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Dear BCT members:

Enclosure (1) is provided for your review and comment regarding Phase IV Radiological Investigation, Parcels D and E, Hunters Point Shipyard. Per the Federal Facilities Agreement, please provide any comments to the undersigned by June 29, 2000.

Should you have any questions concerning this report, please contact me at (619) 532-0913.

Sincerely,

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By direction of the Commander

Enclosure: (1) Draft Phase IV radiation Investigation Report, Hunters Point Shipyard, May 15, 2000

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COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY (CLEAN II)
Northern and Central California, Nevada, and Utah
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PHASE IV RADIATION INVESTIGATION REPORT
HUNTERS POINT SHIPYARD
SAN FRANCISCO, CALIFORNIA

May 15, 2000

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ABBREVIATIONS, ACRONYMS, AND SYMBOLS

σ	Sigma (standard deviation)
A/C	Asphalt/concrete
Am-241	Americium 241
bgs	Below ground surface
CLEAN	Comprehensive Long-term Environmental Action Navy
Co-60	Cobalt 60
Cs-137	Cesium 137
CTO	Contract task order
DCGL	Derived concentration guideline level
DHS	Department of Health Services
DQO	Data quality objective
DTSC	Department of Toxic Substances Control
ELCR	Excess lifetime cancer risk
EPA	U.S. Environmental Protection Agency
Eu-152	Europium 152
Eu-154	Europium 154
GPS	Global positioning system
HPS	Hunters Point Shipyard
IR	Installation Restoration
K-40	Potassium 40
mrem/yr	Millirem per year
Navy	U.S. Department of the Navy
NRC	U.S. Nuclear Regulatory Commission
NRDL	Naval Radiological Defense Laboratory
pCi/g	picoCurie per gram
PRG	Preliminary remediation goal
Ra-226	Radium 226
RASO	Navy Radiological Affairs Support Office
SCRS	Surface confirmation radiation survey
Th-228	Thorium 228
Th-232	Thorium 232
TtEMI	Tetra Tech EM Inc.
U-235	Uranium 235

1.0 INTRODUCTION

In February 1999, Tetra Tech EM Inc. (TtEMI) received Contract Task Order (CTO) No. 128, Modification 02 from the Naval Facilities Engineering Command, Engineering Field Activity West under Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract No. N62474-94-D-7609 (CLEAN II). Under this CTO, TtEMI was tasked with determining ambient concentrations of specific radionuclides and further characterization of two radiation sites at Hunters Point Shipyard (HPS). This report presents the results of the field sampling effort conducted at (1) the Cesium 137 (Cs-137) spill site behind Building 364 and (2) the concrete drum storage pad at Building 707 located within HPS.

The purpose of the Phase IV radiological sampling was to collect data to (1) determine whether further action is required for Cs-137 detected in the asphaltic concrete (A/C) or soil at Building 364 based on whether the levels are indistinguishable from background or below a derived-concentration guideline level (DCGL) for Cs-137 and (2) further characterize the level of radioactive contaminants still present at the Building 707 concrete pad and determine whether the levels are either at background or residual levels above DCGLs for specific radiological isotopes. These levels may or may not require remediation.

This report consists of five sections, including this introduction. Section 2.0 presents the site background, Section 3.0 presents field activities and analytical results, Section 4.0 presents data interpretation and evaluation, and Section 5.0 presents conclusions and recommendations. References, figures, and tables cited throughout this report are presented following Section 5.0.

2.0 BACKGROUND

The general site history is discussed in Section 2.1. The purpose and rationale for the Phase IV radiation investigation are described in Section 2.2. Descriptions of the installation and building sites are provided in Section 2.3. Contaminants present at building sites are identified in Section 2.4, and sample methodology used during the Phase IV radiation investigation and sample locations are described in Section 2.5.

2.1 HISTORY

In late 1946, a group of U.S. Department of the Navy (Navy) personnel at HPS was detailed to arrange for the decontamination and disposition of several ships that had returned from nuclear weapons tests (Operation Crossroads-Baker at Bikini Atoll in the Marshall Islands). Shortly after the group was formed, it was designated as the Naval Radiological Defense Laboratory (NRDL). From 1950 to 1969,

HPS supported the NRDL in a series of projects designed to research the protection of personnel and properties against the effects of nuclear weapons. Broadly defined, these projects encompassed chemistry (decay and fallout studies), biology (fallout effects on animals), and physics (instrumentation and shielding effectiveness). At peak activity, NRDL staff consisted of nearly 600 civilians and more than 100 military personnel. In 1969, all radioactivity studies ceased at HPS. The NRDL was disestablished and NRDL buildings were decontaminated and returned to HPS.

Three phases of HPS radiological characterization have been completed under the CLEAN I program. Phase I work, conduced in 1992 under CTO No. 0155, consisted of ambient air monitoring to evaluate radioactivity airborne particulate matter, a gamma radiation study to establish background activities at HPS, and a surface confirmation radiation survey (SCRS) to confirm previous detections of radioactive anomalies in the preliminary assessment activities. Phase I work yielded recommendations for further investigations of the distribution of radioactive materials in the landfills and screening NRDL sites at HPS. Phase II work, conducted in 1994 under CTO No. 0155, consisted of investigating the distribution of radium-containing materials in the Industrial Landfill (installation restoration [IR] site 01/21) and the Bay Fill Area (IR-02). The Phase II work also established that naturally occurring radioactive materials were the source of elevated gamma activity in the soils at the Submarine Base Area (IR-07) and the Waste Oil Disposal Area (IR-18). Phase III work, conducted in 1997 under CTO No. 0285, consisted of radiation surveys at sites where residual contamination was known to exist or where radiation surveys had not been performed or documented as part of the termination process for a radioactive material license. The Phase III work supported the radiological free release of Buildings 351A, 507, 508, 510, and 510A, but results suggested that further evaluation be conducted for Buildings 364, 506, 529, 509, 517, and 707.

2.2 INVESTIGATION RATIONALE

The purpose of the Phase IV radiation investigation at HPS is to quantify ambient concentrations of specific radionuclides and further characterize two radiation sites at HPS (see Figure 1). The Phase IV radiological investigation will also determine whether specific portions of former NRDL buildings and sites meet either the extant criteria for free release established by California Department of Health Services (DHS) and the U.S. Nuclear Regulatory Commission (NRC) or the protectiveness criteria established by the U.S. Environmental Protection Agency (EPA). If these buildings and sites meet regulatory criteria, they may be used for industrial reuse without further consideration of residual radioactivity in property lease, transfer, or land-use decisions.

2.3 DESCRIPTIONS OF FORMER NAVAL RADIOLOGICAL DEFENSE LABORATORY BUILDING SITES

The following sections describe the former NRDL building sites at HPS that are included in the Phase IV radiation investigation.

2.3.1 Building 364 Cesium 137 Spill Site

Building 364, formerly known as the "hot cell," was used as a chemistry laboratory under the NRDL program. The hot cell contained a sealed Cobalt-60 (Co-60) source. A former storage tank for radioactive effluent with an associated sump for secondary containment was housed in a concrete vault constructed partially underground on the east side of Building 364. The tank and sump operated as a storage facility for low-level radiation waste. The tank within the sump and the pipes associated with the utility vaults has been removed.

The Building 364 Cs-137 spill site, also referred to as the "peanut," was detected in 1993 during a Navy walkover survey of the parking lot behind Buildings 364 and 351A (see Figure 2). A Cs-137 spill was discovered about 12 feet south of the sump. A peanut-shaped area of the A/C was excavated to an average depth of 5 inches below ground surface (bgs) in a subsequent interim removal. The final excavated area measured 5 feet by 16 feet in size. Confirmation sample concentrations of Cs-137 were below the EPA industrial preliminary remediation goal (PRG) for Cs-137. However, EPA felt that the background samples collected as part of the investigation were not representative of background and requested that additional background samples be collected and the results compared to the results of the confirmation samples.

2.3.2 Building 707 Concrete Pad Site

The Building 707 concrete pad measures approximately 60 feet by 210 feet and is composed of six concrete sections. The pad is surrounded by A/C. The concrete pad was used by NRDL as a storage area for drums of radioactive waste. The concrete pad is in an area on the north side of "J" Street and south of 6th Avenue (see Figure 3). A number of 55-gallon steel drums stored at the concrete pad held solid radioactive waste from the chemistry and biology work areas at HPS. Solid wastes were placed in liners before being sealed into waste drums. The drums were then disposed of off site. The concrete pad is in good condition. Four distinct anomalies, apparently caused by a former leaking drum, were identified on and off the concrete pad during the Phase III radiation investigation: two anomalies on the pad (707A3)

and two off the pad (707A1 and 707A2). The two anomalies on the pad (707A3) were close together and were treated as one for the Phase IV radiation investigation.

2.4 CONTAMINANTS OF CONCERN

The primary radioactive contaminant of concern at Building 364 for the Phase IV sampling event is Cs-137. In addition, at Building 707 Americium 241 (Am-241), Co-60, Europium 152 (Eu-152), Europium 154 (Eu-154), Potassium 40 (K-40), Radium 226 (Ra-226), Thorium 228 (Th-228), Thorium 232 (Th-232), and Uranium 235 (U-235) have been detected above respective laboratory detection limits. Additional information regarding these isotopes can be found in Attachment E1 to Appendix E of the Parcel E draft final remedial investigation report (TtEMI 1997a).

2.5 SAMPLE METHODOLOGY AND LOCATIONS

The overall approach to performing the Phase IV radiation sampling is discussed in the following subsections. Figures 2 and 3 show all sampling locations for this investigation.

2.5.2 Building 364 Cesium 137 Spill

On December 15, 1998, the Navy Radiological Affairs Support Office (RASO), in cooperation with EPA, visited the Building 364 Cs-137 spill site to choose sampling locations for the purposes of determining the Cs-137 background concentration at the site. Two background reference locations were chosen outside the fenced area behind Buildings 364 and 351A (see Figure 2). Background reference area 1 contains four sample locations (364B1, 364B2, 364B3, and 364B4) and is located behind Building 365 on the same probable A/C pour (that is, A/C material that was constructed at the same time) as the spill. Background reference area 2 contains four sample locations (364B5, 364B6, 364B7, and 364B8) and is located outside of the fenced area behind buildings 364 and 351A on the same probable A/C pour as the spill.

Inside of the fence around the Cs-137 spill site, eight additional sample locations (364S9, 364S10, 364S11, 364S12, 364S13, 364S14, 364S15, and 364S16) were selected for comparison against the background reference area results. These sample locations were chosen by RASO and approved by the EPA representative on site. The sample locations are located in an approximate circular configuration around the Cs-137 spill site. The sample locations are up- and downgradient of the storm water flow path across the spill.

Sixteen sample locations were measured by global positioning system (GPS) and marked at the Building 364 Cs-137 spill site. The marked position of samples using the GPS is repeatable to within 1 meter.

2.5.2 Building 707 Concrete Pad

The RASO representative also visited the Building 707 concrete pad site on December 15, 1998. Based on that visit, RASO and EPA representatives concluded that additional sampling was required to determine background concentrations of isotopes of potential concern and to further delineate the extent of known anomaly locations for future remediation purposes. Two background location areas were chosen. Background reference area 3 contains four sampling locations (708B1, 708B2, 708B3, and 708B4) and is located near Building 708 on the same probable pour of concrete as the pad. Background reference area 4 contains six sampling locations (707B5, 707B6, 707B7, 707B8, 707B9, and 707B10) and is located on the concrete pad. The pad was built in six separate sections, thus a background sampling location was selected on each section as advised by RASO.

Four distinct anomalous locations, two on the pad and two off the pad on A/C, were identified during the Phase III radiation investigation (TtEMI 1997b). The two anomalies on the pad are close together and are treated as one for the Phase IV radiation investigation. Anomaly sampling locations (707A1, 707A2, and 707A3) were identified at the "hottest" location, as determined by a 2-inch sodium iodide detector, and in a concentric two-ring configuration at 1-meter and 4-meter radii from the central sampling location. Three samples were collected on the 1-meter ring and five samples were collected on the 4-meter ring to delineate the contaminated areas on and off the pad.

Thirty-eight sample locations were measured by GPS and marked at the Building 707 concrete pad.

3.0 FIELD ACTIVITIES AND ANALYTICAL RESULTS

The following paragraphs describe soil and A/C sampling conducted during the Phase IV radiation investigation. Appendix A contains photos documenting the sampling event. Appendix B contains the analytical results for samples collected during the Phase IV radiation investigation.

3.1 SOIL SAMPLES

All soil samples were collected using a stainless steel trowel or soil auger and were placed in plastic freezer bags for analysis. The trowel and auger were decontaminated after each sample was collected.

Samples were sent to an off-site laboratory for gamma spectrometry analysis. Sixteen soil samples were collected at the Building 364 Cs-137 spill site and 38 soil samples were collected at the Building 707 concrete pad site.

3.2 ASPHALTIC-CONCRETE SAMPLES

At each sample location, a 4-inch A/C core was cut using a single-person power concrete cutter. Cores were placed in plastic freezer bags. The core drill bit was decontaminated after each core was drilled. Samples were sent to an off-site laboratory for gamma spectrometry analysis. Sixteen A/C samples were collected at the Building 364 Cs-137 spill site and 38 concrete and A/C samples were collected at the Building 707 concrete pad site.

3.3 ANALYTICAL RESULTS

Thirty-two samples, 16 A/C and 16 soil samples, were collected at the Building 364 Cs-137 spill site. Of the 32 samples, 16 (8 A/C and 8 soil) are background samples. Analytical results for the Building 364 Cs-137 spill site are presented in Appendix B.

Seventy-six samples, 38 A/C and 38 soil samples, were collected at the Building 707 concrete pad site. Both A/C and soil were sampled at each of the anomaly sampling locations. Of the 76 samples, 20 (10 A/C and 10 soil) are background samples. Analytical results for the Building 707 concrete pad site are presented in Appendix B.

4.0 DATA INTERPRETATION

The general data quality objectives (DQO) for the Phase IV radiation investigation are to collect data to (1) determine whether Cs-137 detected at the Building 364 Cs-137 spill is indistinguishable from background and (2) further characterize background and contamination levels of certain radioisotopes at the Building 707 concrete pad for establishing site-specific DCGLs. Using decision rules established in the Phase IV radiation investigation work plan, data from both sites were evaluated to determine whether detected isotopes were distinguishable from background. If distinguishable from background, DCGLs for the specific isotopes were calculated. In addition, the Navy calculated the human health risk posed by the sites using RESRAD. At EPA's request, the Navy also compared the Phase IV radiation investigation data to decay-corrected PRGs supplied by EPA. The following sections describe these evaluations. Tables 1 and 2 summarize the data interpretation for the Building 364 Cs-137 spill site and the Building 707 concrete pad site.

4.1 DEMONSTRATING INDISTINGUISHABILITY FROM BACKGROUND

NRC guidance (NRC 1997) provides criteria and methods for demonstrating indistinguishability from background. Based on that guidance, if the sample data compared to the data from reference background areas are less than three times the standard deviation (σ) of the reference background area, the site sample data is considered indistinguishable from background.

4.1.1 Building 364 Cesium 137 Spill Site

Cs-137 concentrations exceeded background concentrations by more than 3σ of the background data in both A/C and soil samples and is considered distinguishable from background. Based on the decision rules established in the Phase IV radiation investigation work plan, the next step is to calculate DCGLs for the Building 364 Cs-137 spill site data.

4.1.2 Building 707 Concrete Pad Site

Am-241, Co-60, Cs-137, Eu-152, Eu-154, K-40, Ra-226, Th-228, Th-232, and U-235 were detected at the Building 707 concrete pad site. Am-241, Co-60, Cs-137, Eu-152, Eu-154, and U-235 were present at concentrations exceeding background by more than 3σ in A/C or soil samples and are considered distinguishable from background. Based on the decision rules established in the Phase IV radiation investigation work plan, the next step is to calculate DCGLs for the Building 707 concrete pad site data.

4.2 ESTABLISHING DERIVED CONCENTRATION GUIDELINE LEVELS

A DCGL is a site-specific concentration of radioactivity, derived by a radiological assessment to correspond to risk or dose, based on a remedial goal. The Navy used RESRAD and the California Department of Toxic Substance Control's (DTSC) basic radiation dose limit of 25 millirems per year (mrem/yr) to calculate DCGLs for each of the contaminants of concern. RESRAD default settings were used for all entries except for (1) the area of the contaminated zone and (2) the depth of the contaminated zone. Because RESRAD assumes an infinite source size, site-specific information regarding the area and depth of the contaminated zone for each site was used instead of the default settings.

Using RESRAD default settings generates a very conservative DCGL for the conditions present at HPS. The default settings assume that contaminants are in uncovered soil and that all ingestion pathways, including ingestion of soil, meat, plants, milk, aquatic foods, and drinking water, are complete for a receptor. The actual conditions at HPS are that the contaminants are present in concrete and concrete-

covered soil and ingestion of soil is the only available ingestion pathway for an industrial receptor. Although, modifying the ingestion pathway default settings to reflect actual conditions at HPS would result in a more realistic DCGL, DCGLs presented in this section were generated using RESRAD default settings for the ingestion pathway.

4.2.1 Building 364 Cesium 137 Spill Site

The RESRAD default settings were used for all entries except for (1) the area of the contaminated zone and (2) the depth of the contaminated zone. For the Building 364 Cs-137 spill site, the area of the contaminated zone was set at 160 square meters, based on an area encompassing the spill site samples. The contamination depth was set at 0.6 meter. The RESRAD calculated DCGL for Cs-137 is 14.95 picoCuries per gram (piC/g). All samples collected at the Building 364 Cs-137 spill site are below 14.95 piC/g. Appendix C contains the RESRAD summary report for this site. The DCGL, listed as the "Single Radionuclide Soil Guideline," is located on page 11 of the summary report. Table 1 presents the Cs-137 DCGLs and data from Building 364.

4.2.2 Building 707 Concrete Pad Site Derived Concentration Guideline Levels

The RESRAD default settings were used for all entries except for (1) the area of the contaminated zone and (2) the depth of the contaminated zone. For the Building 707 concrete pad site, the area of the contaminated zone was conservatively set at 170 square meters, based on an area encompassing the outer ring of samples at anomalies 707A1 and 707A2. The contamination depth was set at 0.6 meter. DCGLs were calculated for Cs-137, Am-241, Co-60, Eu-152, Eu-154, and U-235. Appendix C contains a full RESRAD summary report for the Cs-137 run. The DCGL, listed as the "Single Radionuclide Soil Guideline," is located on page 11 of the summary report. Because the only input parameter that changes between each of the radionuclide runs is the soil contaminant, Appendix C contains only page 11 of the summary reports for each of the other radionuclides.

With the exception of Cs-137, the maximum concentration of each of the radionuclides detected at the Building 707 concrete pad site is below the respective calculated DCGL. Table 2 presents the calculated DCGLs for each of the radionuclides and Building 707 concrete pad site data.

4.3 RESRAD RISK CALCULATIONS

The excess lifetime cancer risk (ELCR) posed by radiation present at the Building 364 Cs-137 spill site and the Building 707 concrete pad site was calculated using RESRAD. Separate RESRAD runs were

prepared for A/C and soil. The risk contributions from A/C and soil were summed to calculate the total risk from a radionuclide at a site. RESRAD overestimates the ELCR and dose for industrial sites because default parameters are based on residential scenarios. The risk calculations that appear in this report were developed using default RESRAD input parameters, except for modifications discussed below:

- The time interval was calculated at time 0.
- The depth of soil contamination was assumed to be 0.6 meter with a cover depth of 0.3 meter of A/C.
- A/C was assumed to have a density of 2.24 grams per cubic centimeter. This parameter was used as the contaminated zone density for A/C calculations and as the cover material density for soil calculations.
- For A/C, only the external gamma pathway was evaluated. For soil, the external gamma, soil ingestion, plant ingestion, and inhalation pathways were evaluated.
- Site-specific source areas were used: 160 square meters was used for the Building 364 Cs-137 spill site and 19.6 and 113 square meters were used for the inner and outer rings at the anomaly areas at the Building 707 concrete pad site.
- A concrete shielding factor of 0.05 was developed using MicroShield Version 5.0 software. This factor is used by RESRAD to estimate the exposure for indoor periods of time.
- The exposure duration was set at 25 years and the indoor and outdoor time fractions were set equal to each other at 0.114, which represents 50 percent of a 2,000-hour industrial work year being spent inside and 50 percent being spent outside.

4.3.1 Human Health Risk Posed by the Building 364 Cesium 137 Spill Site

For the Building 364 Cs-137 spill site, the matrix-specific average Cs-137 concentration and the site-specific area were used to generate an ELCR for both A/C and soil. The A/C and soil ELCRs were summed to calculate the total ELCR of less than 5×10^{-7}, which is less than the acceptable risk range.

4.3.2 Human Health Risk Posed by the Building 707 Concrete Pad Site

For the Building 707 concrete pad site, RESRAD calculations were run using actual contaminated areas and depths in a two-concentric-ring geometry. For each radionuclide, four RESRAD risk calculations were run, two for the inner ring (A/C and soil) and two for the outer ring (A/C and soil). For the inner ring samples, a contaminated circular area of radius 2.5 meters was assumed (19.6 square meters). For the outer ring samples, a contaminated circular area of radius 6 meters was assumed (113 square meters).

To calculate unit ELCRs, the concentration of each radionuclide was set at 1 piC/g. The matrix-specific average concentrations of each radionuclide for each ring were multiplied by the unit ELCR for that ring. The A/C risk from each ring was summed with the soil risk from each ring to obtain a total risk from each radionuclide. The inner and outer ring risks were summed and the total risk from each radionuclide was summed to determine the total ELCR for the anomaly. Table 2 presents the results of these calculations.

4.4 DECAY-CORRECTED PRELIMINARY REMEDIATION GOAL COMPARISON

In addition to the comparison with site-specific DCGLs and the RESRAD risk determinations, EPA requested that the Phase IV data also be compared to decay-corrected PRGs. At the Building 364 Cs-137 spill site, the average A/C and soil concentrations of Cs-137 do not exceed the EPA decay-corrected PRG. Three samples (364S11 A/C, 364S14 A/C, and 364S14 soil) exceeded the EPA decay-corrected PRG for Cs-137. At the Building 707 concrete pad site, the average A/C and soil concentrations of Cs-137 exceeded the EPA decay-corrected PRG. Maximum concentrations of Am-241, Eu-152, Eu-154, and U-235 exceeded the decay-corrected PRGs; however, the average concentrations of these radionuclides do not exceed decay-corrected PRGs.

5.0 CONCLUSIONS AND RECOMMENDATIONS

This section presents the conclusions and recommendations developed based on the data collected during the Phase IV radiation investigation.

5.1 CONCLUSIONS

After evaluating the Phase IV radiation investigation data by several methods, conclusions can be drawn as follows:

- Samples collected from the Building 364 Cs-137 spill site and the Building 707 concrete pad site contained concentrations of radioactive isotopes that were determined to be distinguishable from background concentrations of radioactive isotopes.
- No samples collected at the Building 364 Cs-137 spill site contained Cs-137 at a concentration greater than the site-specific DCGL (14.95 pCi/g) calculated for Cs-137.
- The human health risk, calculated using RESRAD, posed by Cs-137 at the Building 364 Cs-137 spill site is less than 5×10^{-7} and is less than the acceptable risk range.

- For the Building 707 concrete pad site, Cs-137 is the only radionuclide for which sample concentrations exceeded the DCGL calculated for the site.

- The human health risk, calculated using RESRAD, posed by radioactive isotopes at the Building 707 concrete pad site ranged from 9.1×10^{-6} to 1.2×10^{-5} and is within the acceptable risk range.

5.2 RECOMMENDATIONS

The results of the Phase IV radiation investigation indicate that the Building 364 Cs-137 spill site and the Building 707 concrete pad site do not pose an unacceptable risk to human health or the environment. However, in order to be conservatively protective of human health and the environment and to help expedite the transfer of Parcels D and E to the city of San Francisco, the Navy will perform a Comprehensive Environmental Response, Compensation, and Liability Act removal action at both sites to reduce the radiological contamination to levels consistent with the decay-corrected PRGs.

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DEPARTMENT OF THE NAVY — NAVAL FACILITIES ENGINEERING COMMAND

ENGINEERING FIELD ACTIVITY WEST

SAN BRUNO, CALIFORNIA

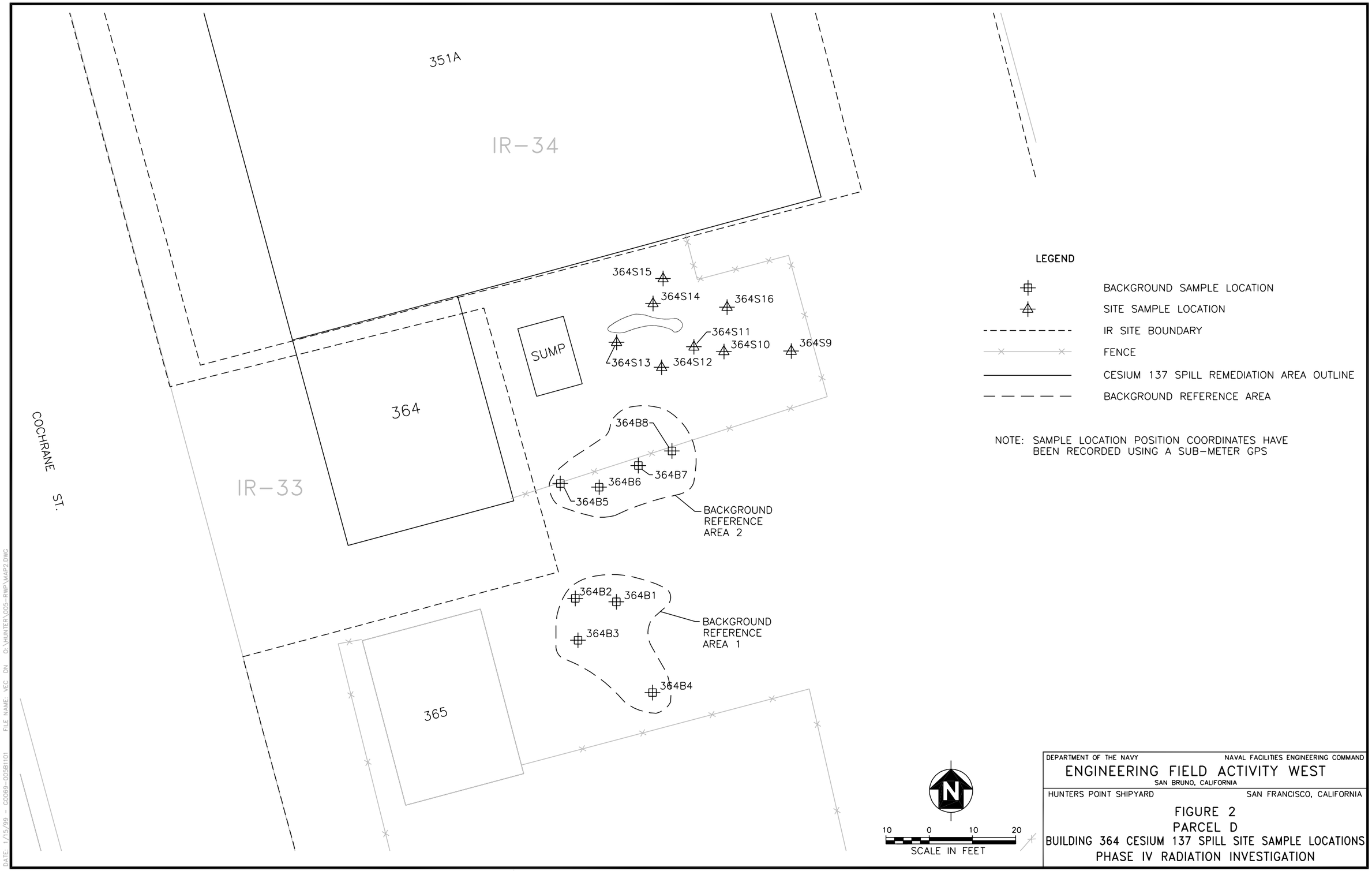
HUNTERS POINT SHIPYARD — SAN FRANCISCO, CALIFORNIA

FIGURE 1

HPS INSTALLATION LAYOUT AND PHASE IV RADIATION SITES

PHASE IV RADIATION INVESTIGATION

DATE: 5/13/99 VEC DN FILE NAME: O:\HUNTER\005-RMP\MAP1.DWG G0069-005B1101



DEPARTMENT OF THE NAVY — NAVAL FACILITIES ENGINEERING COMMAND

ENGINEERING FIELD ACTIVITY WEST

SAN BRUNO, CALIFORNIA

HUNTERS POINT SHIPYARD — SAN FRANCISCO, CALIFORNIA

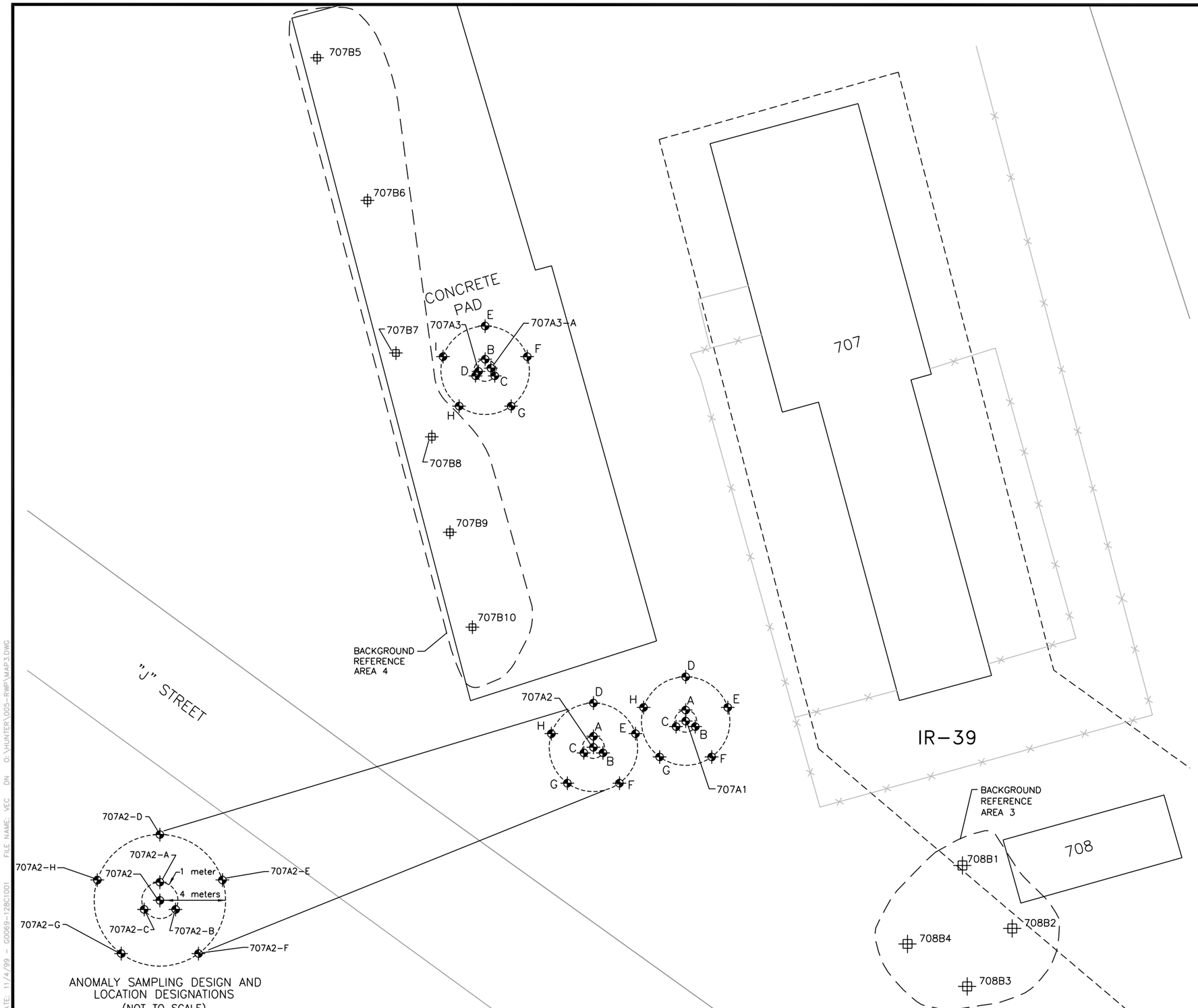
FIGURE 2

PARCEL D

BUILDING 364 CESIUM 137 SPILL SITE SAMPLE LOCATIONS

PHASE IV RADIATION INVESTIGATION

DATE: 1/15/99 – C0069-00581101 FILE NAME: VEC DN O:\HUNTER\005-RWP\MAP2.DWG



ANOMALY SAMPLING DESIGN AND LOCATION DESIGNATIONS (NOT TO SCALE)

LEGEND

- ANOMALY SAMPLE LOCATION
- BACKGROUND SAMPLE LOCATION
- IR SITE BOUNDARY
- FENCE
- BACKGROUND REFERENCE AREA
- SAMPLING BOUNDARY

NOTE: SAMPLE LOCATION POSITION COORDINATES HAVE BEEN RECORDED USING A SUB-METER GPS

TO CHARACTERIZE THE EXTENT OF ANOMALIES AT THE CONCRETE PAD THE FOLLOWING SAMPLING DESIGN WAS IMPLEMENTED.

1) WITHIN THE 1-METER RINGS 3 SAMPLES WERE COLLECTED.

2) WITHIN THE 4-METER RINGS 5 SAMPLES WERE COLLECTED.

N

15 0 15 30

SCALE IN FEET

DEPARTMENT OF THE NAVY — NAVAL FACILITIES ENGINEERING COMMAND

ENGINEERING FIELD ACTIVITY WEST

SAN BRUNO, CALIFORNIA

HUNTERS POINT SHIPYARD — SAN FRANCISCO, CALIFORNIA

FIGURE 3
PARCEL E
BUILDING 707 CONCRETE PAD SAMPLE LOCATIONS
PHASE IV RADIATION INVESTIGATION

DATE: 11/4/99 – G0069-128C1001 FILE NAME: VEC DN O:\HUNTER\005-RWP\MAP3.DWG

TABLE 1

BUILDING 364 CESIUM 137 SPILL SITE DATA

Radionuclide	**Cs-137**
DCGL (piC/g)	14.95
Decay-Corrected PRG (piC/g)	0.13
Average A/C Concentration (piC/g)	0.115
A/C Risk	4.5×10^{-7}
Average Soil Concentration (piC/g)	0.045
Soil Risk	1.1×10^{-8}
Total Risk	$\mathbf{4.6 \times 10^{-7}}$

Notes:

A/C	Asphaltic concrete
Cs-137	Cesium 137
DCGL	Derived concentration guideline level
piC/g	picoCuries per gram
PRG	Preliminary remediation goal

TABLE 2

BUILDING 707 CONCRETE PAD SITE DATA

Radionuclide	Cs-137	Am-241	Co-60	Eu-152	Eu-154	U-235	Total
DCGL (piC/g)	13.1	261.9	2.92	7.41	6.01	56.55	NA
Decay-Corrected PRG (piC/g)	0.13	7.8	0.42	0.13	0.23	.057	NA
Anomaly 707A1							
A/C Risk	7.8×10^{-6}	2.1×10^{-9}	2.3×10^{-8}	1.3×10^{-7}	0	5.2×10^{-8}	8.1×10^{-6}
Soil Risk	9.7×10^{-7}	2.8×10^{-8}	1.8×10^{-9}	0	1.9×10^{-9}	1.5×10^{-9}	1.0×10^{-6}
Total Risk	8.8×10^{-6}	3.0×10^{-8}	2.5×10^{-8}	1.3×10^{-7}	1.9×10^{-9}	5.4×10^{-8}	9.1×10^{-6}
Anomaly 707A2							
A/C Risk	1.1×10^{-5}	0	0	0	0	6.6×10^{-9}	1.1×10^{-5}
Soil Risk	3.1×10^{-8}	0	0	0	0	0	3.1×10^{-8}
Total Risk	1.1×10^{-5}	0	0	0	0	6.6×10^{-9}	1.1×10^{-5}
Anomaly 707A3							
A/C Risk	1.2×10^{-5}	0	0	0	0	3.2×10^{-8}	1.2×10^{-5}
Soil Risk	6.6×10^{-7}	0	0	0	0	8.8×10^{-10}	6.6×10^{-7}
Total Risk	1.2×10^{-5}	0	0	0	0	3.3×10^{-8}	1.2×10^{-5}

Notes:

A/C	Asphaltic concrete	Eu-154	Europium 154
Am-241	Americium 241	NA	Not applicable
Co-60	Cobalt 60	piC/g	picoCuries per gram
Cs-137	Cesium 137	PRG	Preliminary remediation goal
DCGL	Derived concentration guideline level	U-235	Uranium 235
Eu-152	Europium 152		

APPENDIX A

PHOTO LOG

(5 Pages)

DATE: JULY 13, 1999 **PHOTOGRAPH: 1**
SUBJECT: BUILDING 364 CS-137 SPILL SITE, BACKGROUND SAMPLE

DATE: JULY 13, 1999 **PHOTOGRAPH: 2**
SUBJECT: BUILDING 364 CS-137 SPILL SITE, NEW WORLD TECHNOLOGY DECONTAMINATION AREA

DATE: JULY 13, 1999 **PHOTOGRAPH: 3**
SUBJECT: BUILDING 364 CS-137 SPILL SITE, OSBORN'S CONCRETE CORING

DATE: JULY 13, 1999 **PHOTOGRAPH: 5**
SUBJECT: BUILDING 364 CS-137 SPILL SITE, ORIGINAL CS-137 SPILL REMEDIATION AREA

DATE: JULY 14, 1999 **PHOTOGRAPH: 11**
SUBJECT: BUILDING 707 CONCRETE PAD SITE, STEVE DEAN (EPA) WITH PORTABLE GAMMA SPECTROMETER

DATE: JULY 14, 1999 **PHOTOGRAPH: 12**
SUBJECT: BUILDING 707 CONCRETE PAD SITE, STEVE DEAN (EPA) WITH PORTABLE GAMMA SPECTROMETER

DATE: JULY 14, 1999 **PHOTOGRAPH: 14**
SUBJECT: BUILDING 707 CONCRETE PAD SITE, STEVE DEAN (EPA) WITH PORTABLE GAMMA SPECTROMETER

DATE: JULY 14, 1999 **PHOTOGRAPH: 15**
SUBJECT: BUILDING 707 CONCRETE PAD SITE, STEVE DEAN (EPA) WITH PORTABLE GAMMA SPECTROMETER

DATE: JULY 13, 1999 **PHOTOGRAPH: 18**
SUBJECT: BUILDING 364 CS-137 SPILL SITE, ASPHALT CORING

DATE: JULY 14, 1999 **PHOTOGRAPH: 19**
SUBJECT: BUILDING 707 CONCRETE PAD SITE, DECONTAMINATION AREA

APPENDIX B

PHASE IV RADIATION INVESTIGATION ANALYTICAL RESULTS

(36 Pages)

LIST OF TABLES

Table

B-1 BUILDING 364 CESIUM 137 SPILL SITE ANALYTICAL RESULTS

B-2 BUILDING 707 CONCRETE PAD SITE ANALYTICAL RESULTS

TABLE B-1

BUILDING 364 CESIUM 137 SPILL SITE ANALYTICAL RESULTS

Sample Location	Nuclide	Result (pCi/g)	Total Error (pCi/g)	Qualifier	MDA	RDL	Matrix
364B1	Am-241	0	0	U	0.09	0	Asphalt
		0	0	U	0.108	0	SA
	Co-60	0	0	U	0.025	0.015	Asphalt
		0	0	U	0.032	0.015	SA
	Cs-137	0	0	U	0.025	0.01	Asphalt
		0	0	U	0.028	0.01	SA
	Eu-152	0	0	U	0.06	0.03	Asphalt
		0	0	U	0.071	0.03	SA
	Eu-154	0	0	U	0.09	0	Asphalt
		0	0	U	0.105	0	SA
	Eu-155	0	0	U	0.06	0	Asphalt
		0	0	U	0.078	0	SA
	K-40	14.4	3.1		0.279	0	Asphalt
		20.3	4.3		0.333	0	SA
	Ra-226	0.416	0.1		0.044	0.1	Asphalt
		0.558	0.13		0.057	0.1	SA
	Th-228	0.45	0.099		0.029	0.1	Asphalt
		0.604	0.13		0.033	0.1	SA
	Th-232	0.576	0.16		0.11	0.1	Asphalt
		0.659	0.19		0.13	0.1	SA
	U-235	0	0	U	0.087	0	Asphalt
		0	0	U	0.105	0	SA
	U-238	0	0	U	3.24	0	Asphalt
		0	0	U	3.83	0	SA
	Zn-65	0	0	U	0.069	0	Asphalt
		0	0	U	0.082	0	SA
364B2	Am-241	0	0	U	0.044	0	Asphalt
		0	0	U	0.05	0	SA
	Co-60	0	0	U	0.015	0.015	Asphalt
		0	0	U	0.018	0.015	SA
	Cs-137	0	0	U	0.013	0.01	Asphalt
		0	0	U	0.015	0.01	SA
	Eu-152	0	0	U	0.033	0.03	Asphalt
		0	0	U	0.039	0.03	SA
	Eu-154	0	0	U	0.055	0	Asphalt
		0	0	U	0.058	0	SA
	Eu-155	0	0	U	0.034	0	Asphalt
		0	0	U	0.04	0	SA
	K-40	16.9	3.6		0.161	0	Asphalt
		19.2	4.1		0.177	0	SA
	Ra-226	0.399	0.089		0.025	0.1	Asphalt

TABLE B-1

BUILDING 364 CESIUM 137 SPILL SITE ANALYTICAL RESULTS

Sample Location	Nuclide	Result (pCi/g)	Total Error (pCi/g)	Qualifier	MDA	RDL	Matrix
364B2	Ra-226	0.487	0.11		0.033	0.1	SA
	Th-228	0.449	0.097		0.017	0.1	Asphalt
		0.569	0.12		0.02	0.1	SA
	Th-232	0.443	0.12		0.067	0.1	Asphalt
		0.567	0.15		0.08	0.1	SA
	U-235	0	0	U	0.055	0	Asphalt
		0	0	U	0.065	0	SA
	U-238	0	0	U	1.82	0	Asphalt
		0	0	U	2.21	0	SA
	Zn-65	0	0	U	0.043	0	Asphalt
		0	0	U	0.048	0	SA
364B3	Am-241	0	0	U	0.03	0	Asphalt
		0	0	U	0.049	0	SA
	Co-60	0	0	U	0.03	0.015	Asphalt
		0	0	U	0.017	0.015	SA
	Cs-137	0	0	U	0.024	0.01	Asphalt
		0	0	U	0.015	0.01	SA
	Eu-152	0	0	U	0.056	0.03	Asphalt
		0	0	U	0.037	0.03	SA
	Eu-154	0	0	U	0.099	0	Asphalt
		0	0	U	0.056	0	SA
	Eu-155	0	0	U	0.077	0	Asphalt
		0	0	U	0.038	0	SA
	K-40	16.2	3.5		0.257	0	Asphalt
		21	4.5		0.155	0	SA
	Ra-226	0.446	0.11		0.049	0.1	Asphalt
		0.56	0.12		0.029	0.1	SA
	Th-228	0.466	0.1		0.027	0.1	Asphalt
		0.604	0.13		0.019	0.1	SA
	Th-232	0.628	0.19		0.128	0.1	Asphalt
		0.672	0.16		0.072	0.1	SA
	U-235	0	0	U	0.08	0	Asphalt
		0	0	U	0.122	0	SA
	U-238	0	0	U	3.66	0	Asphalt
		0	0	U	2.1	0	SA
	Zn-65	0	0	U	0.088	0	Asphalt
		0	0	U	0.048	0	SA
364B4	Am-241	0	0	U	0.49	0	Asphalt
		0	0	U	0.109	0	SA
	Co-60	0	0	U	0.023	0.015	Asphalt
		0	0	U	0.028	0.015	SA
	Cs-137	0	0	U	0.02	0.01	Asphalt

TABLE B-1

BUILDING 364 CESIUM 137 SPILL SITE ANALYTICAL RESULTS

Sample Location	Nuclide	Result (pCi/g)	Total Error (pCi/g)	Qualifier	MDA	RDL	Matrix
364B4	Cs-137	0	0	U	0.023	0.01	SA
	Eu-152	0	0	U	0.047	0.03	Asphalt
		0	0	U	0.055	0.03	SA
	Eu-154	0	0	U	0.077	0	Asphalt
		0	0	U	0.094	0	SA
	Eu-155	0	0	U	0.059	0	Asphalt
		0	0	U	0.1	0	SA
	K-40	15.4	3.3		0.226	0	Asphalt
		20.7	4.5		0.227	0	SA
	Ra-226	0.431	0.103		0.040	0.1	Asphalt
		0.547	0.125		0.045	0.1	SA
	Th-228	0.515	0.11		0.023	0.1	Asphalt
		0.614	0.135		0.030	0.1	SA
	Th-232	0.539	0.15		0.094	0.1	Asphalt
		0.734	0.195		0.115	0.1	SA
	U-235	0	0	U	0.068	0	Asphalt
		0	0	U	0.094	0	SA
	U-238	0	0	U	2.81	0	Asphalt
		0	0	U	3.28	0	SA
	Zn-65	0	0	U	0.065	0	Asphalt
		0	0	U	0.077	0	SA
364B5	Am-241	0	0	U	0.03	0	Asphalt
		0	0	U	0.07	0	SA
	Co-60	0	0	U	0.012	0.015	Asphalt
		0	0	U	0.02	0.015	SA
	Cs-137	0.018	0.01		0.012	0.01	Asphalt
		0	0	U	0.019	0.01	SA
	Eu-152	0	0	U	0.026	0.03	Asphalt
		0	0	U	0.048	0.03	SA
	Eu-154	0	0	U	0.044	0	Asphalt
		0	0	U	0.074	0	SA
	Eu-155	0	0	U	0.028	0	Asphalt
		0	0	U	0.053	0	SA
	K-40	16	3.4		0.112	0	Asphalt
		9.38	2.1		0.215	0	SA
	Ra-226	0.41	0.09		0.022	0.1	Asphalt
		0.364	0.087		0.04	0.1	SA
	Th-228	0.444	0.095		0.014	0.1	Asphalt
		0.314	0.07		0.022	0.1	SA
	Th-232	0.479	0.12		0.055	0.1	Asphalt
		0.354	0.12		0.096	0.1	SA
	U-235	0	0	U	0.04	0	Asphalt

TABLE B-1

BUILDING 364 CESIUM 137 SPILL SITE ANALYTICAL RESULTS

Sample Location	Nuclide	Result (pCi/g)	Total Error (pCi/g)	Qualifier	MDA	RDL	Matrix
364B5	U-235	0	0	U	0.07	0	SA
	U-238	0	0	U	1.45	0	Asphalt
		0	0	U	2.39	0	SA
	Zn-65	0	0	U	0.035	0	Asphalt
		0	0	U	0.051	0	SA
364B6	Am-241	0	0	U	0.03	0	Asphalt
		0	0	U	0.048	0	SA
	Co-60	0	0	U	0.026	0.015	Asphalt
		0	0	U	0.016	0.015	SA
	Cs-137	0	0	U	0.022	0.01	Asphalt
		0	0	U	0.014	0.01	SA
	Eu-152	0	0	U	0.051	0.03	Asphalt
		0	0	U	0.036	0.03	SA
	Eu-154	0	0	U	0.086	0	Asphalt
		0	0	U	0.053	0	SA
	Eu-155	0	0	U	0.046	0	Asphalt
		0	0	U	0.038	0	SA
	K-40	12.3	2.6		0.26	0	Asphalt
		20.9	4.5		0.159	0	SA
	Ra-226	0.465	0.11		0.042	0.1	Asphalt
		0.538	0.12		0.03	0.1	SA
	Th-228	0.613	0.13		0.027	0.1	Asphalt
		0.641	0.14		0.018	0.1	SA
	Th-232	0.723	0.19		0.112	0.1	Asphalt
		0.692	0.16		0.064	0.1	SA
	U-235	0.065	0.06	U	0.08	0	Asphalt
		0	0	U	0.06	0	SA
	U-238	0	0	U	3.15	0	Asphalt
		0	0	U	2.06	0	SA
	Zn-65	0	0	U	0.079	0	Asphalt
		0	0	U	0.046	0	SA
364B7	Am-241	0	0	U	0.087	0	Asphalt
		0	0	U	0.078	0	SA
	Co-60	0	0	U	0.027	0.015	Asphalt
		0	0	U	0.022	0.015	SA
	Cs-137	0	0	U	0.025	0.01	Asphalt
		0	0	U	0.021	0.01	SA
	Eu-152	0	0	U	0.058	0.03	Asphalt
		0	0	U	0.05	0.03	SA
	Eu-154	0	0	U	0.088	0	Asphalt
		0	0	U	0.075	0	SA
	Eu-155	0	0	U	0.059	0	Asphalt

TABLE B-1

BUILDING 364 CESIUM 137 SPILL SITE ANALYTICAL RESULTS

Sample Location	Nuclide	Result (pCi/g)	Total Error (pCi/g)	Qualifier	MDA	RDL	Matrix
364B7	Eu-155	0	0	U	0.058	0	SA
	K-40	16.6	3.6		0.27	0	Asphalt
		19.9	4.2		0.226	0	SA
	Ra-226	0.424	0.1		0.04	0.1	Asphalt
		0.523	0.12		0.038	0.1	SA
	Th-228	0.456	0.1		0.027	0.1	Asphalt
		0.588	0.13		0.024	0.1	SA
	Th-232	0.465	0.13		0.104	0.1	Asphalt
		0.654	0.16		0.096	0.1	SA
	U-235	0	0	U	0.086	0	Asphalt
		0	0	U	0.078	0	SA
	U-238	0	0	U	3.13	0	Asphalt
		0	0	U	2.67	0	SA
	Zn-65	0	0	U	0.072	0	Asphalt
		0	0	U	0.06	0	SA
364B8	Am-241	0	0	U	0.038	0	Asphalt
		0	0	U	0.041	0	SA
	Co-60	0	0	U	0.015	0.015	Asphalt
		0	0	U	0.014	0.015	SA
	Cs-137	0.015	0.013		0.015	0.01	Asphalt
		0	0	U	0.012	0.01	SA
	Eu-152	0	0	U	0.033	0.03	Asphalt
		0	0	U	0.031	0.03	SA
	Eu-154	0	0	U	0.053	0	Asphalt
		0	0	U	0.047	0	SA
	Eu-155	0	0	U	0.039	0	Asphalt
		0	0	U	0.054	0	SA
	K-40	16.2	3.5		0.13	0	Asphalt
		17.9	3.8		0.137	0	SA
	Ra-226	0.409	0.091		0.026	0.1	Asphalt
		0.47	0.1		0.027	0.1	SA
	Th-228	0.481	0.1		0.017	0.1	Asphalt
		0.521	0.11		0.016	0.1	SA
	Th-232	0.504	0.12		0.06	0.1	Asphalt
		0.51	0.12		0.061	0.1	SA
	U-235	0	0	U	0.051	0	Asphalt
		0	0	U	0.066	0	SA
	U-238	0	0	U	1.85	0	Asphalt
		0	0	U	1.67	0	SA
	Zn-65	0	0	U	0.041	0	Asphalt
		0	0	U	0.038	0	SA

TABLE B-1

BUILDING 364 CESIUM 137 SPILL SITE ANALYTICAL RESULTS

Sample Location	Nuclide	Result (pCi/g)	Total Error (pCi/g)	Qualifier	MDA	RDL	Matrix
364S9	Am-241	0	0	U	0.021	0	Asphalt
		0	0	U	0.026	0	SA
	Co-60	0	0	U	0.019	0.015	Asphalt
		0	0	U	0.021	0.015	SA
	Cs-137	0.019	0.018	U	0.021	0.01	Asphalt
		0	0	U	0.018	0.01	SA
	Eu-152	0	0	U	0.037	0.03	Asphalt
		0	0	U	0.041	0.03	SA
	Eu-154	0	0	U	0.073	0	Asphalt
		0	0	U	0.075	0	SA
	Eu-155	0	0	U	0.032	0	Asphalt
		0	0	U	0.036	0	SA
	K-40	14.1	3.1		0.181	0	Asphalt
		5.23	1.2		0.152	0	SA
	Ra-226	0.384	0.088		0.034	0.1	Asphalt
		0.279	0.071		0.034	0.1	SA
	Th-228	0.416	0.091		0.019	0.1	Asphalt
		0.198	0.047		0.021	0.1	SA
	Th-232	0.464	0.13		0.084	0.1	Asphalt
		0.19	0.093		0.085	0.1	SA
	U-235	0	0	U	0.053	0	Asphalt
		0	0	U	0.06	0	SA
	U-238	0	0	U	2.49	0	Asphalt
		0	0	U	2.38	0	SA
	Zn-65	0	0	U	0.061	0	Asphalt
		0	0	U	0.058	0	SA
364S10	Am-241	0	0	U	0.062	0	Asphalt
		0	0	U	0.058	0	SA
	Co-60	0	0	U	0.019	0.015	Asphalt
		0	0	U	0.014	0.015	SA
	Cs-137	0.011	0.01	U	0.015	0.01	Asphalt
		0	0	U	0.014	0.01	SA
	Eu-152	0	0	U	0.04	0.03	Asphalt
		0	0	U	0.037	0.03	SA
	Eu-154	0	0	U	0.061	0	Asphalt
		0	0	U	0.046	0	SA
	Eu-155	0	0	U	0.046	0	Asphalt
		0	0	U	0.042	0	SA
	K-40	15.8	3.4		0.203	0	Asphalt
		3.88	0.87		0.169	0	SA
	Ra-226	0.391	0.089		0.031	0.1	Asphalt
		0.412	0.093		0.026	0.1	SA

TABLE B-1

BUILDING 364 CESIUM 137 SPILL SITE ANALYTICAL RESULTS

Sample Location	Nuclide	Result (pCi/g)	Total Error (pCi/g)	Qualifier	MDA	RDL	Matrix
364S10	Th-228	0.44	0.095		0.02	0.1	Asphalt
		0.155	0.036		0.018	0.1	SA
	Th-232	0.444	0.12		0.079	0.1	Asphalt
		0.132	0.06		0.061	0.1	SA
	U-235	0	0	U	0.06	0	Asphalt
		0	0	U	0.064	0	SA
	U-238	0	0	U	2.13	0	Asphalt
		0	0	U	2.66	0	SA
	Zn-65	0	0	U	0.052	0	Asphalt
		0	0	U	0.039	0	SA
364S11	Am-241	0	0	U	0.027	0	Asphalt
		0	0	U	0.034	0	SA
	Co-60	0	0	U	0.011	0.015	Asphalt
		0	0	U	0.01	0.015	SA
	Cs-137	0.171	0.038		0.011	0.01	Asphalt
		0	0	U	0.012	0.01	SA
	Eu-152	0	0	U	0.024	0.03	Asphalt
		0	0	U	0.023	0.03	SA
	Eu-154	0	0	U	0.039	0	Asphalt
		0	0	U	0.031	0	SA
	Eu-155	0	0	U	0.031	0	Asphalt
		0	0	U	0.027	0	SA
	K-40	16.5	3.5		0.083	0	Asphalt
		5.52	1.2		0.077	0	SA
	Ra-226	0.385	0.084		0.02	0.1	Asphalt
		0.205	0.048		0.018	0.1	SA
	Th-228	0.439	0.094		0.012	0.1	Asphalt
		0.18	0.04		0.012	0.1	SA
	Th-232	0.445	0.1		0.043	0.1	Asphalt
		0.200	0.059		0.04	0.1	SA
	U-235	0	0	U	0.051	0	Asphalt
		0	0	U	0.038	0	SA
	U-238	0	0	U	1.3	0	Asphalt
		0	0	U	1.16	0	SA
	Zn-65	0	0	U	0.031	0	Asphalt
		0	0	U	0.025	0	SA
364S12	Am-241	0	0	U	0.042	0	Asphalt
		0	0	U	0.032	0	SA
	Co-60	0	0	U	0.044	0.015	Asphalt
		0	0	U	0.01	0.015	SA
	Cs-137	0.05	0.031		0.033	0.01	Asphalt
		0	0	U	0.01	0.01	SA

TABLE B-1

BUILDING 364 CESIUM 137 SPILL SITE ANALYTICAL RESULTS

Sample Location	Nuclide	Result (pCi/g)	Total Error (pCi/g)	Qualifier	MDA	RDL	Matrix
364S12	Eu-152	0	0	U	0.075	0.03	Asphalt
		0	0	U	0.025	0.03	SA
	Eu-154	0	0	U	0.142	0	Asphalt
		0	0	U	0.031	0	SA
	Eu-155	0	0	U	0.065	0	Asphalt
		0	0	U	0.026	0	SA
	K-40	15.6	3.4		0.348	0	Asphalt
		4.72	1		0.122	0	SA
	Ra-226	0.418	0.12		0.073	0.1	Asphalt
		0.335	0.075		0.02	0.1	SA
	Th-228	0.45	0.1		0.038	0.1	Asphalt
		0.197	0.044		0.013	0.1	SA
	Th-232	0.39	0.2		0.186	0.1	Asphalt
		0.225	0.065		0.044	0.1	SA
	U-235	0	0	U	0.109	0	Asphalt
		0	0	U	0.042	0	SA
	U-238	0	0	U	4.62	0	Asphalt
		0	0	U	1.23	0	SA
	Zn-65	0	0	U	0.122	0	Asphalt
		0	0	U	0.029	0	SA
364S13	Am-241	0	0	U	0.079	0	Asphalt
		0	0	U	0.012	0	SA
	Co-60	0	0	U	0.025	0.015	Asphalt
		0	0	U	0.011	0.015	SA
	Cs-137	0.052	0.027		0.026	0.01	Asphalt
		0	0	U	0.012	0.01	SA
	Eu-152	0	0	U	0.056	0.03	Asphalt
		0	0	U	0.024	0.03	SA
	Eu-154	0	0	U	0.09	0	Asphalt
		0	0	U	0.037	0	SA
	Eu-155	0	0	U	0.061	0	Asphalt
		0	0	U	0.023	0	SA
	K-40	16	3.5		0.266	0	Asphalt
		4.67	1.04		0.114	0	SA
	Ra-226	0.376	0.094		0.046	0.1	Asphalt
		0.191	0.046		0.020	0.1	SA
	Th-228	0.456	0.100		0.027	0.1	Asphalt
		0.15	0.034		0.012	0.1	SA
	Th-232	0.462	0.135		0.087	0.1	Asphalt
		0.16	0.058		0.047	0.1	SA
	U-235	0	0	U	0.081	0	Asphalt
		0	0	U	0.036	0	SA

TABLE B-1

BUILDING 364 CESIUM 137 SPILL SITE ANALYTICAL RESULTS

Sample Location	Nuclide	Result (pCi/g)	Total Error (pCi/g)	Qualifier	MDA	RDL	Matrix
364S13	U-238	0	0	U	2.99	0	Asphalt
		0	0	U	1.32	0	SA
	Zn-65	0	0	U	0.093	0	Asphalt
		0	0	U	0.041	0	Asphalt
		0	0	U	0.029	0	SA
364S14	Am-241	0	0	U	0.06	0	Asphalt
		0	0	U	0.028	0	SA
	Co-60	0	0	U	0.028	0.015	Asphalt
		0	0	U	0.017	0.015	SA
	Cs-137	0.386	0.091		0.032	0.01	Asphalt
		0.231	0.057		0.020	0.01	SA
	Eu-152	0	0	U	0.064	0.03	Asphalt
		0	0	U	0.042	0.03	SA
	Eu-154	0	0	U	0.101	0	Asphalt
		0	0	U	0.067	0	SA
	Eu-155	0	0	U	0.057	0	Asphalt
		0	0	U	0.035	0	SA
	K-40	15.3	3.3		0.374	0	Asphalt
		5.9	1.3		0.196	0	SA
	Ra-226	0.377	0.095		0.052	0.1	Asphalt
		0.259	0.067		0.034	0.1	SA
	Th-228	0.419	0.092		0.03	0.1	Asphalt
		0.209	0.049		0.020	0.1	SA
	Th-232	0.461	0.16		0.127	0.1	Asphalt
		0.261	0.115		0.085	0.1	SA
	U-235	0	0	U	0.085	0	Asphalt
		0	0	U	0.059	0	SA
	U-238	0	0	U	3.45	0	Asphalt
		0	0	U	2.44	0	SA
	Zn-65	0	0	U	0.082	0	Asphalt
		0	0	U	0.056	0	SA
364S15	Am-241	0	0	U	0.037	0	Asphalt
		0	0	U	0.093	0	SA
	Co-60	0	0	U	0.014	0.015	Asphalt
		0	0	U	0.028	0.015	SA
	Cs-137	0.058	0.02		0.017	0.01	Asphalt
		0.033	0.024		0.026	0.01	SA
	Eu-152	0	0	U	0.034	0.03	Asphalt
		0	0	U	0.063	0.03	SA
	Eu-154	0	0	U	0.053	0	Asphalt
		0	0	U	0.093	0	SA
	Eu-155	0	0	U	0.034	0	Asphalt

TABLE B-1

BUILDING 364 CESIUM 137 SPILL SITE ANALYTICAL RESULTS

Sample Location	Nuclide	Result (pCi/g)	Total Error (pCi/g)	Qualifier	MDA	RDL	Matrix
364S15	Eu-155	0	0	U	0.065	0	SA
	K-40	16.6	3.5		0.152	0	Asphalt
		6.36	1.5		0.282	0	SA
	Ra-226	0.356	0.08		0.028	0.1	Asphalt
		0.382	0.095		0.041	0.1	SA
	Th-228	0.396	0.086		0.018	0.1	Asphalt
		0.191	0.048		0.031	0.1	SA
	Th-232	0.52	0.13		0.068	0.1	Asphalt
		0.341	0.13		0.108	0.1	SA
	U-235	0	0	U	0.047	0	Asphalt
		0	0	U	0.095	0	SA
	U-238	0	0	U	2.79	0	Asphalt
		0	0	U	3.4	0	SA
	Zn-65	0	0	U	0.044	0	Asphalt
		0	0	U	0.071	0	SA
364S16	Am-241	0	0	U	0.03	0	Asphalt
		0	0	U	0.041	0	SA
	Co-60	0	0	U	0.033	0.015	Asphalt
		0	0	U	0.013	0.015	SA
	Cs-137	0.115	0.035		0.028	0.01	Asphalt
		0	0	U	0.013	0.01	SA
	Eu-152	0	0	U	0.055	0.03	Asphalt
		0	0	U	0.031	0.03	SA
	Eu-154	0	0	U	0.104	0	Asphalt
		0	0	U	0.043	0	SA
	Eu-155	0	0	U	0.047	0	Asphalt
		0	0	U	0.032	0	SA
	K-40	17.6	3.8		0.279	0	Asphalt
		6.21	1.4		0.141	0	SA
	Ra-226	0.408	0.099		0.049	0.1	Asphalt
		0.256	0.061		0.025	0.1	SA
	Th-228	0.49	0.11		0.028	0.1	Asphalt
		0.236	0.053		0.016	0.1	SA
	Th-232	0.516	0.16		0.129	0.1	Asphalt
		0.259	0.079		0.054	0.1	SA
	U-235	0	0	U	0.079	0	Asphalt
		0	0	U	0.053	0	SA
	U-238	0	0	U	3.9	0	Asphalt
		0	0	U	1.68	0	SA

TABLE B-1

BUILDING 364 CESIUM 137 SPILL SITE ANALYTICAL RESULTS

Sample Location	Nuclide	Result (pCi/g)	Total Error (pCi/g)	Qualifier	MDA	RDL	Matrix
364S16	Zn-65	0	0	U	0.087	0	Asphalt
		0	0	U	0.036	0	SA

Notes:

Am-241	Americium 241
Co-60	Cobalt 60
Cs-137	Cesium 137
Eu-152	Europium 152
Eu-154	Europium 152
J	Estimated value
K-40	Potassium 40
MDA	Minimum detectable activity
pCi/g	picoCurie per gram
Ra-226	Radium 226
RDL	Required detection limit
SA	Soil aggragete (soil)
Th-228	Thorium 228
Th-232	Thorium 232
U	Nondetected value
U-235	Uranium 235
U-238	Uranium 238
Zn-65	Zinc 65

TABLE B-2

BUILDING 707 CONCRETE PAD SITE ANALYTICAL RESULTS

Sample Location	Nuclide	Result (pCi/g)	Total Error (pCi/g)	Qualifier	MDA	RDL	Matrix
707A1	Am-241	0.897	0.200		0.060	0.000	Concrete
		11.850	2.500		0.236	0.000	SA
	Co-60	0.014	0.010	J	0.011	0.015	Concrete
		0.088	0.042		0.033	0.015	SA
	Cs-137	5.920	1.250		0.025	0.010	Concrete
		84.200	18.000		0.084	0.010	SA
	Eu-152	0.000	0.000	U	0.142	0.030	Concrete
		0.000	0.000	U	0.280	0.030	SA
	Eu-154	0.000	0.000	U	0.052	0.000	Concrete
		0.250	0.110		0.103	0.000	SA
	Eu-155	0.000	0.000	U	0.050	0.000	Concrete
		0.000	0.000	U	0.183	0.000	SA
	K-40	4.180	0.930		0.141	0.000	Concrete
		14.300	3.100		0.240	0.000	SA
	Ra-226	0.255	0.066		0.037	0.100	Concrete
		0.396	0.135		0.134	0.100	SA
	Th-228	0.326	0.079		0.041	0.100	Concrete
		0.627	0.165		0.143	0.100	SA
	Th-232	0.270	0.085		0.062	0.100	Concrete
		0.392	0.145		0.124	0.100	SA
	U-235	0.157	0.078		0.095	0.000	Concrete
		0.838	0.275		0.312	0.000	SA
	U-238	0.000	0.000	U	1.920	0.000	Concrete
		0.000	0.000	U	3.740	0.000	SA
	Zn-65	0.000	0.000	U	0.047	0.000	Concrete
		0.000	0.000	U	0.076	0.000	SA
707A1-A	Am-241	0.268	0.130		0.130	0.000	Asphalt
		2.200	0.540		0.351	0.000	SA
	Co-60	0.000	0.000	U	0.022	0.015	Asphalt
		0.020	0.013		0.017	0.015	SA
	Cs-137	2.590	0.550		0.029	0.010	Asphalt
		17.800	3.800		0.035	0.010	SA
	Eu-152	0.000	0.000	U	0.071	0.030	Asphalt
		0.000	0.000	U	0.097	0.030	SA
	Eu-154	0.000	0.000	U	0.066	0.000	Asphalt
		0.000	0.000	U	0.070	0.000	SA
	Eu-155	0.000	0.000	U	0.065	0.000	Asphalt
		0.000	0.000	U	0.119	0.000	SA
	K-40	6.120	1.400		0.194	0.000	Asphalt
		18.000	3.800		0.155	0.000	SA
	Ra-226	0.274	0.074		0.048	0.100	Asphalt
		0.470	0.110		0.052	0.100	SA

TABLE B-2

BUILDING 707 CONCRETE PAD SITE ANALYTICAL RESULTS

Sample Location	Nuclide	Result (pCi/g)	Total Error (pCi/g)	Qualifier	MDA	RDL	Matrix
707A1-A	Th-228	0.292	0.067		0.031	0.100	Asphalt
		0.792	0.180		0.067	0.100	SA
	Th-232	0.230	0.084		0.081	0.100	Asphalt
		0.517	0.130		0.066	0.100	SA
	U-235	0.218	0.098		0.112	0.000	Asphalt
		0.374	0.140		0.159	0.000	SA
	U-238	0.000	0.000	U	2.350	0.000	Asphalt
		0.000	0.000	U	2.260	0.000	SA
	Zn-65	0.000	0.000	U	0.054	0.000	Asphalt
		0.000	0.000	U	0.049	0.000	SA
707A1-B	Am-241	0.000	0.000	U	0.042	0.000	Asphalt
		0.000	0.000	U	0.034	0.000	SA
	Co-60	0.000	0.000	U	0.012	0.015	Asphalt
		0.000	0.000	U	0.033	0.015	SA
	Cs-137	0.456	0.098		0.011	0.010	Asphalt
		0.115	0.036		0.029	0.010	SA
	Eu-152	0.059	0.028		0.034	0.030	Asphalt
		0.000	0.000	U	0.063	0.030	SA
	Eu-154	0.000	0.000	U	0.045	0.000	Asphalt
		0.000	0.000	U	0.114	0.000	SA
	Eu-155	0.000	0.000	U	0.044	0.000	Asphalt
		0.000	0.000	U	0.054	0.000	SA
	K-40	11.900	2.500		0.105	0.000	Asphalt
		19.100	4.100		0.270	0.000	SA
	Ra-226	0.429	0.094		0.020	0.100	Asphalt
		0.490	0.110		0.040	0.100	SA
	Th-228	0.490	0.100		0.016	0.100	Asphalt
		0.525	0.120		0.033	0.100	SA
	Th-232	0.584	0.140		0.053	0.100	Asphalt
		0.562	0.160		0.118	0.100	SA
	U-235	0.051	0.039	U	0.054	0.000	Asphalt
		0.000	0.000	U	0.091	0.000	SA
	U-238	0.000	0.000	U	1.570	0.000	Asphalt
		0.000	0.000	U	4.070	0.000	SA
	Zn-65	0.000	0.000	U	0.038	0.000	Asphalt
		0.000	0.000	U	0.094	0.000	SA
707A1-C	Am-241	0.417	0.093		0.037	0.000	Concrete
		0.000	0.000	U	0.143	0.000	SA
	Co-60	0.000	0.000	U	0.025	0.015	Concrete
		0.000	0.000	U	0.030	0.015	SA
	Cs-137	2.650	0.560		0.027	0.010	Concrete
		1.040	0.220		0.034	0.010	SA

TABLE B-2

BUILDING 707 CONCRETE PAD SITE ANALYTICAL RESULTS

Sample Location	Nuclide	Result (pCi/g)	Total Error (pCi/g)	Qualifier	MDA	RDL	Matrix
707A1-C	Eu-152	0.077	0.051		0.068	0.030	Concrete
		0.000	0.000	U	0.077	0.030	SA
	Eu-154	0.000	0.000	U	0.072	0.000	Concrete
		0.000	0.000	U	0.100	0.000	SA
	Eu-155	0.000	0.000	U	0.053	0.000	Concrete
		0.000	0.000	U	0.079	0.000	SA
	K-40	4.330	0.990		0.238	0.000	Concrete
		16.100	3.500		0.283	0.000	SA
	Ra-226	0.273	0.072		0.044	0.100	Concrete
		0.430	0.110		0.055	0.100	SA
	Th-228	0.311	0.071		0.032	0.100	Concrete
		0.491	0.110		0.035	0.100	SA
	Th-232	0.309	0.130		0.109	0.100	Concrete
		0.533	0.150		0.106	0.100	SA
	U-235	0.000	0.000	U	0.134	0.000	Concrete
		0.118	0.092	U	0.123	0.000	SA
	U-238	0.000	0.000	U	2.700	0.000	Concrete
		0.000	0.000	U	3.510	0.000	SA
	Zn-65	0.000	0.000	U	0.068	0.000	Concrete
		0.000	0.000	U	0.079	0.000	SA
707A1-D	Am-241	0.000	0.000	U	0.032	0.000	Asphalt
		0.000	0.000	U	0.047	0.000	SA
	Co-60	0.015	0.011		0.012	0.015	Asphalt
		0.025	0.018		0.019	0.015	SA
	Cs-137	0.440	0.095		0.014	0.010	Asphalt
		2.120	0.450		0.020	0.010	SA
	Eu-152	0.000	0.000	U	0.031	0.030	Asphalt
		0.000	0.000	U	0.046	0.030	SA
	Eu-154	0.000	0.000	U	0.037	0.000	Asphalt
		0.000	0.000	U	0.056	0.000	SA
	Eu-155	0.000	0.000	U	0.032	0.000	Asphalt
		0.000	0.000	U	0.046	0.000	SA
	K-40	4.990	1.100		0.112	0.000	Asphalt
		17.000	3.600		0.148	0.000	SA
	Ra-226	0.223	0.054		0.023	0.100	Asphalt
		0.418	0.094		0.032	0.100	SA
	Th-228	0.202	0.046		0.016	0.100	Asphalt
		0.479	0.100		0.024	0.100	SA
	Th-232	0.196	0.062		0.050	0.100	Asphalt
		0.469	0.120		0.072	0.100	SA
	U-235	0.130	0.057		0.064	0.000	Asphalt
		0.210	0.081		0.089	0.000	SA

TABLE B-2

BUILDING 707 CONCRETE PAD SITE ANALYTICAL RESULTS

Sample Location	Nuclide	Result (pCi/g)	Total Error (pCi/g)	Qualifier	MDA	RDL	Matrix
707A1-D	U-238	0.000	0.000	U	1.310	0.000	Asphalt
		0.000	0.000	U	2.010	0.000	SA
	Zn-65	0.000	0.000	U	0.031	0.000	Asphalt
707A1-E	Am-241	0.000	0.000	U	0.036	0.000	Asphalt
		0.000	0.000	U	0.184	0.000	SA
	Co-60	0.000	0.000	U	0.032	0.015	Asphalt
		0.000	0.000	U	0.026	0.015	SA
	Cs-137	0.000	0.000	U	0.029	0.010	Asphalt
		0.000	0.000	U	0.022	0.010	SA
	Eu-152	0.000	0.000	U	0.065	0.030	Asphalt
		0.000	0.000	U	0.052	0.030	SA
	Eu-154	0.000	0.000	U	0.111	0.000	Asphalt
		0.000	0.000	U	0.088	0.000	SA
	Eu-155	0.000	0.000	U	0.057	0.000	Asphalt
		0.000	0.000	U	0.082	0.000	SA
	K-40	10.200	2.300		0.281	0.000	Asphalt
		22.900	4.900		0.201	0.000	SA
	Ra-226	0.443	0.110		0.052	0.100	Asphalt
		0.462	0.110		0.044	0.100	SA
	Th-228	0.489	0.110		0.034	0.100	Asphalt
		0.500	0.110		0.030	0.100	SA
	Th-232	0.597	0.210		0.153	0.100	Asphalt
		0.628	0.180		0.117	0.100	SA
	U-235	0.000	0.000	U	0.096	0.000	Asphalt
		0.000	0.000	U	0.100	0.000	SA
	U-238	0.000	0.000	U	3.720	0.000	Asphalt
		0.000	0.000	U	3.060	0.000	SA
	Zn-65	0.000	0.000	U	0.103	0.000	Asphalt
		0.000	0.000	U	0.070	0.000	SA
707A1-F	Am-241	0.000	0.000	U	0.110	0.000	Asphalt
		0.000	0.000	U	0.035	0.000	SA
	Co-60	0.000	0.000	U	0.032	0.015	Asphalt
		0.000	0.000	U	0.033	0.015	SA
	Cs-137	0.000	0.000	U	0.031	0.010	Asphalt
		0.000	0.000	U	0.026	0.010	SA
	Eu-152	0.000	0.000	U	0.073	0.030	Asphalt
		0.000	0.000	U	0.062	0.030	SA
	Eu-154	0.000	0.000	U	0.100	0.000	Asphalt
		0.000	0.000	U	0.124	0.000	SA
	Eu-155	0.000	0.000	U	0.084	0.000	Asphalt
		0.000	0.000	U	0.054	0.000	SA
	K-40	10.800	2.300		0.339	0.000	Asphalt

TABLE B-2

BUILDING 707 CONCRETE PAD SITE ANALYTICAL RESULTS

Sample Location	Nuclide	Result (pCi/g)	Total Error (pCi/g)	Qualifier	MDA	RDL	Matrix
707A1-F	K-40	20.000	4.300		0.316	0.000	SA
	Ra-226	0.421	0.110		0.055	0.100	Asphalt
		0.458	0.110		0.050	0.100	SA
	Th-228	0.514	0.110		0.036	0.100	Asphalt
		0.516	0.110		0.031	0.100	SA
	Th-232	0.514	0.160		0.137	0.100	Asphalt
		0.560	0.170		0.128	0.100	SA
	U-235	0.000	0.000	U	0.109	0.000	Asphalt
		0.000	0.000	U	0.090	0.000	SA
	U-238	0.000	0.000	U	3.440	0.000	Asphalt
		0.000	0.000	U	7.860	0.000	SA
	Zn-65	0.000	0.000	U	0.082	0.000	Asphalt
		0.000	0.000	U	0.099	0.000	SA
707A1-G	Am-241	0.000	0.000	U	0.043	0.000	Asphalt
		0.000	0.000	U	0.082	0.000	SA
	Co-60	0.000	0.000	U	0.015	0.015	Asphalt
		0.000	0.000	U	0.024	0.015	SA
	Cs-137	0.079	0.023		0.017	0.010	Asphalt
		0.070	0.025		0.024	0.010	SA
	Eu-152	0.000	0.000	U	0.037	0.030	Asphalt
		0.000	0.000	U	0.053	0.030	SA
	Eu-154	0.000	0.000	U	0.052	0.000	Asphalt
		0.000	0.000	U	0.086	0.000	SA
	Eu-155	0.000	0.000	U	0.038	0.000	Asphalt
		0.000	0.000	U	0.062	0.000	SA
	K-40	9.050	2.000		0.152	0.000	Asphalt
		16.500	3.500		0.234	0.000	SA
	Ra-226	0.384	0.088		0.030	0.100	Asphalt
		0.418	0.097		0.038	0.100	SA
	Th-228	0.437	0.095		0.020	0.100	Asphalt
		0.457	0.100		0.027	0.100	SA
	Th-232	0.485	0.120		0.067	0.100	Asphalt
		0.479	0.150		0.109	0.100	SA
	U-235	0.061	0.047	U	0.064	0.000	Asphalt
		0.000	0.000	U	0.082	0.000	SA
	U-238	0.000	0.000	U	1.770	0.000	Asphalt
		0.000	0.000	U	2.630	0.000	SA
	Zn-65	0.000	0.000	U	0.044	0.000	Asphalt
		0.000	0.000	U	0.066	0.000	SA
707A1-H	Am-241	0.000	0.000	U	0.030	0.000	Asphalt
		0.000	0.000	U	0.040	0.000	SA
	Co-60	0.000	0.000	U	0.029	0.015	Asphalt

TABLE B-2

BUILDING 707 CONCRETE PAD SITE ANALYTICAL RESULTS

Sample Location	Nuclide	Result (pCi/g)	Total Error (pCi/g)	Qualifier	MDA	RDL	Matrix
707A1-H	Co-60	0.000	0.000	U	0.016	0.015	SA
		0.050	0.033		0.031	0.010	Asphalt
	Cs-137	0.000	0.000	U	0.013	0.010	SA
		0.000	0.000	U	0.055	0.030	Asphalt
	Eu-152	0.000	0.000	U	0.033	0.030	SA
		0.000	0.000	U	0.094	0.000	Asphalt
	Eu-154	0.000	0.000	U	0.056	0.000	SA
	Eu-155	0.000	0.000	U	0.046	0.000	Asphalt
		0.000	0.000	U	0.037	0.000	SA
	K-40	10.700	2.300		0.244	0.000	Asphalt
		18.300	3.900		0.148	0.000	SA
	Ra-226	0.435	0.100		0.043	0.100	Asphalt
		0.422	0.093		0.024	0.100	SA
	Th-228	0.512	0.110		0.028	0.100	Asphalt
		0.478	0.100		0.019	0.100	SA
	Th-232	0.480	0.180		0.145	0.100	Asphalt
		0.575	0.150		0.075	0.100	SA
	U-235	0.000	0.000	U	0.076	0.000	Asphalt
		0.000	0.000	U	0.063	0.000	SA
	U-238	0.000	0.000	U	3.280	0.000	Asphalt
		0.000	0.000	U	1.910	0.000	SA
	Zn-65	0.000	0.000	U	0.081	0.000	Asphalt
		0.000	0.000	U	0.045	0.000	SA
707A2	Am-241	0.000	0.000	U	0.097	0.000	Asphalt
		0.000	0.000	U	0.044	0.000	SA
	Co-60	0.000	0.000	U	0.019	0.015	Asphalt
		0.000	0.000	U	0.016	0.015	SA
	Cs-137	10.685	2.250		0.034	0.010	Asphalt
		1.655	0.355		0.018	0.010	SA
	Eu-152	0.000	0.000	U	0.097	0.030	Asphalt
		0.000	0.000	U	0.042	0.030	SA
	Eu-154	0.000	0.000	U	0.063	0.000	Asphalt
		0.000	0.000	U	0.056	0.000	SA
	Eu-155	0.000	0.000	U	0.074	0.000	Asphalt
		0.000	0.000	U	0.040	0.000	SA
	K-40	9.225	2.000		0.196	0.000	Asphalt
		21.200	4.500		0.127	0.000	SA
	Ra-226	0.380	0.101		0.062	0.100	Asphalt
		0.444	0.098		0.029	0.100	SA
	Th-228	0.475	0.110		0.043	0.100	Asphalt
		0.503	0.110		0.022	0.100	SA
	Th-232	0.487	0.135		0.076	0.100	Asphalt

TABLE B-2

BUILDING 707 CONCRETE PAD SITE ANALYTICAL RESULTS

Sample Location	Nuclide	Result (pCi/g)	Total Error (pCi/g)	Qualifier	MDA	RDL	Matrix
707A2	Th-232	0.517	0.135		0.069	0.100	SA
	U-235	0.000	0.000	U	0.116	0.000	Asphalt
		0.000	0.000	U	0.072	0.000	SA
	U-238	0.000	0.000	U	2.240	0.000	Asphalt
		0.000	0.000	U	1.885	0.000	SA
	Zn-65	0.000	0.000	U	0.053	0.000	Asphalt
		0.000	0.000	U	0.043	0.000	SA
707A2-A	Am-241	0.000	0.000	U	0.076	0.000	Asphalt
		0.000	0.000	U	0.184	0.000	SA
	Co-60	0.000	0.000	U	0.021	0.015	Asphalt
		0.000	0.000	U	0.024	0.015	SA
	Cs-137	0.149	0.039		0.025	0.010	Asphalt
		0.066	0.025		0.024	0.010	SA
	Eu-152	0.000	0.000	U	0.051	0.030	Asphalt
		0.000	0.000	U	0.050	0.030	SA
	Eu-154	0.000	0.000	U	0.069	0.000	Asphalt
		0.000	0.000	U	0.087	0.000	SA
	Eu-155	0.000	0.000	U	0.053	0.000	Asphalt
		0.000	0.000	U	0.081	0.000	SA
	K-40	9.120	2.000		0.222	0.000	Asphalt
		21.800	4.600		0.191	0.000	SA
	Ra-226	0.383	0.089		0.036	0.100	Asphalt
		0.478	0.110		0.037	0.100	SA
	Th-228	0.496	0.110		0.024	0.100	Asphalt
		0.543	0.120		0.029	0.100	SA
	Th-232	0.503	0.140		0.093	0.100	Asphalt
		0.647	0.170		0.104	0.100	SA
	U-235	0.000	0.000	U	0.077	0.000	Asphalt
		0.000	0.000	U	0.100	0.000	SA
	U-238	0.000	0.000	U	2.630	0.000	Asphalt
		0.000	0.000	U	3.040	0.000	SA
	Zn-65	0.000	0.000	U	0.056	0.000	Asphalt
		0.000	0.000	U	0.068	0.000	SA
707A2-B	Am-241	0.000	0.000	U	0.040	0.000	Asphalt
		0.000	0.000	U	0.022	0.000	SA
	Co-60	0.000	0.000	U	0.011	0.015	Asphalt
		0.000	0.000	U	0.020	0.015	SA
	Cs-137	0.922	0.200		0.010	0.010	Asphalt
		0.121	0.033		0.021	0.010	SA
	Eu-152	0.000	0.000	U	0.032	0.030	Asphalt
		0.000	0.000	U	0.038	0.030	SA
	Eu-154	0.000	0.000	U	0.040	0.000	Asphalt

TABLE B-2

BUILDING 707 CONCRETE PAD SITE ANALYTICAL RESULTS

Sample Location	Nuclide	Result (pCi/g)	Total Error (pCi/g)	Qualifier	MDA	RDL	Matrix
707A2-B	Eu-154	0.000	0.000	U	0.076	0.000	SA
	Eu-155	0.000	0.000	U	0.032	0.000	Asphalt
		0.000	0.000	U	0.035	0.000	SA
	K-40	9.740	2.100		0.115	0.000	Asphalt
		20.400	4.400		0.168	0.000	SA
	Ra-226	0.393	0.087		0.022	0.100	Asphalt
		0.454	0.100		0.032	0.100	SA
	Th-228	0.476	0.100		0.017	0.100	Asphalt
		0.516	0.110		0.020	0.100	SA
	Th-232	0.531	0.130		0.051	0.100	Asphalt
		0.589	0.150		0.087	0.100	SA
	U-235	0.049	0.039	U	0.054	0.000	Asphalt
		0.000	0.000	U	0.057	0.000	SA
	U-238	0.000	0.000	U	2.170	0.000	Asphalt
		0.000	0.000	U	2.650	0.000	SA
	Zn-65	0.000	0.000	U	0.032	0.000	Asphalt
		0.000	0.000	U	0.061	0.000	SA
707A2-C	Am-241	0.000	0.000	U	0.058	0.000	Asphalt
		0.000	0.000	U	0.065	0.000	SA
	Co-60	0.000	0.000	U	0.013	0.015	Asphalt
		0.000	0.000	U	0.019	0.015	SA
	Cs-137	6.670	1.400		0.020	0.010	Asphalt
		0.623	0.130		0.021	0.010	SA
	Eu-152	0.000	0.000	U	0.061	0.030	Asphalt
		0.000	0.000	U	0.045	0.030	SA
	Eu-154	0.000	0.000	U	0.046	0.000	Asphalt
		0.000	0.000	U	0.071	0.000	SA
	Eu-155	0.000	0.000	U	0.053	0.000	Asphalt
		0.000	0.000	U	0.050	0.000	SA
	K-40	9.610	2.100		0.134	0.000	Asphalt
		21.700	4.600		0.192	0.000	SA
	Ra-226	0.390	0.091		0.039	0.100	Asphalt
		0.439	0.099		0.034	0.100	SA
	Th-228	0.419	0.092		0.029	0.100	Asphalt
		0.483	0.100		0.022	0.100	SA
	Th-232	0.441	0.110		0.062	0.100	Asphalt
		0.524	0.140		0.089	0.100	SA
	U-235	0.000	0.000	U	0.079	0.000	Asphalt
		0.000	0.000	U	0.066	0.000	SA
	U-238	0.000	0.000	U	1.600	0.000	Asphalt
		0.000	0.000	U	2.320	0.000	SA
	Zn-65	0.000	0.000	U	0.039	0.000	Asphalt

TABLE B-2

BUILDING 707 CONCRETE PAD SITE ANALYTICAL RESULTS

Sample Location	Nuclide	Result (pCi/g)	Total Error (pCi/g)	Qualifier	MDA	RDL	Matrix
707A2-C	Zn-65	0.000	0.000	U	0.038	0.000	Asphalt
		0.000	0.000	U	0.055	0.000	SA
707A2-D	Am-241	0.000	0.000	U	0.035	0.000	Asphalt
		0.000	0.000	U	0.027	0.000	SA
	Co-60	0.000	0.000	U	0.013	0.015	Asphalt
		0.000	0.000	U	0.011	0.015	SA
	Cs-137	0.045	0.016		0.014	0.010	Asphalt
		0.000	0.000	U	0.009	0.010	SA
	Eu-152	0.000	0.000	U	0.031	0.030	Asphalt
		0.000	0.000	U	0.023	0.030	SA
	Eu-154	0.000	0.000	U	0.044	0.000	Asphalt
		0.000	0.000	U	0.039	0.000	SA
	Eu-155	0.000	0.000	U	0.032	0.000	Asphalt
		0.000	0.000	U	0.037	0.000	SA
	K-40	10.600	2.300		0.122	0.000	Asphalt
		19.400	4.100		0.095	0.000	SA
	Ra-226	0.419	0.093		0.023	0.100	Asphalt
		0.453	0.098		0.019	0.100	SA
	Th-228	0.486	0.100		0.016	0.100	Asphalt
		0.522	0.110		0.012	0.100	SA
	Th-232	0.532	0.130		0.053	0.100	Asphalt
		0.544	0.120		0.046	0.100	SA
	U-235	0.042	0.040	U	0.054	0.000	Asphalt
		0.000	0.000	U	0.058	0.000	SA
	U-238	0.000	0.000	U	1.570	0.000	Asphalt
		0.000	0.000	U	1.330	0.000	SA
	Zn-65	0.000	0.000	U	0.031	0.000	SA
707A2-E	Am-241	0.000	0.000	U	0.082	0.000	Asphalt
		0.000	0.000	U	0.117	0.000	SA
	Co-60	0.000	0.000	U	0.023	0.015	Asphalt
		0.000	0.000	U	0.015	0.015	SA
	Cs-137	0.703	0.150		0.026	0.010	Asphalt
		0.000	0.000	U	0.014	0.010	SA
	Eu-152	0.000	0.000	U	0.059	0.030	Asphalt
		0.000	0.000	U	0.032	0.030	SA
	Eu-154	0.000	0.000	U	0.081	0.000	Asphalt
		0.000	0.000	U	0.055	0.000	SA
	Eu-155	0.000	0.000	U	0.063	0.000	Asphalt
		0.000	0.000	U	0.052	0.000	SA
	K-40	13.800	2.900		0.177	0.000	Asphalt
		20.800	4.400		0.126	0.000	SA
	Ra-226	0.392	0.094		0.044	0.100	Asphalt

TABLE B-2

BUILDING 707 CONCRETE PAD SITE ANALYTICAL RESULTS

Sample Location	Nuclide	Result (pCi/g)	Total Error (pCi/g)	Qualifier	MDA	RDL	Matrix
707A2-E	Ra-226	0.480	0.110		0.027	0.100	SA
	Th-228	0.499	0.110		0.028	0.100	Asphalt
		0.482	0.100		0.019	0.100	SA
	Th-232	0.537	0.140		0.094	0.100	Asphalt
		0.584	0.140		0.063	0.100	SA
	U-235	0.000	0.000	U	0.084	0.000	Asphalt
		0.000	0.000	U	0.092	0.000	SA
	U-238	0.000	0.000	U	2.730	0.000	Asphalt
		0.000	0.000	U	1.810	0.000	SA
	Zn-65	0.000	0.000	U	0.065	0.000	Asphalt
		0.000	0.000	U	0.041	0.000	SA
707A2-F	Am-241	0.000	0.000	U	0.034	0.000	Asphalt
		0.000	0.000	U	0.033	0.000	SA
	Co-60	0.000	0.000	U	0.011	0.015	Asphalt
		0.000	0.000	U	0.033	0.015	SA
	Cs-137	0.000	0.000	U	0.011	0.010	Asphalt
		0.000	0.000	U	0.025	0.010	SA
	Eu-152	0.000	0.000	U	0.029	0.030	Asphalt
		0.000	0.000	U	0.059	0.030	SA
	Eu-154	0.000	0.000	U	0.042	0.000	Asphalt
		0.000	0.000	U	0.119	0.000	SA
	Eu-155	0.000	0.000	U	0.036	0.000	Asphalt
		0.000	0.000	U	0.051	0.000	SA
	K-40	9.840	2.100		0.101	0.000	Asphalt
		20.500	4.400		0.316	0.000	SA
	Ra-226	0.388	0.086		0.023	0.100	Asphalt
		0.461	0.120		0.056	0.100	SA
	Th-228	0.512	0.110		0.015	0.100	Asphalt
		0.677	0.150		0.044	0.100	SA
	Th-232	0.500	0.120		0.049	0.100	Asphalt
		0.683	0.220		0.154	0.100	SA
	U-235	0.000	0.000	U	0.044	0.000	Asphalt
		0.000	0.000	U	0.086	0.000	SA
	U-238	0.000	0.000	U	1.480	0.000	Asphalt
		0.000	0.000	U	3.960	0.000	SA
	Zn-65	0.000	0.000	U	0.034	0.000	Asphalt
		0.000	0.000	U	0.093	0.000	SA
707A2-G	Am-241	0.000	0.000	U	0.073	0.000	SA
	Co-60	0.000	0.000	U	0.020	0.015	SA
	Cs-137	0.456	0.100		0.025	0.010	SA
	Eu-152	0.000	0.000	U	0.054	0.030	SA
	Eu-154	0.000	0.000	U	0.072	0.000	SA

TABLE B-2

BUILDING 707 CONCRETE PAD SITE ANALYTICAL RESULTS

Sample Location	Nuclide	Result (pCi/g)	Total Error (pCi/g)	Qualifier	MDA	RDL	Matrix
707A2-G	Eu-155	0.000	0.000	U	0.055	0.000	SA
	K-40	8.540	1.900		0.269	0.000	SA
	Ra-226	0.220	0.060		0.037	0.100	SA
	Th-228	0.221	0.051		0.025	0.100	SA
	Th-232	0.279	0.110		0.092	0.100	SA
	U-235	0.000	0.000	U	0.112	0.000	SA
	U-238	0.000	0.000	U	2.360	0.000	SA
	Zn-65	0.000	0.000	U	0.059	0.000	SA
707A2-H	Am-241	0.000	0.000	U	0.178	0.000	Asphalt
		0.000	0.000	U	0.038	0.000	SA
	Co-60	0.000	0.000	U	0.021	0.015	Asphalt
		0.000	0.000	U	0.016	0.015	SA
	Cs-137	0.000	0.000	U	0.022	0.010	Asphalt
		0.000	0.000	U	0.012	0.010	SA
	Eu-152	0.000	0.000	U	0.050	0.030	Asphalt
		0.000	0.000	U	0.034	0.030	SA
	Eu-154	0.000	0.000	U	0.071	0.000	Asphalt
		0.000	0.000	U	0.057	0.000	SA
	Eu-155	0.000	0.000	U	0.077	0.000	Asphalt
		0.000	0.000	U	0.036	0.000	SA
	K-40	9.850	2.100		0.224	0.000	Asphalt
		22.800	4.800		0.149	0.000	SA
	Ra-226	0.421	0.099		0.038	0.100	Asphalt
		0.414	0.092		0.025	0.100	SA
	Th-228	0.430	0.095		0.028	0.100	Asphalt
		0.499	0.110		0.018	0.100	SA
	Th-232	0.491	0.130		0.088	0.100	Asphalt
		0.520	0.130		0.063	0.100	SA
	U-235	0.000	0.000	U	0.093	0.000	Asphalt
		0.000	0.000	U	0.052	0.000	SA
	U-238	0.000	0.000	U	2.520	0.000	Asphalt
		0.000	0.000	U	1.870	0.000	SA
	Zn-65	0.000	0.000	U	0.057	0.000	Asphalt
		0.000	0.000	U	0.046	0.000	SA
707A3	Am-241	0.000	0.000	U	0.102	0.000	Asphalt
		0.000	0.000	U	0.273	0.000	SA
	Co-60	0.000	0.000	U	0.018	0.015	Asphalt
		0.000	0.000	U	0.023	0.015	SA
	Cs-137	19.045	4.050		0.037	0.010	Asphalt
		62.350	13.000		0.058	0.010	SA
	Eu-152	0.000	0.000	U	0.106	0.030	Asphalt
		0.000	0.000	U	0.199	0.030	SA

TABLE B-2

BUILDING 707 CONCRETE PAD SITE ANALYTICAL RESULTS

Sample Location	Nuclide	Result (pCi/g)	Total Error (pCi/g)	Qualifier	MDA	RDL	Matrix
707A3	Eu-154	0.000	0.000	U	0.061	0.000	Asphalt
		0.000	0.000	U	0.086	0.000	SA
	Eu-155	0.000	0.000	U	0.079	0.000	Asphalt
		0.000	0.000	U	0.168	0.000	SA
	K-40	9.605	2.050		0.188	0.000	Asphalt
		18.750	4.050		0.203		
	Ra-226	0.341	0.088		0.058	0.100	Asphalt
		0.465	0.125		0.097	0.100	SA
	Th-228	0.428	0.102		0.054	0.100	Asphalt
		0.457	0.125		0.104	0.100	SA
	Th-232	0.481	0.125		0.075	0.100	Asphalt
		0.546	0.155		0.103	0.100	SA
	U-235	0.102	0.070		0.098	0.000	Asphalt
		0.577	0.205		0.246	0.000	SA
	U-238	0.000	0.000	U	2.115	0.000	Asphalt
		0.000	0.000	U	2.890	0.000	SA
	Zn-65	0.000	0.000	U	0.049	0.000	Asphalt
		0.000	0.000	U	0.066	0.000	SA
707A3-A	Am-241	0.000	0.000	U	0.027	0.000	Asphalt
		0.000	0.000	U	0.142	0.000	SA
	Co-60	0.000	0.000	U	0.022	0.015	Asphalt
		0.000	0.000	U	0.025	0.015	SA
	Cs-137	1.480	0.320		0.025	0.010	Asphalt
		13.900	3.000		0.050	0.010	SA
	Eu-152	0.000	0.000	U	0.055	0.030	Asphalt
		0.000	0.000	U	0.131	0.030	SA
	Eu-154	0.000	0.000	U	0.077	0.000	Asphalt
		0.000	0.000	U	0.092	0.000	SA
	Eu-155	0.000	0.000	U	0.044	0.000	Asphalt
		0.000	0.000	U	0.106	0.000	SA
	K-40	10.000	2.200		0.216	0.000	Asphalt
		17.700	3.800		0.274	0.000	SA
	Ra-226	0.436	0.100		0.040	0.100	Asphalt
		0.457	0.120		0.081	0.100	SA
	Th-228	0.471	0.100		0.025	0.100	Asphalt
		0.513	0.120		0.055	0.100	SA
	Th-232	0.530	0.140		0.093	0.100	Asphalt
		0.518	0.150		0.115	0.100	SA
	U-235	0.083	0.059		0.077	0.000	Asphalt
		0.657	0.210		0.193	0.000	SA
	U-238	0.000	0.000	U	2.700	0.000	Asphalt
		0.000	0.000	U	3.260	0.000	SA

TABLE B-2

BUILDING 707 CONCRETE PAD SITE ANALYTICAL RESULTS

Sample Location	Nuclide	Result (pCi/g)	Total Error (pCi/g)	Qualifier	MDA	RDL	Matrix
707A3-A	Zn-65	0.000	0.000	U	0.066	0.000	Asphalt
		0.000	0.000	U	0.072	0.000	SA
707A3-B	Am-241	0.000	0.000	U	0.112	0.000	Asphalt
		0.000	0.000	U	0.016	0.000	SA
	Co-60	0.000	0.000	U	0.018	0.015	Asphalt
		0.000	0.000	U	0.015	0.015	SA
	Cs-137	11.600	2.400		0.038	0.010	Asphalt
		0.000	0.000	U	0.013	0.010	SA
	Eu-152	0.000	0.000	U	0.107	0.030	Asphalt
		0.000	0.000	U	0.028	0.030	SA
	Eu-154	0.000	0.000	U	0.063	0.000	Asphalt
		0.000	0.000	U	0.053	0.000	SA
	Eu-155	0.000	0.000	U	0.080	0.000	Asphalt
		0.000	0.000	U	0.038	0.000	SA
	K-40	9.250	2.000		0.209	0.000	Asphalt
		17.200	3.700		0.137	0.000	SA
	Ra-226	0.340	0.092		0.067	0.100	Asphalt
		0.448	0.098		0.025	0.100	SA
	Th-228	0.430	0.097		0.045	0.100	Asphalt
		0.516	0.110		0.015	0.100	SA
	Th-232	0.443	0.130		0.087	0.100	Asphalt
		0.539	0.140		0.067	0.100	SA
	U-235	0.160	0.096		0.131	0.000	Asphalt
		0.000	0.000	U	0.042	0.000	SA
	U-238	0.000	0.000	U	2.240	0.000	Asphalt
		0.000	0.000	U	1.950	0.000	SA
	Zn-65	0.000	0.000	U	0.052	0.000	Asphalt
		0.000	0.000	U	0.047	0.000	SA
707A3-C	Am-241	0.000	0.000	U	0.036	0.000	Asphalt
		0.000	0.000	U	0.046	0.000	SA
	Co-60	0.000	0.000	U	0.011	0.015	Asphalt
		0.000	0.000	U	0.014	0.015	SA
	Cs-137	0.246	0.054		0.013	0.010	Asphalt
		0.096	0.022		0.011	0.010	SA
	Eu-152	0.000	0.000	U	0.028	0.030	Asphalt
		0.000	0.000	U	0.030	0.030	SA
	Eu-154	0.000	0.000	U	0.038	0.000	Asphalt
		0.000	0.000	U	0.046	0.000	SA
	Eu-155	0.000	0.000	U	0.029	0.000	Asphalt
		0.000	0.000	U	0.044	0.000	SA
	K-40	8.400	1.800		0.104	0.000	Asphalt
		16.100	3.400		0.139	0.000	SA

TABLE B-2

BUILDING 707 CONCRETE PAD SITE ANALYTICAL RESULTS

Sample Location	Nuclide	Result (pCi/g)	Total Error (pCi/g)	Qualifier	MDA	RDL	Matrix
707A3-C	Ra-226	0.376	0.083		0.020	0.100	Asphalt
		0.417	0.092		0.023	0.100	SA
	Th-228	0.479	0.100		0.014	0.100	Asphalt
		0.467	0.100		0.015	0.100	SA
	Th-232	0.484	0.120		0.052	0.100	Asphalt
		0.492	0.120		0.056	0.100	SA
	U-235	0.000	0.000	U	0.046	0.000	Asphalt
		0.000	0.000	U	0.055	0.000	SA
	U-238	0.000	0.000	U	1.340	0.000	Asphalt
		0.000	0.000	U	1.550	0.000	SA
	Zn-65	0.000	0.000	U	0.032	0.000	Asphalt
		0.000	0.000	U	0.037	0.000	SA
707A3-D	Am-241	0.000	0.000	U	0.029	0.000	Asphalt
		0.000	0.000	U	0.021	0.000	SA
	Co-60	0.000	0.000	U	0.026	0.015	Asphalt
		0.000	0.000	U	0.008	0.015	SA
	Cs-137	0.227	0.056		0.026	0.010	Asphalt
		0.267	0.057		0.009	0.010	SA
	Eu-152	0.000	0.000	U	0.055	0.030	Asphalt
		0.000	0.000	U	0.018	0.030	SA
	Eu-154	0.000	0.000	U	0.089	0.000	Asphalt
		0.000	0.000	U	0.028	0.000	SA
	Eu-155	0.000	0.000	U	0.045	0.000	Asphalt
		0.000	0.000	U	0.026	0.000	SA
	K-40	8.660	1.900		0.234	0.000	Asphalt
		18.700	4.000		0.069	0.000	SA
	Ra-226	0.406	0.097		0.040	0.100	Asphalt
		0.460	0.099		0.014	0.100	SA
	Th-228	0.431	0.095		0.025	0.100	Asphalt
		0.512	0.110		0.009	0.100	SA
	Th-232	0.563	0.170		0.111	0.100	Asphalt
		0.530	0.120		0.033	0.100	SA
	U-235	0.000	0.000	U	0.074	0.000	Asphalt
		0.134	0.040		0.036	0.000	SA
	U-238	0.000	0.000	U	2.960	0.000	Asphalt
		0.000	0.000	U	0.967	0.000	SA
	Zn-65	0.000	0.000	U	0.077	0.000	Asphalt
		0.000	0.000	U	0.023	0.000	SA
707A3-E	Am-241	0.000	0.000	U	0.038	0.000	Asphalt
		0.000	0.000	U	0.093	0.000	SA
	Co-60	0.000	0.000	U	0.013	0.015	Asphalt
		0.000	0.000	U	0.012	0.015	SA

TABLE B-2

BUILDING 707 CONCRETE PAD SITE ANALYTICAL RESULTS

Sample Location	Nuclide	Result (pCi/g)	Total Error (pCi/g)	Qualifier	MDA	RDL	Matrix
707A3-E	Cs-137	0.032	0.014		0.014	0.010	Asphalt
		0.000	0.000	U	0.011	0.010	SA
	Eu-152	0.000	0.000	U	0.032	0.030	Asphalt
		0.000	0.000	U	0.025	0.030	SA
	Eu-154	0.000	0.000	U	0.049	0.000	Asphalt
		0.000	0.000	U	0.043	0.000	SA
	Eu-155	0.000	0.000	U	0.034	0.000	Asphalt
		0.000	0.000	U	0.055	0.000	SA
	K-40	8.760	1.900		0.140	0.000	Asphalt
		20.400	4.400		0.111	0.000	SA
	Ra-226	0.344	0.078		0.024	0.100	Asphalt
		0.475	0.100		0.023	0.100	SA
	Th-228	0.430	0.093		0.017	0.100	Asphalt
		0.524	0.110		0.015	0.100	SA
	Th-232	0.457	0.110		0.060	0.100	Asphalt
		0.591	0.130		0.050	0.100	SA
	U-235	0.000	0.000	U	0.050	0.000	Asphalt
		0.000	0.000	U	0.061	0.000	SA
	U-238	0.000	0.000	U	1.750	0.000	Asphalt
		0.000	0.000	U	1.460	0.000	SA
	Zn-65	0.000	0.000	U	0.038	0.000	Asphalt
		0.000	0.000	U	0.035	0.000	SA
707A3-F	Am-241	0.000	0.000	U	0.182	0.000	Asphalt
		0.000	0.000	U	0.031	0.000	SA
	Co-60	0.000	0.000	U	0.023	0.015	Asphalt
		0.000	0.000	U	0.030	0.015	SA
	Cs-137	0.152	0.041		0.024	0.010	Asphalt
		0.000	0.000	U	0.025	0.010	SA
	Eu-152	0.000	0.000	U	0.051	0.030	Asphalt
		0.000	0.000	U	0.056	0.030	SA
	Eu-154	0.000	0.000	U	0.077	0.000	Asphalt
		0.000	0.000	U	0.106	0.000	SA
	Eu-155	0.000	0.000	U	0.078	0.000	Asphalt
		0.000	0.000	U	0.047	0.000	SA
	K-40	11.900	2.500		0.233	0.000	Asphalt
		20.000	4.300		0.220	0.000	SA
	Ra-226	0.424	0.100		0.042	0.100	Asphalt
		0.442	0.100		0.046	0.100	SA
	Th-228	0.487	0.110		0.029	0.100	Asphalt
		0.542	0.120		0.031	0.100	SA
	Th-232	0.542	0.140		0.078	0.100	Asphalt
		0.493	0.160		0.124	0.100	SA

TABLE B-2

BUILDING 707 CONCRETE PAD SITE ANALYTICAL RESULTS

Sample Location	Nuclide	Result (pCi/g)	Total Error (pCi/g)	Qualifier	MDA	RDL	Matrix
707A3-F	U-235	0.000	0.000	U	0.099	0.000	Asphalt
		0.000	0.000	U	0.080	0.000	SA
	U-238	0.000	0.000	U	2.630	0.000	Asphalt
		0.000	0.000	U	3.730	0.000	SA
	Zn-65	0.000	0.000	U	0.065	0.000	Asphalt
		0.000	0.000	U	0.090	0.000	SA
707A3-G	Am-241	0.000	0.000	U	0.078	0.000	Concrete
		0.000	0.000	U	0.082	0.000	SA
	Co-60	0.000	0.000	U	0.021	0.015	Concrete
		0.000	0.000	U	0.024	0.015	SA
	Cs-137	0.000	0.000	U	0.025	0.010	Concrete
		0.000	0.000	U	0.022	0.010	SA
	Eu-152	0.000	0.000	U	0.054	0.030	Concrete
		0.000	0.000	U	0.053	0.030	SA
	Eu-154	0.000	0.000	U	0.072	0.000	Concrete
		0.000	0.000	U	0.087	0.000	SA
	Eu-155	0.000	0.000	U	0.058	0.000	Concrete
		0.000	0.000	U	0.062	0.000	SA
	K-40	7.120	1.600		0.209	0.000	Concrete
		18.600	4.000		0.248	0.000	SA
	Ra-226	0.337	0.083		0.042	0.100	Concrete
		0.418	0.097		0.039	0.100	SA
	Th-228	0.321	0.072		0.025	0.100	Concrete
		0.499	0.110		0.027	0.100	SA
	Th-232	0.408	0.130		0.099	0.100	Concrete
		0.564	0.150		0.093	0.100	SA
	U-235	0.000	0.000	U	0.079	0.000	Concrete
		0.000	0.000	U	0.082	0.000	SA
	U-238	0.000	0.000	U	2.460	0.000	Concrete
		0.000	0.000	U	2.840	0.000	SA
	Zn-65	0.000	0.000	U	0.057	0.000	Concrete
		0.000	0.000	U	0.070	0.000	SA
707A3-H	Am-241	0.000	0.000	U	0.034	0.000	Concrete
		0.000	0.000	U	0.035	0.000	SA
	Co-60	0.000	0.000	U	0.012	0.015	Concrete
		0.000	0.000	U	0.014	0.015	SA
	Cs-137	0.024	0.014		0.013	0.010	Concrete
		0.000	0.000	U	0.011	0.010	SA
	Eu-152	0.000	0.000	U	0.029	0.030	Concrete
		0.000	0.000	U	0.031	0.030	SA
	Eu-154	0.000	0.000	U	0.040	0.000	Concrete
		0.000	0.000	U	0.049	0.000	SA

TABLE B-2

BUILDING 707 CONCRETE PAD SITE ANALYTICAL RESULTS

Sample Location	Nuclide	Result (pCi/g)	Total Error (pCi/g)	Qualifier	MDA	RDL	Matrix
707A3-H	Eu-155	0.000	0.000	U	0.031	0.000	Concrete
		0.000	0.000	U	0.033	0.000	SA
	K-40	5.340	1.200		0.139	0.000	Concrete
		17.500	3.700		0.132	0.000	SA
	Ra-226	0.282	0.065		0.021	0.100	Concrete
		0.369	0.083		0.026	0.100	SA
	Th-228	0.324	0.070		0.015	0.100	Concrete
		0.454	0.098		0.016	0.100	SA
	Th-232	0.345	0.089		0.050	0.100	Concrete
		0.509	0.130		0.062	0.100	SA
	U-235	0.000	0.000	U	0.045	0.000	Concrete
		0.000	0.000	U	0.046	0.000	SA
	U-238	0.000	0.000	U	1.530	0.000	Concrete
		0.000	0.000	U	1.760	0.000	SA
	Zn-65	0.000	0.000	U	0.032	0.000	Concrete
		0.000	0.000	U	0.040	0.000	SA
707A3-I	Am-241	0.000	0.000	U	0.184	0.000	Asphalt
		0.000	0.000	U	0.155	0.000	SA
	Co-60	0.000	0.000	U	0.024	0.015	Asphalt
		0.000	0.000	U	0.022	0.015	SA
	Cs-137	0.033	0.021		0.023	0.010	Asphalt
		0.000	0.000	U	0.019	0.010	SA
	Eu-152	0.000	0.000	U	0.050	0.030	Asphalt
		0.000	0.000	U	0.043	0.030	SA
	Eu-154	0.000	0.000	U	0.073	0.000	Asphalt
		0.000	0.000	U	0.070	0.000	SA
	Eu-155	0.000	0.000	U	0.078	0.000	Asphalt
		0.000	0.000	U	0.070	0.000	SA
	K-40	12.300	2.600		0.235	0.000	Asphalt
		19.200	4.100		0.216	0.000	SA
	Ra-226	0.415	0.097		0.038	0.100	Asphalt
		0.491	0.110		0.040	0.100	SA
	Th-228	0.476	0.100		0.029	0.100	Asphalt
		0.510	0.110		0.025	0.100	SA
	Th-232	0.503	0.150		0.097	0.100	Asphalt
		0.532	0.140		0.085	0.100	SA
	U-235	0.000	0.000	U	0.098	0.000	Asphalt
		0.000	0.000	U	0.086	0.000	SA
	U-238	0.000	0.000	U	2.660	0.000	Asphalt
		0.000	0.000	U	2.420	0.000	SA
	Zn-65	0.000	0.000	U	0.062	0.000	Asphalt
		0.000	0.000	U	0.060	0.000	SA

TABLE B-2

BUILDING 707 CONCRETE PAD SITE ANALYTICAL RESULTS

Sample Location	Nuclide	Result (pCi/g)	Total Error (pCi/g)	Qualifier	MDA	RDL	Matrix
707B1	Am-241	0.000	0.000	U	0.031	0.000	Asphalt
		0.000	0.000	U	0.033	0.000	SA
	Co-60	0.000	0.000	U	0.021	0.015	Asphalt
		0.000	0.000	U	0.033	0.015	SA
	Cs-137	0.000	0.000	U	0.022	0.010	Asphalt
		0.000	0.000	U	0.025	0.010	SA
	Eu-152	0.000	0.000	U	0.047	0.030	Asphalt
		0.000	0.000	U	0.058	0.030	SA
	Eu-154	0.000	0.000	U	0.079	0.000	Asphalt
		0.000	0.000	U	0.117	0.000	SA
	Eu-155	0.000	0.000	U	0.040	0.000	Asphalt
		0.000	0.000	U	0.052	0.000	SA
	K-40	8.860	1.900		0.240	0.000	Asphalt
		18.800	4.000		0.293	0.000	SA
	Ra-226	0.422	0.100		0.040	0.100	Asphalt
		0.466	0.110		0.048	0.100	SA
	Th-228	0.520	0.110		0.023	0.100	Asphalt
		0.550	0.120		0.028	0.100	SA
	Th-232	0.508	0.140		0.098	0.100	Asphalt
		0.576	0.160		0.120	0.100	SA
	U-235	0.000	0.000	U	0.070	0.000	Asphalt
		0.000	0.000	U	0.087	0.000	SA
	U-238	0.000	0.000	U	2.900	0.000	Asphalt
		0.000	0.000	U	3.860	0.000	SA
	Zn-65	0.000	0.000	U	0.063	0.000	Asphalt
		0.000	0.000	U	0.095	0.000	SA
707B2	Am-241	0.000	0.000	U	0.076	0.000	Asphalt
		0.000	0.000	U	0.093	0.000	SA
	Co-60	0.000	0.000	U	0.021	0.015	Asphalt
		0.000	0.000	U	0.028	0.015	SA
	Cs-137	0.000	0.000	U	0.021	0.010	Asphalt
		0.000	0.000	U	0.025	0.010	SA
	Eu-152	0.000	0.000	U	0.049	0.030	Asphalt
		0.000	0.000	U	0.063	0.030	SA
	Eu-154	0.000	0.000	U	0.073	0.000	Asphalt
		0.000	0.000	U	0.096	0.000	SA
	Eu-155	0.000	0.000	U	0.057	0.000	Asphalt
		0.000	0.000	U	0.070	0.000	SA
	K-40	12.500	2.700		0.250	0.000	Asphalt
		19.900	4.300		0.286	0.000	SA
	Ra-226	0.408	0.094		0.036	0.100	Asphalt
		0.417	0.098		0.041	0.100	SA

TABLE B-2

BUILDING 707 CONCRETE PAD SITE ANALYTICAL RESULTS

Sample Location	Nuclide	Result (pCi/g)	Total Error (pCi/g)	Qualifier	MDA	RDL	Matrix
707B2	Th-228	0.490	0.110		0.023	0.100	Asphalt
		0.544	0.120		0.029	0.100	SA
	Th-232	0.597	0.160		0.100	0.100	Asphalt
		0.521	0.140		0.106	0.100	SA
	U-235	0.000	0.000	U	0.075	0.000	Asphalt
		0.000	0.000	U	0.091	0.000	SA
	U-238	0.000	0.000	U	2.400	0.000	Asphalt
		0.000	0.000	U	3.250	0.000	SA
	Zn-65	0.000	0.000	U	0.054	0.000	Asphalt
		0.000	0.000	U	0.074	0.000	SA
707B3	Am-241	0.000	0.000	U	0.036	0.000	Asphalt
		0.000	0.000	U	0.039	0.000	SA
	Co-60	0.000	0.000	U	0.011	0.015	Asphalt
		0.000	0.000	U	0.016	0.015	SA
	Cs-137	0.000	0.000	U	0.011	0.010	Asphalt
		0.000	0.000	U	0.013	0.010	SA
	Eu-152	0.000	0.000	U	0.027	0.030	Asphalt
		0.000	0.000	U	0.034	0.030	SA
	Eu-154	0.000	0.000	U	0.037	0.000	Asphalt
		0.000	0.000	U	0.055	0.000	SA
	Eu-155	0.000	0.000	U	0.028	0.000	Asphalt
		0.000	0.000	U	0.036	0.000	SA
	K-40	8.580	1.800		0.110	0.000	Asphalt
		19.800	4.200		0.134	0.000	SA
	Ra-226	0.349	0.077		0.021	0.100	Asphalt
		0.418	0.094		0.028	0.100	SA
	Th-228	0.448	0.096		0.014	0.100	Asphalt
		0.477	0.100		0.018	0.100	SA
	Th-232	0.481	0.110		0.044	0.100	Asphalt
		0.526	0.130		0.061	0.100	SA
	U-235	0.000	0.000	U	0.046	0.000	Asphalt
		0.060	0.044		0.060	0.000	SA
	U-238	0.000	0.000	U	1.300	0.000	Asphalt
		0.000	0.000	U	1.840	0.000	SA
	Zn-65	0.000	0.000	U	0.031	0.000	Asphalt
		0.000	0.000	U	0.044	0.000	SA
707B4	Am-241	0.000	0.000	U	0.030	0.000	Asphalt
		0.000	0.000	U	0.169	0.000	SA
	Co-60	0.000	0.000	U	0.024	0.015	Asphalt
		0.000	0.000	U	0.022	0.015	SA
	Cs-137	0.000	0.000	U	0.022	0.010	Asphalt
		0.000	0.000	U	0.021	0.010	SA

TABLE B-2

BUILDING 707 CONCRETE PAD SITE ANALYTICAL RESULTS

Sample Location	Nuclide	Result (pCi/g)	Total Error (pCi/g)	Qualifier	MDA	RDL	Matrix
707B4	Eu-152	0.000	0.000	U	0.049	0.030	Asphalt
		0.000	0.000	U	0.048	0.030	SA
	Eu-154	0.000	0.000	U	0.086	0.000	Asphalt
		0.000	0.000	U	0.083	0.000	SA
	Eu-155	0.000	0.000	U	0.060	0.000	Asphalt
		0.000	0.000	U	0.077	0.000	SA
	K-40	10.000	2.200		0.180	0.000	Asphalt
		19.600	4.200		0.215	0.000	SA
	Ra-226	0.371	0.088		0.036	0.100	Asphalt
		0.443	0.100		0.042	0.100	SA
	Th-228	0.479	0.100		0.025	0.100	Asphalt
		0.458	0.100		0.029	0.100	SA
	Th-232	0.453	0.140		0.100	0.100	Asphalt
		0.565	0.160		0.102	0.100	SA
	U-235	0.000	0.000	U	0.093	0.000	Asphalt
		0.000	0.000	U	0.095	0.000	SA
	U-238	0.000	0.000	U	4.800	0.000	Asphalt
		0.000	0.000	U	2.780	0.000	SA
	Zn-65	0.000	0.000	U	0.073	0.000	Asphalt
		0.000	0.000	U	0.064	0.000	SA
707B5	Am-241	0.000	0.000	U	0.048	0.000	Concrete
		0.000	0.000	U	0.054	0.000	SA
	Co-60	0.000	0.000	U	0.013	0.015	Concrete
		0.000	0.000	U	0.026	0.015	SA
	Cs-137	0.000	0.000	U	0.013	0.010	Concrete
		0.000	0.000	U	0.023	0.010	SA
	Eu-152	0.000	0.000	U	0.033	0.030	Concrete
		0.000	0.000	U	0.054	0.030	SA
	Eu-154	0.000	0.000	U	0.040	0.000	Concrete
		0.000	0.000	U	0.086	0.000	SA
	Eu-155	0.000	0.000	U	0.037	0.000	Concrete
		0.000	0.000	U	0.053	0.000	SA
	K-40	4.580	1.010		0.129	0.000	Asphalt
		9.080	1.950		0.243	0.000	SA
	Ra-226	0.243	0.059		0.027	0.100	Asphalt
		0.292	0.076		0.041	0.100	SA
	Th-228	0.275	0.061		0.017	0.100	Asphalt
		0.317	0.072		0.026	0.100	SA
	Th-232	0.316	0.087		0.053	0.100	Asphalt
		0.334	0.130		0.114	0.100	SA
	U-235	0.000	0.000	U	0.052	0.000	Concrete
		0.000	0.000	U	0.081	0.000	SA

TABLE B-2

BUILDING 707 CONCRETE PAD SITE ANALYTICAL RESULTS

Sample Location	Nuclide	Result (pCi/g)	Total Error (pCi/g)	Qualifier	MDA	RDL	Matrix
707B5	U-238	0.000	0.000	U	1.600	0.000	Concrete
		0.000	0.000	U	3.030	0.000	SA
	Zn-65	0.000	0.000	U	0.035	0.000	Concrete
		0.000	0.000	U	0.069	0.000	SA
707B6	Am-241	0.000	0.000	U	0.026	0.000	Concrete
		0.000	0.000	U	0.033	0.000	SA
	Co-60	0.000	0.000	U	0.020	0.015	Concrete
		0.000	0.000	U	0.013	0.015	SA
	Cs-137	0.000	0.000	U	0.018	0.010	Concrete
		0.000	0.000	U	0.012	0.010	SA
	Eu-152	0.000	0.000	U	0.041	0.030	Concrete
		0.000	0.000	U	0.030	0.030	SA
	Eu-154	0.000	0.000	U	0.069	0.000	Concrete
		0.000	0.000	U	0.045	0.000	SA
	Eu-155	0.000	0.000	U	0.035	0.000	Concrete
		0.000	0.000	U	0.048	0.000	SA
	K-40	4.890	1.100		0.230	0.000	Concrete
		9.970	2.100		0.151	0.000	SA
	Ra-226	0.370	0.088		0.035	0.100	Concrete
		0.267	0.063		0.024	0.100	SA
	Th-228	0.270	0.061		0.020	0.100	Concrete
		0.291	0.063		0.015	0.100	SA
	Th-232	0.294	0.099		0.079	0.100	Concrete
		0.309	0.080		0.044	0.100	SA
	U-235	0.000	0.000	U	0.060	0.000	Concrete
		0.000	0.000	U	0.044	0.000	SA
	U-238	0.000	0.000	U	2.500	0.000	Concrete
		0.000	0.000	U	1.620	0.000	SA
	Zn-65	0.000	0.000	U	0.065	0.000	Concrete
		0.000	0.000	U	0.036	0.000	SA
707B7	Am-241	0.000	0.000	U	0.078	0.000	Asphalt
		0.000	0.000	U	0.181	0.000	SA
	Co-60	0.000	0.000	U	0.022	0.015	Asphalt
		0.000	0.000	U	0.026	0.015	SA
	Cs-137	0.000	0.000	U	0.024	0.010	Asphalt
		0.000	0.000	U	0.022	0.010	SA
	Eu-152	0.000	0.000	U	0.051	0.030	Asphalt
		0.000	0.000	U	0.051	0.030	SA
	Eu-154	0.000	0.000	U	0.072	0.000	Asphalt
		0.000	0.000	U	0.088	0.000	SA
	Eu-155	0.000	0.000	U	0.058	0.000	Asphalt
		0.000	0.000	U	0.083	0.000	SA

TABLE B-2

BUILDING 707 CONCRETE PAD SITE ANALYTICAL RESULTS

Sample Location	Nuclide	Result (pCi/g)	Total Error (pCi/g)	Qualifier	MDA	RDL	Matrix
707B7	K-40	8.130	1.800		0.220	0.000	Asphalt
		21.000	4.500		0.232	0.000	SA
	Ra-226	0.375	0.090		0.041	0.100	Asphalt
		0.413	0.098		0.044	0.100	SA
	Th-228	0.454	0.099		0.024	0.100	Asphalt
		0.505	0.110		0.030	0.100	SA
	Th-232	0.472	0.140		0.097	0.100	Asphalt
		0.588	0.160		0.100	0.100	SA
	U-235	0.000	0.000	U	0.077	0.000	Asphalt
		0.000	0.000	U	0.099	0.000	SA
	U-238	0.000	0.000	U	2.400	0.000	Asphalt
		0.000	0.000	U	2.820	0.000	SA
	Zn-65	0.000	0.000	U	0.056	0.000	Asphalt
		0.000	0.000	U	0.068	0.000	SA
707B8	Am-241	0.000	0.000	U	0.030	0.000	Concrete
		0.000	0.000	U	0.025	0.000	SA
	Co-60	0.000	0.000	U	0.009	0.015	Concrete
		0.000	0.000	U	0.024	0.015	SA
	Cs-137	0.000	0.000	U	0.008	0.010	Concrete
		0.000	0.000	U	0.020	0.010	SA
	Eu-152	0.000	0.000	U	0.023	0.030	Concrete
		0.000	0.000	U	0.047	0.030	SA
	Eu-154	0.000	0.000	U	0.029	0.000	Concrete
		0.000	0.000	U	0.086	0.000	SA
	Eu-155	0.000	0.000	U	0.024	0.000	Concrete
		0.000	0.000	U	0.039	0.000	SA
	K-40	4.510	0.980		0.094	0.000	Concrete
		15.000	3.200		0.219	0.000	SA
	Ra-226	0.286	0.064		0.019	0.100	Concrete
		0.320	0.080		0.041	0.100	SA
	Th-228	0.291	0.063		0.012	0.100	Concrete
		0.400	0.088		0.023	0.100	SA
	Th-232	0.268	0.075		0.046	0.100	Concrete
		0.401	0.150		0.120	0.100	SA
	U-235	0.000	0.000	U	0.040	0.000	Concrete
		0.000	0.000	U	0.065	0.000	SA
	U-238	0.000	0.000	U	1.100	0.000	Concrete
		0.000	0.000	U	3.150	0.000	SA
	Zn-65	0.000	0.000	U	0.025	0.000	Concrete
		0.000	0.000	U	0.069	0.000	SA
707B9	Am-241	0.000	0.000	U	0.021	0.000	Concrete
		0.000	0.000	U	0.070	0.000	SA

TABLE B-2

BUILDING 707 CONCRETE PAD SITE ANALYTICAL RESULTS

Sample Location	Nuclide	Result (pCi/g)	Total Error (pCi/g)	Qualifier	MDA	RDL	Matrix
707B9	Co-60	0.000	0.000	U	0.016	0.015	Concrete
		0.000	0.000	U	0.020	0.015	SA
	Cs-137	0.000	0.000	U	0.014	0.010	Concrete
		0.000	0.000	U	0.018	0.010	SA
	Eu-152	0.000	0.000	U	0.031	0.030	Concrete
		0.000	0.000	U	0.046	0.030	SA
	Eu-154	0.000	0.000	U	0.047	0.000	Concrete
		0.000	0.000	U	0.073	0.000	SA
	Eu-155	0.000	0.000	U	0.027	0.000	Concrete
		0.000	0.000	U	0.053	0.000	SA
	K-40	4.500	0.990		0.150	0.000	Concrete
		17.700	3.800		0.195	0.000	SA
	Ra-226	0.349	0.078		0.024	0.100	Concrete
		0.335	0.080		0.035	0.100	SA
	Th-228	0.291	0.064		0.016	0.100	Concrete
		0.387	0.084		0.022	0.100	SA
	Th-232	0.374	0.100		0.060	0.100	Concrete
		0.386	0.110		0.084	0.100	SA
	U-235	0.000	0.000	U	0.075	0.000	Concrete
		0.000	0.000	U	0.069	0.000	SA
	U-238	0.000	0.000	U	2.000	0.000	Concrete
		0.000	0.000	U	2.360	0.000	SA
	Zn-65	0.000	0.000	U	0.041	0.000	Concrete
		0.000	0.000	U	0.062	0.000	SA
707B10	Am-241	0.000	0.000	U	0.071	0.000	Concrete
		0.000	0.000	U	0.033	0.000	SA
	Co-60	0.000	0.000	U	0.019	0.015	Concrete
		0.000	0.000	U	0.013	0.015	SA
	Cs-137	0.000	0.000	U	0.030	0.010	Concrete
		0.016	0.012		0.014	0.010	SA
	Eu-152	0.000	0.000	U	0.047	0.030	Concrete
		0.000	0.000	U	0.028	0.030	SA
	Eu-154	0.000	0.000	U	0.060	0.000	Concrete
		0.000	0.000	U	0.047	0.000	SA
	Eu-155	0.000	0.000	U	0.048	0.000	Concrete
		0.029	0.019		0.029	0.000	SA
	K-40	6.640	1.500		0.180	0.000	Concrete
		20.700	4.400		0.115	0.000	SA
	Ra-226	0.261	0.067		0.038	0.100	Concrete
		0.438	0.096		0.022	0.100	SA
	Th-228	0.305	0.069		0.023	0.100	Concrete
		0.504	0.110		0.015	0.100	SA

TABLE B-2

BUILDING 707 CONCRETE PAD SITE ANALYTICAL RESULTS

Sample Location	Nuclide	Result (pCi/g)	Total Error (pCi/g)	Qualifier	MDA	RDL	Matrix
707B10	Th-232	0.356	0.110		0.082	0.100	Concrete
		0.551	0.130		0.056	0.100	SA
	U-235	0.000	0.000	U	0.068	0.000	Concrete
		0.000	0.000	U	0.078	0.000	SA
	U-238	0.000	0.000	U	2.300	0.000	Concrete
		0.000	0.000	U	1.600	0.000	SA
	Zn-65	0.000	0.000	U	0.048	0.000	Concrete
		0.000	0.000	U	0.037	0.000	SA

Notes:

Am-241	Americium 241
Co-60	Cobalt 60
Cs-137	Cesium 137
Eu-152	Europium 152
Eu-154	Europium 152
J	Estimated value
K-40	Potassium 40
MDA	Minimum detectable activity
pCi/g	picoCurie per gram
Ra-226	Radium 226
RDL	Required detection limit
SA	Soil aggragete (soil)
Th-228	Thorium 228
Th-232	Thorium 232
U	Nondetected value
U-235	Uranium 235
U-238	Uranium 238
Zn-65	Zinc 65

APPENDIX C

RESRAD SUMMARY REPORTS

(29 Pages)

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RESRAD Building 364 Cs-137 DCGL Run (complete summary report, 12 pages)

RESRAD Building 707 Cs-137 DCGL Run (complete summary report, 12 pages)

RESRAD Building 707 Am-241 DCGL Run (Page 11 of summary report)

RESRAD Building 707 Co-60 DCGL Run (Page 11 of summary report)

RESRAD Building 707 Eu-152 DCGL Run (Page 11 of summary report)

RESRAD Building 707 Eu-154 DCGL Run (Page 11 of summary report)

RESRAD Building 707 U-235 DCGL Run (Page 11 of summary report)

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Dose Conversion Factor (and Related) Parameter Summary
File: Default.LIB

Menu	Parameter	Current Value	Default	Parameter Name
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Cs-137+D	3.190E-05	3.190E-05	DCF2(1)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Cs-137+D	5.000E-05	5.000E-05	DCF3(1)
D-34	Food transfer factors:			
D-34	Cs-137+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(1,1)
D-34	Cs-137+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.000E-02	3.000E-02	RTF(1,2)
D-34	Cs-137+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	8.000E-03	8.000E-03	RTF(1,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Cs-137+D , fish	2.000E+03	2.000E+03	BIOFAC(1,1)
D-5	Cs-137+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(1,2)

Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	1.600E+02	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	6.000E-01	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	1.000E+02	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	not used	3.000E+00	---	T(3)
R011	Times for calculations (yr)	not used	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): Cs-137	1.000E+02	0.000E+00	---	S1(1)
R012	Concentration in groundwater (pCi/L): Cs-137	not used	0.000E+00	---	W1(1)
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)	1.500E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	5.300E+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)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.000E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.000E-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)	1.500E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	4.000E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.000E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	2.000E-01	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	1.000E+02	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	2.000E-02	2.000E-02	---	HGWT
R014	Saturated zone b parameter	5.300E+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)	1.000E+01	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW
R015	Number of unsaturated zone strata	1	1	---	NS

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R015	Unsat. zone 1, thickness (m)	4.000E+00	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.500E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	4.000E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.000E-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	5.300E+00	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Cs-137				
R016	Contaminated zone (cm**3/g)	1.000E+03	1.000E+03	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	1.000E+03	1.000E+03	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	1.000E+03	1.000E+03	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.554E-04	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
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	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	7.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	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)
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)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
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)	9.200E+01	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	6.300E+01	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	5.400E+00	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	9.000E-01	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	3.650E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	5.100E+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	1.000E+00	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	1.000E+00	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	5.000E-01	5.000E-01	---	FR9
R018	Contamination fraction of plant food	-1	-1	0.800E-01	FPLANT
R018	Contamination fraction of meat	-1	-1	0.800E-02	FMEAT
R018	Contamination fraction of milk	-1	-1	0.800E-02	FMILK
R019	Livestock fodder intake for meat (kg/day)	6.800E+01	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	5.500E+01	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	5.000E+01	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	1.600E+02	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	5.000E-01	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	1.000E-04	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	1.000E+00	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)	1.100E+00	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)	8.000E-02	8.000E-02	---	TE(3)
R19B	Translocation Factor for Non-Leafy	1.000E-01	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	1.000E+00	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	1.000E+00	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	2.500E-01	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	2.500E-01	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

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	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
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	active
5 -- milk ingestion	active
6 -- aquatic foods	active
7 -- drinking water	active
8 -- soil ingestion	active
9 -- radon	suppressed
Find peak pathway doses	active

Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	160.00 square meters	Cs-137	1.000E+02
Thickness:	0.60 meters		
Cover Depth:	0.00 meters		

Total Dose TDOSE(t), mrem/yr
Basic Radiation Dose Limit = 25 mrem/yr
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

t (years):	0.000E+00	1.000E+00
TDOSE(t):	1.672E+02	1.633E+02
M(t):	6.688E+00	6.531E+00

Maximum TDOSE(t): 1.672E+02 mrem/yr at t = 0.000E+00 years

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	1.651E+02	0.9875	1.309E-04	0.0000	0.000E+00	0.0000	1.833E+00	0.0110	1.728E-01	0.0010	5.720E-02	0.0003	2.164E-02	0.0001
Total	1.651E+02	0.9875	1.309E-04	0.0000	0.000E+00	0.0000	1.833E+00	0.0110	1.728E-01	0.0010	5.720E-02	0.0003	2.164E-02	0.0001

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.
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	1.672E+02	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.672E+02	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	1.612E+02	0.9876	1.279E-04	0.0000	0.000E+00	0.0000	1.787E+00	0.0109	1.685E-01	0.0010	5.579E-02	0.0003	2.114E-02	0.0001
Total	1.612E+02	0.9876	1.279E-04	0.0000	0.000E+00	0.0000	1.787E+00	0.0109	1.685E-01	0.0010	5.579E-02	0.0003	2.114E-02	0.0001

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	1.633E+02	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.633E+02	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)	Branch Fraction*	DSR(j,t) (mrem/yr)/(pCi/g) t= 0.000E+00	1.000E+00
Cs-137	Cs-137	1.000E+00	1.672E+00	1.633E+00

*Branch Fraction is the cumulative factor for the j't principal radionuclide daughter: CUMBRF(j) = BRF(1)*BRF(2)* ... BRF(j).
The DSR includes contributions from associated (half-life ≤ 0.5 yr) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 25 mrem/yr

Nuclide (i)	t= 0.000E+00	1.000E+00
Cs-137	1.495E+01	1.531E+01

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)
Cs-137	1.000E+02	0.000E+00	1.672E+00	1.495E+01	1.672E+00	1.495E+01

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

Nuclide (j)	Parent (i)	BRF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00
Cs-137	Cs-137	1.000E+00	1.672E+02	1.633E+02

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

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	BRF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00
Cs-137	Cs-137	1.000E+00	1.000E+02	9.766E+01

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

RESMAIN5.EXE execution time = 4.66 seconds

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Dose Conversion Factor (and Related) Parameter Summary
File: Default.LIB

Menu	Parameter	Current Value	Default	Parameter Name
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Cs-137+D	3.190E-05	3.190E-05	DCF2(1)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Cs-137+D	5.000E-05	5.000E-05	DCF3(1)
D-34	Food transfer factors:			
D-34	Cs-137+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(1,1)
D-34	Cs-137+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.000E-02	3.000E-02	RTF(1,2)
D-34	Cs-137+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	8.000E-03	8.000E-03	RTF(1,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Cs-137+D , fish	2.000E+03	2.000E+03	BIOFAC(1,1)
D-5	Cs-137+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(1,2)

Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	1.700E+02	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	6.000E-01	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	1.000E+02	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	not used	3.000E+00	---	T(3)
R011	Times for calculations (yr)	not used	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): Cs-137	1.000E+02	0.000E+00	---	S1(1)
R012	Concentration in groundwater (pCi/L): Cs-137	not used	0.000E+00	---	W1(1)
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)	1.500E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	5.300E+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)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.000E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.000E-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)	1.500E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	4.000E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.000E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	2.000E-01	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	1.000E+02	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	2.000E-02	2.000E-02	---	HGWT
R014	Saturated zone b parameter	5.300E+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)	1.000E+01	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW
R015	Number of unsaturated zone strata	1	1	---	NS

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R015	Unsat. zone 1, thickness (m)	4.000E+00	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.500E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	4.000E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.000E-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	5.300E+00	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Cs-137				
R016	Contaminated zone (cm**3/g)	1.000E+03	1.000E+03	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	1.000E+03	1.000E+03	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	1.000E+03	1.000E+03	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.554E-04	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
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	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	7.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	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	-1 shows non-circular AREA.	FS
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	5.000E+01	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	7.071E+01	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	0.000E+00	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	0.000E+00	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	0.000E+00	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	0.000E+00	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	0.000E+00	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	0.000E+00	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	0.000E+00	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	0.000E+00	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	0.000E+00	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	0.000E+00	0.000E+00	---	RAD_SHAPE(12)
R017	Fractions of annular areas within AREA:				
R017	Ring 1	1.000E+00	1.000E+00	---	FRACA(1)
R017	Ring 2	2.732E-01	2.732E-01	---	FRACA(2)
R017	Ring 3	0.000E+00	0.000E+00	---	FRACA(3)
R017	Ring 4	0.000E+00	0.000E+00	---	FRACA(4)
R017	Ring 5	0.000E+00	0.000E+00	---	FRACA(5)
R017	Ring 6	0.000E+00	0.000E+00	---	FRACA(6)
R017	Ring 7	0.000E+00	0.000E+00	---	FRACA(7)
R017	Ring 8	0.000E+00	0.000E+00	---	FRACA(8)
R017	Ring 9	0.000E+00	0.000E+00	---	FRACA(9)
R017	Ring 10	0.000E+00	0.000E+00	---	FRACA(10)
R017	Ring 11	0.000E+00	0.000E+00	---	FRACA(11)
R017	Ring 12	0.000E+00	0.000E+00	---	FRACA(12)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
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)	9.200E+01	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	6.300E+01	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	5.400E+00	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	9.000E-01	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	3.650E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	5.100E+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	1.000E+00	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	1.000E+00	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	5.000E-01	5.000E-01	---	FR9
R018	Contamination fraction of plant food	-1	-1	0.850E-01	FPLANT
R018	Contamination fraction of meat	-1	-1	0.850E-02	FMEAT
R018	Contamination fraction of milk	-1	-1	0.850E-02	FMILK
R019	Livestock fodder intake for meat (kg/day)	6.800E+01	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	5.500E+01	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	5.000E+01	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	1.600E+02	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	5.000E-01	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	1.000E-04	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	1.000E+00	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)	1.100E+00	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)	8.000E-02	8.000E-02	---	TE(3)
R19B	Translocation Factor for Non-Leafy	1.000E-01	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	1.000E+00	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	1.000E+00	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	2.500E-01	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	2.500E-01	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

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	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
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	active
5 -- milk ingestion	active
6 -- aquatic foods	active
7 -- drinking water	active
8 -- soil ingestion	active
9 -- radon	suppressed
Find peak pathway doses	active

Contaminated Zone Dimensions	
Area:	170.00 square meters
Thickness:	0.60 meters
Cover Depth:	0.00 meters

Initial Soil Concentrations, pCi/g	
Cs-137	1.000E+02

Total Dose TDOSE(t), mrem/yr
Basic Radiation Dose Limit = 25 mrem/yr
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

t (years):	0.000E+00	1.000E+00
TDOSE(t):	1.909E+02	1.864E+02
M(t):	7.635E+00	7.456E+00

Maximum TDOSE(t): 1.909E+02 mrem/yr at t = 0.000E+00 years

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	1.886E+02	0.9884	1.318E-04	0.0000	0.000E+00	0.0000	1.947E+00	0.0102	1.836E-01	0.0010	6.077E-02	0.0003	2.300E-02	0.0001
Total	1.886E+02	0.9884	1.318E-04	0.0000	0.000E+00	0.0000	1.947E+00	0.0102	1.836E-01	0.0010	6.077E-02	0.0003	2.300E-02	0.0001

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.
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	1.909E+02	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.909E+02	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	1.842E+02	0.9884	1.287E-04	0.0000	0.000E+00	0.0000	1.899E+00	0.0102	1.791E-01	0.0010	5.928E-02	0.0003	2.246E-02	0.0001
Total	1.842E+02	0.9884	1.287E-04	0.0000	0.000E+00	0.0000	1.899E+00	0.0102	1.791E-01	0.0010	5.928E-02	0.0003	2.246E-02	0.0001

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	1.864E+02	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.864E+02	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)	Branch Fraction*	DSR(j,t) t= 0.000E+00	(mrem/yr)/(pCi/g) 1.000E+00
Cs-137	Cs-137	1.000E+00	1.909E+00	1.864E+00

*Branch Fraction is the cumulative factor for the j't principal radionuclide daughter: CUMBRF(j) = BRF(1)*BRF(2)* ... BRF(j).
The DSR includes contributions from associated (half-life ≤ 0.5 yr) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 25 mrem/yr

Nuclide (i)	t= 0.000E+00	1.000E+00
Cs-137	1.310E+01	1.341E+01

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)
Cs-137	1.000E+02	0.000E+00	1.909E+00	1.310E+01	1.909E+00	1.310E+01

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

Nuclide (j)	Parent (i)	BRF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00
Cs-137	Cs-137	1.000E+00	1.909E+02	1.864E+02

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

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	BRF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00
Cs-137	Cs-137	1.000E+00	1.000E+02	9.766E+01

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

RESMAIN5.EXE execution time = 4.85 seconds

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

Parent (i)	Product (j)	Branch Fraction*	DSR(j,t) t= 0.000E+00	(mrem/yr)/(pCi/g) 1.000E+00
Am-241	Am-241	1.000E+00	9.545E-02	9.266E-02
Am-241	Np-237	1.000E+00	0.000E+00	7.228E-07
Am-241	U-233	1.000E+00	0.000E+00	2.786E-14
Am-241	Th-229	1.000E+00	0.000E+00	8.707E-17
Am-241	∑DSR(j)		9.545E-02	9.266E-02

*Branch Fraction is the cumulative factor for the j't principal radionuclide daughter: CUMBRF(j) = BRF(1)*BRF(2)* ... BRF(j).
The DSR includes contributions from associated (half-life ≤ 0.5 yr) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 25 mrem/yr

Nuclide (i)	t= 0.000E+00	1.000E+00
Am-241	2.619E+02	2.698E+02

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	1.000E+02	0.000E+00	9.545E-02	2.619E+02	9.545E-02	2.619E+02

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

Parent (i)	Product (j)	Branch Fraction*	DSR(j,t) (mrem/yr)/(pCi/g) t= 0.000E+00	1.000E+00
Co-60	Co-60	1.000E+00	8.558E+00	7.499E+00

*Branch Fraction is the cumulative factor for the j't principal radionuclide daughter: CUMBRF(j) = BRF(1)*BRF(2)* ... BRF(j).
The DSR includes contributions from associated (half-life ≤ 0.5 yr) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 25 mrem/yr

Nuclide (i)	t= 0.000E+00	1.000E+00
Co-60	2.921E+00	3.334E+00

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)
Co-60	1.000E+02	0.000E+00	8.558E+00	2.921E+00	8.558E+00	2.921E+00

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

Parent (i)	Product (j)	Branch Fraction*	DSR(j,t) (mrem/yr)/(pCi/g) t= 0.000E+00	1.000E+00
Eu-152	Eu-152	7.208E-01	2.431E+00	2.306E+00
Eu-152	Eu-152	2.792E-01	9.416E-01	8.933E-01
Eu-152	Gd-152	2.792E-01	0.000E+00	3.862E-17
Eu-152	∑DSR(j)		9.416E-01	8.933E-01
Gd-152	Gd-152	1.000E+00	1.498E-02	1.496E-02

*Branch Fraction is the cumulative factor for the j't principal radionuclide daughter: CUMBRF(j) = BRF(1)*BRF(2)* ... BRF(j).
The DSR includes contributions from associated (half-life ≤ 0.5 yr) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 25 mrem/yr

Nuclide (i)	t= 0.000E+00	1.000E+00
Eu-152	7.413E+00	7.814E+00
Gd-152	*2.178E+01	*2.178E+01

*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)
Eu-152	1.000E+02	0.000E+00	3.373E+00	7.413E+00	3.373E+00	7.413E+00
Gd-152	1.000E+02	0.000E+00	1.498E-02	*2.178E+01	1.498E-02	*2.178E+01

*At specific activity limit

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

Parent (i)	Product (j)	Branch Fraction*	DSR(j,t) t= 0.000E+00	(mrem/yr)/(pCi/g) 1.000E+00
Eu-154	Eu-154	1.000E+00	4.157E+00	3.840E+00

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

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 25 mrem/yr

Nuclide (i)	t= 0.000E+00	1.000E+00
Eu-154	6.014E+00	6.511E+00

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)
Eu-154	1.000E+02	0.000E+00	4.157E+00	6.014E+00	4.157E+00	6.014E+00

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

Parent (i)	Product (j)	Branch Fraction*	DSR(j,t) t= 0.000E+00	(mrem/yr)/(pCi/g) 1.000E+00
U-235	U-235	1.000E+00	4.421E-01	4.372E-01
U-235	Pa-231	1.000E+00	0.000E+00	3.935E-05
U-235	Ac-227	1.000E+00	0.000E+00	1.434E-06
U-235	ΣDSR(j)		4.421E-01	4.372E-01

*Branch Fraction is the cumulative factor for the j't principal radionuclide daughter: CUMBRF(j) = BRF(1)*BRF(2)* ... BRF(j).
The DSR includes contributions from associated (half-life ≤ 0.5 yr) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 25 mrem/yr

Nuclide (i)	t= 0.000E+00	1.000E+00
U-235	5.655E+01	5.718E+01

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

Nuclide (i)	Initial pCi/g	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
U-235	1.000E+02	0.000E+00	4.421E-01	5.655E+01	4.421E-01	5.655E+01