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6.0 COMPLIANCE WITH THE RADIOLOGICAL CRITERIA FOR LICENSE TERMINATION

6.1 Site Release Criteria

The site release criteria for the Rancho Seco site will correspond to the radiological criteria for unrestricted use given in 10 CFR 20.1402, or:

- Dose Criterion: The residual radioactivity that is distinguishable from background radiation results in a Total Effective Dose Equivalent (TEDE) to an average member of the critical group that does not exceed 25 mrem/year, including that from groundwater sources; and

- ALARA Criterion: The residual radioactivity has been reduced to levels that are ALARA.

6.2 Site Conditions

6.2.1 General Description

The site is approximately 25 miles southeast of Sacramento and 26 miles northeast of Stockton in the central valley of California between the foothills of the Sierra Nevada Mountains to the east and the Pacific Coast range bordering the Pacific Ocean to the west.

The plant site's rolling terrain is not directly intersected by any streams; however, drainage from higher levels is well defined and intercepts with runoff streams at lower levels. The plant's grade level of approximately 165 feet above mean sea level (MSL) allows excellent drainage without danger of flooding. The elevation of the site acreage varies from 130 feet to 280 feet above MSL and drainage along natural gullies varies from two to six percent. Runoff from the site drains into a seasonal "No – name" creek that is a tributary to Clay Creek. Clay Creek empties into Hadselville Creek. Hadselville Creek then empties in turn into: Laguna Creek south, Cosumnes River, Mokelomne River, Sacramento River, into the Pacific Ocean via the Sacramento River Delta.

The Rancho Seco site consists of an approximately 87-acre fence-enclosed Industrial Area containing the nuclear facility surrounded by District-owned and District-controlled property totaling 2,480 acres. The District has constructed a 30-acre natural gas-fired power plant on the Rancho Seco site, approximately a half mile south of the Industrial Area boundary. Also within the 2,480 acre site are the 560 acre Rancho Seco Reservoir and Recreation Area; a 50 acre solar power (photo-voltaic) electrical generating station; and the 10 acre, 10 CFR Part 72 licensed Independent Spent Fuel Storage Installation (ISFSI).

A detailed description of applicable Rancho Seco environmental conditions and parameters is provided in Chapter 8, "Supplement to the Environmental Report." These parameters include site and surrounding area physical descriptions including population, topography, vegetation, soil types, surface water quality, climate and meteorology, hydrology and geology. Additionally Chapter 2, Site Characterization, (Section 2.2) contains a detailed description of the Rancho Seco site Hydrogeological Assessment results completed in 2005. The information contained in Chapters 2 and 8 form the basis for determining many of the site-specific dose modeling inputs (see Section 6.6.2).

6.2.2 Remaining Structures at Time of License Termination

In general, especially for structures formerly containing radioactive materials, the structures remaining within the Industrial Area of the site at the time of license termination will be concrete or brick-and-mortar structures, including the cooling towers, with most systems and components removed. The Interim Onsite Storage Building (IOSB) will also remain onsite but will be retained under the 10 CFR 50 license until ultimate disposal of the Class B and Class C radioactive waste that will be stored there.

6.3 Source Term Assumptions

6.3.1 Potential Radionuclides of Concern

As part of the source-term abstraction process, an analysis was performed in Rancho Seco Decommissioning Technical Basis Document DTBD-04-001, "Radionuclides for Consideration During Rancho Seco Nuclear Generating Station Characterization or Final Status Surveys," [Reference 6-1] to identify a suite of radionuclides that could potentially be present on remaining site structural surfaces, in site soils and in groundwater following completion of decommissioning activities. Development of the suite of radionuclides began first with NUREG/CR–3474, "Long-Lived Activation Products in Reactor Materials," [Reference 6-2]. This NUREG assessed the problems posed to reactor decommissioning by long-lived activation products in reactor construction materials. Samples of stainless steel, vessel steel, concrete and concrete ingredients were analyzed for up to 52 elements in order to develop a database of activatable major, minor and trace elements. The suite of radionuclides was developed by combining those radionuclides listed in NUREG/CR–3474 Table 5.6, "Activation of PWR Bioshield (Ci/gm) Average Rebar 30 EFPY at Core Axial Midplane," Table 5.13, "Activity Inventory of PWR Internals at Shutdown (Total Ci)," and Table 5.15, "Inventories of PWR and BWR Vessel Walls at Shutdown (Total Ci)." Only radionuclides with half-lives of two or more years were included on the suite. Radionuclides with half-lives less than two years would not be expected to still be observed since seven or more half-lives would have occurred since final shutdown of the Rancho Seco reactor.

Second, radionuclides with half-lives of two or more years identified in NUREG/CR–4289, "Residual Radionuclide Contamination Within and Around Commercial Nuclear Power Plants," [Reference 6-3] as being present in PWRs were compared with the suite generated above. NUREG/CR-4289 investigated residual radionuclide concentrations, distributions and inventories at seven nuclear power plants (four shutdown and three operating, including Rancho Seco) to provide a database for use in formulating policies, strategies and guidelines for the eventual decommissioning of retired nuclear power plants. This study addressed radionuclides (both activation and fission products) transported from the reactor pressure vessel and deposited in all other contaminated systems of each nuclear plant. Emphasis was placed on measuring the long-lived radionuclides that are of special concern from a low-level waste management standpoint. The study resulting in NUREG/CR–4289 was a companion study to the study that resulted in NUREG/CR–3474. Any radionuclides identified in NUREG/CR–4289 but not in NUREG/CR–3474, were added to the above suite.

Third, radionuclides with half-lives of two or more years identified in NUREG/CR–0130, "Technology, Safety and Cost of Decommissioning," [Reference 6-4] as being present in PWRs were compared with the list generated above. These radionuclides were identified in NUREG/CR-0130 Table 7.3-9, "Reactor Coolant Radionuclide Concentrations (12) in an

Operating PWR," Table 7.3-10, "Radioactive Surface Contamination in the Reference PWR Resulting from Accumulated Coolant Leakage in an Ion Exchanger Vault (Fractional Activity Normalized at Reactor Shutdown)," and Table 7.3-11, "Isotopic Composition of Accumulated Radioactive Surface Contamination in the Reference PWR (Renormalized for Each Decay Time)." Any radionuclides identified in NUREG–0130 but not in either NUREG/CR–3474 or NUREG/CR-4289, were added to the above suite.

Finally, an ORIGEN computer code run was used to determine if there were additional radionuclides that should be added to the above suite. The ORIGEN code run was based on Cycle 4 through 7 irradiation of selected batch 6 fuel assemblies with a decay period of 13.64 years from shutdown. This resulted in the addition of Pm-147, Pu-241, Am-243 and Cm-243 to the suite.

6.3.2 *Discounting Insignificant Radionuclides*

Since the suite of radionuclides developed in Section 6.3.1 includes trace elements that would not likely be found at Rancho Seco due to their low abundance, an evaluation of activation product radionuclides that may be discounted from being of potential importance was performed. The inventory for each radionuclide was determined from activity inventories provided in Table 5.13 and Table 5.15 of NUREG/CR-3474. From this information, the percentage of total inventory for each radionuclide was calculated.

The ORIGEN computer code run also contains trace radionuclides that would not likely be found at Rancho Seco due to their low abundance. The radionuclide inventory was determined from the run as well as relative contribution from each radionuclide.

Based on the above evaluations, it was determined that individual radionuclides which contributed less than 0.1 percent of the total activity could be discounted from the suite of identified radionuclides providing that potential dose contributed by the sum of the radionuclides discounted does not exceed one percent of the total calculated dose.

The radionuclides that meet the criterion of contributing less than 0.1 percent of the total activity include:

Cl-36	Ar-39	Ca-41	Mn-53	Se-79	Kr-81
Kr-85	Zr-93	Mo-93	Sn-121m	I-129	Ba-133
Cs-135	Pm-145	Sm-146	Sm-151	Tb-158	Ho-166m
Hf-178m	Pb-205	U-233	Am-243	Cm-243	

Several additional radionuclides meet the criteria of contributing less than 0.1 percent of the total activity but cannot be discounted because they have other methods of production in addition to activation of reactor components and have been observed in 10 CFR Part 61 waste stream analyses or in site characterization samples. These radionuclides include H-3, C-14, Nb-94, Ag-108m, Eu-152, and Pu-239.

In order to evaluate compliance with the dose criteria for discounted radionuclides, the Nuclear Regulatory Commission (NRC) developed computer code DandD, Version 2.1.0, was used to calculate doses for both residential and occupancy scenarios. The DandD code was used with the NRC determined default parameters to represent a conservative screening tool. Input concentrations for each radionuclide used in the residential scenario were their percent of total activity input as concentration in pCi/g. Input concentrations for each radionuclide used in the occupancy scenario were 1,000 times their percent of total activity input as surface contamination in dpm/100 cm^2. DandD does not support the following radionuclides and could not calculate their dose contribution:

Ar-39	Mn-53	Kr-81	Kr-85	Ag-108m	Ba-133
Pm-145	Sm-146	Tb-158	Hf-178m	Pb-205	

Therefore doses could be calculated for only the following discounted radionuclides:

Cl-36	Ca-41	Se-79	Zr-93	Mo-93	Sn-121m
I-129	Cs-135	Sm-151	Ho-166m	U-233	Am-243
Cm-243					

The calculated dose from discounted NUREG radionuclides represents only 3.73E-02 percent and dose from discounted ORIGEN radionuclides represents only 4.27E-02 percent of the total calculated dose for the residential scenario. The calculated dose from discounted NUREG radionuclides represents only 1.99E-03 percent and dose from discounted ORIGEN radionuclides represents only 5.53E-01 percent for the of the total calculated dose occupancy scenario. Therefore, it is appropriate to discount these radionuclides.

The activity represented by the radionuclides not supported by the DandD code is calculated to be only 4.23E-03 percent of the total activity presented in NUREG/CR-3474. Of these radionuclides, Ar-39, Kr-81 and Kr-85 are noble gases and it is highly unlikely that they would still be present in soil and on structural surfaces. Therefore, it is appropriate to discount Ar-39, Kr-81 and Kr-85.

Potential dose contribution from the remaining radionuclides not supported by the DandD code was evaluated by comparison of the inhalation and ingestion exposure-to-dose conversion factors (DCFs) contained in Federal Guidance Report No.11, "Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion," [Reference 6-5]. Weighted DCFs were calculated for each discounted radionuclide and summed for both inhalation and ingestion DCFs. These totals were then compared to the sum of the weighted DCFs for the two most abundant radionuclides, Co-60 and Ni-63. This resulted in a total of 5.36E-03 percent for inhalation DCFs and 1.25E-03 percent for ingestion DCFs. Therefore, it is appropriate to discount all of the radionuclides not supported by the DandD code.

Although included in the suite of theoretical radionuclides, the naturally occurring radionuclides K-40, U-234, U-235, U-236 and U-238 were not detected in characterization survey samples at concentrations distinguishable from naturally occurring concentrations. Therefore, these radionuclides have been discounted from any further consideration.

Radioactive waste streams are periodically sampled and analyzed at Rancho Seco. Analyses are performed for radionuclides listed in 10 CFR 61.55 Tables 1 and 2 as well as other supplementary radionuclides on a select basis. The potential radionuclides identified for discounting as described above were compared with the Rancho Seco 2003 Waste Stream Evaluation [Reference 6-6]. None of these radionuclides were identified as being present at Rancho Seco. However, an additional radionuclide, Pu-242, had been identified by waste stream analysis and was added to the suite of radionuclides. The resulting suite of radionuclides is considered to be site-specific to Rancho Seco and considered to be potentially present on remaining site structural surfaces, in site soils and in groundwater following completion of decommissioning activities. This site-specific suite of radionuclides is listed in Table 6-1.

Table 6-1
Site-Specific Suite of Radionuclides for Use at Rancho Seco

Radionuclide	Half Life (Years)	Decay Mode	Radionuclide	Half Life (Years)	Decay Mode
H-3	1.23E+01	β	Cs-137	3.02E+01	β
C-14	5.73E+03	β	Pm-147	2.62E+00	β
Na-22	2.60E+00	β^+, γ	Eu-152	1.36E+01	β, γ
Fe-55	2.70E+00	γ	Eu-154	8.80E+00	β, γ
Ni-59	7.50E+04	γ	Eu-155	4.96E+00	β, γ
Co-60	5.27E+00	β, γ	Np-237	2.14E+06	α, γ
Ni-63	1.00E+02	β	Pu-238	8.78E+01	α, γ
Sr-90	2.86E+01	β	Pu-239	2.41E+04	α, γ
Nb-94	2.03E+04	β, γ	Pu-240	6.60E+03	α, γ
Tc-99	2.13E+05	β, γ	Pu-241	1.44E+01	β
Ag-108m	1.27E+02	γ	Am-241	4.32E+02	α, γ
Sb-125	2.77E+00	β, γ	Pu-242	3.76E+05	α, γ
Cs-134	2.06E+00	β, γ	Cm-244	1.81E+01	α, γ

α – Alpha decay
β – Beta decay
β^+ – Positron decay
γ – Gamma decay

6.4 Dose Modeling Considerations

6.4.1 Overview

The NRC states in NUREG–1757, Volume 2, "Consolidated NMSS Decommissioning Guidance - Characterization, Survey, and Determination of Radiological Criteria," [Reference 6-7] that, *"generally, the licensee's dose modeling should have one of the following objectives:*

1. *Develop DCGLs commensurate with demonstrating compliance with the dose-based release criterion, and then demonstrate through FSS that residual radioactivity concentrations at the site are equal to or below the DCGLs.*

2. *Assess dose associated with actual concentrations of residual radioactivity distributed across the site to determine whether the concentrations will result in a dose that is not equal to or below the regulatory dose criterion."*

The District has chosen to use the first of these objectives and will demonstrate at the time of the final status survey (FSS) before release that residual radionuclide concentrations across the site are below a pre-specified concentration limit with a pre-specified degree of confidence. The design of the FSS is based on the proposed derived concentration guideline levels (DCGLs), in accordance with MARSSIM.

The approach taken to dose modeling for the site is consistent with the information provided in Chapter 5 and Appendix I of NUREG- 1757, Volume 2 for site-specific modeling, including the information regarding source term abstraction, scenarios, pathways and critical groups. The dose model is defined by the three factors: 1) the scenario, 2) the critical group and 3) the exposure pathways.

The approach outlined above was used to develop dose models to calculate DCGLs for the following:

- Surface and subsurface soil,
- Buried piping,
- Structural surfaces,
- Embedded piping, and
- Bulk material.

6.4.2 Industrial Worker Scenario for Surface and Subsurface Soil Exposure

6.4.2.1 Industrial Worker Scenario Justification

The District has no plans to release all or part of the District-owned and District-controlled 2,480 acre site for ownership by members of the public. Although the public does have access to a 560 acre Rancho Seco Reservoir and Recreation Area (see Figure 6-1) existing within the 2,480 acre site, the public does not have ready access to the remaining areas of the site. The Reservoir and Recreation Area are located in a non-impacted area hydrogeologically upgradient from the impacted Industrial Area. The reservoir water is replenished by water from the Folsom-South canal, constructed by the U.S. Bureau of Reclamation. No surface water runoff from the Industrial Area or the discharge canal or impacted depression area soils west of the Industrial Area enters the reservoir.

The entire site is owned by the District and is not a tax burden on the District because the District is a tax-exempt governmental organization. Thus there is no enticement to sell portions of the site because it is a tax burden to the District.

The site continues to be an important electrical distribution center for the District. The Rancho Seco switchyard (see Figure 6-2) has been in continual use since permanent shutdown of Rancho Seco and is a major intertie connecting the District's electrical transmission and distribution system with the Western Grid transmission system. There are six energized 220/230-kV transmission lines leaving the switchyard, four exiting the site to the west and two to the south.

A 50-acre photovoltaic (PV) generating facility is located on a non-impacted portion of the 2,480-acre site (see Figure 6-3). This generating facility using solar power consists of six solar arrays (PV1 – PV6) with a total generating capacity of 3.2 MWe. The first phase of the facility became operational in August 1984. This photovoltaic generating facility is connected to the District's electrical transmission and distribution system.

A new 500 MWe natural gas fueled combined-cycle generating facility is located on a 30-acre non-impacted portion of the 2,480-acre site and began commercial operation in February 2006 (see Figure 6-4). This $435 million natural gas fueled generating facility is connected to the District's electrical transmission and distribution system through the Rancho Seco switchyard.

The District operates one of thirty-four Control Areas in the Western Interconnection of the North American Electric Reliability Council (NERC). The Western Interconnection includes the provinces of Alberta and British Columbia, the northern portion of Baja California, Mexico, and all or portions of the 14 western states in between. The District Control Area is responsible for the continuous reliable operation of the transmission system that is owned by: the District; the Western Area Power Administration; and the participants of the California-Oregon Transmission Project, the cities of Redding, Shasta, Roseville, and Modesto, California. In addition, the District control area includes the customer load and generation that are connected to this transmission system. The District Control Area, in Northern California, extends from the California-Oregon border to Modesto, California.

NERC requires the District Control Area to continue to operate the transmission system reliably without relying on any of the elements in the primary control center. To meet this requirement, the District is in the process of building a $13.3 million Backup Control Center (BCC) in the Administration Building at Rancho Seco. The District intends to indefinitely maintain BCC operations at the Rancho Seco site.

The Rancho Seco concrete structures will remain in place after equipment removal and any required decontamination/remediation. There are no current plans for reutilization of these structures. Most easily demolished structures will be removed prior to license termination.

For the reasons stated above, it is reasonable to assume that the District will retain ownership of the site for the foreseeable future and that members of the public will not have ready access to impacted areas of the site.

6.4.2.2 Critical Group for Surface and Subsurface Soil Exposure

The average member of the critical group is defined as a District employee or contractor who is allowed occupational access to impacted areas of the site over the course of his/her employment. The assumption is made that occupancy would be limited to a 50-workweek year (2,000 hours per year). It was further assumed that the industrial worker would spend half of his/her time indoors and half outdoors while onsite.

6.4.2.3 Site-Specific Exposure Pathways

Under the industrial worker scenario the average member of the critical group receives potential exposure from contaminated soil by direct exposure, inhalation of contaminated soil that becomes airborne and ingestion of contaminated soil. The industrial worker could also receive potential exposure from drinking water or buried piping.

As discussed in Section 6.5.1, RESRAD was chosen as the computational method to calculate soil DCGLs. The industrial worker scenario varies significantly from the residential farmer scenario by allowing the following less conservative but realistic assumptions. These less conservative assumptions are realistic based upon the scenario justifications discussed in Section 6.4.2.1:

- Suppression of the plant ingestion pathway,
- Suppression of the meat ingestion pathway,
- Suppression of the aquatic foods pathway, and
- Drinking water pathway is not suppressed – there are currently four potable water wells existing on the 2,480-acre site. Three of these wells are up gradient of the impacted area; however, the fourth well is in the northern portion of the impacted area.

6.4.3 Industrial Worker Scenario for Building Occupancy Exposure

6.4.3.1 Industrial Worker Scenario Justification

The justification provided in Section 6.4.2.1 for using an industrial worker scenario for evaluating exposure to contaminated surface and subsurface soils also applies to using an industrial worker scenario for building occupancy and exposure to contaminated surfaces, bulk materials and embedded piping.

6.4.3.2 Critical Group for Structural Surface Exposure

The average member of the critical group is defined as a District employee or contractor who is allowed occupational access to impacted areas of the site over the course of his/her employment. The occupancy assumed is the 45 hours per week used in NUREG/CR-5512, Volume 3, "Residual Radioactive Contamination from Decommissioning – Parameter Analysis," [Reference 6-8].

6.4.3.3 Site-Specific Exposure Pathways

As discussed in Section 6.5.2, RESRAD-BUILD was chosen as the computational method to calculate structural surface DCGLs. The RESRAD-BUILD code is a pathway analysis model designed to evaluate the potential radiological dose to an individual who works in a building contaminated with radioactive material. It considers the releases of radionuclides into the indoor air by diffusion, mechanical removal, or erosion. RESRAD-BUILD considers seven exposure pathways:

1. External exposure directly from the source,
2. External exposure to materials deposited on the floor,
3. External exposure due to air submersion,
4. Inhalation of airborne radioactive particulates,
5. Inhalation of aerosol indoor radon progeny (in the case of the presence of radon predecessors) and tritiated water vapor (the radon pathway was turned off because the nuclear regulatory commission (NRC) does not regulate dose received from radon and progeny),
6. Inadvertent ingestion of radioactive material directly from the source, and

7. Ingestion of materials deposited on the surfaces of the building compartments.

6.5 Computational Model Used for Dose Calculations

6.5.1 Impacted Area Soils

The computer code RESidual RADioactive materials (RESRAD) v6.22, followed by v6.3 after its release during the summer of 2005, was selected to perform site-specific dose modeling of impacted area soils because of the ability to model subsurface soil contamination contained within the code. Argonne National Laboratory (ANL) developed the RESRAD computer code under the sponsorship of the U.S. Department of Energy (DOE). The code has been used widely by DOE and its contractors, the U.S. NRC, U.S. Environmental Protection Agency (EPA), U.S. Army Corps of Engineers, industrial firms, universities, and foreign government agencies and institutions. This code is a pathway analysis model designed to evaluate potential radiological doses to an average member of the specific critical group.

The NRC has adopted a risk-informed approach in assessing impacts on the health and safety of the public from radioactive contamination remaining at decommissioned sites. Therefore, the NRC tasked ANL to develop parameter distribution functions and parametric analysis for RESRAD for conducting probabilistic dose analysis. As part of this effort, external modules equipped with probabilistic sampling and analytical capabilities were developed for the RESRAD code. The modules are also equipped with user-friendly input/output interface features to accommodate numerous parameter distribution functions and to fulfill results display requirements.

The RESRAD database includes inhalation and ingestion dose conversion factors from the EPA's Federal Guidance Report (FGR) No. 11, direct external exposure dose conversion factors from FGR-12 and radionuclide half-lives from International Commission on Radiological Protection Publication 38 [References 6-9, 6-10 and 6-11 respectively].

6.5.2 Impacted Structural Surfaces and Bulk Material

RESRAD-BUILD v3.22, followed by v3.3 after its release during the summer of 2005, was selected to perform site-specific dose modeling of impacted structural surfaces and bulk material. RESRAD-BUILD is a computer code designed to evaluate the radiation doses from RESidual RADioactivity in BUILDings. The RESRAD-BUILD code was developed by ANL under sponsorship of the U.S. DOE and other federal agencies.

The RESRAD-BUILD computer code is a pathway analysis model designed to evaluate the potential radiological dose incurred by an individual who works or lives in a building contaminated with radioactive material. The transport of radioactive material within the building from one compartment to another is calculated with an indoor air quality model. The air quality model considers the transport of radioactive dust particulates and radon progeny due to air exchange, deposition and resuspension, and radioactive decay and ingrowth.

Seven exposure pathways are considered in the RESRAD-BUILD code: (1) external exposure directly from the source, (2) external exposure from materials deposited on the floor, (3) external exposure due to air submersion, (4) inhalation of airborne radioactive particulates, (5) inhalation of aerosol indoor radon progeny and tritiated water vapor, (6) inadvertent ingestion of radioactive material directly from the source, and (7) ingestion of materials deposited on the surfaces of the building compartments. Various exposure scenarios may be modeled with the RESRAD-BUILD code. These include, but are not limited to, office worker, renovation worker, decontamination worker, building visitor, and residency scenarios. Both deterministic and probabilistic dose analyses can be performed with RESRAD-BUILD, and the results can be shown in both text and graphic reports.

6.5.3 Buried Piping

The buried piping scenario utilizes soil DCGL values derived in Section 6.6.2. Under the scenario, buried piping is assumed to disintegrate instantaneously upon license termination. The disintegrated media is assumed to be soil and the media volume is assumed to be equal to the piping volume. A gross DCGL value applicable to interior piping surfaces was derived using standard computational methods assuming the disintegrated media is contaminated to soil DCGL concentrations using average observed nuclide fractions for soil and piping surface contamination.

Potential dose to the receptor at one meter above the surface soil was evaluated assuming a soil cover depth of 0.305 meter and 1.0 meter. The latter depth is considered a nominal depth for buried piping that will remain on site after license termination. The MicroShield® computer code was used to perform these calculations. MicroShield® is a comprehensive photon/gamma ray shielding and dose assessment program.

6.5.4 Embedded Piping

The embedded piping scenario assumes that the piping remains in place following decommissioning and that the dose to the industrial worker is from direct gamma exposure from the residual activity in the pipe with allowance made for photon attenuation by the wall or floor thickness of concrete remaining over the pipe. Whole body dose from the embedded pipe is considered additive along with the dose to the industrial worker resulting from residual activity on the walls or floors of the room or area in which the embedded pipe is present. The surface DCGL will be reduced as necessary by the dose contribution from the embedded piping in order to ensure compliance with the annual dose limit.

The MicroShield® computer code was used to evaluate dose from embedded piping. MicroShield® is a comprehensive photon/gamma ray shielding and dose assessment program.

6.6 Derived Concentration Guideline Levels (DCGLs)

6.6.1 RESRAD/RESRAD-BUILD Parameter Treatment

6.6.1.1 Parameter Classification

RESRAD and RESRAD-BUILD parameters are classified as behavioral, metabolic or physical. Some parameters may belong to more than one of these types.

In 1999, the NRC tasked Argonne National Laboratory with adapting the existing RESRAD code for use in site-specific dose modeling and analysis in accordance with the NRC's guidance in the Standard Review Plan (SRP) for Decommissioning to demonstrate compliance with the license termination rule. For this reason, ANL revised and customized the code to be consistent with the current NRC guidance for both deterministic and probabilistic dose modeling being developed in the SRP for Decommissioning. The first step in the procedure used by Argonne to develop the probabilistic code involved listing and classifying the parameters. The parameter classification has been documented in Attachment A to NUREG/CR-6697, "Development of Probabilistic RESRAD 6.0 and RESRAD-BUILD 3.0 Computer Codes," [Reference 6-12].

Physical parameters are determined by the source, its location, and geological characteristics of the site (i.e., these parameters are source- and site-specific). These include the geohydrological, geochemical, and meteorological characteristics of the site. The characteristics of atmospheric and biospheric transport up to, but not including, uptake by, or exposure of, the dose receptor, would also be considered physical input parameters.

A behavioral parameter is any parameter whose value would depend on the receptor's behavior and the scenario definition. For the same group of receptors, a parameter value could change if the scenario changed (e.g., parameters for recreational use could be different from those for residential use).

If a parameter represents the metabolic characteristics of the potential receptor and is independent of scenario, it is classified as a metabolic parameter. The parameter values may be different in different population age groups. According to the recommendations of the International Commission on Radiological Protection, Report 43 (ICRP 1985) [Reference 6-13], parameters representing metabolic characteristics are defined by average values for the general population. These values are not expected to be modified for a site-specific analysis because the parameter values would not depend on site conditions.

ANL ranked physical parameters by priority as 1, 2, or 3 where 1 represents high priority, 2 represents medium priority and 3 represents low priority. This ranking was the second step in the procedure used by ANL to develop the probabilistic code. The parameter ranking has been documented in Attachment B to NUREG/CR-6697.

6.6.1.2 Parameter Treatment

The parameters were treated as deterministic or stochastic depending on parameter type, priority, and availability of site-specific data and the relevance of the parameter in dose calculations. Deterministic modules of the code use single values for input parameters and generate a single value for dose. Probabilistic versions of the code use probability distributions for input parameters and generate a range of doses. Stochastic parameters are parameters that are defined by a probabilistic distribution.

The behavioral and metabolic parameters were treated as deterministic. The physical parameters for which site-specific data were available were also treated as deterministic. The remaining physical parameters for which no site-specific data were available to quantify were classified as either priority 1, 2 or 3. Priority 1 and 2 parameters were treated as stochastic. The priority 3 physical parameters were treated as deterministic.

6.6.2 Surface and Subsurface Soils

6.6.2.1 Mathematical Hydrogeological Model

RESRAD requires that the hydrogeological conditions of the site be described in a simplified mathematical model from the surface down to the first saturated potable groundwater zone.

RESRAD allows for the modeling of an uncontaminated cover, a contaminated soil zone, up to five unsaturated (vadose) zones and a saturated zone. The Rancho Seco hydrogeological information used to develop the simplified mathematical model is based on the original siting study performed in 1967 and 1968 and described in the Rancho Seco Final Safety Analysis Report (FSAR).

The subsurface exploration performed for the original siting study included:

1. The excavation of 22 backhoe trenches where natural outcrops were scarce;

2. The drilling and logging of twenty-eight 24-inch bucket auger holes, totaling 1,552 feet (generally, these auger holes were drilled to 70 feet unless special considerations dictated otherwise);

3. Twenty-two small-hole borings (3 ⅞ to 4 ¾ inch), totaling 2,016 feet, for sampling and logging;

4. A core hole, 602 feet deep, which was visually and geophysically logged, and which provided 23 representative core samples for laboratory testing of unconfined compression, absorption, porosity, and apparent and bulk specific gravity (this hole was used in testing for possible yield of ground water and a piezometer was installed for periodic measuring of depth to the ground water surface); and

5. A shallow seismic refraction survey, covering three lines and totaling 11,550 lineal feet, to determine seismic velocities of the foundation material and depths to significant velocity layers.

Boring 104 is closest to the location of the major plant structures. The undisturbed surface elevation of this boring was +174.2 feet msl. In this boring, silty gravel was encountered to a depth of approximately 10 feet (elevation +164), underlain by poorly graded sand to a depth of approximately 20 feet (elevation +154). Below 20 feet, sandstone and siltstone were encountered to a depth of approximately 105 feet (elevation +70). At 105 feet, sandstone was encountered to termination of the boring at 115 feet (elevation (elevation +60).

Boring 301 was drilled at the approximate center of the reactor containment building. Silty, sandy gravel was encountered to a depth of 10 feet and alternating sandstone and siltstone layers to a depth of approximately 73 feet. Sandstone was encountered from 73 feet to 137 feet; alternating sandstone and siltstone were again encountered to a depth of 366.5 feet. A green tuff was logged at 366.5 feet to the bottom of the boring, which terminated at 390 feet. Geologically, the boring penetrated the Laguna formation and the Mehrten formation, and was bottomed in the Valley Springs formation.

A 6¼ inch hole was drilled from a surface elevation of +177.4 feet to a depth of 602 feet (elevation –425) to obtain geologic and seismic data on the deep foundation materials. Groundwater was encountered in this hole at an elevation of +34.5 feet.

The current plant configuration has established the plant finished grade at elevation +165 feet which required excavation of 10 to 20 feet of material at the site. The foundation for the reactor containment building has been established at approximately 35 feet below the plant finished grade.

Based upon the above observations, the following simplified mathematical model is proposed for RESRAD calculations:

- A contaminated silt layer 15 cm thick,
- An unsaturated silt layer 1 foot (0.305 meters) thick,
- An unsaturated fine sand layer 10 feet (3.05 meters) thick,
- An unsaturated siltstone layer 84 feet (25.6 meters) thick,
- An unsaturated sandstone layer 35.5 feet (10.8 meters) thick, and
- An underlying saturated sandstone layer.

6.6.2.2 Radionuclides of Concern

Derivation of a site-specific suite of radionuclides potentially present at Rancho Seco was discussed in Section 6.3. This suite of potential radionuclides contains a total of 26 radionuclides. On May 28, 2004, Rancho Seco submitted a spent fuel pool cooler pad soil sample collected on March 8, 2004, to General Engineering Laboratories (GEL) for analysis of the entire suite of 26 radionuclides potentially present. This sample was known by onsite gamma spectroscopy to have the highest level of contamination of any soil samples collected during the site characterization process. Of the suite of 26 potential radionuclides, GEL positively identified only six radionuclides. These were C-14, Co-60, Ni-63, Sr-90, Cs-134, and Cs-137. Potassium-40 and U-238 were detected but they are naturally occurring radionuclides and the levels at which they were detected are indistinguishable from background levels. Therefore, K-40 and U-238 were discounted from further analysis. Single nuclide DCGL values were derived for each of the six radionuclides detected by GEL.

6.6.2.3 Sensitivity Analysis of Detectable Radionuclides

A sensitivity analysis was performed first to identify the parameters that are sensitive in the industrial worker scenario for the detectable radionuclides. As shown schematically in Figure 6-5, the parameter selection process starts with the selection of the RESRAD-BUILD parameter to be evaluated. If the parameters were classified as physical, then they were reviewed to determine if measured, site-specific values or look-up values based on soil type for the parameters were available. If measured, look-up or site-specific values for physical parameters were not available; the parameters were then ranked by priority as 1, 2, or 3 where 1 represents high priority, 2 represents medium priority and 3 represents low priority. This ranking was the second step in the procedure used by ANL to develop the probabilistic code. If the physical parameters were ranked as priority 3, the assigned default values in RESRAD v6.22 were used for performing sensitivity analyses. ANL developed statistical parameter distributions for the physical parameters ranked as priority 1 or 2. These parameter distributions have been documented in Attachment C to NUREG/CR-6697. The parameters selected for sensitivity analysis and their selection justification are provided in Appendix 6-A and the statistical parameter distributions used are provided in Appendix 6-B.

The first sensitivity analysis was performed using uncorrelated parameters. The site-specific RESRAD v6.22 dose model was loaded with the simplified mathematical model parameters contained in Appendix 6-A then with the statistical parameter distributions provided in

Appendix 6-B and run in the probabilistic mode. The uncertainty analysis input settings for this calculation were:

- Latin Hypercube sampling,
- Random seed – 1000,
- Number of observations – 300,
- Number of repetitions – 1, and
- Grouping of observations – correlated or uncorrelated.

Radionuclide concentrations used for the calculation were values obtained by GEL for sample number SC 8100010 DS08A1 (spent fuel cooler pad soil). This was a single soil sample that represented the most highly contaminated soil sampled onsite as indicated by onsite gamma isotopic analysis. The sample results obtained by GEL were decayed from the date of analysis to July 1, 2008 to represent the radionuclide mixture at the approximate completion of final status surveys. The RESRAD calculation was performed using the entire suite of identified radionuclides with their concentrations expected to exist on July 1, 2008. This approach identifies the sensitive parameters for the entire mixture, not just individual radionuclide parameter sensitivity. Radionuclide concentrations are provided in Table 6-2 below.

Table 6-2
Sensitivity Analysis Radionuclide Concentrations

Radionuclide	Analysis Date	Analysis Result (pCi/g)	Half Life (Years)	Decayed Conc. (pCi/g)
C-14	06/24/04	4.74E+00	5.73E+03	4.74E+00
Co-60	06/22/04	1.13E+01	5.27E+00	6.66E+00
Ni-63	06/24/04	1.75E+02	1.00E+02	1.70E+02
Sr-90	07/08/04	1.41E+00	2.86E+01	1.28E+00
Cs-134	06/22/04	8.90E-01	2.06E+00	2.30E-01
Cs-137	06/22/04	1.04E+03	3.02E+01	9.48E+02

The absolute value of the calculated partial ranked correlation coefficient (PRCC) of the peak of the mean dose was then used to classify the parameters with statistical distributions as sensitive or non-sensitive. PRCC was chosen because NUREG/CR-6692, "Probabilistic Modules for the RESRAD and RESRAD-BUILD Computer Codes," [Reference 6-14] recommends that it be used when nonlinear relationships, widely disparate scales or long tails are present in the inputs and outputs. If the absolute value of the PRCC was greater than 0.25, then the parameter was classified as sensitive. If the absolute value of the PRCC was equal to or less than 0.25, then the parameter was classified as non-sensitive.

Finally, values for use in dose modeling for the physical parameters with sensitive parameters were selected based on sensitivity of the calculated PRCC following the guidance of NUREG/CR-6676, "Probabilistic Dose Analysis Using Parameter Distributions Developed for RESRAD and RESRAD-BUILD Computer," [Reference 6-15]. If the absolute value of the PRCC was greater than 0.25, then the parameter value at either the 75% quartile or the 25% quartile was selected based on TEDE correlation with the parameter. If the PRCC value of the peak of the mean dose was negative, the parameter to dose correlation is negative and the parameter value at the 25% quartile was selected. If the PRCC value was positive, the parameter to dose correlation is positive and the parameter value at the 75% quartile was selected.

The parameter values were obtained from the RESRAD probabilistic calculation results using the interactive output feature of the uncertainty results. A double click on the left mouse button opens the interactive output dropdown window. From the interactive output dropdown window the "Results" folder is selected. From the "Results" folder the "Graphics" sub-folder is selected. The "Cumulative Density" is then selected as the Plot Type and the "Input Vector" is selected as the Primary Object. The parameter value is determined by a right mouse button click on the plot and selecting "Edit Chart Data" from the dropdown window. This opens the Data Grid Editor dropdown window. From this window, 0.25 or 0.75 is selected, as appropriate from the C2 column, which represents the appropriate quartile value. The corresponding parameter value is contained in the C1 column. The sensitive parameters for each radionuclide and the maximum calculated sensitive parameter PRCC values are listed in Appendix 6-C.

A few input parameters are clearly related, such as effective porosity and total porosity. NUREG/CR-6697, Attachment C identifies potential correlations among RESRAD parameters assigned statistical distributions. These correlations (for which RESRAD v6.22 allows correlating and a statistical distribution was used in the uncorrelated parameter distribution calculation) are provided in Table 6-3 below.

Table 6-3
Potential Parameter Correlations

Parameter	Correlated With	Positive/Negative Correlation
Effective porosity of unsaturated zone 1	Total porosity of unsaturated zone 1	Strong positive
Effective porosity of unsaturated zone 2	Total porosity of unsaturated zone 2	Strong positive
Contaminated zone Erosion rate	Runoff coefficient	Positive
Contaminated zone soil density	Contaminated zone total porosity	Negative
Unsaturated zone 1 soil density	Unsaturated zone 1 total porosity	Negative
Unsaturated zone 2 soil density	Unsaturated zone 2 total porosity	Negative

The calculation with uncorrelated parameters performed above was then repeated with the addition of the potential parameter correlations contained in Table 6-3 as additional parameter inputs for the uncertainty analysis. In the correlated/uncorrelated grouping, the RESRAD v6.22 user specifies the degree of correlation between each correlated parameter by inputting the correlation coefficients between the ranks of the parameters. If the correlation identified in Table 6-3 was indicated to be positive, a rank correlation coefficient of 0.5 was used. If the correlation is indicated to be negative, a rank correlation coefficient of -0.5 was used. If the correlation is indicated to be strong positive, a rank correlation coefficient of 0.9 was used.

The PRCC values for each parameter and the sensitive parameter values assigned are listed in Appendix 6-C. As can be seen from the results provided in Appendix 6-C, there is insignificant difference between PRCC values calculated using uncorrelated or correlated parameters and, in each calculation, the same three sensitive parameters were identified. These parameters include density of the contaminated zone, contaminated zone K_d value for Cs-137 and external gamma shielding factor. The PRCC value for the parameter contaminated zone erosion rate just exceeds the value to classify it as a sensitive parameter for the uncorrelated calculation but is just below the same value for the correlated calculation making it a non-sensitive parameter when correlated. Therefore, it was treated as a non-sensitive parameter when calculating DCGL values because correlated parameter pairs are considered to give a more appropriate indication of individual parameter sensitivity. The sensitive parameters were treated deterministically for calculating DCGL values using the assigned parameter values of Appendix 6-C.

6.6.2.4 Potential Dose from Discounted Radionuclides

The guidance contained in NUREG-1757, Vol. 2, Section 3.3, states "it is reasonable that radionuclides or pathways that are insignificant contributors to dose may be eliminated from further detailed consideration." The guidance further states, "NRC staff considers radionuclides and exposure pathways that contribute no greater than 10 percent of the dose criteria to be insignificant contributors." Because the dose criteria are performance criteria, this 10 percent limit for insignificant contributors is an aggregate limitation only. That is, the sum of the dose contributions from all radionuclides and individual scenario pathways considered insignificant should be no greater than 10 percent of the dose criteria. No limitation on either single radionuclides or pathways is necessary.

However, once it has been demonstrated that radionuclides or exposure pathways are insignificant, then (a) the dose from the insignificant radionuclides and pathways must be accounted for in demonstrating compliance, but (b) the insignificant radionuclides and pathways may be eliminated from further detailed evaluations. Therefore, it is necessary to calculate potential dose from undetected radionuclides and compare the aggregate potential dose to ensure that it does not exceed 10% of the dose limit (i.e., 2.5 mrem/year TEDE).

As discussed in Section 6.6.2.2, only six of the potential radionuclides derived in DTBD-04-001 are considered to be radionuclides of concern for Rancho Seco impacted area surface soil. This leaves 20 discounted radionuclides to be evaluated for potential dose. This potential dose is based on the minimum detectable activity (MDA) value for each hard-to-detect radionuclide analyzed by GEL for the spent fuel pool cooler pad soil sample, decayed, as for the radionuclides of concern, to a FSS date of July 1, 2008. The MDA value for readily detectable radionuclides is based on the average MDA from 17 spent fuel pool cooler pad surface soil samples analyzed by onsite gamma spectroscopy. A decay correction was applied to these average MDA values to correspond to an approximate date of July 1, 2008. The resulting concentrations are provided in Table 6-4.

Table 6-4
Discounted Radionuclide Concentrations for Dose Evaluation

Radionuclide	Analysis Date	Analysis MDA (pCi/g)	Decayed Conc. (pCi/g)
H-3	06/24/04	6.82E+00	5.44E+00
Na-22	***Various***	***3.28E-02***	***9.46E-03***
Fe-55	06/24/04	3.56E+00	1.27E+00
Ni-59	06/22/04	3.58E+00	3.58E+00
Nb-94	***Various***	***3.95E-02***	***3.95E-02***
Tc-99	06/28/04	2.35E+00	2.35E+00
Ag-108m	***Various***	***5.64E-02***	***5.50E-02***
Sb-125	***Various***	***4.03E-01***	***1.25E-01***
Pm-147	06/25/04	2.76E+00	9.55E-01
Eu-152	***Various***	***2.23E-01***	***1.76E-01***
Eu-154	***Various***	***9.04E-02***	***6.26E-02***
Eu-155	***Various***	***3.00E-01***	***1.56E-01***
Np-237	06/22/04	4.41E-01	4.41E-01
Pu-238	06/22/04	8.51E-01	8.24E-01
Pu-239	06/22/04	2.07E-01*	2.07E-01
Pu-240	06/22/04	2.07E-01*	2.07E-01
Pu-241	07/04/04	5.90E+01	4.87E+01
Am-241	06/25/04	7.62E-01	7.57E-01
Pu-242	06/22/04	5.94E-01	5.94E-01
Cm-244	06/25/04	5.60E-01**	4.80E-01

Note: Values in ***bold italics*** are the average MDA from onsite gamma isotopic analysis of 17 spent fuel cooler pad surface soil samples.

*Half of the Pu-239/Pu-240 combined MDA
**Half of the Cm-243/Cm-244 combined MDA

6.6.2.4.1 Identification of Discounted Radionuclide Sensitive Parameters

In order to calculate potential dose from discounted radionuclides, the discounted radionuclides were first evaluated to identify sensitive RESRAD parameters to be treated deterministically in the dose calculation. The site-specific mathematical model developed in Section 6.6.2.3 was used with uncorrelated parameter distributions to perform the sensitivity analysis. The RESRAD v6.22 parameters used are provided in Appendix 6-D and the probabilistic parameter distributions and sensitivity analysis results are provided in Appendix 6-E.

6.6.2.4.2 Calculation of Potential Dose from Discounted Radionuclides

Potential dose from discounted radionuclides was calculated using RESRAD v6.22 in the probabilistic mode using the decayed radionuclide concentrations provided in Table 6-4 and selecting the peak of the mean dose. The site-specific mathematical model used to identify sensitive parameters in Section 6.6.2.4.1 was used with uncorrelated parameter distributions to perform the dose calculations. The RESRAD v6.22 parameters used were taken from

Appendix 6-D and the probabilistic parameter distributions and sensitive parameter value assignments were taken from Appendix 6-E. Sensitive parameters were treated deterministically and non-sensitive parameters were treated stochastically. The total potential dose from all transuranic and non-transuranic discounted radionuclides is 0.572 mrem/year, which occurs during the first year following July 1, 2008.

6.6.2.5 Single Nuclide $DCGL_W$ Values for Detectable Radionuclides

Single nuclide $DCGL_W$ values (soil contamination at the $DCGL_W$ value results in a 25 mrem/year TEDE dose from the single radionuclide) for the detectable radionuclides of concern were calculated by performing an individual RESRAD calculation for each of the six detectable radionuclides. The site-specific RESRAD v6.22 dose model was first loaded with the simplified mathematical model parameters contained in Appendix 6-A (with the exception that a concentration of 1 pCi/g was used for each radionuclide) then with the statistical parameter distributions provided in Appendix 6-B. If a parameter was identified as sensitive in Section 6.6.2.3, it was treated deterministically and the sensitive parameter values listed in Appendix 6-C were used instead of a statistical parameter distribution. RESRAD was then run in the probabilistic mode for each detected radionuclide. The uncertainty analysis input settings for these calculations were:

- Latin Hypercube sampling,
- Random seed – 1000,
- Number of observations – 300,
- Number of repetitions – 1, and
- Grouping of observations – correlated or uncorrelated.

These calculations provided the peak of the mean dose in mrem/year per pCi/g for each detected radionuclide that is listed in Table 6-5. $DCGL_W$ values were then calculated by dividing the regulatory dose limit of 25 mrem/year minus the potential dose contribution from discounted radionuclides of 0.572 mrem/year (or a total of 24.4 mrem/year) by the calculated peak of the mean dose (mrem/year per pCi/g). Results of these calculations are also listed in Table 6-5. Derivation of soil DCGLs is detailed in DTBD-04-005, "DCGLs for Rancho Seco Industrial Area Surface Soils," [Reference 6-16].

Table 6-5

Single Nuclide $DCGL_W$ Values for Detectable Radionuclides

Radionuclide	Peak of the Mean Dose (mrem/y per pCi/g)	$DCGL_W$ (pCi/g)
C-14	2.93E-06	8.33E+06
Co-60	1.93E+00	1.26E+01
Ni-63	1.60E-06	1.52E+07
Sr-90	3.76E-03	6.49E+03
Cs-134	1.09E+00	2.24E+01
Cs-137	4.62E-01	5.28E+01

6.6.2.6 Applicability of Surface Soil $DCGL_W$s to Sub-Surface Soil

Single nuclide $DCGL_W$ values for surface soil developed in Section 6.6.2.5 were developed for surface soil. However, subsurface soil (i.e., soil at depths greater than 15 centimeters (5.9 in) below the soil surface) contamination has been identified within the Industrial Area at Rancho Seco. Therefore, it is necessary to evaluate the applicability of the $DCGL_W$ values to subsurface soil contamination. This evaluation is performed in accordance to the guidance provided in Appendix I, Section 2.3.1 of NUREG-1757, Volume 2.

6.6.2.6.1 Radionuclide Concentration Values for Subsurface Soil Dose Calculations

The unity rule was applied to the mixture concentrations of detected radionuclides listed in Table 6-2 (decayed to July 1, 2008 to represent the radionuclide mixture at the approximate completion of final status surveys) using the single nuclide DCGL concentration values of Table 6-5 to calculate maximum radionuclide concentration limits that will result in an annual dose to the industrial worker under the industrial worker scenario of 25 millirem. The unity rule is defined in the following equation:

$$\frac{C_{M(C-14)}}{DCGL_{C-14}}+\frac{C_{M(Co-60)}}{DCGL_{Co-60}}+\frac{C_{M(Ni-63)}}{DCGL_{Ni-63}}+\frac{C_{M(Sr-90)}}{DCGL_{Sr-90}}+\frac{C_{M(Cs-134)}}{DCGL_{Cs-134}}+\frac{C_{M(Cs-137)}}{DCGL_{Cs-137}}\leq 1$$

Equation 6-1

where:

$C_{M(x)}$ = the mixture concentration of radionuclide "x"

Applying the decayed radionuclide concentrations from Table 6-2 and the single nuclide DCGL values from Table 6-5 and solving the unity rule equation results in the following:

$$\frac{4.74}{8.33E+06}+\frac{6.66}{1.26E+01}+\frac{170}{1.52E+07}+\frac{1.28}{6.49E+03}+\frac{0.230}{2.24E+01}+\frac{948}{5.28E+01}=18.5$$

Equation 6-2

Dividing both sides of Equation 2 by 18.5 to maintain the unity rule results in:

$$\frac{0.256}{8.33E+06}+\frac{0.360}{1.26E+01}+\frac{9.18}{1.52E+07}+\frac{0.0692}{6.49E+03}+\frac{0.0124}{2.24E+01}+\frac{51.2}{5.28E+01}=1$$

Equation 6-3

Results of the radionuclide mixture concentrations calculated in Equation 6-3 are provided in Table 6-6.

Table 6-6
Maximum Allowable Radionuclide Mixture Concentrations

Radionuclide	Mixture Conc. (pCi/g)	Radionuclide	Mixture Conc. (pCi/g)
C-14	2.56E-01	Sr-90	6.92E-02
Co-60	3.60E-01	Cs-134	1.24E-02
Ni-63	9.19E+00	Cs-137	5.12E+01

Use of these radionuclide concentrations for homogeneously mixed surface soil (top 15 centimeters) under the industrial worker scenario results in an annual dose to the industrial worker of 25 millirem.

6.6.2.6.2 Evaluation of Dose Effects from Varying Contamination Layer Thickness

Surface soil is described by the NRC in NUREG-1757, Volume 2, as the top layer of the soil, which is approximately 15 centimeters (5.9 in) thick. The single nuclide DCGLs calculated in Section 6.6.2.5 were based on a contamination layer thickness of 15 centimeters. Actual contaminated soil thickness, however, may be considerably deeper than the top 15 centimeters. Therefore, peak of the mean dose using the maximum allowable radionuclide concentrations of Table 6-6 was calculated by RESRAD v6.22 in the probabilistic mode with contaminated zone depths of 0.15, 0.5, 1, 1.5, 2, 2.5 and 3 meters. Deterministic input parameters are listed in Appendix 6-F and stochastic parameter statistical distributions are listed in Appendix 6-G. The initial contaminated zone parameters were retained for all depths while thickness of underlying uncontaminated zones was reduced to account for the increased contaminated zone thickness. Peak of the mean nuclide dose results are summarized in Table 6-7 and depicted graphically in Figure 6-6 and Figure 6-7.

Table 6-7

Peak of the Mean Dose vs Contaminated Layer Thickness

Nuclide	Dose (mrem/year) at Contaminated Layer Thickness						
	0.15 m	**0.5 m**	**1.0 m**	**1.5 m**	**2.0 m**	**2.5 m**	**3.0 m**
C-14	7.51E-07	2.35E-06	4.57E-06	6.83E-06	9.09E-06	1.13E-05	1.36E-05
Co-60	6.95E-01	8.12E-01	8.17E-01	8.17E-01	8.18E-01	8.18E-01	8.18E-01
Ni-63	1.48E-05	2.22E-05	2.23E-05	2.23E-05	2.23E-05	2.23E-05	2.23E-05
Sr-90	2.61E-04	2.91E-04	2.93E-04	2.94E-04	2.95E-04	2.95E-04	2.95E-04
Cs-134	1.35E-02	1.48E-02	1.49E-02	1.49E-02	1.49E-02	1.49E-02	1.49E-02
Cs-137	2.36E+01	2.57E+01	2.57E+01	2.57E+01	2.57E+01	2.57E+01	2.57E+01
Total	2.43E+01	2.65E+01	2.66E+01	2.66E+01	2.66E+01	2.66E+01	2.66E+01

As shown in the results, calculation of DCGLs based on surface soil (top 15 centimeters) is slightly non-conservative. There is a 9.05 percent increase in calculated total peak of the mean dose by increasing the contaminated layer thickness from 0.15 meters to 0.5 meters. However, there is little additional increase in total peak of the mean dose by increasing the contaminated layer thickness up to 3 meters. This non-conservatism may be discounted unless sub-surface soil contamination exists over a large area (greater than 300 m^2). At 300 m^2 the area factor for Cs-137 (the predominant dose contributor for the Table 6-6 radionuclide mixture) calculated in DTBD-05-003, "Soil and Structural Surface Area Factors for Use at Rancho Seco," [Reference 6-17] is 1.11, which is greater than the non-conservatism of 8.74 percent. The area factor for Cs-137 increases for areas less than 300 m^2 up to a factor of 11.3 for 1 m^2.

The steady dose increase with increasing contaminated layer thickness seen for C-14 is because the dominant exposure pathway for C-14 is inhalation. The C-14 available for inhalation is directly proportional to the total quantity of C-14 in the soil because C-14 is volatilized from sub-surface as well as surface soil.

6.6.2.6.3 Evaluation of Discrete Pockets of Contamination at Depth

Since subsurface soil contamination has only been observed to occur in discrete pockets, the application of surface soil DCGLs to subsurface pockets of contamination was evaluated. For purposes of evaluation, these discrete pockets were defined as cylindrical volumes of soil 100 m^2 on the surface and 2 m deep. The soil was considered to be contaminated to the maximum allowable concentrations listed in Table 6-6. Peak of the mean dose calculations were performed with the pocket exposed to the surface and 0.25, 0.5, 1, 2.5, 5 and 10 meters below the surface.

Deterministic input parameters are listed in Appendix 6-H and stochastic parameter statistical distributions are listed in Appendix 6-I. The calculations performed did not use the simplified mathematical model developed in Section 6.6.2.3. Because the discrete pockets of soil contamination transverse several different soil strata, generic stochastic statistical parameter distributions were used to represent the soil physical parameters rather than the deterministic sensitive soil parameters developed in Section 6.6.2.3. Peak of the mean dose results are summarized in Table 6-8 and depicted graphically in Figure 6-8. The times of the peak of the mean dose (years since performance of the FSS) are also included in Table 6-8 and depicted graphically in Figure 6-9.

Table 6-8

Peak of the Mean Dose vs Discrete Contamination Pocket Depth

	Dose (mrem/year) at Contamination Pocket Depth*						
	0 m	0.25 m	0.5 m	1.0 m	2.5 m	5.0 m	10 m
P-o-M♦	2.23E+01	1.54E+00	4.50E-01	2.79E-01	1.36E-01	6.00E-02	2.64E-02
P-o-M Time (y)	0.00E+00	5.38E+01	2.42E+01	2.42E+01	4.12E+01	5.38E+01	7.02E+01

*Depth of top of discrete contamination pocket below ground surface
♦Peak of the mean dose at time of peak of the mean dose

As shown in Table 6-8 and Figure 6-8, the peak of the mean dose decreases with increasing depth of the discrete pockets of contamination beneath the soil surface. Therefore, application of surface soil DCGL values to subsurface soil contamination is conservative. Although DCGL values for discrete pockets of subsurface soil contamination could be developed that are higher than the surface soil DCGL values, these subsurface soil DCGL values would be non-conservative if the subsurface soil contamination is excavated at some later date and spread on the surface, thus becoming surface soil contamination. Therefore, surface soil DCGL values should be applied to discrete pockets of subsurface soil contamination.

6.6.3 Structural Surfaces

6.6.3.1 Identification Of RESRAD-BUILD Sensitive Parameters

A theoretical site-specific suite of 26 radionuclides potentially present at Rancho Seco was derived in Section 6.3. Single nuclide DCGL values were derived for each radionuclide in this theoretical site-specific suite.

RESRAD-BUILD v3.22 was used to generate the single nuclide DCGL values based on an industrial worker building occupancy scenario introduced in NUREG/CR-6755, "Technical Basis for Calculating Radiation Doses for the Building Occupancy Scenario Using the Probabilistic RESRAD-BUILD 3.0 Code," [Reference 6-18]. The RESRAD-BUILD code is a pathway analysis model designed to evaluate the potential radiological dose to an individual who works in a building contaminated with radioactive material. It considers the releases of radionuclides into the indoor air by diffusion, mechanical removal, or erosion. RESRAD-BUILD considers seven exposure pathways:

1. External exposure directly from the source,
2. External exposure to materials deposited on the floor,
3. External exposure due to air submersion,
4. Inhalation of airborne radioactive particulates,
5. Inhalation of aerosol indoor radon progeny (in the case of the presence of radon predecessors) and tritiated water vapor (the radon pathway was turned off because the NRC does not regulate dose received from radon and progeny),
6. Inadvertent ingestion of radioactive material directly from the source, and
7. Ingestion of materials deposited on the surfaces of the building compartments.

A sensitivity analysis was performed first to identify the parameters that are sensitive in the industrial worker building occupancy scenario. As shown schematically in Figure 6-10, the parameter selection process starts with the selection of the RESRAD-BUILD parameter to be evaluated. The RESRAD-BUILD parameters were treated as described in Section 6.6.1.

The dose model included five contaminated surfaces, four walls and a floor. The ceiling was assumed to be either not contaminated, replaced if the room would be reused or to be so far above the floor that it would provide an insignificant contribution to dose to the receptor.

Deterministic input parameters are listed in Appendix 6-J and stochastic parameter statistical distributions are listed in Appendix 6-K. Once the parameter values listed in Appendix 6-J and the statistical parameter distributions listed in Appendix 6-K were loaded into RESRAD-BUILD v3.22 (v3.3 for Eu-154), the code was run in the probabilistic mode for each radionuclide of concern to identify the sensitive parameters. The absolute value of the calculated PRCC at time 1 was then used to classify the parameters with statistical distributions as sensitive or non-sensitive. PRCC was chosen because NUREG/CR-6692 recommends that it be used when nonlinear relationships, widely disparate scales or long tails are present in the inputs and outputs. If the absolute value of the PRCC was greater than 0.10, then the parameter was classified as sensitive. If the absolute value of the PRCC was equal to or less than 0.10, then the parameter was classified as non-sensitive. The sensitive parameters for each radionuclide and the sensitive parameter PRCC values are listed in Appendix 6-L.

6.6.3.2 Derivation Of Single Nuclide DCGL Values

Single nuclide DCGL values for the radionuclides of concern were calculated by performing an individual RESRAD-BUILD calculation for each radionuclide of concern. First, the applicable priority 2 and 3 parameter values listed in Appendix 6-M were loaded into RESRAD-BUILD v3.22 (v3.3 for Eu-154). Next, the non-sensitive priority 1 parameters were treated stochastically by loading the appropriate statistical parameter distributions listed in Appendix 6-K. Finally, the priority 1 sensitive parameters were treated deterministically by loading the assigned parameter value listed in Appendix 6-K and running the code in the probabilistic mode to identify the "Statistics for Dose" for Time 1 for each radionuclide of concern. For each calculation, the Latin Hypercube sampling technique was used with a random seed of 1000, 300 observations and one repetition.

Five parameter values that could be treated stochastically for certain radionuclides (not all radionuclides have the same sensitive parameters as shown in Appendix 6-L) were treated deterministically for all radionuclides. These parameters included room height, room floor area, deposition velocity and air exchange rate, which were assigned the sensitive parameter values listed in Appendix 6-K. Due to the large variation in room size in the structures expected to remain at Rancho Seco, the sensitive parameter values for room height and room floor area were selected to provide conservative calculations. The sensitive parameter values for deposition velocity and air exchange rate were selected to provide consistency in calculation assumptions.

The value of the fifth parameter, resuspension rate, was calculated based on the NUREG-1720, "Re-evaluation of the Indoor Resuspension Factor for the Screening Analysis of the Building Occupancy Scenario for NRC's License Termination Rule," [Reference 6-19] recommended DandD resuspension factor of 9.6E-07 m^{-1} and the sensitive parameter values for deposition velocity, air exchange rate and room height in accordance with the following equation (Equation 3.5 of NUREG/CR-6755):

$$\lambda_r = R_f\left(v_{dep} + \lambda_a \times H\right)$$

Equation 6-4

where:

λ_r = the RESRAD-BUILD parameter, resuspension rate (DKSUS),
R_f = the DandD parameter, resuspension factor,
v_{dep} = the RESRAD-BUILD parameter, deposition velocity (UD),
λ_a = the RESRAD-BUILD parameter, air exchange rate (LAMBDATE), and
H = room height (H).

Radionuclide dose conversion factors (DCFs) were calculated by performing a probabilistic RESRAD-BUILD v3.22 calculation for each of the 26 radionuclides present in the theoretical site-specific suite. The DCFs selected (in units of mrem/yr per 100 dpm/100 cm^2) are the average total dose values for the receptor. Single nuclide DCGL values were then calculated by dividing the dose limit (25 mrem/yr) by the DCF value to give single nuclide DCGL values in units of dpm/100 cm^2. Results of these calculations and the associated DCF values are listed in Table 6-9. The structural surface DCGLs were developed in Rancho Seco DTBD-05-005, "DCGLs for RSNGS Activated and Volumetrically Contaminated Bulk Materials," [Reference 6-20].

Table 6-9

Calculated Structural Surface Single Nuclide DCFs and DCGLs

Radionuclide	Dose Conversion Factor (mrem/yr per dpm/100 cm^2)	DCGL (dpm/100 cm^2)
H-3	7.94E-08	3.15E+08
C-14	2.92E-06	8.56E+06
Na-22	1.47E-03	1.70E+04
Fe-55	7.31E-07	3.42E+07
Ni-59	3.13E-07	7.99E+07
Co-60	1.64E-03	1.52E+04
Ni-63	8.20E-07	3.05E+07
Sr-90	2.07E-04	1.21E+05
Nb-94	1.09E-03	2.29E+04
Tc-99	2.13E-06	1.17E+07
Ag-108m	1.13E-03	2.21E+04
Sb-125	3.13E-04	7.99E+04
Cs-134	1.14E-03	2.19E+04
Cs-137	4.50E-04	5.56E+04
Pm-147	1.50E-06	1.67E+07
Eu-152	7.86E-04	3.18E+04
Eu-154	8.43E-04	2.97E+04
Eu-155	4.78E-05	5.23E+05
Np-237	1.05E-02	2.38E+03
Pu-238	7.30E-03	3.42E+03
Pu-239	8.19E-03	3.05E+03
Pu-240	8.19E-03	3.05E+03
Pu-241	1.37E-04	1.82E+05
Am-241	8.37E-03	2.99E+03
Pu-242	7.81E-03	3.20E+03
Cm-244	4.15E-03	6.02E+03

The calculations for Eu-154 were performed using RESRAD-BUILD v3.3 after it was released by Argonne during the summer of 2005. RESRAD-BUILD v3.22 Eu-154 had a coefficient problem that related the FGR 13 dose conversion factor to source size and shield thickness incorrectly, resulted in an erroneous calculated dose conversion factor. This problem was corrected in RESRAD-BUILD v3.3.

6.6.4 Bulk Material

While the single nuclide DCGLs described in Section 6.6.3 are applicable to most structural surfaces, the potential exists that some structural surfaces are the face surfaces of structural components containing volumetric contamination arising from neutron activation. The possibility also exists for some volumetric contamination caused by the migration of surface contamination into the materials of construction. Therefore, it is necessary to calculate single nuclide DCGLs for bulk materials in order to evaluate these surfaces during the conduct of final status surveys. The bulk material DCGLs were developed in Rancho Seco DTBD-05-005, "DCGLs for RSNGS Activated and Volumetrically Contaminated Bulk Materials," [Reference 6-21].

6.6.4.1 Radionuclides of Concern for Activated Bulk Material Dose Calculations

A site-specific suite of potential radionuclides for use at Rancho Seco was derived in Section 6.3. This suite of potential radionuclides contains a total of 26 radionuclides. Single nuclide bulk material DCGL values were calculated for the entire suite of 26 radionuclides.

6.6.4.2 Identification of RESRAD-BUILD Sensitive Parameters for Bulk Material

Section 6.6.3 used RESRAD-BUILD v3.22 to generate single nuclide structural surface DCGL values based on an industrial worker building occupancy scenario introduced in NUREG/CR-6755. Section 6.6.3.1 identified sensitive parameters for RESRAD-BUILD v3.22 and established the dose model for derivation of DCGLs for structural surfaces. The dose model included five contaminated surfaces, four walls and a floor. The ceiling was assumed to be either not contaminated, replaced if the room would be reused or to be so far above the floor that it would provide an insignificant contribution of dose to the receptor. Due to the large variety of room sizes in the structures that will remain after license termination, the room dimensions were determined probabilistically and given conservative deterministic values.

Only portions of the Section 6.6.3 dose model are considered appropriate for derivation of single nuclide DCGL values for activated or volumetrically contaminated bulk material. Because most interior concrete in the containment building, down to the carbon steel liner plate, will be removed; only the carbon steel liner and concrete below it that are in the area formerly below the reactor vessel have a potential of being activated. Also, in other areas of the remaining structures the floors will have the highest possibility of containing volumetric contamination due to spills of radioactive liquids. Therefore, only the floor area of 137 m^2 derived in the Section 6.6.3 dose model will be used by replacing the floor surface source with a 1 foot thick (the most likely maximum depth of activation or contamination according to NUREG/CR-5884, Volume 2, Revised Analyses of Decommissioning for the Reference Pressurized Water Reactor Power Station, [Reference 6-22]) volume source having the same face surface area as the Section 6.6.3 dose model floor source.

Other parameters that were found to be sensitive in Section 6.6.3.1 and treated deterministically for the derivation of structural surface single nuclide DCGLs may not remain sensitive for volume sources. Therefore, they were treated stochastically for the sensitivity analysis using volume sources.

For the case of tritium in the volume sources, the tritium was assumed to be present in the volume sources in the form of water that is released from the volume sources in the form of vapor (HTO vapor). Under this assumption, ANL/EAD/03-01, "User's Manual for RESRAD-BUILD Version 3," [Reference 6-23] recommends that the deposition velocity be treated deterministically and set to "0".

The same parameter selection process used in Section 6.6.3.1was used for this sensitivity analysis. The parameter values for sensitivity analysis and their assigned classification and priority are provided in Appendix 6-N. The parameter statistical distributions and sensitive parameter selection results for Rancho Seco priority 1 and 2 physical parameters are listed in Appendix 6-O. The parameter values for sensitivity analysis in Appendix 6-N and the parameter distributions listed in Appendix 6-O were loaded into RESRAD-BUILD v3.3 separately for each radionuclide.

Once the parameter values and the statistical parameter distributions were loaded into RESRAD-BUILD v3.3, the code was run in the probabilistic mode for each radionuclide of concern separately to identify the sensitive parameters for that radionuclide. For each calculation, the Latin Hypercube sampling technique was used with a random seed of 1000, 300 observations and one repetition. The absolute value of the calculated PRCC at time 1 was then used to classify the parameters with statistical distributions as sensitive or non-sensitive. If the absolute value of the PRCC was greater than 0.10, then the parameter was classified as sensitive. If the absolute value of the PRCC was equal to or less than 0.10, then the parameter was classified as non-sensitive.

Values for use in dose modeling for the physical parameters with sensitive parameters were selected based on sensitivity of the calculated PRCC following the guidance of NUREG/CR-6676. If the absolute value of the PRCC was greater than 0.10, then the parameter value at either the 75% quartile or the 25% quartile was selected based on TEDE correlation with the parameter. If the PRCC value was negative, the parameter to dose correlation is negative and the parameter value at the 25% quartile was selected. If the PRCC value was positive, the parameter to dose correlation is positive and the parameter value at the 75% quartile was selected. The sensitive parameter deterministic values and the highest sensitive parameter PRCC values (absolute value) of all radionuclides evaluated are listed in Appendix 6-O (with an accuracy of three significant figures).

6.6.4.3 Derivation Of Single Nuclide Bulk Material DCGL Values

Single nuclide dose conversion factors (DCFs) were calculated probabilistically, repeating the RESRAD-BUILD v3.3 calculations performed in Section 6.6.4.2 by replacing the stochastic parameter distributions for each radionuclide identified to be sensitive in Appendix 6-O with the assigned deterministic parameter value listed in Appendix 6-O. The DCF for each radionuclide was determined by performing these calculations with a source concentration of 1 pCi/gram to provide a DCF with the units of mrem/year per pCi/gram. The probabilistic dose used was the average total dose from the "Statistics for Dose (mrem) for Time: 1" report. The DCF for each radionuclide (with an accuracy of three significant figures) is provided in Table 6-10. DCGL values were then calculated by dividing the dose limit (25 mrem/yr) by the DCF value to give DCGL values in units of pCi/gram. Results of these calculations are also in provided in Table 6-10.

Table 6-10
Bulk Material Single Nuclide DCF and DCGL Values

Radionuclide	Dose Conversion Factor (mrem/yr per pCi/g)	DCGL (pCi/g)
H-3	3.18E-03	7.86E+03
C-14	1.56E-05	1.60E+06
Na-22	2.98E+00	8.39E+00
Fe-55	6.40E-07	3.91E+07
Ni-59	1.68E-06	1.49E+07
Co-60	3.54E+00	7.06E+00
Ni-63	3.65E-06	6.85E+06
Sr-90	6.01E-03	4.16E+03
Nb-94	2.11E+00	1.18E+01
Tc-99	3.39E-05	7.37E+05
Ag-108m	2.09E+00	1.20E+01
Sb-125	5.26E-01	4.75E+01
Cs-134	2.05E+00	1.22E+01
Cs-137	7.40E-01	3.38E+01
Pm-147	1.52E-05	1.64E+06
Eu-152	1.52E+00	1.64E+01
Eu-154	1.67E+00	1.50E+01
Eu-155	3.20E-02	7.81E+02
Np-237	3.34E-01	7.49E+01
Pu-238	6.92E-02	3.61E+02
Pu-239	2.04E-01	1.23E+02
Pu-240	8.45E-02	2.96E+02
Pu-241	1.22E-03	2.05E+04
Am-241	9.26E-02	2.70E+02
Pu-242	8.09E-02	3.09E+02
Cm-244	3.72E-02	6.72E+02

6.6.5 Containment Building Interior Surfaces

The District has no plans for beneficial reuse of the Rancho Seco Containment Building. Furthermore, remediation during the decommissioning process will have removed all equipment and structures from the containment building interior and the majority of interior concrete will be also be removed leaving only the carbon steel liner plate. Because of this, the industrial worker building occupancy scenario used to generate structural surface DCGLs in Section 6.6.3 is not a realistic scenario to be applied to the interior surface of the containment building after completion of remediation.

The final condition of the containment building will be one of no ventilation, lighting or power. Also, access will be extremely restricted with most containment penetrations, including personnel access hatches, closed off. Under these conditions, the occupancy factor will not provide the limiting condition for the derivation of containment building surface DCGLs with

RESRAD-BUILD using a normal mathematical model. An industrial worker building inspection scenario is developed in Section 6.6.5.1 and containment surface DCGLs were calculated for this scenario.

The District has no current plans to renovate or demolish the containment building, either prior to or after license termination; however, a building renovation/demolition scenario would be the most limiting scenario for the derivation of containment building surface DCGLs. Therefore, even though it is unlikely that the containment building will be renovated or demolished after license termination, a building renovation/demolition scenario can be used to derive Containment Building surface DCGLs for this scenario.

NUREG/CR-5512, Vol. 1, describes a building renovation scenario. It states:

> *"The building renovation scenario, in Section 3.1, accounts for an average volume (subsurface) concentration of radionuclides in building walls, floors and ceilings. ...*
>
> *...During renovation or demolition, surface and volume sources will be disturbed, creating loose contamination. This loose contamination can produce higher concentrations of radionuclides in the air or on surfaces than the levels in an undisturbed building.*
>
> *Renovation conditions serve as the prudently conservative basis for this scenario analysis. The differences between renovation and demolition are difficult to predict, but both can likely be represented by the same conceptual model. For some conditions, demolition may represent a worst-case situation; in others, renovation may be the worst case. ..."*

ANL/EAD/03-1 provides directions for the use of RESRAD-BUILD for various scenarios, including the building renovation scenario. The exposure pathways considered when using RESRAD-BUILD include:

1. External exposure to penetrating radiation emitted directly from the source,
2. External exposure to penetrating radiation emitted from radioactive particulates deposited on the floors of the compartments,
3. External exposure to penetrating radiation due to submersion in airborne radioactive particulates,
4. Inhalation of airborne radioactive particulates,
5. Inhalation of aerosol indoor tritiated water vapor,
6. Inadvertent ingestion of radioactive material contained in removable material directly from the source, and
7. Inadvertent ingestion of airborne radioactive particulates deposited on the surfaces of the building.

ANL/EAD/03-1 also provides an input data template and input parameter values for the building renovation scenario. The template and input parameter values are designed to match the building renovation scenario introduced in NUREG/CR-5512, Vol. 1. The calculations performed to derive containment building DCGLs used these parameter values. The exposure duration specified in ANL/EAD/03-1 is 179 days, which is the renovation period specified in NUREG/CR-5512, Vol. 1 for the building renovation scenario. Based on the Maine Yankee containment building demolition experience, this is a reasonable exposure duration.

6.6.5.1 Application of an Industrial Worker Building Inspection Scenario

6.6.5.1.1 Radionuclides of Concern for Industrial Worker Building Inspection Scenario DCGL Calculations

A list of nine significant radionuclides out of the 26 radionuclides in the site-specific suite of radionuclides based on characterization samples were identified in DTBD-05-015, Rancho Seco Nuclear Generating Station Structure Nuclide Fraction and DCGLs, [Reference 6-24]. These nine radionuclides include Co-60, Sr-90, Cs-134, Cs-137, Pu-238, Pu-239, Pu-240, Pu-241 and Am-241. Industrial worker building inspection scenario single nuclide DCGLs were derived for these nine radionuclides.

6.6.5.1.2 Mathematical Containment Building Model Used with RESRAD-BUILD

RESRAD-BUILD is designed to perform dose modeling on up to three rectangular compartments, each containing a floor, four walls and a ceiling. For purposes of modeling the Rancho Seco containment building, a single compartment was selected. The compartment is specified by defining a floor area and compartment height. The renovation/demolition scenario defined in ANL/EAD/03-1 specifies the use of volume sources in the mathematical model. Volume sources are modeled in RESRAD-BUILD as cylinders with the source direction defined as the vector from the face of the cylinder perpendicular to the exposed area. The industrial worker building inspection scenario utilizes surface sources with the same areas as the volume sources used in the renovation/demolition scenario.

The Rancho Seco containment building is a cylindrical structure containing a circular basemat, cylindrical walls and a domed ceiling. Therefore, several simplifying assumptions were necessary to model the containment building to obtain a mathematical model usable by RESRAD-BUILD. For use by RESRAD-BUILD, the floor and ceiling were modeled as circular sources 130-feet in diameter to match the containment building interior diameter. The floor source represented the containment basement floor and the ceiling source represented the base of the dome located 145-feet above the center of the basement floor. Next, the cylindrical vertical wall area (59,400 ft^2) was divided into four equal areas and each fourth of the area assigned as the area of each of the four wall sources. This is considered an acceptable approximation of the containment building interior because the majority of calculated potential dose to the renovation/demolition worker is from inhalation and ingestion of the dust created during demolition. This is proportional to total volume, not the shape of the containment building interior surfaces.

6.6.5.1.3 Derivation Of Industrial Worker Building Inspection Scenario Single Nuclide DCGL Values

Industrial worker building inspection scenario single nuclide DCGLs were derived deterministically using the parameters provided in Appendix 6-P. The input parameters contained in Appendix 6-P were input into the RESRAD-BUILD v3.3 code for each of the nine radionuclides of concern. The DCFs selected (in units of mrem/yr per 100 dpm/100 cm^2) are the average total dose values for the receptor. Single Nuclide DCGL values were then calculated by dividing the dose limit (25 mrem/yr) by the DCF value to give DCGL values in units of dpm/100 cm^2. Results of these calculations are provided in Table 6-11 below.

Table 6-11

Containment Building Surface Single Nuclide DCF and DCGL Values for the Industrial Worker Building Inspection Scenario

Radionuclide	Dose Conversion Factor (mrem/yr per 100 dpm/100 cm^2)	DCGL (dpm/100 cm^2)
Co-60	2.81E-05	8.90E+05
Sr-90	1.46E-05	1.71E+06
Cs-134	2.38E-05	1.05E+06
Cs-137	1.09E-05	2.29E+06
Pu-238	3.10E-04	8.06E+04
Pu-239	3.43E-04	7.29E+04
Pu-240	3.43E-04	7.29E+04
Pu-241	6.63E-06	3.77E+06
Am-241	3.53E-04	7.08E+04

6.6.5.2 Application of a Building Renovation/Demolition Scenario

6.6.5.2.1 Radionuclides of Concern for Containment Building DCGL Calculations

The derivation of a theoretical site-specific suite of 26 radionuclides potentially present at RSNGS was discussed in Section 6.3. Single nuclide DCGL values were derived for each radionuclide in this theoretical site-specific suite.

6.6.5.2.2 Identification of RESRAD-BUILD Sensitive Parameters for Containment Building Renovation/Demolition

Sensitive parameters for containment building renovation/demolition were identified using the process described in Section 6.6.4.2. The parameter values for sensitivity analysis and their assigned classification and priority are provided in Appendix 6-Q. The parameter statistical distributions and sensitive parameter selection results for Rancho Seco priority 1 and 2 physical parameters are listed in Appendix 6-R.

Once the parameter values and the statistical parameter distributions were loaded into RESRAD-BUILD v3.3, the code was run in the probabilistic mode for each radionuclide of concern to identify the sensitive parameters for that radionuclide. For each calculation, the Latin Hypercube sampling technique was used with a random seed of 1000, 300 observations and one repetition. The absolute value of the calculated PRCC at time 1 was then used to classify the parameters with statistical distributions as sensitive or non-sensitive.

Values for use in dose modeling for the physical parameters with sensitive parameters were selected based on sensitivity of the calculated PRCC following the guidance of NUREG/CR-6676. If the absolute value of the PRCC was greater than 0.10, then the parameter value at either the 75% quartile or the 25% quartile was selected based on TEDE correlation with the parameter. If the PRCC value was negative, the parameter to dose correlation is negative and the parameter value at the 25% quartile was selected. If the PRCC value was positive, the parameter to dose correlation is positive and the parameter value at the 75% quartile was selected. The sensitive parameter deterministic values and the highest sensitive parameter PRCC values (absolute value) of all radionuclides evaluated are listed in Appendix 6-R (with an accuracy of three significant figures).

6.6.5.3 Derivation Of Containment Building Renovation/Demolition Single Nuclide DCGL Values

Single nuclide DCFs were calculated deterministically if all parameters treated stochastically in Section 6.6.5.2.2 were determined to be sensitive. Single nuclide DCFs were calculated probabilistically if some non-sensitive parameters could be treated stochastically. The RESRAD-BUILD v3.3 calculations performed in Section 6.6.5.2.2 were repeated by replacing the stochastic parameter distributions for each radionuclide identified to be sensitive in Appendix 6-R with the assigned deterministic parameter value listed in Appendix 6-R.

The DCF for each radionuclide was determined by performing the above calculations with a source concentration of 1,000 dpm/gram to provide a DCF with the units of mrem/year per 1,000 dpm/gram. The probabilistic dose used was the average total dose from the "Statistics for Dose (mrem) for Time: 1" report. The DCF for each radionuclide (with an accuracy of three significant figures) is provided in Table 6-12.

The building renovation scenario, also applicable to building demolition (see Section 6.6.5), described in NUREG/CR-5512, Vol. 1, and the input data template and input parameter values provided in ANL/EAD/03-1, specify the use of a volume source with a thickness of 15 cm. In the case of the containment building any residual contamination will likely be fixed on the interior surface rather than dispersed throughout the 15 cm thickness. If the assumption is made that containment building surface activity would be mixed into the 15 cm thickness during demolition, then DCGL values may be calculated by assuming that all of the activity contained in the source is actually on the surface and solving Equation 6-5 to give DCGL values in units of dpm/100 cm^2.

$$\frac{10^3}{DCF_i}\frac{dpm/g}{mrem} \times 25\,mrem \times 2.5\,g/cm^3 \times 1500\,cm^3 \text{ per one hundred } cm^2 \quad = \quad DCGL_i\,dpm/100\,cm^2$$

Equation 6-5

Results of these calculations are also in provided in Table 6-12.

Table 6-12

Containment Building Surface Single Nuclide DCF and DCGL Values – Renovation/Demolition Scenario

Radionuclide	Dose Conversion Factor (mrem/yr per 10^3 dpm/g)	DCGL (dpm/100 cm^2)
H-3	7.72E-02	1.21E+09
C-14	4.62E-01	2.03E+08
Na-22	1.98E+03	4.73E+04
Fe-55	1.50E-01	6.25E+08
Ni-59	6.64E-02	1.41E+09
Co-60	2.33E+03	4.02E+04
Ni-63	1.73E-01	5.42E+08
Sr-90	4.67E+01	2.01E+06
Nb-94	1.42E+03	6.60E+04
Tc-99	3.93E-01	2.39E+08
Ag-108m	1.44E+03	6.51E+04
Sb-125	3.56E+02	2.63E+05
Cs-134	1.40E+03	6.70E+04
Cs-137	5.15E+02	1.82E+05
Pm-147	5.46E-01	1.72E+08
Eu-152	1.02E+03	9.19E+04
Eu-154	1.11E+03	8.45E+04
Eu-155	2.14E+01	4.38E+06
Np-237	5.48E+03	1.71E+04
Pu-238	3.86E+03	2.43E+04
Pu-239	4.23E+03	2.22E+04
Pu-240	4.23E+03	2.22E+04
Pu-241	8.14E+01	1.15E+06
Am-241	4.38E+03	2.14E+04
Pu-242	4.05E+03	2.31E+04
Cm-244	2.44E+03	3.84E+04

6.6.5.4 Application of Containment Building DCGLs

It is clear by comparing the single nuclide DCGL values contained in Tables 6-11 and 6-12 that the containment building renovation/demolition scenario is the most conservative and that the single nuclide DCGL values contained in Table 6-12 should be applied to the containment building interior surfaces. However, a conservative approach will be imposed and the structural surface DCGLs derived in Section 6.6.3 will be applied to the reasonably accessible surfaces of the containment building. These surfaces will include the floor and wall surfaces up to the level of the polar crane rail. The containment building renovation/demolition single nuclide DCGLs will be applied above the polar crane rail and containment building dome surfaces in consideration of worker safety during remediation and FSS activities.

6.6.6 Buried Piping

Approximately 30,700 linear feet of buried pipe have been identified that is expected to remain at Rancho Seco after license termination. The buried pipe ranges from one inch I.D. to 108 inch I.D. and is associated with systems such as the nitrogen gas system (one inch I.D.) to the main circulating water system (108 inch I.D.). Buried piping that will remain following license termination is located at a soil depth of three or more feet. A majority of the buried piping that is associated with systems that contained known contamination has been excavated during decommissioning and piping systems remaining have a low potential for significant internal contamination.

Evaluation of the buried piping scenario utilized soil DCGL values derived in Section 6.6.2. Under the scenario, buried piping, contaminated on the interior surface, is assumed to disintegrate instantaneously upon license termination. The disintegrated media is assumed to be subsurface soil and the media volume is assumed to be equal to the piping volume with the contamination uniformly mixed in the soil volume. A gross DCGL value to apply to interior piping surface was derived using standard computational methods assuming the disintegrated media is contaminated to soil DCGL concentrations using average observed nuclide fractions for soil and piping surface contamination.

The calculations assumed an average radionuclide mixture of 0.17 for Co-60 and 0.83 for Cs-137 (95% C. L.). A conservative gross DCGL of 100,000 dpm/100 cm^2 on the interior surface of the buried pipe was found acceptable based upon these calculations. The details of this analysis were developed in Rancho Seco DTBD-05-013, "Buried Piping Scenario and DCGL Determination Basis," [Reference 6-25].

6.6.7 Embedded Piping

Approximately 5,360 linear feet of embedded pipe have been identified that will remain at Rancho Seco. The embedded pipe ranges from 0.75 inch I.D. to 18 inch I.D. and is associated with the Turbine Building, Auxiliary Building, Reactor Building, and Fuel Building drains. Embedded pipe is located at the drain entrance down to depths between 9 to 30 inches or more beneath the concrete surface, depending on the building.

The embedded piping scenario assumes that the piping remains in place following decommissioning and that the dose to the industrial worker is from direct gamma exposure from the residual activity in the pipe with allowance made for photon attenuation by the wall or floor thickness of concrete remaining over the pipe. Whole body dose from the embedded pipe will be considered additive along with the dose to the industrial worker resulting from residual activity on the walls or floors of the room or area in which the embedded pipe is present. The surface DCGL will be reduced by the dose contribution from the embedded piping in order to ensure compliance with the annual dose limit.

Embedded pipe is partially shielded and constrained by the encasing concrete that limits the dose to the industrial worker to that arising from the gamma emitters in the nuclide mixture. The impact of nuclides that are not gamma emitters is minimal because the pipe is not easily extracted nor is the interior surface readily accessible through the overlying concrete. A total of 53 samples were collected and analyzed by gamma spectroscopy from various drains, sumps, and trenches in the buildings previously mentioned. Twenty samples were selected that reflect the different piping systems covered by the 53 samples. In many instances, several samples were collected from one system. The radionuclide analyses indicated that the primary contributors to whole body dose are Cs-137 and Co-60. The Fuel Building pipe sample results indicate the presence of a small portion of non-gamma emitters in the nuclide fraction. The mean nuclide fractions for Cs-137 and Co-60, as determined by the 20 samples, were 0.802 and 0.161 respectively. The individual building mean fractions were within two standard deviations of the overall mean values indicating a consistent nuclide ratio. This compares well with the concrete nuclide fractions of 0.89 and 0.11 for Cs-137 and Co-60 respectively.

A conservative gross DCGL of 100,000 dpm/100 cm^2 on the interior surface of the embedded pipe was evaluated and found acceptable. MicroShield® runs were used to model the gamma exposure at one meter from the concrete surface resulting from 100,000 dpm/100 cm^2 (4.5E-4 $\mu Ci/cm^2$) in the maximum size pipe in a given building one meter from the surface of the concrete covering the embedded pipe. The amount of the concrete shielding included in the model was based on the thinnest concrete covering above the largest diameter embedded pipe for the given building as determined from site drawings. An occupancy factor of 2,000 hours per year was assumed to calculate the annual dose rate. Results are shown in Table 6-13 below. The annual dose rates are all less than 1 percent of the 25 mrem/y annual limit. The details of this analysis were developed in Rancho Seco DTBD-05-009, "Embedded Piping Scenario and DCGL Determination Basis," [Reference 6-26].

Table 6-13
Embedded Pipe Annual Dose Rate By Building

Building	Turbine	Fuel	Auxiliary	Reactor
Max Pipe Size (inches)	8	8	6	18
Concrete Depth (inches)	18	30	9	12
Annual Dose Rate (mrem/y)	0.01	0.0002	0.19	0.12

The potential for the removal of the embedded pipe and consequent dose to an industrial worker at some time in the future was examined even though this was not part of the industrial worker building occupancy scenario. The published source of dose factors that came the closest to a pipe cutting and removal scenario was NUREG-1640, Volume 1, "Radiological Assessments for Clearance of Materials from Nuclear Facilities," [Reference 6-27]. If the mean dose factors (NUREG-1640, Volume 1, Table 3.24) and scenario for converting pipe into scrap material as outlined in NUREG-1640 are employed using a DCGL of 100,000 dpm/100 cm^2 and the given nuclide fraction for embedded pipe, the annual dose rates are calculated to be 4.0 mrem/y for Cs-137 and 2.7 mrem/y for Co-60. The dose contribution from Cs-137 was principally from the release of contamination and subsequent inhalation by the worker while the dose from Co-60 was mostly the whole body dose from handling the contaminated pipe. In order to preclude the additional dose contribution from embedded pipe, RSNGS plans to grout piping which has residual contamination above the adjusted NRC screening levels (Table 5.19 of NUREG-5512, Volume 3) of 20,000 dpm/100 cm^2. This action level limits the dose rate to the reclamation worker to 0.55 mrem/y from Co-60 and 0.79 mrem/y from Cs-137.

6.7 Derivation of Area Factors

As stated in NUREG-1757, Volume 2, the $DCGL_W$ is the average concentration across an area that is calculated to result in the average member of the critical group receiving a dose at the appropriate dose limit. The general assumption is that the concentration of the radionuclides in the source is fairly homogenous. The degree to which any single localized area can be elevated above the average, assuming the average is at the $DCGL_W$, and not invalidate the homogenous assumption is characterized by the $DCGL_{EMC}$. One method for determining values for the $DCGL_{EMC}$ is to modify the $DCGL_W$ using a correction factor that accounts for the difference in area and the resulting change in dose. The area factor is then the magnitude by which the concentration within the small area of elevated activity can exceed $DCGL_W$ while maintaining compliance with the release criterion.

An area factor for use in elevated measurement comparison during final status surveys is defined by Equation 6-6.

$$Area\ Factor = \frac{DCGL_{EMC}}{DCGL_W}$$

Equation 6-6

where:

$DCGL_W$ = Baseline average DCGL value, and
$DCGL_{EMC}$ = Elevated measurement comparison DCGL value

NUREG-1505, "A Nonparametric Statistical Methodology for the Design and Analysis of Final Status Decommissioning Surveys," [Reference 6-28] provides the methodology for calculating area factors in Chapter 8. Chapter 8 states that the area factors should be calculated using dose pathway models and assumptions that are consistent with those used to calculate the $DCGL_W$. Area factors are computed by taking the ratio of the dose per unit concentration calculated by RESRAD or RESRAD-BUILD for the baseline area to that calculated for various smaller areas.

6.7.1 Area Factors for Rancho Seco Surface Soils

6.7.1.1 Radionuclides of Concern for Surface Soils

A site-specific suite of potential radionuclides for use at Rancho Seco was derived in Section 6.3. Of the suite of 26 potential radionuclides, only six radionuclides were positively identified. These were C-14, Co-60, Ni-63, Sr-90, Cs-134, and Cs-137. Single nuclide DCGL concentration values (each radionuclide DCGL concentration represents 25 millirem per year) were derived for a baseline default area of 10,000 m^2 in Section 6.6.2 for each of the six detected radionuclides. These single nuclide DCGL concentration values are provided in Table 6-14 below. Area factors are calculated in this section only for the six radionuclides for which Section 6.6.2 derived DCGLs.

Table 6-14

Single Nuclide DCGL Values for Detectable Radionuclides

Radionuclide	Peak of the Mean Dose (mrem/y per pCi/g)	DCGL (pCi/g)
C-14	2.93E-06	8.33E+06
Co-60	1.93E+00	1.26E+01
Ni-63	1.60E-06	1.52E+07
Sr-90	3.76E-03	6.49E+03
Cs-134	1.09E+00	2.24E+01
Cs-137	4.62E-01	5.28E+01

6.7.1.2 Mathematical Hydrogeological Model

The mathematical hydrogeological model developed in Section 6.6.2.1 was used to calculate area factors for surface soils.

6.7.1.3 Calculation of Dose to Source Ratios for Surface Soil Area Factors

Dose to source ratios (DSRs) for the detectable radionuclides of concern were calculated by performing individual RESRAD probabilistic calculations for each of the six detectable radionuclides for each of nine specified contaminated area sizes. The site-specific RESRAD v6.22 dose model was first configured with the simplified mathematical model parameters contained in Appendix 6-S then with the statistical parameter distributions provided in Appendix 6-T. Sensitive parameters identified in Section 6.6.2.3 (density of the contaminated zone, contaminated zone K_d value for Cs-137 and external gamma shielding factor) were treated deterministically using the sensitive parameter values listed in Appendix 6-S. Parameters that were not sensitive were treated stochastically using the statistical parameter distributions contained in Appendix 6-T. RESRAD was then run in the probabilistic mode for each detected radionuclide and for each of the nine specified contaminated area sizes. A new value for the parameter "length of contaminated zone parallel to the aquifer flow" was used each time the contaminated area size was changed. The uncertainty analysis input settings for these calculations were:

- Latin Hypercube sampling,
- Random seed – 1000,
- Number of observations – 300,
- Number of repetitions – 1, and
- Grouping of observations – correlated or uncorrelated.

These calculations provided the peak of the mean DSR in mrem/year per pCi/g for each detected radionuclide. These DSRs are listed in Table 6-15.

Table 6-15

Calculated Peak-of-the-Mean DSR Values

Contaminated Area (m^2)	Radionuclide DSR (millirem/year per pCi/gram)					
	C-14	Co-60	Ni-63	Sr-90	Cs-134	Cs-137
10,000	2.92E-06	1.93E+00	1.60E-06	3.76E-03	1.09E+00	4.62E-01
3,000	1.76E-06	1.89E+00	1.60E-06	3.69E-03	1.07E+00	4.53E-01
1,000	1.16E-06	1.85E+00	1.60E-06	3.62E-03	1.05E+00	4.44E-01
300	6.08E-07	1.72E+00	4.90E-07	3.13E-03	9.77E-01	4.15E-01
100	3.63E-07	1.56E+00	1.72E-07	2.77E-03	8.86E-01	3.76E-01
30	2.15E-07	1.19E+00	5.94E-08	2.12E-03	6.88E-01	2.92E-01
10	1.34E-07	8.09E-01	2.64E-08	1.44E-03	4.71E-01	2.00E-01
3	7.04E-08	3.82E-01	1.40E-08	6.82E-04	2.23E-01	9.48E-02
1	3.84E-08	1.63E-01	9.78E-09	2.94E-04	9.65E-02	4.09E-02

6.7.1.4 Calculation of Surface Soil Area Factors

The DSRs calculated in Section 6.7.1.3 were then used to calculate area factors in accordance with Equation 6-7.

$$AF_i = \frac{DSR_{10,000\,m^2}}{DSR_i}$$

Equation 6-7

where:

AF_i = Area Factor at EMC area i

$DSR_{10,000\,m^2}$ = DSR at the baseline area of 10,000 m^2

DSR_i = DSR for EMC area i

The results of these calculations are listed in Table 6-16, shown graphically in Figure 6-11 for gamma emitters and shown graphically in Figure 6-12 for beta emitters.

Table 6-16

Calculated Surface Soil Area Factors

Contaminated Area (m^2)	Radionuclide Area Factor (unitless)					
	C-14	Co-60	Ni-63	Sr-90	Cs-134	Cs-137
10,000	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
3,000	1.66E+00	1.02E+00	1.00E+00	1.02E+00	1.02E+00	1.02E+00
1,000	2.52E+00	1.04E+00	1.00E+00	1.04E+00	1.04E+00	1.04E+00
300	4.80E+00	1.12E+00	3.27E+00	1.20E+00	1.12E+00	1.11E+00
100	8.04E+00	1.24E+00	9.30E+00	1.36E+00	1.23E+00	1.23E+00
30	1.36E+01	1.62E+00	2.69E+01	1.77E+00	1.58E+00	1.58E+00
10	2.18E+01	2.39E+00	6.06E+01	2.61E+00	2.31E+00	2.31E+00
3	4.15E+01	5.05E+00	1.14E+02	5.51E+00	4.89E+00	4.87E+00
1	7.60E+01	1.18E+01	1.64E+02	1.28E+01	1.13E+01	1.13E+01

6.7.2 Area Factors for Rancho Seco Structural Surfaces

6.7.2.1 Radionuclides of Concern for Structural Surfaces

Section 6.3 identified a site-specific suite of 26 radionuclides as potentially present at Rancho Seco. Offsite laboratory analysis of characterization samples representing structural surfaces taken to date have not identified five of these radionuclides as being present above analytical minimum detectable activity (MDA) levels. In addition, three more radionuclides were identified to have activity levels above MDA in only one characterization sample and with questionable results, indicating that these might be false positive results. Therefore, a total of eight radionuclides were discounted from further area factor evaluation. These eight radionuclides include Na-22, Sb-125, Eu-152, Eu-154, Eu-155, Np-237, Pu-242 and Cm-244. Additional radionuclides were removed from consideration based on their dose factor or nuclide fraction. The remaining radionuclides considered for structural surface area factors include:

Co-60 Sr-90 Cs-134 Cs-137

6.7.2.2 Calculation of Dose to Source Ratios for Structural Surface Area Factors

Single nuclide DCGL values for Rancho Seco structural surfaces were developed in Section 6.6.3 using the probabilistic features of RESRAD-BUILD v3.22. These calculations were based on an industrial worker building occupancy scenario introduced in NUREG/CR-6755. Section 6.6.3.1 identified sensitive parameters for RESRAD-BUILD v3.22 and established the dose model for derivation of DCGLs for structural surfaces. The dose model included five contaminated surfaces; four walls and a floor. The room dimensions were determined probabilistically and given conservative deterministic values. Since area factors apply only to one contiguous surface, the floor was selected from which to derive area factors because it was the largest single surface area (137 m^2). The room dimensions and remaining deterministic and stochastic parameters were left as they were derived in Section 6.6.3.1. The RESRAD-BUILD v3.22 parameters used to develop area factors are provided in Appendix 6-U and the statistical parameter distributions for the parameters treated stochastically are provided in Appendix 6-V.

Area factors were calculated in increments ranging from the 137 m^2 floor area down to 0.5 m^2. Complete sets of area factors were calculated only for the principle gamma emitting radionuclides of Co-60, Cs-134 and Cs-137. Area factors for Sr-90 was calculated only for the 0.5 m^2 area to demonstrate that the area factors are conservatively bounded by the area factors calculated for the principle gamma emitting radionuclides.

Dose to source ratios in units of millirem/year per dpm/100 cm^2 were calculated first using RESRAD-BUILD v3.22 in the probabilistic mode to identify the "Statistics for Dose" for Time 1 to obtain the calculated DSR. For each calculation, the Latin Hypercube sampling technique was used with a random seed of 1000, 300 observations and one repetition. The DCFs selected (in units of mrem/yr per 100 dpm/100 cm^2) are the average total dose values for the receptor and are provided in Table 6-17.

Table 6-17

Calculated Mean DSR Values for Structural Surface Area Factors

Contaminated Area (m^2)	**Radionuclide DSR (millirem/year per dpm/100 cm^2)**			
	Co-60	**Sr-90**	**Cs-134**	**Cs-137**
137	1.19E-03	8.92E-05	8.07E-04	3.09E-04
68	9.75E-04	—	6.51E-04	2.45E-04
36	7.87E-04	—	5.21E-04	1.94E-04
25	6.83E-04	—	4.52E-04	1.67E-04
16	5.63E-04	—	3.71E-04	1.37E-04
9	4.21E-04	—	2.77E-04	1.02E-04
4	2.56E-04	—	1.68E-04	6.16E-05
1	8.60E-05	—	5.64E-05	2.07E-05
0.5	4.60E-05	4.26E-07	3.01E-05	1.10E-05

6.7.2.3 Calculation of Structural Surface Area Factors

The DSRs calculated in Section 6.7.2.2 were then used to calculate structural surface area factors in accordance with Equation 6-8.

$$AF_i = \frac{DSR_{137\,m^2}}{DSR_i}$$

Equation 6-8

where:

AF_i = Area Factor at EMC area *i*

$DSR_{137\,m^2}$ = DSR at the floor area of 137 m^2

DSR_i = DSR for EMC area *i*

The results of these calculations are listed in Table 6-18 and shown graphically in Figure 6-13.

Table 6-18

Calculated Surface Area Factor Values

Contaminated Area (m^2)	Radionuclide Area Factor			
	Co-60	Sr-90	Cs-134	Cs-137
137	1.00E+00	1.00E+00	1.00E+00	1.00E+00
68	1.22E+00	—	1.24E+00	1.26E+00
36	1.51E+00	—	1.55E+00	1.59E+00
25	1.74E+00	—	1.79E+00	1.85E+00
16	2.11E+00	—	2.18E+00	2.26E+00
9	2.83E+00	—	2.91E+00	3.03E+00
4	4.65E+00	—	4.80E+00	5.02E+00
1	1.38E+01	—	1.43E+01	1.49E+01
0.5	2.59E+01	2.09E+02	2.68E+01	2.81E+01

6.8 Comparison of Alternative Exposure Scenarios for Impacted Area Soils

Single nuclide DCGL values for impacted area soils were calculated in Section 6.6.2.5 for radionuclides detected in surface soils using an industrial worker scenario. Although the industrial worker scenario is considered the most likely scenario for the Rancho Seco site and is the scenario for this License Termination Plan submittal, the dose impact from using a resident farmer scenario at specified times following license termination (partial site release) and the dose impact of maintaining an industrial area but allowing cattle grazing within impacted areas outside the industrial area and consumption of meat from the grazing cattle by an offsite member of the public has been evaluated.

6.8.1 Radionuclides of Concern and Concentrations for Alternative Scenario Dose Calculations

A site-specific suite of potential radionuclides for use at Rancho Seco was derived in Section 6.3. This suite of potential radionuclides contained a total of 26 radionuclides. On May 28, 2004 Rancho Seco submitted a spent fuel pool cooler pad soil sample collected on March 8, 2004 to General Engineering Laboratories (GEL) for analysis of the entire suite of potentially present 26 radionuclides. This sample was known by onsite gamma spectroscopy to have the highest level of contamination of any soil samples collected during the site characterization process. Of the suite of 26 potential radionuclides, GEL positively identified only six radionuclides. These were C-14, Co-60, Ni-63, Sr-90, Cs-134, and Cs-137. Single nuclide DCGL concentration values were Section 6.6.2.5 for each of the six radionuclides detected by GEL. These single nuclide DCGL concentration values are provided in Table 6-5. The GEL measured activity concentrations; decayed from the date of analysis to July 1, 2008 to represent the radionuclide mixture at the approximate completion of final status surveys were provided in Table 6-2. The unity rule was applied to a mixture of the detected radionuclides in Section 6.6.2.6.1 using the single nuclide DCGL concentration values of Table 6-5 to derive a radionuclide mixture that will result in an annual dose to the industrial worker under the industrial worker scenario of 25 millirem. The concentration values for this mixture were provided in Table 6-6.

6.8.2 Resident Farmer Alternative Exposure Scenario

6.8.2.1 Sensitivity Analysis of Detectable Radionuclides for the Resident Farmer Scenario

A sensitivity analysis was performed first to identify the parameters that are sensitive in the resident farmer scenario for the detectable radionuclides following the same methodology as that used in Section 6.6.2.3. The parameters selected for sensitivity analysis and their selection justification are provided in Appendix 6-W and the statistical parameter distributions used are provided in Appendix 6-X.

Once the parameter values listed in Appendix 6-W and the statistical parameter distributions listed in Appendix 6-X were loaded into RESRAD v6.22, the code was run in the uncorrelated parameter probabilistic mode for the radionuclides and concentrations provided in Table 6-6 to identify the sensitive parameters. This approach identified the sensitive parameters for the entire mixture using the resident farmer scenario, not just individual radionuclide parameter sensitivity. The uncertainty analysis input settings for this calculation were:

- Latin Hypercube sampling,
- Random seed – 1000,
- Number of observations – 300,
- Number of repetitions – 1, and
- Grouping of observations – correlated or uncorrelated.

The absolute value of the calculated partial ranked correlation coefficient (PRCC) of the peak of the mean dose was then used to classify the parameters with statistical distributions as sensitive or non-sensitive. The calculated PRCC values for both sensitive and non-sensitive parameters are listed in Appendix 6-X. If the absolute value of the PRCC was greater than 0.25, then the parameter was classified as sensitive. If the absolute value of the PRCC was equal to or less than 0.25, then the parameter was classified as non-sensitive. The sensitive parameters for each radionuclide and the sensitive parameter PRCC values are listed in Appendix 6-X.

Finally, values for use in dose modeling for the physical parameters with sensitive parameters were selected based on sensitivity of the calculated PRCC following the guidance of NUREG/CR-6676. If the absolute value of the PRCC was greater than 0.25, then the parameter value at either the 75% quartile or the 25% quartile was selected based on TEDE correlation with the parameter. If the PRCC value of the peak of the mean dose was negative, the parameter to dose correlation is negative and the parameter value at the 25% quartile was selected. If the PRCC value was positive, the parameter to dose correlation is positive and the parameter value at the 75% quartile was selected.

The sensitive parameters identified under the resident farmer scenario for detected radionuclides, in decreasing order of importance, include:

1. External gamma shielding factor,
2. Plant transfer factor for Cs,
3. Depth of roots,

4. Density of contaminated zone, and
5. Meat transfer factor for Cs.

6.8.2.2 Calculated Dose from Detected Radionuclides for a Resident Farmer Scenario

Once the sensitive parameters were identified for the resident farmer scenario, the parameter sensitivity model was revised by replacing the sensitive parameter statistical distributions with the deterministically assigned sensitive parameter values and running the model to calculate dose under the resident farmer scenario for industrial worker scenario maximum allowable radionuclide soil concentrations from Table 6-6. The dose factor library used for this calculation was the "RSNGS RF DCGL Dose" library containing the sensitive parameter values for plant, meat and milk transfer factors. The dose calculation times specified were 0, 1, 3, 25, 50, 75, 100, 300, 500 and 1000 years. This calculation assumes uniform contamination over the entire impacted area of the site and assumes that there has been no ALARA reduction from soil contamination limits. The calculated mean dose for the detected radionuclides at the specified times since license termination is provided in Table 6-19.

6.8.2.3 Calculated Dose from Discounted Radionuclides for a Resident Farmer Scenario

6.8.2.3.1 Discounted Radionuclides

As discussed in Section 6.6.2.2, only six of the potential radionuclides derived in Section 6.3 are considered to be radionuclides of concern for impacted area surface soil. This leaves 20 discounted radionuclides to be evaluated for potential dose using the resident farmer scenario. The potential dose is based on the minimum detectable activity (MDA) value for each radionuclide decayed to a FSS date of July 1, 2008 as discussed in Section 6.6.2.4. The decay corrected MDA concentrations were provided in Table 6-4.

6.8.2.3.2 Identification of Discounted Radionuclide Sensitive Parameters

In order to calculate potential dose from discounted radionuclides, the discounted radionuclides were first evaluated to identify sensitive RESRAD parameters to be treated deterministically in the dose calculation. The site-specific mathematical model developed in Section 6.6.2.1 was used with uncorrelated parameter distributions to perform the sensitivity analysis. The RESRAD v6.22 parameters used for the analysis are provided in Appendix 6-Y and the probabilistic parameter distributions and sensitivity analysis results are provided in Appendix 6-Z. The sensitivity analyses PRCC value results and the deterministic parameter selected for sensitive parameters are also included in Appendix 6-Z.

The sensitive parameters identified under the resident farmer scenario for discounted radionuclides in decreasing order of importance, include:

1. Depth of roots,
2. Plant transfer factor for Np,
3. Plant transfer factor for Tc,
4. Plant transfer factor for Pu,
5. External gamma shielding factor,
6. K_d of Tc-99 in contaminated zone

7. Fruit, vegetable and grain consumption rate,
8. Density of contaminated zone,
9. K_d of Np-227 in the contaminated zone,
10. Contaminated zone erosion rate,
11. Depth of soil mixing layer,
12. Density of unsaturated zone 1,
13. K_d of Pa-231 in unsaturated zone 3,
14. K_d of Th-229 in unsaturated zone 1,
15. K_d of Th-228 in the contaminated zone,
16. Plant transfer factor for Am,
17. K_d of Th-232 in the saturated zone, and
18. K_d of H-3 in unsaturated zone 1.

6.8.2.3.3 Calculation of Potential Dose from Discounted Radionuclides

Potential dose from discounted radionuclides was calculated using RESRAD v6.22 in the probabilistic mode using the decayed radionuclide concentrations provided in Table 6-4 and selecting the mean dose at specified times following license termination. The site-specific mathematical model developed in Section 6.6.2.1 was used with uncorrelated parameter distributions to perform the dose calculations. The RESRAD v6.22 parameters used were taken from Appendix 6-Y and the probabilistic parameter distributions and sensitive parameter value assignments were taken from Appendix 6-Z. Sensitive physical parameters were treated deterministically and non-sensitive physical parameters were treated stochastically. The dose factor library used for this calculation was the "RSNGS RF Dis Nuclide Dose" library containing the sensitive parameter values for plant transfer factors. The dose calculation times specified were 0, 1, 3, 25, 50, 75, 100, 300, 500 and 1000 years. The potential probabilistic mean dose at the specified calculated times from discounted radionuclides is provided in Table 6-19. A plot of the total dose (detected plus discounted radionuclides) versus years following license termination for the first 100 years following license termination is shown in Figure 6-14.

6.8.2.4 Calculated Total Dose for a Resident Farmer Scenario

As shown on Table 6-19 and Figure 6-14, the calculated total dose for a resident farmer scenario exceeds 25 mrem/y for approximately 30 years following license termination. However, it is highly unlikely that the District would consider public transfer of all or any portion of the impacted area of the site immediately or within 30 years upon completion of the FSS (partial site release) targeted as July 1, 2008 for the reasons given as justification for an industrial worker scenario in Section 6.4.2. Class B and C radioactive waste will be stored onsite in the Interim Onsite Storage Building (IOSB) under the existing 10 CFR Part 50 license for an indefinite period of time awaiting permanent disposal. Also, the Independent Spent Fuel Storage Installation (ISFSI) will be used to store spent fuel and greater than Class C radioactive waste under a 10 CFR Part 72 license for an indefinite period of time until transfer to the Department of Energy for permanent disposal. Furthermore, a new 500 MWe natural gas fueled cogeneration facility has been constructed on a non-impacted portion of the 2,480-acre site and began commercial operation in February 2006. Thirty years following completion of the partial site release is considered to be a reasonable time period during which the District would not consider public transfer of all or any portion of the impacted area of the site. Therefore, calculated dose for the resident farmer scenario for the one-year period starting July 1, 2038 is comparable to the calculated dose from the industrial worker scenario.

Table 6-19

Calculated Dose Using a Resident Farmer Scenario

Years Following License Termination	Detected Nuclide Dose (mrem/y)	Discounted Nuclide Potential Dose (mrem/y)	Total Dose (mrem/y)
0	7.76E+01	2.45E+00	8.01E+01
1	7.34E+01	2.33E+00	7.58E+01
25	2.90E+01	1.36E+00	3.04E+01
50	1.07E+01	9.50E-01	11.6E+01
75	4.45E+00	6.67E-01	5.12E+00
100	1.96E+00	4.59E-01	2.42E+00
300	9.00E-03	6.00E-03	1.50E-02
500	0.00E-03	4.00E-03	4.00E-03
1000	0.00E-03	3.00E-03	3.00E-03

6.8.3 Cattle Grazing Alternative Exposure Scenario

Portions of the non-impacted area of the 2,480-acre site are open range areas that are leased to local ranchers for cattle grazing. Typically, the open range areas produce an abundance of native grass during the winter and spring rainy season. After the rainy season is over the grass quits growing, dries out and becomes dormant. Portions of the impacted area of the site are also open range areas (e.g., the south storm drain outfall area and the liquid effluent pathway area). Historically, cattle grazing has occurred in the south storm drain outfall area; however, there are no provisions or expectations to preclude cattle grazing in any of the impacted range areas in the future. Therefore, the dose impact of maintaining an industrial worker scenario but allowing cattle grazing within impacted range areas outside the Industrial Area and consumption of meat from the grazing cattle by an offsite member of the public was evaluated.

Although characterization soil samples have shown this not to be the case, a basic assumption was made that all impacted open range areas are contaminated to the industrial worker scenario maximum allowable radionuclide soil concentrations from Table 6-6, similar to the assumption made in Section 6.8.1 to calculate dose from detected radionuclides under a resident farmer scenario.

To perform this evaluation, the calculation described in Section 6.8.2.2 was modified to create a cattle grazing scenario. These modifications included:

- Suppression of all pathways except meat ingestion,
- Turning off irrigation because the open range areas are not irrigated,
- Setting the "livestock water intake for meat" parameter to "0" because livestock drinking water is not provided from Rancho Seco wells, and

- Setting the "fraction of grain in beef cattle feed" parameter to "0" because no grain for cattle feed is grown on the Rancho Seco site.

With the above modifications, the calculated dose represented the maximum potential dose that a member of the public, whether residing onsite or offsite, could receive from consuming meat from cattle grazing on impacted open range areas that are uniformly contaminated to the industrial worker scenario maximum allowable radionuclide soil concentrations. The calculation showed that the maximum potential peak of the mean dose is 5.13 mrem/year.

Although a maximum potential peak of the mean dose of 5.13 mrem/year has been calculated for the cattle grazing alternative exposure scenario, this dose does not need to be accounted for in the industrial worker scenario dose limit because the offsite member of the public is distinctly different from the industrial worker and the two different scenarios do not impact each other.

Figure 6-1
Rancho Seco Reservoir and Recreation Area

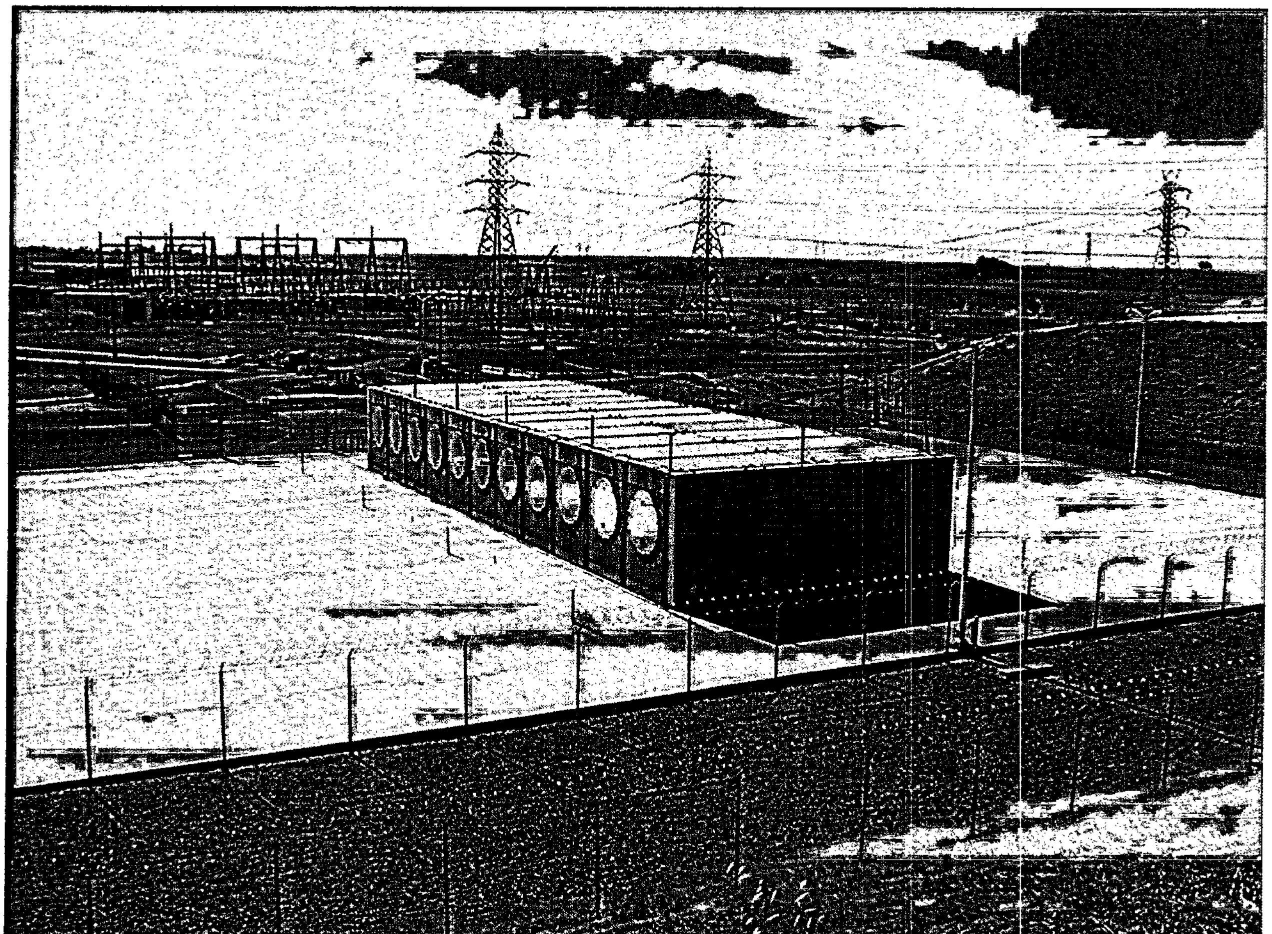

Figure 6-2
Rancho Seco Switchyard and ISFSI

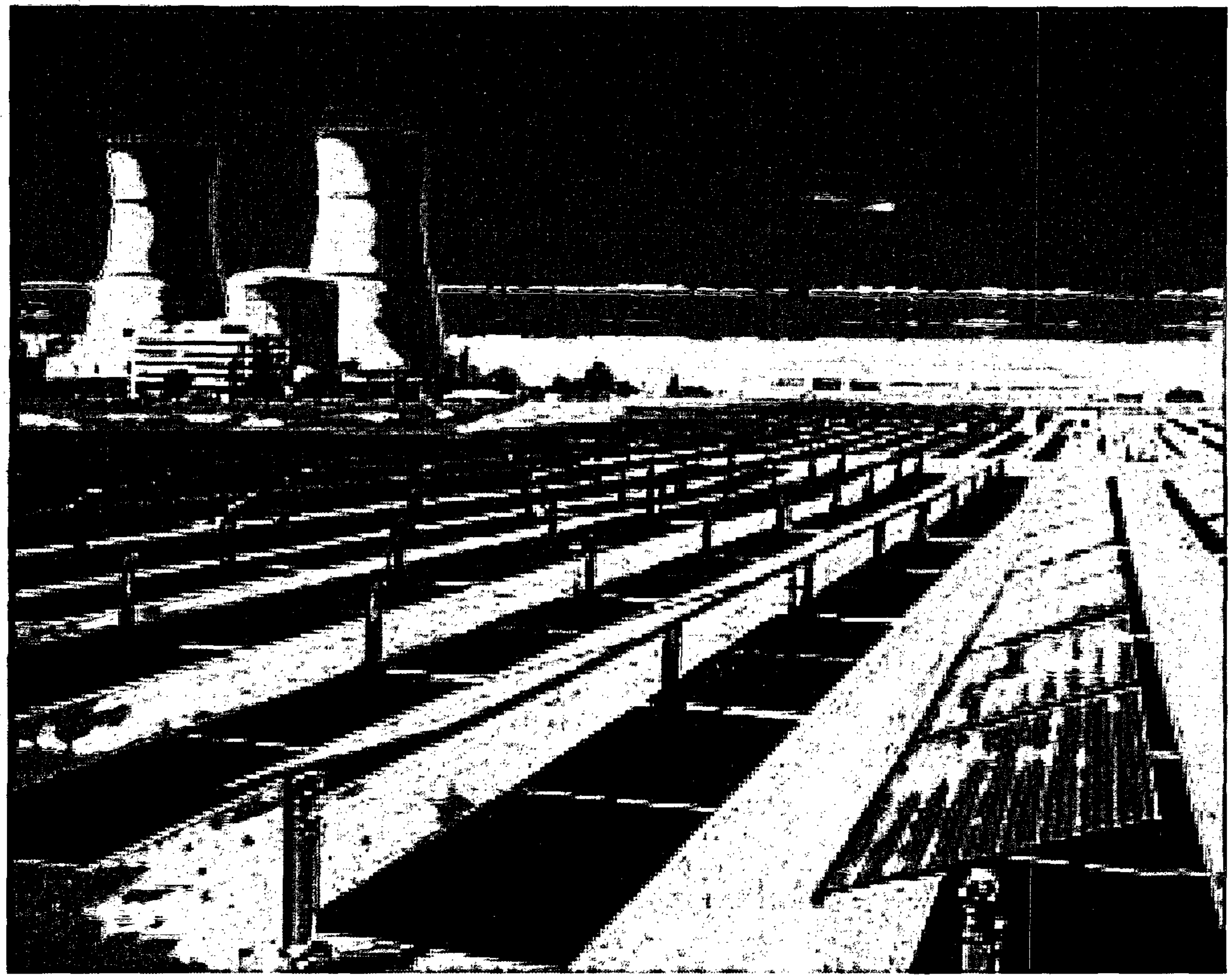

Figure 6-3
Rancho Seco Photovoltaic Generating Facility

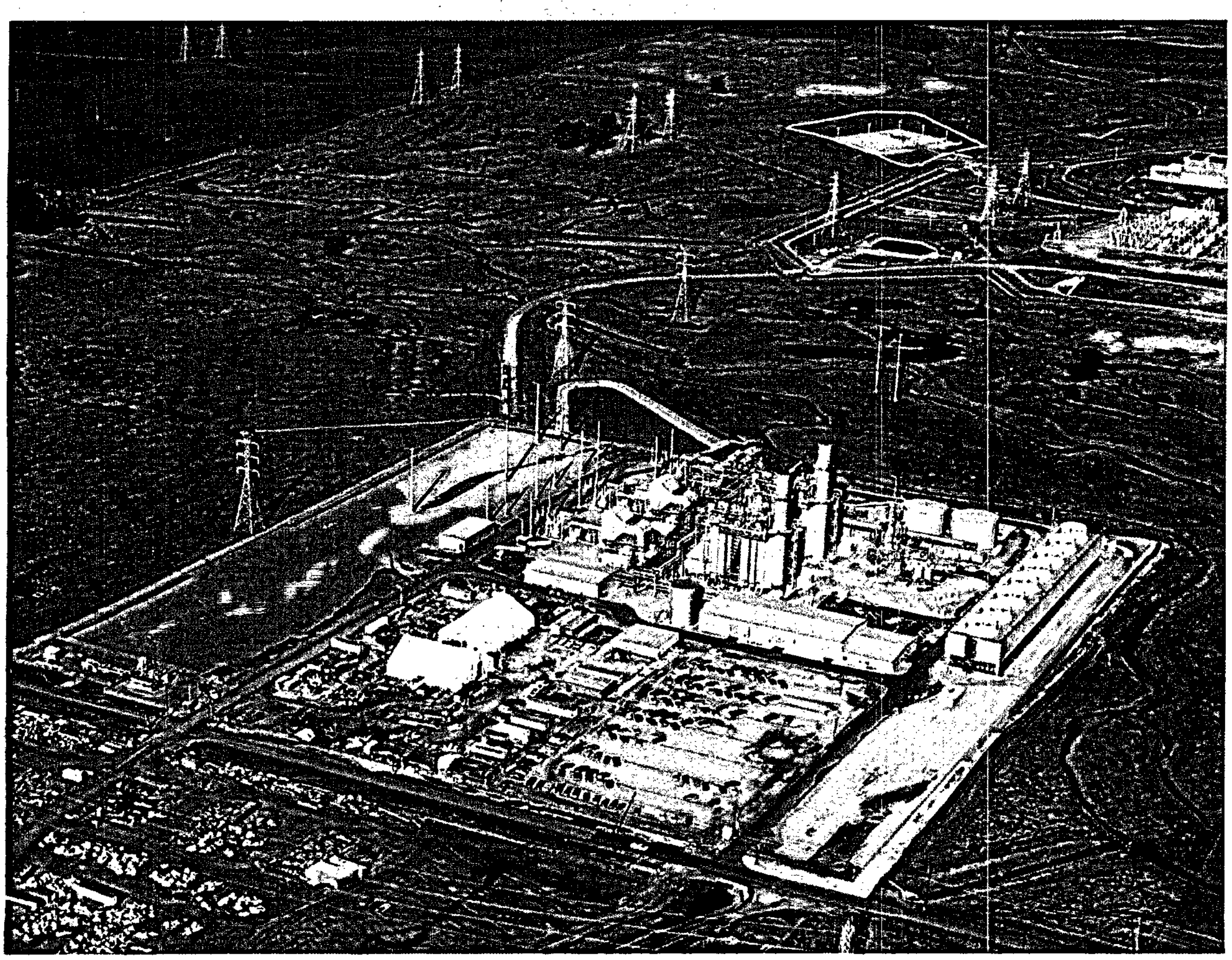

Figure 6-4
Aerial Photograph of the Combined Cycle Cosumnes Power Plant

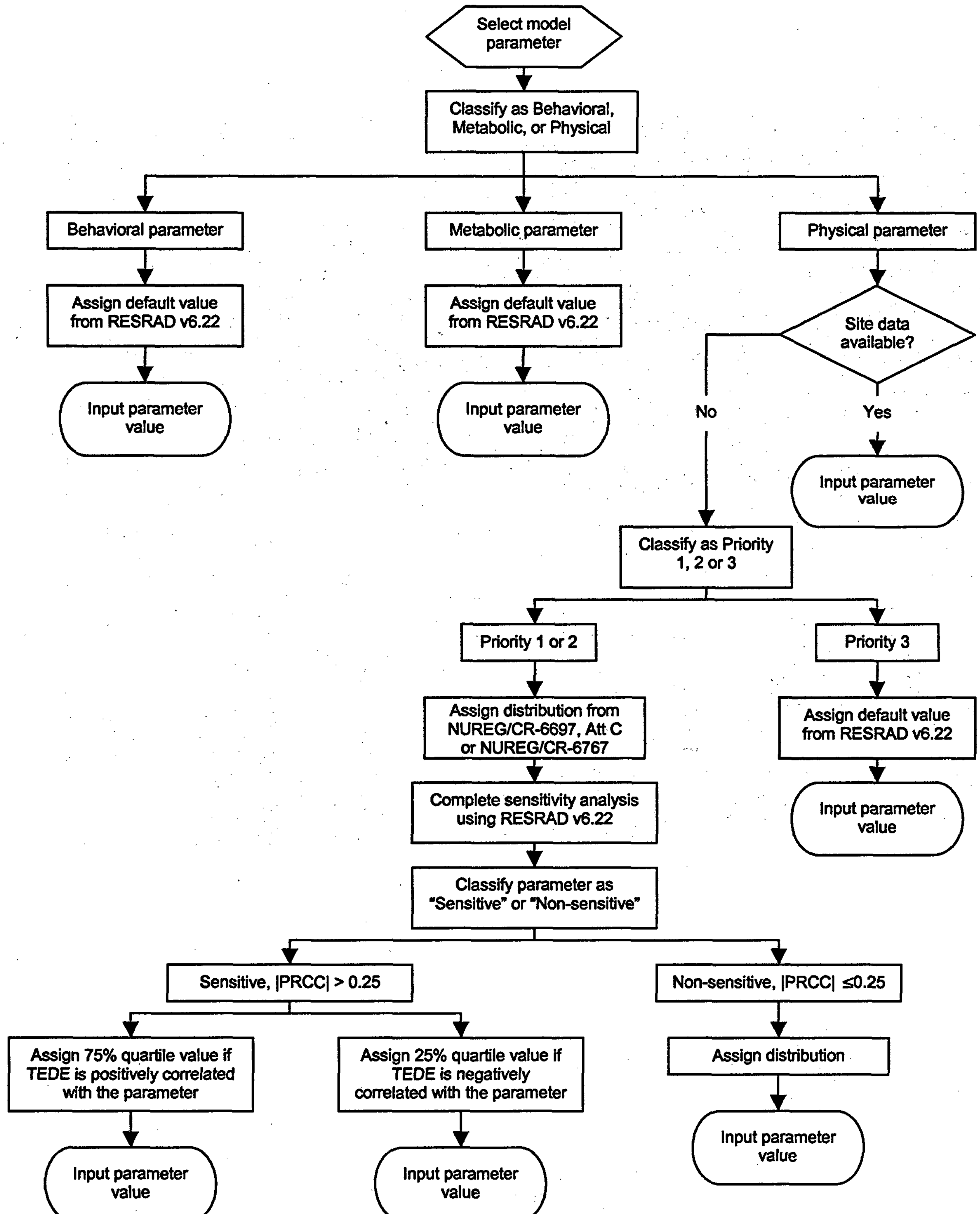

Figure 6-5
RESRAD Parameter Selection Process

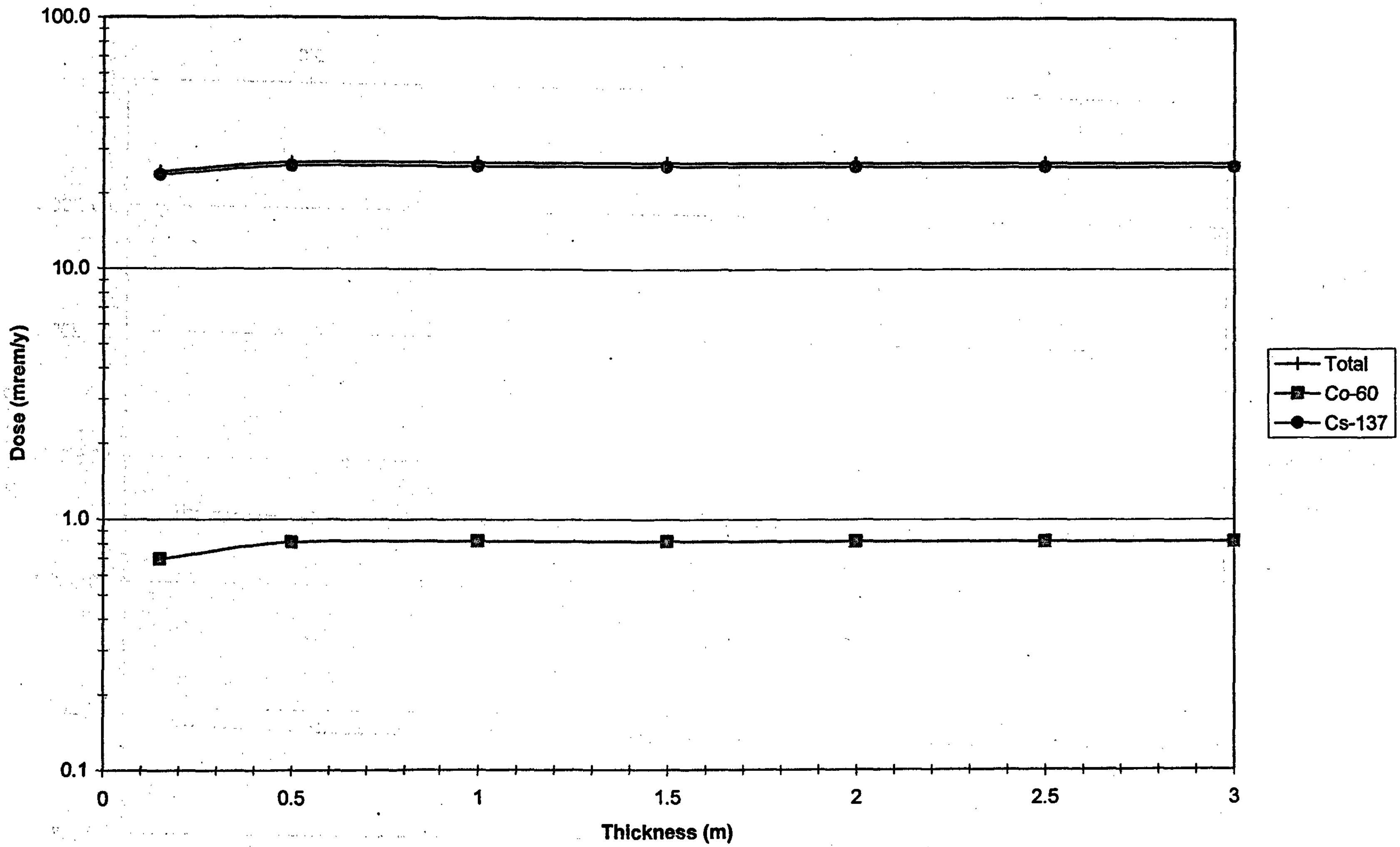

Figure 6-6
Peak of the Mean Dose vs Contaminated Layer Thickness for Principal Dose Contributors

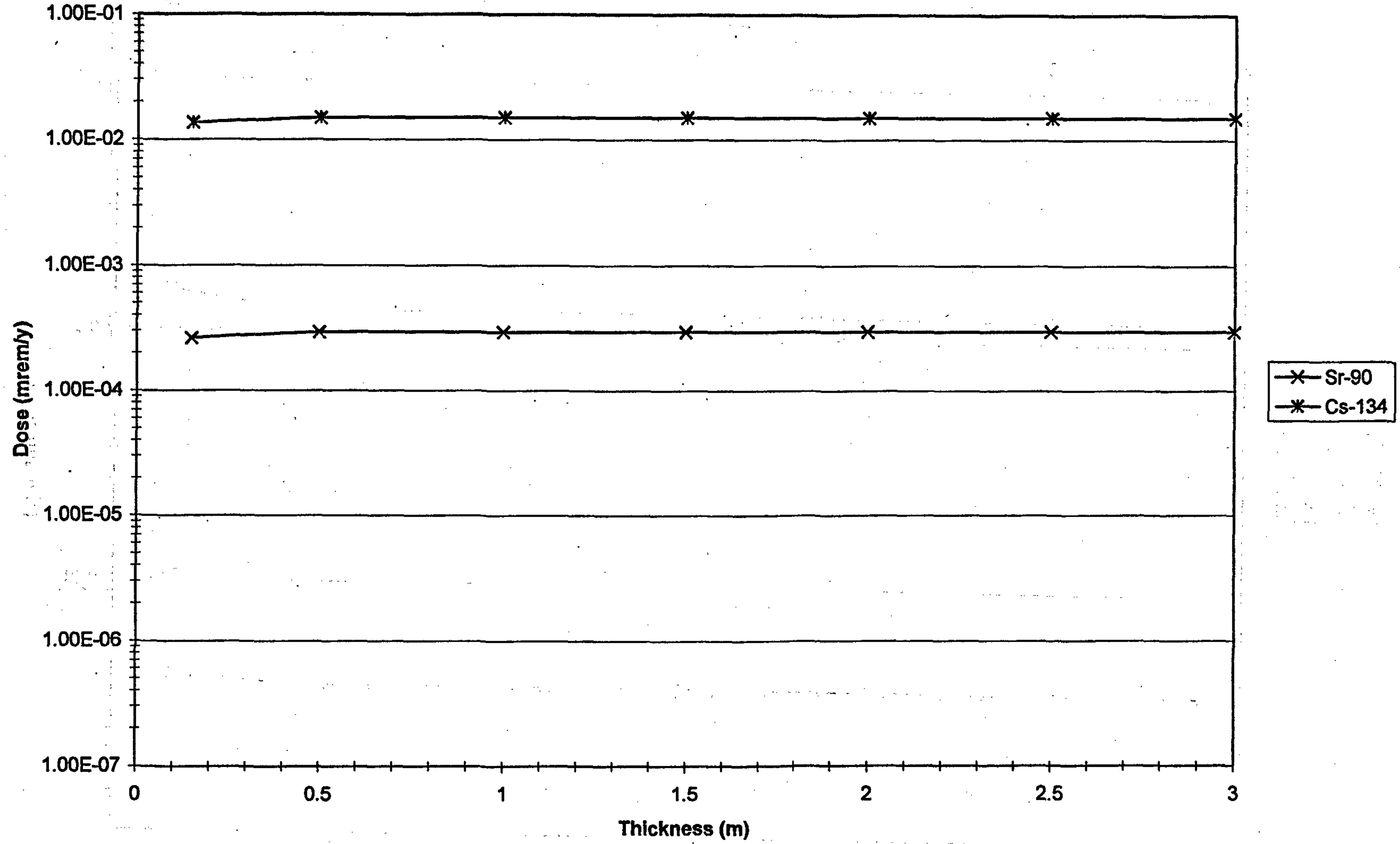

Figure 6-7
Peak of the Mean Dose vs Contaminated Layer Thickness for Minor Dose Contributors

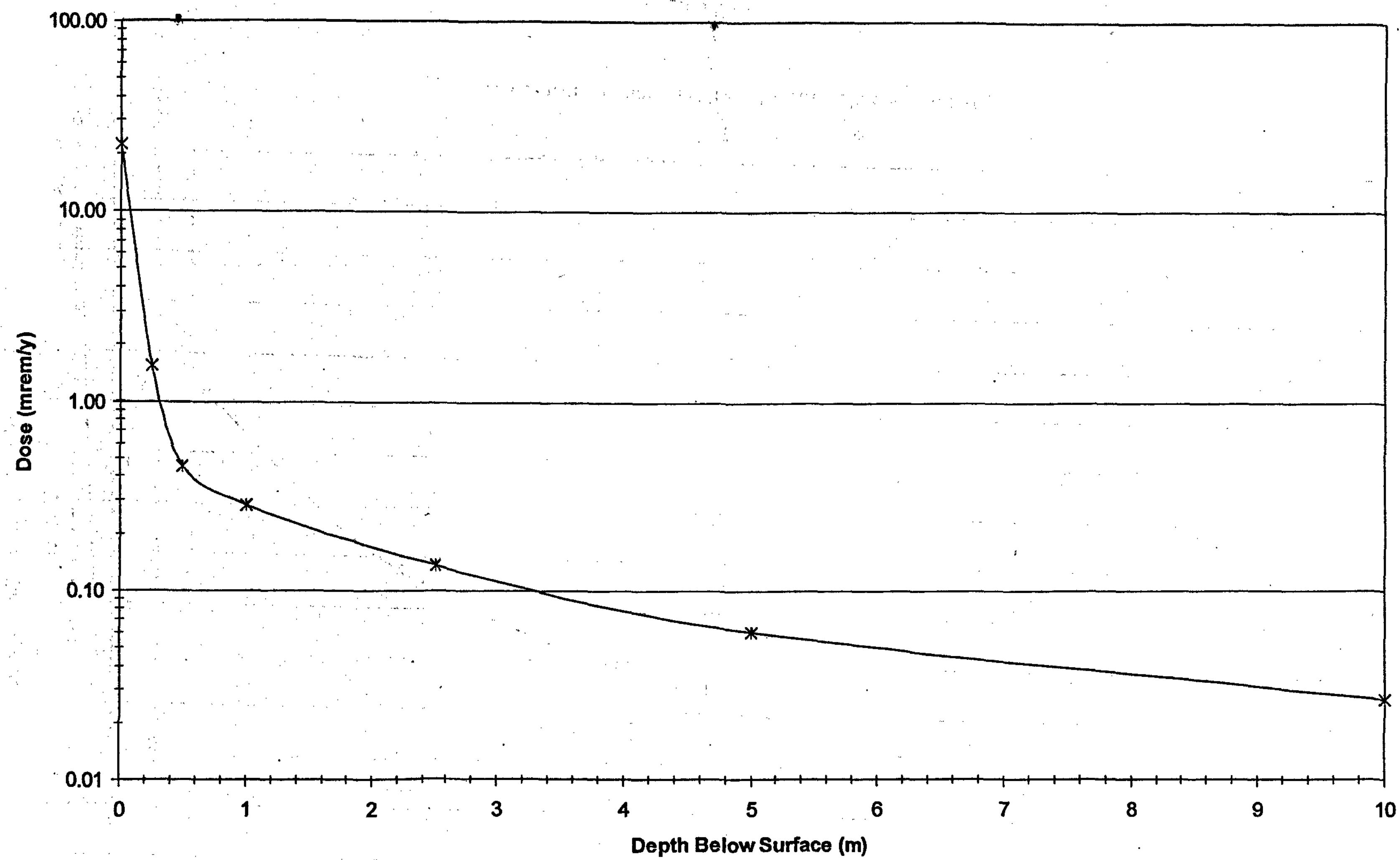

Figure 6-8
Peak of the Peak of the Mean Dose vs Discrete Contamination Pocket Depth

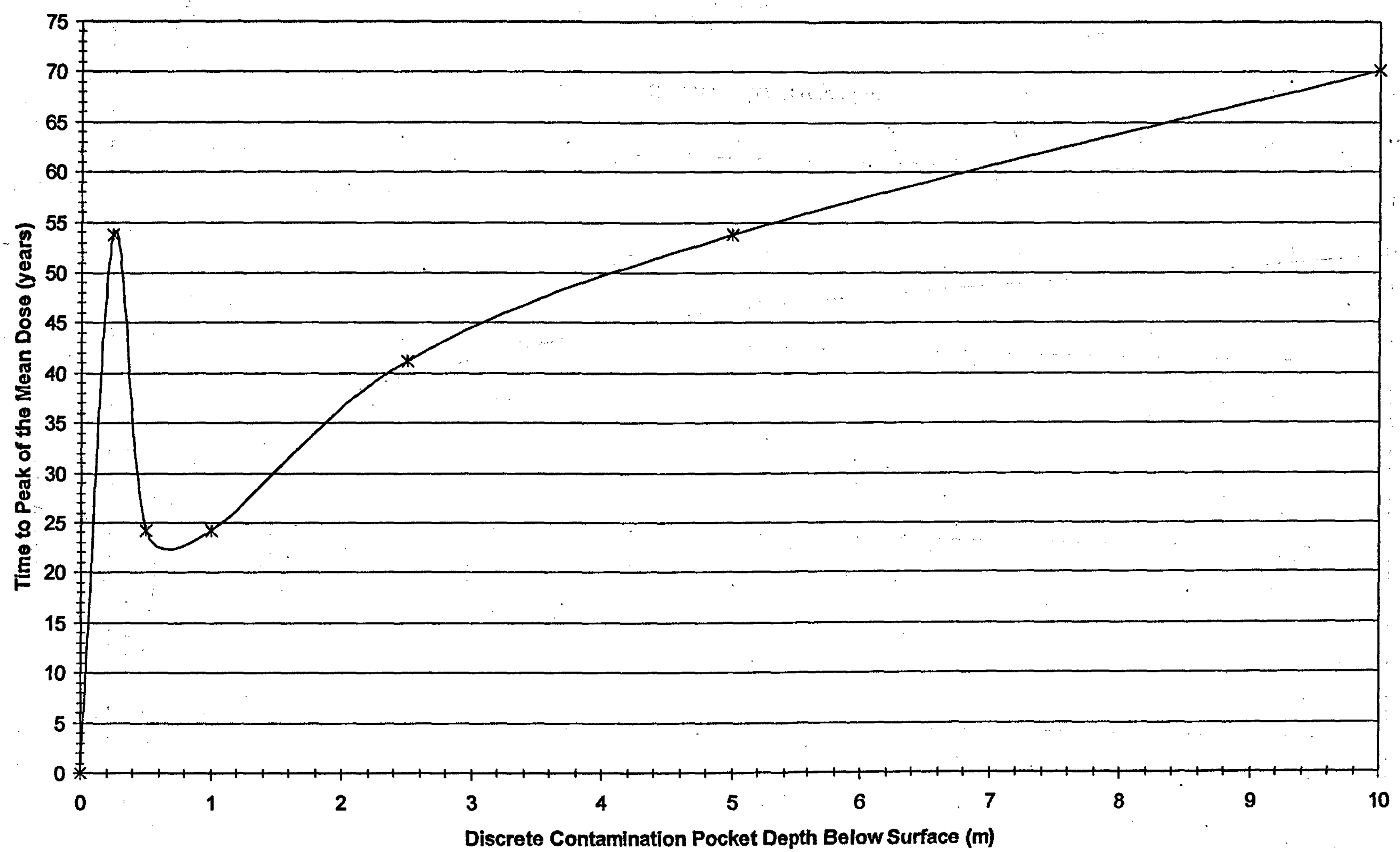

Figure 6-9
Time of the Peak of the Mean Dose vs Discrete Contamination Pocket Depth

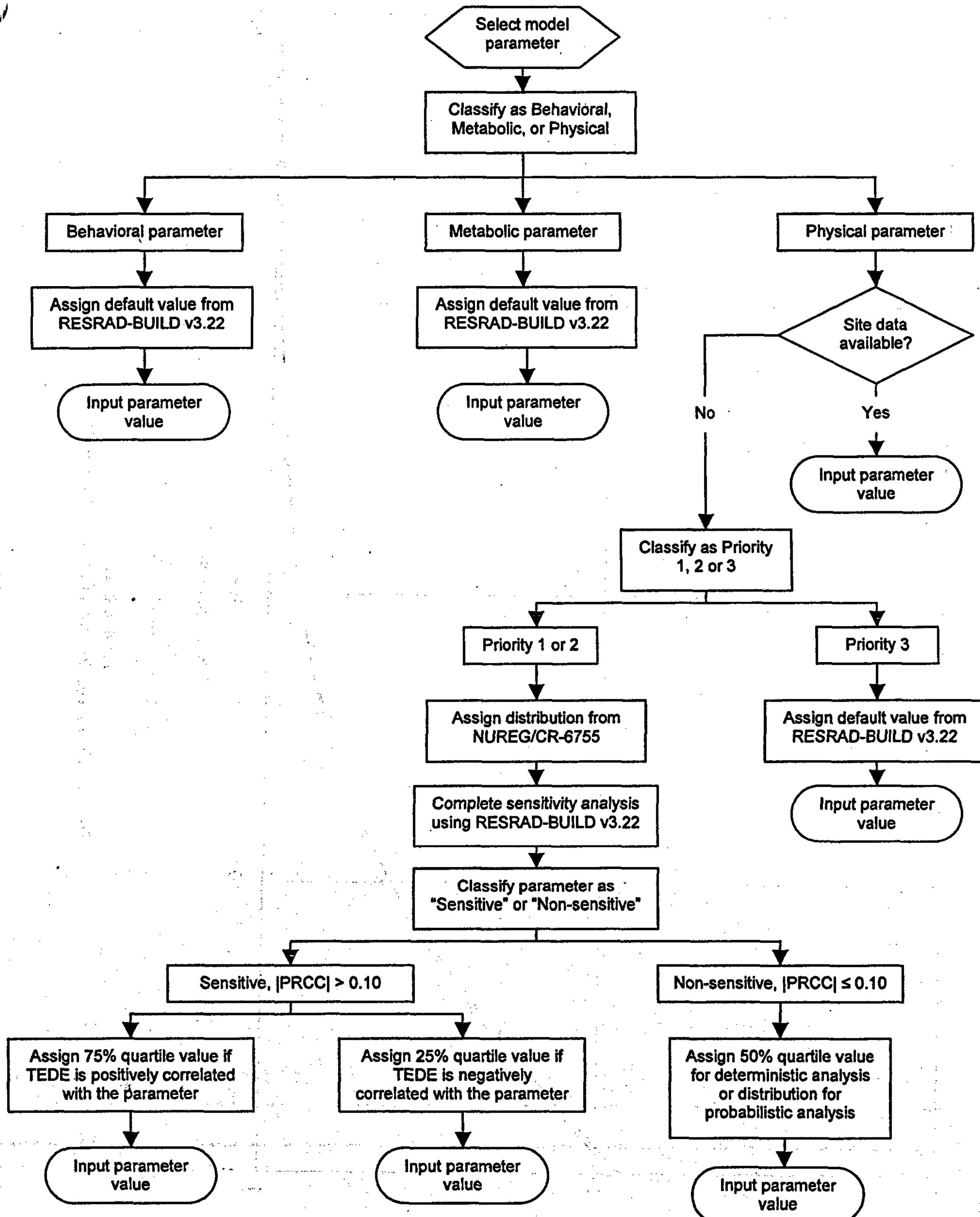

Figure 6-10
RESRAD-BUILD Parameter Selection Process

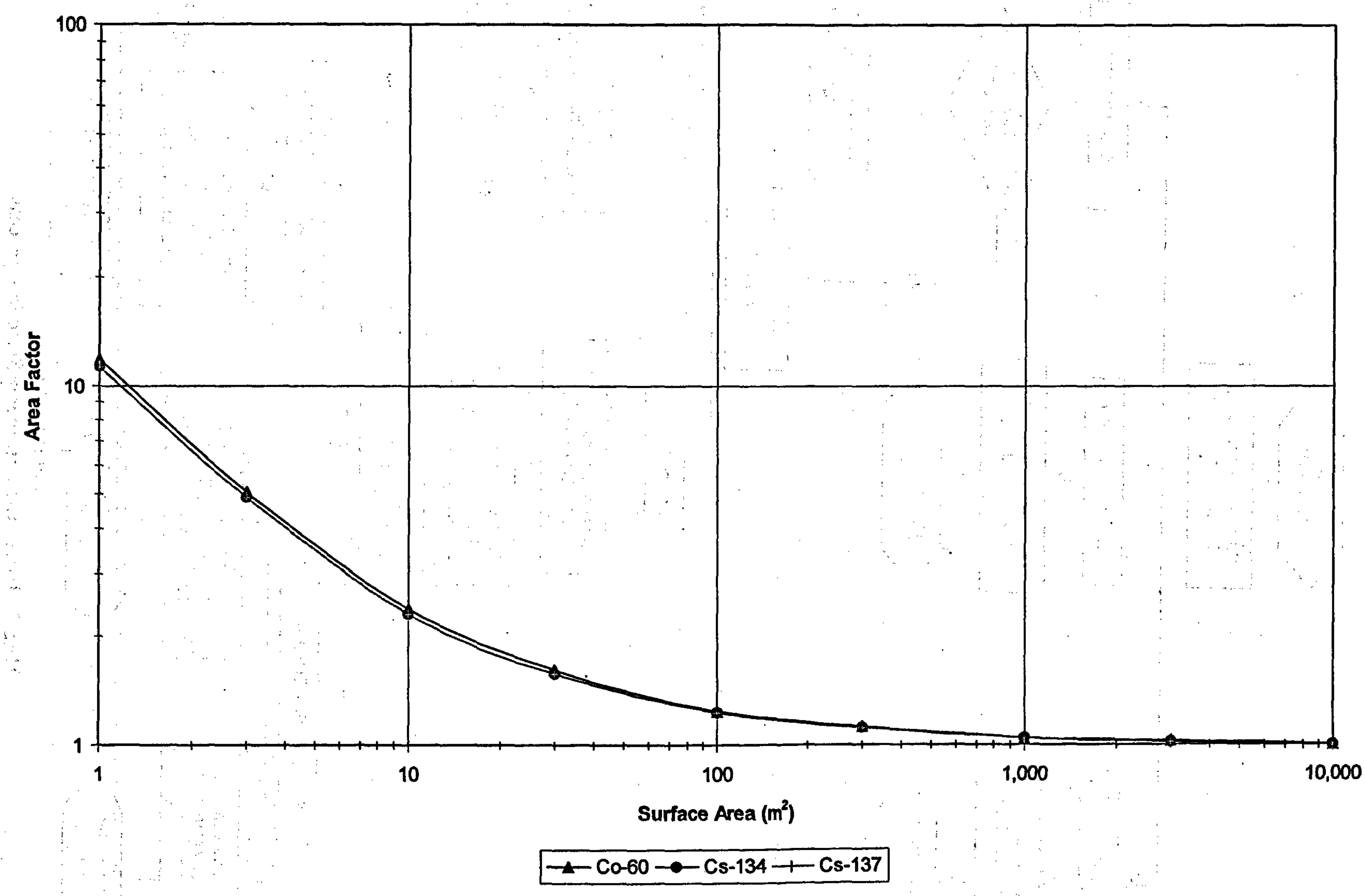

Figure 6-11
Surface Soil Area Factors for Gamma Emitters

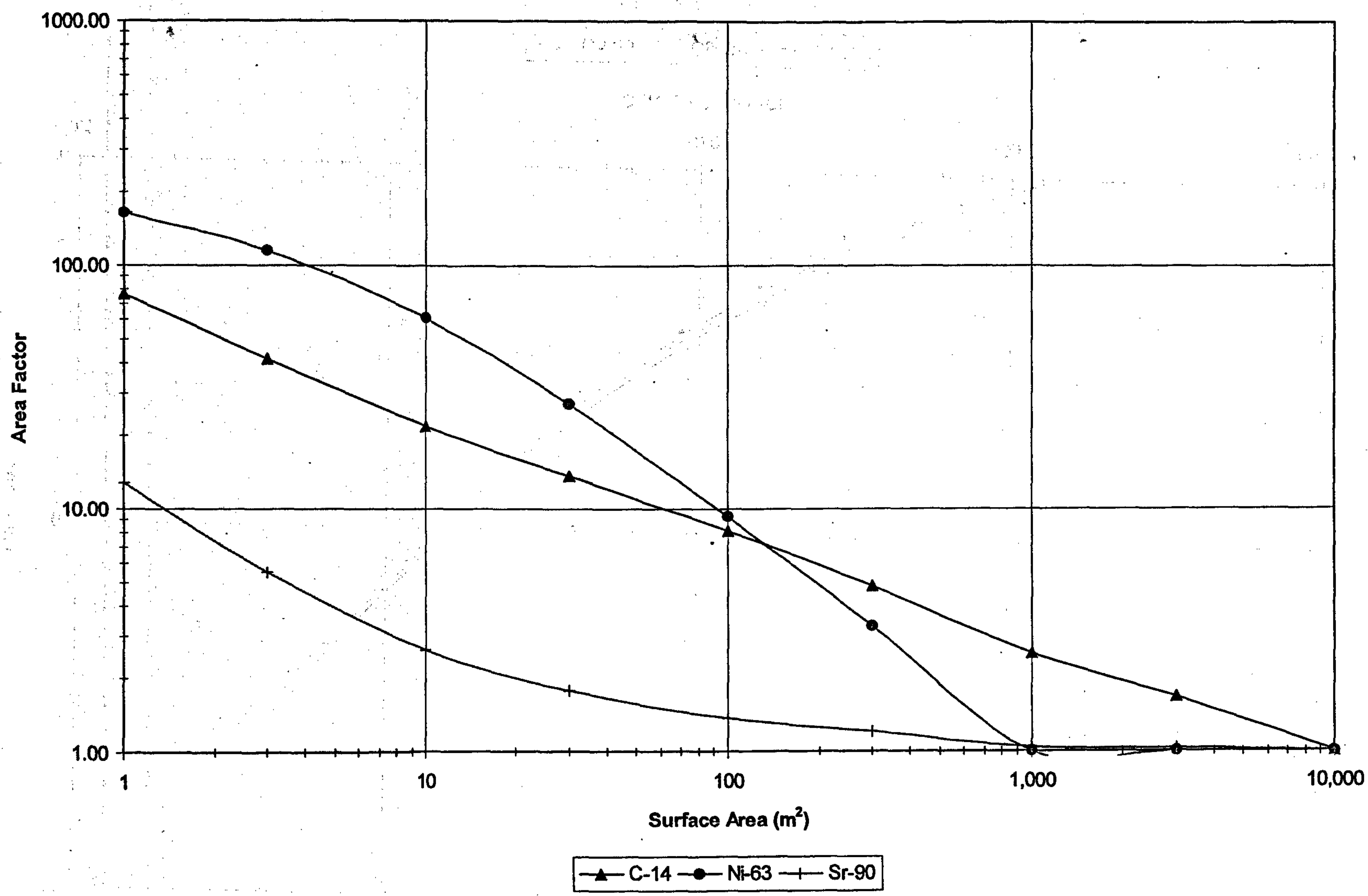

Figure 6-12
Surface Soil Area Factors for Beta Emitters

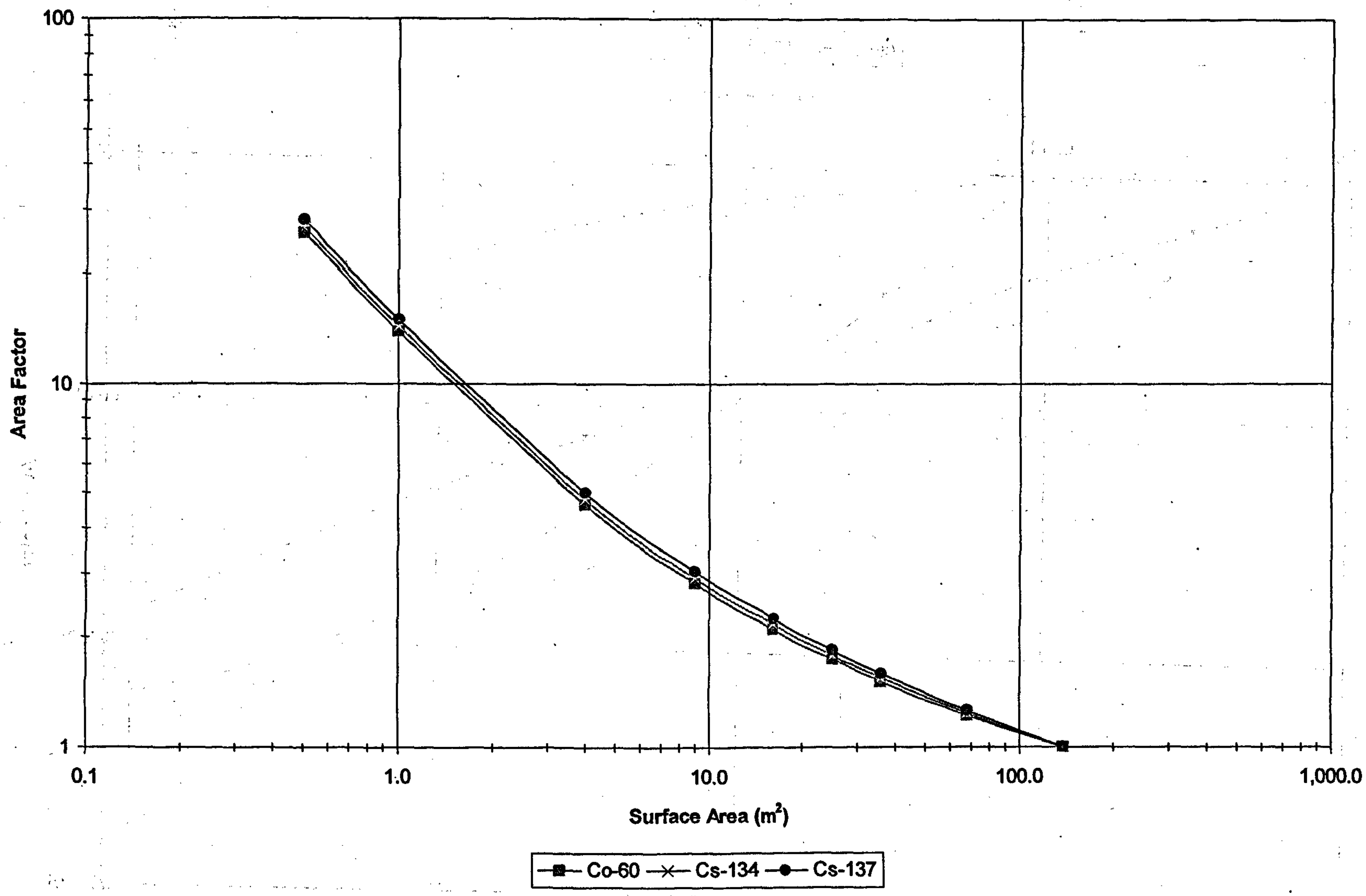

Figure 6-13
Structural Surface Area Factors

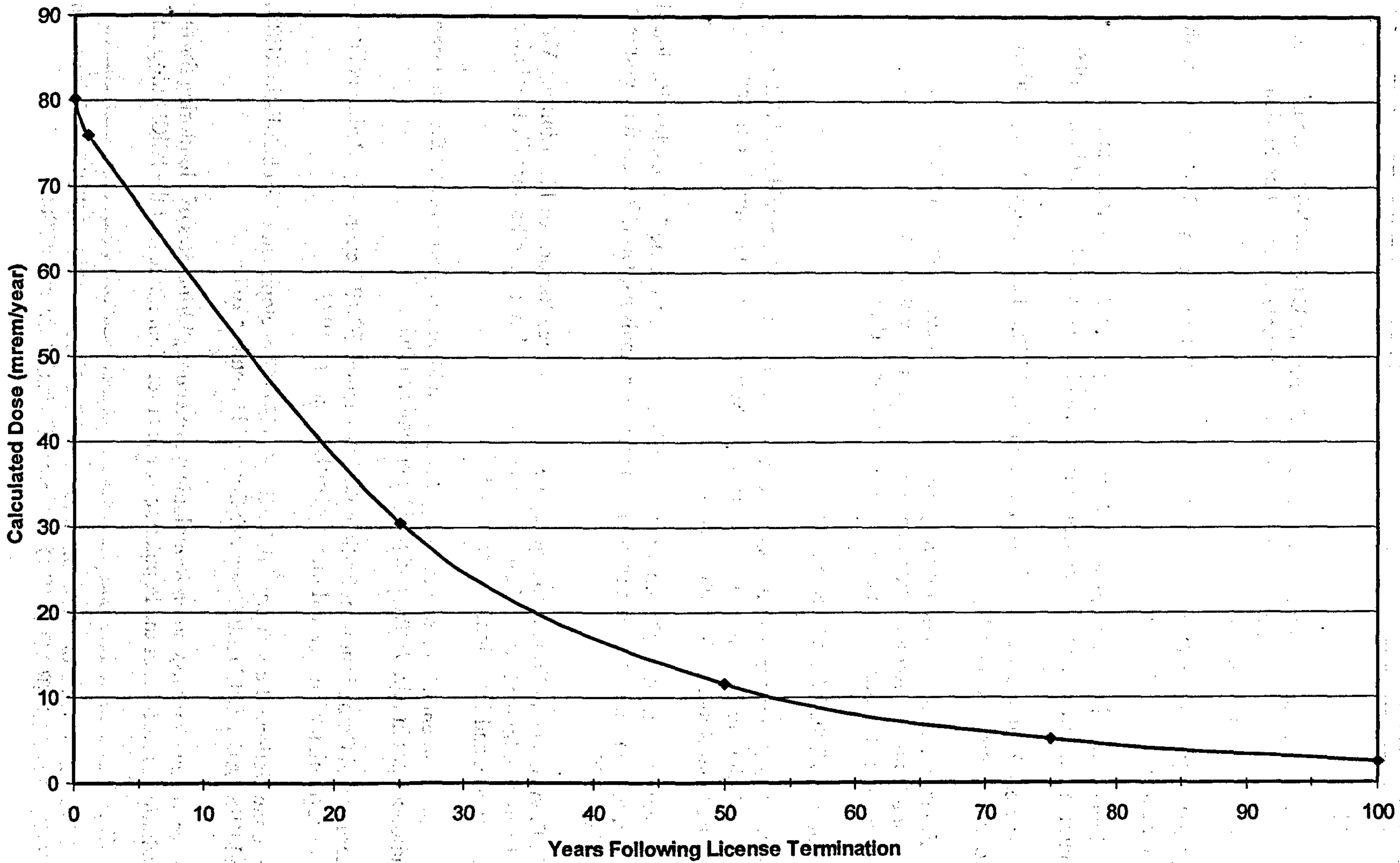

Figure 6-14
Calculated Dose Using a Resident Farmer Scenario

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Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Contamination					
Thickness of contaminated zone	P	2	m	0.15	Assigned value
Area of contaminated zone	P	2	m^2	10,000	Default RESRAD v6.22 Physical priority 2 value acceptable for this evaluation
Shape of the contaminated zone	P	3	-	Circular	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Initial concentration of principal radionuclides in soil	P	2	pCi/g	Table 6-2 Decayed conc. values	Radionuclide concentrations obtained by General Engineering Laboratories (GEL) for sample number SC 8100010 DS08A1 (spent fuel cooler pad soil)
Initial concentration of radionuclides present in ground water	P	3	pCi/L	0	Not Used for this evaluation
Leach rate	P	3	1/yr	0	Default Physical priority 3 value to invoke the calculation of this parameter via a first-order leaching model that uses the value of the soil/water distribution coefficient in the contaminated zone
Solubility limit	P	3	mol/L	0	Default Physical value – not used by RESRAD v6.22 with leach rate flag set to 0
Time since placement of material	P	3	yr	0	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Times for calculation	P	3	yr	1, 3, 10, 30, 100, 300, 1000	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Contaminated zone density	P	1	g/cm^3	Normal distribution	NUREG/CR-6767, Attachment C, Table C-1 distribution for silt
Contaminated zone distribution coefficient for C	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Ni	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Co	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Contaminated zone distribution coefficient for Sr	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Cs	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Use plant/soil ratio	NA	3	Check box	No	For purposes of this evaluation, the code should not be allowed to calculate the distribution coefficients from the plant root uptake factors because they are calculated probabilistically.
Contaminated zone field capacity	P	3	-	0.2	Default RESRAD v6.22 Priority 3 Physical priority 3 value acceptable for this evaluation
Contaminated zone erosion rate	P,B	2	m/yr	Continuous logarithmic distribution	NUREG/CR-6697, Attachment C
Contaminated zone total porosity	P	2	-	Truncated normal distribution	NUREG/CR-6697, Attachment C
Contaminated zone hydraulic conductivity	P	2	m/yr	Lognormal	NUREG/CR-6697, Attachment C
Contaminated zone b parameter	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C
Carbon-Model Parameters					
Thickness of evasion layer of C-14 in soil	P	2	m	Triangular distribution	NUREG/CR-6697, Attachment C
C-14 evasion flux rate from soil	P	3	1/s	7E-07	Default RESRAD v6.22 Priority 3 Physical priority 3 value acceptable for this evaluation
C-12 concentration in local water	P	3	g/cm^3	2E-05	Default RESRAD v6.22 Priority 3 Physical priority 3 value acceptable for this evaluation
C-12 concentration in contaminated soil	P	3	g/g	0.03	Default RESRAD v6.22 Priority 3 Physical priority 3 value acceptable for this evaluation
Fraction of vegetation carbon absorbed from soil	P	3	-	0.02	Default RESRAD v6.22 Priority 3 Physical priority 3 value acceptable for this evaluation

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Fraction of vegetation carbon absorbed from air	P	3	-	0.98	Default RESRAD v6.22 Priority 3 Physical priority 3 value acceptable for this evaluation
C-12 evasion flux rate from soil	P	3	1/s	1E-10	Default RESRAD v6.22 Priority 3 Physical priority 3 value acceptable for this evaluation
Grain fraction in beef cattle feed	B	3	-	0.8	Default RESRAD v6.22 Priority 3 Behavioral priority 3 value acceptable for this evaluation
Grain fraction in milk cow feed	B	3	-	0.2	Default RESRAD v6.22 Priority 3 Behavioral priority 3 value acceptable for this evaluation
DCF correction factor for gaseous forms of C-14	P	3	-	88.94	Default RESRAD v6.22 Priority 3 Physical priority 3 value acceptable for this evaluation
Soil					
Cover depth	P	2	m	0	*The contamination is assumed to be on surface soil*
Density of cover material	P	1	g/cm^3	Not Used	A cover is not used in this evaluation
Cover total porosity	P	3	-	Not Used	Radon is not used in this evaluation
Cover volumetric water content	P	3	-	Not Used	Radon is not used in this evaluation
Cover radon diffusion coefficient	P	3	m^2/s	Not Used	Radon is not used in this evaluation
Cover erosion rate	P,B	2	m/yr	Not Used	A cover is not used in this evaluation
Number of unsaturated zones	P	3	-	4	Simplified hydrogeological model assumption
Unsaturated zone 1 thickness	P	1	m	0.305	Thickness of silt layer above the sand layer
Unsaturated zone 1 density	P	2	g/cm^3	Normal distribution	NUREG/CR-6767, Attachment C, Table C-1 distribution for silt
Unsaturated zone 1 distribution coefficient for C	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Ni	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Unsaturated zone 1 distribution coefficient for Co	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Sr	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Cs	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 total porosity	P	2	-	Truncated normal distribution	NUREG/CR-6697, Attachment C, Table 3.2-1 distribution for silt
Unsaturated zone 1 effective porosity	P	2	-	Truncated normal distribution	NUREG/CR-6767, Attachment A, Table A-7 distribution for silt
Unsaturated zone 1 field capacity	P	3	-	Truncated normal distribution	NUREG/CR-6767, Attachment A, Table A-7 distribution for silt
Unsaturated zone 1 hydraulic conductivity	P	2	m/yr	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 3.4-1 for silt
Unsaturated zone 1 soil-specific b parameter	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 3.5-1 for silt
Unsaturated zone 2 thickness	P	1	m	3.05	Thickness of fine sand layer above the siltstone layer
Unsaturated zone 2 density	P	2	g/cm^3	Normal distribution	NUREG/CR-6767, Attachment C, Table C-1 distribution for sand
Unsaturated zone 2 distribution coefficient for C	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Ni	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Unsaturated zone 2 distribution coefficient for Co	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Sr	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Cs	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 total porosity	P	2	-	Truncated normal distribution	NUREG/CR-6697, Attachment C, Table 3.2-1 distribution for sand
Unsaturated zone 2 effective porosity	P	2	-	Truncated normal distribution	NUREG/CR-6767, Attachment A, Table A-1 distribution for sand
Unsaturated zone 2 field capacity	P	3	-	Truncated normal distribution	NUREG/CR-6767, Attachment A, Table A-1 distribution for sand
Unsaturated zone 2 hydraulic conductivity	P	2	m/yr	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 3.4-1 for sand
Unsaturated zone 2 soil-specific b parameter	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 3.5-1 for sand
Unsaturated zone 3 thickness	P	1	m	25.60	Thickness of siltstone layer
Unsaturated zone 3 density	P	2	g/cm^3	Normal distribution	NUREG/CR-6767, Attachment C, Table C-1 distribution for silt
Unsaturated zone 3 distribution coefficient for C	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Ni	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Unsaturated zone 3 distribution coefficient for Co	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Sr	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Cs	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 total porosity	P	2	-	0.35	RESRAD Data Collection Handbook Table 3.2 arithmetic mean for medium siltstone
Unsaturated zone 3 effective porosity	P	2	-	0.12	RESRAD Data Collection Handbook Table 3.2 arithmetic mean for medium siltstone
Unsaturated zone 3 field capacity	P	3	-	0.23	Total porosity minus effective porosity per RESRAD Data Collection Handbook, Section 4.1
Unsaturated zone 3 hydraulic conductivity	P	2	m/yr	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 3.4-1 for silt
Unsaturated zone 3 soil-specific b parameter	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 3.5-1 for silt
Unsaturated zone 4 thickness	P	1	m	10.82	Thickness of unsaturated sandstone layer
Unsaturated zone 4 density	P	2	g/cm^3	Normal distribution	NUREG/CR-6767, Attachment C, Table C-1 distribution for sand
Unsaturated zone 4 distribution coefficient for C	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Ni	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Co	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Unsaturated zone 4 distribution coefficient for Sr	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Cs	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 total porosity	P	2	-	0.35	RESRAD Data Collection Handbook Table 3.2 arithmetic mean for sandstone
Unsaturated zone 4 effective porosity	P	2	-	0.27	RESRAD Data Collection Handbook Table 3.2 arithmetic mean for sandstone
Unsaturated zone 4 field capacity	P	3	-	0.07	Total porosity minus effective porosity per RESRAD Data Collection Handbook, Section 4.1
Unsaturated zone 4 hydraulic conductivity	P	2	m/yr	10	Upper boundary value from RESRAD Data Collection Handbook, Table 5.1 for sandstone
Unsaturated zone 4 soil-specific b parameter	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 3.5-1 for sand
Water					
Density of saturated zone	P	1	g/cm^3	Normal distribution	NUREG/CR-6767, Attachment C, Table C-1 distribution for sand
Saturated zone distribution coefficient for C	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Ni	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Co	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Sr	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Saturated zone distribution coefficient for Cs	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone total porosity	P	1	-	0.34	RESRAD Data Collection Handbook Table 3.2 arithmetic mean for sandstone
Saturated zone effective porosity	P	1	-	0.27	RESRAD Data Collection Handbook Table 3.2 arithmetic mean for sandstone
Saturated zone field capacity	P	3	-	0.07	Total porosity minus effective porosity per RESRAD Data Collection Handbook, Section 4.1
Saturated zone hydraulic conductivity	P	1	m/yr	10	Upper boundary value from RESRAD Data Collection Handbook, Table 5.1 for sandstone
Saturated zone hydraulic gradient	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone soil-specific b parameter	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C
Length of contaminated zone parallel to the aquifer flow	P	2	m	113	Diameter of an 10,000 m^2 contaminated zone
Water table drop rate	P	3	m/yr	0.783	Site specific value applicable to the RSNGS site as reported in the FSAR, Appendix 2C
Well-pump intake depth (below water table)	P	2	m	23	Site specific value applicable to the RSNGS site as reported in the FSAR, Appendix 2C
Well pumping rate	B, P	2	m^3/yr	Not Used	Well pumping rate is not used with the Mass-Balance model for water transport selected – well pumping rate is used to calculated a dilution factor when the Non- Dispersion model is selected.
Model: non-dispersion or mass balance	NA	3	-	MB	The mass-balance model was chosen as the most conservative since it assumes that all of the radionuclides released from the contaminated zone are withdrawn through the well.

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Evapotranspiration coefficient	P	2	-	Uniform distribution	NUREG/CR-6697, Attachment C
Humidity in air	P	3	g/m^3	Not Used	Not used when the Radon exposure pathway is suppressed
Average annual wind speed	P	2	m/s	3.13	7 mph average annual wind speed for the years of 1930 – 1996 reported by the National Climatic Data Center for Stockton, CA (http://www.ncdc.noaa.gov/oa/documentlibrary/wind/wind1996.pdf)
Precipitation rate	P	2	m/yr	0.38	Mean annual average rainfall measured at Sacramento and Stockton
Irrigation mode	B	3	-	Overhead	Behavioral value - ditch irrigation is not the principal method of irrigation in the local region
Irrigation rate	B	3	m/yr	0.2	Behavioral RESRAD v6.22 default value acceptable for this evaluation
Runoff coefficient	P	2	-	Uniform distribution	NUREG/CR-6697, Attachment C
Watershed area for nearby stream or pond	P	3	m^2	1.00E+07	The majority of the RSNGS site drains into Clay Creek
Accuracy for water soil computation	NA	3	-	0.001	Default RESRAD v6.22 priority 3 value acceptable for this evaluation
Ingestion					
Fruit, vegetable, and grain consumption rate	M, B	2	kg/yr	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Leafy vegetable consumption	M, B	3	kg/yr	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Milk consumption	M, B	2	L/yr	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Meat and poultry consumption	M, B	3	kg/yr	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Fish consumption rate	M, B	3	kg/yr	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Other seafood consumption rate	M, B	3	kg/yr	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Aquatic food contaminated fraction	B, P	2	-	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Soil ingestion rate	M, B	2	g/yr	Triangular distribution	NUREG/CR-6697, Attachment C
Drinking water intake	M, B	2	L/yr	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Storage time for fruits, non-leafy vegetables, and grain	B	3	d	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Storage time for leafy vegetables	B	3	d	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Storage time for milk	B	3	d	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Storage time for meat	B	3	d	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Storage time for fish	B	3	d	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Storage time for crustacea and mollusks	B	3	d	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Storage time for well water	B	3	d	1	Behavioral priority 3 RESRAD v6.22 default value
Storage time for surface water	B	3	d	1	Behavioral priority 3 RESRAD v6.22 default value
Storage time for livestock fodder	B	3	d	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Drinking water contaminated fraction	B, P	3	-	1	Default RESRAD v6.22 Behavioral/Physical priority 3 value acceptable for this evaluation
Household water contaminated fraction	B, P	3	-	Not Used	Not used when the radon exposure pathway is suppressed

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Livestock water contaminated fraction	B, P	3	-	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Irrigation water contaminated fraction	B, P	3	-	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Plant food contaminated fraction	B, P	3	-	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Meat contaminated fraction	B, P	3	-	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Milk contaminated fraction	B, P	3	-	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Livestock fodder intake rate for meat	M	3	kg/d	Not Used	Not used with meat and milk exposure pathways suppressed in accordance with the Industrial Worker Scenario
Livestock fodder intake rate for milk	M	3	kg/d	Not Used	Not used with meat and milk exposure pathways suppressed in accordance with the Industrial Worker Scenario
Livestock water intake rate for meat	M	3	L/d	Not Used	Not used with meat and milk exposure pathways suppressed in accordance with the Industrial Worker Scenario
Livestock water intake rate for milk	M	3	L/d	Not Used	Not used with meat and milk exposure pathways suppressed in accordance with the Industrial Worker Scenario
Livestock intake of soil	M	3	kg/d	Not Used	Not used with meat and milk exposure pathways suppressed in accordance with the Industrial Worker Scenario
Mass loading for foliar deposition	P	3	g/m^3	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Depth of soil mixing layer	P	2	m	Triangular distribution	NUREG/CR-6697, Attachment C
Depth of roots	P	1	m	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Groundwater fractional usage for drinking water	B, P	3	-	1	Default RESRAD v6.22 Behavioral/Physical priority 3 value acceptable for this evaluation
Groundwater fractional usage for household water	B, P	3	-	Not Used	Not used when the radon exposure pathway is suppressed

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Groundwater fractional usage for livestock water	B, P	3	-	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Groundwater fractional usage for irrigation water	B, P	3	-	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Wet weight crop yield for non-leafy plants	P	2	kg/m^2	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Wet weight crop yield for leafy plants	P	3	kg/m^2	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Wet weight crop yield for fodder	P	3	kg/m^2	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Length of growing season for non-leafy vegetables	P	3	yr	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Length of growing season for leafy vegetables	P	3	yr	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Length of growing season for fodder	P	3	yr	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Translocation factor for non-leafy vegetables	P	3	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Translocation factor for leafy vegetables	P	3	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Translocation factor for fodder	P	3	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Weathering removal constant	P	2	1/yr	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Dry foliar interception fraction for non-leafy vegetables	P	3	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Dry foliar interception fraction for leafy vegetables	P	3	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Dry foliar interception fraction for fodder	P	3	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Wet foliar interception fraction for non-leafy vegetables	P	3	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Wet foliar interception fraction for leafy vegetables	P	2	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Wet foliar interception fraction for fodder	P	3	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Slope factor – external	M	3	(risk/yr)/(pCi/g)	Nuclide specific	Metabolic RESRAD v6.22 default value
Slope factor – inhalation	M	3	risk/pCi	Nuclide specific	Metabolic RESRAD v6.22 default value
Slope factor – ingestion	M	3	risk/pCi	Nuclide specific	Metabolic RESRAD v6.22 default value
Plant transfer factor	P	1	-	Nuclide specific - Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Meat transfer factor	P	2	(pCi/kg)/(pCi/d)	Nuclide specific - Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Milk transfer factor	P	2	(pCi/L)/(pCi/d)	Nuclide specific - Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Bioaccumulation factor for fish	P	2	(pCi/kg)/(pCi/L)	Nuclide specific - Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Bioaccumulation factor for crustacea and mollusks	P	3	(pCi/kg)/(pCi/L)	Nuclide specific - Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Occupancy (Inhalation & External Parameters)					
Inhalation rate	M, B	3	m^3/yr	Triangular distribution	NUREG/CR-6697, Attachment C
Inhalation dose conversion factors	M	3	mrem/pCi	Nuclide specific	Metabolic RESRAD v6.22 default value
Ingestion dose conversion factors	M	3	mrem/pCi	Nuclide specific	Metabolic RESRAD v6.22 default value

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Mass loading for inhalation	P, B	2	g/m^3	Continuous linear distribution	NUREG/CR-6697, Attachment C
Indoor dust filtration factor	P, B	2	-	Uniform distribution	NUREG/CR-6697, Attachment C
External gamma shielding factor	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C
Building foundation thickness	P	3	m	Not Used	The Radon Exposure Pathway is not used
Building foundation bulk density	P	3	g/m^3	Not Used	The Radon Exposure Pathway is not used
Building foundation total porosity	P	3	-	Not Used	The Radon Exposure Pathway is not used
Building foundation volumetric water content	P	3	-	Not Used	The Radon Exposure Pathway is not used
Building foundation radon diffusion coefficient	P	3	m^2/s	Not Used	The Radon Exposure Pathway is not used
Contaminated soil zone radon diffusion coefficient	P	3	m^2/s	Not Used	The Radon Exposure Pathway is not used
Radon vertical dimension of mixing	P	3	m	Not Used	The Radon Exposure Pathway is not used
Building air exchange rate	P, B	3	1/hr	Not Used	The Radon Exposure Pathway is not used
Building (room) height	P	3	m	Not Used	The Radon Exposure Pathway is not used
Building indoor area factor	P	3	-	Not Used	The Radon Exposure Pathway is not used
Foundation depth below ground surface	P	3	m	Not Used	The Radon Exposure Pathway is not used
Radon-222 emanation coefficient	P	3	-	Not Used	The Radon Exposure Pathway is not used

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Radon-220 emanation coefficient	P	3	-	Not Used	The Radon Exposure Pathway is not used
Indoor time fraction	B	3	-	0.114	50% of a work year (2000 hrs.) spent inside an industrial facility
Outdoor time fraction	B	3	-	0.114	50% of a work year (2000 hrs.) spent outside at an industrial facility
Exposure duration	B	3	yr	30	Behavioral priority 3 RESRAD v6.22 default value

[1]Parameter Classification: P = Physical; B = Behavioral; M = Metabolic
[2]1 = high priority parameter, 2 = medium priority parameter, 3 = low priority parameter

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Parameter	Priority[1]	Distribution	Distribution's Statistical Parameters[2]			
			1	2	3	4
Density of contaminated zone	1	Normal	1.330	0.202	-	-
Density of saturated zone	1	Normal	1.578	0.158	-	-
Contaminated zone distribution coefficient for C	1	Truncated lognormal-n	2.40	3.22	0.001	0.999
Contaminated zone distribution coefficient for Ni	1	Truncated lognormal-n	6.05	1.46	0.001	0.999
Contaminated zone distribution coefficient for Co	1	Truncated lognormal-n	5.46	2.53	0.001	0.999
Contaminated zone distribution coefficient for Sr	1	Truncated lognormal-n	3.45	2.12	0.001	0.999
Contaminated zone distribution coefficient for Cs-134	1	Truncated lognormal-n	6.10	2.33	0.001	0.999
Contaminated zone distribution coefficient for Cs-137	1	Truncated lognormal-n	6.10	2.33	0.001	0.999
Unsaturated zone 1 distribution coefficient for C	1	Truncated lognormal-n	2.40	3.22	0.001	0.999
Unsaturated zone 1 distribution coefficient for Ni	1	Truncated lognormal-n	6.05	1.46	0.001	0.999
Unsaturated zone 1 distribution coefficient for Co	1	Truncated lognormal-n	5.46	2.53	0.001	0.999
Unsaturated zone 1 distribution coefficient for Sr	1	Truncated lognormal-n	3.45	2.12	0.001	0.999
Unsaturated zone 1 distribution coefficient for Cs-134	1	Truncated lognormal-n	6.10	2.33	0.001	0.999
Unsaturated zone 1 distribution coefficient for Cs-137	1	Truncated lognormal-n	6.10	2.33	0.001	0.999
Unsaturated zone 2 distribution coefficient for C	1	Truncated lognormal-n	2.40	3.22	0.001	0.999
Unsaturated zone 2 distribution coefficient for Ni	1	Truncated lognormal-n	6.05	1.46	0.001	0.999
Unsaturated zone 2 distribution coefficient for Co	1	Truncated lognormal-n	5.46	2.53	0.001	0.999
Unsaturated zone 2 distribution coefficient for Sr	1	Truncated lognormal-n	3.45	2.12	0.001	0.999
Unsaturated zone 2 distribution coefficient for Cs-134	1	Truncated lognormal-n	6.10	2.33	0.001	0.999
Unsaturated zone 2 distribution coefficient for Cs-137	1	Truncated lognormal-n	6.10	2.33	0.001	0.999
Unsaturated zone 3 distribution coefficient for C	1	Truncated lognormal-n	2.40	3.22	0.001	0.999
Unsaturated zone 3 distribution coefficient for Ni	1	Truncated lognormal-n	6.05	1.46	0.001	0.999
Unsaturated zone 3 distribution coefficient for Co	1	Truncated lognormal-n	5.46	2.53	0.001	0.999
Unsaturated zone 3 distribution coefficient for Sr	1	Truncated lognormal-n	3.45	2.12	0.001	0.999
Unsaturated zone 3 distribution coefficient for Cs-134	1	Truncated lognormal-n	6.10	2.33	0.001	0.999
Unsaturated zone 3 distribution coefficient for Cs-137	1	Truncated lognormal-n	6.10	2.33	0.001	0.999
Unsaturated zone 4 distribution coefficient for C	1	Truncated lognormal-n	2.40	3.22	0.001	0.999
Unsaturated zone 4 distribution coefficient for Ni	1	Truncated lognormal-n	6.05	1.46	0.001	0.999
Unsaturated zone 4 distribution coefficient for Co	1	Truncated lognormal-n	5.46	2.53	0.001	0.999
Unsaturated zone 4 distribution coefficient for Sr	1	Truncated lognormal-n	3.45	2.12	0.001	0.999
Unsaturated zone 4 distribution coefficient for Cs-134	1	Truncated lognormal-n	6.10	2.33	0.001	0.999

Parameter	Priority[1]	Distribution	Distribution's Statistical Parameters[2]			
			1	2	3	4
Unsaturated zone 4 distribution coefficient for Cs-137	1	Truncated lognormal-n	6.10	2.33	0.001	0.999
Saturated zone distribution coefficient for C	1	Truncated lognormal-n	2.40	3.22	0.001	0.999
Saturated zone distribution coefficient for Ni	1	Truncated lognormal-n	6.05	1.46	0.001	0.999
Saturated zone distribution coefficient for Co	1	Truncated lognormal-n	5.46	2.53	0.001	0.999
Saturated zone distribution coefficient for Sr	1	Truncated lognormal-n	3.45	2.12	0.001	0.999
Saturated zone distribution coefficient for Cs-134	1	Truncated lognormal-n	6.10	2.33	0.001	0.999
Saturated zone distribution coefficient for Cs-137	1	Truncated lognormal-n	6.10	2.33	0.001	0.999
Contaminated zone b parameter	2	Bounded lognormal-n	1.06	0.66	0.5	30
Contaminated zone erosion rate	2	Continuous logarithmic	Default[3]	-	-	-
Contaminated zone total porosity	2	Truncated normal	0.425	0.0867	0.001	0.999
Contaminated zone hydraulic conductivity	2	Lognormal	3.302	62	-	-
Depth of soil mixing layer	2	Triangular	0.0	0.6	0.15	-
Drinking water intake	2	Truncated lognormal-n	6.015	0.489	0.001	0.999
Evapotranspiration coefficient	2	Uniform	0.5	0.75	-	-
External gamma shielding factor	2	Bounded lognormal-n	-1.3	0.59	0.044	1
Indoor dust filtration factor	2	Uniform	0.15	0.95	-	-
Mass loading for inhalation	2	Continuous linear	Default[3]	-	-	-
Runoff coefficient	2	Uniform	0.1	0.8	-	-
Saturated zone b parameter	2	Bounded lognormal-n	1.06	0.66	0.5	30
Saturated zone hydraulic gradient	2	Bounded lognormal-n	-5.11	1.77	7E-05	0.5
Soil ingestion rate	2	Triangular	0	36.5	18.3	-
Unsaturated zone 1 density	2	Normal	1.33	0.202	-	-
Unsaturated zone 1 effective porosity	2	Truncated normal	0.425	0.110	0.0839	0.766
Unsaturated zone 1 hydraulic conductivity	2	Bounded lognormal-n	2.66	0.475	3.302	62.2
Unsaturated zone 1 b parameter	2	Bounded lognormal-n	1.16	0.140	2.06	4.89
Unsaturated zone 1 total porosity	2	Truncated normal	0.46	0.11	0.1161	0.7959
Unsaturated zone 2 density	2	Normal	1.578	0.158	-	-
Unsaturated zone 2 effective porosity	2	Truncated normal	0.383	0.0610	0.195	0.572
Unsaturated zone 2 hydraulic conductivity	2	Bounded lognormal-n	1.398	1.842	110	5870
Unsaturated zone 2 b parameter	2	Bounded lognormal-n	-0.0253	0.216	0.501	1.90
Unsaturated zone 2 total porosity	2	Truncated normal	0.43	0.06	0.2446	0.6154
Unsaturated zone 3 density	2	Normal	1.33	0.202	-	-
Unsaturated zone 3 hydraulic conductivity	2	Bounded lognormal-n	2.66	0.475	3.302	62.2
Unsaturated zone 3 b parameter	2	Bounded lognormal-n	1.16	0.140	2.06	4.89
Unsaturated zone 4 density	2	Normal	1.578	0.158	-	-
Unsaturated zone 4 hydraulic conductivity	2	Bounded lognormal-n	1.398	1.842	110	5870
Unsaturated zone 4 b parameter	2	Bounded lognormal-n	-0.0253	0.216	0.501	1.90
Thickness of evasion layer of C-14 in soil	2	Triangular	0.5	1.0	0.75	-
Unsaturated zone 1 field capacity	3	Truncated normal	0.236	0.0578	0.0575	0.415
Unsaturated zone 2 field capacity	3	Truncated normal	0.0607	0.0150	0.0280	0.124
Inhalation rate	3	Triangular	4,380	13,100	8,400	-

Notes:

[1] 1 = high priority parameter, 2 = medium priority parameter, 3 = low priority parameter

[2] Distribution's Statistical Parameter
Bounded lognormal-n: 1 = underlying mean value, 2 = underlying standard deviation, 3 = lower limit, 4 = upper limit
Lognormal: 1 = mean, 2 = error factor
Normal: 1 = mean, 2 = standard deviation
Triangular: 1 = minimum, 2 = maximum, 3 = most likely
Truncated lognormal-n: 1 = underlying mean value, 2 = underlying standard deviation, 3 = lower quantile, 4 = upper quantile
Truncated normal: 1 = mean, 2 = standard deviation, 3 = lower quantile, 4 = upper quantile
Uniform: 1 = minimum, 2 = maximum

[3] Default RESRAD v6.22 distribution parameters were used

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Parameter	Uncorrelated Parameter Results			Correlated Parameter Results		
	PRCC Value	25% or 75% Quartile	Assigned Parameter Value	PRCC Value	25% or 75% Quartile	Assigned Parameter Value
Density of contaminated zone	0.79	75%	1.47	0.75	75%	1.47
Density of saturated zone	-0.10	No	Distribution	-0.10	No	Distribution
Contaminated zone distribution coefficient for C	0.12	No	Distribution	0.14	No	Distribution
Contaminated zone distribution coefficient for Ni	0.13	No	Distribution	0.13	No	Distribution
Contaminated zone distribution coefficient for Co	-0.03	No	Distribution	-0.02	No	Distribution
Contaminated zone distribution coefficient for Sr	0.11	No	Distribution	0.10	No	Distribution
Contaminated zone distribution coefficient for Cs-134	0.08	No	Distribution	0.09	No	Distribution
Contaminated zone distribution coefficient for Cs-137	0.29	75%	2130	0.29	75%	2130
Unsaturated zone 1 distribution coefficient for C	-0.04	No	Distribution	-0.04	No	Distribution
Unsaturated zone 1 distribution coefficient for Ni	0.01	No	Distribution	0.02	No	Distribution
Unsaturated zone 1 distribution coefficient for Co	-0.07	No	Distribution	-0.06	No	Distribution
Unsaturated zone 1 distribution coefficient for Sr	-0.10	No	Distribution	-0.09	No	Distribution
Unsaturated zone 1 distribution coefficient for Cs-134	0.10	No	Distribution	0.10	No	Distribution
Unsaturated zone 1 distribution coefficient for Cs-137	-0.02	No	Distribution	-0.02	No	Distribution
Unsaturated zone 2 distribution coefficient for C	-0.08	No	Distribution	-0.08	No	Distribution
Unsaturated zone 2 distribution coefficient for Ni	-0.05	No	Distribution	-0.05	No	Distribution
Unsaturated zone 2 distribution coefficient for Co	0.01	No	Distribution	0.01	No	Distribution
Unsaturated zone 2 distribution coefficient for Sr	0.02	No	Distribution	0.01	No	- Distribution
Unsaturated zone 2 distribution coefficient for Cs-134	0.04	No	Distribution	0.05	No	Distribution
Unsaturated zone 2 distribution coefficient for Cs-137	0.03	No	Distribution	0.03	No	Distribution
Unsaturated zone 3 distribution coefficient for C	0.02	No	Distribution	0.03	No	Distribution
Unsaturated zone 3 distribution coefficient for Ni	-0.04	No	Distribution	-0.04	No	Distribution
Unsaturated zone 3 distribution coefficient for Co	-0.01	No	Distribution	0.01	No	Distribution
Unsaturated zone 3 distribution coefficient for Sr	0.02	No	Distribution	0.02	No	Distribution
Unsaturated zone 3 distribution coefficient for Cs-134	0.00	No	Distribution	0.01	No	Distribution
Unsaturated zone 3 distribution coefficient for Cs-137	-0.01	No	Distribution	-0.02	No	Distribution
Unsaturated zone 4 distribution coefficient for C	0.02	No	Distribution	0.02	No	Distribution
Unsaturated zone 4 distribution coefficient for Ni	0.00	No	Distribution	0.00	No	Distribution
Unsaturated zone 4 distribution coefficient for Co	-0.03	No	Distribution	-0.04	No	Distribution
Unsaturated zone 4 distribution coefficient for Sr	-0.02	No	Distribution	-0.02	No	Distribution

Parameter	Uncorrelated Parameter Results			Correlated Parameter Results		
	PRCC Value	25% or 75% Quartile	Assigned Parameter Value	PRCC Value	25% or 75% Quartile	Assigned Parameter Value
Unsaturated zone 4 distribution coefficient for Cs-134	0.04	No	Distribution	0.01	No	Distribution
Unsaturated zone 4 distribution coefficient for Cs-137	-0.08	No	Distribution	-0.07	No	Distribution
Saturated zone distribution coefficient for C	0.02	No	Distribution	0.02	No	Distribution
Saturated zone distribution coefficient for Ni	0.00	No	Distribution	0.00	No	Distribution
Saturated zone distribution coefficient for Co	-0.11	No	Distribution	-0.11	No	Distribution
Saturated zone distribution coefficient for Sr	0.07	No	Distribution	0.07	No	Distribution
Saturated zone distribution coefficient for Cs-134	0.06	No	Distribution	0.07	No	Distribution
Saturated zone distribution coefficient for Cs-137	0.03	No	Distribution	0.02	No	Distribution
Contaminated zone b parameter	0.06	No	Distribution	0.04	No	Distribution
Contaminated zone erosion rate	-0.29	25%	0.000759	-0.23	No	Distribution
Contaminated zone total porosity	0.04	No	Distribution	0.04	No	Distribution
Contaminated zone hydraulic conductivity	0.07	No	Distribution	0.06	No	Distribution
Depth of soil mixing layer	0.05	No	Distribution	0.05	No	Distribution
Drinking water intake	-0.05	No	Distribution	-0.04	No	Distribution
Evapotranspiration coefficient	0.11	No	Distribution	0.10	No	Distribution
External gamma shielding factor	0.95	75%	0.397	0.95	75%	0.397
Indoor dust filtration factor	-0.01	No	Distribution	0.00	No	Distribution
Mass loading for inhalation	-0.14	No	Distribution	-0.13	No	Distribution
Runoff coefficient	0.04	No	Distribution	-0.03	No	Distribution
Saturated zone b parameter	0.05	No	Distribution	0.04	No	Distribution
Saturated zone hydraulic gradient	-0.06	No	Distribution	-0.06	No	Distribution
Soil ingestion rate	-0.01	No	Distribution	-0.01	No	Distribution
Unsaturated zone 1 density	-0.03	No	Distribution	0.01	No	Distribution
Unsaturated zone 1 effective porosity	0.00	No	Distribution	-0.04	No	Distribution
Unsaturated zone 1 hydraulic conductivity	-0.04	No	Distribution	-0.05	No	Distribution
Unsaturated zone 1 b parameter	0.05	No	Distribution	0.05	No	Distribution
Unsaturated zone 1 total porosity	-0.07	No	Distribution	0.03	No	Distribution
Unsaturated zone 2 density	0.03	No	Distribution	-0.07	No	Distribution
Unsaturated zone 2 effective porosity	0.09	No	Distribution	0.08	No	Distribution
Unsaturated zone 2 hydraulic conductivity	-0.06	No	Distribution	-0.05	No	Distribution
Unsaturated zone 2 b parameter	-0.06	No	Distribution	-0.07	No	Distribution
Unsaturated zone 2 total porosity	0.00	No	Distribution	-0.08	No	Distribution
Unsaturated zone 3 density	-0.07	No	Distribution	-0.01	No	Distribution
Unsaturated zone 3 hydraulic conductivity	0.02	No	Distribution	0.00	No	Distribution
Unsaturated zone 3 b parameter	-0.20	No	Distribution	-0.19	No	Distribution
Unsaturated zone 4 density	0.05	No	Distribution	-0.07	No	Distribution
Unsaturated zone 4 hydraulic conductivity	0.00	No	Distribution	0.00	No	Distribution
Unsaturated zone 4 b parameter	-0.04	No	Distribution	-0.06	No	Distribution
Thickness of evasion layer of C-14 in soil	-0.02	No	Distribution	-0.02	No	Distribution
Unsaturated zone 1 field capacity	-0.05	No	Distribution	-0.05	No	Distribution
Unsaturated zone 2 field capacity	0.04	No	Distribution	0.04	No	Distribution
Inhalation rate	0.08	No	Distribution	0.10	No	Distribution

Parameter	Class[1]	Priority[2]	Units	Parameter Value*	Basis for Parameter Selection
Contamination					
Thickness of contaminated zone	P	2	m	0.15	Assigned value
Area of contaminated zone	P	2	m^2	10,000	Default RESRAD v6.22 Physical priority 2 value acceptable for this preliminary evaluation
Shape of the contaminated zone	P	3	-	Circular	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Initial concentration of discounted radionuclides in soil	P	2	pCi/g	Table 6-4 Decayed MDA values	MDA values for discounted radionuclides obtained by onsite gamma isotopic analysis and by GEL for sample number SC 8100010 DS08A1 (spent fuel cooler pad soil)
Initial concentration of radionuclides present in ground water	P	3	pCi/L	0	Not used for this evaluation
Leach rate	P	3	1/yr	0	Default Physical value to invoke the calculation of this parameter via a first-order leaching model that uses the value of the soil/water distribution coefficient in the contaminated zone
Solubility limit	P	3	mol/L	0	Default Physical value – not used by RESRAD v6.22 with leach rate flag set to 0
Time since placement of material	P	3	yr	0	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Times for calculation	P	3	yr	1, 3, 10, 30, 100, 300, 1000	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Contaminated zone density	P	1	g/cm^3	1.47	Assigned sensitive parameter value based on sensitivity analysis
Contaminated zone distribution coefficient for H	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Na	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Fe	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Contaminated zone distribution coefficient for Ni	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Nb	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Tc	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Ag	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Sb	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Pm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Sm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Eu	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Gd	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Np	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Th	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Contaminated zone distribution coefficient for Pm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for U	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Pu	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Pb	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Ra	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Ac	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Pa	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Am	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Cm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Use plant/soil ratio	NA	3	Check box	No	For purposes of this evaluation, the code should not be allowed to calculate the distribution coefficients from the plant root uptake factors because they are calculated probabilistically
Contaminated zone field capacity	P	3	-	0.2	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Contaminated zone erosion rate	P,B	2	m/yr	Continuous logarithmic distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Contaminated zone total porosity	P	2	-	Truncated normal distribution	NUREG/CR-6697, Attachment C
Contaminated zone hydraulic conductivity	P	2	m/yr	Lognormal	NUREG/CR-6697, Attachment C
Contaminated zone b parameter	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C
Carbon-Model Parameters					
Thickness of evasion layer of C-14 in soil	P	2	m	Not Used	C-14 is not a discounted radionuclide
C-14 evasion flux rate from soil	P	3	1/s	Not Used	C-14 is not a discounted radionuclide
C-12 concentration in local water	P	3	g/cm^3	Not Used	C-14 is not a discounted radionuclide
C-12 concentration in contaminated soil	P	3	g/g	Not Used	C-14 is not a discounted radionuclide
Fraction of vegetation carbon absorbed from soil	P	3	-	Not Used	C-14 is not a discounted radionuclide
Fraction of vegetation carbon absorbed from air	P	3	-	Not Used	C-14 is not a discounted radionuclide
C-12 evasion flux rate from soil	P	3	1/s	Not Used	C-14 is not a discounted radionuclide
Grain fraction in beef cattle feed	B	3	-	Not Used	C-14 is not a discounted radionuclide
Grain fraction in milk cow feed	B	3	-	Not Used	C-14 is not a discounted radionuclide
DCF correction factor for gaseous forms of C-14	P	3	-	Not Used	C-14 is not a discounted radionuclide
Soil					
Cover depth	P	2	m	0	The contamination is assumed to be on surface soil

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Density of cover material	P	1	g/cm^3	Not Used	A cover is not used in this evaluation
Cover total porosity	P	3	-	Not Used	Radon is not used in this evaluation
Cover volumetric water content	P	3	-	Not Used	Radon is not used in this evaluation
Cover radon diffusion coefficient	P	3	m^2/s	Not Used	Radon is not used in this evaluation
Cover erosion rate	P,B	2	m/yr	Not Used	A cover is not used in this evaluation
Number of unsaturated zones	P	3	-	4	Simplified hydrogeological model assumption
Unsaturated zone 1 thickness	P	1	m	0.305	Thickness of silt layer above the sand layer
Unsaturated zone 1 density	P	2	g/cm^3	Normal distribution	NUREG/CR-6767, Attachment C, Table C-1 distribution for silt
Unsaturated zone 1 distribution coefficient for H	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Na	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Fe	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Ni	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Nb	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Tc	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Ag	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Unsaturated zone 1 distribution coefficient for Sb	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Pm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Sm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Eu	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Gd	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Np	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Th	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Pm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for U	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Pu	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Pb	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Unsaturated zone 1 distribution coefficient for Ra	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Ac	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Pa	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Am	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Cm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 total porosity	P	2	-	Truncated normal distribution	NUREG/CR-6697, Attachment C, Table 3.2-1 distribution for silt
Unsaturated zone 1 effective porosity	P	2	-	Truncated normal distribution	NUREG/CR-6767, Attachment A, Table A-7 distribution for silt
Unsaturated zone 1 field capacity	P	3	-	Truncated normal distribution	NUREG/CR-6767, Attachment A, Table A-7 distribution for silt
Unsaturated zone 1 hydraulic conductivity	P	2	m/yr	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 3.4-1 for silt
Unsaturated zone 1 soil-specific b parameter	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 3.5-1 for silt
Unsaturated zone 2 thickness	P	1	m	3.05	Thickness of fine sand layer above the siltstone layer
Unsaturated zone 2 density	P	2	g/cm^3	Normal distribution	NUREG/CR-6767, Attachment C, Table C-1 distribution for sand

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Unsaturated zone 2 distribution coefficient for H	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Na	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Fe	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Ni	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Nb	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Tc	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Ag	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Sb	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Pm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Sm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Eu	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Unsaturated zone 2 distribution coefficient for Gd	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Np	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Th	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Pm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for U	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Pu	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Pb	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Ra	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Ac	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Pa	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Am	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Unsaturated zone 2 distribution coefficient for Cm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 total porosity	P	2	-	Truncated normal distribution	NUREG/CR-6697, Attachment C, Table 3.2-1 distribution for sand
Unsaturated zone 2 effective porosity	P	2	-	Truncated normal distribution	NUREG/CR-6767, Attachment A, Table A-1 distribution for sand
Unsaturated zone 2 field capacity	P	3	-	Truncated normal distribution	NUREG/CR-6767, Attachment A, Table A-1 distribution for sand
Unsaturated zone 2 hydraulic conductivity	P	2	m/yr	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 3.4-1 for sand
Unsaturated zone 2 soil-specific b parameter	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 3.5-1 for sand
Unsaturated zone 3 thickness	P	1	m	25.60	Thickness of siltstone layer
Unsaturated zone 3 density	P	2	g/cm^3	Normal distribution	NUREG/CR-6767, Attachment C, Table C-1 distribution for silt
Unsaturated zone 3 distribution coefficient for H	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Na	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Fe	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Ni	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Unsaturated zone 3 distribution coefficient for Nb	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Tc	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Ag	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Sb	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Pm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Sm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Eu	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Gd	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Np	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Th	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Pm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Unsaturated zone 3 distribution coefficient for U	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Pu	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Pb	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Ra	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Ac	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Pa	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Am	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Cm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 total porosity	P	2	-	0.35	RESRAD Data Collection Handbook Table 3.2 arithmetic mean for medium siltstone
Unsaturated zone 3 effective porosity	P	2	-	0.12	RESRAD Data Collection Handbook Table 3.2 arithmetic mean for medium siltstone
Unsaturated zone 3 field capacity	P	3	-	0.23	Total porosity minus effective porosity per RESRAD Data Collection Handbook, Section 4.1
Unsaturated zone 3 hydraulic conductivity	P	2	m/yr	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 3.4-1 for silt

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Unsaturated zone 3 soil-specific b parameter	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 3.5-1 for silt
Unsaturated zone 4 thickness	P	1	m	10.82	Thickness of unsaturated sandstone layer
Unsaturated zone 4 density	P	2	g/cm^3	Normal distribution	NUREG/CR-6767, Attachment C, Table C-1 distribution for sand
Unsaturated zone 4 distribution coefficient for H	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Na	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Fe	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Ni	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Nb	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Tc	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Ag	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Sb	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Pm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Unsaturated zone 4 distribution coefficient for Sm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Eu	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Gd	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Np	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Th	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Pm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for U	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Pu	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Pb	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Ra	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Ac	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Unsaturated zone 4 distribution coefficient for Pa	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Am	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Cm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 total porosity	P	2	-	0.35	RESRAD Data Collection Handbook Table 3.2 arithmetic mean for sandstone
Unsaturated zone 4 effective porosity	P	2	-	0.27	RESRAD Data Collection Handbook Table 3.2 arithmetic mean for sandstone
Unsaturated zone 4 field capacity	P	3	-	0.07	Total porosity minus effective porosity per RESRAD Data Collection Handbook, Section 4.1
Unsaturated zone 4 hydraulic conductivity	P	2	m/yr	10	Upper boundary value from RESRAD Data Collection Handbook, Table 5.1 for sandstone
Unsaturated zone 4 soil-specific b parameter	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 3.5-1 for sand
Water					
Density of saturated zone	P	1	g/cm^3	Normal distribution	NUREG/CR-6767, Attachment C, Table C-1 distribution for sand
Saturated zone distribution coefficient for H	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Na	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Fe	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Saturated zone distribution coefficient for Ni	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Nb	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Tc	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Ag	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Sb	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Pm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Sm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Eu	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Gd	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Np	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Th	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Saturated zone distribution coefficient for Pm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for U	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Pu	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Pb	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Ra	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Ac	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Pa	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Am	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Cm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone total porosity	P	1	-	0.34	RESRAD Data Collection Handbook Table 3.2 arithmetic mean for sandstone
Saturated zone effective porosity	P	1	-	0.27	RESRAD Data Collection Handbook Table 3.2 arithmetic mean for sandstone
Saturated zone field capacity	P	3	-	0.07	Total porosity minus effective porosity per RESRAD Data Collection Handbook, Section 4.1

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Saturated zone hydraulic conductivity	P	1	m/yr	10	Upper boundary value from RESRAD Data Collection Handbook, Table 5.1 for sandstone
Saturated zone hydraulic gradient	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone soil-specific b parameter	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C
Length of contaminated zone parallel to the aquifer flow	P	2	m	113	Diameter of an 10,000 m^2 contaminated zone
Water table drop rate	P	3	m/yr	0.783	Site specific value applicable to the RSNGS site as reported in the FSAR, Appendix 2C
Well-pump intake depth (below water table)	P	2	m	23	Site specific value applicable to the RSNGS site as reported in the FSAR, Appendix 2C
Well pumping rate	B, P	2	m^3/yr	Not Used	Well pumping rate is not used with the Mass-Balance model for water transport selected – well pumping rate is used to calculated a dilution factor when the Non- Dispersion model is selected.
Model: non-dispersion or mass balance	NA	3	-	MB	The mass-balance model was chosen as the most conservative since it assumes that all of the radionuclides released from the contaminated zone are withdrawn through the well.
Evapotranspiration coefficient	P	2	-	Uniform distribution	NUREG/CR-6697, Attachment C
Humidity in air	P	3	g/m^3	Not Used	Not used when the Radon exposure pathway is suppressed
Average annual wind speed	P	2	m/s	3.13	7 mph average annual wind speed for the years of 1930 – 1996 reported by the National Climatic Data Center for Stockton, CA (http://www.ncdc.noaa.gov/oa/documentlibrary/wind/wind1996.pdf)
Precipitation rate	P	2	m/yr	0.38	Mean annual average rainfall measured at Sacramento and Stockton

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Irrigation mode	B	3	-	Overhead	Behavioral value - ditch irrigation is not the principal method of irrigation in the local region
Irrigation rate	B	3	m/yr	0.2	Behavioral RESRAD v6.22 default value acceptable for this evaluation
Runoff coefficient	P	2	-	Uniform distribution	NUREG/CR-6697, Attachment C
Watershed area for nearby stream or pond	P	3	m^2	1.00E+07	The majority of RSNGS site drains into Clay Creek
Accuracy for water soil computation	NA	3	-	0.001	Default RESRAD v6.22 value acceptable for this evaluation
Ingestion					
Fruit, vegetable, and grain consumption rate	M, B	2	kg/yr	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Leafy vegetable consumption	M, B	3	kg/yr	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Milk consumption	M, B	2	L/yr	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Meat and poultry consumption	M, B	3	kg/yr	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Fish consumption rate	M, B	3	kg/yr	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Other seafood consumption rate	M, B	3	kg/yr	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Aquatic food contaminated fraction	B, P	2	-	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Soil ingestion rate	M, B	2	g/yr	Triangular distribution	NUREG/CR-6697, Attachment C
Drinking water intake	M, B	2	L/yr	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Storage time for fruits, non-leafy vegetables, and grain	B	3	d	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Storage time for leafy vegetables	B	3	d	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Storage time for milk	B	3	d	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Storage time for meat	B	3	d	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Storage time for fish	B	3	d	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Storage time for crustacea and mollusks	B	3	d	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Storage time for well water	B	3	d	1	Behavioral RESRAD v6.22 default value
Storage time for surface water	B	3	d	1	Behavioral RESRAD v6.22 default value
Storage time for livestock fodder	B	3	d	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Drinking water contaminated fraction	B, P	3	-	1	Default RESRAD v6.22 Behavioral/Physical value acceptable for this evaluation
Household water contaminated fraction	B, P	3	-	Not Used	Not used when the radon exposure pathway is suppressed
Livestock water contaminated fraction	B, P	3	-	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Irrigation water contaminated fraction	B, P	3	-	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Plant food contaminated fraction	B, P	3	-	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Meat contaminated fraction	B, P	3	-	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Milk contaminated fraction	B, P	3	-	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Livestock fodder intake rate for meat	M	3	kg/d	Not Used	Not used with meat and milk exposure pathways suppressed in accordance with the Industrial Worker Scenario
Livestock fodder intake rate for milk	M	3	kg/d	Not Used	Not used with meat and milk exposure pathways suppressed in accordance with the Industrial Worker Scenario
Livestock water intake rate for meat	M	3	L/d	Not Used	Not used with meat and milk exposure pathways suppressed in accordance with the Industrial Worker Scenario
Livestock water intake rate for milk	M	3	L/d	Not Used	Not used with meat and milk exposure pathways suppressed in accordance with the Industrial Worker Scenario
Livestock intake of soil	M	3	kg/d	Not Used	Not used with meat and milk exposure pathways suppressed in accordance with the Industrial Worker Scenario
Mass loading for foliar deposition	P	3	g/m^3	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Depth of soil mixing layer	P	2	m	Triangular distribution	NUREG/CR-6697, Attachment C
Depth of roots	P	1	m	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Groundwater fractional usage for drinking water	B, P	3	-	1	Default RESRAD v6.22 Behavioral/Physical priority 3 value acceptable for this evaluation
Groundwater fractional usage for household water	B, P	3	-	Not Used	Not used when the radon exposure pathway is suppressed
Groundwater fractional usage for livestock water	B, P	3	-	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Groundwater fractional usage for irrigation water	B, P	3	-	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Wet weight crop yield for non-leafy plants	P	2	kg/m^2	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Wet weight crop yield for leafy plants	P	3	kg/m^2	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Wet weight crop yield for fodder	P	3	kg/m^2	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Length of growing season for non-leafy vegetables	P	3	yr	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Length of growing season for leafy vegetables	P	3	yr	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Length of growing season for fodder	P	3	yr	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Translocation factor for non-leafy vegetables	P	3	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Translocation factor for leafy vegetables	P	3	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Translocation factor for fodder	P	3	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Weathering removal constant	P	2	1/yr	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Dry foliar interception fraction for non-leafy vegetables	P	3	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Dry foliar interception fraction for leafy vegetables	P	3	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Dry foliar interception fraction for fodder	P	3	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Wet foliar interception fraction for non-leafy vegetables	P	3	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Wet foliar interception fraction for leafy vegetables	P	2	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Wet foliar interception fraction for fodder	P	3	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Slope factor – external	M	3	(risk/yr)/(pCi/g)	Nuclide specific	Metabolic RESRAD v6.22 default priority 3 value acceptable for this evaluation
Slope factor – inhalation	M	3	risk/pCi	Nuclide specific	Metabolic RESRAD v6.22 default priority 3 value acceptable for this evaluation
Slope factor – ingestion	M	3	risk/pCi	Nuclide specific	Metabolic RESRAD v6.22 default priority 3 value acceptable for this evaluation
Plant transfer factor	P	1	-	Nuclide specific - Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Meat transfer factor	P	2	(pCi/kg)/(pCi/d)	Nuclide specific - Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Milk transfer factor	P	2	(pCi/L)/(pCi/d)	Nuclide specific - Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Bioaccumulation factor for fish	P	2	(pCi/kg)/(pCi/L)	Nuclide specific - Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Bioaccumulation factor for crustacea and mollusks	P	3	(pCi/kg)/(pCi/L)	Nuclide specific - Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Occupancy (Inhalation & External Parameters)					
Inhalation rate	M, B	3	m^3/yr	Triangular distribution	NUREG/CR-6697, Attachment C
Inhalation dose conversion factors	M	3	mrem/pCi	Nuclide specific	Metabolic RESRAD v6.22 default value
Ingestion dose conversion factors	M	3	mrem/pCi	Nuclide specific	Metabolic RESRAD v6.22 default value
Mass loading for inhalation	P, B	2	g/m^3	Continuous linear distribution	NUREG/CR-6697, Attachment C
Indoor dust filtration factor	P, B	2	-	Uniform distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
External gamma shielding factor	P	2	-	0.397	Assigned sensitive parameter value based on sensitivity analysis of detected radionuclides
Building foundation thickness	P	3	m	Not Used	The Radon Exposure Pathway is not used
Building foundation bulk density	P	3	g/m^3	Not Used	The Radon Exposure Pathway is not used
Building foundation total porosity	P	3	-	Not Used	The Radon Exposure Pathway is not used
Building foundation volumetric water content	P	3	-	Not Used	The Radon Exposure Pathway is not used
Building foundation radon diffusion coefficient	P	3	m^2/s	Not Used	The Radon Exposure Pathway is not used
Contaminated soil zone radon diffusion coefficient	P	3	m^2/s	Not Used	The Radon Exposure Pathway is not used
Radon vertical dimension of mixing	P	3	m	Not Used	The Radon Exposure Pathway is not used
Building air exchange rate	P, B	3	1/hr	Not Used	The Radon Exposure Pathway is not used
Building (room) height	P	3	m	Not Used	The Radon Exposure Pathway is not used
Building indoor area factor	P	3	-	Not Used	The Radon Exposure Pathway is not used
Foundation depth below ground surface	P	3	m	Not Used	The Radon Exposure Pathway is not used
Radon-222 emanation coefficient	P	3	-	Not Used	The Radon Exposure Pathway is not used
Radon-220 emanation coefficient	P	3	-	Not Used	The Radon Exposure Pathway is not used
Indoor time fraction	B	3	-	0.114	50% of a work year (2000 hrs.) spent inside an industrial facility
Outdoor time fraction	B	3	-	0.114	50% of a work year (2000 hrs.) spent outside at an industrial facility

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Exposure duration	B	3	yr	30	Behavioral RESRAD v6.22 default priority 3 value acceptable for this evaluation

[1]Parameter Classification: P = Physical; B = Behavioral; M = Metabolic
[2]1 = high priority parameter, 2 = medium priority parameter, 3 = low priority parameter

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Parameter	Priority[1]	Distribution	Distribution's Statistical Parameters[2]				Sensitivity Results		
			1	2	3	4	PRCC Value	25% or 75% Quartile	Assigned Parameter Value
Density of saturated zone	1	Normal	1.578	0.158	-	-	-0.11	No	Distribution
Contaminated zone distribution coefficient for H-3	1	Truncated lognormal-n	-2.81	0.5	0.001	0.999	0.05	No	Distribution
Contaminated zone distribution coefficient for Na-22	1	Truncated lognormal-n	5.04	3.22	0.001	0.999	0.29	75%	1310
Contaminated zone distribution coefficient for Fe-55	1	Truncated lognormal-n	5.34	2.67	0.001	0.999	0.05	No	Distribution
Contaminated zone distribution coefficient for Ni-59	1	Truncated lognormal-n	6.05	1.46	0.001	0.999	0.06	No	Distribution
Contaminated zone distribution coefficient for Nb-94	1	Truncated lognormal-n	5.94	3.22	0.001	0.999	0.34	75%	3290
Contaminated zone distribution coefficient for Tc-99	1	Truncated lognormal-n	-0.67	3.16	0.001	0.999	0.00	No	Distribution
Contaminated zone distribution coefficient for Ag-108m	1	Truncated lognormal-n	5.38	2.10	0.001	0.999	0.30	75%	877
Contaminated zone distribution coefficient for Sb-125	1	Truncated lognormal-n	5.94	3.22	0.001	0.999	0.37	75%	3300
Contaminated zone distribution coefficient for Pm-147	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.02	No	Distribution
Contaminated zone distribution coefficient for Sm-147	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.04	No	Distribution
Contaminated zone distribution coefficient for Eu-152	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.41	75%	7080
Contaminated zone distribution coefficient for Eu-154	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.28	75%	7090
Contaminated zone distribution coefficient for Eu-155	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.05	No	Distribution
Contaminated zone distribution coefficient for Gd-152	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.02	No	Distribution
Contaminated zone distribution coefficient for Np-237	1	Truncated lognormal-n	2.84	2.25	0.001	0.999	0.72	75%	76.9
Contaminated zone distribution coefficient for Th-228	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	-0.03	No	Distribution
Contaminated zone distribution coefficient for Th-229	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	0.13	No	Distribution
Contaminated zone distribution coefficient for Th-230	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	-0.05	No	Distribution
Contaminated zone distribution coefficient for Th-232	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	0.02	No	Distribution
Contaminated zone distribution coefficient for U-233	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	-0.02	No	Distribution
Contaminated zone distribution coefficient for U-234	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	0.05	No	Distribution

Parameter	Priority[1]	Distribution	Distribution's Statistical Parameters[2]				Sensitivity Results		
			1	2	3	4	PRCC Value	25% or 75% Quartile	Assigned Parameter Value
Contaminated zone distribution coefficient for U-235	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	0.07	No	Distribution
Contaminated zone distribution coefficient for U-236	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	0.09	No	Distribution
Contaminated zone distribution coefficient for U-238	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	0.02	No	Distribution
Contaminated zone distribution coefficient for Pu-238	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	0.03	No	Distribution
Contaminated zone distribution coefficient for Pu-239	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	0.01	No	Distribution
Contaminated zone distribution coefficient for Pu-240	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	-0.03	No	Distribution
Contaminated zone distribution coefficient for Pu-241	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	0.10	No	Distribution
Contaminated zone distribution coefficient for Pu-242	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	0.00	No	Distribution
Contaminated zone distribution coefficient for Pb-210	1	Truncated lognormal-n	7.78	2.76	0.001	0.999	0.06	No	Distribution
Contaminated zone distribution coefficient for Ra-226	1	Truncated lognormal-n	8.17	1.70	0.001	0.999	-0.16	No	Distribution
Contaminated zone distribution coefficient for Ra-228	1	Truncated lognormal-n	8.17	1.70	0.001	0.999	-0.03	No	Distribution
Contaminated zone distribution coefficient for Ac-227	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.00	No	Distribution
Contaminated zone distribution coefficient for Pa-231	1	Truncated lognormal-n	5.94	3.22	0.001	0.999	-0.15	No	Distribution
Contaminated zone distribution coefficient for Am-241	1	Truncated lognormal-n	7.28	3.15	0.001	0.999	0.01	No	Distribution
Contaminated zone distribution coefficient for Cm-244	1	Truncated lognormal-n	8.82	1.82	0.001	0.999	-0.03	No	Distribution
Unsaturated zone 1 distribution coefficient for H-3	1	Truncated lognormal-n	-2.81	0.5	0.001	0.999	0.01	No	Distribution
Unsaturated zone 1 distribution coefficient for Na-22	1	Truncated lognormal-n	5.04	3.22	0.001	0.999	0.04	No	Distribution
Unsaturated zone 1 distribution coefficient for Fe-55	1	Truncated lognormal-n	5.34	2.67	0.001	0.999	0.05	No	Distribution
Unsaturated zone 1 distribution coefficient for Ni-59	1	Truncated lognormal-n	6.05	1.46	0.001	0.999	0.07	No	Distribution
Unsaturated zone 1 distribution coefficient for Nb-94	1	Truncated lognormal-n	5.94	3.22	0.001	0.999	0.08	No	Distribution
Unsaturated zone 1 distribution coefficient for Tc-99	1	Truncated lognormal-n	-0.67	3.16	0.001	0.999	-0.03	No	Distribution

Parameter	Priority[1]	Distribution	Distribution's Statistical Parameters[2]				Sensitivity Results		
			1	2	3	4	PRCC Value	25% or 75% Quartile	Assigned Parameter Value
Unsaturated zone 1 distribution coefficient for Ag-108m	1	Truncated lognormal-n	5.38	2.10	0.001	0.999	0.02	No	Distribution
Unsaturated zone 1 distribution coefficient for Sb-125	1	Truncated lognormal-n	5.94	3.22	0.001	0.999	0.02	No	Distribution
Unsaturated zone 1 distribution coefficient for Pm-147	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	-0.07	No	Distribution
Unsaturated zone 1 distribution coefficient for Sm-147	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.03	No	Distribution
Unsaturated zone 1 distribution coefficient for Eu-152	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	-0.10	No	Distribution
Unsaturated zone 1 distribution coefficient for Eu-154	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.04	No	Distribution
Unsaturated zone 1 distribution coefficient for Eu-155	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	-0.01	No	Distribution
Unsaturated zone 1 distribution coefficient for Gd-152	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	-0.11	No	Distribution
Unsaturated zone 1 distribution coefficient for Np-237	1	Truncated lognormal-n	2.84	2.25	0.001	0.999	-0.09	No	Distribution
Unsaturated zone 1 distribution coefficient for Th-228	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	0.14	No	Distribution
Unsaturated zone 1 distribution coefficient for Th-229	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	-0.06	No	Distribution
Unsaturated zone 1 distribution coefficient for Th-230	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	-0.11	No	Distribution
Unsaturated zone 1 distribution coefficient for Th-232	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	-0.13	No	Distribution
Unsaturated zone 1 distribution coefficient for U-233	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	0.08	No	Distribution
Unsaturated zone 1 distribution coefficient for U-234	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	-0.07	No	Distribution
Unsaturated zone 1 distribution coefficient for U-235	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	0.01	No	Distribution
Unsaturated zone 1 distribution coefficient for U-236	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	-0.19	No	Distribution
Unsaturated zone 1 distribution coefficient for U-238	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	0.01	No	Distribution
Unsaturated zone 1 distribution coefficient for Pu-238	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	0.08	No	Distribution
Unsaturated zone 1 distribution coefficient for Pu-239	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	0.04	No	Distribution
Unsaturated zone 1 distribution coefficient for Pu-240	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	0.01	No	Distribution

Parameter	Priority[1]	Distribution	Distribution's Statistical Parameters[2]				Sensitivity Results		
			1	2	3	4	PRCC Value	25% or 75% Quartile	Assigned Parameter Value
Unsaturated zone 1 distribution coefficient for Pu-241	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	-0.16	No	Distribution
Unsaturated zone 1 distribution coefficient for Pu-242	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	-0.05	No	Distribution
Unsaturated zone 1 distribution coefficient for Pb-210	1	Truncated lognormal-n	7.78	2.76	0.001	0.999	-0.02	No	Distribution
Unsaturated zone 1 distribution coefficient for Ra-226	1	Truncated lognormal-n	8.17	1.70	0.001	0.999	-0.01	No	Distribution
Unsaturated zone 1 distribution coefficient for Ra-228	1	Truncated lognormal-n	8.17	1.70	0.001	0.999	-0.08	No	Distribution
Unsaturated zone 1 distribution coefficient for Ac-227	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	-0.12	No	Distribution
Unsaturated zone 1 distribution coefficient for Pa-231	1	Truncated lognormal-n	5.94	3.22	0.001	0.999	-0.12	No	Distribution
Unsaturated zone 1 distribution coefficient for Am-241	1	Truncated lognormal-n	7.28	3.15	0.001	0.999	-0.02	No	Distribution
Unsaturated zone 1 distribution coefficient for Cm-244	1	Truncated lognormal-n	8.82	1.82	0.001	0.999	-0.01	No	Distribution
Unsaturated zone 2 distribution coefficient for H-3	1	Truncated lognormal-n	-2.81	0.5	0.001	0.999	0.11	No	Distribution
Unsaturated zone 2 distribution coefficient for Na-22	1	Truncated lognormal-n	5.04	3.22	0.001	0.999	0.08	No	Distribution
Unsaturated zone 2 distribution coefficient for Fe-55	1	Truncated lognormal-n	5.34	2.67	0.001	0.999	-0.06	No	Distribution
Unsaturated zone 2 distribution coefficient for Ni-59	1	Truncated lognormal-n	6.05	1.46	0.001	0.999	-0.10	No	Distribution
Unsaturated zone 2 distribution coefficient for Nb-94	1	Truncated lognormal-n	5.94	3.22	0.001	0.999	0.00	No	Distribution
Unsaturated zone 2 distribution coefficient for Tc-99	1	Truncated lognormal-n	-0.67	3.16	0.001	0.999	0.09	No	Distribution
Unsaturated zone 2 distribution coefficient for Ag-108m	1	Truncated lognormal-n	5.38	2.10	0.001	0.999	0.02	No	Distribution
Unsaturated zone 2 distribution coefficient for Sb-125	1	Truncated lognormal-n	5.94	3.22	0.001	0.999	0.00	No	Distribution
Unsaturated zone 2 distribution coefficient for Pm-147	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.09	No	Distribution
Unsaturated zone 2 distribution coefficient for Sm-147	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.11	No	Distribution
Unsaturated zone 2 distribution coefficient for Eu-152	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	-0.05	No	Distribution
Unsaturated zone 2 distribution coefficient for Eu-154	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	-0.01	No	Distribution

Parameter	Priority[1]	Distribution	Distribution's Statistical Parameters[2]				Sensitivity Results		
			1	2	3	4	PRCC Value	25% or 75% Quartile	Assigned Parameter Value
Unsaturated zone 2 distribution coefficient for Eu-155	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.03	No	Distribution
Unsaturated zone 2 distribution coefficient for Gd-152	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	-0.03	No	Distribution
Unsaturated zone 2 distribution coefficient for Np-237	1	Truncated lognormal-n	2.84	2.25	0.001	0.999	0.14	No	Distribution
Unsaturated zone 2 distribution coefficient for Th-228	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	0.14	No	Distribution
Unsaturated zone 2 distribution coefficient for Th-229	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	0.06	No	Distribution
Unsaturated zone 2 distribution coefficient for Th-230	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	-0.14	No	Distribution
Unsaturated zone 2 distribution coefficient for Th-232	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	0.08	No	Distribution
Unsaturated zone 2 distribution coefficient for U-233	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	0.06	No	Distribution
Unsaturated zone 2 distribution coefficient for U-234	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	0.06	No	Distribution
Unsaturated zone 2 distribution coefficient for U-235	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	-0.04	No	Distribution
Unsaturated zone 2 distribution coefficient for U-236	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	0.17	No	Distribution
Unsaturated zone 2 distribution coefficient for U-238	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	0.02	No	Distribution
Unsaturated zone 2 distribution coefficient for Pu-238	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	-0.06	No	Distribution
Unsaturated zone 2 distribution coefficient for Pu-239	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	-0.07	No	Distribution
Unsaturated zone 2 distribution coefficient for Pu-240	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	0.08	No	Distribution
Unsaturated zone 2 distribution coefficient for Pu-241	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	-0.04	No	Distribution
Unsaturated zone 2 distribution coefficient for Pu-242	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	-0.01	No	Distribution
Unsaturated zone 2 distribution coefficient for Pb-210	1	Truncated lognormal-n	7.78	2.76	0.001	0.999	-0.12	No	Distribution
Unsaturated zone 2 distribution coefficient for Ra-226	1	Truncated lognormal-n	8.17	1.70	0.001	0.999	0.14	No	Distribution
Unsaturated zone 2 distribution coefficient for Ra-228	1	Truncated lognormal-n	8.17	1.70	0.001	0.999	-0.06	No	Distribution
Unsaturated zone 2 distribution coefficient for Ac-227	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.12	No	Distribution

Parameter	Priority[1]	Distribution	Distribution's Statistical Parameters[2]				Sensitivity Results		
			1	2	3	4	PRCC Value	25% or 75% Quartile	Assigned Parameter Value
Unsaturated zone 2 distribution coefficient for Pa-231	1	Truncated lognormal-n	5.94	3.22	0.001	0.999	-0.11	No	Distribution
Unsaturated zone 2 distribution coefficient for Am-241	1	Truncated lognormal-n	7.28	3.15	0.001	0.999	-0.06	No	Distribution
Unsaturated zone 2 distribution coefficient for Cm-244	1	Truncated lognormal-n	8.82	1.82	0.001	0.999	-0.03	No	Distribution
Unsaturated zone 3 distribution coefficient for H-3	1	Truncated lognormal-n	-2.81	0.5	0.001	0.999	-0.09	No	Distribution
Unsaturated zone 3 distribution coefficient for Na-22	1	Truncated lognormal-n	5.04	3.22	0.001	0.999	-0.10	No	Distribution
Unsaturated zone 3 distribution coefficient for Fe-55	1	Truncated lognormal-n	5.34	2.67	0.001	0.999	-0.04	No	Distribution
Unsaturated zone 3 distribution coefficient for Ni-59	1	Truncated lognormal-n	6.05	1.46	0.001	0.999	0.05	No	Distribution
Unsaturated zone 3 distribution coefficient for Nb-94	1	Truncated lognormal-n	5.94	3.22	0.001	0.999	-0.07	No	Distribution
Unsaturated zone 3 distribution coefficient for Tc-99	1	Truncated lognormal-n	-0.67	3.16	0.001	0.999	-0.02	No	Distribution
Unsaturated zone 3 distribution coefficient for Ag-108m	1	Truncated lognormal-n	5.38	2.10	0.001	0.999	0.03	No	Distribution
Unsaturated zone 3 distribution coefficient for Sb-125	1	Truncated lognormal-n	5.94	3.22	0.001	0.999	0.09	No	Distribution
Unsaturated zone 3 distribution coefficient for Pm-147	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.09	No	Distribution
Unsaturated zone 3 distribution coefficient for Sm-147	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.06	No	Distribution
Unsaturated zone 3 distribution coefficient for Eu-152	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	-0.02	No	Distribution
Unsaturated zone 3 distribution coefficient for Eu-154	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	-0.09	No	Distribution
Unsaturated zone 3 distribution coefficient for Eu-155	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	-0.10	No	Distribution
Unsaturated zone 3 distribution coefficient for Gd-152	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.01	No	Distribution
Unsaturated zone 3 distribution coefficient for Np-237	1	Truncated lognormal-n	2.84	2.25	0.001	0.999	-0.10	No	Distribution
Unsaturated zone 3 distribution coefficient for Th-228	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	0.05	No	Distribution
Unsaturated zone 3 distribution coefficient for Th-229	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	-0.14	No	Distribution
Unsaturated zone 3 distribution coefficient for Th-230	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	-0.07	No	Distribution

Parameter	Priority[1]	Distribution	Distribution's Statistical Parameters[2]				Sensitivity Results		
			1	2	3	4	PRCC Value	25% or 75% Quartile	Assigned Parameter Value
Unsaturated zone 3 distribution coefficient for Th-232	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	0.10	No	Distribution
Unsaturated zone 3 distribution coefficient for U-233	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	0.00	No	Distribution
Unsaturated zone 3 distribution coefficient for U-234	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	-0.13	No	Distribution
Unsaturated zone 3 distribution coefficient for U-235	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	0.09	No	Distribution
Unsaturated zone 3 distribution coefficient for U-236	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	0.09	No	Distribution
Unsaturated zone 3 distribution coefficient for U-238	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	0.02	No	Distribution
Unsaturated zone 3 distribution coefficient for Pu-238	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	0.00	No	Distribution
Unsaturated zone 3 distribution coefficient for Pu-239	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	-0.09	No	Distribution
Unsaturated zone 3 distribution coefficient for Pu-240	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	-0.06	No	Distribution
Unsaturated zone 3 distribution coefficient for Pu-241	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	-0.07	No	Distribution
Unsaturated zone 3 distribution coefficient for Pu-242	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	0.06	No	Distribution
Unsaturated zone 3 distribution coefficient for Pb-210	1	Truncated lognormal-n	7.78	2.76	0.001	0.999	-0.16	No	Distribution
Unsaturated zone 3 distribution coefficient for Ra-226	1	Truncated lognormal-n	8.17	1.70	0.001	0.999	0.15	No	Distribution
Unsaturated zone 3 distribution coefficient for Ra-228	1	Truncated lognormal-n	8.17	1.70	0.001	0.999	-0.02	No	Distribution
Unsaturated zone 3 distribution coefficient for Ac-227	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	-0.05	No	Distribution
Unsaturated zone 3 distribution coefficient for Pa-231	1	Truncated lognormal-n	5.94	3.22	0.001	0.999	-0.16	No	Distribution
Unsaturated zone 3 distribution coefficient for Am-241	1	Truncated lognormal-n	7.28	3.15	0.001	0.999	-0.10	No	Distribution
Unsaturated zone 3 distribution coefficient for Cm-244	1	Truncated lognormal-n	8.82	1.82	0.001	0.999	-0.06	No	Distribution
Unsaturated zone 4 distribution coefficient for H-3	1	Truncated lognormal-n	-2.81	0.5	0.001	0.999	0.14	No	Distribution
Unsaturated zone 4 distribution coefficient for Na-22	1	Truncated lognormal-n	5.04	3.22	0.001	0.999	0.05	No	Distribution
Unsaturated zone 4 distribution coefficient for Fe-55	1	Truncated lognormal-n	5.34	2.67	0.001	0.999	-0.09	No	Distribution

Parameter	Priority[1]	Distribution	Distribution's Statistical Parameters[2]				Sensitivity Results		
			1	2	3	4	PRCC Value	25% or 75% Quartile	Assigned Parameter Value
Unsaturated zone 4 distribution coefficient for Ni-59	1	Truncated lognormal-n	6.05	1.46	0.001	0.999	0.13	No	Distribution
Unsaturated zone 4 distribution coefficient for Nb-94	1	Truncated lognormal-n	5.94	3.22	0.001	0.999	-0.07	No	Distribution
Unsaturated zone 4 distribution coefficient for Tc-99	1	Truncated lognormal-n	-0.67	3.16	0.001	0.999	-0.07	No	Distribution
Unsaturated zone 4 distribution coefficient for Ag-108m	1	Truncated lognormal-n	5.38	2.10	0.001	0.999	0.04	No	Distribution
Unsaturated zone 4 distribution coefficient for Sb-125	1	Truncated lognormal-n	5.94	3.22	0.001	0.999	-0.02	No	Distribution
Unsaturated zone 4 distribution coefficient for Pm-147	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	-0.06	No	Distribution
Unsaturated zone 4 distribution coefficient for Sm-147	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	-0.05	No	Distribution
Unsaturated zone 4 distribution coefficient for Eu-152	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.09	No	Distribution
Unsaturated zone 4 distribution coefficient for Eu-154	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.09	No	Distribution
Unsaturated zone 4 distribution coefficient for Eu-155	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.08	No	Distribution
Unsaturated zone 4 distribution coefficient for Gd-152	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.01	No	Distribution
Unsaturated zone 4 distribution coefficient for Np-237	1	Truncated lognormal-n	2.84	2.25	0.001	0.999	0.00	No	Distribution
Unsaturated zone 4 distribution coefficient for Th-228	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	0.02	No	Distribution
Unsaturated zone 4 distribution coefficient for Th-229	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	-0.01	No	Distribution
Unsaturated zone 4 distribution coefficient for Th-230	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	-0.01	No	Distribution
Unsaturated zone 4 distribution coefficient for Th-232	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	-0.05	No	Distribution
Unsaturated zone 4 distribution coefficient for U-233	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	-0.14	No	Distribution
Unsaturated zone 4 distribution coefficient for U-234	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	0.01	No	Distribution
Unsaturated zone 4 distribution coefficient for U-235	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	0.01	No	Distribution
Unsaturated zone 4 distribution coefficient for U-236	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	-0.02	No	Distribution
Unsaturated zone 4 distribution coefficient for U-238	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	0.03	No	Distribution

Parameter	Priority[1]	Distribution	Distribution's Statistical Parameters[2]				Sensitivity Results		
			1	2	3	4	PRCC Value	25% or 75% Quartile	Assigned Parameter Value
Unsaturated zone 4 distribution coefficient for Pu-238	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	-0.05	No	Distribution
Unsaturated zone 4 distribution coefficient for Pu-239	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	-0.01	No	Distribution
Unsaturated zone 4 distribution coefficient for Pu-240	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	0.11	No	Distribution
Unsaturated zone 4 distribution coefficient for Pu-241	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	-0.01	No	Distribution
Unsaturated zone 4 distribution coefficient for Pu-242	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	-0.11	No	Distribution
Unsaturated zone 4 distribution coefficient for Pb-210	1	Truncated lognormal-n	7.78	2.76	0.001	0.999	0.08	No	Distribution
Unsaturated zone 4 distribution coefficient for Ra-226	1	Truncated lognormal-n	8.17	1.70	0.001	0.999	-0.02	No	Distribution
Unsaturated zone 4 distribution coefficient for Ra-228	1	Truncated lognormal-n	8.17	1.70	0.001	0.999	-0.08	No	Distribution
Unsaturated zone 4 distribution coefficient for Ac-227	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	-0.13	No	Distribution
Unsaturated zone 4 distribution coefficient for Pa-231	1	Truncated lognormal-n	5.94	3.22	0.001	0.999	0.05	No	Distribution
Unsaturated zone 4 distribution coefficient for Am-241	1	Truncated lognormal-n	7.28	3.15	0.001	0.999	0.06	No	Distribution
Unsaturated zone 4 distribution coefficient for Cm-244	1	Truncated lognormal-n	8.82	1.82	0.001	0.999	0.07	No	Distribution
Saturated zone distribution coefficient for H-3	1	Truncated lognormal-n	-2.81	0.5	0.001	0.999	-0.01	No	Distribution
Saturated zone distribution coefficient for Na-22	1	Truncated lognormal-n	5.04	3.22	0.001	0.999	0.01	No	Distribution
Saturated zone distribution coefficient for Fe-55	1	Truncated lognormal-n	5.34	2.67	0.001	0.999	-0.11	No	Distribution
Saturated zone distribution coefficient for Ni-59	1	Truncated lognormal-n	6.05	1.46	0.001	0.999	-0.01	No	Distribution
Saturated zone distribution coefficient for Nb-94	1	Truncated lognormal-n	5.94	3.22	0.001	0.999	-0.21	No	Distribution
Saturated zone distribution coefficient for Tc-99	1	Truncated lognormal-n	-0.67	3.16	0.001	0.999	0.11	No	Distribution
Saturated zone distribution coefficient for Ag-108m	1	Truncated lognormal-n	5.38	2.10	0.001	0.999	-0.05	No	Distribution
Saturated zone distribution coefficient for Sb-125	1	Truncated lognormal-n	5.94	3.22	0.001	0.999	-0.10	No	Distribution
Saturated zone distribution coefficient for Pm-147	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	-0.08	No	Distribution

Parameter	Priority[1]	Distribution	Distribution's Statistical Parameters[2]				Sensitivity Results		
			1	2	3	4	PRCC Value	25% or 75% Quartile	Assigned Parameter Value
Saturated zone distribution coefficient for Sm-147	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.15	No	Distribution
Saturated zone distribution coefficient for Eu-152	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	-0.04	No	Distribution
Saturated zone distribution coefficient for Eu-154	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	-0.05	No	Distribution
Saturated zone distribution coefficient for Eu-155	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	-0.02	No	Distribution
Saturated zone distribution coefficient for Gd-152	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	-0.03	No	Distribution
Saturated zone distribution coefficient for Np-237	1	Truncated lognormal-n	2.84	2.25	0.001	0.999	0.01	No	Distribution
Saturated zone distribution coefficient for Th-228	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	-0.08	No	Distribution
Saturated zone distribution coefficient for Th-229	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	-0.10	No	Distribution
Saturated zone distribution coefficient for Th-230	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	-0.02	No	Distribution
Saturated zone distribution coefficient for Th-232	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	0.05	No	Distribution
Saturated zone distribution coefficient for U-233	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	0.05	No	Distribution
Saturated zone distribution coefficient for U-234	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	0.05	No	Distribution
Saturated zone distribution coefficient for U-235	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	-0.01	No	Distribution
Saturated zone distribution coefficient for U-236	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	-0.09	No	Distribution
Saturated zone distribution coefficient for U-238	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	-0.03	No	Distribution
Saturated zone distribution coefficient for Pu-238	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	0.14	No	Distribution
Saturated zone distribution coefficient for Pu-239	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	-0.03	No	Distribution
Saturated zone distribution coefficient for Pu-240	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	0.04	No	Distribution
Saturated zone distribution coefficient for Pu-241	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	-0.03	No	Distribution
Saturated zone distribution coefficient for Pu-242	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	0.05	No	Distribution
Saturated zone distribution coefficient for Pb-210	1	Truncated lognormal-n	7.78	2.76	0.001	0.999	0.17	No	Distribution

Parameter	Priority[1]	Distribution	Distribution's Statistical Parameters[2]				Sensitivity Results		
			1	2	3	4	PRCC Value	25% or 75% Quartile	Assigned Parameter Value
Saturated zone distribution coefficient for Ra-226	1	Truncated lognormal-n	8.17	1.70	0.001	0.999	-0.02	No	Distribution
Saturated zone distribution coefficient for Ra-228	1	Truncated lognormal-n	8.17	1.70	0.001	0.999	0.20	No	Distribution
Saturated zone distribution coefficient for Ac-227	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.04	No	Distribution
Saturated zone distribution coefficient for Pa-231	1	Truncated lognormal-n	5.94	3.22	0.001	0.999	0.01	No	Distribution
Saturated zone distribution coefficient for Am-241	1	Truncated lognormal-n	7.28	3.15	0.001	0.999	0.09	No	Distribution
Saturated zone distribution coefficient for Cm-244	1	Truncated lognormal-n	8.82	1.82	0.001	0.999	-0.02	No	Distribution
Contaminated zone b parameter	2	Bounded lognormal-n	1.06	0.66	0.5	30	0.07	No	Distribution
Contaminated zone erosion rate	2	Continuous logarithmic	Default[3]	-	-	-	-0.45	25%	0.000759
Contaminated zone total porosity	2	Truncated normal	0.425	0.0867	0.001	0.999	0.10	No	Distribution
Contaminated zone hydraulic conductivity	2	Bounded lognormal-n	2.66	0.475	3.302	62.2	-0.22	No	Distribution
Depth of soil mixing layer	2	Triangular	0.0	0.6	0.15	-	-0.93	25%	0.149
Drinking water intake	2	Truncated lognormal-n	6.015	0.489	0.001	0.999	0.06	No	Distribution
Evapotranspiration coefficient	2	Uniform	0.5	0.75	-	-	0.17	No	Distribution
Indoor dust filtration factor	2	Uniform	0.15	0.95	-	-	0.13	No	Distribution
Mass loading for inhalation	2	Continuous linear	Default[3]	-	-	-	0.19	No	Distribution
Runoff coefficient	2	Uniform	0.1	0.8	-	-	0.24	No	Distribution
Saturated zone b parameter	2	Bounded lognormal-n	1.06	0.66	0.5	30	0.11	No	Distribution
Saturated zone hydraulic gradient	2	Bounded lognormal-n	-5.11	1.77	7E-05	0.5	0.09	No	Distribution
Soil ingestion rate	2	Triangular	0	36.5	18.3	-	0.92	75%	23.6
Unsaturated zone 1 density	2	Normal	1.33	0.202	-	-	-0.06	No	Distribution
Unsaturated zone 1 effective porosity	2	Truncated normal	0.425	0.110	0.0839	0.766	0.05	No	Distribution
Unsaturated zone 1 hydraulic conductivity	2	Bounded lognormal-n	2.66	0.475	3.302	62.2	0.11	No	Distribution
Unsaturated zone 1 b parameter	2	Bounded lognormal-n	1.16	0.140	2.06	4.89	-0.04	No	Distribution
Unsaturated zone 1 total porosity	2	Truncated normal	0.46	0.11	0.1161	0.7959	0.17	No	Distribution
Unsaturated zone 2 density	2	Normal	1.578	0.158	-	-	-0.08	No	Distribution
Unsaturated zone 2 effective porosity	2	Truncated normal	0.383	0.0610	0.195	0.572	0.01	No	Distribution
Unsaturated zone 2 hydraulic conductivity	2	Bounded lognormal-n	1.398	1.842	110	5870	0.03	No	Distribution
Unsaturated zone 2 b parameter	2	Bounded lognormal-n	-0.0253	0.216	0.501	1.90	0.23	No	Distribution
Unsaturated zone 2 total porosity	2	Truncated normal	0.43	0.06	0.2446	0.6154	0.05	No	Distribution
Unsaturated zone 3 density	2	Normal	1.33	0.202	-	-	-0.18	No	Distribution

Parameter	Priority[1]	Distribution	Distribution's Statistical Parameters[2]				Sensitivity Results		
			1	2	3	4	PRCC Value	25% or 75% Quartile	Assigned Parameter Value
Unsaturated zone 3 hydraulic conductivity	2	Bounded lognormal-n	2.66	0.475	3.302	62.2	0.11	No	Distribution
Unsaturated zone 3 b parameter	2	Bounded lognormal-n	1.16	0.140	2.06	4.89	-0.12	No	Distribution
Unsaturated zone 4 density	2	Normal	1.578	0.158	-	-	0.11	No	Distribution
Unsaturated zone 4 hydraulic conductivity	2	Bounded lognormal-n	1.398	1.842	110	5870	-0.03	No	Distribution
Unsaturated zone 4 b parameter	2	Bounded lognormal-n	-0.0253	0.216	0.501	1.90	0.14	No	Distribution
Unsaturated zone 1 field capacity	3	Truncated normal	0.236	0.0578	0.0575	0.415	-0.06	No	Distribution
Unsaturated zone 2 field capacity	3	Truncated normal	0.0607	0.0150	0.0280	0.124	-0.03	No	Distribution
Inhalation rate	3	Triangular	4,380	13,100	8,400	-	0.07	No	Distribution

Notes:

[1]1 = high priority parameter, 2 = medium priority parameter

[2]Distribution's Statistical Parameter
Bounded lognormal-n: 1 = underlying mean value, 2 = underlying standard deviation, 3 = lower limit, 4 = upper limit
Lognormal: 1 = mean, 2 = error factor
Normal: 1 = mean, 2 = standard deviation

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Contamination					
Thickness of contaminated zone	P	2	m	0.15, 0.5, 1, 1.5, 2, 2.5, 3	Assigned value
Area of contaminated zone	P	2	m^2	10,000	Example contaminated zone area used to calculate DCGLs in DTBD-04-005
Shape of the contaminated zone	P	3	-	Circular	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Initial concentration of principal radionuclides in soil	P	2	pCi/g	Various	Table 6-1 maximum allowed radionuclide mixture concentrations
Initial concentration of radionuclides present in ground water	P	3	pCi/L	0	Not Used for this evaluation
Leach rate	P	3	1/yr	0	Default Physical value to invoke the calculation of this parameter via a first-order leaching model that uses the value of the soil/water distribution coefficient in the contaminated zone
Solubility limit	P	3	mol/L	0	Default Physical value – not used by RESRAD v6.22 with leach rate flag set to 0
Time since placement of material	P	3	yr	0	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Times for calculation	P	3	yr	1, 3, 10, 30, 100, 300, 1000	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Contaminated zone density	P	1	g/cm^3	1.47	Deterministic sensitive parameter value determined in DTBD-04-005
Contaminated zone distribution coefficient for C-14	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Ni-63	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Co-60	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Contaminated zone distribution coefficient for Sr-90	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Cs-134	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Cs-137	P	1	cm^3/g	2130	Deterministic sensitive parameter value determined in DTBD-05-005
Use plant/soil ratio	NA	3	Check box	No	For purposes of this evaluation, the code should not be allowed to calculate the distribution coefficients from the plant root uptake factors because they are calculated probabilistically
Contaminated zone field capacity	P	3	-	0.2	Default RESRAD v6.22 Priority 3 Physical priority 3 value acceptable for this evaluation
Contaminated zone erosion rate	P,B	2	m/yr	Continuous logarithmic distribution	NUREG/CR-6697, Attachment C
Contaminated zone total porosity	P	2	-	Truncated normal distribution	NUREG/CR-6697, Attachment C
Contaminated zone hydraulic conductivity	P	2	m/yr	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 3.4-1 for silt
Contaminated zone b parameter	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C
Carbon-Model Parameters					
Thickness of evasion layer of C-14 in soil	P	2	m	Triangular distribution	NUREG/CR-6697, Attachment C
C-14 evasion flux rate from soil	P	3	1/s	7E-07	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
C-12 concentration in local water	P	3	g/cm^3	2E-05	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
C-12 concentration in contaminated soil	P	3	g/g	0.03	Default RESRAD v6.22 Priority 3 Physical value acceptable for this evaluation
Fraction of vegetation carbon absorbed from soil	P	3	-	0.02	Default RESRAD v6.22 Priority 3 Physical value acceptable for this evaluation
Fraction of vegetation carbon absorbed from air	P	3	-	0.98	Default RESRAD v6.22 Priority 3 Physical value acceptable for this evaluation
C-12 evasion flux rate from soil	P	3	1/s	1E-10	Default RESRAD v6.22 Priority 3 Physical value acceptable for this evaluation
Grain fraction in beef cattle feed	B	3	-	0.8	Default RESRAD v6.22 Priority 3 Physical value acceptable for this evaluation
Grain fraction in milk cow feed	B	3	-	0.2	Default RESRAD v6.22 Priority 3 Physical value acceptable for this evaluation
DCF correction factor for gaseous forms of C-14	P	3	-	88.94	Default RESRAD v6.22 Priority 3 Physical value acceptable for this evaluation
Soil					
Cover depth	P	2	m	0	The contamination is assumed to be on surface soil
Density of cover material	P	1	g/cm^3	Not Used	A cover is not used in this evaluation
Cover total porosity	P	3	-	Not Used	Radon is not used in this evaluation
Cover volumetric water content	P	3	-	Not Used	Radon is not used in this evaluation
Cover radon diffusion coefficient	P	3	m^2/s	Not Used	Radon is not used in this evaluation
Cover erosion rate	P,B	2	m/yr	Not Used	A cover is not used in this evaluation
Number of unsaturated zones	P	3	-	4, 3, 3, 3, 3, 3, 3	Simplified hydrogeological model assumption
Unsaturated zone 1 thickness	P	1	m	0.305, 0, 0, 0, 0, 0, 0	Thickness of silt layer above the sand layer
Unsaturated zone 1 density	P	2	g/cm^3	Normal distribution	NUREG/CR-6767, Attachment C, Table C-1 distribution for silt

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Unsaturated zone 1 distribution coefficient for C-14	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Ni-63	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Co-60	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Sr-90	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Cs-134	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Cs-137	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 total porosity	P	2	-	Truncated normal distribution	NUREG/CR-6697, Attachment C, Table 3.2-1 distribution for silt
Unsaturated zone 1 effective porosity	P	2	-	Truncated normal distribution	NUREG/CR-6767, Attachment A, Table A-7 distribution for silt
Unsaturated zone 1 field capacity	P	3	-	Truncated normal distribution	NUREG/CR-6767, Attachment A, Table A-7 distribution for silt
Unsaturated zone 1 hydraulic conductivity	P	2	m/yr	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 3.4-1 for silt
Unsaturated zone 1 soil-specific b parameter	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 3.5-1 for silt

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Unsaturated zone 2 thickness	P	1	m	3.05, 3.005, 2.505, 2.005, 1.505, 1.005, 0.505	Thickness of fine sand layer above the siltstone layer
Unsaturated zone 2 density	P	2	g/cm^3	Normal distribution	NUREG/CR-6767, Attachment C, Table C-1 distribution for sand
Unsaturated zone 2 distribution coefficient for C-14	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Ni-63	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Co-60	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Sr-90	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Cs-134	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Cs-137	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 total porosity	P	2	-	Truncated normal distribution	NUREG/CR-6697, Attachment C, Table 3.2-1 distribution for sand
Unsaturated zone 2 effective porosity	P	2	-	Truncated normal distribution	NUREG/CR-6767, Attachment A, Table A-1 distribution for sand
Unsaturated zone 2 field capacity	P	3	-	Truncated normal distribution	NUREG/CR-6767, Attachment A, Table A-1 distribution for sand

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Unsaturated zone 2 hydraulic conductivity	P	2	m/yr	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 3.4-1 for sand
Unsaturated zone 2 soil-specific b parameter	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 3.5-1 for sand
Unsaturated zone 3 thickness	P	1	m	25.60	Thickness of siltstone layer
Unsaturated zone 3 density	P	2	g/cm^3	Normal distribution	NUREG/CR-6767, Attachment C, Table C-1 distribution for silt
Unsaturated zone 3 distribution coefficient for C-14	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Ni-63	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Co-60	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Sr-90	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Cs-134	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Cs-137	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 total porosity	P	2	-	0.35	RESRAD Data Collection Handbook Table 3.2 arithmetic mean for medium siltstone
Unsaturated zone 3 effective porosity	P	2	-	0.12	RESRAD Data Collection Handbook Table 3.2 arithmetic mean for medium siltstone

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Unsaturated zone 3 field capacity	P	3	-	0.23	Total porosity minus effective porosity per RESRAD Data Collection Handbook, Section 4.1
Unsaturated zone 3 hydraulic conductivity	P	2	m/yr	Bounded lognormal-n	NUREG/CR-6697, Attachment C, Table 3.4-1 for silt
Unsaturated zone 3 soil-specific b parameter	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 3.5-1 for silt
Unsaturated zone 4 thickness	P	1	m	10.82	Thickness of unsaturated sandstone layer
Unsaturated zone 4 density	P	2	g/cm^3	Normal distribution	NUREG/CR-6767, Attachment C, Table C-1 distribution for sand
Unsaturated zone 4 distribution coefficient for C-14	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Ni-63	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Co-60	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Sr-90	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Cs-134	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Cs-137	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 total porosity	P	2	-	0.35	RESRAD Data Collection Handbook Table 3.2 arithmetic mean for sandstone

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Unsaturated zone 4 effective porosity	P	2	-	0.27	RESRAD Data Collection Handbook Table 3.2 arithmetic mean for sandstone
Unsaturated zone 4 field capacity	P	3	-	0.07	Total porosity minus effective porosity per RESRAD Data Collection Handbook, Section 4.1
Unsaturated zone 4 hydraulic conductivity	P	2	m/yr	10	Upper boundary value from RESRAD Data Collection Handbook, Table 5.1 for sandstone
Unsaturated zone 4 soil-specific b parameter	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 3.5-1 for sand
Water					
Density of saturated zone	P	1	g/cm^3	Normal distribution	NUREG/CR-6767, Attachment C, Table C-1 distribution for sand
Saturated zone distribution coefficient for C-14	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Ni-63	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Co-60	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Sr-90	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Cs-134	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Cs-137	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone total porosity	P	1	-	0.34	RESRAD Data Collection Handbook Table 3.2 arithmetic mean for sandstone

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Saturated zone effective porosity	P	1	-	0.27	RESRAD Data Collection Handbook Table 3.2 arithmetic mean for sandstone
Saturated zone field capacity	P	3	-	0.07	Total porosity minus effective porosity per RESRAD Data Collection Handbook, Section 4.1
Saturated zone hydraulic conductivity	P	1	m/yr	10	Upper boundary value from RESRAD Data Collection Handbook, Table 5.1 for sandstone
Saturated zone hydraulic gradient	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone soil-specific b parameter	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C
Length of contaminated zone parallel to the aquifer flow	P	2	m	113	Diameter of the 10,000 m^2 contaminated zone
Water table drop rate	P	3	m/yr	0.783	Site specific value applicable to the RSNGS site as reported in the FSAR, Appendix 2C
Well-pump intake depth (below water table)	P	2	m	23	Site specific value applicable to the RSNGS site as reported in the FSAR, Appendix 2C
Well pumping rate	B, P	2	m^3/yr	Not Used	Well pumping rate is not used with the Mass-Balance model for water transport selected – well pumping rate is used to calculated a dilution factor when the Non- Dispersion model is selected.
Model: non-dispersion or mass balance	NA	3	-	MB	The mass-balance model was chosen as the most conservative since it assumes that all of the radionuclides released from the contaminated zone are withdrawn through the well.
Evapotranspiration coefficient	P	2	-	Uniform distribution	NUREG/CR-6697, Attachment C
Humidity in air	P	3	g/m^3	Not Used	Not used when the Radon exposure pathway is suppressed

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Average annual wind speed	P	2	m/s	3.13	7 mph average annual wind speed for the years of 1930 – 1996 reported by the National Climatic Data Center for Stockton, CA (http://www.ncdc.noaa.gov/oa/documentlibrary/wind/wind1996.pdf)
Precipitation rate	P	2	m/yr	0.38	Mean annual average rainfall measured at Sacramento and Stockton
Irrigation mode	B	3	-	Overhead	Behavioral value - ditch irrigation is not the principal method of irrigation in the local region
Irrigation rate	B	3	m/yr	0.2	Behavioral RESRAD v6.22 default priority 3 value acceptable for this evaluation
Runoff coefficient	P	2	-	Uniform distribution	NUREG/CR-6697, Attachment C
Watershed area for nearby stream or pond	P	3	m^2	1.00E+07	The majority of RSNGS site drains into Clay Creek
Accuracy for water soil computation	NA	3	-	0.001	Default RESRAD v6.22 priority 3 value acceptable for this evaluation
Ingestion					
Fruit, vegetable, and grain consumption rate	M, B	2	kg/yr	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Leafy vegetable consumption	M, B	3	kg/yr	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Milk consumption	M, B	2	L/yr	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Meat and poultry consumption	M, B	3	kg/yr	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Fish consumption rate	M, B	3	kg/yr	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Other seafood consumption rate	M, B	3	kg/yr	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Soil ingestion rate	M, B	2	g/yr	Triangular distribution	NUREG/CR-6697, Attachment C
Drinking water intake	M, B	2	L/yr	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Storage time for fruits, non-leafy vegetables, and grain	B	3	d	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Storage time for leafy vegetables	B	3	d	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Storage time for milk	B	3	d	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Storage time for meat	B	3	d	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Storage time for fish	B	3	d	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Storage time for crustacea and mollusks	B	3	d	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Storage time for well water	B	3	d	1	Behavioral RESRAD v6.22 default priority 3 value
Storage time for surface water	B	3	d	1	Behavioral RESRAD v6.22 default priority 3 value
Storage time for livestock fodder	B	3	d	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Drinking water contaminated fraction	B, P	3	-	1	Default RESRAD v6.22 Behavioral/Physical priority 3 value acceptable for this evaluation
Household water contaminated fraction	B, P	3	-	Not Used	Not used when the radon exposure pathway is suppressed
Livestock water contaminated fraction	B, P	3	-	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Irrigation water contaminated fraction	B, P	3	-	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Plant food contaminated fraction	B, P	3	-	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Meat contaminated fraction	B, P	3	-	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Milk contaminated fraction	B, P	3	-	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Livestock fodder intake rate for meat	M	3	kg/d	Not Used	Not used with meat and milk exposure pathways suppressed in accordance with the Industrial Worker Scenario
Livestock fodder intake rate for milk	M	3	kg/d	Not Used	Not used with meat and milk exposure pathways suppressed in accordance with the Industrial Worker Scenario
Livestock water intake rate for meat	M	3	L/d	Not Used	Not used with meat and milk exposure pathways suppressed in accordance with the Industrial Worker Scenario
Livestock water intake rate for milk	M	3	L/d	Not Used	Not used with meat and milk exposure pathways suppressed in accordance with the Industrial Worker Scenario
Livestock intake of soil	M	3	kg/d	Not Used	Not used with meat and milk exposure pathways suppressed in accordance with the Industrial Worker Scenario
Mass loading for foliar deposition	P	3	g/m^3	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Depth of soil mixing layer	P	2	m	Triangular distribution	NUREG/CR-6697, Attachment C
Depth of roots	P	1	m	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Groundwater fractional usage for drinking water	B, P	3	-	1	Default RESRAD v6.22 Behavioral/Physical priority 3 value acceptable for this evaluation
Groundwater fractional usage for household water	B, P	3	-	Not Used	Not used when the radon exposure pathway is suppressed
Groundwater fractional usage for livestock water	B, P	3	-	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Groundwater fractional usage for irrigation water	B, P	3	-	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Wet weight crop yield for non-leafy plants	P	2	kg/m^2	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Wet weight crop yield for leafy plants	P	3	kg/m^2	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Wet weight crop yield for fodder	P	3	kg/m^2	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Length of growing season for non-leafy vegetables	P	3	yr	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Length of growing season for leafy vegetables	P	3	yr	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Length of growing season for fodder	P	3	yr	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Translocation factor for non-leafy vegetables	P	3	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Translocation factor for leafy vegetables	P	3	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Translocation factor for fodder	P	3	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Weathering removal constant	P	2	1/yr	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Dry foliar interception fraction for non-leafy vegetables	P	3	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Dry foliar interception fraction for leafy vegetables	P	3	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Dry foliar interception fraction for fodder	P	3	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Wet foliar interception fraction for non-leafy vegetables	P	3	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Wet foliar interception fraction for leafy vegetables	P	2	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Wet foliar interception fraction for fodder	P	3	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Slope factor – external	M	3	(risk/yr)/(pCi/g)	Nuclide specific	Metabolic RESRAD v6.22 default priority 3 value
Slope factor – inhalation	M	3	risk/pCi	Nuclide specific	Metabolic RESRAD v6.22 default priority 3 value
Slope factor – ingestion	M	3	risk/pCi	Nuclide specific	Metabolic RESRAD v6.22 default priority 3 value
Plant transfer factor	P	1	-	Nuclide specific - Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Meat transfer factor	P	2	(pCi/kg)/(pCi/d)	Nuclide specific - Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Milk transfer factor	P	2	(pCi/L)/(pCi/d)	Nuclide specific - Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Bioaccumulation factor for fish	P	2	(pCi/kg)/(pCi/L)	Nuclide specific - Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Bioaccumulation factor for crustacea and mollusks	P	3	(pCi/kg)/(pCi/L)	Nuclide specific - Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Occupancy (Inhalation & External Parameters)					
Inhalation rate	M, B	3	m^3/yr	Triangular distribution	NUREG/CR-6697, Attachment C
Inhalation dose conversion factors	M	3	mrem/pCi	Nuclide Specific	Metabolic RESRAD v6.22 default priority 3 value
Ingestion dose conversion factors	M	3	mrem/pCi	Nuclide Specific	Metabolic RESRAD v6.22 default priority 3 value
Mass loading for inhalation	P, B	2	g/m^3	Continuous linear distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Indoor dust filtration factor	P, B	2	-	Uniform distribution	NUREG/CR-6697, Attachment C
External gamma shielding factor	P	2	-	0.397	Deterministic sensitive parameter value determined in DTBD-05-005
Building foundation thickness	P	3	m	Not Used	The Radon Exposure Pathway is not used
Building foundation bulk density	P	3	g/m^3	Not Used	The Radon Exposure Pathway is not used
Building foundation total porosity	P	3	-	Not Used	The Radon Exposure Pathway is not used
Building foundation volumetric water content	P	3	-	Not Used	The Radon Exposure Pathway is not used
Building foundation radon diffusion coefficient	P	3	m^2/s	Not Used	The Radon Exposure Pathway is not used
Contaminated soil zone radon diffusion coefficient	P	3	m^2/s	Not Used	The Radon Exposure Pathway is not used
Radon vertical dimension of mixing	P	3	m	Not Used	The Radon Exposure Pathway is not used
Building air exchange rate	P, B	3	1/hr	Not Used	The Radon Exposure Pathway is not used
Building (room) height	P	3	m	Not Used	The Radon Exposure Pathway is not used
Building indoor area factor	P	3	-	Not Used	The Radon Exposure Pathway is not used
Foundation depth below ground surface	P	3	m	Not Used	The Radon Exposure Pathway is not used
Radon-222 emanation coefficient	P	3	-	Not Used	The Radon Exposure Pathway is not used
Radon-220 emanation coefficient	P	3	-	Not Used	The Radon Exposure Pathway is not used
Indoor time fraction	B	3	-	0.114	50% of a work year (2000 hrs.) spent inside an industrial facility

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Outdoor time fraction	B	3	-	0.114	50% of a work year (2000 hrs.) spent outside at an industrial facility
Exposure duration	B	3	yr	30	Behavioral RESRAD v6.22 default priority 3 value

[1]Parameter Classification: P = Physical; B = Behavioral; M = Metabolic
[2]1 = high priority parameter, 2 = medium priority parameter, 3 = low priority parameter

Parameter	Priority[1]	Distribution	Distribution's Statistical Parameters[2]			
			1	2	3	4
Density of saturated zone	1	Normal	1.578	0.158	-	-
Contaminated zone distribution coefficient for C-14	1	Truncated lognormal-n	2.40	3.22	0.001	0.999
Contaminated zone distribution coefficient for Ni-63	1	Truncated lognormal-n	6.05	1.46	0.001	0.999
Contaminated zone distribution coefficient for Co-60	1	Truncated lognormal-n	5.46	2.53	0.001	0.999
Contaminated zone distribution coefficient for Sr-90	1	Truncated lognormal-n	3.45	2.12	0.001	0.999
Contaminated zone distribution coefficient for Cs-134	1	Truncated lognormal-n	6.10	2.33	0.001	0.999
Unsaturated zone 1 distribution coefficient for C-14	1	Truncated lognormal-n	2.40	3.22	0.001	0.999
Unsaturated zone 1 distribution coefficient for Ni-63	1	Truncated lognormal-n	6.05	1.46	0.001	0.999
Unsaturated zone 1 distribution coefficient for Co-60	1	Truncated lognormal-n	5.46	2.53	0.001	0.999
Unsaturated zone 1 distribution coefficient for Sr-90	1	Truncated lognormal-n	3.45	2.12	0.001	0.999
Unsaturated zone 1 distribution coefficient for Cs-134	1	Truncated lognormal-n	6.10	2.33	0.001	0.999
Unsaturated zone 1 distribution coefficient for Cs-137	1	Truncated lognormal-n	6.10	2.33	0.001	0.999
Unsaturated zone 2 distribution coefficient for C-14	1	Truncated lognormal-n	2.40	3.22	0.001	0.999
Unsaturated zone 2 distribution coefficient for Ni-63	1	Truncated lognormal-n	6.05	1.46	0.001	0.999
Unsaturated zone 2 distribution coefficient for Co-60	1	Truncated lognormal-n	5.46	2.53	0.001	0.999
Unsaturated zone 2 distribution coefficient for Sr-90	1	Truncated lognormal-n	3.45	2.12	0.001	0.999
Unsaturated zone 2 distribution coefficient for Cs-134	1	Truncated lognormal-n	6.10	2.33	0.001	0.999
Unsaturated zone 2 distribution coefficient for Cs-137	1	Truncated lognormal-n	6.10	2.33	0.001	0.999
Unsaturated zone 3 distribution coefficient for C-14	1	Truncated lognormal-n	2.40	3.22	0.001	0.999
Unsaturated zone 3 distribution coefficient for Ni-63	1	Truncated lognormal-n	6.05	1.46	0.001	0.999
Unsaturated zone 3 distribution coefficient for Co-60	1	Truncated lognormal-n	5.46	2.53	0.001	0.999
Unsaturated zone 3 distribution coefficient for Sr-90	1	Truncated lognormal-n	3.45	2.12	0.001	0.999
Unsaturated zone 3 distribution coefficient for Cs-134	1	Truncated lognormal-n	6.10	2.33	0.001	0.999
Unsaturated zone 3 distribution coefficient for Cs-137	1	Truncated lognormal-n	6.10	2.33	0.001	0.999
Unsaturated zone 4 distribution coefficient for C-14	1	Truncated lognormal-n	2.40	3.22	0.001	0.999
Unsaturated zone 4 distribution coefficient for Ni-63	1	Truncated lognormal-n	6.05	1.46	0.001	0.999
Unsaturated zone 4 distribution coefficient for Co-60	1	Truncated lognormal-n	5.46	2.53	0.001	0.999
Unsaturated zone 4 distribution coefficient for Sr-90	1	Truncated lognormal-n	3.45	2.12	0.001	0.999
Unsaturated zone 4 distribution coefficient for Cs-134	1	Truncated lognormal-n	6.10	2.33	0.001	0.999
Unsaturated zone 4 distribution coefficient for Cs-137	1	Truncated lognormal-n	6.10	2.33	0.001	0.999

Parameter	Priority[1]	Distribution	Distribution's Statistical Parameters[2]			
			1	2	3	4
Saturated zone distribution coefficient for C-14	1	Truncated lognormal-n	2.40	3.22	0.001	0.999
Saturated zone distribution coefficient for Ni-63	1	Truncated lognormal-n	6.05	1.46	0.001	0.999
Saturated zone distribution coefficient for Co-60	1	Truncated lognormal-n	5.46	2.53	0.001	0.999
Saturated zone distribution coefficient for Sr-90	1	Truncated lognormal-n	3.45	2.12	0.001	0.999
Saturated zone distribution coefficient for Cs-134	1	Truncated lognormal-n	6.10	2.33	0.001	0.999
Saturated zone distribution coefficient for Cs-137	1	Truncated lognormal-n	6.10	2.33	0.001	0.999
Contaminated zone b parameter	2	Bounded lognormal-n	1.06	0.66	0.5	30
Contaminated zone erosion rate	2	Continuous logarithmic	Default[3]	-	-	-
Contaminated zone total porosity	2	Truncated normal	0.425	0.0867	0.001	0.999
Contaminated zone hydraulic conductivity	2	Bounded lognormal-n	2.66	0.475	3.302	62.2
Depth of soil mixing layer	2	Triangular	0.0	0.6	0.15	-
Drinking water intake	2	Truncated lognormal-n	6.015	0.489	0.001	0.999
Evapotranspiration coefficient	2	Uniform	0.5	0.75	-	-
Indoor dust filtration factor	2	Uniform	0.15	0.95	-	-
Mass loading for inhalation	2	Continuous linear	Default[3]	-	-	-
Runoff coefficient	2	Uniform	0.1	0.8	-	-
Saturated zone b parameter	2	Bounded lognormal-n	1.06	0.66	0.5	30
Saturated zone hydraulic gradient	2	Bounded lognormal-n	-5.11	1.77	7E-05	0.5
Soil ingestion rate	2	Triangular	0	36.5	18.3	-
Unsaturated zone 1 density	2	Normal	1.33	0.202	-	-
Unsaturated zone 1 effective porosity	2	Truncated normal	0.425	0.110	0.0839	0.766
Unsaturated zone 1 hydraulic conductivity	2	Bounded lognormal-n	2.66	0.475	3.302	62.2
Unsaturated zone 1 b parameter	2	Bounded lognormal-n	1.16	0.140	2.06	4.89
Unsaturated zone 1 total porosity	2	Truncated normal	0.46	0.11	0.1161	0.7959
Unsaturated zone 2 density	2	Normal	1.578	0.158	-	-
Unsaturated zone 2 effective porosity	2	Truncated normal	0.383	0.0610	0.195	0.572
Unsaturated zone 2 hydraulic conductivity	2	Bounded lognormal-n	1.398	1.842	110	5870
Unsaturated zone 2 b parameter	2	Bounded lognormal-n	-0.0253	0.216	0.501	1.90
Unsaturated zone 2 total porosity	2	Truncated normal	0.43	0.06	0.2446	0.6154
Unsaturated zone 3 density	2	Normal	1.33	0.202	-	-
Unsaturated zone 3 hydraulic conductivity	2	Bounded lognormal-n	2.66	0.475	3.302	62.2
Unsaturated zone 3 b parameter	2	Bounded lognormal-n	1.16	0.140	2.06	4.89
Unsaturated zone 4 density	2	Normal	1.578	0.158	-	-
Unsaturated zone 4 hydraulic conductivity	2	Bounded lognormal-n	1.398	1.842	110	5870
Unsaturated zone 4 b parameter	2	Bounded lognormal-n	-0.0253	0.216	0.501	1.90
Thickness of evasion layer of C-14 in soil	2	Triangular	0.5	1.0	0.75	-
Unsaturated zone 1 field capacity	3	Truncated normal	0.236	0.0578	0.0575	0.415
Unsaturated zone 2 field capacity	3	Truncated normal	0.0607	0.0150	0.0280	0.124
Inhalation rate	3	Triangular	4,380	13,100	8,400	-

Notes:

[1]1 = high priority parameter, 2 = medium priority parameter

[2]Distribution's Statistical Parameter

Bounded lognormal-n: 1 = underlying mean value, 2 = underlying standard deviation, 3 = lower limit, 4 = upper limit
Lognormal: 1 = mean, 2 = error factor
Normal: 1 = mean, 2 = standard deviation
Triangular: 1 = minimum, 2 = maximum, 3 = most likely
Truncated lognormal-n: 1 = underlying mean value, 2 = underlying standard deviation, 3 = lower quantile, 4 = upper quantile
Truncated normal: 1 = mean, 2 = standard deviation, 3 = lower quantile, 4 = upper quantile
Uniform: 1 = minimum, 2 = maximum

[3]Default RESRAD v6.22 distribution parameters were used

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Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Contamination					
Thickness of contaminated zone	P	2	m	2	Assigned value for depth of discrete pocket of contamination
Area of contaminated zone	P	2	m^2	100	Assigned surface area of discrete pocket of contamination
Shape of the contaminated zone	P	3	-	Circular	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Initial concentration of principal radionuclides in soil	P	2	pCi/g	Various	Table 6-6 maximum allowable radionuclide mixture concentrations
Initial concentration of radionuclides present in ground water	P	3	pCi/L	0	Not Used for this evaluation
Leach rate	P	3	1/yr	0	Default Physical value to invoke the calculation of this parameter via a first-order leaching model that uses the value of the soil/water distribution coefficient in the contaminated zone
Solubility limit	P	3	mol/L	0	Default Physical value – not used by RESRAD v6.22 with leach rate flag set to 0
Time since placement of material	P	3	yr	0	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Times for calculation	P	3	yr	1, 3, 10, 30, 100, 300, 1000	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Contaminated zone density	P	1	g/cm^3	Truncated normal distribution	NUREG/CR-6767, Attachment C generic distribution due to variations in soil type depending on depth of discrete pocket of contamination
Contaminated zone distribution coefficient for C-14	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Ni-63	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Co-60	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Contaminated zone distribution coefficient for Sr-90	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Cs-134	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Cs-137	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Use plant/soil ratio	NA	3	Check box	No	For purposes of this evaluation, the code should not be allowed to calculate the distribution coefficients from the plant root uptake factors because they are calculated probabilistically
Contaminated zone field capacity	P	3	-	0.2	Default RESRAD v6.22 Priority 3 Physical priority 3 value acceptable for this evaluation
Contaminated zone erosion rate	P,B	2	m/yr	Continuous logarithmic distribution	NUREG/CR-6697, Attachment C (RESRAD default values)
Contaminated zone total porosity	P	2	-	Truncated normal distribution	NUREG/CR-6697, Attachment C generic distribution due to variations in soil type depending on depth of discrete pocket of contamination
Contaminated zone hydraulic conductivity	P	2	m/yr	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C generic distribution due to variations in soil type depending on depth of discrete pocket of contamination
Contaminated zone b parameter	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C generic distribution due to variations in soil type depending on depth of discrete pocket of contamination
Carbon-Model Parameters					
Thickness of evasion layer of C-14 in soil	P	2	m	Triangular distribution	NUREG/CR-6697, Attachment C
C-14 evasion flux rate from soil	P	3	1/s	7E-07	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
C-12 concentration in local water	P	3	g/cm^3	2E-05	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
C-12 concentration in contaminated soil	P	3	g/g	0.03	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Fraction of vegetation carbon absorbed from soil	P	3	-	0.02	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Fraction of vegetation carbon absorbed from air	P	3	-	0.98	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
C-12 evasion flux rate from soil	P	3	1/s	1E-10	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Grain fraction in beef cattle feed	B	3	-	0.8	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Grain fraction in milk cow feed	B	3	-	0.2	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
DCF correction factor for gaseous forms of C-14	P	3	-	88.94	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Soil					
Cover depth	P	2	m	0, 0.25, 0.5, 1, 2.5, 5 and 10	Depth of discrete contamination surface below the soil surface
Density of cover material	P	1	g/cm^3	Truncated normal distribution	NUREG/CR-6767, Attachment C generic distribution due to variations in soil type depending on depth of discrete pocket of contamination
Cover total porosity	P	3	-	Not Used	Radon is not used in this evaluation
Cover volumetric water content	P	3	-	Not Used	Radon is not used in this evaluation
Cover radon diffusion coefficient	P	3	m^2/s	Not Used	Radon is not used in this evaluation
Cover erosion rate	P,B	2	m/yr	Continuous logarithmic distribution	NUREG/CR-6697, Attachment C (RESRAD default values)
Number of unsaturated zones	P	3	-	3, 3, 3, 2, 2, 2 and 2	Simplified hydrogeological model assumptions for various depths of discrete pockets of contamination
Unsaturated zone 1 thickness	P	1	m	1.505, 1.255, 0.755, 0, 0, 0, 0	Thickness of fine soil layer above the siltstone layer

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Unsaturated zone 1 density	P	2	g/cm^3	Truncated normal distribution	NUREG/CR-6767, Attachment C generic distribution due to variations in soil type depending on depth of discrete pocket of contamination
Unsaturated zone 1 distribution coefficient for C-14	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Ni-63	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Co-60	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Sr-90	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Cs-134	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Cs-137	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 total porosity	P	2	-	Truncated normal distribution	NUREG/CR-6697, Attachment C generic distribution due to variations in soil type depending on depth of discrete pocket of contamination
Unsaturated zone 1 effective porosity	P	2	-	Truncated normal distribution	NUREG/CR-6697, Attachment C generic distribution due to variations in soil type depending on depth of discrete pocket of contamination
Unsaturated zone 1 field capacity	P	3	-	0.2	RESRAD default value acceptable for this evaluation
Unsaturated zone 1 hydraulic conductivity	P	2	m/yr	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C generic distribution due to variations in soil type depending on depth of discrete pocket of contamination

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Unsaturated zone 1 soil-specific b parameter	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C generic distribution due to variations in soil type depending on depth of discrete pocket of contamination
Unsaturated zone 2 thickness	P	1	m	25.6, 25.6, 25.6, 25.35, 23.85, 21.35, 16.35	Thickness of siltstone layer
Unsaturated zone 2 density	P	2	g/cm^3	Truncated normal distribution	NUREG/CR-6767, Attachment C generic distribution due to variations in soil type depending on depth of discrete pocket of contamination
Unsaturated zone 2 distribution coefficient for C-14	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Ni-63	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Co-60	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Sr-90	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Cs-134	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Cs-137	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 total porosity	P	2	-	Truncated normal distribution	NUREG/CR-6697, Attachment C generic distribution due to variations in soil type depending on depth of discrete pocket of contamination
Unsaturated zone 2 effective porosity	P	2	-	Truncated normal distribution	NUREG/CR-6697, Attachment C generic distribution due to variations in soil type depending on depth of discrete pocket of contamination

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Unsaturated zone 2 field capacity	P	3	-	0.2	RESRAD default value acceptable for this evaluation
Unsaturated zone 2 hydraulic conductivity	P	2	m/yr	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C generic distribution due to variations in soil type depending on depth of discrete pocket of contamination
Unsaturated zone 2 soil-specific b parameter	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C generic distribution due to variations in soil type depending on depth of discrete pocket of contamination
Unsaturated zone 3 thickness	P	1	m	10.82	Thickness of unsaturated sandstone layer
Unsaturated zone 3 density	P	2	g/cm^3	Truncated normal distribution	NUREG/CR-6767, Attachment C generic distribution due to variations in soil type depending on depth of discrete pocket of contamination
Unsaturated zone 3 distribution coefficient for C-14	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Ni-63	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Co-60	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Sr-90	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Cs-134	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Cs-137	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Unsaturated zone 3 total porosity	P	2	-	Truncated normal distribution	NUREG/CR-6697, Attachment C generic distribution due to variations in soil type depending on depth of discrete pocket of contamination
Unsaturated zone 3 effective porosity	P	2	-	Truncated normal distribution	NUREG/CR-6697, Attachment C generic distribution due to variations in soil type depending on depth of discrete pocket of contamination
Unsaturated zone 3 field capacity	P	3	-	0.2	RESRAD default value acceptable for this evaluation
Unsaturated zone 3 hydraulic conductivity	P	2	m/yr	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C generic distribution due to variations in soil type depending on depth of discrete pocket of contamination
Unsaturated zone 3 soil-specific b parameter	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C generic distribution due to variations in soil type depending on depth of discrete pocket of contamination
Water					
Density of saturated zone	P	1	g/cm^3	Truncated normal distribution	NUREG/CR-6767, Attachment C generic distribution due to variations in soil type depending on depth of discrete pocket of contamination
Saturated zone distribution coefficient for C-14	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Ni-63	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Co-60	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Sr-90	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Cs-134	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Saturated zone distribution coefficient for Cs-137	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone total porosity	P	1	-	Truncated normal distribution	NUREG/CR-6697, Attachment C generic distribution due to variations in soil type depending on depth of discrete pocket of contamination
Saturated zone effective porosity	P	1	-	Truncated normal distribution	NUREG/CR-6697, Attachment C generic distribution due to variations in soil type depending on depth of discrete pocket of contamination
Saturated zone field capacity	P	3	-	0.2	RESRAD default value acceptable for this evaluation
Saturated zone hydraulic conductivity	P	1	m/yr	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C generic distribution due to variations in soil type depending on depth of discrete pocket of contamination
Saturated zone hydraulic gradient	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone soil-specific b parameter	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C
Length of contaminated zone parallel to the aquifer flow	P	2	m	11.3	Diameter of the 100 m^2 contaminated zone
Water table drop rate	P	3	m/yr	0.783	Site specific value applicable to the RSNGS site as reported in the FSAR, Appendix 2C
Well-pump intake depth (below water table)	P	2	m	23	Site specific value applicable to the RSNGS site as reported in the FSAR, Appendix 2C
Well pumping rate	B, P	2	m^3/yr	Not Used	Well pumping rate is not used with the Mass-Balance model for water transport selected – well pumping rate is used to calculated a dilution factor when the Non- Dispersion model is selected.

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Model: non-dispersion or mass balance	NA	3	-	MB	The mass-balance model was chosen as the most conservative since it assumes that all of the radionuclides released from the contaminated zone are withdrawn through the well.
Evapotranspiration coefficient	P	2	-	Uniform distribution	NUREG/CR-6697, Attachment C
Humidity in air	P	3	g/m^3	Not Used	Not used when the Radon exposure pathway is suppressed
Average annual wind speed	P	2	m/s	3.13	7 mph average annual wind speed for the years of 1930 – 1996 reported by the National Climatic Data Center for Stockton, CA (http://www.ncdc.noaa.gov/oa/documentlibrary/wind/wind1996.pdf)
Precipitation rate	P	2	m/yr	0.38	Mean annual average rainfall measured at Sacramento and Stockton
Irrigation mode	B	3	-	Overhead	Behavioral value - ditch irrigation is not the principal method of irrigation in the local region
Irrigation rate	B	3	m/yr	0.2	Behavioral RESRAD v6.22 default priority 3 value acceptable for this evaluation
Runoff coefficient	P	2	-	Uniform distribution	NUREG/CR-6697, Attachment C
Watershed area for nearby stream or pond	P	3	m^2	1.00E+07	The entire RSNGS site drains into Clay Creek
Accuracy for water soil computation	NA	3	-	0.001	Default RESRAD v6.22 priority 3 value acceptable for this evaluation
Ingestion					
Fruit, vegetable, and grain consumption rate	M, B	2	kg/yr	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Leafy vegetable consumption	M, B	3	kg/yr	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Milk consumption	M, B	2	L/yr	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Meat and poultry consumption	M, B	3	kg/yr	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Fish consumption rate	M, B	3	kg/yr	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Other seafood consumption rate	M, B	3	kg/yr	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Aquatic food contaminated fraction	B, P	2	-	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Soil ingestion rate	M, B	2	g/yr	Triangular distribution	NUREG/CR-6697, Attachment C
Drinking water intake	M, B	2	L/yr	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Storage time for fruits, non-leafy vegetables, and grain	B	3	d	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Storage time for leafy vegetables	B	3	d	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Storage time for milk	B	3	d	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Storage time for meat	B	3	d	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Storage time for fish	B	3	d	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Storage time for crustacea and mollusks	B	3	d	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Storage time for well water	B	3	d	1	Behavioral RESRAD v6.22 default value
Storage time for surface water	B	3	d	1	Behavioral RESRAD v6.22 default value
Storage time for livestock fodder	B	3	d	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Drinking water contaminated fraction	B, P	3	-	1	Default RESRAD v6.22 Behavioral/Physical priority 3 value acceptable for this evaluation

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Household water contaminated fraction	B, P	3	-	Not Used	Not used when the radon exposure pathway is suppressed
Livestock water contaminated fraction	B, P	3	-	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Irrigation water contaminated fraction	B, P	3	-	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Plant food contaminated fraction	B, P	3	-	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Meat contaminated fraction	B, P	3	-	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Milk contaminated fraction	B, P	3	-	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Livestock fodder intake rate for meat	M	3	kg/d	Not Used	Not used with meat and milk exposure pathways suppressed in accordance with the Industrial Worker Scenario
Livestock fodder intake rate for milk	M	3	kg/d	Not Used	Not used with meat and milk exposure pathways suppressed in accordance with the Industrial Worker Scenario
Livestock water intake rate for meat	M	3	L/d	Not Used	Not used with meat and milk exposure pathways suppressed in accordance with the Industrial Worker Scenario
Livestock water intake rate for milk	M	3	L/d	Not Used	Not used with meat and milk exposure pathways suppressed in accordance with the Industrial Worker Scenario
Livestock intake of soil	M	3	kg/d	Not Used	Not used with meat and milk exposure pathways suppressed in accordance with the Industrial Worker Scenario
Mass loading for foliar deposition	P	3	g/m^3	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Depth of soil mixing layer	P	2	m	Triangular distribution	NUREG/CR-6697, Attachment C
Depth of roots	P	1	m	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Groundwater fractional usage for drinking water	B, P	3	-	1	Default RESRAD v6.22 Behavioral/Physical priority 3 value acceptable for this evaluation

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Groundwater fractional usage for household water	B, P	3	-	Not Used	Not used when the radon exposure pathway is suppressed
Groundwater fractional usage for livestock water	B, P	3	-	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Groundwater fractional usage for irrigation water	B, P	3	-	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Wet weight crop yield for non-leafy plants	P	2	kg/m^2	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Wet weight crop yield for leafy plants	P	3	kg/m^2	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Wet weight crop yield for fodder	P	3	kg/m^2	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Length of growing season for non-leafy vegetables	P	3	yr	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Length of growing season for leafy vegetables	P	3	yr	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Length of growing season for fodder	P	3	yr	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Translocation factor for non-leafy vegetables	P	3	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Translocation factor for leafy vegetables	P	3	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Translocation factor for fodder	P	3	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Weathering removal constant	P	2	1/yr	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Dry foliar interception fraction for non-leafy vegetables	P	3	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Dry foliar interception fraction for leafy vegetables	P	3	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Dry foliar interception fraction for fodder	P	3	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Wet foliar interception fraction for non-leafy vegetables	P	3	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Wet foliar interception fraction for leafy vegetables	P	2	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Wet foliar interception fraction for fodder	P	3	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Slope factor – external	M	3	(risk/yr)/(pCi/g)	Nuclide specific	Metabolic RESRAD v6.22 default priority 3 value
Slope factor – inhalation	M	3	risk/pCi	Nuclide specific	Metabolic RESRAD v6.22 default priority 3 value
Slope factor – ingestion	M	3	risk/pCi	Nuclide specific	Metabolic RESRAD v6.22 default priority 3 value
Plant transfer factor	P	1	-	Nuclide specific - Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Meat transfer factor	P	2	(pCi/kg)/(pCi/d)	Nuclide specific - Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Milk transfer factor	P	2	(pCi/L)/(pCi/d)	Nuclide specific - Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Bioaccumulation factor for fish	P	2	(pCi/kg)/(pCi/L)	Nuclide specific - Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Bioaccumulation factor for crustacea and mollusks	P	3	(pCi/kg)/(pCi/L)	Nuclide specific - Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Occupancy (Inhalation & External Parameters)					
Inhalation rate	M, B	3	m^3/yr	Triangular distribution	NUREG/CR-6697, Attachment C
Inhalation dose conversion factors	M	3	mrem/pCi	Nuclide specific	Metabolic RESRAD v6.22 default priority 3 value

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Ingestion dose conversion factors	M	3	mrem/pCi	Nuclide specific	Metabolic RESRAD v6.22 default priority 3 value
Mass loading for inhalation	P, B	2	g/m^3	Continuous linear distribution	NUREG/CR-6697, Attachment C
Indoor dust filtration factor	P, B	2	-	Uniform distribution	NUREG/CR-6697, Attachment C
External gamma shielding factor	P	2	-	0.397	Deterministic sensitive parameter value determined in DTBD-05-005
Building foundation thickness	P	3	m	Not Used	The Radon Exposure Pathway is not used
Building foundation bulk density	P	3	g/m^3	Not Used	The Radon Exposure Pathway is not used
Building foundation total porosity	P	3	-	Not Used	The Radon Exposure Pathway is not used
Building foundation volumetric water content	P	3	-	Not Used	The Radon Exposure Pathway is not used
Building foundation radon diffusion coefficient	P	3	m^2/s	Not Used	The Radon Exposure Pathway is not used
Contaminated soil zone radon diffusion coefficient	P	3	m^2/s	Not Used	The Radon Exposure Pathway is not used
Radon vertical dimension of mixing	P	3	m	Not Used	The Radon Exposure Pathway is not used
Building air exchange rate	P, B	3	1/hr	Not Used	The Radon Exposure Pathway is not used
Building (room) height	P	3	m	Not Used	The Radon Exposure Pathway is not used
Building indoor area factor	P	3	-	Not Used	The Radon Exposure Pathway is not used
Foundation depth below ground surface	P	3	m	Not Used	The Radon Exposure Pathway is not used

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Radon-222 emanation coefficient	P	3	-	Not Used	The Radon Exposure Pathway is not used
Radon-220 emanation coefficient	P	3	-	Not Used	The Radon Exposure Pathway is not used
Indoor time fraction	B	3	-	0.114	50% of a work year (2000 hrs.) spent inside an industrial facility
Outdoor time fraction	B	3	-	0.114	50% of a work year (2000 hrs.) spent outside at an industrial facility
Exposure duration	B	3	yr	30	Behavioral RESRAD v6.22 default priority 3 value

[1]Parameter Classification: P = Physical; B = Behavioral; M = Metabolic
[2]1 = high priority parameter, 2 = medium priority parameter, 3 = low priority parameter

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Parameter	Priority[1]	Distribution	Distribution's Statistical Parameters[2]			
			1	2	3	4
Contaminated zone distribution coefficient for C-14	1	Truncated lognormal-n	2.40	3.22	0.001	0.999
Contaminated zone distribution coefficient for Ni-63	1	Truncated lognormal-n	6.05	1.46	0.001	0.999
Contaminated zone distribution coefficient for Co-60	1	Truncated lognormal-n	5.46	2.53	0.001	0.999
Contaminated zone distribution coefficient for Sr-90	1	Truncated lognormal-n	3.45	2.12	0.001	0.999
Contaminated zone distribution coefficient for Cs-134	1	Truncated lognormal-n	6.10	2.33	0.001	0.999
Contaminated zone distribution coefficient for Cs-137	1	Truncated lognormal-n	6.10	2.33	0.001	0.999
Unsaturated zone 1 distribution coefficient for C-14	1	Truncated lognormal-n	2.40	3.22	0.001	0.999
Unsaturated zone 1 distribution coefficient for Ni-63	1	Truncated lognormal-n	6.05	1.46	0.001	0.999
Unsaturated zone 1 distribution coefficient for Co-60	1	Truncated lognormal-n	5.46	2.53	0.001	0.999
Unsaturated zone 1 distribution coefficient for Sr-90	1	Truncated lognormal-n	3.45	2.12	0.001	0.999
Unsaturated zone 1 distribution coefficient for Cs-134	1	Truncated lognormal-n	6.10	2.33	0.001	0.999
Unsaturated zone 1 distribution coefficient for Cs-137	1	Truncated lognormal-n	6.10	2.33	0.001	0.999
Unsaturated zone 2 distribution coefficient for C-14	1	Truncated lognormal-n	2.40	3.22	0.001	0.999
Unsaturated zone 2 distribution coefficient for Ni-63	1	Truncated lognormal-n	6.05	1.46	0.001	0.999
Unsaturated zone 2 distribution coefficient for Co-60	1	Truncated lognormal-n	5.46	2.53	0.001	0.999
Unsaturated zone 2 distribution coefficient for Sr-90	1	Truncated lognormal-n	3.45	2.12	0.001	0.999
Unsaturated zone 2 distribution coefficient for Cs-134	1	Truncated lognormal-n	6.10	2.33	0.001	0.999
Unsaturated zone 2 distribution coefficient for Cs-137	1	Truncated lognormal-n	6.10	2.33	0.001	0.999
Unsaturated zone 3 distribution coefficient for C-14	1	Truncated lognormal-n	2.40	3.22	0.001	0.999
Unsaturated zone 3 distribution coefficient for Ni-63	1	Truncated lognormal-n	6.05	1.46	0.001	0.999
Unsaturated zone 3 distribution coefficient for Co-60	1	Truncated lognormal-n	5.46	2.53	0.001	0.999
Unsaturated zone 3 distribution coefficient for Sr-90	1	Truncated lognormal-n	3.45	2.12	0.001	0.999
Unsaturated zone 3 distribution coefficient for Cs-134	1	Truncated lognormal-n	6.10	2.33	0.001	0.999
Unsaturated zone 3 distribution coefficient for Cs-137	1	Truncated lognormal-n	6.10	2.33	0.001	0.999
Saturated zone distribution coefficient for C-14	1	Truncated lognormal-n	2.40	3.22	0.001	0.999
Saturated zone distribution coefficient for Ni-63	1	Truncated lognormal-n	6.05	1.46	0.001	0.999
Saturated zone distribution coefficient for Co-60	1	Truncated lognormal-n	5.46	2.53	0.001	0.999
Saturated zone distribution coefficient for Sr-90	1	Truncated lognormal-n	3.45	2.12	0.001	0.999
Saturated zone distribution coefficient for Cs-134	1	Truncated lognormal-n	6.10	2.33	0.001	0.999
Saturated zone distribution coefficient for Cs-137	1	Truncated lognormal-n	6.10	2.33	0.001	0.999

Parameter	Priority[1]	Distribution	Distribution's Statistical Parameters[2]			
			1	2	3	4
Cover density	1	Truncated normal	1.52	0.230	0.001	0.999
Cover erosion rate	2	Continuous logarithmic	Default[3]	-	-	-
Contaminated zone density	2	Truncated normal	1.52	0.230	0.001	0.999
Contaminated zone b parameter	2	Bounded lognomal-n	1.06	0.66	0.5	30
Contaminated zone erosion rate	2	Continuous logarithmic	Default[3]	-	-	-
Contaminated zone total porosity	2	Truncated normal	0.425	0.0867	0.001	0.999
Contaminated zone hydraulic conductivity	2	Bounded lognormal-n	2.3	2.11	0.004	9250
Depth of soil mixing layer	2	Triangular	0.0	0.6	0.15	-
Drinking water intake	2	Truncated lognomal-n	6.015	0.489	0.001	0.999
Evapotranspiration coefficient	2	Uniform	0.5	0.75	-	-
Indoor dust filtration factor	2	Uniform	0.15	0.95	-	-
Inhalation rate	3	Triangular	4,380	13,100	8,400	-
Mass loading for inhalation	2	Continuous linear	Default[3]	-	-	-
Soil ingestion rate	2	Triangular	0	36.5	18.3	-
Runoff coefficient	2	Uniform	0.1	0.8	-	-
Density of saturated zone	1	Truncated normal	1.52	0.230	0.001	0.999
Saturated zone b parameter	2	Bounded lognormal-n	1.06	0.66	0.5	30
Saturated zone hydraulic conductivity	2	Bounded lognormal-n	2.3	2.11	0.004	9250
Saturated zone hydraulic gradient	2	Bounded lognormal-n	-5.11	1.77	7E-05	0.5
Saturated zone total porosity	2	Truncated normal	0.425	0.0867	0.001	0.999
Saturated zone effective porosity	2	Truncated normal	0.355	0.0906	0.001	0.999
Unsaturated zone 1 density	2	Truncated normal	1.52	0.230	0.001	0.999
Unsaturated zone 1 total porosity	2	Truncated normal	0.425	0.0867	0.001	0.999
Unsaturated zone 1 effective porosity	2	Truncated normal	0.355	0.0906	0.001	0.999
Unsaturated zone 1 hydraulic conductivity	2	Bounded lognormal-n	2.3	2.11	0.004	9250
Unsaturated zone 1 b parameter	2	Bounded lognormal-n	1.06	0.66	0.5	30
Unsaturated zone 2 density	2	Truncated normal	1.52	0.230	0.001	0.999
Unsaturated zone 2 total porosity	2	Truncated normal	0.425	0.0867	0.001	0.999
Unsaturated zone 2 effective porosity	2	Truncated normal	0.355	0.0906	0.001	0.999
Unsaturated zone 2 hydraulic conductivity	2	Bounded lognormal-n	2.3	2.11	0.004	9250
Unsaturated zone 2 b parameter	2	Bounded lognormal-n	1.06	0.66	0.5	30
Unsaturated zone 3 density	2	Truncated normal	1.52	0.230	0.001	0.999
Unsaturated zone 3 total porosity	2	Truncated normal	0.425	0.0867	0.001	0.999
Unsaturated zone 3 effective porosity	2	Truncated normal	0.355	0.0906	0.001	0.999
Unsaturated zone 3 hydraulic conductivity	2	Bounded lognormal-n	2.3	2.11	0.004	9250
Unsaturated zone 3 b parameter	2	Bounded lognormal-n	1.06	0.66	0.5	30
Thickness of evasion layer of C-14 in soil	2	Triangular	0.5	1.0	0.75	-

Notes:

[1]1 = high priority parameter, 2 = medium priority parameter

[2]Distribution's Statistical Parameter
Bounded lognormal-n: 1 = underlying mean value, 2 = underlying standard deviation, 3 = lower limit, 4 = upper limit
Lognormal: 1 = mean, 2 = error factor
Normal: 1 = mean, 2 = standard deviation
Triangular: 1 = minimum, 2 = maximum, 3 = most likely

Truncated lognormal-n: 1 = underlying mean value, 2 = underlying standard deviation, 3 = lower quantile, 4 = upper quantile
Truncated normal: 1 = mean, 2 = standard deviation, 3 = lower quantile, 4 = upper quantile
Uniform: 1 = minimum, 2 = maximum

[3]Default RESRAD v6.22 distribution parameters were used

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Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
TIME PARAMETERS							
TTIME	Exposure duration	B	3	D	d	365.25	NUREG/CR-5512, Vol. 1
FTIN	Indoor fraction	B	2	D	-	0.267	NUREG/CR-5512, Vol. 3 Section 5.2.2.4
NTIME	Number of times for calculation	P	3	D	-	2	RESRAD-BUILD default Physical priority 3 value
DOSE_TIME	Time	P	3	D	yr	1	NUREG/CR-5512, Vol. 3 Section 5.2.2.4
POINT	Maximum time integration points	P	3	D	-	257	RESRAD-BUILD default Physical priority 3 value
BUILDING PARAMETERS							
NROOM	Number of rooms	P	3	D	-	1	NUREG/CR-5512
UD	Deposition velocity	P	2	S	m/s	Loguniform distribution	NUREG/CR-6755, Section 3.3
DKSUS	Resuspension rate	P, B	1	S	s^{-1}	Loguniform distribution	NUREG/CR-6755, Section 3.1
H	Room height	P	2	S	m	Triangular distribution	NUREG/CR-6755, Appendix A
AREA	Room area	P	2	S	m^2	Triangular distribution	NUREG/CR-6755, Appendix A
LAMBDAT (building); LINPUT (room)	Air exchange rate	B	2	S	1/h	Truncated lognormal-n	NUREG/CR-6755, Section 3.2
Q12 and Q21; Q23 and Q32	Flow rate between rooms	B	3	D	m^3/h	0	This dose model contains only one receptor room
Q10 and Q01; Q20 and Q02; Q30 and Q03	Outdoor inflow and outflow	B, P	3	D	m^3/h	Not used	Outdoor inflow is calculated from room volume and air exchange rate
RECEPTOR PARAMETERS							
ND	Number of receptors	B	3	D	-	1	This dose model contains only one receptor

Parameter							
Name	**Description**	**Class[1]**	**Priority[2]**	**Treatment[3]**	**Units**	**Parameter Value**	**Basis for Parameter Selection**
DLVL	Receptor room	B	3	D	-	1	This dose model contains only one receptor room
DX	Receptor location (x, y, z)	B	3	D	m	3, 3, 1	Center of the room's floor
TWGHT	Receptor time fraction	B	3	D	-	1	NUREG/CR-5512, Vol. 3
BRTRATE	Receptor breathing/inhalation rate	M, B	2	S	m^3/d	Triangular distribution	NUREG/CR-6755, Appendix A
INGE2	Indirect ingestion rate	B	2	S	m^2/h	Loguniform distribution	NUREG/CR-6755, Appendix A
SOURCE PARAMETERS							
NS	Number of sources	P	3	D	-	5	Assumes contamination on four walls plus the floor
Source 1 - Floor							
SLVL	Source room (also primary room)	P	3	D	-	1	This dose model contains only one room
STYPE	Source type	P	3	D	-	Area	NUREG/CR-5512
SDIR	Source direction	P	3	D	-	z	NUREG/CR-5512
SX	Source location (x, y, z)	P	3	D	m	3, 3, 0	X and Y distances are half of the square root of the most likely room area from NUREG/CR-6755, Appendix A, triangular distribution
SAREA	Source area	P	2	D	m^2	36	Most likely room area from NUREG/CR-6755, Appendix A, triangular distribution
AIRFR	Air release fraction	B	2	S	-	Triangular distribution	NUREG/CR-6755, Appendix A
INGE1	Direct ingestion rate	B	2	D	g/h or 1/h	1.34E-06	NUREG/CR-5512, Vol. 3, Section 5.2.3 1.1E-04 m^2/h / 82.03 m^2
RMVFR	Removable fraction	P, B	1	S	-	Triangular distribution	NUREG/CR-6755, Section 3.5

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
RF0	Source lifetime (also time for source removal)	P, B	2	S	d	Triangular distribution	NUREG/CR-6755, Section 3.6
RRF	Radon release fraction	P, B	3	D	-	0	Radon exposure is not regulated by the NRC
RNUCACT	Radionuclide concentration/activity	P	2	D	Act/m^2	1	Allows for proportional DCGL calculation
NREGI0	Number of regions in volume source	P	3	D	-	Not used	A volume source is not used in this dose model
FCONT0	Contaminated region (volume source)	P	3	D	-	Not used	A volume source is not used in this dose model
THICK0	Source region thickness (volume source)	P	2	S	cm	Not used	A volume source is not used in this dose model
DENSI0	Source density (volume source)	P	1	S	g/cm^3	Not used	A volume source is not used in this dose model
EROS0	Source erosion rate (volume source)	P, B	2	S	cm/d	Not used	A volume source is not used in this dose model
POROS0	Source porosity	P	2	S	-	Not used	A volume source is not used in this dose model
EFDIF0	Radon effective diffusion coefficient	P	3	D	m^2/sec	0	Radon exposure is not regulated by the NRC
EMANA0	Radon emanation fraction	P	3	D	-	0	Radon exposure is not regulated by the NRC
MTLS	Source material			D	-	Not used	A volume source is not used in this dose model
Source 2 – West wall							
SLVL	Source room (also primary room)	P	3	D	-	1	This dose model contains only one room
STYPE	Source type	P	3	D	-	Area	NUREG/CR-5512
SDIR	Source direction	P	3	D	-	x	NUREG/CR-5512

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
SX	Source location (x, y, z)	P	3	D	m	0, 3, 1.85	Y distance is half of the square root of the most likely room area and z distance is half of the most likely room height from NUREG/CR-6755, Appendix A, triangular distributions
SAREA	Source area	P	2	D	m/m^2	22.2	Square root of the most likely room area times the most likely room height from NUREG/CR-6755, Appendix A, triangular distributions
AIRFR	Air release fraction	B	2	S	-	Triangular distribution	NUREG/CR-6755, Appendix A
INGE1	Direct ingestion rate	B	2	D	g/h or 1/h	1.34E-06	NUREG/CR-5512, Vol. 3, Section 5.2.3 1.1E0-4 m^2/h / 82.03 m^2
RMVFR	Removable fraction	P, B	1	S	-	Triangular distribution	NUREG/CR-6755, Section 3.5
RF0	Source lifetime (also time for source removal)	P, B	2	S	d	Triangular distribution	NUREG/CR-6755, Section 3.6
RRF	Radon release fraction	P, B	3	D	-	0	Radon exposure is not regulated by the NRC
RNUCACT	Radionuclide concentration/activity	P	2	D	Act/m Act/m^2 Act/g	1	Allows for proportional DCGL calculation
NREGI0	Number of regions in volume source	P	3	D	-	Not used	A volume source is not used in this dose model
FCONT0	Contaminated region (volume source)	P	3	D	-	Not used	A volume source is not used in this dose model
THICK0	Source region thickness (volume source)	P	2	S	cm	Not used	A volume source is not used in this dose model
DENSI0	Source density (volume source)	P	1	S	g/cm^3	Not used	A volume source is not used in this dose model

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
EROS0	Source erosion rate (volume source)	P, B	2	S	cm/d	Not used	A volume source is not used in this dose model
POROS0	Source porosity	P	2	S	-	Not used	A volume source is not used in this dose model
EFDIF0	Radon effective diffusion coefficient	P	3	D	m^2/sec	0	Radon exposure is not regulated by the NRC
EMANA0	Radon emanation fraction	P	3	D	-	0	Radon exposure is not regulated by the NRC
MTLS	Source material			D	-	Not used	A volume source is not used in this dose model
Source 3 – North wall							
SLVL	Source room (also primary room)	P	3	D	-	1	This dose model contains only one room
STYPE	Source type	P	3	D	-	Area	NUREG/CR-5512
SDIR	Source direction	P	3	D	-	y	NUREG/CR-5512
SX	Source location (x, y, z)	P	3	D	m	3, 6, 1.85	X distance is the half of square root of the most likely room area, Y distance is the square root of the most likely room area and Z distance is half of the most likely room height from NUREG/CR-6755, Appendix A, triangular distributions
SAREA	Source area	P	2	D	m/m^2	22.2	Square root of the most likely room area times the most likely room height from NUREG/CR-6755, Appendix A, triangular distributions
AIRFR	Air release fraction	B	2	S	-	Triangular distribution	NUREG/CR-6755, Appendix A
INGE1	Direct ingestion rate	B	2	D	g/h or 1/h	1.34E-06	NUREG/CR-5512, Vol. 3, Section 5.2.3 1.1E-04 m^2/h / 82.03 m^2

Parameter							
Name	**Description**	**Class[1]**	**Priority[2]**	**Treatment[3]**	**Units**	**Parameter Value**	**Basis for Parameter Selection**
RMVFR	Removable fraction	P, B	1	S	-	Triangular distribution	NUREG/CR-6755, Section 3.5
RF0	Source lifetime (also time for source removal)	P, B	2	S	d	Triangular distribution	NUREG/CR-6755, Section 3.6
RRF	Radon release fraction	P, B	3	D	-	0	Radon exposure is not regulated by the NRC
RNUCACT	Radionuclide concentration/activity	P	2	D	Act/m Act/m^2 Act/g	1	Allows for proportional DCGL calculation
NREGI0	Number of regions in volume source	P	3	D	-	Not used	A volume source is not used in this dose model
FCONT0	Contaminated region (volume source)	P	3	D	-	Not used	A volume source is not used in this dose model
THICK0	Source region thickness (volume source)	P	2	S	cm	Not used	A volume source is not used in this dose model
DENSI0	Source density (volume source)	P	1	S	g/cm^3	Not used	A volume source is not used in this dose model
EROS0	Source erosion rate (volume source)	P, B	2	S	cm/d	Not used	A volume source is not used in this dose model
POROS0	Source porosity	P	2	S	-	Not used	A volume source is not used in this dose model
EFDIF0	Radon effective diffusion coefficient	P	3	D	m^2/sec	0	Radon exposure is not regulated by the NRC
EMANA0	Radon emanation fraction	P	3	D	-	0	Radon exposure is not regulated by the NRC
MTLS	Source material			D	-	Not used	A volume source is not used in this dose model
Source 4 – East wall							
SLVL	Source room (also primary room)	P	3	D	-	1	This dose model contains only one room
STYPE	Source type	P	3	D	-	Area	NUREG/CR-5512
SDIR	Source direction	P	3	D	-	x	NUREG/CR-5512

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
SX	Source location	P	3	D	m	6, 3, 1.85	X distance is the square root of the most likely room area, Y distance is half of the square root of the most likely room area and Z distance is half of the most likely room height from NUREG/CR-6755, Appendix A, triangular distributions
SAREA	Source area	P	2	D	m/m^2	22.2	Square root of the most likely room area times the most likely room height from NUREG/CR-6755, Appendix A, triangular distributions
AIRFR	Air release fraction	B	2	S	-	Triangular distribution	NUREG/CR-6755, Appendix A
INGE1	Direct ingestion rate	B	2	D	g/h or 1/h	1.34E-06	NUREG/CR-5512, Vol. 3, Section 5.2.3 1.1E-04 m^2/h / 82.03 m^2
RMVFR	Removable fraction	P, B	1	S	-	Triangular distribution	NUREG/CR-6755, Section 3.5
RF0	Source lifetime (also time for source removal)	P, B	2	S	d	Triangular distribution	NUREG/CR-6755, Section 3.6
RRF	Radon release fraction	P, B	3	D	-	0	Radon exposure is not regulated by the NRC
RNUCACT	Radionuclide concentration/activity	P	2	D	Act/m Act/m^2 Act/g	1	Allows for proportional DCGL calculation
NREGI0	Number of regions in volume source	P	3	D	-	Not used	A volume source is not used in this dose model
FCONT0	Contaminated region (volume source)	P	3	D	-	Not used	A volume source is not used in this dose model
THICK0	Source region thickness (volume source)	P	2	S	cm	Not used	A volume source is not used in this dose model

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
DENSI0	Source density (volume source)	P	1	S	g/cm^3	Not used	A volume source is not used in this dose model
EROS0	Source erosion rate (volume source)	P, B	2	S	cm/d	Not used	A volume source is not used in this dose model
POROS0	Source porosity	P	2	S	-	Not used	A volume source is not used in this dose model
EFDIF0	Radon effective diffusion coefficient	P	3	D	m^2/sec	0	Radon exposure is not regulated by the NRC
EMANA0	Radon emanation fraction	P	3	D	-	0	Radon exposure is not regulated by the NRC
MTLS	Source material			D	-	Not used	A volume source is not used in this dose model
Source 5 – South wall							
SLVL	Source room (also primary room)	P	3	D	-	1	This dose model contains only one room
STYPE	Source type	P	3	D	-	Area	NUREG/CR-5512
SDIR	Source direction	P	3	D	-	y	NUREG/CR-5512
SX	Source location	P	3	D	m	3, 0, 1.85	X and Y distances are half of the square root of the most likely room area and Z distance is half of the most likely room height from NUREG/CR-6755, Appendix A, triangular distributions
SAREA	Source area	P	2	D	m/m^2	22.2	Square root of the most likely room area times the most likely room height from NUREG/CR-6755, Appendix A, triangular distributions
AIRFR	Air release fraction	B	2	S	-	Triangular distribution	NUREG/CR-6755, Appendix A
INGE1	Direct ingestion rate	B	2	D	g/h or 1/h	1.34E-06	NUREG/CR-5512, Vol. 3, Section 5.2.3 1.1E-04 m^2/h / 82.03 m^2

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
RMVFR	Removable fraction	P, B	1	S	-	Triangular distribution	NUREG/CR-6755, Section 3.5
RF0	Source lifetime (also time for source removal)	P, B	2	S	d	Triangular distribution	NUREG/CR-6755, Section 3.6
RRF	Radon release fraction	P, B	3	D	-	0	Radon exposure is not regulated by the NRC
RNUCACT	Radionuclide concentration/activity	P	2	D	Act/m Act/m^2 Act/g	1	Allows for proportional DCGL calculation
NREGI0	Number of regions in volume source	P	3	D	-	Not used	A volume source is not used in this dose model
FCONT0	Contaminated region (volume source)	P	3	D	-	Not used	A volume source is not used in this dose model
THICK0	Source region thickness (volume source)	P	2	S	cm	Not used	A volume source is not used in this dose model
DENSI0	Source density (volume source)	P	1	S	g/cm^3	Not used	A volume source is not used in this dose model
EROS0	Source erosion rate (volume source)	P, B	2	S	cm/d	Not used	A volume source is not used in this dose model
POROS0	Source porosity	P	2	S	-	Not used	A volume source is not used in this dose model
EFDIF0	Radon effective diffusion coefficient	P	3	D	m^2/sec	0	Radon exposure is not regulated by the NRC
EMANA0	Radon emanation fraction	P	3	D	-	0	Radon exposure is not regulated by the NRC
MTLS	Source material			D	-	Not used	A volume source is not used in this dose model
SHIELDING PARAMETERS							
DSTH	Shielding thickness	P, B	2	S	cm	0	Shielding is not used in this dose model
DSDEN	Shielding density	P	1	S	g/cm^3	0	Shielding is not used in this dose model

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
MTLC	Shielding material	P	3	D	-	None	Shielding is not used in this dose model
TRITIUM MODEL PARAMETERS							
DRYTHICK	Dry zone thickness	P	3		cm	Not Used	This parameter is not used for a surface source
H3THICK	Wet + dry zone thickness	P	2	S	cm	Not Used	This parameter is not used for a surface source
H3VOLFRACT	Volumetric water content	P	2	S	-	Not Used	This parameter is not used for a surface source
H3RMVF	Water fraction available for vaporization	P	2	S	-	Not Used	This parameter is not used for a surface source
HUMIDITY	Humidity	P, B	2	S	g/m^3	Not Used	This parameter is not used for a surface source

[1]Parameter Classification: P = Physical; B = Behavioral; M = Metabolic
[2]1 = high priority parameter, 2 = medium priority parameter, 3 = low priority parameter
[3]D = Deterministic treatment, S = Stochastic treatment

Parameter	Priority[1]	Distribution	Distribution's Statistical Parameters[2]				PRCC[3]	25% or 75% Quartile	Assigned Parameter Value
			1	2	3	4			
Resuspension rate	1	Loguniform	2.5E-11	1.3E-05			-0.30	25%	4.15E-09
Removable fraction	1	Triangular	0.0	1.0	0.1		0.94	75%	0.552
Deposition velocity	2	Loguniform	2.7E-06	2.7E-03			0.27	75%	4.78E-04
Room height	2	Triangular	2.4	9.1	3.7		-0.18	25%	3.89
Room area	2	Triangular	3	900	36		-0.40	25%	137
Air exchange rate	2	Truncated lognormal-n	0.4187	0.88	0.001	0.999	-0.29	25%	0.835
Receptor breathing/inhalation rate	2	Triangular	12	46	33.6		0.18	75%	35.7
Indirect ingestion rate	2	Loguniform	2.8E-05	2.9E-04			0.11	75%	1.61E-04
Air release fraction	2	Triangular	1E-06	1	0.07		0.21	75%	0.517
Source lifetime	2	Triangular	1,000	100,000	10,000		0.21	75%	52800

Notes:

[1] 1 = high priority parameter, 2 = medium priority parameter

[2] Distribution's Statistical Parameter
Loguniform: 1 = minimum, 2 = maximum
Triangular: 1 = minimum, 2 = maximum, 3 = most likely
Truncated lognormal-n: 1 = underlying mean value, 2 = underlying standard deviation, 3 = lower quantile, 4 = upper quantile

[3] PRCC = Partial ranked correlation coefficient for Time 1

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	Radionuclide											
	H-3		C-14		Na-22		Fe-55		Ni-59		Co-60	
Rank	Parameter	PRCC	Parameter	PRCC	Parameter	PRCC	Parameter	PRCC	Parameter	PRCC	Parameter	PRCC
1	RMVFR(S1)	0.94	RMVFR(S1)	0.93	RMVFR(S1)	0.92	RMVFR(S1)	0.94	RMVFR(S1)	0.93	RMVFR(S1)	0.93
2	RMVFR(S3)	0.87	RMVFR(S3)	0.85	RMVFR(S3)	0.86	RMVFR(S3)	0.87	RMVFR(S3)	0.84	RMVFR(S3)	0.87
3	RMVFR(S2)	0.87	RMVFR(S5)	0.85	RMVFR(S5)	0.85	RMVFR(S2)	0.87	RMVFR(S5)	0.84	RMVFR(S5)	0.86
4	RMVFR(S5)	0.86	RMVFR(S2)	0.85	RMVFR(S2)	0.84	RMVFR(S5)	0.86	RMVFR(S2)	0.84	RMVFR(S2)	0.86
5	RMVFR(S4)	0.86	RMVFR(S4)	0.85	RMVFR(S4)	0.84	RMVFR(S4)	0.86	RMVFR(S4)	0.83	RMVFR(S4)	0.85
6			UD	0.13	RF0(S1)	0.34	AREA	-0.11	AREA	-0.23	AREA	-0.19
7					RF0(S4)	0.16			BRTRATE	0.12	RF0(S1)	0.17
8					RF0(S2)	0.14			H	-0.11		
9					AREA	-0.11						
10					RF0(S3)	0.11						
11												
12												
13												
14												
15												

	Radionuclide											
	Ni-63		Sr-90		Nb-94		Tc-99		Ag-108m		Sb-125	
Rank	Parameter	PRCC	Parameter	PRCC	Parameter	PRCC	Parameter	PRCC	Parameter	PRCC	Parameter	PRCC
1	RMVFR(S1)	0.93	RMVFR(S1)	0.94	RMVFR(S1)	0.77	RMVFR(S1)	0.93	RMVFR(S1)	0.80	RMVFR(S1)	0.93
2	RMVFR(S3)	0.86	RMVFR(S3)	0.87	RMVFR(S5)	0.65	RMVFR(S3)	0.85	RMVFR(S5)	0.69	RMVFR(S3)	0.87
3	RMVFR(S2)	0.85	RMVFR(S2)	0.86	RMVFR(S3)	0.65	RMVFR(S5)	0.85	RMVFR(S3)	0.69	RMVFR(S5)	0.86
4	RMVFR(S5)	0.85	RMVFR(S5)	0.86	RMVFR(S2)	0.64	RMVFR(S2)	0.84	RMVFR(S2)	0.67	RMVFR(S2)	0.86
5	RMVFR(S4)	0.85	RMVFR(S4)	0.86	RMVFR(S4)	0.61	RMVFR(S4)	0.84	RMVFR(S4)	0.65	RMVFR(S4)	0.85
6	AREA	-0.21	AREA	-0.17	AREA	-0.37	AREA	-0.16	AREA	-0.34	RF0(S1)	0.23
7	BRTRATE	0.11			DKSUS	-0.30	UD	0.12	DKSUS	-0.29	AREA	-0.14
8					LAMBDAT	-0.29			UD	0.27	RF0(S4)	0.13
9					UD	0.27			LAMBDAT	-0.24	RF0(S2)	0.11
10					AIRFR(S4)	0.21			AIRFR(S4)	0.21		
11					AIRFR(S5)	0.20			RF0(S1)	0.20		
12					H	-0.17			AIRFR(S5)	0.19		
13					RF0(S1)	0.15			H	-0.18		
14					BRTRATE	0.15			BRTRATE	0.12		
15												

	Radionuclide											
	Cs-134		Cs-137		Pm-147		Eu-152		Eu-154		Eu-155	
Rank	Parameter	PRCC	Parameter	PRCC	Parameter	PRCC	Parameter	PRCC	Parameter	PRCC	Parameter	PRCC
1	RMVFR(S1)	0.94	RMVFR(S1)	0.94	RMVFR(S1)	0.92	RMVFR(S1)	0.88	RMVFR(S1)	0.91	RMVFR(S1)	0.93
2	RMVFR(S3)	0.87	RMVFR(S3)	0.87	RMVFR(S3)	0.83	RMVFR(S3)	0.79	RMVFR(S3)	0.83	RMVFR(S3)	0.85
3	RMVFR(S5)	0.87	RMVFR(S5)	0.86	RMVFR(S2)	0.83	RMVFR(S5)	0.78	RMVFR(S5)	0.82	RMVFR(S2)	0.84
4	RMVFR(S2)	0.87	RMVFR(S2)	0.86	RMVFR(S5)	0.81	RMVFR(S2)	0.77	RMVFR(S2)	0.82	RMVFR(S5)	0.84
5	RMVFR(S4)	0.86	RMVFR(S4)	0.86	RMVFR(S4)	0.81	RMVFR(S4)	0.76	RMVFR(S4)	0.81	RMVFR(S4)	0.84
6					AREA	-0.37	AREA	-0.40	AREA	-0.39	AREA	-0.34
7					LAMBDAT	-0.18	LAMBDAT	-0.23	LAMBDAT	-0.20	BRTRATE	0.16
8					BRTRATE	0.18	RF0(S1)	0.23	RF0(S1)	0.18	LAMBDAT	-0.15
9					AIRFR(S5)	0.12	AIRFR(S5)	0.18	BRTRATE	0.16	AIRFR(S4)	0.12
10					AIRFR(S4)	0.12	H	-0.17	AIRFR(S4)	0.15		
11							AIRFR(S4)	0.17	AIRFR(S5)	0.15		
12							UD	0.16	H	-0.15		
13							BRTRATE	0.15	UD	0.11		
14							DKSUS	-0.12				
15							RF0(S2)	0.11				
16												
17												

	Radionuclide											
	Np-237		Pu-238		Pu-239		Pu-240		Pu-241		Am-241	
Rank	Parameter	PRCC	Parameter	PRCC	Parameter	PRCC	Parameter	PRCC	Parameter	PRCC	Parameter	PRCC
1	RMVFR(S1)	0.84	RMVFR(S1)	0.85	RMVFR(S1)	0.79	RMVFR(S1)	0.80	RMVFR(S1)	0.86	RMVFR(S1)	0.82
2	RMVFR(S4)	0.69	RMVFR(S2)	0.71	RMVFR(S2)	0.64	RMVFR(S2)	0.64	RMVFR(S2)	0.74	RMVFR(S4)	0.67
3	RMVFR(S2)	0.69	RMVFR(S4)	0.71	RMVFR(S5)	0.62	RMVFR(S3)	0.63	RMVFR(S4)	0.73	RMVFR(S2)	0.67
4	RMVFR(S3)	0.68	RMVFR(S3)	0.70	RMVFR(S3)	0.62	RMVFR(S5)	0.63	RMVFR(S3)	0.73	RMVFR(S3)	0.67
5	RMVFR(S5)	0.68	RMVFR(S5)	0.70	RMVFR(S4)	0.62	RMVFR(S4)	0.63	RMVFR(S5)	0.72	RMVFR(S5)	0.65
6	AREA	-0.55	AREA	-0.53	AREA	-0.47	AREA	-0.48	AREA	-0.53	AREA	-0.51
7	LAMBDAT	-0.42	LAMBDAT	-0.39	LAMBDAT	-0.37	LAMBDAT	-0.38	LAMBDAT	-0.37	LAMBDAT	-0.39
8	BRTRATE	0.27	BRTRATE	0.26	BRTRATE	0.24	BRTRATE	0.24	BRTRATE	0.26	BRTRATE	0.26
9	AIRFR(S5)	0.19	AIRFR(S5)	0.18	DKSUS	-0.20	DKSUS		AIRFR(S5)	0.17	AIRFR(S5)	0.17
10	H	-0.16	H	-0.15	AIRFR(S5)	0.19	AIRFR(S5)	0.19	AIRFR(S4)	0.13	H	-0.17
11	AIRFR(S4)	0.15	AIRFR(S4)	0.14	UD	0.18	H	-0.18	H	-0.13	AIRFR(S4)	0.14
12	RF0(S4)	-0.12	RF0(S4)	-0.12	H	-0.18	UD	0.17	RF0(S4)	-0.13	UD	0.12
13			INGE2	0.11	AIRFR(S4)	0.16	AIRFR(S4)	0.16	INGE2	0.11	RF0(S4)	-0.11
14					RF0(S4)	-0.11	RF0(S4)	-0.11				

	Radionuclide											
	Pu-242		Cm-244									
Rank	Parameter	PRCC	Parameter	PRCC	Parameter	PRCC	Parameter	PRCC	Parameter	PRCC	Parameter	PRCC
1	RMVFR(S1)	0.79	RMVFR(S1)	0.86								
2	RMVFR(S2)	0.63	RMVFR(S2)	0.74								
3	RMVFR(S5)	0.62	RMVFR(S4)	0.73								
4	RMVFR(S3)	0.62	RMVFR(S3)	0.72								
5	RMVFR(S4)	0.62	RMVFR(S5)	0.72								
6	AREA	-0.47	AREA	-0.53								
7	LAMBDAT	-0.38	LAMBDAT	-0.37								
8	BRTRATE	0.23	BRTRATE	0.26								
9	DKSUS	-0.20	AIRFR(S5)	0.17								
10	AIRFR(S5)	0.19	AIRFR(S4)	0.13								
11	UD	0.18	RF0(S4)	-0.12								
12	H	-0.18	H	-0.12								
13	AIRFR(S4)	0.16	INGE2	0.11								
14	RF0(S4)	-0.11										
15												

Parameter Code Explanation

UD - Deposition velocity
AIRFR - Air release fraction
AREA - Room area
BRTRATE - Receptor breathing/inhalation rate
DKSUS - Resuspension rate
H - Room height
INGE2 - Indirect ingestion rate
LAMBDAT - Air exchange rate
RF0 - Source lifetime (also time for source removal)
RMVFR - Removable fraction
(S#) Source number

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
TIME PARAMETERS							
TTIME	Exposure duration	B	3	D	d	365.25	NUREG/CR-5512, Vol. 1
FTIN	Indoor fraction	B	2	D	-	0.267	NUREG/CR-5512, Vol. 3 Section 5.2.2.4 to match the 97.4 d/yr time in the building. This is the time the average member of the group spends in the building.
NTIME	Number of times for calculation	P	3	D	-	2	RESRAD-BUILD current Physical priority 3 default acceptable for this calculation
DOSE_TIME	Time	P	3	D	yr	1	NUREG/CR-5512, Vol. 3 Section 5.2.2.4
POINT	Maximum time integration points	P	3	D	-	1	Argonne recommended value for probabilistic calculations
BUILDING PARAMETERS							
NROOM	Number of rooms	P	3	D	-	1	NUREG/CR-5512 building occupancy scenario assumes only one contaminated room
UD	Deposition velocity	P	2	S or D	m/s	4.78E-04	The result of sensitivity analysis
DKSUS	Resuspension rate	P, B	1	S or D	s^{-1}	1.33E-09	Calculated from the NUREG-1720 recommended DandD resuspension factor of 9.6E-07 m^{-1}, deposition velocity, air exchange rate and room height (see Section 6.2)
H	Room height	P	2	S	m	3.89	Result of sensitivity analysis
AREA	Room area	P	2	S	m^2	137	Result of sensitivity analysis
LAMBDAT (building); LINPUT (room)	Air exchange rate	B	2	S or D	1/h	0.835	The result of sensitivity analysis

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
Q12 and Q21; Q23 and Q32	Flow rate between rooms	B	3	D	m^3/h	0	This dose model contains only one receptor room
Q10 and Q01; Q20 and Q02; Q30 and Q03	Outdoor inflow and outflow	B, P	3	D	m^3/h	Not used	Outdoor inflow is calculated from room volume and air exchange rate
RECEPTOR PARAMETERS							
ND	Number of receptors	B	3	D	-	1	This dose model contains only one receptor
DLVL	Receptor room	B	3	D	-	1	This dose model contains only one receptor room
DX	Receptor location (x, y, z)	B	3	D	m	5.85, 5.85, 1	Center of the room's floor
TWGHT	Receptor time fraction	B	3	D	-	1	NUREG/CR-5512, Vol. 3
BRTRATE	Receptor breathing/inhalation rate	M, B	2	S or D	m^3/d	Triangular distribution or 35.7	NUREG/CR-6755, Appendix A or the result of sensitivity analysis
INGE2	Indirect ingestion rate	B	2	S	m^2/h	Loguniform distribution or 1.61E-04	NUREG/CR-6755, Appendix A or the result of sensitivity analysis
SOURCE PARAMETERS							
NS	Number of sources	P	3	D	-	5	Assumes contamination on four walls plus the floor
Source 1 - Floor							
SLVL	Source room (also primary room)	P	3	D	-	1	This dose model contains only one room
STYPE	Source type	P	3	D	-	Area	NUREG/CR-5512
SDIR	Source direction	P	3	D	-	z	NUREG/CR-5512
SX	Source location (x, y, z)	P	3	D	m	5.85, 5.85, 0	X and Y distances are half of the square root of the room area derived from sensitivity analysis
SAREA	Source area	P	2	D	m^2	137	Room area from derived from sensitivity analysis

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
AIRFR	Air release fraction	B	2	S or D	-	Triangular distribution or 0.517	NUREG/CR-6755, Appendix A or the result of sensitivity analysis
INGE1	Direct ingestion rate	B	2	D	g/h or 1/h	3.45E-07	Calculated from the default ingestion rate of 1.1E-04 m^2/h in the NUREG/CR-5512 industrial worker building occupancy scenario. 3.45E-07 h^{-1} is 1.1E-04 m^2/h divided by the total contaminated area of 319 m^2.
RMVFR	Removable fraction	P, B	1	D	-	0.1	10% of the contamination is removable (NUREG/CR-5512 industrial worker building occupancy scenario default). The default parameter value for the loose fraction for the building occupancy scenario is 0.1 (Table C7.1, NUREG/CR-1727).
RF0	Source lifetime (also time for source removal)	P, B	2	S or D	d	Triangular distribution or 52800	NUREG/CR-6755, Section 3.6 or the result of sensitivity analysis
RRF	Radon release fraction	P, B	3	D	-	0	Radon exposure is not regulated by the NRC
RNUCACT	Radionuclide concentration/activity	P	2	D	dpm/m^2	100	Calculates a dose conversion factor in units of mrem/yr per dpm/100 cm^2
NREGI0	Number of regions in volume source	P	3	D	-	Not used	A volume source is not used in this dose model
FCONT0	Contaminated region (volume source)	P	3	D	-	Not used	A volume source is not used in this dose model
THICK0	Source region thickness (volume source)	P	2	S	cm	Not used	A volume source is not used in this dose model

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
DENSI0	Source density (volume source)	P	1	S	g/cm^3	Not used	A volume source is not used in this dose model
EROS0	Source erosion rate (volume source)	P, B	2	S	cm/d	Not used	A volume source is not used in this dose model
POROS0	Source porosity	P	2	S	-	Not used	A volume source is not used in this dose model
EFDIF0	Radon effective diffusion coefficient	P	3	D	m^2/sec	0	Radon exposure is not regulated by the NRC
EMANA0	Radon emanation fraction	P	3	D	-	0	Radon exposure is not regulated by the NRC
MTLS	Source material			D	-	Not used	A volume source is not used in this dose model
Source 2 – Westwall							
SLVL	Source room (also primary room)	P	3	D	-	1	This dose model contains only one room
STYPE	Source type	P	3	D	-	Area	NUREG/CR-5512
SDIR	Source direction	P	3	D	-	x	NUREG/CR-5512
SX	Source location (x, y, z)	P	3	D	m	0, 5.85, 1.945	Y distance is half of the square root of the room area and z distance is half of the room height derived from sensitivity analysis
SAREA	Source area	P	2	D	m/m^2	45.5	Square root of the room area times the room height derived from sensitivity analysis
AIRFR	Air release fraction	B	2	S or D	-	Triangular distribution or 0.517	NUREG/CR-6755, Appendix A or the result of sensitivity analysis

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
INGE1	Direct ingestion rate	B	2	D	g/h or 1/h	3.45E-07	Calculated from the default ingestion rate of 1.1E-04 m^2/h in the NUREG/CR-5512 industrial worker building occupancy scenario. 3.45E-07 h^{-1} is 1.1E-04 m^2/h divided by the total contaminated area of 319 m^2.
RMVFR	Removable fraction	P, B	1	D	-	0.1	10% of the contamination is removable (NUREG/CR-5512 industrial worker building occupancy scenario default). The default parameter value for the loose fraction for the building occupancy scenario is 0.1 (Table C7.1, NUREG/CR-1727).
RF0	Source lifetime (also time for source removal)	P, B	2	S or D	d	Triangular distribution or 52800	NUREG/CR-6755, Section 3.6 or the result of sensitivity analysis
RRF	Radon release fraction	P, B	3	D	-	0	Radon exposure is not regulated by the NRC
RNUCACT	Radionuclide concentration/activity	P	2	D	dpm/m^2	100	Calculates a dose conversion factor in units of mrem/yr per dpm/100 cm^2
NREGI0	Number of regions in volume source	P	3	D	-	Not used	A volume source is not used in this dose model
FCONT0	Contaminated region (volume source)	P	3	D	-	Not used	A volume source is not used in this dose model
THICK0	Source region thickness (volume source)	P	2	S	cm	Not used	A volume source is not used in this dose model
DENSI0	Source density (volume source)	P	1	S	g/cm^3	Not used	A volume source is not used in this dose model

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
EROS0	Source erosion rate (volume source)	P, B	2	S	cm/d	Not used	A volume source is not used in this dose model
POROS0	Source porosity	P	2	S	-	Not used	A volume source is not used in this dose model
EFDIF0	Radon effective diffusion coefficient	P	3	D	m^2/sec	0	Radon exposure is not regulated by the NRC
EMANA0	Radon emanation fraction	P	3	D	-	0	Radon exposure is not regulated by the NRC
MTLS	Source material			D	-	Not used	A volume source is not used in this dose model
Source 3 – North wall							
SLVL	Source room (also primary room)	P	3	D	-	1	This dose model contains only one room
STYPE	Source type	P	3	D	-	Area	NUREG/CR-5512
SDIR	Source direction	P	3	D	-	y	NUREG/CR-5512
SX	Source location (x, y, z)	P	3	D	m	5.85, 11.7, 1.945	X distance is half of the square root of the room area, Y distance is the square root of the room area and Z distance is half of the room height derived from sensitivity analysis
SAREA	Source area	P	2	D	m/m^2	45.5	Square root of the room area times the room height derived from sensitivity analysis
AIRFR	Air release fraction	B	2	S or D	-	Triangular distribution or 0.517	NUREG/CR-6755, Appendix A or the result of sensitivity analysis

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
INGE1	Direct ingestion rate	B	2	D	g/h or 1/h	3.45E-07	Calculated from the default ingestion rate of 1.1E-04 m^2/h in the NUREG/CR-5512 industrial worker building occupancy scenario. 3.45E-07 h^{-1} is 1.1E-04 m^2/h divided by the total contaminated area of 319 m^2.
RMVFR	Removable fraction	P, B	1	D	-	0.1	10% of the contamination is removable (NUREG/CR-5512 industrial worker building occupancy scenario default). The default parameter value for the loose fraction for the building occupancy scenario is 0.1 (Table C7.1, NUREG/CR-1727).
RF0	Source lifetime (also time for source removal)	P, B	2	S or D	d	Triangular distribution or 52800	NUREG/CR-6755, Section 3.6 or the result of sensitivity analysis
RRF	Radon release fraction	P, B	3	D	-	0	Radon exposure is not regulated by the NRC
RNUCACT	Radionuclide concentration/activity	P	2	D	dpm/m^2	100	Calculates a dose conversion factor in units of mrem/yr per dpm/100 cm^2
NREGI0	Number of regions in volume source	P	3	D	-	Not used	A volume source is not used in this dose model
FCONT0	Contaminated region (volume source)	P	3	D	-	Not used	A volume source is not used in this dose model
THICK0	Source region thickness (volume source)	P	2	S	cm	Not used	A volume source is not used in this dose model
DENSI0	Source density (volume source)	P	1	S	g/cm^3	Not used	A volume source is not used in this dose model

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
EROS0	Source erosion rate (volume source)	P, B	2	S	cm/d	Not used	A volume source is not used in this dose model
POROS0	Source porosity	P	2	S	-	Not used	A volume source is not used in this dose model
EFDIF0	Radon effective diffusion coefficient	P	3	D	m^2/sec	0	Radon exposure is not regulated by the NRC
EMANA0	Radon emanation fraction	P	3	D	-	0	Radon exposure is not regulated by the NRC
MTLS	Source material			D	-	Not used	A volume source is not used in this dose model
Source 4 – East wall							
SLVL	Source room (also primary room)	P	3	D	-	1	This dose model contains only one room
STYPE	Source type	P	3	D	-	Area	NUREG/CR-5512
SDIR	Source direction	P	3	D	-	x	NUREG/CR-5512
SX	Source location	P	3	D	m	11.7, 5.85, 1.945	X distance is the square root of the room area, Y distance is half of the square root of the room area and Z distance is half of the room height derived from sensitivity analysis
SAREA	Source area	P	2	D	m/m^2	45.5	Square root of the room area times the room height derived from sensitivity analysis
AIRFR	Air release fraction	B	2	S or D	-	Triangular distribution or 0.517	NUREG/CR-6755, Appendix A or the result of sensitivity analysis

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
INGE1	Direct ingestion rate	B	2	D	g/h or 1/h	3.45E-07	Calculated from the default ingestion rate of 1.1E-04 m^2/h in the NUREG/CR-5512 industrial worker building occupancy scenario. 3.45E-07 h^{-1} is 1.1E-04 m^2/h divided by the total contaminated area of 319 m^2.
RMVFR	Removable fraction	P, B	1	D	-	0.1	10% of the contamination is removable (NUREG/CR-5512 industrial worker building occupancy scenario default). The default parameter value for the loose fraction for the building occupancy scenario is 0.1 (Table C7.1, NUREG/CR-1727).
RF0	Source lifetime (also time for source removal)	P, B	2	S or D	d	Triangular distribution or 52800	NUREG/CR-6755, Section 3.6 or the result of sensitivity analysis
RRF	Radon release fraction	P, B	3	D	-	0	Radon exposure is not regulated by the NRC
RNUCACT	Radionuclide concentration/activity	P	2	D	dpm/m^2	100	Calculates a dose conversion factor in units of mrem/yr per dpm/100 cm^2
NREGI0	Number of regions in volume source	P	3	D	-	Not used	A volume source is not used in this dose model
FCONT0	Contaminated region (volume source)	P	3	D	-	Not used	A volume source is not used in this dose model
THICK0	Source region thickness (volume source)	P	2	S	cm	Not used	A volume source is not used in this dose model
DENSI0	Source density (volume source)	P	1	S	g/cm^3	Not used	A volume source is not used in this dose model

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
EROS0	Source erosion rate (volume source)	P, B	2	S	cm/d	Not used	A volume source is not used in this dose model
POROS0	Source porosity	P	2	S	-	Not used	A volume source is not used in this dose model
EFDIF0	Radon effective diffusion coefficient	P	3	D	m^2/sec	0	Radon exposure is not regulated by the NRC
EMANA0	Radon emanation fraction	P	3	D	-	0	Radon exposure is not regulated by the NRC
MTLS	Source material			D	-	Not used	A volume source is not used in this dose model
Source 5 – South wall							
SLVL	Source room (also primary room)	P	3	D	-	1	This dose model contains only one room
STYPE	Source type	P	3	D	-	Area	NUREG/CR-5512
SDIR	Source direction	P	3	D	-	y	NUREG/CR-5512
SX	Source location	P	3	D	m	5.85, 0, 1.945	X and Y distances are half of the square root of the room area and Z distance is half of the room height derived from sensitivity analysis
SAREA	Source area	P	2	D	m/m^2	45.5	Square root of the room area times the room height derived from sensitivity analysis
AIRFR	Air release fraction	B	2	S or D	-	Triangular distribution or 0.517	NUREG/CR-6755, Appendix A or the result of sensitivity analysis

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
INGE1	Direct ingestion rate	B	2	D	g/h or 1/h	3.45E-07	Calculated from the default ingestion rate of 1.1E-04 m^2/h in the NUREG/CR-5512 industrial worker building occupancy scenario. 3.45E-07 h^{-1} is 1.1E-04 m^2/h divided by the total contaminated area of 319 m^2.
RMVFR	Removable fraction	P, B	1	D	-	0.1	10% of the contamination is removable (NUREG/CR-5512 industrial worker building occupancy scenario default). The default parameter value for the loose fraction for the building occupancy scenario is 0.1 (Table C7.1, NUREG/CR-1727).
RF0	Source lifetime (also time for source removal)	P, B	2	S or D	d	Triangular distribution or 52800	NUREG/CR-6755, Section 3.6 or the result of sensitivity analysis
RRF	Radon release fraction	P, B	3	D	-	0	Radon exposure is not regulated by the NRC
RNUCACT	Radionuclide concentration/activity	P	2	D	dpm/m^2	100	Calculates a dose conversion factor in units of mrem/yr per dpm/100 cm^2
NREGI0	Number of regions in volume source	P	3	D	-	Not used	A volume source is not used in this dose model
FCONT0	Contaminated region (volume source)	P	3	D	-	Not used	A volume source is not used in this dose model
THICK0	Source region thickness (volume source)	P	2	S	cm	Not used	A volume source is not used in this dose model
DENSI0	Source density (volume source)	P	1	S	g/cm^3	Not used	A volume source is not used in this dose model

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
EROS0	Source erosion rate (volume source)	P, B	2	S	cm/d	Not used	A volume source is not used in this dose model
POROS0	Source porosity	P	2	S	-	Not used	A volume source is not used in this dose model
EFDIF0	Radon effective diffusion coefficient	P	3	D	m^2/sec	0	Radon exposure is not regulated by the NRC
EMANA0	Radon emanation fraction	P	3	D	-	0	Radon exposure is not regulated by the NRC
MTLS	Source material			D	-	Not used	A volume source is not used in this dose model
SHIELDING PARAMETERS							
DSTH	Shielding thickness	P, B	2	S	cm	0	Shielding is not used in this dose model
DSDEN	Shielding density	P	1	S	g/cm^3	0	Shielding is not used in this dose model
MTLC	Shielding material	P	3	D	-	None	Shielding is not used in this dose model
TRITIUM MODEL PARAMETERS							
DRYTHICK	Dry zone thickness	P	3		cm	Not Used	This parameter is not used for a surface source
H3THICK	Wet + dry zone thickness	P	2	S	cm	Not Used	This parameter is not used for a surface source
H3VOLFRACT	Volumetric water content	P	2	S	-	Not Used	This parameter is not used for a surface source
H3RMVF	Water fraction available for vaporization	P	2	S	-	Not Used	This parameter is not used for a surface source
HUMIDITY	Humidity	P, B	2	S	g/m^3	Not Used	This parameter is not used for a surface source

[1]Parameter Classification: P = Physical; B = Behavioral; M = Metabolic
[2]1 = high priority parameter, 2 = medium priority parameter, 3 = low priority parameter
[3]D = Deterministic treatment, S = Stochastic treatment

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
TIME PARAMETERS							
TTIME	Exposure duration	B	3	D	d	365.25	NUREG/CR-5512, Vol. 1
FTIN	Indoor fraction	B	2	D	-	0.267	NUREG/CR-5512, Vol. 3 Section 5.2.2.4 to match the 97.4 d/yr time in the building. This is the time the average member of the group spends in the building.
NTIME	Number of times for calculation	P	3	D	-	2	RESRAD-BUILD current Physical priority 3 default value acceptable for this evaluation
DOSE_TIME	Time	P	3	D	yr	1	NUREG/CR-5512, Vol. 3 Section 5.2.2.4
POINT	Maximum time integration points	P	3	D	-	1	Argonne National Laboratory recommended value for probabilistic calculations
BUILDING PARAMETERS							
NROOM	Number of rooms	P	3	D	-	1	NUREG/CR-5512 building occupancy scenario assumes only one contaminated room
UD	Deposition velocity	P	2	S	m/s	Loguniform distribution	NUREG/CR-6755, Section 3.3
UD (H-3 only)	Deposition velocity	P	2	S	m/s	0	ANL-EAD-03-01, Appendix G, Section G.3.2
DKSUS	Resuspension rate	P, B	1	D	s^{-1}	1.33E-09	Calculated from the NUREG-1720 recommended DandD resuspension factor of 9.6E-07 m^{-1}, deposition velocity, air exchange rate and room height (see Section 6.2 of DTBD-04-004)
H	Room height	P	2	D	m	3.89	Result of DTBD-04-004 sensitivity analysis

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
AREA	Room area	P	2	D	m^2	137	Result of DTBD-04-004 sensitivity analysis
LAMBDAT (building)	Air exchange rate	B	2	S	1/h	Truncated lognormal-n	NUREG/CR-6755, Section 3.2
Q12 and Q21; Q23 and Q32	Flow rate between rooms	B	3	D	m^3/h	0	This dose model contains only one receptor room
Q10 and Q01; Q20 and Q02; Q30 and Q03	Outdoor inflow and outflow	B, P	3	NA	m^3/h	Not used	Outdoor inflow is calculated from room volume and air exchange rate
RECEPTOR PARAMETERS							
ND	Number of receptors	B	3	D	-	1	This dose model contains only one receptor
DLVL	Receptor room	B	3	D	-	1	This dose model contains only one receptor room
DX	Receptor location (x, y, z)	B	3	D	m	5.85, 5.85, 1	Center of the room's floor
TWGHT	Receptor time fraction	B	3	D	-	1	NUREG/CR-5512, Vol. 3
BRTRATE	Receptor breathing/inhalation rate	M, B	2	S	m^3/d	Triangular distribution	NUREG/CR-6755, Appendix A
INGE2	Indirect ingestion rate	B	2	S	m^2/h	Loguniform distribution	NUREG/CR-6755, Appendix A
SOURCE PARAMETERS							
NS	Number of sources	P	3	D	-	1	Assumes contamination on the floor
Source 1: Floor							
SLVL	Source room (also primary room)	P	3	D	-	1	This dose model contains only one room
STYPE	Source type	P	3	D	-	Volume	Source type selected for derivation of bulk material DCGLs

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
SDIR	Source direction	P	3	D	-	z	NUREG/CR-5512
SX	Source location (x, y, z)	P	3	D	m	5.85, 5.85, 0	X and Y distances are half of the square root of the room area derived from DTBD-04-004 sensitivity analysis
SAREA	Source area	P	2	D	m^2	137	Room area from derived from DTBD-04-004 sensitivity analysis
AIRFR	Air release fraction	B	2	S	-	Triangular distribution	NUREG/CR-6755, Appendix A
INGE1	Direct ingestion rate	B	2	D	g/h	3.45E-07	Calculated from the default ingestion rate of 1.1E-04 m^2/h in the NUREG/CR-5512 industrial worker building occupancy scenario. 3.45E-07 h^{-1} is 1.1E-04 m^2/h divided by the total contaminated area of 319 m^2.
RMVFR	Removable fraction	P, B	1	NA	-	Not used	Removable contamination is not assumed to be present on a volume source.
RF0	Source lifetime (also time for source removal)	P, B	2	NA	d	Not used	Removable contamination is not assumed to be present on a volume source.
RRF	Radon release fraction	P, B	3	NA	-	Not used	Radon exposure is not regulated by the NRC
RNUCACT	Radionuclide concentration/activity	P	2	D	pCi/g	1	Calculates a dose conversion factor in units of mrem/yr per pCi/g
NREGI0	Number of regions in volume source	P	3	D	-	1	One homogenous region is assumed for the volume source
FCONT0	Contaminated region (volume source)	P	3	D	-	1	One homogenous region is assumed for the volume source

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
THICK0	Source region thickness (volume source)	P	2	D	cm	30.48	Assumed maximum depth of neutron activation or contamination
DENSI0	Source density (volume source)	P	1	S	g/cm^3	Uniform distribution	ANL-EAD-03-01, Appendix J
EROS0	Source erosion rate (volume source)	P, B	2	S	cm/d	Triangular distribution	ANL-EAD-03-01, Appendix J
POROS0	Source porosity	P	2	S	-	Uniform distribution	ANL-EAD-03-01, Appendix J
EFDIF0	Radon effective diffusion coefficient	P	3	NA	m^2/sec	Not used	Radon exposure is not regulated by the NRC
EMANA0	Radon emanation fraction	P	3	NA	-	Not used	Radon exposure is not regulated by the NRC
MTLS	Source material			D	-	Concrete	One homogenous region is assumed for the volume source
SHIELDING PARAMETERS							
DSTH	Shielding thickness	P, B	2	S	cm	0	Shielding is not used in this dose model
DSDEN	Shielding density	P	1	NA	g/cm^3	2.4	Default value but not used in this dose model
MTLC	Shielding material	P	3	NA	-	None	Default value but not used in this dose model
TRITIUM MODEL PARAMETERS							
DRYTHICK	Dry zone thickness	P	3	D	cm	0	This model assumes that all bulk material is contaminated
H3THICK	Wet + dry zone thickness	P	2	D	cm	100	This parameter represents the depth from the surface of the contaminated material to the deepest point of the contaminated zone, thus the source region thickness.
H3VOLFRACT	Volumetric water content	P	2	S	-	Uniform distribution	ANL-EAD-03-01, Appendix J

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
H3RMVF	Water fraction available for vaporization	P	2	S	-	Triangular distribution	ANL-EAD-03-01, Appendix J
HUMIDITY	Humidity	P, B	2	S	g/m^3	Uniform distribution	ANL-EAD-03-01, Appendix J

[1]Parameter Classification: P = Physical; B = Behavioral; M = Metabolic

[2]1 = high priority parameter, 2 = medium priority parameter, 3 = low priority parameter

[3]D = deterministic; S = stochastic; NA = not applicable

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Parameter	Priority[1]	Distribution	Distribution's Statistical Parameters[2]				PRCC[3]	25% or 75% Quartile	Assigned Parameter Value
			1	2	3	4			
Deposition velocity	2	Loguniform	2.7E-06	2.7E-03	-	-	0.96	75%	4.78E-04
Deposition velocity - Pm-147	2	Loguniform	2.7E-06	2.7E-03	-	-	-0.18	25%	1.52E-05
Building air exchange rate	2	Truncated lognormal-n	0.4187	0.88	0.001	0.999	-0.97	25%	0.839
Receptor breathing/inhalation rate	2	Triangular	12	46	33.6	-	0.74	75%	35.7
Indirect ingestion rate	2	Loguniform	2.8E-05	2.9E-04	-	-	0.74	75%	1.61E-04
Indirect ingestion rate - Eu-154	2	Loguniform	2.8E-05	2.9E-04	-	-	-0.11	25%	5.02E-05
Air release fraction	2	Triangular	1E-06	1	0.07	-	0.80	75%	0.518
H-2 Air release fraction	2	Triangular	1E-06	1	0.07	-	-0.05	No	Distribution
Source density – H-3, C-14, Fe-55, Tc-99, Pm-147, Eu-155, Np-237, Pu-238, Pu-239, Pu-240, Pu-241, Am-241, Pu-242, Cm-244	1	Uniform	2.2	2.6	-	-	0.16	75%	2.50
Source density – Na-22, Co-60, Sr-90, Nb-94, Ag-108m, Sb-125, Cs-134, Cs-137, Eu-152, Eu-154	1	Uniform	2.2	2.6	-	-	-1.00	25%	2.30
Source erosion rate	2	Triangular	0.0	5.6E-07	0.0	-	0.88	75%	2.80E-07
H-3 Source porosity	2	Uniform	0.04	0.25	-	-	0.82	75%	0.197
H-3 Volumetric water content	2	Uniform	0.04	0.25	-	-	-0.70	25%	0.0923
H-3 Water fraction available for vaporization	2	Triangular	0.5	1.0	0.75	-	0.28	75%	0.823
H-3 Humidity	2	Uniform	6.5	13.1	-	-	-0.47	25%	8.13

Notes:

[1]1 = high priority parameter, 2 = medium priority parameter

[2]Distribution's Statistical Parameter
Loguniform: 1 = minimum, 2 = maximum
Triangular: 1 = minimum, 2 = maximum, 3 = most likely
Uniform: 1 = minimum, 2 = maximum
Truncated lognormal-n: 1 = underlying mean value, 2 = underlying standard deviation, 3 = lower quantile, 4 = upper quantile

[3]PRCC = Partial ranked correlation coefficient for Time 1

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Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
TIME PARAMETERS							
TTIME	Exposure duration	B	3	D	d	365.25	NUREG/CR-5512, Vol. 1
FTIN	Indoor fraction	B	2	D	-	3.65E-03	4 d/yr time in the containment building.
NTIME	Number of times for calculation	P	3	D	-	1	RESRAD-BUILD current default acceptable for this calculation
DOSE_TIME	Time	P	3	D	yr	1	NUREG/CR-5512, Vol. 3 Section 5.2.2.4
POINT	Maximum time integration points	P	3	D	-	1	Argonne recommended value for probabilistic calculations
BUILDING PARAMETERS							
NROOM	Number of rooms	P	3	D	-	1	NUREG/CR-5512 building occupancy scenario assumes only one contaminated room
UD	Deposition velocity	P	2	D	m/s	4.78E-04	The result of DTBD-04-004 sensitivity analysis
DKSUS	Resuspension rate	P, B	1	D	s^{-1}	3.54E-05	Calculated from the NUREG-1720 recommended DandD resuspension factor of 9.6E-07 m^{-1}, deposition velocity, air exchange rate and room height (DTBD-04-004)
H	Room height	P	2	D	m	44.2	Distance of 145 ft. from the containment building basement to the base of the dome
AREA	Room area	P	2	D	m^2	1230	Area of the containment building basement which is 130 ft. in diameter
LAMBDAT (building); LINPUT (room)	Air exchange rate	B	2	D	1/h	0.835	The result of DTBD-04-004 sensitivity analysis

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
Q12 and Q21; Q23 and Q32	Flow rate between rooms	B	3	D	m^3/h	0	This dose model contains only one receptor room
Q10 and Q01; Q20 and Q02; Q30 and Q03	Outdoor inflow and outflow	B, P	3	D	m^3/h	Not used	Outdoor inflow is calculated from room volume and air exchange rate
RECEPTOR PARAMETERS							
ND	Number of receptors	B	3	D	-	1	This dose model contains only one receptor
DLVL	Receptor room	B	3	D	-	1	This dose model contains only one receptor room
DX	Receptor location (x, y, z)	B	3	D	m	19.8, 3.05, 9:23	Center of the 10 ft. x 20 ft. access platform extending into the containment building at grade level
TWGHT	Receptor time fraction	B	3	D	-	1	NUREG/CR-5512, Vol. 3
BRTRATE	Receptor breathing/inhalation rate	M, B	2	D	m^3/d	35.7	The result of the DTBD-04-004 sensitivity analysis
INGE2	Indirect ingestion rate	B	2	D	m^2/h	1.61E-04	The result of the DTBD-04-004 sensitivity analysis
SOURCE PARAMETERS							
NS	Number of sources	P	3	D	-	6	Assumes contamination on four walls plus the floor and ceiling
Source 1 - Floor							
SLVL	Source room (also primary room)	P	3	D	-	1	This dose model contains only one room
STYPE	Source type	P	3	D	-	Area	NUREG/CR-5512
SDIR	Source direction	P	3	D	-	z	NUREG/CR-5512
SX	Source location (x, y, z)	P	3	D	m	19.8, 19.8, 0	Center of containment building basement
SAREA	Source area	P	2	D	m^2	1230	Area of containment building basement

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
AIRFR	Air release fraction	B	2	D	-	0.517	The result of the DTBD-04-004 sensitivity analysis
INGE1	Direct ingestion rate	B	2	D	g/h or 1/h	8.94E-08	Calculated from the default ingestion rate of 1.1E-04 m^2/h in the NUREG/CR-5512 industrial worker building occupancy scenario. 8.94E-08 h^{-1} is 1.1E-04 m^2/h divided by the total contaminated area of 1230 m^2.
RMVFR	Removable fraction	P, B	1	D	-	0.1	10% of the contamination is removable (NUREG/CR-5512 industrial worker building occupancy scenario default). The default parameter value for the loose fraction for the building occupancy scenario is 0.1 (Table C7.1, NUREG/CR-1727).
RF0	Source lifetime (also time for source removal)	P, B	2	D	d	52800	The result of the DTBD-04-004 sensitivity analysis
RRF	Radon release fraction	P, B	3	D	-	0	Radon exposure is not regulated by the NRC
RNUCACT	Radionuclide concentration/activity	P	2	D	dpm/m^2	100	Calculates a dose conversion factor in units of mrem/yr per dpm/100 cm^2
NREGI0	Number of regions in volume source	P	3	D	-	Not used	A volume source is not used in this dose model
FCONT0	Contaminated region (volume source)	P	3	D	-	Not used	A volume source is not used in this dose model
THICK0	Source region thickness (volume source)	P	2	D	cm	Not used	A volume source is not used in this dose model
DENSI0	Source density (volume source)	P	1	D	g/cm^3	Not used	A volume source is not used in this dose model

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
EROS0	Source erosion rate (volume source)	P, B	2	D	cm/d	Not used	A volume source is not used in this dose model
POROS0	Source porosity	P	2	D	-	Not used	A volume source is not used in this dose model
EFDIF0	Radon effective diffusion coefficient	P	3	D	m^2/sec	0	Radon exposure is not regulated by the NRC
EMANA0	Radon emanation fraction	P	3	D	-	0	Radon exposure is not regulated by the NRC
MTLS	Source material			D	-	Not used	A volume source is not used in this dose model
Source 2 – West wall							
SLVL	Source room (also primary room)	P	3	D	-	1	This dose model contains only one room
STYPE	Source type	P	3	D	-	Area	NUREG/CR-5512
SDIR	Source direction	P	3	D	-	x	NUREG/CR-5512
SX	Source location (x, y, z)	P	3	D	m	0, 19.8, 22.1	Y distance is half of the containment building floor diameter and the z distance is half of the containment building distance from basement floor to base of the dome (72.5 ft.)
SAREA	Source area	P	2	D	m/m^2	1380	One fourth of the containment building cylindrical wall area
AIRFR	Air release fraction	B	2	D	-	0.517	The result of the DTBD-04-004 sensitivity analysis
INGE1	Direct ingestion rate	B	2	D	g/h or 1/h	7.97E-08	Calculated from the default ingestion rate of 1.1E-04 m^2/h in the NUREG/CR-5512 industrial worker building occupancy scenario. 7.97E-08 h^{-1} is 1.1E-04 m^2/h divided by the total contaminated area of 1380 m^2.

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
RMVFR	Removable fraction	P, B	1	D	-	0.1	10% of the contamination is removable (NUREG/CR-5512 industrial worker building occupancy scenario default). The default parameter value for the loose fraction for the building occupancy scenario is 0.1 (Table C7.1, NUREG/CR-1727).
RF0	Source lifetime (also time for source removal)	P, B	2	D	d	52800	The result of the DTBD-04-004 sensitivity analysis
RRF	Radon release fraction	P, B	3	D	-	0	Radon exposure is not regulated by the NRC
RNUCACT	Radionuclide concentration/activity	P	2	D	dpm/m^2	100	Calculates a dose conversion factor in units of mrem/yr per dpm/100 cm^2
NREGI0	Number of regions in volume source	P	3	D	-	Not used	A volume source is not used in this dose model
FCONT0	Contaminated region (volume source)	P	3	D	-	Not used	A volume source is not used in this dose model
THICK0	Source region thickness (volume source)	P	2	D	cm	Not used	A volume source is not used in this dose model
DENSI0	Source density (volume source)	P	1	D	g/cm^3	Not used	A volume source is not used in this dose model
EROS0	Source erosion rate (volume source)	P, B	2	D	cm/d	Not used	A volume source is not used in this dose model
POROS0	Source porosity	P	2	D	-	Not used	A volume source is not used in this dose model
EFDIF0	Radon effective diffusion coefficient	P	3	D	m^2/sec	0	Radon exposure is not regulated by the NRC
EMANA0	Radon emanation fraction	P	3	D	-	0	Radon exposure is not regulated by the NRC
MTLS	Source material			D	-	Not used	A volume source is not used in this dose model

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
Source 3 – North wall							
SLVL	Source room (also primary room)	P	3	D	-	1	This dose model contains only one room
STYPE	Source type	P	3	D	-	Area	NUREG/CR-5512
SDIR	Source direction	P	3	D	-	y	NUREG/CR-5512
SX	Source location (x, y, z)	P	3	D	m	19.8, 0, 22.1	X distance is half of the containment building floor diameter and the Z distance is half of the containment building distance from basement floor to base of the dome (72.5 ft.)
SAREA	Source area	P	2	D	m/m^2	1380	One fourth of the containment building cylindrical wall area
AIRFR	Air release fraction	B	2	D	-	0.517	The result of the DTBD-04-004 sensitivity analysis
INGE1	Direct ingestion rate	B	2	D	g/h or 1/h	7.97E-08	Calculated from the default ingestion rate of 1.1E-04 m^2/h in the NUREG/CR-5512 industrial worker building occupancy scenario. 7.97E-08 h^{-1} is 1.1E-04 m^2/h divided by the total contaminated area of 1380 m^2.
RMVFR	Removable fraction	P, B	1	D	-	0.1	10% of the contamination is removable (NUREG/CR-5512 industrial worker building occupancy scenario default). The default parameter value for the loose fraction for the building occupancy scenario is 0.1 (Table C7.1, NUREG/CR-1727).
RF0	Source lifetime (also time for source removal)	P, B	2	D	d	52800	The result of the DTBD-04-004 sensitivity analysis

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
RRF	Radon release fraction	P, B	3	D	-	0	Radon exposure is not regulated by the NRC
RNUCACT	Radionuclide concentration/activity	P	2	D	dpm/m^2	100	Calculates a dose conversion factor in units of mrem/yr per $dpm/100\ cm^2$
NREGI0	Number of regions in volume source	P	3	D	-	Not used	A volume source is not used in this dose model
FCONT0	Contaminated region (volume source)	P	3	D	-	Not used	A volume source is not used in this dose model
THICK0	Source region thickness (volume source)	P	2	D	cm	Not used	A volume source is not used in this dose model
DENSI0	Source density (volume source)	P	1	D	g/cm^3	Not used	A volume source is not used in this dose model
EROS0	Source erosion rate (volume source)	P, B	2	D	cm/d	Not used	A volume source is not used in this dose model
POROS0	Source porosity	P	2	D	-	Not used	A volume source is not used in this dose model
EFDIF0	Radon effective diffusion coefficient	P	3	D	m^2/sec	0	Radon exposure is not regulated by the NRC
EMANA0	Radon emanation fraction	P	3	D	-	0	Radon exposure is not regulated by the NRC
MTLS	Source material			D	-	Not used	A volume source is not used in this dose model
Source 4 – East wall							
SLVL	Source room (also primary room)	P	3	D	-	1	This dose model contains only one room
STYPE	Source type	P	3	D	-	Area	NUREG/CR-5512
SDIR	Source direction	P	3	D	-	x	NUREG/CR-5512

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
SX	Source location	P	3	D	m	39.6, 19.8, 22.1	X distance is the diameter of the containment building floor, the Y distance is half of the diameter of the containment building floor and the Z distance is half of the containment building distance from basement floor to base of the dome (72.5 ft.)
SAREA	Source area	P	2	D	m/m^2	1380	One fourth of the containment building cylindrical wall area
AIRFR	Air release fraction	B	2	D	-	0.517	The result of the DTBD-04-004 sensitivity analysis
INGE1	Direct ingestion rate	B	2	D	g/h or 1/h	7.97E-08	Calculated from the default ingestion rate of 1.1E-04 m^2/h in the NUREG/CR-5512 industrial worker building occupancy scenario. 7.97E-08 h^{-1} is 1.1E-04 m^2/h divided by the total contaminated area of 1380 m^2.
RMVFR	Removable fraction	P, B	1	D	-	0.1	10% of the contamination is removable (NUREG/CR-5512 industrial worker building occupancy scenario default). The default parameter value for the loose fraction for the building occupancy scenario is 0.1 (Table C7.1, NUREG/CR-1727).
RF0	Source lifetime (also time for source removal)	P, B	2	D	d	52800	The result of the DTBD-04-004 sensitivity analysis
RRF	Radon release fraction	P, B	3	D	-	0	Radon exposure is not regulated by the NRC

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
RNUCACT	Radionuclide concentration/activity	P	2	D	dpm/m^2	100	Calculates a dose conversion factor in units of mrem/yr per dpm/100 cm^2
NREGI0	Number of regions in volume source	P	3	D	-	Not used	A volume source is not used in this dose model
FCONT0	Contaminated region (volume source)	P	3	D	-	Not used	A volume source is not used in this dose model
THICK0	Source region thickness (volume source)	P	2	D	cm	Not used	A volume source is not used in this dose model
DENSI0	Source density (volume source)	P	1	D	g/cm^3	Not used	A volume source is not used in this dose model
EROS0	Source erosion rate (volume source)	P, B	2	D	cm/d	Not used	A volume source is not used in this dose model
POROS0	Source porosity	P	2	D	-	Not used	A volume source is not used in this dose model
EFDIF0	Radon effective diffusion coefficient	P	3	D	m^2/sec	0	Radon exposure is not regulated by the NRC
EMANA0	Radon emanation fraction	P	3	D	-	0	Radon exposure is not regulated by the NRC
MTLS	Source material			D	-	Not used	A volume source is not used in this dose model
Source 5 – South wall							
SLVL	Source room (also primary room)	P	3	D	-	1	This dose model contains only one room
STYPE	Source type	P	3	D	-	Area	NUREG/CR-5512
SDIR	Source direction	P	3	D	-	y	NUREG/CR-5512

Parameter							
Name	**Description**	**Class[1]**	**Priority[2]**	**Treatment[3]**	**Units**	**Parameter Value**	**Basis for Parameter Selection**
SX	Source location	P	3	D	m	19.8, 39.6, 22.1	X is half of the diameter of the containment building floor, the Y distance is the diameter of the containment building floor and the Z distance is half of the containment building distance from basement floor to base of the dome (72.5 ft.)
SAREA	Source area	P	2	D	m/m^2	1380	One fourth of the containment building cylindrical wall area
AIRFR	Air release fraction	B	2	D	-	0.517	The result of the DTBD-04-004 sensitivity analysis
INGE1	Direct ingestion rate	B	2	D	g/h or 1/h	7.97E-08	Calculated from the default ingestion rate of 1.1E-04 m^2/h in the NUREG/CR-5512 industrial worker building occupancy scenario. 7.97E-08 h^{-1} is 1.1E-04 m^2/h divided by the total contaminated area of 1380 m^2.
RMVFR	Removable fraction	P, B	1	D	-	0.1	10% of the contamination is removable (NUREG/CR-5512 industrial worker building occupancy scenario default). The default parameter value for the loose fraction for the building occupancy scenario is 0.1 (Table C7.1, NUREG/CR-1727).
RF0	Source lifetime (also time for source removal)	P, B	2	D	d	52800	The result of the DTBD-04-004 sensitivity analysis
RRF	Radon release fraction	P, B	3	D	-	0	Radon exposure is not regulated by the NRC

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
RNUCACT	Radionuclide concentration/activity	P	2	D	dpm/m^2	100	Calculates a dose conversion factor in units of mrem/yr per dpm/100 cm^2
NREGI0	Number of regions in volume source	P	3	D	-	Not used	A volume source is not used in this dose model
FCONT0	Contaminated region (volume source)	P	3	D	-	Not used	A volume source is not used in this dose model
THICK0	Source region thickness (volume source)	P	2	D	cm	Not used	A volume source is not used in this dose model
DENSI0	Source density (volume source)	P	1	D	g/cm^3	Not used	A volume source is not used in this dose model
EROS0	Source erosion rate (volume source)	P, B	2	D	cm/d	Not used	A volume source is not used in this dose model
POROS0	Source porosity	P	2	D	-	Not used	A volume source is not used in this dose model
EFDIF0	Radon effective diffusion coefficient	P	3	D	m^2/sec	0	Radon exposure is not regulated by the NRC
EMANA0	Radon emanation fraction	P	3	D	-	0	Radon exposure is not regulated by the NRC
MTLS	Source material			D	-	Not used	A volume source is not used in this dose model
Source 6 – Ceiling							
SLVL	Source room (also primary room)	P	3	D	-	1	This dose model contains only one room
STYPE	Source type	P	3	D	-	Area	NUREG/CR-5512
SDIR	Source direction	P	3	D	-	z	NUREG/CR-5512
SX	Source location	P	3	D	m	19.8, 19.8, 44.2	This defines the center of the base of the containment building's dome
SAREA	Source area	P	2	D	m/m^2	1230	Area of the containment building basement which is 130 ft. in diameter

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
AIRFR	Air release fraction	B	2	D	-	0.517	The result of the DTBD-04-004 sensitivity analysis
INGE1	Direct ingestion rate	B	2	D	g/h or 1/h	8.94E-08	Calculated from the default ingestion rate of 1.1E-04 m^2/h in the NUREG/CR-5512 industrial worker building occupancy scenario. 8.94E-08 h^{-1} is 1.1E-04 m^2/h divided by the total contaminated area of 1230 m^2.
RMVFR	Removable fraction	P, B	1	D	-	0.1	10% of the contamination is removable (NUREG/CR-5512 industrial worker building occupancy scenario default). The default parameter value for the loose fraction for the building occupancy scenario is 0.1 (Table C7.1, NUREG/CR-1727).
RF0	Source lifetime (also time for source removal)	P, B	2	D	d	52800	The result of the DTBD-04-004 sensitivity analysis
RRF	Radon release fraction	P, B	3	D	-	0	Radon exposure is not regulated by the NRC
RNUCACT	Radionuclide concentration/activity	P	2	D	dpm/m^2	100	Calculates a dose conversion factor in units of mrem/yr per dpm/100 cm^2
NREGI0	Number of regions in volume source	P	3	D	-	Not used	A volume source is not used in this dose model
FCONT0	Contaminated region (volume source)	P	3	D	-	Not used	A volume source is not used in this dose model
THICK0	Source region thickness (volume source)	P	2	D	cm	Not used	A volume source is not used in this dose model
DENSI0	Source density (volume source)	P	1	D	g/cm^3	Not used	A volume source is not used in this dose model

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
EROS0	Source erosion rate (volume source)	P, B	2	D	cm/d	Not used	A volume source is not used in this dose model
POROS0	Source porosity	P	2	D	-	Not used	A volume source is not used in this dose model
EFDIF0	Radon effective diffusion coefficient	P	3	D	m^2/sec	0	Radon exposure is not regulated by the NRC
EMANA0	Radon emanation fraction	P	3	D	-	0	Radon exposure is not regulated by the NRC
MTLS	Source material			D	-	Not used	A volume source is not used in this dose model
SHIELDING PARAMETERS							
DSTH	Shielding thickness	P, B	2	D	cm	0	Shielding is not used in this dose model
DSDEN	Shielding density	P	1	D	g/cm^3	0	Shielding is not used in this dose model
MTLC	Shielding material	P	3	D	-	None	Shielding is not used in this dose model
TRITIUM MODEL PARAMETERS							
DRYTHICK	Dry zone thickness	P	3	D	cm	Not Used	This parameter is not used for a surface source
H3THICK	Wet + dry zone thickness	P	2	D	cm	Not Used	This parameter is not used for a surface source
H3VOLFRACT	Volumetric water content	P	2	D	-	Not Used	This parameter is not used for a surface source
H3RMVF	Water fraction available for vaporization	P	2	D	-	Not Used	This parameter is not used for a surface source
HUMIDITY	Humidity	P, B	2	D	g/m^3	Not Used	This parameter is not used for a surface source

Notes:

[1]Parameter Classification: P = Physical; B = Behavioral; M = Metabolic

[2]1 = high priority parameter, 2 = medium priority parameter, 3 = low priority parameter

[3]D = Deterministic treatment, S = Stochastic treatment

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Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
TIME PARAMETERS							
TTIME	Exposure duration	B	3	D	d	179.00	ANL/EAD/03-01 template for building renovation scenario
FTIN	Indoor fraction	B	2	D	-	0.351	ANL/EAD/03-01 template for building renovation scenario
NTIME	Number of times for calculation	P	3	D	-	2	RESRAD-BUILD current default Physical priority 3 value acceptable for the calculation
DOSE_TIME	Time	P	3	D	yr	1	NUREG/CR-5512, Vol. 3 Section 5.2.2.4
POINT	Maximum time integration points	P	3	D	-	1	Argonne National Laboratory recommended value for probabilistic calculations
BUILDING PARAMETERS							
NROOM	Number of rooms	P	3	D	-	1	The decommissioned containment building contains only one contaminated room
UD	Deposition velocity	P	2	S	m/s	Loguniform distribution	NUREG/CR-6755, Section 3.3
UD (H-3 only)	Deposition velocity	P	2	S	m/s	0	ANL-EAD-03-01, Appendix G, Section G.3.2
DKSUS	Resuspension rate	P, B	1	D	s^{-1}	1.33E-09	Calculated from the NUREG-1720 recommended DandD resuspension factor of 9.6E-07 m^{-1}, deposition velocity, air exchange rate and room height (see Section 6.2 of DTBD-04-004)
H	Room height	P	2	D	m	44.2	Distance of 145 ft. from the containment building basement to the base of the dome

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
AREA	Room area	P	2	D	m^2	1230	Area of the containment building basement which is 130 ft. in diameter
LAMBDAT (building)	Air exchange rate	B	2	S	1/h	Truncated lognormal-n	NUREG/CR-6755, Section 3.2
Q12 and Q21; Q23 and Q32	Flow rate between rooms	B	3	D	m^3/h	0	This dose model contains only one receptor room
Q10 and Q01; Q20 and Q02; Q30 and Q03	Outdoor inflow and outflow	B, P	3	NA	m^3/h	Not used	Outdoor inflow is calculated from room volume and air exchange rate
RECEPTOR PARAMETERS							
ND	Number of receptors	B	3	D	-	1	This dose model contains only one receptor
DLVL	Receptor room	B	3	D	-	1	This dose model contains only one receptor room
DX	Receptor location (x, y, z)	B	3	D	m	19.8, 19.8, 1	One meter above the center of the containment building's floor
TWGHT	Receptor time fraction	B	3	D	-	1	NUREG/CR-5512, Vol. 3
BRTRATE	Receptor breathing/inhalation rate	M, B	2	S	m^3/d	38.4	ANL/EAD/03-1 Table 3.1 receptor inhalation rate for the building renovation scenario
INGE2	Indirect ingestion rate	B	2	S	m^2/h	0	ANL/EAD/03-1 Table 3.1 receptor indirect ingestion rate for the building renovation scenario
SOURCE PARAMETERS							
NS	Number of sources	P	3	D	-	6	Assumes contamination on four walls plus the floor and ceiling
Source 1 - Floor							
SLVL	Source room (also primary room)	P	3	D	-	1	This dose model contains only one room
STYPE	Source type	P	3	D	-	Volume	ANL/EAD/03-1 Table 3.1 source type for the building renovation scenario

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
SDIR	Source direction	P	3	D	-	z	NUREG/CR-5512
SX	Source location (x, y, z)	P	3	D	m	19.8, 19.8, 0	This defines the center of the containment building's floor
SAREA	Source area	P	2	D	m^2	1230	Area of the containment building basement which is 130 ft. in diameter
AIRFR	Air release fraction	B	2	S	-	0.1	ANL/EAD/03-1 Table 3.1 air release fraction for the building renovation scenario
INGE1	Direct ingestion rate	B	2	D	g/h	0.052	Effective transfer rate from NUREG/CR-5512, Vol. 1 building renovation scenario for ingestion of loose dust to the hands and mouth during building renovation
RMVFR	Removable fraction	P, B	1	NA	-	Not used	Removable contamination is not assumed to be present on a volume source
RF0	Source lifetime (also time for source removal)	P, B	2	NA	d	Not used	Removable contamination is not assumed to be present on a volume source
RRF	Radon release fraction	P, B	3	NA	-	Not used	Radon exposure is not regulated by the NRC
RNUCACT	Radionuclide concentration/activity	P	2	D	pCi/g	1	Calculates a dose conversion factor in units of mrem/yr per pCi/g
NREGI0	Number of regions in volume source	P	3	D	-	1	One homogenous region is assumed for the volume source
FCONT0	Contaminated region (volume source)	P	3	D	-	1	One homogenous region is assumed for the volume source
THICK0	Source region thickness (volume source)	P	2	D	cm	15	ANL/EAD/03-01 template for building renovation scenario

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
DENSI0	Source density (volume source)	P	1	S	g/cm^3	Uniform distribution	ANL-EAD-03-01, Appendix J
EROS0	Source erosion rate (volume source)	P, B	2	S	cm/d	4.1E-4	ANL/EAD/03-1 Table 3.1 source erosion rate for the building renovation scenario
POROS0	Source porosity	P	2	S	-	Uniform distribution	ANL-EAD-03-01, Appendix J
EFDIF0	Radon effective diffusion coefficient	P	3	NA	m^2/sec	Not used	Radon exposure is not regulated by the NRC
EMANA0	Radon emanation fraction	P	3	NA	-	Not used	Radon exposure is not regulated by the NRC
MTLS	Source material			D	-	Concrete	One homogenous region is assumed
Source 2 – West wall							
SLVL	Source room (also primary room)	P	3	D	-	1	This dose model contains only one room
STYPE	Source type	P	3	D	-	Volume	ANL/EAD/03-1 Table 3.1 source type for the building renovation scenario
SDIR	Source direction	P	3	D	-	x	NUREG/CR-5512
SX	Source location (x, y, z)	P	3	D	m	0, 17.5, 22.1	Y distance is half of the square root of the containment building basement area and z distance is half of the containment building distance from basement floor to base of the dome (72.5 ft.)
SAREA	Source area	P	2	D	m^2	1380	One fourth of the containment building cylindrical wall area
AIRFR	Air release fraction	B	2	S	-	0.1	ANL/EAD/03-1 Table 3.1 air release fraction for the building renovation scenario

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
INGE1	Direct ingestion rate	B	2	D	g/h or 1/h	0.052	Effective transfer rate from NUREG/CR-5512, Vol. 1 building renovation scenario for ingestion of loose dust to the hands and mouth during building renovation
RMVFR	Removable fraction	P, B	1	NA	-	Not used	Removable contamination is not assumed to be present on a volume source.
RF0	Source lifetime (also time for source removal)	P, B	2	NA	d	Not used	Removable contamination is not assumed to be present on a volume source.
RRF	Radon release fraction	P, B	3	NA	-	Not used	Radon exposure is not regulated by the NRC
RNUCACT	Radionuclide concentration/activity	P	2	D	pCi/g	1	Calculates a dose conversion factor in units of mrem/yr per pCi/g
NREGI0	Number of regions in volume source	P	3	D	-	1	One homogenous region is assumed for the volume source
FCONT0	Contaminated region (volume source)	P	3	D	-	1	One homogenous region is assumed for the volume source
THICK0	Source region thickness (volume source)	P	2	D	cm	15	ANL/EAD/03-01 template for building renovation scenario
DENSI0	Source density (volume source)	P	1	S	g/cm^3	Uniform distribution	ANL-EAD-03-01, Appendix J
EROS0	Source erosion rate (volume source)	P, B	2	S	cm/d	4.1E-4	ANL/EAD/03-1 Table 3.1 source erosion rate for the building renovation scenario
POROS0	Source porosity	P	2	S	-	Uniform distribution	ANL-EAD-03-01, Appendix J
EFDIF0	Radon effective diffusion coefficient	P	3	NA	m^2/sec	Not used	Radon exposure is not regulated by the NRC

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
EMANA0	Radon emanation fraction	P	3	NA	-	Not used	Radon exposure is not regulated by the NRC
MTLS	Source material			D	-	Concrete	One homogenous region is assumed
Source 3 – North wall							
SLVL	Source room (also primary room)	P	3	D	-	1	This dose model contains only one room
STYPE	Source type	P	3	D	-	Volume	ANL/EAD/03-1 Table 3.1 source type for the building renovation scenario
SDIR	Source direction	P	3	D	-	y	NUREG/CR-5512
SX	Source location (x, y, z)	P	3	D	m	17.5, 35, 22.1	X distance is half of the square root of the containment building basement area, Y distance is the square root of the containment building basement area and Z distance is half of the containment building distance from basement floor to base of the dome (72.5 ft.)
SAREA	Source area	P	2	D	m^2	1380	One fourth of the containment building cylindrical wall area
AIRFR	Air release fraction	B	2	S	-	0.1	ANL/EAD/03-1 Table 3.1 air release fraction for the building renovation scenario
INGE1	Direct ingestion rate	B	2	D	g/h or 1/h	0.052	Effective transfer rate from NUREG/CR-5512, Vol. 1 building renovation scenario for ingestion of loose dust to the hands and mouth during building renovation
RMVFR	Removable fraction	P, B	1	NA	-	Not used	Removable contamination is not assumed to be present on a volume source.

Parameter							
Name	**Description**	**Class[1]**	**Priority[2]**	**Treatment[3]**	**Units**	**Parameter Value**	**Basis for Parameter Selection**
RF0	Source lifetime (also time for source removal)	P, B	2	NA	d	Not used	Removable contamination is not assumed to be present on a volume source.
RRF	Radon release fraction	P, B	3	NA	-	Not used	Radon exposure is not regulated by the NRC
RNUCACT	Radionuclide concentration/activity	P	2	D	pCi/g	1	Calculates a dose conversion factor in units of mrem/yr per pCi/g
NREGI0	Number of regions in volume source	P	3	D	-	1	One homogenous region is assumed for the volume source
FCONT0	Contaminated region (volume source)	P	3	D	-	1	One homogenous region is assumed for the volume source
THICK0	Source region thickness (volume source)	P	2	D	cm	15	ANL/EAD/03-01 template for building renovation scenario
DENSI0	Source density (volume source)	P	1	S	g/cm^3	Uniform distribution	ANL-EAD-03-01, Appendix J
EROS0	Source erosion rate (volume source)	P, B	2	S	cm/d	4.1E-4	ANL/EAD/03-1 Table 3.1 source erosion rate for the building renovation scenario
POROS0	Source porosity	P	2	S	-	Uniform distribution	ANL-EAD-03-01, Appendix J
EFDIF0	Radon effective diffusion coefficient	P	3	NA	m^2/sec	Not used	Radon exposure is not regulated by the NRC
EMANA0	Radon emanation fraction	P	3	NA	-	Not used	Radon exposure is not regulated by the NRC
MTLS	Source material			D	-	Concrete	One homogenous region is assumed
Source 4 – East wall							
SLVL	Source room (also primary room)	P	3	D	-	1	This dose model contains only one room
STYPE	Source type	P	3	D	-	Volume	ANL/EAD/03-1 Table 3.1 source type for the building renovation scenario

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
SDIR	Source direction	P	3	D	-	x	NUREG/CR-5512
SX	Source location	P	3	D	m	35, 17.5, 22.1	X distance is the square root of the containment building basement area, Y distance is half of the square root of the containment building basement area and Z distance is half of the containment building distance from basement floor to base of the dome (72.5 ft.)
SAREA	Source area	P	2	D	m^2	1380	One fourth of the containment building cylindrical wall area
AIRFR	Air release fraction	B	2	S	-	0.1	ANL/EAD/03-1 Table 3.1 air release fraction for the building renovation scenario
INGE1	Direct ingestion rate	B	2	D	g/h or 1/h	0.052	Effective transfer rate from NUREG/CR-5512, Vol. 1 building renovation scenario for ingestion of loose dust to the hands and mouth during building renovation
RMVFR	Removable fraction	P, B	1	NA	-	Not used	Removable contamination is not assumed to be present on a volume source.
RF0	Source lifetime (also time for source removal)	P, B	2	NA	d	Not used	Removable contamination is not assumed to be present on a volume source.
RRF	Radon release fraction	P, B	3	NA	-	Not used	Radon exposure is not regulated by the NRC
RNUCACT	Radionuclide concentration/activity	P	2	D	pCi/g	1	Calculates a dose conversion factor in units of mrem/yr per pCi/g
NREGI0	Number of regions in volume source	P	3	D	-	1	One homogenous region is assumed for the volume source

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
FCONT0	Contaminated region (volume source)	P	3	D	-	1	One homogenous region is assumed for the volume source
THICK0	Source region thickness (volume source)	P	2	D	cm	15	ANL/EAD/03-01 template for building renovation scenario
DENSI0	Source density (volume source)	P	1	S	g/cm^3	Uniform distribution	ANL-EAD-03-01, Appendix J
EROS0	Source erosion rate (volume source)	P, B	2	S	cm/d	4.1E-4	ANL/EAD/03-1 Table 3.1 source erosion rate for the building renovation scenario
POROS0	Source porosity	P	2	S	-	Uniform distribution	ANL-EAD-03-01, Appendix J
EFDIF0	Radon effective diffusion coefficient	P	3	NA	m^2/sec	Not used	Radon exposure is not regulated by the NRC
EMANA0	Radon emanation fraction	P	3	NA	-	Not used	Radon exposure is not regulated by the NRC
MTLS	Source material			D	-	Concrete	One homogenous region is assumed
Source 5 – South wall							
SLVL	Source room (also primary room)	P	3	D	-	1	This dose model contains only one room
STYPE	Source type	P	3	D	-	Volume	ANL/EAD/03-1 Table 3.1 source type for the building renovation scenario
SDIR	Source direction	P	3	D	-	y	NUREG/CR-5512
SX	Source location	P	3	D	m	17.5, 17.5, 22.1	X and Y distances are half of the square root of the containment building basement area and Z distance is half of the containment building distance from basement floor to base of the dome (72.5 ft.)
SAREA	Source area	P	2	D	m^2	1380	One fourth of the containment building cylindrical wall area

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
AIRFR	Air release fraction	B	2	S	-	0.1	ANL/EAD/03-1 Table 3.1 air release fraction for the building renovation scenario
INGE1	Direct ingestion rate	B	2	D	g/h or 1/h	0.052	Effective transfer rate from NUREG/CR-5512, Vol. 1 building renovation scenario for ingestion of loose dust to the hands and mouth during building renovation
RMVFR	Removable fraction	P, B	1	NA	-	Not used	Removable contamination is not assumed to be present on a volume source.
RF0	Source lifetime (also time for source removal)	P, B	2	NA	d	Not used	Removable contamination is not assumed to be present on a volume source.
RRF	Radon release fraction	P, B	3	NA	-	Not used	Radon exposure is not regulated by the NRC
RNUCACT	Radionuclide concentration/activity	P	2	D	pCi/g	1	Calculates a dose conversion factor in units of mrem/yr per pCi/g
NREGI0	Number of regions in volume source	P	3	D	-	1	One homogenous region is assumed for the volume source
FCONT0	Contaminated region (volume source)	P	3	D	-	1	One homogenous region is assumed for the volume source
THICK0	Source region thickness (volume source)	P	2	D	cm	15	ANL/EAD/03-01 template for building renovation scenario
DENSI0	Source density (volume source)	P	1	S	g/cm^3	Uniform distribution	ANL-EAD-03-01, Appendix J
EROS0	Source erosion rate (volume source)	P, B	2	S	cm/d	4.1E-4	ANL/EAD/03-1 Table 3.1 source erosion rate for the building renovation scenario
POROS0	Source porosity	P	2	S	-	Uniform distribution	ANL-EAD-03-01, Appendix J

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
EFDIF0	Radon effective diffusion coefficient	P	3	NA	m^2/sec	Not used	Radon exposure is not regulated by the NRC
EMANA0	Radon emanation fraction	P	3	NA	-	Not used	Radon exposure is not regulated by the NRC
MTLS	Source material			D	-	Concrete	One homogenous region is assumed
Source 6 – Ceiling							
SLVL	Source room (also primary room)	P	3	D	-	1	This dose model contains only one room
STYPE	Source type	P	3	D	-	Volume	ANL/EAD/03-1 Table 3.1 source type for the building renovation scenario
SDIR	Source direction	P	3	D	-	z	NUREG/CR-5512
SX	Source location (x, y, z)	P	3	D	m	19.8, 19.8, 44.2	This defines the center of the base of the containment building's dome
SAREA	Source area	P	2	D	m^2	1230	Area of the containment building basement which is 130 ft. in diameter
AIRFR	Air release fraction	B	2	S	-	0.1	ANL/EAD/03-1 Table 3.1 air release fraction for the building renovation scenario
INGE1	Direct ingestion rate	B	2	D	g/h	0.052	Effective transfer rate from NUREG/CR-5512, Vol. 1 building renovation scenario for ingestion of loose dust to the hands and mouth during building renovation
RMVFR	Removable fraction	P, B	1	NA	-	Not used	Removable contamination is not assumed to be present on a volume source.

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
RF0	Source lifetime (also time for source removal)	P, B	2	NA	d	Not used	Removable contamination is not assumed to be present on a volume source.
RRF	Radon release fraction	P, B	3	NA	-	Not used	Radon exposure is not regulated by the NRC
RNUCACT	Radionuclide concentration/activity	P	2	D	pCi/g	1	Calculates a dose conversion factor in units of mrem/yr per pCi/g
NREGI0	Number of regions in volume source	P	3	D	-	1	One homogenous region is assumed for the volume source
FCONT0	Contaminated region (volume source)	P	3	D	-	1	One homogenous region is assumed for the volume source
THICK0	Source region thickness (volume source)	P	2	D	cm	15	ANL/EAD/03-01 template for building renovation scenario
DENSI0	Source density (volume source)	P	1	S	g/cm^3	Uniform distribution	ANL-EAD-03-01, Appendix J
EROS0	Source erosion rate (volume source)	P, B	2	S	cm/d	4.1E-4	ANL/EAD/03-1 Table 3.1 source erosion rate for the building renovation scenario
POROS0	Source porosity	P	2	S	-	Uniform distribution	ANL-EAD-03-01, Appendix J
EFDIF0	Radon effective diffusion coefficient	P	3	NA	m^2/sec	Not used	Radon exposure is not regulated by the NRC
EMANA0	Radon emanation fraction	P	3	NA	-	Not used	Radon exposure is not regulated by the NRC
MTLS	Source material			D	-	Concrete	One homogenous region is assumed
SHIELDING PARAMETERS							
DSTH	Shielding thickness	P, B	2	S	cm	0	Shielding is not used in this dose model
DSDEN	Shielding density	P	1	NA	g/cm^3	2.4	Default value but not used in this dose model

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
MTLC	Shielding material	P	3	NA	-	None	Default value but not used in this dose model
TRITIUM MODEL PARAMETERS							
DRYTHICK	Dry zone thickness	P	3	D	cm	0	This model assumes that all bulk material is contaminated
H3THICK	Wet + dry zone thickness	P	2	D	cm	1	This parameter represents the depth from the surface of the contaminated material to the deepest point of the contaminated zone, thus the source region thickness.
H3VOLFRACT	Volumetric water content	P	2	S	-	Uniform distribution	ANL-EAD-03-01, Appendix J
H3RMVF	Water fraction available for vaporization	P	2	S	-	Triangular distribution	ANL-EAD-03-01, Appendix J
HUMIDITY	Humidity	P, B	2	S	g/m^3	Uniform distribution	ANL-EAD-03-01, Appendix J

[1]Parameter Classification: P = Physical; B = Behavioral; M = Metabolic

[2]1 = high priority parameter, 2 = medium priority parameter, 3 = low priority parameter

[3]D = deterministic; S = stochastic; NA = not applicable

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Parameter	Priority[1]	Distribution	Distribution's Statistical Parameters[2]				PRCC[3]	25% or 75% Quartile	Assigned Parameter Value
			1	2	3	4			
Deposition velocity	2	Loguniform	2.7E-06	2.7E-03	-	-	0.93	75%	0.000478
Deposition velocity (Fe-55, Ni-63, Sr-90,Pm-147, Pu-238, Pu-241, & Cm-244)	2	Loguniform	2.7E-06	2.7E-03	-	-	-0.62	25%	1.52E-05
Building air exchange rate	2	Truncated lognormal-n	0.4187	0.88	0.001	0.999	-1.00	25%	0.839
Source density (S1)	1	Uniform	2.2	2.6	-	-	0.96	75%	2.50
H-3 Source porosity (S1)	2	Uniform	0.04	0.25	-	-	0.45	75%	0.197
Source density (S2)	1	Uniform	2.2	2.6	-	-	0.18	75%	2.50
H-3 Source porosity (S2)	2	Uniform	0.04	0.25	-	-	0.51	75%	0.197
Source density (S3)	1	Uniform	2.2	2.6	-	-	0.52	75%	2.50
H-3 Source porosity (S3)	2	Uniform	0.04	0.25	-	-	0.47	75%	0.197
Source density (S4)	1	Uniform	2.2	2.6	-	-	0.47	75%	2.50
H-3 Source porosity (S4)	2	Uniform	0.04	0.25	-	-	0.44	75%	0.197
Source density (S5)	1	Uniform	2.2	2.6	-	-	0.79	75%	2.50
H-3 Source porosity (S5)	2	Uniform	0.04	0.25	-	-	0.53	75%	0.197
Source density (S6)	1	Uniform	2.2	2.6	-	-	0.23	75%	2.50
H-3 Source porosity (S6)	2	Uniform	0.04	0.25	-	-	0.42	75%	0.197
Source erosion rate (S6)	2	Triangular	0	5.6E-07	0	-	0.01	No	Distribution
H-3 Volumetric water content(S1)	2	Uniform	0.04	0.25	-	-	-0.38	25%	0.0920
H-3 Water fraction available for vaporization(S1)	2	Triangular	0.5	1.0	0.75	-	0.02	No	Distribution
H-3 Humidity(S1)	2	Uniform	6.5	13.1	-	-	-0.16	25%	8.15
H-3 Volumetric water content(S2)	2	Uniform	0.04	0.25	-	-	-0.45	25%	0.0920
H-3 Water fraction available for vaporization(S2)	2	Triangular	0.5	1.0	0.75	-	0.03	No	Distribution
H-3 Humidity(S2)	2	Uniform	6.5	13.1	-	-	-0.25	25%	8.15
H-3 Volumetric water content(S3)	2	Uniform	0.04	0.25	-	-	-0.34	25%	0.0920
H-3 Water fraction available for vaporization(S3)	2	Triangular	0.5	1.0	0.75	-	0.12	75%	0.823
H-3 Humidity(S3)	2	Uniform	6.5	13.1	-	-	-0.26	25%	8.15
H-3 Volumetric water content(S4)	2	Uniform	0.04	0.25	-	-	-0.35	25%	0.0920
H-3 Water fraction available for vaporization(S4)	2	Triangular	0.5	1.0	0.75	-	0.15	75%	0.823
H-3 Humidity(S4)	2	Uniform	6.5	13.1	-	-	-0.16	25%	8.15
H-3 Volumetric water content(S5)	2	Uniform	0.04	0.25	-	-	-0.42	25%	0.0920
H-3 Water fraction available for vaporization(S5)	2	Triangular	0.5	1.0	0.75	-	0.03	No	Distribution
H-3 Humidity(S5)	2	Uniform	6.5	13.1	-	-	-0.25	25%	8.15
H-3 Volumetric water content(S6)	2	Uniform	0.04	0.25	-	-	-0.34	25%	0.0920
H-3 Water fraction available for vaporization(S6)	2	Triangular	0.5	1.0	0.75	-	0.15	75%	0.823
H-3 Humidity(S6)	2	Uniform	6.5	13.1	-	-	-0.19	25%	8.15

Notes:

[1] 1 = high priority parameter, 2 = medium priority parameter

[2] Distribution's Statistical Parameter
Loguniform: 1 = minimum, 2 = maximum
Triangular: 1 = minimum, 2 = maximum, 3 = most likely
Uniform: 1 = minimum, 2 = maximum
Truncated lognormal-n: 1 = underlying mean value, 2 = underlying standard deviation, 3 = lower quantile, 4 = upper quantile

[3] PRCC = Partial ranked correlation coefficient for Time 1

Radionuclide Specific RESRAD-BUILD Sensitive Parameters												
	Radionuclide											
	H-3		C-14		Na-22		Fe-55		Ni-59		Co-60	
Rank	Parameter	PRCC	Parameter	PRCC	Parameter	PRCC	Parameter	PRCC	Parameter	PRCC	Parameter	PRCC
1	LAMBDAT	-1.00	LAMBDAT	-1.00	DENSI0(S1)	0.85	LAMBDAT	-1.00	LAMBDAT	-1.00	DENSI0(S1)	0.85
2	H3POROSITY(S5)	0.53	UD	0.60	UD	0.62	UD	-0.62	DENSI0(S6)	0.53	UD	0.69
3	H3POROSITY(S2)	0.51	DENSI0(S3)	0.37	DENSI0(S4)	0.59	DENSI0(S3)	0.28	DENSI0(S3)	0.52	DENSI0(S5)	0.65
4	H3POROSITY(S3)	0.47	DENSI0(S6)	0.34	DENSI0(S3)	0.56	DENSI0(S2)	0.26	DENSI0(S2)	0.50	LAMBDAT	-0.60
5	H3POROSITY(S1)	0.45	DENSI0(S2)	0.31	DENSI0(S5)	0.54	DENSI0(S1)	0.23	DENSI0(S5)	0.47	DENSI0(S4)	0.59
6	H3VOLFRACT(S2)	-0.45	DENSI0(S5)	0.30	DENSI0(S2)	0.52	DENSI0(S4)	0.23	DENSI0(S4)	0.47	DENSI0(S3)	0.56
7	H3POROSITY(S4)	0.44	DENSI0(S4)	0.27	LAMBDAT	-0.40	DENSI0(S5)	0.21	DENSI0(S1)	0.39	DENSI0(S2)	0.51
8	H3VOLFRACT(S5)	-0.42	DENSI0(S1)	0.16	DENSI0(S6)	0.40	DENSI0(S6)	0.19			DENSI0(S6)	0.32
9	H3POROSITY(S6)	0.42										
10	H3VOLFRACT(S1)	-0.38										
11	H3VOLFRACT(S4)	-0.35										
12	H3VOLFRACT(S6)	-0.34										
13	H3VOLFRACT(S3)	-0.34										
14	HUMIDITY(S3)	-0.26										
15	HUMIDITY(S2)	-0.25										
16	HUMIDITY(S5)	-0.25										
17	DENSI0(S6)	0.23										
18	HUMIDITY(S6)	-0.19										
19	DENSI0(S2)	0.18										
20	HUMIDITY(S1)	-0.16										
21	HUMIDITY(S4)	-0.16										
22	H3RMV(S4)	0.15										
23	H3RMV(S6)	0.15										
24	H3RMV(S3)	0.12										

Radionuclide Specific Sensitive RESRAD-BUILD Parameters, Cont.

	Radionuclide											
	Ni-63		Sr-90		Nb-94		Tc-99		Ag-108m		Sb-125	
Rank	Parameter	PRCC	Parameter	PRCC	Parameter	PRCC	Parameter	PRCC	Parameter	PRCC	Parameter	PRCC
1	LAMBDAT	-1.00	LAMBDAT	-1.00	UD	0.86	LAMBDAT	-1.00	UD	0.85	UD	0.58
2	DENSI0(S3)	0.49	DENSI0(S3)	0.47	LAMBDAT	-0.76	UD	0.60	LAMBDAT	-0.68	DENSI0(S1)	0.55
3	DENSI0(S2)	0.48	DENSI0(S2)	0.45	DENSI0(S1)	0.62	DENSI0(S3)	0.38	DENSI0(S1)	0.55	DENSI0(S3)	0.42
4	DENSI0(S6)	0.44	DENSI0(S6)	0.42	DENSI0(S4)	0.47	DENSI0(S6)	0.35	DENSI0(S4)	0.44	DENSI0(S4)	0.40
5	DENSI0(S5)	0.44	DENSI0(S1)	0.39	DENSI0(S3)	0.43	DENSI0(S2)	0.35	DENSI0(S3)	0.42	LAMBDAT	-0.40
6	DENSI0(S4)	0.41	DENSI0(S5)	0.39	DENSI0(S5)	0.33	DENSI0(S4)	0.34	DENSI0(S2)	0.33	DENSI0(S5)	0.37
7	DENSI0(S1)	0.41	DENSI0(S4)	0.39	DENSI0(S2)	0.33	DENSI0(S5)	0.33	DENSI0(S5)	0.33	DENSI0(S2)	0.34
8	UD	-0.21	UD	-0.31	DENSI0(S6)	0.30	DENSI0(S1)	0.14	DENSI0(S6)	0.26	DENSI0(S6)	0.33
	Radionuclide											
	Cs-134		Cs-137		Pm-147		Eu-152		Eu-154		Eu-155	
Rank	Parameter	PRCC	Parameter	PRCC	Parameter	PRCC	Parameter	PRCC	Parameter	PRCC	Parameter	PRCC
1	DENSI0(S1)	0.83	UD	0.82	LAMBDAT	-1.00	UD	0.76	DENSI0(S1)	0.78	LAMBDAT	-0.97
2	UD	0.59	DENSI0(S1)	0.62	UD	-0.62	DENSI0(S1)	0.73	LAMBDAT	-0.75	UD	0.83
3	DENSI0(S5)	0.57	LAMBDAT	-0.60	DENSI0(S3)	0.26	LAMBDAT	-0.71	UD	0.74	DENSI0(S3)	0.14
4	DENSI0(S3)	0.56	DENSI0(S4)	0.43	DENSI0(S2)	0.25	DENSI0(S4)	0.48	DENSI0(S5)	0.55		
5	DENSI0(S4)	0.56	DENSI0(S5)	0.42	DENSI0(S4)	0.25	DENSI0(S5)	0.47	DENSI0(S4)	0.52		
6	DENSI0(S2)	0.53	DENSI0(S3)	0.40	DENSI0(S1)	0.22	DENSI0(S3)	0.43	DENSI0(S3)	0.50		
7	LAMBDAT	-0.44	DENSI0(S2)	0.37	DENSI0(S5)	0.21	DENSI0(S2)	0.39	DENSI0(S2)	0.44		
8	DENSI0(S6)	0.38	DENSI0(S6)	0.28	DENSI0(S6)	0.17	DENSI0(S6)	0.30	DENSI0(S6)	0.32		
	Radionuclide											
	Np-237		Pu-238		Pu-239		Pu-240		Pu-241		Am-241	
Rank	Parameter	PRCC	Parameter	PRCC	Parameter	PRCC	Parameter	PRCC	Parameter	PRCC	Parameter	PRCC
1	LAMBDAT	-1.00	LAMBDAT	-1.00	LAMBDAT	-1.00	LAMBDAT	-1.00	LAMBDAT	-1.00	LAMBDAT	-1.00
2	DENSI0(S6)	0.53	DENSI0(S3)	0.48	DENSI0(S3)	0.52	DENSI0(S5)	0.48	UD	-0.58	DENSI0(S3)	0.52
3	DENSI0(S3)	0.51	DENSI0(S5)	0.46	DENSI0(S6)	0.51	DENSI0(S2)	0.47	DENSI0(S2)	0.35	DENSI0(S6)	0.50
4	DENSI0(S2)	0.48	DENSI0(S1)	0.44	DENSI0(S2)	0.48	DENSI0(S3)	0.46	DENSI0(S3)	0.35	DENSI0(S2)	0.49
5	DENSI0(S5)	0.47	DENSI0(S4)	0.42	DENSI0(S5)	0.46	DENSI0(S1)	0.44	DENSI0(S1)	0.31	DENSI0(S4)	0.47
6	DENSI0(S4)	0.46	DENSI0(S2)	0.42	DENSI0(S4)	0.46	DENSI0(S4)	0.44	DENSI0(S4)	0.27	DENSI0(S5)	0.45
7	DENSI0(S1)	0.38	DENSI0(S6)	0.41	DENSI0(S1)	0.38	DENSI0(S6)	0.40	DENSI0(S5)	0.27	DENSI0(S1)	0.39
8			UD	-0.32			POROSITY(S6)	0.13	DENSI0(S6)	0.25		

Radionuclide Specific Sensitive RESRAD-BUILD Parameters, Cont.																					
	Radionuclide											
	Pu-242		Cm-244									
Rank	Parameter	PRCC	Parameter	PRCC	Parameter	PRCC	Parameter	PRCC	Parameter	PRCC	Parameter	PRCC
1	LAMBDAT	-1.00	LAMBDAT	-1.00								
2	DENSI0(S5)	0.48	UD	-0.56								
3	DENSI0(S2)	0.47	DENSI0(S3)	0.39								
4	DENSI0(S3)	0.46	DENSI0(S5)	0.39								
5	DENSI0(S1)	0.44	DENSI0(S1)	0.34								
6	DENSI0(S4)	0.44	DENSI0(S4)	0.32								
7	DENSI0(S6)	0.41	DENSI0(S6)	0.30								
8	POROSITY(S6)	0.12	DENSI0(S2)	0.27								

Parameter Code Explanation

DENSI0 - Source density
H3RMV - Water fraction available for vaporization (for H-3)
H3VOLFRACT - Volumetric water content (for H-3)
LAMBDAT - Building air exchange rate
POROSITY - Total porosity
UD - Deposition velocity
(S#) Source number

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Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Contamination					
Thickness of contaminated zone	P	2	m	0.15	Assigned value
Area of contaminated zone	P	2	m^2	10,000, 3,000, 1,000, 300, 100, 30, 10, 3, 1	Example contaminated zone areas provided in NUREG-1505 for calculation of area factors
Shape of the contaminated zone	P	3	-	Circular	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Initial concentration of principal radionuclides in soil	P	2	pCi/g	1	Input value selected to provide probabilistic DCF results in units of millirem/year per pCi/g
Initial concentration of radionuclides present in ground water	P	3	pCi/L	0	Not Used for this evaluation
Leach rate	P	3	1/yr	0	Default Physical value to invoke the calculation of this parameter via a first-order leaching model that uses the value of the soil/water distribution coefficient in the contaminated zone
Solubility limit	P	3	mol/L	0	Default Physical value – not used by RESRAD v6.22 with leach rate flag set to 0
Time since placement of material	P	3	yr	0	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Times for calculation	P	3	yr	1, 3, 10, 30, 100, 300, 1000	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Contaminated zone density	P	1	g/cm^3	1.47	Deterministic sensitive parameter value determined in DTBD-05-005
Contaminated zone distribution coefficient for C-14	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Ni-63	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Contaminated zone distribution coefficient for Co-60	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Sr-90	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Cs-134	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Cs-137	P	1	cm^3/g	2130	Deterministic sensitive parameter value determined in DTBD-05-005
Use plant/soil ratio	NA	3	Check box	No	For purposes of this evaluation, the code should not be allowed to calculate the distribution coefficient from the plant root uptake factors because statistical distributions are used for distribution coefficients
Contaminated zone field capacity	P	3	-	0.2	Default RESRAD v6.22 Priority 3 Physical priority 3 value acceptable for this evaluation
Contaminated zone erosion rate	P,B	2	m/yr	Continuous logarithmic distribution	NUREG/CR-6697, Attachment C
Contaminated zone total porosity	P	2	-	Truncated normal distribution	NUREG/CR-6697, Attachment C
Contaminated zone hydraulic conductivity	P	2	m/yr	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 3.4-1 for silt
Contaminated zone b parameter	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C
Carbon-Model Parameters					
Thickness of evasion layer of C-14 in soil	P	2	m	Triangular distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
C-14 evasion flux rate from soil	P	3	1/s	7E-07	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
C-12 concentration in local water	P	3	g/cm^3	2E-05	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
C-12 concentration in contaminated soil	P	3	g/g	0.03	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Fraction of vegetation carbon absorbed from soil	P	3	-	0.02	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Fraction of vegetation carbon absorbed from air	P	3	-	0.98	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
C-12 evasion flux rate from soil	P	3	1/s	1E-10	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Grain fraction in beef cattle feed	B	3	-	0.8	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Grain fraction in milk cow feed	B	3	-	0.2	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
DCF correction factor for gaseous forms of C-14	P	3	-	88.94	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Soil					
Cover depth	P	2	m	0	The contamination is assumed to be on surface soil
Density of cover material	P	1	g/cm^3	Not Used	A cover is not used in this evaluation
Cover total porosity	P	3	-	Not Used	Radon is not used in this evaluation
Cover volumetric water content	P	3	-	Not Used	Radon is not used in this evaluation
Cover radon diffusion coefficient	P	3	m^2/s	Not Used	Radon is not used in this evaluation
Cover erosion rate	P,B	2	m/yr	Not Used	A cover is not used in this evaluation
Number of unsaturated zones	P	3	-	4	Simplified hydrogeological model assumption
Unsaturated zone 1 thickness	P	1	m	0.305	Thickness of silt layer above the sand layer

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Unsaturated zone 1 density	P	2	g/cm^3	Normal distribution	NUREG/CR-6767, Attachment C, Table C-1 distribution for silt
Unsaturated zone 1 distribution coefficient for C-14	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Ni-63	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Co-60	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Sr-90	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Cs-134	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Cs-137	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 total porosity	P	2	-	Truncated normal distribution	NUREG/CR-6697, Attachment C, Table 3.2-1 distribution for silt
Unsaturated zone 1 effective porosity	P	2	-	Truncated normal distribution	NUREG/CR-6767, Attachment A, Table A-7 distribution for silt
Unsaturated zone 1 field capacity	P	3	-	Truncated normal distribution	NUREG/CR-6767, Attachment A, Table A-7 distribution for silt
Unsaturated zone 1 hydraulic conductivity	P	2	m/yr	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 3.4-1 for silt

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Unsaturated zone 1 soil-specific b parameter	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 3.5-1 for silt
Unsaturated zone 2 thickness	P	1	m	3.05	Thickness of fine sand layer above the siltstone layer
Unsaturated zone 2 density	P	2	g/cm^3	Normal distribution	NUREG/CR-6767, Attachment C, Table C-1 distribution for sand
Unsaturated zone 2 distribution coefficient for C-14	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Ni-63	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Co-60	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Sr-90	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Cs-134	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Cs-137	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 total porosity	P	2	-	Truncated normal distribution	NUREG/CR-6697, Attachment C, Table 3.2-1 distribution for sand
Unsaturated zone 2 effective porosity	P	2	-	Truncated normal distribution	NUREG/CR-6767, Attachment A, Table A-1 distribution for sand

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Unsaturated zone 2 field capacity	P	3	-	Truncated normal distribution	NUREG/CR-6767, Attachment A, Table A-1 distribution for sand
Unsaturated zone 2 hydraulic conductivity	P	2	m/yr	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 3.4-1 for sand
Unsaturated zone 2 soil-specific b parameter	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 3.5-1 for sand
Unsaturated zone 3 thickness	P	1	m	25.60	Thickness of siltstone layer
Unsaturated zone 3 density	P	2	g/cm^3	Normal distribution	NUREG/CR-6767, Attachment C, Table C-1 distribution for silt
Unsaturated zone 3 distribution coefficient for C-14	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Ni-63	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Co-60	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Sr-90	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Cs-134	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Cs-137	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 total porosity	P	2	-	0.35	RESRAD Data Collection Handbook Table 3.2 arithmetic mean for medium siltstone

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Unsaturated zone 3 effective porosity	P	2	-	0.12	RESRAD Data Collection Handbook Table 3.2 arithmetic mean for medium siltstone
Unsaturated zone 3 field capacity	P	3	-	0.23	Total porosity minus effective porosity per RESRAD Data Collection Handbook, Section 4.1
Unsaturated zone 3 hydraulic conductivity	P	2	m/yr	Bounded lognormal-n	NUREG/CR-6697, Attachment C, Table 3.4-1 for silt
Unsaturated zone 3 soil-specific b parameter	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 3.5-1 for silt
Unsaturated zone 4 thickness	P	1	m	10.82	Thickness of unsaturated sandstone layer
Unsaturated zone 4 density	P	2	g/cm^3	Normal distribution	NUREG/CR-6767, Attachment C, Table C-1 distribution for sand
Unsaturated zone 4 distribution coefficient for C-14	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Ni-63	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Co-60	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Sr-90	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Cs-134	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Cs-137	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Unsaturated zone 4 total porosity	P	2	-	0.35	RESRAD Data Collection Handbook Table 3.2 arithmetic mean for sandstone
Unsaturated zone 4 effective porosity	P	2	-	0.27	RESRAD Data Collection Handbook Table 3.2 arithmetic mean for sandstone
Unsaturated zone 4 field capacity	P	3	-	0.07	Total porosity minus effective porosity per RESRAD Data Collection Handbook, Section 4.1
Unsaturated zone 4 hydraulic conductivity	P	2	m/yr	10	Upper boundary value from RESRAD Data Collection Handbook, Table 5.1 for sandstone
Unsaturated zone 4 soil-specific b parameter	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 3.5-1 for sand
Water					
Density of saturated zone	P	1	g/cm^3	Normal distribution	NUREG/CR-6767, Attachment C, Table C-1 distribution for sand
Saturated zone distribution coefficient for C-14	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Ni-63	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Co-60	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Sr-90	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Cs-134	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Cs-137	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Saturated zone total porosity	P	1	-	0.34	RESRAD Data Collection Handbook Table 3.2 arithmetic mean for sandstone
Saturated zone effective porosity	P	1	-	0.27	RESRAD Data Collection Handbook Table 3.2 arithmetic mean for sandstone
Saturated zone field capacity	P	3	-	0.07	Total porosity minus effective porosity per RESRAD Data Collection Handbook, Section 4.1
Saturated zone hydraulic conductivity	P	1	m/yr	10	Upper boundary value from RESRAD Data Collection Handbook, Table 5.1 for sandstone
Saturated zone hydraulic gradient	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone soil-specific b parameter	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C
Length of contaminated zone parallel to the aquifer flow	P	2	m	113, 61.8, 35.7, 19.5, 11.3, 6.18, 3.57, 1.95, 1.13	Diameter of 10,000, 3,000, 1,000, 300, 100, 30, 10, 3 and 1 m^2 contaminated zones
Water table drop rate	P	3	m/yr	0.783	Site specific value applicable to the RSNGS site as reported in the FSAR, Appendix 2C
Well-pump intake depth (below water table)	P	2	m	23	Site specific value applicable to the RSNGS site as reported in the FSAR, Appendix 2C
Well pumping rate	B, P	2	m^3/yr	Not Used	Well pumping rate is not used with the Mass-Balance model for water transport selected – well pumping rate is used to calculated a dilution factor when the Non- dispersion I model is selected.
Model: non-dispersion or mass balance	NA	3	-	MB	The mass-balance model was chosen as the most conservative since it assumes that all of the radionuclides released from the contaminated zone are withdrawn through the well.
Evapotranspiration coefficient	P	2	-	Uniform distribution	NUREG/CR-6697, Attachment C
Humidity in air	P	3	g/m^3	Not Used	Not used when the Radon exposure pathway is suppressed

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Average annual wind speed	P	2	m/s	3.13	7 mph average annual wind speed for the years of 1930 – 1996 reported by the National Climatic Data Center for Stockton, CA (http://www.ncdc.noaa.gov/oa/documentlibrary/wind/wind1996.pdf)
Precipitation rate	P	2	m/yr	0.38	Mean annual average rainfall measured at Sacramento and Stockton
Irrigation mode	B	3	-	Overhead	Behavioral value - ditch irrigation is not the principal method of irrigation in the local region
Irrigation rate	B	3	m/yr	0.2	Behavioral RESRAD v6.22 default value acceptable for this evaluation
Runoff coefficient	P	2	-	Uniform distribution	NUREG/CR-6697, Attachment C
Watershed area for nearby stream or pond	P	3	m^2	1.00E+07	The entire RSNGS site drains into Clay Creek
Accuracy for water soil computation	NA	3	-	0.001	Default RESRAD v6.22 priority 3 value acceptable for this evaluation
Ingestion					
Fruit, vegetable, and grain consumption rate	M, B	2	kg/yr	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Leafy vegetable consumption	M, B	3	kg/yr	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Milk consumption	M, B	2	L/yr	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Meat and poultry consumption	M, B	3	kg/yr	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Fish consumption rate	M, B	3	kg/yr	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Other seafood consumption rate	M, B	3	kg/yr	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Aquatic food contaminated fraction	B, P	2	-	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Soil ingestion rate	M, B	2	g/yr	Triangular distribution	NUREG/CR-6697, Attachment C
Drinking water intake	M, B	2	L/yr	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Storage time for fruits, non-leafy vegetables, and grain	B	3	d	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Storage time for leafy vegetables	B	3	d	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Storage time for milk	B	3	d	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Storage time for meat	B	3	d	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Storage time for fish	B	3	d	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Storage time for crustacea and mollusks	B	3	d	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Storage time for well water	B	3	d	1	Behavioral RESRAD v6.22 default priority 3 value acceptable for this evaluation
Storage time for surface water	B	3	d	1	Behavioral RESRAD v6.22 default priority 3 value acceptable for this evaluation
Storage time for livestock fodder	B	3	d	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Drinking water contaminated fraction	B, P	3	-	1	Default RESRAD v6.22 Behavioral/Physical priority 3 value acceptable for this evaluation
Household water contaminated fraction	B, P	3	-	Not Used	Not used when the radon exposure pathway is suppressed
Livestock water contaminated fraction	B, P	3	-	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Irrigation water contaminated fraction	B, P	3	-	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Plant food contaminated fraction	B, P	3	-	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Meat contaminated fraction	B, P	3	-	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Milk contaminated fraction	B, P	3	-	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Livestock fodder intake rate for meat	M	3	kg/d	Not Used	Not used with meat and milk exposure pathways suppressed in accordance with the Industrial Worker Scenario
Livestock fodder intake rate for milk	M	3	kg/d	Not Used	Not used with meat and milk exposure pathways suppressed in accordance with the Industrial Worker Scenario
Livestock water intake rate for meat	M	3	L/d	Not Used	Not used with meat and milk exposure pathways suppressed in accordance with the Industrial Worker Scenario
Livestock water intake rate for milk	M	3	L/d	Not Used	Not used with meat and milk exposure pathways suppressed in accordance with the Industrial Worker Scenario
Livestock intake of soil	M	3	kg/d	Not Used	Not used with meat and milk exposure pathways suppressed in accordance with the Industrial Worker Scenario
Mass loading for foliar deposition	P	3	g/m^3	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Depth of soil mixing layer	P	2	m	Triangular distribution	NUREG/CR-6697, Attachment C
Depth of roots	P	1	m	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Groundwater fractional usage for drinking water	B, P	3	-	1	Default RESRAD v6.22 Behavioral/Physical priority 3 value acceptable for this evaluation
Groundwater fractional usage for household water	B, P	3	-	Not Used	Not used when the radon exposure pathway is suppressed
Groundwater fractional usage for livestock water	B, P	3	-	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario

Parameter*	Class[1]	Priority[2]	Units	Parameter Value*	Basis for Parameter Selection
Groundwater fractional usage for irrigation water	B, P	3	-	Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Wet weight crop yield for non-leafy plants	P	2	kg/m^2	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Wet weight crop yield for leafy plants	P	3	kg/m^2	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Wet weight crop yield for fodder	P	3	kg/m^2	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Length of growing season for non-leafy vegetables	P	3	yr	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Length of growing season for leafy vegetables	P	3	yr	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Length of growing season for fodder	P	3	yr	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Translocation factor for non-leafy vegetables	P	3	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Translocation factor for leafy vegetables	P	3	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Translocation factor for fodder	P	3	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Weathering removal constant	P	2	1/yr	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Dry foliar interception fraction for non-leafy vegetables	P	3	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Dry foliar interception fraction for leafy vegetables	P	3	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Dry foliar interception fraction for fodder	P	3	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Wet foliar interception fraction for non-leafy vegetables	P	3	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Wet foliar interception fraction for leafy vegetables	P	2	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Wet foliar interception fraction for fodder	P	3	-	Not Used	Not used with vegetation exposure pathways suppressed in accordance with the Industrial Worker Scenario
Slope factor – external	M	3	(risk/yr)/(pCi/g)	Nuclide specific	Metabolic RESRAD v6.22 default priority 3 value acceptable for this evaluation
Slope factor – inhalation	M	3	risk/pCi	Nuclide specific	Metabolic RESRAD v6.22 default priority 3 value acceptable for this evaluation
Slope factor – ingestion	M	3	risk/pCi	Nuclide specific	Metabolic RESRAD v6.22 default priority 3 value acceptable for this evaluation
Plant transfer factor	P	1	-	Nuclide specific - Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Meat transfer factor	P	2	(pCi/kg)/(pCi/d)	Nuclide specific - Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Milk transfer factor	P	2	(pCi/L)/(pCi/d)	Nuclide specific - Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Bioaccumulation factor for fish	P	2	(pCi/kg)/(pCi/L)	Nuclide specific - Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Bioaccumulation factor for crustacea and mollusks	P	3	(pCi/kg)/(pCi/L)	Nuclide specific - Not Used	Not used with ingestion exposure pathways suppressed in accordance with the Industrial Worker Scenario
Occupancy (Inhalation & External Parameters)					
Inhalation rate	M, B	3	m^3/yr	Triangular distribution	NUREG/CR-6697, Attachment C
Inhalation dose conversion factors	M	3	mrem/pCi	Nuclide specific	Metabolic RESRAD v6.22 default priority 3 value acceptable for this evaluation
Ingestion dose conversion factors	M	3	mrem/pCi	Nuclide specific	Metabolic RESRAD v6.22 default priority 3 value acceptable for this evaluation
Mass loading for inhalation	P, B	2	g/m^3	Continuous linear distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Indoor dust filtration factor	P, B	2	-	Uniform distribution	NUREG/CR-6697, Attachment C
External gamma shielding factor	P	2	-	0.397	Deterministic sensitive parameter value determined in DTBD-05-005
Building foundation thickness	P	3	m	Not Used	The Radon Exposure Pathway is not used
Building foundation bulk density	P	3	g/m^3	Not Used	The Radon Exposure Pathway is not used
Building foundation total porosity	P	3	-	Not Used	The Radon Exposure Pathway is not used
Building foundation volumetric water content	P	3	-	Not Used	The Radon Exposure Pathway is not used
Building foundation radon diffusion coefficient	P	3	m^2/s	Not Used	The Radon Exposure Pathway is not used
Contaminated soil zone radon diffusion coefficient	P	3	m^2/s	Not Used	The Radon Exposure Pathway is not used
Radon vertical dimension of mixing	P	3	m	Not Used	The Radon Exposure Pathway is not used
Building air exchange rate	P, B	3	1/hr	Not Used	The Radon Exposure Pathway is not used
Building (room) height	P	3	m	Not Used	The Radon Exposure Pathway is not used
Building indoor area factor	P	3	-	Not Used	The Radon Exposure Pathway is not used
Foundation depth below ground surface	P	3	m	Not Used	The Radon Exposure Pathway is not used
Radon-222 emanation coefficient	P	3	-	Not Used	The Radon Exposure Pathway is not used
Radon-220 emanation coefficient	P	3	-	Not Used	The Radon Exposure Pathway is not used
Indoor time fraction	B	3	-	0.114	50% of a work year (2000 hrs.) spent inside an industrial facility

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Outdoor time fraction	B	3	-	0.114	50% of a work year (2000 hrs.) spent outside at an industrial facility
Exposure duration	B	3	yr	30	Behavioral RESRAD v6.22 default value

[1]Parameter Classification: P = Physical; B = Behavioral; M = Metabolic
[2]1 = high priority parameter, 2 = medium priority parameter, 3 = low priority parameter

Parameter	Priority[1]	Distribution	Distribution's Statistical Parameters[2]			
			1	2	3	4
Density of saturated zone	1	Normal	1.578	0.158	-	-
Contaminated zone distribution coefficient for C-14	1	Truncated lognormal-n	2.40	3.22	0.001	0.999
Contaminated zone distribution coefficient for Ni-63	1	Truncated lognormal-n	6.05	1.46	0.001	0.999
Contaminated zone distribution coefficient for Co-60	1	Truncated lognormal-n	5.46	2.53	0.001	0.999
Contaminated zone distribution coefficient for Sr-90	1	Truncated lognormal-n	3.45	2.12	0.001	0.999
Contaminated zone distribution coefficient for Cs-134	1	Truncated lognormal-n	6.10	2.33	0.001	0.999
Unsaturated zone 1 distribution coefficient for C-14	1	Truncated lognormal-n	2.40	3.22	0.001	0.999
Unsaturated zone 1 distribution coefficient for Ni-63	1	Truncated lognormal-n	6.05	1.46	0.001	0.999
Unsaturated zone 1 distribution coefficient for Co-60	1	Truncated lognormal-n	5.46	2.53	0.001	0.999
Unsaturated zone 1 distribution coefficient for Sr-90	1	Truncated lognormal-n	3.45	2.12	0.001	0.999
Unsaturated zone 1 distribution coefficient for Cs-134	1	Truncated lognormal-n	6.10	2.33	0.001	0.999
Unsaturated zone 1 distribution coefficient for Cs-137	1	Truncated lognormal-n	6.10	2.33	0.001	0.999
Unsaturated zone 2 distribution coefficient for C-14	1	Truncated lognormal-n	2.40	3.22	0.001	0.999
Unsaturated zone 2 distribution coefficient for Ni-63	1	Truncated lognormal-n	6.05	1.46	0.001	0.999
Unsaturated zone 2 distribution coefficient for Co-60	1	Truncated lognormal-n	5.46	2.53	0.001	0.999
Unsaturated zone 2 distribution coefficient for Sr-90	1	Truncated lognormal-n	3.45	2.12	0.001	0.999
Unsaturated zone 2 distribution coefficient for Cs-134	1	Truncated lognormal-n	6.10	2.33	0.001	0.999
Unsaturated zone 2 distribution coefficient for Cs-137	1	Truncated lognormal-n	6.10	2.33	0.001	0.999
Unsaturated zone 3 distribution coefficient for C-14	1	Truncated lognormal-n	2.40	3.22	0.001	0.999
Unsaturated zone 3 distribution coefficient for Ni-63	1	Truncated lognormal-n	6.05	1.46	0.001	0.999
Unsaturated zone 3 distribution coefficient for Co-60	1	Truncated lognormal-n	5.46	2.53	0.001	0.999
Unsaturated zone 3 distribution coefficient for Sr-90	1	Truncated lognormal-n	3.45	2.12	0.001	0.999
Unsaturated zone 3 distribution coefficient for Cs-134	1	Truncated lognormal-n	6.10	2.33	0.001	0.999
Unsaturated zone 3 distribution coefficient for Cs-137	1	Truncated lognormal-n	6.10	2.33	0.001	0.999
Unsaturated zone 4 distribution coefficient for C-14	1	Truncated lognormal-n	2.40	3.22	0.001	0.999
Unsaturated zone 4 distribution coefficient for Ni-63	1	Truncated lognormal-n	6.05	1.46	0.001	0.999
Unsaturated zone 4 distribution coefficient for Co-60	1	Truncated lognormal-n	5.46	2.53	0.001	0.999
Unsaturated zone 4 distribution coefficient for Sr-90	1	Truncated lognormal-n	3.45	2.12	0.001	0.999
Unsaturated zone 4 distribution coefficient for Cs-134	1	Truncated lognormal-n	6.10	2.33	0.001	0.999
Unsaturated zone 4 distribution coefficient for Cs-137	1	Truncated lognormal-n	6.10	2.33	0.001	0.999

Parameter	Priority[1]	Distribution	Distribution's Statistical Parameters[2]			
			1	2	3	4
Saturated zone distribution coefficient for C-14	1	Truncated lognormal-n	2.40	3.22	0.001	0.999
Saturated zone distribution coefficient for Ni-63	1	Truncated lognormal-n	6.05	1.46	0.001	0.999
Saturated zone distribution coefficient for Co-60	1	Truncated lognormal-n	5.46	2.53	0.001	0.999
Saturated zone distribution coefficient for Sr-90	1	Truncated lognormal-n	3.45	2.12	0.001	0.999
Saturated zone distribution coefficient for Cs-134	1	Truncated lognormal-n	6.10	2.33	0.001	0.999
Saturated zone distribution coefficient for Cs-137	1	Truncated lognormal-n	6.10	2.33	0.001	0.999
Contaminated zone b parameter	2	Bounded lognormal-n	1.06	0.66	0.5	30
Contaminated zone erosion rate	2	Continuous logarithmic	Default[3]	-	-	-
Contaminated zone total porosity	2	Truncated normal	0.425	0.0867	0.001	0.999
Contaminated zone hydraulic conductivity	2	Bounded lognormal-n	2.66	0.475	3.302	62.2
Depth of soil mixing layer	2	Triangular	0.0	0.6	0.15	-
Drinking water intake	2	Truncated lognormal-n	6.015	0.489	0.001	0.999
Evapotranspiration coefficient	2	Uniform	0.5	0.75	-	-
Indoor dust filtration factor	2	Uniform	0.15	0.95	-	-
Mass loading for inhalation	2	Continuous linear	Default[3]	-	-	-
Runoff coefficient	2	Uniform	0.1	0.8	-	-
Saturated zone b parameter	2	Bounded lognormal-n	1.06	0.66	0.5	30
Saturated zone hydraulic gradient	2	Bounded lognormal-n	-5.11	1.77	7E-05	0.5
Soil ingestion rate	2	Triangular	0	36.5	18.3	-
Unsaturated zone 1 density	2	Normal	1.33	0.202	-	-
Unsaturated zone 1 effective porosity	2	Truncated normal	0.425	0.110	0.0839	0.766
Unsaturated zone 1 hydraulic conductivity	2	Bounded lognormal-n	2.66	0.475	3.302	62.2
Unsaturated zone 1 b parameter	2	Bounded lognormal-n	1.16	0.140	2.06	4.89
Unsaturated zone 1 total porosity	2	Truncated normal	0.46	0.11	0.1161	0.7959
Unsaturated zone 2 density	2	Normal	1.578	0.158	-	-
Unsaturated zone 2 effective porosity	2	Truncated normal	0.383	0.0610	0.195	0.572
Unsaturated zone 2 hydraulic conductivity	2	Bounded lognormal-n	1.398	1.842	110	5870
Unsaturated zone 2 b parameter	2	Bounded lognormal-n	-0.0253	0.216	0.501	1.90
Unsaturated zone 2 total porosity	2	Truncated normal	0.43	0.06	0.2446	0.6154
Unsaturated zone 3 density	2	Normal	1.33	0.202	-	-
Unsaturated zone 3 hydraulic conductivity	2	Bounded lognormal-n	2.66	0.475	3.302	62.2
Unsaturated zone 3 b parameter	2	Bounded lognormal-n	1.16	0.140	2.06	4.89
Unsaturated zone 4 density	2	Normal	1.578	0.158	-	-
Unsaturated zone 4 hydraulic conductivity	2	Bounded lognormal-n	1.398	1.842	110	5870
Unsaturated zone 4 b parameter	2	Bounded lognormal-n	-0.0253	0.216	0.501	1.90
Thickness of evasion layer of C-14 in soil	2	Triangular	0.5	1.0	0.75	-
Unsaturated zone 1 field capacity	3	Truncated normal	0.236	0.0578	0.0575	0.415
Unsaturated zone 2 field capacity	3	Truncated normal	0.0607	0.0150	0.0280	0.124
Inhalation rate	3	Triangular	4,380	13,100	8,400	-

Notes:

[1]1 = high priority parameter, 2 = medium priority parameter

[2]Distribution's Statistical Parameter
Bounded lognormal-n: 1 = underlying mean value, 2 = underlying standard deviation, 3 = lower limit, 4 = upper limit
Lognormal: 1 = mean, 2 = error factor
Normal: 1 = mean, 2 = standard deviation
Triangular: 1 = minimum, 2 = maximum, 3 = most likely
Truncated lognormal-n: 1 = underlying mean value, 2 = underlying standard deviation, 3 = lower quantile, 4 = upper quantile
Truncated normal: 1 = mean, 2 = standard deviation, 3 = lower quantile, 4 = upper quantile
Uniform: 1 = minimum, 2 = maximum

[3]Default RESRAD v6.22 distribution parameters were used

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Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
TIME PARAMETERS							
TTIME	Exposure duration	B	3	D	d	365.25	NUREG/CR-5512, Vol. 1
FTIN	Indoor fraction	B	2	D	-	0.267	NUREG/CR-5512, Vol. 3 Section 5.2.2.4 to match the 97.4 d/yr time in the building. This is the time the average member of the group spends in the building.
NTIME	Number of times for calculation	P	3	D	-	2	RESRAD-BUILD current default Physical priority 3 value acceptable for this evaluation
DOSE_TIME	Time	P	3	D	yr	1	NUREG/CR-5512, Vol. 3 Section 5.2.2.4
POINT	Maximum time integration points	P	3	D	-	1	Argonne recommended value for probabilistic calculations
BUILDING PARAMETERS							
NROOM	Number of rooms	P	3	D	-	1	NUREG/CR-5512 building occupancy scenario assumes only one contaminated room
UD	Deposition velocity	P	2	D	m/s	4.78E-04	The result of sensitivity analysis in DTBD-04-004
DKSUS	Resuspension rate	P, B	1	D	s^{-1}	1.33E-09	Calculated from the NUREG-1720 recommended DandD resuspension factor of 9.6E-07 m^{-1}, deposition velocity, air exchange rate and room height (see Section 6.2 of DTBD-04-004)
H	Room height	P	2	D	m	3.89	Result of sensitivity analysis in DTBD-04-004
AREA	Room area	P	2	D	m^2	137	Result of sensitivity analysis in DTBD-04-004

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
LAMBDAT (building); LINPUT (room)	Air exchange rate	B	2	D	1/h	0.835	The result of sensitivity analysis in DTBD-04-004
Q12 and Q21; Q23 and Q32	Flow rate between rooms	B	3	D	m^3/h	0	This dose model contains only one receptor room
Q10 and Q01; Q20 and Q02; Q30 and Q03	Outdoor inflow and outflow	B, P	3	N/A	m^3/h	Not used	Outdoor inflow is calculated from room volume and air exchange rate
RECEPTOR PARAMETERS							
ND	Number of receptors	B	3	D	-	1	This dose model contains only one receptor
DLVL	Receptor room	B	3	D	-	1	This dose model contains only one receptor room
DX	Receptor location (x, y, z)	B	3	D	m	5.85, 5.85, 1	Center of the room's floor
TWGHT	Receptor time fraction	B	3	D	-	1	NUREG/CR-5512, Vol. 3
BRTRATE	Receptor breathing/inhalation rate	M, B	2	S	m^3/d	Triangular distribution	NUREG/CR-6755, Appendix A
BRTRATE	Receptor breathing/inhalation rate	M, B	2	D	m^3/d	35.7	For Ni-59, Ni-63, Nb-94, Ag-108m, Pm-147, Pu-238, Pu-239, Pu-240, Pu-241, and Am-241, the result of sensitivity analysis in DTBD-04-004
INGE2	Indirect ingestion rate	B	2	S	m^2/h	Loguniform distribution	NUREG/CR-6755, Appendix A
INGE2	Indirect ingestion rate	B	2	D	m^2/h	1.61E-04	For Pu-238 and Pu-241, the result of sensitivity analysis in DTBD-04-004
SOURCE PARAMETERS							
NS	Number of sources	P	3	D	-	1	Assumes contamination on the floor
Source 1 - Floor							

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
SLVL	Source room (also primary room)	P	3	D	-	1	This dose model contains only one room
STYPE	Source type	P	3	D	-	Area	NUREG/CR-5512
SDIR	Source direction	P	3	D	-	z	NUREG/CR-5512
SX	Source location (x, y, z)	P	3	D	m	5.85, 5.85, 0	X and Y distances are half of the square root of the room area derived from sensitivity analysis in DTBD-04-004
SAREA	Source area	P	2	D	m^2	137, 68, 36, 25, 16, 9, 4, 1, and 0.5	Maximum floor area from derived from sensitivity analysis in DTBD-04-004 – reduced areas used to calculate area factors
AIRFR	Air release fraction	B	2	S	-	Triangular distribution	NUREG/CR-6755, Appendix A
AIRFR	Air release fraction	B	2	D		0.517	For Nb-94, Ag-108m, Pm-147, Pu-238, Pu-239, Pu-240, Pu-241, and Am-241, the result of sensitivity analysis in DTBD-04-004
INGE1	Direct ingestion rate	B	2	D	g/h or 1/h	3.45E-07	Calculated from the default ingestion rate of 1.1E-04 m^2/h in the NUREG/CR-5512 industrial worker building occupancy scenario. 3.45E-07 h^{-1} is 1.1E-04 m^2/h divided by the total contaminated area of 319 m^2.

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
RMVFR	Removable fraction	P, B	1	D	-	0.1	10% of the contamination is removable (NUREG/CR-5512 industrial worker building occupancy scenario default). The default parameter value for the loose fraction for the building occupancy scenario is 0.1 (Table C7.1, NUREG/CR-1727).
RF0	Source lifetime (also time for source removal)	P, B	2	S	d	Triangular distribution	NUREG/CR-6755, Section 3.6
RF0	Source lifetime (also time for source removal)	P, B	2	D	d	52800	For Co-60, Nb-94, Ag-108m, Pu-238, Pu-239, Pu-240, Pu-241, and Am-241, the result of sensitivity analysis in DTBD-04-004
RRF	Radon release fraction	P, B	3	D	-	0	Radon exposure is not regulated by the NRC
RNUCACT	Radionuclide concentration/activity	P	2	D	dpm/m^2	100	Calculates a dose conversion factor in units of mrem/yr per $dpm/100\ cm^2$
NREGI0	Number of regions in volume source	P	3	N/A	-	Not used	A volume source is not used in this dose model
FCONT0	Contaminated region (volume source)	P	3	N/A	-	Not used	A volume source is not used in this dose model
THICK0	Source region thickness (volume source)	P	2	N/A	cm	Not used	A volume source is not used in this dose model
DENSI0	Source density (volume source)	P	1	N/A	g/cm^3	Not used	A volume source is not used in this dose model
EROS0	Source erosion rate (volume source)	P, B	2	N/A	cm/d	Not used	A volume source is not used in this dose model
POROS0	Source porosity	P	2	N/A	-	Not used	A volume source is not used in this dose model

Parameter							
Name	Description	Class[1]	Priority[2]	Treatment[3]	Units	Parameter Value	Basis for Parameter Selection
EFDIF0	Radon effective diffusion coefficient	P	3	D	m^2/sec	0	Radon exposure is not regulated by the NRC
EMANA0	Radon emanation fraction	P	3	D	-	0	Radon exposure is not regulated by the NRC
MTLS	Source material			N/A	-	Not used	A volume source is not used in this dose model
SHIELDING PARAMETERS							
DSTH	Shielding thickness	P, B	2	S	cm	0	Shielding is not used in this dose model
DSDEN	Shielding density	P	1	S	g/cm^3	0	Shielding is not used in this dose model
MTLC	Shielding material	P	3	N/A	-	None	Shielding is not used in this dose model
TRITIUM MODEL PARAMETERS							
DRYTHICK	Dry zone thickness	P	3	N/A	cm	Not Used	This parameter is not used for a surface source
H3THICK	Wet + dry zone thickness	P	2	N/A	cm	Not Used	This parameter is not used for a surface source
H3VOLFRACT	Volumetric water content	P	2	N/A	-	Not Used	This parameter is not used for a surface source
H3RMVF	Water fraction available for vaporization	P	2	N/A	-	Not Used	This parameter is not used for a surface source
HUMIDITY	Humidity	P, B	2	N/A	g/m^3	Not Used	This parameter is not used for a surface source

Notes:

[1]Parameter Classification: P = Physical; B = Behavioral; M = Metabolic

[2]1 = high priority parameter, 2 = medium priority parameter, 3 = low priority parameter

[3]D = Deterministic treatment, S = Stochastic treatment

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Parameter	Priority[1]	Distribution	Distribution's Statistical Parameters[2]			
			1	2	3	4
Receptor breathing/inhalation rate	2	Triangular	12	46	33.6	
Indirect ingestion rate	2	Loguniform	2.8E-05	2.9E-04		
Air release fraction	2	Triangular	1E-06	1	0.07	
Source lifetime	2	Triangular	1,000	100,000	10,000	

Notes:

[1] 1 = high priority parameter, 2 = medium priority parameter

[2] Distribution's Statistical Parameter
Loguniform: 1 = minimum, 2 = maximum
Triangular: 1 = minimum, 2 = maximum, 3 = most likely

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Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Contamination					
Thickness of contaminated zone	P	2	m	0.15	Assigned value
Area of contaminated zone	P	2	m^2	10,000	Default RESRAD v6.22 Physical priority 2 value acceptable for this preliminary evaluation
Shape of the contaminated zone	P	3	-	Circular	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Initial concentration of C-14 in soil	P	2	pCi/g	0.256	Table 6-6
Initial concentration of Co-60 in soil	P	2	pCi/g	0.360	Table 6-6
Initial concentration of Ni-63 in soil	P	2	pCi/g	9.19	Table 6-6
Initial concentration of Sr-90 in soil	P	2	pCi/g	0.0692	Table 6-6
Initial concentration of Cs-134 in soil	P	2	pCi/g	0.0124	Table 6-6
Initial concentration of Cs-137 in soil	P	2	pCi/g	51.2	Table 6-6
Initial concentration of radionuclides present in ground water	P	3	pCi/L	0	Not Used for this evaluation
Leach rate	P	3	1/yr	0	Default Physical value to invoke the calculation of this parameter via a first-order leaching model that uses the value of the soil/water distribution coefficient in the contaminated zone
Solubility limit	P	3	mol/L	0	Default Physical value – not used by RESRAD v6.22 with leach rate flag set to 0
Time since placement of material	P	3	yr	0	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Times for calculation	P	3	yr	1, 3, 10, 30, 100, 300, 1000	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Contaminated zone density	P	1	g/cm^3	Normal distribution	NUREG/CR-6767, Attachment C, Table C-1 distribution for silt

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Contaminated zone distribution coefficient for C	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Ni	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Co	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Sr	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Cs	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Use plant/soil ratio	NA	3	Check box	No	For purposes of this evaluation, the code should not be allowed to calculate the distribution coefficients from the plant root uptake factors because they are calculated probabilistically
Contaminated zone field capacity	P	3	-	0.2	Default RESRAD v6.22 Priority 3 Physical priority 3 value acceptable for this evaluation
Contaminated zone erosion rate	P,B	2	m/yr	Continuous logarithmic distribution	NUREG/CR-6697, Attachment C
Contaminated zone total porosity	P	2	-	Truncated normal distribution	NUREG/CR-6697, Attachment C
Contaminated zone hydraulic conductivity	P	2	m/yr	Lognormal	NUREG/CR-6697, Attachment C, Table 3.4-1 for silt
Contaminated zone b parameter	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C
Carbon-Model Parameters					
Thickness of evasion layer of C-14 in soil	P	2	m	Triangular distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
C-14 evasion flux rate from soil	P	3	1/s	7E-07	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
C-12 concentration in local water	P	3	g/cm^3	2E-05	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
C-12 concentration in contaminated soil	P	3	g/g	0.03	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Fraction of vegetation carbon absorbed from soil	P	3	-	0.02	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Fraction of vegetation carbon absorbed from air	P	3	-	0.98	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
C-12 evasion flux rate from soil	P	3	1/s	1E-10	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Grain fraction in beef cattle feed	B	3	-	0.8	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Grain fraction in milk cow feed	B	3	-	0.2	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
DCF correction factor for gaseous forms of C-14	P	3	-	88.94	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Soil					
Cover depth	P	2	m	0	The contamination is assumed to be on surface soil
Density of cover material	P	1	g/cm^3	Not Used	A cover is not used in this evaluation
Cover total porosity	P	3	-	Not Used	Radon is not used in this evaluation
Cover volumetric water content	P	3	-	Not Used	Radon is not used in this evaluation
Cover radon diffusion coefficient	P	3	m^2/s	Not Used	Radon is not used in this evaluation
Cover erosion rate	P,B	2	m/yr	Not Used	A cover is not used in this evaluation
Number of unsaturated zones	P	3	-	4	Simplified hydrogeological model assumption
Unsaturated zone 1 thickness	P	1	m	0.305	Thickness of silt layer above the sand layer

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Unsaturated zone 1 density	P	2	g/cm^3	Normal distribution	NUREG/CR-6767, Attachment C, Table C-1 distribution for silt
Unsaturated zone 1 distribution coefficient for C	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Ni	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Co	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Sr	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Cs	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 total porosity	P	2	-	Truncated normal distribution	NUREG/CR-6697, Attachment C, Table 3.2-1 distribution for silt
Unsaturated zone 1 effective porosity	P	2	-	Truncated normal distribution	NUREG/CR-6767, Attachment A, Table A-7 distribution for silt
Unsaturated zone 1 field capacity	P	3	-	Truncated normal distribution	NUREG/CR-6767, Attachment A, Table A-7 distribution for silt
Unsaturated zone 1 hydraulic conductivity	P	2	m/yr	Bounded lognormal-n	NUREG/CR-6697, Attachment C, Table 3.4-1 for silt
Unsaturated zone 1 soil-specific b parameter	P	2	-	Bounded lognormal-n	NUREG/CR-6697, Attachment C, Table 3.5-1 for silt
Unsaturated zone 2 thickness	P	1	m	3.05	Thickness of fine sand layer above the siltstone layer

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Unsaturated zone 2 density	P	2	g/cm^3	Normal distribution	NUREG/CR-6767, Attachment C, Table C-1 distribution for sand
Unsaturated zone 2 distribution coefficient for C	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Ni	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Co	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Sr	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Cs	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 total porosity	P	2	-	Truncated normal distribution	NUREG/CR-6697, Attachment C, Table 3.2-1 distribution for sand
Unsaturated zone 2 effective porosity	P	2	-	Truncated normal distribution	NUREG/CR-6767, Attachment A, Table A-1 distribution for sand
Unsaturated zone 2 field capacity	P	3	-	Truncated normal distribution	NUREG/CR-6767, Attachment A, Table A-1 distribution for sand
Unsaturated zone 2 hydraulic conductivity	P	2	m/yr	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 3.4-1 for sand
Unsaturated zone 2 soil-specific b parameter	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 3.5-1 for sand
Unsaturated zone 3 thickness	P	1	m	25.60	Thickness of siltstone layer

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Unsaturated zone 3 density	P	2	g/cm^3	Normal distribution	NUREG/CR-6767, Attachment C, Table C-1 distribution for silt
Unsaturated zone 3 distribution coefficient for C	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Ni	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Co	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Sr	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Cs	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 total porosity	P	2	-	0.35	RESRAD Data Collection Handbook Table 3.2 arithmetic mean for medium siltstone
Unsaturated zone 3 effective porosity	P	2	-	0.12	RESRAD Data Collection Handbook Table 3.2 arithmetic mean for medium siltstone
Unsaturated zone 3 field capacity	P	3	-	0.23	Total porosity minus effective porosity per RESRAD Data Collection Handbook, Section 4.1
Unsaturated zone 3 hydraulic conductivity	P	2	m/yr	Bounded lognormal-n	NUREG/CR-6697, Attachment C, Table 3.4-1 for silt
Unsaturated zone 3 soil-specific b parameter	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 3.5-1 for silt
Unsaturated zone 4 thickness	P	1	m	10.82	Thickness of unsaturated sandstone layer
Unsaturated zone 4 density	P	2	g/cm^3	Normal distribution	NUREG/CR-6767, Attachment C, Table C-1 distribution for sand

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Unsaturated zone 4 distribution coefficient for C	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Ni	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Co	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Sr	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Cs	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 total porosity	P	2	-	0.35	RESRAD Data Collection Handbook Table 3.2 arithmetic mean for sandstone
Unsaturated zone 4 effective porosity	P	2	-	0.27	RESRAD Data Collection Handbook Table 3.2 arithmetic mean for sandstone
Unsaturated zone 4 field capacity	P	3	-	0.07	Total porosity minus effective porosity per RESRAD Data Collection Handbook, Section 4.1
Unsaturated zone 4 hydraulic conductivity	P	2	m/yr	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 3.4-1 for sand
Unsaturated zone 4 soil-specific b parameter	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 3.5-1 for sand
Water					
Density of saturated zone	P	1	g/cm^3	Normal distribution	NUREG/CR-6767, Attachment C, Table C-1 distribution for sand
Saturated zone distribution coefficient for C	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Saturated zone distribution coefficient for Ni	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Co	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Sr	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Cs	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone total porosity	P	1	-	0.34	RESRAD Data Collection Handbook Table 3.2 arithmetic mean for sandstone
Saturated zone effective porosity	P	1	-	0.27	RESRAD Data Collection Handbook Table 3.2 arithmetic mean for sandstone
Saturated zone field capacity	P	3	-	0.07	Total porosity minus effective porosity per RESRAD Data Collection Handbook, Section 4.1
Saturated zone hydraulic conductivity	P	1	m/yr	10	Upper boundary value from RESRAD Data Collection Handbook, Table 5.1 for sandstone
Saturated zone hydraulic gradient	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone soil-specific b parameter	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C
Length of contaminated zone parallel to the aquifer flow	P	2	m	113	Diameter of an 10,000 m^2 contaminated zone
Water table drop rate	P	3	m/yr	0.783	Site specific value applicable to the RSNGS site as reported in the FSAR, Appendix 2C

Parameter	Class[1]	Priority[2]	Units	Parameter Value *	Basis for Parameter Selection
Well-pump intake depth (below water table)	P	2	m	23	Site specific value applicable to the RSNGS site as reported in the FSAR, Appendix 2C
Well pumping rate	B, P	2	m^3/yr	Not Used	Well pumping rate is not used with the Mass-Balance model for water transport selected – well pumping rate is used to calculated a dilution factor when the Nondisposal model is selected.
Model: non-dispersion or mass balance	NA	3	-	MB	The mass-balance model was chosen as the most conservative since it assumes that all of the radionuclides released from the contaminated zone are withdrawn through the well.
Evapotranspiration coefficient	P	2	-	Uniform distribution	NUREG/CR-6697, Attachment C
Humidity in air	P	3	g/m^3	Not Used	Not used when the Radon exposure pathway is suppressed
Average annual wind speed	P	2	m/s	3.13	7 mph average annual wind speed for the years of 1930 – 1996 reported by the National Climatic Data Center for Stockton, CA (http://www.ncdc.noaa.gov/oa/documentlibrary/wind/wind1996.pdf)
Precipitation rate	P	2	m/yr	0.38	Mean annual average rainfall measured at Sacramento and Stockton
Irrigation mode	B	3	-	Overhead	Behavioral value – ditch irrigation is not the principal method of irrigation in the local region
Irrigation rate	B	3	m/yr	0.732	Table 8, Estimated Quantity of Water Applied Using Only Sprinkler Systems to Distribute Water: 1998 and 1994, average value for California, 1997 USDA Census of Agriculture, (http://www.nass.usda.gov/census/census97/fris/tbl08.pdf)
Runoff coefficient	P	2	-	Uniform distribution	NUREG/CR-6697, Attachment C
Watershed area for nearby stream or pond	P	3	m^2	1.00E+07	The entire RSNGS site drains into Clay Creek
Accuracy for water soil computation	NA	3	-	0.001	Default RESRAD v6.22 priority 3 value acceptable for this evaluation
Ingestion					

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Fruit, vegetable, and grain consumption rate	M, B	2	kg/yr	Triangular distribution	NUREG/CR-6697, Attachment C
Leafy vegetable consumption	M, B	3	kg/yr	14	Default RESRAD v6.22 Metabolic/ Behavioral priority 3 value acceptable for this evaluation
Milk consumption	M, B	2	L/yr	Triangular distribution	NUREG/CR-6697, Attachment C
Meat and poultry consumption	M, B	3	kg/yr	63	Default RESRAD v6.22 Metabolic/ Behavioral priority 3 value acceptable for this evaluation
Fish consumption rate	M, B	3	kg/yr	5.4	Default RESRAD v6.22 Metabolic/ Behavioral priority 3 value acceptable for this evaluation
Other seafood consumption rate	M, B	3	kg/yr	0.9	Default RESRAD v6.22 Metabolic/ Behavioral priority 3 value acceptable for this evaluation
Aquatic food contaminated fraction	B, P	2	-	Triangular distribution	NUREG/CR-6697, Attachment C
Soil ingestion rate	M, B	2	g/yr	Triangular distribution	NUREG/CR-6697, Attachment C
Drinking water intake	M, B	2	L/yr	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Storage time for fruits, non-leafy vegetables, and grain	B	3	d	14	Default RESRAD v6.22 Behavioral priority 3 value acceptable for this evaluation
Storage time for leafy vegetables	B	3	d	1	Default RESRAD v6.22 Behavioral priority 3 value acceptable for this evaluation
Storage time for milk	B	3	d	1	Default RESRAD v6.22 Behavioral priority 3 value acceptable for this evaluation
Storage time for meat	B	3	d	20	Default RESRAD v6.22 Behavioral priority 3 value acceptable for this evaluation
Storage time for fish	B	3	d	7	Default RESRAD v6.22 Behavioral priority 3 value acceptable for this evaluation

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Storage time for crustacea and mollusks	B	3	d	7	Default RESRAD v6.22 Behavioral priority 3 value acceptable for this evaluation
Storage time for well water	B	3	d	1	Default RESRAD v6.22 Behavioral priority 3 value acceptable for this evaluation
Storage time for surface water	B	3	d	1	Default RESRAD v6.22 Behavioral priority 3 value acceptable for this evaluation
Storage time for livestock fodder	B	3	d	45	Default RESRAD v6.22 Behavioral priority 3 value acceptable for this evaluation
Drinking water contaminated fraction	B, P	3	-	1	Default RESRAD v6.22 Behavioral/Physical priority 3 value acceptable for this evaluation
Household water contaminated fraction	B, P	3	-	Not Used	Not used when the radon exposure pathway is suppressed
Livestock water contaminated fraction	B, P	3	-	1	Default RESRAD v6.22 Behavioral priority 3 value acceptable for this evaluation
Irrigation water contaminated fraction	B, P	3	-	1	Default RESRAD v6.22 Behavioral priority 3 value acceptable for this evaluation
Plant food contaminated fraction	B, P	3	-	-1	Default RESRAD v6.22 Behavioral/Physical priority 3 value acceptable for this evaluation
Meat contaminated fraction	B, P	3	-	-1	Default RESRAD v6.22 Behavioral/Physical priority 3 value acceptable for this evaluation
Milk contaminated fraction	B, P	3	-	-1	Default RESRAD v6.22 Behavioral/Physical priority 3 value acceptable for this evaluation
Livestock fodder intake rate for meat	M	3	kg/d	68	Default RESRAD v6.22 Metabolic priority 3 value acceptable for this evaluation
Livestock fodder intake rate for milk	M	3	kg/d	55	Default RESRAD v6.22 Metabolic priority 3 value acceptable for this evaluation
Livestock water intake rate for meat	M	3	L/d	50	Default RESRAD v6.22 Metabolic priority 3 value acceptable for this evaluation

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Livestock water intake rate for milk	M	3	L/d	160	Default RESRAD v6.22 Metabolic priority 3 value acceptable for this evaluation
Livestock intake of soil	M	3	kg/d	0.5	Default RESRAD v6.22 Metabolic priority 3 value acceptable for this evaluation
Mass loading for foliar deposition	P	3	g/m^3	0.0001	Default RESRAD v6.22 Metabolic priority 3 value acceptable for this evaluation
Depth of soil mixing layer	P	2	m	Triangular distribution	NUREG/CR-6697, Attachment C
Depth of roots	P	1	m	Uniform distribution	NUREG/CR-6697, Attachment C
Groundwater fractional usage for drinking water	B, P	3	-	1	Default RESRAD v6.22 Behavioral/Physical priority 3 value acceptable for this evaluation
Groundwater fractional usage for household water	B, P	3	-	Not Used	Not used when the radon exposure pathway is suppressed
Groundwater fractional usage for livestock water	B, P	3	-	1	Default RESRAD v6.22 Behavioral/Physical priority 3 value acceptable for this evaluation
Groundwater fractional usage for irrigation water	B, P	3	-	1	Default RESRAD v6.22 Behavioral/Physical priority 3 value acceptable for this evaluation
Wet weight crop yield for non-leafy plants	P	2	kg/m^2	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Wet weight crop yield for leafy plants	P	3	kg/m^2	1.5	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Wet weight crop yield for fodder	P	3	kg/m^2	1.1	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Length of growing season for non-leafy vegetables	P	3	yr	0.17	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Length of growing season for leafy vegetables	P	3	yr	0.25	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Length of growing season for fodder	P	3	yr	0.08	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Translocation factor for non-leafy vegetables	P	3	-	0.1	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Translocation factor for leafy vegetables	P	3	-	1	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Translocation factor for fodder	P	3	-	1	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Weathering removal constant	P	2	1/yr	Triangular distribution	NUREG/CR-6697, Attachment C
Dry foliar interception fraction for non-leafy vegetables	P	3	-	0.25	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Dry foliar interception fraction for leafy vegetables	P	3	-	0.25	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Dry foliar interception fraction for fodder	P	3	-	0.25	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Wet foliar interception fraction for non-leafy vegetables	P	3	-	0.25	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Wet foliar interception fraction for leafy vegetables	P	2	-	Triangular distribution	NUREG/CR-6697, Attachment C
Wet foliar interception fraction for fodder	P	3	-	0.25	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Slope factor – external	M	3	(risk/yr)/(pCi/g)	Nuclide specific	Default RESRAD v6.22 Metabolic priority 3 value acceptable for this evaluation
Slope factor – inhalation	M	3	risk/pCi	Nuclide specific	Default RESRAD v6.22 Metabolic priority 3 value acceptable for this evaluation
Slope factor – ingestion	M	3	risk/pCi	Nuclide specific	Default RESRAD v6.22 Metabolic priority 3 value acceptable for this evaluation

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Plant transfer factor for C	P	1	pCi/g plant(wet) per pCi/g soil (dry)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Plant transfer factor for Co	P	1	pCi/g plant(wet) per pCi/g soil (dry)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Plant transfer factor for Ni	P	1	pCi/g plant(wet) per pCi/g soil (dry)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Plant transfer factor for Sr	P	1	pCi/g plant(wet) per pCi/g soil (dry)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Plant transfer factor for Cs	P	1	pCi/g plant(wet) per pCi/g soil (dry)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Meat transfer factor for C	P	2	(pCi/kg)/(pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Meat transfer factor for Co	P	2	(pCi/kg)/(pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Meat transfer factor for Ni	P	2	(pCi/kg)/(pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Meat transfer factor for Sr	P	2	(pCi/kg)/(pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Meat transfer factor for Cs	P	2	(pCi/kg)/(pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Milk transfer factor for C	P	2	(pCi/L)/(pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Milk transfer factor for Co	P	2	(pCi/L)/(pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Milk transfer factor for Ni	P	2	(pCi/L)/(pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Milk transfer factor for Sr	P	2	(pCi/L)/(pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Milk transfer factor for Cs	P	2	(pCi/L)/(pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
C bioaccumulation factor for fish	P	2	(pCi/kg)/(pCi/L)	Lognormal-n distribution	NUREG/CR-6697, Attachment C
Co bioaccumulation factor for fish	P	2	(pCi/kg)/(pCi/L)	Lognormal-n distribution	NUREG/CR-6697, Attachment C
Ni bioaccumulation factor for fish	P	2	(pCi/kg)/(pCi/L)	Lognormal-n distribution	NUREG/CR-6697, Attachment C
Sr bioaccumulation factor for fish	P	2	(pCi/kg)/(pCi/L)	Lognormal-n distribution	NUREG/CR-6697, Attachment C
Cs bioaccumulation factor for fish	P	2	(pCi/kg)/(pCi/L)	Lognormal-n distribution	NUREG/CR-6697, Attachment C
C bioaccumulation factor for crustacea and mollusks	P	3	(pCi/kg)/(pCi/L)	9100	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Co bioaccumulation factor for crustacea and mollusks	P	3	(pCi/kg)/(pCi/L)	200	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Ni bioaccumulation factor for crustacea and mollusks	P	3	(pCi/kg)/(pCi/L)	100	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Sr bioaccumulation factor for crustacea and mollusks	P	3	(pCi/kg)/(pCi/L)	100	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Cs bioaccumulation factor for crustacea and mollusks	P	3	(pCi/kg)/(pCi/L)	100	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Occupancy (Inhalation & External Parameters)					
Inhalation rate	M, B	3	m^3/yr	Triangular distribution	NUREG/CR-6697, Attachment C
Inhalation dose conversion factors	M	3	mrem/pCi	Nuclide specific	Metabolic RESRAD v6.22 default priority 3 value acceptable for this evaluation
Ingestion dose conversion factors	M	3	mrem/pCi	Nuclide specific	Metabolic RESRAD v6.22 default priority 3 value acceptable for this evaluation
Mass loading for inhalation	P, B	2	g/m^3	Continuous linear distribution	NUREG/CR-6697, Attachment C
Indoor dust filtration factor	P, B	2	-	Uniform distribution	NUREG/CR-6697, Attachment C
External gamma shielding factor	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C
Building foundation thickness	P	3	m	Not Used	The Radon Exposure Pathway is not used
Building foundation bulk density	P	3	g/m^3	Not Used	The Radon Exposure Pathway is not used
Building foundation total porosity	P	3	-	Not Used	The Radon Exposure Pathway is not used
Building foundation volumetric water content	P	3	-	Not Used	The Radon Exposure Pathway is not used
Building foundation radon diffusion coefficient	P	3	m^2/s	Not Used	The Radon Exposure Pathway is not used

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Contaminated soil zone radon diffusion coefficient	P	3	m^2/s	Not Used	The Radon Exposure Pathway is not used
Radon vertical dimension of mixing	P	3	m	Not Used	The Radon Exposure Pathway is not used
Building air exchange rate	P, B	3	1/hr	Not Used	The Radon Exposure Pathway is not used
Building (room) height	P	3	m	Not Used	The Radon Exposure Pathway is not used
Building indoor area factor	P	3	-	Not Used	The Radon Exposure Pathway is not used
Foundation depth below ground surface	P	3	m	Not Used	The Radon Exposure Pathway is not used
Radon-222 emanation coefficient	P	3	-	Not Used	The Radon Exposure Pathway is not used
Radon-220 emanation coefficient	P	3	-	Not Used	The Radon Exposure Pathway is not used
Indoor time fraction	B	3	-	0.50	Default RESRAD v6.22 Behavioral priority 3 value acceptable for this evaluation
Outdoor time fraction	B	3	-	0.25	Default RESRAD v6.22 Behavioral priority 3 value acceptable for this evaluation
Exposure duration	B	3	yr	30	Behavioral RESRAD v6.22 default Behavioral priority 3 value acceptable for this evaluation

[1]Parameter Classification: P = Physical; B = Behavioral; M = Metabolic
[2]1 = high priority parameter, 2 = medium priority parameter, 3 = low priority parameter

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Parameter	Priority[1]	Distribution	Distribution's Statistical Parameters[2] 1	2	3	4	PRCC[3]	25% or 75% Quartile	Assigned Parameter Value
Density of contaminated zone	1	Normal	1.330	0.202	-	-	0.53	75%	1.47
Density of saturated zone	1	Normal	1.578	0.158	-	-	0.00	No	Distribution
Contaminated zone distribution coefficient for C-14	1	Truncated lognormal-n	2.40	3.22	0.001	0.999	0.13	No	Distribution
Contaminated zone distribution coefficient for Ni-63	1	Truncated lognormal-n	6.05	1.46	0.001	0.999	-0.03	No	Distribution
Contaminated zone distribution coefficient for Co-60	1	Truncated lognormal-n	5.46	2.53	0.001	0.999	0.07	No	Distribution
Contaminated zone distribution coefficient for Sr-90	1	Truncated lognormal-n	3.45	2.12	0.001	0.999	-0.08	No	Distribution
Contaminated zone distribution coefficient for Cs-134	1	Truncated lognormal-n	6.10	2.33	0.001	0.999	-0.04	No	Distribution
Contaminated zone distribution coefficient for Cs-137	1	Truncated lognormal-n	6.10	2.33	0.001	0.999	0.19	No	Distribution
Unsaturated zone 1 distribution coefficient for C-14	1	Truncated lognormal-n	2.40	3.22	0.001	0.999	0.07	No	Distribution
Unsaturated zone 1 distribution coefficient for Ni-63	1	Truncated lognormal-n	6.05	1.46	0.001	0.999	0.12	No	Distribution
Unsaturated zone 1 distribution coefficient for Co-60	1	Truncated lognormal-n	5.46	2.53	0.001	0.999	-0.04	No	Distribution
Unsaturated zone 1 distribution coefficient for Sr-90	1	Truncated lognormal-n	3.45	2.12	0.001	0.999	-0.04	No	Distribution
Unsaturated zone 1 distribution coefficient for Cs-134	1	Truncated lognormal-n	6.10	2.33	0.001	0.999	-0.04	No	Distribution
Unsaturated zone 1 distribution coefficient for Cs-137	1	Truncated lognormal-n	6.10	2.33	0.001	0.999	0.06	No	Distribution
Unsaturated zone 2 distribution coefficient for C-14	1	Truncated lognormal-n	2.40	3.22	0.001	0.999	0.01	No	Distribution
Unsaturated zone 2 distribution coefficient for Ni-63	1	Truncated lognormal-n	6.05	1.46	0.001	0.999	-0.03	No	Distribution
Unsaturated zone 2 distribution coefficient for Co-60	1	Truncated lognormal-n	5.46	2.53	0.001	0.999	0.03	No	Distribution
Unsaturated zone 2 distribution coefficient for Sr-90	1	Truncated lognormal-n	3.45	2.12	0.001	0.999	0.01	No	Distribution
Unsaturated zone 2 distribution coefficient for Cs-134	1	Truncated lognormal-n	6.10	2.33	0.001	0.999	-0.05	No	Distribution
Unsaturated zone 2 distribution coefficient for Cs-137	1	Truncated lognormal-n	6.10	2.33	0.001	0.999	0.03	No	Distribution
Unsaturated zone 3 distribution coefficient for C-14	1	Truncated lognormal-n	2.40	3.22	0.001	0.999	-0.02	No	Distribution
Unsaturated zone 3 distribution coefficient for Ni-63	1	Truncated lognormal-n	6.05	1.46	0.001	0.999	0.01	No	Distribution

Parameter	Priority[1]	Distribution	Distribution's Statistical Parameters[2]				PRCC[3]	25% or 75% Quartile	Assigned Parameter Value
			1	2	3	4			
Unsaturated zone 3 distribution coefficient for Co-60	1	Truncated lognormal-n	5.46	2.53	0.001	0.999	-0.06	No	Distribution
Unsaturated zone 3 distribution coefficient for Sr-90	1	Truncated lognormal-n	3.45	2.12	0.001	0.999	0.03	No	Distribution
Unsaturated zone 3 distribution coefficient for Cs-134	1	Truncated lognormal-n	6.10	2.33	0.001	0.999	-0.04	No	Distribution
Unsaturated zone 3 distribution coefficient for Cs-137	1	Truncated lognormal-n	6.10	2.33	0.001	0.999	0.03	No	Distribution
Unsaturated zone 4 distribution coefficient for C-14	1	Truncated lognormal-n	2.40	3.22	0.001	0.999	-0.03	No	Distribution
Unsaturated zone 4 distribution coefficient for Ni-63	1	Truncated lognormal-n	6.05	1.46	0.001	0.999	0.08	No	Distribution
Unsaturated zone 4 distribution coefficient for Co-60	1	Truncated lognormal-n	5.46	2.53	0.001	0.999	0.04	No	Distribution
Unsaturated zone 4 distribution coefficient for Sr-90	1	Truncated lognormal-n	3.45	2.12	0.001	0.999	0.04	No	Distribution
Unsaturated zone 4 distribution coefficient for Cs-134	1	Truncated lognormal-n	6.10	2.33	0.001	0.999	0.11	No	Distribution
Unsaturated zone 4 distribution coefficient for Cs-137	1	Truncated lognormal-n	6.10	2.33	0.001	0.999	-0.11	No	Distribution
Saturated zone distribution coefficient for C-14	1	Truncated lognormal-n	2.40	3.22	0.001	0.999	-0.02	No	Distribution
Saturated zone distribution coefficient for Ni-63	1	Truncated lognormal-n	6.05	1.46	0.001	0.999	-0.04	No	Distribution
Saturated zone distribution coefficient for Co-60	1	Truncated lognormal-n	5.46	2.53	0.001	0.999	0.06	No	Distribution
Saturated zone distribution coefficient for Sr-90	1	Truncated lognormal-n	3.45	2.12	0.001	0.999	0.04	No	Distribution
Saturated zone distribution coefficient for Cs-134	1	Truncated lognormal-n	6.10	2.33	0.001	0.999	-0.02	No	Distribution
Saturated zone distribution coefficient for Cs-137	1	Truncated lognormal-n	6.10	2.33	0.001	0.999	0.01	No	Distribution
Depth of roots	1	Uniform	0.3	4.0	-	-	-0.53	25%	1.21
Plant transfer factor for C	1	Truncated lognormal-n	-0.36	0.9	0.001	0.999	0.01	No	Distribution
Plant transfer factor for Co	1	Truncated lognormal-n	-2.53	0.9	0.001	0.999	-0.04	No	Distribution
Plant transfer factor for Ni	1	Truncated lognormal-n	-3.00	0.9	0.001	0.999	-0.05	No	Distribution
Plant transfer factor for Sr	1	Truncated lognormal-n	-1.20	1.0	0.001	0.999	-0.09	No	Distribution
Plant transfer factor for Cs	1	Truncated lognormal-n	-3.22	1.0	0.001	0.999	0.63	75%	0.0781
Contaminated zone b parameter	2	Bounded lognormal-n	1.06	0.66	0.5	30	-0.09	No	Distribution
Contaminated zone erosion rate	2	Continuous logarithmic	Default[5]	-	-	-	-0.19	No	Distribution
Contaminated zone total porosity	2	Truncated normal	0.425	0.0867	0.001	0.999	0.17	No	Distribution

Parameter	Priority[1]	Distribution	Distribution's Statistical Parameters[2]				PRCC[3]	25% or 75% Quartile	Assigned Parameter Value
			1	2	3	4			
Contaminated zone hydraulic conductivity	2	Lognormal	3.302	62.0	-	-	-0.16	No	Distribution
Depth of soil mixing layer	2	Triangular	0.0	0.6	0.15	-	-0.25	No	Distribution
Drinking water intake	2	Truncated lognormal-n	6.015	0.489	0.001	0.999	0.03	No	Distribution
Evapotranspiration coefficient	2	Uniform	0.5	0.75	-	-	-0.01	No	Distribution
External gamma shielding factor	2	Bounded lognormal-n	-1.3	0.59	0.044	1	0.93	75%	0.398
Indoor dust filtration factor	2	Uniform	0.15	0.95	-	-	-0.01	No	Distribution
Mass loading for inhalation	2	Continuous linear	Default[3]	-	-	-	-0.05	No	Distribution
Runoff coefficient	2	Uniform	0.1	0.8	-	-	0.07	No	Distribution
Fruit, vegetable and grain consumption rate	2	Triangular	135	318	178	-	0.02	No	Distribution
Milk consumption rate	2	Triangular	60	200	102	-	0.19	No	Distribution
Aquatic food contaminated fraction	2	Triangular	0	1	0.39	-	-0.02	No	Distribution
Wet weight crop yield for non-leafy plants	2	Truncated lognormal-n	0.56	0.48	0.001	0.999	-0.13	No	Distribution
Weathering removal constant	2	Triangular	5.1	84	18	-	-0.05	No	Distribution
Wet foliar interception fraction for leafy vegetables	2	Triangular	0.06	0.95	0.67	-	0.18	No	Distribution
Saturated zone b parameter	2	Bounded lognormal-n	1.06	0.66	0.5	30	-0.14	No	Distribution
Saturated zone hydraulic gradient	2	Bounded lognormal-n	-5.11	1.77	7E-05	0.5	-0.07	No	Distribution
Soil ingestion rate	2	Triangular	0	36.5	18.3	-	0.02	No	Distribution
Unsaturated zone 1 density	2	Normal	1.33	0.202	-	-	-0.13	No	Distribution
Unsaturated zone 1 effective porosity	2	Truncated normal	0.425	0.110	0.0839	0.766	0.02	No	Distribution
Unsaturated zone 1 hydraulic conductivity	2	Bounded lognormal-n	2.66	0.475	3.302	62.2	0.00	No	Distribution
Unsaturated zone 1 b parameter	2	Bounded lognormal-n	1.16	0.140	2.06	4.89	-0.02	No	Distribution
Unsaturated zone 1 total porosity	2	Truncated normal	0.46	0.11	0.1161	0.7959	0.04	No	Distribution
Unsaturated zone 2 density	2	Normal	1.578	0.158	-	-	0.05	No	Distribution
Unsaturated zone 2 effective porosity	2	Truncated normal	0.383	0.0610	0.195	0.572	0.02	No	Distribution
Unsaturated zone 2 hydraulic conductivity	2	Bounded lognormal-n	1.398	1.842	110	5870	0.02	No	Distribution
Unsaturated zone 2 b parameter	2	Bounded lognormal-n	-0.0253	0.216	0.501	1.90	-0.05	No	Distribution
Unsaturated zone 2 total porosity	2	Truncated normal	0.43	0.06	0.2446	0.6154	0.02	No	Distribution
Unsaturated zone 3 density	2	Normal	1.33	0.202	-	-	-0.02	No	Distribution
Unsaturated zone 3 hydraulic conductivity	2	Bounded lognormal-n	2.66	0.475	3.302	62.2	-0.04	No	Distribution
Unsaturated zone 3 b parameter	2	Bounded lognormal-n	1.16	0.140	2.06	4.89	-0.01	No	Distribution
Unsaturated zone 4 density	2	Normal	1.578	0.158	-	-	0.01	No	Distribution
Unsaturated zone 4 hydraulic conductivity	2	Bounded lognormal-n	1.398	1.842	110	5870	-0.07	No	Distribution

Parameter	Priority[1]	Distribution	Distribution's Statistical Parameters[2]				PRCC[3]	25% or 75% Quartile	Assigned Parameter Value
			1	2	3	4			
Unsaturated zone 4 b parameter	2	Bounded lognormal-n	-0.0253	0.216	0.501	1.90	-0.12	No	Distribution
Thickness of evasion layer of C-14 in soil	2	Triangular	0.5	1.0	0.75	-	-0.09	No	Distribution
Meat transfer factor for C	2	Truncated lognormal-n	-3.47	1.0	0.001	0.999	0.14	No	Distribution
Meat transfer factor for Co	2	Truncated lognormal-n	-3.51	1.0	0.001	0.999	-0.02	No	Distribution
Meat transfer factor for Ni	2	Truncated lognormal-n	-5.30	0.9	0.001	0.999	-0.16	No	Distribution
Meat transfer factor for Sr	2	Truncated lognormal-n	-4.61	0.4	0.001	0.999	-0.02	No	Distribution
Meat transfer factor for Cs	2	Truncated lognormal-n	-3.00	0.4	0.001	0.999	0.43	75%	0.0649
Milk transfer factor for C	2	Truncated lognormal-n	-4.4	0.9	0.001	0.999	-0.10	No	Distribution
Milk transfer factor for Co	2	Truncated lognormal-n	-6.21	0.7	0.001	0.999	0.04	No	Distribution
Milk transfer factor for Ni	2	Truncated lognormal-n	-3.91	0.7	0.001	0.999	-0.04	No	Distribution
Milk transfer factor for Sr	2	Truncated lognormal-n	-6.21	0.5	0.001	0.999	0.07	No	Distribution
Milk transfer factor for Cs	2	Truncated lognormal-n	-4.61	0.5	0.001	0.999	0.16	No	Distribution
C bioaccumulation factor for fish	2	Lognormal-n	10.8	1.1	-	-	-0.05	No	Distribution
Co bioaccumulation factor for fish	2	Lognormal-n	5.7	1.1	-	-	0.04	No	Distribution
Ni bioaccumulation factor for fish	2	Lognormal-n	4.6	1.1	-	-	0.07	No	Distribution
Sr bioaccumulation factor for fish	2	Lognormal-n	4.1	1.1	-	-	-0.03	No	Distribution
Cs bioaccumulation factor for fish	2	Lognormal-n	7.6	0.7	-	-	-0.04	No	Distribution
Unsaturated zone 1 field capacity	3	Truncated normal	0.236	0.0578	0.0575	0.415	0.06	No	Distribution
Unsaturated zone 2 field capacity	3	Truncated normal	0.0607	0.0150	0.0280	0.124	-0.07	No	Distribution
Inhalation rate	3	Triangular	4,380	13,100	8,400	-	-0.01	No	Distribution

Notes:

[1] 1 = high priority parameter, 2 = medium priority parameter

[2] Distribution's Statistical Parameter
Bounded lognormal-n: 1 = underlying mean value, 2 = underlying standard deviation, 3 = lower limit, 4 = upper limit
Lognormal: 1 = mean, 2 = error factor
Lognormal-n: 1 = mean, 2 = standard deviation
Normal: 1 = mean, 2 = standard deviation
Triangular: 1 = minimum, 2 = maximum, 3 = most likely
Truncated lognormal-n: 1 = underlying mean value, 2 = underlying standard deviation, 3 = lower quantile, 4 = upper quantile
Truncated normal: 1 = mean, 2 = standard deviation, 3 = lower quantile, 4 = upper quantile
Uniform: 1 = minimum, 2 = maximum

[3] Default RESRAD v6.22 distribution parameters were used

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Contamination					
Thickness of contaminated zone	P	2	m	0.15	Assigned value
Area of contaminated zone	P	2	m^2	10,000	Default RESRAD v6.22 Physical priority 2 value acceptable for this preliminary evaluation
Shape of the contaminated zone	P	3	-	Circular	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Initial concentration of H-3 in soil	P	2	pCi/g	5.44	Table 6-4 discounted radionuclide decayed laboratory analysis MDA value
Initial concentration of Na-22in soil	P	2	pCi/g	0.00946	Table 6-4 discounted radionuclide decayed laboratory analysis MDA value
Initial concentration of Fe-55 in soil	P	2	pCi/g	1.27	Table 6-4 discounted radionuclide decayed laboratory analysis MDA value
Initial concentration of Ni-59 in soil	P	2	pCi/g	3.58	Table 6-4 discounted radionuclide decayed laboratory analysis MDA value
Initial concentration of Nb-94 in soil	P	2	pCi/g	0.0395	Table 6-4 discounted radionuclide decayed laboratory analysis MDA value
Initial concentration of Tc-99 in soil	P	2	pCi/g	2.35	Table 6-4 discounted radionuclide decayed laboratory analysis MDA value
Initial concentration of Ag-108 in soil	P	2	pCi/g	0.0550	Table 6-4 discounted radionuclide decayed laboratory analysis MDA value
Initial concentration of Sb-125 in soil	P	2	pCi/g	0.125	Table 6-4 discounted radionuclide decayed laboratory analysis MDA value
Initial concentration of Pm-147 in soil	P	2	pCi/g	0.955	Table 6-4 discounted radionuclide decayed laboratory analysis MDA value
Initial concentration of Eu-152 in soil	P	2	pCi/g	0.176	Table 6-4 discounted radionuclide decayed laboratory analysis MDA value
Initial concentration of Eu-154 in soil	P	2	pCi/g	0.0626	Table 6-4 discounted radionuclide decayed laboratory analysis MDA value
Initial concentration of Eu-155 in soil	P	2	pCi/g	0.156	Table 6-4 discounted radionuclide decayed laboratory analysis MDA value
Initial concentration of Np-237 in soil	P	2	pCi/g	0.441	Table 6-4 discounted radionuclide decayed laboratory analysis MDA value
Initial concentration of Pu-238 in soil	P	2	pCi/g	0.824	Table 6-4 discounted radionuclide decayed laboratory analysis MDA value

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Initial concentration of Pu-239 in soil	P	2	pCi/g	0.207	Table 6-4 discounted radionuclide decayed laboratory analysis MDA value
Initial concentration of Pu-240 in soil	P	2	pCi/g	0.207	Table 6-4 discounted radionuclide decayed laboratory analysis MDA value
Initial concentration of Pu-241 in soil	P	2	pCi/g	48.7	Table 6-4 discounted radionuclide decayed laboratory analysis MDA value
Initial concentration of Am-241 in soil	P	2	pCi/g	0.757	Table 6-4 discounted radionuclide decayed laboratory analysis MDA value
Initial concentration of Pu-242 in soil	P	2	pCi/g	0.594	Table 6-4 discounted radionuclide decayed laboratory analysis MDA value
Initial concentration of Cm-244 in soil	P	2	pCi/g	0.480	Table 6-4 discounted radionuclide decayed laboratory analysis MDA value
Initial concentration of radionuclides present in ground water	P	3	pCi/L	0	Not Used for this evaluation
Leach rate	P	3	1/yr	0	Default Physical value to invoke the calculation of this parameter via a first-order leaching model that uses the value of the soil/water distribution coefficient in the contaminated zone
Solubility limit	P	3	mol/L	0	Default Physical value – not used by RESRAD v6.22 with leach rate flag set to 0
Time since placement of material	P	3	yr	0	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Times for calculation	P	3	yr	1, 3, 25, 50, 75 100, 300, 500, and 1000	Specified calculations times for this evaluation
Contaminated zone density	P	1	g/cm^3	Normal distribution	NUREG/CR-6767, Attachment C, Table C-1 distribution for silt
Contaminated zone distribution coefficient for H	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Na	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Contaminated zone distribution coefficient for Fe	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Ni	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Nb	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Tc	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Ag	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Sb	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Pm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Sm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Eu	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Gd	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Np	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Contaminated zone distribution coefficient for U	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Th	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Pu	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Pb	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Ra	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Ac	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Pa	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Am	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Contaminated zone distribution coefficient for Cm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Use plant/soil ratio	NA	3	Check box	No	For purposes of this evaluation, the code should not be allowed to calculate the distribution coefficients from the plant root uptake factors because they are calculated probabilistically
Contaminated zone field capacity	P	3	-	0.2	Default RESRAD v6.22 Priority 3 Physical priority 3 value acceptable for this evaluation
Contaminated zone erosion rate	P,B	2	m/yr	Continuous logarithmic distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Contaminated zone total porosity	P	2	-	Truncated normal distribution	NUREG/CR-6697, Attachment C
Contaminated zone hydraulic conductivity	P	2	m/yr	Lognormal	NUREG/CR-6697, Attachment C, Table 3.4-1 for silt
Contaminated zone b parameter	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C
Carbon-Model Parameters					
Thickness of evasion layer of C-14 in soil	P	2	m	Not Used	C-14 is not a discounted radionuclide
C-14 evasion flux rate from soil	P	3	1/s	Not Used	C-14 is not a discounted radionuclide
C-12 concentration in local water	P	3	g/cm^3	Not Used	C-14 is not a discounted radionuclide
C-12 concentration in contaminated soil	P	3	g/g	Not Used	C-14 is not a discounted radionuclide
Fraction of vegetation carbon absorbed from soil	P	3	-	Not Used	C-14 is not a discounted radionuclide
Fraction of vegetation carbon absorbed from air	P	3	-	Not Used	C-14 is not a discounted radionuclide
C-12 evasion flux rate from soil	P	3	1/s	Not Used	C-14 is not a discounted radionuclide
Grain fraction in beef cattle feed	B	3	-	Not Used	C-14 is not a discounted radionuclide
Grain fraction in milk cow feed	B	3	-	Not Used	C-14 is not a discounted radionuclide
DCF correction factor for gaseous forms of C-14	P	3	-	Not Used	C-14 is not a discounted radionuclide
Soil					
Cover depth	P	2	m	0	The contamination is assumed to be on surface soil

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Density of cover material	P	1	g/cm^3	Not Used	A cover is not used in this evaluation
Cover total porosity	P	3	-	Not Used	Radon is not used in this evaluation
Cover volumetric water content	P	3	-	Not Used	Radon is not used in this evaluation
Cover radon diffusion coefficient	P	3	m^2/s	Not Used	Radon is not used in this evaluation
Cover erosion rate	P,B	2	m/yr	Not Used	A cover is not used in this evaluation
Number of unsaturated zones	P	3	-	4	Simplified hydrogeological model assumption
Unsaturated zone 1 thickness	P	1	m	0.305	Thickness of silt layer above the sand layer
Unsaturated zone 1 density	P	2	g/cm^3	Normal distribution	NUREG/CR-6767, Attachment C, Table C-1 distribution for silt
Unsaturated zone 1 distribution coefficient for H	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Na	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Fe	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Ni	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Nb	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Tc	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Ag	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Unsaturated zone 1 distribution coefficient for Sb	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Pm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Sm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Eu	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Gd	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Np	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Th	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for U	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Pu	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Pb	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Ra	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Unsaturated zone 1 distribution coefficient for Ac	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Pa	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Am	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 distribution coefficient for Cm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 1 total porosity	P	2	-	Truncated normal distribution	NUREG/CR-6697, Attachment C, Table 3.2-1 distribution for silt
Unsaturated zone 1 effective porosity	P	2	-	Truncated normal distribution	NUREG/CR-6767, Attachment A, Table A-7 distribution for silt
Unsaturated zone 1 field capacity	P	3	-	Truncated normal distribution	NUREG/CR-6767, Attachment A, Table A-7 distribution for silt
Unsaturated zone 1 hydraulic conductivity	P	2	m/yr	Bounded lognormal-n	NUREG/CR-6697, Attachment C, Table 3.4-1 for silt
Unsaturated zone 1 soil-specific b parameter	P	2	-	Bounded lognormal-n	NUREG/CR-6697, Attachment C, Table 3.5-1 for silt
Unsaturated zone 2 thickness	P	1	m	3.05	Thickness of fine sand layer above the siltstone layer
Unsaturated zone 2 density	P	2	g/cm^3	Normal distribution	NUREG/CR-6767, Attachment C, Table C-1 distribution for sand
Unsaturated zone 2 distribution coefficient for H	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Unsaturated zone 2 distribution coefficient for Na	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Fe	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Ni	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Nb	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Tc	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Ag	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Sb	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Pm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Sm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Eu	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Gd	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Unsaturated zone 2 distribution coefficient for Np	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Th	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Pm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for U	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Pu	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Pb	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Ra	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Ac	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Pa	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Am	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 2 distribution coefficient for Cm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Unsaturated zone 2 total porosity	P	2	-	Truncated normal distribution	NUREG/CR-6697, Attachment C, Table 3.2-1 distribution for sand
Unsaturated zone 2 effective porosity	P	2	-	Truncated normal distribution	NUREG/CR-6767, Attachment A, Table A-1 distribution for sand
Unsaturated zone 2 field capacity	P	3	-	Truncated normal distribution	NUREG/CR-6767, Attachment A, Table A-1 distribution for sand
Unsaturated zone 2 hydraulic conductivity	P	2	m/yr	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 3.4-1 for sand
Unsaturated zone 2 soil-specific b parameter	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 3.5-1 for sand
Unsaturated zone 3 thickness	P	1	m	25.60	Thickness of siltstone layer
Unsaturated zone 3 density	P	2	g/cm^3	Normal distribution	NUREG/CR-6767, Attachment C, Table C-1 distribution for silt
Unsaturated zone 3 distribution coefficient for H	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Na	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Fe	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Ni	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Nb	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Unsaturated zone 3 distribution coefficient for Tc	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Ag	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Sb	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Pm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Sm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Eu	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Gd	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Np	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Th	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Pm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for U	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Unsaturated zone 3 distribution coefficient for Pu	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Pb	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Ra	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Ac	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Pa	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Am	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 distribution coefficient for Cm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 3 total porosity	P	2	-	0.35	RESRAD Data Collection Handbook Table 3.2 arithmetic mean for medium siltstone
Unsaturated zone 3 effective porosity	P	2	-	0.12	RESRAD Data Collection Handbook Table 3.2 arithmetic mean for medium siltstone
Unsaturated zone 3 field capacity	P	3	-	0.23	Total porosity minus effective porosity per RESRAD Data Collection Handbook, Section 4.1
Unsaturated zone 3 hydraulic conductivity	P	2	m/yr	Bounded lognormal-n	NUREG/CR-6697, Attachment C, Table 3.4-1 for silt
Unsaturated zone 3 soil-specific b	P	2	-	Bounded lognormal-n	NUREG/CR-6697, Attachment C, Table 3.5-1 for silt

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Unsaturated zone 4 density	P	2	g/cm^3	Normal distribution	NUREG/CR-6767, Attachment C, Table C-1 distribution for sand
Unsaturated zone 4 distribution coefficient for H	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Na	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Fe	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Ni	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Nb	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Tc	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Ag	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Sb	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Pm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Sm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Eu	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Unsaturated zone 4 distribution coefficient for Gd	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Np	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Th	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Pm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for U	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Pu	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Pb	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Ra	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Ac	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Pa	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 distribution coefficient for Am	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Unsaturated zone 4 distribution coefficient for Cm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Unsaturated zone 4 total porosity	P	2	-	0.35	RESRAD Data Collection Handbook Table 3.2 arithmetic mean for sandstone
Unsaturated zone 4 effective porosity	P	2	-	0.27	RESRAD Data Collection Handbook Table 3.2 arithmetic mean for sandstone
Unsaturated zone 4 field capacity	P	3	-	0.07	Total porosity minus effective porosity per RESRAD Data Collection Handbook, Section 4.1
Unsaturated zone 4 hydraulic conductivity	P	2	m/yr	10	Upper boundary value from RESRAD Data Collection Handbook, Table 5.1 for sandstone
Unsaturated zone 4 soil-specific b parameter	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 3.5-1 for sand
Water					
Density of saturated zone	P	1	g/cm^3	Normal distribution	NUREG/CR-6767, Attachment C, Table C-1 distribution for sand
Saturated zone distribution coefficient for H	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Na	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Fe	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Ni	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Nb	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Saturated zone distribution coefficient for Tc	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Ag	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Sb	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Pm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Sm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Eu	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Gd	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Np	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Th	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Pm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for U	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Saturated zone distribution coefficient for Pu	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Pb	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Ra	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Ac	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Pa	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Am	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone distribution coefficient for Cm	P	1	cm^3/g	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Saturated zone total porosity	P	1	-	0.34	RESRAD Data Collection Handbook Table 3.2 arithmetic mean for sandstone
Saturated zone effective porosity	P	1	-	0.27	RESRAD Data Collection Handbook Table 3.2 arithmetic mean for sandstone
Saturated zone field capacity	P	3	-	0.07	Total porosity minus effective porosity per RESRAD Data Collection Handbook, Section 4.1
Saturated zone hydraulic conductivity	P	1	m/yr	10	Upper boundary value from RESRAD Data Collection Handbook, Table 5.1 for sandstone
Saturated zone hydraulic gradient	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Saturated zone soil-specific b parameter	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C
Length of contaminated zone parallel to the aquifer flow	P	2	m	113	Diameter of a 10,000 m^2 contaminated zone
Water table drop rate	P	3	m/yr	0.783	Site specific value applicable to the RSNGS site as reported in the FSAR, Appendix 2C
Well-pump intake depth (below water table)	P	2	m	23	Site specific value applicable to the RSNGS site as reported in the FSAR, Appendix 2C
Well pumping rate	B, P	2	m^3/yr	Not Used	Well pumping rate is not used with the Mass-Balance model for water transport selected – well pumping rate is used to calculated a dilution factor when the Nondisposal model is selected.
Model: non-dispersion or mass balance	NA	3	-	MB	The mass-balance model was chosen as the most conservative since it assumes that all of the radionuclides released from the contaminated zone are withdrawn through the well.
Evapotranspiration coefficient	P	2	-	Uniform distribution	NUREG/CR-6697, Attachment C
Humidity in air	P	3	g/m^3	Not Used	Not used when the Radon exposure pathway is suppressed
Average annual wind speed	P	2	m/s	3.13	7 mph average annual wind speed for the years of 1930 – 1996 reported by the National Climatic Data Center for Stockton, CA (http://www.ncdc.noaa.gov/oa/documentlibrary/wind/wind1996.pdf)
Precipitation rate	P	2	m/yr	0.38	Mean annual average rainfall measured at Sacramento and Stockton
Irrigation mode	B	3	-	Overhead	Behavioral value – ditch irrigation is not the principal method of irrigation in the local region
Irrigation rate	B	3	m/yr	0.732	Table 8, Estimated Quantity of Water Applied Using Only Sprinkler Systems to Distribute Water: 1998 and 1994, average value for California, 1997 USDA Census of Agriculture, (http://www.nass.usda.gov/census/census97/fris/tbl08.pdf)

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Runoff coefficient	P	2	-	Uniform distribution	NUREG/CR-6697, Attachment C
Watershed area for nearby stream or pond	P	3	m^2	1.00E+07	The majority of RSNGS site drains into Clay Creek
Accuracy for water soil computation	NA	3	-	0.001	Default RESRAD v6.22 priority 3 value acceptable for this evaluation
Ingestion					
Fruit, vegetable, and grain consumption rate	M, B	2	kg/yr	Triangular distribution	NUREG/CR-6697, Attachment C
Leafy vegetable consumption	M, B	3	kg/yr	14	Default RESRAD v6.22 Metabolic/ Behavioral priority 3 value acceptable for this evaluation
Milk consumption	M, B	2	L/yr	Triangular distribution	NUREG/CR-6697, Attachment C
Meat and poultry consumption	M, B	3	kg/yr	63	Default RESRAD v6.22 Metabolic/ Behavioral priority 3 value acceptable for this evaluation
Fish consumption rate	M, B	3	kg/yr	5.4	Default RESRAD v6.22 Metabolic/ Behavioral priority 3 value acceptable for this evaluation
Other seafood consumption rate	M, B	3	kg/yr	0.9	Default RESRAD v6.22 Metabolic/ Behavioral priority 3 value acceptable for this evaluation
Aquatic food contaminated fraction	B, P	2	-	Triangular distribution	NUREG/CR-6697, Attachment C
Soil ingestion rate	M, B	2	g/yr	Triangular distribution	NUREG/CR-6697, Attachment C
Drinking water intake	M, B	2	L/yr	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Storage time for fruits, non-leafy vegetables, and grain	B	3	d	14	Default RESRAD v6.22 Behavioral priority 3 value acceptable for this evaluation
Storage time for leafy vegetables	B	3	d	1	Default RESRAD v6.22 Behavioral priority 3 value acceptable for this evaluation

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Storage time for milk	B	3	d	1	Default RESRAD v6.22 Behavioral priority 3 value acceptable for this evaluation
Storage time for meat	B	3	d	20	Default RESRAD v6.22 Behavioral priority 3 value acceptable for this evaluation
Storage time for fish	B	3	d	7	Default RESRAD v6.22 Behavioral priority 3 value acceptable for this evaluation
Storage time for crustacea and mollusks	B	3	d	7	Default RESRAD v6.22 Behavioral priority 3 value acceptable for this evaluation
Storage time for well water	B	3	d	1	Default RESRAD v6.22 Behavioral priority 3 value acceptable for this evaluation
Storage time for surface water	B	3	d	1	Default RESRAD v6.22 Behavioral priority 3 value acceptable for this evaluation
Storage time for livestock fodder	B	3	d	45	Default RESRAD v6.22 Behavioral priority 3 value acceptable for this evaluation
Drinking water contaminated fraction	B, P	3	-	1	Default RESRAD v6.22 Behavioral/Physical priority 3 value acceptable for this evaluation
Household water contaminated fraction	B, P	3	-	Not Used	Not used when the radon exposure pathway is suppressed
Livestock water contaminated fraction	B, P	3	-	1	Default RESRAD v6.22 Behavioral priority 3 value acceptable for this evaluation
Irrigation water contaminated fraction	B, P	3	-	1	Default RESRAD v6.22 Behavioral priority 3 value acceptable for this evaluation
Plant food contaminated fraction	B, P	3	-	-1	Default RESRAD v6.22 Behavioral/Physical priority 3 value acceptable for this evaluation
Meat contaminated fraction	B, P	3	-	-1	Default RESRAD v6.22 Behavioral/Physical priority 3 value acceptable for this evaluation
Milk contaminated fraction	B, P	3	-	-1	Default RESRAD v6.22 Behavioral/Physical priority 3 value acceptable for this evaluation

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Livestock fodder intake rate for meat	M	3	kg/d	68	Default RESRAD v6.22 Metabolic priority 3 value acceptable for this evaluation
Livestock fodder intake rate for milk	M	3	kg/d	55	Default RESRAD v6.22 Metabolic priority 3 value acceptable for this evaluation
Livestock water intake rate for meat	M	3	L/d	50	Default RESRAD v6.22 Metabolic priority 3 value acceptable for this evaluation
Livestock water intake rate for milk	M	3	L/d	160	Default RESRAD v6.22 Metabolic priority 3 value acceptable for this evaluation
Livestock intake of soil	M	3	kg/d	0.5	Default RESRAD v6.22 Metabolic priority 3 value acceptable for this evaluation
Mass loading for foliar deposition	P	3	g/m^3	0.0001	Default RESRAD v6.22 Metabolic priority 3 value acceptable for this evaluation
Depth of soil mixing layer	P	2	m	Triangular distribution	NUREG/CR-6697, Attachment C
Depth of roots	P	1	m	Uniform distribution	NUREG/CR-6697, Attachment C
Groundwater fractional usage for drinking water	B, P	3	-	1	Default RESRAD v6.22 Behavioral/Physical priority 3 value acceptable for this evaluation
Groundwater fractional usage for household water	B, P	3	-	Not Used	Not used when the radon exposure pathway is suppressed
Groundwater fractional usage for livestock water	B, P	3	-	1	Default RESRAD v6.22 Behavioral/Physical priority 3 value acceptable for this evaluation
Groundwater fractional usage for irrigation water	B, P	3	-	1	Default RESRAD v6.22 Behavioral/Physical priority 3 value acceptable for this evaluation
Wet weight crop yield for non-leafy plants	P	2	kg/m^2	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C
Wet weight crop yield for leafy plants	P	3	kg/m^2	1.5	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Wet weight crop yield for fodder	P	3	kg/m^2	1.1	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Length of growing season for non-leafy vegetables	P	3	yr	0.17	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Length of growing season for leafy vegetables	P	3	yr	0.25	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Length of growing season for fodder	P	3	yr	0.08	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Translocation factor for non-leafy vegetables	P	3	-	0.1	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Translocation factor for leafy vegetables	P	3	-	1	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Translocation factor for fodder	P	3	-	1	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Weathering removal constant	P	2	1/yr	Triangular distribution	NUREG/CR-6697, Attachment C
Dry foliar interception fraction for non-leafy vegetables	P	3	-	0.25	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Dry foliar interception fraction for leafy vegetables	P	3	-	0.25	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Dry foliar interception fraction for fodder	P	3	-	0.25	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Wet foliar interception fraction for non-leafy vegetables	P	3	-	0.25	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Wet foliar interception fraction for leafy vegetables	P	2	-	Triangular distribution	NUREG/CR-6697, Attachment C
Wet foliar interception fraction for fodder	P	3	-	0.25	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Slope factor – external	M	3	(risk/yr)/(pCi/g)	Nuclide specific	Default RESRAD v6.22 Metabolic priority 3 value acceptable for this evaluation

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Slope factor – inhalation	M	3	risk/pCi	Nuclide specific	Default RESRAD v6.22 Metabolic priority 3 value acceptable for this evaluation
Slope factor – ingestion	M	3	risk/pCi	Nuclide specific	Default RESRAD v6.22 Metabolic priority 3 value acceptable for this evaluation
Plant transfer factor for H	P	1	pCi/g plant(wet) per pCi/g soil (dry)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.2-1
Plant transfer factor for Na	P	1	pCi/g plant(wet) per pCi/g soil (dry)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.2-1
Plant transfer factor for Fe	P	1	pCi/g plant(wet) per pCi/g soil (dry)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.2-1
Plant transfer factor for Ni	P	1	pCi/g plant(wet) per pCi/g soil (dry)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.2-1
Plant transfer factor for Nb	P	1	pCi/g plant(wet) per pCi/g soil (dry)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.2-1
Plant transfer factor for Tc	P	1	pCi/g plant(wet) per pCi/g soil (dry)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.2-1
Plant transfer factor for Ag	P	1	pCi/g plant(wet) per pCi/g soil (dry)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.2-1
Plant transfer factor for Sb	P	1	pCi/g plant(wet) per pCi/g soil (dry)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.2-1

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Plant transfer factor for Pm	P	1	pCi/g plant(wet) per pCi/g soil (dry)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.2-1
Plant transfer factor for Sm	P	1	- pCi/g plant(wet) per pCi/g soil (dry)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.2-1
Plant transfer factor for Eu	P	1	pCi/g plant(wet) per pCi/g soil (dry)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.2-1
Plant transfer factor for Gd	P	1	pCi/g plant(wet) per pCi/g soil (dry)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.2-1
Plant transfer factor for Np	P	1	pCi/g plant(wet) per pCi/g soil (dry)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.2-1
Plant transfer factor for Th	P	1	pCi/g plant(wet) per pCi/g soil (dry)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.2-1
Plant transfer factor for U	P	1	pCi/g plant(wet) per pCi/g soil (dry)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.2-1
Plant transfer factor for Pu	P	1	pCi/g plant(wet) per pCi/g soil (dry)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.2-1
Plant transfer factor for Pb	P	1	pCi/g plant(wet) per pCi/g soil (dry)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.2-1

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Plant transfer factor for Ra	P	1	pCi/g plant(wet) per pCi/g soil (dry)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.2-1
Plant transfer factor for Ac	P	1	pCi/g plant(wet) per pCi/g soil (dry)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.2-1
Plant transfer factor for Pa	P	1	pCi/g plant(wet) per pCi/g soil (dry)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.2-1
Plant transfer factor for Am	P	1	pCi/g plant(wet) per pCi/g soil (dry)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.2-1
Plant transfer factor for Cm	P	1	pCi/g plant(wet) per pCi/g soil (dry)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.2-1
Meat transfer factor for H	P	2	(pCi/kg)/(pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.3-1
Meat transfer factor for Na	P	2	(pCi/kg)/(pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.3-1
Meat transfer factor for Fe	P	2	(pCi/kg)/(pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.3-1
Meat transfer factor for Ni	P	2	(pCi/kg)/(pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.3-1
Meat transfer factor for Nb	P	2	(pCi/kg)/(pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.3-1

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Meat transfer factor for Tc	P	2	(pCi/kg)/(pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.3-1
Meat transfer factor for Ag	P	2	(pCi/kg)/(pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.3-1
Meat transfer factor for Sb	P	2	(pCi/kg)/(pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.3-1
Meat transfer factor for Pm	P	2	(pCi/kg)/(pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.3-1
Meat transfer factor for Sm	P	2	(pCi/kg)/(pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.3-1
Meat transfer factor for Eu	P	2	(pCi/kg)/(pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.3-1
Meat transfer factor for Gd	P	2	(pCi/kg)/(pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.3-1
Meat transfer factor for Np	P	2	(pCi/kg)/(pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.3-1
Meat transfer factor for Th	P	2	(pCi/kg)/(pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.3-1
Meat transfer factor for U	P	2	(pCi/kg)/(pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.3-1
Meat transfer factor for Pu	P	2	(pCi/kg)/(pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.3-1

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Meat transfer factor for Pb	P	2	(pCi/kg)/ (pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.3-1
Meat transfer factor for Ra	P	2	(pCi/kg)/ (pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.3-1
Meat transfer factor for Ac	P	2	(pCi/kg)/ (pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.3-1
Meat transfer factor for Pa	P	2	(pCi/kg)/ (pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.3-1
Meat transfer factor for Am	P	2	(pCi/kg)/ (pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.3-1
Meat transfer factor for Cm	P	2	(pCi/kg)/ (pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.3-1
Milk transfer factor for H	P	2	(pCi/L)/ (pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.4-1
Milk transfer factor for Na	P	2	(pCi/L)/ (pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.4-1
Milk transfer factor for Fe	P	2	(pCi/L)/ (pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.4-1
Milk transfer factor for Ni	P	2	(pCi/L)/ (pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.4-1
Milk transfer factor for Nb	P	2	(pCi/L)/ (pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.4-1

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Milk transfer factor for Tc	P	2	(pCi/L)/(pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.4-1
Milk transfer factor for Ag	P	2	(pCi/L)/(pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.4-1
Milk transfer factor for Sb	P	2	(pCi/L)/(pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.4-1
Milk transfer factor for Pm	P	2	(pCi/L)/(pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.4-1
Milk transfer factor for Sm	P	2	(pCi/L)/(pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.4-1
Milk transfer factor for Eu	P	2	(pCi/L)/(pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.4-1
Milk transfer factor for Gd	P	2	(pCi/L)/(pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.4-1
Milk transfer factor for Np	P	2	(pCi/L)/(pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.4-1
Milk transfer factor for Th	P	2	(pCi/L)/(pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.4-1
Milk transfer factor for Pu	P	2	(pCi/L)/(pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.4-1
Milk transfer factor for Pb	P	2	(pCi/L)/(pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.4-1

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Milk transfer factor for Ra	P	2	(pCi/L)/ (pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.4-1
Milk transfer factor for Ac	P	2	(pCi/L)/ (pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.4-1
Milk transfer factor for Pa	P	2	(pCi/L)/ (pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.4-1
Milk transfer factor for Am	P	2	(pCi/L)/ (pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.4-1
Milk transfer factor for Cm	P	2	(pCi/L)/ (pCi/d)	Truncated lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.4-1
H bioaccumulation factor for fish	P	2	(pCi/kg)/ (pCi/L)	Lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.8-1
Na bioaccumulation factor for fish	P	2	(pCi/kg)/ (pCi/L)	Lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.8-1
Fe bioaccumulation factor for fish	P	2	(pCi/kg)/ (pCi/L)	Lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.8-1
Ni bioaccumulation factor for fish	P	2	(pCi/kg)/ (pCi/L)	Lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.8-1
Nb bioaccumulation factor for fish	P	2	(pCi/kg)/ (pCi/L)	Lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.8-1
Tc bioaccumulation factor for fish	P	2	(pCi/kg)/ (pCi/L)	Lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.8-1
Ag bioaccumulation factor for fish	P	2	(pCi/kg)/ (pCi/L)	Lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.8-1
Sb bioaccumulation factor for fish	P	2	(pCi/kg)/ (pCi/L)	Lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.8-1
Pm bioaccumulation factor for fish	P	2	(pCi/kg)/ (pCi/L)	Lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.8-1
Sm bioaccumulation factor for fish	P	2	(pCi/kg)/ (pCi/L)	Lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.8-1

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Eu bioaccumulation factor for fish	P	2	(pCi/kg)/(pCi/L)	Lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.8-1
Gd bioaccumulation factor for fish	P	2	(pCi/kg)/(pCi/L)	Lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.8-1
Np bioaccumulation factor for fish	P	2	(pCi/kg)/(pCi/L)	Lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.8-1
Th bioaccumulation factor for fish	P	2	(pCi/kg)/(pCi/L)	Lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.8-1
U bioaccumulation factor for fish	P	2	(pCi/kg)/(pCi/L)	Lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.8-1
Pu bioaccumulation factor for fish	P	2	(pCi/kg)/(pCi/L)	Lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.8-1
Pb bioaccumulation factor for fish	P	2	(pCi/kg)/(pCi/L)	Lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.8-1
Ra bioaccumulation factor for fish	P	2	(pCi/kg)/(pCi/L)	Lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.8-1
Ac bioaccumulation factor for fish	P	2	(pCi/kg)/(pCi/L)	Lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.8-1
Pa bioaccumulation factor for fish	P	2	(pCi/kg)/(pCi/L)	Lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.8-1
Am bioaccumulation factor for fish	P	2	(pCi/kg)/(pCi/L)	Lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.8-1
Cm bioaccumulation factor for fish	P	2	(pCi/kg)/(pCi/L)	Lognormal-n distribution	NUREG/CR-6697, Attachment C, Table 6.8-1
H bioaccumulation factor for crustacea and mollusks	P	3	(pCi/kg)/(pCi/L)	1	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Na bioaccumulation factor for crustacea and mollusks	P	3	(pCi/kg)/(pCi/L)	200	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Fe bioaccumulation factor for crustacea and mollusks	P	3	(pCi/kg)/(pCi/L)	3200	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Ni bioaccumulation factor for crustacea and mollusks	P	3	(pCi/kg)/(pCi/L)	100	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Nb bioaccumulation factor for crustacea and mollusks	P	3	(pCi/kg)/(pCi/L)	100	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Tc bioaccumulation factor for crustacea and mollusks	P	3	(pCi/kg)/(pCi/L)	5	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Ag bioaccumulation factor for crustacea and mollusks	P	3	(pCi/kg)/(pCi/L)	770	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Sb bioaccumulation factor for crustacea and mollusks	P	3	(pCi/kg)/(pCi/L)	10	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Pm bioaccumulation factor for crustacea and mollusks	P	3	(pCi/kg)/(pCi/L)	1000	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Sm bioaccumulation factor for crustacea and mollusks	P	3	(pCi/kg)/(pCi/L)	1000	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Eu bioaccumulation factor for crustacea and mollusks	P	3	(pCi/kg)/(pCi/L)	1000	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Gd bioaccumulation factor for crustacea and mollusks	P	3	(pCi/kg)/(pCi/L)	1000	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Np bioaccumulation factor for crustacea and mollusks	P	3	(pCi/kg)/(pCi/L)	400	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Th bioaccumulation factor for crustacea and mollusks	P	3	(pCi/kg)/(pCi/L)	500	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation

Parameter	Class[1]	Priority[2]	Units	Parameter Value*	Basis for Parameter Selection
Pm bioaccumulation factor for crustacea and mollusks	P	3	(pCi/kg)/(pCi/L)	1000	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
U bioaccumulation factor for crustacea and mollusks	P	3	(pCi/kg)/(pCi/L)	60	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Pu bioaccumulation factor for crustacea and mollusks	P	3	(pCi/kg)/(pCi/L)	100	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Pb bioaccumulation factor for crustacea and mollusks	P	3	(pCi/kg)/(pCi/L)	100	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Ra bioaccumulation factor for crustacea and mollusks	P	3	(pCi/kg)/(pCi/L)	250	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Ac bioaccumulation factor for crustacea and mollusks	P	3	(pCi/kg)/(pCi/L)	1000	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Pa bioaccumulation factor for crustacea and mollusks	P	3	(pCi/kg)/(pCi/L)	110	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Am bioaccumulation factor for crustacea and mollusks	P	3	(pCi/kg)/(pCi/L)	1000	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Cm bioaccumulation factor for crustacea and mollusks	P	3	(pCi/kg)/(pCi/L)	1000	Default RESRAD v6.22 Physical priority 3 value acceptable for this evaluation
Occupancy (Inhalation & External Parameters)					
Inhalation rate	M, B	3	m^3/yr	Triangular distribution	NUREG/CR-6697, Attachment C
Inhalation dose conversion factors	M	3	mrem/pCi	Nuclide specific	Metabolic RESRAD v6.22 default priority 3 value acceptable for this evaluation
Ingestion dose conversion factors	M	3	mrem/pCi	Nuclide specific	Metabolic RESRAD v6.22 default priority 3 value acceptable for this evaluation

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Mass loading for inhalation	P, B	2	g/m^3	Continuous linear distribution	NUREG/CR-6697, Attachment C
Indoor dust filtration factor	P, B	2	-	Uniform distribution	NUREG/CR-6697, Attachment C
External gamma shielding factor	P	2	-	Bounded lognormal-n distribution	NUREG/CR-6697, Attachment C
Building foundation thickness	P	3	m	Not Used	The Radon Exposure Pathway is not used
Building foundation bulk density	P	3	g/m^3	Not Used	The Radon Exposure Pathway is not used
Building foundation total porosity	P	3	-	Not Used	The Radon Exposure Pathway is not used
Building foundation volumetric water content	P	3	-	Not Used	The Radon Exposure Pathway is not used
Building foundation radon diffusion coefficient	P	3	m^2/s	Not Used	The Radon Exposure Pathway is not used
Contaminated soil zone radon diffusion coefficient	P	3	m^2/s	Not Used	The Radon Exposure Pathway is not used
Radon vertical dimension of mixing	P	3	m	Not Used	The Radon Exposure Pathway is not used
Building air exchange rate	P, B	3	1/hr	Not Used	The Radon Exposure Pathway is not used
Building (room) height	P	3	m	Not Used	The Radon Exposure Pathway is not used
Building indoor area factor	P	3	-	Not Used	The Radon Exposure Pathway is not used
Foundation depth below ground surface	P	3	m	Not Used	The Radon Exposure Pathway is not used
Radon-222 emanation coefficient	P	3	-	Not Used	The Radon Exposure Pathway is not used

Parameter	Class[1]	Priority[2]	Units	Parameter Value	Basis for Parameter Selection
Radon-220 emanation coefficient	P	3	-	Not Used	The Radon Exposure Pathway is not used
Indoor time fraction	B	3	-	0.50	Default RESRAD v6.22 Priority 3 Behavioral value acceptable for this evaluation
Outdoor time fraction	B	3	-	0.25	Default RESRAD v6.22 Priority 3 Behavioral priority 3 value acceptable for this evaluation
Exposure duration	B	3	yr	30	Behavioral RESRAD v6.22 default priority 3 value acceptable for this evaluation

[1]Parameter Classification: P = Physical; B = Behavioral; M = Metabolic
[2]1 = high priority parameter, 2 = medium priority parameter, 3 = low priority parameter

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Parameter	Priority[1]	Distribution	Distribution's Statistical Parameters[2]				PRCC[3]	25% or 75% Quartile	Assigned Parameter Value
			1	2	3	4			
Density of contaminated zone	1	Normal	1.330	0.202	-	-	0.58	75%	1.46
Density of saturated zone	1	Normal	1.578	0.158	-	-	0.10	No	Distribution
Contaminated zone distribution coefficient for H-3	1	Truncated lognormal-n	-2.81	0.5	0.001	0.999	-0.08	No	Distribution
Contaminated zone distribution coefficient for Na-22	1	Truncated lognormal-n	5.04	3.22	0.001	0.999	0.04	No	Distribution
Contaminated zone distribution coefficient for Fe-55	1	Truncated lognormal-n	5.34	2.67	0.001	0.999	-0.11	No	Distribution
Contaminated zone distribution coefficient for Ni-59	1	Truncated lognormal-n	6.05	1.46	0.001	0.999	-0.06	No	Distribution
Contaminated zone distribution coefficient for Nb-94	1	Truncated lognormal-n	5.94	3.22	0.001	0.999	-0.09	No	Distribution
Contaminated zone distribution coefficient for Tc-99	1	Truncated lognormal-n	-0.67	3.16	0.001	0.999	0.69	75%	4.21
Contaminated zone distribution coefficient for Ag-108m	1	Truncated lognormal-n	5.38	2.10	0.001	0.999	-0.02	No	Distribution
Contaminated zone distribution coefficient for Sb-125	1	Truncated lognormal-n	5.94	3.22	0.001	0.999	0.17	No	Distribution
Contaminated zone distribution coefficient for Pm-147	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.09	No	Distribution
Contaminated zone distribution coefficient for Sm-147	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.17	No	Distribution
Contaminated zone distribution coefficient for Eu-152	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.17	No	Distribution
Contaminated zone distribution coefficient for Eu-154	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.13	No	Distribution
Contaminated zone distribution coefficient for Eu-155	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	-0.10	No	Distribution
Contaminated zone distribution coefficient for Gd-152	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	-0.06	No	Distribution
Contaminated zone distribution coefficient for Np-237	1	Truncated lognormal-n	2.84	2.25	0.001	0.999	0.47	75%	77.8
Contaminated zone distribution coefficient for Th-228	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	-0.27	25%	507
Contaminated zone distribution coefficient for Th-229	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	-0.09	No	Distribution
Contaminated zone distribution coefficient for Th-230	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	-0.06	No	Distribution
Contaminated zone distribution coefficient for Th-232	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	0.12	No	Distribution
Contaminated zone distribution coefficient for U-233	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	0.21	No	Distribution

Parameter	Priority[1]	Distribution	Distribution's Statistical Parameters[2]				PRCC[3]	25% or 75% Quartile	Assigned Parameter Value
			1	2	3	4			
Contaminated zone distribution coefficient for U-234	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	0.14	No	Distribution
Contaminated zone distribution coefficient for U-235	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	-0.14	No	Distribution
Contaminated zone distribution coefficient for U-236	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	0.02	No	Distribution
Contaminated zone distribution coefficient for U-238	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	0.06	No	Distribution
Contaminated zone distribution coefficient for Pu-238	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	0.21	No	Distribution
Contaminated zone distribution coefficient for Pu-239	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	0.00	No	Distribution
Contaminated zone distribution coefficient for Pu-240	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	-0.13	No	Distribution
Contaminated zone distribution coefficient for Pu-241	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	-0.04	No	Distribution
Contaminated zone distribution coefficient for Pu-242	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	-0.03	No	Distribution
Contaminated zone distribution coefficient for Pb-210	1	Truncated lognormal-n	7.78	2.76	0.001	0.999	-0.01	No	Distribution
Contaminated zone distribution coefficient for Ra-226	1	Truncated lognormal-n	8.17	1.70	0.001	0.999	0.07	No	Distribution
Contaminated zone distribution coefficient for Ra-228	1	Truncated lognormal-n	8.17	1.70	0.001	0.999	-0.02	No	Distribution
Contaminated zone distribution coefficient for Ac-227	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	-0.02	No	Distribution
Contaminated zone distribution coefficient for Pa-231	1	Truncated lognormal-n	5.94	3.22	0.001	0.999	-0.15	No	Distribution
Contaminated zone distribution coefficient for Am-241	1	Truncated lognormal-n	7.28	3.15	0.001	0.999	-0.02	No	Distribution
Contaminated zone distribution coefficient for Cm-244	1	Truncated lognormal-n	8.82	1.82	0.001	0.999	0.08	No	Distribution
Unsaturated zone 1 distribution coefficient for H-3	1	Truncated lognormal-n	-2.81	0.5	0.001	0.999	0.26	75%	0.0840
Unsaturated zone 1 distribution coefficient for Na-22	1	Truncated lognormal-n	5.04	3.22	0.001	0.999	-0.04	No	Distribution
Unsaturated zone 1 distribution coefficient for Fe-55	1	Truncated lognormal-n	5.34	2.67	0.001	0.999	0.07	No	Distribution
Unsaturated zone 1 distribution coefficient for Ni-59	1	Truncated lognormal-n	6.05	1.46	0.001	0.999	-0.23	No	Distribution
Unsaturated zone 1 distribution coefficient for Nb-94	1	Truncated lognormal-n	5.94	3.22	0.001	0.999	-0.02	No	Distribution

Parameter	Priority[1]	Distribution	Distribution's Statistical Parameters[2]				PRCC[3]	25% or 75% Quartile	Assigned Parameter Value
			1	2	3	4			
Unsaturated zone 1 distribution coefficient for Tc-99	1	Truncated lognormal-n	-0.67	3.16	0.001	0.999	0.08	No	Distribution
Unsaturated zone 1 distribution coefficient for Ag-108m	1	Truncated lognormal-n	5.38	2.10	0.001	0.999	-0.21	No	Distribution
Unsaturated zone 1 distribution coefficient for Sb-125	1	Truncated lognormal-n	5.94	3.22	0.001	0.999	-0.04	No	Distribution
Unsaturated zone 1 distribution coefficient for Pm-147	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	-0.02	No	Distribution
Unsaturated zone 1 distribution coefficient for Sm-147	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	-0.08	No	Distribution
Unsaturated zone 1 distribution coefficient for Eu-152	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.02	No	Distribution
Unsaturated zone 1 distribution coefficient for Eu-154	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.00	No	Distribution
Unsaturated zone 1 distribution coefficient for Eu-155	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.06	No	Distribution
Unsaturated zone 1 distribution coefficient for Gd-152	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.01	No	Distribution
Unsaturated zone 1 distribution coefficient for Np-237	1	Truncated lognormal-n	2.84	2.25	0.001	0.999	0.06	No	Distribution
Unsaturated zone 1 distribution coefficient for Th-228	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	0.03	No	Distribution
Unsaturated zone 1 distribution coefficient for Th-229	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	-0.29	25%	504
Unsaturated zone 1 distribution coefficient for Th-230	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	0.18	No	Distribution
Unsaturated zone 1 distribution coefficient for Th-232	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	-0.06	No	Distribution
Unsaturated zone 1 distribution coefficient for U-233	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	0.00	No	Distribution
Unsaturated zone 1 distribution coefficient for U-234	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	-0.05	No	Distribution
Unsaturated zone 1 distribution coefficient for U-235	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	-0.05	No	Distribution
Unsaturated zone 1 distribution coefficient for U-236	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	-0.13	No	Distribution
Unsaturated zone 1 distribution coefficient for U-238	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	0.02	No	Distribution
Unsaturated zone 1 distribution coefficient for Pu-238	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	0.21	No	Distribution
Unsaturated zone 1 distribution coefficient for Pu-239	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	0.12	No	Distribution

Parameter	Priority[1]	Distribution	Distribution's Statistical Parameters[2]				PRCC[3]	25% or 75% Quartile	Assigned Parameter Value
			1	2	3	4			
Unsaturated zone 1 distribution coefficient for Pu-240	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	-0.08	No	Distribution
Unsaturated zone 1 distribution coefficient for Pu-241	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	-0.25	No	Distribution
Unsaturated zone 1 distribution coefficient for Pu-242	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	0.09	No	Distribution
Unsaturated zone 1 distribution coefficient for Pb-210	1	Truncated lognormal-n	7.78	2.76	0.001	0.999	-0.08	No	Distribution
Unsaturated zone 1 distribution coefficient for Ra-226	1	Truncated lognormal-n	8.17	1.70	0.001	0.999	-0.11	No	Distribution
Unsaturated zone 1 distribution coefficient for Ra-228	1	Truncated lognormal-n	8.17	1.70	0.001	0.999	-0.12	No	Distribution
Unsaturated zone 1 distribution coefficient for Ac-227	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.08	No	Distribution
Unsaturated zone 1 distribution coefficient for Pa-231	1	Truncated lognormal-n	5.94	3.22	0.001	0.999	-0.10	No	Distribution
Unsaturated zone 1 distribution coefficient for Am-241	1	Truncated lognormal-n	7.28	3.15	0.001	0.999	0.05	No	Distribution
Unsaturated zone 1 distribution coefficient for Cm-244	1	Truncated lognormal-n	8.82	1.82	0.001	0.999	0.10	No	Distribution
Unsaturated zone 2 distribution coefficient for H-3	1	Truncated lognormal-n	-2.81	0.5	0.001	0.999	0.07	No	Distribution
Unsaturated zone 2 distribution coefficient for Na-22	1	Truncated lognormal-n	5.04	3.22	0.001	0.999	0.00	No	Distribution
Unsaturated zone 2 distribution coefficient for Fe-55	1	Truncated lognormal-n	5.34	2.67	0.001	0.999	-0.06	No	Distribution
Unsaturated zone 2 distribution coefficient for Ni-59	1	Truncated lognormal-n	6.05	1.46	0.001	0.999	0.10	No	Distribution
Unsaturated zone 2 distribution coefficient for Nb-94	1	Truncated lognormal-n	5.94	3.22	0.001	0.999	-0.04	No	Distribution
Unsaturated zone 2 distribution coefficient for Tc-99	1	Truncated lognormal-n	-0.67	3.16	0.001	0.999	0.05	No	Distribution
Unsaturated zone 2 distribution coefficient for Ag-108m	1	Truncated lognormal-n	5.38	2.10	0.001	0.999	-0.09	No	Distribution
Unsaturated zone 2 distribution coefficient for Sb-125	1	Truncated lognormal-n	5.94	3.22	0.001	0.999	-0.05	No	Distribution
Unsaturated zone 2 distribution coefficient for Pm-147	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	-0.07	No	Distribution
Unsaturated zone 2 distribution coefficient for Sm-147	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.06	No	Distribution
Unsaturated zone 2 distribution coefficient for Eu-152	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.12	No	Distribution

Parameter	Priority[1]	Distribution	Distribution's Statistical Parameters[2]				PRCC[3]	25% or 75% Quartile	Assigned Parameter Value
			1	2	3	4			
Unsaturated zone 2 distribution coefficient for Eu-154	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.08	No	Distribution
Unsaturated zone 2 distribution coefficient for Eu-155	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	-0.07	No	Distribution
Unsaturated zone 2 distribution coefficient for Gd-152	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	-0.02	No	Distribution
Unsaturated zone 2 distribution coefficient for Np-237	1	Truncated lognormal-n	2.84	2.25	0.001	0.999	0.04	No	Distribution
Unsaturated zone 2 distribution coefficient for Th-228	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	0.00	No	Distribution
Unsaturated zone 2 distribution coefficient for Th-229	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	-0.04	No	Distribution
Unsaturated zone 2 distribution coefficient for Th-230	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	-0.06	No	Distribution
Unsaturated zone 2 distribution coefficient for Th-232	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	-0.02	No	Distribution
Unsaturated zone 2 distribution coefficient for U-233	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	0.04	No	Distribution
Unsaturated zone 2 distribution coefficient for U-234	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	0.02	No	Distribution
Unsaturated zone 2 distribution coefficient for U-235	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	0.00	No	Distribution
Unsaturated zone 2 distribution coefficient for U-236	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	0.24	No	Distribution
Unsaturated zone 2 distribution coefficient for U-238	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	-0.01	No	Distribution
Unsaturated zone 2 distribution coefficient for Pu-238	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	-0.10	No	Distribution
Unsaturated zone 2 distribution coefficient for Pu-239	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	-0.24	No	Distribution
Unsaturated zone 2 distribution coefficient for Pu-240	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	0.07	No	Distribution
Unsaturated zone 2 distribution coefficient for Pu-241	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	-0.07	No	Distribution
Unsaturated zone 2 distribution coefficient for Pu-242	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	0.01	No	Distribution
Unsaturated zone 2 distribution coefficient for Pb-210	1	Truncated lognormal-n	7.78	2.76	0.001	0.999	0.02	No	Distribution
Unsaturated zone 2 distribution coefficient for Ra-226	1	Truncated lognormal-n	8.17	1.70	0.001	0.999	0.03	No	Distribution
Unsaturated zone 2 distribution coefficient for Ra-228	1	Truncated lognormal-n	8.17	1.70	0.001	0.999	0.10	No	Distribution

Parameter	Priority[1]	Distribution	Distribution's Statistical Parameters[2]				PRCC[3]	25% or 75% Quartile	Assigned Parameter Value
			1	2	3	4			
Unsaturated zone 2 distribution coefficient for Ac-227	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.10	No	Distribution
Unsaturated zone 2 distribution coefficient for Pa-231	1	Truncated lognormal-n	5.94	3.22	0.001	0.999	0.08	No	Distribution
Unsaturated zone 2 distribution coefficient for Am-241	1	Truncated lognormal-n	7.28	3.15	0.001	0.999	0.13	No	Distribution
Unsaturated zone 2 distribution coefficient for Cm-244	1	Truncated lognormal-n	8.82	1.82	0.001	0.999	-0.15	No	Distribution
Unsaturated zone 3 distribution coefficient for H-3	1	Truncated lognormal-n	-2.81	0.5	0.001	0.999	-0.01	No	Distribution
Unsaturated zone 3 distribution coefficient for Na-22	1	Truncated lognormal-n	5.04	3.22	0.001	0.999	-0.08	No	Distribution
Unsaturated zone 3 distribution coefficient for Fe-55	1	Truncated lognormal-n	5.34	2.67	0.001	0.999	0.25	No	Distribution
Unsaturated zone 3 distribution coefficient for Ni-59	1	Truncated lognormal-n	6.05	1.46	0.001	0.999	0.01	No	Distribution
Unsaturated zone 3 distribution coefficient for Nb-94	1	Truncated lognormal-n	5.94	3.22	0.001	0.999	-0.17	No	Distribution
Unsaturated zone 3 distribution coefficient for Tc-99	1	Truncated lognormal-n	-0.67	3.16	0.001	0.999	-0.18	No	Distribution
Unsaturated zone 3 distribution coefficient for Ag-108m	1	Truncated lognormal-n	5.38	2.10	0.001	0.999	0.12	No	Distribution
Unsaturated zone 3 distribution coefficient for Sb-125	1	Truncated lognormal-n	5.94	3.22	0.001	0.999	0.11	No	Distribution
Unsaturated zone 3 distribution coefficient for Pm-147	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.00	No	Distribution
Unsaturated zone 3 distribution coefficient for Sm-147	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	-0.10	No	Distribution
Unsaturated zone 3 distribution coefficient for Eu-152	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.01	No	Distribution
Unsaturated zone 3 distribution coefficient for Eu-154	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.12	No	Distribution
Unsaturated zone 3 distribution coefficient for Eu-155	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.14	No	Distribution
Unsaturated zone 3 distribution coefficient for Gd-152	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.05	No	Distribution
Unsaturated zone 3 distribution coefficient for Np-237	1	Truncated lognormal-n	2.84	2.25	0.001	0.999	-0.14	No	Distribution
Unsaturated zone 3 distribution coefficient for Th-228	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	-0.03	No	Distribution
Unsaturated zone 3 distribution coefficient for Th-229	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	-0.07	No	Distribution

Parameter	Priority[1]	Distribution	Distribution's Statistical Parameters[2]				PRCC[3]	25% or 75% Quartile	Assigned Parameter Value
			1	2	3	4			
Unsaturated zone 3 distribution coefficient for Th-230	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	0.01	No	Distribution
Unsaturated zone 3 distribution coefficient for Th-232	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	-0.17	No	Distribution
Unsaturated zone 3 distribution coefficient for U-233	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	0.05	No	Distribution
Unsaturated zone 3 distribution coefficient for U-234	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	-0.02	No	Distribution
Unsaturated zone 3 distribution coefficient for U-235	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	0.06	No	Distribution
Unsaturated zone 3 distribution coefficient for U-236	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	0.16	No	Distribution
Unsaturated zone 3 distribution coefficient for U-238	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	-0.05	No	Distribution
Unsaturated zone 3 distribution coefficient for Pu-238	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	0.07	No	Distribution
Unsaturated zone 3 distribution coefficient for Pu-239	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	0.22	No	Distribution
Unsaturated zone 3 distribution coefficient for Pu-240	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	-0.03	No	Distribution
Unsaturated zone 3 distribution coefficient for Pu-241	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	-0.12	No	Distribution
Unsaturated zone 3 distribution coefficient for Pu-242	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	0.16	No	Distribution
Unsaturated zone 3 distribution coefficient for Pb-210	1	Truncated lognormal-n	7.78	2.76	0.001	0.999	0.01	No	Distribution
Unsaturated zone 3 distribution coefficient for Ra-226	1	Truncated lognormal-n	8.17	1.70	0.001	0.999	-0.15	No	Distribution
Unsaturated zone 3 distribution coefficient for Ra-228	1	Truncated lognormal-n	8.17	1.70	0.001	0.999	-0.06	No	Distribution
Unsaturated zone 3 distribution coefficient for Ac-227	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	-0.18	No	Distribution
Unsaturated zone 3 distribution coefficient for Pa-231	1	Truncated lognormal-n	5.94	3.22	0.001	0.999	0.31	75%	3300
Unsaturated zone 3 distribution coefficient for Am-241	1	Truncated lognormal-n	7.28	3.15	0.001	0.999	-0.08	No	Distribution
Unsaturated zone 3 distribution coefficient for Cm-244	1	Truncated lognormal-n	8.82	1.82	0.001	0.999	-0.13	No	Distribution
Unsaturated zone 4 distribution coefficient for H-3	1	Truncated lognormal-n	-2.81	0.5	0.001	0.999	-0.06	No	Distribution
Unsaturated zone 4 distribution coefficient for Na-22	1	Truncated lognormal-n	5.04	3.22	0.001	0.999	0.02	No	Distribution

Parameter	Priority[1]	Distribution	Distribution's Statistical Parameters[2]				PRCC[3]	25% or 75% Quartile	Assigned Parameter Value
			1	2	3	4			
Unsaturated zone 4 distribution coefficient for Fe-55	1	Truncated lognormal-n	5.34	2.67	0.001	0.999	-0.06	No	Distribution
Unsaturated zone 4 distribution coefficient for Ni-59	1	Truncated lognormal-n	6.05	1.46	0.001	0.999	-0.04	No	Distribution
Unsaturated zone 4 distribution coefficient for Nb-94	1	Truncated lognormal-n	5.94	3.22	0.001	0.999	-0.06	No	Distribution
Unsaturated zone 4 distribution coefficient for Tc-99	1	Truncated lognormal-n	-0.67	3.16	0.001	0.999	0.06	No	Distribution
Unsaturated zone 4 distribution coefficient for Ag-108m	1	Truncated lognormal-n	5.38	2.10	0.001	0.999	0.12	No	Distribution
Unsaturated zone 4 distribution coefficient for Sb-125	1	Truncated lognormal-n	5.94	3.22	0.001	0.999	-0.01	No	Distribution
Unsaturated zone 4 distribution coefficient for Pm-147	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.09	No	Distribution
Unsaturated zone 4 distribution coefficient for Sm-147	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.11	No	Distribution
Unsaturated zone 4 distribution coefficient for Eu-152	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	-0.25	No	Distribution
Unsaturated zone 4 distribution coefficient for Eu-154	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	-0.01	No	Distribution
Unsaturated zone 4 distribution coefficient for Eu-155	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.03	No	Distribution
Unsaturated zone 4 distribution coefficient for Gd-152	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.00	No	Distribution
Unsaturated zone 4 distribution coefficient for Np-237	1	Truncated lognormal-n	2.84	2.25	0.001	0.999	-0.23	No	Distribution
Unsaturated zone 4 distribution coefficient for Th-228	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	0.16	No	Distribution
Unsaturated zone 4 distribution coefficient for Th-229	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	0.15	No	Distribution
Unsaturated zone 4 distribution coefficient for Th-230	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	0.07	No	Distribution
Unsaturated zone 4 distribution coefficient for Th-232	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	-0.08	No	Distribution
Unsaturated zone 4 distribution coefficient for U-233	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	-0.02	No	Distribution
Unsaturated zone 4 distribution coefficient for U-234	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	0.01	No	Distribution
Unsaturated zone 4 distribution coefficient for U-235	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	0.07	No	Distribution
Unsaturated zone 4 distribution coefficient for U-236	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	0.02	No	Distribution

Parameter	Priority[1]	Distribution	Distribution's Statistical Parameters[2]				PRCC[3]	25% or 75% Quartile	Assigned Parameter Value
			1	2	3	4			
Unsaturated zone 4 distribution coefficient for U-238	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	0.01	No	Distribution
Unsaturated zone 4 distribution coefficient for Pu-238	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	0.06	No	Distribution
Unsaturated zone 4 distribution coefficient for Pu-239	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	-0.07	No	Distribution
Unsaturated zone 4 distribution coefficient for Pu-240	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	-0.06	No	Distribution
Unsaturated zone 4 distribution coefficient for Pu-241	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	0.03	No	Distribution
Unsaturated zone 4 distribution coefficient for Pu-242	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	-0.12	No	Distribution
Unsaturated zone 4 distribution coefficient for Pb-210	1	Truncated lognormal-n	7.78	2.76	0.001	0.999	-0.15	No	Distribution
Unsaturated zone 4 distribution coefficient for Ra-226	1	Truncated lognormal-n	8.17	1.70	0.001	0.999	-0.09	No	Distribution
Unsaturated zone 4 distribution coefficient for Ra-228	1	Truncated lognormal-n	8.17	1.70	0.001	0.999	-0.03	No	Distribution
Unsaturated zone 4 distribution coefficient for Ac-227	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.18	No	Distribution
Unsaturated zone 4 distribution coefficient for Pa-231	1	Truncated lognormal-n	5.94	3.22	0.001	0.999	-0.18	No	Distribution
Unsaturated zone 4 distribution coefficient for Am-241	1	Truncated lognormal-n	7.28	3.15	0.001	0.999	-0.15	No	Distribution
Unsaturated zone 4 distribution coefficient for Cm-244	1	Truncated lognormal-n	8.82	1.82	0.001	0.999	-0.05	No	Distribution
Saturated zone distribution coefficient for H-3	1	Truncated lognormal-n	-2.81	0.5	0.001	0.999	-0.02	No	Distribution
Saturated zone distribution coefficient for Na-22	1	Truncated lognormal-n	5.04	3.22	0.001	0.999	0.01	No	Distribution
Saturated zone distribution coefficient for Fe-55	1	Truncated lognormal-n	5.34	2.67	0.001	0.999	0.06	No	Distribution
Saturated zone distribution coefficient for Ni-59	1	Truncated lognormal-n	6.05	1.46	0.001	0.999	-0.10	No	Distribution
Saturated zone distribution coefficient for Nb-94	1	Truncated lognormal-n	5.94	3.22	0.001	0.999	0.02	No	Distribution
Saturated zone distribution coefficient for Tc-99	1	Truncated lognormal-n	-0.67	3.16	0.001	0.999	-0.12	No	Distribution
Saturated zone distribution coefficient for Ag-108m	1	Truncated lognormal-n	5.38	2.10	0.001	0.999	0.01	No	Distribution
Saturated zone distribution coefficient for Sb-125	1	Truncated lognormal-n	5.94	3.22	0.001	0.999	0.04	No	Distribution

Parameter	Priority[1]	Distribution	Distribution's Statistical Parameters[2]				PRCC[3]	25% or 75% Quartile	Assigned Parameter Value
			1	2	3	4			
Saturated zone distribution coefficient for Pm-147	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	-0.07	No	Distribution
Saturated zone distribution coefficient for Sm-147	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	-0.07	No	Distribution
Saturated zone distribution coefficient for Eu-152	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	-0.11	No	Distribution
Saturated zone distribution coefficient for Eu-154	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.01	No	Distribution
Saturated zone distribution coefficient for Eu-155	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.04	No	Distribution
Saturated zone distribution coefficient for Gd-152	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	-0.13	No	Distribution
Saturated zone distribution coefficient for Np-237	1	Truncated lognormal-n	2.84	2.25	0.001	0.999	0.16	No	Distribution
Saturated zone distribution coefficient for Th-228	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	0.06	No	Distribution
Saturated zone distribution coefficient for Th-229	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	-0.04	No	Distribution
Saturated zone distribution coefficient for Th-230	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	-0.01	No	Distribution
Saturated zone distribution coefficient for Th-232	1	Truncated lognormal-n	8.68	3.62	0.001	0.999	0.26	75%	6520
Saturated zone distribution coefficient for U-233	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	0.05	No	Distribution
Saturated zone distribution coefficient for U-234	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	0.03	No	Distribution
Saturated zone distribution coefficient for U-235	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	-0.08	No	Distribution
Saturated zone distribution coefficient for U-236	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	0.08	No	Distribution
Saturated zone distribution coefficient for U-238	1	Truncated lognormal-n	4.84	3.13	0.001	0.999	0.08	No	Distribution
Saturated zone distribution coefficient for Pu-238	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	-0.05	No	Distribution
Saturated zone distribution coefficient for Pu-239	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	-0.01	No	Distribution
Saturated zone distribution coefficient for Pu-240	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	-0.10	No	Distribution
Saturated zone distribution coefficient for Pu-241	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	0.09	No	Distribution
Saturated zone distribution coefficient for Pu-242	1	Truncated lognormal-n	6.86	1.89	0.001	0.999	-0.04	No	Distribution

Parameter	Priority[1]	Distribution	Distribution's Statistical Parameters[2]				PRCC[3]	25% or 75% Quartile	Assigned Parameter Value
			1	2	3	4			
Saturated zone distribution coefficient for Pb-210	1	Truncated lognormal-n	7.78	2.76	0.001	0.999	0.06	No	Distribution
Saturated zone distribution coefficient for Ra-226	1	Truncated lognormal-n	8.17	1.70	0.001	0.999	-0.05	No	Distribution
Saturated zone distribution coefficient for Ra-228	1	Truncated lognormal-n	8.17	1.70	0.001	0.999	-0.02	No	Distribution
Saturated zone distribution coefficient for Ac-227	1	Truncated lognormal-n	6.72	3.22	0.001	0.999	0.13	No	Distribution
Saturated zone distribution coefficient for Pa-231	1	Truncated lognormal-n	5.94	3.22	0.001	0.999	0.16	No	Distribution
Saturated zone distribution coefficient for Am-241	1	Truncated lognormal-n	7.28	3.15	0.001	0.999	0.18	No	Distribution
Saturated zone distribution coefficient for Cm-244	1	Truncated lognormal-n	8.82	1.82	0.001	0.999	-0.12	No	Distribution
Depth of roots	1	Uniform	0.3	4.0	-	-	-0.95	25%	1.22
Plant transfer factor for H	1	Truncated lognormal-n	1.57	1.1	0.001	0.999	-0.02	No	Distribution
Plant transfer factor for Na	1	Truncated lognormal-n	-3.00	1.0	0.001	0.999	0.01	No	Distribution
Plant transfer factor for Fe	1	Truncated lognormal-n	-6.91	0.9	0.001	0.999	-0.20	No	Distribution
Plant transfer factor for Ni	1	Truncated lognormal-n	-3.00	0.9	0.001	0.999	0.01	No	Distribution
Plant transfer factor for Nb	1	Truncated lognormal-n	-4.61	1.1	0.001	0.999	-0.01	No	Distribution
Plant transfer factor for Tc	1	Truncated lognormal-n	1.61	0.9	0.001	0.999	0.93	75%	9.17
Plant transfer factor for Ag	1	Truncated lognormal-n	-5.51	0.9	0.001	0.999	-0.10	No	Distribution
Plant transfer factor for Sb	1	Truncated lognormal-n	-4.61	1.0	0.001	0.999	0.06	No	Distribution
Plant transfer factor for Pm	1	Truncated lognormal-n	-6.21	1.1	0.001	0.999	0.02	No	Distribution
Plant transfer factor for Sm	1	Truncated lognormal-n	-6.21	1.1	0.001	0.999	0.03	No	Distribution
Plant transfer factor for Eu	1	Truncated lognormal-n	-6.21	1.1	0.001	0.999	0.00	No	Distribution
Plant transfer factor for Gd	1	Truncated lognormal-n	-6.21	1.1	0.001	0.999	-0.10	No	Distribution
Plant transfer factor for Np	1	Truncated lognormal-n	-3.91	0.9	0.001	0.999	0.94	75%	0.0365
Plant transfer factor for Th	1	Truncated lognormal-n	-6.91	0.9	0.001	0.999	-0.03	No	Distribution
Plant transfer factor for U	1	Truncated lognormal-n	-6.21	0.9	0.001	0.999	0.00	No	Distribution
Plant transfer factor for Pu	1	Truncated lognormal-n	-6.91	0.9	0.001	0.999	0.77	75%	0.00183
Plant transfer factor for Pb	1	Truncated lognormal-n	-5.52	0.9	0.001	0.999	-0.03	No	Distribution
Plant transfer factor for Ra	1	Truncated lognormal-n	-3.22	0.9	0.001	0.999	-0.10	No	Distribution
Plant transfer factor for Ac	1	Truncated lognormal-n	-6.91	1.1	0.001	0.999	-0.02	No	Distribution
Plant transfer factor for Pa	1	Truncated lognormal-n	-4.61	1.1	0.001	0.999	-0.08	No	Distribution
Plant transfer factor for Am	1	Truncated lognormal-n	-6.91	0.9	0.001	0.999	0.27	75%	0.00182
Plant transfer factor for Cm	1	Truncated lognormal-n	-6.91	0.9	0.001	0.999	0.03	No	Distribution
Contaminated zone b parameter	2	Bounded lognormal-n	1.06	0.66	0.5	30	-0.11	No	Distribution
Contaminated zone erosion rate	2	Continuous logarithmic	Default[3]	-	-	-	-0.34	25%	0.000759
Contaminated zone total porosity	2	Truncated normal	0.425	0.0867	0.001	0.999	0.16	No	Distribution

Parameter	Priority[1]	Distribution	Distribution's Statistical Parameters[2]				PRCC[3]	25% or 75% Quartile	Assigned Parameter Value
			1	2	3	4			
Contaminated zone hydraulic conductivity	2	Lognormal	3.302	62.0	-	-	-0.24	No	Distribution
Depth of soil mixing layer	2	Triangular	0.0	0.6	0.15	-	-0.33	25%	0.149
Drinking water intake	2	Truncated lognormal-n	6.015	0.489	0.001	0.999	0.16	No	Distribution
Evapotranspiration coefficient	2	Uniform	0.5	0.75	-	-	0.25	No	Distribution
External gamma shielding factor	2	Bounded lognormal-n	-1.3	0.59	0.044	1	0.74	75%	0.397
Indoor dust filtration factor	2	Uniform	0.15	0.95	-	-	-0.12	No	Distribution
Mass loading for inhalation	2	Continuous linear	Default[3]	-	-	-	0.10	No	Distribution
Runoff coefficient	2	Uniform	0.1	0.8	-	-	0.18	No	Distribution
Fruit, vegetable and grain consumption rate	2	Triangular	135	318	178	-	0.66	75%	237
Milk consumption rate	2	Triangular	60	200	102	-	-0.05	No	Distribution
Aquatic food contaminated fraction	2	Triangular	0	1	0.39	-	0.05	No	Distribution
Wet weight crop yield for non-leafy plants	2	Truncated lognormal-n	0.56	0.48	0.001	0.999	-0.04	No	Distribution
Weathering removal constant	2	Triangular	5.1	84	18	-	0.14	No	Distribution
Wet foliar interception fraction for leafy vegetables	2	Triangular	0.06	0.95	0.67	-	-0.02	No	Distribution
Saturated zone b parameter	2	Bounded lognormal-n	1.06	0.66	0.5	30	-0.13	No	Distribution
Saturated zone hydraulic gradient	2	Bounded lognormal-n	-5.11	1.77	7E-05	0.5	-0.21	No	Distribution
Soil ingestion rate	2	Triangular	0	36.5	18.3	-	0.09	No	Distribution
Unsaturated zone 1 density	2	Normal	1.33	0.202	-	-	-0.32	25%	1.19
Unsaturated zone 1 effective porosity	2	Truncated normal	0.425	0.110	0.0839	0.766	0.03	No	Distribution
Unsaturated zone 1 hydraulic conductivity	2	Bounded lognormal-n	2.66	0.475	3.302	62.2	0.06	No	Distribution
Unsaturated zone 1 b parameter	2	Bounded lognormal-n	1.16	0.140	2.06	4.89	-0.07	No	Distribution
Unsaturated zone 1 total porosity	2	Truncated normal	0.46	0.11	0.1161	0.7959	0.00	No	Distribution
Unsaturated zone 2 density	2	Normal	1.578	0.158	-	-	-0.02	No	Distribution
Unsaturated zone 2 effective porosity	2	Truncated normal	0.383	0.0610	0.195	0.572	-0.15	No	Distribution
Unsaturated zone 2 hydraulic conductivity	2	Bounded lognormal-n	1.398	1.842	110	5870	-0.04	No	Distribution
Unsaturated zone 2 b parameter	2	Bounded lognormal-n	-0.0253	0.216	0.501	1.90	-0.22	No	Distribution
Unsaturated zone 2 total porosity	2	Truncated normal	0.43	0.06	0.2446	0.6154	0.09	No	Distribution
Unsaturated zone 3 density	2	Normal	1.33	0.202	-	-	0.13	No	Distribution
Unsaturated zone 3 hydraulic conductivity	2	Bounded lognormal-n	2.66	0.475	3.302	62.2	-0.13	No	Distribution
Unsaturated zone 3 b parameter	2	Bounded lognormal-n	1.16	0.140	2.06	4.89	0.16	No	Distribution
Unsaturated zone 4 density	2	Normal	1.578	0.158	-	-	0.15	No	Distribution

Parameter	Priority[1]	Distribution	Distribution's Statistical Parameters[2]				PRCC[3]	25% or 75% Quartile	Assigned Parameter Value
			1	2	3	4			
Unsaturated zone 4 hydraulic conductivity	2	Bounded lognormal-n	1.398	1.842	110	5870	0.17	No	Distribution
Unsaturated zone 4 b parameter	2	Bounded lognormal-n	-0.0253	0.216	0.501	1.90	-0.17	No	Distribution
Thickness of evasion layer of C-14 in soil	2	Triangular	0.5	1.0	0.75	-		No	Distribution
Meat transfer factor for H	2	Truncated lognormal-n	-4.42	1.0	0.001	0.999	-0.1	No	Distribution
Meat transfer factor for Na	2	Truncated lognormal-n	-2.53	0.2	0.001	0.999	0.01	No	Distribution
Meat transfer factor for Fe	2	Truncated lognormal-n	-3.51	0.4	0.001	0.999	0.17	No	Distribution
Meat transfer factor for Ni	2	Truncated lognormal-n	-5.30	0.9	0.001	0.999	0.14	No	Distribution
Meat transfer factor for Nb	2	Truncated lognormal-n	-13.82	0.9	0.001	0.999	0.10	No	Distribution
Meat transfer factor for Tc	2	Truncated lognormal-n	-9.21	0.7	0.001	0.999	-0.05	No	Distribution
Meat transfer factor for Ag	2	Truncated lognormal-n	-6.21	0.7	0.001	0.999	-0.21	No	Distribution
Meat transfer factor for Sb	2	Truncated lognormal-n	-6.91	0.9	0.001	0.999	-0.03	No	Distribution
Meat transfer factor for Pm	2	Truncated lognormal-n	-6.21	1.0	0.001	0.999	-0.07	No	Distribution
Meat transfer factor for Sm	2	Truncated lognormal-n	-6.21	1.0	0.001	0.999	-0.22	No	Distribution
Meat transfer factor for Eu	2	Truncated lognormal-n	-6.21	1.0	0.001	0.999	-0.21	No	Distribution
Meat transfer factor for Gd	2	Truncated lognormal-n	-6.21	1.0	0.001	0.999	0.08	No	Distribution
Meat transfer factor for Np	2	Truncated lognormal-n	-6.91	0.7	0.001	0.999	0.01	No	Distribution
Meat transfer factor for Th	2	Truncated lognormal-n	-9.21	1.0	0.001	0.999	0.06	No	Distribution
Meat transfer factor for U	2	Truncated lognormal-n	-7.13	0.7	0.001	0.999	0.01	No	Distribution
Meat transfer factor for Pu	2	Truncated lognormal-n	-9.21	0.2	0.001	0.999	0.06	No	Distribution
Meat transfer factor for Pb	2	Truncated lognormal-n	-7.13	0.7	0.001	0.999	0.01	No	Distribution
Meat transfer factor for Ra	2	Truncated lognormal-n	-6.91	0.7	0.001	0.999	0.00	No	Distribution
Meat transfer factor for Ac	2	Truncated lognormal-n	-10.82	1.0	0.001	0.999	-0.12	No	Distribution
Meat transfer factor for Pa	2	Truncated lognormal-n	-12.21	1.0	0.001	0.999	-0.10	No	Distribution
Meat transfer factor for Am	2	Truncated lognormal-n	-9.90	0.2	0.001	0.999	-0.06	No	Distribution
Meat transfer factor for Cm	2	Truncated lognormal-n	-10.82	1.0	0.001	0.999	-0.08	No	Distribution
Milk transfer factor for H	2	Truncated lognormal-n	-4.6	0.9	0.001	0.999	-0.04	No	Distribution
Milk transfer factor for Na	2	Truncated lognormal-n	-3.22	0.5	0.001	0.999	-0.07	No	Distribution
Milk transfer factor for Fe	2	Truncated lognormal-n	-8.11	0.7	0.001	0.999	0.07	No	Distribution
Milk transfer factor for Ni	2	Truncated lognormal-n	-3.91	0.7	0.001	0.999	0.04	No	Distribution
Milk transfer factor for Nb	2	Truncated lognormal-n	-13.12	0.7	0.001	0.999	0.01	No	Distribution
Milk transfer factor for Tc	2	Truncated lognormal-n	-6.91	0.7	0.001	0.999	0.03	No	Distribution
Milk transfer factor for Ag	2	Truncated lognormal-n	-5.12	0.7	0.001	0.999	0.15	No	Distribution
Milk transfer factor for Sb	2	Truncated lognormal-n	-9.72	0.9	0.001	0.999	0.12	No	Distribution
Milk transfer factor for Pm	2	Truncated lognormal-n	-9.72	0.9	0.001	0.999	0.18	No	Distribution
Milk transfer factor for Sm	2	Truncated lognormal-n	-9.72	0.9	0.001	0.999	-0.04	No	Distribution
Milk transfer factor for Eu	2	Truncated lognormal-n	-9.72	0.9	0.001	0.999	0.06	No	Distribution
Milk transfer factor for Gd	2	Truncated lognormal-n	-9.72	0.9	0.001	0.999	0.02	No	Distribution
Milk transfer factor for Np	2	Truncated lognormal-n	-11.51	0.7	0.001	0.999	-0.04	No	Distribution
Milk transfer factor for Th	2	Truncated lognormal-n	-12.21	0.9	0.001	0.999	-0.03	No	Distribution

Parameter	Priority[1]	Distribution	Distribution's Statistical Parameters[2]				PRCC[3]	25% or 75% Quartile	Assigned Parameter Value
			1	2	3	4			
Milk transfer factor for U	2	Truncated lognormal-n	-7.82	0.6	0.001	0.999	-0.04	No	Distribution
Milk transfer factor for Pu	2	Truncated lognormal-n	-13.82	0.5	0.001	0.999	0.14	No	Distribution
Milk transfer factor for Pb	2	Truncated lognormal-n	-8.11	0.9	0.001	0.999	0.19	No	Distribution
Milk transfer factor for Ra	2	Truncated lognormal-n	-6.91	0.5	0.001	0.999	-0.23	No	Distribution
Milk transfer factor for Ac	2	Truncated lognormal-n	-13.12	0.9	0.001	0.999	0.15	No	Distribution
Milk transfer factor for Pa	2	Truncated lognormal-n	-12.21	0.9	0.001	0.999	-0.02	No	Distribution
Milk transfer factor for Am	2	Truncated lognormal-n	-13.12	0.7	0.001	0.999	0.15	No	Distribution
Milk transfer factor for Cm	2	Truncated lognormal-n	-13.12	0.9	0.001	0.999	-0.16	No	Distribution
H bioaccumulation factor for fish	2	Lognormal-n	0	0.1	-	-	-0.01	No	Distribution
Na bioaccumulation factor for fish	2	Lognormal-n	3	1.1	-	-	-0.10	No	Distribution
Fe bioaccumulation factor for fish	2	Lognormal-n	5.3	1.1	-	-	0.25	No	Distribution
Ni bioaccumulation factor for fish	2	Lognormal-n	4.6	1.1	-	-	-0.21	No	Distribution
Nb bioaccumulation factor for fish	2	Lognormal-n	5.7	1.1	-	-	-0.10	No	Distribution
Tc bioaccumulation factor for fish	2	Lognormal-n	3.0	1.1	-	-	0.05	No	Distribution
Ag bioaccumulation factor for fish	2	Lognormal-n	1.6	1.1	-	-	0.01	No	Distribution
Sb bioaccumulation factor for fish	2	Lognormal-n	4.6	1.1	-	-	-0.05	No	Distribution
Pm bioaccumulation factor for fish	2	Lognormal-n	3.4	1.1	-	-	0.09	No	Distribution
Sm bioaccumulation factor for fish	2	Lognormal-n	3.2	1.1	-	-	0.22	No	Distribution
Eu bioaccumulation factor for fish	2	Lognormal-n	3.9	1.1	-	-	-0.04	No	Distribution
Gd bioaccumulation factor for fish	2	Lognormal-n	3.2	1.1	-	-	0.02	No	Distribution
Np bioaccumulation factor for fish	2	Lognormal-n	3.4	1.1	-	-	0.06	No	Distribution
Th bioaccumulation factor for fish	2	Lognormal-n	4.6	1.1	-	-	0.08	No	Distribution
U bioaccumulation factor for fish	2	Lognormal-n	2.3	1.1	-	-	0.07	No	Distribution
Pu bioaccumulation factor for fish	2	Lognormal-n	3.4	1.1	-	-	-0.02	No	Distribution
Pb bioaccumulation factor for fish	2	Lognormal-n	5.7	1.1	-	-	0.11	No	Distribution
Ra bioaccumulation factor for fish	2	Lognormal-n	3.9	1.1	-	-	-0.20	No	Distribution
Ac bioaccumulation factor for fish	2	Lognormal-n	2.7	1.1	-	-	-0.07	No	Distribution
Pa bioaccumulation factor for fish	2	Lognormal-n	2.3	1.1	-	-	0.04	No	Distribution
Am bioaccumulation factor for fish	2	Lognormal-n	3.4	1.1	-	-	-0.16	No	Distribution
Cm bioaccumulation factor for fish	2	Lognormal-n	3.4	1.1	-	-	0.07	No	Distribution
Unsaturated zone 1 field capacity	3	Truncated normal	0.236	0.0578	0.0575	0.415	-0.07	No	Distribution
Unsaturated zone 2 field capacity	3	Truncated normal	0.0607	0.0150	0.0280	0.124	0.05	No	Distribution
Inhalation rate	3	Triangular	4,380	13,100	8,400	-	-0.06	No	Distribution

Notes:

[1]1 = high priority parameter, 2 = medium priority parameter

[2]Distribution's Statistical Parameter
Bounded lognormal-n: 1 = underlying mean value, 2 = underlying standard deviation, 3 = lower limit, 4 = upper limit

Continuous linear: user-defined continuous with linear interpolation
Continuous logarithmic: user defined with continuous logarithmic interpolation
Lognormal: 1 = mean, 2 = error factor
Lognormal-n: 1 = mean, 2 = standard deviation
Normal: 1 = mean, 2 = standard deviation
Triangular: 1 = minimum, 2 = maximum, 3 = most likely
Truncated lognormal-n: 1 = underlying mean value, 2 = underlying standard deviation, 3 = lower quantile, 4 = upper quantile
Truncated normal: 1 = mean, 2 = standard deviation, 3 = lower quantile, 4 = upper quantile
Uniform: 1 = minimum, 2 = maximum

[3]Default RESRAD v6.22 distribution parameters were used

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7.0 UPDATE OF SITE-SPECIFIC DECOMMISSIONING COSTS

7.1 Introduction

In accordance with 10 CFR 50.82(a)(9)(ii)(F) [Reference 0] and Regulatory Guide 1.179, "Standard Format and Content of License Termination Plans for Nuclear Power Reactors," [Reference 0] the site-specific cost estimate and funding plans are provided. Regulatory Guide 1.179 provides guidance with respect to the information to be presented.

The License Termination Plan (LTP) must:

Provide an estimate of the remaining decommissioning costs, and compare the estimated costs with the present funds set aside for decommissioning. The financial assurance instrument required per 10 CFR 50.75 must be funded to the amount of the cost estimate. If there is a deficit in present funding, the LTP must indicate the means for ensuring adequate funds to complete the decommissioning.

The decommissioning cost estimate includes an evaluation of the following cost elements:

- Cost assumptions used, including a contingency factor,
- Major decommissioning activities and tasks,
- Unit cost factors,
- Estimated costs of decontamination and removal of equipment and structures,
- Estimated costs of waste disposal, including applicable disposal site surcharges and transportation costs,
- Estimated final survey costs, and
- Estimated total costs.

The cost estimate should focus on the remaining work, detailed activity by activity. The cost estimates should be based on credible engineering assumptions that are related to all major remaining decommissioning activities and tasks. The cost estimate should include the cost of the remediation action being evaluated, the cost of transportation and disposal of the waste generated by the action, and other costs that are appropriate for the specific case.

Sacramento Municipal Utility District (the District) owns a 100% undivided interest in Rancho Seco Nuclear Generating Station (Rancho Seco) and provides financial assurance for decommissioning through the use of an external sinking fund.

7.1.1 History

After plant shutdown in 1989, Decommissioning Cost Estimates were performed. Beginning in 1995, TLG Services, Inc. (TLG) provided the District with alternative cost estimates that included options for the decommissioning of the facility. Delays in the Fuel Dry Storage project caused large increases in projected costs, and the alternatives were provided to take advantage of the available opportunities, including: availability of District Staff on site to support dismantlement due to delays in the Fuel Dry Storage project, and; availability of Energy*Solutions*[1] as an appealing option for low-level radioactive waste disposal.

In January of 1997, the District Board of Directors (the Board) approved the Incremental Decommissioning Project, and dismantlement of the facility began in earnest. In 1999, the Board approved expansion of the Incremental project to include all activities necessary for license termination. Currently, the available options for disposition of Class B and Class C low level radioactive waste are not considered to be suitable by the District. Therefore, this waste will be stored onsite until a suitable option becomes available. In addition, the greater than Class C (GTCC) waste will be stored at the Independent Spent Fuel Storage Installation (ISFSI) until the Department of Energy (DOE) develops a suitable disposal site to accept that waste. The Cost Estimate includes the disposal costs for the Class B, Class C, and GTCC wastes. The basis for the current estimate includes completion of all dismantlement work by 2008, with disposition of the stored radioactive waste by 2028.

After the cessation of plant operations, the initial decommissioning alternative chosen was a modified SAFSTOR option identified as Hardened SAFSTOR. The facility was to be placed into a safe, stable condition including transferring the used nuclear fuel from wet to dry storage. Because of the premature shutdown, the Decommissioning Trust Fund was not adequately funded to carry out decommissioning. The District proposed a plan, which the Nuclear Regulatory Commission (NRC) approved, to continue annual contributions to the Decommissioning Trust Fund over the time period of the original operating license, extending through 2008, at which time the Trust would be fully funded. This allowed collection of funds while minimizing the overall financial impact to District operations. Dismantlement activities were to commence once the funding was complete.

In the original basis for the cost estimate, after Hardened SAFSTOR was achieved, a staffing reduction was planned to correspond with the reduced need to maintain plant systems and facilities. Delays in the fuel project resulted in maintaining site staff at a higher level longer than originally planned resulting in overall increases in decommissioning costs. While the delays resulted in increased annual contributions to the trust fund, they also resulted in maintaining a large talent pool on site with considerable process knowledge of operating history and radiological conditions within the facility.

The availability of Energy*Solutions* combined with the presence of a large talent pool within the available staff presented an opportunity to begin the dismantlement process early. In 1996, a plan was developed to take advantage of both circumstances and perform dismantlement of the majority of the secondary systems in the Turbine Building. This was proposed to the Board as the Incremental Decommissioning Project, which they subsequently approved as a 3-year project in January 1997.

The Incremental Decommissioning Project was successful in helping to mitigate the impacts of the delay in the fuel project, and the work was completed ahead of schedule and below projected costs. The Incremental project was so successful that the scope was expanded to include systems in the Tank Farm and other outside areas.

During the time period of Incremental Decommissioning, additional circumstances outside of the District's control resulted in further delays in the fuel project and additional impacts to the cost estimate and the Annual Trust Fund contribution. Based upon the success of the

[1] Energy*Solutions* was previously Envirocare of Utah

Incremental project and the need to mitigate additional increases to future Annual Trust Fund contributions, District staff put together a plan for continuing decommissioning through license termination, with the goal to complete decommissioning in 2008. The Board approved this plan in July 1999, and the District shifted from Incremental Decommissioning to Decommissioning.

7.2 Decommissioning Cost Estimate

7.2.1 Cost Estimate Description & Methodology

The decommissioning cost estimate is prepared to satisfy the requirements of Title 10 of the Code of Federal Regulations, Part 50.75. The origin of this cost estimate is the Area-Based Decommissioning Cost Estimate prepared in 1999 and later updated in the year 2000 by TLG. Subsequently, District staff updated the estimate in the year 2001, 2002, 2003, 2004 and again in the year 2005 [Reference 7-3]. Each of these updates prepared by District staff was reviewed by TLG and, as such, is utilizing the current 2005 estimate updated with actual cost and forecast data as the basis for the cost estimate in this submittal of the LTP.

The methodology used to develop the cost estimate follows the basic approach originally presented in the Atomic Industrial Forum (now Nuclear Energy Institute) program for developing standardized decommissioning cost estimates published as AIF/NESP-036, "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates," [Reference 7-4]. This document presents a unit cost factor method for estimating direct activity costs, activity by activity, simplifying the estimating process. Unit factors for the removal of equipment, concrete, steel, etc., were constructed from site-specific labor costs provided by the District. The unit factors are based upon labor costs currently being used as part of the incremental decommissioning project. The direct activity costs were then estimated using the plant inventory developed for each work area.

The unit cost factor method provides a demonstrable basis for establishing reliable cost estimates. The detail available in the unit cost factors for activity time, labor costs (by craft), and equipment and consumable costs provides assurance that cost elements have not been omitted. The detailed unit cost factor, coupled with the plant-specific inventory of piping, components, and structures, provide a high degree of confidence in the reliability of the cost estimate.

To account for the unique working conditions associated with decommissioning, work difficulty factors (WDFs) were assigned to each work area. WDFs are commensurate with the inefficiencies associated with working in confined, hazardous environments and are applied as increases to the unit cost factors. The WDFs take into account factors associated with access difficulties, use of respiratory protection, Radiation Protection/ALARA, use of protective clothing and accounting for work breaks. These factors and their associated range of values were developed in conjunction with the Atomic Industrial Forum's Guidelines Study.

The decommissioning plan schedule was used to determine the period-dependent costs for program management, administration, field engineering, equipment rental, contracted services, etc. The study relies upon site-specific salary and wage rates for the personnel associated with the intended program.

TLG's cost model is comprised of a multitude of distinct cost line items, calculated using cost factor methodology described earlier. Period-dependent and collateral costs are combined to produce a comprehensive accounting of the identified expenditures. However, the resulting costs in and of themselves do not comprise the total cost to accomplish the project goal of license termination.

Consistent with industry practice, contingencies were applied to the decontamination and dismantlement costs developed as specific provision for unforeseeable elements of cost within the defined project scope, particularly important where previous experience has shown that unforeseeable events that will increase costs are likely to occur. The cost elements in the estimate are based on ideal conditions; therefore, the types of unforeseeable events that are almost certain to occur in decommissioning, based on industry experience, are addressed through a percentage contingency applied on a line item basis. The contingency, as used in the estimate, does not account for price escalation and inflation in the cost of decommissioning over the remaining project duration.

7.2.2 Summary of the Site Specific Decommissioning Cost Estimate

The decommissioning cost estimate in total is defined as the funding required to complete decommissioning, however, the cost assigned to a given line item within the estimate is not as rigorously defended. A basic assumption of the estimating process is that when specific line items have been over-estimated, the unspent funds will be required to cover the costs associated with other line items that have been under-estimated. Historically, the overall impact is that the cost of work completed to date has been, in general, over-estimated. This has resulted in funds that were not required to offset the actual costs incurred in completing work. However, the presupposition of the correctness of the total estimated cost requires that these funds be preserved for future work. The remaining cost projected to complete the decommissioning of Rancho Seco is \$138.3[2] million for the period 2006 through Phase I site release in 2008, with additional amounts of \$24.7 million for the transfer of GTCC waste to the DOE in 2027, oversight of waste stored in the Interim Onsite Storage Building (IOSB) through 2028, and Phase II license termination in 2028. The total cost for decommissioning, including previously expended funds, is \$534 million (to-date actual costs in the year spent dollars plus future work in year 2005 dollars). A summary of the remaining major cost contributors is provided in Table 7-1 and graphically in Figure 7-1.

The cost estimate provides an overall cost for the duration of the project including all costs incurred after transitioning from operating and maintenance (O&M)-financed expenses after plant shutdown through 10 CFR 50 license termination, plus an amount to cover District costs anticipated for transferring control of the used nuclear fuel to the DOE. The costs contained in this cost estimate can be generally grouped into four basic categories. These are: technical decommissioning costs; non-technical District costs; the staffing plan; and fuel dry storage project costs.

The section of the cost estimate based upon detailed engineering calculations is the technical portion of the decommissioning cost estimate. This portion is based upon engineering calculations that use a variety of input factors, which include the following:

- Unit cost factors for removal;
- Inventories of plant systems and components remaining after the Incremental Decommissioning project;

[2] From the current Cost Estimate, Reference 7-3

- Difficulty factors involving the level of effort required and the ability to physically access the material;
- Impacts due to radiological conditions (both radiation and contamination); and
- The presence of hazardous materials (e.g., lead-based coatings, asbestos insulation).

The technical costs include the direct costs of dismantlement and the indirect costs including generation of incidental radioactive waste, required health physics supplies, small tool allowances, and other costs in the "Undistributed" category. The basis for the technical decommissioning costs remains the 2000 Cost Estimate Update prepared by TLG, except when specific costs are updated based upon additional data such as recent industry or site experience.

The Area Based Decommissioning Cost Estimate prepared by TLG Services in 1999 and subsequently updated in 2000 is the basis for the LTP cost estimate for Rancho Seco. The estimated total cost is $534 million which is the sum of previously expended funds in the dollars for the year spent, plus future costs in 2005 dollars. For budgetary and financial planning purposes, this estimate has escalated annually for inflation at a average rate of 2.7% for general costs and 3% for staffing costs.

Technical costs are now updated using the basic methodology described above. The basis for the technical costs remains that used for the 1999 Area-Based Cost Estimate with long-term contract information as provided in the 2000 update. Both the 1999 Estimate and 2000 Update were performed by TLG.

In certain instances, line item values have been changed to reflect an increased level of detail in work planning. The changes are made by redistributing available funds among a larger number of detailed line items, however, the total costs remain consistent with previous estimates and the update methodology described. In these cases, the changes reflect the increased level of detail in the scheduling software and maintain consistency between the scheduling software and the cost estimate.

Non-technical District costs are those associated with facility maintenance, District overhead, travel to professional seminars, and other costs not directly derived from the decommissioning process. These costs are determined through the annual budgeting process, and are forecast through the end of the project based upon historical data. The schedule of the technical portion of the project provides the basis for determining the non-technical costs.

A major contributor to the overall cost of decommissioning is the staff cost. The cost of staff is based upon the staffing plan developed to meet the decommissioning schedule and needs of the project in terms of staffing levels, and also based upon the actual and projected staffing costs derived from current contracts and the budgeting process. Also included are additional staff costs required to oversee the radioactive waste stored in the IOSB until shipped for disposal.

Fuel dry storage project costs include fuel storage costs through 2008 and the cost of transferring the GTCC material, which will be stored until transfer with the fuel in the ISFSI, to the DOE. The transfer of the GTCC material is tied to the fuel storage because it is assumed the GTCC material would be placed into the same repository as the fuel when the DOE develops the repository.

Consistent with the NRC definition of decommissioning under 10 CFR 50.2, the radiological decommissioning costs consider those costs that are associated with normal decommissioning activities necessary for termination of the Part 50 license and release of the site for unrestricted use. Additionally, the Cost Estimate includes costs for fuel storage through 2008, coinciding with the scheduled completion of phase one of License Termination. The Cost Estimate does not include costs associated with the disposal of non-radiological materials or structures beyond that necessary to terminate the Part 50 license.

Table 7-1
Summary of Remaining Decommissioning Costs
In Year 2005 Dollars (thousands of dollars)

Work Category	Cost in 2005$ (2006 & beyond)	Remaining Costs
Decontamination	2,663	1.6%
Large Components, RB Concrete	28,429	17.4%
Transportation	2,768	1.7%
Waste Disposal	7,126	4.4%
Characterization/Remediation	14,961	9.2%
Final Status Survey	13,434	8.2%
Project Staffing	52,730	32.3%
Materials and Equipment	3,278	2.0%
Insurance	1,156	0.7%
Other Undistributed Costs	12,811	7.9%
Contract & Material Surcharges	823	0.5%
Stored Waste Oversight	1,994	1.2%
Class B, C, & GTCC Disposal Costs	20,552	12.6%
Total	163,088	100.0%
Expended thru 2005	371,097	
Grand Total	534,185	

7.3 Decommissioning Funding Plan

The District had maintained an internal decommissioning fund since the early 1980's. In 1991, the District transferred $90 million from the internal fund into an "external sinking decommissioning trust fund" and submitted its Financial Assurance Plan to the NRC describing the use of the external sinking fund. There have been no significant modifications to the external sinking fund since the initial submittal.

The District plans to accumulate funds in the external trust fund, at the rate of $27 million per year, through 2008. Based on the current decommissioning cost estimate and funding rate, collecting funds through 2008 will provide sufficient funds to complete decommissioning Rancho Seco and terminate the 10 CFR Part 50 license.

The external trust fund is currently maintained by Wells Fargo Bank. The balance is reviewed on an annual basis to ensure the adequacy of the annual contribution to assure funds will be available to complete decommissioning and terminate the 10CFR Part 50 license.

The District has concluded that the current estimate forecast is adequate to complete the remaining decommissioning activities for Rancho Seco. Actual costs are monitored continuously against estimated costs. The Cost Estimate is updated annually per 10 CFR 50.75(b)(2) and reflects impacts such as industry experience and items identified by the monitoring process.

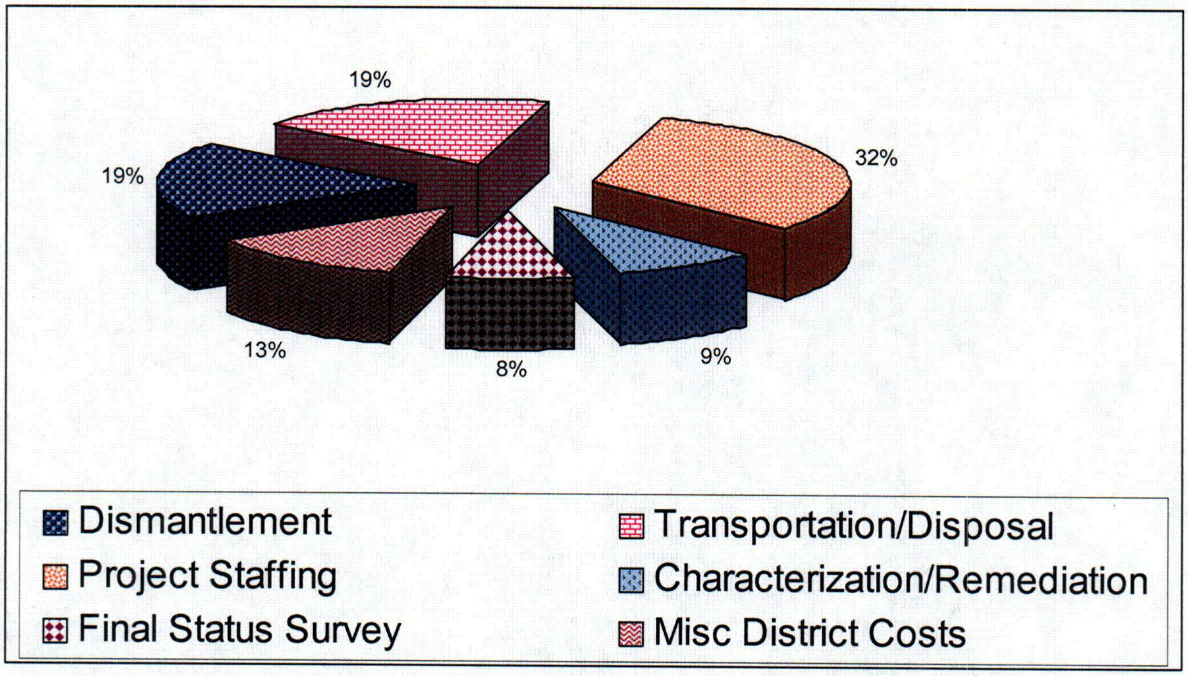

Figure 7-1
Summary of Remaining Decommissioning Costs in Year 2005 Dollars

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7.4 References

7-1 U.S. Code of Federal Regulations, Title 10, Part 50--Domestic Licensing of Production and Utilization Facilities, Section 82—Termination of License

7-2 U.S. Nuclear Regulatory Commission, Regulatory Guide 1.179, "Standard Format and Content of License Termination Plans for Nuclear Power Reactors," January 1999

7-3 TLG Services, Inc., "2005 Decommissioning Cost Estimate for the Rancho Seco Nuclear Generating Station," December 31, 2005, Rev. 1

7-4 AIF/NESP-036, "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates," May, 1986

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8.0 SUPPLEMENT TO THE ENVIRONMENTAL REPORT

8.1 Summary

License Termination Plan (LTP) Chapter 8 provides an assessment of the environmental effects of decommissioning Rancho Seco Nuclear Generating Station (Rancho Seco). The assessment determined that the environmental effects from decommissioning Rancho Seco are minimal and there are no adverse effects outside the bounds of NUREG-0586 "Final Generic Environmental Impact Statement (FGEIS) on Decommissioning of Nuclear Facilities," [Reference 8-1] or the associated Supplement 1 [Reference 8-2].

Additionally, the conclusions contained in the "Supplement to Rancho Seco Environmental Report - Post Operating License Stage," [Reference 8-3] used as the original basis for the decommissioning environmental assessment of radiological and non-radiological effects of decommissioning are still valid. These conclusions are summarized as follows:

- The Sacramento Municipal Utility District (District) will maintain annual occupational radiation exposure to individuals as low as reasonably achievable (ALARA). These exposures will be below historical levels for the operating phase of the plant.
- All effluents, both radiological and non-radiological, will remain within regulatory limits as specified in applicable control documents throughout the decommissioning process.
- The District expects to maintain exposure to onsite workers and the offsite public as a result of waste transportation well below the levels projected by NUREG-0586.

8.2 Introduction and Purpose

8.2.1 Purpose

The purpose of this section of the License Termination Plan (LTP) is to update the environmental report for Rancho Seco with new information and significant environmental changes associated with the site's decommissioning and license termination activities. This section of the LTP is prepared pursuant to 10 CFR 51.53(d) and 10 CFR 50.82(a)(9)(ii)(G).

The information contained in this chapter generally follows the Nuclear Regulatory Commission (NRC) guidance of Regulatory Guide 1.179, "Standard Format and Content of License Termination Plans for Nuclear Power Reactors," [Reference 8-4] and NUREG-1700, "Standard Review Plan for Evaluation Nuclear Power Reactor License Termination Plans," [Reference 8-5]. Guidance contained in Supplement 1 to NUREG-0586 was also used during preparation of this chapter. The contents of this section have also been reviewed against the appropriate sections of NUREG-1757 "Consolidated NMSS Decommissioning Guidance Decommissioning Process for Materials Licensees," [Reference 8-7].

Much of the information in this document has also been provided to the NRC in other forms (e.g., Updated Safety Analysis Report and "Supplement to Rancho Seco Environmental Report - Post Operating License Stage").

8.2.2 Background

On November 20, 1967, the District filed an application with the Atomic Energy Commission (AEC) for a provisional construction permit for Rancho Seco, Unit 1. On October 11, 1968, the AEC issued provisional Construction Permit No. CPPR-56.

In March 1973, the U.S. Atomic Energy Commission, Directorate of Licensing issued the Final Environmental Statement related to the operation of Rancho Seco Unit 1. The report concluded that, after weighing the environmental, economic, technical, and other benefits of Rancho Seco against the environmental and other costs and considering available alternatives, the AEC should allow the continuation of Construction Permit No. CPPR-56 and issue an operating license for the Rancho Seco facility. The continuation of the construction permit was subject to the following conditions for the protection of the environment:

1. Implement a comprehensive environmental monitoring program to determine any radiological effects on the environment from the operation of the plant. The monitoring program must include groundwater monitoring.

2. If the environmental monitoring program detects harmful effects or evidence of irreversible damage, provide an analysis of the program and a course of action to alleviate the problem.

3. Provide soil stabilization in disturbed construction areas.

Due to a public vote on June 6, 1989, the District decided to shut down Rancho Seco permanently. Accordingly, on August 29, 1989, the District notified the NRC of its intent to seek amendments to the Rancho Seco operating license and decommission the facility. The NRC acknowledged this notification on November 27, 1989.

Initially, the District selected the SAFSTOR option for decommissioning Rancho Seco. Rancho Seco would remain in SAFSTOR through 2008, at which time the District would begin Deferred-DECON. In accordance with 10 CFR 51.53(d), the District submitted, "Supplement to Rancho Seco Environmental Report - Post Operating License Stage." This environmental report addressed the actual or potential environmental impacts associated with Custodial and Hardened-SAFSTOR, and provided an initial assessment of the effects of Deferred-DECON.

"Supplement to Rancho Seco Environmental Report - Post Operating License Stage," compared Rancho Seco decommissioning attributes to those identified in NUREG-0586. NUREG-0586 provides a generic environmental assessment of decommissioning a reference nuclear facility. When the NRC issued the Decommissioning Rule in 1988, and based on the findings in NUREG-0586, it concluded a generic finding of "no significant (environmental) impact." The NRC further concluded that no additional Environmental Impact Statement (EIS) would need to be prepared in connection with decommissioning a particular nuclear site unless the impacts of a particular plant have site-specific considerations significantly different from those studied generically.

The attributes of a prematurely shutdown plant would fall below the "end-of-life" envelope established in NUREG-0586. Although Rancho Seco operated for about 14 years, its reactor had only approximately six full effective power years of operation. Therefore, the irradiated components of Rancho Seco fall within the bounds of NUREG-0586 reference facility that had operated over its 40-year design life.

NUREG-0586, Section 4.0 provides a description of a generic pressurized water reactor (PWR) of a size and rating larger than Rancho Seco. In particular, the reference facility is a 1,175-MWe PWR owned by Portland General Electric and designed by Westinghouse Corporation. The Rancho Seco facility is a 913-MWe PWR designed by Babcock and Wilcox Co. Although the designs of the facilities and Nuclear Steam Supply Systems (NSSS) are slightly different, the B&W design includes the same type of major components, buildings, and structures associated with the reference PWR, and consequently involves the same type of decommissioning tasks and considerations. The Supplement to Rancho Seco Environmental Report - Post Operating License Stage concludes that Rancho Seco falls within the envelope of the generic environmental assessment.

Additionally, in accordance with the California Environmental Quality Act (CEQA), the District conducted an initial study of the potential environmental impacts resulting from closing and decommissioning Rancho Seco. Based on the results of that study, the District staff prepared a Negative Declaration stating that decommissioning would not have a significant environmental impact.

In February 1997, the District began a pilot program called "incremental" decommissioning. Based on the success of incremental decommissioning, the District began full-scale dismantlement in 1999, with the goal of terminating the 10 CFR Part 50 license by 2008. Prior to beginning dismantlement activities, the District conducted another evaluation under CEQA and again concluded that decommissioning would not have a significant environmental impact.

In March 1997, the District submitted its Post Shutdown Decommissioning Activities Report (PSDAR), in accordance with 10 CFR 50.82. The PSDAR superseded the original Decommissioning Plan and provided the information required by 10 CFR 50.82(a)(4). PSDAR Section 4, Environmental Review, provides a discussion of the environmental impacts associated with site-specific decommissioning activities and concluded that all of the decommissioning attributes identified for Rancho Seco are within the envelope of NUREG-0586, except for the decommissioning cost estimate, which is not directly comparable.

In August 2002, the District completed the transfer of all of the Rancho Seco spent nuclear fuel into dry storage at the Rancho Seco Independent Spent Fuel Storage Installation (ISFSI), licensed under 10 CFR Part 72.

8.2.3 Environmental Effects of Decommissioning

A description of both the radiological and non-radiological environmental effects of decommissioning is provided in Section 8.6. Radiological impacts reviewed include evaluations of occupational and public doses, decommissioning accidents, low-level waste (LLW) generation, transportation and disposal, and adherence to radiological criteria for license termination.

The non-radiological effects include potential impacts governed by Federal, State and local regulations. The District used NUREG-0586, Supplement 1 as guidance in evaluating the non-radiological effects of decommissioning. Sections 8.6.3.10 through 8.6.3.12 provide information that addresses the decommissioning impacts on socio-economics, environmental justice, and cultural, historical, and archeological resources.

8.2.4 Overview of Regulations Governing Decommissioning and Final Site Release

Section 8.7 provides a summary of Federal, State, and local regulations governing Rancho Seco decommissioning and final status survey (FSS).

8.3 Site Description After Unrestricted Release

This section presents a summary of the final condition of the site at the conclusion of dismantlement and license termination activities. Chapter 3 of this LTP provides a more detailed description of the final site condition. The impacts of these activities are discussed in Section 8.6.

The District intends to release the Rancho Seco site for unrestricted use in two phases. The majority of the site, including impacted and non-impacted areas, will be released after the completion of the final status surveys for the portions of the site requested to be released. Once an area has been verified as ready for release, no additional surveys or decontamination of the subject area will be required unless the controls (e.g., administrative or engineered) to prevent re-contamination are known or suspected to have been compromised.

Following completion of an FSS survey unit, Rancho Seco staff will compile an FSS report to document areas where remediation tasks are completed and demonstrate that the criteria in 10 CFR 20.1402 are met. The results of these surveys will be documented and submitted to the NRC. Following the completion of the FSS reports for the first phase, the District will submit a license amendment request to release the first portion of the site for unrestricted use.

Since there is currently no disposal site for Class B & C radioactive waste acceptable to the District, the District will continue to store this waste in the Interim Onsite Storage Building (IOSB). After disposing of the Class B & C radioactive waste, the District will complete the FSS for the remainder of the site (i.e., the IOSB) and submit a license amendment request to release the remainder of the site and terminate the 10 CFR Part 50 license.

Chapter 5 of this LTP, Final Status Survey Plan, describes the contents of the FSS report.

The spent nuclear fuel and the greater than Class C (GTCC) waste will remain in storage at the ISFSI[1] until the Department of Energy (DOE) transfers this waste to a federal repository.

8.4 Impacts to the Post-Shutdown Decommissioning Activities Report

In March 1997, the District submitted the Rancho Seco PSDAR to the NRC in accordance with 10 CFR 50.82(a)(7). The PSDAR provides a description of planned decommissioning activities, a schedule for their accomplishment, an estimate of expected decommissioning costs, and the reasons for concluding that the environmental impacts associated with site-specific decommissioning activities will be in compliance with 10 CFR 50.82(a)(6)(ii). The District intends to decommission Rancho Seco in accordance with the DECON option found acceptable to the NRC in NUREG-0586.

[1] The ISFSI is licensed under 10 CFR Part 72, independent of the 10 CFR Part 50 licensed site.

Chapter 3 of this LTP, Identification of Remaining Site Dismantlement Activities, identifies the dismantlement and decontamination activities that are scheduled to be completed prior to license termination and unrestricted release. These activities are compared to the descriptions provided in the PSDAR and any changes are identified.

Although additional detail regarding major decommissioning activities is available through decommissioning planning efforts, no significant impacts beyond those identified in the PSDAR have been identified. Subsequent sections in this chapter of the LTP provide additional information regarding environmental effects of decommissioning.

8.5 Rancho Seco Site Environmental Description

The Supplement to Rancho Seco Environmental Report - Post Operating License Stage, submitted with the original Rancho Seco Decommissioning Plan, was used as the basis for this supplement to the environmental report. The District reviewed the Supplement to Rancho Seco Environmental Report - Post Operating License Stage to identify any relevant new information or significant environmental changes that would affect the report. The District also reviewed the guidance contained in NUREG-0586, Supplement 1, to determine the nature of any new information to be included in Section 8 of this LTP.

8.5.1 Geography and Demography

8.5.1.1 Site Location Description

The Rancho Seco site is located in the southeast part of Sacramento County, California. It lies either wholly or partly in Sections 27, 28, 29, 32, 33, and 34 of Township 6 North, Range 8E. The site is approximately 26 miles north-northeast of Stockton and 25 miles southeast of Sacramento. The Rancho Seco nuclear reactor unit and ISFSI lie wholly within Section 29.

More generally, the site is located between the Sierra Nevada mountains to the east and the Coast Range along the Pacific Ocean to the west in an area of flat to lightly rolling terrain at an elevation of approximately 200 feet mean sea level (msl). To the east of the site the land becomes more rolling, rising to an elevation of 600 feet at a distance of about seven miles, and increasing in elevation thereafter approaching the Sierra Nevada foothills.

The site area is almost exclusively agricultural and is presently used as grazing land. The climatology of the Rancho Seco site is typical of the Great Central Valley of California. Cloudless skies prevail during summer and much of the spring and fall seasons due to the Pacific anticyclone off the California coast, which prevents Pacific storms from entering inland. The rainy season usually extends from December through March. Atmospheric dispersion factors for the site are considered favorable.

The owner-controlled site is approximately 2,480 acres with all acreage being owned by the District. Within the owner-controlled area is an approximately 87-acre fence-enclosed Industrial Area containing the nuclear facility.

A 30-acre natural gas-fired power plant is approximately one half mile south of the Industrial Area boundary. Also within the 2,480-acre site are:

- The 560-acre Rancho Seco Reservoir and Recreation Area,
- A 50-acre solar power (photo-voltaic) electrical generating station, and

- The 10-acre, 10 CFR Part 72 licensed ISFSI.

Groundwater in the site area occurs under free or semi-confined conditions. It is stored chiefly in the alluvium, the older alluvial type deposits, and the Mehrten Formation. Groundwater movement in the area is to the southwest with a slope of about ten feet/mile.

There is no indication of faulting beneath the site. The nearest fault system, the Foothill Fault System, is about ten miles east of the site and has been inactive since the Jurassic Period, some 135 million years ago.

The soils at the Rancho Seco site can be categorized as hard to very hard silts and silty clays with dense to very dense sands and gravels.

8.5.1.2 Population

The land surrounding the Rancho Seco site is undeveloped and is used primarily for grazing beef cattle and other agricultural activities (e.g., wine grapes). Current land use assumptions indicate that these areas will continue to be used for grazing beef cattle and other agricultural purposes. A five-mile radius area surrounding the Rancho Seco facility is a low population zone. This area is primarily farmland, with few tourist attractions and little seasonal variation in the population.

The nearest population center of 25,000 or more is Lodi, 17 miles south-southwest of the site. Other population centers of greater than 25,000 people include Sacramento at 25 miles, Stockton at 26 miles, and Modesto at 50 miles.

There is currently a housing development under construction approximately 5 miles northwest of the site. The residences are 2-5 acre plots; hence, the buildup is relatively sparse. There is no development projected within a 5-mile radius for the east or south sides of the site. There may be some subdivision of the land to the west of the site with the subsequent buildup of new residences. One to ten acre plots are projected; hence the buildup will continue to be relatively sparse.

Permanent residents are defined as those persons having year-round residences within the described area. Table 8-1 below shows the projected total county population within the three counties that have any portion of the county within a ten-mile radius of Rancho Seco.

Table 8-1
Projected Population Growth[2]

County	2000	2010	2020	2030	2040	2050
Amador	35,434	39,287	42,257	44,404	45,929	47,829
Sacramento	1,230,465	1,555,848	1,946,679	2,293,028	2,579,720	2,858,427
San Joaquin	567,798	747,149	989,462	1,229,757	1,457,128	1,707,599

[2] Source: Department of Finance, Demographic Research Unit, May 2004

8.5.1.3 Land and Water Use

8.5.1.3.1 Land Use

The site area is almost exclusively agricultural. The Rancho Seco Updated Safety Analysis Report (USAR) Figure 2.2-6 provides a detailed description of all agriculture and residential activities within a 5-mile radius of the site. The agricultural activities in the counties lying within the 50-mile radius are shown in USAR Figures 2.2-7, 2.2-8, and 2.2-9.

There are at present three large-scale commercial dairies in the vicinity, each with over 200 cows. The closest dairy is approximately 8 miles northwest of the site. A ranch, within the 2,480 acre site, one mile east of the Industrial Area has dairy cows for domestic use only.

Activities in the area immediately surrounding the site are not expected to change extensively. Proposed land use for the southeast section of Sacramento County is predominantly (70 percent) agricultural and is expected to remain agricultural.

8.5.1.3.2 Access and Egress

As shown in Figure 8-1, State Route 104 (Twin Cities Road) runs just north of the site in a general east-west direction and connects with State Route 99 to the west and State Route 88 to the east. The access road off of Twin Cities Road is the main access road to the Rancho Seco site including the reservoir and the recreation area. The access road is designed to handle heavy construction vehicles and will be maintained during decommissioning. The roadway to the ISFSI terminates at the entrance to the ISFSI Protected Area and will also be maintained during decommissioning.

Rail access to the site is available via a rail spur from the Union Pacific Railroad line that runs roughly parallel to State Route 104 adjacent to the site.

8.5.1.3.3 Water Supply

The District obtains non-potable water for Rancho Seco from the Folsom South Canal. The Bureau of Reclamation constructed the canal as part of the Central Valley Project. A pipeline and pumping station are located between the plant and the Folsom South Canal.

Potable water for the Rancho Seco site comes from four wells. Two of the four wells provide water for use inside the Industrial Area, one well serves the Rancho Seco Reservoir and Recreation Area, and one well serves a residence located at the northeastern corner of the site.

8.5.2 Climate

8.5.2.1 General Climatology

The climate of the Rancho Seco site is generally that of the Great Central Valley of California. Summers are hot and cloudless and winters are mild. The rainy season occurs between October and May with more than two-thirds of the annual rainfall occurring in December through March. Heavy fog occurs in mid-winter, primarily in December and January, and may last for several days. Incidents of severe weather, such as tornados and thunderstorms are infrequent.

The most controlling geographical influence on climate results from the mountains, which surround the valley to the west, north, and east. During the winter, storms that pass through the area are moderated by the mountains, which collect much of the precipitation. The precipitation that does occur in the valley is usually accompanied by south to southeast winds. The cold north and northwest winds pass over the mountains to the north where the air is warmed dynamically by the descent into the valley resulting in comparatively warm, dry winds. A similar condition occurs infrequently in the summer when a steep pressure gradient develops, producing a pronounced heat wave.

The Central Valley warms greatly during the day resulting in a marked thermal contrast between the valley and the air over the Pacific Ocean. The Coast Range separates the marine air from the valley air except for a gap through the range formed by the Sacramento and San Joaquin Rivers. The heavy marine air flows through this gap and splits into a northerly flow into the San Joaquin Valley and a southerly flow into the Sacramento Valley.

The divergence zone between the two flows usually lies between Stockton and Sacramento near the site. The divergence zone is typically north of the site during the day, resulting in north to northwest winds. As the air in the valley cools, the flow decreases and calm may set in. If the drainage from the Sierra Nevada is sufficient, the winds may shift to southeasterly and increase in speed.

During the hottest mid-summer months, light westerly winds may persist all night. During the winter, the synoptic gradients prevail much of the time and the wind trajectories over the Sacramento-Stockton-Rancho Seco region are reasonably uniform.

The wind flow regime in the Sacramento-Stockton area is governed by two major climatic controls:

- The thermally driven marine flow predominate in the summer season, and
- The synoptic-scale pressure gradients of the winter season.

Spring and fall tend to be influenced primarily by thermal gradients.

The usual winter pressure pattern has a strong high-pressure region situated over the great basin and an intense low-pressure area approaching from the northwest. This situation results in a rather homogeneous wind flow from the south or southeast over the Rancho Seco region. Precipitation may accompany these southerly winds.

In the summer, the synoptic-scale pressure gradient weakens, and the thermal gradient between the cooler maritime air and the warm valley air increases. The resultant flow of air pours into the valley from the west diverging into a northerly flow due to the deflecting effect of the Sierra Nevada in the San Joaquin Valley and a southerly flow in the Sacramento Valley.

As the cool maritime air in the valley cools, the flow decreases and low wind velocities may occur during the night. If the drainage from the Sierra Nevada is sufficiently strong, the winds may shift to the north and increase in speed.

The divergence zone usually lies between Sacramento and Stockton near Rancho Seco. Figure 8-2 shows the seasonal wind roses for Rancho Seco, Sacramento, and Stockton showing the seasonal variation of the flow regime. Figure 8-3 shows the yearly wind roses for Rancho Seco, Sacramento, and Stockton. The dominant wind direction is from the west although the wind direction will oscillate from southwest to northwest reflecting the seasonal effects.

8.5.2.2 Extreme Winds

Wind data from Sacramento Executive Airport from 1951 to 1971 were used to conduct an extreme wind probability distribution approximate to the Rancho Seco site. Table 8-2 presents the highest expected wind speed that will be expected for the indicated recurrence interval.

Table 8-2

Expected Extreme Wind Speeds

Return Period (years)	Wind speed (mph)
50	90
100	101
1000	149
10000	169

8.5.2.3 Tornados

Tornados have been recorded in California but with a frequency of only two per year (National Climatic Summary, 1969). They are generally not severe and in many cases amount to little more than a whirlwind that may cause damage to trees and light structures. An examination of newspaper accounts of nine tornados in California indicates that only one may have been accompanied by wind speeds higher than 100 mph.

A geometrical point can approximate the location of a possible tornado strike. The probability of a tornado occurring at a specific point can be estimated by the principle of geometric probability. If two tornados per year are used, the return period for Rancho Seco is approximately 27,855 years. Because the intensity of California tornados is much less than the "classical mid-western types," winds in only one of five of these tornados would be expected to exceed 100 mph.

This information is reasonably confirmed by searches conducted of the National Oceanic and Atmospheric Administration's (NOAA) database, which result in the following information from 1950 through 1995; California, as a whole, averaged 5 tornados per year. This relates to an average of 0.3 tornados per year per 10,000 square miles. The annual average number of strong-violent (F2-F5) tornados in California for the same period is zero (0).

8.5.2.4 Tropical Storms and Hurricanes

The possibility of severe storms in the area can be limited to thunderstorms and tornados. A discussion of tropical storms and hurricanes is not applicable to Rancho Seco.

8.5.2.5 Precipitation Extremes

The precipitation climatology of the Great Central Valley is characterized by a dry season from June through September and a rainy season from October to May. No precipitation records were taken from Rancho Seco but because precipitation is associated with large-scale synoptic systems, the data in Table 8-3 below, taken from the ISFSI FSAR, are believed to be representative of the site.

The annual rainfall occurs almost exclusively in the winter months.

Table 8-3
Precipitation Climatology
Averages (inches)

Month	Sacramento	Stockton
January	3.18	2.55
February	2.99	2.46
March	2.36	2.05
April	1.40	1.14
May	0.59	0.44
June	0.1	0.07
July	0.01	0.01
August	0.02	0.01
September	0.19	0.19
October	0.77	0.63
November	1.45	1.17
December	3.24	2.66
Total	**16.29**	**13.37**

A frequency of occurrence of a given precipitation intensity for Sacramento is presented in Table 8-4 (from the ISFSI FSAR). As stated above, this data is believed representative of the conditions that exist at the site and shows that virtually all of the precipitation falls at a rate of under a quarter inch per hour.

Table 8-4
Precipitation Intensity

Year	Intensity (inches/hour)			
	0.01-0.09	0.10-0.24	0.25-0.49	0.50-0.99
1961	79.5%	17.7%	2.3%	0.5%
1962	81.8%	17.0%	0.8%	0.4%
1963	80.0%	17.8%	2.2%	0.0%
1964	86.2%	11.3%	2.2%	0.3%
1965	89.0%	10.0%	1.0%	0.0%
Average	**83.5%**	**14.6%**	**1.7%**	**0.2%**

8.5.2.6 Snow and Ice Storms

The possibility of severe storms in the area can be limited to thunderstorms and tornados. Snow in the Sacramento area is extremely rare. Most snow that has been observed in the Sacramento Valley occurs in January. Given the lack of significant snowfall in the region, a detailed discussion of snow and ice is not applicable to the Rancho Seco site.

8.5.2.7 Thunderstorms

Thunderstorms, and associated lighting strike, occur infrequently in the area, with the mean number of days per year with thunderstorm activity ranging between five in the Sacramento area to three in the Stockton area.

8.5.2.8 Restrictive Dilution Conditions (Inversions)

Inversions occur in the Great Central Valley as a result of cold air advection near the ground or cooling of the earth causing a cooling of the air near the ground. Cooling occurs at night when there are no low clouds. Both types occur at Rancho Seco with the advection type usually associated with the westerly wind bringing in cool air from the Pacific Ocean.

Temperature inversions at the ground can be expected to occur every night during the summer upwards to several hundred feet. These temperature inversions are the result of the flow of cool maritime air in to the area during the late afternoon and evening hours. During the winter, shallow (a few hundred feet) but intense surface inversions can be expected occasionally during the nighttime hours under light wind conditions.

8.5.3 Geology and Seismology

8.5.3.1 Geology

Information regarding the geology of the site is taken, in part, from the USAR.

Rancho Seco is located about 25 miles southeast of Sacramento, California in the low foothills of the Sierra Nevada Mountains. The site is founded on the Pliocene Laguna Formation and is underlain by an estimated 1,500 to 2,000 feet of Tertiary or older sediments deposited on a basement complex of granite to metamorphic rocks. Field exploration included:

- 1,552 feet of bucket auger holes logged in detail,
- A 602 foot core hole visually and geophysically logged,
- 2,016 feet of small-bore hole borings that were logged and from which, soil samples were taken for laboratory analysis, and
- Approximately 11,500 feet of geophysical refraction profiles.

The resulting data from this exploration strongly indicate a lack of faulting below the Rancho Seco site.

8.5.3.2 Seismology

Information regarding the seismology of the site is taken, in part, from the USAR.

There are no indications of faulting below the site. The nearest fault, located approximately 10 miles to the east of the site, is the Foothill Fault System. This system has been inactive since the Jurassic Period, some 135 million years ago. The nearest active faults, located over 70 miles to the west, are the Hayward and San Andreas.

A search of the USGS database for earthquakes with intensities greater than IV on the modified Mercalli scale (Richter scale 4.0 or larger) within a 200-mile radius of the plant resulted in 846 such events.

The largest event was the 1989 Loma Prieta earthquake (Magnitude 7.1), Modified Mercalli IX, 99.42 miles (160 km) distant and the nearest was a magnitude 4.3, Modified Mercalli V, quake, 45.36 miles (73 km) from the site.

Restricting the search criteria to a 50-mile (80.5 km) radius results in only three monitored events. These results, along with the geographical positioning of the site, aerial photos, and mapping of the facility are included in Appendix D of the Historical Site Assessment.

8.5.4 Hydrology and Hydrogeology

8.5.4.1 Hydrology

Information regarding the hydrology of the site is taken, in part, from the USAR.

The plant site's rolling terrain is not directly intersected by any streams; however, drainage from higher levels is well defined and intercepts with runoff streams at lower levels. Runoff from the site drains into an un-named "No-Name" creek, which in-turn empties into Clay creek. Clay creek empties into Hadselville creek. Hadselville creek then empties in turn into Laguna creek south, Cosumnes River, Mokelomne River, Sacramento River and finally into the Pacific Ocean via the Delta.

Within recent historical times no flooding or inundation from storms or runoff has occurred within the site boundaries. It is highly unlikely that the site could be flooded, even with abnormal rainfall intensities.

Since the commencement of operations in 1974, the only significant change in regional land use had been the conversion of several sections of land near the facility from grazing to grape production. An additional change of some note would be the population expansion that has occurred in the communities of Galt and Ione, California. According to the City of Galt Housing Needs Assessment, Administrative Draft, October 2001, the population of this historically- agricultural community, located between 10 and 15 miles from the site, doubled from 1990 to 2000 and the number of residential properties nearly doubled to almost 6000 units. While notable, the Ione expansion has not been as dramatic.

Surveys conducted by the County of Sacramento indicate that the land adjoining the site, within at least a 15-mile radius, will remain primarily for agricultural and grazing use; therefore, the rainfall runoff factors will remain constant and not cause any difference in the hydrological properties of the region.

Within this 15-mile radius, seven reservoirs or lakes of note exist. These include small, private impoundments for agricultural use (i.e., Arroyo Seco and Wallace – under 3,000 acre feet) and moderate, municipal reservoirs for recreation and domestic, municipal usage (Comanche and Pardee reservoirs and Lake Amador – up to 435,000 acre feet).

8.5.4.2 Hydrogeology

The following information regarding the hydrogeology of the site is taken, in part, from the USAR. Chapter 2 of this LTP contains updated information based on hydrogeological studies conducted as part of site characterization.

Ground water in the area is found at depths generally greater than 100 feet in the sediments of the Laguna and Mehrten Formations. The sand and gravel zones of these formations yield water readily to wells predominately west of the facility in the Central Valley. At the site however, the formations are less permeable, and the Laguna Formation is above the water table. Depth to water in the vicinity of the site is approximately 150 feet.

Ground water flow is generally to the west. West of the site the flow is affected by a conical depression resulting from the ground water pumping center to the Southwest near the town of Galt, California. (Figure 8-4)

Water from the Laguna and Mehrten formations is of generally good quality in the vicinity of Rancho Seco. It is a sodium bicarbonate-type with low total dissolved solids, generally less than 200 ppm. Potable water for the Rancho Seco site comes from four wells producing from the Mehrten formation at a depth interval of 200-350 feet. Two of the four wells provide water for use inside the Industrial Area, one well serves the Rancho Seco Reservoir and Recreation Area, and one well serves a residence located at the northeastern corner of the site.

Studies performed during the initial sighting evaluation and documented in the USAR, as well as several conducted since the commencement of operations (Geotechnical Investigation for Proposed Evaporation Ponds, ERPT-C0104, Rev.1 and the Final Engineering Report Assessment of Spent Fuel Liner Leakage, ERPT-M0221, Rev.0, 1990), indicate that the permeability of the site soils result in infiltration rates (from several hundred to several thousand years) that effectively preclude any radiological impact on the aquifer or the closest well to the site by the facility.

8.5.5 Biota

8.5.5.1 Ecology of the Site

The site is located at the eastern edge of the Central Valley grassland in the vegetation type known as the California prairie or the California annual grasslands. These grasslands are part of the complex of plant communities that evolve in seasonally hot and dry climates dominated by maritime influences.

Such community complexes were first described for the eastern Mediterranean basin and are consequently called Mediterranean-type ecosystems. The Rancho Seco grassland is a fairly typical Mediterranean-type annual grassland, both with respect to important physical parameters and the limited evidence on ecosystem structure and function.

The gently rolling topography characteristic of the site stretches along the low foothills to the northwest and southeast. To the west, the grassland continues onto the flat alluvial plain of the Central Valley floor less than four miles away. Since the site is so severely water-limited, nearby areas having abundant water may be particularly important sources of immigrant species, which are either accidental or temporarily resident in the Rancho Seco region. Examples of such areas include the Sacramento - San Joaquin Delta, 20 miles to the northwest, and the Folsom and Comanche Reservoirs, 27 miles to the north and 10 miles to the southeast, respectively.

The Rancho Seco grassland ecosystem appears to be the same as other sections of grazed annual grassland along the east side of the Central Valley, except for the large areas of vernal pools found about one and a half to two miles to the south and east of the power plant.

8.5.5.2 Vegetation Patterns at Rancho Seco

Like other annual grasslands, the vegetation growth in the area surrounding Rancho Seco is highly seasonal and limited by annual precipitation. Its productivity is a function of variation in rainfall, which in turn affects soil moisture and ultimately the length of the growing season. In addition, the combined stress of high temperatures, strong solar insolation, low atmospheric humidity, and low soil moisture force the grassland into dormancy during the summer season (approximately May to October).

The Rancho Seco grassland has the additional stress of cattle-grazing. In the final analysis, the grassland is essentially a cow pasture, in which the dual effects of energy removal by grazing and cover reduction limit the diversity of both the flora and the fauna.

Although the vegetation of the Rancho Seco area is basically all annual grassland, it is not homogeneous. A number of local associations are discernible.

The Upland Annual Grasslands is distinguished as land which is relatively well drained, not containing areas of standing water, and dominated by grasses and forbs (broad-leaved plants) characteristic of annual grasslands.

The vernal-pool areas correspond to the extent of hardpan soil. The vernal-pool areas, generally about one and a half to two miles to the southeast and east of the site, consist of rolling topography underlaid by hardpan. Winter rains fill the depressions to begin the annual cycle of vernal-pool development. The plant species of vernal pools are quite unique to this kind of habitat, and the vernal pools tend to retain their unique character except when insufficient rainfall allows typical annual grassland species to successfully invade the vernal pool areas. Often vernal pool basins will remain bare or have only a few non-vernal species during the dry season.

8.5.5.3 The Fauna of Rancho Seco

The list of vertebrate species that could potentially occur in the Rancho Seco area is quite long. Mouse burrows and meadow-vole (*Microtus californicus*) runs are common, especially where there is cover and where water is nearby. Pocket gophers (*Thomomys bottae*) are the most common mammal on site. Cattle grazing reduces low ground cover that is valuable to common species such as jack-tailed rabbit (*Lepus californicus*) and California quail (*Lophortyx californicus*).

Skunk and raccoon signs are seen near water. Several species of water-fowl, including geese, are common. Grassland birds (savannah sparrows, Brewer's blackbirds, meadowlarks and horned larks) and various raptors (red-tailed hawks, turkey vultures, sparrow hawks) are sighted frequently. The most important natural consumer is the gopher (*Thomomys bottae*), but cattle pastured by man are the most important faunal species affecting the vegetation.

The cattle are the dominant consumers. The next largest herbivore is probably the jackrabbit; the site is not a suitable deer habitat, because of the lack of browse and cover.

Feral cats are numerous and may be the dominant carnivores, especially on smaller ground-nesting birds.

The fauna is probably most diverse during the winter and early spring. Many migratory bird species use the area during the late fall and winter, but leave during the spring to breed in other areas. Populations of the resident species, especially the mammals, can be expected to fluctuate seasonally from high densities near the end of the growing season to low densities at the end of the dry season.

The major limitation on the diversity of fauna in the grassland is the extremely simple structure of the vegetation, consisting almost solely of short, close-cropped grasses and forbs. The lack of tall, herbaceous and shrubby vegetation makes the area unsuitable for species requiring this type of vegetation for foraging, nesting, roosting, or resting sites.

The species in the Rancho Seco grassland are generalist feeders, well adapted to disturbance, and in general not dependent upon heavy cover. Species that are sensitive in one way or another are restricted to a few suitable areas, principally near the reservoir, ponds, or streams.

These observations reaffirm impressions of the substantial impact of the cattle upon the natural faunal elements of the ecosystem.

The Rancho Seco ecosystem, as water-limited as it is, has responded strongly to the additional water resulting from the operation of Rancho Seco. Riparian elements are invading areas where year-round moisture is available, and a number of waterfowl/wading-bird species are using the area. These elements are expected to use the ecosystem seasonally, coinciding with the vegetative growth cycle, and to provide interchange between Rancho Seco, the Delta, and other aquatic habitats.

The fish fauna of the reservoir is entirely introduced and heavily managed. The role of the fish and the reservoir as part of the trophic web of the Rancho Seco grassland has not been clarified, although the lake itself provides an important riparian ecotone that probably increases use of the grassland, particularly by birds.

8.6 Environmental Effects Of Decommissioning

The principal environmental effects of decommissioning activities are radiation exposure and the disposal of radioactive waste. Decommissioning Rancho Seco has had a minimal and insignificant adverse environmental impact. The beneficial impacts include eliminating the problems associated with a radioactively contaminated facility.

The adverse effects associated with decommissioning include routine occupational radiation exposure and the commitment of land for radioactive waste disposal. As discussed in Supplement 1 to NUREG-0586, radiation exposure to the public is small, even when accidental airborne radioactive releases are considered. The low probability, worst-case exposure to an individual from an accident involving a truck transporting radioactive waste to a disposal facility is small.

8.6.1 Radiological Impacts of Decommissioning

During decommissioning, Rancho Seco continues to implement its Radiological Controls Program. The objectives of the Radiological Controls Program are to control radiation hazards, avoid accidental radiation exposures, maintain worker Total Effective Dose Equivalent (TEDE) to less than 5 rem/year, and maintain doses to workers and the public ALARA. The philosophies, policies, and objectives of the Radiological Controls Program are based on federal regulations and associated regulatory guidance.

The Rancho Seco ALARA program is implemented in accordance with 10 CFR Part 20, Regulatory Guide 8.8, "Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations Will Be As Low As Is Reasonably Achievable," [Reference 8-10] and Regulatory Guide 8.10 "Operating Philosophy for Maintaining Occupational Radiation Exposures As Low As Is Reasonably Achievable," [Reference 8-11]. The ALARA policy states management's commitment to maintain exposures to workers and the public ALARA. This commitment is contained in the Defueled Safety Analysis Report (DSAR) and is implemented by plant administrative procedures and Radiation Protection Department implementing procedures.

Supplement 1 to NUREG-0586 provides estimates of occupational radiation dose for various periods of SAFSTOR after reactor shutdown. The dose estimate for immediate dismantlement is 560 - 1,000 person-rem. The dose estimate for 10 years of safe storage is 480 - 667 person-rem.

Rancho Seco shutdown permanently in June 1989, and remained in SAFSTOR until February 1997, when the District began "incremental" decommissioning. Hence, Rancho Seco was in SAFSTOR for nearly eight years.

The most significant contributors to occupational doses from remaining dismantlement activities include segmenting, packaging, and shipping the reactor vessel internals and reactor vessel.

8.6.2 Offsite Radiation Exposure and Monitoring

The District is committed to decommissioning Rancho Seco in a manner that will ensure adequate radiation protection to employees, contractors, and the public. Accordingly, the District implements the Radiological Environmental Monitoring Program (REMP), which provides an accurate assessment of the radiological environment in and around the environs of the Rancho Seco site.

Exposure pathways are analyzed through a systematic process that identifies a sample medium or organism that is found in the effluent pathways. The analysis of the effluent and exposure pathways enables the selection of sampling and monitoring locations that fall into one of two classes, those that are, and those that are not, influenced by effluent pathways. Those in the pathways are referred to as indicator locations. Several of the unaffected locations are selected to represent baseline or control locations.

Indicator locations provide data from the surrounding environment that may be influenced by plant decommissioning because they are nearby, downwind, or downstream of the release pathway. Such data can be used to calculate doses to verify compliance with 40 CFR Part 190, using methodology contained in the Offsite Dose Calculation Manual (ODCM).

Control sample locations provide data that should not be influenced by decommissioning Rancho Seco. These locations are selected based upon the distance from the plant, being upwind, or upstream of the release pathways. Data from these locations help discriminate between Rancho Seco releases and other natural or manmade events that may impact human exposure.

At Rancho Seco, potentially radioactive liquid effluent is discharged into Clay Creek. A continuous flow of Folsom South Canal water is released above the discharge point. The continuous flow and the liquid effluent release are the major effluent release pathway, and thus the exposure pathway during decommissioning.

Prior to the minimum release rate being established, Clay Creek was a seasonal stream, formed as the confluence of three and one half square miles of drainage runoff upstream of the site. The now-continuous flow of Clay Creek intersects Hadselville Creek north and west of California State Highway 104. Hadselville Creek intersects Laguna Creek just east of the Folsom South Canal. Laguna Creek flows into the Cosumnes River approximately 20 miles from Rancho Seco.

Hadselville and Laguna Creeks are also seasonal streams and also receive irrigation runoff during periods when irrigation is used. These streams are the major release pathways for liquid effluents from the site.

The gaseous pathway analysis is subject to the meteorological conditions during the time of the release. While not a significant release or exposure pathway, routine air sampling is performed to determine the dose due to radioactive gaseous releases.

The direct radiation exposure pathway is measured continuously with the use of passive monitoring devices. The dose is integrated over three months to accumulate a statistically significant exposure. The majority of the dose is delivered from naturally radioactive elements in the surface of the Earth. A smaller fraction of the dose is delivered by cosmic radiation that has penetrated the Earth's atmosphere.

The environmental effects of radiation dose and radioactivity in effluents released to the environment during safe storage and decommissioning have been substantially less than the environmental effects during reactor operation.

According to NUREG-0586, the radiation dose to the public from the truck transport of radioactive wastes during preparation for SAFSTOR is estimated to be about 2.1 man-rem, and that from the truck transport of radioactive wastes during Deferred-DECON after 10 years of storage is estimated to be about 0.5 man-rem.

Calculated radiation doses to the maximum-exposed individual from postulated accidental airborne radioactivity releases during decommissioning activities are considered low. Based on the most severe transportation accident scenario, NUREG-0586 calculated the radiation dose to the maximally exposed individual to be 24 rem (50-year dose commitment) to the lungs. The frequency of such an accident was conservatively estimated to be 5.7E-4 for the SAFSTOR period.

The design bases for the ISFSI precludes airborne radioactive releases during spent fuel storage and provides adequate shielding to minimize exposure. Radiation monitoring for the ISFSI is performed in accordance with the Rancho Seco Radiation Protection Program. Under a worst case scenario, where there is total loss of the confinement barrier, projected doses at the site boundary are substantially below the limits established in 10 CFR 72.106(b). Exposure from the ISFSI to the nearest permanent resident will not exceed 25 millirems per year as specified in 10 CFR 72.104 and 40 CFR Part 190.

8.6.2.1 Environmental Effects of Accidents and Decommissioning Events

The Rancho Seco Decommissioning accident analysis is part of the Rancho Seco licensing design basis.

While decommissioning radioactively contaminated structures, systems, and components at Rancho Seco, it is necessary to assure the safety of the public in the surrounding area and workers. Worker safety is addressed in the Rancho Seco Radiation Protection Program, which relies on ALARA principles and the Rancho Seco Safety Program, which is defined in the Rancho Seco Safety Manual. The safety of the public is principally related to potential hazards associated with an airborne release of radioactive materials during decommissioning operations.

During decommissioning the District will perform decontamination and dismantlement of structures, systems, and components in addition to maintenance, waste management, and surveillance. The accidents discussed in Supplement 1 to NUREG-0586 associated with immediate dismantlement would be applicable during decommissioning at Rancho Seco. However, the potential consequences associated with these accidents would be less because of a reduction in the Rancho Seco radionuclide inventory due to:

- Decontamination efforts made before decommissioning,
- Prior radioactive waste shipments, and
- Radioactive decay.

Therefore, the potential decommissioning accidents at Rancho Seco are bounded by the accident evaluation specified in Supplement 1 to NUREG-0586.

Operational accidents during decommissioning could result from equipment failure, human error, and service conditions. With spent fuel removed from the plant, operational accidents during decommissioning may be categorized as follows:

- Radioactive waste transportation accidents,
- Explosions and/or fires associated with explosive and/or combustible materials,
- Loss of contamination control,
- Natural phenomena, and
- Human caused events external to Rancho Seco.

These potential operational accidents during decommissioning are addressed in Supplement 1 to NUREG-0586 for immediate dismantlement. Therefore, for decommissioning Rancho Seco, the associated potential accidents are bounded by the Supplement 1 to NUREG-0586 evaluation.

8.6.2.2 Decommissioning Low-Level Radioactive Waste (LLRW)

Decommissioning Rancho Seco has required the disposal of large volumes of radioactive and non-radioactive materials to allow for the release of the site for unrestricted use and license termination. Materials that cannot be free-released are processed as radioactive waste. Rancho Seco ensures appropriate processing, packaging, and control of solid, liquid, and gaseous radioactive wastes through the Process Control Program and associated implementing procedures.

Given the smaller size of Rancho Seco compared to the reference PWR in NUREG-0586 (913-MWe vs. 1,175-MWe) and its limited operational life, the volume and total quantities of radioactive waste requiring disposal are significantly less than those assumed in NUREG-0586. LTP Section 3.4.3 provides an estimate of the amount of radioactive material to be shipped for disposal or processing.

The majority of Rancho Seco radioactive waste was shipped to Energy*Solutions*[3] for disposal. Some radioactive waste was shipped for processing. As of December 31, 2005, Rancho Seco has shipped 196,325 ft^3 (5,560 m^3) of radioactive waste to Energy*Solutions*.

Due to the current lack of an acceptable disposal site for radioactive Class B & C waste, Rancho Seco will continue to store its Class B & C waste at the IOSB until a suitable site becomes available. The District will store the GTCC waste at the ISFSI until a suitable site becomes available and the DOE removes the waste.

8.6.2.3 Spent Fuel Storage

The District completed transferring all of its spent nuclear fuel to the Rancho Seco ISFSI in August 2002. Decontamination of the loaded transfer cask took place in the Fuel Storage Building before the cask and canisters were moved to the ISFSI. Descriptions of cask decontamination and radioactive waste treatment processes are provided in Chapters 5 and 6 of the Rancho Seco ISFSI FSAR. The fuel will remain in storage under the Part 72 license until the DOE develops a permanent repository.

The ISFSI does not generate any gaseous, liquid, or solid radioactive waste. No hazardous chemicals are used during its operation.

8.6.2.4 Radiological Criteria for License Termination

Following decommissioning, residual radioactivity will be limited to allow release of the property for unrestricted use such that the average member of a critical group working on the site would not be expected to receive a TEDE dose greater than 25 mrem/year from all applicable combined environmental exposure pathways. Chapter 2 of this LTP, Site Characterization, Chapter 5, Final Status Survey Plan, and Chapter 6, Compliance with the Radiological Criteria for License Termination, provide the methodology for achieving unrestricted site release.

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[3] Energy*Solutions* was previously Envirocare of Utah

8.6.3 Non-Radiological Environmental Impacts

The following subsections provide an assessment of the non-radiological impacts of decommissioning and site release. NUREG-0586 Supplement 1 was used as the basis for identifying potential environmental impacts and determining the significance of these impacts.

8.6.3.1 Onsite / Offsite Land Use

The 2,480-acre Rancho Seco owner controlled area contains the following features:

- An 87-acre fence-enclosed Industrial Area,
- A 560-acre Rancho Seco Reservoir and Recreation Area,
- A 50-acre solar power generating station,
- A 10-acre ISFSI,
- A 30-acre, 500 MWe gas-fired power plant, and
- The Rancho Seco switchyard (major intertie with the Western Grid – six transmission lines and switchyard).

The District will retain ownership of the site indefinitely.

There have been no significant changes in onsite land use as the result of decommissioning Rancho Seco. Laydown areas, parking lots, office buildings, and other onsite facilities that were used during plant operation were adequate to support decommissioning activities. No additional land was disturbed to support decommissioning.

The District removed major components of primary and secondary plant systems (e.g., the pressurizer, steam generators, reactor vessel internals, etc.) without any significant changes in onsite land use. Specialized equipment (e.g., cranes, heavy lifting equipment, etc.) was brought in as required. The District performs packaging and storage of low-level radioactive waste in accordance with existing administrative procedures using existing facilities and equipment.

There was no offsite land used for decommissioning except for the use of a local landfill for the disposal of non-radioactive waste or recycling of non-radioactive scrap metal.

8.6.3.2 Water Use

In 1970, the District constructed Rancho Seco Lake to serve as a back-up water source for the plant. This 165-acre reservoir was designed to hold a capacity of 2,700 acre-feet. Pumping from the Folsom South Canal, in combination with surface runoff, is designed to maintain a stable volume of water in Rancho Seco Lake. However, drawdowns from the lake have occurred occasionally when required by reduced pumping from the Folsom South Canal.

Rancho Seco Lake served as a back-up water supply for the plant cooling and fire systems. Water for plant use is pumped from Folsom South Canal, located approximately 3.5 miles west of the plant site, through an underground pipeline. The District's contract with the U.S. Bureau of Reclamation commits the District to draw approximately 32 cubic feet per second (cfs) from this source. Decommissioning activities have not affected the District's contract with the U.S. Bureau of Reclamation.

The water supply system (e.g., Folsom South Canal pumping station, lake, interconnecting piping) also provides cooling water to the new Cosumnes Power Plant. Operation of the water system will continue for as long as the new plant is in service. The District has no plans to abandon the water supply system.

Potable water is supplied from groundwater from the site well water system. Groundwater usage is expected to decrease as staffing levels decline throughout the decommissioning process.

8.6.3.3 Water Quality

No significant, long-term impacts on Folsom South Canal have occurred from decommissioning. The District continues to meet the requirements of the Rancho Seco National Pollutant Discharge Elimination System (NPDES) permit.

No adverse impacts on groundwater are anticipated from specific decommissioning activities.

8.6.3.4 Air Quality

Agencies involved in air pollution control in Sacramento County include the Air Resources Board and the Sacramento Metropolitan Air Quality Management District (SMAQMD). The District will comply with all applicable air quality regulations, including the requirements of SMAQMD.

Fugitive dust is generated from the various decommissioning activities including the removal of buried piping and from soil excavation to remove components such as underground utilities or potentially contaminated soils. The primary cause of health problems associated with suspended particulate matter is with particles that are small enough to reach the lungs when inhaled. Reasonable control measures, such as the use of wet suppression, are used to minimize the quantities of fugitive dust.

The controlled dismantlement and packaging of site components and structures will preclude fugitive dust from becoming an ambient air quality concern during decommissioning.

8.6.3.5 Aquatic Ecology

Aquatic impacts associated with plant operation were considered to be minimal and the potential impacts associated with the decommissioning process are also minor because plant water usage and discharge quantities are reduced. Therefore, no additional adverse impacts to the aquatic flora or fauna are anticipated from decommissioning activities. Additionally, all applicable NPDES limits will be maintained throughout the decommissioning process.

Prior to authorizing actions that could result in termination or substantial alteration of current water discharges, the District will conduct an assessment of potential effects on the creek environment and maintenance of Rancho Seco Lake. Measures to minimize environmental impacts identified by the District and responsible or trustee agencies will be implemented, as appropriate.

8.6.3.6 Terrestrial Ecology

Since decommissioning activities generally take place in areas of the site that have already been disturbed, there are no anticipated additional impacts to the flora and fauna of the Rancho Seco site.

8.6.3.7 Threatened and Endangered Species

The District has conducted numerous field surveys in the vicinity of the Rancho Seco site. The site was field surveyed for the original development of Rancho Seco, has been surveyed various times recently to develop a mitigation bank for fairy shrimp, and was surveyed in 1994, as part of the Master Plan for development of Rancho Seco Park. Most recently the District has conducted field surveys in support of the license application for the Cosumnes Power Plant located approximately one half mile south of the Rancho Seco Industrial Area.

Although several "special-status" plants and animals have been identified on the Rancho Seco site, very little, if any, land will be disturbed during decommissioning that was not already used during plant operations or original construction. Almost all decommissioning activities are taking place in paved areas within the Industrial Area boundary.

Prior to the start of construction on Cosumnes Power Plant, Rancho Seco staff performed radiation surveys in the grassland area south of the Industrial Area. There were no discernable impacts to endangered or threatened species as the result of these radiation surveys.

8.6.3.8 Occupational Safety

The District is committed to decommissioning Rancho Seco safely. The Rancho Seco Occupational Injury and Illness Prevention Program (IIPP) is intended to effectively control hazards in the work environment and prevent occupational injuries and illnesses. The injuries and illnesses prevention program complies with Cal/OSHA regulatory requirements and provides the basis for controlling safety during decommissioning activities.

The IIPP applies to all District employees working at Rancho Seco facilities as well as visitors and contract employees working under direct District supervision. Contract personnel not under direct District supervision follow their own injury prevention program.

Elements of the Rancho Seco IIPP include:

- Communications,
- Hazard recognition,
- Hazard control,
- Injury and illness investigation,
- Training, and
- Compliance requirements.

The Rancho Seco IIPP establishes and maintains a safe work place for workers, contractors, and visitors through procedures and guidelines to be used to reduce industrial hazards and risks. While decommissioning activities are different from plant operational activities, qualified staff, facilities, and equipment are available to perform decommissioning in a safe and effective manner. Compliance with applicable Cal/OSHA regulations and to the guidance provided through industry standards and good work practices is a top priority of site management and employees.

8.6.3.9 Cost

Chapter 7 of this LTP, Update of Site-Specific Decommissioning Costs, provides a summary and update of Rancho Seco decommissioning costs.

8.6.3.10 Socioeconomics

The District's original decision to permanently cease plant operations was not subject to NRC review or approval. The economic growth and job opportunities in the Sacramento metropolitan area and the nuclear industry at the time of shutdown minimized the effects of unemployment that could have potentially resulted from decommissioning.

The radiological decommissioning process itself may have various minor effects on the local economy due to changes in the plant's payroll and other types of expenditures. The decommissioning staff has increased, providing jobs and local business opportunities.

Except for solid waste collection and disposal, the decommissioning process will require no additional public services.

Since the District is a municipal utility, it is exempt from paying local property taxes. Accordingly, there is no affect on local tax revenues and services due to Rancho Seco decommissioning.

8.6.3.11 Environmental Justice

High and adverse health, economic, or environmental effects to local low-income and minority populations characterize environmental justice. There is no reason to believe that low-income or minority populations would be affected by Rancho Seco decommissioning.

Since the District will retain ownership of the site, which will continue to be used for District business purposes, environmental justice considerations are not significant for Rancho Seco decommissioning.

8.6.3.12 Cultural, Historical, and Archeological Resources

As part of the original environmental evaluation for the construction and operation of Rancho Seco, Sacramento State College conducted an archeological survey of the Rancho Seco area to determine if there was any prehistoric use of the site. Their survey did not find any archeological sites within the project area nor was there any evidence of prehistoric occupation.

In support of the license application to the California Energy Commission for the Cosumnes Power Plant, the District contracted for additional cultural resources inventories for 220 acres at the Cosumnes Power Plant site (approximately one half mile south of the Rancho Seco Industrial Area). This inventory identified two historical period archeological sites and one prehistoric period archeological resource. Further study is required to determine the significance of these sites.

Decommissioning Rancho Seco has not resulted in disturbing land beyond the Industrial Area and other paved areas of the Rancho Seco site. Accordingly, the impact to cultural, historical, and archeological resources is not significant.

8.6.3.13 Aesthetic Issues

Aesthetic issues associated with decommissioning are primarily visual and relate to the structures and visual attributes of the decommissioning site. The impact of decommissioning, on site aesthetics (e.g., truck traffic, noise, etc.) is limited both in terms of land disturbance and duration (i.e., any impacts are temporary and will cease when decommissioning activities are completed).

The District intends on leaving the major concrete plant structures in place after the completion of decommissioning and license termination. Hence, decommissioning will not significantly change the appearance of the site and the impact on site aesthetics due to decommissioning will not be detectable to the local community.

8.6.3.14 Noise

Shipping low-level waste during Deferred-DECON has had minimal impact on existing transportation systems in the site vicinity due to increased heavy truck traffic. The District completed construction of the ISFSI in 1995, and completed transferring fuel to the ISFSI in 2002. Since the ISFSI is a passive facility, there is no noise generated from the ISFSI.

Noise associated with crane operations and concrete removal is intermittent and temporary and occurs during the daylight hours.

Due to the remote location of the site and by limiting decommissioning activities to normal working hours, the effects of increased noise associated with decommissioning will not be significant.

8.6.3.15 Irretrievable Resources

Irreversible commitments are commitments of resources that cannot be recovered and irretrievable commitments of resources are those that are lost only for a period of time. Irretrievable commitments of resources that could occur during decommissioning include fuel for equipment and transportation of materials to and from the site, rags, solvents, gases, tools, etc. The use of these resources is minimal.

The use of land for the disposal of radioactive and non-radioactive waste is also relatively small. Therefore, decommissioning and dismantlement of the site does not have any additional adverse effect on resources beyond the materials required to construct and operate the facility.

8.7 Overview Of Regulations Governing Decommissioning Activities and Site Release

Decommissioning Rancho Seco requires adherence to numerous Federal, State, and local regulations. Applicable federal, state, and local requirements are identified and reviewed below. The information provided below is intended as a broad overview of applicable regulations and is not intended to be all-inclusive.

8.7.1 Federal Requirements

Decommissioning activities that are subject to federal regulations, permits, licenses, notification, approvals, or acknowledgments include:

- Spent fuel storage at the ISFSI,
- Handling, packaging, and shipment of radioactive waste,
- Worker radiation protection,
- License termination and final site release,
- Worker health and safety,
- Liquid effluent releases,
- Hazardous waste generation/disposition,
- Handling and removal of asbestos,
- Handling and removal of lead paint, and
- Management and closure of mixed LLW storage facility.

8.7.1.1 Nuclear Regulatory Commission

The majority of radiological activities falls under Title 10 of the Code of Federal Regulation (CFR) and are administered by the NRC. Applicable Title 10 regulations include:

- Part 50 - Decommissioning activities,
- Part 20 - Radiation protection,
- Part 51 - Environmental protection,
- Part 61 - Disposal of radioactive waste, and
- Part 71 - Packaging and transportation of radioactive waste (regulations in 49 CFR Parts 171 through 174 also apply).

8.7.1.2 California Occupational Safety and Health Administration

Worker health and safety protection during decommissioning is subject to Cal/OSHA regulations. These regulations include requirements for respiratory protection (non-radiological), hearing protection, illumination, scaffold safety, crane and rigging safety, chemical usage and release response, and cleanup operations.

8.7.1.3 Environmental Protection Agency

The Environmental Protection Agency (EPA) regulations outlined in Title 40 of the Code of Federal Regulations apply as follows:

- Part 61 - Asbestos Handling and Removal,
- Parts 122 to 125 - National Pollutant Discharge Elimination System (NPDES),
- Part 141 - Safe Drinking Water Standards,
- Part 190 - Radiation Protection Standards for Nuclear Power Operations,
- Parts 260 to 272 - Resource Conservation and Recovery Act (RCRA),
- Part 280 - Underground Storage Tanks,

- Part 761 - Polychlorinated Biphenyls (PCBs), and
- Part 129-132 - Clean Water Act.

8.7.2 State and Local Requirements

Permits and approvals from or notifications to state and local agencies are required for safety and environmental protection purposes. Decommissioning activities and related site operations that fall under state and local jurisdiction include:

- Diversion permit from the State Water Resources Board,
- Waste discharge agreement from the Central Valley Regional Water Quality Control Board,
- Agreement with the County of Sacramento regarding the administration, operation, and maintenance of recreational facilities at Rancho Seco Lake,
- Permits from the Army Corp of Engineers to dredge, discharge, or deposit materials into navigable waters or their tributaries, and
- Water quality certification as required under the Federal Water Pollution Control Act.

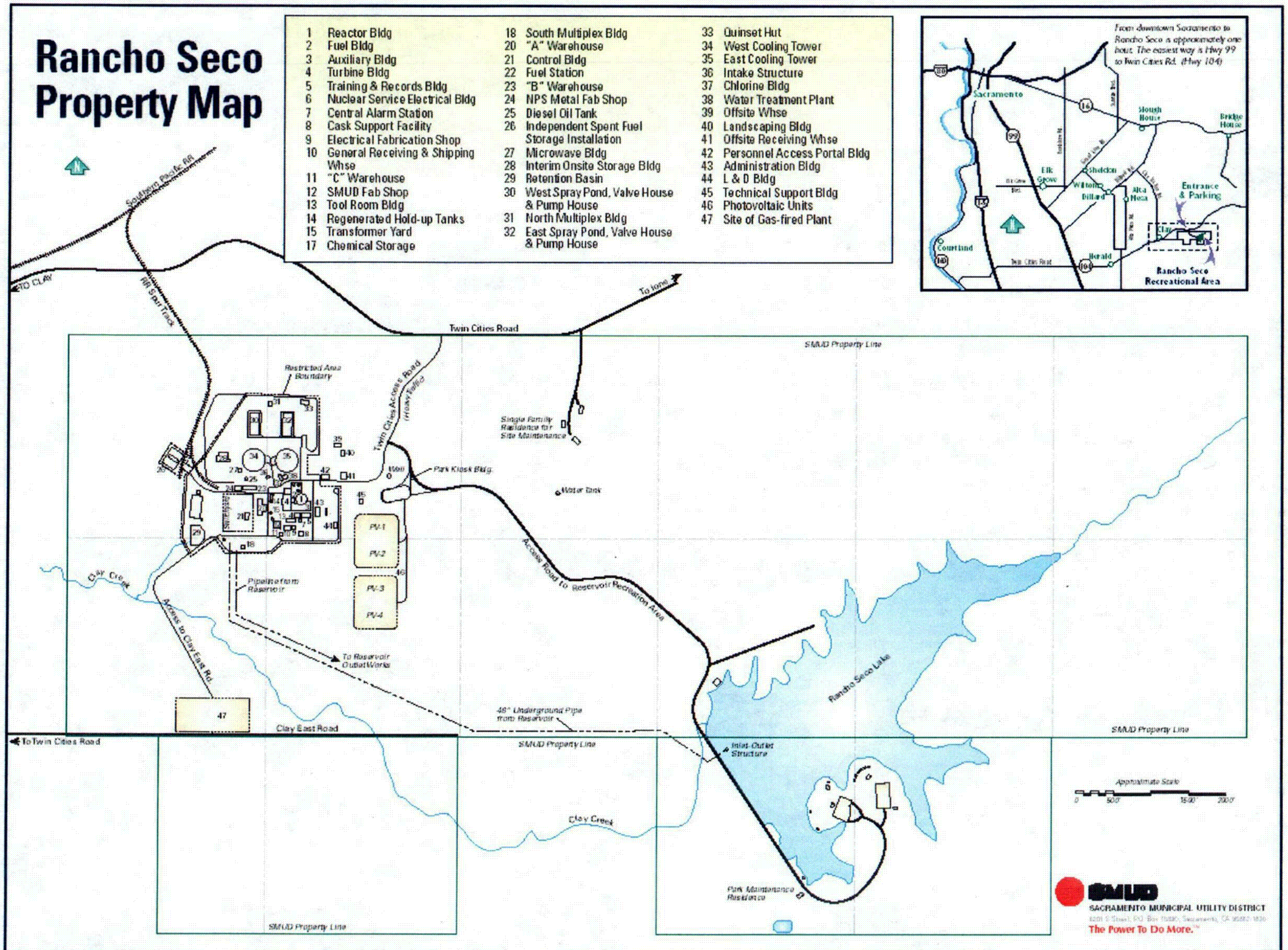

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Figure 8-1
Rancho Seco Site Map

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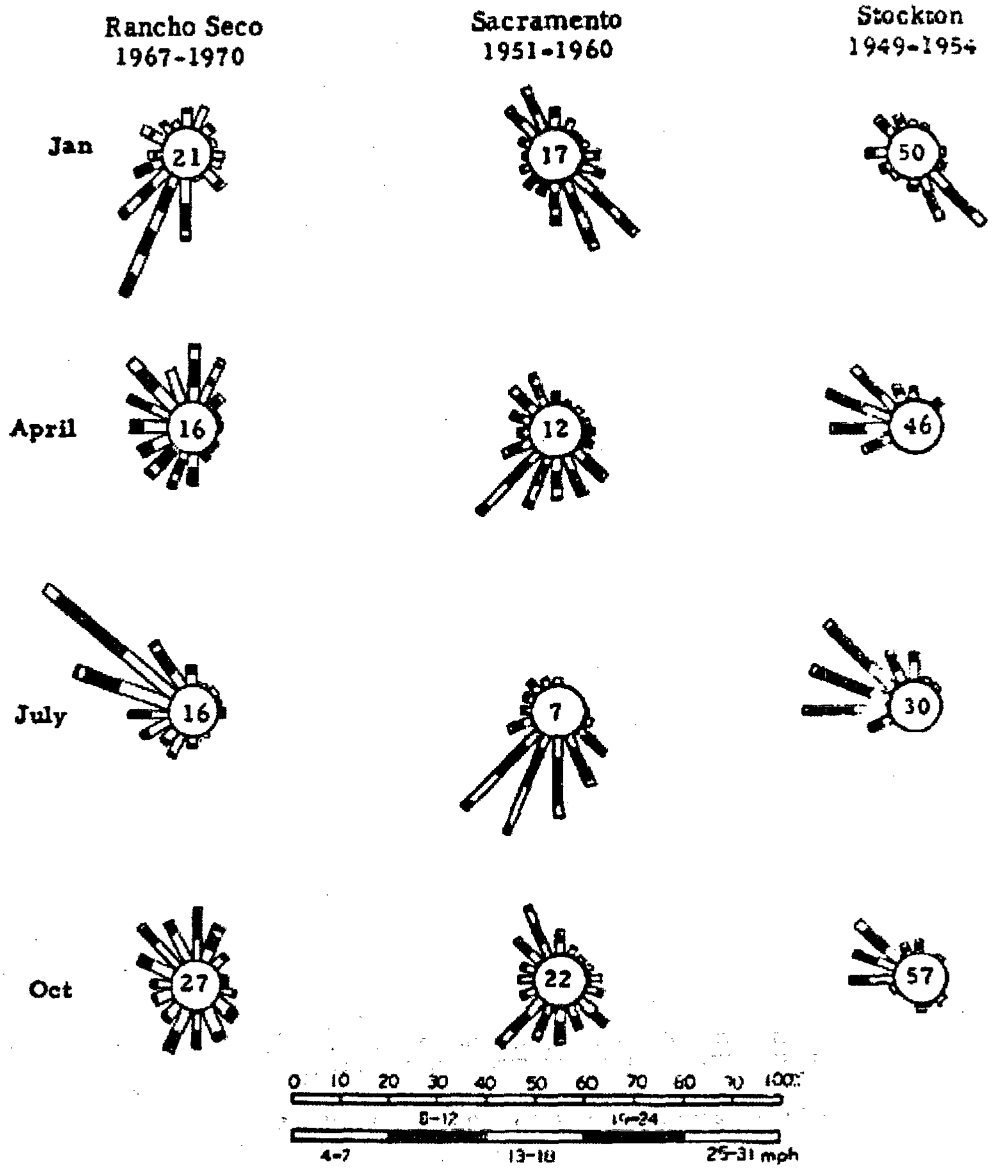


% Frequency of Occurrence of Wind ≤3 mph in Circle

Figure 8-2
Wind Roses

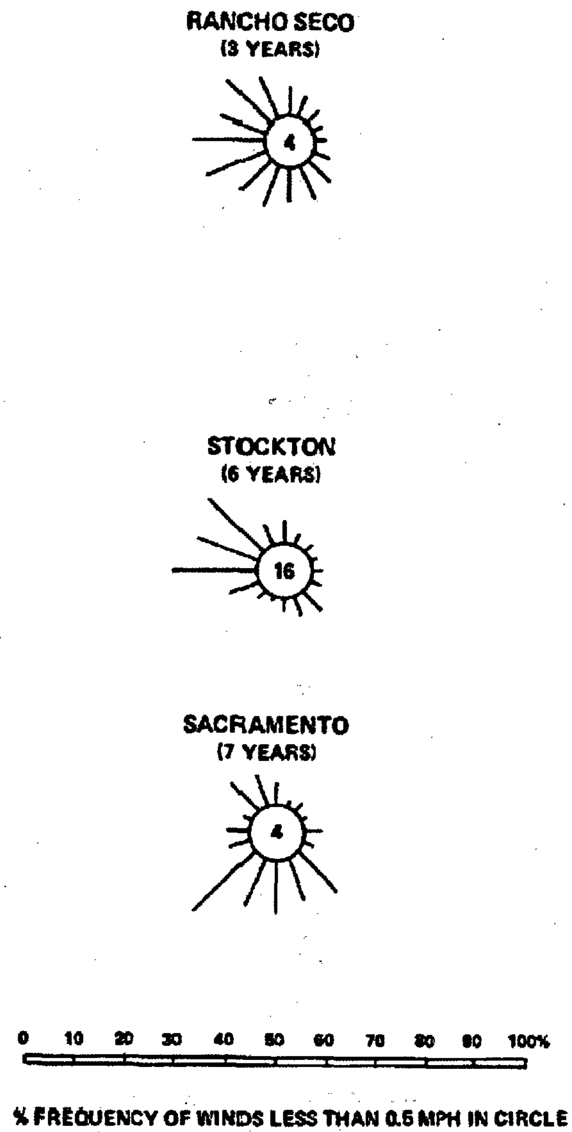
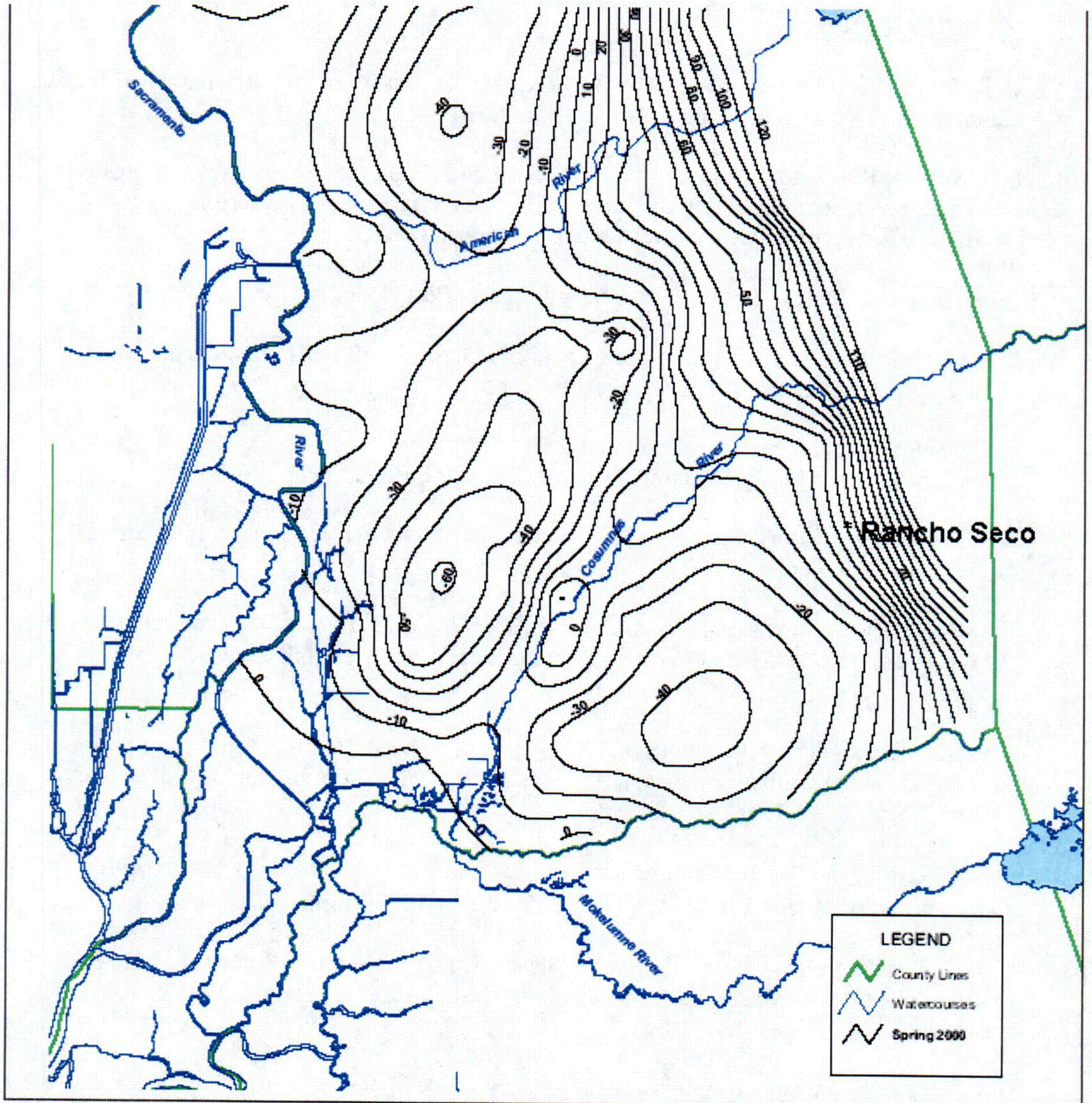


Figure 8-3
Yearly Wind Roses



Source: Based on measured spring 2000 water level data from Sacramento County Department of Water Resources

Contour numbers indicate feet from mean sea level (msl)
Credit: Sacramento County 2002 Zone 40 Water Supply Master Plan EIR

Figure 8-4
Ground Water Contour Map

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8.8 REFERENCES

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8-3 "Supplement to Rancho Seco Environmental Report - Post Operating License Stage," 1991

8-4 U.S. Nuclear Regulatory Commission Regulatory Guide 1.179, "Standard Format and Content of License Termination Plans for Nuclear Power Reactors," January 1999

8-5 U.S. Nuclear Regulatory Commission NUREG-1700, Rev. 1, "Standard Review Plan for Evaluation Nuclear Power Reactor License Termination Plans," April 2003

8-6 U.S. Nuclear Regulatory Commission NUREG-1727 "NMSS Decommissioning Standard Review Plan," September 2000

8-7 U.S. Nuclear Regulatory Commission NUREG-1757, Vol. 1, Rev. 1, "Consolidated NMSS Decommissioning Guidance Decommissioning Process for Materials Licensees," September 2003

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8-9 State of California, Department of Finance, "Population Projections by Race/Ethnicity for California and its Counties 2000–2050," Sacramento, California, May 2004

8-10 U.S. Nuclear Regulatory Commission Regulatory Guide 8.8, Rev. 3, "Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations Will Be As Low As Is Reasonably Achievable," June 1978

8-11 U.S. Nuclear Regulatory Commission Regulatory Guide 8.10, Rev. 1-R, "Operating Philosophy for Maintaining Occupational Radiation Exposures As Low As Is Reasonably Achievable," September 1975