9. RISKS TO ECOLOGICAL RECEPTORS FROM EXPOSURE TO RADIONUCLIDES

Aquatic and terrestrial organisms may be exposed to radionuclides via internal exposures after ingestion of contaminated food, soil, or water or via external exposures to contaminated media (surface soil, surface water, sediment). An assessment of the total radiation dose received from internal and external exposures was conducted for aquatic organisms, piscivorous wildlife, and terrestrial biota. In the assessment it is assumed that all parts of an organism are exposed equally to radionuclide energies. While ecological receptors are exposed to radiation from natural sources, doses were only quantified for radiation from nuclides detected in the WOCW. This section discusses the potential risks to terrestrial and aquatic biota (fish, aquatic macroinvertebrates, soil invertebrates, plants, terrestrial wildlife, and piscivorous wildlife) from current exposure to radionuclides in surface soil, surface water, and sediment collected from subbasins within the WOCW.

9.1 EXPOSURE ASSESSMENT

Native biota may receive external radiation exposure from radionuclides in water, soil, and sediment. Organisms also receive internal radiation exposure from radionuclides ingested via food and water and from radionuclides absorbed through the skin and respiratory organs (Templeton et al. 1971, IAEA 1976, Blaylock and Trabalka 1978, Woodhead 1984). Evaluation of the resulting radiation doses received by biota requires quantitative information on the radionuclides to which they are exposed. In all cases, the radiation source must be known in terms of the quantity of each specific radionuclide and the corresponding energy released per disintegration. Factors to correct for specific conditions that may effect exposures are applied when appropriate.

Radiation dose rates (mrad/d) from radionuclide exposures were calculated for plants, earthworms, and representative terrestrial and semiaquatic wildlife species in the White Oak Creek watershed using methodology adapted from Blaylock et al. (1993) and Baker and Soldat (1992). The methodology was modified to address site-specific conditions and receptors. Dose rates from internal exposures via ingestion of food and soil and inhalation of dust were evaluated, as were dose rates from external exposures via soil. Dose rates for large aquatic invertebrates and large fish were calculated using the methodology described in Blaylock et al. (1993).

The representative terrestrial and semiaquatic wildlife selected as endpoints for the radiological assessment were the same as those for the chemical data assessment: short-tailed shrew, white-footed mouse, red fox, white-tailed deer, red-tailed hawk, wild turkey, river otter, mink, great blue heron, mink, osprey, and belted kingfisher (refer to Sect. 7 and 8). Life history parameters used in the radiological assessment were identical to those used for the chemical data assessment (Tables 7.2 through 7.8 and 8.1 through 8.4). In addition, it was necessary to assume species-specific values for fraction of time spent above and below ground, underwater, or at the water's surface (Table 9.1). Mink were assumed to spend 50% of their time above ground, 20% below ground (in burrows), 20% swimming at the water's surface, and, conservatively, 10% of their time immersed in water. Otter were assumed to split time equally above and below ground, immersed in water, and at the water's surface. Kingfishers were assumed to split their time equally among perching above water or soil and roosting in burrows. The short-tailed shrew, white-footed mouse, and red fox were all assumed to spend 75% of their time above ground and 25% below the soil surface in dens or burrows. White-tailed deer and wild turkey spend 100% of their time above ground and were assigned a value

of 1. Red-tailed hawks and osprey also spend 100% of their time above ground, but much of this is flying or perched high in trees; thus, it was assumed that they would only be exposed to external radiation 10% of the time. Great blue herons were assumed to spend 50% of their time exposed to surface soil, 25% exposed to the water's surface, and 25% wading in water.

9.1.1 Exposure models

Biotic receptors may receive both external and internal doses of radiation. Internal exposures are a result of ingestion of contaminated food, soil, or water or inhalation of contaminated soil. Receptors on the ground surface receive external exposures from contaminated surface soil via direct radiation. Both above-ground and below-ground exposures are possible, depending on the habits of the receptor. Baker and Soldat (1992) provide general equations for estimating dose rates to wildlife. An adaptation of Blaylock et al.'s (1993) methodology was used in estimating radiation dose rates in the RI for Waste Area Grouping 5 at Oak Ridge National Laboratory (DOE 1995a). The Blaylock et al. methodology was further modified for the current assessment to account for the availability of site-specific uptake and biota data. The general methodology and the equations specific to each exposure route used in estimation of dose rates for White Oak Creek biota are described in this subsection. Equations used in this assessment estimate the daily dose from current conditions. Dose from α, β, and γ emissions (only β and γ for external exposures of earthworms and plants and only γ for external exposures of wildlife receptors) were calculated for each radionuclide, including the dose rates from all short-lived daughter products. Dose from each radionuclide was then summed over all exposure routes and all radionuclides to arrive at the overall dose received for each receptor at each site.

9.1.1.1 Plants, soil invertebrates, and terrestrial and piscivorous wildlife

External exposures: direct radiation from soil

The equation for estimating above ground external dose rates (mrad/d) for terrestrial receptors exposed to contaminated soil uses dose coefficients published by Eckerman and Ryman (1993). Dose rate reduction factors are used to account for the fraction of time the receptor spends above ground. Dose coefficients assume the source region is a smooth plane (Eckerman and Ryman 1993), but this is rarely the case in a terrestrial habitat. A representative average dose reduction factor for ground roughness is 0.7 (Eckerman and Ryman 1993). For the shrew, mouse, and mink, all relatively small mammals which are effectively much closer than 1 m to the source, an elevation correction factor of 2 was applied to account for the increased dose expected at ground level relative to the effective height of a standard human used to derive the dose coefficients. For plants it was assumed that the dose represents that to the reproductive part of the plant with an effective height similar to that of the standard human. The equation for above ground dose from external exposures for a plant or wildlife receptor is written:

Above soil exposures:

$$D_{abovegrd} = F_{above} \; F_{ruf} \sum C_{soil,i} \; DF_{grd,i} \; CFb \; ECF \qquad (5)$$

where:

$D_{above\,grd}$ = External dose rate to receptor from above-ground exposures to contaminated soil (mrad/d)

F_{above}	=	Dose rate reduction factor accounting for the fraction of time the receptor spends above ground (unitless)
F_{ruf}	=	Dose rate reduction factor accounting for ground roughness (unitless). Representative average of 0.7 (Eckerman and Ryman 1993) used for this assessment.
$C_{soil,i}$	=	Activity of radionuclide *i* in surface soil (pCi/g)
$DF_{grd,i}$	=	Dose coefficient for radionuclide *i* in soil contaminated to depth of 15 cm (Table III.6, Eckerman and Ryman 1993) (Sv/s per Bq/m^3)
CFb	=	Conversion factor to change Sv/s per Bq/m^3 to mrad g/pCi d. Equals 5.12×10^{14}.
ECF	=	Elevation correction factor to adjust dose coefficients to value representative of effective height of animal above ground.

Dose from alpha radiation is not a concern for external sources, as alpha radiation lacks penetrating power. The effective dose coefficients from Eckerman and Ryman (1993) incorporate both high energy β and γ emissions. Radionuclide-specific parameters are provided in Table 9.2. The lower of the UCL95 and the maximum detected concentration in surface soil within a subbasin were used in estimating the dose from external exposures. Summary statistics for surface soil collected from the White Oak Creek watershed are provided in Appendix A.

Below-ground exposures are calculated assuming immersion in a continuous soil medium. Dose coefficients were unavailable for the immersion scenario, so exposures were modeled as dose to soil adjusted for absorption by a small volume of tissue. The exposure fraction reflects the fraction of time the receptor spends below ground. Because white-tailed deer, red-tailed hawks, wild turkey, osprey, and great blue heron do not go below ground, they do not receive a dose via this exposure route. Only γ radiations with energies greater than 0.01 MeV were evaluated for wildlife receptors as those with lower energies are unlikely to penetrate skin. Both β and γ radiations were evaluated for earthworms. The equation for below-ground external exposures of earthworms and wildlife receptors is written:

Below-ground exposures:

$$D_{belowgrd} = 1.05 \quad F_{below} \sum C_{soil,i} \quad \epsilon_i \quad CFa \qquad (6)$$

where:

$D_{below\ grd}$	=	External dose rate to earthworm or wildlife receptor in burrow from contaminated soil (mrad/d)
F_{below}	=	Dose rate reduction factor accounting for the fraction of time the receptor spends below ground (unitless)
$C_{soil,\,i}$	=	Activity of radionuclide *i* in surface soil (pCi/g)
ϵ_i	=	Energy for γ emissions by nuclide *i* (MeV/nt).
1.05	=	Conversion factor to account for immersion in soil vs water (Estimated value; Keith Eckerman, Health Sciences Research Division, Oak Ridge National Laboratory, personal communication, June 1996)
CFa	=	Conversion factor to go from MeV/nt to g mrad/pCi d. (5.12×10^{-2})

External Exposures: Direct radiation from water

The equation for estimating external dose rates (mrad/d) for wildlife receptors exposed to radionuclides in water uses dose coefficients published by Eckerman and Ryman (1993) and is similar to the equation used for soil. Dose rate reduction factors are used to account for the fraction of time the receptor spends underwater or at the water's surface. The equation for dose from external exposures for a wildlife receptor immersed in water is written:

Underwater exposures:

$$_{underwater} = F_{underwater} \sum C_{water,i} \frac{1}{WD} DF_{water,i} CF \qquad (7)$$

where:

$D_{underwater}$	=	External dose rate to receptor from underwater exposures (mrad/d)
$F_{underwater}$	=	Dose rate reduction factor accounting for the fraction of time the receptor spends underwater (unitless)
$C_{water,i}$	=	Activity of radionuclide *i* in water (pCi/L)
WD	=	Density of water (1000 g/L)
$DF_{water,i}$	=	Dose coefficient for radionuclide *i* for organism immersed in water (Eckerman and Ryman 1993) (Sv m^3/Bq s)
CFw	=	Conversion factor to change Sv m^3/Bq s to mrad g/pCi d. Equals 3.20 x 10^{14}.

Dose from alpha radiation is not a concern for external sources, as alpha radiation lacks penetrating power. The effective dose coefficients from Eckerman and Ryman (1993) incorporate both high energy β and γ emissions. Radionuclide-specific parameters are provided in Table 9.3. The mink and otter are the only representative wildlife species likely to spend significant time underwater.

Exposures at the water surface are calculated similarly. However, the exposure fraction is adjusted to reflect the fraction of time the receptor spends at the water surface. Because organisms at the water's surface are exposed from below instead of from above and below, a dose reduction factor of 0.5 is applied. Mink were assumed to spend 20% of their time swimming at the water surface, otters 25%. Herons were assumed to spend 25% of their time standing at the water's edge; kingfishers were assumed to spend 33% of their time perched close to the water surface; and osprey were assumed to spend 10% of their time near the water surface. Other receptors were not expected to spend significant time in water, so external water exposures were not addressed. The equation for external exposures at the water surface is written:

Water surface exposures:

$$_{surface} = F_{surface} \; 0.5 \sum C_{water,i} \frac{1}{WD} DF_{water,i} CF \qquad (8)$$

where:

$D_{surface}$	=	External dose rate to receptor from exposures at the water surface (mrad/d)

$F_{surface}$	=	Dose rate reduction factor accounting for the fraction of time the receptor spends at the water surface (unitless)
0.5	=	Dose reduction factor to account for the difference between being immersed in water and being at the water surface (unitless).

All other parameters are the same as those defined for underwater exposures (see Eq. 3).

Internal exposures: ingestion

Wildlife receptors may receive internal radiation doses after ingesting contaminated prey, soil, or water or after inhaling contaminated dust. Blaylock et al. (1993) provide an equation for estimating the internal dose to fish contaminated with radionuclides. This equation can be modified to address consumers eating a variety of prey types, ingesting soil, and drinking water as well as plants and invertebrates taking up contaminants directly from the soil:

$$D_{ing} = \sum QF \quad C_{tissue} \quad \epsilon_i \quad CFa \quad AF \tag{9}$$

where:

D_{ing}	=	Internal dose rate received after ingestion of contaminated prey and soil (mrad/d).
QF	=	Quality factor to account for the greater biological effectiveness of α particles. (20 for α; 1 for β and γ emissions; unitless).
C_{tissue}	=	Activity (pCi/g) of radionuclide *i* in tissue of organism.
ϵ_i	=	Energy for α, β, or γ emissions by nuclide *i* (MeV/nt).
CFa	=	Conversion factor to go from MeV/nt to g mrad/pCi d. (5.12×10^{-2})
AF	=	Absorption factor (unitless)

Radionuclide activity in tissue was determined a number of ways depending on data availability. Measured plant, earthworm, and small mammal data were unavailable. ORR-specific soil-to-tissue uptake factors were available for a number of analytes. When they were available, tissue concentrations were calculated as discussed in Sect. 7.1. When soil-to-tissue uptake factors were unavailable for wildlife receptors, literature-derived uptake factors were used to obtain terrestrial biota tissue concentrations (see Sect. 7.1). Concentrations in fish were estimated by multiplying water concentrations by fish bioconcentration factors obtained from Blaylock et al. (1993).

ORR-specific uptake factors for plants, earthworms, and small mammals were available for a number of radionuclides and were used in the assessment. When site-specific uptake factors were unavailable for specific radionuclides, values were derived from those for related isotopes with measured values, from measured values of the elemental form of the radionuclide, or from available literature sources. Uptake factors used in this assessment are provided in Table 9.3 and 9.4. It was assumed that uptake of radionuclides from ingested food, water, and soil was similar.

Absorbed energy fractions for α radiations were assumed unity for all receptors. Absorption fractions for β radiations were assumed unity for wildlife receptors, but β absorption fractions for large insects from Blaylock et al. (1993) were used for plants (assuming small reproductive parts of greatest concern) and earthworms. Absorption fractions for γ radiations for plants and earthworms were also obtained from those for large insects presented in Blaylock et al. (1993). Absorption fractions for γ radiations derived for infant, 1 yr-old, and adult humans using the methodology

described in Cristy and Eckerman (1987) were used for wildlife receptors of similar sizes. Tables 9.2 and 9.3 present absorption factors used for each receptor-radionuclide combination evaluated in this report.

Dose from internal exposures was calculated for α, β, and γ energies of each radionuclide. Energies were obtained from Eckerman and Ryman (1993) and are provided in Tables 9.2 and 9.3 for radionuclides detected in surface soil and surface water, respectively. Because different types of radiation differ in their relative biological effectiveness per unit of absorbed dose, a quality factor derived from data on humans is normally applied (NCRP 1987). A quality factor of 1 is used for β and γ radiation and 20 for α radiation (Blaylock et al. 1993).

The lower of the UCL95 and the maximum detected concentration in surface soil collected from the WOCW was used in estimating dose rates from internal exposures within each subbasin. Summary statistics for surface soil collected from the WOCW are provided in Appendix A.

Internal exposures: inhalation

Wildlife species using burrows receive an additional internal dose from inhalation of dust originating from contaminated soil. Intake of radionuclide *i* by inhalation is estimated as (DOE 1995b):

$$D_{inh} = QF \quad F_{below} \sum C_{soil,i} \quad A \quad \frac{1}{AD} \quad \epsilon_i \; CFa \quad AF \qquad \textbf{(10)}$$

where:

D_{inh}	=	Internal dose rate from inhalation of contaminated soil (mrad/d)
F_{exp}	=	Dose reduction factor for fraction of time receptor spends below ground (unitless)
A	=	Mass of respirable dust per volume of air breathed (0.1 g/m^3; DOE 1995b)
AD	=	Air density (1200 g/m^3; Eckerman and Ryman 1993)
ϵ_i	=	α, β, or γ radiation energies for radionuclide *i* (MeV)
CFa	=	Conversion factor to go from MeV to mrad g/pCi/d (5.12 x 10^{-2})
AF	=	Absorption factor (unitless)

Healy (1980) suggests that 0.0001 g/m^3 would be a conservative value when addressing human exposures to dust. Because burrowing animals are likely to spend a greater portion of their time in a confined space (burrow) than humans and are physically closer to the soil surface, an air mass loading of 0.1 g/m^3 was selected as a conservative estimate of the mass of respirable dust (A) to which these animals may be exposed.

Total internal exposures are obtained by adding ingestion and inhalation dose rates over all radionuclides, including all short-lived daughter products.

9.1.1.2 Aquatic organisms

The Point Source Dose Distribution approach presented in Blaylock et al. (1993) was used to estimate doses to aquatic organisms. Aquatic organisms representing two geometries (large aquatic invertebrate and large fish) were evaluated for each site. The equations used to estimate α, β, and γ radiation doses to aquatic organisms were obtained from Blaylock et al. (1993) and are provided

in Table 9.5. Internal exposures were estimated using the activity in tissue of each organism. Organism tissue concentrations were calculated by multiplying water-to-fish tissue bioconcentration factors provided in Blaylock et al. (1993) by surface water concentrations. External exposures to radionuclides in surface water and sediment were estimated separately using surface water or sediment activity levels, respectively. In estimating external exposures from sediment, it was assumed that sediment-associated invertebrates spend 100% of their time at the sediment-water interface while fish spend 50% of their time at this interface. The average energy of decay for α, β, and γ particles emitted by each radionuclide were obtained from ICRP (1983) and are presented in Table 9.3. Transfer factors used in estimation of radiation doses are presented in Table 9.3. Dose estimates for α, β, and γ radiation were summed for each radionuclide to obtain the total dose from that radionuclide. Total doses from all radionuclides detected at a site were then summed to obtain the overall dose rate for each receptor type at each site.

Summary statistics for surface water data collected from the WOCW are provided in Appendix A. Radionuclide exposures were determined for mainstem and seep surface water data summarized by subbasin. The 95% upper confidence limit on the mean was considered an appropriately conservative estimate of exposure and was used in dose rate calculations.

9.2 EFFECTS LEVELS FOR RADIONUCLIDES

The discharge of radioactive waste into the environment results in long-term, low-dose exposure to organisms. In most cases, acute mortality can be discounted. Any potential increase in morbidity and mortality that might result from the exposure to chronic irradiation above background is unlikely to be detected because of natural fluctuations in the size of populations.

The International Atomic Energy Agency (IAEA) recommends limiting the dose for terrestrial organisms to 100 mrad/d (IAEA 1992). Studies evaluating reproductive success and survival were used to determine the dose limit. Species-specific effects data were not available, so 100 mrad/d was selected as the threshold dose for all representative wildlife receptors. A dose rate of this magnitude is unlikely to cause observable changes in terrestrial animal populations (IAEA 1992). Higher dose rates may result in impaired reproduction or reduced survivorship. A dose rate of 1 rad/d is generally considered protective of plant and invertebrate populations (IAEA 1992, Barnthouse 1995) based on studies of productivity and community characteristics. This dose rate or less is unlikely to cause observable changes in terrestrial plant populations (IAEA 1992). Higher dose rates may result in reduced productivity or changes in species composition within communities. Therefore, 1 rad/d was selected as the threshold dose for effects on plant and invertebrate populations. Invertebrates tend to be less radiosensitive than plants or animals, and indirect responses to radiation-induced vegetation changes appear more critical than direct effects from radiation (IAEA 1992).

Blaylock et al. (1993) summarize reviews of the effects of radiation on aquatic organisms. DOE recommends limiting the radiation dose to aquatic biota to 1 rad/d (Blaylock et al. 1993). The recommended acceptable dose rate to natural populations of aquatic biota is 1 rad/d (NCRP 1991). If the dose rate to aquatic organisms is less than the recommended level, there should be no detrimental effects from radiation exposure at the population level (Blaylock et al. 1993).

9.3 RISK CHARACTERIZATION FOR BIOTA EXPOSED TO RADIONUCLIDES

Risk characterization integrates the results of the exposure assessment (Sect. 9.1) and the effects assessment (Sect. 9.2) to estimate the likelihood of effects based on exposures. Generally a weight-of-evidence approach is used to determine the best estimate of risk to each assessment endpoint. Only a single line of evidence, comparison of estimated exposures to recommended dose rate limits, was available for the radionuclide assessment. Current exposures to radionuclides in floodplain soils along White Oak Creek and in surface water and sediment of White Oak Creek and its tributaries are evaluated in this assessment.

Monte Carlo simulations of radionuclide exposures were not performed; therefore, all results represent point estimates of exposures. Computational limitations associated with defining and drawing from distributions of all radionuclides detected within a subbasin for multiple subbasins prevented evaluation of watershed-wide exposures. However, the effects levels to which estimated dose rates are compared are already interpreted as population-level effects (IAEA 1992).

Estimated dose rates are provided in Tables 9.6a-c for terrestrial biota, Table 9.7 for piscivorous wildlife, and Tables 9.8 (surface water) and 9.9 (sediment) for aquatic biota within each subbasin. The East Seep subbasin resulted in the highest dose rates to terrestrial biota with ^{137}Cs accounting for nearly all of the dose rate (Table 9.10). The Intermediate Pond, MB-15, West Seep, SWSA 4 Main, and Lower WOC/WOL subbasins also resulted in high dose rates with risk drivers including combinations of $^{239/240}$Pu, ^{241}Am, ^{137}Cs, $^{233/234}$U, ^{238}U, ^{60}Co, and ^{238}Pu (Table 9.10). Only one subbasin, SWSA5/WOC presented a risk to piscivorous wildlife (Table 9.11). While dose rates from ^{137}Cs were high, data from this subbasin were limited to the OHF Pond and do not represent a widespread ecological problem. Risks to aquatic organisms from exposure to radionuclides in surface water and sediment were also limited. The OHF Pond in the SWSA5/WOC subbasin also presented risks to aquatic biota as a result of ^{137}Cs in sediment, and ^{90}Sr in Seep C surface water resulted in dose rates exceeding 1 rad/d for large aquatic invertebrates (Table 9.12).

The following paragraphs present risks for each receptor by basin and subbasin within the WOCW.

9.3.1 HFIR Basin

- **HFIR Subbasin.** Risks to terrestrial biota were evaluated for radionuclides in soil in the HFIR subbasin. Potential risks from exposure to the 7 radionuclides detected in soil were identified for soil invertebrates (HI = 2.0), red fox (1.4), white-tailed deer (3.1), and wild turkey (3.7). Strontium-90 was the primary risk driver, contributing >90% of the HI for all receptors (Table 9.10).

- **HFIR East.** Risks to biota were evaluated for radionuclides in soil and surface water in the HFIR East subbasin. Only one radionuclide (potassium-40) was detected in three soil samples from this subbasin, and no risks are anticipated for terrestrial biota. No risks were identified for aquatic organisms exposed to radionuclides in surface water in the HFIR East subbasin. Dose rates estimated for large invertebrates and large fish were below recommended dose rate limits.

- **MB-15 Subbasin.** Risks to biota were evaluated for radionuclides in soil and surface water in the MB-15 subbasin. Potential risks from exposure to the 2 radionuclides detected in soil were identified for all receptors with HIs ranging from 1.1 for plants to 30.6 for shrews and

mice (Table 9.10). Cobalt-60 was the primary risk driver, contributing >95% of the HI for all receptors. No risks were identified for aquatic organisms exposed to radionuclides in surface water in the MB-15 subbasin. Dose rates estimated for large invertebrates and large fish were below recommended dose rate limits.

- **HF-2 Subbasin.** Risks to biota were evaluated for radionuclides in soil and surface water in the HF-2 subbasin. Overall dose rates from exposure to the 8 radionuclides detected in soil were well below the recommended dose limits for all receptors. No risks were identified for aquatic organisms exposed to radionuclides in surface water in the HF-2 subbasin. Dose rates estimated for large invertebrates and large fish were below recommended dose rate limits.

9.3.2 HRE Basin

HRE Subbasin. Risks to biota were evaluated for radionuclides in soil and surface water in the HRE subbasin. Seventeen radionuclides were detected in soil samples from the HRE, but risks are only anticipated for wild turkey (Table 9.10). The overall Hi for turkeys was 4.0 with ^{234}Th and $^{233/234}$U as the risk drivers. Overall dose rates for all other receptors were well below recommended dose limits. No risks were identified for aquatic organisms exposed to radionuclides in surface water in the HRT-3 subbasin. Dose rates estimated for large invertebrates and large fish were below recommended dose rate limits.

9.3.3 SWSA5 Seep A Basin

Seep A Subbasin. Risks to biota were evaluated for radionuclides in soil, surface water, and sediment in the Seep A subbasin. Overall dose rates from exposure to the 27 radionuclides detected in soil marginally exceeded recommended dose limits for shrews and mice (HI = 1.0) but were well below the recommended dose limits for all other receptors (Table 9.10). Plutonium-239/240 was the primary risk driver, contributing 60% of the dose for both mice and shrews. No risks were identified for aquatic organisms exposed to radionuclides in surface water and sediment in the Seep A subbasin. Combined surface water and sediment dose rates estimated for large invertebrates and large fish were below recommended dose rate limits.

9.3.4 SWSA5 Seep B Basin

- **Seep B West Subbasin.** Risks to biota were evaluated for radionuclides in soil and surface water in the Seep B West subbasin. Overall dose rates from exposure to the 18 radionuclides detected exceeded recommended dose limits for soil invertebrates (HI = 1.2), shrews and mice (HI = 8.0), deer (1.4), and turkeys (2.3), but were below the recommended dose limits for all other receptors (Table 9.10). Strontium-90 was the risk driver for soil invertebrates, deer, and turkey, contributing >57% of the dose rate, while curium-244 and americium-241 contributed 71% and 14%, respectively, to the dose rate received by shrews and mice. No risks were identified for aquatic organisms exposed to radionuclides in surface water in the Seep B West subbasin. Dose rates estimated for large invertebrates and large fish were below recommended dose rate limits.

- **Seep B East Subbasin.** Risks to biota were evaluated for radionuclides in soil and surface water in the Seep B East subbasin. Overall dose rates from exposure to the 13 radionuclides detected marginally exceeded recommended dose limits for short-tailed shrews (HI = 2.6), white-footed mice (HI = 2.3), red fox (1.9), wild turkeys (1.7), and mink (1.7) but were below the recommended dose limits for all other receptors (Table 9.10). Cs-137 was the risk driver

for all receptors, contributing >91% of the dose rate. No risks were identified for aquatic organisms exposed to radionuclides in surface water in the Seep B East subbasin. Dose rates estimated for large invertebrates and large fish were below recommended dose rate limits.

9.3.5 SWSA 5 Drainage D-2 Basin

SWSA 5 Drainage D-2 Basin. Risks to biota were evaluated for radionuclides in soil, surface water, and sediment in the SWSA 5 Drainage D-2 subbasin. Overall dose rates from exposure to the 18 radionuclides detected in soil were well below the recommended dose limits for all receptors. No risks were identified for aquatic organisms exposed to radionuclides in surface water and sediment in the SWSA 5 Drainage D-2 subbasin. Combined surface water and sediment dose rates estimated for large invertebrates and large fish were below recommended dose rate limits.

9.3.6 SWSA5 Seep C Basin

Seep C Subbasin. Risks to biota were evaluated for radionuclides in soil, surface water, and sediment in the Seep C subbasin. Overall dose rates from exposure to the 22 radionuclides detected exceeded recommended dose limits for shrews and mice (HI = 1.7), but were below the recommended dose limits for all other receptors (Table 9.10). Curium-244 contributed >52% of the dose rate received by shrews and mice. Radionuclides in surface water in the Seep C subbasin result in some of the highest dose rates to aquatic organisms of all the subbasins in the watershed. The hazard index for large aquatic invertebrates was 2.2, and the HI for large fish was 0.4. Sr-90 contributed virtually all (99.6%) of the dose rate. The Sr-90 activity recorded at station SW5-4 was two orders of magnitude higher than at any of the other stations and may represent a hot spot. Sediment exposures did not account for a significant fraction of the overall dose rate to aquatic organisms in the Seep C subbasin.

9.3.7 MWOC/East Basin

- **SWSA 5 Tributary 1.** Risks to biota were evaluated for radionuclides in soil, surface water, and sediment in the SWSA5 Trib-1 subbasin. Overall dose rates from exposure to the 27 radionuclides detected in soil marginally exceeded recommended dose limits for shrews, mice and turkeys (HI = 2.2, 2.1, and 1.1), but were below the recommended dose limits for all other receptors (Table 9.10). Plutonium-238 contributed >59% of the dose rate received by shrews and mice. No risks were identified for aquatic organisms exposed to radionuclides in surface water and sediment in the SWSA5 Trib1 subbasin. Combined surface water and sediment dose rates estimated for large invertebrates and large fish were below recommended dose rate limits.

- **MVDrive Subbasin.** Risks to biota were evaluated for radionuclides in soil in the MVDrive subbasin. Only 5 radionuclides were detected in up to three soil samples from this subbasin, and no risks are anticipated for terrestrial biota. Overall dose rates were well below recommended dose limits for all receptors. No risks were identified for aquatic organisms exposed to radionuclides in surface water in the MVDrive subbasin. Dose rates estimated for large invertebrates and large fish were below recommended dose rate limits.

- **SWSA 5 WOC.** Risks to biota were evaluated for radionuclides in soil, surface water, and sediment in the SWSA 5 WOC subbasin. No risks were identified for exposure to radionuclides in soil. Overall dose rates from exposure to the 27 radionuclides detected in soil were well below the recommended dose limits for all receptors. Radionuclides in surface water

and sediment in the SWSA 5 WOC subbasin result in the highest dose rates to aquatic and piscivorous organisms of all the subbasins in the watershed. Risks for piscivorous wildlife exposed to radionuclides were predicted to be likely for the SWSA 5 WOC subbasin based on exposures modeled from surface water concentrations. Hazard indices ranged from 12.7 for the kingfisher to 24.2 for the otter (Table 9.11). Cs-137 accounted for >94% of the dose, and Strontium-90 accounted for 5.7%. The hazard index for large aquatic invertebrates from water exposures was 0.5, and the HI for large fish was 1.1 (Table 9.12). Cs-137 contributed 98.6% of the dose rate, and Co-60 accounted for 1.3%. Radionuclides in sediment in the SWSA 5 WOC subbasin result in the highest dose rates in the watershed (Table 9.12). The hazard index for large aquatic invertebrates from sediment exposures was 202, and the HI for large fish was 91. Cs-137 accounted for 98.6% of the dose rate from sediment, and Co-60 accounted for 1.3%. While the risks are high, the surface water and sediment data for this subbasin were collected from a single location, the OHF Pond, and do not represent a widespread ecological concern.

- **SWSA5 N WOC.** Risks to biota were evaluated for radionuclides in soil and surface water in the SWSA5 N WOC subbasin. No risks were identified for exposure to radionuclides. Overall dose rates from exposure to the 18 radionuclides detected were well below the recommended dose limits for all receptors. No risks were identified for aquatic organisms exposed to radionuclides in surface water in the SWSA5 N WOC subbasin. Dose rates estimated for large invertebrates and large fish were below recommended dose rate limits.

9.3.8 MWOC/West Basin

- **SWSA 4 Main.** Risks to biota were evaluated for radionuclides in surface soil, surface water, and sediment in the SWSA 4 Main. Potential risks from exposure to the 4 radionuclides detected in soil were identified for all receptors except plants with HIs ranging from 4.7 for soil invertebrates to 18.8 for shrews (Table 9.10). Cesium-137 was the primary risk driver, contributing >82% of the HI for all receptors. Strontium-90 was an additional risk driver for deer and turkey, accounting for 17% and 9% of the overall dose rate, respectively. No risks were identified for aquatic organisms exposed to radionuclides in surface water and sediment in the SWSA 4 Main subbasin. Combined surface water and sediment dose rates estimated for large invertebrates and large fish were below recommended dose rate limits.

- **WAG 7 WOC.** Risks to terrestrial biota exposed to radionuclides and nonradionuclides in WAG 7 WOC soil were evaluated. Potential risks to shrews, mice, and turkeys from exposure to radionuclides were identified (Table 9.10), but dose rates were below dose limits for all other receptors. Cesium-137 was the primary risk driver in all cases.

- **Intermediate Pond.** Risks to biota were evaluated for radionuclides in surface soil, surface water, and sediment in the Intermediate Pond subbasin. Overall dose rates from exposure to the 14 radionuclides detected in soil exceeded recommended dose limits for plants, soil invertebrates, shrews and mice, fox, and turkeys, but were below the recommended dose limits for all other receptors (Table 9.10). Plutonium-239/240 was the primary risk driver for plants, soil invertebrates, shrews, and mice, contributing 52-81% of the dose rate for these receptors while Americium-241 contributed 11-26%. Cesium-137 accounted for virtually all of the dose rate to the fox, 21.3% for turkeys, and 3% for shrews and mice. The primary radionuclide risk driver for wild turkeys was Uranium-233/234 (contributing 53% of the overall dose rate). Uranium was a risk driver for turkey but not for shrews or other mammals because the uranium uptake factor for turkeys was higher than that for mammals (Table 9.4).

No risks were identified for aquatic organisms exposed to radionuclides in surface water and sediment in the Intermediate Pond subbasin. Combined surface water and sediment dose rates estimated for large invertebrates and large fish were below recommended dose rate limits.

- **WOC Subbasin.** Risks to biota were evaluated for radionuclides in surface soil, surface water, and sediment in the WOC subbasin. Overall dose rates from exposure to the 14 radionuclides detected in soil exceeded recommended dose limits for shrews and mice, but were below the recommended dose limits for all other receptors (Table 9.10). Plutonium-239/240 was the primary risk driver, contributing 67% of the dose rate for shrews and mice while Curium-244 and Americium-241 contributed 12% and 10%, respectively. No risks were identified for aquatic organisms exposed to radionuclides in surface water and sediment in the Intermediate Pond subbasin. Combined surface water and sediment dose rates estimated for large invertebrates and large fish were below recommended dose rate limits.

- **Haw Ridge Subbasin.** Risks to terrestrial biota were evaluated for radionuclides in soil in the Haw Ridge subbasin. Only 3 radionuclides were detected in the one sample from this subbasin, and no risks are anticipated for terrestrial biota. Overall dose rates were below recommended dose limits for all receptors.

9.3.9 West Seep Basin

West Seep Subbasin. Risks to biota were evaluated for radionuclides in soil and surface water in the West Seep subbasin. Overall dose rates from exposure to the 29 radionuclides detected exceeded recommended dose limits for all receptors with HIs ranging from 2.0 for plants to 53.0 for shrews (Table 9.10). Cobalt-60 was the primary risk driver for all receptors, contributing >68% of the dose rate for all receptors. No risks were identified for aquatic organisms exposed to radionuclides in surface water in the West Seep subbasin. Dose rates estimated for large invertebrates and large fish were below recommended dose rate limits.

9.3.10 SWSA6 Basin

- **W6MS3 Subbasin.** Risks to biota were evaluated for radionuclides in soil and surface water in the W6MS3 subbasin. No risks were identified for exposure to radionuclides. Overall dose rates to terrestrial biota from exposure to the 21 radionuclides detected in soil were below the recommended dose limits for all receptors. No risks were identified for aquatic organisms exposed to radionuclides in surface water in the W6MS3 subbasin. Dose rates estimated for large invertebrates and large fish were below recommended dose rate limits.

- **W6MS1 Subbasin.** Risks to biota were evaluated for radionuclides in soil and surface water in the W6MS1 subbasin. No risks were identified for exposure to radionuclides. Overall dose rates to terrestrial biota from exposure to the 17 radionuclides detected in soil were below the recommended dose limits for all receptors. Dose rates estimated for large invertebrates and large fish exposed to radionuclides in surface water were below recommended dose rate limits.

9.3.11 WOL, Creek, and Floodplain Basin

- **Lower WOC/WOL Subbasin.** Risks to biota were evaluated for radionuclides in surface soil, surface water, and sediment in the Lower WOC/WOL subbasin. Overall dose rates from exposure to the 14 radionuclides detected in soil exceeded recommended dose limits for plants (HI = 1.4), shrews (HI = 17.4), and mice (HI = 17.3), but were below the recommended dose

limits for all other receptors (Table 9.10). Plutonium-239/240 was the primary risk driver for all receptors, contributing >86% of the dose rate. Americium-241 accounted for 6% of the HI for shrews and mice. No risks were identified for aquatic organisms exposed to radionuclides in surface water and sediment in the Lower WOC/WOL subbasin. Combined surface water and sediment dose rates estimated for large invertebrates and large fish were below recommended dose rate limits.

- **SWSA6Sth Subbasin.** Risks to terrestrial biota were evaluated for radionuclides in soil in the SWSA6Sth subbasin. No risks were identified for exposure to radionuclides. Overall dose rates from exposure to the 14 radionuclides detected were below the recommended dose limits for all receptors.

- **SWSA6 East Subbasin.** Risks to biota were evaluated for radionuclides in soil and surface water in SWSA6 East subbasin. No risks were identified for exposure to radionuclides. Overall dose rates from exposure to the 15 radionuclides detected in soil were below the recommended dose limits for all receptors, and dose rates estimated for large invertebrates and large fish exposed to radionuclides in surface water were below recommended dose rate limits.

- **Pit 4 South Subbasin.** Risks to biota were evaluated for radionuclides in soil and surface water in the Pit 4 South subbasin. No risks were identified for exposure to radionuclides. Overall dose rates from exposure to the 12 radionuclides detected were below the recommended dose limits for all receptors, and dose rates estimated for large invertebrates and large fish exposed to radionuclides in surface water were below recommended dose rate limits.

- **WOC Embayment.** Risks to aquatic biota were evaluated for radionuclides in surface water and sediment. No risks were identified for aquatic organisms exposed to radionuclides in surface water and sediment in the WOC Embayment subbasin. Combined surface water and sediment dose rates estimated for large invertebrates and large fish were below recommended dose rate limits.

9.3.12 NHF Basin

NHF Subbasin. Risks to terrestrial biota were evaluated for radionuclides in soil in the NHF subbasin. No risks were identified for exposure to radionuclides. Overall dose rates from exposure to the 16 radionuclides detected were below the recommended dose limits for all receptors.

9.3.13 East Seep Basin

East Seep Subbasin. Risks to biota were evaluated for radionuclides in soil and surface water in the East Seep subbasin. Potential risks from exposure to the 19 radionuclides detected in soil were identified for all receptors with HIs ranging from 8.6 for plants to 148 for shrews (Table 9.10). Cesium-137 was the primary risk driver, contributing >99% of the HI for all receptors, except turkeys (^{234}Th and $^{233/234}$U were additional risk drivers for turkeys). Cesium-137 in East Seep soil resulted in the highest soil-related radiological risks identified for terrestrial biota in the Melton Valley area of the White Oak Creek Watershed. No risks were identified for aquatic organisms exposed to radionuclides in surface water in the East Seep subbasin. Dose rates estimated for large invertebrates and large fish were below recommended dose rate limits.

9.3.14 WCTrib1 & ^{60}Co Basin

WCTrib1 Subbasin. Risks to terrestrial biota were evaluated for radionuclides in soil in the WCTrib1 subbasin. Potential risks from exposure to the 3 radionuclides detected in soil were identified for shrews, mice, foxes, turkeys, and mink with HIs ranging from 1.3 for mink to 2.0 for shrews (Table 9.10). Cesium-137 was the primary risk driver, contributing >80% of the HI for all receptors.

9.4 SUMMARY OF RISKS TO BIOTA FROM EXPOSURE TO RADIONUCLIDES

9.4.1 Risks to terrestrial biota from exposure to radionuclides

Potential risks to plants from exposure to radionuclides were identified in 5 subbasins (Table 9.10). Cesium-137 was the risk driver in East Seep soils. Plutonium-239/240 was the primary risk driver at the Intermediate Pond and Lower WOC/WOL subbasins, and Co-60 was the risk driver at MB-15 and West Seep.

Potential risks to soil invertebrates from exposure to radionuclides in surface soil were identified in 7 subbasins (Table 9.10). Cesium-137 was the risk driver in East Seep and SWSA 4 Main soils. Cobalt-60 was the primary risk driver at MB-15 and West Seep, and Plutonium-239/240 was the primary risk driver at the Intermediate Pond. Strontium-90 was the risk driver at the HFIR and Seep B subbasins.

Potential risks from exposure to radionuclides in surface soil were identified for at least one wildlife receptor at 16 subbasins (Table 9.10). Shrews and mice generally received the highest dose rates. Cs-137 was the primary risk driver in East Seep, SWSA 4 Main, Seep B East, WCTrib-1, and WAG 7 WOC soils. Plutonium-239/240 was the primary risk driver at the Intermediate Pond, Lower WOC/WOL, WOC, and SWSA 5 Seep A. Cobalt-60 contributed the highest dose rate at MB-15 and West Seep. Curium-244 was the risk driver at Seep B West and SWSA 5 Seep C and was a significant contributor at WOC. Strontium-90 was a risk driver at the HFIR subbasin and at Seep B West. Plutonium-238 was the primary risk driver at SWSA 5 Trib-1.

9.4.2 Risks to piscivorous wildlife from exposure to radionuclides

Risks from exposure of piscivorous wildlife to radionuclides are not anticipated in the White Oak Creek watershed. Exposure of piscivorous wildlife to radionuclides were modeled using available surface water data and measured fish body burden data. Potential risks were identified in only one subbasin: SWSA5/WOC. As noted above, the sample from this subbasin was associated with the OHF Pond and does not represent a widespread problem. Estimated exposures were below recommended dose rate limits for all receptors in all other subbasins.

9.4.3 Risks to aquatic biota from exposure to radionuclides

Potential risks to aquatic organisms exposed to radionuclides in surface water within the watershed were identified for only two subbasins: SWSA5/WOC and Seep C. The dose rate to large fish in the SWSA5/WOC subbasin marginally exceeded the recommended dose rate limit (HI = 1.1) as a result of high Cs-137 activity. This dose was associated with the 05.OHF station at the OHF Pond and does not represent a widespread problem. The dose rate for large insects at Seep C also

marginally exceeded the dose limit (HI = 2.2) but was a result of Sr-90, which contributed >99% of the dose. No aquatic receptors received doses above the dose rate limit in any of the other subbasins.

9.5 UNCERTAINTIES IN THE RADIOLOGICAL RISK ASSESSMENT

A number of areas of uncertainty exist in the estimation of risks to wildlife from exposure to radionuclides in the White Oak Creek watershed. It is believed that the methodology used in this assessment overestimates the dose rates that would be received. Whereas some of the information needed to implement the methodology is well-known, much is unknown or unspecified statistically. A conservative but reasonable approach to model assumptions and radiological exposure scenarios was adopted for this assessment in order to avoid underestimating risks to biota. Many of the uncertainties identified in the plant, soil invertebrate, and wildlife sections also apply to the radionuclide assessment. Specific uncertainties identified in the radionuclide assessment are presented here.

- It was assumed that uptake of radionuclides from soil, food, and water are similar. Radionuclides bound to soil may be less available than those in tissue or water. Therefore, assuming uptake from soil equal to uptake from food may result in a conservative estimate of actual uptake.
- Uptake factors from soil to earthworms were not available for many radionuclides. If uptake factors were unavailable, the higher of the plant or mammal uptake factors was used for earthworms. It is unknown whether actual earthworm uptake factors for these radionuclides would be higher or lower than those used, but use of the larger of the plant and mammal values was a conservative approach. Where measured values were available, earthworm uptake factors were generally lower than at least one of the corresponding plant or small mammal values.
- Uptake factors were not available for birds for all radionuclides. In the absence of bird-specific uptake factors, radionuclide activities in bird tissue were estimated using mammal uptake factors assuming that uptake would be similar for birds and mammals. It is unknown whether actual bird uptake factors would be higher or lower than those used here.
- Mammal soil-to-tissue uptake factors were calculated from ORR-specific data on small rodents. While these clearly apply directly to white-footed mice, they were also used for the other small mammalian receptor, the short-tailed shrew. Short-tailed shrew diets differ somewhat from that of white-footed mice as shrews eat a higher proportion of invertebrates. However, it was assumed that site-specific data on mice was more applicable to shrews than literature-derived bioaccumulation factors.
- Literature-derived uptake factors were used to estimate radionuclide activities in mammal and bird tissues when ORR-specific data were unavailable. While these values are believed to be representative of bioaccumulation likely to be observed on site, actual values may be higher or lower than those used in this assessment.
- Species-specific time budget information is lacking, so it was necessary to make a number of assumptions regarding the fraction of time each receptor spends above or below ground, underwater, or at the water's surface. The fractions used in this assessment were selected based on general knowledge of species behavior patterns, but actual fractions may be higher or lower.

- Wide-ranging wildlife species such as the red fox, white-tailed deer, and red-tailed hawk are unlikely to receive 100% of their exposure at any one location. Therefore, dose rates presented for these species are likely overestimated as they would average their exposures over a broader area than a single subbasin.

- The dose coefficients obtained from Eckerman and Ryman (1993) used to estimate dose rates from external exposures were developed for application in determining dose rates to humans. These dose coefficients were applied directly for wildlife receptors or adjusted based on the effective height of the receptors, but the actual dose coefficients for wildlife, given differences in size, behavior, and general morphology, may be greater or lesser than those developed for humans.

- Dietary information for the wildlife receptors evaluated here was obtained from available literature. Diets of given species in the White Oak Creek watershed may vary somewhat from those reported in the literature from other areas.

- The air mass loading factor of 0.1 g/m^3 used in estimating exposures from inhalation of radionuclide-contaminated dust was selected as a conservative value. Healy (1980) suggested 0.0001 g/m^3 would be a conservative value for estimating human exposures from inhalation of dust.

- Monte Carlo simulation were not performed for radionuclide exposures. Therefore, exposure estimates assume that UCL95 activity levels represent the activities to which organisms were exposed. This is a conservative assumption and likely results in overestimates of exposures, particularly for wide-ranging wildlife species that average their exposures over larger areas than individual subbasins.

Table 9.1. Species-specific exposure parameters used in estimating wildlife exposures to radionuclides

Receptor Species	% Dietary composition										
	plants	inverts	small mammals	birds	fish	soil[a]	Soil above grd[b]	Soil below grd[c]	ECF[d]	Water immersion[e]	water surface[f]
mink	0	0	0.454	0	0.546	0	0.5	0.2	2	0.1	0.2
belted kingfisher	0	0	0	0	1	0	0.33	0.33	1	0	0.33
short-tailed shrew	0	1	0	0	0	0.13	0.75	0.25	2		
white-footed mouse	0.5	0.5	0	0	0	0.02	0.75	0.25	2		
red fox	0.104	0.088	0.688	0.12	0	0.028	0.75	0.25	1		
white-tailed deer	1	0	0	0	0	0.02	1	0	1		
red-tailed hawk	0	0	1	0	0	0	0.1	0	1		
turkey	0.903	0.097	0	0	0	0.093	1	0	1		
Osprey	0	0	0	0	1	0	0.9	0	1	0	0.1
Heron	0	0	0	0	1	0	0.5	0	1	0.25	0.25
Otter	0	0	0	0	1	0	0.25	0.25	2	0.25	0.25

[a] Soil ingetion as a percentage of overall dietary intake.

[b] Dose rate reduction factor accounting for the fraction of time the receptor spends above ground (unitless).

[c] Dose rate reduction factor accounting for the fraction of time the receptor spends below ground (unitless).

[d] Elevation correction factor to adjust dose coefficients derived for 1 m height to value representative of effective height of animal above ground.

[e] Fraction of time organism spends underwater (unitless).

[f] Fraction of time organism spends at or just above water (unitless).

Table 9.2 Average energy of decay and absorbed fractions for radionuclides detected in soil in the WOCW

Radionuclide	Average energy of decay[a] alpha	beta	gamma	Absorbed fractions (gamma)[b] A	B	C	D	E	DFgrd 0-15 (Sv m3/s Bq)[c]
Actinium-228		0.475	0.971	0.06	0.01	0.0127	0.04	0.14	2.76E-17
Americium-241	5.479	0.052	0.033	0.16	0.04	0.05	0.12	0.3	2.34E-19
Antimony-126		0.283	2.834	0.04	0.008	0.01	0.03	0.11	8.13E-17
Antimony-126m		0.591	1.548	0.05	0.085	0.0123	0.03	0.12	4.44E-17
Astatine-218	6.697	0.04	0.007	0.94	0.63	0.79	0.94	0.94	3.13E-20
Barium-137m		0.065	0.597	0.06	0.011	0.015	0.04	0.15	1.71E-17
Beryllium-7			0.049	0.09	0.012	0.017	0.06	0.2	1.40E-18
Bismuth-210		0.389							1.86E-20
Bismuth-211	6.55	0.01	0.047	0.15	0.027	0.04	0.11	0.29	1.28E-18
Bismuth-212	2.174	0.472	0.186	0.06	0.0085	0.011	0.04	0.14	5.36E-18
Bismuth-214		0.659	1.508	0.05	0.085	0.0123	0.03	0.12	4.36E-17
Cadmium-109		0.083	0.026	0.21	0.09	0.126	0.16	0.36	7.88E-20
Calcium-45		0.077							3.35E-22
Carbon-14		0.049							7.20E-23
Cesium-134		0.164	1.555	0.05	0.085	0.0123	0.03	0.12	4.47E-17
Cesium-137		0.187							3.94E-21
Cobalt-57		0.019	0.125	0.06	0.0079	0.012	0.04	0.15	2.66E-18
Cobalt-60		0.097	2.504	0.04	0.008	0.01	0.03	0.11	7.25E-17
Curium-242	6.102	0.01	0.002	0.94	0.63	0.79	0.94	0.94	9.07E-22
Curium-243	5.797	0.138	0.134	0.06	0.008	0.0105	0.04	0.15	3.02E-18
Curium-244	5.795	0.009	0.002	0.94	0.63	0.79	0.94	0.94	6.74E-22
Europium-152		0.139	1.155	0.05	0.085	0.0123	0.03	0.12	3.75E-17
Europium-154		0.292	1.242	0.05	0.085	0.0123	0.03	0.12	4.11E-17
Europium-155		0.063	0.061	0.09	0.012	0.017	0.06	0.2	9.75E-19
Iodine-129		0.064	0.025	0.21	0.09	0.126	0.16	0.36	6.93E-20
Lead-212		0.176	0.148	0.06	0.0082	0.011	0.04	0.15	3.62E-18
Lead-214		0.293	0.25	0.06	0.009	0.01	0.04	0.14	6.70E-18
Neptunium-237	4.769	0.07	0.035	0.15	0.027	0.04	0.11	0.29	4.16E-19
Plutonium-238	5.487	0.011	0.002	0.94	0.63	0.79	0.94	0.94	8.07E-22
Plutonium-239	5.148	0.007		0.94	0.63	0.79	0.94	0.94	1.52E-21
Plutonium-239/40	5.148	0.007	0.002	0.94	0.63	0.79	0.94	0.94	1.52E-21
Plutonium-240	5.156	0.011	0.002	0.94	0.63	0.79	0.94	0.94	7.84E-22
Polonium-210		0.038	0.005	0.94	0.63	0.79	0.94	0.94	2.45E-22
Polonium-211	7.442		0.008	0.94	0.63	0.79	0.94	0.94	2.24E-19
Polonium-212	8.785								3.62E-18
Polonium-214	7.687								2.40E-21
Polonium-216	6.779								4.87E-22
Polonium-218	6.001								2.63E-22
Potassium-40		0.523	0.156	0.06	0.008	0.0115	0.04	0.14	4.57E-18
Protactinium-233		0.196	0.204	0.06	0.009	0.01	0.04	0.14	5.16E-18
Protactinium-234		0.494	1.919	0.05	0.085	0.0123	0.03	0.12	5.38E-17
Protactinium-234m		0.822	0.012	0.93	0.55	0.63	0.93	0.93	4.20E-19
Radium-223	5.667	0.076	0.134	0.06	0.008	0.0105	0.04	0.15	3.10E-18
Radium-224	5.674	0.002	0.01	0.35	0.63	0.79	0.29	0.52	2.62E-19

Table 9.2 (continued)

Radionuclide	Average energy of decay[a] alpha	beta	gamma	Absorbed fractions (gamma)[b] A	B	C	D	E	DFgrd 0-15 (Sv m3/s Bq)[c]
Radium-226	4.774	0.004	0.007	0.94	0.63	0.79	0.94	0.94	1.65E-19
Radium-228		0.017							0.00E+00
Radon-220	6.288								1.10E-20
Radon-222	5.489								1.14E-20
Sodium-22		0.194	2.193	0.05	0.085	0.0123	0.03	0.12	6.31E-17
Strontium-90		0.196							3.72E-21
Technetium-99		0.101							6.70E-22
Thallium-207		0.493	0.002	0.94	0.63	0.79	0.94	0.94	9.48E-20
Thallium-208		0.598	3.375	0.04	0.008	0.01	0.03	0.11	9.68E-17
Thorium-228	5.4	0.021	0.003	0.94	0.63	0.79	0.94	0.94	4.17E-20
Thorium-230	4.671	0.015	0.002	0.94	0.63	0.79	0.94	0.94	6.39E-21
Thorium-231		0.165	0.026	0.21	0.09	0.126	0.16	0.36	1.94E-19
Thorium-232	3.996	0.012	0.001	0.94	0.63	0.79	0.94	0.94	2.78E-21
Thorium-234		0.06	0.009	0.94	0.63	0.79	0.94	0.94	1.29E-19
Tin-126		0.172	0.057	0.09	0.012	0.017	0.06	0.2	7.90E-19
Tritium		0.006							0
Uranium-232	5.302	0.017	0.002	0.94	0.63	0.79	0.94	0.94	4.83E-21
Uranium-233	4.817	0.006	0.001	0.94	0.63	0.79	0.94	0.94	7.24E-21
Uranium-233/234	4.817	0.006	0.001	0.94	0.63	0.79	0.94	0.94	7.24E-21
Uranium-234	4.758	0.013	0.002	0.94	0.63	0.79	0.94	0.94	2.14E-21
Uranium-235	4.396	0.049	0.156	0.06	0.008	0.0115	0.04	0.14	3.75E-18
Uranium-235/236	4.396	0.049	0.156	0.06	0.008	0.0115	0.04	0.14	3.75E-18
Uranium-236	4.396	0.049	0.156	0.06	0.008	0.0115	0.04	0.14	3.75E-18
Uranium-238	4.187	0.01	0.001	0.94	0.63	0.79	0.94	0.94	5.52E-22
Yttrium-90		0.935							1.20E-19
Zirconium-89		0.101	1.165	0.05	0.085	0.0123	0.03	0.12	3.85E-17

[a] Values were obtained from ICRP (1983)

[b] Absorbed fractions for worms, plants, and mouse were derived from data in Blaylock et al. (1993). Absorbed fraction for other receptors were derived following methodology of Cristy and Eckerman (1987). Absorbed fractions for beta radiation were 100% for all radinoclides listed.

[c] DFgrad is the dose coefficient for soil 0-15 cm in depth (Eckerman and Ryman, 1993).

A = Fox, Turkey, Heron, Otter

B = Worms, Plants

C = Shrew, Mouse

D = Mink, Hawk, Kingfisher, Osprey

E = Deer

Table 9.3a. Average energy of decay and absorbed fractions for radionuclides detected in surface water used to evaluate exposures for aquatic organisms in the WOCW

	BCF (L/kg)[a]		Energies (MeV/nt)[b]			Gamma Absorption[c]	
Radionuclide	Fish	Inverts	alpha	beta	gamma	B	D
Actinium-225	25	25	5.787	0.022	0.018	0.33	0.75
Actinium-228	25	25		0.475	0.971	0.01	0.1
Americium-237	30	1000	0.002	0.077	0.37	0.01	0.09
Americium-241	30	1000	5.479	0.052	0.033	0.04	0.4
Americium-242	30	1000		0.179	0.018	0.33	0.75
Americium-243	30	1000	5.27	0.022	0.056	0.0125	0.15
Antimony-125	1	10		0.1	0.431	0.01	0.1
Antimony-122	1	10		0.565	0.441	0.01	0.1
Antimony-126	100	100		0.283	2.834	0.0081	0.08
Antimony-126m	100	100		0.591	1.548	0.009	0.08
Astatine-217			7.067				
Astatine-218			6.697	0.04	0.007	0.63	0.94
Barium-137m	4	200		0.065	0.597	0.011	0.11
Bismuth-210	20	100000		0.389			
Bismuth-212	20	100000	2.174	0.472	0.186	0.0085	0.12
Bismuth-213	20	100000	0.126	0.442	0.133	0.008	0.12
Bismuth-214	20	100000		0.659	1.508	0.01	0.08
Cadmium-109	2000	2000		0.083	0.026	0.14	0.58
Calcium-45	40	40		0.077			
Carbon-14	4550	3640		0.049			
Cerium-139	30	30		0.036	0.16	0.008	0.12
Cerium-141	30	1000		0.171	0.076	0.009	0.12
Cerium-143	30	1000		0.433	0.282	0.01	0.08
Cerium-144	30	1000		0.092	0.021	0.14	0.58
Cesium-134	2000	1000		0.164	1.555	0.009	0.08
Cesium-137	2000	1000		0.187			
Cobalt-57	300	10000		0.019	0.125	0.0079	0.11
Cobalt-58	300	10000		0.034	0.976	0.01	0.1
Cobalt-60	300	10000		0.097	2.504	0.0081	0.08
Curium-242	30	1000	6.102	0.01	0.002	0.63	0.94
Curium-242/243	30	1000					
Curium-243	30	1000	5.797	0.138	0.134	0.008	0.12
Curium-244	30	1000	5.795	0.009	0.002	0.63	0.94
Curium243/244	30	1000					
Europium-152	50	50		0.139	1.155	0.01	0.08
Europium-154	50	50		0.292	1.242	0.01	0.08
Europium-155	50	50		0.063	0.061	0.01	0.1
Francium-221			6.304	0.01	0.031	0.045	0.42
Holmium-166				0.695	0.029	0.063	0.58
Iodine-123	40	400		0.028	0.172	0.008	0.12
Iodine-125	40	400		0.019	0.042	0.0149	0.2
Iodine-129	40	400		0.064	0.025	0.11	0.58
Iron-55	100	3000		0.004	0.002	0.63	0.94
Lead-205	300	100		0.007	0.002	0.63	0.94
Lead-209	300	100		0.198			

Table 9.3a. (Continued)

Radionuclide	BCF (L/kg)[a] Fish	Inverts	Energies (MeV/nt)[b] alpha	beta	gamma	Gamma Absorption[c] B	D
Lead-210	300	100		0.038	0.005	0.63	0.94
Lead-212	300	100		0.176	0.148	0.0082	0.12
Lead-214	300	100		0.293	0.25	0.009	0.09
Neptunium-233	10	400		0.014	0.091	0.0079	0.06
Neptunium-237	10	400	4.769	0.07	0.035	0.027	0.3
Neptunium-239	10	400		0.26	0.173	0.008	0.12
Niobium-95	300	300		0.044	0.766	0.01	0.1
Niobium-95	300	300		0.166	0.068	0.01	0.1
Nickel-63	100	100		0.017			
Plutonium-237	4	100		0.016	0.052	0.0125	0.16
Plutonium-238	4	100	5.487	0.011	0.002	0.63	0.94
Plutonium-239	4	100	5.148	0.007			
Plutonium-239/40	4	100		0.007			
Plutonium-240	4	100	5.156	0.011	0.002	0.63	0.94
Plutonium-241	4	100		0.005			
Plutonium-242	4	100	4.891	0.009	0.001	0.63	0.94
Polonium-210	50	20000	5.297				
Polonium-212	50	20000	8.785				
Polonium-213	50	20000	8.376				
Polonium-214	50	20000	7.687				
Polonium-216	50	20000	6.779				
Polonium-218	50	20000	6.001				
Potassium-40				0.523	0.156	0.008	0.12
Praseodymium-143	100	100		0.314			
Praseodymium-144	100	100		1.208	0.032	0.04	0.35
Praseodymium-144	100	100		0.047	0.013	0.39	0.925
Promethium-145	30	3000		0.014	0.031	0.04	0.35
Promethium-147	30	3000		0.062			
Protactinium-233	10	100		0.196	0.204	0.009	0.09
Protactinium-234	10	100		0.494	1.919	0.085	0.08
Protactinium-234m	10	100		0.822	0.012	0.55	0.93
Protactinium-234m	10	100		0.822	0.012	0.55	0.93
Radium-224	50	300	5.674	0.002	0.01	0.63	0.94
Radium-225	50	300		0.107	0.014	0.39	0.925
Radium-226	50	300	4.774	0.004	0.007	0.63	0.94
Radium-228	50	300		0.017			
Radon-219	410	410	6.757	0.006	0.056	0.0125	0.15
Radon-220	410	410	6.288				
Radon-222	410	410	5.489				
Rhodium-103m	10	10		0.038	0.002	0.63	0.94
Rhodium-106	10	10		1.413	0.205	0.009	0.09
Ruthenium-103	10	300		0.075	0.469	0.01	0.1
Ruthenium-106	10	300		0.01			
Samarium-153	25	25		0.273	0.062	0.01	0.1
Sodium-22	20	20		0.194	2.193	0.0082	0.08
Strontium-89	60	300		0.583			

Table 9.3a. (Continued)

Radionuclide	BCF (L/kg)[a] Fish	Inverts	Energies (MeV/nt)[b] alpha	beta	gamma	Gamma Absorption[c] B	D
Strontium-90	60	300		0.196			
Technetium-99	20	5		0.101			
Tellurium-123	400	6000		0.006	0.02	0.156	0.58
Tellurium-123m	400	6000		0.099	0.148	0.0082	0.12
Tellurium-125m	400	6000		0.109	0.036	0.026	0.28
Thallium-208	10000	10000		0.598	3.375	0.008	0.08
Thallium-209	10000	10000		0.688	2.032	0.0082	0.08
Thorium-228	30	500	5.4	0.021	0.003	0.63	0.94
Thorium-229	30	500	4.873	0.116	0.096	0.0079	0.09
Thorium-230	30	500	4.671	0.015	0.002	0.63	0.94
Thorium-231	30	500		0.165	0.026	0.09	0.58
Thorium-232	30	500	3.996	0.012	0.001	0.63	0.94
Thorium-234	30	500		0.06	0.009	0.63	0.94
Tin-119m	3000	3000		0.078	0.011	0.58	0.94
Tin-121	3000	3000		0.114			
Tin-121m	3000	3000		0.035	0.005	0.63	0.94
Tritium	1	1		0.006			
Uranium-232	10	100	5.302	0.017	0.002	0.63	0.94
Uranium-232/233	10	100	5.302	0.017	0.002	0.63	0.94
Uranium-233	10	100	4.817	0.006	0.001	0.63	0.94
Uranium-233/234	10	100	4.817	0.006	0.001	0.63	0.94
Uranium-234	10	100	4.758	0.013	0.002	0.63	0.94
Uranium-234/235	10	100	4.758	0.013	0.002	0.63	0.94
Uranium-235	10	100	4.396	0.049	0.156	0.008	0.12
Uranium-235/236	10	100	4.396	0.049	0.156	0.008	0.12
Uranium-236	10	100	4.505	0.011	0.002	0.63	0.94
Uranium-237	10	100		0.196	0.143	0.0081	0.12
Uranium-238	10	100	4.187	0.01	0.001	0.63	0.94
Yttrium-90	30	1000		0.935			
Zinc-65	100	100		0.007	0.584	0.01	0.1
Zirconium-95	300	300		0.116	0.739	0.01	0.1

[a] BCF, bioconcentration factor, obtained from IAEA (1982) and Blaylock et al . (1993).

[b] Energies were obtained from Eckerman and Rayman (1993).

[c] Gamma absorption factors were derived from Blaylock et al. (1993).

B = Large insect

D = Large fish

MeV/nt = million electronvolts/disintegration

Table 9.3b Average energy of decay and absorbed fractions for radionuclides detected surface water used to evaluate piscivore exposures in the WOCW

Radionuclide	Energies (MeV/nt)[a] alpha	beta	gamma	Gamma Absorption[b] A	B	DFwat (Sv m3/s Bq)[c]	Fish BCF (L/kg)[d]	BAFs Mammal Food-to-tissue
Actinium-228		0.475	0.971	0.06	0.04	1.04E-16	25	0.000025
Americium-241	5.479	0.052	0.033	0.16	0.12	1.88E-18	30	0.002
Antimony-126		0.283	2.834	0.04	0.03	2.99E-16	100	
Antimony-126m		0.591	1.548	0.05	0.03	1.63E-16	100	
Astatine-218	6.697	0.04	0.007	0.94	0.94	2.75E-19		
Barium-137m		0.065	0.597	0.06	0.04	6.26E-17	4	
Beryllium-7			0.049	0.09	0.06	5.15E-18		
Bismuth-210		0.389				6.33E-20	20	0.02
Bismuth-211	6.55	0.01	0.047	0.13	0.11	4.85E-18	20	0.02
Bismuth-212	2.174	0.472	0.186	0.06	0.04	2.00E-17	20	0.02
Bismuth-214		0.659	1.508	0.05	0.03	1.66E-16	20	0.02
Cadmium-109		0.083	0.026	0.21	0.16	6.77E-19	2000	
Calcium-45		0.077				1.68E-21	40	0.1
Carbon-14		0.049				4.39E-22	4550	1
Cesium-134		0.164	1.555	0.05	0.03	1.64E-16	2000	2.5
Cesium-137		0.187				1.49E-20	2000	2.5
Cobalt-57		0.019	0.125	0.06	0.04	1.25E-17	300	1.5
Cobalt-60		0.097	2.504	0.04	0.03	2.74E-16	300	1.5
Curium-242	6.102	0.01	0.002	0.94	0.94	1.33E-20	30	0.001
Curium-243	5.797	0.138	0.134	0.06	0.04	1.30E-17	30	0.001
Curium-244	5.795	0.009	0.002	0.94	0.94	1.15E-20	30	0.001
Europium-152		0.139	1.155	0.05	0.03	1.23E-16	50	0.25
Europium-154		0.292	1.242	0.05	0.03	1.33E-16	50	0.25
Europium-155		0.063	0.061	0.09	0.06	5.61E-18	50	0.25
Europium-156		0.423	1.329	0.05	0.03	1.46E-16	50	0.25
Iodine-129		0.064	0.025	0.21	0.16	8.91E-19	40	2
Lead-212		0.176	0.148	0.06	0.04	1.52E-17	300	0.02
Lead-214		0.293	0.25	0.06	0.04	2.59E-17	300	0.02
Neptunium-237	4.769	0.07	0.035	0.15	0.11	2.32E-18	10	0.00384
Plutonium-238	5.487	0.011	0.002	0.94	0.94	1.14E-20	4	0.0005
Plutonium-239	5.148	0.007		0.94	0.94	9.60E-21	4	0.0005
Plutonium-239/40	5.148	0.007	0.002	0.94	0.94	1.04E-20	4	0.0005
Plutonium-240	5.156	0.011	0.002	0.94	0.94	1.11E-20	4	0.0005
Polonium-210		0.038	0.005	0.94	0.94	9.03E-22	50	
Polonium-211	7.442		0.008	0.94	0.94		50	
Polonium-212	8.785					0	50	
Polonium-214	7.687					8.85E-21	50	
Polonium-216	6.779					1.80E-21	50	
Polonium-218	6.001					9.71E-22	50	
Potassium-40		0.523	0.156	0.06	0.04	1.74E-17		1
Protactinium-233		0.196	0.204	0.06	0.04	2.05E-17	10	0.05
Protactinium-234		0.494	1.919	0.05	0.03	2.03E-16	10	0.05
Protactinium-234m		0.822	0.012	0.93	0.93	1.52E-18	10	0.05
Radium-223	5.667	0.076	0.134	0.06	0.04	1.35E-17	50	0.045

Table 9.3b (Continued)

Radionuclide	Energies (MeV/nt)[a] alpha	beta	gamma	Gamma Absorption[b] A	B	DFwat (Sv m3/s Bq)[c]	Fish BCF (L/kg)[d]	BAFs Mammal Food-to-tissue
Radium-224	5.674	0.002	0.01	0.35	0.29	1.03E-18	50	0.045
Radium-226	4.774	0.004	0.007	0.94	0.94	6.95E-19	50	0.045
Radium-228		0.017				0	50	0.045
Radon-220	6.288					4.03E-20	410	
Radon-222	5.489					4.16E-20	410	
Sodium-22		0.194	2.193	0.05	0.03	2.35E-16	20	4
Strontium-90		0.196				1.46E-20	60	0.4
Technetium-99		0.101				3.14E-21	20	0.0005
Thallium-207		0.493	0.002	0.94	0.94	3.38E-19	10000	2
Thallium-208		0.598	3.375	0.04	0.03	3.84E-16	10000	2
Thorium-228	5.4	0.021	0.003	0.94	0.94	2.05E-19	30	0.005
Thorium-230	4.671	0.015	0.002	0.94	0.94	3.94E-20	30	0.005
Thorium-231		0.165	0.026	0.21	0.16	1.18E-18	30	0.005
Thorium-232	3.996	0.012	0.001	0.94	0.94	1.99E-20	30	0.005
Thorium-234		0.06	0.009	0.94	0.94	7.64E-19	30	0.005
Tin-126		0.172	0.057	0.09	0.06	4.76E-18	3000	0.01
Tritium		0.006				0.00E+00	1	1
Uranium-232	5.302	0.017	0.002	0.94	0.94	3.22E-20	10	0.015
Uranium-233	4.817	0.006	0.001	0.94	0.94	3.64E-20	10	0.015
Uranium-233/234	4.817	0.006	0.001	0.94	0.94	2.695E-20	10	0.015
Uranium-234	4.758	0.013	0.002	0.94	0.94	1.75E-20	10	0.015
Uranium-235	4.396	0.049	0.156	0.06	0.04	1.59E-17	10	0.015
Uranium-235/236	4.396	0.049	0.156	0.06	0.04	1.59E-17	10	0.015
Uranium-236	4.396	0.049	0.156	0.06	0.04	1.16E-20	10	0.015
Uranium-238	4.187	0.01	0.001	0.94	0.94	7.95E-21	10	0.015
Yttrium-90		0.935				3.63E-19	30	
Zirconium-89		0.101	1.165	0.05	0.03	7.82E-17	300	

[a] Energies were obtained from Eckerman and Rayman (1993).

[b] Gamma absorption factors were derived from Blaylock et al. (1993).

[c] Dfwater is dose coefficient for external exposure to water (Ecferman and Rayman (1993).

[d] BCF, bioconcentration factor, obtained from IAEA (1982) and Blaylock et al . (1993).

A = Heron, Otter.

B = Mink, Kingfisher, Osprey.

Table 9.4 Soil-to-tissue and food-to-tissue radionuclide uptake factors used in food chain models

Radionuclide	Soil to Plant BTF* (wet wt.)	Ref	Soil to Worm BTF* (wet wt.)	Ref	BAFs for Mammal Soil-to-Tissue	Ref	BAFs for Mammal Food-to-tissue	Ref	BAFs for Bird Food-to-tissue	Ref
Actinium-228	0.0009		0.0009				0.000025		0.000025	
Americium-241	2.489	b	3.644	a	2.777	a	0.002	k	0.0042	k,m
Bismuth-212	0.00875	l,m	0.02	s			0.02	l	0.02	w
Bismuth-214	0.00875	l,m	0.02	s			0.02	l	0.02	w
Carbon-14	1						1		1	
Calcium-45	3.867	b,m	1.896	a,m	9.378	a,m	0.1	k	0.028	k,m
Curium-242	1.09		0.886		2.331		0.001		0.001	
Curium-243	1.09		0.886		2.331		0.001		0.001	
Curium-244	1.093	b	0.886	a	2.693	a	0.001	r	0.001	w
Cobalt-57	0.012	b,m	0.291	a,m	0.01	a,m	1.5	r	1.4	k,m
Cobalt-60	0.012	b,m	0.291	a,m	0.01	a,m	1.5	r	1.4	k,m
Cesium-134	0.011	t	0.015	a,n			2.5	k,m	7	k,m
Cesium-137	0.011	t	0.015	a			2.5	k,m	7	k,m
Europium-152	0.0105	t	0.25	s			0.25	l	0.25	w
Europium-154	0.0105	t	0.25	s			0.25	l	0.25	w
Europium-155	0.0105	t	0.25	s			0.25	l	0.25	w
Iodine-129	0.00034	t	2	s			2	k,m	0.007	k,m
Potassium-40	9.236	b,m	0.269	a	5.112	a,m	1	k	1	w
Lead-210	0.00019	t	0.078	a,m	0.045	a,m	0.02	k	0.02	w
Lead-212	0.00019	t	0.078	a,m	0.045	a,m	0.02	k	0.02	w
Lead-214	0.00019	t	0.078	a,m	0.045	a,m	0.02	k	0.02	w
Sodium-22	0.618	b,m	64.503	a,m	10.223	a,m	4	k	4	w
Neptunium-237	0.009	t	0.009	s			0.00384	i,m	0.00384	w
Protactinium-234m	0.000625	l,m	0.05	s			0.05	l	0.05	w
Plutonium-238	0.0003	t	2.5	a,n	6.467	a,n	0.0005	r	0.0021	k,m
Plutonium-239	0.0003	t	0.00912	j	6.467	a,n	0.0005	r	0.0021	k,m
Plutonium-239/40	5.2	b	2.5	a	6.467	a	0.0005	r	0.0021	k,m
Radium-223	0.00375	l,m	0.075	s			0.045	k	0.045	w
Radium-224	0.00375	l,m	0.075	s			0.045	k	0.045	w
Radium-226	0.00375	l,m	0.075	s			0.045	k	0.045	w
Radium-228	0.00375	l,m	0.075	s			0.045	k	0.045	w
Radon-219										

Table 9.4 (Continued)

Radionuclide	Soil to Plant BTF* (wet wt.)	Ref	Soil to Worm BTF* (wet wt.)	Ref	BAFs for Mammal Soil-to-Tissue	Ref	BAFs for Mammal Food-to-tissue	Ref	BAFs for Bird Food-to-tissue	Ref
Strontium-90	0.495	t	0.278	a,m	0.026	a,m	0.4	k	0.4	w
Technetium-99	76		76				0.0005		0.0005	
Thorium-228	0.0009	t	0.005	s	0.000032	c	0.005	r	0.005	w
Thorium-230	0.0009	t	0.005	s	0.000032	c	0.005	r	0.005	w
Thorium-232	0.0009	t	0.005	s	0.000032	c	0.005	r	0.005	w
Thorium-234	0.0009	t	0.005	s	0.000032	c	0.005	r	0.005	w
Thallium-208	0.001	l,m	2	s			2	l	2	w
Tin-126	0.3		0.3				0.01		0.01	
Tritium	1		1				1		1	
Uranium-232	1.965	t	0.063	a,m	0.00032	c	0.015	k	0.7	k,m
Uranium-233	1.965	t	0.063	a,m	0.00032	c	0.015	k	0.7	k,m
Uranium-233/234	1.965	t	0.063	a,m	0.00032	c	0.015	k	0.7	k,m
Uranium-234	1.965	t	0.063	a,m	0.00032	c	0.015	k	0.7	k,m
Uranium-234/235	1.965	t	0.063	a,m	0.00032	c	0.015	k	0.7	k,m
Uranium-235	1.965	t	0.063	a,m	0.00032	c	0.015	k	0.7	k,m
Uranium-235/236	1.965	t	0.063	a,m	0.00032	c	0.015	k	0.7	k,m
Uranium-238	1.965	t	0.063	a,m	0.00032	c	0.015	k	0.7	k,m

* Biotransfer factor

a = Sample et al. (1996b)

b = Efroymson et al. (1996b)

c = Garten et at., 1987

i = Trabalka and Garten, 1983

j = Garten and Dahlman, 1978

k = IAEA 1994

l = Baes et al., 1984

m = Elemental form of the Analyte was used for isotope.

r = NCRP 1989

s = Uptake factor for earthworms was unavailable. Used the larger of the plant BAFs and small mammal values.

t = surrogate maximum plant value was used

u = EPA 1990

w = surrogate mammal BAF was used

Ref = Source

Table 9.5. Equations for estimation of internal and external dose rates for aquatic organisms (Blaylock et al. 1993).

Estimation of internal dose rate:

	Radiation Type		
Receptor Type	α	β	γ
Small insects	$D_\alpha = 5.76*10^{-4}E_\alpha C_o$	$D_\beta = 5.76*10^{-4}E_\beta \Phi C_o$	$D_\gamma = 5.76*10^{-4}E_\gamma \Phi C_o$
Large insects	"	"	"
Small fish	"	"	"
Large fish	"	$D_\beta = 5.76*10^{-4}E_\beta C_o$	"

Estimation of external dose rate from water:

Receptor Type	α	β	γ
Small insects	ns	$D_\beta = 5.76*10^{-4}E_\beta(1-\Phi)C_w$	$D_\gamma = 5.76*10^{-4}E_\gamma (1-\Phi)C_w$
Large insects	ns	"	"
Small fish	ns	"	"
Large fish	ns	ns	"

Estimation of external dose rate from sediment:

Receptor Type	α	β	γ
Small insects	ns	$D_\beta = 2.88*10^{-4}E_\beta(1-\Phi)C_sR$	$D_\gamma = 2.88*10^{-4}E_\gamma (1-\Phi)C_sR$
Large insects	ns	"	"
Small fish	ns	"	"
Large fish	ns	ns	"

D_α = Dose rate for α-radiation (uGy/h) from radionuclide i.
D_β = Dose rate for β-radiation (uGy/h) from radionuclide i.
D_γ = Dose rate for γ-radiation (uGy/h) from radionuclide i.
E_α = Average energy of decay (MeV) for alpha particles from radionuclide I. Obtained from ICRP (1983).
E_β = Average energy of decay (MeV) for beta particles from radionuclide i. Obtained from ICRP (1983).
E_γ = Average energy of decay (MeV) for gamma particles from radionuclide i. Obtained from ICRP (1983).
Φ = Absorbed fraction of photon energy emitted by the source (unitless). Obtained from Blaylock et al. (1993).
C_o = Concentration of radionuclide in the organism (Bq/kg wet weight). Estimated by multiplying bioconcentration factors provided in Blaylock et al. (1993) by radionuclide activity in water.
C_w = Concentration of radionuclide in water (Bq/L)
C_s = Concentration of radionuclide in sediment (Bq/kg wet weight)
R = Fraction of time the organism spends at the sediment-water interface. Assumed 1 for small and large aquatic insects; assumed 0.5 for small and large fish.
ns = Exposure of organism to radiation of this type is not considered significant

Table 9.6a. Estimated radiation doses (mrad/d) from surface soil for soil invertebrates, plants, and short-tailed shrew at WOC

Radionuclide[a]	Soil Activity[b] (pCi/g)	Soil invertebrates Internal	Soil invertebrates External	Soil invertebrates Total	Plants Internal	Plants External	Plants Total	Short-tailed shrew Internal	Short-tailed shrew External	Short-tailed shrew Total
East Seep										
Actinium-228	7.80E-01	1.74E-05	6.06E-02	6.07E-02	1.74E-05	7.72E-03	7.73E-03	4.69E-07	2.18E-02	2.18E-02
Bismuth-214	7.90E-01	1.25E-01	9.20E-02	2.17E-01	5.47E-02	1.23E-02	6.70E-02	1.89E-02	3.45E-02	5.34E-02
Cesium-137	7.00E+05	1.37E+02	3.07E+04	3.08E+04	1.01E+02	4.08E+03	4.18E+03	3.34E+03	1.15E+04	1.48E+04
Cobalt-60	9.28E+00	1.62E-02	1.30E+00	1.31E+00	6.67E-04	2.41E-01	2.42E-01	5.81E-04	6.74E-01	6.75E-01
Lead-212	7.05E+00	4.41E+00	9.14E-01	5.33E+00	1.08E-02	1.17E-01	1.27E-01	2.55E+00	3.22E-01	2.87E+00
Lead-214	8.80E-01	3.80E-03	1.28E-01	1.32E-01	9.27E-06	1.59E-02	1.59E-02	2.12E-03	4.46E-02	4.67E-02
Plutonium-238	1.40E-02	1.97E-01	9.78E-06	1.97E-01	2.36E-05	4.05E-09	2.36E-05	5.09E-01	6.07E-09	5.09E-01
Plutonium-239/40	4.40E-02	5.80E-01	2.13E-05	5.80E-01	1.21E+00	2.40E-08	1.21E+00	1.50E+00	3.60E-08	1.50E+00
Potassium-40	2.53E+01	1.83E-01	9.24E-01	1.11E+00	6.27E+00	4.14E-02	6.31E+00	3.48E+00	1.15E-01	3.59E+00
Strontium-90	4.32E+01	6.95E-01	2.63E+00	3.32E+00	1.24E+00	1.92E-03	1.24E+00	6.51E-02	2.87E-03	6.80E-02
Thallium-208	2.16E+00	1.38E-01	4.61E-01	6.00E-01	6.91E-05	7.49E-02	7.50E-02	2.98E-01	2.10E-01	5.08E-01
Thorium-228	9.60E+00	1.57E+00	1.26E+00	2.84E+00	2.83E-01	1.60E-01	4.43E-01	1.66E-02	4.41E-01	4.58E-01
Thorium-230	8.30E-01	1.99E-02	7.59E-04	2.06E-02	3.57E-03	1.90E-06	3.58E-03	2.10E-04	2.85E-06	2.13E-04
Thorium-232	8.10E-01	1.67E-02	6.43E-02	8.10E-02	3.00E-03	8.01E-03	1.10E-02	1.76E-04	2.26E-02	2.28E-02
Thorium-234	3.45E+00	6.83E+01	1.02E-01	6.84E+01	2.13E+03	7.18E-04	2.13E+03	3.70E-01	1.08E-03	3.71E-01
Uranium-232	1.08E+01	3.69E+00	1.10E-02	3.71E+00	1.15E+02	1.87E-05	1.15E+02	2.00E-02	2.80E-05	2.00E-02
Uranium-233/234	2.08E+02	6.46E+01	7.83E-02	6.47E+01	2.02E+03	5.40E-04	2.02E+03	3.50E-01	8.10E-04	3.51E-01
Uranium-235	2.51E+00	7.12E-01	2.77E-02	7.40E-01	2.22E+01	3.37E-03	2.22E+01	3.85E-03	1.03E-02	1.42E-02
Uranium-238	1.05E+01	2.87E+00	5.19E-01	3.39E+00	8.94E+01	2.47E-03	8.94E+01	1.55E-02	5.94E-03	2.15E-02
Total		2.85E+02	3.07E+04	3.10E+04	4.48E+03	4.08E+03	8.56E+03	3.35E+03	1.15E+04	1.48E+04
Haw Ridge										
Cobalt-60	4.70E+00	8.20E-03	6.57E-01	6.65E-01	3.38E-04	1.22E-01	1.22E-01	2.94E-04	3.41E-01	3.42E-01
Cesium-137	2.00E+03	3.92E-01	8.77E+01	8.81E+01	2.87E-01	1.16E+01	1.19E+01	9.55E+00	3.27E+01	4.23E+01
Potassium-40	1.60E+01	1.16E-01	5.84E-01	7.00E-01	3.97E+00	2.62E-02	3.99E+00	2.20E+00	7.29E-02	2.27E+00
Total		5.15E-01	8.90E+01	8.95E+01	4.25E+00	1.18E+01	1.60E+01	1.17E+01	3.31E+01	4.49E+01
HF-2										
Cobalt-60	1.94E+02	3.38E-01	2.71E+01	2.75E+01	1.39E-02	5.04E+00	5.05E+00	1.21E-02	1.41E+01	1.41E+01

Table 9.6a. (continued)

Radionuclide[a]	Soil Activity[b] (pCi/g)	Soil invertebrates Internal	Soil invertebrates External	Soil invertebrates Total	Plants Internal	Plants External	Plants Total	Short-tailed shrew Internal	Short-tailed shrew External	Short-tailed shrew Total
Strontium-90	7.40E-02	1.19E-03	4.50E-03	5.69E-03	2.12E-03	3.28E-06	2.12E-03	1.12E-04	4.92E-06	1.16E-04
Thorium-228	1.40E+00	2.29E-01	1.84E-01	4.14E-01	4.13E-02	2.33E-02	6.46E-02	2.42E-03	6.43E-02	6.67E-02
Thorium-230	1.30E+00	3.11E-02	1.19E-03	3.23E-02	5.60E-03	2.98E-06	5.60E-03	3.29E-04	4.47E-06	3.33E-04
Thorium-232	1.40E+00	2.88E-02	1.11E-01	1.40E-01	5.19E-03	1.38E-02	1.90E-02	3.05E-04	3.90E-02	3.93E-02
Uranium-233/234	1.10E+00	3.42E-01	4.14E-04	3.42E-01	1.07E+01	2.85E-06	1.07E+01	1.85E-03	4.28E-06	1.85E-03
Uranium-235	1.10E-01	3.12E-02	1.21E-03	3.24E-02	9.74E-01	1.48E-04	9.74E-01	1.69E-04	4.52E-04	6.21E-04
Uranium-238	8.70E-01	2.38E-01	4.30E-02	2.81E-01	7.41E+00	2.05E-04	7.41E+00	1.29E-03	4.93E-04	1.78E-03
Total		1.24E+00	2.75E+01	2.87E+01	1.91E+01	5.08E+00	2.42E+01	1.86E-02	1.42E+01	1.42E+01
HFIR										
Cobalt-60	4.64E+00	8.09E-03	6.49E-01	6.57E-01	3.34E-04	1.21E-01	1.21E-01	2.91E-04	3.37E-01	3.37E-01
Cesium-137	5.07E+01	9.93E-03	2.22E+00	2.23E+00	7.28E-03	2.95E-01	3.03E-01	2.42E-01	8.29E-01	1.07E+00
Potassium-40	1.95E+01	1.41E-01	7.12E-01	8.53E-01	4.83E+00	3.19E-02	4.87E+00	2.68E+00	8.88E-02	2.77E+00
Strontium-90	2.50E+04	4.02E+02	1.52E+03	1.92E+03	7.17E+02	1.11E+00	7.18E+02	3.77E+01	1.66E+00	3.93E+01
Thorium-228	6.50E+01	1.06E+01	8.56E+00	1.92E+01	1.92E+00	1.08E+00	3.00E+00	1.12E-01	2.99E+00	3.10E+00
Uranium-234	3.50E+00	1.07E+00	2.82E-03	1.08E+00	3.35E+01	2.68E-06	3.35E+01	5.81E-03	4.03E-06	5.82E-03
Uranium-238	2.10E+00	5.73E-01	1.04E-01	6.77E-01	1.79E+01	4.95E-04	1.79E+01	3.10E-03	1.19E-03	4.29E-03
Total		4.15E+02	1.53E+03	1.95E+03	7.75E+02	2.64E+00	7.77E+02	4.07E+01	5.90E+00	4.66E+01
HFIR East										
Potassium-40	2.00E+01	1.44E-01	7.30E-01	8.74E-01	4.96E+00	3.28E-02	4.99E+00	2.75E+00	9.11E-02	2.84E+00
Total		1.44E-01	7.30E-01	8.74E-01	4.96E+00	3.28E-02	4.99E+00	2.75E+00	9.11E-02	2.84E+00
HRE										
Actinium-228	1.27E+00	2.84E-05	9.87E-02	9.88E-02	2.84E-05	1.26E-02	1.26E-02	7.64E-07	3.54E-02	3.54E-02
Bismuth-214	7.41E-01	1.17E-01	8.63E-02	2.04E-01	5.13E-02	1.16E-02	6.29E-02	1.77E-02	3.24E-02	5.01E-02
Cesium-137	3.84E+03	7.52E-01	1.68E+02	1.69E+02	5.51E-01	2.24E+01	2.29E+01	1.83E+01	6.28E+01	8.12E+01
Cobalt-60	4.35E-01	7.59E-04	6.08E-02	6.16E-02	3.13E-05	1.13E-02	1.13E-02	2.72E-05	3.16E-02	3.16E-02
Europium-154	1.25E+00	6.36E-03	1.03E-01	1.09E-01	2.67E-04	1.84E-02	1.87E-02	1.87E-03	4.85E-02	5.04E-02
Potassium-40	1.82E+01	1.31E-01	6.64E-01	7.96E-01	4.51E+00	2.98E-02	4.54E+00	2.50E+00	8.29E-02	2.58E+00

Table 9.6a. (continued)

Radionuclide[a]	Soil Activity[b] (pCi/g)	Soil invertebrates Internal	Soil invertebrates External	Soil invertebrates Total	Plants Internal	Plants External	Plants Total	Short-tailed shrew Internal	Short-tailed shrew External	Short-tailed shrew Total
Radium-226	1.03E+00	1.90E+00	1.51E-01	2.05E+00	9.50E-02	1.86E-02	1.14E-01	2.34E-01	5.23E-02	2.86E-01
Radium-228	1.37E+00	8.94E-05	1.25E-03	1.34E-03	4.47E-06		4.47E-06	1.10E-05		1.10E-05
Strontium-90	2.03E+02	3.27E+00	1.23E+01	1.56E+01	5.82E+00	9.00E-03	5.83E+00	3.06E-01	1.35E-02	3.19E-01
Thallium-208	4.39E-01	2.81E-02	9.38E-02	1.22E-01	1.40E-05	1.52E-02	1.52E-02	6.05E-02	4.28E-02	1.03E-01
Thorium-228	5.50E-01	9.01E-02	7.24E-02	1.62E-01	1.62E-02	9.16E-03	2.54E-02	9.52E-04	2.53E-02	2.62E-02
Thorium-230	1.30E-01	3.11E-03	1.19E-04	3.23E-03	5.60E-04	2.98E-07	5.60E-04	3.29E-05	4.47E-07	3.33E-05
Thorium-232	1.50E+00	3.09E-02	1.19E-01	1.50E-01	5.56E-03	1.48E-02	2.04E-02	3.26E-04	4.18E-02	4.22E-02
Thorium-234	2.56E+00	7.71E+00	2.48E-02	7.73E+00	2.40E+02	9.27E-04	2.40E+02	4.17E-02	2.55E-03	4.43E-02
Uranium-233/234	2.43E+01	7.55E+00	9.14E-03	7.56E+00	2.36E+02	6.31E-05	2.36E+02	4.09E-02	9.46E-05	4.10E-02
Uranium-235	5.55E-01	1.57E-01	6.12E-03	1.64E-01	4.91E+00	7.46E-04	4.91E+00	8.52E-04	2.28E-03	3.13E-03
Uranium-238	1.29E+00	3.52E-01	6.37E-02	4.16E-01	1.10E+01	3.04E-04	1.10E+01	1.91E-03	7.30E-04	2.64E-03
Total		2.21E+01	1.82E+02	2.04E+02	5.03E+02	2.25E+01	5.25E+02	2.15E+01	6.32E+01	8.48E+01
Intermediate Pond										
Americium-241	3.06E+01	6.26E+02	1.40E-01	6.26E+02	4.28E+02	2.57E-03	4.28E+02	4.77E+02	1.74E-02	4.77E+02
Curium-244	5.72E+00	3.01E+01	3.38E-03	3.01E+01	3.71E+01	1.38E-06	3.71E+01	9.14E+01	2.07E-06	9.14E+01
Cobalt-60	1.31E+01	2.28E-02	1.83E+00	1.85E+00	9.42E-04	3.40E-01	3.41E-01	8.20E-04	9.51E-01	9.52E-01
Cesium-137	6.35E+03	1.24E+00	2.79E+02	2.80E+02	9.12E-01	3.70E+01	3.79E+01	3.03E+01	1.04E+02	1.34E+02
Plutonium-238	2.20E+00	3.09E+01	1.54E-03	3.09E+01	3.71E-03	6.36E-07	3.71E-03	7.99E+01	9.54E-07	7.99E+01
Plutonium-239/40	9.49E+01	1.25E+03	4.59E-02	1.25E+03	2.60E+03	5.17E-05	2.60E+03	3.24E+03	7.75E-05	3.24E+03
Strontium-90	2.48E+02	3.99E+00	1.51E+01	1.91E+01	7.11E+00	1.10E-02	7.12E+00	3.74E-01	1.65E-02	3.90E-01
Technetium-99	4.66E+00	1.83E+00	2.53E-02	1.86E+00	1.83E+00	1.12E-06	1.83E+00	9.18E-04	1.68E-06	9.19E-04
Thorium-228	5.08E+00	8.32E-01	6.69E-01	1.50E+00	1.50E-01	8.46E-02	2.34E-01	8.79E-03	2.33E-01	2.42E-01
Thorium-230	1.86E+01	4.45E-01	1.70E-02	4.62E-01	8.01E-02	4.26E-05	8.01E-02	4.70E-03	6.39E-05	4.77E-03
Thorium-232	5.28E+00	1.09E-01	4.19E-01	5.28E-01	1.96E-02	5.22E-02	7.18E-02	1.15E-03	1.47E-01	1.48E-01
Uranium-233/234	3.89E+01	1.21E+01	1.46E-02	1.21E+01	3.77E+02	1.01E-04	3.77E+02	6.54E-02	1.51E-04	6.56E-02
Uranium-235	5.29E+00	1.50E+00	5.83E-02	1.56E+00	4.68E+01	7.11E-03	4.68E+01	8.12E-03	2.18E-02	2.99E-02
Uranium-238	1.24E+01	3.39E+00	6.13E-01	4.00E+00	1.06E+02	2.92E-03	1.06E+02	1.83E-02	7.02E-03	2.53E-02
Total		1.96E+03	2.97E+02	2.26E+03	3.61E+03	3.75E+01	3.64E+03	3.91E+03	1.05E+02	4.02E+03

Table 9.6a. (continued)

Radionuclide[a]	Soil Activity[b] (pCi/g)	Soil invertebrates Internal	Soil invertebrates External	Soil invertebrates Total	Plants Internal	Plants External	Plants Total	Short-tailed shrew Internal	Short-tailed shrew External	Short-tailed shrew Total
Lower WOC										
Americium-241	6.38E+00	1.31E+02	2.92E-02	1.31E+02	8.91E+01	5.35E-04	8.91E+01	9.95E+01	3.63E-03	9.95E+01
Curium-244	2.28E+00	1.20E+01	1.35E-03	1.20E+01	1.48E+01	5.51E-07	1.48E+01	3.64E+01	8.26E-07	3.64E+01
Cobalt-60	1.55E+01	2.70E-02	2.17E+00	2.19E+00	1.11E-03	4.03E-01	4.04E-01	9.71E-04	1.13E+00	1.13E+00
Cesium-137	8.68E+02	1.70E-01	3.81E+01	3.82E+01	1.25E-01	5.05E+00	5.18E+00	4.14E+00	1.42E+01	1.83E+01
Plutonium-238	1.14E+00	1.60E+01	7.97E-04	1.60E+01	1.92E-03	3.30E-07	1.92E-03	4.14E+01	4.95E-07	4.14E+01
Plutonium-239/40	4.51E+01	5.94E+02	2.18E-02	5.94E+02	1.24E+03	2.46E-05	1.24E+03	1.54E+03	3.69E-05	1.54E+03
Strontium-90	3.10E+01	4.99E-01	1.88E+00	2.38E+00	8.89E-01	1.37E-03	8.90E-01	4.67E-02	2.06E-03	4.88E-02
Technetium-99	1.47E+01	5.78E+00	7.98E-02	5.86E+00	5.78E+00	3.53E-06	5.78E+00	2.90E-03	5.29E-06	2.90E-03
Thorium-228	3.80E+00	6.22E-01	5.00E-01	1.12E+00	1.12E-01	6.33E-02	1.75E-01	6.58E-03	1.75E-01	1.81E-01
Thorium-230	4.84E+00	1.16E-01	4.42E-03	1.20E-01	2.08E-02	1.11E-05	2.08E-02	1.22E-03	1.66E-05	1.24E-03
Thorium-232	1.80E+00	3.71E-02	1.43E-01	1.80E-01	6.67E-03	1.78E-02	2.45E-02	3.92E-04	5.02E-02	5.06E-02
Uranium-233/234	4.94E+00	1.54E+00	1.86E-03	1.54E+00	4.79E+01	1.28E-05	4.79E+01	8.31E-03	1.92E-05	8.32E-03
Uranium-235	6.15E-01	1.75E-01	6.78E-03	1.81E-01	5.44E+00	8.27E-04	5.44E+00	9.44E-04	2.53E-03	3.47E-03
Uranium-238	2.10E+00	5.73E-01	1.04E-01	6.77E-01	1.79E+01	4.95E-04	1.79E+01	3.10E-03	1.19E-03	4.29E-03
Total		7.62E+02	4.30E+01	8.05E+02	1.42E+03	5.54E+00	1.42E+03	1.72E+03	1.56E+01	1.73E+03
MB-15										
Cobalt-60	4.20E+04	7.32E+01	5.87E+03	5.95E+03	3.02E+00	1.09E+03	1.09E+03	2.63E+00	3.05E+03	3.05E+03
Cesium-137	3.80E+02	7.44E-02	1.67E+01	1.67E+01	5.46E-02	2.21E+00	2.27E+00	1.81E+00	6.22E+00	8.03E+00
Total		7.33E+01	5.89E+03	5.96E+03	3.07E+00	1.09E+03	1.10E+03	4.44E+00	3.06E+03	3.06E+03
MV Drive										
Carbon-14	1.80E-01		4.74E-04	4.74E-04	4.52E-04	4.64E-09	4.52E-04	5.87E-05	6.97E-09	5.87E-05
Cobalt-60	1.20E+00	2.09E-03	1.68E-01	1.70E-01	8.63E-05	3.12E-02	3.13E-02	7.51E-05	8.72E-02	8.72E-02
Cesium-137	3.20E+02	6.27E-02	1.40E+01	1.41E+01	4.60E-02	1.86E+00	1.91E+00	1.53E+00	5.23E+00	6.76E+00
Potassium-40	1.20E+01	8.66E-02	4.38E-01	5.25E-01	2.97E+00	1.97E-02	2.99E+00	1.65E+00	5.46E-02	1.70E+00
Tritium	8.50E+00	2.61E-03	2.74E-03	5.35E-03	2.61E-03		2.61E-03	2.95E-03		2.95E-03
Total		1.54E-01	1.46E+01	1.48E+01	3.02E+00	1.91E+00	4.94E+00	3.18E+00	5.38E+00	8.56E+00

Table 9.6a. (continued)

Radionuclide[a]	Soil Activity[b] (pCi/g)	Soil invertebrates Internal	Soil invertebrates External	Soil invertebrates Total	Plants Internal	Plants External	Plants Total	Short-tailed shrew Internal	Short-tailed shrew External	Short-tailed shrew Total
NHF										
Americium-241	1.10E-01	2.25E+00	5.03E-04	2.25E+00	1.54E+00	9.23E-06	1.54E+00	1.71E+00	6.26E-05	1.71E+00
Carbon-14	2.07E+00		5.45E-03	5.45E-03	5.19E-03	5.34E-08	5.19E-03	6.75E-04	8.01E-08	6.75E-04
Cesium-137	1.40E-01	2.74E-05	6.14E-03	6.17E-03	2.01E-05	8.15E-04	8.35E-04	6.68E-04	2.29E-03	2.96E-03
Potassium-40	2.66E+01	1.92E-01	9.71E-01	1.16E+00	6.59E+00	4.36E-02	6.64E+00	3.65E+00	1.21E-01	3.77E+00
Plutonium-238	2.60E-01	3.65E+00	1.82E-04	3.65E+00	4.38E-04	7.52E-08	4.38E-04	9.45E+00	1.13E-07	9.45E+00
Plutonium-239/40	5.00E-02	6.59E-01	2.42E-05	6.59E-01	1.37E+00	2.72E-08	1.37E+00	1.70E+00	4.09E-08	1.70E+00
Radium-226	9.50E-01	1.75E+00	1.39E-01	1.89E+00	8.76E-02	1.72E-02	1.05E-01	2.16E-01	4.82E-02	2.64E-01
Radium-228	1.70E+00	1.11E-04	1.55E-03	1.66E-03	5.55E-06		5.55E-06	1.37E-05		1.37E-05
Strontium-90	9.10E-01	1.46E-02	5.53E-02	7.00E-02	2.61E-02	4.04E-05	2.61E-02	1.37E-03	6.05E-05	1.43E-03
Thorium-228	2.42E+00	3.96E-01	3.19E-01	7.15E-01	7.13E-02	4.03E-02	1.12E-01	4.19E-03	1.11E-01	1.15E-01
Thorium-230	1.28E+00	3.06E-02	1.17E-03	3.18E-02	5.51E-03	2.93E-06	5.51E-03	3.24E-04	4.40E-06	3.28E-04
Thorium-232	1.55E+00	3.19E-02	1.23E-01	1.55E-01	5.74E-03	1.53E-02	2.11E-02	3.37E-04	4.32E-02	4.36E-02
Tritium	7.99E+00	2.45E-03	2.58E-03	5.03E-03	2.45E-03		2.45E-03	2.77E-03		2.77E-03
Uranium-233/234	9.70E-01	3.01E-01	3.65E-04	3.02E-01	9.40E+00	2.52E-06	9.40E+00	1.63E-03	3.78E-06	1.63E-03
Uranium-235/236	8.00E-02	2.87E-01	1.46E-03	2.89E-01	8.97E+00	1.08E-04	8.97E+00	1.56E-03	3.29E-04	1.88E-03
Uranium-238	9.80E-01	2.68E-01	4.84E-02	3.16E-01	8.35E+00	2.31E-04	8.35E+00	1.45E-03	5.55E-04	2.00E-03
Total		9.84E+00	1.67E+00	1.15E+01	3.64E+01	1.18E-01	3.65E+01	1.68E+01	3.27E-01	1.71E+01
Pit 4 South										
Americium-241	1.10E-01	2.25E+00	5.03E-04	2.25E+00	1.54E+00	9.23E-06	1.54E+00	1.71E+00	6.26E-05	1.71E+00
Cobalt-60	2.34E+02	4.08E-01	3.27E+01	3.31E+01	1.68E-02	6.08E+00	6.10E+00	1.47E-02	1.70E+01	1.70E+01
Cesium-137	1.34E+01	2.62E-03	5.88E-01	5.90E-01	1.92E-03	7.80E-02	8.00E-02	6.40E-02	2.19E-01	2.83E-01
Plutonium-238	6.70E-03	9.41E-02	4.68E-06	9.41E-02	1.13E-05	1.94E-09	1.13E-05	2.43E-01	2.91E-09	2.43E-01
Plutonium-239/40	2.90E-02	3.82E-01	1.40E-05	3.82E-01	7.95E-01	1.58E-08	7.95E-01	9.89E-01	2.37E-08	9.89E-01
Strontium-90	1.00E+00	1.61E-02	6.08E-02	7.69E-02	2.87E-02	4.43E-05	2.87E-02	1.51E-03	6.65E-05	1.57E-03
Thorium-228	6.40E+00	1.05E+00	8.42E-01	1.89E+00	1.89E-01	1.07E-01	2.95E-01	1.11E-02	2.94E-01	3.05E-01
Thorium-230	1.20E+00	2.87E-02	1.10E-03	2.98E-02	5.17E-03	2.75E-06	5.17E-03	3.03E-04	4.12E-06	3.07E-04
Thorium-232	1.50E+00	3.09E-02	1.19E-01	1.50E-01	5.56E-03	1.48E-02	2.04E-02	3.26E-04	4.18E-02	4.22E-02
Uranium-233/234	8.50E+00	2.64E+00	3.20E-03	2.64E+00	8.24E+01	2.21E-05	8.24E+01	1.43E-02	3.31E-05	1.43E-02

Table 9.6a. (continued)

Radionuclide[a]	Soil Activity[b] (pCi/g)	Soil invertebrates Internal	Soil invertebrates External	Soil invertebrates Total	Plants Internal	Plants External	Plants Total	Short-tailed shrew Internal	Short-tailed shrew External	Short-tailed shrew Total
Uranium-235	9.80E-02	2.78E-02	1.08E-03	2.89E-02	8.67E-01	1.32E-04	8.67E-01	1.50E-04	4.03E-04	5.53E-04
Uranium-238	3.10E-01	8.46E-02	1.53E-02	1.00E-01	2.64E+00	7.30E-05	2.64E+00	4.58E-04	1.76E-04	6.33E-04
Total		7.01E+00	3.44E+01	4.14E+01	8.85E+01	6.28E+00	9.48E+01	3.05E+00	1.76E+01	2.06E+01
SWSA 5 Seep A										
Actinium-228	1.90E+00	4.24E-05	1.48E-01	1.48E-01	4.24E-05	1.88E-02	1.88E-02	1.14E-06	5.30E-02	5.30E-02
Americium-241	1.24E+00	2.54E+01	5.67E-03	2.54E+01	1.73E+01	1.04E-04	1.73E+01	1.93E+01	7.06E-04	1.93E+01
Bismuth-214	6.90E-01	1.09E-01	8.04E-02	1.90E-01	4.78E-02	1.08E-02	5.86E-02	1.65E-02	3.02E-02	4.66E-02
Calcium-45	3.00E+01	2.24E-01	1.24E-01	3.48E-01	4.57E-01	3.60E-06	4.57E-01	1.11E+00	5.40E-06	1.11E+00
Carbon-14	1.51E+00		3.98E-03	3.98E-03	3.79E-03	3.90E-08	3.79E-03	4.93E-04	5.84E-08	4.93E-04
Cesium-137	3.15E+00	6.17E-04	1.38E-01	1.39E-01	4.52E-04	1.83E-02	1.88E-02	1.50E-02	5.15E-02	6.66E-02
Iodine-129	3.40E+00	2.31E-02	1.63E-02	3.93E-02	3.92E-06	8.44E-05	8.84E-05	4.98E-02	1.27E-03	5.11E-02
Lead-212	1.90E+00	1.19E+00	2.46E-01	1.44E+00	2.90E-03	3.14E-02	3.43E-02	6.87E-01	8.67E-02	7.73E-01
Lead-214	9.80E-01	6.06E-01	1.43E-01	7.49E-01	1.48E-03	1.77E-02	1.91E-02	3.49E-01	4.97E-02	3.99E-01
Potassium-40	2.19E+01	1.58E-01	7.99E-01	9.58E-01	5.43E+00	3.59E-02	5.47E+00	3.01E+00	9.97E-02	3.11E+00
Plutonium-238	3.20E-01	4.50E+00	2.24E-04	4.50E+00	5.39E-04	9.26E-08	5.40E-04	1.16E+01	1.39E-07	1.16E+01
Plutonium-239/40	1.77E+00	2.33E+01	8.56E-04	2.33E+01	4.85E+01	9.64E-07	4.85E+01	6.03E+01	1.45E-06	6.03E+01
Radium-223	5.70E-01	2.48E-01	6.44E-03	2.55E-01	1.24E-02	6.33E-04	1.30E-02	3.06E-02	1.98E-03	3.26E-02
Radium-224	3.40E+00	6.94E+00	4.43E-01	7.38E+00	3.47E-01	5.66E-02	4.04E-01	8.56E-01	1.56E-01	1.01E+00
Radium-226	1.01E+00	1.86E+00	1.48E-01	2.01E+00	9.31E-02	1.83E-02	1.11E-01	2.30E-01	5.13E-02	2.81E-01
Radium-228	1.65E+00	1.08E-04	1.51E-03	1.62E-03	5.39E-06		5.39E-06	1.33E-05		1.33E-05
Radon-219	7.30E-01									
Strontium-90	1.33E+02	2.14E+00	8.09E+00	1.02E+01	3.81E+00	5.90E-03	3.82E+00	2.00E-01	8.85E-03	2.09E-01
Thorium-228	1.54E+00	2.52E-01	2.03E-01	4.55E-01	4.54E-02	2.56E-02	7.10E-02	2.66E-03	7.07E-02	7.34E-02
Thorium-230	1.65E+00	3.95E-02	1.51E-03	4.10E-02	7.10E-03	3.78E-06	7.11E-03	4.17E-04	5.67E-06	4.23E-04
Thorium-232	1.59E+00	3.27E-02	1.26E-01	1.59E-01	5.89E-03	1.57E-02	2.16E-02	3.46E-04	4.43E-02	4.47E-02
Thallium-208	1.40E+00	8.96E-02	2.99E-01	3.89E-01	4.48E-05	4.86E-02	4.86E-02	1.93E-01	1.36E-01	3.29E-01
Tin-126	1.80E-01	4.77E-04	2.22E-03	2.69E-03	4.77E-04	5.10E-05	5.28E-04	6.89E-06	2.14E-04	2.21E-04
Tritium	2.95E+02	9.06E-02	9.52E-02	1.86E-01	9.06E-02		9.06E-02	1.02E-01		1.02E-01
Uranium-232	1.50E-01	5.13E-02	1.53E-04	5.15E-02	1.60E+00	2.60E-07	1.60E+00	2.78E-04	3.89E-07	2.78E-04

Table 9.6a. (continued)

Radionuclide[a]	Soil Activity[b] (pCi/g)	Soil invertebrates Internal	External	Total	Plants Internal	External	Total	Short-tailed shrew Internal	External	Total
Uranium-233/234	5.65E+00	1.76E+00	2.13E-03	1.76E+00	5.48E+01	1.47E-05	5.48E+01	9.50E-03	2.20E-05	9.52E-03
Uranium-238	1.02E+00	2.78E-01	5.04E-02	3.29E-01	8.69E+00	2.40E-04	8.69E+00	1.51E-03	5.77E-04	2.08E-03
Total		6.93E+01	1.12E+01	8.05E+01	1.41E+02	3.05E-01	1.42E+02	9.82E+01	8.43E-01	9.90E+01
SWSA 5 Seep B West										
Americium-241	6.78E+00	1.39E+02	3.10E-02	1.39E+02	9.47E+01	5.69E-04	9.47E+01	1.06E+02	3.86E-03	1.06E+02
Carbon-14	2.77E+01		7.30E-02	7.30E-02	6.95E-02	7.15E-07	6.95E-02	9.04E-03	1.07E-06	9.04E-03
Curium-244	3.56E+01	1.87E+02	2.11E-02	1.87E+02	2.31E+02	8.60E-06	2.31E+02	5.69E+02	1.29E-05	5.69E+02
Cobalt-60	2.24E+02	3.91E-01	3.13E+01	3.17E+01	1.61E-02	5.82E+00	5.84E+00	1.40E-02	1.63E+01	1.63E+01
Cesium-137	1.37E+01	2.68E-03	6.01E-01	6.04E-01	1.97E-03	7.98E-02	8.18E-02	6.54E-02	2.24E-01	2.90E-01
Potassium-40	3.20E+01	2.31E-01	1.17E+00	1.40E+00	7.93E+00	5.24E-02	7.99E+00	4.40E+00	1.46E-01	4.54E+00
Plutonium-238	8.90E-01	1.25E+01	6.22E-04	1.25E+01	1.50E-03	2.57E-07	1.50E-03	3.23E+01	3.86E-07	3.23E+01
Plutonium-239/40	1.46E+00	1.92E+01	7.06E-04	1.92E+01	4.00E+01	7.95E-07	4.00E+01	4.98E+01	1.19E-06	4.98E+01
Radium-226	3.50E+00	6.45E+00	5.12E-01	6.97E+00	3.23E-01	6.33E-02	3.86E-01	7.95E-01	1.78E-01	9.73E-01
Radium-228	8.60E+00	5.61E-04	7.86E-03	8.42E-03	2.81E-05		2.81E-05	6.92E-05		6.92E-05
Strontium-90	1.03E+04	1.66E+02	6.26E+02	7.92E+02	2.95E+02	4.57E-01	2.96E+02	1.55E+01	6.85E-01	1.62E+01
Thorium-228	1.91E+00	3.13E-01	2.51E-01	5.64E-01	5.63E-02	3.18E-02	8.81E-02	3.30E-03	8.77E-02	9.10E-02
Thorium-230	1.23E+01	2.94E-01	1.12E-02	3.05E-01	5.30E-02	2.82E-05	5.30E-02	3.11E-03	4.23E-05	3.15E-03
Thorium-232	1.55E+00	3.19E-02	1.23E-01	1.55E-01	5.74E-03	1.53E-02	2.11E-02	3.37E-04	4.32E-02	4.36E-02
Tritium	1.90E+03	5.84E-01	6.13E-01	1.20E+00	5.84E-01		5.84E-01	6.60E-01		6.60E-01
Uranium-232	5.30E-01	1.81E-01	5.41E-04	1.82E-01	5.66E+00	9.17E-07	5.66E+00	9.81E-04	1.38E-06	9.82E-04
Uranium-233	1.05E+01	3.26E+00	3.95E-03	3.27E+00	1.02E+02	2.72E-05	1.02E+02	1.77E-02	4.09E-05	1.77E-02
Uranium-238	9.60E-01	2.62E-01	4.74E-02	3.10E-01	8.18E+00	2.26E-04	8.18E+00	1.42E-03	5.44E-04	1.96E-03
Total		5.35E+02	6.61E+02	1.20E+03	7.86E+02	6.52E+00	7.92E+02	7.78E+02	1.76E+01	7.96E+02
SWSA 5 Seep B East										
Actinium-228	1.10E+00	2.46E-05	8.55E-02	8.55E-02	2.46E-05	1.09E-02	1.09E-02	6.62E-07	3.07E-02	3.07E-02
Carbon-14	2.05E+00		5.40E-03	5.40E-03	5.14E-03	5.29E-08	5.14E-03	6.69E-04	7.93E-08	6.69E-04
Cesium-137	6.53E+03	1.28E+00	2.86E+02	2.88E+02	9.38E-01	3.80E+01	3.90E+01	3.12E+01	1.07E+02	1.38E+02
Barium-137m	6.20E+03	3.41E-01	2.21E+02	2.21E+02	2.50E-01	3.80E+01	3.83E+01	8.52E+00	1.07E+02	1.15E+02

Table 9.6a. (continued)

Radionuclide[a]	Soil Activity[b] (pCi/g)	Soil invertebrates Internal	Soil invertebrates External	Soil invertebrates Total	Plants Internal	Plants External	Plants Total	Short-tailed shrew Internal	Short-tailed shrew External	Short-tailed shrew Total
Lead-212	1.40E+00	8.77E-01	1.82E-01	1.06E+00	2.14E-03	2.32E-02	2.53E-02	5.06E-01	6.39E-02	5.70E-01
Lead-214	9.10E-01	5.63E-01	1.33E-01	6.95E-01	1.37E-03	1.64E-02	1.78E-02	3.24E-01	4.61E-02	3.70E-01
Potassium-40	1.95E+01	1.41E-01	7.12E-01	8.53E-01	4.83E+00	3.19E-02	4.87E+00	2.68E+00	8.88E-02	2.77E+00
Radium-226	1.10E+00	2.03E+00	1.61E-01	2.19E+00	1.01E-01	1.99E-02	1.21E-01	2.50E-01	5.59E-02	3.06E-01
Radium-228	1.10E+00	7.18E-05	1.01E-03	1.08E-03	3.59E-06		3.59E-06	8.85E-06		8.85E-06
Strontium-90	2.80E+01	4.51E-01	1.70E+00	2.15E+00	8.03E-01	1.24E-03	8.04E-01	4.22E-02	1.86E-03	4.41E-02
Thorium-228	1.50E+00	2.46E-01	1.97E-01	4.43E-01	4.42E-02	2.50E-02	6.92E-02	2.60E-03	6.89E-02	7.15E-02
Thorium-232	1.10E+00	2.27E-02	8.73E-02	1.10E-01	4.08E-03	1.09E-02	1.50E-02	2.39E-04	3.07E-02	3.09E-02
Thallium-208	1.40E+00	8.96E-02	2.99E-01	3.89E-01	4.48E-05	4.86E-02	4.86E-02	1.93E-01	1.36E-01	3.29E-01
Tritium	5.28E+01	1.62E-02	1.70E-02	3.33E-02	1.62E-02		1.62E-02	1.83E-02		1.83E-02
Total		6.05E+00	5.11E+02	5.17E+02	7.00E+00	7.62E+01	8.32E+01	4.37E+01	2.14E+02	2.58E+02
SWSA 5 Seep C										
Americium-241	1.10E+00	2.25E+01	5.03E-03	2.25E+01	1.54E+01	9.23E-05	1.54E+01	1.71E+01	6.26E-04	1.71E+01
Calcium-45	5.30E+02	3.96E+00	2.19E+00	6.16E+00	8.08E+00	6.36E-05	8.08E+00	1.96E+01	9.55E-05	1.96E+01
Carbon-14	4.55E+01		1.20E-01	1.20E-01	1.14E-01	1.17E-06	1.14E-01	1.48E-02	1.76E-06	1.48E-02
Curium-244	5.65E+00	2.97E+01	3.34E-03	2.97E+01	3.66E+01	1.36E-06	3.66E+01	9.03E+01	2.05E-06	9.03E+01
Cobalt-60	2.75E+00	4.80E-03	3.85E-01	3.89E-01	1.98E-04	7.15E-02	7.17E-02	1.72E-04	2.00E-01	2.00E-01
Cesium-137	4.30E+02	8.42E-02	1.89E+01	1.89E+01	6.18E-02	2.50E+00	2.57E+00	2.05E+00	7.03E+00	9.09E+00
Lead-212	3.81E-01	2.39E-01	4.94E-02	2.88E-01	5.81E-04	6.30E-03	6.88E-03	1.38E-01	1.74E-02	1.55E-01
Potassium-40	1.90E+01	1.37E-01	6.94E-01	8.31E-01	4.71E+00	3.11E-02	4.74E+00	2.61E+00	8.65E-02	2.70E+00
Plutonium-238	6.73E-01	9.45E+00	4.70E-04	9.45E+00	1.13E-03	1.95E-07	1.13E-03	2.45E+01	2.92E-07	2.45E+01
Plutonium-239/40	1.91E-01	2.52E+00	9.24E-05	2.52E+00	5.24E+00	1.04E-07	5.24E+00	6.51E+00	1.56E-07	6.51E+00
Radium-226	1.29E+00	2.38E+00	1.89E-01	2.57E+00	1.19E-01	2.33E-02	1.42E-01	2.93E-01	6.55E-02	3.59E-01
Radium-228	1.58E+00	1.03E-04	1.44E-03	1.55E-03	5.16E-06		5.16E-06	1.27E-05		1.27E-05
Strontium-90	1.58E+03	2.54E+01	9.61E+01	1.22E+02	4.53E+01	7.01E-02	4.54E+01	2.38E+00	1.05E-01	2.49E+00
Technetium-99	4.17E+00	1.64E+00	2.26E-02	1.66E+00	1.64E+00	1.00E-06	1.64E+00	8.21E-04	1.50E-06	8.23E-04
Thorium-228	1.88E+00	3.08E-01	2.47E-01	5.55E-01	5.54E-02	3.13E-02	8.67E-02	3.25E-03	8.63E-02	8.96E-02
Thorium-230	2.45E+00	5.86E-02	2.24E-03	6.08E-02	1.05E-02	5.61E-06	1.06E-02	6.19E-04	8.42E-06	6.28E-04
Thorium-232	1.73E+00	3.56E-02	1.37E-01	1.73E-01	6.41E-03	1.71E-02	2.35E-02	3.76E-04	4.82E-02	4.86E-02

Table 9.6a. (continued)

Radionuclide[a]	Soil Activity[b] (pCi/g)	Soil invertebrates Internal	External	Total	Plants Internal	External	Total	Short-tailed shrew Internal	External	Total
Tritium	5.52E+02	1.70E-01	1.78E-01	3.48E-01	1.70E-01		1.70E-01	1.92E-01		1.92E-01
Uranium-233/234	2.11E+00	6.56E-01	7.94E-04	6.57E-01	2.05E+01	5.48E-06	2.05E+01	3.55E-03	8.21E-06	3.56E-03
Uranium-235	1.80E-01	5.11E-02	1.98E-03	5.31E-02	1.59E+00	2.42E-04	1.59E+00	2.76E-04	7.40E-04	1.02E-03
Uranium-235/236	6.29E-02	4.96E-01	1.74E-03	4.98E-01	1.55E+01	8.49E-05	1.55E+01	2.68E-03	2.59E-04	2.94E-03
Uranium-238	1.77E+00	4.83E-01	8.74E-02	5.71E-01	1.51E+01	4.17E-04	1.51E+01	2.61E-03	1.00E-03	3.62E-03
Total		1.00E+02	1.19E+02	2.20E+02	1.70E+02	2.76E+00	1.73E+02	1.66E+02	7.65E+00	1.73E+02
SWSA 5 Trib 1										
Actinium-228	2.17E+00	4.85E-05	1.69E-01	1.69E-01	4.85E-05	2.15E-02	2.15E-02	1.31E-06	6.05E-02	6.05E-02
Americium-241	4.95E-01	1.01E+01	2.26E-03	1.01E+01	6.92E+00	4.15E-05	6.92E+00	7.72E+00	2.82E-04	7.72E+00
Bismuth-212	2.60E+00	1.17E-01	9.20E-02	2.09E-01	5.12E-02	4.99E-03	5.62E-02	1.77E-02	1.40E-02	3.17E-02
Bismuth-214	9.40E-01	1.49E-01	1.10E-01	2.58E-01	6.51E-02	1.47E-02	7.98E-02	2.25E-02	4.11E-02	6.35E-02
Carbon-14	8.00E-01		2.11E-03	2.11E-03	2.01E-03	2.06E-08	2.01E-03	2.61E-04	3.10E-08	2.61E-04
Cesium-134	4.00E-02	9.10E-06	3.70E-03	3.71E-03	6.67E-06	6.41E-04	6.47E-04	1.36E-04	1.80E-03	1.93E-03
Cobalt-60	9.11E+01	1.59E-01	1.27E+01	1.29E+01	6.55E-03	2.37E+00	2.37E+00	5.70E-03	6.62E+00	6.62E+00
Cesium-137	3.27E+03	6.40E-01	1.43E+02	1.44E+02	4.70E-01	1.90E+01	1.95E+01	1.56E+01	5.35E+01	6.91E+01
Curium-243	1.80E-01	9.48E-01	2.63E-03	9.50E-01	1.17E+00	1.95E-04	1.17E+00	2.49E+00	6.16E-04	2.49E+00
Iodine-129	5.70E+00	3.87E-02	2.73E-02	6.59E-02	6.57E-06	1.42E-04	1.48E-04	8.35E-02	2.13E-03	8.56E-02
Lead-212	1.24E+00	7.77E-01	1.61E-01	9.37E-01	1.89E-03	2.05E-02	2.24E-02	4.48E-01	5.66E-02	5.05E-01
Lead-214	1.13E+00	6.99E-01	1.65E-01	8.63E-01	1.70E-03	2.04E-02	2.21E-02	4.03E-01	5.73E-02	4.60E-01
Potassium-40	2.39E+01	1.73E-01	8.72E-01	1.04E+00	5.93E+00	3.91E-02	5.96E+00	3.28E+00	1.09E-01	3.39E+00
Plutonium-238	3.50E+00	4.92E+01	2.45E-03	4.92E+01	5.90E-03	1.01E-06	5.90E-03	1.27E+02	1.52E-06	1.27E+02
Radium-223	5.60E-01	2.44E-01	6.32E-03	2.50E-01	1.22E-02	6.22E-04	1.28E-02	3.01E-02	1.94E-03	3.20E-02
Radium-226	1.43E+00	2.64E+00	2.09E-01	2.85E+00	1.32E-01	2.59E-02	1.58E-01	3.25E-01	7.26E-02	3.98E-01
Radium-228	1.70E+00	1.11E-04	1.55E-03	1.66E-03	5.55E-06		5.55E-06	1.37E-05		1.37E-05
Strontium-90	2.60E+01	4.19E-01	1.58E+00	2.00E+00	7.45E-01	1.15E-03	7.46E-01	3.92E-02	1.73E-03	4.09E-02
Thorium-228	1.66E+00	2.72E-01	2.18E-01	4.90E-01	4.89E-02	2.76E-02	7.66E-02	2.87E-03	7.62E-02	7.91E-02
Thorium-230	9.36E-01	2.24E-02	8.55E-04	2.32E-02	4.03E-03	2.14E-06	4.03E-03	2.37E-04	3.22E-06	2.40E-04
Thorium-232	1.79E+00	3.69E-02	1.42E-01	1.79E-01	6.63E-03	1.77E-02	2.43E-02	3.89E-04	4.99E-02	5.03E-02
Thallium-208	1.50E+00	9.60E-02	3.20E-01	4.16E-01	4.80E-05	5.20E-02	5.21E-02	2.07E-01	1.46E-01	3.53E-01

Table 9.6a. (continued)

Radionuclide[a]	Soil Activity[b] (pCi/g)	Soil invertebrates Internal	Soil invertebrates External	Soil invertebrates Total	Plants Internal	Plants External	Plants Total	Short-tailed shrew Internal	Short-tailed shrew External	Short-tailed shrew Total
Thorium-234	7.30E+00	6.45E-03	8.56E-02	9.21E-02	6.35E-03	7.79E-03	1.41E-02	8.10E-05	2.16E-02	2.17E-02
Tin-126	4.60E-01	1.22E-03	5.66E-03	6.88E-03	1.22E-03	1.30E-04	1.35E-03	1.76E-05	5.48E-04	5.65E-04
Tritium	4.82E+00	1.48E-03	1.55E-03	3.04E-03	1.48E-03		1.48E-03	1.67E-03		1.67E-03
Uranium-233/234	4.00E+00	1.24E+00	1.51E-03	1.24E+00	3.88E+01	1.04E-05	3.88E+01	6.73E-03	1.56E-05	6.74E-03
Uranium-238	3.87E+00	1.06E+00	1.91E-01	1.25E+00	3.30E+01	9.11E-04	3.30E+01	5.72E-03	2.19E-03	7.91E-03
Total		6.90E+01	1.61E+02	2.30E+02	8.73E+01	2.17E+01	1.09E+02	1.58E+02	6.08E+01	2.19E+02
SWSA 5 WOC										
Actinium-228	1.80E+00	4.02E-05	1.40E-01	1.40E-01	4.02E-05	1.78E-02	1.78E-02	1.08E-06	5.02E-02	5.02E-02
Americium-241	1.58E-01	3.23E+00	7.22E-04	3.23E+00	2.21E+00	1.33E-05	2.21E+00	2.46E+00	9.00E-05	2.46E+00
Carbon-14	1.99E+00		5.24E-03	5.24E-03	4.99E-03	5.14E-08	4.99E-03	6.49E-04	7.70E-08	6.49E-04
Curium-244	1.51E-01	7.94E-01	8.93E-05	7.94E-01	9.79E-01	3.65E-08	9.79E-01	2.41E+00	5.47E-08	2.41E+00
Cobalt-60	5.34E+00	9.31E-03	7.47E-01	7.56E-01	3.84E-04	1.39E-01	1.39E-01	3.34E-04	3.88E-01	3.88E-01
Cobalt-57	2.30E+00	6.85E-04	1.78E-02	1.85E-02	2.82E-05	2.19E-03	2.22E-03	2.42E-05	7.15E-03	7.18E-03
Cesium-137	4.91E+02	9.62E-02	2.15E+01	2.16E+01	7.05E-02	2.86E+00	2.93E+00	2.34E+00	8.03E+00	1.04E+01
Curium-242	1.78E-02	9.86E-02	1.15E-05	9.86E-02	1.21E-01	5.79E-09	1.21E-01	2.59E-01	8.68E-09	2.59E-01
Lead-212	5.84E-01	3.66E-01	7.57E-02	4.41E-01	8.91E-04	9.66E-03	1.05E-02	2.11E-01	2.66E-02	2.38E-01
Lead-214	1.12E+00	6.92E-01	1.63E-01	8.56E-01	1.69E-03	2.02E-02	2.19E-02	3.99E-01	5.67E-02	4.56E-01
Potassium-40	1.57E+01	1.13E-01	5.73E-01	6.86E-01	3.89E+00	2.57E-02	3.92E+00	2.16E+00	7.15E-02	2.23E+00
Plutonium-238	2.90E-01	4.07E+00	2.03E-04	4.07E+00	4.89E-04	8.39E-08	4.89E-04	1.05E+01	1.26E-07	1.05E+01
Plutonium-239/40	2.22E-02	2.93E-01	1.07E-05	2.93E-01	6.09E-01	1.21E-08	6.09E-01	7.57E-01	1.81E-08	7.57E-01
Radium-226	1.21E+00	2.23E+00	1.77E-01	2.41E+00	1.12E-01	2.19E-02	1.33E-01	2.75E-01	6.14E-02	3.36E-01
Radium-228	2.10E+00	1.37E-04	1.92E-03	2.06E-03	6.85E-06		6.85E-06	1.69E-05		1.69E-05
Sodium-22	1.50E+00	1.88E+00	1.92E-01	2.08E+00	1.81E-02	3.39E-02	5.20E-02	1.73E-01	9.51E-02	2.69E-01
Strontium-90	6.69E+02	1.08E+01	4.07E+01	5.14E+01	1.92E+01	2.97E-02	1.92E+01	1.01E+00	4.45E-02	1.05E+00
Technetium-99	1.90E-01	7.47E-02	1.03E-03	7.57E-02	7.47E-02	4.56E-08	7.47E-02	3.74E-05	6.84E-08	3.75E-05
Thorium-228	1.50E+00	2.46E-01	1.97E-01	4.43E-01	4.42E-02	2.50E-02	6.92E-02	2.60E-03	6.89E-02	7.15E-02
Thorium-230	1.33E+00	3.18E-02	1.22E-03	3.30E-02	5.73E-03	3.05E-06	5.73E-03	3.36E-04	4.57E-06	3.41E-04
Thorium-232	1.30E+00	2.68E-02	1.03E-01	1.30E-01	4.82E-03	1.29E-02	1.77E-02	2.83E-04	3.63E-02	3.65E-02
Thallium-208	2.00E+00	1.28E-01	4.27E-01	5.55E-01	6.40E-05	6.94E-02	6.95E-02	2.76E-01	1.95E-01	4.70E-01

Table 9.6a. (continued)

Radionuclide[a]	Soil Activity[b] (pCi/g)	Soil invertebrates Internal	External	Total	Plants Internal	External	Total	Short-tailed shrew Internal	External	Total
Tritium	1.28E+01	3.93E-03	4.13E-03	8.06E-03	3.93E-03		3.93E-03	4.44E-03		4.44E-03
Uranium-233/234	9.76E-01	3.03E-01	3.67E-04	3.04E-01	9.46E+00	2.53E-06	9.46E+00	1.64E-03	3.80E-06	1.64E-03
Uranium-235	4.39E-02	1.25E-02	4.84E-04	1.29E-02	3.89E-01	5.90E-05	3.89E-01	6.74E-05	1.81E-04	2.48E-04
Uranium-235/236	1.11E-01	2.90E-01	1.79E-03	2.92E-01	9.05E+00	1.49E-04	9.05E+00	1.57E-03	4.57E-04	2.03E-03
Uranium-238	9.57E-01	2.61E-01	4.73E-02	3.09E-01	8.15E+00	2.25E-04	8.15E+00	1.41E-03	5.42E-04	1.96E-03
Total		2.60E+01	6.51E+01	9.11E+01	5.44E+01	3.27E+00	5.76E+01	2.33E+01	9.13E+00	3.24E+01
SWSA 4 Main										
Cesium-137	8.80E+04	1.72E+01	3.86E+03	3.88E+03	1.26E+01	5.12E+02	5.25E+02	4.20E+02	1.44E+03	1.86E+03
Potassium-40	1.30E+01	9.39E-02	4.75E-01	5.68E-01	3.22E+00	2.13E-02	3.24E+00	1.79E+00	5.92E-02	1.84E+00
Strontium-90	1.10E+04	1.77E+02	6.69E+02	8.46E+02	3.15E+02	4.88E-01	3.16E+02	1.66E+01	7.32E-01	1.73E+01
Tritium	6.70E+02	2.06E-01	2.16E-01	4.22E-01	2.06E-01		2.06E-01	2.33E-01		2.33E-01
Total		1.95E+02	4.53E+03	4.72E+03	3.31E+02	5.13E+02	8.44E+02	4.39E+02	1.44E+03	1.88E+03
SWSA 5 N WOC										
Actinium-228	2.10E+00	4.69E-05	1.63E-01	1.63E-01	4.69E-05	2.08E-02	2.08E-02	1.26E-06	5.86E-02	5.86E-02
Bismuth-212	1.90E+00	8.55E-02	6.72E-02	1.53E-01	3.74E-02	3.65E-03	4.11E-02	1.29E-02	1.02E-02	2.31E-02
Bismuth-214	8.10E-01	1.28E-01	9.44E-02	2.23E-01	5.61E-02	1.27E-02	6.87E-02	1.93E-02	3.54E-02	5.47E-02
Carbon-14	4.01E-01		1.06E-03	1.06E-03	1.01E-03	1.03E-08	1.01E-03	1.31E-04	1.55E-08	1.31E-04
Iodine-129	4.40E+00	2.98E-02	2.11E-02	5.09E-02	5.07E-06	1.09E-04	1.14E-04	6.44E-02	1.64E-03	6.61E-02
Lead-212	1.60E+00	1.00E+00	2.07E-01	1.21E+00	2.44E-03	2.65E-02	2.89E-02	5.78E-01	7.30E-02	6.51E-01
Lead-214	1.07E+00	6.62E-01	1.56E-01	8.17E-01	1.61E-03	1.93E-02	2.09E-02	3.81E-01	5.42E-02	4.36E-01
Potassium-40	3.08E+01	2.22E-01	1.12E+00	1.35E+00	7.64E+00	5.04E-02	7.69E+00	4.23E+00	1.40E-01	4.37E+00
Radium-226	9.50E-01	1.75E+00	1.39E-01	1.89E+00	8.76E-02	1.72E-02	1.05E-01	2.16E-01	4.82E-02	2.64E-01
Radium-228	2.10E+00	1.37E-04	1.92E-03	2.06E-03	6.85E-06		6.85E-06	1.69E-05		1.69E-05
Strontium-90	3.13E-01	5.04E-03	1.90E-02	2.41E-02	8.97E-03	1.39E-05	8.99E-03	4.72E-04	2.08E-05	4.92E-04
Thorium-228	2.00E+00	3.28E-01	2.63E-01	5.91E-01	5.90E-02	3.33E-02	9.23E-02	3.46E-03	9.19E-02	9.53E-02
Thorium-232	2.10E+00	4.32E-02	1.67E-01	2.10E-01	7.78E-03	2.08E-02	2.86E-02	4.57E-04	5.86E-02	5.90E-02
Thallium-208	1.80E+00	1.15E-01	3.84E-01	5.00E-01	5.76E-05	6.24E-02	6.25E-02	2.48E-01	1.75E-01	4.23E-01
Thorium-234	1.90E+00	4.71E-03	5.03E-02	5.50E-02	4.68E-03	5.59E-03	1.03E-02	5.92E-05	1.57E-02	1.58E-02

Table 9.6a. (continued)

Radionuclide[a]	Soil Activity[b] (pCi/g)	Soil invertebrates Internal	Soil invertebrates External	Soil invertebrates Total	Plants Internal	Plants External	Plants Total	Short-tailed shrew Internal	Short-tailed shrew External	Short-tailed shrew Total
Tin-126	3.40E-01	9.02E-04	4.19E-03	5.09E-03	9.02E-04	9.63E-05	9.98E-04	1.30E-05	4.05E-04	4.18E-04
Tritium	1.06E+01	3.26E-03	3.42E-03	6.68E-03	3.26E-03		3.26E-03	3.68E-03		3.68E-03
Total		4.38E+00	2.87E+00	7.25E+00	7.91E+00	2.73E-01	8.18E+00	5.76E+00	7.63E-01	6.52E+00
SWSA 6 East										
Cobalt-60	5.33E+01	9.29E-02	7.45E+00	7.55E+00	3.83E-03	1.38E+00	1.39E+00	3.34E-03	3.87E+00	3.87E+00
Cesium-137	2.14E+00	4.19E-04	9.39E-02	9.43E-02	3.07E-04	1.25E-02	1.28E-02	1.02E-02	3.50E-02	4.52E-02
Potassium-40	2.57E+01	1.86E-01	9.38E-01	1.12E+00	6.37E+00	4.21E-02	6.41E+00	3.53E+00	1.17E-01	3.65E+00
Radium-224	1.52E+00	3.10E+00	1.98E-01	3.30E+00	1.55E-01	2.53E-02	1.80E-01	3.83E-01	6.98E-02	4.52E-01
Radium-226	8.00E-01	1.48E+00	1.17E-01	1.59E+00	7.38E-02	1.45E-02	8.82E-02	1.82E-01	4.06E-02	2.22E-01
Radium-228	1.52E+00	9.92E-05	1.39E-03	1.49E-03	4.96E-06		4.96E-06	1.22E-05		1.22E-05
Strontium-90	6.22E+00	1.00E-01	3.78E-01	4.78E-01	1.78E-01	2.76E-04	1.79E-01	9.37E-03	4.14E-04	9.79E-03
Thorium-228	1.45E+00	2.37E-01	1.91E-01	4.28E-01	4.27E-02	2.41E-02	6.69E-02	2.51E-03	6.66E-02	6.91E-02
Thorium-230	1.27E+00	3.04E-02	1.16E-03	3.15E-02	5.47E-03	2.91E-06	5.47E-03	3.21E-04	4.36E-06	3.25E-04
Thorium-232	1.11E+00	2.29E-02	8.81E-02	1.11E-01	4.11E-03	1.10E-02	1.51E-02	2.42E-04	3.10E-02	3.12E-02
Thorium-234	3.96E-01	2.28E-01	2.49E-02	2.52E-01	6.44E+00	1.88E-05	6.44E+00	2.58E-02	2.82E-05	2.58E-02
Tritium	7.10E+01	2.18E-02	2.29E-02	4.47E-02	2.18E-02		2.18E-02	2.46E-02		2.46E-02
Uranium-234	6.70E-01	2.06E-01	5.40E-04	2.06E-01	6.42E+00	5.14E-07	6.42E+00	1.11E-03	7.71E-07	1.11E-03
Uranium-235/236	6.00E-01	3.74E-01	7.06E-03	3.81E-01	1.17E+01	8.07E-04	1.17E+01	2.02E-03	2.47E-03	4.49E-03
Uranium-238	7.54E-01	2.06E-01	3.72E-02	2.43E-01	6.42E+00	1.78E-04	6.42E+00	1.11E-03	4.27E-04	1.54E-03
Total		6.28E+00	9.55E+00	1.58E+01	3.78E+01	1.52E+00	3.93E+01	4.18E+00	4.23E+00	8.41E+00
SWSA 6 South										
Americium-241	6.00E-01	1.23E+01	2.74E-03	1.23E+01	8.38E+00	5.03E-05	8.38E+00	9.35E+00	3.42E-04	9.35E+00
Potassium-40	1.81E+01	1.31E-01	6.61E-01	7.91E-01	4.49E+00	2.96E-02	4.52E+00	2.49E+00	8.24E-02	2.57E+00
Plutonium-238	6.00E-01	8.43E+00	4.19E-04	8.43E+00	1.01E-03	1.74E-07	1.01E-03	2.18E+01	2.60E-07	2.18E+01
Plutonium-239/40	6.00E-01	7.91E+00	2.90E-04	7.91E+00	1.64E+01	3.27E-07	1.64E+01	2.05E+01	4.90E-07	2.05E+01
Radium-224	1.40E+00	2.86E+00	1.82E-01	3.04E+00	1.43E-01	2.33E-02	1.66E-01	3.52E-01	6.43E-02	4.17E-01
Radium-226	8.30E-01	1.53E+00	1.21E-01	1.65E+00	7.65E-02	1.50E-02	9.15E-02	1.89E-01	4.21E-02	2.31E-01
Radium-228	1.46E+00	9.53E-05	1.33E-03	1.43E-03	4.77E-06		4.77E-06	1.17E-05		1.17E-05

Table 9.6a. (continued)

Radionuclide[a]	Soil Activity[b] (pCi/g)	Soil invertebrates Internal	External	Total	Plants Internal	External	Total	Short-tailed shrew Internal	External	Total
Thorium-228	1.04E+00	1.70E-01	1.37E-01	3.07E-01	3.07E-02	1.73E-02	4.80E-02	1.80E-03	4.78E-02	4.96E-02
Thorium-230	1.00E+00	2.39E-02	9.14E-04	2.48E-02	4.31E-03	2.29E-06	4.31E-03	2.53E-04	3.44E-06	2.56E-04
Thorium-232	1.07E+00	2.20E-02	8.49E-02	1.07E-01	3.97E-03	1.06E-02	1.46E-02	2.33E-04	2.98E-02	3.01E-02
Thorium-234	1.12E+00	4.07E-01	1.14E-02	4.18E-01	1.27E+01	8.59E-04	1.27E+01	2.20E-03	2.55E-03	4.75E-03
Uranium-234	7.70E-01	2.36E-01	6.21E-04	2.37E-01	7.37E+00	5.91E-07	7.37E+00	1.28E-03	8.86E-07	1.28E-03
Uranium-235/236	6.00E-01	3.97E-01	7.11E-03	4.04E-01	1.24E+01	8.07E-04	1.24E+01	2.15E-03	2.47E-03	4.62E-03
Uranium-238	8.40E-01	2.29E-01	4.15E-02	2.71E-01	7.15E+00	1.98E-04	7.15E+00	1.24E-03	4.76E-04	1.72E-03
Total		3.46E+01	1.25E+00	3.59E+01	6.92E+01	9.78E-02	6.93E+01	5.46E+01	2.72E-01	5.49E+01
W6MS3										
Americium-241	8.90E-01	1.82E+01	4.07E-03	1.82E+01	1.24E+01	7.46E-05	1.24E+01	1.39E+01	5.07E-04	1.39E+01
Curium-244	6.00E-01	3.15E+00	3.55E-04	3.16E+00	3.89E+00	1.45E-07	3.89E+00	9.59E+00	2.17E-07	9.59E+00
Cobalt-60	1.06E-01	1.85E-04	1.48E-02	1.50E-02	7.62E-06	2.75E-03	2.76E-03	6.64E-06	7.70E-03	7.71E-03
Cesium-137	6.01E-01	1.18E-04	2.64E-02	2.65E-02	8.63E-05	3.50E-03	3.59E-03	2.87E-03	9.83E-03	1.27E-02
Curium-242	6.00E-01	3.32E+00	3.87E-04	3.32E+00	4.09E+00	1.95E-07	4.09E+00	8.74E+00	2.93E-07	8.74E+00
Potassium-40	2.39E+01	1.73E-01	8.72E-01	1.04E+00	5.93E+00	3.91E-02	5.96E+00	3.28E+00	1.09E-01	3.39E+00
Plutonium-238	6.00E-01	8.43E+00	4.19E-04	8.43E+00	1.01E-03	1.74E-07	1.01E-03	2.18E+01	2.60E-07	2.18E+01
Plutonium-239/40	6.00E-01	7.91E+00	2.90E-04	7.91E+00	1.64E+01	3.27E-07	1.64E+01	2.05E+01	4.90E-07	2.05E+01
Radium-224	1.27E+00	2.59E+00	1.66E-01	2.76E+00	1.30E-01	2.11E-02	1.51E-01	3.20E-01	5.83E-02	3.78E-01
Radium-226	8.21E-01	1.51E+00	1.20E-01	1.63E+00	7.57E-02	1.49E-02	9.05E-02	1.87E-01	4.17E-02	2.28E-01
Radium-228	1.34E+00	8.75E-05	1.22E-03	1.31E-03	4.37E-06		4.37E-06	1.08E-05		1.08E-05
Strontium-90	2.55E+01	4.11E-01	1.55E+00	1.96E+00	7.31E-01	1.13E-03	7.32E-01	3.84E-02	1.70E-03	4.01E-02
Technetium-99	9.00E-01	3.54E-01	4.89E-03	3.59E-01	3.54E-01	2.16E-07	3.54E-01	1.77E-04	3.24E-07	1.78E-04
Thorium-228	1.25E+00	2.05E-01	1.65E-01	3.69E-01	3.68E-02	2.08E-02	5.77E-02	2.16E-03	5.74E-02	5.96E-02
Thorium-230	1.59E+00	3.80E-02	1.45E-03	3.95E-02	6.85E-03	3.64E-06	6.85E-03	4.02E-04	5.46E-06	4.07E-04
Thorium-232	9.37E-01	1.93E-02	7.44E-02	9.36E-02	3.47E-03	9.27E-03	1.27E-02	2.04E-04	2.61E-02	2.63E-02
Thorium-234	1.50E+00	7.85E-01	1.73E-01	9.58E-01	1.97E+01	7.09E-05	1.97E+01	1.82E-01	1.06E-04	1.82E-01
Tritium	5.15E+02	1.58E-01	1.66E-01	3.24E-01	1.58E-01		1.58E-01	1.79E-01		1.79E-01
Uranium-234	2.04E+00	6.26E-01	1.65E-03	6.28E-01	1.95E+01	1.56E-06	1.95E+01	3.39E-03	2.35E-06	3.39E-03
Uranium-235/236	6.00E-01	4.54E-01	7.23E-03	4.61E-01	1.42E+01	8.07E-04	1.42E+01	2.46E-03	2.47E-03	4.92E-03

Table 9.6a. (continued)

Radionuclide[a]	Soil Activity[b] (pCi/g)	Soil invertebrates Internal	Soil invertebrates External	Soil invertebrates Total	Plants Internal	Plants External	Plants Total	Short-tailed shrew Internal	Short-tailed shrew External	Short-tailed shrew Total
Uranium-238	1.05E+00	2.87E-01	5.19E-02	3.39E-01	8.94E+00	2.47E-04	8.94E+00	1.55E-03	5.94E-04	2.15E-03
Total		4.86E+01	3.40E+00	5.20E+01	1.07E+02	1.14E-01	1.07E+02	7.87E+01	3.15E-01	7.90E+01
W6MS1										
Americium-241	6.00E-01	1.23E+01	2.74E-03	1.23E+01	8.38E+00	5.03E-05	8.38E+00	9.35E+00	3.42E-04	9.35E+00
Cobalt-60	1.80E-01	3.14E-04	2.52E-02	2.55E-02	1.29E-05	4.68E-03	4.69E-03	1.13E-05	1.31E-02	1.31E-02
Cesium-137	6.48E-01	1.27E-04	2.84E-02	2.85E-02	9.31E-05	3.77E-03	3.87E-03	3.09E-03	1.06E-02	1.37E-02
Potassium-40	2.65E+01	1.91E-01	9.67E-01	1.16E+00	6.57E+00	4.34E-02	6.61E+00	3.64E+00	1.21E-01	3.76E+00
Plutonium-238	6.00E-01	8.43E+00	4.19E-04	8.43E+00	1.01E-03	1.74E-07	1.01E-03	2.18E+01	2.60E-07	2.18E+01
Plutonium-239/40	6.00E-01	7.91E+00	2.90E-04	7.91E+00	1.64E+01	3.27E-07	1.64E+01	2.05E+01	4.90E-07	2.05E+01
Radium-224	1.32E+00	2.69E+00	1.72E-01	2.87E+00	1.35E-01	2.20E-02	1.57E-01	3.32E-01	6.06E-02	3.93E-01
Radium-226	8.27E-01	1.52E+00	1.21E-01	1.65E+00	7.62E-02	1.50E-02	9.12E-02	1.88E-01	4.20E-02	2.30E-01
Radium-228	1.33E+00	8.68E-05	1.22E-03	1.30E-03	4.34E-06		4.34E-06	1.07E-05		1.07E-05
Thorium-228	1.13E+00	1.85E-01	1.49E-01	3.34E-01	3.33E-02	1.88E-02	5.21E-02	1.96E-03	5.19E-02	5.39E-02
Thorium-230	8.40E-01	2.01E-02	7.68E-04	2.09E-02	3.62E-03	1.92E-06	3.62E-03	2.12E-04	2.89E-06	2.15E-04
Thorium-232	7.40E-01	1.52E-02	5.87E-02	7.40E-02	2.74E-03	7.32E-03	1.01E-02	1.61E-04	2.06E-02	2.08E-02
Thorium-234	1.52E+00	4.19E-01	1.40E-01	5.59E-01	9.22E+00	7.10E-05	9.22E+00	1.45E-01	1.07E-04	1.45E-01
Tritium	4.14E+02	1.27E-01	1.34E-01	2.61E-01	1.27E-01		1.27E-01	1.44E-01		1.44E-01
Uranium-234	9.50E-01	2.92E-01	7.66E-04	2.92E-01	9.10E+00	7.29E-07	9.10E+00	1.58E-03	1.09E-06	1.58E-03
Uranium-235/236	6.00E-01	4.27E-01	7.17E-03	4.34E-01	1.33E+01	8.07E-04	1.33E+01	2.31E-03	2.47E-03	4.78E-03
Uranium-238	9.50E-01	2.59E-01	4.69E-02	3.06E-01	8.09E+00	2.24E-04	8.09E+00	1.40E-03	5.38E-04	1.94E-03
Total		3.48E+01	1.86E+00	3.66E+01	7.15E+01	1.16E-01	7.16E+01	5.61E+01	3.23E-01	5.64E+01
WCTRIB-1										
Cobalt-60	3.00E+02	5.23E-01	4.19E+01	4.25E+01	2.16E-02	7.80E+00	7.82E+00	1.88E-02	2.18E+01	2.18E+01
Cesium-137	8.50E+03	1.66E+00	3.73E+02	3.74E+02	1.22E+00	4.95E+01	5.07E+01	4.06E+01	1.39E+02	1.80E+02
Strontium-90	6.80E+02	1.09E+01	4.13E+01	5.23E+01	1.95E+01	3.02E-02	1.95E+01	1.02E+00	4.52E-02	1.07E+00
Total		1.31E+01	4.56E+02	4.69E+02	2.07E+01	5.73E+01	7.81E+01	4.16E+01	1.61E+02	2.03E+02
West Seep										

Table 9.6a. (continued)

Radionuclide[a]	Soil Activity[b] (pCi/g)	Soil invertebrates Internal	Soil invertebrates External	Soil invertebrates Total	Plants Internal	Plants External	Plants Total	Short-tailed shrew Internal	Short-tailed shrew External	Short-tailed shrew Total
Actinium-228	1.19E+00	2.66E-05	9.25E-02	9.25E-02	2.66E-05	1.18E-02	1.18E-02	7.16E-07	3.32E-02	3.32E-02
Americium-241	8.39E-01	1.72E+01	3.83E-03	1.72E+01	1.17E+01	7.04E-05	1.17E+01	1.31E+01	4.78E-04	1.31E+01
Bismuth-214	6.40E-01	1.01E-01	7.46E-02	1.76E-01	4.43E-02	1.00E-02	5.43E-02	1.53E-02	2.80E-02	4.33E-02
Cesium-137	4.34E+02	8.50E-02	1.90E+01	1.91E+01	6.23E-02	2.53E+00	2.59E+00	2.07E+00	7.10E+00	9.17E+00
Curium-243/244	2.40E-02	1.26E-01	3.51E-04	1.27E-01	1.55E-01	2.60E-05	1.56E-01	3.32E-01	8.22E-05	3.33E-01
Curium-245/246	3.35E-02	1.63E-01	2.90E-04	1.63E-01	2.01E-01	2.16E-05	2.01E-01	4.29E-01	7.56E-05	4.29E-01
Cobalt-57	2.00E-02	5.96E-06	1.55E-04	1.61E-04	2.46E-07	1.91E-05	1.93E-05	2.10E-07	6.22E-05	6.24E-05
Cobalt-60	7.20E+04	1.26E+02	1.01E+04	1.02E+04	5.18E+00	1.87E+03	1.88E+03	4.51E+00	5.23E+03	5.23E+03
Europium-152	-6.30E-02	-1.91E-04	-4.38E-03	-4.57E-03	-8.03E-06	-8.47E-04	-8.55E-04	-4.70E-05	-2.25E-03	-2.29E-03
Lead-212	1.34E+00	8.39E-01	1.74E-01	1.01E+00	2.04E-03	2.22E-02	2.42E-02	4.84E-01	6.11E-02	5.45E-01
Lead-214	7.50E-01	3.24E-03	1.09E-01	1.13E-01	7.90E-06	1.35E-02	1.35E-02	1.81E-03	3.80E-02	3.98E-02
Plutonium-238	8.13E-02	1.14E+00	5.68E-05	1.14E+00	1.37E-04	2.35E-08	1.37E-04	2.95E+00	3.53E-08	2.95E+00
Plutonium-239/40	1.10E+00	1.45E+01	5.32E-04	1.45E+01	3.02E+01	5.99E-07	3.02E+01	3.75E+01	8.99E-07	3.75E+01
Potassium-40	2.12E+01	1.53E-01	7.74E-01	9.27E-01	5.26E+00	3.47E-02	5.29E+00	2.91E+00	9.65E-02	3.01E+00
Radium-224	2.46E+00	5.02E+00	3.21E-01	5.34E+00	2.51E-01	4.09E-02	2.92E-01	6.19E-01	1.13E-01	7.32E-01
Radium-226	7.87E-01	1.45E+00	1.15E-01	1.57E+00	7.26E-02	1.42E-02	8.68E-02	1.79E-01	4.00E-02	2.19E-01
Radium-228	1.40E+00	9.14E-05	1.28E-03	1.37E-03	4.57E-06		4.57E-06	1.13E-05		1.13E-05
Strontium-90	1.88E+02	3.03E+00	1.14E+01	1.45E+01	5.39E+00	8.34E-03	5.40E+00	2.83E-01	1.25E-02	2.96E-01
Thallium-208	4.60E-01	2.94E-02	9.83E-02	1.28E-01	1.47E-05	1.60E-02	1.60E-02	6.34E-02	4.48E-02	1.08E-01
Thorium-228	1.39E+00	2.28E-01	1.83E-01	4.11E-01	4.10E-02	2.31E-02	6.41E-02	2.41E-03	6.38E-02	6.62E-02
Thorium-230	9.81E-01	2.35E-02	8.97E-04	2.44E-02	4.22E-03	2.25E-06	4.23E-03	2.48E-04	3.37E-06	2.51E-04
Thorium-232	1.20E+00	2.47E-02	9.52E-02	1.20E-01	4.45E-03	1.19E-02	1.63E-02	2.61E-04	3.35E-02	3.37E-02
Thorium-234	1.55E+00	9.05E-02	3.70E-02	1.27E-01	1.93E+00	7.20E-05	1.93E+00	3.37E-02	1.08E-04	3.38E-02
Tritium	9.62E+01	2.96E-02	3.10E-02	6.06E-02	2.96E-02		2.96E-02	3.34E-02		3.34E-02
Uranium-232	1.78E-01	6.09E-02	1.82E-04	6.11E-02	1.90E+00	3.08E-07	1.90E+00	3.29E-04	4.62E-07	3.30E-04
Uranium-233/234	4.51E+00	1.40E+00	1.70E-03	1.40E+00	4.37E+01	1.17E-05	4.37E+01	7.58E-03	1.76E-05	7.60E-03
Uranium-234	1.19E+00	3.65E-01	9.60E-04	3.66E-01	1.14E+01	9.13E-07	1.14E+01	1.98E-03	1.37E-06	1.98E-03
Uranium-235	3.80E-01	1.08E-01	4.19E-03	1.12E-01	3.36E+00	5.11E-04	3.36E+00	5.83E-04	1.56E-03	2.15E-03
Uranium-238	1.82E+00	4.97E-01	8.99E-02	5.87E-01	1.55E+01	4.29E-04	1.55E+01	2.69E-03	1.03E-03	3.72E-03
Total		1.72E+02	1.01E+04	1.03E+04	1.36E+02	1.87E+03	2.01E+03	6.55E+01	5.24E+03	5.30E+03

Table 9.6a. (continued)

Radionuclide[a]	Soil Activity[b] (pCi/g)	Soil invertebrates Internal	Soil invertebrates External	Soil invertebrates Total	Plants Internal	Plants External	Plants Total	Short-tailed shrew Internal	Short-tailed shrew External	Short-tailed shrew Total
SWSA 5 Drainage D-2										
Actinium-228	2.30E+00	5.14E-05	1.79E-01	1.79E-01	5.14E-05	2.28E-02	2.28E-02	1.38E-06	6.41E-02	6.41E-02
Bismuth-214	8.20E-01	1.30E-01	9.55E-02	2.25E-01	5.68E-02	1.28E-02	6.96E-02	1.96E-02	3.58E-02	5.54E-02
Calcium-45	1.30E+01	9.72E-02	5.38E-02	1.51E-01	1.98E-01	1.56E-06	1.98E-01	4.81E-01	2.34E-06	4.81E-01
Carbon-14	4.60E-01		1.21E-03	1.21E-03	1.15E-03	1.19E-08	1.15E-03	1.50E-04	1.78E-08	1.50E-04
Cesium-137	1.99E+01	3.90E-03	8.73E-01	8.77E-01	2.86E-03	1.16E-01	1.19E-01	9.50E-02	3.26E-01	4.21E-01
Iodine-129	3.30E+00	2.24E-02	1.58E-02	3.82E-02	3.81E-06	8.20E-05	8.58E-05	4.83E-02	1.23E-03	4.96E-02
Lead-210	6.10E+00									
Lead-212	9.23E-01	5.78E-01	1.20E-01	6.98E-01	1.41E-03	1.53E-02	1.67E-02	3.34E-01	4.21E-02	3.76E-01
Lead-214	1.40E+00	8.66E-01	2.04E-01	1.07E+00	2.11E-03	2.52E-02	2.73E-02	4.99E-01	7.09E-02	5.70E-01
Potassium-40	2.01E+01	1.45E-01	7.34E-01	8.79E-01	4.98E+00	3.29E-02	5.02E+00	2.76E+00	9.15E-02	2.85E+00
Radium-226	7.90E-01	1.46E+00	1.16E-01	1.57E+00	7.28E-02	1.43E-02	8.71E-02	1.80E-01	4.01E-02	2.20E-01
Radium-228	1.88E+00	1.23E-04	1.72E-03	1.84E-03	6.14E-06		6.14E-06	1.51E-05		1.51E-05
Strontium-90	1.28E+02	2.06E+00	7.78E+00	9.84E+00	3.67E+00	5.68E-03	3.67E+00	1.93E-01	8.51E-03	2.01E-01
Technetium-99	1.18E+00	4.64E-01	6.41E-03	4.70E-01	4.64E-01	2.83E-07	4.64E-01	2.32E-04	4.25E-07	2.33E-04
Thorium-228	1.50E+00	2.46E-01	1.97E-01	4.43E-01	4.42E-02	2.50E-02	6.92E-02	2.60E-03	6.89E-02	7.15E-02
Thorium-232	2.15E+00	4.43E-02	1.71E-01	2.15E-01	7.97E-03	2.13E-02	2.92E-02	4.68E-04	6.00E-02	6.04E-02
Thallium-208	1.40E+00	8.96E-02	2.99E-01	3.89E-01	4.48E-05	4.86E-02	4.86E-02	1.93E-01	1.36E-01	3.29E-01
Tritium	2.29E+01	7.03E-03	7.39E-03	1.44E-02	7.03E-03		7.03E-03	7.95E-03		7.95E-03
Total		6.21E+00	1.09E+01	1.71E+01	9.51E+00	3.40E-01	9.85E+00	4.81E+00	9.45E-01	5.76E+00
WAG 7 WOC										
Actinium-228	1.09E+00	2.43E-05	8.47E-02	8.48E-02	2.43E-05	1.08E-02	1.08E-02	6.56E-07	3.04E-02	3.04E-02
Americium-241	1.11E-01	2.27E+00	5.07E-04	2.27E+00	1.55E+00	9.31E-06	1.55E+00	1.73E+00	6.32E-05	1.73E+00
Bismuth-214	6.50E-01	1.03E-01	7.57E-02	1.79E-01	4.50E-02	1.02E-02	5.52E-02	1.55E-02	2.84E-02	4.39E-02
Cesium-137	5.62E+03	1.10E+00	2.57E+02	2.58E+02	8.07E-01	3.45E+01	3.53E+01	2.68E+01	9.68E+01	1.24E+02
Curium-243/244	1.08E+00	5.69E+00	1.58E-02	5.70E+00	7.00E+00	1.17E-03	7.00E+00	1.50E+01	3.70E-03	1.50E+01
Cobalt-57	9.00E-02	2.68E-05	6.97E-04	7.24E-04	1.11E-06	8.58E-05	8.69E-05	9.47E-07	2.80E-04	2.81E-04
Cobalt-60	2.02E-01	3.52E-04	2.82E-02	2.86E-02	1.45E-05	5.25E-03	5.26E-03	1.26E-05	1.47E-02	1.47E-02

Table 9.6a. (continued)

Radionuclide[a]	Soil Activity[b] (pCi/g)	Soil invertebrates Internal	Soil invertebrates External	Soil invertebrates Total	Plants Internal	Plants External	Plants Total	Short-tailed shrew Internal	Short-tailed shrew External	Short-tailed shrew Total
Plutonium-238	2.42E-01	3.40E+00	1.69E-04	3.40E+00	4.08E-04	7.00E-08	4.08E-04	8.79E+00	1.05E-07	8.79E+00
Plutonium-239/40	5.10E-02	6.72E-01	2.47E-05	6.72E-01	1.40E+00	2.78E-08	1.40E+00	1.74E+00	4.17E-08	1.74E+00
Potassium-40	2.60E+01	1.88E-01	9.49E-01	1.14E+00	6.45E+00	4.26E-02	6.49E+00	3.57E+00	1.18E-01	3.69E+00
Thorium-228	5.00E-01	8.19E-02	6.58E-02	1.48E-01	1.47E-02	8.33E-03	2.31E-02	8.65E-04	2.30E-02	2.38E-02
Thorium-230	4.10E-01	9.81E-03	3.75E-04	1.02E-02	1.77E-03	9.39E-07	1.77E-03	1.04E-04	1.41E-06	1.05E-04
Thorium-232	4.00E-01	8.24E-03	3.17E-02	4.00E-02	1.48E-03	3.96E-03	5.44E-03	8.70E-05	1.12E-02	1.12E-02
Uranium-233/234	1.10E+00	3.42E-01	4.14E-04	3.42E-01	1.07E+01	2.85E-06	1.07E+01	1.85E-03	4.28E-06	1.85E-03
Uranium-235	8.30E-02	2.36E-02	9.15E-04	2.45E-02	7.35E-01	1.12E-04	7.35E-01	1.27E-04	3.41E-04	4.69E-04
Uranium-238	1.23E+00	3.36E-01	6.08E-02	3.97E-01	1.05E+01	2.90E-04	1.05E+01	1.82E-03	6.96E-04	2.51E-03
Total		1.42E+01	2.58E+02	2.72E+02	3.91E+01	3.45E+01	7.37E+01	5.77E+01	9.70E+01	1.55E+02
WOC										
Americium-241	2.86E+00	5.85E+01	1.31E-02	5.85E+01	4.00E+01	2.40E-04	4.00E+01	4.46E+01	1.63E-03	4.46E+01
Curium-244	3.22E+00	1.69E+01	1.90E-03	1.69E+01	2.09E+01	7.78E-07	2.09E+01	5.15E+01	1.17E-06	5.15E+01
Cobalt-60	4.56E+00	7.95E-03	6.38E-01	6.46E-01	3.28E-04	1.18E-01	1.19E-01	2.86E-04	3.31E-01	3.31E-01
Cesium-137	3.57E+02	6.99E-02	1.57E+01	1.57E+01	5.13E-02	2.08E+00	2.13E+00	1.70E+00	5.84E+00	7.54E+00
Plutonium-238	1.04E+00	1.46E+01	7.27E-04	1.46E+01	1.75E-03	3.01E-07	1.75E-03	3.78E+01	4.51E-07	3.78E+01
Plutonium-239/40	8.07E+00	1.06E+02	3.90E-03	1.06E+02	2.21E+02	4.40E-06	2.21E+02	2.75E+02	6.59E-06	2.75E+02
Strontium-90	2.16E+01	3.48E-01	1.31E+00	1.66E+00	6.19E-01	9.58E-04	6.20E-01	3.25E-02	1.44E-03	3.40E-02
Technetium-99	3.94E+00	1.55E+00	2.14E-02	1.57E+00	1.55E+00	9.46E-07	1.55E+00	7.76E-04	1.42E-06	7.77E-04
Thorium-228	2.81E+00	4.60E-01	3.70E-01	8.30E-01	8.28E-02	4.68E-02	1.30E-01	4.86E-03	1.29E-01	1.34E-01
Thorium-230	5.50E+00	1.32E-01	5.03E-03	1.37E-01	2.37E-02	1.26E-05	2.37E-02	1.39E-03	1.89E-05	1.41E-03
Thorium-232	1.80E+00	3.71E-02	1.43E-01	1.80E-01	6.67E-03	1.78E-02	2.45E-02	3.92E-04	5.02E-02	5.06E-02
Uranium-233/234	3.24E+00	1.01E+00	1.22E-03	1.01E+00	3.14E+01	8.41E-06	3.14E+01	5.45E-03	1.26E-05	5.46E-03
Uranium-235	2.49E-01	7.07E-02	2.74E-03	7.34E-02	2.20E+00	3.35E-04	2.20E+00	3.82E-04	1.02E-03	1.41E-03
Uranium-238	2.97E+00	8.11E-01	1.47E-01	9.58E-01	2.53E+01	7.00E-04	2.53E+01	4.39E-03	1.68E-03	6.07E-03
Total		2.01E+02	1.83E+01	2.19E+02	3.43E+02	2.26E+00	3.46E+02	4.11E+02	6.36E+00	4.17E+02

[a] Dose from each radionuclide includes all short-lived daughter products

[b] Representative concentration is the minimum of the UCL95 and the maximum detect.

Table 9.6b. Estimated radiation doses (mrad/d) from surface soil for white-footed mouse, red fox, and white-tailed deer at WOC

Radionuclide[a]	Soil Activity[b] (pCi/g)	White-footed mouse Internal	White-footed mouse External	White-footed mouse Total	Red Fox Internal	Red Fox External	Red Fox Total	White-tailed Deer Internal	White-tailed Deer External	White-tailed Deer Total
East Seep										
Actinium-228	7.80E-01	4.16E-07	2.18E-02	2.18E-02	4.59E-07	1.60E-02	1.60E-02	1.27E-08	7.72E-03	7.72E-03
Bismuth-214	7.90E-01	4.42E-03	3.45E-02	3.90E-02	4.03E-03	2.53E-02	2.93E-02	3.60E-03	1.23E-02	1.59E-02
Cesium-137	7.00E+05	7.61E+02	1.15E+04	1.22E+04	2.46E+03	8.39E+03	1.09E+04	9.27E+02	4.08E+03	5.00E+03
Cobalt-60	9.28E+00	5.81E-04	6.74E-01	6.75E-01	3.69E-02	4.93E-01	5.30E-01	8.49E-03	2.41E-01	2.50E-01
Lead-212	7.05E+00	2.55E+00	3.22E-01	2.87E+00	4.18E-02	2.34E-01	2.76E-01	2.29E-02	1.17E-01	1.39E-01
Lead-214	8.80E-01	2.12E-03	4.46E-02	4.67E-02	1.79E-04	3.27E-02	3.29E-02	2.12E-05	1.59E-02	1.59E-02
Plutonium-238	1.40E-02	5.09E-01	6.07E-09	5.09E-01	1.14E-05	3.04E-09	1.14E-05	7.99E-07	4.05E-09	8.03E-07
Plutonium-239/40	4.40E-02	1.50E+00	3.60E-08	1.50E+00	9.65E-05	1.80E-08	9.65E-05	6.05E-04	2.40E-08	6.05E-04
Potassium-40	2.53E+01	3.48E+00	1.15E-01	3.59E+00	3.36E+00	8.41E-02	3.44E+00	6.53E+00	4.14E-02	6.57E+00
Strontium-90	4.32E+01	6.51E-02	2.87E-03	6.80E-02	2.36E-01	1.44E-03	2.37E-01	5.15E-01	1.92E-03	5.17E-01
Thallium-208	2.16E+00	1.43E-01	2.10E-01	3.53E-01	3.00E-01	1.54E-01	4.55E-01	4.50E-03	7.49E-02	7.94E-02
Thorium-228	9.60E+00	1.66E-02	4.41E-01	4.58E-01	5.16E-02	3.21E-01	3.73E-01	3.29E-02	1.60E-01	1.93E-01
Thorium-230	8.30E-01	2.10E-04	2.85E-06	2.13E-04	6.51E-04	1.43E-06	6.52E-04	4.15E-04	1.90E-06	4.17E-04
Thorium-232	8.10E-01	1.76E-04	2.26E-02	2.28E-02	5.47E-04	1.66E-02	1.71E-02	3.49E-04	8.01E-03	8.36E-03
Thorium-234	3.45E+00	3.70E-01	1.08E-03	3.71E-01	4.10E+00	5.38E-04	4.10E+00	3.23E+01	7.18E-04	3.23E+01
Uranium-232	1.08E+01	2.00E-02	2.80E-05	2.00E-02	2.22E-01	1.40E-05	2.22E-01	1.75E+00	1.87E-05	1.75E+00
Uranium-233/234	2.08E+02	3.50E-01	8.10E-04	3.51E-01	3.88E+00	4.05E-04	3.88E+00	3.06E+01	5.40E-04	3.06E+01
Uranium-235	2.51E+00	3.85E-03	1.03E-02	1.42E-02	4.27E-02	7.79E-03	5.05E-02	3.37E-01	3.37E-03	3.40E-01
Uranium-238	1.05E+01	1.55E-02	5.94E-03	2.15E-02	1.72E-01	4.09E-03	1.76E-01	1.36E+00	2.47E-03	1.36E+00
Total		7.70E+02	1.15E+04	1.22E+04	2.47E+03	8.39E+03	1.09E+04	1.00E+03	4.08E+03	5.08E+03
Haw Ridge										
Cobalt-60	4.70E+00	2.94E-04	3.41E-01	3.42E-01	1.87E-02	2.50E-01	2.68E-01	4.30E-03	1.22E-01	1.26E-01
Cesium-137	2.00E+03	2.17E+00	3.27E+01	3.49E+01	7.03E+00	2.40E+01	3.10E+01	2.65E+00	1.16E+01	1.43E+01
Potassium-40	1.60E+01	2.20E+00	7.29E-02	2.27E+00	2.12E+00	5.32E-02	2.18E+00	4.13E+00	2.62E-02	4.16E+00
Total		4.37E+00	3.31E+01	3.75E+01	9.17E+00	2.43E+01	3.35E+01	6.78E+00	1.18E+01	1.86E+01
HF-2										
Cobalt-60	1.94E+02	1.21E-02	1.41E+01	1.41E+01	7.72E-01	1.03E+01	1.11E+01	1.78E-01	5.04E+00	5.22E+00

Table 9.6b. (continued)

Radionuclide[a]	Soil Activity[b] (pCi/g)	White-footed mouse Internal	White-footed mouse External	White-footed mouse Total	Red Fox Internal	Red Fox External	Red Fox Total	White-tailed Deer Internal	White-tailed Deer External	White-tailed Deer Total
Strontium-90	7.40E-02	1.12E-04	4.92E-06	1.16E-04	4.03E-04	2.46E-06	4.06E-04	8.83E-04	3.28E-06	8.86E-04
Thorium-228	1.40E+00	2.42E-03	6.43E-02	6.67E-02	7.52E-03	4.68E-02	5.43E-02	4.79E-03	2.33E-02	2.81E-02
Thorium-230	1.30E+00	3.29E-04	4.47E-06	3.33E-04	1.02E-03	2.23E-06	1.02E-03	6.50E-04	2.98E-06	6.53E-04
Thorium-232	1.40E+00	3.05E-04	3.90E-02	3.93E-02	9.46E-04	2.87E-02	2.96E-02	6.03E-04	1.38E-02	1.45E-02
Uranium-233/234	1.10E+00	1.85E-03	4.28E-06	1.85E-03	2.05E-02	2.14E-06	2.05E-02	1.62E-01	2.85E-06	1.62E-01
Uranium-235	1.10E-01	1.69E-04	4.52E-04	6.21E-04	1.87E-03	3.42E-04	2.21E-03	1.48E-02	1.48E-04	1.49E-02
Uranium-238	8.70E-01	1.29E-03	4.93E-04	1.78E-03	1.42E-02	3.39E-04	1.46E-02	1.12E-01	2.05E-04	1.12E-01
Total		1.86E-02	1.42E+01	1.42E+01	8.18E-01	1.04E+01	1.12E+01	4.73E-01	5.08E+00	5.55E+00
HFIR										
Cobalt-60	4.64E+00	2.91E-04	3.37E-01	3.37E-01	1.85E-02	2.47E-01	2.65E-01	4.25E-03	1.21E-01	1.25E-01
Cesium-137	5.07E+01	5.51E-02	8.29E-01	8.84E-01	1.78E-01	6.08E-01	7.86E-01	6.72E-02	2.95E-01	3.62E-01
Potassium-40	1.95E+01	2.68E+00	8.88E-02	2.77E+00	2.59E+00	6.48E-02	2.65E+00	5.03E+00	3.19E-02	5.07E+00
Strontium-90	2.50E+04	3.77E+01	1.66E+00	3.93E+01	1.36E+02	8.31E-01	1.37E+02	2.98E+02	1.11E+00	2.99E+02
Thorium-228	6.50E+01	1.12E-01	2.99E+00	3.10E+00	3.49E-01	2.17E+00	2.52E+00	2.23E-01	1.08E+00	1.30E+00
Uranium-234	3.50E+00	5.81E-03	4.03E-06	5.82E-03	6.44E-02	2.01E-06	6.44E-02	5.08E-01	2.68E-06	5.08E-01
Uranium-238	2.10E+00	3.10E-03	1.19E-03	4.29E-03	3.44E-02	8.18E-04	3.52E-02	2.71E-01	4.95E-04	2.72E-01
Total		4.05E+01	5.90E+00	4.64E+01	1.40E+02	3.93E+00	1.43E+02	3.04E+02	2.64E+00	3.07E+02
HFIR East										
Potassium-40	2.00E+01	2.75E+00	9.11E-02	2.84E+00	2.65E+00	6.65E-02	2.72E+00	5.16E+00	3.28E-02	5.20E+00
Total		2.75E+00	9.11E-02	2.84E+00	2.65E+00	6.65E-02	2.72E+00	5.16E+00	3.28E-02	5.20E+00
HRE										
Actinium-228	1.27E+00	6.77E-07	3.54E-02	3.54E-02	7.47E-07	2.60E-02	2.60E-02	2.08E-08	1.26E-02	1.26E-02
Bismuth-214	7.41E-01	4.15E-03	3.24E-02	3.65E-02	3.78E-03	2.37E-02	2.75E-02	3.37E-03	1.16E-02	1.50E-02
Cesium-137	3.84E+03	4.17E+00	6.28E+01	6.70E+01	1.35E+01	4.60E+01	5.95E+01	5.09E+00	2.24E+01	2.74E+01
Cobalt-60	4.35E-01	2.72E-05	3.16E-02	3.16E-02	1.73E-03	2.31E-02	2.48E-02	3.98E-04	1.13E-02	1.17E-02
Europium-154	1.25E+00	7.39E-04	4.85E-02	4.92E-02	4.62E-04	3.47E-02	3.51E-02	2.15E-04	1.84E-02	1.86E-02
Potassium-40	1.82E+01	2.50E+00	8.29E-02	2.58E+00	2.42E+00	6.05E-02	2.48E+00	4.70E+00	2.98E-02	4.73E+00

Table 9.6b. (continued)

Radionuclide[a]	Soil Activity[b] (pCi/g)	White-footed mouse Internal	White-footed mouse External	White-footed mouse Total	Red Fox Internal	Red Fox External	Red Fox Total	White-tailed Deer Internal	White-tailed Deer External	White-tailed Deer Total
Radium-226	1.03E+00	6.82E-02	5.23E-02	1.20E-01	4.29E-02	3.83E-02	8.12E-02	2.71E-02	1.86E-02	4.57E-02
Radium-228	1.37E+00	3.21E-06		3.21E-06	2.02E-06		2.02E-06	1.27E-06		1.27E-06
Strontium-90	2.03E+02	3.06E-01	1.35E-02	3.19E-01	1.11E+00	6.75E-03	1.11E+00	2.42E+00	9.00E-03	2.43E+00
Thallium-208	4.39E-01	2.90E-02	4.28E-02	7.17E-02	6.11E-02	3.13E-02	9.24E-02	9.15E-04	1.52E-02	1.61E-02
Thorium-228	5.50E-01	9.52E-04	2.53E-02	2.62E-02	2.95E-03	1.84E-02	2.13E-02	1.88E-03	9.16E-03	1.10E-02
Thorium-230	1.30E-01	3.29E-05	4.47E-07	3.33E-05	1.02E-04	2.23E-07	1.02E-04	6.50E-05	2.98E-07	6.53E-05
Thorium-232	1.50E+00	3.26E-04	4.18E-02	4.22E-02	1.01E-03	3.07E-02	3.17E-02	6.47E-04	1.48E-02	1.55E-02
Thorium-234	2.56E+00	4.17E-02	2.55E-03	4.43E-02	4.62E-01	1.86E-03	4.64E-01	3.64E+00	9.27E-04	3.64E+00
Uranium-233/234	2.43E+01	4.09E-02	9.46E-05	4.10E-02	4.53E-01	4.73E-05	4.53E-01	3.57E+00	6.31E-05	3.57E+00
Uranium-235	5.55E-01	8.52E-04	2.28E-03	3.13E-03	9.44E-03	1.72E-03	1.12E-02	7.44E-02	7.46E-04	7.52E-02
Uranium-238	1.29E+00	1.91E-03	7.30E-04	2.64E-03	2.11E-02	5.02E-04	2.16E-02	1.66E-01	3.04E-04	1.67E-01
Total		7.17E+00	6.32E+01	7.04E+01	1.81E+01	4.63E+01	6.44E+01	1.97E+01	2.25E+01	4.22E+01
Intermediate Pond										
Americium-241	3.06E+01	4.77E+02	1.74E-02	4.77E+02	2.14E-01	1.55E-02	2.29E-01	8.62E-01	2.57E-03	8.65E-01
Curium-244	5.72E+00	9.14E+01	2.07E-06	9.14E+01	8.19E-03	1.04E-06	8.19E-03	3.78E-02	1.38E-06	3.78E-02
Cobalt-60	1.31E+01	8.20E-04	9.51E-01	9.52E-01	5.21E-02	6.96E-01	7.48E-01	1.20E-02	3.40E-01	3.52E-01
Cesium-137	6.35E+03	6.90E+00	1.04E+02	1.11E+02	2.23E+01	7.61E+01	9.85E+01	8.41E+00	3.70E+01	4.54E+01
Plutonium-238	2.20E+00	7.99E+01	9.54E-07	7.99E+01	1.79E-03	4.77E-07	1.79E-03	1.25E-04	6.36E-07	1.26E-04
Plutonium-239/40	9.49E+01	3.24E+03	7.75E-05	3.24E+03	2.08E-01	3.88E-05	2.08E-01	1.31E+00	5.17E-05	1.31E+00
Strontium-90	2.48E+02	3.74E-01	1.65E-02	3.90E-01	1.35E+00	8.25E-03	1.36E+00	2.96E+00	1.10E-02	2.97E+00
Technetium-99	4.66E+00	9.16E-04	1.68E-06	9.18E-04	1.77E-04	8.39E-07	1.78E-04	9.16E-04	1.12E-06	9.17E-04
Thorium-228	5.08E+00	8.79E-03	2.33E-01	2.42E-01	2.73E-02	1.70E-01	1.97E-01	1.74E-02	8.46E-02	1.02E-01
Thorium-230	1.86E+01	4.70E-03	6.39E-05	4.77E-03	1.46E-02	3.19E-05	1.46E-02	9.30E-03	4.26E-05	9.34E-03
Thorium-232	5.28E+00	1.15E-03	1.47E-01	1.48E-01	3.57E-03	1.08E-01	1.12E-01	2.28E-03	5.22E-02	5.45E-02
Uranium-233/234	3.89E+01	6.54E-02	1.51E-04	6.56E-02	7.25E-01	7.57E-05	7.25E-01	5.71E+00	1.01E-04	5.71E+00
Uranium-235	5.29E+00	8.12E-03	2.18E-02	2.99E-02	9.00E-02	1.64E-02	1.06E-01	7.10E-01	7.11E-03	7.17E-01
Uranium-238	1.24E+01	1.83E-02	7.02E-03	2.53E-02	2.03E-01	4.83E-03	2.08E-01	1.60E+00	2.92E-03	1.60E+00
Total		3.89E+03	1.05E+02	4.00E+03	2.52E+01	7.72E+01	1.02E+02	2.16E+01	3.75E+01	5.91E+01

Table 9.6b. (continued)

Radionuclide[a]	Soil Activity[b] (pCi/g)	White-footed mouse Internal	White-footed mouse External	White-footed mouse Total	Red Fox Internal	Red Fox External	Red Fox Total	White-tailed Deer Internal	White-tailed Deer External	White-tailed Deer Total
Lower WOC										
Americium-241	6.38E+00	9.95E+01	3.63E-03	9.95E+01	4.46E-02	3.23E-03	4.78E-02	1.80E-01	5.35E-04	1.80E-01
Curium-244	2.28E+00	3.64E+01	8.26E-07	3.64E+01	3.26E-03	4.13E-07	3.27E-03	1.51E-02	5.51E-07	1.51E-02
Cobalt-60	1.55E+01	9.71E-04	1.13E+00	1.13E+00	6.17E-02	8.24E-01	8.85E-01	1.42E-02	4.03E-01	4.17E-01
Cesium-137	8.68E+02	9.43E-01	1.42E+01	1.51E+01	3.05E+00	1.04E+01	1.35E+01	1.15E+00	5.05E+00	6.20E+00
Plutonium-238	1.14E+00	4.14E+01	4.95E-07	4.14E+01	9.30E-04	2.47E-07	9.30E-04	6.50E-05	3.30E-07	6.54E-05
Plutonium-239/40	4.51E+01	1.54E+03	3.69E-05	1.54E+03	9.89E-02	1.84E-05	9.89E-02	6.21E-01	2.46E-05	6.21E-01
Strontium-90	3.10E+01	4.67E-02	2.06E-03	4.88E-02	1.69E-01	1.03E-03	1.70E-01	3.70E-01	1.37E-03	3.71E-01
Technetium-99	1.47E+01	2.89E-03	5.29E-06	2.90E-03	5.58E-04	2.65E-06	5.61E-04	2.89E-03	3.53E-06	2.89E-03
Thorium-228	3.80E+00	6.58E-03	1.75E-01	1.81E-01	2.04E-02	1.27E-01	1.47E-01	1.30E-02	6.33E-02	7.63E-02
Thorium-230	4.84E+00	1.22E-03	1.66E-05	1.24E-03	3.80E-03	8.31E-06	3.80E-03	2.42E-03	1.11E-05	2.43E-03
Thorium-232	1.80E+00	3.92E-04	5.02E-02	5.06E-02	1.22E-03	3.68E-02	3.81E-02	7.76E-04	1.78E-02	1.86E-02
Uranium-233/234	4.94E+00	8.31E-03	1.92E-05	8.32E-03	9.21E-02	9.61E-06	9.21E-02	7.26E-01	1.28E-05	7.26E-01
Uranium-235	6.15E-01	9.44E-04	2.53E-03	3.47E-03	1.05E-02	1.91E-03	1.24E-02	8.25E-02	8.27E-04	8.33E-02
Uranium-238	2.10E+00	3.10E-03	1.19E-03	4.29E-03	3.44E-02	8.18E-04	3.52E-02	2.71E-01	4.95E-04	2.72E-01
Total		1.72E+03	1.56E+01	1.73E+03	3.59E+00	1.14E+01	1.50E+01	3.45E+00	5.54E+00	8.99E+00
MB-15										
Cobalt-60	4.20E+04	2.63E+00	3.05E+03	3.05E+03	1.67E+02	2.23E+03	2.40E+03	3.84E+01	1.09E+03	1.13E+03
Cesium-137	3.80E+02	4.13E-01	6.22E+00	6.63E+00	1.34E+00	4.56E+00	5.89E+00	5.03E-01	2.21E+00	2.72E+00
Total		3.04E+00	3.06E+03	3.06E+03	1.68E+02	2.24E+03	2.40E+03	3.89E+01	1.09E+03	1.13E+03
MV Drive										
Carbon-14	1.80E-01	2.35E-04	6.97E-09	2.35E-04	2.49E-04	3.48E-09	2.49E-04	4.61E-04	4.64E-09	4.61E-04
Cobalt-60	1.20E+00	7.51E-05	8.72E-02	8.72E-02	4.77E-03	6.38E-02	6.85E-02	1.10E-03	3.12E-02	3.23E-02
Cesium-137	3.20E+02	3.48E-01	5.23E+00	5.58E+00	1.13E+00	3.84E+00	4.96E+00	4.24E-01	1.86E+00	2.29E+00
Potassium-40	1.20E+01	1.65E+00	5.46E-02	1.70E+00	1.59E+00	3.99E-02	1.63E+00	3.10E+00	1.97E-02	3.12E+00
Tritium	8.50E+00	2.66E-03		2.66E-03	2.73E-03		2.73E-03	2.66E-03		2.66E-03
Total		2.00E+00	5.38E+00	7.38E+00	2.73E+00	3.94E+00	6.67E+00	3.53E+00	1.91E+00	5.44E+00

Table 9.6b. (continued)

Radionuclide[a]	Soil Activity[b] (pCi/g)	White-footed mouse Internal	White-footed mouse External	White-footed mouse Total	Red Fox Internal	Red Fox External	Red Fox Total	White-tailed Deer Internal	White-tailed Deer External	White-tailed Deer Total
NHF										
Americium-241	1.10E-01	1.71E+00	6.26E-05	1.71E+00	7.69E-04	5.57E-05	8.25E-04	3.10E-03	9.23E-06	3.11E-03
Carbon-14	2.07E+00	2.70E-03	8.01E-08	2.70E-03	2.87E-03	4.01E-08	2.87E-03	5.30E-03	5.34E-08	5.30E-03
Cesium-137	1.40E-01	1.52E-04	2.29E-03	2.44E-03	4.92E-04	1.68E-03	2.17E-03	1.85E-04	8.15E-04	1.00E-03
Potassium-40	2.66E+01	3.65E+00	1.21E-01	3.77E+00	3.53E+00	8.84E-02	3.62E+00	6.87E+00	4.36E-02	6.91E+00
Plutonium-238	2.60E-01	9.45E+00	1.13E-07	9.45E+00	2.12E-04	5.64E-08	2.12E-04	1.48E-05	7.52E-08	1.49E-05
Plutonium-239/40	5.00E-02	1.70E+00	4.09E-08	1.70E+00	1.10E-04	2.04E-08	1.10E-04	6.88E-04	2.72E-08	6.88E-04
Radium-226	9.50E-01	6.29E-02	4.82E-02	1.11E-01	3.95E-02	3.53E-02	7.49E-02	2.50E-02	1.72E-02	4.22E-02
Radium-228	1.70E+00	3.98E-06		3.98E-06	2.50E-06		2.50E-06	1.58E-06		1.58E-06
Strontium-90	9.10E-01	1.37E-03	6.05E-05	1.43E-03	4.96E-03	3.03E-05	4.99E-03	1.09E-02	4.04E-05	1.09E-02
Thorium-228	2.42E+00	4.19E-03	1.11E-01	1.15E-01	1.30E-02	8.09E-02	9.39E-02	8.28E-03	4.03E-02	4.86E-02
Thorium-230	1.28E+00	3.24E-04	4.40E-06	3.28E-04	1.00E-03	2.20E-06	1.01E-03	6.40E-04	2.93E-06	6.43E-04
Thorium-232	1.55E+00	3.37E-04	4.32E-02	4.36E-02	1.05E-03	3.17E-02	3.28E-02	6.68E-04	1.53E-02	1.60E-02
Tritium	7.99E+00	2.50E-03		2.50E-03	2.56E-03		2.56E-03	2.50E-03		2.50E-03
Uranium-233/234	9.70E-01	1.63E-03	3.78E-06	1.63E-03	1.81E-02	1.89E-06	1.81E-02	1.42E-01	2.52E-06	1.42E-01
Uranium-235/236	8.00E-02	1.56E-03	3.29E-04	1.88E-03	1.72E-02	2.49E-04	1.75E-02	1.36E-01	1.08E-04	1.36E-01
Uranium-238	9.80E-01	1.45E-03	5.55E-04	2.00E-03	1.60E-02	3.82E-04	1.64E-02	1.26E-01	2.31E-04	1.27E-01
Total		1.66E+01	3.27E-01	1.69E+01	3.65E+00	2.39E-01	3.89E+00	7.33E+00	1.18E-01	7.45E+00
Pit 4 South										
Americium-241	1.10E-01	1.71E+00	6.26E-05	1.71E+00	7.69E-04	5.57E-05	8.25E-04	3.10E-03	9.23E-06	3.11E-03
Cobalt-60	2.34E+02	1.47E-02	1.70E+01	1.70E+01	9.31E-01	1.24E+01	1.34E+01	2.14E-01	6.08E+00	6.29E+00
Cesium-137	1.34E+01	1.46E-02	2.19E-01	2.34E-01	4.71E-02	1.61E-01	2.08E-01	1.77E-02	7.80E-02	9.58E-02
Plutonium-238	6.70E-03	2.43E-01	2.91E-09	2.43E-01	5.46E-06	1.45E-09	5.46E-06	3.82E-07	1.94E-09	3.84E-07
Plutonium-239/40	2.90E-02	9.89E-01	2.37E-08	9.89E-01	6.36E-05	1.18E-08	6.36E-05	3.99E-04	1.58E-08	3.99E-04
Strontium-90	1.00E+00	1.51E-03	6.65E-05	1.57E-03	5.45E-03	3.33E-05	5.49E-03	1.19E-02	4.43E-05	1.20E-02
Thorium-228	6.40E+00	1.11E-02	2.94E-01	3.05E-01	3.44E-02	2.14E-01	2.48E-01	2.19E-02	1.07E-01	1.28E-01
Thorium-230	1.20E+00	3.03E-04	4.12E-06	3.07E-04	9.41E-04	2.06E-06	9.43E-04	6.00E-04	2.75E-06	6.03E-04
Thorium-232	1.50E+00	3.26E-04	4.18E-02	4.22E-02	1.01E-03	3.07E-02	3.17E-02	6.47E-04	1.48E-02	1.55E-02
Uranium-233/234	8.50E+00	1.43E-02	3.31E-05	1.43E-02	1.58E-01	1.65E-05	1.58E-01	1.25E+00	2.21E-05	1.25E+00

Table 9.6b. (continued)

Radionuclide[a]	Soil Activity[b] (pCi/g)	White-footed mouse Internal	White-footed mouse External	White-footed mouse Total	Red Fox Internal	Red Fox External	Red Fox Total	White-tailed Deer Internal	White-tailed Deer External	White-tailed Deer Total
Uranium-235	9.80E-02	1.50E-04	4.03E-04	5.53E-04	1.67E-03	3.04E-04	1.97E-03	1.31E-02	1.32E-04	1.33E-02
Uranium-238	3.10E-01	4.58E-04	1.76E-04	6.33E-04	5.08E-03	1.21E-04	5.20E-03	4.00E-02	7.30E-05	4.01E-02
Total		3.00E+00	1.76E+01	2.06E+01	1.19E+00	1.28E+01	1.40E+01	1.57E+00	6.28E+00	7.85E+00
SWSA 5 Seep A										
Actinium-228	1.90E+00	1.01E-06	5.30E-02	5.30E-02	1.12E-06	3.89E-02	3.89E-02	3.11E-08	1.88E-02	1.88E-02
Americium-241	1.24E+00	1.93E+01	7.06E-04	1.93E+01	8.67E-03	6.28E-04	9.30E-03	3.49E-02	1.04E-04	3.50E-02
Bismuth-214	6.90E-01	3.86E-03	3.02E-02	3.40E-02	3.52E-03	2.21E-02	2.56E-02	3.14E-03	1.08E-02	1.39E-02
Calcium-45	3.00E+01	1.11E+00	5.40E-06	1.11E+00	9.84E-03	2.70E-06	9.84E-03	4.60E-02	3.60E-06	4.60E-02
Carbon-14	1.51E+00	1.97E-03	5.84E-08	1.97E-03	2.09E-03	2.92E-08	2.09E-03	3.86E-03	3.90E-08	3.86E-03
Cesium-137	3.15E+00	3.42E-03	5.15E-02	5.50E-02	1.11E-02	3.78E-02	4.88E-02	4.17E-03	1.83E-02	2.25E-02
Iodine-129	3.40E+00	2.39E-02	1.27E-03	2.51E-02	4.47E-02	1.21E-03	4.59E-02	5.17E-04	8.44E-05	6.01E-04
Lead-212	1.90E+00	6.87E-01	8.67E-02	7.73E-01	1.13E-02	6.31E-02	7.44E-02	6.17E-03	3.14E-02	3.76E-02
Lead-214	9.80E-01	3.49E-01	4.97E-02	3.99E-01	5.73E-03	3.64E-02	4.21E-02	3.14E-03	1.77E-02	2.08E-02
Potassium-40	2.19E+01	3.01E+00	9.97E-02	3.11E+00	2.91E+00	7.28E-02	2.98E+00	5.65E+00	3.59E-02	5.69E+00
Plutonium-238	3.20E-01	1.16E+01	1.39E-07	1.16E+01	2.61E-04	6.94E-08	2.61E-04	1.83E-05	9.26E-08	1.83E-05
Plutonium-239/40	1.77E+00	6.03E+01	1.45E-06	6.03E+01	3.88E-03	7.23E-07	3.88E-03	2.44E-02	9.64E-07	2.44E-02
Radium-223	5.70E-01	8.91E-03	1.98E-03	1.09E-02	5.60E-03	1.50E-03	7.10E-03	3.54E-03	6.33E-04	4.17E-03
Radium-224	3.40E+00	2.49E-01	1.56E-01	4.05E-01	1.57E-01	1.14E-01	2.70E-01	9.89E-02	5.66E-02	1.56E-01
Radium-226	1.01E+00	6.68E-02	5.13E-02	1.18E-01	4.20E-02	3.76E-02	7.96E-02	2.65E-02	1.83E-02	4.48E-02
Radium-228	1.65E+00	3.87E-06		3.87E-06	2.43E-06		2.43E-06	1.53E-06		1.53E-06
Radon-219	7.30E-01									
Strontium-90	1.33E+02	2.00E-01	8.85E-03	2.09E-01	7.25E-01	4.42E-03	7.30E-01	1.59E+00	5.90E-03	1.59E+00
Thorium-228	1.54E+00	2.66E-03	7.07E-02	7.34E-02	8.27E-03	5.15E-02	5.98E-02	5.27E-03	2.56E-02	3.09E-02
Thorium-230	1.65E+00	4.17E-04	5.67E-06	4.23E-04	1.29E-03	2.83E-06	1.30E-03	8.25E-04	3.78E-06	8.29E-04
Thorium-232	1.59E+00	3.46E-04	4.43E-02	4.47E-02	1.07E-03	3.25E-02	3.36E-02	6.85E-04	1.57E-02	1.64E-02
Thallium-208	1.40E+00	9.24E-02	1.36E-01	2.29E-01	1.95E-01	9.99E-02	2.95E-01	2.92E-03	4.86E-02	5.15E-02
Tin-126	1.80E-01	5.13E-06	2.14E-04	2.19E-04	1.47E-06	1.76E-04	1.78E-04	5.41E-06	5.10E-05	5.64E-05
Tritium	2.95E+02	9.24E-02		9.24E-02	9.46E-02		9.46E-02	9.24E-02		9.24E-02
Uranium-232	1.50E-01	2.78E-04	3.89E-07	2.78E-04	3.08E-03	1.95E-07	3.08E-03	2.43E-02	2.60E-07	2.43E-02

Table 9.6b. (continued)

Radionuclide[a]	Soil Activity[b] (pCi/g)	White-footed mouse Internal	White-footed mouse External	White-footed mouse Total	Red Fox Internal	Red Fox External	Red Fox Total	White-tailed Deer Internal	White-tailed Deer External	White-tailed Deer Total
Uranium-233/234	5.65E+00	9.50E-03	2.20E-05	9.52E-03	1.05E-01	1.10E-05	1.05E-01	8.30E-01	1.47E-05	8.30E-01
Uranium-238	1.02E+00	1.51E-03	5.77E-04	2.08E-03	1.67E-02	3.97E-04	1.71E-02	1.32E-01	2.40E-04	1.32E-01
Total		9.72E+01	8.43E-01	9.81E+01	4.36E+00	6.15E-01	4.98E+00	8.58E+00	3.05E-01	8.89E+00
SWSA 5 Seep B West										
Americium-241	6.78E+00	1.06E+02	3.86E-03	1.06E+02	4.74E-02	3.43E-03	5.08E-02	1.91E-01	5.69E-04	1.92E-01
Carbon-14	2.77E+01	3.61E-02	1.07E-06	3.61E-02	3.84E-02	5.36E-07	3.84E-02	7.09E-02	7.15E-07	7.09E-02
Curium-244	3.56E+01	5.69E+02	1.29E-05	5.69E+02	5.10E-02	6.45E-06	5.10E-02	2.35E-01	8.60E-06	2.35E-01
Cobalt-60	2.24E+02	1.40E-02	1.63E+01	1.63E+01	8.91E-01	1.19E+01	1.28E+01	2.05E-01	5.82E+00	6.03E+00
Cesium-137	1.37E+01	1.49E-02	2.24E-01	2.39E-01	4.82E-02	1.64E-01	2.12E-01	1.81E-02	7.98E-02	9.79E-02
Potassium-40	3.20E+01	4.40E+00	1.46E-01	4.54E+00	4.25E+00	1.06E-01	4.35E+00	8.26E+00	5.24E-02	8.31E+00
Plutonium-238	8.90E-01	3.23E+01	3.86E-07	3.23E+01	7.26E-04	1.93E-07	7.26E-04	5.08E-05	2.57E-07	5.10E-05
Plutonium-239/40	1.46E+00	4.98E+01	1.19E-06	4.98E+01	3.20E-03	5.97E-07	3.20E-03	2.01E-02	7.95E-07	2.01E-02
Radium-226	3.50E+00	2.32E-01	1.78E-01	4.09E-01	1.46E-01	1.30E-01	2.76E-01	9.20E-02	6.33E-02	1.55E-01
Radium-228	8.60E+00	2.02E-05		2.02E-05	1.27E-05		1.27E-05	8.00E-06		8.00E-06
Strontium-90	1.03E+04	1.55E+01	6.85E-01	1.62E+01	5.62E+01	3.43E-01	5.65E+01	1.23E+02	4.57E-01	1.23E+02
Thorium-228	1.91E+00	3.30E-03	8.77E-02	9.10E-02	1.03E-02	6.39E-02	7.41E-02	6.54E-03	3.18E-02	3.83E-02
Thorium-230	1.23E+01	3.11E-03	4.23E-05	3.15E-03	9.65E-03	2.11E-05	9.67E-03	6.15E-03	2.82E-05	6.18E-03
Thorium-232	1.55E+00	3.37E-04	4.32E-02	4.36E-02	1.05E-03	3.17E-02	3.28E-02	6.68E-04	1.53E-02	1.60E-02
Tritium	1.90E+03	5.95E-01		5.95E-01	6.09E-01		6.09E-01	5.95E-01		5.95E-01
Uranium-232	5.30E-01	9.81E-04	1.38E-06	9.82E-04	1.09E-02	6.88E-07	1.09E-02	8.57E-02	9.17E-07	8.57E-02
Uranium-233	1.05E+01	1.77E-02	4.09E-05	1.77E-02	1.96E-01	2.04E-05	1.96E-01	1.54E+00	2.72E-05	1.54E+00
Uranium-238	9.60E-01	1.42E-03	5.44E-04	1.96E-03	1.57E-02	3.74E-04	1.61E-02	1.24E-01	2.26E-04	1.24E-01
Total		7.78E+02	1.76E+01	7.95E+02	6.25E+01	1.27E+01	7.52E+01	1.34E+02	6.52E+00	1.41E+02
SWSA 5 Seep B East										
Actinium-228	1.10E+00	5.86E-07	3.07E-02	3.07E-02	6.47E-07	2.25E-02	2.25E-02	1.80E-08	1.09E-02	1.09E-02
Carbon-14	2.05E+00	2.67E-03	7.93E-08	2.67E-03	2.84E-03	3.97E-08	2.84E-03	5.25E-03	5.29E-08	5.25E-03
Cesium-137	6.53E+03	7.10E+00	1.07E+02	1.14E+02	2.30E+01	7.83E+01	1.01E+02	8.65E+00	3.80E+01	4.67E+01
Barium-137m	6.20E+03	1.94E+00	1.07E+02	1.09E+02	7.78E+00	7.83E+01	8.61E+01	3.80E+00	3.80E+01	4.18E+01

Table 9.6b. (continued)

Radionuclide[a]	Soil Activity[b] (pCi/g)	White-footed mouse Internal	White-footed mouse External	White-footed mouse Total	Red Fox Internal	Red Fox External	Red Fox Total	White-tailed Deer Internal	White-tailed Deer External	White-tailed Deer Total
Lead-212	1.40E+00	5.06E-01	6.39E-02	5.70E-01	8.29E-03	4.65E-02	5.48E-02	4.54E-03	2.32E-02	2.77E-02
Lead-214	9.10E-01	3.24E-01	4.61E-02	3.70E-01	5.17E-03	3.38E-02	3.90E-02	2.91E-03	1.64E-02	1.93E-02
Potassium-40	1.95E+01	2.68E+00	8.88E-02	2.77E+00	2.59E+00	6.48E-02	2.65E+00	5.03E+00	3.19E-02	5.07E+00
Radium-226	1.10E+00	7.28E-02	5.59E-02	1.29E-01	4.58E-02	4.09E-02	8.67E-02	2.89E-02	1.99E-02	4.88E-02
Radium-228	1.10E+00	2.58E-06		2.58E-06	1.62E-06		1.62E-06	1.02E-06		1.02E-06
Strontium-90	2.80E+01	4.22E-02	1.86E-03	4.41E-02	1.53E-01	9.31E-04	1.54E-01	3.34E-01	1.24E-03	3.35E-01
Thorium-228	1.50E+00	2.60E-03	6.89E-02	7.15E-02	8.06E-03	5.02E-02	5.82E-02	5.13E-03	2.50E-02	3.01E-02
Thorium-232	1.10E+00	2.39E-04	3.07E-02	3.09E-02	7.43E-04	2.25E-02	2.33E-02	4.74E-04	1.09E-02	1.14E-02
Thallium-208	1.40E+00	9.24E-02	1.36E-01	2.29E-01	1.95E-01	9.99E-02	2.95E-01	2.92E-03	4.86E-02	5.15E-02
Tritium	5.28E+01	1.65E-02		1.65E-02	1.69E-02		1.69E-02	1.65E-02		1.65E-02
Total		1.28E+01	2.14E+02	2.27E+02	3.38E+01	1.57E+02	1.91E+02	1.79E+01	7.62E+01	9.41E+01
SWSA 5 Seep C										
Americium-241	1.10E+00	1.71E+01	6.26E-04	1.71E+01	7.69E-03	5.57E-04	8.25E-03	3.10E-02	9.23E-05	3.11E-02
Calcium-45	5.30E+02	1.96E+01	9.55E-05	1.96E+01	1.74E-01	4.77E-05	1.74E-01	8.12E-01	6.36E-05	8.12E-01
Carbon-14	4.55E+01	5.94E-02	1.76E-06	5.94E-02	6.30E-02	8.81E-07	6.30E-02	1.16E-01	1.17E-06	1.16E-01
Curium-244	5.65E+00	9.03E+01	2.05E-06	9.03E+01	8.09E-03	1.02E-06	8.09E-03	3.73E-02	1.36E-06	3.73E-02
Cobalt-60	2.75E+00	1.72E-04	2.00E-01	2.00E-01	1.09E-02	1.46E-01	1.57E-01	2.52E-03	7.15E-02	7.40E-02
Cesium-137	4.30E+02	4.67E-01	7.03E+00	7.50E+00	1.51E+00	5.16E+00	6.67E+00	5.70E-01	2.50E+00	3.07E+00
Lead-212	3.81E-01	1.38E-01	1.74E-02	1.55E-01	2.26E-03	1.27E-02	1.49E-02	1.24E-03	6.30E-03	7.54E-03
Potassium-40	1.90E+01	2.61E+00	8.65E-02	2.70E+00	2.52E+00	6.32E-02	2.58E+00	4.91E+00	3.11E-02	4.94E+00
Plutonium-238	6.73E-01	2.45E+01	2.92E-07	2.45E+01	5.49E-04	1.46E-07	5.49E-04	3.84E-05	1.95E-07	3.86E-05
Plutonium-239/40	1.91E-01	6.51E+00	1.56E-07	6.51E+00	4.19E-04	7.80E-08	4.19E-04	2.63E-03	1.04E-07	2.63E-03
Radium-226	1.29E+00	8.54E-02	6.55E-02	1.51E-01	5.37E-02	4.80E-02	1.02E-01	3.39E-02	2.33E-02	5.72E-02
Radium-228	1.58E+00	3.70E-06		3.70E-06	2.33E-06		2.33E-06	1.47E-06		1.47E-06
Strontium-90	1.58E+03	2.38E+00	1.05E-01	2.49E+00	8.61E+00	5.25E-02	8.67E+00	1.88E+01	7.01E-02	1.89E+01
Technetium-99	4.17E+00	8.20E-04	1.50E-06	8.22E-04	1.58E-04	7.51E-07	1.59E-04	8.20E-04	1.00E-06	8.21E-04
Thorium-228	1.88E+00	3.25E-03	8.63E-02	8.96E-02	1.01E-02	6.29E-02	7.30E-02	6.44E-03	3.13E-02	3.77E-02
Thorium-230	2.45E+00	6.19E-04	8.42E-06	6.28E-04	1.92E-03	4.21E-06	1.93E-03	1.22E-03	5.61E-06	1.23E-03
Thorium-232	1.73E+00	3.76E-04	4.82E-02	4.86E-02	1.17E-03	3.54E-02	3.66E-02	7.46E-04	1.71E-02	1.79E-02

Table 9.6b. (continued)

Radionuclide[a]	Soil Activity[b] (pCi/g)	White-footed mouse Internal	White-footed mouse External	White-footed mouse Total	Red Fox Internal	Red Fox External	Red Fox Total	White-tailed Deer Internal	White-tailed Deer External	White-tailed Deer Total
Tritium	5.52E+02	1.73E-01		1.73E-01	1.77E-01		1.77E-01	1.73E-01		1.73E-01
Uranium-233/234	2.11E+00	3.55E-03	8.21E-06	3.56E-03	3.93E-02	4.11E-06	3.93E-02	3.10E-01	5.48E-06	3.10E-01
Uranium-235	1.80E-01	2.76E-04	7.40E-04	1.02E-03	3.06E-03	5.59E-04	3.62E-03	2.41E-02	2.42E-04	2.44E-02
Uranium-235/236	6.29E-02	2.68E-03	2.59E-04	2.94E-03	2.97E-02	1.96E-04	2.99E-02	2.34E-01	8.49E-05	2.35E-01
Uranium-238	1.77E+00	2.61E-03	1.00E-03	3.62E-03	2.90E-02	6.89E-04	2.97E-02	2.28E-01	4.17E-04	2.29E-01
Total		1.64E+02	7.65E+00	1.72E+02	1.33E+01	5.58E+00	1.88E+01	2.63E+01	2.76E+00	2.91E+01
SWSA 5 Trib 1										
Actinium-228	2.17E+00	1.16E-06	6.05E-02	6.05E-02	1.28E-06	4.44E-02	4.44E-02	3.55E-08	2.15E-02	2.15E-02
Americium-241	4.95E-01	7.72E+00	2.82E-04	7.72E+00	3.46E-03	2.51E-04	3.71E-03	1.39E-02	4.15E-05	1.40E-02
Bismuth-212	2.60E+00	4.14E-03	1.40E-02	1.81E-02	3.78E-03	1.02E-02	1.40E-02	3.37E-03	4.99E-03	8.36E-03
Bismuth-214	9.40E-01	5.26E-03	4.11E-02	4.63E-02	4.80E-03	3.01E-02	3.49E-02	4.28E-03	1.47E-02	1.90E-02
Carbon-14	8.00E-01	1.04E-03	3.10E-08	1.04E-03	1.11E-03	1.55E-08	1.11E-03	2.05E-03	2.06E-08	2.05E-03
Cesium-134	4.00E-02	3.09E-05	1.80E-03	1.83E-03	1.20E-04	1.32E-03	1.44E-03	5.56E-05	6.41E-04	6.96E-04
Cobalt-60	9.11E+01	5.70E-03	6.62E+00	6.62E+00	3.62E-01	4.84E+00	5.20E+00	8.34E-02	2.37E+00	2.45E+00
Cesium-137	3.27E+03	3.55E+00	5.35E+01	5.70E+01	1.15E+01	3.92E+01	5.07E+01	4.33E+00	1.90E+01	2.34E+01
Curium-243	1.80E-01	2.49E+00	6.16E-04	2.49E+00	2.58E-04	4.70E-04	7.28E-04	1.19E-03	1.95E-04	1.38E-03
Iodine-129	5.70E+00	4.00E-02	2.13E-03	4.21E-02	7.49E-02	2.02E-03	7.69E-02	8.67E-04	1.42E-04	1.01E-03
Lead-212	1.24E+00	4.48E-01	5.66E-02	5.05E-01	7.35E-03	4.12E-02	4.85E-02	4.02E-03	2.05E-02	2.45E-02
Lead-214	1.13E+00	4.03E-01	5.73E-02	4.60E-01	6.42E-03	4.20E-02	4.84E-02	3.62E-03	2.04E-02	2.40E-02
Potassium-40	2.39E+01	3.28E+00	1.09E-01	3.39E+00	3.17E+00	7.95E-02	3.25E+00	6.17E+00	3.91E-02	6.21E+00
Plutonium-238	3.50E+00	1.27E+02	1.52E-06	1.27E+02	2.85E-03	7.59E-07	2.85E-03	2.00E-04	1.01E-06	2.01E-04
Radium-223	5.60E-01	8.76E-03	1.94E-03	1.07E-02	5.50E-03	1.48E-03	6.98E-03	3.48E-03	6.22E-04	4.10E-03
Radium-226	1.43E+00	9.46E-02	7.26E-02	1.67E-01	5.95E-02	5.32E-02	1.13E-01	3.76E-02	2.59E-02	6.35E-02
Radium-228	1.70E+00	3.98E-06		3.98E-06	2.50E-06		2.50E-06	1.58E-06		1.58E-06
Strontium-90	2.60E+01	3.92E-02	1.73E-03	4.09E-02	1.42E-01	8.65E-04	1.43E-01	3.10E-01	1.15E-03	3.11E-01
Thorium-228	1.66E+00	2.87E-03	7.62E-02	7.91E-02	8.91E-03	5.55E-02	6.44E-02	5.68E-03	2.76E-02	3.33E-02
Thorium-230	9.36E-01	2.37E-04	3.22E-06	2.40E-04	7.34E-04	1.61E-06	7.36E-04	4.68E-04	2.14E-06	4.70E-04
Thorium-232	1.79E+00	3.89E-04	4.99E-02	5.03E-02	1.21E-03	3.66E-02	3.79E-02	7.72E-04	1.77E-02	1.85E-02
Thallium-208	1.50E+00	9.90E-02	1.46E-01	2.45E-01	2.09E-01	1.07E-01	3.16E-01	3.13E-03	5.20E-02	5.52E-02

Table 9.6b. (continued)

Radionuclide[a]	Soil Activity[b] (pCi/g)	White-footed mouse Internal	White-footed mouse External	White-footed mouse Total	Red Fox Internal	Red Fox External	Red Fox Total	White-tailed Deer Internal	White-tailed Deer External	White-tailed Deer Total
Thorium-234	7.30E+00	6.07E-05	2.16E-02	2.17E-02	2.22E-05	1.58E-02	1.58E-02	7.50E-05	7.79E-03	7.86E-03
Tin-126	4.60E-01	1.31E-05	5.48E-04	5.61E-04	3.77E-06	4.50E-04	4.54E-04	1.38E-05	1.30E-04	1.44E-04
Tritium	4.82E+00	1.51E-03		1.51E-03	1.55E-03		1.55E-03	1.51E-03		1.51E-03
Uranium-233/234	4.00E+00	6.73E-03	1.56E-05	6.74E-03	7.45E-02	7.78E-06	7.45E-02	5.88E-01	1.04E-05	5.88E-01
Uranium-238	3.87E+00	5.72E-03	2.19E-03	7.91E-03	6.34E-02	1.51E-03	6.49E-02	4.99E-01	9.11E-04	5.00E-01
Total		1.45E+02	6.08E+01	2.06E+02	1.57E+01	4.46E+01	6.03E+01	1.21E+01	2.17E+01	3.37E+01
SWSA 5 WOC										
Actinium-228	1.80E+00	9.59E-07	5.02E-02	5.02E-02	1.06E-06	3.68E-02	3.68E-02	2.94E-08	1.78E-02	1.78E-02
Americium-241	1.58E-01	2.46E+00	9.00E-05	2.46E+00	1.10E-03	8.00E-05	1.18E-03	4.45E-03	1.33E-05	4.46E-03
Carbon-14	1.99E+00	2.60E-03	7.70E-08	2.60E-03	2.76E-03	3.85E-08	2.76E-03	5.09E-03	5.14E-08	5.09E-03
Curium-244	1.51E-01	2.41E+00	5.47E-08	2.41E+00	2.16E-04	2.74E-08	2.16E-04	9.97E-04	3.65E-08	9.97E-04
Cobalt-60	5.34E+00	3.34E-04	3.88E-01	3.88E-01	2.12E-02	2.84E-01	3.05E-01	4.89E-03	1.39E-01	1.44E-01
Cobalt-57	2.30E+00	2.42E-05	7.15E-03	7.18E-03	1.23E-03	5.51E-03	6.74E-03	2.13E-04	2.19E-03	2.41E-03
Cesium-137	4.91E+02	5.34E-01	8.03E+00	8.57E+00	1.73E+00	5.89E+00	7.61E+00	6.50E-01	2.86E+00	3.51E+00
Curium-242	1.78E-02	2.59E-01	8.68E-09	2.59E-01	2.68E-05	4.34E-09	2.68E-05	1.23E-04	5.79E-09	1.23E-04
Lead-212	5.84E-01	2.11E-01	2.66E-02	2.38E-01	3.46E-03	1.94E-02	2.29E-02	1.90E-03	9.66E-03	1.16E-02
Lead-214	1.12E+00	3.99E-01	5.67E-02	4.56E-01	6.36E-03	4.16E-02	4.80E-02	3.59E-03	2.02E-02	2.38E-02
Potassium-40	1.57E+01	2.16E+00	7.15E-02	2.23E+00	2.08E+00	5.22E-02	2.14E+00	4.05E+00	2.57E-02	4.08E+00
Plutonium-238	2.90E-01	1.05E+01	1.26E-07	1.05E+01	2.36E-04	6.29E-08	2.37E-04	1.65E-05	8.39E-08	1.66E-05
Plutonium-239/40	2.22E-02	7.57E-01	1.81E-08	7.57E-01	4.87E-05	9.07E-09	4.87E-05	3.05E-04	1.21E-08	3.05E-04
Radium-226	1.21E+00	8.01E-02	6.14E-02	1.42E-01	5.03E-02	4.50E-02	9.54E-02	3.18E-02	2.19E-02	5.37E-02
Radium-228	2.10E+00	4.92E-06		4.92E-06	3.09E-06		3.09E-06	1.95E-06		1.95E-06
Sodium-22	1.50E+00	1.73E-01	9.51E-02	2.69E-01	1.04E+01	6.97E-02	1.04E+01	8.96E-02	3.39E-02	1.24E-01
Strontium-90	6.69E+02	1.01E+00	4.45E-02	1.05E+00	3.65E+00	2.22E-02	3.67E+00	7.98E+00	2.97E-02	8.01E+00
Technetium-99	1.90E-01	3.74E-05	6.84E-08	3.74E-05	7.22E-06	3.42E-08	7.25E-06	3.73E-05	4.56E-08	3.74E-05
Thorium-228	1.50E+00	2.60E-03	6.89E-02	7.15E-02	8.06E-03	5.02E-02	5.82E-02	5.13E-03	2.50E-02	3.01E-02
Thorium-230	1.33E+00	3.36E-04	4.57E-06	3.41E-04	1.04E-03	2.28E-06	1.05E-03	6.65E-04	3.05E-06	6.68E-04
Thorium-232	1.30E+00	2.83E-04	3.63E-02	3.65E-02	8.78E-04	2.66E-02	2.75E-02	5.60E-04	1.29E-02	1.34E-02
Thallium-208	2.00E+00	1.32E-01	1.95E-01	3.27E-01	2.78E-01	1.43E-01	4.21E-01	4.17E-03	6.94E-02	7.36E-02

Table 9.6b. (continued)

Radionuclide[a]	Soil Activity[b] (pCi/g)	White-footed mouse Internal	White-footed mouse External	White-footed mouse Total	Red Fox Internal	Red Fox External	Red Fox Total	White-tailed Deer Internal	White-tailed Deer External	White-tailed Deer Total
Tritium	1.28E+01	4.01E-03		4.01E-03	4.11E-03		4.11E-03	4.01E-03		4.01E-03
Uranium-233/234	9.76E-01	1.64E-03	3.80E-06	1.64E-03	1.82E-02	1.90E-06	1.82E-02	1.43E-01	2.53E-06	1.43E-01
Uranium-235	4.39E-02	6.74E-05	1.81E-04	2.48E-04	7.47E-04	1.36E-04	8.83E-04	5.89E-03	5.90E-05	5.95E-03
Uranium-235/236	1.11E-01	1.57E-03	4.57E-04	2.03E-03	1.74E-02	3.45E-04	1.77E-02	1.37E-01	1.49E-04	1.37E-01
Uranium-238	9.57E-01	1.41E-03	5.42E-04	1.96E-03	1.57E-02	3.73E-04	1.60E-02	1.24E-01	2.25E-04	1.24E-01
Total		2.11E+01	9.13E+00	3.03E+01	1.82E+01	6.68E+00	2.49E+01	1.33E+01	3.27E+00	1.65E+01
SWSA 4 Main										
Cesium-137	8.80E+04	9.56E+01	1.44E+03	1.54E+03	3.09E+02	1.06E+03	1.36E+03	1.17E+02	5.12E+02	6.29E+02
Potassium-40	1.30E+01	1.79E+00	5.92E-02	1.84E+00	1.73E+00	4.32E-02	1.77E+00	3.36E+00	2.13E-02	3.38E+00
Strontium-90	1.10E+04	1.66E+01	7.32E-01	1.73E+01	6.00E+01	3.66E-01	6.03E+01	1.31E+02	4.88E-01	1.32E+02
Tritium	6.70E+02	2.10E-01		2.10E-01	2.15E-01		2.15E-01	2.10E-01		2.10E-01
Total		1.14E+02	1.44E+03	1.55E+03	3.71E+02	1.06E+03	1.43E+03	2.51E+02	5.13E+02	7.64E+02
SWSA 5 N WOC										
Actinium-228	2.10E+00	1.12E-06	5.86E-02	5.86E-02	1.23E-06	4.30E-02	4.30E-02	3.43E-08	2.08E-02	2.08E-02
Bismuth-212	1.90E+00	3.03E-03	1.02E-02	1.33E-02	2.76E-03	7.49E-03	1.02E-02	2.46E-03	3.65E-03	6.11E-03
Bismuth-214	8.10E-01	4.54E-03	3.54E-02	3.99E-02	4.13E-03	2.59E-02	3.00E-02	3.69E-03	1.27E-02	1.63E-02
Carbon-14	4.01E-01	5.23E-04	1.55E-08	5.23E-04	5.56E-04	7.76E-09	5.56E-04	1.03E-03	1.03E-08	1.03E-03
Iodine-129	4.40E+00	3.09E-02	1.64E-03	3.25E-02	5.78E-02	1.56E-03	5.94E-02	6.69E-04	1.09E-04	7.78E-04
Lead-212	1.60E+00	5.78E-01	7.30E-02	6.51E-01	9.48E-03	5.32E-02	6.26E-02	5.19E-03	2.65E-02	3.17E-02
Lead-214	1.07E+00	3.81E-01	5.42E-02	4.36E-01	6.08E-03	3.97E-02	4.58E-02	3.43E-03	1.93E-02	2.27E-02
Potassium-40	3.08E+01	4.23E+00	1.40E-01	4.37E+00	4.09E+00	1.02E-01	4.19E+00	7.95E+00	5.04E-02	8.00E+00
Radium-226	9.50E-01	6.29E-02	4.82E-02	1.11E-01	3.95E-02	3.53E-02	7.49E-02	2.50E-02	1.72E-02	4.22E-02
Radium-228	2.10E+00	4.92E-06		4.92E-06	3.09E-06		3.09E-06	1.95E-06		1.95E-06
Strontium-90	3.13E-01	4.72E-04	2.08E-05	4.92E-04	1.71E-03	1.04E-05	1.72E-03	3.73E-03	1.39E-05	3.75E-03
Thorium-228	2.00E+00	3.46E-03	9.19E-02	9.53E-02	1.07E-02	6.69E-02	7.76E-02	6.85E-03	3.33E-02	4.01E-02
Thorium-232	2.10E+00	4.57E-04	5.86E-02	5.90E-02	1.42E-03	4.30E-02	4.44E-02	9.05E-04	2.08E-02	2.17E-02
Thallium-208	1.80E+00	1.19E-01	1.75E-01	2.94E-01	2.50E-01	1.28E-01	3.79E-01	3.75E-03	6.24E-02	6.62E-02
Thorium-234	1.90E+00	4.42E-05	1.57E-02	1.58E-02	1.44E-05	1.15E-02	1.15E-02	5.42E-05	5.59E-03	5.65E-03

Table 9.6b. (continued)

Radionuclide[a]	Soil Activity[b] (pCi/g)	White-footed mouse Internal	White-footed mouse External	White-footed mouse Total	Red Fox Internal	Red Fox External	Red Fox Total	White-tailed Deer Internal	White-tailed Deer External	White-tailed Deer Total
Tin-126	3.40E-01	9.70E-06	4.05E-04	4.15E-04	2.78E-06	3.33E-04	3.35E-04	1.02E-05	9.63E-05	1.06E-04
Tritium	1.06E+01	3.32E-03		3.32E-03	3.40E-03		3.40E-03	3.32E-03		3.32E-03
Total		5.42E+00	7.63E-01	6.18E+00	4.48E+00	5.59E-01	5.03E+00	8.01E+00	2.73E-01	8.29E+00
SWSA 6 East										
Cobalt-60	5.33E+01	3.34E-03	3.87E+00	3.87E+00	2.12E-01	2.83E+00	3.04E+00	4.88E-02	1.38E+00	1.43E+00
Cesium-137	2.14E+00	2.33E-03	3.50E-02	3.73E-02	7.52E-03	2.57E-02	3.32E-02	2.83E-03	1.25E-02	1.53E-02
Potassium-40	2.57E+01	3.53E+00	1.17E-01	3.65E+00	3.41E+00	8.55E-02	3.50E+00	6.64E+00	4.21E-02	6.68E+00
Radium-224	1.52E+00	1.11E-01	6.98E-02	1.81E-01	7.00E-02	5.08E-02	1.21E-01	4.42E-02	2.53E-02	6.95E-02
Radium-226	8.00E-01	5.29E-02	4.06E-02	9.36E-02	3.33E-02	2.98E-02	6.30E-02	2.10E-02	1.45E-02	3.55E-02
Radium-228	1.52E+00	3.56E-06		3.56E-06	2.24E-06		2.24E-06	1.41E-06		1.41E-06
Strontium-90	6.22E+00	9.37E-03	4.14E-04	9.79E-03	3.39E-02	2.07E-04	3.41E-02	7.42E-02	2.76E-04	7.45E-02
Thorium-228	1.45E+00	2.51E-03	6.66E-02	6.91E-02	7.79E-03	4.85E-02	5.63E-02	4.96E-03	2.41E-02	2.91E-02
Thorium-230	1.27E+00	3.21E-04	4.36E-06	3.25E-04	9.96E-04	2.18E-06	9.98E-04	6.35E-04	2.91E-06	6.38E-04
Thorium-232	1.11E+00	2.42E-04	3.10E-02	3.12E-02	7.50E-04	2.27E-02	2.35E-02	4.78E-04	1.10E-02	1.15E-02
Thorium-234	3.96E-01	2.34E-02	2.82E-05	2.34E-02	3.51E-02	1.41E-05	3.51E-02	1.19E-01	1.88E-05	1.19E-01
Tritium	7.10E+01	2.22E-02		2.22E-02	2.28E-02		2.28E-02	2.22E-02		2.22E-02
Uranium-234	6.70E-01	1.11E-03	7.71E-07	1.11E-03	1.23E-02	3.85E-07	1.23E-02	9.72E-02	5.14E-07	9.72E-02
Uranium-235/236	6.00E-01	2.02E-03	2.47E-03	4.49E-03	2.24E-02	1.86E-03	2.43E-02	1.77E-01	8.07E-04	1.78E-01
Uranium-238	7.54E-01	1.11E-03	4.27E-04	1.54E-03	1.23E-02	2.94E-04	1.26E-02	9.73E-02	1.78E-04	9.75E-02
Total		3.76E+00	4.23E+00	8.00E+00	3.88E+00	3.10E+00	6.98E+00	7.35E+00	1.52E+00	8.86E+00
SWSA 6 South										
Americium-241	6.00E-01	9.35E+00	3.42E-04	9.35E+00	4.20E-03	3.04E-04	4.50E-03	1.69E-02	5.03E-05	1.70E-02
Potassium-40	1.81E+01	2.49E+00	8.24E-02	2.57E+00	2.40E+00	6.02E-02	2.46E+00	4.67E+00	2.96E-02	4.70E+00
Plutonium-238	6.00E-01	2.18E+01	2.60E-07	2.18E+01	4.89E-04	1.30E-07	4.89E-04	3.42E-05	1.74E-07	3.44E-05
Plutonium-239/40	6.00E-01	2.05E+01	4.90E-07	2.05E+01	1.32E-03	2.45E-07	1.32E-03	8.26E-03	3.27E-07	8.26E-03
Radium-224	1.40E+00	1.03E-01	6.43E-02	1.67E-01	6.45E-02	4.68E-02	1.11E-01	4.07E-02	2.33E-02	6.40E-02
Radium-226	8.30E-01	5.49E-02	4.21E-02	9.71E-02	3.45E-02	3.09E-02	6.54E-02	2.18E-02	1.50E-02	3.68E-02
Radium-228	1.46E+00	3.42E-06		3.42E-06	2.15E-06		2.15E-06	1.36E-06		1.36E-06

Table 9.6b. (continued)

Radionuclide[a]	Soil Activity[b] (pCi/g)	White-footed mouse Internal	White-footed mouse External	White-footed mouse Total	Red Fox Internal	Red Fox External	Red Fox Total	White-tailed Deer Internal	White-tailed Deer External	White-tailed Deer Total
Thorium-228	1.04E+00	1.80E-03	4.78E-02	4.96E-02	5.59E-03	3.48E-02	4.04E-02	3.56E-03	1.73E-02	2.09E-02
Thorium-230	1.00E+00	2.53E-04	3.44E-06	2.56E-04	7.84E-04	1.72E-06	7.86E-04	5.00E-04	2.29E-06	5.02E-04
Thorium-232	1.07E+00	2.33E-04	2.98E-02	3.01E-02	7.23E-04	2.19E-02	2.26E-02	4.61E-04	1.06E-02	1.10E-02
Thorium-234	1.12E+00	2.20E-03	2.55E-03	4.75E-03	2.44E-02	1.90E-03	2.63E-02	1.92E-01	8.59E-04	1.93E-01
Uranium-234	7.70E-01	1.28E-03	8.86E-07	1.28E-03	1.42E-02	4.43E-07	1.42E-02	1.12E-01	5.91E-07	1.12E-01
Uranium-235/236	6.00E-01	2.15E-03	2.47E-03	4.62E-03	2.38E-02	1.86E-03	2.57E-02	1.88E-01	8.07E-04	1.89E-01
Uranium-238	8.40E-01	1.24E-03	4.76E-04	1.72E-03	1.38E-02	3.27E-04	1.41E-02	1.08E-01	1.98E-04	1.09E-01
Total		5.43E+01	2.72E-01	5.45E+01	2.59E+00	1.99E-01	2.79E+00	5.37E+00	9.78E-02	5.46E+00
W6MS3										
Americium-241	8.90E-01	1.39E+01	5.07E-04	1.39E+01	6.22E-03	4.51E-04	6.67E-03	2.51E-02	7.46E-05	2.51E-02
Curium-244	6.00E-01	9.59E+00	2.17E-07	9.59E+00	8.59E-04	1.09E-07	8.59E-04	3.96E-03	1.45E-07	3.96E-03
Cobalt-60	1.06E-01	6.64E-06	7.70E-03	7.71E-03	4.22E-04	5.63E-03	6.05E-03	9.70E-05	2.75E-03	2.85E-03
Cesium-137	6.01E-01	6.53E-04	9.83E-03	1.05E-02	2.11E-03	7.21E-03	9.32E-03	7.96E-04	3.50E-03	4.30E-03
Curium-242	6.00E-01	8.74E+00	2.93E-07	8.74E+00	9.04E-04	1.46E-07	9.04E-04	4.16E-03	1.95E-07	4.16E-03
Potassium-40	2.39E+01	3.28E+00	1.09E-01	3.39E+00	3.17E+00	7.95E-02	3.25E+00	6.17E+00	3.91E-02	6.21E+00
Plutonium-238	6.00E-01	2.18E+01	2.60E-07	2.18E+01	4.89E-04	1.30E-07	4.89E-04	3.42E-05	1.74E-07	3.44E-05
Plutonium-239/40	6.00E-01	2.05E+01	4.90E-07	2.05E+01	1.32E-03	2.45E-07	1.32E-03	8.26E-03	3.27E-07	8.26E-03
Radium-224	1.27E+00	9.31E-02	5.83E-02	1.51E-01	5.85E-02	4.25E-02	1.01E-01	3.70E-02	2.11E-02	5.81E-02
Radium-226	8.21E-01	5.43E-02	4.17E-02	9.60E-02	3.42E-02	3.05E-02	6.47E-02	2.16E-02	1.49E-02	3.64E-02
Radium-228	1.34E+00	3.14E-06		3.14E-06	1.97E-06		1.97E-06	1.25E-06		1.25E-06
Strontium-90	2.55E+01	3.84E-02	1.70E-03	4.01E-02	1.39E-01	8.48E-04	1.40E-01	3.04E-01	1.13E-03	3.05E-01
Technetium-99	9.00E-01	1.77E-04	3.24E-07	1.77E-04	3.42E-05	1.62E-07	3.44E-05	1.77E-04	2.16E-07	1.77E-04
Thorium-228	1.25E+00	2.16E-03	5.74E-02	5.96E-02	6.71E-03	4.18E-02	4.85E-02	4.28E-03	2.08E-02	2.51E-02
Thorium-230	1.59E+00	4.02E-04	5.46E-06	4.07E-04	1.25E-03	2.73E-06	1.25E-03	7.95E-04	3.64E-06	7.99E-04
Thorium-232	9.37E-01	2.04E-04	2.61E-02	2.63E-02	6.33E-04	1.92E-02	1.98E-02	4.04E-04	9.27E-03	9.67E-03
Thorium-234	1.50E+00	1.65E-01	1.06E-04	1.65E-01	2.03E-01	5.32E-05	2.03E-01	4.57E-01	7.09E-05	4.57E-01
Tritium	5.15E+02	1.61E-01		1.61E-01	1.65E-01		1.65E-01	1.61E-01		1.61E-01
Uranium-234	2.04E+00	3.39E-03	2.35E-06	3.39E-03	3.76E-02	1.17E-06	3.76E-02	2.96E-01	1.56E-06	2.96E-01
Uranium-235/236	6.00E-01	2.46E-03	2.47E-03	4.92E-03	2.72E-02	1.86E-03	2.91E-02	2.15E-01	8.07E-04	2.15E-01

Table 9.6b. (continued)

Radionuclide[a]	Soil Activity[b] (pCi/g)	White-footed mouse Internal	White-footed mouse External	White-footed mouse Total	Red Fox Internal	Red Fox External	Red Fox Total	White-tailed Deer Internal	White-tailed Deer External	White-tailed Deer Total
Uranium-238	1.05E+00	1.55E-03	5.94E-04	2.15E-03	1.72E-02	4.09E-04	1.76E-02	1.36E-01	2.47E-04	1.36E-01
Total		7.83E+01	3.15E-01	7.86E+01	3.87E+00	2.30E-01	4.10E+00	7.85E+00	1.14E-01	7.96E+00
W6MS1										
Americium-241	6.00E-01	9.35E+00	3.42E-04	9.35E+00	4.20E-03	3.04E-04	4.50E-03	1.69E-02	5.03E-05	1.70E-02
Cobalt-60	1.80E-01	1.13E-05	1.31E-02	1.31E-02	7.16E-04	9.57E-03	1.03E-02	1.65E-04	4.68E-03	4.84E-03
Cesium-137	6.48E-01	7.04E-04	1.06E-02	1.13E-02	2.28E-03	7.77E-03	1.00E-02	8.58E-04	3.77E-03	4.63E-03
Potassium-40	2.65E+01	3.64E+00	1.21E-01	3.76E+00	3.52E+00	8.81E-02	3.60E+00	6.84E+00	4.34E-02	6.89E+00
Plutonium-238	6.00E-01	2.18E+01	2.60E-07	2.18E+01	4.89E-04	1.30E-07	4.89E-04	3.42E-05	1.74E-07	3.44E-05
Plutonium-239/40	6.00E-01	2.05E+01	4.90E-07	2.05E+01	1.32E-03	2.45E-07	1.32E-03	8.26E-03	3.27E-07	8.26E-03
Radium-224	1.32E+00	9.67E-02	6.06E-02	1.57E-01	6.08E-02	4.41E-02	1.05E-01	3.84E-02	2.20E-02	6.04E-02
Radium-226	8.27E-01	5.47E-02	4.20E-02	9.67E-02	3.44E-02	3.08E-02	6.52E-02	2.17E-02	1.50E-02	3.67E-02
Radium-228	1.33E+00	3.12E-06		3.12E-06	1.96E-06		1.96E-06	1.24E-06		1.24E-06
Thorium-228	1.13E+00	1.96E-03	5.19E-02	5.39E-02	6.07E-03	3.78E-02	4.39E-02	3.87E-03	1.88E-02	2.27E-02
Thorium-230	8.40E-01	2.12E-04	2.89E-06	2.15E-04	6.59E-04	1.44E-06	6.60E-04	4.20E-04	1.92E-06	4.22E-04
Thorium-232	7.40E-01	1.61E-04	2.06E-02	2.08E-02	5.00E-04	1.51E-02	1.56E-02	3.19E-04	7.32E-03	7.64E-03
Thorium-234	1.52E+00	1.31E-01	1.07E-04	1.31E-01	1.50E-01	5.33E-05	1.50E-01	2.68E-01	7.10E-05	2.68E-01
Tritium	4.14E+02	1.30E-01		1.30E-01	1.33E-01		1.33E-01	1.30E-01		1.30E-01
Uranium-234	9.50E-01	1.58E-03	1.09E-06	1.58E-03	1.75E-02	5.46E-07	1.75E-02	1.38E-01	7.29E-07	1.38E-01
Uranium-235/236	6.00E-01	2.31E-03	2.47E-03	4.78E-03	2.56E-02	1.86E-03	2.75E-02	2.02E-01	8.07E-04	2.03E-01
Uranium-238	9.50E-01	1.40E-03	5.38E-04	1.94E-03	1.56E-02	3.70E-04	1.59E-02	1.23E-01	2.24E-04	1.23E-01
Total		5.57E+01	3.23E-01	5.60E+01	3.97E+00	2.36E-01	4.21E+00	7.79E+00	1.16E-01	7.91E+00
WCTRIB-1										
Cobalt-60	3.00E+02	1.88E-02	2.18E+01	2.18E+01	1.19E+00	1.59E+01	1.71E+01	2.75E-01	7.80E+00	8.07E+00
Cesium-137	8.50E+03	9.24E+00	1.39E+02	1.48E+02	2.99E+01	1.02E+02	1.32E+02	1.13E+01	4.95E+01	6.08E+01
Strontium-90	6.80E+02	1.02E+00	4.52E-02	1.07E+00	3.71E+00	2.26E-02	3.73E+00	8.11E+00	3.02E-02	8.14E+00
Total		1.03E+01	1.61E+02	1.71E+02	3.48E+01	1.18E+02	1.53E+02	1.96E+01	5.73E+01	7.70E+01
West Seep										

Table 9.6b. (continued)

Radionuclide[a]	Soil Activity[b] (pCi/g)	White-footed mouse Internal	White-footed mouse External	White-footed mouse Total	Red Fox Internal	Red Fox External	Red Fox Total	White-tailed Deer Internal	White-tailed Deer External	White-tailed Deer Total
Actinium-228	1.19E+00	6.34E-07	3.32E-02	3.32E-02	7.00E-07	2.44E-02	2.44E-02	1.94E-08	1.18E-02	1.18E-02
Americium-241	8.39E-01	1.31E+01	4.78E-04	1.31E+01	5.87E-03	4.25E-04	6.29E-03	2.36E-02	7.04E-05	2.37E-02
Bismuth-214	6.40E-01	3.58E-03	2.80E-02	3.16E-02	3.27E-03	2.05E-02	2.37E-02	2.91E-03	1.00E-02	1.29E-02
Cesium-137	4.34E+02	4.72E-01	7.10E+00	7.57E+00	1.53E+00	5.20E+00	6.73E+00	5.75E-01	2.53E+00	3.10E+00
Curium-243/244	2.40E-02	3.32E-01	8.22E-05	3.33E-01	3.44E-05	6.27E-05	9.71E-05	1.58E-04	2.60E-05	1.84E-04
Curium-245/246	3.35E-02	4.29E-01	7.56E-05	4.29E-01	4.44E-05	5.94E-05	1.04E-04	2.04E-04	2.16E-05	2.26E-04
Cobalt-57	2.00E-02	2.10E-07	6.22E-05	6.24E-05	1.07E-05	4.79E-05	5.86E-05	1.86E-06	1.91E-05	2.09E-05
Cobalt-60	7.20E+04	4.51E+00	5.23E+03	5.23E+03	2.86E+02	3.83E+03	4.11E+03	6.59E+01	1.87E+03	1.94E+03
Europium-152	-6.30E-02	-1.86E-05	-2.25E-03	-2.27E-03	-1.29E-05	-1.61E-03	-1.63E-03	-6.83E-06	-8.47E-04	-8.54E-04
Lead-212	1.34E+00	4.84E-01	6.11E-02	5.45E-01	7.94E-03	4.45E-02	5.25E-02	4.35E-03	2.22E-02	2.65E-02
Lead-214	7.50E-01	1.81E-03	3.80E-02	3.98E-02	1.53E-04	2.79E-02	2.80E-02	1.81E-05	1.35E-02	1.35E-02
Plutonium-238	8.13E-02	2.95E+00	3.53E-08	2.95E+00	6.63E-05	1.76E-08	6.63E-05	4.64E-06	2.35E-08	4.66E-06
Plutonium-239/40	1.10E+00	3.75E+01	8.99E-07	3.75E+01	2.41E-03	4.49E-07	2.41E-03	1.51E-02	5.99E-07	1.51E-02
Potassium-40	2.12E+01	2.91E+00	9.65E-02	3.01E+00	2.81E+00	7.05E-02	2.88E+00	5.47E+00	3.47E-02	5.51E+00
Radium-224	2.46E+00	1.80E-01	1.13E-01	2.93E-01	1.13E-01	8.22E-02	1.96E-01	7.16E-02	4.09E-02	1.13E-01
Radium-226	7.87E-01	5.21E-02	4.00E-02	9.20E-02	3.27E-02	2.93E-02	6.20E-02	2.07E-02	1.42E-02	3.49E-02
Radium-228	1.40E+00	3.28E-06		3.28E-06	2.06E-06		2.06E-06	1.30E-06		1.30E-06
Strontium-90	1.88E+02	2.83E-01	1.25E-02	2.96E-01	1.02E+00	6.25E-03	1.03E+00	2.24E+00	8.34E-03	2.25E+00
Thallium-208	4.60E-01	3.04E-02	4.48E-02	7.52E-02	6.40E-02	3.28E-02	9.68E-02	9.59E-04	1.60E-02	1.69E-02
Thorium-228	1.39E+00	2.41E-03	6.38E-02	6.62E-02	7.46E-03	4.65E-02	5.39E-02	4.76E-03	2.31E-02	2.79E-02
Thorium-230	9.81E-01	2.48E-04	3.37E-06	2.51E-04	7.69E-04	1.68E-06	7.71E-04	4.90E-04	2.25E-06	4.93E-04
Thorium-232	1.20E+00	2.61E-04	3.35E-02	3.37E-02	8.11E-04	2.46E-02	2.54E-02	5.17E-04	1.19E-02	1.24E-02
Thorium-234	1.55E+00	3.05E-02	1.08E-04	3.06E-02	3.45E-02	5.40E-05	3.46E-02	5.89E-02	7.20E-05	5.90E-02
Tritium	9.62E+01	3.01E-02		3.01E-02	3.09E-02		3.09E-02	3.01E-02		3.01E-02
Uranium-232	1.78E-01	3.29E-04	4.62E-07	3.30E-04	3.65E-03	2.31E-07	3.65E-03	2.88E-02	3.08E-07	2.88E-02
Uranium-233/234	4.51E+00	7.58E-03	1.76E-05	7.60E-03	8.40E-02	8.78E-06	8.40E-02	6.62E-01	1.17E-05	6.62E-01
Uranium-234	1.19E+00	1.98E-03	1.37E-06	1.98E-03	2.19E-02	6.85E-07	2.19E-02	1.73E-01	9.13E-07	1.73E-01
Uranium-235	3.80E-01	5.83E-04	1.56E-03	2.15E-03	6.47E-03	1.18E-03	7.65E-03	5.10E-02	5.11E-04	5.15E-02
Uranium-238	1.82E+00	2.69E-03	1.03E-03	3.72E-03	2.98E-02	7.09E-04	3.05E-02	2.35E-01	4.29E-04	2.35E-01
Total		6.33E+01	5.24E+03	5.30E+03	2.92E+02	3.83E+03	4.12E+03	7.56E+01	1.87E+03	1.95E+03

Table 9.6b. (continued)

Radionuclide[a]	Soil Activity[b] (pCi/g)	White-footed mouse Internal	White-footed mouse External	White-footed mouse Total	Red Fox Internal	Red Fox External	Red Fox Total	White-tailed Deer Internal	White-tailed Deer External	White-tailed Deer Total
SWSA 5 Drainage D-2										
Actinium-228	2.30E+00	1.23E-06	6.41E-02	6.41E-02	1.35E-06	4.71E-02	4.71E-02	3.76E-08	2.28E-02	2.28E-02
Bismuth-214	8.20E-01	4.59E-03	3.58E-02	4.04E-02	4.19E-03	2.62E-02	3.04E-02	3.73E-03	1.28E-02	1.65E-02
Calcium-45	1.30E+01	4.81E-01	2.34E-06	4.81E-01	4.26E-03	1.17E-06	4.26E-03	1.99E-02	1.56E-06	1.99E-02
Carbon-14	4.60E-01	6.00E-04	1.78E-08	6.00E-04	6.37E-04	8.90E-09	6.37E-04	1.18E-03	1.19E-08	1.18E-03
Cesium-137	1.99E+01	2.16E-02	3.26E-01	3.47E-01	7.00E-02	2.39E-01	3.09E-01	2.64E-02	1.16E-01	1.42E-01
Iodine-129	3.30E+00	2.31E-02	1.23E-03	2.44E-02	4.34E-02	1.17E-03	4.45E-02	5.02E-04	8.20E-05	5.84E-04
Lead-210	6.10E+00									
Lead-212	9.23E-01	3.34E-01	4.21E-02	3.76E-01	5.47E-03	3.07E-02	3.61E-02	3.00E-03	1.53E-02	1.83E-02
Lead-214	1.40E+00	4.99E-01	7.09E-02	5.70E-01	7.95E-03	5.20E-02	6.00E-02	4.48E-03	2.52E-02	2.97E-02
Potassium-40	2.01E+01	2.76E+00	9.15E-02	2.85E+00	2.67E+00	6.68E-02	2.73E+00	5.19E+00	3.29E-02	5.22E+00
Radium-226	7.90E-01	5.23E-02	4.01E-02	9.24E-02	3.29E-02	2.94E-02	6.23E-02	2.08E-02	1.43E-02	3.51E-02
Radium-228	1.88E+00	4.41E-06		4.41E-06	2.77E-06		2.77E-06	1.75E-06		1.75E-06
Strontium-90	1.28E+02	1.93E-01	8.51E-03	2.01E-01	6.98E-01	4.26E-03	7.02E-01	1.53E+00	5.68E-03	1.53E+00
Technetium-99	1.18E+00	2.32E-04	4.25E-07	2.32E-04	4.48E-05	2.13E-07	4.50E-05	2.32E-04	2.83E-07	2.32E-04
Thorium-228	1.50E+00	2.60E-03	6.89E-02	7.15E-02	8.06E-03	5.02E-02	5.82E-02	5.13E-03	2.50E-02	3.01E-02
Thorium-232	2.15E+00	4.68E-04	6.00E-02	6.04E-02	1.45E-03	4.40E-02	4.55E-02	9.27E-04	2.13E-02	2.22E-02
Thallium-208	1.40E+00	9.24E-02	1.36E-01	2.29E-01	1.95E-01	9.99E-02	2.95E-01	2.92E-03	4.86E-02	5.15E-02
Tritium	2.29E+01	7.18E-03		7.18E-03	7.35E-03		7.35E-03	7.18E-03		7.18E-03
Total		4.47E+00	9.45E-01	5.42E+00	3.75E+00	6.90E-01	4.44E+00	6.81E+00	3.40E-01	7.15E+00
WAG 7 WOC										
Actinium-228	1.09E+00	5.81E-07	3.04E-02	3.04E-02	6.41E-07	2.23E-02	2.23E-02	1.78E-08	1.08E-02	1.08E-02
Americium-241	1.11E-01	1.73E+00	6.32E-05	1.73E+00	7.76E-04	5.62E-05	8.32E-04	3.13E-03	9.31E-06	3.14E-03
Bismuth-214	6.50E-01	3.64E-03	2.84E-02	3.21E-02	3.32E-03	2.08E-02	2.41E-02	2.96E-03	1.02E-02	1.31E-02
Cesium-137	5.62E+03	6.11E+00	9.68E+01	1.03E+02	1.98E+01	7.09E+01	9.07E+01	7.44E+00	3.45E+01	4.19E+01
Curium-243/244	1.08E+00	1.50E+01	3.70E-03	1.50E+01	1.55E-03	2.82E-03	4.37E-03	7.13E-03	1.17E-03	8.29E-03
Cobalt-57	9.00E-02	9.47E-07	2.80E-04	2.81E-04	4.81E-05	2.16E-04	2.64E-04	8.35E-06	8.58E-05	9.42E-05
Cobalt-60	2.02E-01	1.26E-05	1.47E-02	1.47E-02	8.04E-04	1.07E-02	1.15E-02	1.85E-04	5.25E-03	5.43E-03

Table 9.6b. (continued)

Radionuclide[a]	Soil Activity[b] (pCi/g)	White-footed mouse Internal	White-footed mouse External	White-footed mouse Total	Red Fox Internal	Red Fox External	Red Fox Total	White-tailed Deer Internal	White-tailed Deer External	White-tailed Deer Total
Plutonium-238	2.42E-01	8.79E+00	1.05E-07	8.79E+00	1.97E-04	5.25E-08	1.97E-04	1.38E-05	7.00E-08	1.39E-05
Plutonium-239/40	5.10E-02	1.74E+00	4.17E-08	1.74E+00	1.12E-04	2.08E-08	1.12E-04	7.02E-04	2.78E-08	7.02E-04
Potassium-40	2.60E+01	3.57E+00	1.18E-01	3.69E+00	3.45E+00	8.65E-02	3.54E+00	6.71E+00	4.26E-02	6.76E+00
Thorium-228	5.00E-01	8.65E-04	2.30E-02	2.38E-02	2.69E-03	1.67E-02	1.94E-02	1.71E-03	8.33E-03	1.00E-02
Thorium-230	4.10E-01	1.04E-04	1.41E-06	1.05E-04	3.22E-04	7.04E-07	3.22E-04	2.05E-04	9.39E-07	2.06E-04
Thorium-232	4.00E-01	8.70E-05	1.12E-02	1.12E-02	2.70E-04	8.19E-03	8.46E-03	1.72E-04	3.96E-03	4.13E-03
Uranium-233/234	1.10E+00	1.85E-03	4.28E-06	1.85E-03	2.05E-02	2.14E-06	2.05E-02	1.62E-01	2.85E-06	1.62E-01
Uranium-235	8.30E-02	1.27E-04	3.41E-04	4.69E-04	1.41E-03	2.58E-04	1.67E-03	1.11E-02	1.12E-04	1.12E-02
Uranium-238	1.23E+00	1.82E-03	6.96E-04	2.51E-03	2.01E-02	4.79E-04	2.06E-02	1.59E-01	2.90E-04	1.59E-01
Total		3.69E+01	9.70E+01	1.34E+02	2.33E+01	7.11E+01	9.44E+01	1.45E+01	3.45E+01	4.90E+01
WOC										
Americium-241	2.86E+00	4.46E+01	1.63E-03	4.46E+01	2.00E-02	1.45E-03	2.14E-02	8.06E-02	2.40E-04	8.08E-02
Curium-244	3.22E+00	5.15E+01	1.17E-06	5.15E+01	4.61E-03	5.83E-07	4.61E-03	2.13E-02	7.78E-07	2.13E-02
Cobalt-60	4.56E+00	2.86E-04	3.31E-01	3.31E-01	1.81E-02	2.42E-01	2.60E-01	4.17E-03	1.18E-01	1.23E-01
Cesium-137	3.57E+02	3.88E-01	5.84E+00	6.23E+00	1.26E+00	4.28E+00	5.54E+00	4.73E-01	2.08E+00	2.55E+00
Plutonium-238	1.04E+00	3.78E+01	4.51E-07	3.78E+01	8.48E-04	2.26E-07	8.48E-04	5.93E-05	3.01E-07	5.96E-05
Plutonium-239/40	8.07E+00	2.75E+02	6.59E-06	2.75E+02	1.77E-02	3.30E-06	1.77E-02	1.11E-01	4.40E-06	1.11E-01
Strontium-90	2.16E+01	3.25E-02	1.44E-03	3.40E-02	1.18E-01	7.18E-04	1.18E-01	2.58E-01	9.58E-04	2.59E-01
Technetium-99	3.94E+00	7.75E-04	1.42E-06	7.76E-04	1.50E-04	7.10E-07	1.50E-04	7.74E-04	9.46E-07	7.75E-04
Thorium-228	2.81E+00	4.86E-03	1.29E-01	1.34E-01	1.51E-02	9.40E-02	1.09E-01	9.62E-03	4.68E-02	5.64E-02
Thorium-230	5.50E+00	1.39E-03	1.89E-05	1.41E-03	4.31E-03	9.45E-06	4.32E-03	2.75E-03	1.26E-05	2.76E-03
Thorium-232	1.80E+00	3.92E-04	5.02E-02	5.06E-02	1.22E-03	3.68E-02	3.81E-02	7.76E-04	1.78E-02	1.86E-02
Uranium-233/234	3.24E+00	5.45E-03	1.26E-05	5.46E-03	6.04E-02	6.31E-06	6.04E-02	4.76E-01	8.41E-06	4.76E-01
Uranium-235	2.49E-01	3.82E-04	1.02E-03	1.41E-03	4.24E-03	7.73E-04	5.01E-03	3.34E-02	3.35E-04	3.37E-02
Uranium-238	2.97E+00	4.39E-03	1.68E-03	6.07E-03	4.86E-02	1.16E-03	4.98E-02	3.83E-01	7.00E-04	3.84E-01
Total		4.09E+02	6.36E+00	4.16E+02	1.57E+00	4.66E+00	6.23E+00	1.85E+00	2.26E+00	4.12E+00

[a] Dose from each radionuclide includes all short-lived daughter products

[b] Representative concentration is the minimum of the UCL95 and the maximum detect.