sr-90 was present as a mixed fission product in numerous waste streams that were processed at the former facility. Therefore, Sr-90 analysis was performed on selected samples where the Cs-137 concentrations were significantly greater than background and for samples where the contractor indicated that higher Sr-90 concentrations had been identified. Table 1 provides the radionuclide concentrations in the soil samples collected in all survey units for the radionuclides of interest. Also included in Table 1 are the BNL contractor's comparison gamma spectroscopy results using the ISOCS methodology. All samples were analyzed by gamma spectroscopy. Thirty-seven of these samples were selected for analyses to determine Sr-90 concentrations. Sample selection for Sr-90 was based upon samples with a Cs-137 concentration greater than 200 pCi/g as well as information per the BNL contractor results that identified particular areas within a survey unit as having higher Sr-90 concentrations than Cs-137. Radionuclide concentrations in soils ranged from 0.04 to 2550 pCi/g for Cs-137, -0.64 to 64.1 pCi/g for Sr-90, and 0.17 to 1.35 pCi/g for Ra-226. In soil sample 118 collected from the horseshoe area in K-4, gamma spectroscopy analysis identified 490 pCi/g of depleted uranium. All other sample uranium results were within background ranges.

In June 2005 when ESSAP conducted the initial scanning survey, several locations were determined to have exceeded the Cs-137 criteria. Upon returning to the site in August 2005 to complete in-process verification efforts, ESSAP selected eleven of the previous locations that had either a Cs-137 concentration exceeding the 200 pCi/g or had a post sampling NaI count rate measurement that was greater than 30,000 cpm (Table 2). The radionuclide concentrations for Cs-137 ranged from 2.81 to 437 pCi/g; Sr-90 concentration ranged from -0.10 to 9.35 pCi/g; and Ra-226 concentrations ranged from 0.45 to 1.26 pCi/g. Three of the eleven samples were selected for Sr-90 analysis based on information received from the contractor.

COMPARISON OF RESULTS WITH GUIDELINES

Verification survey data results were compared with the DOE-approved site-specific release criteria established for the BNL (BNL 2004a). Cs-137 is the dominant radiological contaminant; however, Sr-90 was present as a mixed fission product in a variety of waste streams.

Gamma spectroscopy results of the seventy-two samples collected in April and June of 2005 from survey units A, C-1 through C-3, D-1 through D-6, and Z-1 and Z-2, identified eleven samples that ranged from 262.9 to 2550 pCi/g for Cs-137 (Table 1). Four of the highest concentrations were identified in survey unit C-1. All Sr-90 results for these samples were below the 15 pCi/g guideline. Ten of the eleven locations were re-sampled in August 2005 to determine if additional remediation by BNL removed or reduced the initial radionuclide concentrations. A visual inspection at each of these locations identified several where it appeared that no additional remediation had been performed prior to ORISE arrival. The Cs-137 concentrations ranged from 2.81 to 437 pCi/g (Table 2). The two locations (074 and 075) previously identified were noted as still having Cs-137 concentrations exceeding the 200 pCi/g Elevated Measurement Comparison (EMC) guideline after the re-sampling effort. Samples 074 and 075 in survey unit C-1 represent previous sample locations 009 and 011, respectively. BNL performed additional remediation at these locations. This process revealed that contamination was often greater than 15 cm below the soil surface and covered an area of at least a square meter in size. Because of time constraints ESSAP did not take additional samples; instead additional post-remediation NaI count rate measurements were obtained. The count rate (after the additional removal of soil) decreased from 60,000 to 22,000 cpm for sample 074 (below the field action level) and from 105,000 to 8,000 cpm for sample 075.

The BNL comparison results from split sampling are also provided in Table 1. Comparison data is available only for samples 019 through 072. Sample results between ESSAP and BNL were not statistically equivalent, possibly a result of the inability to completely homogenize a sample in the field. It is likely that radioactivity was not evenly distributed during the blending. Therefore, either of these split samples could have contained a greater concentration of radioactivity.

Although sample collection was initiated in April 2005, scans of the FHWMF did not begin until the survey effort in June. During this period, ESSAP indicated to DOE and BNL that gamma activity on an area on the 448 Pad was found to be approximately 300,000 cpm[1]. BNL conducted additional remediation and removed soil from the northwest portion of the pad to a depth of at least a half meter. Sample 073 collected from that excavation location had a Cs-137 concentration of 149.5 pCi/g, less than the 200 pCi/g hot spot guideline, and a Sr-90 concentration of 64.1 pCi/g. This is the only sample that had a Sr-90 concentration greater than 15 pCi/g. The ESSAP post sample count rate was 44,000 cpm. Additional soil and concrete was removed from that location after which ESSAP obtained a post-remediation count rate of 26,000 cpm inferring that the concentration of the radionuclide of concern is below the Cs-137 guideline of 67 pCi/g.

The results for the remaining soils collected from survey units K-1 through K-4 and Z-3 (north and south) were below the site-specific guidelines for the radionuclides of concern. Sample 118 was the only anomaly identified containing 490 pCi/g of depleted uranium. BNL was informed by ESSAP of this finding through correspondence with the DOE. BNL responded by removing additional soil and collecting samples to document that the remediation effort was successful (BNL 2005b and c).

Several locations of elevated radioactivity were identified in the Class 2 survey unit Z-2. These locations were marked and identified to the BNL contractor. Soil samples were not obtained at these locations because they were on an asphalt surface. However, ESSAP rescanned these locations post-remediation. These measurements were less than the field action levels, averaging 10,000 cpm.

SUMMARY

At the request of the Department of Energy Brookhaven Site Office, the Environmental Survey and Site Assessment Program of the Oak Ridge Institute for Science and Education conducted

[1] Note: The former building pads were not initially in the scope of the verification.

verification survey activities of the Former Hazardous Waste Management Facility at the Brookhaven National Laboratory in Upton, New York. Verification activities included document and data reviews, independent surface scans, surface activity measurements, and soil sampling during the periods of April 19 through 20, June 13 through 16, and August 9 through 11, 2005. The initial visit in April addressed sampling the wetlands area which was at the time under water and was expected to remain under water during the remainder of the remediation and final status surveys. The remaining visits included the scanning and sampling of sixteen survey units. Survey units verified by ESSAP included A areas, C-1 through C-3, D-1 through D-4, K-1 through K-4, and Z-1 through Z-3 (north and south areas). Scans identified numerous locations throughout the site that were above the field action level. Numerous locations were marked for either additional investigation, sampling, or remediation. The surface activity in Class 1 area soils ranged from 4,000 to 300,000 cpm. Several locations were identified in a Class 2 survey unit above the field action level. Surface activity ranged from 4,000 to 420,000 cpm. ESSAP's responsibility in the verification process is not to perform characterization of the area. Therefore, there is a potential for contamination above the guideline to exist on the surface as well as below the surface. Note: Not all areas of contamination identified by ESSAP were sampled or bounded during the verification surveys.

ESSAP collected 119 samples, 26 exceeded the average Cs-137 guideline and eleven of these samples indicated radionuclide concentrations above the EMC level. However, BNL's reported final survey data indicated that no areas exhibited Cs-137 levels above the release criteria. Therefore, ESSAP is not able to confirm that BNL's documentation adequately describes the existing radiological conditions in the FHWMF. During ESSAP's re-evaluation of areas that were sampled in June, additional contamination above the guideline was identified. BNL remediated the contaminated areas identified by the ESSAP survey. However, given the number of samples identified as exceeding the release criteria, and the necessary remediation that followed each independent verification sampling campaign, it is ESSAP's opinion that additional contamination at levels greater than the release criteria are likely, particularly in subsurface soils.

FIGURES

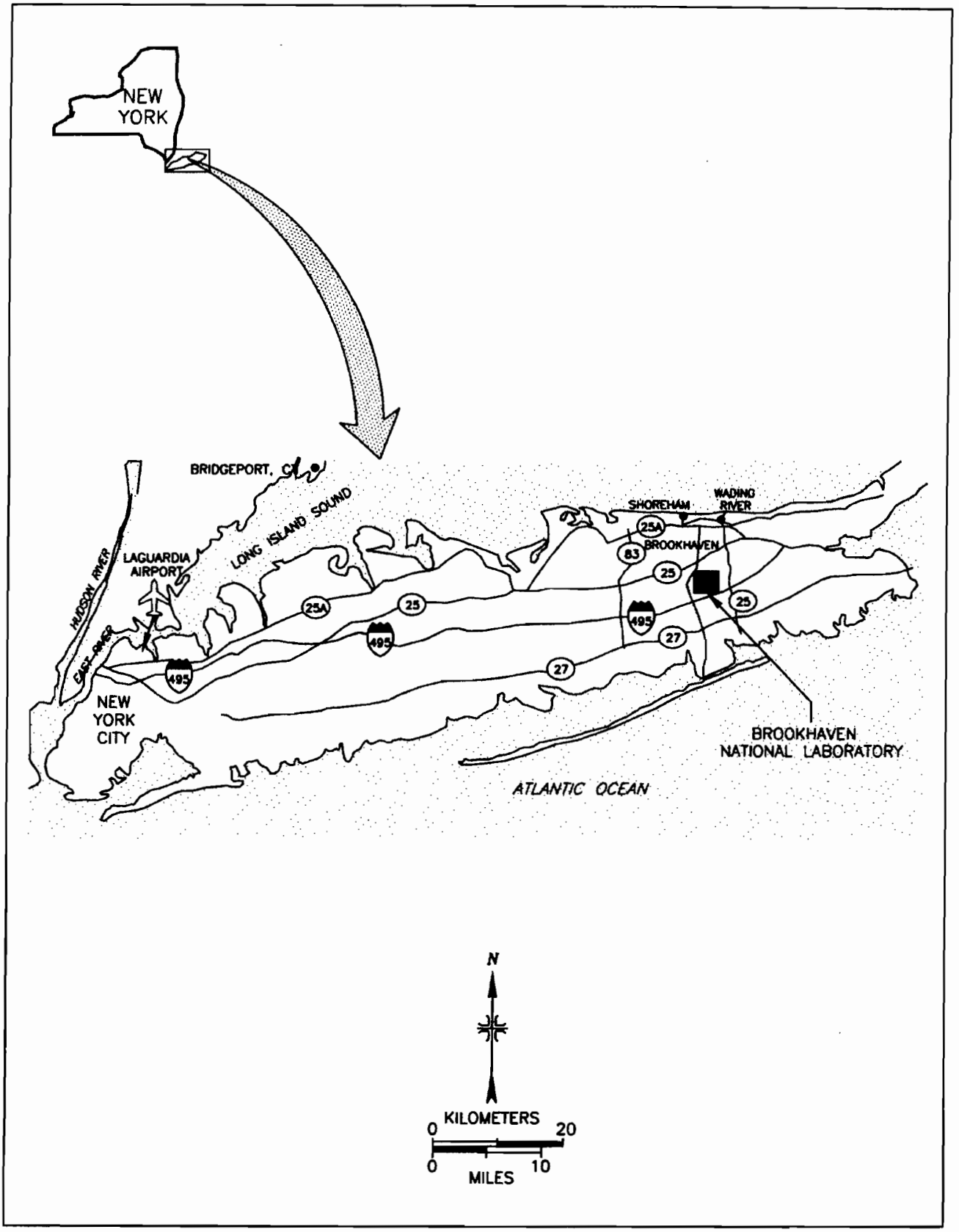


FIGURE 1: Location of Brookhaven National Laboratory, Upton, New York

420-002 (2)

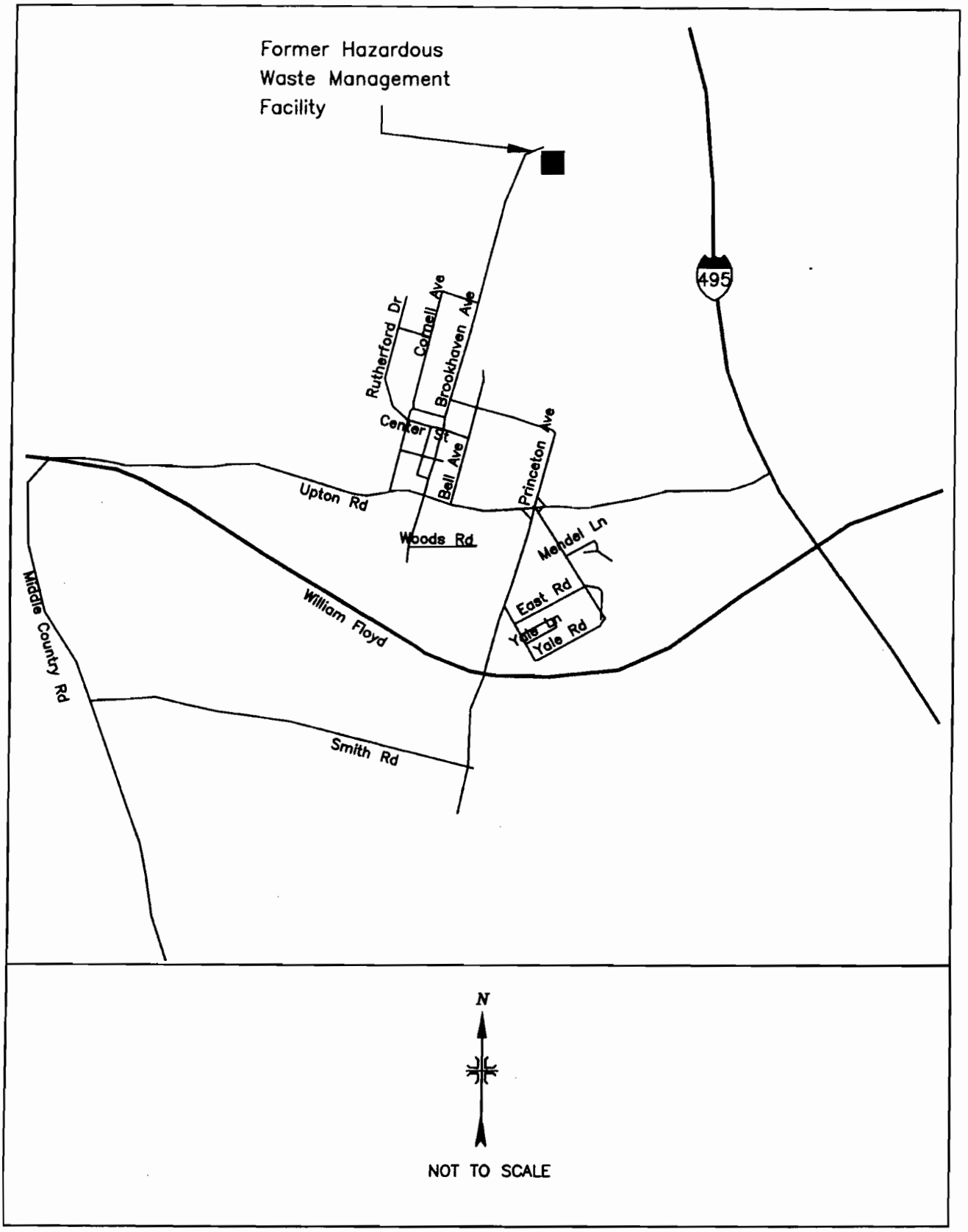


FIGURE 2: Location of the Former Hazardous Waste Management Facility – Upton, New York

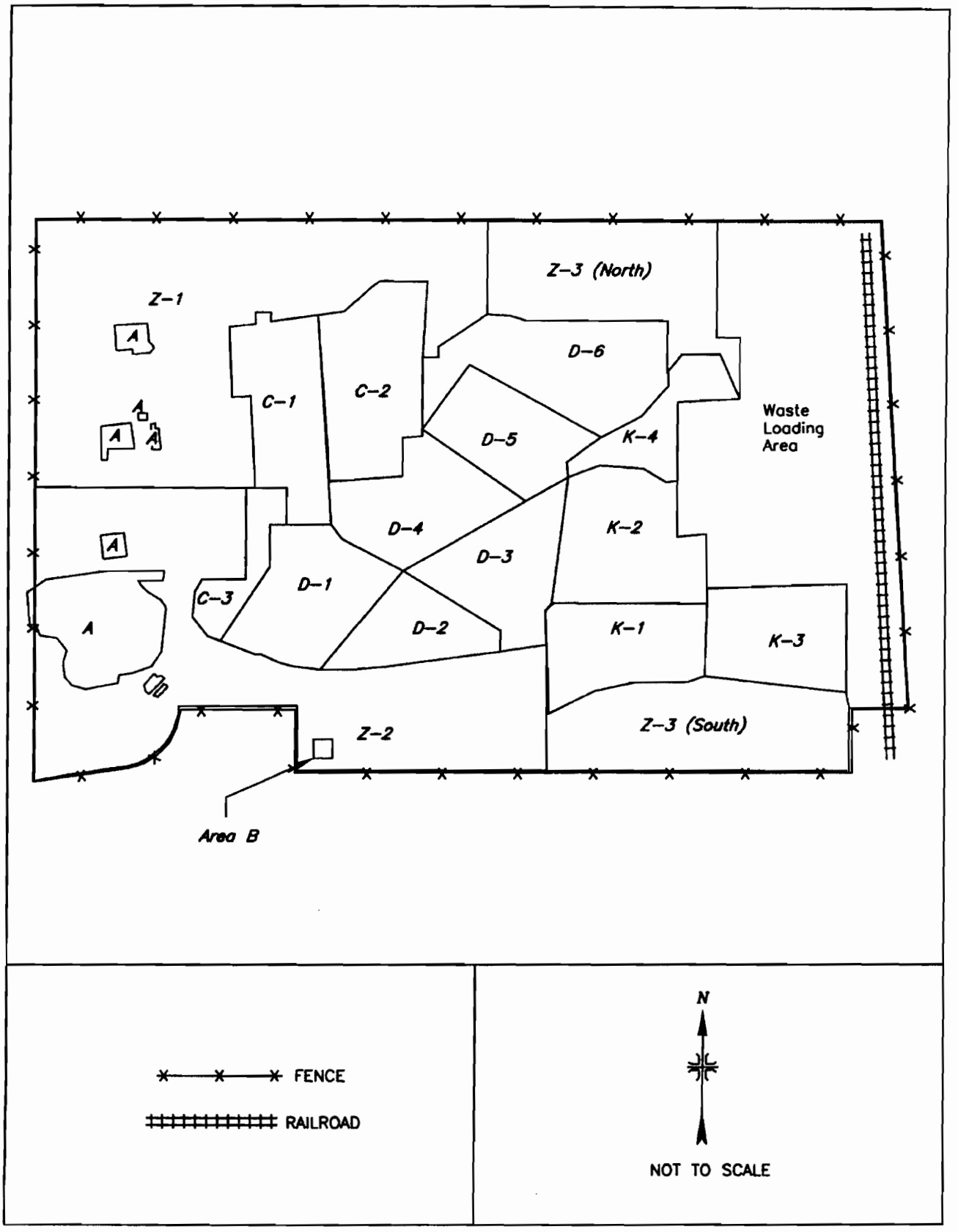


FIGURE 3: Plot Plan of the Former Hazardous Waste Management Facility

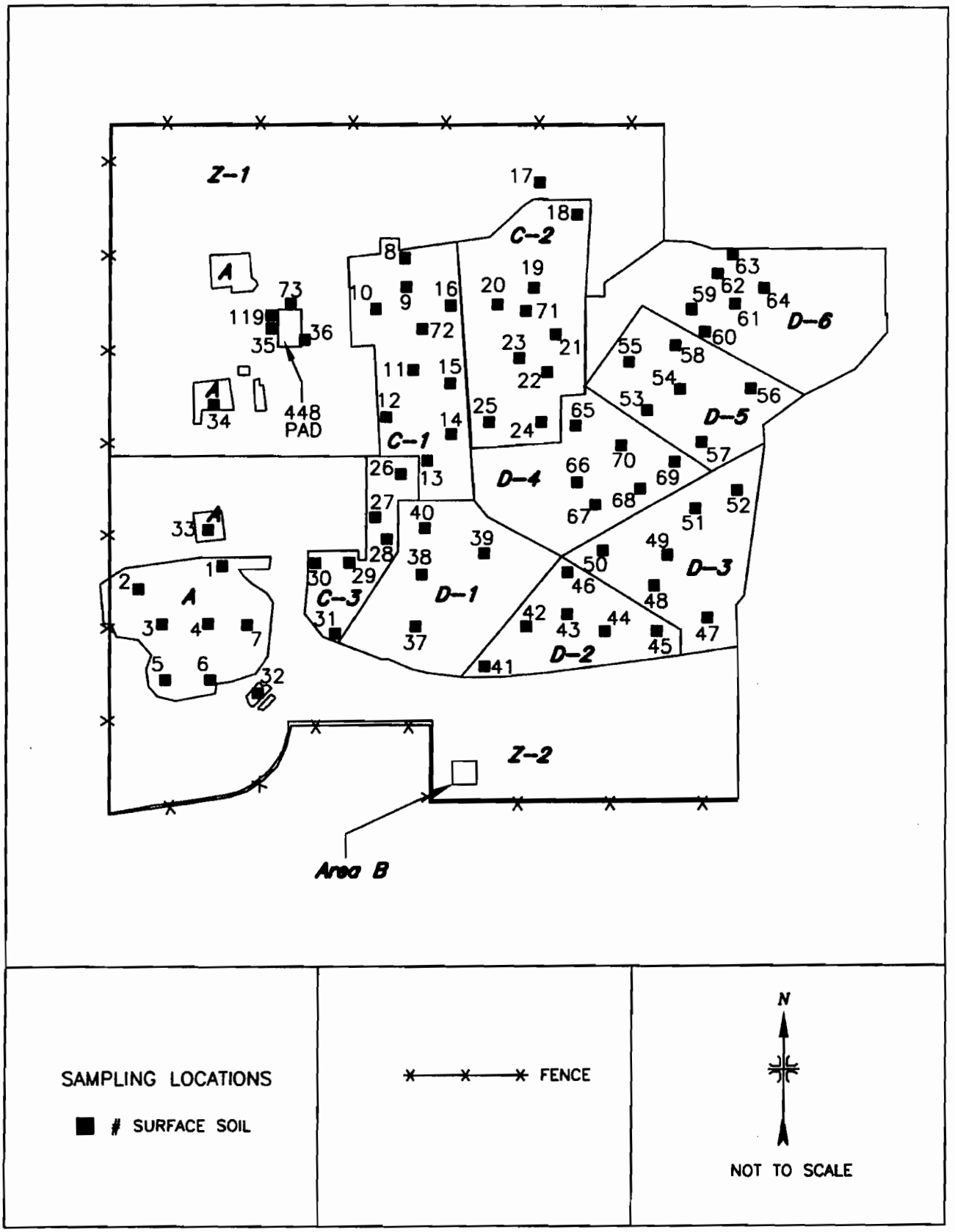


FIGURE 4: Former Hazardous Waste Management Facility, Survey Units A, C-1 to C-3 D-1 to D-6, and Z-1 to Z-2 - Sampling Locations

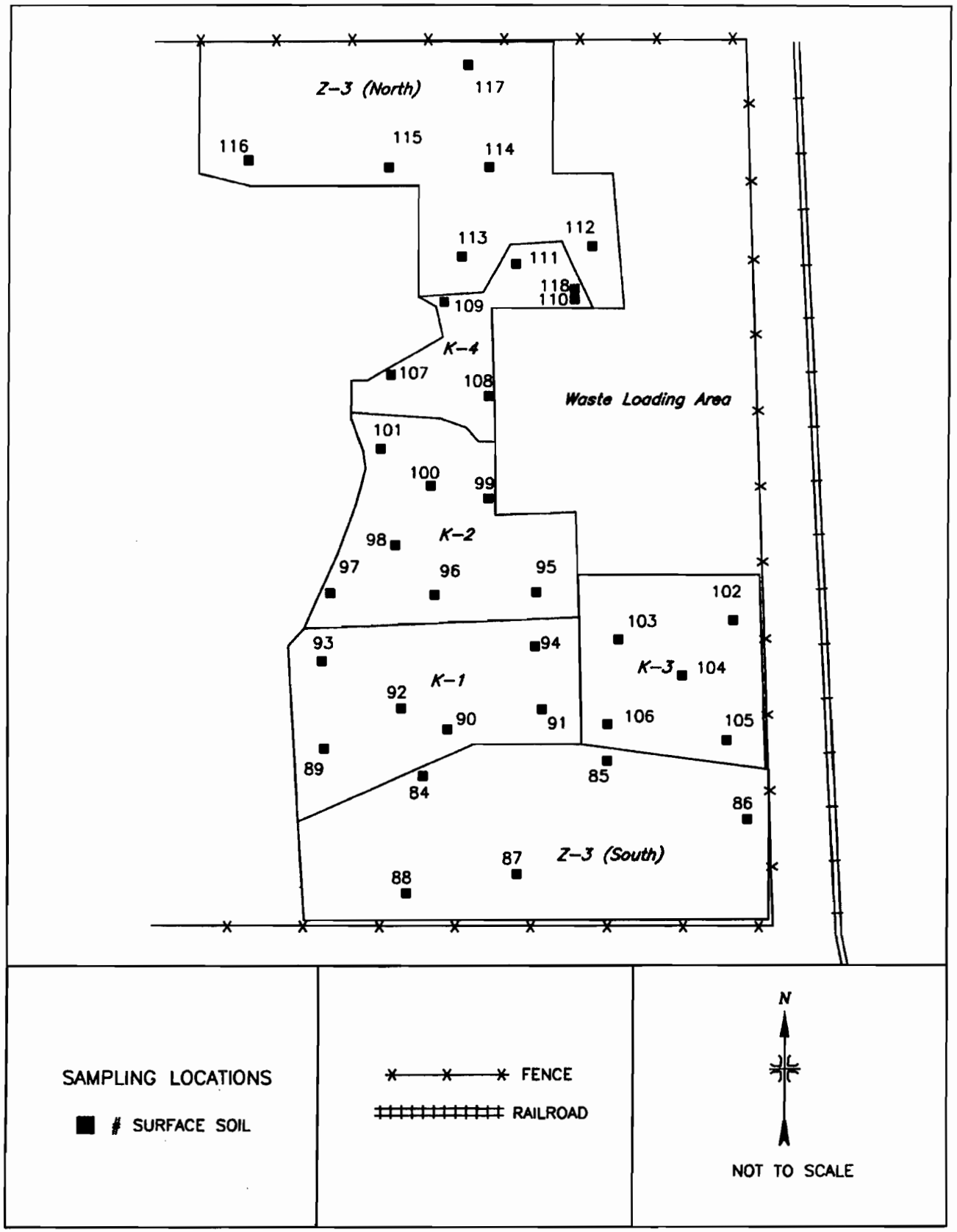


FIGURE 5: Former Hazardous Waste Management Facility, Survey Units K-1 to K-4 and Z-3 North and South – Sampling Locotions

TABLES

TABLE 1

RADIONUCLIDE CONCENTRATIONS IN SOIL
FORMER HAZARDOUS WASTE MANAGEMENT FACILITY
BROOKHAVEN NATIONAL LABORATORY
UPTON, NEW YORK

Sample No.[a]	Radionuclide Concentration (pCi/g)			
	ESSAP Cs-137	BNL Cs-137	Sr-90	Ra-226
Survey Unit A (Wetlands)				
001	20.60 ± 0.71	NS[b]	0.66 ± 0.27	0.37 ± 0.14
002	8.43 ± 0.31	NS	0.41 ± 0.26	0.45 ± 0.09
003	10.46 ± 0.34	NS	0.19 ± 0.25	0.41 ± 0.09
004	5.79 ± 0.21	NS	--[c]	0.42 ± 0.08
005	2.88 ± 0.13	NS	--	0.53 ± 0.08
006	8.66 ± 0.32	NS	0.65 ± 0.26	0.47 ± 0.11
007	2.92 ± 0.12	NS	--	0.53 ± 0.07
Survey Unit C-1				
008	95.6 ± 3.2	NS	-0.13 ± 0.28	0.17 ± 0.40
009	669 ± 22	NS	4.06 ±0.43	0.61 ± 0.96
010	5.72 ± 0.22	NS	0.44 ± 0.26	0.54 ± 0.08
011	1496 ± 47	NS	1.62 ± 0.33	1.00 ± 1.10
012	47.9 ± 1.5	NS	0.74 ± 0.28	0.45 ± 0.15
013	274.8 ± 8.4	NS	0.56 ± 0.30	0.69 ± 0.63
014	0.10 ± 0.03	NS	1.90 ± 0.34	0.58 ± 0.06
015	2550 ± 83	NS	0.68 ± 0.23	1.30 ± 2.00
016	8.00 ± 0.31	NS	0.52 ± 0.23	0.68 ± 0.13
Survey Unit Z-1				
017	62.0 ± 2.0	NS	1.05 ± 0.26	0.74 ± 0.25
Survey Unit C-2				
018	407 ± 13	NS	8.03 ± 0.56	1.22 ± 0. 95
019	145.6 ± 4.8	139.8	9.85 ± 0.63	1.35 ± 0.41
020	0.16 ± 0.03	0.8	0.18 ± 0.20	0.81 ± 0.08
021	158.8 ± 4.9	119.3	0.59 ± 0.22	0.95 ± 0.40
022	755 ± 25	1369.7	1.45 ± 0.32	1.06 ± 0.72
023	21.33 ± 0.74	34.3	1.79 ± 0.36	0.82 ± 0.14
024	0.47 ± 0.04	0.9	0.13 ± 0.26	0.61 ± 0.06
025	2.27 ± 0.12	3.2	0.00 ± 0.27	0.59 ± 0.09
Survey Unit C-3				
026	2.81 ± 0.13	3.5	-0.20 ± 0.25	0.54 ± 0.07
027	111.2 ± 3.7	105.2	2.47 ± 0.37	0.58 ± 0.25

TABLE 1 (Continued)

RADIONUCLIDE CONCENTRATIONS IN SOIL
FORMER HAZARDOUS WASTE MANAGEMENT FACILITY
BROOKHAVEN NATIONAL LABORATORY
UPTON, NEW YORK

Sample No.[a]	Radionuclide Concentration (pCi/g)			
	ESSAP Cs-137	BNL Cs-137	Sr-90	Ra-226
Survey Unit C-3 (Continued)				
028	323 ± 11	432.0	-0.09 ± 0.27	0.45 ± 0.45
029	105.4 ± 3.5	79.8	1.20 ± 0.29	0.32 ± 0.28
030	78.0 ± 2.5	52.2	1.90 ± 0.33	0.71 ± 0.24
031	7.78 ± 0.30	5.8	1.48 ± 0.31	0.40 ± 0.09
Survey Unit A				
032	0.36 ± 0.04	1.1	--	0.34 ± 0.04
033	0.45 ± 0.04	1.5	--	0.42 ± 0.05
034	85.6 ± 2.9	63.2	--	0.77 ± 0.30
Survey Unit Z-1				
035	262.9 ± 8.6	307.3	--	0.40 ± 0.36
036	108.3 ± 3.6	157.5	--	0.65 ± 0.32
Survey Unit D-1				
037	90.4 ± 3.0	80.4	--	0.40 ± 0.24
038	107.8 ± 3.6	87.9	--	0.78 ± 0.40
039	0.04 ± 0.03	1.1	--	0.50 ± 0.07
040	54.4 ± 1.7	213.7	--	0.30 ± 0.23
Survey Unit D-2				
041	0.25 ± 0.04	0.0	--	0.36 ± 0.06
042	123.3 ± 3.7	25.6	--	0.30 ± 0.27
043	361 ± 11	61.2	--	0.51 ± 0.49
044	13.09 ± 0.51	0.0	--	0.70 ± 0.12
045	4.36 ± 0.16	0.0	--	0.50 ± 0.08
046	0.21 ± 0.03	1.8	--	0.48 ± 0.07
Survey Unit D-3				
047	66.8 ± 2.1	54.1	--	0.76 ± 0.26
048	40.4 ± 1.4	32.2	--	0.56 ± 0.16
049	295.9 ± 9.7	279.7	--	1.25 ± 0.55
050	25.77 ± 0.86	25.8	--	0.31 ± 0.13
051	18.69 ± 0.70	14.6	--	0.66 ± 0.21
052	45.4 ± 1.5	35.1	--	0.66 ± 0.19

TABLE 1 (Continued)

RADIONUCLIDE CONCENTRATIONS IN SOIL
FORMER HAZARDOUS WASTE MANAGEMENT FACILITY
BROOKHAVEN NATIONAL LABORATORY
UPTON, NEW YORK

Sample No.[a]	Radionuclide Concentration (pCi/g)			
	ESSAP Cs-137	BNL Cs-137	Sr-90	Ra-226
Survey Unit D-5				
053	54.3 ± 1.8	56.2	--	0.70 ± 0.24
054	16.78 ± 0.56	0.7	--	0.53 ± 0.09
055	7.37 ± 0.29	3.1	--	0.57 ± 0.11
056	1.53 ± 0.08	4.1	--	0.23 ± 0.05
057	4.59 ± 0.20	4.8	--	0.93 ± 0.11
058	1.74 ± 0.09	2.9	--	0.61 ± 0.07
Survey Unit D-6				
059	129.2 ± 4.3	114.0	--	0.52 ± 0.30
060	2.33 ± 0.11	4.7	--	0.51 ± 0.07
061	5.93 ± 0.24	6.5	--	0.58 ± 0.09
062	433 ± 14	546.1	--	0.98 ± 0.84
063	1.38 ± 0.07	3.1	--	0.65 ± 0.07
064	3.51 ± 0.14	3.4	--	0.38 ± 0.06
Survey Unit D-4				
065	0.26 ± 0.03	2.0	--	0.61 ± 0.06
066	95.8 ± 3.0	82.2	--	0.24 ± 0.23
067	0.18 ± 0.03	1.7	0.83 ± 0.26	0.45 ± 0.06
068	160.4 ± 4.9	93.6	--	0.47 ± 0.37
069	0.10 ± 0.03	1.6	--	0.51 ± 0.08
070	3.35 ± 0.14	3.3	3.05 ± 0.40	0.26 ± 0.06
Survey Unit C-2				
071	1.03 ± 0.07	2.4	4.18 ± 0.43	0.66 ± 0.08
Survey Unit C-1				
072	1.21 ± 0.08	1.8	0.30 ± 0.21	0.89 ± 0.09
Survey Unit Z-1				
073	149.5 ± 5.2	NS	64.1 ± 2.4	0.87 ± 0.54
Survey Unit Z-3 (South)				
084	41.2 ± 1.4	NS	--	0.59 ± 0.16
085	1.40 ± 0.08	NS	--	0.57 ± 0.08
086	2.51 ± 0.12	NS	--	0.27 ± 0.05
087	12.23 ± 0.45	NS	--	0.48 ± 0.13

TABLE 1 (Continued)

RADIONUCLIDE CONCENTRATIONS IN SOIL
FORMER HAZARDOUS WASTE MANAGEMENT FACILITY
BROOKHAVEN NATIONAL LABORATORY
UPTON, NEW YORK

Sample No.[a]	Radionuclide Concentration (pCi/g)			
	ESSAP Cs-137	BNL Cs-137	Sr-90	Ra-226
Survey Unit Z-3 (South) (Continued)				
088	6.97 ± 0.28	NS	--	0.59 ± 0.11
Survey Unit K-1				
089	21.09 ± 0.69	NS	--	0.80 ± 0.12
090	10.03 ± 0.37	NS	--	0.75 ± 0.11
091	11.25 ± 0.38	NS	--	0.45 ± 0.10
092	0.33 ± 0.04	NS	--	0.65 ± 0.08
093	0.67 ± 0.05	NS	--	0.50 ± 0.07
094	1.54 ± 0.09	NS	--	0.40 ± 0.07
Survey Unit K-2				
095	2.50 ± 0.12	NS	--	0.50 ± 0.07
096	1.36 ± 0.09	NS	--	0.43 ± 0.07
097	1.25 ± 0.08	NS	--	0.49 ± 0.07
098	0.10 ± 0.03	NS	--	0.51 ± 0.06
099	34.8 ± 1.1	NS	--	0.44 ± 0.13
100	1.87 ± 0.09	NS	--	0.32 ± 0.06
101	52.9 ± 1.7	NS	3.10 ± 0.43	0.50 ± 0.12
Survey Unit K-3				
102	0.23 ± 0.04	NS	--	0.43 ± 0.07
103	0.78 ± 0.06	NS	--	0.41 ± 0.06
104	0.45 ± 0.04	NS	--	0.29 ± 0.04
105	1.25 ± 0.08	NS	--	0.58 ± 0.06
106	0.05 ± 0.02	NS	--	0.50 ± 0.05
Survey Unit K-4				
107	33.8 ± 1.1	NS	-0.64 ± 0.34	0.61 ± 0.11
108	3.21 ± 0.15	NS	--	0.46 ± 0.08
109	1.14 ± 0.08	NS	--	0.67 ± 0.08
110	0.21 ± 0.03	NS	--	0.57 ± 0.06
111	4.97 ± 0.20	NS	--	0.57 ± 0.09
Survey Unit Z-3 (North)				
112	1.99 ± 0.10	NS	--	0.61 ± 0.08
113	0.28 ± 0.03	NS	--	0.43 ± 0.06

TABLE 1 (Continued)
RADIONUCLIDE CONCENTRATIONS IN SOIL
FORMER HAZARDOUS WASTE MANAGEMENT FACILITY
BROOKHAVEN NATIONAL LABORATORY
UPTON, NEW YORK

Sample No.[a]	Radionuclide Concentration (pCi/g)			
	ESSAP Cs-137	BNL Cs-137	Sr-90	Ra-226
Survey Unit Z-3 (North) (Continued)				
114	46.6 ± 1.5	NS	--	0.53 ± 0.13
115	8.26 ± 0.32	NS	--	0.74 ± 0.11
116	3.54 ± 0.16	NS	--	0.66 ± 0.09
117	0.28 ± 0.03	NS	--	0.61 ± 0.06
Survey Unit K-4				
118	0.12 ± 0.14	NS	0.07 ± 0.24	0.42 ± 0.22

[a]Refer to Figures 4 and 5.
[b]NS = not sampled.
[c]--Analysis not performed.

TABLE 2

RADIONUCLIDE CONCENTRATIONS IN SOIL AT RE-SAMPLED LOCATIONS FORMER HAZARDOUS WASTE MANAGEMENT FACILITY BROOKHAVEN NATIONAL LABORATORY UPTON, NEW YORK

Sample No.	Location	Radionuclide Concentration (pCi/g)		
		Cs-137	Sr-90[c]	Ra-226
074	C-1 (009)[b]	304 ± 10	--	0.48 ± 0.76
075	C-1 (011)	437 ± 14	--	0.96 ± 0.77
076	C-1 (015)	2.97 ± 0.14	--	0.77± 0.09
077	C-2 (018)	35.0 ± 1.2	--	0.87 ± 0.18
078	C-2 (022)	25.56 ± 0.88	--	0.45 ± 0.15
079	C-3 (028)	97.9 ± 3.0	--	0.47 ± 0.19
080	D-1 (040)	2.81 ± 0.13	--	0.48 ± 0.07
081	D-4 (068)	25.57 ± 0.78	--	0.45 ± 0.13
082	D-3 (049)	42.6 ± 1.4	9.35 ± 0.68	0.49 ± 0.18
083	D-6 (062)	76.9 ± 2.5	1.00 ± 0.33	0.74 ± 0.20
119[a]	Z-1 (West edge of 448 pad) (035)	58.5 ± 1.8	-0.10 ± 0.33	1.26 ± 0.19

[a]Refer to figure 4.
[b]() indicates previous sample location.
[c]--Analysis not performed.

REFERENCES

Brookhaven National Laboratory (BNL). Record of Decision Operable Unit I and Radiologically Contaminated Soils (including areas of concern 6, 8, 10, 16, 17, and 18). Upton, NY; August 25, 1999.

Brookhaven National Laboratory. Remedial Design Implementation Plan. Operable Unit 1 Area of Concern 1 Former Hazardous Waste Management Facility. Upton, NY; March 26, 2004a.

Brookhaven National Laboratory. Remedial Action Field Sampling Plan. Area of Concern 1 Former Hazardous Waste Management Facility. Upton, NY; August 10, 2004b.

Brookhaven National Laboratory. Handout—Preliminary Final Status Survey Package—FHWMF Remediation Site. Brookhaven National Laboratory. Upton, NY; June 2, 2005a.

Brookhaven National Laboratory. E-mail from T. Daniels to P. Weaver "FHWMF project FSH260142-20730" September 1, 2005b.

Brookhaven National Laboratory. E-mail from T. Kneitel to P. Weaver "Photo of Post-Excavation Hot Spot 118" August 30, 2005c.

Oak Ridge Institute for Science and Education (ORISE). Survey Procedures Manual for the Environmental Survey and Site Assessment Program. Oak Ridge, Tennessee; September 2, 2004.

Oak Ridge Institute for Science and Education. Verification Survey Plan for the Former Hazardous Waste Management Facility. Oak Ridge, Tennessee; June 9, 2005a.

Oak Ridge Institute for Science and Education. Quality Assurance Manual for the Environmental Survey and Site Assessment Program. Oak Ridge, Tennessee; July 29, 2005b.

Oak Ridge Institute for Science and Education. Laboratory Procedures Manual for the Environmental Survey and Site Assessment Program. Oak Ridge, Tennessee; June 20, 2005c.

U.S. Nuclear Regulatory Commission (NRC). Multiagency Radiation Survey and Site Investigation Manual (MARSSIM) Revision 1. Washington D.C.; NUREG-1575; August 2000.

APPENDIX A

MAJOR INSTRUMENTATION

APPENDIX A

MAJOR INSTRUMENTATION

The display of a specific product is not to be construed as an endorsement of the product or its manufacturer by the author or employer.

SCANNING INSTRUMENT/DETECTOR COMBINATIONS

Ludlum Model 12
(Ludlum Measurements, Inc., Sweetwater, TX)
coupled to
Victoreen NaI Scintillation Detector Model 489-55, Crystal: 3.2 cm x 3.8 cm
(Victoreen, Cleveland, OH)

LABORATORY ANALYTICAL INSTRUMENTATION

Low Background Gas Proportional Counter
Model LB-5100-W
(Canberra/Tennelec, Oak Ridge, TN)

High Purity Extended Range Intrinsic Detector
CANBERRA/Tennelec Model No: ERVDS30-25195
(Canberra, Meriden, CT)
Used in conjunction with:
Lead Shield Model G-11
(Nuclear Lead, Oak Ridge, TN) and
Multichannel Analyzer
DEC ALPHA Workstation
(Canberra, Meriden, CT)

High Purity Extended Range Intrinsic Detector
Model No. GMX-45200-5
(AMETEK/ORTEC, Oak Ridge, TN)
used in conjunction with:
Lead Shield Model SPG-16-K8
(Nuclear Data)
Multichannel Analyzer
DEC ALPHA Workstation
(Canberra, Meriden, CT)

LABORATORY ANALYTICAL INSTRUMENTATION (CONTINUED)

High-Purity Germanium Detector
Model GMX-30-P4, 30% Eff.
(AMETEK/ORTEC, Oak Ridge, TN)
Used in conjunction with:
Lead Shield Model G-16
(Gamma Products, Palos Hills, IL) and
Multichannel Analyzer
DEC ALPHA Workstation
(Canberra, Meriden, CT)

APPENDIX B

SURVEY AND ANALYTICAL PROCEDURES

APPENDIX B
SURVEY AND ANALYTICAL PROCEDURES

PROJECT HEALTH AND SAFETY

The proposed survey and sampling procedures were evaluated to ensure that any hazards inherent to the procedures themselves were addressed in current job hazard analyses (JHAs). All survey and laboratory activities were conducted in accordance with ORISE health and safety and radiation protection procedures.

A walkdown of the survey areas was performed in order to evaluate and identify potential health and safety issues. BNL provided general site-specific safety awareness, fall protection, and confined space training. Verification survey activities were performed according to ORISE generic health and safety plan requirements, a site-specific integrated safety management (ISM) pre-job hazard checklist, and the safety procedures discussed during the training provided by BNL.

QUALITY ASSURANCE

Analytical and field survey activities were conducted in accordance with procedures from the following documents of the Environmental Survey and Site Assessment Program:

- Survey Procedures Manual (September 2004)
- Laboratory Procedures Manual (June 2005)
- Quality Assurance Manual (July 2005)

The procedures contained in these manuals were developed to meet the requirements of Department of Energy (DOE) Order 414.1C and the U.S. Nuclear Regulatory Commission *Quality Assurance Manual for the Office of Nuclear Material Safety and Safeguards* and contain measures to assess processes during their performance.

Quality control procedures include:

- Daily instrument background and check-source measurements to confirm that equipment operation is within acceptable statistical fluctuations.

- Participation in MAPEP, NRIP, and ITP Laboratory Quality Assurance Programs.
- Training and certification of all individuals performing procedures.
- Periodic internal and external audits.

SURVEY PROCEDURES

Surface Scans

The scan minimum detectable concentrations (MDCs) for the NaI scintillation detector for the contaminants of concern in surface soil were obtained directly from NUREG-1507 when available. The scan MDCs provided in NUREG-1507[1], are 10.4 pCi/g for Cs-137 and 4.5 pCi/g for Ra-226. In such a case, it is standard procedure for ESSAP staff to pause and investigate any locations where gamma radiation is distinguishable from background levels.

ANALYTICAL PROCEDURES

Strontium 90 Analyses

Soil samples are dissolved by a combination of potassium hydrogen fluoride and pyrosulfate fusions. The fusion cake was dissolved and strontium was coprecipitated on lead sulfate. The strontium was separated from residual calcium and lead by reprecipitating strontium sulfate from EDTA at a pH of 4.0. Strontium was separated from barium by complexing the strontium in DTPA while precipitating barium as barium chromate. The strontium was ultimately converted to strontium carbonate and counted on a low-background gas proportional counter. The typical MDC of the procedure is 0.8 pCi/g for a one hour count time.

Gamma Spectroscopy

Samples of soil were dried, mixed, crushed, and/or homogenized as necessary, and a portion sealed in a 0.5-liter Marinelli beaker or other appropriate container. The quantity placed in the beaker was chosen to reproduce the calibrated counting geometry. Net material weights were determined and the samples counted using intrinsic germanium detectors coupled to a pulse

[1]NUREG-1507. Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions. US Nuclear Regulatory Commission. Washington, DC; June 1998.

height analyzer system. Background and Compton stripping, peak search, peak identification, and concentration calculations were performed using the computer capabilities inherent in the analyzer system. All total absorption peaks (TAP) associated with the radionuclides of concern were reviewed for consistency of activity. Total absorption peaks used for determining the activities of radionuclides of concern and the typical associated MDCs for a one-hour count time were:

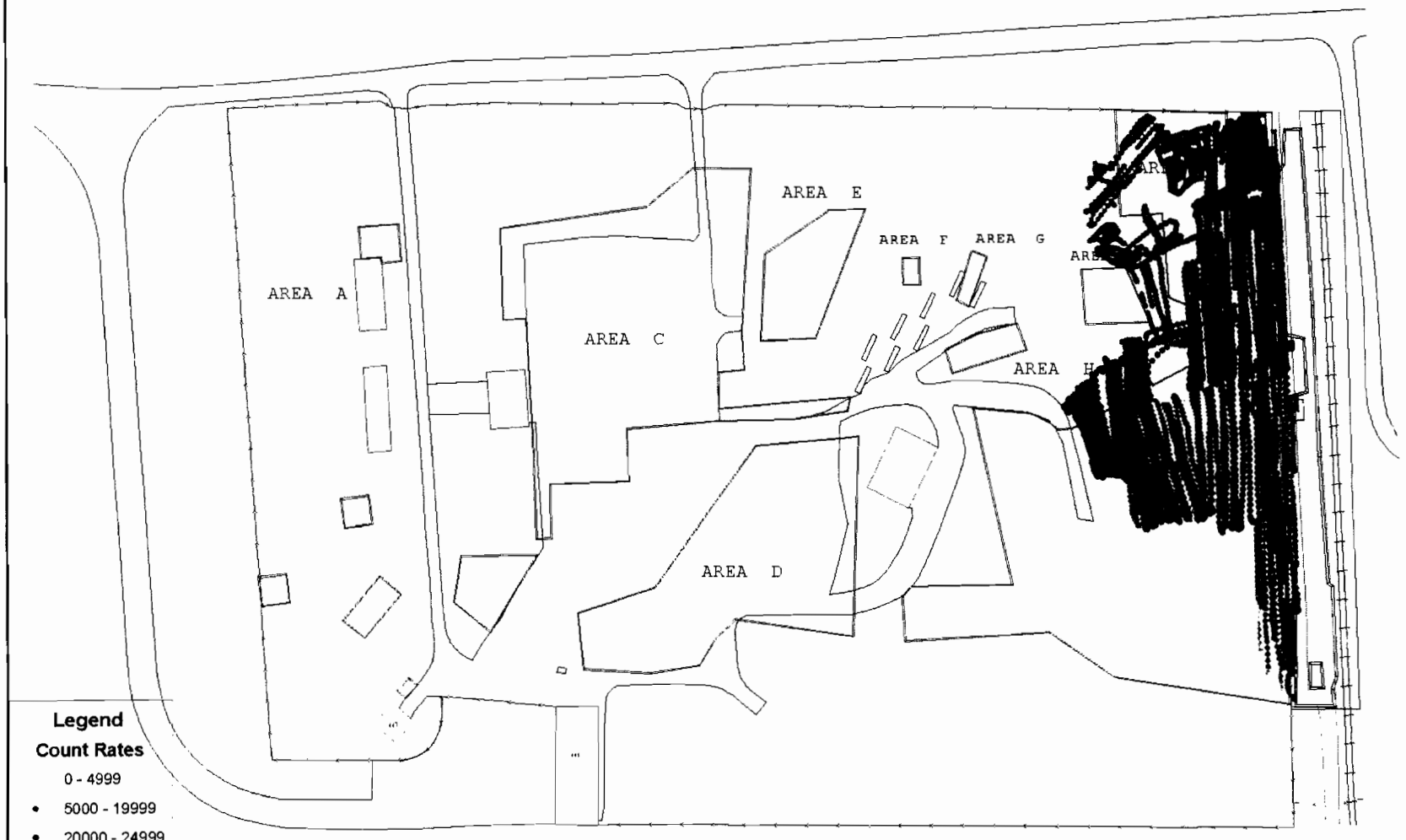
Radionuclide	TAP (MeV)	MDC (pCi/g)
Cs-137	0.662	0.05
Ra-226 (from Pb-214)	0.351	0.19
Depleted Uranium (from Th-234)	0.063	1.74

Spectra were also reviewed for other identifiable TAPs.

Uncertainties

The uncertainties associated with the analytical data presented in the tables of this report represent the total propagated uncertainties for that data. These uncertainties were calculated based on both the gross sample count levels and the associated background count level.

Appendix F
Waste Loading Area As-Left Radiological Walkover Survey



Waste Loading Area
September 2005 Walkover Survey

BNL RADIOLOGICAL SURVEY FORM

Reason for Survey
- ☐ ROUTINE
- ☐ SPECIAL
- ☐ RWP#
- ☐ WP#

Date: 9-16-5 | Time: 1600 | Bldg. # NA | Location: 445

INSTRUMENTS — BONE YARD

MODEL	SERIAL #	Cal Due Date	Source Check (Y/N)	COMMENTS:
BICRON	C386 F	3-7-6	YES	CONTAMINATION AREA SURVEY
NA	NA	NA	NA	MONTHLY

DOSE RATES (HIGHEST)	
CONTACT	
GENERAL AREA	

AIRBORNE CONTAMINATION			
SAMPLE #	VOLUME	uCi/cc	%DAC
	NA		

LEGEND
- O SMEAR SURVEY LOCATION — XXX Y — XXX = CONTACT READING
- ☐ MASSLINN SURVEY LOCATION — ZZZ — ZZZ = READING @ 30 Cm
- Δ AIR SAMPLE LOCATION — Y = RADIATION TYPE

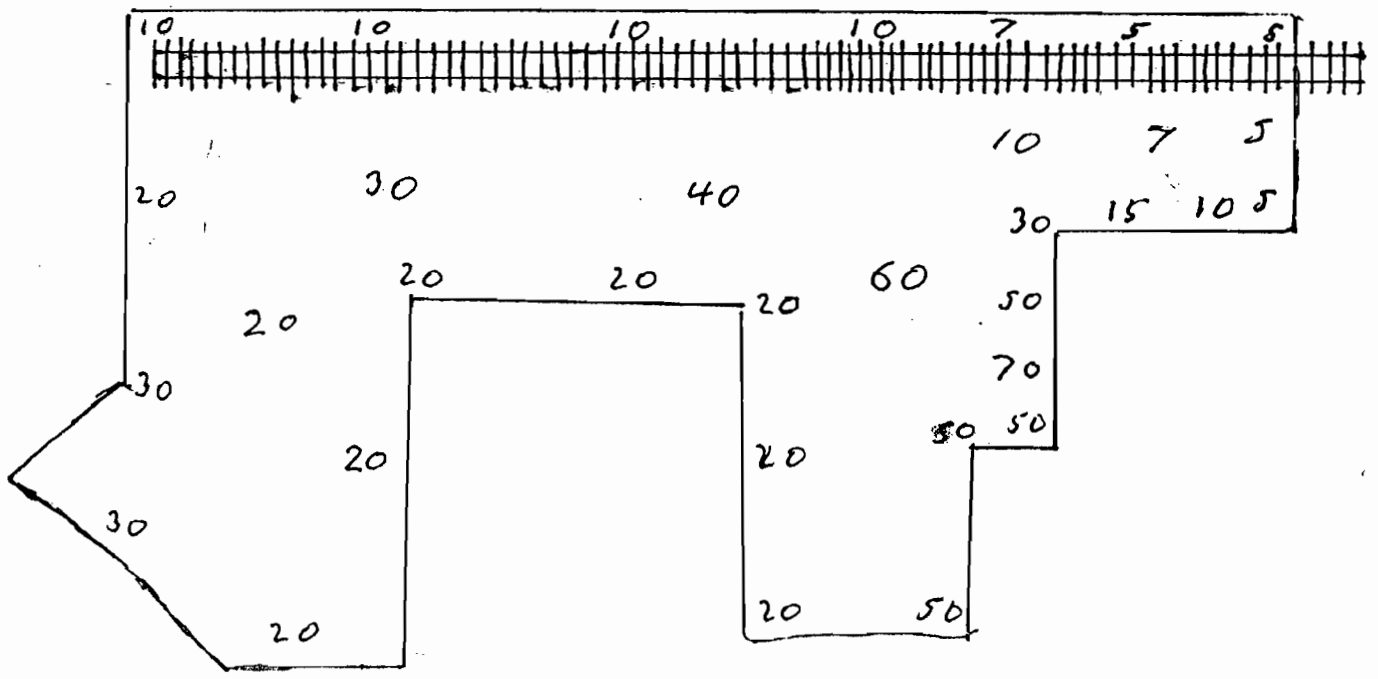
SMEAR SURVEY LOCATIONS (DPM/100 cm²) ^{3}H B-γ α (See Attached Printout for Survey Results)

1.	8.	15.	22.
2.	9.	16.	23.
3.	10.	17. NA	24.
4.	11.	18.	25.
5.	12.	19.	26.
6.	13.	20.	27.
7.	14.	21.	28.

MASSLINN SURVEY RESULTS (DPM)

1.	8.
2.	9.
3. NA	10.
4.	11.
5.	12.
6.	13.
7.	14.

ALL DOSE READINGS ARE IN MR/HR



Surveyed By: Peter Evatt Rated 9-16-5 Signature/Date

Reviewed By: Signature/Date